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September 20, 2022

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

Attention: Ms. Sara Hardgrave, Acting Commission Secretary

Dear Ms. Hardgrave:

Re: FortisBC Energy Inc. (FEI)

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Interior Transmission System Transmission Integrity Management Capabilities Project (ITS TIMC Project or the Project) (Application)

Pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA), FEI applies to the British Columbia Utilities Commission (BCUC) for a CPCN for the ITS TIMC Project as described in the attached Application. In this Application, FEI is also requesting approval, pursuant to sections 59 to 61 of the UCA, to transfer the balance of the TIMC Development Cost deferral account that is related to the ITS TIMC Application, estimated to be a credit of $0.574 million, from the existing non-rate base TIMC Development Cost deferral account to the existing rate base TIMC Development Cost deferral account, which has an approved amortization period of 5 years.

Request for Confidential Treatment of Certain Appendices

To support the Application, FEI has filed several appendices, with the following ones being filed confidentially pursuant to Section 19 of the BCUC's Rules of Practice and Procedure regarding confidential documents, as set out in Order G-178-22.

- Appendix B – JANA's (Quantitative Risk Assessment expert) Reports
- Appendix G – Stantec FEED Report Documents
- Appendix H – Risk Analysis
- Appendix J – Financial Schedules

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

Appendix B

Appendix B consists of reports to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a quantitative risk assessment (QRA) of the safety risks to FEI's transmission systems. These QRA expert reports identify vulnerable points on the Company's gas transmission system and areas of risk to FEI's assets 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.

Appendices G and H

Appendices G and H are engineering and risk analysis documents and should be kept confidential on the basis that they contain operationally sensitive information pertaining to the Company's assets, which 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 areas of risk to the Project. 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 J

Appendix J includes cost estimates, containing capital cost estimates for the Project. 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.

Access to Confidential Information for Interveners

Should parties that choose to register in the review of this Application require access to some or all of the information filed confidentially, FEI has provided a proposed Undertaking of Confidentiality in Appendix Q-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. FEI requests that the BCUC provide it with the opportunity to file comments on any objections or concerns that it may have, should any other registered parties seek access to confidential information.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Registered Interveners in the:
FEI Annual Review for 2023 Delivery Rates
FEI CTS TIMC CPCN Application

FortisBC Energy Inc.

Application for Approval of a Certificate of Public Convenience and Necessity for the Interior Transmission System Transmission Integrity Management Capabilities Project

September 20, 2022

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1. APPLICATION

1.1 *INTRODUCTION*

FortisBC Energy Inc. (FEI or the Company) applies to the British Columbia Utilities Commission (BCUC), pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA), for a Certificate of Public Convenience and Necessity (CPCN) for the Interior Transmission System (ITS) Transmission Integrity Management Capabilities (TIMC) Project (referred to as the ITS TIMC Project or the Project) as described in this application (Application).

As approved by BCUC Order C-3-22, the deferral costs related to the ITS TIMC Application are recorded in the existing non-rate base TIMC Development Cost deferral account, which also recorded the deferral costs related to the Coastal Transmission System (CTS) TIMC application. Pursuant to sections 59-61 of the UCA, and consistent with the approved treatment of the deferred costs related to the CTS TIMC application, FEI is also requesting approval to transfer the balance of the TIMC Development Cost deferral account related to the ITS TIMC Application, estimated to be a credit of $0.574 million at December 31, 2023, from the existing non-rate base deferral account to the existing rate base TIMC Development Cost deferral account which has an approved amortization period of 5 years.

The ITS TIMC Project is a pipeline integrity project that is required for FEI to continue to operate its 8 identified ITS pipelines with credible cracking threats in a safe and reliable manner. Cracking threats have resulted in rupture failure of transmission pipelines, and FEI's risk assessment has confirmed that cracking is a credible threat to these 8 ITS pipelines. The only feasible and cost effective alternative to mitigate cracking threats is to adopt the use of electro-magnetic acoustic transducer (EMAT) in-line inspection (ILI) tools, which can detect planar imperfections such as cracking, and are currently available only for larger diameter pipelines. EMAT ILI is increasingly becoming the standard industry practice on pipelines of this size. As a prudent operator, FEI must keep pace with evolving industry practice and regulatory expectations for managing the safety risk posed by cracking threats. The potential consequences of not doing so are significant and unacceptable to FEI.

The Project is confined to existing rights of way and facilities, and consists of the replacement of three heavy wall segments on two ITS pipelines and alterations to 13 transmission pressure facilities. These modifications are necessary to enable EMAT ILI runs. The estimated total cost of the Project in as-spent dollars is $84.588 million, including Allowance for Funds Used During Construction (AFUDC). The ITS TIMC Project is the most cost-effective way for FEI to mitigate the cracking threats to the 8 ITS pipelines.

FEI submits that the information provided in this Application, which meets the requirements of the BCUC's CPCN Guidelines[1], demonstrates that the Project is in the public interest and FEI

[1] Appendix A to Order G-20-15.

requests that the BCUC grant a CPCN for the Project be described in the Application. A draft Procedural Order and draft Final Order are included in Appendices Q-1 and Q-2, respectively.

In its Decision and Order C-3-22 approving the CTS TIMC CPCN, the BCUC Panel requested FEI to provide a suggestion in terms of timing for the preparation and review of a proposal to develop a robust process to assess the value of incremental improvement in risk to fully assess the cost and benefits to ratepayers of a proposed project. In its compliance letter filed on June 17, 2022, FEI provided some initial observations on the BCUC direction and suggested a process where assessing the value of incremental risk improvements can be considered further. FEI also proposed to include considerations associated with assessing the value of incremental improvements in risk as part of its application for the ITS TIMC Project, which can then be reviewed as part of the ITS TIMC regulatory proceeding. FEI provides its current response to this issue in Appendix R attached to this Application but considers that fully assessing the value of incremental improvements in risk is more appropriately considered to be an ongoing conversation that can occur over future filings and, in particular, as part of CPCN applications. .

1.1 *SUMMARY OF APPROVALS SOUGHT*

FEI is seeking the approvals necessary to implement the Project as proposed and ensure the appropriate financial treatment of costs for regulatory purposes. The approvals are summarized below. The specific form of approvals sought is set out in the draft order in Appendix O-2.

1.1.1 Certificate of Public Convenience and Necessity

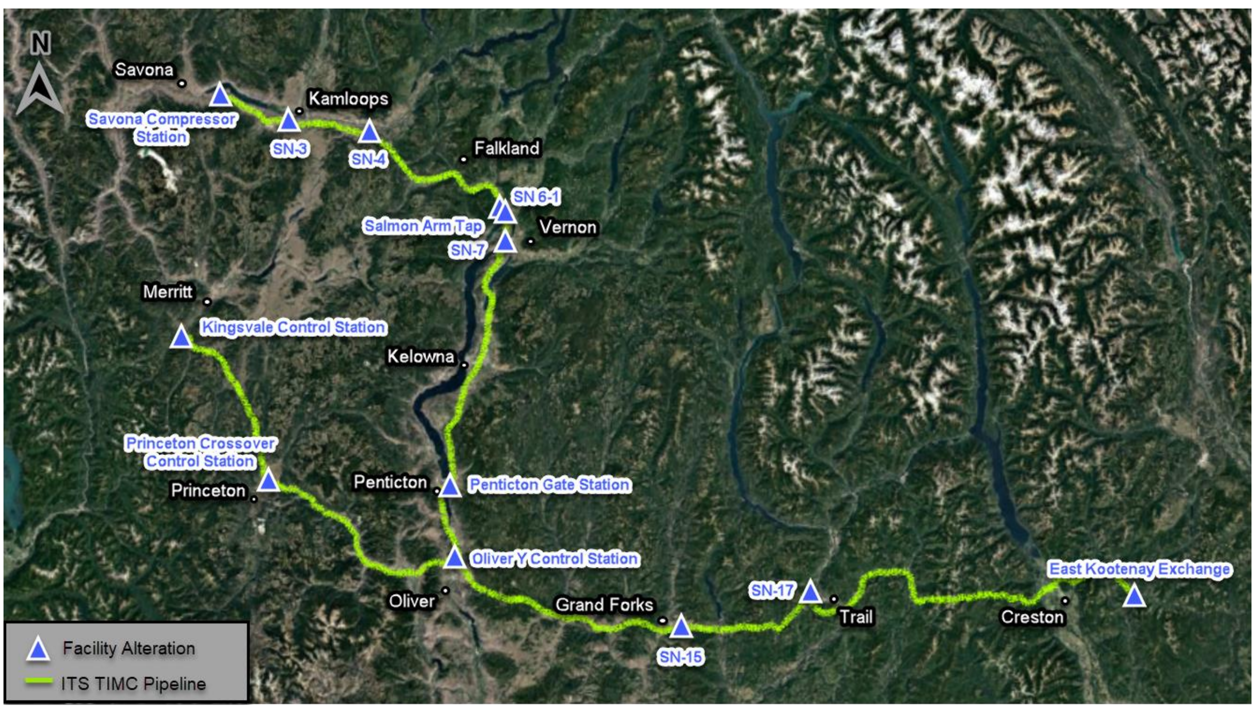
Pursuant to sections 45 and 46 of the UCA, FEI requests that the BCUC grant a CPCN for the ITS TIMC Project as described in the Application. The Project will encompass the components of the Project as summarized below and described in detail in Section 5 of the Application:

1. Alterations to two ITS pipelines, consisting of the replacement of three heavy wall segments within existing rights of way, at the locations shown in Figure 1-1 below noted as “Event 1”, “Event 29” and “Event 31”. “Events” are instances where FEI’s current ILI tools have had speed excursions which indicate the need for pipeline alternations to enable the EMAT ILI tools to travel within their optimal velocity range.

2. Alterations to 13 ITS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure regulating and flow control capabilities as needed to run the EMAT ILI tools and respond to crack findings, in the locations shown in Figure 1-2 below.

Figure 1-1: Project Overview Map Showing Pipeline Alteration Locations

Figure 1-2: Project Overview Map Showing Facilities Alteration Locations



1.1.2 Disposition of Balance in TIMC Development Cost Deferral Account

In Order G-237-18, the BCUC approved the creation of the TIMC Development Cost deferral account, attracting a weighted average cost of capital (WACC) return, with disposition to be proposed in a future application. Costs charged to the TIMC deferral account include:

- Application Costs, which include CPCN proceeding costs, which were estimated based on a written process with two rounds of Information Requests;
- Preliminary Stage Development Costs, which consist of the development of a quantitative risk assessment, records and data refinement, and EMAT ILI Pilot project costs; and
- The Pre-Construction Development Costs, which include the costs related to front-end engineering and design, CPCN development costs including environmental assessments, Indigenous engagement, and stakeholder consultation.

Consistent with the approved treatment of deferral costs related to the CTS TIMC application, FEI is seeking approval, pursuant to sections 59 to 61 of the UCA, to transfer the balance of the TIMC Development Cost deferral account that is related to the ITS TIMC Application, estimated to be a credit of $0.574 million, from the existing non-rate base TIMC Development Cost deferral account to the existing rate base TIMC Development Cost deferral account, which has an approved amortization period of 5 years.

1.1.3 Confidential Filings Request

Certain sections and appendices of the Application contain operationally and commercially sensitive information, 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. FEI is still completing negotiation for the acquisition of temporary land rights for construction activities and public disclosure of associated payments, costs and strategies could hinder the ability to negotiate fair and reasonable agreements. The Confidential Appendices also contain market sensitive information that should be kept confidential so as not to influence the construction contractor selection process for the Project.

In accordance with the BCUC's Rules of Practice and Procedure established in Order G-178-22 regarding Confidential Documents, FEI requests that the interveners requesting access to confidential information execute an Undertaking of Confidentiality. A sample of the Undertaking of Confidentiality is included as Appendix O-3.

1.2 *EXECUTIVE SUMMARY*

1.2.1 FEI Must Enhance its Integrity Management Capabilities to Mitigate the Risk Due to Cracking on the ITS

The ITS TIMC Project is needed to enhance FEI's integrity management practices to mitigate cracking threats on 8 ITS pipelines in the ITS.

As required by regulation, FEI manages threats to the integrity of its transmission pipeline systems in a proactive and systematic way through its Integrity Management Program – Pipeline (IMP-P). However, integrity management practices continually improve as the industry learns more about the threats to pipelines and as it develops new tools and techniques to manage them. This is the case with the threat of cracking. Cracking is a threat to the safe operation of pipelines that has the potential to grow during the operation of a pipeline and lead to failures, including ruptures. The industry is learning that pipelines are more susceptible to cracking threats than previously believed, and industry practice is moving towards active monitoring and mitigating cracking threats on larger diameter pipelines using EMAT ILI tools. However, modifications to pipelines and related facilities may be required in order to enable the use of these tools.

Given the evolution of industry knowledge and practice related to cracking threats, FEI contracted JANA Corporation (JANA), a quantitative risk assessment expert, to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a baseline system-level QRA of the safety risks to FEI's transmission systems. Based on its assessments, JANA concluded that pipelines on FEI's CTS and ITS are susceptible to cracking threats which can lead to failure by rupture.

In 2021, as part of the CTS TIMC Project proceeding, the BCUC retained Dynamic Risk Assessment Systems Inc., an external independent pipeline integrity expert consultant, to review FEI's application and submit an independent report on FEI's pipeline integrity management planning with respect to the threat of Stress Corrosion Cracking (SCC), including the preparation and use of JANA's reports, and to provide their expert opinion in response to information requests from the BCUC and interveners. The report and responses to the information requests, attached as Appendices O-1 and O-2, concluded that SCC is a credible threat for FEI that could lead to pipeline rupture, that there is a gap in FEI's existing integrity management practices, and that EMAT ILI tools (when used in conjunction with other integrity management practices) were appropriate to detect and manage the threat of SCC.

Given FEI's obligations to ensure safe and reliable operation of its assets, the credibility of cracking threats to the ITS identified by FEI's risk assessment, the potential consequences of not addressing these threats (as discussed in Section 3.5.3), and emerging changes in industry practices, FEI as a prudent operator needs to enhance its transmission integrity management capabilities to mitigate cracking threats on the 8 ITS pipelines.

1.2.2 FEI Evaluated Several Alternatives and Selected the EMAT ILI Program to Achieve the Project Objective

Based on the Project need and justification set out in Section 3, the objective of the Project is to enhance FEI's integrity management capabilities to mitigate cracking threats to the 8 ITS pipelines (Project Objective).

As described in Section 4, there are six alternatives currently available that could achieve the Project Objective which FEI evaluated using non-financial and financial criteria. A summary of the alternatives evaluation is provided in **Error! Reference source not found.** below.

Table 1-1: Summary of Alternatives Evaluation

	Non-Financial Assessment	Technical Feasibility	Financial Assessment	Financial Feasibility
Alternative 1: SCCDA		Not Feasible		
Alternative 2: PRS		Not Feasible		
Alternative 3: HSTP		Not Feasible		
Alternative 4: EMAT ILI		**Feasible**		**Feasible**
Alternative 5: PLR		Potentially Feasible		Not Feasible
Alternative 6: PLE		Potentially Feasible		Not Feasible

Based on an assessment using the non-financial criteria, three alternatives were screened out as not technically feasible because they were unable to be implemented on the ITS in such a way as to sufficiently mitigate cracking threats. Based on a financial assessment, two of the remaining three alternatives were screened out because they were significantly higher in cost compared to EMAT ILI. EMAT ILI is therefore the only alternative which is both technically and financially feasible and is therefore the preferred alternative for the ITS TIMC Project.

1.2.2.1 FEI Cannot Defer ITS TIMC Project Due to the Potential for Hydrogen-Related Developments on its System

During the CTS TIMC CPCN proceeding, the BCUC Panel asked information requests to understand FEI's future plans for, and evaluation of the impacts of, blending increasing concentrations of hydrogen into its natural gas transmission and distribution systems. As FEI discussed in the responses to those information requests[2] (included as Appendix P), regardless of FEI's activities to study, test and verify that hydrogen is safe to use in the existing gas system and to identify any changes that may be required to ensure the continued safe operation of the gas system, the data collected by EMAT ILI is necessary to allow FEI to identify and address any cracking threats on the ITS pipelines today. While there is some uncertainty around the future pace of hydrogen adoption and distribution within FEI's existing system, this uncertainty has no impact on the need for the ITS TIMC Project. FEI's ITS pipelines will continue to be used and useful as they are capable of safely transporting a blend of hydrogen, and large scale replacement of the ITS is neither expected nor cost-effective. The only prudent course of action at this time is to modify the existing ITS pipelines to allow them to be inspected using EMAT ILI. This will allow

[2] CTS TIMC CPCN proceeding, FEI Exhibit B-20 FEI further response to Panel IR No. 1

any existing cracking issues to be identified and addressed. Given that the ITS pipelines can carry a blend of hydrogen today, and replacement of the ITS to accommodate hydrogen is not reasonably contemplated, FEI's ITS pipelines will continue to be used and useful. As FEI has an obligation to provide safe and reliable service to its customers, FEI cannot defer the ITS TIMC Project due to the potential for hydrogen-related developments on its system.

The BCUC, in its decision for the CTS TIMC CPCN[3], was satisfied with FEI's response that deployment of EMAT ILI tools can potentially enhance the viability of the CTS network to carry hydrogen blends in the longer term, in addition to providing critical safety enhancements in the near and medium term.

1.2.3 Project Description, Timeline, Costs, and Rate Impacts

As described in Section 5, the Project consists of the work required to modify pipelines within FEI's existing rights of way and associated facilities to ready the ITS for EMAT ILI tools. This work includes the replacement of 3 heavy wall segments to enable the EMAT ILI tools to travel within optimal velocity range on two ITS pipelines. The work also includes alterations to 13 ITS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure regulating and flow control capabilities, as needed to run the EMAT ILI tools, obtain quality data from the EMAT ILI tools, and respond to crack findings.

The preliminary Project schedule is based on receiving BCUC CPCN Approval during Q3 2023 and an assumed construction start of Q2 2025 with Project completion at the end of 2026 and close-out activities to be completed in Q1 2027. The detailed Project schedule and milestones are described in Section 5.5 of the Application.

The total Project cost estimate for the ITS TIMC Project is $84.588 million (as-spent). As described in Section 6 of the Application, the Project will result in an estimated delivery rate impact of 0.72 percent by 2028 when all construction and closing costs are completed and all capital costs have entered FEI's rate base. The average annual delivery rate impact over the five years from 2024 to 2028 is estimated to be 0.14 percent annually or $0.007 per GJ annually as compared to 2022 approved rates. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an average bill increase of approximately $0.63 per year over the five years, or $3.15 cumulatively by 2028.

1.2.4 FEI will Account for Environmental and Archaeological Considerations

Section 7 provides an overview of the Project environment, including a discussion of the environmental and archaeological impacts that the Project may have and FEI's plans to assess and mitigate those impacts.

Based on an Environmental Overview Assessment, the potential for environmental risk associated with the Project is low to moderate and any potential environmental impacts of the

[3] BCUC Decision and Order C-3-22 May 18, 2022; page 46.

Project can be mitigated through the implementation of standard best management practices and mitigation measures.

Based on an Archaeological Overview Assessment (AOA), no registered archaeological or heritage sites overlap with the Project footprint, but the areas where work is required to modify pipelines within FEI's existing rights of way and associated facilities may have moderate to high archaeological potential, with the exception of one valve station which has low archaeological potential. FEI plans to conduct additional archaeological assessments (e.g. Archaeological Impact Assessment (AIA), Preliminary Field Reconnaissance) and archaeological monitoring for the Project to further assess and mitigate potential archaeological and cultural impacts associated with construction within areas of moderate and high archaeological potential identified in the AOA. The additional assessments will provide recommendations to allow for development of site-specific mitigation strategies to offset any potential impacts associated with the Project. Further, any potential archaeological impacts of the Project can be mitigated through the implementation of permit conditions and standard best management practices.

1.2.5 FEI's Public Consultation and Indigenous Groups Engagement Efforts to Date are Sufficient and Will Continue

Section 8 discusses FEI's stakeholder and public consultation and communication efforts regarding the Project and FEI's consultation with Indigenous groups potentially impacted by the Project. FEI has developed a Consultation and Engagement Plan to inform and engage stakeholders and Indigenous groups with respect to the Project.

FEI's consultation and engagement has been sufficient to date, reflecting the Project's scope within existing rights of way and within FEI facilities. FEI has recorded questions, issues, and concerns from Project stakeholders and Indigenous groups and will continue engaging with these groups by keeping lines of communication open as the Project advances. FEI will incorporate feedback as the Project progresses and will continue to work with stakeholders and Indigenous groups to address any outstanding interests and issues throughout the lifecycle of the Project, including through the Project's planning, construction and restoration phases.

1.2.6 Conclusion

FEI submits that the Project is in the public interest and should be approved as set out in the Application.

1.3 *PROPOSED REGULATORY PROCESS*

FEI considers that the extent of regulatory process for the review of the Application should reflect that there is considerable overlap between the subject matter in the ITS TIMC Project and the CTS TIMC Project, which underwent a significant level of review leading up to its approval by the BCUC. Indeed, much of FEI's Application is based on the CTS TIMC Application, and evidence from the CTS TIMC Application proceeding has been included as appendices to this Application. FEI also notes that this is the third integrity-related CPCN project related to ILI tools that it is has filed in recent years, with the first being the Inland Gas Upgrades Project, approved by Order G-12-20. FEI's use of ILI tools has also been a subject explored in FEI's 2020-2024 Multi-Year Ratemaking Plan (MRP) and annual reviews under the MRP. Therefore, FEI expects that much of the material in this Application should be familiar to BCUC staff and interveners that customarily participate in the review of FEI's applications to the BCUC, and there will be a much higher level of understanding of the Project than is typical for a CPCN application.

For these reasons, FEI considers that a written process consisting of one round of information requests (IRs) would be appropriate for the review of the Application. FEI's proposed regulatory timetable is set out in Table 1-2 below. FEI proposes that after a round of IRs, there should be submissions to determine whether further process is needed or whether the proceeding can move to the argument phase.

Table 1-2: Proposed Preliminary Regulatory Timetable

ACTION	DATE (2022)
FEI Publishes Notice by	Friday, October 28
Intervener Registration	Thursday, November 17
BCUC Information Request (IR) No. 1	Tuesday, November 22
Intervener IR No. 1	Tuesday, November 29
ACTION	**DATE (2023)**
FEI Response to IR No. 1	Thursday, January 19
Submissions on Further Process	Thursday, February 2

1.4 *ORGANIZATION OF THE APPLICATION*

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

- **Section 2** provides an overview of FEI, and its financial and technical capabilities to carry out the Project.
- **Section 3** describes the need and justification of the Project, including that:
  - cracking is a threat to the integrity of transmission pressure pipelines on FEI's system that can lead to significant safety and other consequences;
  - FEI has identified and correctly prioritized the need to mitigate the threat of cracking on 8 pipelines in its ITS based on the FEI's assessment of the safety risk; and

  - to maintain compliance with regulations and standards and align with evolving industry practice, FEI must enhance its transmission integrity management capabilities to mitigate cracking threats on the 8 ITS pipelines.

- **Section 4** describes the alternatives evaluation process, including alternatives considered, alternatives analysis methodology, alternatives screened out for feasibility, and the basis for selecting EMAT ILI as the preferred alternative.
- **Section 5** provides a detailed description of the Project, including design, construction, resource planning and management, schedule and basis of the cost estimate, as well as setting out a risk analysis and discussing potential Project impacts.
- **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 that the Project may have, and FEI's plans to mitigate those impacts.
- **Section 8** discusses FEI's communication efforts and consultation with the public and stakeholders regarding the Project, including FEI's engagement with Indigenous groups potentially impacted by the Project.
- **Section 9** describes how the Project supports BC's energy objectives, including the Project's positive impact on economic development and employment, as well as how the Project aligns with FEI's most recently filed long-term gas resource plan.
- **Section 10** concludes that the Project is in the public interest and should be approved.

2. APPLICANT

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 energy delivered to customers in British Columbia.

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 DBRS Morningstar and Moody's Investors Service of A and A3, respectively.

2.3 TECHNICAL CAPACITY

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

2.4 COMPANY CONTACT

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E-mail:	diane.roy@fortisbc.com
Regulatory Matters:	gas.regulatory.affairs@fortisbc.com

2.5 *LEGAL COUNSEL*

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Fasken Martineau DuMoulin LLP
2900 – 550 Burrard Street
Vancouver, B.C. V6C 0A3
Phone: (604) 631-4715
Facsimile: (604) 631-3232
E-mail: cbystrom@fasken.com; nrand@fasken.com

3. PROJECT NEED AND JUSTIFICATION

3.1 INTRODUCTION AND OVERVIEW

In this section, FEI describes the need for the Project, which is to enhance FEI's integrity management practices to mitigate cracking threats on 8 pipelines in its Interior Transmission System (ITS) that are susceptible to cracking.

As required by regulation, FEI manages threats to the integrity of its transmission pipeline systems in a proactive and systematic way through its Integrity Management Program – Pipeline (IMP-P). However, integrity management practices continually improve as the industry learns more about the threats to pipelines and as it develops new tools and techniques to manage them. This is the case with the threat of cracking. Since cracking is a threat to the safe operation of pipelines that has the potential to grow during the operation of a pipeline and lead to failures, including ruptures, cracking threats needs to be managed proactively and systematically under applicable regulation. The industry is learning that pipelines are more susceptible to cracking threats than previously believed, and industry practice is moving towards active monitoring and mitigating cracking threats on larger diameter pipelines using electro-magnetic acoustic transducer (EMAT) in-line inspection (ILI) tools. However, costly modifications to pipelines and related facilities can be required in order to enable the use of these tools.

Given the evolution of industry knowledge and practice related to cracking threats, FEI contracted JANA Corporation (JANA), a quantitative risk assessment expert, to assess the susceptibility of FEI's transmission systems to cracking threats and to undertake a quantitative risk assessment (QRA) of the safety risks to FEI's transmission systems. JANA's assessment shows that 9 pipelines on the ITS, of which 8 are large enough diameter for EMAT ILI tools[4], and 11 on the CTS are susceptible to cracking. FEI submitted its CTS TIMC application[5] on February 11, 2021 to address cracking threats on the 11 CTS pipelines and was granted a CPCN[6] for the project on May 18, 2022.

Given FEI's obligations to ensure safe and reliable operation of its assets, the credibility of cracking threats to the ITS identified by JANA, the potential safety and reliability consequences of not addressing these threats, and emerging changes in industry practices, FEI, as a prudent operator, needs to enhance its transmission integrity management capabilities to mitigate cracking threats on 8 ITS pipelines. Figure 3-1 below is a map of the ITS pipelines within the scope of this Project.

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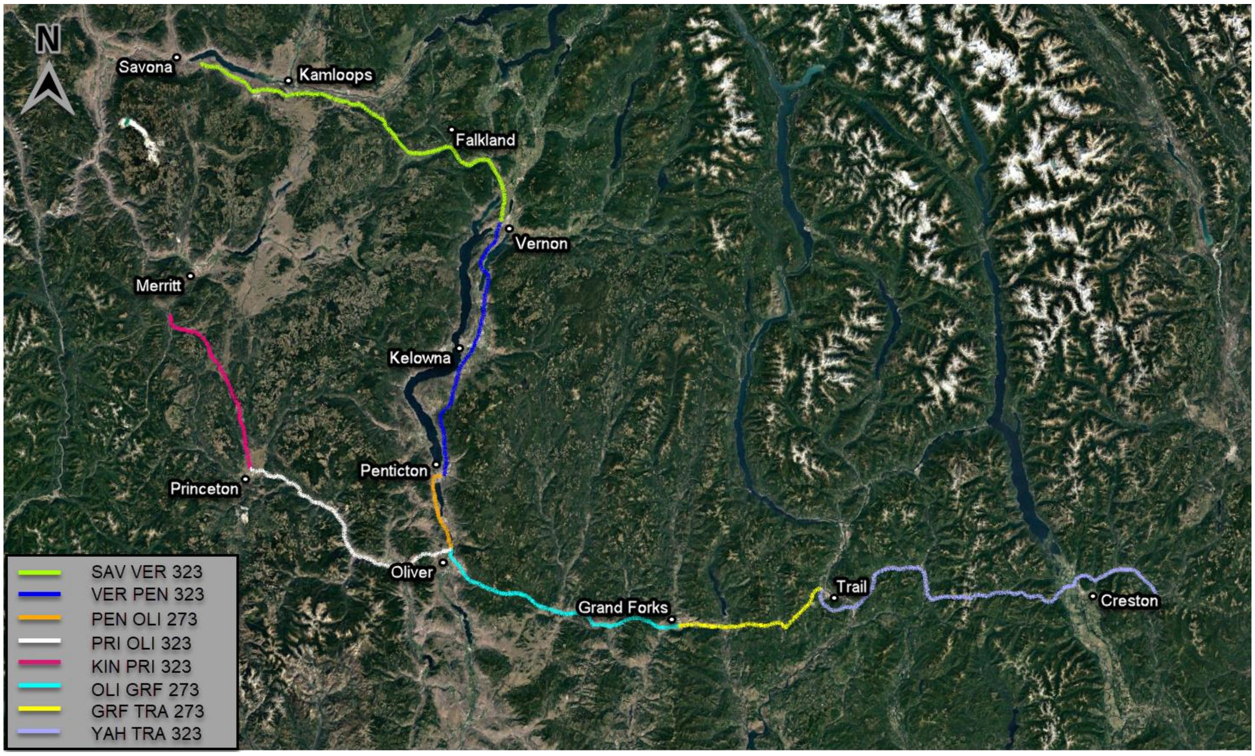
4 Currently, EMAT ILI tools are commercially available for pipelines with diameters NPS 10 and larger. As such, EMAT is not available for the NPS 8 Trail to Castlegar (TRA CAS 219) pipeline, which was identified as susceptible to cracking. Further discussion on the treatment of the TRA CAS 219 ppipeline is provided in Section 3.4.7.

5 Certificate for Public Convenience and Necessity (CPCN) for the Coastal Transmission System Transmission Integrity Management Capabilities Project (CTS TIMC Project), dated February 11, 2021. Online: https://docs.bcuc.com/Documents/Proceedings/2021/DOC_61095_B-1-FEI-CTS-TIMC-Project-CPCN-Application.pdf.

6 BCUC Decision and Order C-3-22, dated May 18, 2022. Online: https://docs.bcuc.com/Documents/Proceedings/2022/DOC_66603_C-3-22-FEI-CTS-TIMC-CPCN-Decision.pdf.

Figure 3-1: 8 ITS Pipelines Requiring System-Level Cracking Mitigation



In the following sections, FEI explains the need and justification for the Project in detail, as follows:

- Section 3.2 describes how pipeline integrity is initially established during design, manufacturing, installation, and commissioning, and is then monitored and maintained by FEI using activities such as ILI. This section also describes how cracking is a threat to FEI's pipelines, but FEI's current integrity management practices on the ITS do not provide the capability of proactively and systematically identifying all instances of cracking.
- Section 3.3 outlines how industry knowledge and practice with respect to cracking threats are evolving, that cracking threats are more pervasive than previously believed, and that ILI tools have been developed that can detect cracking on FEI's system.
- Section 3.4 provides an overview of JANA's analysis of FEI's transmission system, confirming that transmission pipelines on FEI's ITS are susceptible to cracking that can lead to failure, and explains how a QRA informed the prioritization and urgency of FEI's TIMC projects.
- Section 3.5 describes FEI's obligation to enhance its transmission integrity management capabilities to proactively and systematically monitor and mitigate the potential consequences and risks posed by cracking threats to the 88 ITS pipelines. As a prudent operator, FEI must respond to the risk of cracking and keep pace with evolving industry practice for managing this risk.
- Section 3.6 summarizes the Project need and justification.

3.2 *PIPELINE INTEGRITY MANAGEMENT CONCEPTS CENTRAL TO UNDERSTANDING NEED AND JUSTIFICATION FOR PROJECT*

3.2.1 Summary of Section

This section provides background information on pipeline integrity management, which is central to understanding the need and justification for the Project.

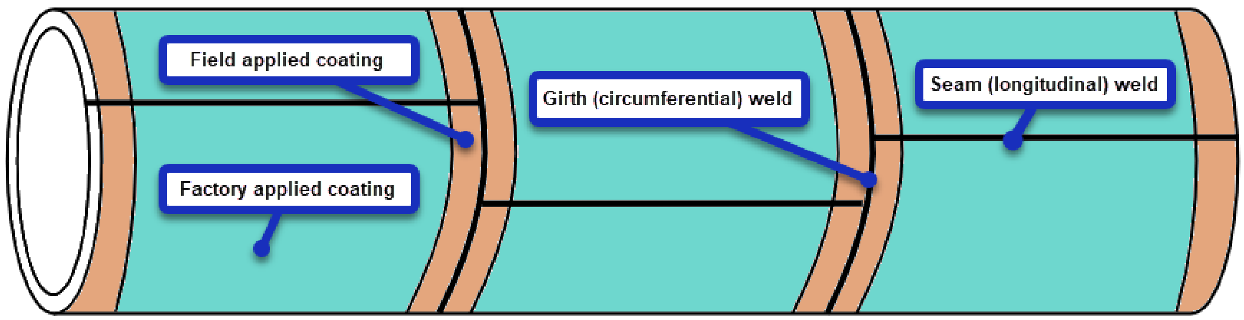
Pipeline integrity management is the "cradle-to-grave" management of a pipeline's suitability for continued safe, reliable, and environmentally responsible delivery of natural gas. As described in detail below, the integrity of a pipeline is initially established through its design, manufacturing, installation, and commissioning, and that integrity is then monitored and maintained during its operation. FEI's IMP-P covers ILI and all other aspects of pipeline integrity management, including identifying and monitoring ongoing hazards and threats[7] to the integrity of FEI's pipelines through various activities. ILI is an industry-preferred integrity management methodology as it provides active monitoring of ongoing threats. FEI's ILI capabilities have been expanding as new ILI tools are developed to monitor different threats and various diameter pipelines. Cracking, including stress corrosion cracking (SCC) and crack-like imperfections in the seam weld of pipelines, is a threat to pipelines, but FEI's existing integrity management tools and practices cannot detect all instances of such cracking.

3.2.2 Integrity of Pipelines is Established During Design, Manufacturing, Installation and Commissioning

The integrity of a pipeline is initially established through the engineering design, manufacturing, installation and commissioning processes. Engineering design must not only reflect regulations and adopted standards, but must also anticipate and provide necessary integrity management capabilities. Design processes establish important specifications pertaining to manufacturing, installation, and commissioning. The following subsections describe the manufacture of pipelines in FEI's transmission systems and the steps taken after manufacturing to ensure their ongoing integrity. Figure 3-2 provides a reference for the pipeline features and terminology discussed in this section.

[7] Hazards and threats are used synonymously, but it is common practice to use one or the other depending on the context. E.g., it is common to refer to "natural hazards" and "cracking threats," but not "natural threats" and cracking hazards."

Figure 3-2: Typical Pipeline Features



3.2.2.1 Modern Pipe Manufacturing Processes Result in Superior Pipe Materials

Steel and pipe manufacturing practices and processes have continually evolved and significant improvements have occurred since the early 1970s. Pipe manufactured prior to 1970 is often referred to as "vintage" pipe and pipe manufactured after 1970 is referred to as "modern" pipe. Vintage pipe can contain a larger quantity of manufacturing anomalies, with the majority of these anomalies occurring in the seam welds, which are also referred to as longitudinal welds. The quantity of manufacturing anomalies also varies with pipe manufacturer. Types of manufacturing anomalies are further discussed in Section 3.2.4.2.

The majority of pipe in FEI's transmission systems was manufactured using one of two processes:

1. **Electric Resistance Welding**
   The majority of pipelines in FEI's transmission systems that are nominal pipe size (NPS) 18 and smaller were manufactured using the electric resistance welding (ERW) process. The ERW process uses an electric current to bond two edges of steel to form a cylindrical pipe. This process was described in a publication by the American Society of Mechanical Engineers (ASME) as follows:[8]

   > [ERW] is manufactured by cold-forming previously-hot-rolled strip to a circular shape, heating the two abutting edges by passing electric current through the interface as the edges come together, and effecting a bond between the edges as the molten or near-molten edges are forced together by mechanical means without the addition of any filler metal.

   While the pipe is still hot, the material pushed out at the bond line, where the two edges of steel meet, is removed from the internal and external surfaces of the pipe, leaving both surfaces flat.

   There are two categories of ERW:

[8] J. Kiefner and E. Clark, *History of line pipe manufacturing in North America.* New York, N.Y: American Society of Mechanical Engineers, 1996.

a. Low frequency ERW (LFERW), for pipe manufactured prior to 1970; and

b. High frequency ERW (HFERW), typically available post-1970 (although there is a period around 1970 where pipe was manufactured using both processes).

Low and high frequency refers to the frequency of the alternating electrical current used to heat the pipe edges prior to forming the weld.

2. **Submerged Arc Welding**
The majority of pipelines in FEI's transmission systems larger than NPS 18 were manufactured using the submerged arc welding process. In this process, the pipe is made by arc welding, using a filler material to bond the edges of cylinders that are cold-formed using previously hot rolled steel plates. The seam weld cap is not removed from the pipe, leaving a slight protrusion on the inside and outside surfaces at the seam weld.

There are two categories of submerged arc welding:

a. Single submerged arc weld (SAW)

b. Double submerged arc weld (DSAW)

The primary difference between SAW and DSAW welding is that the pipe seam is welded from only the outside surface in SAW pipe and from both the inside and outside surfaces in DSAW pipe.

Seam welds, regardless of whether they are ERW, SAW, or DSAW, are performed in a pipe manufacturing facility, commonly referred to as a pipe mill. Once manufactured, each pipe segment is subjected to a short-duration hydrostatic test at the pipe mill, also referred to as a "mill test". Mill testing at the pipe mill and hydrostatic testing prior to commissioning both involve filling the pipe with water, increasing the pressure of the water in the pipe to a predetermined test level, and holding that pressure for a specified period of time. Mill tests use a pressure and duration specified in the pipe standard used at the time of manufacturing. The purpose of this test is to validate that the pipe segment will perform as expected during its useful life and to identify and remove any significant defects present in the pipe from the manufacturing process, which will fail during the test and allow the operator to replace the affected segment. A mill test does not replace the need for a subsequent hydrostatic test prior to commissioning (described further in Section 3.2.2.3 below).

3.2.2.2 External Coatings and Electric Current Help Protect Steel Pipelines From Degrading Over Their Lifecycle

When bare steel is exposed to moisture and oxygen in soil, it can begin to rust, resulting in patches of corrosion. To protect against corrosion and other related threats, the bare steel manufactured pipeline segments are coated. Coatings can be made of various materials, such as plastic or epoxy, and act as a barrier between the steel pipe surface and the soil. Generally, this coating is applied in a controlled environment, such as in a coating shop, and is commonly referred to as "factory coating".

The coated pipe lengths are transported to the installation location and welded together. Welds connecting pipe segments (referred to as "girth welds"), run around the circumference of the pipeline, and are typically performed in field conditions during pipeline construction. The girth welds completed at the installation location are coated using a field-applied coating, and then the pipeline is buried.

Once buried, the pipeline is hydrostatically tested, and cathodic protection is applied. Cathodic protection involves applying an electric current to the pipeline to minimize the natural corrosion tendency of buried steel. Cathodic protection provides a secondary defence where imperfections in the pipeline coating, such as holes or disbonded areas, may exist.

3.2.2.3 Hydrostatic Tests Ensure Pipeline Integrity at the Time of Installation

Once a pipeline has been constructed, coated and buried, it is subjected to a hydrostatic test prior to being placed in service. This hydrostatic test is in addition to the mill test, as described in Section 3.2.2.1. The pipeline is pressurized to the level and duration set out in the pipeline code in effect at the time of construction. The minimum test pressure is based on the required test factor. The test factor must be greater than 1.0 to achieve a safety margin above the maximum operating pressure.

$$Test\ Factor = \frac{Minimum\ Hydrostatic\ Test\ Pressure}{Maximum\ Operating\ Pressure}$$

Subjecting the pipeline to pressures above the maximum operating pressure as part of a pre-commissioning hydrostatic test will cause any significant manufacturing, transportation and construction defects to fail. If a failure occurs, the segment of pipe that failed is exposed, replaced, and the hydrostatic test is performed again. A pipeline is put into service only after it has passed the hydrostatic test, thus validating the integrity of the pipeline at installation.

Studies have established, and standards have adopted, that a minimum test pressure of 1.25 times the maximum operating pressure is sufficient to identify and remove initial manufacturing and construction flaws that could grow to failure through fatigue on gas pipelines. As a result, manufacturing imperfections that survive the hydrostatic test are typically considered benign or stable, unless they occur in conjunction with other integrity-related threats – such as external corrosion, dents, or gouges – thereby resulting in a combined effect that may pose a threat to pipeline integrity.

3.2.2.4 Pipelines Operating at Transmission Pressure Experience High Hoop Stress Levels That Require Ongoing Oversight

During operation, gas flowing through the pipeline exerts a consistent pressure on the pipeline (indicated as $P_{internal}$ in Figure 3-3). This pressure results in a circumferential tensile stress, called hoop stress (S_{hoop}) within the pipe steel that tries to pull the pipe apart. Hoop stress makes up a majority of internal pressure-induced stress, with the remainder of stress occurring in the longitudinal direction ($S_{longitudinal}$), which is typically half the hoop stress (see Figure 3-4).

Figure 3-3: Profile view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in hoop stress within the pipeline steel

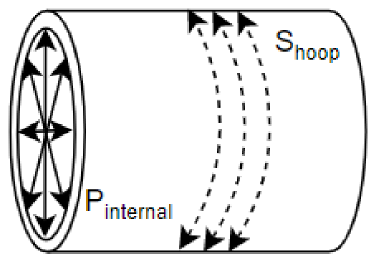


Figure 3-4: Profile view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in longitudinal stress within the pipeline steel

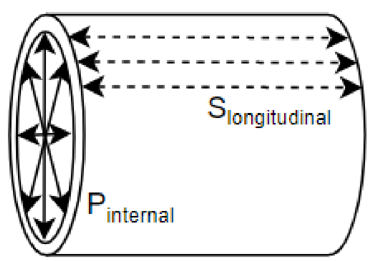
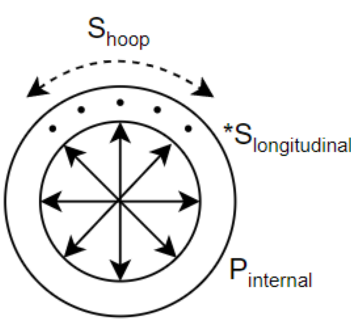


Figure 3-5: Cross section view of a typical segment of pipe showing how the internal pressure of the contained natural gas results in hoop and longitudinal stresses within the pipeline steel



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Hoop stresses are counteracted by the strength of the steel material and the wall thickness of the pipe, which ensures that the pipeline can contain the pressurized gas. Typically, if a higher-grade material is used, the pipe wall can be thinner. However, the wall of a pipeline may thin over time due to pipe condition hazards such as corrosion or physical damage due to third-party contacts, if not protected and monitored. As discussed in Section 3.2.3 below, FEI's activities under its IMP-P are intended to ensure that the pipe wall does not thin to the point that the hoop stress can no longer be restrained, and hence cause a pipeline failure.

3.2.3 FEI Monitors and Maintains Integrity of Pipelines During Their Operation

As discussed in this section, throughout their operation, pipelines may be exposed to hazards and threats, that can undermine their integrity, such as corrosion and cracking. However, with an effective integrity management program, hazards and threats can be managed to keep pipelines operating safely and reliably indefinitely.

3.2.3.1 Hazards and Threats to FEI's Pipelines Need to be Monitored and Managed

While the integrity of the pipeline is proven at the time of installation through the hydrostatic test, it needs to be validated and confirmed over time due to ongoing integrity threats. Hazards and threats to FEI's transmission pipelines include:

Third-Party Damage: is the result of external interference such as third-party contact with the pipeline, or vandalism;

- **Natural Hazards:** may be the result of geotechnical (e.g., landslide), hydrotechnical (e.g., flood) and seismic (e.g., earthquake) causes. Natural hazards can cause a pipeline to become exposed or move from its installation location;
- **Pipe Condition:** includes conditions such as metal loss (e.g., external corrosion) and cracking (e.g., SCC). These conditions can be time-dependent, meaning they may have the potential to grow to failure during the operation of the pipeline, and must be monitored;
- **Material Defects and Equipment Failures:** includes features introduced during the pipe manufacturing process (e.g. defective seam weld), and failures related to other equipment such as valves, gaskets, etc.; or
- **Human Factors:** includes hazards resulting from human error, such as construction errors (e.g., defective welds, dents, buckles) or operational errors.

These threats and hazards can be:

- **Time-dependent:** with the potential to impact the pipeline increasing over time if they are not appropriately mitigated (e.g., corrosion and cracking).
- **Time-independent:** with a varying potential to impact the pipeline on a random basis and not linked to the passage of time (e.g., third-party damage and natural hazards); or
- **Stable:** with the potential, in and of themselves, to impact the pipeline that does not change over time (e.g., manufacturing and construction imperfections that pass mill and pre-commissioning hydrostatic tests for a typical natural gas pipeline).

All hazards have the potential to undermine the integrity of the pipeline and are controlled by physical and operational barriers. Physical barriers include depth of cover (i.e., how deep the pipeline is buried) and engineering design considerations, such as pipe wall thickness and material grade. Operational barriers include pipeline patrols, cathodic protection, ILI, and preventative maintenance programs. Hazards that can be identified and prevented prior to installation are managed through quality control processes such as pressure testing; however, most hazards are monitored through operational barriers.

FEI's IMP-P, which documents hazards and barriers applicable to FEI's pipeline system, is outlined in the following section.

3.2.3.2 Overview of FEI's Integrity Management Program – Pipeline (IMP-P)

FEI manages the integrity of its transmission pipeline systems with its IMP-P. FEI's IMP-P meets the requirements of the BC *Pipeline Regulation* under the *Oil and Gas Activities Act* (OGAA). The *Pipeline Regulation* requires FEI to employ a quality management system with a plan-do-check-act (PDCA) cycle designed to promote continual improvement of its integrity management activities. Implementation of a quality management system, founded on PDCA principles, is the internationally recognized way for an industry to improve its asset performance and reduce failures over the life of assets. As such, it has been embedded within Canadian pipeline regulations, standards and industry practices.

FEI's IMP-P is a quality-driven program that anticipates, plans for and establishes practices for the management and mitigation of conditions that could adversely affect safety, reliability, or the environment during an asset's lifecycle. Examples of activities within the scope of FEI's IMP-P and related activities include the following:

- **Design, material selection, and procurement:** intended to ensure that assets have been designed in compliance with applicable codes, standards, regulations and industry practices, and can meet constructability, reliability, maintainability, and operability requirements in a safe, efficient, economic, environmentally and socially responsible manner. Material selection and procurement also help to mitigate failure incidents associated with material defects and equipment failure attributed to the manufacture or manufacturer's design of the material or equipment.
- **Construction, including** installation**, inspection, and quality assurance and control:** intended to mitigate failure incidents caused during asset construction activities by operations personnel and contractors.
- **Operations and maintenance**, which includes:
    - **Vegetation management and pipeline patrol for preventing third-party damage:** intended to mitigate failure incidents caused by third-party damage by ensuring clear sight lines to identify the existence of pipelines and to monitor activity or events which might impact the integrity of transmission pipelines.
    - **Water crossing inspections and seismic mitigation for preventing failures due to natural hazards:** intended to prevent and/or mitigate failure incidents caused by geotechnical and hydrotechnical hazards.

- **Pipeline condition monitoring using ILI, where feasible, for detecting and sizing of geometric imperfections (e.g., dents, wrinkles, and buckles) and metal loss imperfections (e.g., corrosion and gouges):** intended to identify, size, and monitor anomalies that may adversely affect integrity for those pipelines for which ILI tools are proven, commercialized, and adopted by industry.
    - **Emergency preparedness, response, and recovery:** intended to ensure verifiable capability to respond to an emergency in accordance with emergency procedures and response plans, and to demonstrate the effectiveness of such procedures and plans.
    - **Risk management:** intended to identify, assess and manage the hazards and associated risks for the life cycle of the pipeline system.

As part of FEI's implementation of its IMP-P, integrity management decisions, such as determining the appropriateness and timing of undertaking continual improvement activities, are made based on FEI's analysis of various inputs and factors. These inputs and factors can include regulations, standards, industry practice, other transmission operators' experiences, FEI asset knowledge (e.g., condition data, system capacity demands, population around the pipeline, and risk assessment outputs), and availability of technologies. These inputs and factors have evolved and will continue to do so over time. For example:

- Integrity management standards have evolved over the past two decades. Integrity management program requirements were first published in the Canadian Standards Association (CSA) Z662 Oil and Gas Pipeline Systems standard in 2005. While operators have been mitigating hazards to their pipelines since their original construction, the standards for integrity management programs formalized these operating activities into a management system framework with increased focus on performance monitoring and continual improvement.
- Industry practice has also evolved, particularly with respect to condition monitoring activities, with the increasing availability and widespread adoption of ILI technologies by operators as part of their integrity management efforts.
- Public and regulatory expectations have changed in parallel with the industry's efforts to manage their aging transmission pipelines. All unplanned pipeline releases are subject to public scrutiny and regulatory inquiry. Incidents with the potential for significant consequences, such as pipeline ruptures, are not acceptable to regulators, the public, or FEI.

As these inputs and factors change, and as FEI's pipelines continue to age, FEI must continue to improve its IMP-P activities and ensure the safety and reliability of its pipeline system.

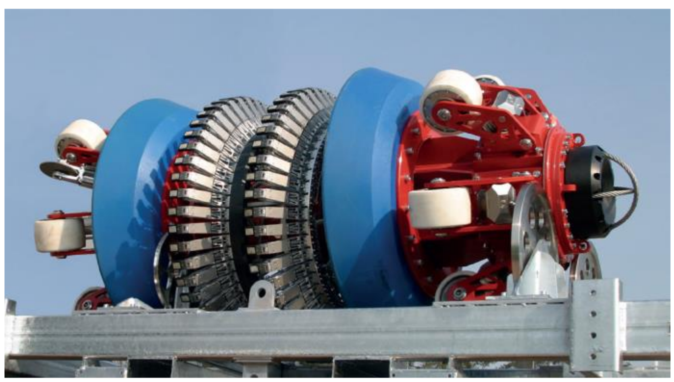
3.2.3.3 Overview of FEI's ILI Program

ILI is a common industry-preferred integrity management methodology that involves inserting a tool inside a pipeline, which is typically propelled through the line using the existing gas flow, for the purpose of collecting data on the pipe's condition. ILI provides cost-effective integrity management because it identifies imperfections or defects at site-specific locations that can be repaired, reducing the need for large-scale and costly system-level pipeline rehabilitation efforts (such as pipeline replacement). ILI also enables proactive asset management by providing condition data, including changes over time, which can inform long-term asset planning.

FEI has a long history of using ILI to manage the integrity of its transmission pipeline system. FEI has been utilizing geometry and magnetic flux leakage (MFL) tools since the late 1980s. Geometry tools are capable of detecting and sizing geometric imperfections such as dents, wrinkles, and buckles. MFL tools are used for detecting and sizing three-dimensional metal loss defects, including corrosion and gouges. More recently, the industry developed circumferential magnetic flux leakage (CMFL) tools to address limitations in the capabilities of MFL tools to detect and size long, narrow, longitudinally-oriented metal loss.

FEI has been conducting baseline surveys of its pipeline system using CMFL tools since 2014. Photos of the different ILI tools are shown below in Figure 3-6.

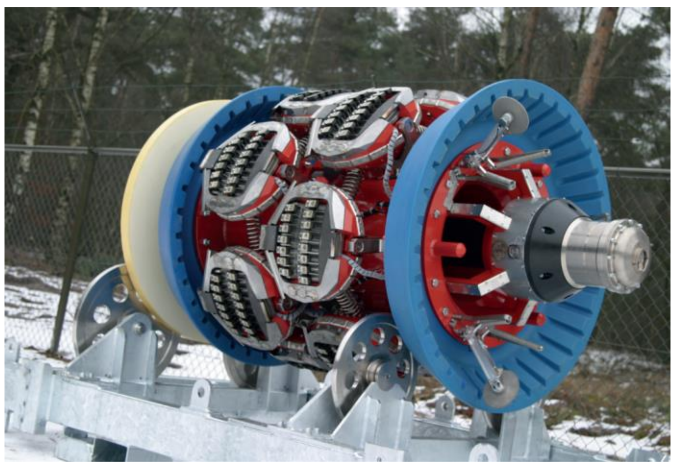
Figure 3-6: Examples of ILI Tools (Source: ROSEN)



(a) Geometry Tool[9]

[9] *Dent Assessment: Stress Based Assessment of Denting and Buckling.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/dent-assessment/Rosen-Group_Dent-Assessement/ROSEN-GROUP_DENT-ASSESSMENT.pdf

(b) MFL Tool[10]



(c) CMFL Tool[11]

As ILI technology has developed for smaller pipeline diameters, FEI has undertaken three significant projects over the past 20 years to expand its ILI capabilities:

- **Transmission Pipeline Integrity Plan (TPIP)**: The TPIP was completed over the years 2000 to 2005, and expanded FEI's ILI capabilities for geometric and metal-loss imperfections to all larger-diameter transmission pipelines, primarily focused on lines of diameter greater than NPS 10.

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[10] *RoCorr MFL-A Service: In-Line High Resolution Metal Loss Detection and Sizing.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rocorr-mfl-a/ROSEN-GROUP_ROCORR-MFL-A_SERVICE.pdf.

[11] *RoCorr MFL-C Service: In-Line High Resolution Metal Loss and Narrow Axial Feature Analysis.* ROSEN Swiss AG. Online: https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rocorr-mfl-c/ROSEN-GROUP_ROCORR-MFL-C-SERVICE.pdf.

- **Inland Gas Upgrade (IGU):** The IGU is expected to be complete in 2024, and will expand FEI's ILI capabilities for geometric and metal loss imperfections to smaller diameter transmission pipelines, focused on lines of diameter as small as NPS 6 (limited by the availability of proven and commercialized ILI tools).
- **Coastal Transmission System Transmission Integrity Management Capabilities (CTS TIMC):** The CTS TIMC is expected to be complete in 2024, and will expand FEI's ILI capabilities for cracking and crack-like imperfections to larger diameter transmission pipelines within its Coastal Transmission System (CTS), and specifically, lines with diameters between NPS 12 and NPS 42.

Operators and integrity-related service providers (e.g., ILI and leak detection vendors) have invested significantly in the development of technology to support the ongoing management of integrity hazards, as evidenced by the existence of new tools and technology on the market. In recent decades, significant technological development has occurred in the area of ILI, including most recently, the development and commercialization of EMAT ILI tools that are capable of detecting and sizing certain types of cracking and other two-dimensional defects. At the time of this Application, EMAT tools suitable for FEI's natural gas pipelines of NPS 10 and larger have been sufficiently commercialized.

For ILI tools to be suitable for FEI's pipelines, they must be able to operate within the variable flow rates on FEI's system. Unlike many other gas transmission systems where flow is dependent on the daily volumes contracted by midstream shippers, the flow through the FEI transmission system is almost entirely dependent on FEI's customer demand, which is temperature sensitive. For example, during peak winter months (typically November through March), gas flows in FEI's transmission pipelines are high compared to the shoulder and light-load seasons (typically approximately April to October). For this reason, FEI has limited windows during which it can run ILI tools. During periods of higher demand, gas flow rates can be sufficiently high that the ILI tool travels through the pipe at an excessive speed, resulting in either no data collection or degraded data collection.

Recently, technology that allows a variable portion of the gas flow to bypass the ILI tool as it travels through the pipe have been developed and commercialized for smaller diameter ILI tools. This is to allow the tool to control its own speed in real time to assist with consistent collection of high-quality data. Given the widely varying flow rates in FEI's system that result from the end-use customers' daily and seasonal consumption, FEI is interested in tool speed control capabilities such as to potentially expand the seasonal windows during which inspections can be scheduled. However, where tools with speed control are unavailable either due to a lack of technology or scheduling conflicts, FEI may use ILI tools without speed control capability and thus, FEI's system must be capable of meeting those tool requirements.

Table 3-1 summarizes the primary ILI tools adopted by industry and their respective capabilities.

Table 3-1: Summary of ILI Tool Feature Detection Capabilities

	Geometry	Magnetic Flux Leakage (MFL)	Circumferential MFL (CMFL)	Electro-Magnetic Acoustic Transducer (EMAT)
Dents	✓			
Wrinkles / Buckles	✓			
Metal loss		✓ (circumferentially-oriented features)	✓ (narrow longitudinally-oriented features)	
Long seam weld location			✓	
Girth weld location	✓	✓	✓	✓
SCC and crack-like features				✓
Longitudinal seam weld flaws				✓

3.2.4 Cracking Threats to FEI's System

Cracking threats are considered "planar imperfections" that, due to a lack of volume, cannot be detected by FEI's current ILI tools. Cracks are considered planar because they are essentially two dimensional. Cracks have a measurable length and depth, but negligible width – similar to a crack in a car windshield. Corrosion and metal loss features (which FEI's current ILI tools can detect) are three dimensional, with a measurable length, depth and width. This results in a three-dimensional void in the pipeline wall – similar to a chip or "bulls-eye" in a car windshield. It is because of the lack of this third dimension that a crack cannot be detected by current ILI tools.

Cracking threats affect the strength of a pipeline by effectively reducing the wall thickness of the pipeline. The two main types of cracking threats to FEI's system are SCC and crack-like imperfections in the seam weld of a pipeline. In addition, SCC and crack-like imperfections can interact with other time-dependent integrity threats, such as external corrosion, to compound integrity issues on a pipeline.

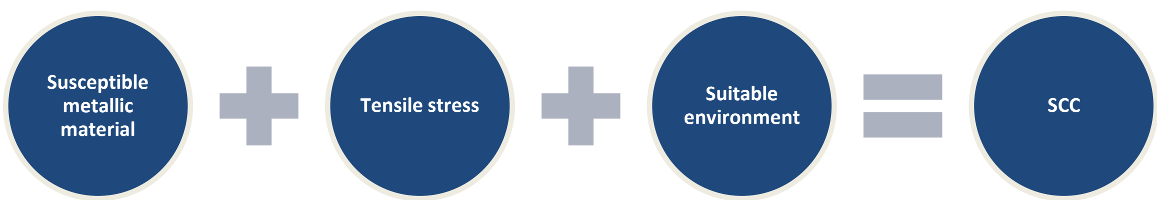
3.2.4.1 Stress Corrosion Cracking

SCC is defined as "cracking of a material produced by the combined action of corrosion and tensile stress (residual or applied)."[12] The difference between residual and applied stresses is explained in the table below.

Table 3-2: Residual and Applied Stresses

Residual Stresses	Applied Stresses
May be imparted in a pipeline from: • Original pipe manufacture, as forces are applied when bending the original flat steel plate into a cylinder. • Construction, as force may need to be applied to achieve the correct spacing and alignment when preparing two segments of pipe for a field weld.	**Are imparted during operation and include:** • **Hoop stresses, resulting from the forces inside of the pipeline acting in an outward direction (see Figure 3-3).** • **Longitudinal stresses, resulting from forces acting along the length of the pipeline (see Figure 3-4), such as could occur due to ground movement.**

SCC occurs on transmission pipelines as a result of the combination of three factors: [13]



1. **Susceptible metallic material**: All pipeline steels are considered susceptible materials, although it is expected that susceptibility amongst steels will vary depending on when they were manufactured (e.g., pre-1980s steel is expected to be more susceptible).

2. **Tensile stress**: This may include residual or applied stresses. Tensile stress is often referenced as a percentage of the specified minimum yield stress (SMYS) of a pipe, which is the minimum stress that will cause a pipe to permanently deform.

3. **Suitable environment**: A suitable environment may be present if:
    - Uncoated steel, resulting from coating damage or where coating has disbonded and come away from the pipe, is exposed to the surrounding soil. SCC can occur in the range of soil types and terrain/drainage conditions found in FEI's operating territory.
    - Other conditions for corrosion exist, such as cathodic protection (CP) shielding or

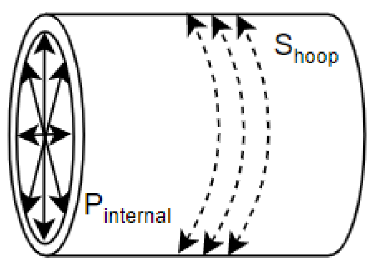
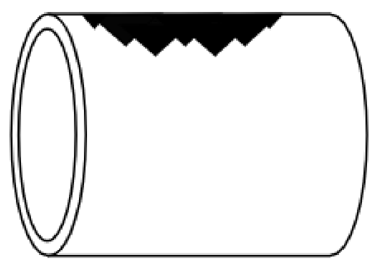
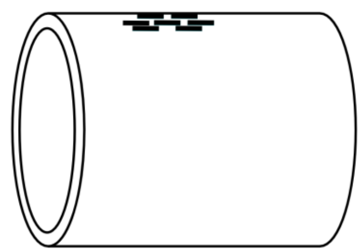
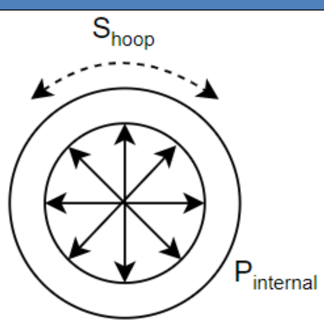
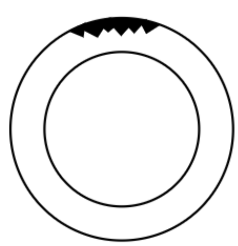
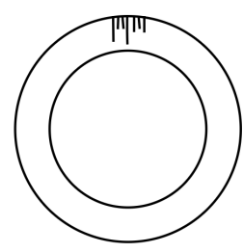
[12] CEPA Pipeline Integrity Working Group, "CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015.

[13] Canadian Energy Pipeline Association, *CEPA Recommended Practices for Managing Nearneutral pH Stress Corrosion Cracking*, 3rd edition, May 2015, prepared by CEPA Pipeline Integrity Working Group.

where there are inadequate levels of CP. CP shielding can occur due to disbonded coatings, large rocks, or foreign structures preventing the CP current from reaching the pipeline, and which in turn contributes to a corrosive environment where corrosion and/or SCC may initiate and grow.

SCC, like corrosion, is a time-dependent integrity threat, meaning that its potential to impact the pipeline may increase over time if not appropriately mitigated. SCC may or may not form in conjunction with corrosion. As described by the Canadian Energy Pipeline Association (CEPA), *"SCC initiates on the external surface of the pipe and grows in both depth and length,"* with shorter cracks having the potential to coalesce and become a greater threat.[14] Figure 3-7 below compares the effects of SCC and corrosion on a pipe wall against steel without flaws or defects. If SCC occurs in combination with other hazards and threats, such as external corrosion, there can be a higher potential for a pipeline failure.

Figure 3-7: Illustrations of Corrosion and Cracking, Showing (a) Steel without Flaws or Defects, (b) External Corrosion and (c) SCC

(a)	(b)	(c)
PROFILE VIEW		
		
CROSS-SECTION VIEW		
		
DESCRIPTION		
Steel pipe without flaws or defects; internal gas pressure results in hoop stresses in pipe wall	Steel pipe with external corrosion	Steel pipe with stress corrosion cracking

[14] Ibid.

3.2.4.2 Crack-Like Imperfections in Seam Welds

There are a number of crack-like imperfections associated with seam welds that – when occurring in conjunction with mechanical damage, such as dents, or other time-dependent integrity threats such as metal-loss corrosion – could grow to failure under normal operating conditions. These imperfections are related to the way the pipe is manufactured. As described in Section 3.2.2.1, most of FEI's transmission pipelines have been manufactured by either electric resistance welding (ERW) or submerged arc welding (SAW and DSAW). The seam weld imperfections that could arise from these manufacturing processes are listed below.

- Potential imperfections in ERW seam welds:
  - Lack of fusion;
  - Inclusions; or
  - Hook cracks.
- Potential imperfections in SAW and DSAW seam welds:
  - Toe cracks; or
  - Transit fatigue.

More information on these seam weld-related imperfections can be found in Appendix A.

3.2.5 FEI's Existing Integrity Management Practices Do Not Identify All Cracking on the ITS

FEI's current integrity management practices for managing cracking threats on the ITS involve the inspection of its transmission pipelines for cracking during "opportunity digs", when a portion of the pipeline (in the order of 10 metres) is exposed because of other pipe condition assessments. These digs are referred to as "opportunity digs," as the primary reason for the integrity dig is not related to cracking. These integrity digs are scheduled for other reasons, including the following:

- To assess metal loss anomalies (e.g., corrosion) identified through ILI and to repair or replace if necessary;
- To assess mechanical damage anomalies (e.g., dents, gouges) identified through ILI and to repair or replace if necessary; and
- To assess sites identified through above-ground surveys of its pipelines without ILI capability and to repair or replace if necessary.

During an integrity dig, in addition to the primary anomaly assessment (e.g., visual analysis, measurement, and assessment of the corrosion, dent, or gouge), FEI performs an industry-standard, non-destructive evaluation methodology called magnetic particle inspection (MPI). MPI provides a visual indication of microscopic imperfections along the exposed surface of the steel pipe, which may be indicative of cracking. FEI addresses any cracking through pipeline repairs or replacement, as necessary, and records any SCC-related findings for future tracking. Through these digs FEI is aware of the existence of cracking threats on its system and has been monitoring such threats on its transmission pipeline system as part of its IMP-P.

FEI estimates that the total amount of pipeline exposed to date as part of the Integrity Dig Program (and hence assessed for cracking) is approximately one percent of the total length of pipe in FEI's transmission systems. As such, these opportunity digs are not expected to have identified all cases of cracking due to the limited lengths that have been exposed relative to the full length of buried pipelines.

As cracking is a highly localized and often unpredictable phenomenon, it is also not possible to use the analysis from integrity digs to determine where cracking may be occurring on other segments of FEI's pipelines. Crack initiation and growth is a complex function of a number of factors.[15] As described in Section 3.2.4.1, SCC requires the presence of three factors: a susceptible material, a tensile stress, and a suitable environment. The degree of contribution from each of these factors varies such that SCC found at one location cannot be relied upon for locating SCC at other locations. As such, and importantly, it is not possible to pinpoint the exact locations where SCC will occur simply through assessing the factors that cause it. Therefore, FEI's current practices do not provide the capability of identifying all instances of cracking on its ITS pipelines.

3.3 *INDUSTRY KNOWLEDGE OF CRACKING THREATS AND MEANS TO MITIGATE THEM ARE IMPROVING*

3.3.1 Summary of Section

A primary driver for the Project is the evolution of industry knowledge about cracking threats and industry practice on how to manage those threats. Other operators have found cracking on pipelines with characteristics similar to those in the FEI system and are moving towards using EMAT ILI tools to monitor cracking threats on pipelines for which suitable tools exist. To inform the development of the CTS and ITS TIMC Projects, FEI has been conducting a pilot project and has completed EMAT ILI tool runs on two of its CTS pipelines. The tool runs were successful and found instances of cracking that were not previously identified.

3.3.2 Industry Knowledge and Practice Regarding Cracking Threats

In order to stay current with evolving industry practices and to leverage industry experience, FEI is an active member of the pipeline community and participates in industry groups. Participation in these groups includes conducting research, developing industry recommended practice and guidance documents (such as the Canadian Energy Pipeline Association Recommended Practice for Managing Near-neutral pH Stress Corrosion Cracking), conducting benchmarking exercises, and the sharing of integrity-related experiences. FEI engages periodically with its peer operators,

[15] CEPA Pipeline Integrity Working Group, "CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015.

confidentially sharing information regarding recent failure incidents, company best practices, as well as integrity management challenges and successes. Through these activities, FEI has developed an understanding of evolving industry practice regarding crack management.

The transmission pipeline industry works collaboratively to prevent pipeline failures, as a failure on any pipeline affects the entire industry. Through the experiences of other gas transmission operators managing cracking on pipelines, FEI is aware that SCC (which could lead to failure) has been found on pipelines similar to those operated by FEI (i.e., with similar coatings, age, diameters, and operating stress level).

JANA observes the following regarding the increasing knowledge of cracking threats:[16]

> Historically, the majority of significant SCC has been associated with [polyethylene] tape. However, as companies have expanded monitoring, significant SCC has been found on asphalt-coated lines and on coal-tar coated pipe (previously considered to have a low susceptibility to SCC). This is consistent with the overall trend of SCC being found more and more in pipelines previously thought to be less susceptible, as the time dependent mechanisms at play continue to manifest themselves.

EMAT ILI is increasingly being adopted by industry for managing cracks and crack-like imperfections on transmission pipelines and enabling the mitigation of their potential for rupture. Gas transmission operators are having success with this approach to crack management and, as such, the use of EMAT crack detection ILI is rapidly becoming the industry standard for managing cracking threats on transmission pipelines. This adoption reflects the importance of crack detection due to the potential for significant consequences should a pipeline failure occur. A picture of a typical EMAT tool is shown below in Figure 3-8.

Figure 3-8: Typical EMAT Tool[17]

[16] Confidential Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines,* at p. 5.

[17] *RODD EMAT Service: In-Line High Resolution Coating Disbondment Analysis.* ROSEN Swiss AG. Online:

A summary of the feedback from other transmission pipeline operators regarding their recent experiences with EMAT is provided below:

- EMAT ILI has been run in pipelines with previously observed cracking, with diameters from NPS 10 to 42 and operating at a stress level greater than 30 percent SMYS. As technology becomes available, the operators plan to run EMAT ILI in smaller diameter pipelines.
- EMAT ILI has been successful in detecting crack-like features, although discriminating SCC within these crack-like features has been challenging. This uncertainty warrants conservative initial assessments followed by field verification digs in conjunction with laboratory material testing.
- The operators use a risk assessment (either qualitative, semi-quantitative, or quantitative) to prioritize EMAT ILI runs.
- Common challenges with successfully running EMAT ILI tools are:
    - Need for launching/receiving barrel modifications to accommodate EMAT ILI tools which are typically longer than other ILI technology tools;
    - Need for pipeline modifications such as removing heavy-wall sections and tight bends to minimize tool speed excursions;
    - Cleaning pipelines for optimal sensor performance so that crack-like features can be detected and sized to the best of tool capability; and
    - Controlling tool speed during the run in low-flow and/or customer-demand dependent pipelines.

Consistent with this evolving industry knowledge and practice, FEI initiated the TIMC projects to assess the threat of cracking on its larger diameter pipelines operating at transmission pressure, and assess the need to enhance its approach to managing cracking threats on these pipelines.

3.3.3 Pilot Project Demonstrates that EMAT ILI Detects Previously Unknown Instances of Potential Cracking

As part of FEI's project development work, FEI is completing a pilot of EMAT ILI evaluations on two CTS pipelines. The EMAT ILI tool runs on these pipelines are complete; however, FEI is in the process of validating potential cracking detected by the EMAT tool. These instances of potential cracking on FEI's pipelines were not previously detected through opportunistic digs.

The two pipelines chosen for the pilot, CPH BUR 508 and LIV PAT 457, had instances of cracking that FEI discovered during integrity dig activities, unrelated to investigating cracking. FEI determined that these pipelines could be modified to run EMAT ILI tools on a timeline suitable for informing the TIMC projects.

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https://www.rosen-group.com/dms/rosen-website/rosen-documents/solutions/services/rodd-emat/ROSEN-GROUP_RODD-EMAT-SERVICE/RoDD_EMAT_SF_E_201405.pdf.

This pilot demonstrates that instances of cracking that FEI was previously unaware of and which were not discovered through opportunistic integrity digs exist. While the results of the pilot are encouraging, as significant repairs or replacements have not been required to address these instances of cracking, the pilot also demonstrates that cracking exists on FEI's pipelines which FEI's existing practices on the ITS are unable to detect. The results to-date and current status of the pilot project are described further in Appendix D, including how the pilot has informed TIMC project activities.

3.4 *JANA'S ANALYSIS CONFIRMS CREDIBILITY OF CRACKING THREATS TO THE ITS*

3.4.1 Summary of Section

To assess the risk of cracking threats to FEI's transmission systems, FEI retained JANA to conduct two related assessments. The first was to assess the susceptibility of FEI's transmission system pipelines to cracking. The second was to conduct a baseline, system-level, safety QRA of FEI's transmissions systems that would quantify the safety risk posed by cracking threats in comparison to other threats and hazards. Based on its assessments, JANA concluded that pipelines on FEI's ITS and CTS are susceptible to cracking threats which can lead to failure by rupture.

JANA's reports are attached to this Application in Confidential Appendices B-1 and B-2:

- Confidential Appendix B-1 is JANA's report titled Analysis of Cracking Threats in FEI Mainline[18] Transmission Pipelines.
- Confidential Appendix B-2 is JANA's report titled Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines.

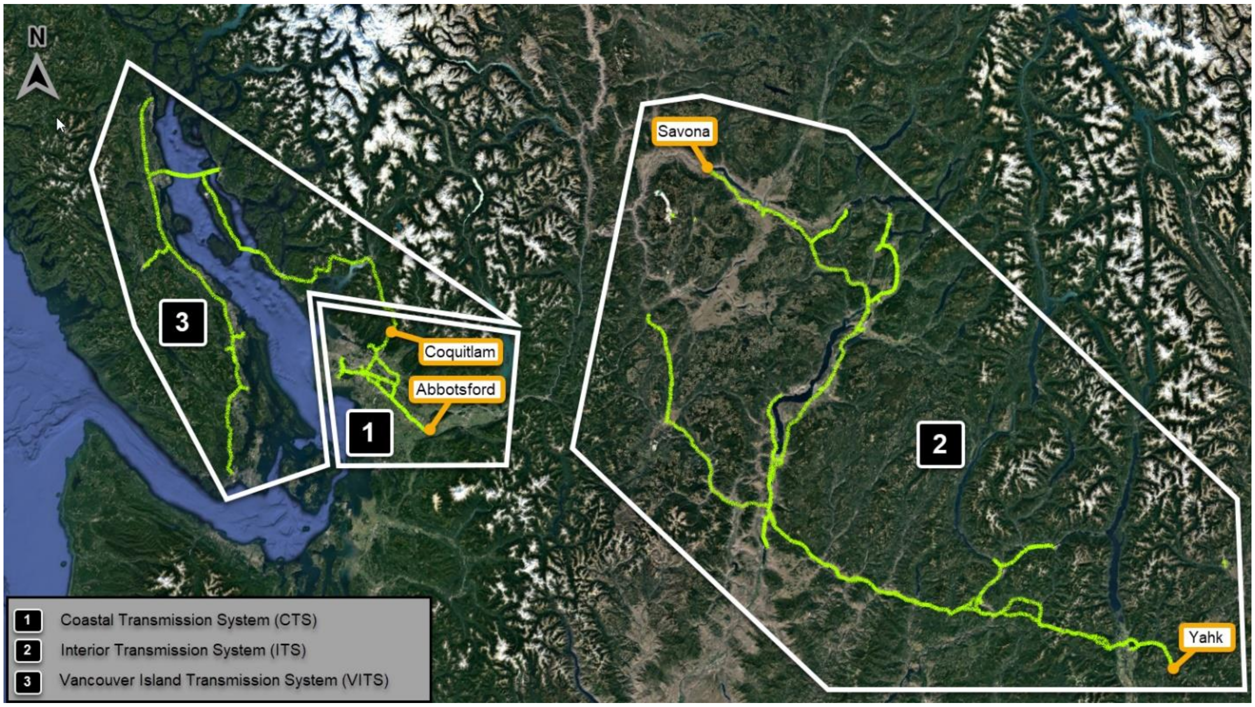
Included in the appendices of the JANA reports are the C.V.s of the lead authors, Ken Oliphant, Ph.D., P.Eng. and James DuQuesnay, M.A.Sc.

3.4.2 FEI's Coastal, Interior and Vancouver Island Transmission Systems Were Assessed

JANA's investigation into the susceptibility of FEI's transmission pipelines to cracking threats focused on a total of 35 pipelines located within the three transmission systems that FEI operates, as shown in Figure 3-9 below. These transmission systems are comprised of a network of natural gas pipelines that deliver gas to local distribution systems, which supply customers in the southern parts of the province and Vancouver Island.

[18] JANA has adopted the term "mainline" in Confidential Appendices B-1 and B-2 to describe pipelines within the scope of their studies. Mainline refers to FEI's transmission pipelines that are not laterals, and includes FEI's larger diameter pipelines that are in-line inspected.

Figure 3-9: FEI's Transmission Systems



An overview of each transmission system identified is provided below.

1. <u>Coastal Transmission System (CTS)</u>
   The CTS supplies gas to the Lower Mainland, Sunshine Coast and Vancouver Island. The CTS receives natural gas in Abbotsford and distributes it west. Construction of the CTS began in the 1950s and continues today.

2. <u>Interior Transmission System (ITS)</u>
   The ITS supplies gas to the Okanagan, Kootenays, and portions of the Thompson. Natural gas is received by the ITS at two points: (1) in Savona and distributed east, and (2) in Yahk and distributed west. Construction of the ITS began in the 1950s and continues today.

3. <u>Vancouver Island Transmission System (VITS)</u>
   The VITS supplies gas to the Sunshine Coast and Vancouver Island. Natural gas from the CTS is initially compressed at Coquitlam and sent to the Sunshine Coast and Vancouver Island. The VITS contains several marine crossings. Construction of the VITS began in the 1990s and continues today.

The 35 pipelines assessed by JANA are FEI's larger diameter pipelines that operate at hoop stress levels greater than 30 percent SMYS and are in-line inspected. These pipelines were selected to optimize the scope of the assessment, by focusing on those diameters for which EMAT ILI tools are commercially available.

3.4.3 The ITS is Susceptible to Cracking Threats

JANA's report, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, attached as Confidential Appendix B-1 to this Application, concludes that cracking poses a credible integrity hazard that needs to be addressed through active integrity management. JANA's assessment included:[19]

- A line-by-line assessment of susceptibility to cracking threats for the CTS, ITS, and VITS mainline transmission pipelines based on pipeline properties and operating conditions compared with those where historical failures have been observed in industry through analysis of PHMSA and NEB databases and technical publications and discussions with FEI Subject Matter Experts (SMEs).
- An assessment of historical FEI dig reports and discussions with FEI SMEs to assess cracking found to date on FEI pipelines.
- An assessment of the potential for SCC cracks to grow to failure under the operating conditions of FEI's pipelines through analysis of industry historical failures and crack growth modelling in conjunction with Dr. Chen, University of Alberta.

JANA summarized the results of its assessment as follows (at pages 3-4 of Appendix B-1):

> Based on its assessment of the potential for cracking threats on FEI pipelines, JANA concluded that cracking threats (SCC and pipe seam) pose a credible integrity hazard that needs to be addressed through active integrity management. This is based on:
>
> - Identification of lines with characteristics that make them susceptible to cracking threats in the FEI system.
> - Identification of SCC and seam issues in FEI pipelines during integrity digs.
> - Analysis that indicates the identified SCC can grow to failure under FEI operating conditions as:
>   - Industry failures have been observed within the operating stress range of the FEI susceptible lines.
>   - Analysis of SCC crack growth rates based on FEI operating conditions in conjunction with Dr. Chen of the University of Alberta indicate the potential for cracks to grow to failure and, with practical assumptions, in timeframes on the order of five years under the most aggressive condition.

The key aspects of the above conclusions are discussed below.

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[19] Confidential Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, at p. 4.

3.4.3.1 ITS Pipelines Have the Same Properties as Pipelines Where Failures Have Been Observed by Other Operators

JANA explains that it uses the term “susceptible” to indicate the potential for SCC or pipe seam cracking to initiate on the lines, based on the specific characteristics of the lines and their operating conditions. A “yes” susceptible line is one where the characteristics of the line are consistent with lines where SCC or pipe seam cracking has been observed on multiple systems within the broader pipeline industry. A “low” susceptible line is one with characteristics where no or very limited failures have historically been observed in the industry.

JANA applied susceptibility ratings to FEI’s pipelines considering criteria such as coating type and manufacturing process that are typically found to be associated with the formation of SCC and seam weld cracking. Generally, pipelines constructed in 1990 or thereafter are considered to have low susceptibility to SCC based on age and coating types, whereas pipelines manufactured prior to 1970 are considered within the industry to be more susceptible to seam weld cracking.

JANA’s high-level conclusion was as follows:

- Eleven of the 13 CTS mainline transmission pipelines were identified as susceptible to cracking threats;
- Nine of the 12 ITS mainline transmission pipelines were identified as susceptible to cracking threats; and
- None of the 10 VITS mainline transmission pipelines were identified as being susceptible to cracking threats.

JANA’s susceptibility conclusions for the ITS are presented below in Table 3-3. Susceptibility conclusions for the CTS and VITS can be found in Appendix B-1. Note that the Trail-Castlegar NPS 8 pipeline in line 6 below is not of a sufficiently large diameter for the use of EMAT ILI tools at this time.

Table 3-3: FEI ITS Pipelines: Susceptibility to Cracking Threats based on Installation Year and Coating Type

#	Pipeline Short Name	Pipeline Full Name	SCC Susceptibility*	Seam Weld Cracking Susceptibility*	Original Install Year(s)	Coating Types	Seam Type(s)
1	SAV VER 323	Savona – Vernon 12”	Yes	Yes	1957	Asphalt, Polymer Tape	Unknown
2	VER PEN 323	Vernon – Penticton 12”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
3	GRF TRA 273	Grand Forks – Trail 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
4	OLI GRF 273	Oliver Y – Grand Forks 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
5	PEN OLI 273	Penticton – Oliver Y 10”	Yes	Yes	1957	Asphalt, Polymer Tape	ERW
6	TRA CAS 219	Trail – Castlegar 8”	Yes	Yes	1957	Asphalt, Polymer Tape	Unknown
7	KIN PRI 323	Kingsvale – Princeton 12”	Yes	Low	1971	Extruded PE, Shrink Sleeve on girth welds	ERW
8	PRI OLI 323	Princeton – Oliver 12”	Yes	Low	1971	Extruded PE, Shrink Sleeve on girth welds	ERW
9	YAH TRA 323	Yahk – Trail (EKL) 12”	Yes	Low	1974, 1975	Extruded PE, Polymer Tape on girth welds	Unknown
10	OLI PEN 406	Oliver – Penticton 16”	Low	Low	1994	Extruded PE	ERW
11	DUK SAV 508	Duke Tap – Savona C/S 20”	Low	Low	1997	Extruded PE - Multilayer	ERW
12	YAH OLI 610	Yahk – Rossland 24”, Rossland – Oliver 24”	Low	Low	2000	Fusion Bonded Epoxy	SAW

* A susceptibility rating of “Yes” indicates that the cracking type has been found on pipelines with similar attributes in the industry. A rating of “Low” indicates that there are relatively limited or no cases of that cracking type found on pipelines with similar attributes in the industry.

3.4.3.2 Evidence of Cracking on FEI's System

As evidence in support of its conclusion regarding the susceptibility of FEI's transmission system to cracking threats, JANA also observes that cracking has been detected on FEI's pipelines. FEI is aware of the existence of these cracking threats through inspections of its pipelines during integrity dig activities. Examples of SCC and other crack-like imperfections found on FEI's pipelines are shown in Figure 3-10 and Figure 3-11, respectively.

Figure 3-10: Examples of Stress Corrosion Cracking as Identified on FEI's Transmission Pipelines

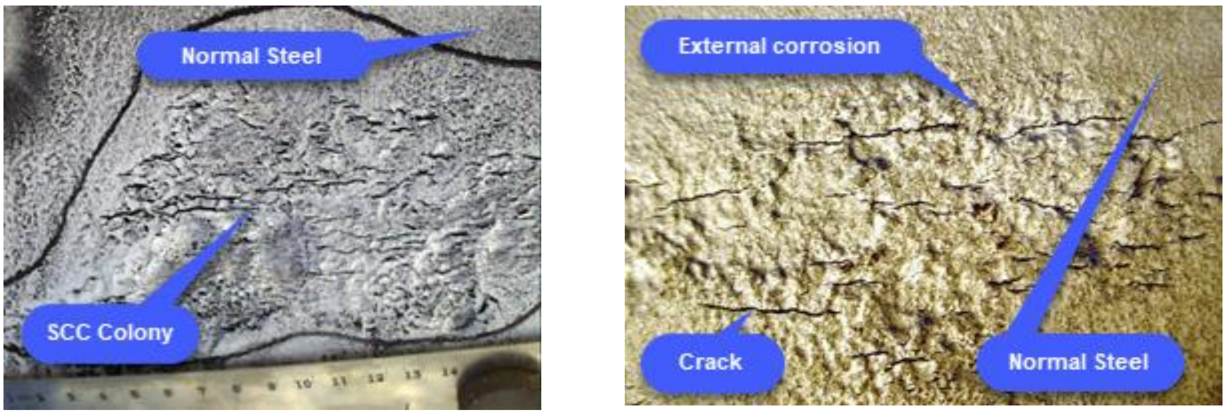

Figure 3-11: Example of Lack of Fusion Weld Imperfection found on a FEI Transmission Pipeline

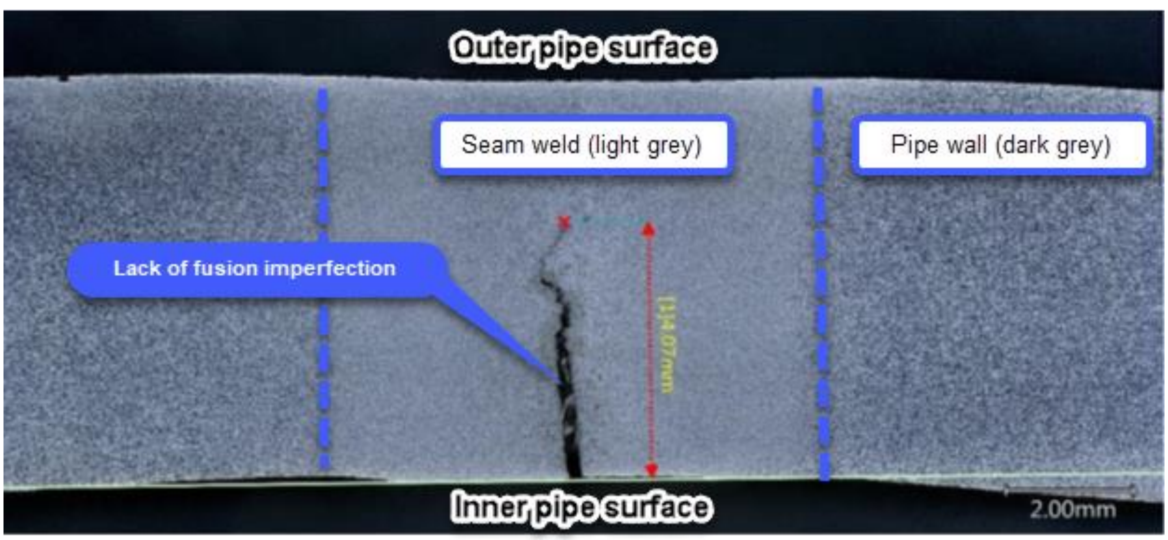

Table 3-4**Error! Reference source not found.Error! Reference source not found.** below summarizes cracking identified on several FEI ITS pipelines during select integrity digs, the results of which were reviewed by JANA. The results indicate that the conditions required for SCC crack initiation exist within FEI's ITS.

Table 3-4: FEI ITS Pipelines: Occurrences of Cracking on FEI Pipe Identified Through JANA's Review of Selected Integrity Digs and Total Integrity Digs Analyzed

#	Line Name	FEI Name	SCC Susceptibility	Seam Weld Cracking Susceptibility	Integrity Digs with Cracking Threats	Total Integrity Digs Analyzed
1	SAV VER 323	Savona – Vernon 12"	Yes	Yes	50	92
2	VER PEN 323	Vernon – Penticton 12"	Yes	Yes	38	67
3	GRF TRA 273	Grand Forks – Trail 10"	Yes	Yes	138	228
4	OLI GRF 273	Oliver Y – Grand Forks 10"	Yes	Yes	79	163
5	PEN OLI 273	Penticton – Oliver Y 10"	Yes	Yes	13	23
6	TRA CAS 219	Trail – Castlegar 8"	Yes	Yes	11	76
7	KIN PRI 323	Kingsvale – Princeton 12"	Yes	Low	0	3
8	PRI OLI 323	Princeton – Oliver 12"	Yes	Low	2	12
9	YAH TRA 323	Yahk – Trail (ELK) 12"	Yes	Low	9	53
10	OLI PEN 406	Oliver – Penticton 16"	Low	Low	0	1
11	DUK SAV 508	Duke Tap – Savona C/S 20"	Low	Low	0	0
12	YAH OLI 610	Yahk – Rossland 24", Rossland – Oliver 24"	Low	Low	0	6

3.4.3.3 SCC Cracks Have the Potential to Grow to Failure Under FEI Operating Conditions

JANA's assessment is that SCC cracks can grow to failure under FEI operating conditions. In particular, JANA concludes:[20]

1. Industry failures have been observed within the operating pressure range of FEI's susceptible lines.
2. Analysis of SCC crack growth rates based on FEI operating conditions, in conjunction with Dr. Chen of the University of Alberta, indicates the potential for cracks to grow to failure and, with practical assumptions, in timeframes in the order of five years under the most aggressive conditions.

Each of these conclusions is discussed in turn below.

First, JANA observes that industry failures have occurred on pipelines at operating stresses across the range of the operating stresses of the FEI susceptible transmission pipelines (i.e., from 12 to 72 percent of SMYS). Specifically, JANA's review of Pipeline and Hazardous Materials Safety Administration (PHMSA) / Industry Incident Data indicates that:

[20] Confidential Appendix B-1, JANA Corporation, *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*, p. 12.

- Approximately half of reported PHMSA SCC incidents[21] through 2002-2016 occurred at 60 percent of SMYS or lower; and
- Approximately one quarter of reported incidents occurred at 55 percent of SMYS or lower, with some circumferential SCC leaks occurring below 30 percent of SMYS (in presence of additional loading factors).

Through information gathered during FEI's industry participation activities, FEI is also aware that its peer Canadian and American transmission pipeline operators have found, through their crack-detection ILI runs, potentially injurious SCC on pipelines operating below 50 percent of SMYS.

CEPA has also stated that "based upon the data collected by CEPA member companies it is apparent that there was no absolute threshold operating stress value for SCC initiation or propagation."[22] This is supported by CEPA's failure record where ruptures had occurred at operating stress levels between 49 and 71 percent of SMYS. There were no reported SCC ruptures in the PHMSA or CEPA failure records below 30 percent of SMYS.

Second, analysis performed on SCC crack growth rates based on FEI operating conditions indicates the potential for SCC cracks to grow to failure within certain timeframes requiring active mitigation (e.g., in the order of five years under the most aggressive conditions).[23]

This analysis was conducted in conjunction with Dr. Chen of the University of Alberta, a recognized SCC expert researcher. Software developed by Dr. Chen, called *Pipe-Online*, was used for the analysis of SCC crack growth behaviour and to predict the remaining lifespan of a pipeline prior to cracks growing to failure. The analysis utilized pressure data from 54 pipeline locations in the CTS and ITS, 8 FEI detailed field inspection reports from integrity digs, and a summary of SCC findings from 14 dig excavations. The analysis considered a range of crack depths and lengths, which are reasonable approximations of what could be anticipated to be present in the FEI system. The analysis also considered a range of fracture toughness[24] values

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[21] PHMSA defines an 'incident' as any of the following events: (1) An event that involves a release of gas from a pipeline, or of liquefied natural gas, liquefied petroleum gas, refridgerant gas or gas from an LNG facility, and that results in one or more of the following consequences: (i) A death, or personal injury necessitating in-patient hospitalization; (ii) Estimate property damage of $50,000 or more, including loss to the operator and others, or both, but excluding cost of gas lost; (iii) Unintential estimated gas loss of three million cubic feet or more; (2) An event that results in an emergency shutdown of an LNG facility. Activation of an emergency shutdown system for reasons other than an actual emergency does not constitute an incident. (3) An event that is significant in the judgement of the operator, even though it did not meet the criteria of paragraphs (1) or (2) of this definition. An SCC incident is an incident as defined by PHMSA where the cause of the incident was identified as an SCC failure.

[22] Bruce. "The Canadian Energy Pipeline Association Stress Corrosion Cracking Database," *International Pipeline Conference – Volume I, ASME 1998* (IPC1998-2067).

[23] This analysis by Dr. Chen is included within Confidential Appendix B-1: Report: JANA Project 18-1651:P *Analysis of Cracking Threats in FEI Mainline Transmission Pipelines*. SCC crack growth analysis was applied to SCC crack features derived from a sample of FEI dig reports, actual FEI operating data and pipe material properties characteristic of the FEI system.

[24] Fracture toughness is a measure of the resistance of a material to static or dynamic crack extension, used in the calculation of critical flaw size for crack-like defects.

consistent with typical industry values. The analysis used these inputs, FEI's operating conditions, and the *Pipe-Online* software to project the time to failure of SCC cracks.

The analysis estimated a range of potential time until failure from 5 to 85 years, indicating that there is the potential for SCC cracks to grow to failure under the operating conditions of the FEI system. While the lower bound timeframe of five years is considered highly unlikely (reflecting a combination of the longest, deepest crack with the lowest toughness pipeline), the analysis does indicate that SCC is a credible integrity threat that needs to be managed in a timely manner.

3.4.4 QRA Identifies Cracking as a Safety Risk to the ITS

As described above, to estimate the relative safety risk level of cracking threats to FEI's transmission pipelines and inform the priority and urgency of its TIMC projects, FEI contracted JANA to conduct a baseline, system-level, safety QRA. The results are presented in JANA's report, *Quantitative Safety Risk Assessment of FEI Mainline Transmission Pipelines*, attached as Confidential Appendix B-2 to this Application.

The sections below provide more information regarding the QRA undertaken by JANA.

3.4.4.1 A QRA Systematically and Quantitatively Estimates the Probability and Consequences of Hazardous Events

A QRA is a formal and systematic approach to estimating the probability and consequences of hazardous events, and expresses the results quantitatively as risk to people, the environment, and/or the business.

QRAs can be performed at the system level (general) or the integrity management level (specific). The purpose of a system-level QRA is to assess the overall threats to the pipeline system at a level that enables identification of general system risk and the threats driving that risk, to identify where additional integrity management activities may be warranted. Where significant risk and/or significant consequence is identified, mitigation approaches can be identified and evaluated to reduce the level of risk or to monitor for conditions that can result in those significant consequences, such as ruptures. By design, a system-level QRA uses available information to derive the best possible forecast of system risk and consequence, typically employing models based on historical industry failure rates or higher-level models.

Where more detailed risk management is required, an integrity management-level QRA can be performed. For example, whereas a system-level QRA can identify pipelines where mitigation may be deemed necessary, an integrity management-level QRA is needed to identify the specific locations on the pipelines where the mitigation is required (i.e., where to dig and repair). An integrity management-level QRA requires specific input data, such as the output of ILI tools, to identify the specific location and size of the flaws.

QRAs are an accepted method for transmission operators to comply with the CSA Z662 standard, which requires operators to develop, implement, and continually improve a risk management process for their pipeline systems that identifies, assesses, and manages the hazards and associated risks over their life cycle.

Quantitative risk assessments turn data into information about an asset that, when combined with other information, provides for more informed decision making. Examples of other information critical to FEI's asset decision making include:

- Regulations and standards;
- Industry experience and practice;
- Resourcing; and
- Stakeholder impacts.

QRA results do not relinquish an operator's obligations to comply with regulations and standards, or reduce the importance to FEI of aligning its practices with its industry peers. It is expected that a primary value of QRAs may be as a means of identifying incremental opportunities for risk mitigation that may not otherwise have been identified through traditional means (i.e., incremental to compliance and industry practice considerations). The QRA process incorporates vast quantities of data and performs complex calculations using specialized software. Manual analysis is not equivalent to what can be achieved through QRA.

3.4.4.2 Results of QRA Prioritized Need for Two TIMC Projects

The baseline system-level QRA, provided in Confidential Appendix B-2, includes risk estimates for the ITS, CTS and VITS. It is important to note that the QRA is not informed by ILI data that would identify actual cracking on the system. As discussed in Section 3.2.5, FEI existing integrity management practices are not able to identify all cracking on its pipelines.

In a baseline system-level QRA, the safety risk associated with a pipeline is calculated by the following equation:

$$Safety\ Risk = Likelihood\ of\ a\ Failure\ * Safety\ Consequence\ of\ a\ Failure$$

The likelihood of a failure is based on the type of threat and the safety consequence of a failure is based on the size of a gas release and the potential for the gas to ignite.

The baseline QRA assessed over 20 potential threats[25] to the 12 ITS pipelines listed in Table 3-3, as well as 13 CTS and 10 VITS pipelines listed in Appendix B-1. The degree of contribution of each threat to overall safety risk, as well as to the rupture rate, is also identified. Ruptures are the dominant driver of safety risk due to the thermal radiation hazard of an ignited jet fire. It is noted that the baseline QRA is an assessment of this immediate safety risk. Ruptures can have significant and unacceptable consequences in addition to immediate safety impacts, including

[25] As examples, the potential threats assessed include external corrosion, internal corrosion, stress corrosion cracking, excavation damage, manufacturing defects, construction defects, and earth movements.

indirect safety impacts (e.g. forest fire), reliability, environment and/or regulatory impacts. These impacts are further described in Section 3.5.3.

At the system level, the QRA estimates that the CTS has the highest risk followed by the ITS and then the VITS. As detailed in FEI's CPCN Application for the CTS TIMC Project, the QRA identified that cracking was the top driver of risk for the CTS pipelines. With respect to the ITS, JANA's model estimates that cracking threats are the second highest threat for seven of the ITS pipelines identified as susceptible to cracking threats and third highest threat for the other two susceptible ITS pipelines. However, cracking threats are the top contributor to safety risk and rupture rate for segments of all nine ITS pipelines identified as susceptible to cracking threats. These segments are typically located in lower population areas where the operating hoop stress of the pipeline is higher.[26]

The relative risk due to cracking is lower on the ITS, as compared to the CTS, primarily due to the lower population densities surrounding the ITS pipelines. In particular, lower population in the Interior compared to the Lower Mainland reduces the estimated safety consequences of a rupture. However, as discussed in Section 3.5.3 below, the potential consequences of a rupture can still be significant in unpopulated areas, including the risk of igniting forest fires and loss of gas supply for a potentially extended period – which could result in indirect safety consequences not considered by the QRA.

As indicated by the QRA, threats that were more highly ranked than cracking on the ITS pipelines include: (1) third-party damage; and (2) natural hazards. Third-party damage results from external interference such as third-party contact with the pipeline or vandalism. Natural hazards result from environmental factors such as landslides, floods or earthquakes and can expose and/or cause damage to the pipeline. FEI's IMP-P includes established activities, further discussed in Appendix E, to mitigate threats due to third-party damage and natural hazards, which are in accordance with standards and regulations or industry practice. In contrast, FEI's current activities to identify cracking on the ITS (see Section 3.2.5 above) are not sufficient or aligned with industry practice (see Section 3.3.2 above).

In consideration of the results of the QRA and other factors such as industry practice, FEI prioritized the need for the CTS and ITS TIMC projects to enhance FEI's transmission integrity management capability in addressing cracking threats. The delineation for the two CPCN applications is based primarily on risk, and results in a regional split: the application for the CTS, which has been approved by the BCUC, followed by the present Application for the ITS pipelines. Dividing the applications at the system level has enabled FEI to advance its risk mitigation efforts in a timely and pragmatic manner.

[26] As described in Section 3.2.4, SCC occurs on transmission pipelines as the result of three factors, one of which is tensile stress. Hoop stress, which is a function of the operating pressure of the pipeline, is an example of a tensile stress. SCC is associated with higher tensile stresses.

3.4.5 JANA's Analysis Supports the Need for ITS TIMC Project

Based on the assessments described above, nine ITS transmission pipelines have been identified as susceptible to cracking and, in some cases, evidence of cracking has already been found on these pipelines. The QRA also shows that cracking threats are one of the drivers of safety risk to the ITS pipelines.

As described in Section 3.2.4, cracking is a time-dependent threat, meaning that its potential to impact the pipeline increases over time. Given factors including industry knowledge about cracking threats, FEI's identification of cracking on its own pipelines and the understanding that FEI's existing integrity management practices do not, and cannot, identify all cracking, it is necessary for FEI to initiate this project in a timely manner.

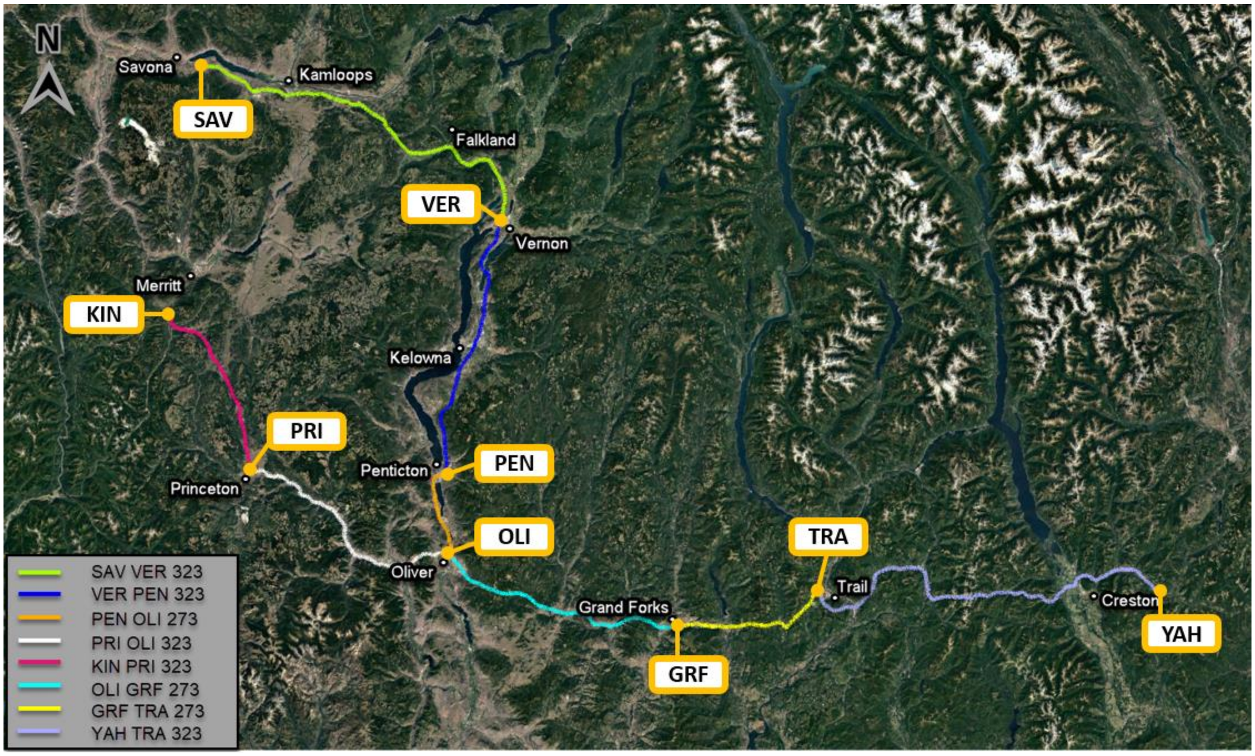
FEI has timed its CPCN applications for the two TIMC projects with consideration to the availability of proven and commercialized EMAT tools suitable for use in its transmission pipelines, and following its baseline QRA, which has informed the priority and urgency of the CTS and ITS TIMC projects. The ITS TIMC Project, if completed over a reasonable planning horizon as FEI is proposing, reflects an appropriate operator response to available information regarding the potential threat posed by pipeline cracking.

The subject of this Application is the 8 ITS pipelines that are NPS 10 or greater for which EMAT ILI tools are available, and which have been identified as being susceptible to cracking. The ITS pipelines that are the subject of the Application are listed in Table 3-5, and a map showing the location of these ITS pipelines is in Figure 3-12 below.

Table 3-5: Transmission Pipelines Addressed by the ITS TIMC Project

#	Line Name	FEI Name	Approximate Length
1	SAV VER 323	Savona – Vernon 12"	143 km
2	VER PEN 323	Vernon – Penticton 12"	99 km
3	GRF TRA 273	Grand Forks – Trail 10"	60 km
4	OLI GRF 273	Oliver – Grand Forks 10"	95 km
5	PEN OLI 273	Penticton – Oliver 10"	30 km
6	KIN PRI 323	Kingsvale – Princeton 12"	67 km
7	PRI OLI 323	Princeton – Oliver 12"	95 km
8	YAH TRA 323	Yahk – Trail 12"	163 km
Total Length of ITS TIMC Pipelines			**752 km**

Figure 3-12: 8 ITS Pipelines Requiring System-Level Cracking Mitigation



3.4.6 Confirmation of Risk of Cracking Threats By Dynamic Risk

During the regulatory proceeding for FEI's CTS TIMC Project CPCN application, the BCUC retained Dynamic Risk Assessment Systems Inc. (Dynamic Risk), an external independent pipeline integrity expert consultant, to review the application and submit an independent report on FEI's pipeline integrity management planning with respect to the threat of SCC, including the preparation and use of JANA's reports. A number of Dynamic Risk's conclusions are equally relevant to the ITS TIMC Project. Therefore, FEI is including Dynamic Risk's Independent Report and responses to information requests filed in the CTS TIMC regulatory proceeding as Appendix O to the Application.

In its Independent Report, Dynamic Risk concluded that cracking is a credible threat for FEI's transmission system that, if left unmitigated, could lead to pipeline rupture, stating:

> SCC is a form of environmentally assisted cracking; wherein small surface cracks can form and grow over time. Cracks that continue to grow will frequently overlap and/or coalesce to become the equivalent of a large single crack in terms of their effect on the pressure carrying capacity of the pipe. Eventually such overlapping and coalescence can create a crack of sufficient size to cause the pipeline to leak or rupture. It is the independent pipeline integrity expert panel's view that SCC is a credible threat for FEI that if left unmitigated, could lead to pipeline failure.[27]

[27] Appendix O-1, Independent Report of Dynamic Risk, p. 30.

Further, Dynamic Risk concluded that FEI's existing practices are not sufficient to manage the threat:

> Currently, there is a gap in the existing FEI integrity management practices to address the threat of SCC, as opportunistic excavations alone are not sufficient to fully characterize, detect and manage the threat. The results of the quantitative risk assessment (QRA) demonstrate the risk of SCC to be highest on the CTS pipeline segments and it is the independent pipeline integrity expert panel's view that EMAT ILI is the most appropriate response and mitigation action to reduce risk and strengthen the overall integrity management program.[28]

Dynamic Risk also endorsed the QRA, stating:[29]

> The QRA performed on the three (3) transmission systems is in alignment and follows the approach defined in the CSA Z662-19 with hazard identification, frequency and consequence analysis, and risk estimation.

While these conclusions of Dynamic Risk were developed specifically for the CTS TIMC Project, FEI contends that they also support the need for the ITS TIMC Project as set out in this Application.

3.4.7 Treatment of Smaller Diameter Transmission Pipelines Operating at Greater than 30 Percent SMYS

While nine ITS pipelines have been identified as susceptible to cracking, one of these is the NPS 8 Trail to Castlegar (TRA CAS 219) transmission pipeline for which EMAT ILI tools are not currently available. The TRA CAS 219 pipeline has been omitted from the scope of the ITS TIMC Project, as EMAT ILI tools are not available for pipelines NPS 8 or smaller.

FEI currently operates approximately 100 transmission pipelines with diameters NPS 8 or smaller, which operate at a hoop stress level greater than 30 percent SMYS. Since EMAT tools are currently only commercialized and available for pipelines of diameter NPS 10 and larger, FEI did not include transmission pipelines with diameters smaller than NPS 10 in the scope of its TIMC projects. FEI will continue to inspect these pipelines for cracking during opportunity digs and, if significant cracking is discovered, it will develop a line specific mitigation plan. Moreover, when proven and commercialized EMAT ILI technology becomes available and adopted by industry for smaller diameter pipelines, FEI will evaluate the use of such technology and make a decision as to whether to introduce EMAT for these pipelines.

[28] Appendix O-1, Independent Report of Dynamic Risk, p. 2.
[29] Appendix O-1, Independent Report of Dynamic Risk, p. 7.

3.5 FEI MUST ENHANCE ITS INTEGRITY MANAGEMENT CAPABILITIES TO MITIGATE CRACKING ON THE ITS

3.5.1 Summary of Section

Based on the changes in industry practice described in Section 3.3 and the assessments in Section 3.4, FEI's obligations to ensure safe and reliable operation of its assets dictate that FEI must enhance its integrity management capabilities to manage cracking threats on the ITS. The potential consequences of not doing so are significant and unacceptable to FEI.

3.5.2 FEI's Statutory and Regulatory Obligations to Mitigate Cracking Threats

FEI's statutory and regulatory obligations align with FEI's efforts to take additional measures to mitigate the risk of failure on the 8 ITS pipelines due to cracking threats.

The integrity-related regulatory provisions applicable to FEI's gas system assets, as expressed by standards such as CSA Z662, are typically goal-oriented rather than prescriptive in nature. As such, the requirements are expressed as outcomes to be achieved, rather than as descriptions of how to achieve those outcomes. The specific actions that FEI must take to eliminate or mitigate cracking threats are therefore not specifically defined in the applicable laws, regulations, or standards. For example, a key outcome-based requirement for pipeline operators in British Columbia is Section 37 (1) (a) of the OGAA, which requires BCOGC permit holders to "prevent spillage"[30] associated with the operation of pipelines operating at or above 700 kPa. Of particular relevance is FEI's obligation to comply with the CSA Z662 standard, which is prescribed by the *Pipeline Regulation* under the OGAA. An operative section of CSA Z662 is section 10.3.1, which states:

> 10.3.1 The pipeline system integrity management program required by Clause 3.3 shall include procedures to monitor for conditions that can lead to failures, to eliminate or mitigate such conditions, and to manage integrity data. Such integrity management programs shall include a description of the operating company commitment and responsibilities, quantifiable objectives, and methods for
>
> a) assessing risks;
>
> b) identifying risk reduction approaches and corrective actions;
>
> c) implementing the integrity management program; and
>
> d) monitoring results.

[30] "Spillage" as defined in the OGAA, means "petroleum, natural gas, oil, solids or other substances escaping, leaking or spilling from (a) a pipeline, well, shot hole, flow line, or facility, or (b) any source apparently associated with any of those substances."

As FEI has identified cracking threats as a condition that can lead to failure on the ITS, and there are known approaches that can eliminate or mitigate these conditions, FEI must enhance the ability of its IMP-P to locate, assess and address cracking threats on these pipelines.

The BCOGC has provided written support for FEI's TIMC projects, recognizing that it is in alignment with FEI's regulatory and legal responsibilities as a BCOGC permit holder. The letter from the BCOGC to FEI, dated November 16, 2020, is attached as Appendix C to the Application.

The BCUC has recently recognized FEI's obligations to ensure the safety and security of its pipeline operations.

- In the case of FEI's application for a CPCN for the Inland Gas Upgrade (IGU) Project, the BCUC noted in its Decision[31] (at p. 7) that "the primary justification for the IGU Project relates to safety, specifically, safety of supply and the continued provision of natural gas without interruption to customers, as well as the physical safety of residents and others along and near the laterals." The BCUC went on to state (at p. 7): "In the Panel's view, FEI has a duty to ensure the safety and security of individuals who may be injured due to an explosion emanating from a pipeline rupture and subsequent ignition."
- In the case of FEI's application for a CPCN for the CTS TIMC Project, the BCUC noted in its Decision[32] (at p. 11) that, consistent with the views of the BCOGC and Dynamic Risk, "there is a need to mitigate the risk of undetected cracks that FEI's existing tools and techniques are insufficient in addressing." Ultimately, the BCUC concluded that (at p. 12): "it would be unacceptable from a safety and reliability perspective to expose the public to any undetected cracking risk, which can be avoided through proactive measures."

The need for the ITS TIMC Project similarly relates to safety, and FEI's duty to ensure the continued safe operation of the ITS pipelines. As discussed in Section 3.4, FEI has assessed the safety risk of cracking threats and confirmed that they are a credible threat to the ITS. As discussed below, the potential consequences of not mitigating this threat are significant. As such, in order to properly mitigate cracking, FEI must enhance its integrity management practices in ways that are consistent with industry technologies and practices.

3.5.3 Failure Due to Cracking Could Have Unacceptable Consequences

As set out in Section 3.4, FEI has demonstrated that cracking is a credible threat to the ITS that has the potential to cause failure by rupture. While such failures are low probability events, the potential consequences are significant and are unacceptable to FEI. This section discusses these potential consequences.

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[31] BCUC Decision and Order G-12-20, dated January 21, 2020. Online: https://www.bcuc.com/Documents/Proceedings/2020/DOC_56891_2020-01-21-G-12-20-FEI-CPCN-IGU-Project-Decision.pdf.

[32] BCUC Decision and Order G-3-22, dated May 18, 2021. Online: https://docs.bcuc.com/Documents/Proceedings/2022/DOC_66603_C-3-22-FEI-CTS-TIMC-CPCN-Decision.pdf.

3.5.3.1 Transmission Pipelines Operating at or Above 30 Percent of SMYS Can Rupture

The consequences of pipeline failure depend in large part on whether it will fail by rupture or by leaking. As discussed below, the 8 ITS pipelines can all fail by rupture, which increases the potential safety and reliability consequences when compared to a leak.

A pipeline's potential to fail by rupture due to time-dependent threats can be determined by comparing the pipeline's operating hoop stress to the SMYS of the pipe. For ease of reference:

- The operating hoop stress of a pipeline is the force per unit area exerted in the circumferential direction of the pipe wall due to the internal pressure of the gas in the piping.
- The yield strength of a pipe is the level of stress where the pipe begins to permanently deform or yield.
- The SMYS of a pipe is the minimum yield strength prescribed by the specification or standard to which a material is manufactured.

A threshold of 30 percent for the ratio of a pipeline's operating hoop stress, as compared to the SMYS of the pipe, has been adopted by CSA Z662 as the delineation between a transmission pipeline and a gas distribution system.[33] It is generally accepted by FEI and the Canadian pipeline industry that a pipeline operating at or above 30 percent of SMYS has a potential to fail by rupture, whereas a pipeline operating below 30 percent of SMYS would have a potential to leak. The CSA Z662 delineation is supported by a 2004 ASME International Pipeline Conference Paper entitled "A Review of the Time Dependent Behaviour of Line Pipe Steel" by Andrew Cosham and Phil Hopkins,[34] which indicates that full scale tests on part-wall and through-wall defects showed that it is very unlikely that a part-wall defect will fail as a rupture at a stress level less than 30 percent.

Pipeline leaks are accepted by the Canadian natural gas delivery industry as generally having a lower potential for significant consequences than ruptures. This acceptance is demonstrated by CSA Z662-19 Clause O.2.2.3.1, which states that human and environmental safety consequences of a small leak in a non-sour natural gas[35] pipeline are insignificant. The same is not true for failure by rupture.

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[33] Transmission pipelines have an operating hoop stress of greater than or equal to 30% of the SMYS of the pipe, whereas distribution pipelines have an operating hoop stress less than 30%. FEI's operating pressure classifications of its system (e.g. Transmission Pressure (TP), Intermediate Pressure (IP), and Distribution Pressure (DP)) are different from the operating stress-based classification that is applicable to this Application. Some FEI TP assets are certified by the BCOGC to operate above 30 percent SMYS, while others are certified to operate below 30% SMYS.

[34] Andrew Cosham and Phil Hopkins, "A Review of the Time Dependent Behaviour of Line Pipe Steel", online: http://proceedings.asmedigitalcollection.asme.org/proceeding.aspx?articleid=1646086.

[35] Non-sour natural gas is gas that does not contain material amounts of hydrogen sulphide, a substance that can significantly increase the potential safety consequences of a leak. FEI transports and delivers non-sour natural gas.

3.5.3.2 The Consequences of a Rupture Can be Significant

FEI is committed to adopting integrity management solutions to prevent ruptures on its systems, as it is recognized that ruptures can have significant and unacceptable consequences, such as:

- **Safety Consequences:** If the gas ignites, there can be significant safety impacts beyond the immediate area surrounding the pipeline. An ignited release can result in potential near and widespread harm due to the ensuing fire and resulting thermal effects on people and property.
- **Reliability Consequences:** A pipeline rupture, in the absence of a redundant gas supply source, could result in loss of supply to end-use customers with potential safety and economic consequences for residential, commercial, and industrial customers. An example of the potential reliability consequences of a rupture on an ITS pipeline is provided in Section 3.5.3.3.
- **Environmental Consequences:** A pipeline rupture could result in damage to the natural environment, potentially impacting aquatic and terrestrial resources, in addition to degraded air quality and greenhouse gas emissions. The environmental consequences associated with a pipeline rupture or a sudden and uncontrolled release of natural gas would be classified as a Level 2 Major or Level 3 Serious reportable incident by the BCOGC. In addition, the release of gas by rupture would be considered a reportable incident under the *Environmental Management Act Spill Reporting Regulation* for transmission pipelines.
- **Regulatory Consequences:** In alignment with the Canadian transmission pipeline industry, FEI and the BCOGC consider that a failure by rupture of FEI's natural gas pipelines to be a significant incident and not acceptable performance within its IMP-P.

While the ITS operates in some lower population areas, the risk of wildfires resulting from an ignited rupture on an ITS pipeline is elevated in the Interior because of its expansive woodlands and vegetation, and the dry conditions particularly prevalent in the hot summer months. Wildfires can impact people and property far beyond the immediate location of the rupture and cause significant environmental damage. While this incident was not ignited by a natural gas pipeline rupture, the following provides an example of the most significant wildfire started by failed energy infrastructure in a remote area and its consequences.

- On November 8, 2018, a fire (later named Camp Fire) started near the community of Pulga in Butte County, California. The California Department of Forestry and Fire Protection determined that the cause of the fire was electrical transmission lines owned and operated by Pacific Gas & Electric Company. The fire was active for 17 days and burned a total of 153,336 acres, resulting in the destruction of 18,804 structures and 85 fatalities and several injuries.[36] The fire caused a large amount of heavy smoke that elevated the air pollution to dangerously high levels in Sacremento Valley and Bay Area for approximately

[36] California Department of Forestry and Fire Protection (CAL FIRE). "CAL FIRE Investigators Determine Cause of the Camp Fire." Online: https://www.fire.ca.gov/media/5121/campfire_cause.pdf.

two weeks. Additionally, due to burning structures, harmful and toxic substances were released into the air which travelled to communities more than 150 miles away.[37] The total cost of the Camp Fire was estimated at $16.5 billion dollars.[38]

To illustrate the potential consequences of a natural gas pipeline rupture, the following are examples experienced by North American natural gas transmission pipeline operators. The incidents described below that occurred in the United States are included due to their influence on gas transmission pipeline operator practice and the regulatory environment in both the United States and Canada.

- On October 9, 2018, the Enbridge (Westcoast) NPS 36 natural gas transmission pipeline experienced an ignited rupture. As identified in the Transportation Safety Board of Canada's investigation report,[39] the rupture originated at stress corrosion cracks on the outside surface of the pipe. The Enbridge media statements state:[40] "The BC Pipeline comprises of two pipelines, a 36-inch and a 30-inch, that run parallel to each other. Both pipelines were shut down following the rupture on the 36-inch line." While one of the two pipelines (i.e. the NPS 30 line) became operational on October 11, 2018, pipeline capacity remained constrained without the larger NPS 36 line in-service, resulting in reduced gas supplies and a loss of service for some FEI customers. A more widespread and impactful loss of service to Lower Mainland and Vancouver Island customers, including a system shutdown, could have occurred had this event taken place during a period with colder temperatures.
- On January 25, 2014, the TransCanada PipeLines Limited NPS 30 natural gas transmission pipeline experienced an ignited rupture in an agricultural area. The cause pertained to a construction-related imperfection in a weld (constructed in 1960) that remained stable until being subject to increasing stresses during operation. Possible factors included weakened soil support around the pipeline during past excavation activity, frost effects, and pipe thermal contraction due to a prior absence of gas flow in the line. The rupture impacted nearly 4000 residents during a cold winter month with local temperatures as low as approximately minus 20 degrees Celsius. The Transportation Safety Board of Canada's website states:[41]

  > "A crater measuring approximately 24 metres long by 12.5 metres wide was created, and debris was ejected approximately 100 metres from the rupture site. Natural gas burned for approximately 12 hours. Five residences in the immediate

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[37] California Air Resources Board. "Camp Fire Air Quality Data Analysis." Online: https://ww2.arb.ca.gov/sites/default/files/2021-07/Camp_Fire_report_July2021.pdf (dated July 2021).

[38] U.S. Department of Commerce. "November 2018 Camp Fire." Online: https://www.weather.gov/media/publications/assessments/sa1162SignedReport.pdf.

[39] Transportation Safety Board of Canada. "Pipeline Transportation Safety Investigation P18H0088." Online: https://www.tsb.gc.ca/eng/rapports-reports/pipeline/2018/p18h0088/p18h0088.html.

[40] Enbridge. "Enbridge Responds to Natural Gas Transmission Pipeline Incident North of Prince George." Online: https://www.enbridge.com/media-center/media-statements/prince-george-pipeline-incident (dated October 10, 2018, 3:48 p.m. PST).

[41] Transportation Safety Board of Canada. "Pipeline Transportation Safety Investigation P14H0011." Online: http://bst-tsb.gc.ca/eng/rapports-reports/pipeline/2014/p14h0011/p14h0011.asp.

> vicinity were evacuated, and Provincial Highway 303 was closed until the fire was extinguished. There were no injuries."
>
> …
>
> "As a precaution, two adjacent pipelines, lines 400-2 and 400-3, were shut down, assessed, and returned to service on 26 January 2015. This resulted in the loss of natural gas service to 9 rural communities in Manitoba for approximately 80 hours."

- On September 9, 2010, the Pacific Gas and Electric Company, NPS 30 natural gas transmission pipeline experienced an ignited rupture in a residential area in San Bruno, California. The probable cause was identified as "inadequate quality assurance and quality control in 1956 during its Line 132 relocation project" and an "inadequate pipeline integrity management program, which failed to detect and repair or remove the defective pipe section". The National Transportation Safety Board website states:[42]

> "The rupture produced a crater about 72 feet long by 26 feet wide. The section of pipe that ruptured, which was about 28 feet long and weighed about 3,000 pounds, was found 100 feet south of the crater. PG&E estimated that 47.6 million standard cubic feet of natural gas was released. The released natural gas ignited, resulting in a fire that destroyed 38 homes and damaged 70. Eight people were killed, many were injured, and many more were evacuated from the area."

- On August 19, 2000, the El Paso Natural Gas Company, NPS 30 natural gas transmission pipeline experienced an ignited rupture that occurred adjacent to a river crossing. The probable cause was identified as internal corrosion. The National Transportation Safety Board website states:[43]

> "The released gas ignited and burned for 55 minutes. Twelve persons who were camping under a concrete-decked steel bridge that supported the pipeline across the river were killed and their three vehicles destroyed. Two nearby steel suspension bridges for gas pipelines crossing the river were extensively damaged."

- On August 7, 2000, the Westcoast Energy Inc. NPS 30 natural gas transmission pipeline, near the Zopkios Rest Stop at Exit 217 Coquihalla Highway, British Columbia, ruptured. The National Transportation Safety Board of Canada website states:[44]

> "…a rupture occurred at a localized hard spot on the Westcoast Energy Inc. 762-millimetre outside diameter T-South Mainline at Mile Post 569.9 near the Zopkios rest stop at Exit 217, Coquihalla Highway, British Columbia. Several vehicles at the rest stop were damaged as a result of thrown debris from the explosion. There

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[42] National Transportation Safety Board. "Pacific Gas and Electric Company Natural Gas Transmission Rupture and Fire." Online: https://www.ntsb.gov/investigations/accidentreports/pages/PAR1101.aspx.

[43] National Transportation Safety Board. "Natural Gas Pipeline Rupture and Fire." Online: https://www.ntsb.gov/investigations/accidentreports/pages/PAR0301.aspx.

[44] Transportation Safety Board of Canada. "Pipeline Investigation Report P00H0037." Online: http://www.bst-tsb.gc.ca/eng/rapports-reports/pipeline/2000/p00h0037/p00h0037.asp.

> were no injuries. The Coquihalla Highway was closed to traffic for 3 ½ hours following the rupture."

These examples demonstrate the significant and extended consequences of a rupture including loss of life and injuries, environmental damage, loss of property and damage to property, loss of service and transportation impacts. A rupture on any of the 8 ITS pipelines could result in similar consequences. Due to the configuration of the ITS, service interruptions and outages resulting from a rupture are an amplified concern, especially if occurring during cold winter months. The following section describes the reliability consequences of a rupture on the ITS in more detail.

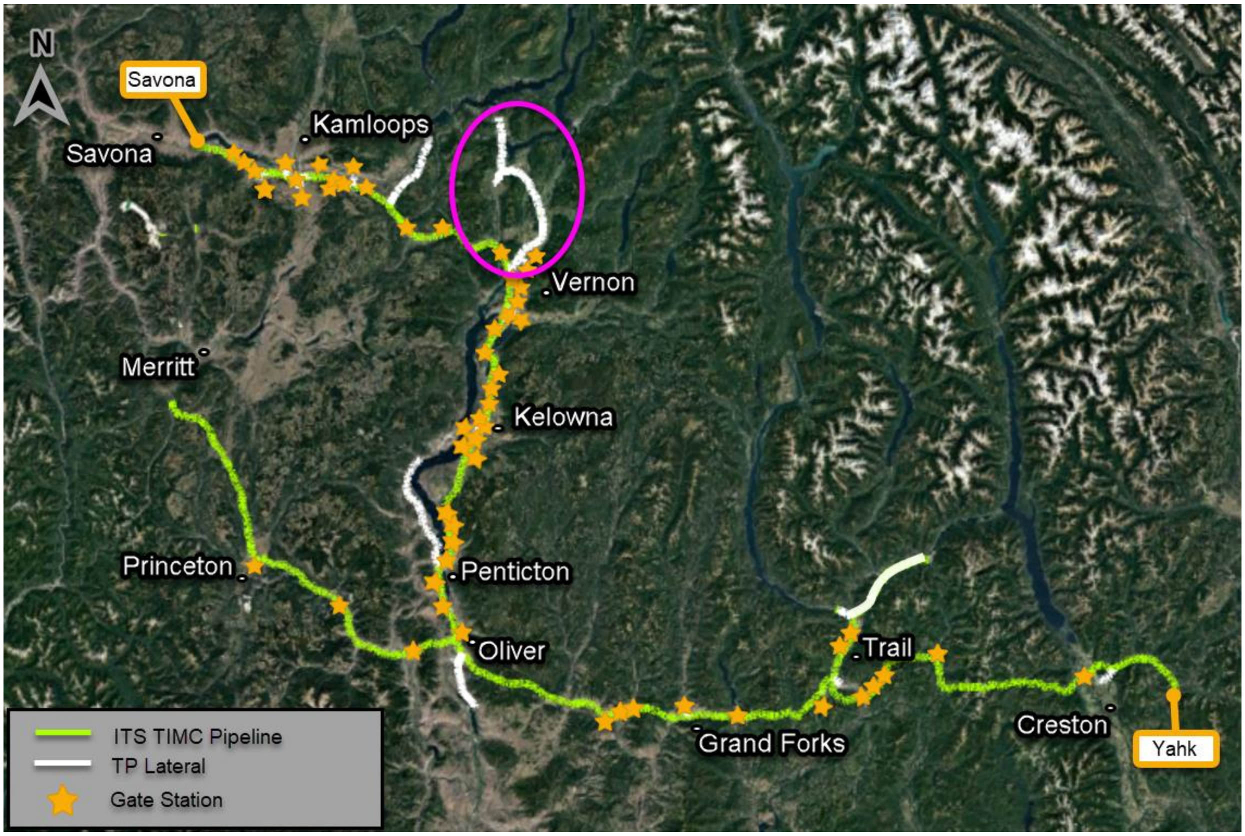
3.5.3.3 The Reliability Consequences of an ITS Pipeline Rupture Can be Significant

As described in Section 3.4.2, the ITS receives gas at two points: (1) in Savona, where gas is then distributed east, and (2) in Yahk, where gas is then distributed west. Gas travels through transmission pressure (TP) pipelines, including the 8 ITS pipelines, to feed gate stations[45] which in turn feed distribution pressure systems that serve customers located within various communities in the Interior.

Figure 3-13 below depicts: (1) the 8 ITS pipelines (green lines); (2) the various gate stations (yellow stars) fed from the ITS pipelines; and (3) adjoining TP laterals (white lines) that are also fed by the 8 ITS pipelines and supply gas to additional customers and communities.

[45] 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.

Figure 3-13: Gate Stations Supplied by the 8 ITS Pipelines[46]



The ITS pipelines are bi-directional providing the ability to flow gas in either direction depending on system supply sources. However, under high demand conditions,[47] the ITS pipelines are highly reliant on the dominant supply coming from one direction effectively making them uni-directional lines at these times. Further, the ITS pipelines are generally unlooped, meaning the gate stations and laterals fed by these pipelines are not supported by other pipelines. If a pipeline failure occurs, especially during cold winter conditions, gas supply to communities fed by these gate stations and laterals could be lost, leaving residents with an inability to heat their homes and result in potential safety consequences. An example of one of the many potential to impacts Interior communities is shown below for the area circled in pink in Figure 3-13 above.

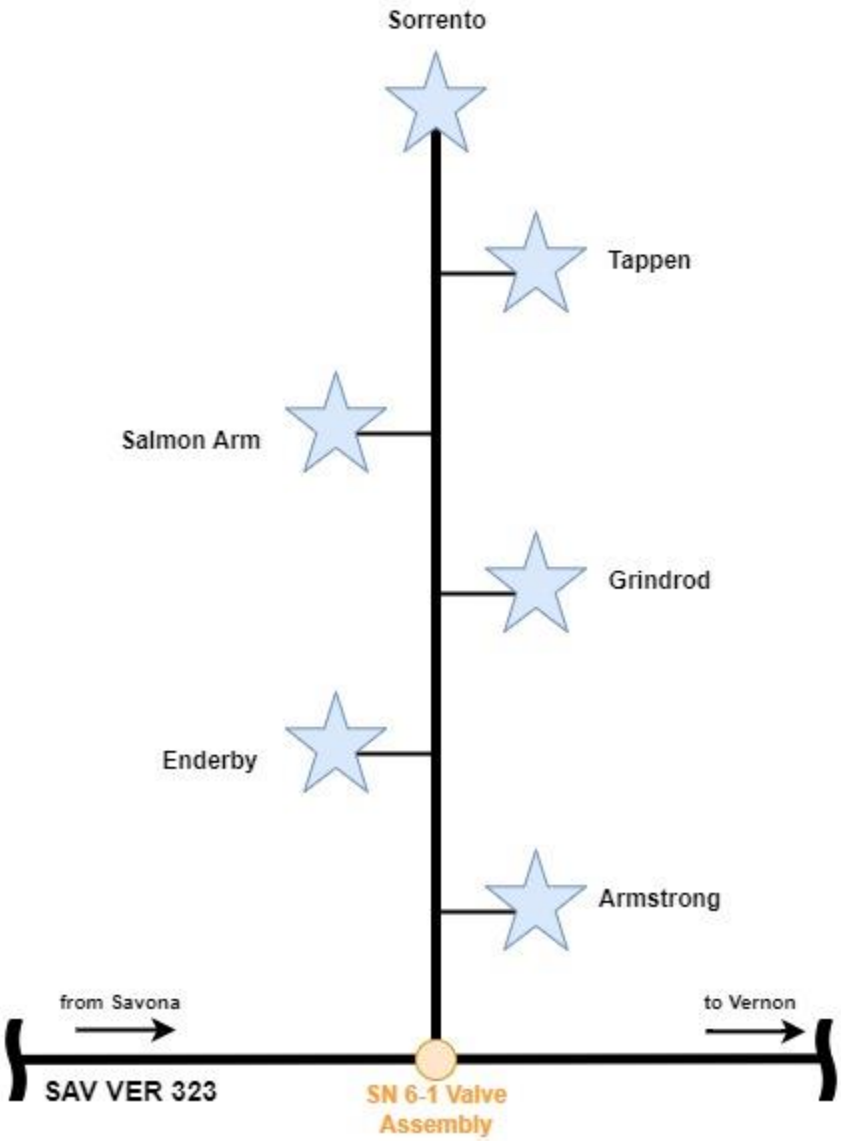
As shown in Figure 3-14 below, the SAV VER 323 pipeline feeds a transmission pressure (TP) lateral system downstream of the SN 6-1 Valve Assembly (orange circle). The TP lateral system supplies various gate stations, where the gas pressure is reduced and then fed to distribution pressure (DP) systems to feed customers' homes and businesses in communities such as Armstrong, Enderby, Grindrod, Salmon Arm and Sorrento. During fall and winter months, the flow of gas on the SAV VER 323 pipeline is restricted and must flow from Savona (west) to Vernon (east). As such, if there is a supply disruption on the SAV VER 323 pipeline near the SN 6-1 Valve

[46] Gate stations on TP Laterals have been omitted.

[47] High demand conditions typically occur throughout the fall and winter months due to increased heating demand in cold weather conditions.

Assembly, the supply of gas available to the nearly 14,000 customers in these communities may be interrupted or lost. Additionally, other nearby communities along the SAV VER 323 pipeline could be impacted.

Figure 3-14: Interior Communities Only Supplied by SAV VER 323



The extent of customer outages as a result of a rupture is greater when the demand for gas is higher. Demand is higher in fall and winter months when outside temperatures are colder. As such, during these months there is less capacity available to mitigate the extent of customer outages if a supply disruption occurs. Depending on the time of year and the location of a rupture along the SAV VER 323 and the connected VER PEN 323 pipeline, approximately 5,000 to 105,000 customers could lose service in communities between Savona and Penticton if a rupture were to occur. Depending on the time of year and location of the rupture, these customers could experience an outage as short as days while the rupture is repaired, or as long as multiple months if the system pressure collapses and the system needs to be purged prior to regasification and service restoration.

The gas supply to many other Interior communities along the ITS pipelines is similar to the SAV VER 323 and VER PEN 323 pipelines, whereby the pipelines are typically unlooped and the flow of gas is restricted to a single direction through the fall and winter months. Thus, the potential reliability consequences of a failure, which can lead to additional safety consequences during colder months, are significant and support the need to enhance FEI's integrity management capabilities.

3.6 CONCLUSION

FEI has a robust IMP-P with which it successfully operates and manages its transmission pipelines. Continual improvement is an expected and necessary component of an IMP-P, as the inputs to a company's integrity management decisions, and the decisions themselves, will evolve as industry knowledge, technology and expectations change. FEI's transmission pipelines will therefore require investment over their lifecycle to ensure their ongoing safety, reliability, and environmentally responsible performance.

At this time, FEI's continual improvement activities have identified the need to enhance its capabilities for mitigating cracking threats on 8 of its ITS pipelines. Cracking threats have resulted in rupture failure of transmission pipelines in industry, and FEI's risk assessment has confirmed that cracking is a credible threat to these ITS pipelines. FEI is committed to adopting proactive integrity management solutions to prevent such failures on its system.

To respond to FEI's evolving understanding of the cracking threat to the identified pipelines in its ITS and to align with evolving industry best practices that are utilizing tools with new and improved capabilities and functionalities to assess, manage and mitigate cracking, FEI must evaluate the feasibility, appropriateness, and cost-effectiveness of improved alternatives to its status quo. Section 4 evaluates the alternatives for meeting this need.

4. DESCRIPTION AND EVALUATION OF ALTERNATIVES

4.1 *INTRODUCTION AND OVERVIEW*

This section describes FEI's evaluation of alternatives to complete the ITS TIMC Project. Based on the Project need and justification set out in Section 3, the objective of the Project is to enhance FEI's integrity management capabilities to mitigate cracking threats on 8 ITS pipelines (Project Objective).

There are six alternatives currently available to achieve the Project Objective which FEI evaluated using non-financial and financial criteria. A summary of the alternatives evaluation is provided in Table 4-1 below.

Table 4-1: Summary of Alternatives Evaluation

Alternative	Non-Financial Assessment	Technical Feasibility	Financial Assessment	Financial Feasibility
Alternative 1: SCCDA		Not Feasible		
Alternative 2: PRS		Not Feasible		
Alternative 3: HSTP		Not Feasible		
Alternative 4: EMAT ILI		**Feasible**		**Feasible**
Alternative 5: PLR		Potentially Feasible		Not Feasible
Alternative 6: PLE		Potentially Feasible		Not Feasible

Based on an assessment using the non-financial criteria, FEI screened out three alternatives as not technically feasible because they could not sufficiently mitigate cracking threats when implemented on the 8 ITS pipelines. Two of the remaining three alternatives were then screened out using a financial criterion due to the significantly higher costs expected when compared to EMAT ILI. EMAT ILI is therefore the only alternative which is both technically and financially feasible and is therefore the preferred alternative for the ITS TIMC Project.

The remainder of Section 4 provides details of the alternatives analysis as follows:

- Section 4.2 describes the six alternatives that are available to achieve the Project Objective.
- Section 4.3 describes FEI's alternatives evaluation methodology, consisting of non-financial and financial critiera, used to evaluate the six alternatives.
- Section 4.4 describes how three alternatives were screened out as they were not technically feasible due to an inability to detect cracking threats, system constraints or operational challenges.

- Section 4.5 describes how two of the alternatives were screened out as they were not financially feasible due to their high cost relative to EMAT ILI.
- Section 4.6 describes how EMAT ILI is both technically and financially feasible and is therefore the preferred alternative.
- Section 4.7 concludes this section by summarizing the results of the alternatives analysis.

4.2 ALTERNATIVES IDENTIFIED TO ENHANCE FEI'S CAPABILITIES TO MANAGE CRACKING THREATS ON FEI'S TRANSMISSION PIPELINES

FEI considered six alternatives to mitigate cracking threats on the 8 ITS pipelines identified as being susceptible to cracking threats. The six alternatives that are currently available to pipeline operators are:

- **Alternative 1:** Stress Corrosion Cracking Direct Assessment (SCCDA);
- **Alternative 2:** Pressure Regulating Station (PRS);
- **Alternative 3:** Hydrostatic Test Program (HSTP);
- **Alternative 4:** Electro-Magnetic Acoustic Transducer In-Line Inspection Program (EMAT ILI);
- **Alternative 5:** Pipeline Replacement (PLR); and
- **Alternative 6:** Pipeline Exposure and Recoat (PLE).

Each alternative is described in detail below.

4.2.1 Alternative 1 – Stress Corrosion Cracking Direct Assessment

Stress corrosion cracking direct assessment (SCCDA) is an integrity management approach developed by the National Association of Corrosion Engineers (NACE) International, as detailed in the Standard Recommended Practice – Stress Corrosion Cracking (SCC) Direct Assessment Methodology.[48] This approach is analogous to External Corrosion Direct Assessment (ECDA), which FEI currently uses a modified version of to detect metal-loss corrosion on many of its pipelines.

SCCDA consists of the following steps:

- **Pre-assessment:** Collection and consideration of pipeline information (e.g., construction, vintage, coating type, operation, operating environment, and other relevant factors) to establish the applicability of this methodology for each segment of the pipeline, and to determine indirect inspection methods to be applied in the next step.

[48] ANSI/NACE Standard SP0204-2015.

- **Indirect Inspection:** Implementation of various surveys from the ground surface above a buried pipeline. Above-ground surveys can provide information on coating imperfections[49] and areas of potential corrosion and cracking activity, such as where cathodic protection may not be at the required level to prevent corrosion. The above-ground measurements are not direct measurements of the level of cathodic protection at the pipe surface or precise measurements of coating condition. The surveys comprise electrical data obtained from above-ground, from which the level of cathodic protection at the pipe surface and coating condition are then inferred.
- **Direct Examination:** The data obtained during the pre-assessment and indirect inspection is analyzed, pipe condition is inferred, and excavation sites that allow direct examination are selected. The pipeline is exposed at these sites and detailed inspection is conducted to confirm the presence or absence of SCC and the severity of the cracking present. Pipeline repair, replacement and/or recoat is performed on an as-needed basis.
- **Post Assessment:** The data from all preceding steps is analyzed to confirm that the objectives have been met, to refine predictive models for where SCC is suspected to be present, to establish any further investigation to confirm pipe integrity (subject to the limitations associated with the inferred pipe condition), and to establish a re-inspection interval.
- **SCCDA Records:** All data obtained in the prior steps is collected and retained as a record of the decisions made during the SCCDA process.

The integrity of sections of the pipeline that were not exposed during the integrity dig is inferred based on the process above, including information collected at excavated sites. The number of excavations required depends greatly on the coating condition of the pipeline, the level of cathodic protection, and the severity and amount of SCC found.

4.2.2 Alternative 2 – Pressure Regulating Station

This alternative involves the installation of a pressure regulating station[50] (PRS) at the upstream end of a pipeline or segment of a pipeline to permanently lower the maximum operating pressure of a pipeline such that the resultant hoop stresses[51] are reduced to below 30 percent of the specified minimum yield stress (SMYS).[52] For some pipelines, existing pressure regulating stations could be utilized to effect pressure reductions.

As explained in Section 3.5.3.1, a pipeline operating at or above 30 percent of SMYS has a potential to fail by rupture, whereas a pipeline operating below 30 percent of SMYS has a potential

49 Coating imperfections or holidays are areas where coating may be missing, degraded, or damaged. Commonly referred to as “coating holidays”.

50 A pressure regulating station is a permanent installation that allows pressure regulation of natural gas via a control valve. It comes with fully redundant flow paths (2 x 100 percent capacity) with each flow path containing two control valves (main and monitor) capable of independently regulating pressure to avoid over pressure.

51 The hoop stress of a pipeline is the force per unit area exerted in the circumferential direction of the pipe wall due to the internal pressure of the fluid in the piping.

52 The ITS pipelines operate at maximum hoop stress levels between 58 to 71 percent of SMYS.

to leak, rather than rupture. The potential consequences of a leak are significantly less than those of a rupture.

Clause 12.10.3.3 of CSA Z662 applies to gas pipelines operating at less than 30 percent of SMYS. FEI is obligated to comply with Clause 12.10.3.3 per section 3(1)(a) of the *Pipeline Regulation*, which states:[53]

> Leak management shall be subject to the following requirements: …
>
> (c) Upon discovery, all leaks shall be immediately assessed and documented by competent personnel in accordance with the company's established guidelines to determine if a hazard exists. (…)
>
> (d) Where the condition of distribution or service lines, as indicated by leak records or visual observation, deteriorates to the point where they are not suitable in service, they shall be replaced, reconditioned, or abandoned."

This clause indicates that it is appropriate for an operator of a gas distribution system to wait for an occurrence of leaks on its system prior to implementing a significant condition monitoring program (such as a regular in-line inspection program) or mitigation (replacement, reconditioning, or abandonment).

Therefore, by bringing the pipeline hoop stress below 30 percent of SMYS, the PRS alternative mitigates the potential for rupture from cracking threats in a manner that satisfies FEI's obligations under CSA Z662 and the *Pipeline Regulation.*

4.2.3 Alternative 3 – Hydrostatic Testing Program

A hydrostatic testing program (HSTP) involves periodically taking the pipeline out of service (e.g., at recurring intervals such as every five years) and subjecting it to a hydrostatic test to verify the integrity of a transmission pipeline over its lifecycle. Hydrostatic testing can be used to confirm the integrity of pipelines that may have time-dependent threats such as corrosion and cracking, construction damage, and/or manufacturing defects. Hydrostatic testing has been proven effective at safely removing near-critical axial flaws, such as SCC. By removing flaws that are approaching critical dimensions, a hydrostatic test helps prove the integrity of the pipeline, providing a margin of safety against an in-service failure for a period of time.

Hydrostatic testing of an existing pipeline is a complex process that involves:

- Developing a hydrostatic test plan, including planning for a temporary supply of gas to customers served by the test section.
- Isolating and removing the natural gas in the test section.
- Purging the test section of any remaining gas using nitrogen or air.

[53] Clause 12.10.3.3, CAN/CSA Z662-190 – Oil and Gas Pipeline Systems.

- Excavating and cutting test heads into the pipeline, which allow the test section to be filled with water.
- Evacuating residents within a pre-determined radius of the test section, including shutting down road crossings for the duration of the test.
- Sourcing and transporting to site the large volumes of water required to conduct the test.
- Filling the pipeline with water and bringing the pressure up to the calculated integrity test level, holding the pressure at the required level for a specified period of time (integrity test), reducing the test pressure to a calculated leak test level, and holding that pressure for a specified period of time (leak test). If a failure occurs during the integrity test, the failure location must be located, excavated and the pipe repaired, and the pipeline pressure test repeated until no more failures occur.
- Removing and disposing of the test water (or transporting and storing it for subsequent tests) followed by drying the test section using drying pigs[54].
- Removing temporary test heads and welding the test section back into the pipeline, followed by non-destructive testing of the tie-in welds.
- Purging the pipeline of air using natural gas.
- Restoring the pressure in the pipeline to normal operating pressure.
- Backfilling the exposed sections of pipe.

Hydrostatic testing has been used on pipelines where SCC failures have occurred or where near-critical cracking has been detected; however, this testing method does not identify the presence or absence of sub-critical cracks.[55] Any SCC or crack-like flaws that did not fail during the hydrostatic test can be expected to grow over time. Therefore, the pipeline would require periodic retesting to ensure continued integrity. Re-test intervals are established using an engineering assessment, which includes calculating the maximum size of flaws that could have survived the hydrostatic test, growing these flaws using a reasonably conservative crack growth rate, and determining when the calculated failure pressure is below a specified factor of safety.

4.2.4 Alternative 4 – Electro-Magnetic Acoustic Transducer (EMAT) In-Line Inspection (ILI) Program

An EMAT ILI program involves periodically running an in-line inspection tool equipped with specialized sensors through the pipeline to detect anomalies or defects. These anomalies or defects are then analyzed and integrity digs are performed to remove defects and validate the EMAT tool data. Anomalies or defects that could lead to pipeline failure in the foreseeable future are repaired or the affected segment of the pipeline is replaced.

[54] Drying pigs are commonly made of foam and pushed through the pipeline using air after the hydrostatic test to absorb and remove any residual water from the test section.

[55] Sub-critical cracks or flaws are those that would survive an integrity hydrostatic test.

EMAT ILI operates similarly to magnetic flux leakage (MFL) and circumferential magnetic flux leakage (CMFL) ILI tools used to manage external corrosion, but differs in its signal and sensor technology. MFL and CMFL tools use magnets to magnetize the steel pipeline. When metal loss is present, such as external corrosion, the magnetic field is disturbed, which the ILI tool then identifies through its sensors. In contrast, EMAT tools use a varying magnetic field to impart a force into the steel pipeline wall to generate sound waves. When a cracking anomaly or defect is present, such as SCC, the sound waves are interrupted, which the ILI tool then identifies through its sensors. The information from ILI tools are not direct measurements of the dimensions of anomalies and significant interpretation by the ILI vendor is required.

The frequency of ILI tool runs in FEI's ITS is commonly set at every seven years, but may be shorter if required. The run frequency is determined on a pipeline-by-pipeline basis by analysis of the run results and other factors including operating history, pipeline availability for ILI (i.e., scheduling factors), and industry practice. It is not possible for FEI to establish its initial frequency of EMAT inspection with complete certainty in the absence of baseline EMAT ILI and subsequent integrity dig program results for the ITS pipelines, and the frequency could also change over time as the various inputs change.

EMAT ILI tools can be propelled through a pipeline using the gas flow like other conventional ILI tools, or via robotics. However, FEI does not consider robotic EMAT ILI tools to be proven and fully commercialized at the time of this Application for the following reasons:

- **Robotic EMAT ILI tools require the pipeline being inspected to be taken out of service.** This is challenging for cases where the pipeline being inspected is not looped (i.e., does not have a redundant parallel path), and therefore, downstream customers would require an alternate source of natural gas (e.g., compressed natural gas) to maintain supply while the pipeline is out of service for inspection. Conventional EMAT ILI tools allows the pipeline to remain in service during inspection.

- **Robotic EMAT ILI tools require the inside surface of the pipeline to be impeccably clean for its sensors to function properly.** This is very difficult to achieve for pipelines that have been in service for many decades. While cleaning tools must be run through the pipeline prior to inspection with conventional ILI tools as well, conventional ILI tools do not require the same level of cleanliness as robotic tools for data collection.

- **Robotic EMAT ILI tools do not allow for detection of SCC near or within welds.** FEI is interested in inspecting its pipelines for various cracking threats, including those located within long seam welds. Conventional EMAT ILI tools are capable of detecting cracks and crack-like features within welds that meet a minimum detection threshold.

- **Robotic EMAT ILI tools have very low productivity rates as compared to conventional EMAT ILI tools**. For example, according to one vendor of robotic EMAT ILI tools, with their best efforts, the length of pipe that can be inspected in one day ranges from only 45 to 90 metres. In contrast, conventional EMAT ILI tools are capable of inspecting many kilometres of pipe within one day.

- **Robotic EMAT ILI tools need to be inserted into the pipeline through cut-outs.** These cut-outs are required at a minimum of every 550 metres, resulting in a significant number of excavations to remove and insert the tool. Conventional EMAT ILI tools can be inserted and retrieved from the endpoints of the pipeline. The 8 ITS pipelines are already equipped with sending and receiving barrels, which, with some modification, can accommodate loading and retrieval of conventional EMAT ILI tools.

As such, this alternative considers the use of conventional, gas-propelled EMAT ILI tools. At present, conventional EMAT ILI tools are both technically feasible and sufficiently commercialized to be employed as a mitigation measure in pipelines down to a nominal pipe size of 10 inches, including the 8 ITS pipelines identified as being susceptible to cracking threats as part of this Application. To implement an EMAT ILI program on the ITS, the following system and process improvements would be required:

- **Pipeline Alterations:** Such alterations are required to address locations where speed excursions[56] may occur. Pipeline alterations generally consist of cutting out the heavy wall features (e.g., fittings, pipe, etc.) which are known to have caused speed excursions in other ILI tools and replacing them with higher grade pipe with a wall thickness that matches the rest of the pipeline.

[56] Speed excursions occur when an ILI tool travels outside the optimum range as provided by the ILI vendor and may be caused be pipeline fittings, wall thickness transitions, gas flow conditions, etc. Speed excursions result in partially or fully degraded data.

1 **Figure 4-1(a): Example of a Pipeline Alteration with Natural Gas Bypass[57] – Before Cut Out**

2

[57] A natural gas bypass allows the flow of gas to be maintained while performing a pipeline alteration.

Figure 4-1(b): Example of a Pipeline Alteration with Natural Gas Bypass – After Cut Out

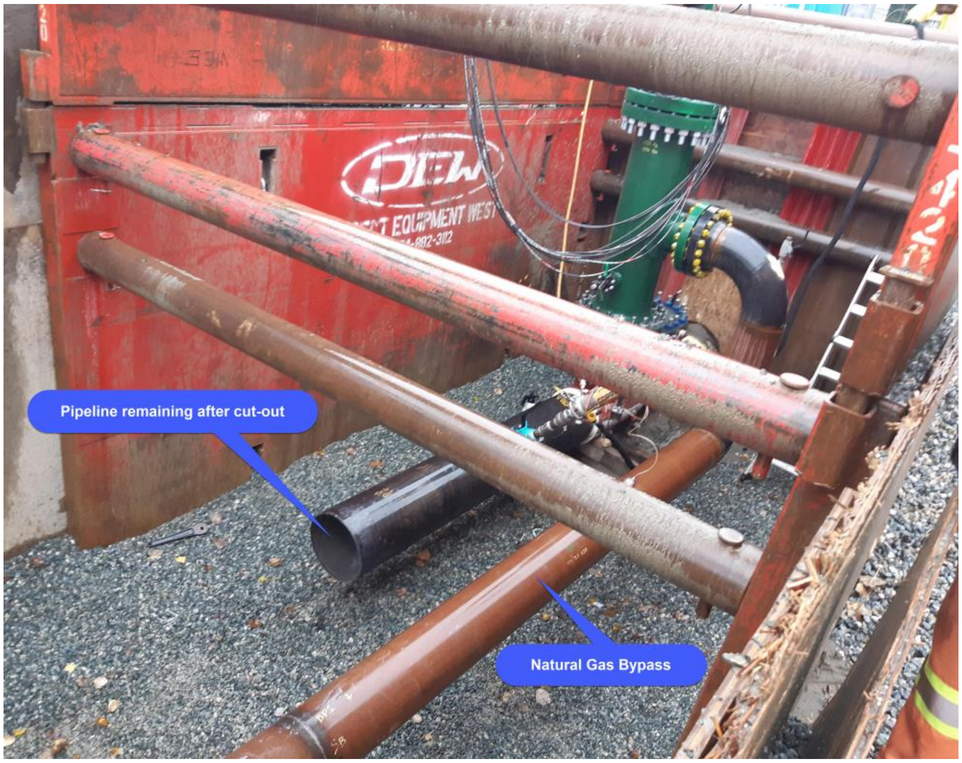
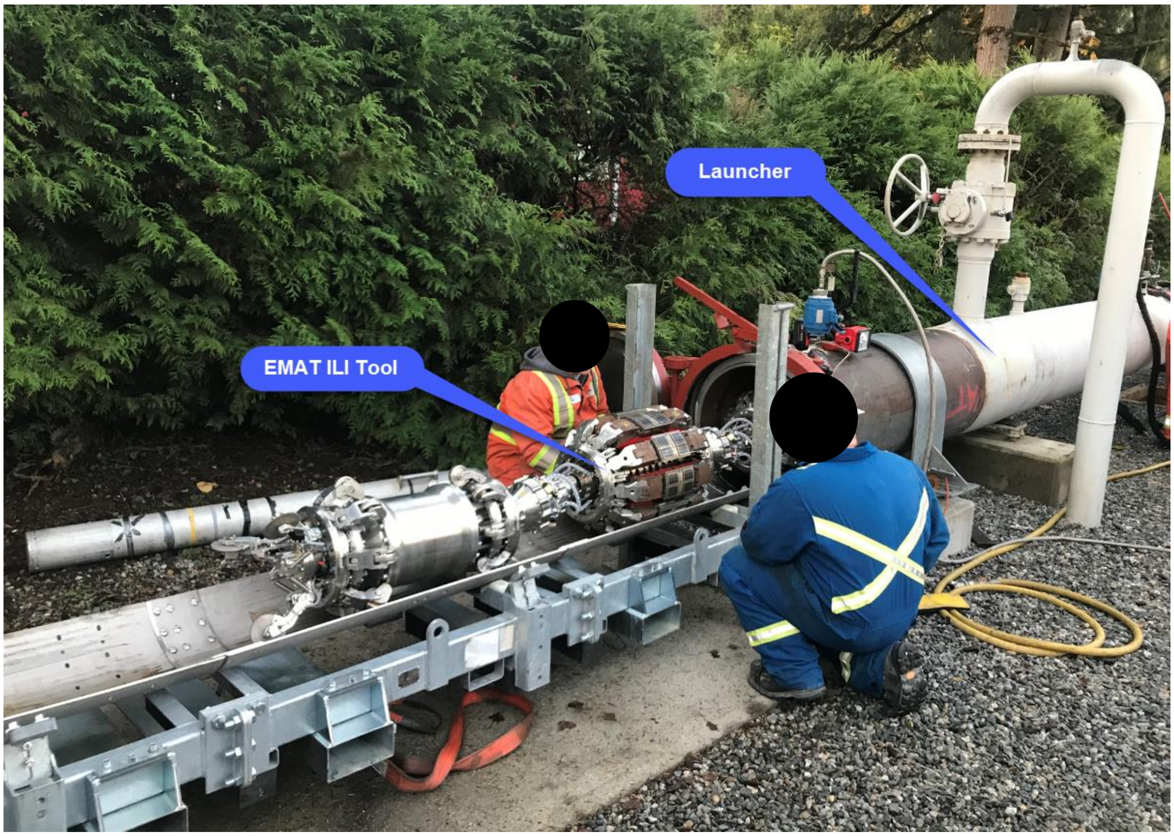


Figure 4-1(c): Example of a Pipeline Alteration with Natural Gas Bypass – Completed Alteration and Bypass Removed

- **Facility Alterations:** EMAT ILI tools are generally longer than CMFL and MFL tools. Therefore, launchers and receivers[58] located within existing FEI facilities must be permanently modified or replaced to facilitate insertion and retrieval of the tool from the pipeline.

Figure 4-2: EMAT ILI Tool being Inserted into a Launcher



- **Flow Control Stations:** Speed excursions can also be caused by variable gas flow rates in the pipeline, which can propel the tool outside the optimum velocity range. Flow control stations, comprised of a bi-directional flow control valve and/or flowmeter and associated telemetry, may be installed to allow for control of the gas flow rate in the pipeline being inspected, and ultimately the ILI tool velocity.

- **Pressure Regulating Stations:** Pressure regulating stations are required to allow for pressure reductions on the affected pipeline for operational responses, such as to establish a factor of safety if a significant cracking threat is found. The pressure reduction is typically by 20 percent, which corresponds to a 1.25 Safety Factor.

[58] Launchers and receivers are assemblies located at the upstream and downstream ends of a pipeline that are used to introduce and remove in-line inspection and cleaning tools in a safe and effective manner.

Figure 4-3: Example of Pressure Regulating Station

4.2.5 Alternative 5 – Pipeline Replacement

The pipeline replacement (PLR) alternative involves replacing the existing pipeline, in its entirety, with a new pipeline coated with a high integrity coating that is not conducive to the formation of SCC. Modern steel manufacturing practices and quality control programs also greatly reduce the likelihood of seam weld flaws on newly constructed pipelines, resulting in a pipeline that is less susceptible to cracking and constructed to current standards of design, material selection, and construction.

4.2.6 Alternative 6 – Pipeline Exposure and Recoat

The pipeline exposure and recoat (PLE) alternative involves exposing the entire length of a pipeline, removing the coating, inspecting 100 percent of the surface using non-destructive examinations, repairing any cracking or other anomalies discovered, and recoating the entire pipeline with a high integrity coating. The size of excavation required for this approach is greater than for replacing the pipeline, as the excavation would need to be sufficiently large to allow for coating removal, pipe inspection and repair, and in-ditch pipe recoating. The pipeline may need to be taken out of service, or operated at a reduced pressure, during the rehabilitation process. After the rehabilitation process, the pipeline would be reburied.

4.3 *ALTERNATIVES EVALUATION METHODOLOGY*

FEI evaluated the alternatives at the system level against three non-financial criteria and one financial criterion using a "Good-Acceptable-Poor Choice" rating system. System level evaluation means that each alternative was considered for use on all 8 ITS pipelines. FEI considered this approach to be applicable because of the interconnected and dependent nature of the 8 pipelines to each other. These interactions, coupled with the fact that the ITS pipelines are generally unlooped, means that the application of an alternative to one pipeline generally impacts the operation of other connected pipelines.

FEI first assessed all of the alternatives against the non-financial criteria to determine their technical feasibility, and then assessed the three remaining alternatives using the financial criterion to assess their financial feasibility. The evaluation criteria, rating system, and results of the assessments are described in the subsections below.

4.3.1 Evaluation Criteria

The following criteria were used to evaluate the alternatives described in Section 4.2 above:

- Non-Financial:
  a. Method Effectiveness
  b. Implementation Complexity
  c. Community and Environmental Impacts

- Financial:
  a. Relative Cost

Each criterion is described in more detail below.

4.3.1.1 Non-Financial

The following non-financial evaluation criteria were used to evaluate all six alternatives:

a. Method Effectiveness

This criterion considers the effectiveness of the alternative in enhancing FEI's ability to mitigate in-service pipeline failures resulting from time-dependent cracking threats. The highest rated alternatives can identify and locate cracking threats for mitigation, or eliminate cracking threats altogether.

b. Implementation Complexity

This criterion considers how easily the alternative can be implemented on FEI's system and the relative complexity of performing the alternative. Factors contributing to the complexity of an alternative may include:

- Relative impact of the proposed construction methodology. An alternative that requires significant impacts or changes to system operation during implementation would be rated low while one with minimal impacts would be rated high.
- Available system capacity. An alternative that would compromise FEI's ability to provide reliable service to its customers without major system alterations would be rated low, while one that fits within the existing system capacity would be high.
- Land and workspace requirements. An alternative that stays within the existing FEI statutory right-of-way (SRW) with minimal impacts to the surrounding lands would be rated highly.

c. Community and Environmental Impacts

This criterion considers the potential effects on the community and environment while performing field activities associated with each alternative. Alternatives that minimize the following are rated higher:

- Impacts to community infrastructure;
- Road closures and other traffic impacts;
- Displacement / evacuation of residents;
- Time duration and frequency of impact to residents and businesses;
- Management of waste, emissions and/or contamination; and
- Impacts to the surrounding environment (vegetation, soil, watercourses).

4.3.1.2 Financial

The following financial criterion was used to evaluate the three alternatives remaining after the non-financial assessment:

a. Relative Cost

FEI used cost estimates prepared for its CTS TIMC Project[59] to compare the relative costs of the three remaining alternatives. FEI did not consider it a prudent use of funds to develop cost estimates for these alternatives under the ITS TIMC Project as it did not expect material differences in the the order of magnitude costs between the alternatives.

4.3.2 Rating System for the Evaluation Criteria

FEI used a "Good-Acceptable-Poor-Unacceptable Choice" rating system to independently evaluate the alternatives using the evaluation criteria described in the previous subsection. The

[59] Certificate for Public Convenience and Necessity (CPCN) for the Coastal Transmission System Transmission Integrity Management Capabilities Project (CTS TIMC Project), dated February 11, 2021. Online: https://docs.bcuc.com/Documents/Proceedings/2021/DOC_61095_B-1-FEI-CTS-TIMC-Project-CPCN-Application.pdf.

ratings were determined through collaborative discussions with FEI's subject matter experts. Table 4-2 below describes the relationship between a green, yellow, orange or red rating and the impact associated with each alternative. Red ratings were given for alternatives that were not feasible, whether for technical or financial reasons.

Table 4-2: Rating Definitions

Rating Color	Impact Evaluation
✓	**Good choice:** Minimal concerns or risks; most effective
-	**Acceptable choice:** Moderate concerns or risks; partially effective
~	**Poor Choice:** Significant concerns or risks; minimally effective
×	**Unacceptable Choice:** Not feasible; not effective

4.3.3 Results of Alternatives Assessment

The following table provides a summary of FEI's assessment of the six alternatives against the non-financial and financial evaluation criteria outlined in Section 4.3.1. Based on the ratings presented in Table 4-3 and the assessment below, FEI determined Alternatives 1, 2 and 3 to be not technically feasible with respect to managing cracking threats on the ITS. FEI then evaluated the remaining three alternatives against the financial criterion and determined Alternatives 5 and 6 to be not feasible due to significantly higher costs than Alternative 4. The results of the evaluation indicate that Alternative 4: EMAT ILI is the preferred alternative.

Table 4-3: Summary of Alternatives Assessment

	Non-Financial			Financial
	Method Effectiveness	Implementation Complexity	Community and Environmental Impacts	Relative Cost
Alternative 1: SCCDA	×	✓	-	n/a
Alternative 2: PRS	✓	×	✓	n/a
Alternative 3: HSTP	-	×	~	n/a
Alternative 4: EMAT ILI	✓	✓	✓	✓
Alternative 5: PLR	✓	~	~	×
Alternative 6: PLE	✓	~	~	×

Method Effectiveness

Alternative 1 (SCCDA) is rated as an "unacceptable choice" as it cannot reliably identify locations of critical or sub-critical cracking due to its reliance on indirect data (e.g., coatings, cathodic protection, etc.). As explained further in Section 4.4.1 below, SCC is a random phenomenon making identification through indirect assessments difficult and inefficient. As such, FEI cannot rely on this method to prevent ruptures caused by cracking.

Alternative 3 (HSTP) is rated as an "acceptable choice" as it is an effective method for removing critical cracking threats by testing them for failure. Once a crack has failed, the segment of pipe with the crack is located and cut-out and new pipe is installed. Despite being effective at removing critical cracking threats, HSTP can also exacerbate sub-critical cracks and does not provide the capability of identifying and locating these sub-critical cracks. Therefore, the HSTP alternative does not provide FEI with the same level of confidence (i.e., visibility of cracking on its system) as other on-going active monitoring methods.

Alternatives 2, 4, 5 and 6 are rated as "good choices" for method effectiveness as they allow FEI to significantly and confidently reduce the risk of rupture due to cracking, as follows:

- **Alternative 2 (PRS):** PRS lowers the operating stress of the pipelines to below 30 percent of SMYS. As described in Sections 3.5.3.1 and 4.2.2, pipelines operating at or below 30 percent of SMYS are more likely to leak rather than rupture, which has significantly lower consequences.
- **Alternative 4 (EMAT ILI):** EMAT ILI is a highly effective method of reducing the risk of rupture due to cracking because it allows FEI to collect data continuously to identify and qualify cracks on its susceptible pipelines. FEI can confirm this data and then perform repairs at the most critical locations. Additionally, by repeating EMAT ILI runs at a certain frequency, FEI can monitor and predict the growth of sub-critical cracks to ensure they do not grow to failure.
- **Alternatives 5 and 6:** PLR and PLE both allow for the elimination of cracks through either complete replacement of the pipeline with modern steel which is less susceptible to cracking, or by exposing the entire pipeline, inspecting it for cracking, and recoating it with a high integrity coating to prevent future exposure to the soil environment.

Implementation Complexity

Alternatives 2 and 3 are rated as "unacceptable choices" because they can impact FEI's ability to maintain supply to its customers:

- **Alternative 2:** PRS cannot be implemented to achieve hoop stresses below 30 percent of SMYS on any of the 8 ITS pipelines while maintaining reliable gas supply to customers. Refer to Section 4.4.2 below for further details.
- **Alternative 3**: Hydrostatic testing is performed on a segment-by-segment basis for each pipeline. HSTP can lead to capacity challenges if a failure on a test segment has occurred and the hydrostatic test cannot be completed on the entirety of the pipeline prior to winter when it needs to be back in service. Additionally, hydrostatic testing can require extensive temporary workspace, which due to the on-going nature of the program, would need to be obtained each time testing occurred.

Alternatives 5 and 6 are rated as "poor choices" for implementation complexity due to the following significant challenges with their implementation:

- **Alternative 5:** PLR would involve replacement of the 8 ITS pipelines within FEI's existing statutory rights-of-way (SRW), totalling approximately 752 kilometres of pipe. Certain segments of the ITS pipelines are located in narrow SRWs, such that additional SRW or extensive temporary workspace would be required. The acquisition of additional SRW and/or temporary workspace in highly populated areas, such as Kamloops or Kelowna, would be challenging. Moreover, since the ITS pipelines are generally unlooped, they must typically remain in service while the new pipeline is being installed. When working around live lines, it is FEI's practice to lower the operating pressure of those lines, resulting in reduced capacity and operational flexibility during construction.
- **Alternative 6:** PLE would involve removing the coating of the 8 ITS pipelines, inspecting and then re-coating the pipelines. In some cases, these pipelines are coal tar or asphalt coated. Coal tar and asphalt coatings can contain asbestos, and therefore, must be removed according to FEI's *CRL 1120: Coal Tar Wrap Removal* procedure to minimize worker and environmental exposure and its transport and disposal must comply with hazardous waste management requirements. Further, when working on live lines, it is FEI's practice to lower the operating pressure of those lines, resulting in reduced capacity and operational flexibility when the pipeline is exposed.

Alternatives 1 (SCCDA) and 4 (EMAT ILI) are rated as "good choices" as they can be reasonably implemented on FEI's 8 ITS pipelines.

Community and Environmental Impact

Alternatives 5 (PLR) and 6 (PLE) are rated as "poor choices" for community and environmental impact due to their significant excavation requirements in close proximity to public and private infrastructure, as well as potentially environmentally sensitive areas. Alternative 3 (HSTP) is also rated as a "poor choice" given the risk associated with the failure of a hydrostatic test which could result in the release of pressurized water. Such a failure could require the evacuation of nearby residents and would necessitate the creation of a safe testing zone.

Alternative 1 (SCCDA) is rated as an "acceptable choice" for community and environmental impact because of the limited excavation requirements. SCCDA requires pre-assessment and indirect inspection prior to any direct inspection activities (i.e., excavations). Depending on the pipeline information and condition, the locations and number of excavations could be limited.

Alternatives 2 (PRS) and 4 (EMAT ILI) are rated as "good" choices as they have minimal impacts on the community and environment, with minimal excavation requirements and work mainly occurring within FEI's existing SRWs and facilities.

Relative Cost

The alternatives compared using the financial criterion can be categorized into two types of integrity management strategies, as follows:

- **On-going Active Monitoring:** Cracks are monitored and managed through on-going activities, usually performed on a specified time interval (e.g., every seven years), as part of an integrity management program. Alternative 4 (EMAT ILI) is an on-going active monitoring method.

- **Direct Management:** Susceptible pipelines are either replaced or refurbished, thereby eliminating cracking threats, or new permanent infrastructure is installed allowing for significant and long-term reduction in the risk of cracking. Alternative 5 (PLR) and 6 (PLE) constitute direct management strategies as each requires a one-time installation of new permanent infrastructure to allow for crack-related rupture management.

Each category has different cost implications. In particular, on-going active monitoring is typically the most cost-effective long-term asset management option as it allows for targeted crack mitigation, with most critical threats being prioritized and repaired. In contrast, direct management alternatives must be applied to the entirety of the pipeline that has been identified susceptible to cracking because current capabilities cannot reliably identify the specific location of cracks. As a result, Alternatives 5 (PLR) and 6 (PLE) are significantly more expensive than Alternative 4 (EMAT ILI) and were rated as “unacceptable choices.” A comparison of the relative costs of these three alternatives can be found in Section 4.5.

4.4 *ALTERNATIVES SCREENED OUT AS NOT TECHNICALLY FEASIBLE*

Based on its evaluation of the six alternatives using the criteria described above, FEI determined Alternatives 1, 2, and 3 to be not technically feasible. Technical feasibility relates to an alternative’s ability to be implemented on FEI’s 8 ITS pipelines to mitigate cracking threats. Alternative 1 (SCCDA) is not feasible due to its inability to identify critical cracking threats, Alternative 2 (PRS) and Alternative 3 (HSTP) are not feasible based on significant system and operational constraints. Further details regarding the elimination of these alternatives is provided in the following sections.

4.4.1 Alternative 1: SCCDA Cannot Reliably Identify Cracking Threats

Effective management of SCC threats requires FEI to identify and appropriately address areas of highest potential SCC failure, which are areas with the worst SCC, before those cracks grow to failure. Based on a review of industry publications on SCC, it is generally accepted that SCCDA is not an effective tool for managing SCC for the following reasons:

- SCC crack initiation, or the start of cracking at the surface of the pipeline, is heavily influenced by localized residual stresses, coating disbondment and the environment around the pipeline. SCCDA does not provide guidance for detecting localized residual stresses and only provides partial guidance on the detection of coating disbondment and environmental conditions. As such, SCC can be highly randomized and unpredictable along a susceptible pipeline. Due to the random nature of crack initiation, it is not possible to reliably identify where SCC is likely to occur or identify the areas that are most likely to have significant cracking through a dig program;[60] and

- While existing assessment approaches, such as soil models "may help identify SCC susceptible segments, they have limited value in pin-pointing the location of the deepest crack."[61]

SCCDA cannot be counted on to reliably identify the most significant SCC defects on the pipeline; namely those that are most likely to fail. Therefore, on its own, the SCCDA method is not considered an effective approach to SCC integrity management and was not developed to manage crack-like imperfections in seam welds.

The National Association of Corrosion Engineers (NACE), which developed this approach, states that SCCDA is complementary to other inspection methods such as ILI or hydrostatic testing.[62] While SCCDA is not an alternative or replacement for these methods, it can be used to prioritize these other integrity methods "if SCC is found that is sufficient to warrant general mitigation."[63] Therefore, SCCDA can be used to assess pipelines to determine if SCC is a potentially significant threat that would then be mitigated through ILI or pressure testing; however, the analysis conducted by FEI to date has already identified that SCC is a credible threat for the specified lines.

Moreover, in its *Safety Study: Integrity Management of Gas Transmission Pipelines in High Consequence Areas*,[64] the U.S. National Transportation Safety Board made the recommendation to the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) that they "develop and implement a plan for eliminating the use of direct assessment as the sole integrity assessment method for gas transmission pipelines". PHMSA stated that "SCCDA is not as effective and does not provide an equivalent understanding of pipe conditions with respect to SCC defects as ILI or hydrostatic pressure testing."[65]

FEI is also aware through its participation in industry groups that its peers do not regard this method as effective in comparison to the other alternatives identified for the ITS TIMC Project.

Ultimately, SCCDA cannot reliably identify the worst cases of SCC that can grow to failure and is therefore unable to achieve the Project Objective of mitigating cracking threats on the 8 ITS pipelines susceptible to cracking. On this basis, SCCDA was not considered further in the evaluation process.

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60 Stress Corrosion Cracking on Canadian Oil and Gas Pipelines, National Energy board , 1996, MH–2-95.

61 *Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience (Phase I and II)*, Integrity & Inspection of Technical Committee of Pipeline Research Council International, Contract PR-328-083501 (Contract Project No.: PRC-U212-014), 13 Sept. 2017.

62 Stress Corrosion Cracking on Canadian Oil and Gas Pipelines, National Energy board , 1996, MH–2-95

63 NACE SP024-2015 *Stress Corrosion Cracking (SCC) Direct Assessment Methodology.*

64 NTSB/SS-15/01 PB2015-102735, Safety Study: Integrity Management of Gas Transmission Pipelines in High Consequence Areas.

65 NPRM Part 192 Vol. 81 No.68, US Department of Transportation.

4.4.2 Alternative 2: PRS Leads to System Capacity Limitations

PRS can be highly effective in reducing the likelihood for SCC to cause an in-service pipeline rupture, as these SCC threats would instead be expected to result in leaks. However, pressure reduction creates capacity limitations and significant operational challenges when applied to FEI's 8 ITS pipelines.

As shown in Figure 4-4, the 8 pipelines comprise three bi-directional sub-systems[66] within the ITS, operating between the following FEI facilities (indicated by yellow stars):

1. Kingsvale Control Station and Oliver Y Control Station;
2. Savona Control Station and Oliver Y Control Station; and
3. East Kootenay Exchange Control Station and Oliver Y Control Station.

Each control station is a pressure control point, whereby the pressure in the sub-system pipelines is currently controlled within its operating pressure. These stations could be used to reduce pressure further if the systems had sufficient capacity. As such, a pressure reduction in one sub-system does not limit the pressure and available capacity of another sub-system. However, as described in the following sections, when any of the sub-systems are operated at a reduced pressure, the capacity requirements under current peak day demand cannot be met and extensive system looping would be required to meet current and future gas supply needs. Pressure reduction on the sub-systems also impacts FEI's operational flexibility resulting in a reduced ability to plan and perform maintenance and construction work, establish line pack needs, move gas through the system, and respond to upset conditions.

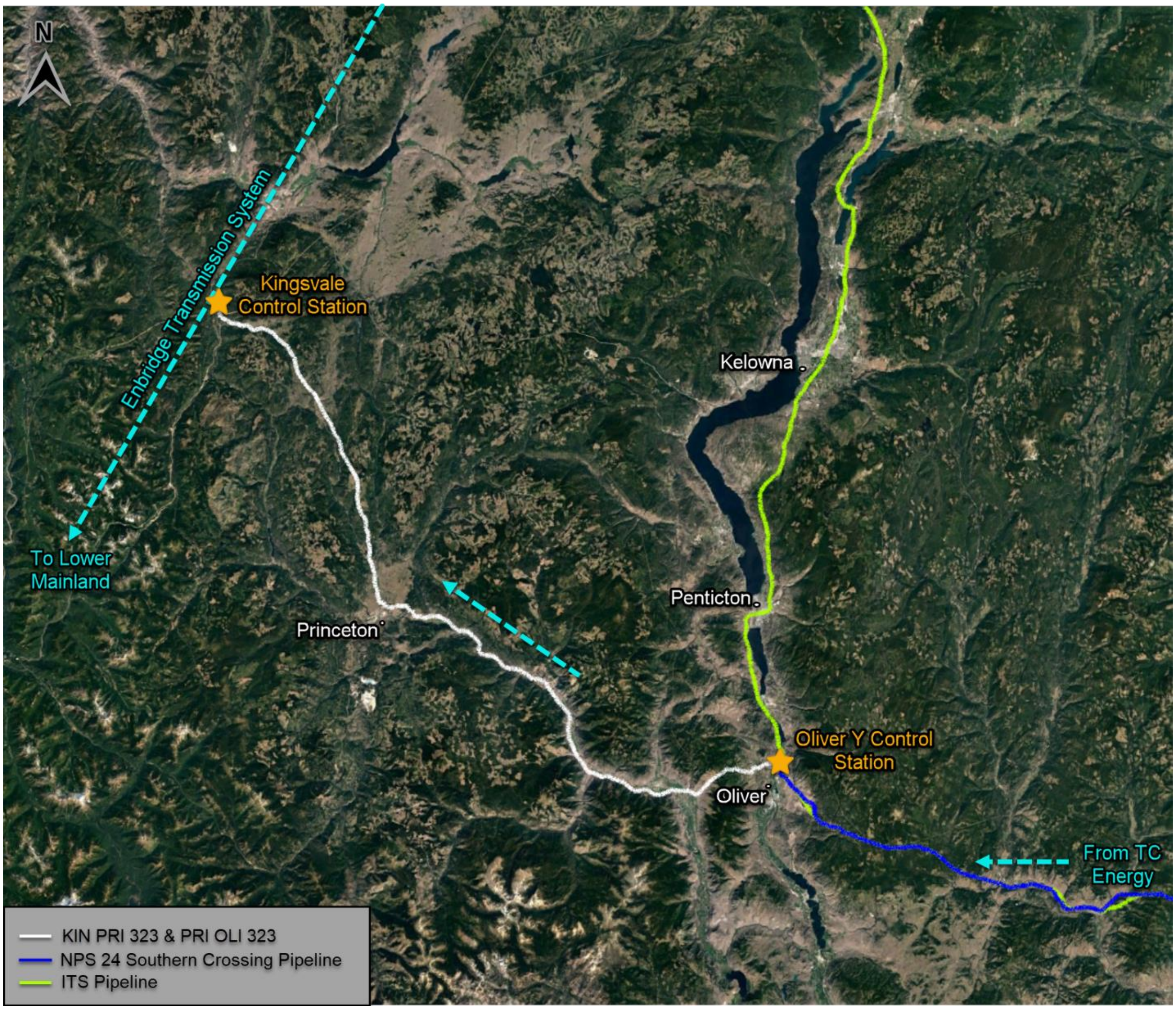
[66] The analysis of the PRS alternative cannot be performed on a pipeline-by-pipeline basis due to the interconnected and dependent nature of some of the pipelines to each other. For example, the KIN PRI 323 and PRI OLI 323 are connected linearly, meaning that if you lower the pressure at Oliver, it will lower the pressure in both pipelines, not just the PRI OLI 323, with no opportunity to gain back the pressure in the KIN PRI 323. Thus, the impacts to capacity on each individual pipeline would be the same as the sub-system. As such, FEI has described the capacity challenges with the PRS alternative at the sub-system level.

Figure 4-4: Major Control Stations on 8 ITS TIMC Pipelines

4.4.2.1 Sub-System 1 between Kingsvale Control Station and Oliver Y Control Station

The first sub-system operates between the Kingsvale Control Station in Kingsvale, BC and the Oliver Y Control Station in Oliver, BC via the KIN PRI 323 and PRI OLI 323 transmission pipelines. These pipelines provide gas to approximately 2,700 existing customers in local communities surrounding the pipelines. However, the majority of capacity on the KIN PRI 323 and PRI OLI 323 pipelines is used to provide additional gas to FEI's CTS. While FEI sources most of the gas needed for the CTS from northern BC via Enbridge's transmission pipeline system, as shown in Figure 4-5, the KIN PRI 323 and PRI OLI 323 pipelines are able to deliver gas from TC Energy in Alberta to the Lower Mainland via FEI's NPS 24 Southern Crossing Pipeline and Enbridge's transmission pipeline system. Thus, the KIN PRI 323 and PRI OLI 323 pipelines provide an alternate source of supply to the CTS and are capable of providing support in the event of a supply interruption from Enbridge north of Kingsvale.

Figure 4-5: Flow of Gas from TC Energy to the CTS



As described in Section 4.2.2, Alternative 2 involves permanently lowering the maximum operating pressure of a pipeline such that the resultant hoop stresses are reduced to below 30 percent of SMYS. The KIN PRI 323 and PRI OLI 323 operate at a maximum hoop stress level of 59 percent of SMYS. The pressure reduction required to achieve a hoop stress below 30 percent of SMYS would result in FEI being able to supply only approximately 30 percent of the gas that can be delivered to the CTS currently. As such, in the event of a supply interruption on the Enbridge transmission system north of Kingsvale, FEI would be further limited in its ability to support the CTS.

FEI recently required this capability for its emergency response to the ignited rupture on the Enbridge NPS 36 natural gas transmission pipeline that occurred on October 9, 2018 near Prince George, BC. During this event, FEI's supply from Enbridge to the CTS was restricted and FEI was able to leverage the ability to flow some gas from TC Energy to the Lower Mainland to support gas needs.

4.4.2.2 Sub-System 2 between Savona Control Station and Oliver Y Control Station

The second sub-system operates between Savona Control Station in Savona, BC and the Oliver Y Control Station via the SAV VER 323, VER PEN 323 and PEN OLI 273 transmission pipelines. These pipelines provide gas to approximately 167,000 existing customers in local communities surrounding the pipelines. The three pipelines operate at maximum hoop stress levels between 59 and 71 percent SMYS.

In 2020, FEI submitted its Okanagan Capacity Upgrade (OCU) Project CPCN Application[67] to address the capacity shortfall that will result in the Okanagan region of the ITS in the near future. As described in Section 3.3 of the OCU Project Application, approximately 60 percent of the demand on the ITS is concentrated in the Okanagan region, which is serviced by the SAV VER 323, VER PEN 323 and PEN OLI 273 pipelines, and a capacity shortfall will occur in the Okanagan region as the result of population growth and increasing industrial loads in the area. As discussed in Section 4.2.1 of the OCU Project Application, the operating pressure of segments of the VER PEN 323 pipeline have been derated over time due to changes in class location, which has contributed to the capacity shortfall in this pipeline system. As such, additional pressure reductions in a system where FEI requires capacity expansion is contrary to the needs expressed in the OCU Project CPCN Application.

Even with the proposed OCU Project in-service to restore the capacity shortfall identified in the OCU Project CPCN, based on current demand, the pressure reduction required to achieve a hoop stress level below 30 percent of SMYS would result in pressure supplied at the inlet to the sub-system at Savona and Oliver Y being very close to the minimum pressure needed for the pipeline to deliver into the laterals and gate stations served by the pipeline. This would result in a capacity shortfall reappearing on this sub-system and the inability to maintain reliable customer supply in all but the warmest days of the year.

4.4.2.3 Sub-System 3 between East Kootenay Exchange Control Station and Oliver Y Control Station

The third sub-system operates between the East Kootenay Exchange Control Station in Yahk, BC and the Oliver Y Control Station via the YAH TRA 323, OLI GRF 273 and GRF TRA 273 transmission pipelines. These pipelines provide gas to approximately 28,000 existing customers in local communities surrounding the pipelines.

The three pipelines operate at maximum hoop stress levels between 59 and 67 percent SMYS. Based on current demand, the pressure reduction required to achieve a hoop stress below 30 percent of SMYS would result in a capacity shortfall on this sub-system and the inability to maintain reliable supply for customers in the Central Kootenay, Castlegar and Nelson regions

[67] Certificate for Public Convenience and Necessity (CPCN) for the Okanagan Capacity Upgrade Project (OCU Project), dated November 16, 2020. Online: https://docs.bcuc.com/Documents/Proceedings/2020/DOC_59948_B-1-FEI-CPCN-Application-for-Okanagan-Capacity-Upgrade-Project.pdf.

outside of the summer months, and would be inadequate to meet the needs of current industrial customers in these communities throughout the year.

4.4.2.4 Conclusion

PRS is not viable when applied to each sub-system because of capacity limitations. Therefore, Alternative 2 was deemed not feasible and was not considered further in the evaluation process.

4.4.3 Alternative 3: HSTP has Unacceptable Operational Challenges

As described in Section 4.2.3, HSTP involves periodically taking each pipeline out of service and subjecting it to a hydrostatic test. While HSTP is currently used in FEI's integrity management program as part of its construction verification activities, it is not considered effective as a method for managing SCC and cracking threats on operating gas lines for the following reasons:

- Hydrostatic pressure testing does not provide any information on crack growth rates or identify the development of new sub-critical SCC,[68] both of which can be assessed by EMAT ILI;[69] and
- Studies have been published describing the potential for sub-critical SCC cracks that have not failed through hydrostatic pressure testing being made more severe by undergoing the testing process.[70]

As such, FEI would not be able to anticipate where new cracks had developed and whether sub-critical cracks had grown to critical dimensions since the last testing interval, and would not fail upon testing. Other on-going monitoring methods, like EMAT ILI, can provide information on the size and location of cracks.

If undertaking the HSTP alternative, FEI would perform hydrostatic testing on a segment-by-segment basis until the entire pipeline is tested. If a failure occured during the test, FEI would locate the failure, repair and re-test the segment of pipeline. Due to the long lengths of the ITS pipelines,[71] uncertainty as to whether failures would occur and the quantity of repairs required, FEI may not be able to complete testing of the entire pipeline prior to winter when it would be required to be back in service. In the event that there are untested segments of pipeline and a failure occurred in a previous test, it would be consistent with industry practice for FEI to implement a 20 percent pressure reduction when the pipeline is put back into service to establish a factor of safety on any integrity features that remain in the untested segments of the pipeline.

[68] David Katz, Steve Potts, Ralf Weber, Joerg Grillenberger, Thomas Beuker, "In-Line Inspection Technology for Crack Detection In Gas Pipelines," IBP2387_17, Brazilian Petroleum, Gas and Biofuels Institute – IBP, 2017.

[69] Ibid.

[70] Jian Li, M. Elboudjdaini, M. Gao, R. W. Revie, "Hydrostatic Testing as an Integrity Management Tool," *API Technical Report 1179*, first edition; "Investigation of plastic zones near SCC tips in a pipeline after hydrostatic testing," *Materials bScience and Engineering A*, Volume 486, Issues 1-2, 15 July 2008, 496-502; "In-Line Inspection Technology For Crack Detection In Gas Pipelines," IBP2387_17, Brazilian Petroleum, Gas and Biofuels Institute – IBP, 2017.

[71] The length of each ITS pipeline ranges from 30 km to 163 km.

Recognizing that the ITS pipelines are generally unlooped and pressure reductions on these pipelines result in capacity constraints, similar to those described in Section 4.4.2, FEI would need to consider alternate ways to supply customers serviced by the ITS pipelines, such as pipeline looping which can be costly and lengthy to complete.

Due to the on-going nature of the hydrostatic testing program, FEI also observes the following operational, community and environmental challenges that would occur each time a hydrostatic test was performed:

- Public notifications and evacuations may be required to establish safe testing zones due to the potential for a test failure.[72]
- Work sites up to two acres may be required for setup and staging as part of the project,[73] which can be challenging to source in the densely populated areas where the ITS pipelines operate (e.g., Kelowna).
- It can be difficult to locate leaks and contain the released water due to urban infrastructure (e.g., sidewalks and buildings) in and around the pipeline, leading to environmental clean-up issues.

For the reasons described, HSTP was deemed not technically feasible for application to the 8 ITS pipelines as was not considered further in the evaluation process.

4.5 ALTERNATIVES SCREENED OUT AS NOT FINANCIALLY FEASIBLE

As part of its CTS TIMC Project alternatives analysis, FEI calculated and compared the net present value (NPV) of the total cost for Alternatives 4 (EMAT ILI), 5 (PLR) and 6 (PLE) as applicable to the 11 CTS pipelines within the scope of the project. The NPV calculation included one-time capital costs associated with the implementation of the alternative, as well as increases and/or decreases in ongoing capital and O&M costs, and resulted in an order of magnitude difference in costs between EMAT ILI and the PLR and PLE alternatives (as shown in Table 4-4 below). The details of this analysis can be found in Section 4.5 of the CTS TIMC CPCN application.[74]

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[72] INGAA Technical, Operational, Practical, and Safety Considerations of Hydrostatic Pressure Testing Existing Pipelines, 2003; ATCO Pipelines Pipeline Replacement Project Application, March 2013.

[73] CEPA Recommended Practices for Managing Near-neutral pH SCC, 3rd edition, May 2015.

[74] Certificate for Public Convenience and Necessity (CPCN) for the Coastal Transmission System Transmission Integrity Management Capabilities Project (CTS TIMC Project), dated February 11, 2021. Online: https://docs.bcuc.com/Documents/Proceedings/2021/DOC_61095_B-1-FEI-CTS-TIMC-Project-CPCN-Application.pdf.

Table 4-4: NPV Cost Comparison of CTS TIMC Alternatives (2020$)

	Alternative 4: EMAT ILI ($ millions)	Alternative 5: PLR ($ millions)	Alternative 6: PLE ($ millions)
Net Present Value of Total Capital and O&M Cost[75]	$307	$1,811	$1,902

Based on the order of magnitude differences in cost between the alternatives, and recognizing that the total length of the 11 CTS pipelines was approximately 254 km and the total length of the 8 ITS pipelines is approximately three times longer (752 km), FEI did not consider it a prudent use of funds to undertake another cost estimate of these alternatives for the ITS TIMC Project.[76]

However, FEI considers the results from the CTS TIMC Project to be a reasonable comparator for the financial evaluation of the ITS TIMC Project alternatives and anticipates a similar or larger ratio of costs between EMAT ILI and the PLR and PLE alternatives on the ITS for the following reasons:

- **Construction Environment:** On the CTS, the PLR and PLE alternatives would have involved performing construction activities in urban and suburban environments, driving higher costs than typical cross-country transmission pipelines due restricted work areas and the requirement to restore previous landscaping. While the ITS pipelines travel through more remote areas, the terrain is rocky and mountainous and the pipeline can be difficult to access in certain areas. As such, the construction environment for the ITS pipelines would drive comparable higher costs than typical cross-country transmission pipelines, reflecting the need to blast rock and build safe access routes prior to performing any construction activities.
- **Pipeline Specifications:** The diameter of the CTS TIMC pipelines ranged from NPS 12 to NPS 42, whereas the diameters of the ITS TIMC pipelines are limited to NPS 10 and NPS 12. While costs are typically higher for the material and construction of larger diameter pipelines, the length of pipeline requiring replacement or expose and recoat on the ITS is approximately three times longer than on the CTS, resulting in comparable or higher costs.
- **Capacity Requirements:** The CTS TIMC pipelines are interconnected in such a way that certain lines may be taken out of service and customer supply may be maintained by an alternate looped pipeline. As such, the pipeline being replaced may be isolated using existing valves on the pipeline. In contrast, the ITS TIMC pipelines are not interconnected in the same way, meaning customer supply generally cannot be maintained if a pipeline is taken out of service. As a result, the ITS pipeline being replaced may need to stay in

[75] As assessed by the CTS TIMC Project.

[76] The BCUC supported the cost prohibitive nature of the PLR and PLE alternatives in Decision and Order C-3-22 for the CTS TIMC Project, stating "FEI has demonstrated that, of the six available alternatives for meeting the objectives of the Project, at this time, only three are technically feasible and of the latter, only the EMAT ILI alternative is financially feasible, as both the PLR and PLE alternatives are prohibitively expensive."

service through construction – necessitating the use of a gas bypass driving additional costs for equipment and resources.

As such, FEI used the financial information in Table 4-4 prepared for the CTS TIMC Project to calculate the relative costs of the three alternatives (shown in Table 4-5). The relative cost of each alternative was determined by dividing each NPV in Table 4-4 by the lowest value, which corresponds to $307 million for the EMAT ILI alternative.[77] Since Alternative 4 (EMAT ILI) is the lowest cost alternative, it has a relative cost of 1.

Table 4-5: Relative Cost Comparison of Three Remaining Alternatives (using NPVs from CTS TIMC Project)

	Alternative 4: EMAT ILI	Alternative 5: PLR	Alternative 6: PLE
Relative Cost	1	5.9	6.2

FEI has used the relative costs of the three alternatives from the CTS TIMC Project to evaluate the financial feasibility of the alternatives for the ITS TIMC Project. Table 4-5 shows that Alternative 5 and 6 are approximately six times the cost of Alternative 4. Thus, it is clear that Alternatives 5 and 6 are cost prohibitive as compared to Alternative 4, and therefore, are not considered to be financially feasible. FEI did not progress Alternatives 5 and 6 further in the evaluation process.

4.6 *ALTERNATIVE 4: EMAT ILI IS THE ONLY FEASIBLE ALTERNATIVE TO ACHIEVE THE PROJECT OBJECTIVE*

Based on the results of the alternatives evaluation, EMAT ILI is the sole option that is both technically and financially feasible and is therefore the preferred alternative to achieve the Project Objective. By utilizing EMAT ILI on all 8 ITS pipelines, FEI will realize the following benefits:

- **Meet statutory and regulatory obligations:** FEI has regulatory and legal responsibilities to maintain a safe and secure pipeline operations. EMAT ILI will provide FEI with the ability to locate, assess and mitigate cracking threats on its transmission pipelines for continued safe operation of the ITS pipelines.
- **Align with industry best and standard practice:** EMAT ILI is increasingly being adopted by industry and rapidly becoming the industry standard for managing cracking and crack-like imperfections on transmission pipelines and enabling the mitigation of their potential for ruptures. With the adoption of EMAT ILI, FEI will continue to be able to collaborate and leverage valuable industry experience with respect to crack management.

[77] For example, the relative cost of Alternative 5: PLR = $1,811 million / $307 million = 5.9.

- **Cost effective and proactive approach to managing cracking threats:** EMAT ILI is a practical and economical method to manage cracking threats on the ITS pipelines. EMAT ILI is able to provide superior data with respect to cracking, including the size and location of features, allowing FEI to monitor crack growth over time.
- **Optimized response to cracking threats**: EMAT ILI allows FEI to monitor the growth of features on an ongoing basis and prioritize its response to these features, leading to optimization of resources and costs with respect to crack management integrity work.

EMAT ILI is highly effective for managing cracking threats as it is capable of identifying, locating, and sizing cracking defects.[78] EMAT ILI provides insight into imperfections and defects that would not fail a hydrostatic pressure test, for both SCC and sub-critical long seam weld features. The detection and sizing capability of EMAT ILI enables identification of specific sites on the pipeline that have critical as well as larger sub-critical cracking. Further, given the ongoing availability of updated ILI information, FEI can actively monitor and manage cracking threats in the most cost effective manner, by prioritizing mitigation of those cracks posing significant threats. The data collected through an EMAT ILI program can be utilized in FEI's on-going QRAs to better inform integrity management activities related to time-dependent threats.

Dynamic Risk's Independent Report on the CTS TIMC Project supported EMAT ILI as an effective method for managing cracking, stating the following:[79]

> The evolution of EMAT technology has allowed for the reliable detection, identification and sizing of crack anomalies and has increasingly provided an effective basis for managing the threat of SCC to an appropriate safety level. When evaluated against other SCC assessment approaches, EMAT ILI exhibits the distinct advantage of providing information on both critical and sub-critical flaws.
>
> The EMAT ILI program involves pipeline modifications to ready the system, periodically running EMAT ILI and targeted repairs based on the results. Utilizing the EMAT ILI along with a robust validation process (as outlined in Section E.7) is considered a reliable approach to managing the threat of SCC on natural gas pipelines.

Dynamic Risk concluded:[80]

> Currently, there is a gap in the existing FEI integrity management practices to address the threat of SCC, as opportunistic excavations alone are not sufficient to fully characterize, detect and manage the threat. The results of the quantitative risk assessment (QRA) demonstrate the risk of SCC to be highest on the CTS pipeline segments and <u>it is the independent pipeline integrity expert panel's view that EMAT</u>

[78] Defects must be larger than the detection threshold of the tool to be found by the EMAT tool.
[79] Appendix O-1, Independent Report of Dynamic Risk, p. 14.
[80] Appendix O-1, Independent Report of Dynamic Risk, p. 30.

> ILI is the most appropriate response and mitigation action to reduce risk and strengthen the overall integrity management program. [Emphasis added.]

With the system alterations proposed as part of the Project, EMAT ILI can be implemented on 8 ITS pipelines and has less impact on the community or environment as compared to other alternatives. Details of the required system alterations are set out in Section 5 of the Application.

As detailed in Appendix D, FEI has undertaken a pilot project in which FEI altered two segments of pipeline in its CTS and successfully ran EMAT ILI tools. This pilot project demonstrates the feasibility of EMAT ILI for FEI's systems and explains how the pilot project informed the scope of the ITS TIMC Project (see p. 5-7 of Appendix D).

FEI's selection of an EMAT ILI program to enhance its capabilities for mitigating cracking threats also aligns with FEI's peer operators. As discussed in Section 3.3.2, EMAT ILI is increasingly being adopted by industry for managing cracks and crack-like imperfections on transmission pipelines and enabling the mitigation of their potential for rupture. Gas transmission operators are having success with this approach to crack management and, as such, the use of EMAT crack detection ILI is rapidly becoming the industry standard for managing cracking threats on transmission pipelines which have the potential for significant consequences should failure occur.

4.7 CONCLUSION

FEI analyzed six alternatives to achieve the Project Objective. Of these six alternatives, three were screened out because they are not technically feasible. The remaining three alternatives were evaluated against a financial criterion and two alternatives were determined to be not financially feasible. As such, FEI's alternatives analysis concluded that EMAT ILI is the preferred and only technically and financially feasible alternative for the ITS TIMC Project. To accommodate EMAT ILI tools on the 8 ITS pipelines, FEI will need to complete the modifications outlined in Section 5 of the Application.

5. PROJECT DESCRIPTION

5.1 *INTRODUCTION*

In this section, FEI describes the ITS TIMC Project in detail based on the preferred EMAT ILI alternative identified in Section 4. In particular, FEI describes the Project components, consisting of pipeline and facility modifications, project development activities, schedule, resource requirements, construction management, required permits and approvals, and provides a Project cost estimate. FEI also describes the post-project work that is anticipated to follow once FEI begins running the EMAT ILI tools on the ITS.

This section is organized as follows:

- Section 5.2 provides an overview of the Project and describes the rationale for performing alterations to the pipelines and their associated facilities in preparation for EMAT ILI runs.
- Section 5.3 describes the modifications to the pipelines that are necessary for the collection of full resolution ILI data.
- Section 5.4 describes the modifications required to the facilities associated with the 8 pipelines that are necessary to run EMAT ILI tools and to respond to any anomalies found as a result of the in-line inspections.
- Sections 5.5 to 5.8 describes the Project schedule, Project resource requirements and management.
- Section 5.9 provides the basis of the cost estimate, and the processes undertaken to validate the estimate including risk assessment and contingency determination.
- Section 5.10 describes post-Project work following the completion of alterations described in Sections 5.3 and 5.4.

5.2 *OVERVIEW OF PROJECT COMPONENTS*

The ITS TIMC Project consists of the work necessary to ready 8 ITS pipelines for EMAT ILI tool runs by completing modifications to 2 pipelines and 13 facilities to ready the system for introduction of EMAT ILI tools, ensure EMAT ILI tools travel at optimal velocity ranges for collection of full resolution data during inspections and respond to cracking threats until repairs are completed. Table 5-1 below provides an overview of the Project components and how they are required to achieve the Project Objectives.

Table 5-1: Overview of Project Components

Key Project Component	How Component Serves Project Objective
Alterations to two ITS pipelines, consisting of the replacement of 3 heavy wall segments	The replacement of the 3 heavy wall segments will enable the EMAT ILI tool to travel within its optimal velocity range, which is critical for the collection of full resolution ILI data. This Project component is described in detail in Section 5.3.

Key Project Component	How Component Serves Project Objective
Alterations to 13 ITS facilities, consisting of modifications to pig barrels and station piping, and the addition of pressure and flow regulating capability	Alterations at 13 transmission pressure facilities will allow the EMAT ILI tools to be inserted into the pipelines and provide FEI with the capability to alter and control flowrates and pressures in the pipelines as needed to run the EMAT ILI tools and respond to cracking threats. This Project component is described in detail in Section 5.4.

While FEI has been running geometry, MFL-A and MFL-C tools in the ITS pipelines for many years, EMAT ILI tools have a different set of system readiness criteria as they are generally longer than other ILI tools and require different conditions for a successful run. The system readiness criteria for EMAT ILI tools are set out in Appendix F, and can be summarized as follows:

- **Can the EMAT ILI tools be introduced into the pipelines using existing infrastructure?** The existing launching and receiving facilities were designed to accommodate geometry, MFL-A and MFL-C ILI tools which are generally shorter than EMAT ILI tools. Modifications are required to the existing ILI launchers and receivers to accommodate EMAT ILI tools.
- **Can the EMAT ILI tools successfully navigate these pipelines and, in particular, are there any locations on these pipelines where a certain feature or pipeline geometric feature can stop the tool from navigating through them?** A feature which may not have been a problem for the geometry, MFL-A and MFL-C tools may be a problem for the EMAT ILI tools because EMAT ILI tools are longer, heavier and operate at slower speeds which may react differently to changes in conditions than these other tools. Based on analysis from historical MFL-A and MFL-C ILI tool runs, as well as FEI's EMAT ILI pilot project, FEI expects the EMAT ILI tool to successfully navigate the ITS TIMC pipelines.
- **Can the EMAT ILI tools, which are dependent on the gas flow for propulsion, navigate through these pipelines within its optimal velocity range?** Navigation of EMAT ILI tools within their optimal velocity range is critical for collection of good quality data which is impacted by the conditions in which the tool is operating (e.g., gas flow rates, heavy-wall pipe, etc.). FEI has completed an analysis of gas flow ranges and determined that optimal velocity ranges for data collection is possible with the support of a Flow Control Station (FCS), as discussed further in Section 5.4.3. As discussed in Section 5.3, several sections of heavy walled pipe need to be replaced to limit speed excursions and keep the tool within its optimal velocity range.
- **If an integrity concern is detected by the EMAT ILI run, is the system ready to ensure safe continued operation while meeting FEI's obligation to provide gas to its customers?** In the event that the EMAT ILI identifies a feature that could credibly fail in the immediate future, and which could not be repaired in a timely manner, FEI needs to be able to reduce the operating pressure of the pipeline to mitigate the risk of rupture in the interim period prior to repair. As discussed in Section 5.4.4, existing pressure control points and new pressure regulating stations (PRS) will be used to implement pressure reductions as needed while providing continued reliable gas service to its customers.

As summarized in Table 5-1 above, 3 heavy wall pipeline segments need to be replaced and 13 facilities need alterations to meet the system readiness criteria for the ITS. These alterations enable launching and receiving the longer EMAT ILI tools, limit potential speed excursions to ensure complete data collection, and allow FEI to control flowrates to manage tool velocity and pressures to mitigate the risk of failure due to cracking threats.

Table 5-2 below provides a summary of the number of alterations required on each of the 8 ITS pipelines for which EMAT ILI is the preferred alternative and Table 5-3 provides a list of the associated facilities requiring alterations to ready the system for EMAT ILI.

Table 5-2: Pipelines Within Project Scope

Pipeline	Approximate Length (km)	Number of Alterations	Summary of Alterations
Savona Vernon 323	143	1	Replacement of one approximately 80 metre heavy wall pipe segment and bends on either side of the crossing at Cherry Creek (kP 16.9).[81] Replacement pipe and fittings to match upstream and downstream line pipe wall thickness. **(Event 1)**
Vernon Penticton 323	99	N/A	No mitigations required.
Penticton Oliver 273	30	N/A	No mitigations required.
Oliver Grand Forks 273	95	N/A	No mitigations required.
Grand Forks Trail 273	60	N/A	No mitigations required.
Kingsvale Princeton 323	67	2	Replacement of two 2.5 metre heavy wall pipe segments at kP 39.4. Replacement pipe to match upstream and downstream line pipe wall thickness. **(Event 29)** Replacement of one heavy wall above ground valve assembly at block valve assembly KO-3[82] (kP 47.7). Replacement to match upstream and downstream line pipe wall thickness. This includes replacement of bends, fittings and other heavy wall features. **(Event 31)**
Princeton Oliver 323	95	N/A	No mitigations required.
East Kootenay Link 323	163	N/A	No mitigations required.

Table 5-3: Facilities Within Project Scope

Facility	Associated Pipelines	Summary of Alterations
Savona Compressor Station	SAV VER 323	Modification to one pig barrel.

[81] kP is the annotation for the kilometer point measured from the start of the pipeline.
[82] KO-3 is the annotation for the third block valve on the Kingsvale to Oliver mainline.

Facility	Associated Pipelines	Summary of Alterations
SN-3 (Kamloops)	SAV VER 323	Addition of clamp-on ultrasonic flowmeter, power and telemetry.
SN-4 (Kamloops)	SAV VER 323	Addition of temporary pressure regulating capability (PRS)
SN-6-1 (Vernon)	SAV VER 323	Replace existing insertion meter with clamp-on ultrasonic flowmeter, power and telemetry (by others).
Salmon Arm Tap	SAV VER 323	Replace existing insertion flowmeter with clamp-on ultrasonic flowmeter.
SN-7 (Vernon)	SAV VER 323 VER PEN 323	Modification on two pig barrels, addition of flow control station (FCS), including power and telemetry.
Penticton Gate Station	VER PEN 323 PEN OLI 273	Modification to two pig barrels, addition of flow control station (FCS).
Oliver Y Station	PEN OLI 273 PRI OLI 323 OLI GRF 273	Modification to three pig barrels.
Princeton Crossover Control Station	PRI OLI 323 KIN PRI 323	Modification to two pig barrels, addition of flow control capability (FCS), telemetry and power.
Kingsvale Control Station	KIN PRI 323	Modification to one pig barrel.
SN-15 (Grand Forks)	OLI GRF 273 GRF TRA 273	Modification to two pig barrels, addition of flow control capability (FCS), telemetry and power.
SN-17 (Trail)	GRF TRA 273 YAH TRA 323	Modification to two pig barrels.
East Kootenay Exchange	YAH TRA 323	Modification to one pig barrel and addition of permanent pressure regulating system (PRS).

FEI describes the required pipeline and facility alterations in Sections 5.3 and 5.4 of the Application, respectively.

5.2.1 Future Blending of Hydrogen in the ITS Pipeline System

As discussed further in Section 9.3 of this Application, FEI's ITS pipeline system will continue to be used and useful with the transition to safely transport a blend of hydrogen and natural gas. FEI has completed preliminary analysis to understand the admissible limits for hydrogen blending in its existing natural gas infrastructure which indicates the existing gas system (including the ITS) can transport a blend of natural gas and hydrogen. FEI continues to develop its strategy with respect to the injection of hydrogen into its ITS.

To support this strategy, the ITS TIMC Project will ensure all new Project assets installed into the ITS will be compatible with future hydrogen blending, and therefore, will not become a limiting factor for future hydrogen blending activities.

Furthermore, the information collected from the EMAT ILI tool runs will also directly factor into the analysis of determining the future hydrogen concentration levels that can be safely and cost-effectively blended with natural gas.

5.3 PIPELINE ALTERATIONS REQUIRED FOR EMAT ILI TOOL RUNS

In this section, FEI describes the scope of alterations required to ready the pipelines on the ITS for successful EMAT ILI runs. As part of Project development, FEI's assessment of the 8 ITS transmission pressure pipelines determined that modifications are required to replace heavy wall segments on two pipelines (Savona Vernon 323 and Kingsvale Princeton 323) before running EMAT ILI tools. A list of the pipelines and scope of alterations is provided in Table 5-2 above.

There are a total of 3 segments on the above-noted two pipelines where alterations are required to replace heavy wall portions of pipe to reduce speed excursions. FEI identified the locations based on a detailed review of historical ILI reports, as-built information, discussions with ILI vendors regarding the pipelines identified in , and learnings from the pilot EMAT ILI runs (as further explained in Appendix D).

Figure 5-1 shows the locations where these heavy wall segment replacements are required.

Figure 5-1: Project Overview Map Showing Pipeline Alteration Locations

ILI tools are sensitive to speed, which affects the tools' ability to collect quality data. EMAT ILI tools are more sensitive to speed than the ILI tools currently used by FEI. In particular, data quality is compromised for these tools when the maximum velocity goes beyond 2 m/s. This compares to a maximum velocity of 5 m/s for the MFL tools.

One phenomenon that affects the tools' data collection capabilities is a speed excursion. Speed excursions are localized increases in tool velocity where the tool travels beyond the maximum allowable velocity at which it can collect quality data. The effect of speed excursion ranges from degradation of data quality to a complete inability for the tool to collect data, resulting in "blind spots" in data collection.

Based on FEI's analysis of ILI velocity data from previous inspection runs, EMAT ILI tool specifications and discussions with ILI tool vendors, speed excursions frequently happen downstream of heavy-wall portions of pipe. Heavy-wall pipe can be found along a segment of pipe for a variety of reasons (e.g., a road crossing) or can be associated with tight-radius forged fittings, such as elbows or tees.

Currently, when FEI does not obtain data or only degraded data from ILI tool runs due to speed excursions, FEI manages integrity by:

- Relying on data from a complementary technology previously run successfully in the line, with additional conservatism applied, where available;
- Relying on data from a prior successful run(s) of the same technology, with additional conservatism applied, where available; and
- Undertaking an analysis that adds conservatism for those segments where a degraded data specification is available from the vendor. If a vendor does not provide assurance of the degree of accuracy of ILI data (i.e., through a data specification), the information is not suitable for integrity decision-making.

The above strategies are not appropriate on a permanent basis for managing time dependent threats on an aging pipeline system, especially with respect to cracking threats. In particular, there are no complementary technologies that can be fully relied upon for crack analysis (MFL-C and EMAT are both required), and because FEI is running EMAT tools for the first time, there are no prior runs available from which data can be obtained. Further, MFL-C and EMAT tool vendors do not consistently offer a degraded data specification which would allow for integrity decision-making with lower quality data. As such, FEI requires full coverage for crack mitigation on each of the 8 ITS pipelines. Where data has not been obtained or where degraded data with no specification has been obtained, FEI will perform a site-specific assessment to determine a cost-effective mitigation.

Therefore, to reduce speed excursions that compromise FEI's ability to collect quality data as much as practicably possible, the Project will replace heavy-wall pipe that is known to have caused speed excursions in the past when undertaking MFL-C ILI runs. FEI determined that it could use historical MFL-C tool data to anticipate EMAT ILI tool behaviour through its EMAT ILI

Pilot Project, which is further described in Appendix D. FEI is confident that speed excursions will also occur at these locations with the EMAT ILI tools. The replacement pipe will match the wall thickness of adjacent line pipe, thus ensuring that the tools do not encounter the transition in pipe wall thickness during inspection, avoiding speed excursions, and ultimately, reducing the distances where FEI cannot obtain high quality data.

FEI utilized the system readiness criteria from Appendix F to evaluate known excursion events from MFL tool runs to select the required pipeline modifications for the ITS TIMC Project. The ITS TIMC Project will replace 3 segments of pipe along two pipelines outlined in Table 5-4 below, and described in detail below. These alterations were selected for inclusion in the project for the following reasons:

1. The MFL-C tool exceeded the maximum velocity for data collection (7 m/s); and
2. The length of pipe impacted by the speed excursion were significantly longer than the length of heavy-wall feature causing the sped excursion, meaning that it would be more cost effective to replace the shorter heavy-wall feature than the downstream impacted pipe.

Table 5-4: Heavy-Wall Pipe Modification Scope

Pipeline	Event ID	Location	Type	Length of Heavy-Wall Pipe to be Replaced (m)	Length of Downstream Pipe Impacted by Speed Excursion (m)	Installation Technique for Replacement Segment
SAV PEN 323	1	SAVONA	Creek Crossing	60-80	193	Open Cut
KIN PRI 323	29	OKANAGAN SIMILKAMEEN	Pipe segment	Two segments of 2.5	112	Open Cut
KIN PRI 323	31	OKANAGAN SIMILKAMEEN	Valve assembly	15	223	Open Cut

- **Event 1:** has been associated with speed excursions where heavy-wall pipe was used to cross Cherry Creek. This heavy-wall pipe segment was an emergency installation after the original crossing was exposed due to erosion during the freshet in 2010. All such heavy-wall crossing pipe and bends on either side of the crossing will be replaced with line pipe that matches the wall thickness of the adjacent pipe and will meet applicable code requirements by using a higher grade pipe. The Crossing Methodology Report, M-0002-PIP-REP-0004, can be found in Confidential Appendix G-1.
- **Event 29:** involves two (2) short heavy-wall pipeline segments of 2.5 metres each separated by approximately 50 metres. These two segments were part of the initial installation in 1971. The heavy-wall segments of pipe will be replaced with line pipe that matches the wall thickness of the adjacent pipe and will meet applicable code requirements by using a higher grade pipe.

- **Event 31:** has been identified where a heavy-wall valve assembly has caused speed excursions in the past. The valve assembly was installed in 2013 to replace an existing underground valve to above ground. All heavy-wall segments of pipe will be replaced with line pipe that matches the wall thickness of the adjacent pipe and will meet applicable code requirements by using a higher grade pipe. In order to minimize speed excursions as much as possible, replaced valves and fittings will be selected with an internal diameter that matches the internal diameter of the adjacent line pipe.

Further details on pipeline alterations can be found in Section 2.0 of the FEED Report provided in Confidential Appendix G-1 as well as the Design Basis Memorandum, M-0002-ENG-DBM-0001, and the Overview Maps, M-0002-P-000-0001 and M-0002-P-000-0002. Associated Project costs are provided in Section 5.9 of the Application.

Table 1 in Appendix D identifies the remaining speed excursion events FEI has experienced during previous MFL-A and MFL-C ILI tool runs and has deferred for the ITS TIMC Project. If the EMAT tool exhibits a speed excursion during the baseline EMAT run at one of these locations, FEI will evaluate the method that will be applied to mitigate cracking threats on a case-by-case basis.

5.4 *FACILITY ALTERATIONS REQUIRED FOR EMAT ILI TOOL RUNS*

In this section, FEI describes the scope of alterations required at the ITS facilities to enable successful EMAT ILI runs. This section is organized as follows:

- Section 5.4.1 identifies the facilities that are part of ITS TIMC Project scope and provides an overview of the alterations required; and
- Sections 5.4.2 to 5.4.4 provide the details of the scope of alterations required to ready the facilities for successful EMAT ILI runs.

5.4.1 FEI Assessed the ITS Transmission Facilities to Determine the Need for Alterations

As part of Project development, FEI assessed the 13 transmission pressure facilities associated with the 8 ITS pipelines within the scope of the Project to determine the scope of alterations required to make the system ready for the introduction of EMAT ILI tools. A list of the facilities that were evaluated to determine the scope of facility alterations along with a summary of alterations required is set out in Table 5-3 above.

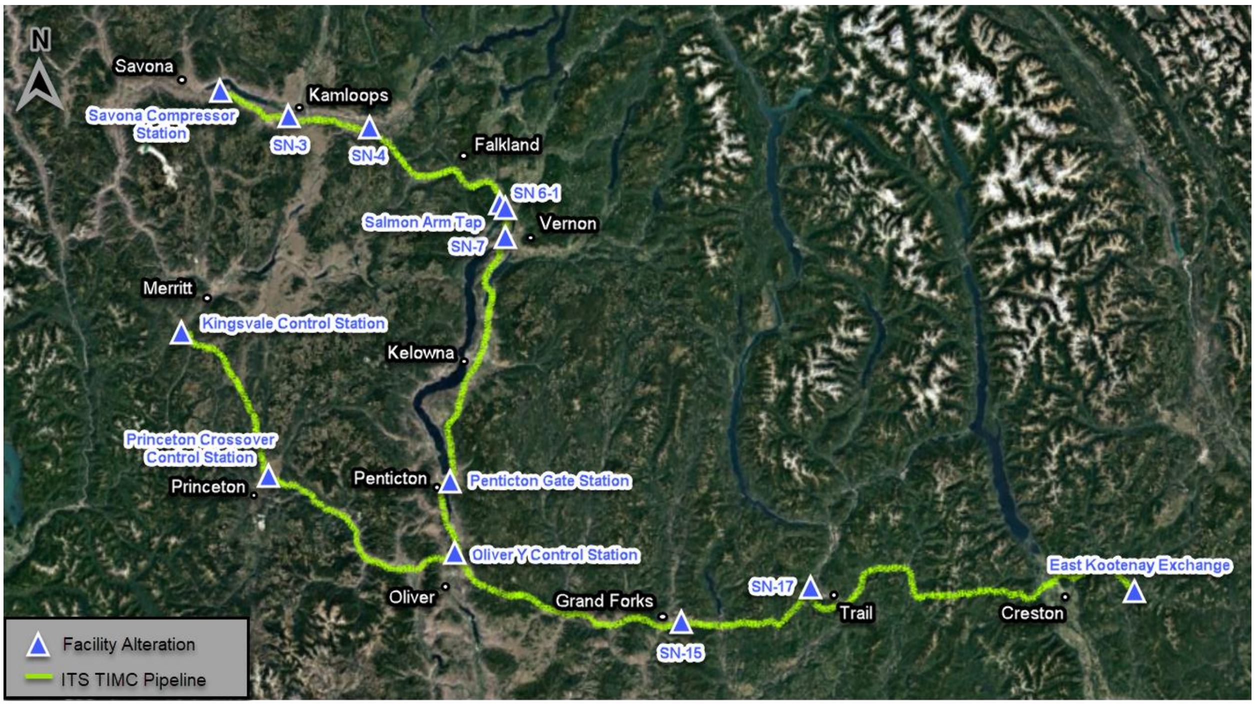
As noted above, FEI identified 13 facilities as requiring modifications to: (1) ready the system for introduction of EMAT ILI tools; (2) ensure EMAT ILI tools travel at optimal velocity ranges for collection of full resolution data during inspections; and (3) respond to cracking threats until repairs are completed. These modifications can be categorized into the following three categories:

1. Pig barrel modifications;

2. Installation of flow control capability; and
3. Installation of pressure regulation capability.

Sections 5.4.2 to 5.4.4 describe the proposed facilities modifications and Figure 5-2 below shows the locations where these modifications will take place. Refer to the Final FEED Report provided in Confidential Appendix G-1 for further details on the analysis performed to determine the scope of work required to enhance FEI's integrity management capabilities.

Figure 5-2: Project Overview Map Showing Facilities Alteration Locations



5.4.2 Pig Barrel Modifications Are Required to Accommodate EMAT ILI Tools

Launching and receiving barrels, also referred to as "launchers" and "receivers", respectively (and collectively as "pig barrels"), are required to facilitate the insertion and retrieval of ILI tools into a pipeline. All 8 ITS pipelines in the Project's scope already have pig barrels installed that have been used in the past for in-line inspections. However, these pig barrels are not capable of accommodating EMAT ILI tools, which are generally longer than the ILI tools that FEI currently uses.

In order to ensure that FEI can launch and retrieve EMAT ILI tools, the pig barrels on the Project's pipelines were analyzed for compliance with EMAT ILI tool specifications and necessary modifications were proposed. FEI provides a summary of these modifications below:

1. Extend the nominal and/or oversize portions of the launchers to ensure that the ILI tool is fully within the barrel to allow for the barrel door to be shut closed before launch;

2. Extend the nominal and/or oversize portions of the receivers to ensure that the ILI tool has completely cleared the barrel isolation valve to allow for ILI tool retrieval;
3. Modify and/or extend kicker lines to accommodate new barrel dimensions;
4. Install pull-in mechanisms in the launchers that will allow the insertion of these tools far enough into the pig barrel to enable launch; and
5. Install new concrete supports under the extended portions of the pig barrels along with the installation of new and longer pigging slabs that will facilitate the ILI tool launch trays to be positioned in place for launch and receipt.

Following a review of the existing pig barrels installed on the Project pipelines, FEI determined that all 16 pig barrels on the 8 pipelines will require modification to meet the requirements described above. The pig barrels requiring modification are located across 13 facilities.

Further details on pig barrel modifications can be found in Section 3.2.3 of the FEED Report provided in Confidential Appendix G-1 as well as the the Design Basis Memorandum, M-0002-ENG-DBM-0001, and the Overview Maps, M-0002-P-000-0001 and M-0002-P-000-0002. Associated Project costs are provided in Section 5.9 of the Application.

5.4.3 Gas Flow Control Is Required to Manage Tool Velocity

As described in Section 5.3**Error! Reference source not found.**, high travel velocities due to heavy wall segments negatively affect the quality of data collected by ILI tools. Another significant contributor to speed excursions are high gas flow rates within the existing pipelines.

To ensure that all ILI tools are capable of traveling as close as possible to their optimum travel velocity, a Flow Control Station (FCS) will be installed on the downstream end of the pipeline in order to control the gas flowrate in the pipeline subjected to EMAT inspection. Based on current analysis of the ITS, control over gas flowrate is required to control the velocity of tools, regardless of whether the ILI tool contains a velocity control mechanism because there are segments of the system where flow exceeds the tool speed control ability (typically at the feed to major urban centers). The benefits of the FCS will allow FEI to complete successful EMAT ILI runs and expand the seasonal window for running ILI tools and under a broader range of system conditions.

A summary of the various aspects of the FCS is provided below:

1. The FCS works on the principle of pressure differential, in which a fluid moves from a region of higher pressure to a region of lower pressure. This means that the FCS will be installed at the downstream end of the pipeline where flowrate control is required. This installation orientation will enable the movement of gas, in a controlled manner, from the pipeline at higher pressure to an adjacent pipeline that is operating at a lower pressure;
2. A single FCS will be fabricated that will come equipped with either a NPS4 or NPS6 control valve for flowrate control and an ultrasonic flowmeter for flowrate monitoring.

3. The FCS has been designed to be a fully independent unit that will be installed at the downstream end of the pipeline undergoing an in-line inspection with an EMAT tool with or without speed control capability; and
4. Piping and foundation for the FCS will be installed at select station facilities on a permanent basis, allowing the FCS to be connected when required.

Four facilities will require permanent piping and foundations in order to accommodate the FCS installation for flow control during ILI inspections. These facilities include:

1. SN-7 in Vernon;
2. Penticton Gate Station;
3. Princeton Crossover Control Station; and
4. SN-15 in Grand Forks.

Further details on flow control capability can be found in Section 3.2.1 of the FEED Report provided in Confidential Appendix G-1 as well as the Design Basis Memorandum, M-0002-ENG-DBM-0001, and the Overview Maps, M-0002-P-000-0001 and M-0002-P-000-0002. Associated Project costs are provided in Section 5.9 of the Application.

5.4.4 Pressure Regulation Is Required to Support EMAT ILI Activities

As described in detail in Section 3.5.2, FEI's statutory and regulatory obligations align with FEI's efforts to take additional measures to mitigate the risk of failure on the 8 ITS pipelines due to cracking threats. As the extent of the threats is unknown until after the successful EMAT ILI run and initial data analysis, FEI must consider and be ready to implement additional operational changes to safeguard the system through pressure reduction.

Pressure reduction will be achieved across the 8 ITS pipelines through the existing pressure control points listed in Table 5-5 and two new pressure regulating stations. The need for additional pressure regulating facilities is driven by three key factors:

1. FEI will not know how many features will be found on any of the 8 ITS pipelines until after each of their respective baseline EMAT ILI runs and resulting data analysis is complete. The uncertainty around the number of repairs and their timelines that will be initiated from the EMAT ILI runs requires a greater level of operational and maintenance flexibility;
2. If FEI finds severe cracking on the ITS through its ILI EMAT runs, FEI is required to determine (by engineering assessment) and implement a safe operating pressure. With the pressure reduction facilities, FEI would be able to implement a pressure reduction of up to 20 percent of the Established Operating Pressure (EOP), which is reasonable and accepted industry standard practice, until the underyling threat is addressed; and

3. FEI is currently able to control pipeline pressures on the ITS at control facilities listed in Table 5-5. Without additional control points, FEI will not have the operational flexibility to sustain gas supply to all customers.

5.4.4.1 Installation of New PRS for 20 Percent Reduction in Established Operating Pressure

New PRSs have been designed for installation at two facilities across the ITS in order to expand FEI's operational and maintenance capabilities. The two facilities that will require a PRS to meet the Project objectives are:

1. East Kootenay Exchange Station; and
2. SN-4 Valve Assembly.

Pressure reductions are required to respond to cracking which may be found during the baseline or subsequent EMAT ILI runs. Key features of the two PRS are provided below:

1. Both PRS will be installed at the upstream end of a pipeline allowing the downstream pressure to be reduced by 20 percent of the EOP (when required);
2. Both PRS will be designed with two fully redundant flow paths where each path contains its own set of control valves and isolation valves enabling uninterrupted operation in case one flow path fails to perform; and
3. The design will consider special control valves with noise abatement that operate more quietly when compared to normal control valves. Sound attenuating enclosures may be utilized to further minimize noise emanating from control valve operation to meet municipal bylaw requirements.

Further details on pressure regulating stations can be found in Section 3.2.2 of the FEED Report provided in Confidential Appendix G-1 as well as the Design Basis Memorandum, M-0002-ENG-DBM-0001, and the Overview Maps, M-0002-P-000-0001 and M-0002-P-000-0002. Additional information regarding a change in scope in PRS locations is available in Confidential Appendix G-4. Associated Project costs are provided in Section 5.9 of the Application.

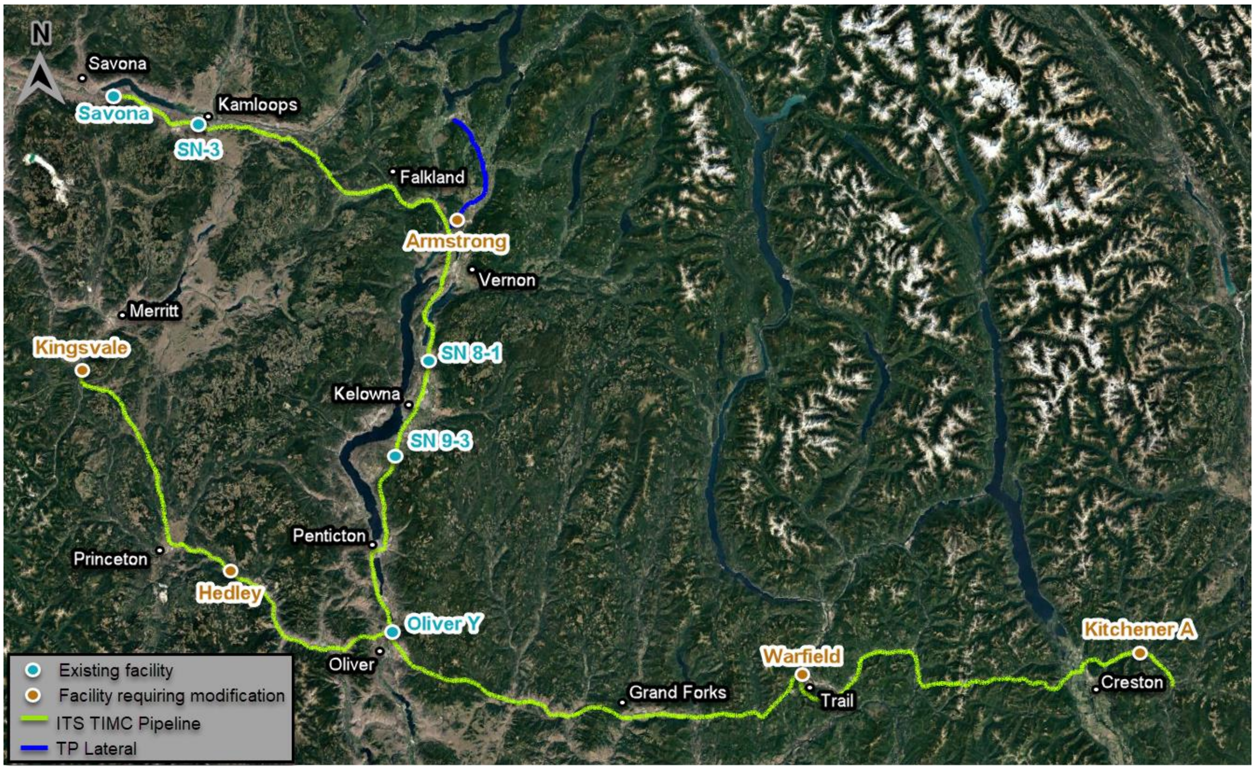
5.4.4.2 Modifications to Control and Safety Systems

Modifications will be required to the control and safety systems at various stations within the ITS TIMC area prior to ability to operate the system at a 20 percent reduction of EOP. As described in Section 5.4.4, pressure reduction will be achieved across the 8 ITS pipelines through existing control points as well as the addition of a temporary PRS at SN-4 Valve Assembly near Kamloops and a permanent PRS at East Kootenay Exchange Station.

FEI will be required to modify control and safety systems at five existing facilities in order to prevent unintended overpressure situations prior to a pressure reduction. These modifications include the installation of pressure safety valves pre-set and tested to the new reduced operating pressure, replacement of pressure switches that will function at the new pressure ranges and modifications to existing control systems. Additional valves and instrumentation may be required to manage the operational impacts as a result of the pressure reduction activation.

Figure 5-3 below shows the locations of existing pressure control facilities and which of these facilities will require modifications to control and safety systems.

Figure 5-3: Project Overview Map Showing ITS Pressure Control Locations



A list of the facilities that were evaluated to determine the scope of facility alterations along with a summary of alterations required is set out in Table 5-5 below.

Table 5-5: ITS Pressure Control Locations

Station FID	Station Name	Operating Scenario	Scope of Modifications
13028	Savona Compressor Station	Savona to Penticton 323 mainline operating at 80% EOP	No modifications required
13102	SN-3 Control Station	Savona to Penticton 323 mainline operating at 80% EOP	No modifications required
13141	Armstrong Compressor Station	Savona to Penticton 323 mainline operating at 80% EOP	Add one pressure safety valve Modify four pressure switches Modify existing control systems
13273	SN 8-1 Valve Assembly	Savona to Penticton 323 mainline operating at 80% EOP	No modifications required

Station FID	Station Name	Operating Scenario	Scope of Modifications
13280	SN 9-3 Control Station	Savona to Penticton 323 mainline operating at 80% EOP	No modifications required
13029	Oliver Y Control Station	Penticton to Trail 273 mainline operating at 80% EOP East Kootenay Link 323 pipeline operating at 80% EOP Kingsvale to Oliver 323 mainline operating at 80% EOP	No modifications required
13037	Warfield Compressor Station	Penticton to Trail 273 mainline operating at 80% EOP East Kootenay Link 323 pipeline operating at 80% EOP	Replace four pressure safety valves Modify existing control systems
13065	Kitchener A Compressor Station	East Kootenay Link 323 pipeline operating at 80% EOP	Replace one pressure safety valve Modify eight pressure switches Modify existing control systems
13125	Hedley Compressor Station	Kingsvale to Oliver 323 mainline operating at 80% EOP	Replace one (1) pressure safety valve Modify existing control systems
13027	Kingsvale Compressor Station	Kingsvale to Oliver 323 mainline operating at 80% EOP	Replace two pressure safety valves Modify six pressure switches Modify existing control systems

The ITS TIMC Project will procure the required materials and have the materials available for installation prior to activation of EOP reduction for system repairs.

5.5 *PROJECT SCHEDULE*

The preliminary Project schedule is based on receiving the approvals sought through this Application by Q3 2023 and an assumed construction start of Q2 2025. The schedule considers performance of the site work between the months of April 2025 to September 2026. FEI, in conjunction with the Project FEED engineering consultant (Tetra Tech), developed the Project construction schedule. The schedule basis can be found in Confidential Appendix G-2.

The Project execution will be subdivided into two phases, completing activities as follows:

- Phase 1 will consist of activities on the SAV VER 323 and VER PEN 323 pipeline systems, including pipeline alteration Event 1, as well as facility alterations at Savona Compressor Station, SN-3, SN-4, SN6-1, Salmon Arm Tap, SN-7, and Penticton Gate Station.
- Phase 2 will consist of pipeline alteration Events 29 and 31, as well as facility alterations at Kingsvale Control Station, Princeton Crossover Control Station, Oliver Y Control Station, SN-15, SN-17 and East Kootenay Exchange.

The Project activities will be subdivided into six main groups as follows:

1. Project Services;
2. Permitting;
3. Engineering Detailed Design;
4. Contract Award / Procurement / Manufacturing;
5. Pipeline Construction; and
6. Facilities Construction.

Table 5-1 Project Schedule

Activity	Date
CPCN Preparation	Sep 2021 to Aug 2022
CPCN Filing	Sep 2022
CPCN Approval	Q3 2023
Contractor Selection and Award	
Engineering Services Contractor Selection and Contractor Negotiation	Sep 2023 to Nov 2023
Construction Contractor Selection and Contract Negotiation	Jul 2024 to Jan 2025
Permitting for ITS TIMC	
Municipal and Community Consultation	Aug 2022 to May 2025
Indigenous Communities Consultation	Aug 2022 to Apr 2025
Landowner Consultation & Communication	Mar 2023 to Feb 2024
Federal Permits (Department of Fisheries and Oceans)	May to Dec 2024 (Phase 1) Mar to Sep 2025 (Phase 2)
OGC Permits	Oct 2023 to Feb 2024 (Early Works) Feb 2024 to Mar 2025 (Phase 1) Mar 2025 to Mar 2026 (Phase 2)
ALC Permits	Feb 2024 to Mar 2025 (Phase 1) Mar 2025 to Mar 2026 (Phase 2)
MFLNRORD Permits	Sep 2023 to Feb 2025 (Phase 1) Sep 2024 to Jan 2026(Phase 2)
Ministry of Transportation and Infrastructure Permits	Mar 2024 to Aug 2025
Municipal and Regional District Permits	Aug 2024 to Jan 2025 (Phase 1) Jun 2025 to Oct 2025 (Phase 2)
Utility Permits & Approvals	Aug 2024 to Jan 2025 (Phase 1) Jun 2025 to Feb 2026 (Phase 2)
Environmental and Archaeological Permits	Nov 2023 to Apr 2025 (Phase 1) Feb 2025 to Apr 2026 (Phase 2)

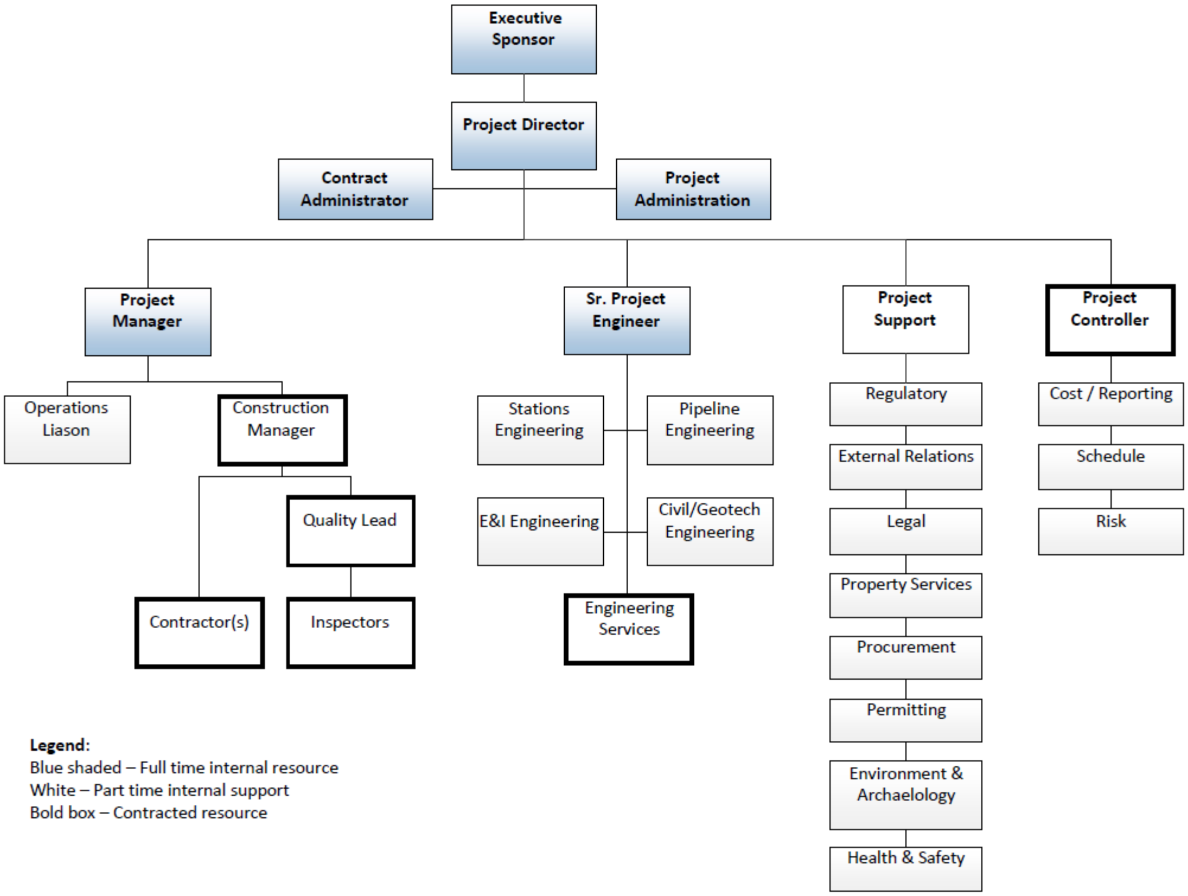
Activity	Date
ITS TIMC CONSTRUCTION	
Engineering Detailed Design	Nov 2023 to Aug 2024 (Phase 1) Sep 2024 to Apr 2025 (Phase 2)
Procurement and Manufacturing	
Long Lead Items	Apr 2024 (both Phases)
Facilities, Electrical, and Instrumentation	Jan 2025 (Phase 1) Aug 2025 (Phase 2)
Fabrication	Mar 2025 to Apr 2025 (Phase 1) Mar 2026 to Apr 2026 (Phase 2)
Mobilization to Site	April 2025 (Phase 1) April 2026 (Phase 2)
Site Installation	
Construction	Apr 2025 to Sep 2025 (Phase 1) Apr 2026 to Sep 2026 (Phase 2)
Restoration and Demobilization	Sep 2025 (Phase 1) Sep 2026 (Phase 2)
Project Close Out	Sept 2026 to Mar 2027

A more detailed Project schedule is included in Appendix I.

5.6 *PROJECT RESOURCES*

Figure 5-6 below outlines a functional organization chart for the execution of the Project. The ITS TIMC Project will be managed by FEI's Project management team and will include both internal and external personnel and use external engineering resources as required. The Executive Sponsor for the execution of the Project is the Vice President, Major Projects.

Figure 5-6: Proposed Resource and Organization Chart for ITS TIMC Execution



5.7 *CONSTRUCTION MANAGEMENT*

Construction activities on the Project will be spread across the Interior of BC, within the boundaries of several local governments. The location of worksites will range from agricultural fields to densely populated urban neighbourhoods, with each worksite presenting its own set of challenges for construction. The work will be primarily performed within the existing pipeline ROW and station footprints; however, temporary workspace will be required at 13 of the 16 work sites where navigating the existing infrastructure is unachievable and where the existing ROW cannot provide enough room to carry out construction activities safely and effectively. These temporary workspaces are as set out in Tables 5-8 and 5-9 below.

The sections below provide an overview of the construction execution activities. Further details can be found in the Construction Execution Plan (M-0002-PMT-PLN-0002) provided in Confidential Appendix G-1, as part of the Final FEED Report.

5.7.1 Site Setup

All worksites including temporary construction workspaces will be secured by construction fencing to restrict public access. These fences will stay up until all construction activities at the site have finished or pose no hazard to the public. Where required, traffic management plans will be prepared in consultation with local governments to assist in maintaining traffic flow.

5.7.2 Safety and Security

Construction site safety and security will be maintained during the course of construction including all working and non-working hours (inclusive of weekends). A comprehensive safety plan will be developed by the construction contractor in compliance with FEI standards, WorkSafeBC regulations and the requirements of other stakeholders impacted by the Project, including local governments.

5.7.3 Land Acquisition

The Project will require fee-simple temporary construction working space and access rights. Certain sites will also require permanent expansion in order to allow for the modifications to be completed. FEI will develop a land management plan to assess the required properties and prioritize the access agreements based on risk and impacts to the Project schedule. In order to reduce the potential uncertainty associated with securing ROW Access Rights, FEI will notify the affected landowners beginning in Q2 2023 based on the land management plan. Upon granting of the CPCN, FEI will complete the confirmation of temporary workspace acquisition and ROW access rights with all affected landowners. The following tables identify land requirements for the pipeline and facilities scope to aid construction activities.

Table 5-2: Temporary Workspace Requirements for Pipeline Scope

Pipeline	Event ID	City	Dimension (approx.)	Land Classification
SAV VER 323	1	Savona	40 m x 80 m	Private
KIN PRI 323	29	Okanagan-Similkameen H	10 m x 200 m (access road) and 10 m x 100 m (shoofly access from west to pipe replacement area)	Crown
KIN PRI 323	31	Okanagan-Similkameen H	40 m x 18 m (north side) 48 m x 18 m (south side) 5 m along east fence length	Crown

Table 5-3: Temporary Workspace Requirements for Facilities Scope

Facility	Workspace Requirements	Ownership
SN-7 (Vernon)	5m along perimeter of the north, west and south boundaries of the site.	Private

Facility	Workspace Requirements	Ownership
SN 6-1 (Vernon)	25m x 18m from north fenceline 28m x 18m from south fenceline 5m x 15m east perimeter	Private
Salmon Arm Tap	5m x 35m on south perimeter 10m x 35m on north perimeter 10m x 4m for east and west perimeter	Private
SN-3 (Kamloops)	10m along north perimeter 14m x 10m on east and west perimeter	Municipal
SN-4 (Kamloops)	Not required	Crown
Savona Compressor Station	Not required	N/A
Kingsvale Control Station	7m x 25m from north perimeter	Private
Princeton Crossover Control Station	45m x 18m east, in addition to 5m in excess of permanent easement 40m x 20m north	Private and Crown
Penticton Gate Station	Not required	N/A
Oliver Y Control Station	Not required	N/A
SN-15 (Grand Forks)	5m along east and south perimeter 2m along west perimeter	Private
SN-17 (Trail)	5m along south, west and east perimeters 5m x 34m north and west perimeter	Private
East Kootenay Exchange	5m x 58m on west of perimeter 5m x 31m on north of perimeter 20m x 26m on south of perimeter	Crown

Table 5-5: Site Expansion Requirements for Facilities Scope

Facility	Expansion Requirements	Ownership
SN 6-1 (Vernon)	Expansion of 5m to the north	Private
Princeton Crossover Control Station	Expansion of 15m to the south, and 5m to the east	Private
SN 15 (Grand Forks)	Expansion of 15m to the east	Private
SN 17 (Trail)	Expansion of 20m to the south	Private

5.7.4 Access Requirements

FEI will use existing public and private roads in order to access the pipelines and facilities along the ROWs requiring modifications. Appropriate traffic management will be implemented, as required, adhering to municipal guidelines to ensure safety of the public and construction crews.

5.7.5 Fabrication

All pressure regulating and flow control assemblies will be fabricated in a shop and transported to site for installation. Piping spools for facilities will also be fabricated in a shop, as much as practically possible, with final fit-up taking place on site.

Valve assemblies and pipe segments to be installed on the pipelines will also be fabricated in a shop or contractor's yard and then transported to site for installation, unless not practical to do so.

5.7.6 Temporary Stop-off and Bypass Requirements to Maintain Supply

FEI must ensure that natural gas supplies are maintained when alterations are taking place. At the same time, the segment of pipe to be replaced needs to be isolated from the rest of the system so that construction crews can replace it. One of the following two methods can achieve both of these objectives:

1. Isolating and purging a segment of pipeline between existing adjacent valves[83]; or
2. Use of stop-off assemblies and bypass piping.

While some of the locations where modifications will take place can be temporarily isolated, the majority of the work locations will require stop-off assemblies with bypass piping due to the absence of parallel pipelines that could be used to maintain supply.

The locations requiring the installation of stop-off assemblies and bypass piping to isolate a segment of pipeline so that construction crews can carry out the replacement are identified in Table 5-5 below.

Table 5-4: Temporary Stop-off and Bypass Scope

Pipeline or Facility	Event ID Or FID	Location
Cherry Creek	1	Heavy wall pipe and bend replacement, Savona Cherry Creek Crossing (SAV VER 323)
Okanagan-Similkameen H	29	Replacement of two (2) heavy wall pipe segments (KIN PRI 323) located approximately 35 km north of Princeton

[83] Where practical, the gas in isolated segments of pipeline will be drawn down using Zero Emission Vacuum and Compression (ZEVAC) units to eliminate or minimize emissions.

Pipeline or Facility	Event ID Or FID	Location
Okanagan Similkameen H	31	Replacement of heavy wall valve station piping (KIN PRI 323) located approximately 30 km north of Princeton
Vernon SN-7	12056	Bypass to be located outside station footprint and will require temporary work space (at Davison Orchards) (SAV VER 323 and VER PEN 323)
Salmon Arm Tap	13047	Bypass to be located outside the station footprint and will require temproary work space. (SAV VER 323)
Vernon SN 6-1	13047	Bypass will be located outside the station footprint and will require temporary work space. (SAV VER 323)
Kamloops SN-3	12056	Bypass will be located outside the station footprint and will require temporary work space. (SAV VER 323)
Kamloops SN-4	12056	Bypass will be located outside the valve assembly footprint and within existing ROW. (SAV VER 323)
Princeton Crossover Station	13061	Bypass will be located outside the station footprint and will require temporary work space. (KIN PRI 323 and PRI OLI 323)
Penticton Gate Station	10459	Bypass will be located within Station footprint (Municipality of Penticton) (VER PEN 323 and PEN OLI 273)
Oliver Y Control Station	13209	Part of the bypass will be located outside the station footprint and will require temporary work space. (PRI OLI 323, PEN OLI 273 and OLI GRF 273)
Grand Forks SN-15	12057	Part of the bypass will be located outside the station footprint and will require temporary work space. (OLI GRF 273 and GRF TRA 273)
Trail SN-17	13113	Bypass will be located outside the station footprint and will require temporary work space. (GRF TRA 273 and YAH TRA 323)
East Kootenay Exchange	23051	Bypass will be located inside the station footprint. (YAH TRA 323)

5.7.7 Testing

All shop welds will undergo non-destructive examination as per FEI specifications and industry standards. Pressure testing activities will generally take place in a fabrication shop or the contractor's yard and pressure testing on site will only take place when necessary. All closure welds (or golden welds) will undergo non-destructive examination before backfill.

5.7.8 Excavation

Excavations within a facility boundary will be carried out via hand digging or by hydrovac. Hydrovac is the use of pressurized water in conjunction with an industrial strength vacuum to simultaneously excavate and evacuate soil. No mechanical excavations will be allowed within a facility.

Excavation along FEI pipeline ROWs (i.e., outside facility boundaries) will be carried out using a combination of mechanical means, hand digging or hydrovac. Mechanical excavation will be used to remove the over-burden up to a meter on top of pipe followed by hand digging or hydrovac until the pipe is fully exposed.

5.7.9 Clean-Up and Post-Construction Restoration

Following the completion of construction, FEI will restore construction workspaces and remove any temporary facilities. Further, private properties will be restored to standards allowing for future operational access and only modified if necessary to mitigate local conditions.

5.8 *REQUIRED PERMITS AND APPROVALS*

5.8.1 Federal

Federal notifications and approvals from DFO will be required to comply with the provisions of the *Fisheries Act*. In particular, applications for licenses and the request for review regarding work in and around fish-bearing streams will require approximately two months for preparation and approval.

5.8.2 Provincial

As discussed below, FEI will require permits and approvals from several provincial agencies, including: the BC Oil and Gas Commission (BCOGC), Agricultural Land Commission (ALC), Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD), and Ministry of Transportation and Infrastructure (MOTI).

5.8.2.1 BC Oil and Gas Commission

The construction and operation of the Project are governed by the *Oil and Gas Activities Act* and are expected to require pipeline and facility permit amendment applications, as well as Notice of Intent to Repair and Replace in Kind (NOI-RRIK) submissions. All pipelines and facilities fall under existing permits through the BCOGC. An Amendment Application requires notification to directly impacted landowners, rightsholders and Indigenous groups prior to submission. The Amendment Application process includes engineering details, mapping package, landowner notification, land or access rights, archaeological requirements, design reviews, and environmental permits/approvals for work in and around fish bearing streams. The upgrades that require a Notice of Intent, instead of an Amendment Application, will be submitted approximately 30 days in advance of construction. Permits under Section 11 of the *Water Sustainability Act* for changes in and about a stream or short-term water use may also be required from the BCOGC.

5.8.2.2 Agricultural Land Reserve

Activities on land designated as Agricultural Land Reserve are regulated under the *Agricultural Land Commission Act*. The construction of the Project will affect lands within the Agricultural Land Reserve (ALR). Works within FEI's existing ROW within ALR Lands are covered under existing approvals, unless soils will be removed from or added to the right of way area. If materials are added or removed, FEI must submit a Notice of Intent to the ALC. Any new land acquisition for the extension of station sites, either in fee simple or ROW, or additions to existing ROW or Temporary Work Space within the ALR will require an application to be submitted. ALC approval must be received prior to OGC approval being granted.

5.8.2.3 Ministry of Transportation and Infrastructure Permits

Highways and areas under the jurisdiction of the Ministry of Transportation and Infrastructure will require permits under the *Transportation Act*. 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.

5.8.2.4 BC Ministry of Forests, Lands, Natural Resource Operations, and Rural Development

The BC MNFLRORD maintains authority to administer General Wildlife Permits and some aspects of the BC *Heritage Conservation Act*. Once the extent of the impact is determined during detailed design, permits will be prepared and submitted for approval if required. The terms and conditions outlined in these permits will be adhered to during the construction of the Project.

5.8.3 Local Governments

The Project construction activities will occur in the following municipalities and regional districts:

- City of Kamloops
- Savona
- Thompson-Nicola Regional District
- Township of Spallumcheen
- City of Vernon
- City of Penticton
- Town of Princeton
- Okanagan-Similkameen

- Kootenay Boundary Regional District
- Central Kootenay Regional District

FEI has operating agreements with most of the local governments affected by the Project. Gas line construction may require additional municipal permits to ensure construction and installation meets municipal bylaws and guidelines. FEI is currently in the process of verifying all required municipal permits and will finalize which permits are required during detailed design.

5.8.4 Other Permits, Licenses or Authorizations

In addition to approvals from federal, provincial, and local governments, the Project may require approvals from stakeholders owning infrastructure in proximity to the proposed scope of work, including the following:

- BC Hydro
- Telus
- TC Energy
- Enbridge
- Local government utilities

Additional notifications to or approvals from WorkSafeBC may also be required prior to the start of construction.

5.9 *PROJECT COST ESTIMATE*

FEI, in conjunction with the FEED engineering and cost estimation consultant (Tetra Tech), developed the cost estimate for the Project using AACE International Recommended Practices Nos. 18R-97 and 97R-18 as guides. The AACE Class 3 cost estimate is based on quantities developed from designs and material take-offs (MTOs) completed by Tetra Tech. Tetra Tech then used these quantities as the basis to establish the direct and indirect costs.

The Tetra Tech estimate includes:

- Engineering services, including regulatory, procurement, fabrication and construction support
- Engineering sub-contracts, such as survey and geotech
- Materials
- Pipeline and stations direct construction costs
- Pipeline and stations indirect construction costs
- Construction sub-contracts

- Construction support services.

FEI completed the portion of the Project cost estimate related to owner's costs, which includes the following:

- Construction Management
- Engineering
- Environmental / Archaeological
- External Relations (Community Relations, Indigenous Relations, Communications)
- Health & Safety
- Legal
- Operations Support
- Procurement & Contract Management
- Project Management
- Project Services
- Property Services
- Regulatory / Permitting

Contingency and escalation are discussed in Section 5.9.2.

5.9.1 Basis of Estimate

The Class 3 Cost Estimate and Basis of Estimate are attached in Confidential Appendix G-3. These documents detail:

- Introduction:
  - Project Overview
  - Purpose of the Basis of Estimate
  - Cost Estimate Classification
  - Construction Schedule
  - Estimating Milestones
  - Design basis
- Project Scope
- Estimating and Engineering Personnel
- Cost Estimating Approach and Assumptions

  - General – Pipeline and Facilities
  - Pipeline Construction Estimating
  - Facilities Construction Estimating
- Cost Basis – Direct Cost
  - Pipelines
  - Facilities
- Cost Basis – Indirect Cost
- Environmental and Archaeological
- Growth Allowances
- Assumptions, Clarifications, and Qualifications
- Estimate Exclusions and Exceptions
- Potential Project Opportunities and Risks
- Estimate Quality Assurance
- Contingency
- Escalation Currency Exchange
- Management Reserve
- Cash Flow
- References

5.9.1.1 Project Cost Estimate Details

The Total Project cost estimate is $84.588. million in as-spent dollars, including AFUDC of $4.513 million and income tax recovery of $0.883 million. The total Project capital cost also includes contingency of $5.900 million and management reserve of $5.000 million that FEI plans to hold based on its current understanding of the Project's risk profile and to account for possible scope changes or unknown future events which cannot be anticipated and which were not quantified in the contingency analysis. The capital cost estimate with the 10.1 percent contingency of the base cost estimate of $58.364 million in 2022 dollars approximates a P50 confidence level and will form the Project capital budget. The following Table 5-6 below presents a summary of the Project capital budget.

Table 5-5: Project Capital Budget

Line	Item	Amount ($millions)
1	Construction Cost Estimate (Contractor + FEI)	$50.231
2	Owners Costs (FEI)	$8.133

Line	Item	Amount ($millions)
3	**Subtotal Construction Base Cost Estimate ($2022-Q2)**	**$58.364**
4	CPCN Application Costs	$0.400
5	Pre-Construction Development Costs	$3.665
6	Contingency	$5.900
7	**Subtotal Project Cost Estimate ($2021-Q4)**	**$68.328**
8	Cost Escalation Estimate	$7.630
9	Management Reserve	$5.000
10	**Sub-Total Project Cost Estimate (As-Spent)**	**$80.958**
11	AFUDC	$4.513
12	Income Tax Recovery[84]	$(0.883)
13	**Total Project Cost Estimate (As-Spent)**	**$84.588**

5.9.1.2 Cost Estimate Validation

Cost estimate quality assurance, verification, and independent estimating were completed as follows:

- Internal reviews of Tetra Tech's assumptions, deliverables and document quality checks;
- Verification reviews involving both Tetra Tech and FEI team members throughout the estimate development process to confirm that the estimate assumptions were valid;
- Independent external review of the Class 3 cost estimate was done by Universal Pegasus International (UPI), an engineering consultant, to verify from an engineering perspective that the estimate criteria and requirements were met and a documented, reasonable estimate was developed; and
- Independent external estimate completed by Pipestone Projects, a company that specializes in construction planning and estimating, in order to verify from a construction perspective that suitable construction strategy, cost basis and estimating methodology were utilized to provide a detailed, representative estimate.

5.9.2 Risk Analysis, Contingency Determination, & Escalation

FEI engaged Yohannes Project Consulting Inc. (YPCI), a company specializing in risk management, to conduct a qualitative risk analysis of the risks associated with the Project. YPCI conducted multiple workshops to identify risks that are likely to occur with impacted stakeholders and these risks were recorded in the risk register for the Project. As the engineering advanced on the Project, the probability or the consequence of several risks which were initially identified

[84] Income tax recovered or paid related to the pre-tax application and pre-construction development costs recorded in the deferral account. Refer to Section 6.4.2 of the Application.

were either mitigated entirely or reduced materially. All of the remaining risks associated with the Project are contained within the Risk Report and included in Confidential Appendix H-1.

5.9.2.1 Risk Identification Planning

The risk identification and qualitative analysis was completed using the AACE International Recommended Practice 62R-11: *Risk Assessment: Identification and Qualitative Analysis* (Revision May 11, 2012) (AACE 62R-11) as a guide. First, the risks were identified by Tetra Tech and FEI through a risk workshop facilitated by YPCI in September 2021. Furthermore, the risk analyses and identification workshops were collaboratively undertaken with YPCI in September and October 2021, resulting in:

- The risk response actions; and
- Qualitative rating of the likelihood and consequences

5.9.2.2 Risk Register, Qualitative Assessment and Action Plan

The risk identification process identified a number of risks, which were tabulated and included in the YPCI's Risk Report's risk register (Confidential Appendix H-2). The risk response actions to deal with the identified risks were also recorded in the risk register. Once the risks were identified, a qualitative analysis was completed to prioritize or rank the risks so that the Project team could focus on risk response actions and recommendations. Through this qualitative process, a likelihood and consequence rating was assigned to each identified risks using a risk assessment matrix. The risk likelihood and consequence scales used for the Project is based on the 5 by 5 risk assessment matrix recommended in AACE 62R-11 (illustrated in Figure 5-7) below.

Figure 5-7: Risk Assessment Matrix

	Risk Impact Category				
CTS TIMC	Scope, Cost, Schedule, Performance, Quality				
	Impact				
Likelihood (Probability)	Very Low	Low	Medium	High	Very High
very High (>50%)					
High (5-50%)		2	1	2	1
Medium (1-5%)			4	1	1
Low (0.1-1.0%)		4	8	4	1
Very Low (<0.1%)	2	3			1

5.9.2.3 Risk Quantification & Contingency Analysis

FEI retained an independent expert Validation Estimating LLC, USA (Validation Estimating, John Hollmann), a company that provides services in estimate validation, risk analysis and contingency, to complete a contingency estimation and a quantitative analysis using an integrated parametric and expected value methodology. This analysis is described in the report titled "ITS

Transmission Integrity Management Capabilities Capital Cost and Schedule Risk Analysis and Contingency Estimate," dated January 10, 2022 and provided in Confidential Appendix H-3.

Validation Estimating facilitated a series of risk workshops to evaluate the systemic and project-specific risks with the extended project team and identify critical risks. Following the workshops, the independent expert quantified the contingency, using probabilistic methods to provide a distribution of possible cost and duration outcomes, to adequately address Project risks over a multi-year execution timeframe. This risk quantification applies a hybrid approach that combines a parametric model analysis for systemic risks based on empirical knowledge, and an expected value analysis for project specific risks, which assesses probability of occurrence and integrates anticipated cost and schedule impacts. The hybrid approach is in accordance with and is aligned to the following AACE International Recommended Practices:

- 40R-08 Contingency Estimating – General Principles;
- 42R-08 Risk Analysis and Contingency Determination Using Parametric Estimating; and
- AACE 113R: Integrated Cost and Schedule Risk Analysis and Contingency Determination Using Combined Parametric and Expected Value.

The risk analysis was used to establish a contingency percentage of 10.1 percent ($5.9 million) at the P50 confidence level, based on the current understanding of the Project's risk profile. A recommendation for the management reserve for the project has also been included in the risk analysis. The recommended P50 confidence level management reserve for the project is $5.0 million, which is 8.6 percent of the base cost estimate value.

5.9.2.4 Escalation

All cost estimates, including material supply and construction contracts, were developed based on 2022 market prices. The probabilistic assessment of escalation was completed by Validation Estimating.

The escalation analysis was based on price indices forecasted by economic consulting firm IHS Markit, forecasted global and regional capital spending market conditions, and a cash flow developed from the master schedule. The analysis is in accordance with AACE Recommended Practice 68R-11: *Escalation Estimating Using Indices and Monte Carlo Simulation*, and is documented in the report titled "ITS Transmission Integrity Management Capability (TIMC) Project Escalation Estimate" dated September 9, 2022 and provided in Confidential Appendix H-4. This report established the escalation at $7.630 million (11.9 percent of the total base cost plus contingency) that aligns with the P50 confidence level.

5.10 *POST PROJECT WORK*

Once the pipeline and facility modifications described in the sections above have been completed for each of the pipelines in the ITS, FEI will undertake the following work:

1. Run EMAT ILI tools in the ITS pipelines as modifications are completed and runs can be undertaken;
2. The results of the EMAT ILI tool run will be used to inform integrity digs and repairs, as required; and,
3. Segments with poor quality EMAT ILI data may need further investigation into the presence of cracking threats.

A description of each of these activities is provided in the Table 5-7 below, including the type of cost and likely timing.

Table 5-7: ILI Activities

Activity	Cost Type	Timing
Run EMAT ILI Tools in the ITS: With the required pipeline and facility alterations complete, FEI will schedule and run the EMAT ILI tools in each pipeline. It is estimated that these tools will need to be run at least every seven years to monitor the growth of crack-like threats to the pipeline and to provide information on where FEI needs to respond to and repair any crack-like threats. The actual run frequency for each pipeline will be determined after the initial baseline run, once the condition of the pipeline (with regards to the crack-like features) is better understood.	Capital	Initial runs to begin in 2026. Runs will continue through the useful life of the asset.
Perform Integrity Digs and Repairs: Informed by the information gathered by the EMAT ILI tool runs, FEI will perform Integrity Digs to validate the data and repair integrity concerns on the pipeline. Interpretation of the EMAT ILI tool data is iterative and consists of a review of the data and then field validation. There may be multiple phases of integrity digs associated with the same EMAT ILI tool run, with the information gathered from the validation digs fed back into the data analysis.	Flow-through O&M	2026 through 2035 Integrity Digs for validation and repair will start shortly after the EMAT ILI run, and may continue up to three years after the run.
In-Ditch Inspection of EMAT ILI Tool Blind Spots: If, once the validation digs are complete, there remain sections of the pipeline with deficiencies in the collected data (blind spots), FEI will evaluate the sections to determine whether further work needs to be done to ensure adequate risk identification and mitigation. This evaluation will be based on the following factors: 1. The severity of the data degradation; 2. The condition of the rest of the pipeline; 3. The percent coverage of the tool; and 4. The location of the blind spots. Where required by the evaluation, discrete projects will be raised to mitigate SCC risk at these blind spots. A committee of FEI subject matter experts will determine the length of pipe that needs to be addressed and the method that will be applied to mitigate SCC. Integrity management methods including pipeline replacement (PLR) or pipeline exposure and recoat (PLE) may be used in localized applications where blind spots have occurred and where altering the pipeline to obtain high quality EMAT ILI data is not feasible.	O&M or Capital, in accordance with FEI's Capitalization Policy	2027 through 2035 The Final Report for the EMAT ILI run is a key input for defining these projects, and is likely to take two to three years to receive following a tool run.

To manage the additional work associated with FEI’s transmission system integrity management activities described above, FEI may require additional headcount as well as new double block and bleed tools to perform repair work. The extent of post project work required cannot be confirmed until the EMAT ILI tool has been run on each pipeline, integrity digs have been performed, and results interpreted.

FEI will request approval of the incremental increase in O&M or Sustainment Capital either in an upcoming Annual Review, or in the next MRP or Revenue Requirements application (RRA) filing, depending on when the runs are planned. As integrity digs have been approved for flow-through treatment during the term of the MRP, FEI will include estimates of additional integrity dig costs that are associated with the capabilities enabled by the ITS TIMC Project for review by the BCUC in its annual reviews as applicable.

5.11 *CONCLUSION*

In this section, FEI has provided a detailed description of the proposed ITS TIMC Project. The Project includes the pipeline and facility modifications required to ready the ITS for EMAT ILI tool runs. FEI has reasonably scheduled the Project activities, has the appropriate resources in place for the Project, descried the Project construction activities, is obtaining all required permits and approvals, and has reasonably estimated the project cost.

6. PROJECT COSTS, FINANCIAL ANALYSIS, ACCOUNTING TREATMENT AND RATE IMPACT

6.1 *INTRODUCTION*

The ITS TIMC Project has a Total Cost Estimate of $84.588 million. This section provides a breakdown of the Project costs, including the details of the actual and forecast deferral costs for the ITS TIMC Project recorded in the existing TIMC Development Cost deferral account. This section also summarizes the financial analysis, the accounting treatment of the capital costs, as well as the delivery rate impact of the Project.

6.2 *SUMMARY OF PROJECT COSTS*

Table 6-1 below summarizes the total Project costs, including pipeline and stations construction costs, Project management and owner's costs, contingency and management reserve, Project development costs, and financing costs, in both 2022 and as-spent dollars.

Table 6-1: Breakdown of the ITS TIMC Project Cost Estimate ($millions)

Line	Particular	2022 $	As-Spent $	Reference
1	Pipeline Construction Costs	6.251	7.039	Section 5.3 and Confidential Appendix G-3 (2021 $)
2	Stations Construction Costs	43.980	49.329	Section 5.4 and Confidential Appendix G-3 (2021 $)
3	Project Management and Owner's Costs	8.133	8.905	Section 5.7
4	**Subtotal Project Capital Cost**	**58.364**	**65.273**	**Sum of Line 1 to 3; also see Section 5.9**
5	Contingency	5.900	6.621	Section 5.9.2.3 and see Note 1 for As-spent $
6	**Subtotal w/ Contingency**	**64.264**	**71.894**	**Sum of Line 4 to 5**
7	Pre-Construction Development Costs	3.665	3.665	Section 6.3
	Preliminary Stage Development Costs (Deferral)	-	-	Section 6.3
8	CPCN Application Costs (Deferral)	0.400	0.400	Section 6.3
9	**Subtotal w/ Development and Deferral Cost**	**68.328**	**75.958**	**Sum of Line 6 to 8**
10	Management Reserve	5.000	5.000	Section 5.9.2.3
11	AFUDC		4.513	Table 6-2, Line 18, Column 6
12	Income Tax Recovery (Deferral Cost)		(0.883)	Table 6-2, Line 18, Column 5
13	**Total Project Cost**	**73.328**	**84.588**	**Table 6-2, Line 18, Column 7**

The ITS TIMC Project cost estimate, reflected in the table above, is based on the following:

- A base cost estimate of $58.364 million in 2022 dollars developed by FEI, in conjunction with FEED engineering and Tetra Tech (Cost Estimation Consultant), as discussed in Section 5.9 and Confidential Appendix G-3;
- A contingency estimate of $5.900 million in 2022 dollars (approximately 10.1 percent of the base cost estimate of $58.364 million in 2022 dollars) provides a total capital budget at a P50 confidence level, as discussed in Section 5.9.2.3;
- A recommended P50 management reserve of $5.000 million (approximately 8.6 percent of the base cost estimate of $58.364 million in 2022 dollars), as discussed in Section 5.9.2.3;

- A P50 escalation value of $7.630 million during the Project from 2022 to 2027[85], as discussed in Section 5.9.2.4 of the Application, applied to both the base capital cost and contingency ($6.909 million of escalation on capital cost and $0.721 million of escalation on contingency). The escalation is used to convert the Project capital cost from 2021 dollars to as-spent dollars;
- An estimate of $0.400 million for the preparation and regulatory review of the Application from 2021 to 2023, recorded in the existing TIMC Development Cost deferral account, as further discussed in Section 6.3.3;
- A total of $3.665 million ($4.108 million with AFUDC) of capitalized pre-construction development costs, including an actual of $2.556 million ($2.616 million with AFUDC) for 2021 and a forecast of $0.829 million and $0.279 million ($1.003 million and $0.489 million with AFUDC) for 2022 and 2023, respectively; and
- AFUDC, assumed at FEI's 2022 AFUDC rate of 5.42 percent, which is equal to FEI's after-tax weighted average cost of capital.[86]

6.3 *FINANCIAL ANALYSIS*

FEI has performed a financial evaluation of the Project based on the present value (PV) of the incremental revenue requirement and the levelized delivery rate impact to FEI's non-bypass customers over a 70-year analysis period. The 70-year analysis period is based on a 65 year post-project analysis period (from 2027 as all assets, except for the closing costs, are estimated to be placed in-service by 2026) plus five prior years for the estimated Project schedule from 2022 to 2026. The 65-year post-project analysis period is the average service life (ASL) of transmission mains pooled asset account 46500, as detailed in FEI's depreciation study approved by Order G-165-20 as part of FEI's 2020-2024 Multi-Year Rate Plan (MRP) Application.

Table 6-2 below provides the breakdown of the Project capital costs of $84.588 million (as-spent dollars) into asset and deferral account components.

[85] No escalation applied on actual costs incurred by FEI prior to January 2022
[86] As approved for 2022 by Order G-366-21. The actual AFUDC will be calculated based on the approved AFUDC rate at the time of construction.

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

Line	Particular	As-Spent $	Owner's Costs	Capitalized Development Costs	Contingency & Management Reserve	Income Tax Recovery	AFUDC	Total	Reference (Confidential Appendix J, Financial Schedule)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
1	**Pipeline Construction**								
2	46101 - Transmission Land Rights	-	0.020	-	0.002	-	0.002	0.025	Schedule 6, Sum of Line 2, 12, 22, and 32 (2022-2026)
3	46500 - Mains Installation	7.039	1.100	0.458	1.449	-	0.540	10.586	Schedule 6, Sum of Line 4, 14, 24, and 34 (2022-2026)
4	Subtotal Pipeline Construction	7.039	1.120	0.458	1.451	-	0.542	10.610	Line 2 + Line 3
5									
6	**Station Construction**								
7	46101 - Transmission Land Rights	-	0.076	-	0.009	-	0.009	0.093	Schedule 6, Sum of Line 3, 13, 23, and 33 (2022-2026)
8	46500 - Mains Installation	36.997	5.782	2.405	7.621	-	3.039	55.844	Schedule 6, Sum of Line 5, 15, 25, and 35 (2022-2026)
9	46710 - Measuring & Regulating Equipment	7.399	1.156	0.481	1.524	-	0.608	11.169	Schedule 6, Sum of Line 6, 16, 26, and 36 (2022-2026)
10	46720 - Telemetering	4.933	0.771	0.321	1.016	-	0.405	7.446	Schedule 6, Sum of Line 7, 17, 27, and 37 (2022-2026)
11	Subtotal Station Construction	49.329	7.785	3.207	10.170	-	4.061	74.551	Sum of Line 7 to 10
12									
13	**TIMC Deferral Additions**								
14	Application Costs	0.400	-	-	-	(0.108)	0.016	0.308	
15	Tax Recovery on Pre-Construction Costs					(0.775)	(0.106)	(0.881)	
16	Subtotal TIMC Deferral Additions	0.400	-	-	-	(0.883)	(0.090)	(0.574)	Schedule 9, Line 8 (2022)
17									
18	**Total Project Costs**	**56.768**	**8.905**	**3.665**	**11.621**	**(0.883)**	**4.513**	**84.588**	**Sum of Line 4, 11, and 16**

Table 6-3 below summaries the financial analysis based on the assumptions discussed in this section. Details of the financial evaluation of the Project can be found in the Financial Schedules included in Confidential Appendix J.

The ITS TIMC Project will result a cumulative delivery rate impact of 0.72 percent by 2028 when all assets as well as all closing costs have entered FEI's rate base. Please refer to Section 6.5 for further discussion on the delivery rate impact and equivalent bill impact to typical residential customers. Over 70-year analysis period (i.e., 65 years for the average service life of the assets plus 5 prior years for the project), the PV of the incremental revenue requirement is approximately $93.621 million and the levelized delivery rate impact is 0.54 percent or $0.027 per GJ.

Table 6-3: Financial Analysis of the Project

Line	Particular	TOTAL	Reference (Confidential Appendix J, Financial Schedule)
1	Total Charged to Gas Plant in Service ($ millions)	85.161	Schedule 6, Sum of Line 43 (2022-2027)
2	Total Project Deferral Costs, Net of Tax	(0.574)	Schedule 9, Line 8 (2023)
3	***Total Project Cost - Excl. Sustainment Capital ($ millions)***	***84.588***	***Line 1 + Line 2***
4	Sustainment Capital	103.062	Schedule 6, Sum of Line 43 (2028-2091)
5	***Total Project Cost - incl. Sustainment Capital ($ millions)***	***187.650***	***Line 3 + Line 4***
6			
7	Incremental Rate Base in 2028 ($ millions)	81.004	Schedule 5, Line 19 (2028)
8	Incremental Revenue Requirement in 2028 ($ millions)	6.860	Schedule 1, Line 11 (2028)
9	***PV of Incremental Revenue Requirement 70 years ($ millions)***	***93.621***	***Schedule 10, Line 25***
10	Net Cash Flow NPV 70 years ($ millions)	4.227	Schedule 11, Line 17
11			
12	Delivery Rate Impact in 2028 (%)	0.72%	Schedule 10, Line 28 (2028)
13	***Levelized Delivery Rate Impact 70 years (%)***	***0.54%***	***Schedule 10, Line 32***
14	Levelized Delivery Rate Impact 70 years ($/GJ)	0.027	Schedule 10, Line 45

The financial evaluation of the ITS TIMC Project includes the following assumptions:

- **Incremental Sustainment Capital**: The financial analysis over the 70-year period included the future replacement costs of the station's telemetry and the measuring & regulating equipment. The timing of the replacement costs is based on the average service life of the telemetry and the measuring & regulating equipment, which is 11 years and 47 years, respectively, as detailed in FEI's most recently approved Depreciation Study;

- **Property Tax**: Incremental property tax due to the construction at the stations based on the 2022 tax rate; and
- **Inflation**: Two percent annually for incremental property tax and the aforementioned future sustainment capital costs estimated to occur in 2027 and beyond during the post-Project analysis period. FEI used the midpoint of inflation-control target range of 1 to 3 percent by the Bank of Canada for long-term inflation forecasts for 2027 and beyond.

6.4 *ACCOUNTING TREATMENT*

In the subsections below, FEI describes the proposed treatment of the Project capital costs as well as the actual and forecast costs to be recorded in the TIMC Development Cost deferral account.

6.4.1 Treatment of Capital Costs

Consistent with FEI's treatment of major project capital costs, including CPCNs:

- As the capital costs of the ITS TIMC Project (i.e., $85.161 million as set out in Line 1 of Table 6-3 above) are incurred, they will be recorded in Work in Progress during construction, attracting AFUDC;
- 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. For example, the estimated amount to be transferred to FEI's rate base each year is shown in the opening balance of FEI's Gross Plant in Service in Financial Schedule 7 of Confidential Appendix J; and
- Depreciation of the assets will begin on January 1 of the year that they enter FEI's rate base.

6.4.2 TIMC Development Cost Deferral Account

As discussed in Section 1.2.2, FEI received BCUC approval with BCUC Order G-237-18, granting the creation of the non-rate base TIMC Development Cost deferral account. The deferral account was approved to attract a WACC return, with disposition to be proposed in a future application. Costs captured in the TIMC deferral account include the Application Costs, the Preliminary Stage Development Costs, and the Pre-Construction Development Costs. Each of these are described as below:

- CPCN Application Costs are related to expenses incurred for the regulatory process to review the Application. The cost estimate is based on a written process with one round of

IRs with expenses for external legal counsels, consultant costs, BCUC costs, and BCUC-approved intervener costs.

- Preliminary Stage Development Costs are related to expenses incurred for engaging third party consultants for feasibility evaluation, preliminary development, and assessment of the potential design for the TIMC projects (both CTS and ITS). It also consists of the QRA of FEI's transmission pipeline assets and the EMAT ILI Pilot project costs.
- The Pre-Construction Development Costs include the costs related to the front-end engineering and design, CPCN development costs including environmental assessments, First Nations and stakeholder consultations.

In addition, pursuant to Order C-3-22 of the CTS TIMC CPCN Application, dated May 8, 2022, FEI was approved to capitalize the costs associated with the EMAT ILI Pilot projects as well as the pre-construction development costs related to the CTS TIMC Project, both of which were originally recorded in the existing non-rate base TIMC Development Cost deferral account, while the remaining CPCN application costs as well as the preliminary stage development costs related to CTS TIMC Project were approved to transfer from the existing non-rate base deferral account to rate base with an amortization period of 5 years commencing January 1, 2023. FEI was also approved to continue to record costs associated with the future ITS TIMC CPCN Application in the same non-rate base deferral account, to be tracked and recorded separately from the CTS TIMC development costs and to request disposition as part of the ITS TIMC CPCN Application.

Table 6-4 below provides the application costs as well as the pre-construction development costs associated with the ITS TIMC CPCN Application captured in the existing TIMC Development Cost deferral account[87]. The application and development costs associated with the ITS TIMC CPCN Application are already recorded in the existing non-rate base TIMC deferral account as approved by Order C-3-22. Consistent with approved treatment of similar costs, FEI proposes the following:

- The pre-construction development costs associated with the ITS TIMC Project will be capitalized by transferring to construction work-in-progress (CWIP); and
- The remaining costs in the deferral account, i.e., the application costs associated with the ITS TIMC CPCN Application, including the financing costs and any income tax recovery, estimated to be a credit of \$0.574 million (at December 31, 2023; Line 9 of Table 6-4 below), will be transferred from the existing non-rate base deferral account to the existing rate base deferral account on January 1 of the year following a BCUC decision on the ITS TIMC CPCN Application. As approved by Order C-3-22, the existing rate base TIMC development cost deferral account has an approved amortization period of 5-years.

[87] There are no preliminary stage development costs associated with the ITS TIMC Project.

Table 6-4: Summary of ITS TIMC Deferral Costs for Application and Development ($millions)

Line	Particular	2021	2022	2023	Total
1	Application Costs	0.002	0.228	0.170	0.400
2	ITS Preliminary Stage Development Costs	-	-	-	-
3	ITS Pre-Construction Development Costs (Capitalized)	2.556	0.829	0.279	3.665
4	**Subtotal, Pre-Tax Costs[1]**	**2.558**	**1.057**	**0.449**	**4.065**
5	Financing, WACC Return	0.043	0.133	0.177	0.353
6	Income Tax Recovery	(0.691)	(0.147)	(0.046)	(0.883)
7	**Subtotal w/ Financing & Income Tax Recovery**	**1.911**	**1.043**	**0.581**	**3.535**
8	Less: Cost Capitalized (Incl. AFUDC)	-	(3.619)	(0.489)	(4.108)
9	**Total Deferral Costs**	**1.911**	**(2.576)**	**0.092**	**(0.574)**

Note 1: Total of Line 4 agrees with Table 5-2, Line 4 + Line 5

6.5 *DELIVERY RATE IMPACT*

Based on the estimated Project schedule, and as discussed in Section 5.5 of the Application, FEI expects to complete the construction of the Project in two phases, i.e., phase 1 by the end of 2025 and phase 2 by the end of 2026, with a small amount of closing costs in the first quarter of 2027. Per the treatment of capital costs described in Section 6.4.1 above, assets related to phase 1 of the Project will enter FEI's rate base on January 1, 2026 while the assets related to phase 2 will be entering FEI's rate base on January 1, 2027, with the small amount of remaining closing costs incurred in 2027 to enter FEI's rate base on January 1, 2028. Table 6-5 below provides an estimate of the annual delivery rate impact to FEI's non-bypass ratepayers due to the ITS TIMC Project from 2024 to 2028 when compared to the 2022 approved non-bypass revenue requirement as well as the year-to-year increase of incremental annual delivery rate impact in percentage terms. It is to be noted that the annual delivery rate impact as shown in Table 6-5 includes the annual credit amortization (5-years from 2024 to 2028) of the TIMC Development Costs deferral account related to the ITS TIMC Project as discussed in Section 6.4.2 above.

Table 6-5: Summary of Delivery Rate Impact of the Project

	2024	2025	2026	2027	2028
Annual Delivery Margin, Incremental to Approved, Non-Bypass ($ millions)	(0.195)	(0.173)	3.099	6.782	6.860
% Increase to Approved Delivery Margin, Non-bypass	***(0.02%)***	***(0.02%)***	***0.32%***	***0.71%***	***0.72%***
Incremental % Delivery Rate Impact (Year-over-Year)	***(0.02%)***	***0.00%***	***0.34%***	***0.38%***	***0.01%***
Average Annual % Delivery Rate Impact (5 years, 2024 - 2028)	0.14%				
Average Annual Delivery Rate Impact (5 years, 2024 - 2028), $/GJ	0.007				
Cumulative % Delivery Rate Impact (5 years, 2024 - 2028)	0.72%				
Cumulative Delivery Rate Impact (5 years, 2024 - 2028), $/GJ	0.035				

The ITS TIMC Project will result in an estimated cumulative delivery rate impact of 0.72 percent by 2028 when all construction and closing costs are complete and all capital costs have entered FEI's rate base. The average annual delivery rate impact over the five years from 2024 to 2028 is estimated to be 0.14 percent annually or $0.007 per GJ annually. For a typical FEI residential customer consuming 90 GJ per year, this would equate to an average bill increase of approximately $0.63 per year over the five years, or $3.15 cumulatively by 2028.

6.6 *CONCLUSION*

In summary, the ITS TIMC Project has a Total Cost Estimate of $84.588. million and will result in an estimated delivery rate impact of 0.72 percent in 2028 when all construction is complete and after all assets are placed in service. For a typical FEI residential customer consuming 90 GJs per year, this would equate to an approximate average bill increase of $3.15 per year.

7. ENVIRONMENT AND ARCHAEOLOGY

7.1 INTRODUCTION

FEI is committed to delivering safe and reliable energy in an environmentally responsible manner to all the communities that it serves. Based on its preliminary environmental and archaeological assessment, FEI expects that the Project's scope, which includes existing rights of way and facilities and associated temporary workspaces, has low to moderate potential for environmental impacts, which can be mitigated through the implementation of best management practices and recommended mitigation measures. Archaeological potential within the Project's scope was also assessed, and FEI obtained recommendations to mitigate possible impacts from the proposed alterations. Detailed descriptions of each pipeline and facility modification are provided in Section 5 of the Application.

The Environmental Overview Assessment (EOA) of the Project, filed as Appendix K of the Application, concludes that the potential for environmental risk associated with the Project is low to moderate. FEI will mitigate the 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.

The Archaeological Overview Assessment (AOA) of the Project, filed as Appendix L of the Application, concluded that the areas in which the three pipeline modifications (Pipeline Events) and 13 Project Facilities are located may have moderate to high archaeological potential, with the exception of SN-17 valve station which has low archaeological potential. No registered archaeological or heritage sites overlap with the Project footprint. The AOA recommends conducting additional preliminary field reconnaissance (PFR), archaeological monitoring, or Archaeological Impact Assessment (AIA) for Project Events and Facilities with moderate to high archaeological potential prior to, or concurrent with, construction. FEI will be undertaking the PFR and AIA as recommended.

The remainder of this section is organized as follows:

- Section 7.2 describes the potential environmental impacts identified through the EOA and how these impacts can be mitigated through additional assessment, the implementation of best management practices and mitigation measures, and municipal, regional, provincial and federal permitting processes.
- Section 7.3 describes the archaeological potential identified by the AOA and how potential impacts can be mitigated through additional assessment, the implementation of standard best management practices, and provincial and Indigenous permitting processes.

7.2 ENVIRONMENT

In this section, FEI describes its approach and plan with respect to the identification, management, and mitigation of potential environmental impacts associated with the Project.

FEI retained Wood Environment and Infrastructure Solutions[88] to complete an EOA of the ITS TIMC Project, comprised of 3 Pipeline Events within the existing rights of way and 13 alterations to existing Facilities.[89] The EAO report is provided as Appendix K to the Application. The EOA identifies the potential impacts to the biophysical environment from the Project and provides a basis for the completion of additional assessments and preparation of environmental management plans prior to construction commencement.

The EOA was based on a combination of a desktop review of available information and preliminary field reconnaissance surveys. Descriptions of potential impacts to the biophysical environment and recommended mitigations can be found in Section 9.0 of the EOA report. As described in the EOA, potential Project impacts vary by location but may include disturbance to environmental features such as terrestrial and aquatic resources, species at risk and soils within the study area.

The EOA assessed the overall environmental risk of the Project as low to moderate. In particular, the potential modification or disruption of fish habitat at the Cherry Creek crossing (SAV VER Event 1), disruption of breeding birds at the three Pipeline Events and eleven Facilities,[90] and the spread of noxious weeds at all Pipeline Events and Project Facilities have been assessed as posing a moderate risk. All potential environmental impacts from the Project can be mitigated through the application of standard environmental best management practices and mitigation measures.

7.2.1 Environmental Overview Assessment

The EOA includes a review and description of environmental resources, such as fish, wildlife, and terrestrial habitat, which may be impacted by construction. The EOA also identifies land use across the Project footprint and locations where soil, trench water, or groundwater contamination may be present. These environmental resources influence construction costs, schedule, and methodology, as summarized in the sections that follow.

7.2.1.1 Current Land Use

Land use varies across the Project, which occurs in seven municipalities in central and eastern British Columbia. While the land on which Project facilities are located is considered to be industrial, the land use surrounding each facility varies. Table 7-1 provides the current land use

88 Wood is a multi-discipline consulting company that provide professional expertise in environmental sciences, social sciences, archaeology, and engineering.

89 Refer to Table 5-1 and as described in detail in Sections 5.3 and 5.4.

90 SN-6-1, Salmon Arm Tap, SN-7, Oliver Y Control Station, SN-17, East Kootenay Exchange, Princeton Crossover Control Station, Kingsvale Control Station, Savona Compressor Station, SN-4 Valve Assembly, and SN-3.

of the Pipeline Events and Project Facilities within the Project's scope. Additional details regarding land use is also provided in Section 4.4 of the EOA (Appendix K).

Table 7-1: Land Use

	Land Use				
	Industrial	Residential / Urban	Commercial / Industrial	Agricultural / Rural	Greenspace / Park / Wildlands
Pipeline Events					
KIN PRI 323 Event 29					X
KIN PRI 323 Event 31					X
SAV VER 323 Event 1				X	
Project Facilities					
Savona Compressor Station				X	
SN-4 Valve Assembly				X	
SN-3		X			
SN-6-1				X	
Salmon Arm Tap				X	
SN-7				X	
Penticton Gate Station	X				
Oliver Y Control Station		X			
Princeton Crossover Station				X	
Kingvale Control Station				X	
SN-15 (Grand Forks)				X	
SN-17 Valve Assembly				X	
East Kootenay Exchange				X	

7.2.1.2 Contaminated Sites

Locations where there is a medium to high potential for encountering soil or groundwater contamination within the Project footprint may impact the Project's construction cost and schedule. These areas are defined as Areas of Potential Environmental Concern (APEC). The EOA included a desktop contaminated sites study, with environmental database searches conducted within a 250 meter buffer on both sides of the centreline of Pipeline Events (500 metre total width) and surrounding the Project Facilities. A field assessment was also conducted which identified site activities and surrounding land uses within 125 metres of the Pipeline Event or Facility that may result in contamination.

Twenty APECs were identified in the contaminated sites study area as occurring on or around Project Facilities and are summarized in the EOA (Appendix K) and in Table 7-2 below. No APECs were identified as occurring on or around the Pipeline Events. Prior to or during construction, these soils will be assessed to assist in identification of appropriate disposal facilities.

Table 7-2: Registered Contaminated Sites and APECs Overlapping with Project Facilities

Facility	APEC Address	Distance from Facility	Description
Savona Compressor Station	Tunkwa Lake Road, Savona	Onsite	Compressor station 1998: Remediation of hydrocarbon contaminated soil 2011: Hazardous waste generator (flammable liquids)
Penticton Gate Station	401 Warren Avenue E, Penticton	Onsite	1994: Remediation of soils containing mercury
Penticton Gate Station	Structurlam 402 Warren Avenue E, Penticton	Approx. 32 m south	Manufacturer: Hardwood veneer and plywood 1995: PCB storage 1997: PCB storage
Penticton Gate Station	Acklands Grainger 445 Warren Avenue E, Penticton	East adjacent	2014: Waste storage of various contaminants
Penticton Gate Station	Aphill Industries 465 Warren Avenue E, Penticton	Approx. 35 m east	1988: Sheet metal work 2012: Site profile registered
Penticton Gate Station	Waycon Manufacturing 485 Warren Avenue E, Penticton	Approx. 45 m northeast	1987: Machine shop
Penticton Gate Station	1945 Government Street	Approx. 98 m northwest	2013: Certificate of Compliance issued by the Ministry for former Imperial Oil bulk station
Penticton Gate Station	#1 – 2025 Government Street	Approx. 20 m northwest	1995: Waste generation – waste oil, batteries, and antifreeze
Penticton Gate Station	Alcast Foundry #5 – 2025 Government Street	Approx. 45 m northwest	1986: Metal product manufacturing
Penticton Gate Station	AccuTruss Industries 2060 Government Street	North adjacent	2012: Site profile registered; above ground storage tanks.
Penticton Gate Station	Thorcast Inc. 2130 Government Street	60 m south	1987: Stainless steel manufacturing

Facility	APEC Address	Distance from Facility	Description
Penticton Gate Station	Thor Cast Inc. 2170 Government Street	Approx. 90 m south	1989: Metal manufacturing
Penticton Gate Station	1980 Barnes Street	Approx. 125 m northeast	2007: Notice of Independent Remediation Completion (no additional information)
Penticton Gate Station	Pederson Metals and Salvage 2000 Barnes Street	Approx. 115 m northeast	1995: Waste generator
Penticton Gate Station	#102 – 2001 Barnes Street	Approx. 25 m northeast	2008: Metal manufacturing
Penticton Gate Station	380 Cherry Avenue	Approx. 50 m northwest	1999: Waste oil generating
Penticton Gate Station	444 Okanagan Avenue E.	Approx. 94 m north	2011: Waste oil generating 2013: Waste oil and toxic waste generating 2014: Waste oil generating
Penticton Gate Station	Petro Canada Bulk Plant Facility 466 Okanagan Avenue E.	Approx. 104 m northeast	1992 – 1993: Partial site remediation complete 1995: Waste oil and gasoline
Oliver Y Control Station	8702 & 8704 Highway 97 Oliver	Onsite	2012: Waste batteries, paints, corrosive liquids, and waste oil
Kingsvale Control Station	Suttie Road	Onsite	Current land use: Enbridge Compressor Station Pole mounted transformer with unknown PCB concentrations
East Kootenay Exchange	N/A	Onsite	Current land use: Natural gas exchange facility

FEI will undertake further assessment of APECs during the detailed engineering phase of the Project to minimize the risk they may pose to the Project's construction costs and schedule.

7.2.1.3 Fish and Fish Habitat

The EOA identified watercourses (e.g., streams, ditches, or wetlands) and fish species at risk in proximity to the Project (Section 4.3 of the EOA). As set out in Table 7-3 below, two Pipeline Events and four Project Facilities are located within 100 metres of a watercourse.

Three species of conservation concern were noted within 3 km of the Project:

- Ridged mussel was identified within 2 km of two Project Facilities: Oliver Y Control Station and SN-7.
- Speckled dace was identified within 1 km of SN-15 (Grand Forks).
- Columbia sculpin was identified within 3 km of KIN PRI Event 31.

These species are not expected to be impacted by Project construction.

Table 7-3: Aquatic Resources in Proximity to Pipeline Events and Project Facilities

Event / Facility	Watercourse Name	Distance to Event / Facility	Waterbody Type	Provincial Waterbody Classification
KIN PRI Event 29	Allison Creek	Immediately south	Stream	Could not be accessed in the field due to access constraints. Will be assessed during development of the Project's Environmental Management Plan.
Oliver Y Control Station	Okanagan River	68 m west	Stream	S1B
Savona Compressor Station	Un-named stream	80 m west	Stream	S6
Savona Compressor Station	Un-named stream	Immediately north	Stream	S6
SAV VER Event 1	Cherry Creek	Immediately west	Stream	S2
SN-7	Three un-named streams	Immediately southwest	Non-classified drainages	Non-classified drainages
		30 m west		
		100 m west		

7.2.1.4 Vegetation

Vegetation resources including plant species at risk, ecological communities at risk, and noxious plant species were also reviewed as a part of the EOA. Section 4.1 of the EOA (Appendix K) describes the presence of these and other terrestrial resources occurring on or near Pipeline Events and Project Facilities, such as patches of mature forest. The EOA references the following desktop search areas for vegetation and noxious weeds:

- **Vegetation:** 1 km radius buffer on both sides of the centreline of Pipeline Events (2 km total width) and surrounding Project Facilities.

- **Noxious weeds:** 0.5 km radius buffer on both sides of the centreline of Pipeline Events (1 km total width) and surrounding Project Facilities.

In addition, a field assessment area was established that consisted of a 10 metre buffer on either side of the centreline of Pipeline Events (20 metre total width) and a 30 metre buffer surrounding Project Facilities.

As presented in Tables 7-4 and 7-5 below, the following vegetation resources were identified as part of the EOA:

- One plant species at risk with potential to occur within 1 km of a Project Facility;
- Two ecological communities at risk with potential to occur within 1 km of Project Facilities; and
- Five noxious plant species with potential to occur or having mapped occurrences within 10 m of Project Facilities.

Table 7-4: Plant Species and Ecological Communities in Proximity to Project Facilities

Facility	Name	Distance from Facility	Conservation Status
Ecological Communities			
SN-7	Black cottonwood / common snowberry – roses ecosystem	1.0 km	Red listed
SN-17 Valve Assembly	Common cattail Marsh ecosystem	0.3 km	Blue listed
	Black cottonwood / common snowberry – roses ecosystem	0.1 km	Red listed
Plant Species			
Princeton Crossover Station	White western groundsel	0.9 km	Red listed

Table 7-5: Noxious Weeds in Proximity to Project Facilities

Facility	Name	Distance from Facility	Classification
Savona Compressor Station	Canada thistle	Within 10 m	Provincially Noxious
SN-4 Valve Assembly	Spotted knapweed	Within 10 m	Provincially Noxious
	Diffuse knapweed	Within 10 m	Provincially Noxious
Penticton Gate Station	Puncture vine	Within 10 m	Regionally Noxious

Facility	Name	Distance from Facility	Classification
Kingsvale Control Station	Spotted knapweed	Within 10 m	Provincially Noxious
East Kootenay Exchange	Canada thistle	Within 10 m	Provincially Noxious
	Spotted knapweed	Within 10 m	Provincially Noxious
	Common tansy	Within 10 m	Regionally Noxious
	Diffuse knapweed	Within 10 m	Provincially Noxious

7.2.1.5 Wildlife

The EOA included a desktop review of the potential presence and use of the wildlife study area by known wildlife species and species at risk. Section 4.2 of the EOA describes wildlife resources occurring on or near Project Events and Project Facilities. The desktop study area was comprised of a 5 km radius buffer on either side of the centreline of Pipeline Events (10 km total width), and a 5 km radius surrounding Project Facilities;

In addition, a field assessment area was established that consisted of a 10 meter buffer on either side of the centreline of Pipeline Events (20 metre total width) and a 30 meter buffer surrounding Project Facilities. The results of the desktop study were reported as follows:

- Nineteen wildlife species of conservation concern have moderate to high potential to occur within 1 km of Pipeline Events and Project Facilities, including:
  - Three amphibians;
  - Six birds;
  - Two insects;
  - Five mammals; and,
  - Six reptiles.
- One Pipeline Event and thirteen Project Facilities overlap with posted Critical Habitat of six species at risk.

The EOA determined that proposed construction activities will have no adverse effects to any species of conservation concern. There is moderate potential to negatively affect breeding birds during construction at all Pipeline Events and Project Facilities, particularly if work commences during the breeding bird season. This impact can be mitigated by employing standard best management practices and the mitigation measures listed in Section 7.2.2 of the Application.

7.2.2 Implementation of Best Management Practices & Mitigation Measures

Section 10.0 of the EOA (Appendix K) describes best management practices and mitigation measures to minimize and avoid potential negative effects of the Project, including:

- Designing the Project to avoid potential environmental effects where practicable;
- Applying best practices for managing noxious plants;
- Adhering to general wildlife measures;
- Completing fish and wildlife salvages;
- Minimizing vegetation removal; and
- Adhering to least-risk timing windows (e.g., bird nesting and fish spawning seasons) to protect fish species, breeding birds, and sensitive periods for other wildlife species.

During construction, FEI will follow the best management practices and mitigation measures identified in the EOA as applicable to the Project.

7.2.3 Permitting

Based on the results of the EOA, the Project will likely require permitting/authorization under the legislation, regulations and bylaws described in Section 5 of the Application.

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

7.2.4 Further Plans

Environmental constraints and potential environmental impacts related to the Project will be further assessed and documented during the detailed engineering phase of the Project. The detailed engineering phase will include assessment of vegetation, fish and wildlife and their habitat, contaminated soils, and surface/ground water resources.

FEI will develop site specific mitigation strategies, as described in the Section 10.0 of the EOA (Appendix K), to offset any potential impacts associated with the Project and potential impacts caused by the environment (e.g., weather events). All required environmental permits and approvals for the Project will be identified and applied for prior to construction of the Project.

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 also be required to review and abide by the project-specific Environmental Management Plan (required as a part of the application to the BCOGC), submit task-specific Environmental Protection Plans, and retain the services of environmental monitor(s) prior to commencement of construction activities for the Project.

FEI will ensure environmental monitoring is undertaken during all sensitive aspects of the proposed work program. The purpose of environmental monitoring during construction is to oversee the natural and social environments, to monitor for any adverse effects, and to verify that the construction site is returned to pre-construction conditions as soon as possible. This includes monitoring compliance with applicable environmental legislation, regulations, industry standards, and project permit conditions, including any notification requirements or conditions set by the regulator. The environmental monitor will provide inspection of contractor environmental mitigation measures and respond to any environmental issues that may develop during construction. They will have "stop work authority" in the event that works underway are deemed to pose a potential impact to the natural environment.

FEI will also 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 (EMP), Environmental Protection Plans (EPP), 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.

7.3 *ARCHAEOLOGY*

FEI retained Wood Environmental and Infrastructure Solutions to complete an AOA of the Project, filed as Appendix L of the Application, to assess archaeological and/or cultural heritage resources within the Project area. The AOA determined the necessity and, as required, the scope of, additional archaeological assessments (e.g., AIA) prior to, or concurrent with, the commencement of any ground disturbing activities.

The AOA consisted of a desktop review that examined existing archaeological potential models for the Pipeline Events and Project Facilities, queries of the Remote Access to Archaeological Data application, Provincial Archaeological Report Library, Provincial Consultative Areas Database, and orthophoto imagery, as well as some Preliminary Field Reconnaissance (PFR) in areas inaccessible due to wildfires or access constraints. A buffer of 50 meter on each side of the Pipeline Events and surrounding the Project Facilities was applied to the desktop and field studies.

7.3.1 Participation of Indigenous Groups

Based on the Consultative Areas Database (CAD), the Indigenous groups listed in the table below were contacted as a part of the AOA (Table 7-6).

Table 7-6: Indigenous Groups Contacted for the AOA

Indigenous Groups	
Adams Lake Indian Band	Penticton Indian Band
Esh-Kn-Am (Coldwater, Cook's Ferry)	Scw'exmx Tribal Council
Ktunaxa Nation Council	Skeetchestn Indian Band
Little Shuswap Lake Band	Splatsin First Nation

Indigenous Groups	
Lower Nicola Indian Band	Tk'emlups Band
Lower Similkameen Indian Band	Upper Nicola Band
Neskonlith Indian Band	Upper Similkameen Indian Band
Okanagan Indian Band	Westbank First Nation
Osoyoos Indian Band	

Of the Indigenous groups listed in the table above, Adams Lake Indian Band, Lower Similkameen Indian Band, Little Shuswap Lake Indian Band, Neskonlith Indian Band, Okanagan Indian Band, Penticton Indian Band, and Westbank First Nation currently maintain cultural heritage permitting systems. Permits were obtained from these groups during the AOA process. The permitting Nations were also invited to review the AOA and all comments received during the review were incorporated in the final AOA (Appendix L). No major concerns were raised. In addition, invitations were sent out to the Indigenous groups identified in Table 7-6 inviting them to participate in PFR, where applicable. Please refer to Section 8.3 of this Application for detailed information regarding Indigenous engagement.

7.3.2 Archaeology Overview Assessment

The objective of the AOA was to identify archaeological and historical heritage resources overlapping with the Project's 3 Pipeline Events and 13 Project Facilities and, if present, to evaluate the Project's potential impacts to those resources and to provide recommendations to effectively manage the impacts to those resources.

The AOA did not identify any registered archaeological sites or registered historic heritage sites overlapping the Pipeline Events or Project Facilities. Section 4.0 of the AOA describes the results of the desktop and PFR studies (Appendix L). Table 7-7 summarizes the results of the AOA and recommended archaeological actions.

Table 7-7: Summary of Archaeological Recommendations

Event/Facility	Archaeological Potential	Recommended Action
Pipeline Events		
KIN PRI 323 Event 29	High	AIA
KIN PRI 323 Event 31	Low to moderate	PFR
SAV VER 323 Event 1	Low to moderate	PFR
Project Facilities		
Savona Compressor Station	Moderate	AIA
SN-4 Valve Assembly	Moderate	PFR
SN-3	Moderate	AIA
SN-6-1	Moderate	AIA
Salmon Arm Tap	Moderate	AIA

Event/Facility	Archaeological Potential	Recommended Action
SN-7	Moderate	AIA
Penticton Gate Station	Moderate	Concurrent monitoring
Oliver Y Control Station	High	AIA
Princeton Crossover Station	High	AIA
Kingsvale Control Station	Low to moderate	PFR
SN-15 (Grand Forks)	High	AIA
SN-17 Valve Assembly	Low	None (chance find)
East Kootenay Exchange	High	AIA

7.3.3 Further Plans

Potential impacts to archaeological and historic heritage sites will be further assessed during the AIA, which will be initiated in locations assessed as having moderate to high archaeological potential following the additional PFR and during the detailed engineering phase of the Project. It is anticipated that some of the AIA will be completed prior to construction.

The AIA will provide a detailed assessment to allow for development of site specific mitigation strategies to manage potential impacts to archaeological and historic heritage sites associated with the Project, and will determine if additional permitting (e.g., Site Alteration Permits) will be required.

As per the AOA, archaeological monitoring of portions of the Project will also be conducted concurrently with construction (e.g., areas with potentially deep buried resources, access constraints, or where ground conditions are not suitable for manual testing). Monitoring will be undertaken by a qualified archaeologist and Indigenous community representatives and will develop an appropriate response if artifacts are found.

A permit will be required under Section 12.2 of the *Heritage Conservation Act* (HCA) in order to undertake AIA activities. At the time of the AIA, the archaeological consultant will also obtain any Indigenous cultural heritage permits that are required.

Prior to the onset of the AIA and additional PFR, Indigenous communities will be contacted again to take part in field activities. The notification will outline the intended work, invite community members to participate in the AIA and PFR, and, upon completion of the draft report, these groups will be offered an opportunity to provide additional information or comments.

The Project's EMP, which will include mitigations and recommendations to avoid impact to archaeological resources, will be prepared and included in the contractor RFP documents. The EMP is also required as a part of the application to the BCOGC. Environmental Protection Plan(s) specific to the Project, including protection of archaeological, historic heritage, and cultural resources, will be developed by successful contractor(s) prior to commencement of the Project.

7.4 CONCLUSION

As described in the sections above, FEI has assessed the potential environmental and archaeological impacts of the Project. The Project has low to moderate potential for environmental impacts. The archaeological potential of areas affected by the Project was also assessed, and no registered archaeological sites or registered historic heritage sites overlap the Pipeline Events or Project Facilities.

Additional environmental surveys for fish and fish habitat, wildlife habitat, and noxious weeds will be undertaken prior to construction to further assess potential impacts on these resources. Any potential environmental impacts of the Project can be mitigated through the implementation of standard best management practices and mitigation measures. Project-specific mitigation measures will be incorporated into the Project EMP, EPP, and any other associated environmental documents.

FEI plans to conduct AIA, PFR, and archaeological monitoring for the Project to further assess and mitigate potential archaeological and cultural impacts associated with construction within areas of moderate and high archaeological potential identified in the AOA. The AIA will provide a detailed assessment to allow for development of site-specific mitigation strategies to offset any potential impacts associated with the Project. Any potential archaeological impacts of the Project can be mitigated through the implementation of permit conditions and standard best management practices.

8. CONSULTATION AND ENGAGEMENT

8.1 *INTRODUCTION*

Consultation and engagement are integral to FEI's project development process. FEI has created a Consultation and Engagement Plan (Appendix M-1) that sets out the utility's general approach to consultation and engagement activities and will guide activities throughout the Project's lifecycle. This plan strives to provide Indigenous groups and other stakeholders, including local governments, customers, residents, and businesses, with a meaningful opportunity to learn about and provide input into the Project.

As stated in Section 5.2, the ITS TIMC Project consists of the work necessary to ready 8 ITS pipelines for EMAT ILI tool runs by completing modifications to two pipelines and 13 facilities to ready the system for introduction of EMAT ILI tools, ensure EMAT ILI tools travel at optimal velocity ranges for collection of full resolution data during inspections, and respond to cracking threats until repairs are completed. The Project is expected to have minimal impacts on the community and environment, along with minimal excavation requirements. The plan takes into consideration the specific nature of the Project, which largely includes work within existing SRWs and within FEI facilities. As a result, FEI's consultation and engagement activities are primarily targeted towards Indigenous groups, local governments and those stakeholders who live and work in close proximity to the Project.

FEI initiated consultation and engagement for the Project in May 2021 with the distribution of Project information letters to 35 Indigenous groups, and 13 municipalities and regional districts that may be impacted by the Project. FEI continues to track the Project-specific interests, issues and concerns of potentially impacted stakeholders and Indigenous groups. FEI has also launched a dedicated Project webpage, email address and phone line, allowing anyone interested in the Project to find more information and to discuss any questions and/or concerns with an FEI representative. FEI will continue working with stakeholders and rights holders to address any outstanding items related to the Project.

Due to the ongoing COVID-19 pandemic, FEI assessed its consultation and engagement requirements, as outlined in the Consultation and Engagement Plan, and adapted its approach to address COVID-19 safety requirements. FEI understands the significant and ongoing impact of the COVID-19 pandemic on communities and, as such, continues to adapt its consultation and engagement methods to ensure adequate consultation and engagement opportunities are safely available for stakeholders and Indigenous groups.

In Sections 8.2 and 8.3 below, FEI describes its public consultation activities and engagement with Indigenous groups. Public consultation activities are recorded in the Stakeholder Consultation Log (Appendix M-2) and engagement activities are recorded in the Indigenous Engagement Log (Appendix N-4).

8.2 *FEI IS UNDERTAKING MEANINGFUL PUBLIC CONSULTATION*

FEI recognizes the importance of meaningful consultation and of developing, maintaining and enhancing strong stakeholder relationships. To support the successful completion of the Project, FEI's interactions with stakeholders will continue to be open, transparent and consistent.

FEI began public consultation with respect to the Project in May 2021. Initial consultation activities introduced the Project to local governments, regional stakeholders and residents. During this period, FEI shared information related to the Project such as scope of work, planned work locations, regulatory processes, and sought feedback to support Project planning and development.

The subsections below are organized as follows:

- Section 8.2.1 describes how FEI has adopted industry best practices in public consultation throughout development of the Project.
- Section 8.2.2 explains that FEI has broadly identified the stakeholders with an interest in the Project, and with whom it has and will continue to consult.
- Section 8.2.3 describes the variety of communication materials and methods used by FEI to consult with stakeholders regarding the Project.
- Section 8.2.4 outlines why FEI's public consultation activities have been appropriate to date.
- Section 8.2.5 identifies issues and concerns raised by customers, residents, businesses and stakeholder groups associated with the Project and describes FEI's response.
- Section 8.2.6 explains that FEI will continue with its public consultation activities, primarily through virtual meetings, telephone and letters/emails, and will address any issues or concerns that may arise.

8.2.1 FEI Has Adopted Appropriate Communication and Public Consultation Objectives

Consistent with industry best practices, FEI plans to guide public consultation and solicit community feedback throughout the Project, as follows:

- Ensure balanced and objective information is provided to all affected and interested stakeholders;
- Communicate the benefits of the Project (e.g., reliability and integrity of FEI's system), and potential positive socio-economic impacts to communities during construction;
- Provide opportunities for stakeholders to give feedback and to understand their concerns through an ongoing dialogue; and
- Consider and, where possible, incorporate stakeholder feedback.

8.2.2 FEI Has Identified Stakeholders for Public Consultation

As part of its Consultation and Engagement Plan, FEI has and will continue to consult with the following stakeholders:

- Municipal and regional governments including:
  - City of Kamloops
  - City of Kelowna
  - City of Penticton
  - City of Vernon
  - Regional District Central Kootenay, Area B
  - Regional District Kootenay Boundary, Area B and D
  - Regional District Okanagan Similkameen, Area H
  - Thompson Nicola Regional District, Area J
  - Thompson Nicola Regional District, Area N
  - Town of Oliver
  - Town of Princeton
  - Township of Spallumcheen
- FEI's customers;
- Residents and businesses directly affected by FEI's rights of way; and
- Permitting authorities (see Section 8.2.4.5 for additional details).

8.2.3 FEI Has Used Appropriate Communication Materials to Support Consultation

As described further below, FEI relies on a number of communication methods to carry out its public consultation activities. The scope of work for the Project is primarily within existing FEI facilities and along existing FEI rights of way. The nature of the sustainment work involves FEI replacing sections of the gas lines and upgrading the facilities to allow the use of new inspection tools in the system. Potential impacts will be limited to those living and working near planned work sites. As such, the primary focus of FEI's communication materials is to provide transparent and accurate information to stakeholders, directly impacted landowners and rights holders. Communication materials will be updated as required throughout the Project's development.

In FEI's public communications outlined in Section 8.2.2, the Project is referred to as the "Interior Transmission System Upgrades" (ITSU) Project, rather than the "Interior Transmission System Transmission Integrity Management Capacity" (ITS TIMC) Project used in this Application. FEI selected ITSU as its public-facing name because it is simple, concise and easy to understand.

Project Webpage

FEI created a dedicated Project webpage on FEI's "Talking Energy" website,[91] which provides an overview of the Project, including a high-level map showing all Project sites. The webpage also provides information to support consultation efforts and solicit feedback in a clear and easily accessible form. The webpage was made available to the public on September 30, 2021. Between September 30 and December 31, 2021, 161 unique visitors viewed the project webpage and between January 1 and August 31, 2022, there were 354 unique pageviews. Webpage screenshots are provided in Appendix M-3. FEI will continue to update the Project webpage with the latest Project information and monitor web traffic to the webpage as the Project progresses.

Mail Notifications

On August 14, 2021, FEI distributed 14 Project information letters to directly impacted residents and businesses along the rights of way where work is proposed. The letters provided information about the proposed work, including a link to the project webpage, phone number and email address in case residents or businesses want to learn more, ask questions or provide feedback about the Project. As outlined in Section 8.2.6, FEI will continue to provide information regarding the Project through multiple communication methods, including by mail.

Email and Phone Line

On October 15, 2021, FEI activated a project-specific phone number (1.888.486.0138) and email address (InteriorTransmission@FortisBC.com), encouraging stakeholders with questions or feedback to contact FEI directly. This phone number and email address are included in all Project communication materials. FEI will continue to closely monitor the Project email address and phone line throughout the duration of the Project, answering questions and responding to queries as needed.

Other FEI Communication Channels

FEI has and will continue to use other channels to communicate with affected stakeholders, including through FEI's e-newsletters and its various social media channels. On December 1, 2021, FEI sent a Talking Energy newsletter including information about the ITS TIMC Project to 447 subscribers. The newsletter is provided in Appendix M-4. Stakeholders interested in the Project are encouraged to sign up through FEI's online subscriber centre to receive regular updates via FEI's newsletters.[92] As of September 1, 2022 the Project newsletter has 42 active subscribers.

Customer and Public Notifications

FEI will notify all natural gas customers of the Project, including potential rate impacts. A number of communication methods will be used including, but not limited to, bill inserts, the Accounts Online payment portal, e-bill messages, FEI's website and/or the Project webpage. Notifications

[91] https://talkingenergy.ca/project/interior-transmission-system-upgrades
[92] https://subscriptions.fortisbc.com/forms/talking-energy.

about associated rate impacts and the filing of this Application will be distributed to all FEI customer rate classes later in 2022.

8.2.4 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 have been raised, how FEI has responded to these to date, and FEI's plan for addressing concerns and questions during the Project execution phase. FEI will continue to track consultation and corresponding feedback received from stakeholders as the Project progresses in the Consultation Log (Appendix M-2).

8.2.4.1 Consultation to Date with Local Governments

In May 2021, FEI sent project notification letters to 13 local governments introducing the ITS TIMC Project. The letters provided project information, notification of FEI's intent to file an application with the BCUC and contact information for stakeholders to ask questions and provide feedback. A copy of the letter to municipalities and regional districts is included in Appendix M-5. At the time of filing, FEI has not received responses to the information letters, and these local governments have not identified any issues or concerns. Follow-up meetings and communication will continue with local governments throughout the project lifecycle and more detailed information, including detailed engineering drawings, will be shared when available.

8.2.4.2 Consultation to Date with Residents and Businesses along the Rights of Way

As discussed in Section 8.2.3, FEI started consultation with residents and businesses along the rights of way in August 2021. Beginning on August 14, 2021, 14 directly affected landowners along the rights of way, and in direct proximity to worksites, were mailed project information letters. A copy of the letter to property owners along the rights of way is included as Appendix M-6.

Follow-up phone calls were made to directly affected residents and businesses confirming they received the letter, gathering feedback and addressing any outstanding concerns. By the time of filing the Application, the residents and businesses contacted have not raised any issues or concerns. Feedback received is included as part of the consultation log (Appendix M-2). FEI will continue to consult with residents and businesses along the rights of way throughout the lifecycle of the Project.

8.2.4.3 Future Consultation with Residents and Businesses along FEI's Rights of Way and Worksites

FEI has identified residents and businesses directly affected by the rights of way and will send notifications in advance of construction in their area. FEI will continue to inform residents and businesses nearby the rights of way throughout the lifecycle of the Project.

8.2.4.4 Consultation to Date with Customers

FEI began broadly sharing information with customers in December 2021. As outlined in Section 8.2.3, a Talking Energy newsletter with Project information was emailed to 447 subscribers on December 1, 2021. Individuals may also sign up for future Project-specific updates through FEI's online subscriber centre.[93]

Further customer and public consultation activities are planned for 2022, including additional information about the Project and its associated rate impacts. For example, FEI will be distributing a bill insert to all residential and small business gas customers in September 2022. FEI is also planning to share project information via FEI's various social media channels.

8.2.4.5 Consultation to Date with Permitting Agencies

FEI has undertaken meaningful engagement with permitting agencies – including BC Oil and Gas Commission (BC OGC), Ministry of Transportation and Infrastructure, TELUS, and BC Hydro – to verify points of contact, process, deliverables, and timelines for permitting. At the present time, the proposed scope of work is not anticipated to involve conflicts, redesign, pole relocations, wire raises or other complications with existing infrastructure that may delay the permitting process. Nevertheless, conservative permitting timelines have been accounted for within the project schedule and consultation with permitting agencies is planned throughout detailed design to proactively identify and address any potential concerns. Engagement to date with the various permitting agencies can be found in the stakeholder consultation log (Appendix M-2).

8.2.5 FEI Has Responded to Issues and Concerns Raised by Customers, Residents, Businesses and Stakeholder Groups

Community, social and environmental considerations, along with the nature of the work proposed, have helped guide FEI's Consultation and Engagement Plan. To help mitigate potential adverse impacts of Project construction, FEI will continue proactively communicating with Project stakeholders, and undertake the consultation and mitigation measures. Further, FEI will:

- Require construction contractor(s) to develop and execute a Public Impact Mitigation Plan, which will outline strategies to minimize community impacts. The Public Impact Mitigation Plan will help ensure that impacts, such as noise, access, dust, and visual impacts, are minimal.
- Ensure all construction activities are carried out in compliance with municipal bylaws and operating agreements.

FEI has been open and transparent in its consultation and communication with stakeholders, including proactively discussing Project details and addressing questions that arise in a timely

[93] https://subscriptions.fortisbc.com/forms/talking-energy.

manner. FEI values and is committed to responding to the feedback received from customers, residents, businesses, and stakeholder groups during the consultation on the Project.

A variety of topics were discussed during these interactions and mitigation tactics were raised during engagement are detailed further in the Table 8-1 below.

Table 8-1: Public Impacts and Consultation and Mitigation Measures

Work Location	Public Impacts Identified	Consultation Method and Mitigation Measures
Thompson Nicola Regional District, Area J: Cherry Creek Crossing	• Surrounding residents may experience an increase in noise from heavy machinery. • Traffic may be rerouted.	• Notifications will be distributed ahead of work to residents near the ROW, who may be impacted by the noise. FEI will work with the contractor(s) to minimize community impacts, including noise.
City of Kamloops: Kenna Cartwright Park	• Nearby residents and trail users may experience an increase in noise and construction traffic. • Trail users may have limited access to some trails.	• FEI will consult with affected stakeholders throughout the Project lifecycle, including through the planning, construction and restoration phases. • Signage will be displayed at access points of walking trails where access may be limited. Signage will reiterate FEI's commitment to public safety. • Noise monitoring and control will comply with local guidelines. Construction activities will be carried out in compliance with municipal bylaws with respect to noise and construction equipment usage.
Work within existing FEI facilities: • City of Kelowna • City of Penticton • City of Vernon • Thompson Nicola Regional District, Area N • Town of Oliver • Town of Princeton • Regional District Central Kootenay, Area B • Regional District Kootenay Boundary, Area B and D	• Surrounding residents and businesses may experience an increase in noise and construction-related traffic. • Traffic may be rerouted.	• Throughout the Project lifecycle, FEI will notify the community of this work, during the planning, construction and restoration phases. FEI will also work with the contractor(s) to minimize noise and traffic impacts throughout construction.

8.2.6 FEI Will Continue to Consult with the Public

FEI believes the consultation and communication activities at the time of filing the Application have been sufficient, appropriate, and reasonable. FEI will continue to consult with stakeholders regarding construction timelines, scope of work, safety and mitigation plans. In an effort to minimize impacts, further consultation will continue prior to and throughout construction to substantively inform stakeholders about construction activities in their area.

FEI is committed to providing updates regarding the Project and proactively communicating with stakeholders in order to respond to issues or concerns throughout the Project lifecycle and will continue to:

- Communicate with local governments through meetings, presentations, information letters, phone calls and emails throughout the Project lifecycle.
- Communicate Project information to FEI's gas customers as needed through FEI's various platforms including: the Project's Talking Energy webpage, e-newsletters, social media channels, advertising and news media outreach.
- Communicate with residents and businesses along or nearby the rights of way through meetings, information letters, phone calls and emails throughout the Project lifecycle.

FEI is committed to responding to any feedback received from stakeholders as the Project continues to develop. At the time of filing, there are no concerns raised by stakeholders.

8.3 *FEI IS ENGAGING WITH INDIGENOUS GROUPS*

In this section, FEI outlines its engagement of potentially impacted Indigenous groups to date and details the Company's Indigenous engagement plan going forward.

Since May 2021, FEI has engaged with Indigenous groups (set out in Section 8.3.2) through a transparent, frequent, two-way dialogue, which has allowed for the early identification of issues, concerns and shared interests, and has focused engagement activities on finding mutually agreeable solutions.

FEI seeks to build and maintain relationships with Indigenous groups across the province and will continue to be guided by FEI's Statement of Indigenous Principles (Appendix N-1) throughout the lifecycle of the Project. This approach to engagement ensures that the potential impacts of the Project on the title, rights and interests of affected Indigenous groups are documented and considered. In keeping with these principles, the Project team has and will continue to:

- Uphold a high standard of engagement throughout the Project lifecycle; and
- Identify potential opportunities for Indigenous participation, ensuring local Indigenous individuals and groups are offered access to opportunities through the development of the Project.

The subsections below are organized as follows:

- Section 8.3.1 describes FEI's approach to engagement with Indigenous groups, which has been thorough, timely and meaningful.
- Section 8.3.2 identifies the identified 35 Indigenous groups potentially affected by the Project based on the results of the Provincial Government's Consultative Area Database (CAD).
- Section 8.3.3 outlines its engagement with potentially affected Indigenous groups to date, which it and explains how it will continue engaging with these groups, while respecting COVID-19 safety measures and capacity constraints as groups address the pandemic and weather-related events.
- Section 8.3.4 describes how the overall response to engagement to-date has been neutral as FEI has only received questions and comments about the Project, but no issues or concerns have been raised. FEI will continue tracking, monitoring and addressing issues, and identifying interests and/or issues raised by Indigenous groups.
- Section 8.3.5 confirms that FEI has made sufficient efforts to engage Indigenous groups to date.
- Section 8.3.6 describes how FEI will continue engaging with the 35 Indigenous groups through follow-up meetings (virtual or in person, as appropriate), information sharing and letters/emails/phone calls. This includes advising the Indigenous groups when FEI files the Application.

8.3.1 FEI's Engagement Approach is Thorough, Timely and Meaningful

FEI is committed to thorough, timely and meaningful engagement with Indigenous groups and has taken this approach in developing its Consultation and Engagement Plan for the Project (Appendix M-1). In May 2021, FEI initiated early engagement activities that included emailing a Project information letter, as well as preliminary maps to selected Indigenous groups (see Section 8.3.3 for more detail regarding these activities). FEI will keep potentially affected Indigenous groups informed about the Project as it advances and will provide capacity funding to interested Indigenous groups to facilitate engagement activities.

FEI's approach to engagement also reflected the impact of the COVID-19 pandemic at the time early engagement was initiated and weather-related events, and respects the capacity constraints of Indigenous groups that may have limited their ability to respond to and review information in a timely fashion. As noted in Section 7, although several Indigenous groups expressed interest in participating in archaeological field assessments, capacity was limited by evacuations, forest fires in the region, and COVID-19. Additional opportunities will be provided during the Archaeological Impact Assessment (AIA) (Section 7.3.3). The approach also considers the importance of offering virtual engagement opportunities. FEI has ensured a minimum of 45 days were available for Indigenous groups to review materials, and that all correspondence takes place through email, over the phone or through a virtual meeting.

While the constitutional duty to consult with Indigenous groups rests with the Crown, FEI's Indigenous engagement activities will aid the appropriate Crown agencies in meeting that duty. FEI's goal is to incorporate feedback from Indigenous groups throughout the Project lifecycle, including Project planning (particularly the BC OGC permitting processes), construction and restoration. FEI is committed to working with responsible Crown agencies, including the BC OGC, to identify, avoid and mitigate potential impacts on Indigenous title, rights and interests and, when appropriate, to discuss and develop options for mitigation and/or accommodation.

8.3.2 FEI has Identified Indigenous Groups Potentially Affected

Using the BC Government's Consultative Areas Database (CAD), FEI developed a list of Indigenous groups with asserted interests in this Project. FEI identified 35 Indigenous groups, as per the Spatial Overview Engine (SOE) Reports queried on March 25, 2021 (Appendix N-2).

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

Table 8-2: Indigenous Groups Key Engagement Activities

Indigenous Groups		
Adam's Lake Band	Lytton First Nation**	Shuswap Band
Ashcroft Indian Band	Neskonlith Band	Siska First Nation
Bonaparte First Nation	Scw'exmx (Nicola) Tribal Council	Skeetchestn Indian Band
Boothroyd Indian Band**	Nicomen Band	Skuppah Indian Band**
Boston Bar First Nation	Nlaka'pamux Nation Tribal Council	Splats'in First Nation
Coldwater Indian Band	Nooaitch Band	Spuzzum First Nation**
Cook's Ferry Indian Band*	Okanagan Indian Band	SSN (Stk'emlupsemc te Secwepemc)
Esh-kn-am Cultural Resource Management*	Okanagan Nation Alliance	Tk'emlups Band
Ktunaxa Nation Council	Oregon Jack Creek Indian Band**	Upper Nicola Band
Little Shuswap Lake Band	Osoyoos Indian Band	Upper Similkameen Indian Band
Lower Nicola Band	Penticton Indian Band	Westbank First Nation
Lower Similkameen Indian Band	Shackan Indian Band	

*Cook's Ferry, Coldwater Indian Band and Siska First Nation are collectively notified through Esh-kn-am Cultural Resource Management,
** Boothroyd Indian Band, Lytton First Nation, Oregon Jack Creek Indian Band, Skuppah Indian Band and Spuzzum First Nation are collectively notified through Nlaka'pamux Nation Tribal Council.

8.3.3 FEI's Engagement with Indigenous Groups to Date

In May 2021, FEI initiated early engagement with Indigenous groups. As described in Section 8.3.1, early engagement activities consisted of an emailed Project information letter and maps that were based on the preliminary project scope (Appendix N-3). FEI offered to schedule virtual meetings with Indigenous groups to review Project details to respond to any questions or concerns about the Project. FEI has also followed up on questions from Indigenous groups either by email, phone, or through virtual meetings (see Table 8-3).

8.3.4 FEI has Responded to Issues and Interests Raised by Indigenous Groups

Engagement activities have primarily focused on information sharing and Indigenous involvement on the Project. Table 8-3 provides a summary of questions, issues and concerns raised by Indigenous groups. A complete log of engagement with Indigenous groups is included in Appendix N-4.

Table 8-3: Questions, Issues, and Concerns by Indigenous Groups

Indigenous Group	Summary of questions, issues or concerns	Next Steps/follow-up
Esh-kn-am Cultural Resource Management	• **July 12, 2021:** FEI received a response letter by email requesting onsite Field Tech monitoring during the AIA work at pipeline and facility locations due to high potential for unrecorded archaeological sites and knowledge of culturally sensitive areas. • **July 13, 2021:** FEI shared the information received with the consultant identified in Section 7. The consultant confirmed they made note of the comments received and that a representative was confirmed for the PFR Preliminary Field Reconnaissance (PFR) field work.	• FEI will continue to provide updates as the Project moves forward and will provide opportunity for onsite Field monitoring as outlined in Section 7.3 during the AIA works at locations identified, once field work is scheduled.
Lower Nicola Indian Band (LNIB)	• **June 8, 2021:** LNIB advised FEI of various types of LNIB traditional uses that have or do occur at or near all the sites listed in the notification; identified culturally sensitive areas within 1km of two facilities where construction is planned; and requested for FEI to share information on LNIB's Cultural Heritage Policy with FEI's consultants prior to the AOA and EOA • **August 4, 2021:** FEI provided the LNIB Cultural Heritage Policy information to the consultant identified in section 7 for review in advance of field visits.	• FEI will continue to provide updates as the Project moves forward, along with opportunities to participate in planned field work activities as outlined in section 7.3.

Indigenous Group	Summary of questions, issues or concerns	Next Steps/follow-up
Nooaitch Indian Band (NIB)	• **May 12, 2021:** FEI received a call requesting that FEI provide additional information on the proposed station upgrades and requested that cultural monitors be onsite during construction activities. During the discussion, information was shared about sensitive grizzly bear habitat in the area near two pipeline locations and several facilities. Concerns were raised about road density and impacts from access roads and interest expressed about supporting FEI's restoration plans for those temporary access roads. A concern was also raised regarding the consultant FEI contracted and that it was a firm they were not familiar with. • **May 14, 2021:** FEI responded to NIB by email and provided information about FEI's consultant identified in section 7. FEI also confirmed that the information regarding sensitive habitat areas had been forwarded to FEI's Environmental team to provide to the consultant.	• FEI will continue to provide updates as the Project moves forward and will offer opportunities for onsite participation during planned field work activities as outlined in section 7.3. FEI will follow up in advance of planning construction activities to discuss road prescription standards and opportunity to include in planning process.
Upper Similkameen Indian Band (USIB)	• **June 1, 2021:** Upon desktop review by the USIB Natural Resources Department of the band, USIB has requested to be kept informed throughout the AOA and EOA process and request copies of all reports and documents related to the EO and AO Assessments.	• FEI will provide copies of AOA and EOA reports once they have been finalized, and will continue to provide updates as the Project moves forward. FEI will coordinate onsite participation during planned field activities as outlined in Section 7.2 and 7.3.
Westbank First Nation (WFN)	• **June 15, 2021:** WFN provided conditional approval to the Project subject to an archaeology assessment being completed. Following the assessment, WFN will determine any impacts and will provide a response to the application. • **July 13, 2021:** FEI provided the information to the consultant identified in section 7, and the consultant confirmed they had been in contact with WFN to coordinate onsite monitoring for the Preliminary Field Reconnaissance (PFR) works.	• FEI will continue to provide updates as the Project moves forward and will provide assessment opportunities in advance of planned field activities.
Scw'exmx Tribal Council (STC)	• **September 2, 2021:** STC advised FEI that a preliminary assessment was completed by Tmixʷ Research, who provides technical work on behalf of Nooaitch Indian Band and Shackan Indian Band. Their assessment identified four project locations within areas of cultural use. As a result, STC participation in field assessment work will be required and they understand that FEI's consultant, identified in Section 7, would contact them to coordinate participation. • **September 30, 2021:** FEI provided information received from STC to the consultant.	• FEI will continue to provide updates as the Project moves forward and will coordinate participation during planned field activities as outlined in Section 7.3.

Indigenous Group	Summary of questions, issues or concerns	Next Steps/follow-up
Tk'emlups te Secwepemc	• **January 12, 2022** FEI met virtually with the band and provided a high level project overview specific to local work that would impact the band. There were no issues or concerns raised about the Project.	• FEI will continue to provide updates as the Project moves forward and will coordinate participation during planned field activities.
Skeetchestn Indian Band (SIB)	• **January 13, 2022** FEI met with Skeetchestn Indian Band and Ckukutusem Utilities Services (CUS), the contracting company owned by the Band, and discussed procurement opportunities for the Project. SIB informed FEI that where construction is planned is culturally sensitive and should be treated as such during construction.	• FEI has listed CUS as the preferred contractor for the Cherry Creek Crossing, which would mitigate unfamiliarity with cultural significance.

8.3.5 Overview of Sufficiency of Engagement on Project to Date

FEI has initiated thorough, timely and meaningful engagement with the Indigenous groups identified as having an interest in the Project area, reflecting its Statement of Indigenous Principles (Appendix N-1). To date, engagement activities have introduced the Project by sharing maps and project information regarding construction timelines and the scope of work. All engagement activities and correspondence have been appropriately logged and included in the appendices of this Application (Appendix N-4).

FEI has established key points of contact with Indigenous groups potentially affected by the Project, identified their preferred methods of communication, developed an early understanding of interests and concerns (as applicable), and ensured that interests and concerns received were provided, where applicable, to FEI's Environmental and Archaeological consultant to incorporate into field assessment activities and reporting as outlined in Section 7. As the Project advances, engagement with Indigenous groups will continue. These efforts are consistent with FEI's dedication to maintaining an open dialogue and positive relationships with Indigenous groups.

8.3.6 FEI Will Continue to Engage with Indigenous Groups

FEI will continue providing detailed Project information to the 35 Indigenous groups identified for their consideration and comment. Further engagement will take place throughout the Project's lifecycle, including project planning, construction and restoration. In particular, FEI is committed to:

- Notifying Indigenous groups once the Application is filed with BCUC.
- Engaging Indigenous groups during the permitting process (particularly as part of the BC OGC permitting process), sharing relevant documents (e.g., Environmental Management Plans) and sending periodic Project updates.

- Communicating and soliciting feedback regarding construction timelines, scope of work, and safety and mitigation plans. This particularly includes working with Indigenous groups in advance of completing an Archaeological Overview Assessment (AOA) and Archaeological Impact Assessment (AIA) by, for example, obtaining relevant Indigenous-issued permits and sharing results for assessment review and comment (see Section 7.3).

As the Project progresses, FEI will continue to follow up and address concerns that have been identified as part of our early engagement efforts. FEI will support Indigenous engagement activities through capacity funding if requested and will reach out to Indigenous groups during the procurement process to identify employment and contract opportunities.

8.4 CONCLUSION

FEI has consulted with and sought feedback from all Project stakeholders and Indigenous groups during the pre-submission phase of the Project. FEI's consultation and engagement has been sufficient to date. FEI has recorded questions, issues and concerns from Project stakeholders and Indigenous groups, and will continue engaging by keeping lines of communication open as the Project advances. FEI will continue working with stakeholders, and Indigenous groups to address any outstanding interests and issues throughout the lifecycle of the Project, including planning, construction and restoration.

9. PROVINCIAL GOVERNMENT ENERGY OBJECTIVES AND LONG TERM RESOURCE PLAN

9.1 *INTRODUCTION*

This section discusses the factors that section 46(3.1) of the *Utilities Commission Act*[94] states the BCUC must consider when determining whether to issue a CPCN:

(a) the applicable British Columbia's energy objectives,

(b) the most recent long-term gas resource plan filed by the public utility under section 44.1, if any, and

(c) the extent to which the application for the certificate is consistent with the applicable requirements under sections 6 and 19 of the *Clean Energy Act* (CEA).

Sections 6 and 19 of the CEA,[95] as referred to in subsection (c) above, do not apply to FEI. FEI addresses the other two requirements below.

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 Project will create jobs in BC through FEI's contractors, and result in the procurement of goods and services from locally-owned and operated vendors and subcontractors. FEI also anticipates an increase in the use of local services, such as dining, lodging accommodations and other services, during construction will benefit the economy.

FEI is committed to working with Indigenous groups, community leaders and local organizations, developing the local workforce, supporting local businesses, and connecting them to Project opportunities. For example, to promote Indigenous and other local participation in the Project, FEI will host business-to-business and worker-to-business networking events. 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.

9.3 *LONG TERM GAS RESOURCE PLAN*

The Project is described in section 6.4 of FEI's accepted 2017 Long Term Gas Resource Plan (LTGRP)[96] and in section 7.6.4 of FEI's most recently filed 2022 LTGRP with BCUC.[97] As

94 https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/96473_01.
95 https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/10022_01.
96 https://www.bcuc.com/ApplicationView.aspx?ApplicationId=617;
97 https://www.bcuc.com/OurWork/ViewProceeding?applicationid=1000

mentioned in the 2022 LTGRP, the implementation of the EMAT technology includes upgrades such as:

- Alterations of the sending and receiving barrels to accept the newer tools;
- Alterations to the transmission pipelines so that the new tools can traverse them without hindrance or interruption to ensure successful data collection;
- The installation of flow control equipment and/or transmission loops to facilitate the control (i.e. reduction) of the gas flow velocity in order to ensure successful data collection; and
- Capacity upgrades to facilitate operation at reduced pressures when SCC features are detected and subsequently investigated and corrected.

9.3.1 ITS TIMC Project Supports FEI's Decarbonization Goals

As discussed in section 3.3.4 of the 2022 LTGRP, FEI envisions hydrogen playing a critical role in decarbonizing BC's industrial sector and meeting BC's climate targets. The information gathered through EMAT ILI runs will factor into FEI's analysis regarding the concentration of hydrogen each pipeline can safely accommodate in the future. In turn, this will allow FEI to determine a safe and cost-effective plan for transitioning to increased hydrogen distribution, further enabling FEI to meet its Clean Growth Pathway.

9.4 *CONCLUSION*

In summary, the Project is consistent with British Columbia's energy objectives, FEI's 2017 LTGRP and most recently filed 2022 LTGRP. These factors support the approval of the Project.

10. CONCLUSION

FEI submits that the ITS TIMC Project is in the public interest, as it is the most cost-effective way for FEI to mitigate the identified cracking risk to the ITS pipelines. FEI has prudently responded to changing industry knowledge and practice related to cracking by conducting an assessment of the susceptibility of its own pipelines to cracking and a quantitative assessment of the relative risk that cracking poses to its system. FEI's assessments have identified 8 of its ITS pipelines with credible cracking threats, that at the system level QRA confirms cracking as a safety risk for these identified pipelines. Therefore, the Project correctly prioritizes work on these susceptible ITS pipelines ready for EMAT ILI tools, which will allow FEI to monitor, mitigate cracking threats and operate these pipelines in a safe and reliable manner. EMAT ILI tools are the only feasible option for mitigating the identified cracking risk and are becoming the standard industry practice for mitigating cracking risk on pipelines of this size. Given the potential significant consequences of not addressing cracking threats, FEI's obligations to ensure safe and reliable operations of its assets compel FEI to undertake the ITS TIMC Project.

FEI has appropriately planned and defined the Project, will be mitigating environmental and archaeological impacts, and will continue to consult and engage with stakeholders and Indigenous communities.

FEI requests that the BCUC grant a CPCN for the Project as set out in the Application.

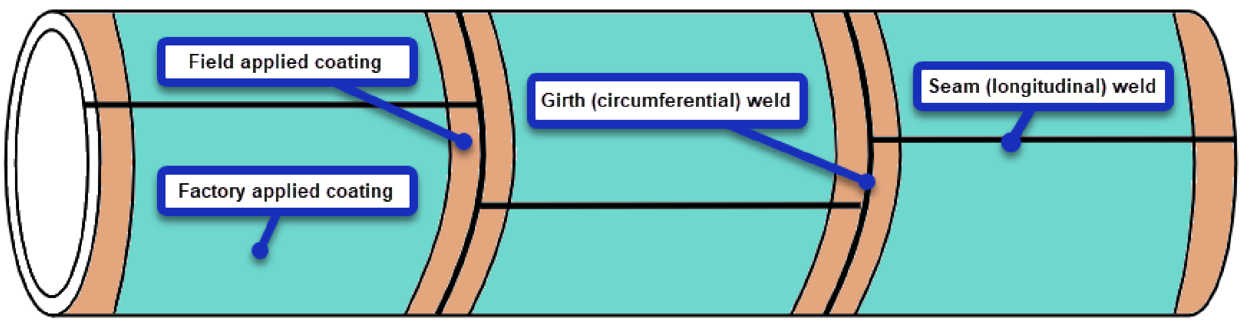
Appendix A

EXAMPLES OF CRACK-LIKE IMPERFECTIONS IN SEAM WELDS

EXAMPLES OF CRACK-LIKE IMPERFECTIONS IN SEAM WELDS

Crack and crack-like imperfections are typically associated with the seam (longitudinal) weld of a pipeline that is formed during the manufacturing process. During manufacturing, the two edges of a sheet of steel are joined, creating a seam weld, to form the cylindrical pipe. As described in Section 3.2.4.2, the welding processes used to form the seam weld during manufacturing can result in several crack and crack-like imperfections. These imperfections are generally considered stable in natural gas pipelines if they have survived the mill test and pre-commissioning hydrostatic test. However, if these manufacturing imperfections occur in conjunction with other integrity threats, such as corrosion or dents, they may grow to failure.

Figure 1 Typical Pipeline Features



Imperfections Associated with Seam Welds Formed by Electric Resistance Welding (ERW)

Some imperfections associated with seam welds formed by ERW include:

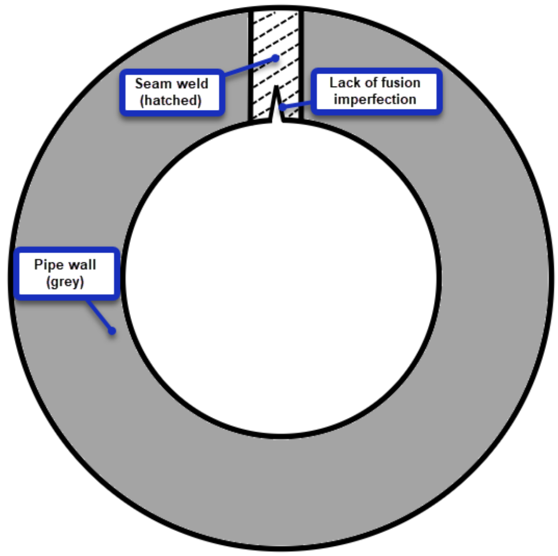
(a) Lack of fusion
(b) Hook cracks
(c) Selective seam weld corrosion

These imperfections can occur on both the inside or outside surfaces of the weld. A description of each is provided in the following sections.

(a) Lack of Fusion

Lack of fusion results when the abutting edges of the pipe at the weld only partially bond. This can be a result of contamination of the bond surfaces or the weld process itself. These “crack-like” planar imperfections are more prevalent in pipe manufactured using low frequency ERW as compared to high frequency ERW.

Figure 2 Example of a Lack of Fusion Imperfection



(b) Hook Cracks

Non-metallic inclusions can be present in the steel used to manufacture pipe. Non-metallic inclusions are chemical compounds such as sulfides and oxides. When steel is rolled out to form the strip used to make the pipe, inclusions can be flattened and extended to form laminations. As shown in Figure 3, laminations are subsurface separations that are typically parallel to the surface of the pipe. Laminations typically occur near the mid-wall of the pipe and stay within the steel, but can occasionally slope and break the surface of the steel. Surface breaking laminations effectively reduce the wall thickness of the pipe in the area of the lamination. Non-surface breaking laminations are typically considered benign except when they have occurred at the edge of the steel sheet being used to form the pipe. However, as pressure is applied during the creation of the seam weld, laminations can be pushed to the surface, forming a J-shaped crack known as a hook crack (shown in Figure 4).

Figure 3 Example of a Non-Surface Breaking Lamination in a Steel Plate

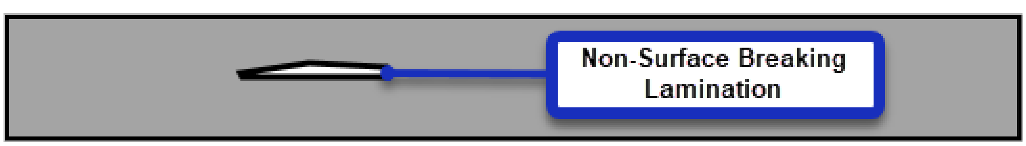
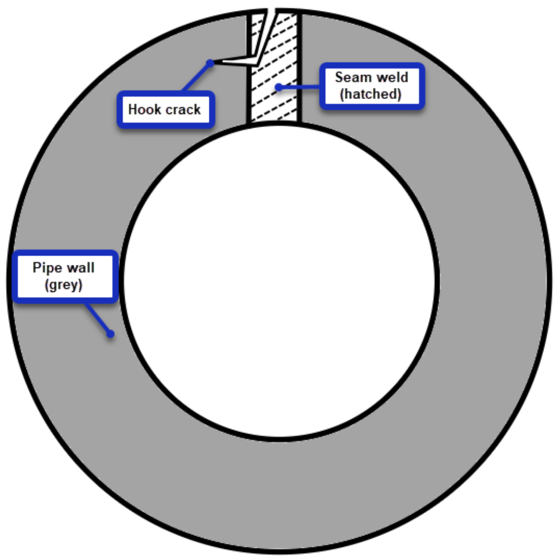


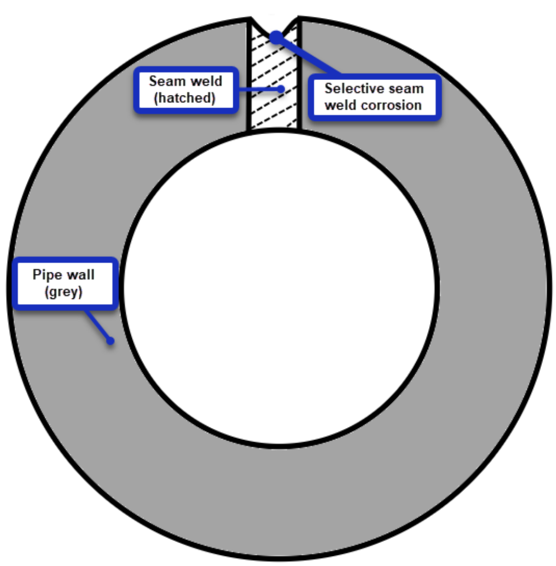
Figure 4 Example of a Hook Crack



(c) Selective Seam Weld Corrosion

Although not a manufacturing imperfection, some ERW seam weld materials are also susceptible to a phenomenon known as selective seam weld corrosion or “grooving” corrosion, where corrosion preferentially attacks the bondline region of the weld at a higher rate than the surrounding material. Due to the higher rate of corrosion this can result in failure sooner than corrosion in the parent material comprising the rest of the pipe wall. Since the bondline region in older ERW materials is not as tough as the parent material, it is more likely to fail as a rupture should sufficient penetration occur.

Figure 5 Example of Selective Seam Weld Corrosion



Imperfections Associated Seam Welds formed by Submerged Arc Welding (SAW)

Unlike ERW, the SAW process leaves slight protrusions at the inside and outside surfaces of the seam weld. As a result, protrusions on the external surface can cause challenges with some pipe coating systems. Tape coatings[1], which are commonly used to protect the pipeline from corrosion and surface damage, can pull away from the pipe and create a tent-like void along the length of the seam weld. If moisture gets between the coating and the pipe, and the pipe is experiencing CP shielding[2], corrosion known as narrow axial inline corrosion (NAIC) can occur. Corrosion, in conjunction with other manufacturing imperfections, can lead to a pipeline failure at pressures lower than expected for the metal loss by itself.

Some imperfections associated with seam welds formed by SAW include:

(a) Toe cracks
(b) Transit fatigue

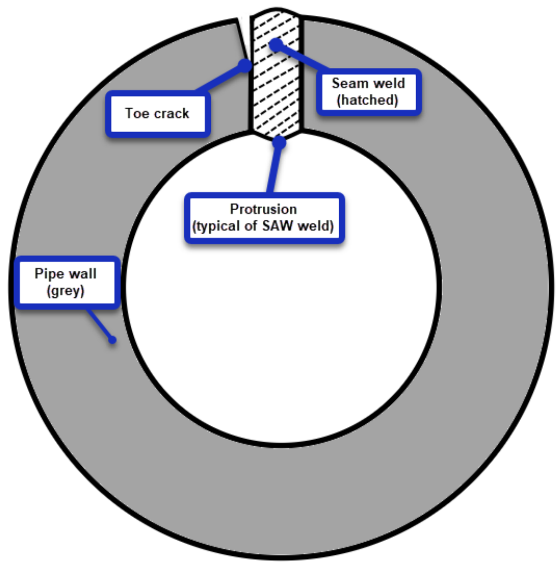
A description of each is provided in the following sections.

(a) Toe Cracks

Toe cracks are the most common seam weld imperfection found in SAW pipe. These cracks occur post-welding, at the edge or "toe'" of the weld causing it to become a stress raiser.[3] Toe cracks also typically occur at locations where non-metallic inclusions are present in the steel and can occur on either surface of the pipe.

[1] Tape coatings are applied by wrapping a coating material around the circumference of the pipeline along its entire length.
[2] CP shielding prevents the CP current from reaching the pipeline and contributes to a corrosive environment where corrosion and/or cracking may initiate and grow.
[3] As per Canadian Energy Pipeline Association (CEPA), a stress raiser is defined as "a discontinuity, such as a crack, gouge, notch, or geometry change that causes an intensification of the local stress."

Figure 6 Example of a Toe Crack



(b) Transit Fatigue

Transit fatigue is cracking that can occur on vintage SAW pipeline. Fatigue cracks can occur from repeated stresses from bouncing and shaking during pipe transport, especially if the pipe is inadequately supported. It is more likely to occur on pipe that is shipped by rail, but can occur on pipe shipped by truck or ship. This type of cracking most commonly occurs at the toe of the seam weld on SAW pipe on both the internal and external surfaces of the pipe. As such, transit fatigue looks similar to a toe crack (see Figure 6).

Appendix B

JANA'S REPORTS

FILED CONFIDENTIALLY

Appendix B-1

ANALYSIS OF CRACKING THREATS REPORT

FILED CONFIDENTIALLY

Appendix B-2

QUANTITATIVE SAFETY RISK ASSESSMENT REPORT

FILED CONFIDENTIALLY

Appendix C

BCOGC LETTER TO FEI

November 16, 2020

BC UTILITIES COMMISSION
900 Howe Street
Vancouver, BC V6Z 2S9

Subject: TIMC Project Justification

As you are aware, FortisBC Energy Inc. (FEI) is a permit holder with the BC Oil and Gas Commission (Commission). As a permit holder, FEI has certain obligations to maintain its pipeline infrastructure to accord with legislative, regulatory and code requirements, including:

> *Oil and Gas Activities Act,* [SBC 2008], c. 36
>
> 37(1) A permit holder, an authorization holder and a person carrying out an oil and gas activity must
>
> (a) Prevent spillage, and
>
> …
>
> CSA Z662:19 Oil and gas pipeline systems (excerpts only)
>
> 10.3.2.2
>
> Where an engineering assessment, the operating company's integrity management program, or observation indicates that portions of the pipeline system are susceptible to failure, the operating company shall either implement measures preventing such failures or operate the system under conditions that are determined by an engineering assessment to be acceptable.

FEI has advised the Commission that it has identified integrity concerns as a result of its assessments that require additional action to maintain suitable continued service. The Commission understands that the Transmission Integrity Management Capabilities (TIMC) Project will be part of FEI's plan to address the identified integrity concerns. The Commission is supportive of FEI taking action to address its known integrity concerns and to ensure that it meets its requirements as a permit holder under the Oil and Gas Activities Act.

Sincerely,

Nicole Koosmann
Vice President, Engineering, Integrity & Technical Compliance

Appendix D

EMAT ILI PILOT PROJECT

APPENDIX D: EMAT ILI PILOT PROJECT

FEI CONDUCTED AN EMAT ILI PILOT PROJECT TO SUPPORT DEVELOPMENT OF THE TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES (TIMC) PROJECTS

FEI identified two pipeline segments where it could undertake necessary system improvements within timelines practical to inform the development of the CTS and ITS TIMC Projects. This approach enabled FEI to incorporate further refinements and certainty into the scope and requirements of the projects. As such, FEI proceeded with the required alterations and baseline EMAT inspection of these two pipeline segments through a pilot project to inform FEI's development of the Projects. The two pipeline segments were:

1. LIV PAT 457
2. CPH BUR 508

These pipelines were selected for the pilot project for the following reasons:

- Both pipelines had experienced SCC which was found when conducting routine pipeline exposure activities, unrelated to investigating SCC;
- Analysis of the behavior of geometry, MFL-A, and MFL-C tools indicated that the EMAT ILI tool would have no issues traveling through the pipelines, with only a minor likelihood of data loss; and
- The pipelines could be configured for flow control and to operate at a reduced pressure, with relatively minor upgrades.

Details of the alterations made to each of these pipelines are provided below, followed by a description of how this pilot project informed development and planning for the TIMC Projects.

LIV PAT 457

In October 2019, FEI conducted a baseline inspection of the entire 29.8 km length of this pipeline, as shown in Figure 1 below. The following alterations were needed to make the pipeline ready for the EMAT ILI run and to enable post-EMAT inspection response:

- Modification to the launcher at Livingstone Regulating Station to allow launch of a longer EMAT ILI tool;
- Modification to the receiver at Pattullo Regulating Station to allow the retrieval of a longer EMAT ILI tool; and
- Installation of a pressure regulating station (PRS) at Livingstone Regulating Station (the upstream end) to allow pressure reduction, post EMAT run, if required.

Figure 1: Overview Map of LIV PAT 457

EMAT ILI Findings To-Date on the LIV PAT 457

In 2020, FEI received a preliminary report outlining the results of the pilot project run on the LIV PAT 457. While there was no severe cracking identified in the report warranting urgent repair work, the following features that had not been identified through FEI's current integrity management practices were reported:

- 6 crack features located in the seam weld
- 8 crack features located in the pipe
- 1 crack group

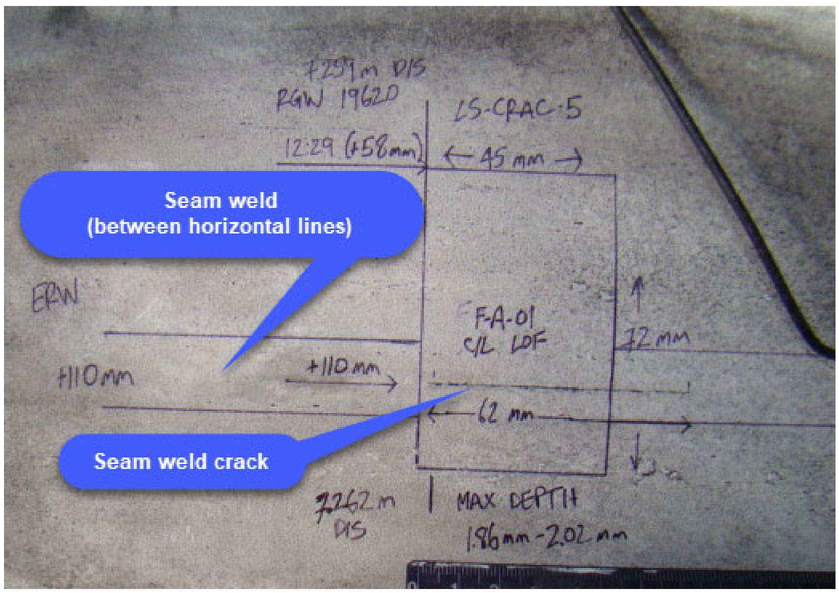
FEI prioritized a subset of the reported features and conducted ten initial validation digs. Five of the digs were completed in 2020 and the remaining five were completed in 2021. The findings are described below:

- All six reported seam weld features were inspected and removed from service for further advanced non-destructive and destructive testing.
- Two of the eight crack features in the pipe were inspected and were not required to be removed from service.
- The reported crack group feature was inspected and removed from service for further advanced non-destructive and destructive testing. One segment of pipe was cut-out and replaced.
- SCC was not found at any of the excavations.

FEI is planning an additional five digs to be completed in 2022 to address the remainder of features identified. The features will be inspected, and a subset may be removed from service for further testing. Once testing is complete on all features, the data will be sent to the ILI vendor for further analysis and additional digs may be conducted as a result.

Figure 2 shows a seam weld crack feature, which correlated well to the location reported from the ILI data. The feature is 62mm in length and was removed for further analysis and testing in 2020.

Figure 2: Seam Weld Crack Feature Identified by EMAT ILI on the LIVPAT457 Pipeline at Joint 19620



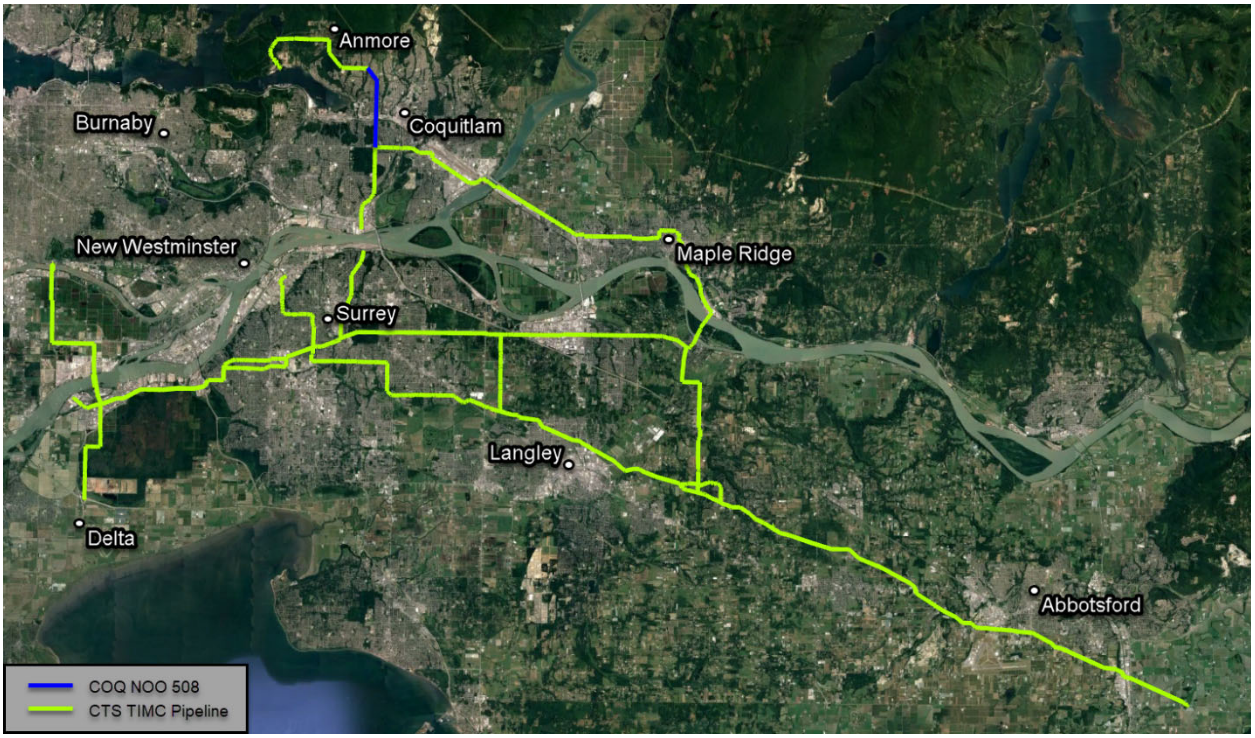
CPH BUR 508

In September 2020, FEI performed a baseline inspection on a 4.4 km long segment of CPH BUR 508 between Coquitlam Gate Station and Noons Creek Valve Station (referred to as COQ NOO 508), as shown in Figure 3 below. The following alterations were needed to make the pipeline ready for the EMAT ILI run and to enable post-EMAT inspection response:

- Piping adjustments were made to the launching end at Coquitlam Gate Station to allow for the installation of a temporary launcher. The launcher used at this station was relocated from Noons Creek Valve Station, where it was used to launch ILI tools, into the second half of the CPH BUR 508 pipeline. The relocated launcher had to be modified before installation to allow the launch of the longer EMAT ILI tool; and

- Installation of a PRS at Cape Horn Valve Station (the upstream end) to allow for pressure reduction, post EMAT run, if required.

Figure 3: Overview Map showing COQ NOO 508



EMAT ILI Findings To-Date on the CPH BUR 508

In 2021, FEI received a preliminary report outlining the results of the pilot project run on COQ NOO 508. While there was no severe cracking identified warranting immediate repair work, the following features that had not been identified by FEI's current integrity management practices were reported:

- 4 linear indications
- 1 crack group

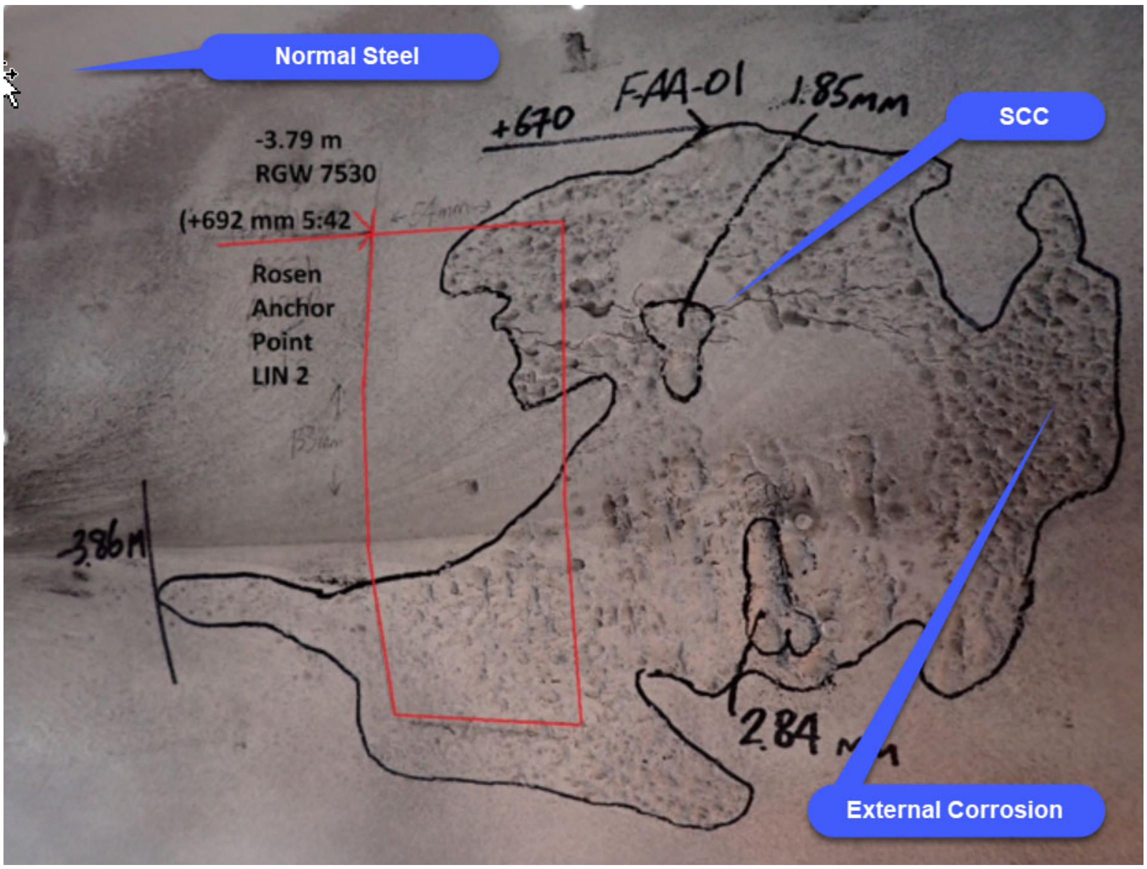
As a result, all of the reported features were selected for inspection and four validation digs were completed in 2021. The findings are described below:

- One of the reported linear indications and the crack group feature correlated to SCC (shown in Figure 4 below) upon field inspection and were removed from the pipe surface through buffing.
- All other reported features were inspected and were not required to be removed from service.

Data collected during the digs will be sent to the ILI vendor for further analysis and additional digs may be conducted as a result.

Figure 4 shows SCC within corrosion that was found through one of the validation digs, at a location on the pipe which correlated well to the location reported from the ILI data. The SCC was removed from the surface of the pipe through buffing and the pipe was left in-service.

Figure 4: Linear Indication Identified by EMAT ILI on the CPHBUR508 Pipeline, Correlating to SCC within Corrosion



PILOT PROJECT INFORMED DEVELOPMENT AND PLANNING OF TIMC PROJECTS

In addition to providing an opportunity for earlier mitigation of the cracking threats for these two pipelines, this pilot project has informed the planning and development of FEI's CTS and ITS TIMC projects.

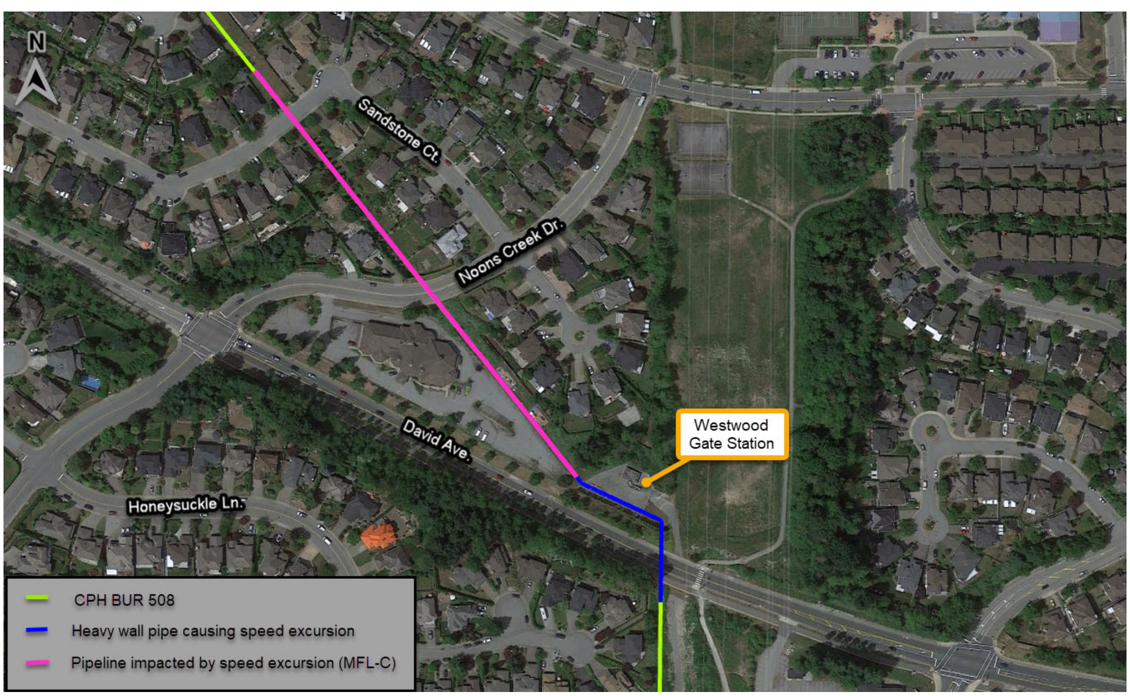
The preliminary results of the LIV PAT 457 provided FEI with valuable insight into the behaviour of the EMAT ILI tool performance and especially how it performed with respect to the MFL-A and MFL-C tools. In particular, the EMAT ILI tool run confirmed that, in a majority of cases, the same features were causing speed excursions in both MFL-C and EMAT ILI tools. The EMAT ILI data collected during the pilot project run also confirmed that while EMAT ILI tools with speed control returned back to their optimal velocity range more quickly than MFL-C tools, speed excursions still occurred with the EMAT ILI tool. By leveraging the similarities between MFL-C and EMAT ILI tool data, FEI was able to identify where speed excursions were likely to occur on pipelines where

EMAT ILI data was not available, thus conservatively refining the scope of the CTS and ITS TIMC Projects and deferring the removal or alteration of pipeline components with a minor or moderate affect on the speed until after the baseline EMAT ILI runs. This resulted in reduced Project scopes, and therefore, reduced Project costs.

FEI observed an example of the related behaviour between the MFL-C and EMAT ILI tools during its baseline inspection of the 4.4 km segment of the CPH BUR 508 pipeline between Coquitlam Gate Station and Noons Creek Valve Assembly. As shown in Figure 5, the MFL-C tool experienced a speed excursion as the result of an approximate 110 metre heavy wall segment (shown in blue), reaching an average tool velocity of 8.8 m/s and exceeding the maximum velocity for data collection. This speed excursion impacted approximately 310 metres of pipeline downstream of the heavy wall segment (shown in pink), resulting in compromised data quality through a residential neighbour of Coquitlam. FEI ran the EMAT ILI tool through the pipeline and observed a speed excursion at the same location as the MFL-C tool. The EMAT tool reached an average tool velocity of 5.2 m/s, exceeding the maximum velocity for data collection.

As a result of these observations, as part of its CTS TIMC CPCN Application, FEI proposed to replace the heavy wall pipe and fittings at this location to prevent speed excursions and ensure high quality data collection by the ILI tools.[1]

Figure 5: Example of a speed excursion resulting from a heavy wall segment on the CPH BUR 508 pipeline



[1] Event ID 20 discussed in Section 5 of the CTS TIMC CPCN Application.

REFINEMENT OF THE ITS TIMC PROJECT AS A RESULT OF EMAT ILI PILOT PROJECT OBSERVATIONS

Based on observations of EMAT ILI tool behaviour during the pilot project, FEI was able to refine the evaluation criteria used to analyse historical MFL tool data to anticipate EMAT tool behaviour. This allowed FEI to identify and select heavy wall segments with a high probability of causing EMAT tool speed excursions and include them in the ITS TIMC Project, while also deferring replacement of other heavy wall segments until after reviewing data collected during the first run.

Table 1 below lists the number of instances where previous MFL ILI tool runs exhibited speed excursions, the length of heavy wall pipe that caused them, and the length of pipe where the quality of data was affected as a result of speed excursions, organized by pipeline. The three speed excursion events driving the three pipeline alterations that are part of the ITS TIMC Project scope are not included in Table 1.

Table 1: Pipeline Alterations Deferred as a Result of the EMAT ILI Pilot Project

Pipeline ID	Approximate length of pipeline (km)	Number of speed excursion events	Approximate length of heavy wall pipeline causing speed excursions (m)	Approximate length of pipe affected by speed excursions[2] (m)
SAV VER 323	143	8	382	383
VER PEN 323	99	3	317	103
GRF TRA 273	60	9	852	640
OLI GRF 273	95	5	70	218
PEN OLI 273	30	3	47	391
KIN PRI 323	67	21	330	817
PRI OLI 323	95	9	257	221
YAH TRA 323	163	4	81	94
Total	**752**	**62**	**2,336**	**2,867**

The magnitude of speed excursions using EMAT ILI tools cannot be determined until the first tool run is complete. As such, in order to ensure a prudent use of funds and avoid doing work unnecessarily, FEI did not include these heavy wall segments in the scope of the ITS TIMC Project. However, if the EMAT tool exhibits a speed excursion during the baseline run at one of these locations, FEI may need to replace the heavy wall piping causing the speed excursion, thus avoiding depreciated data for future runs. Alternatively, FEI may choose to address the integrity of the affected segment of pipe through the use of pipeline replacement or pipeline exposure and recoat alternatives. FEI will evaluate the method that will be applied to mitigate cracking threats on a case-by-case basis to determine the most cost-effective solution.

[2] Affected pipe has a combination of degraded data or no data collected by the ILI tools.

Appendix E

FEI'S IMP-P ACTIVITIES

APPENDIX E: IMP-P ACTIVITIES RELATED TO THIRD-PARTY DAMAGE AND NATURAL HAZARDS

The following sections discuss the activities within the scope of FEI's IMP-P that mitigate the threats due to third-party damage and natural hazards. FEI continually explores feasible improvements to its integrity management activities.

THIRD-PARTY DAMAGE

Third-party damage is a recognized threat to the operation of transmission pipelines. This safety risk is elevated in higher density areas due to a greater likelihood of activity over the pipeline, as well as a greater impact to people should a pipeline failure occur. Unlike cracking, third-party damage is a time-*independent* threat, meaning the safety risk associated with third-party damage does not increase due to time.

The activities listed in the table below outline how FEI is managing third-party damage threats.

IMP-P Activity	**How IMP-P Activity is Intended to Prevent Third-party Damage Threats**
Depth of cover management	Piping cover is intended to mitigate the potential for third-party damage by creating a physical barrier between the buried piping and any subsequent surface and/or ground disturbance activities.
Gas facility location requests	FEI's participation in BC 1 Call mitigates the potential for third-party damage by providing information to the public on the location of gas system assets to persons undertaking ground disturbance activities.
Lands management	Lands management mitigates the potential for third-party damage by managing rights-of-way for FEI transmission pipelines, including controlling activities around gas system assets (e.g., issuing permits and conducting inspections).
Pipeline identification	Pipeline identification is used to reduce the potential for third-party damage by placing signs along the length of transmission pipelines, making the public aware of their presence.
Pipeline patrol	Periodic pipeline patrol is undertaken to mitigate the threat of third-party damage by monitoring for signs of activity or events that might impact the integrity of transmission pipelines.
Public safety awareness	Public safety awareness is comprised of programs aimed at educating the public (including customers, landowners, municipalities, excavators, etc.) about the presence of FortisBC's gas system assets and how to safely engage in activities in the vicinity of these assets.
Security management	This activity is intended to mitigate the potential for security-related incidents through such measures as risk assessments, design enhancements, and operational reviews. This activity aligns with Canadian Standards Association (CSA) Z246.1 Security management for petroleum and natural gas industry systems.
Vegetation management	The provision of clear sight lines to identify the existence of pipelines is a key component of third-party damage prevention.

	Note: Other reasons for vegetation management include the provision of clear access to FEI pipelines and facilities (e.g., to maintain signage, conduct surveys, and other operations work in order to maintain the integrity of the pipeline system) and to protect from potentially hazardous tree and root interactions.

NATURAL HAZARDS

Natural hazards occur as a result of environmental factors and thus cannot be prevented; however, FEI nonetheless takes measures to avoid or minimize the impacts of natural hazard events to its pipelines. This can be achieved through a combination of design, operations and maintenance activities. These activities are listed in the table below.

IMP-P Activity	How IMP-P Activity is Intended to Avoid or Minimize Damage from Natural Hazards
Design requirements	Seismic design requirements for buried pipelines and design requirements for pipeline water crossings provide an improved ability to withstand adverse effects of natural hazards, or avoid such hazards where possible.
Crossing inspections	Underwater crossings: Routine inspections are performed to identify conditions that may have the potential to expose a pipeline and to identify locations where a watercourse may encroach upon a pipeline without crossing it. Bridge and aerial crossings: Routine inspections are performed to identify conditions that may compromise the integrity of the crossing (e.g., stretched support cables), which could be worsened by natural hazards.
Pipeline patrol	Periodic pipeline patrol can identify events that might impact the integrity of transmission pipelines, including natural hazards (e.g., slope movements or landslides).
Geotechnical assessments	Routine inspections of known and potential geotechnical hazard sites to identify any changes or conditions that require mitigation.
Seismic assessments	Periodic assessment of assets for potential seismic hazards to identify any changes or conditions that require mitigation.

Appendix F

FEI'S SYSTEM READINESS CRITERIA

APPENDIX F: SYSTEM READINESS CRITERIA

WHY ALTERATIONS ON ITS PIPELINES AND FACILITIES ARE NEEDED FOR EMAT ILI TOOL RUNS

FEI requires alterations on its ITS pipelines and facilities to allow for the use of EMAT ILI tools. FEI considers system readiness for EMAT ILI runs with respect to the following:

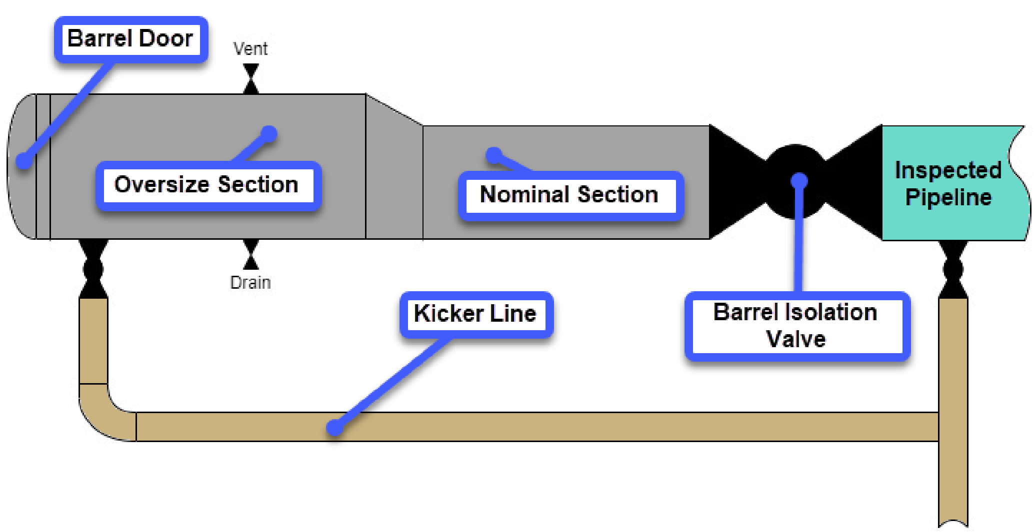
1. Whether the EMAT ILI tool can be introduced into the pipeline (Section 1);
2. Whether the EMAT ILI tool can successfully navigate through the geometry of the pipeline (Section 2);
3. Whether the EMAT ILI tool can navigate through the pipeline within its optimal velocity range (Section 3); and
4. Whether FEI can respond to integrity concerns detected by the EMAT ILI tool (Section 4).

Each of these criteria are further described in the following sections.

1. EMAT ILI Tool Length

ILI tools are inserted into and removed from the pipeline using pigging barrels located at the start and end of the pipeline. As shown in Figure 1 below, pigging barrels are comprised of: (1) a nominal section, which is the same diameter as the pipeline being inspected; (2) an oversize section, which is typically two pipeline diameter sizes larger than the pipeline being inspected; (3) a barrel isolation valve that, in conjunction with the barrel door, isolates the barrel from the pipeline and outside environment, respectively; and (4) a kicker line which gasifies the barrel when preparing to launch the ILI tool into the pipeline.

Figure 1: Typical Pigging Barrel



The existing launcher and receiver barrels were built to accommodate geometry (GEO), MFL-A and MFL-C tools, which are shorter than EMAT tools. FEI provides the maximum lengths of each tool below.

Maximum lengths for typical NPS 10 ILI tools are:

- GEO/MFL-A:[1] 4.5 m
- MFL-C: 4.2 m
- EMAT: 9.0 m

Maximum lengths for typical NPS 12 ILI tools are:

- GEO/MFL-A: 3.8 m
- MFL-C: 5.2 m
- EMAT: 6.5 m

In order to accommodate the longer EMAT tools, modifications to the existing barrels are required including extensions to the nominal and/or oversize sections and changes to the kicker lines to accommodate new barrel lengths.

2. EMAT ILI Tool Passage

ILI tools must be able to pass through the pipeline to collect data. In some cases, pipelines that were constructed prior to ILI capabilities have features or geometry that ILI tools cannot navigate through (e.g., tight-radius bends, significant wall thickness changes). When the ILI tool encounters one of these features, it can get stuck and may need to be cut-out of the pipeline. The process of cutting an ILI tool out of a pipeline is costly, time-consuming, and may impact gas supplies; therefore, it should be avoided.

Currently, geometry, MFL-A and MFL-C tools can navigate through the ITS TIMC pipelines. However, the EMAT ILI tools are longer, and therefore, a feature which may not have impeded navigation for these tools may impede the navigation of EMAT ILI tools. Typical passage criteria for ILI tools are provided below.

Typical passage criteria for NPS 12 MFL-C ILI tools are:

- Minimum bend radius: 1.5D
- Minimum bore in 1.5D bend: 284mm
- Straight pipe in-between back-to-back bends: 0mm
- Minimum bore in straight pipe: 274mm

[1] A combined tool length is provided as geometry and MFL-A tools are typically run together.

Typical passage criteria for NPS 12 EMAT ILI tools are:

- Minimum bend radius: 1.5D
- Minimum bore in 1.5D bend: 278mm
- Straight pipe in-between back-to-back bends: 688mm
- Minimum bore in straight pipe: 284mm

Typical passage criteria for NPS 10 MFL-C tools are:

- Minimum bend radius: 1.5D
- Minimum bore in 1.5D bend: 238mm
- Straight pipe in-between back-to-back bends: 0mm
- Minimum bore in straight pipe: 220mm

Typical passage criteria for NPS 10 EMAT ILI tools are:

- Minimum bend radius: 1.5D
- Minimum bore in 1.5D bend: 238mm
- Straight pipe in-between back-to-back bends: 584mm
- Minimum bore in straight pipe: 237mm

FEI has reviewed its ITS TIMC pipelines against the passage criteria and expects that the EMAT ILI tool will successfully navigate the geometry of the ITS TIMC pipelines without modification.

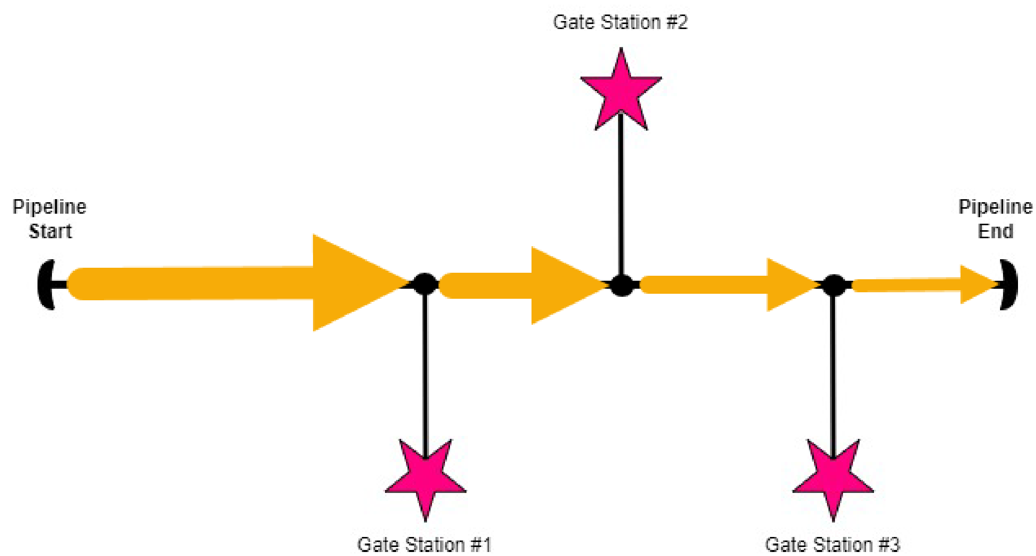
3. EMAT ILI Tool Travel Velocity

As discussed in Sections 3 and 4 of the Application, gas flow in a pipeline propels the ILI tool. The flow rates required to move tools at target velocities can be calculated using the pipeline pressure, diameter and tool characteristics.

FEI's pipeline systems present some unique challenges in establishing and maintaining the flow rates required for successful ILI inspection because FEI's transmission pipelines are configured and operated differently than typical cross-country gas transmission pipelines. Typical cross-country pipelines are looped, allowing the required volume of gas to be directed into the pipeline being inspected. As a result, the flow rate in the looped pipeline can be set and maintained with consistency using compressor stations, and flow at take-offs (such as downstream ends or laterals) along the pipeline can be eliminated, thus allowing consistent flow rates for the entire length of the inspection. In contrast, only some of FEI's pipelines are looped, or partially looped.

Further, a large portion of the load or flow rate in FEI's pipelines is a result of the heating load demand, which varies widely throughout the year as it is dependent on the outside temperature. The load or flow rate in the pipeline also changes throughout the day with peaks in the morning and the early evening. FEI's transmission pipelines supply customers through gate stations, many of which cannot be isolated from the pipeline being inspected. As illustrated in Figure 2 below, as gas flows from the pipeline into a gate station, the flow rate in the transmission pipeline (represented by the orange arrow) downstream of the station is reduced. The larger the gate station, the more significant the drop in the flow rate. On some of FEI's pipelines, the flow rate at the end of the line is a fraction of the flow rate at the start of the line. Significant effort is required to identify "inspection windows" where the flow rates in the entire length of the pipeline is able to produce the ILI tool velocities required for full resolution inspection.

Figure 2 Example Flow Schematic for Transmission Pipeline



In order to collect quality data, an ILI inspection tool must travel within the specified velocity range for that specific tool. Velocities outside of the acceptable range either result in data with degraded specification or total loss of data depending on the magnitude of the deviation. Tool performance, especially for EMAT tools, is optimal if the velocity is consistent throughout the run. The degree of data degradation increases as the velocity increases beyond the acceptable range. Data degradation, as a result of the tool travelling outside of the specific velocity range, reduces the probability that the tool will detect an anomaly, increases the minimum dimensions required for an anomaly to be detected, and reduces the accuracy of the anomaly sizing.

The required velocity range for full resolution data depends primarily on the type of ILI tool technology employed (and to a lesser extent the ILI vendor and the specific tool used). ILI vendors typically specify the tools' optimal velocity range, maximum velocity for full resolution data, velocity bands for degraded specification data, and the maximum tool velocity for data collection for each individual ILI tool.

Typical velocities for MFL-A ILI tools are:

- Optimal Velocity Range: 1-3 m/s
- Maximum Velocity for Full Resolution Data: 4.5 m/s
- Degraded Specification Range: > 4.5 m/s and < 8 m/s

- Maximum Velocity for Data Collection: 8 m/s

Typical velocities for MFL-C ILI tools are:

- Optimal Velocity Range: 1-3 m/s
- Maximum Velocity for Full Resolution Data: 5 m/s
- Degraded Specification Range: > 5 m/s and < 7 m/s
- Maximum Velocity for Data Collection: 7 m/s

Typical velocities for EMAT ILI tools are:

- Optimal Velocity Range: 1-2 m/s
- Minimum Velocity: 0.1 m/s
- Maximum Velocity for Full Resolution Data: 2 m/s
- Degraded Specification Range: > 2 m/s and < 5 m/s
- Maximum Velocity for Data Collection: 5 m/s

Regardless of the technology employed, ILI vendors provide a tool specification, which identifies feature detection thresholds and sizing accuracies. This specification can only be achieved up to a threshold tool velocity. Data acquired above the threshold velocity becomes degraded and/or compromised, impacting the ability to make effective long-term integrity management decisions.

In the sections below, FEI discusses the challenges of maintaining optimal EMAT ILI tool velocity on the ITS.

a. Flow Control Capabilities

Depending on the pipeline diameter, some MFL-A, MFL-C and EMAT ILI tools can be equipped with a speed control valve in the drive assembly at the front of the tool. This valve can be set to open when the tool velocity exceeds the target velocity, allowing some of the gas to pass through the tool. As the velocity increases, the valve can open further, allowing more gas flow to pass through the tool. The gas flow through the tool reduces the velocity of the ILI tool relative to the gas velocity. The amount of gas bypass, and the potential amount of velocity reduction achieved, varies based on the pipe diameter, the pressure in the pipeline, and the design of the speed control unit. For example, a tool with a bypass capability of 3 m/s can be run at 2 m/s in a pipeline with flow rates that would normally result in tool velocities of 5 m/s. The velocity bypass expands the range of gas velocities the tool can effectively operate within while providing full resolution data. The velocity bypass is particularly beneficial on pipelines like FEI’s where the gas flow changes along the pipeline. At the start of the pipeline, where the gas velocity is highest, the velocity bypass valve would be open wide, while near the end of the line, where the flow rate is the lowest, the velocity bypass may be closed. This would result in a more consistent tool velocity throughout the run.

FEI is currently able to run MFL-A and MFL-C tools in all of its ITS TIMC pipelines within the required flow rate ranges. Speed control has not been utilized on these tool runs because, at the time of this Application, speed control on ILI tools is not commercially available for the pipeline diameters within the scope of the ITS TIMC Project (NPS 10 and NPS 12). For many of the ITS pipelines, the lower flow velocities required for successful EMAT inspection are not achievable without the use of speed control and/or other forms of flow control. For some ITS pipelines, the flow rate in the pipeline often exceeds the maximum velocity required for full resolution EMAT data collection, which severely restricts the window available to run the EMAT tool. In other ITS pipelines, the range of flow rates is too large, making it difficult to maintain the ILI tool within its target velocity range across the changing flow conditions. As such, in the absence of a speed control, FEI requires flow control stations (FCS) to maintain the EMAT ILI tool velocity in the ITS TIMC pipelines.

In 2021, FEI participated in a pilot project on one of its CTS pipelines for the commercial development of speed control for NPS 12 ILI tools. Using the preliminary information gathered from the pilot project and the ILI vendor regarding target ILI tool velocities with speed control, FEI determined that, due to the seasonally variable flow rates in the ITS pipelines, flow control stations that can operate in conjunction with speed control on the ILI tool are required to achieve the target EMAT tool velocities and allow for a wider window in which tools can be run.

As such, FEI will maintain and control the flow in these lines using permanent flow control stations that will be installed as part of the ITS TIMC Project.

b. Heavy-Wall Features

Even at optimal flow rates and pressure, ILI tools can experience velocity excursions that result in data degradation or data loss when there are abrupt restrictions (e.g., significant wall thickness changes from pipe–to-pipe or pipe–to-fitting, tight radius bends, etc.) in a pipeline. Gas flow and differential pressure dictate tool speeds, and each ILI tool will require varying differential pressures to move it through a particular restriction.

Provided that differential pressure remains constant between the front and back of an ILI tool, gas flow is the only variable controlling tool speed. However, when an ILI tool encounters a restriction, such as thicker pipe, the tool has to compress, which increases friction between the tool and the pipe wall - reducing the tool velocity. Once the tool stops, it can only move through the restricted section when a higher differential pressure is achieved to counter the increased frictional forces. When the tool enters into the thinner (nominal) pipe after the thicker pipe section, however, the elevated differential pressure built up in the thicker pipe section causes a peak velocity spike, as there are reduced frictional forces in the nominal pipe. After the peak velocity spike, the tool velocity will decrease over time until the differential pressure reduces and stabilizes to the required differential pressure that will move the tool at a specified velocity. The duration of the over-speed period can vary between several metres to hundreds of metres, and is more pronounced in smaller diameter pipelines as the reduction in cross-sectional area in a pipeline (compared to larger diameter pipelines) results in longer time for large differential pressure to dissipate and stabilize. Lower operating pressures also cause ILI tool speed excursions, especially when the inside diameter of a pipeline is inconsistent.

As such, FEI will remove certain heavy-wall segments known to cause speed excursions in the MFL tools, and are expected to cause speed excursions in the EMAT ILI tools.

4. Pressure Reduction Capability over an Extended Time Period

It is industry standard practice to reduce the operating pressure in a pipeline:

- While conducting an integrity related excavation (e.g., to inspect an imperfection such as cracking, metal loss, or mechanical damage); and
- Where ILI results, adjusted to account for tool uncertainty, indicate defect(s) may exist that impact the safe operating pressure of the pipeline. This reduced pressure should be maintained until all defects are addressed.

Section 10.10.1.4 of CSA Z662-19 states: "Excavation of piping suspected of containing defects and if required, the subsequent permanent or temporary repair of such piping shall be performed after the piping is depressurized as necessary to an operating pressure that is considered to be safe for the proposed work." Industry practice is to reduce the pressure in the pipeline to a maximum of 80 percent of its recent operating pressure.

Section 10.10.1.5 of CSA Z662-19 also states that:

> Where piping is not suitable for continued service at the established operating pressure due to the presence of defects, either the piping shall be operated at pressures that are determined by an engineering assessment to be acceptable or the affected piping shall be repaired as specified in Clauses 10.10.2 to 10.12. The engineering assessment shall include consideration of service history and loading, anticipated service conditions (including the effects of corrosive and chemical attack), the mechanism of imperfection formation, imperfection dimensions, imperfection growth mechanisms, failure modes, and material properties (including fracture toughness properties).

Depending on the number of defects discovered during an EMAT ILI tool run, FEI may be required to operate the affected pipeline at reduced pressures for extended periods of time.

To allow for pressure reduction capability over an extended period of time, FEI will leverage the existing control points in the ITS, as well as install two new Pressure Regulating Stations (PRS) where current pressure control capabilities are insufficient.

Appendix G

FEED REPORTS AND DOCUMENTS

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Appendix G-1

FEED REPORT DOCUMENTS

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Appendix G-2

BASIS OF SCHEDULE AND SCHEDULE REPORT DOCUMENTS

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Appendix G-3

BASIS OF ESTIMATE AND ESTIMATE REPORT DOCUMENTS

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Appendix G-4

PRS SCOPE CHANGE DUE TO DELAY IN OCU PROJECT

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Appendix H

RISK ANALYSIS

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Appendix H-1

PROJECT QUALITATIVE RISK ASSESSMENT REPORT

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Appendix H-2

PROJECT RISK REGISTER

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Appendix H-3

VALIDATION ESTIMATING CONTINGENCY REPORT

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Appendix H-4

VALIDATION ESTIMATING ESCALATION REPORT

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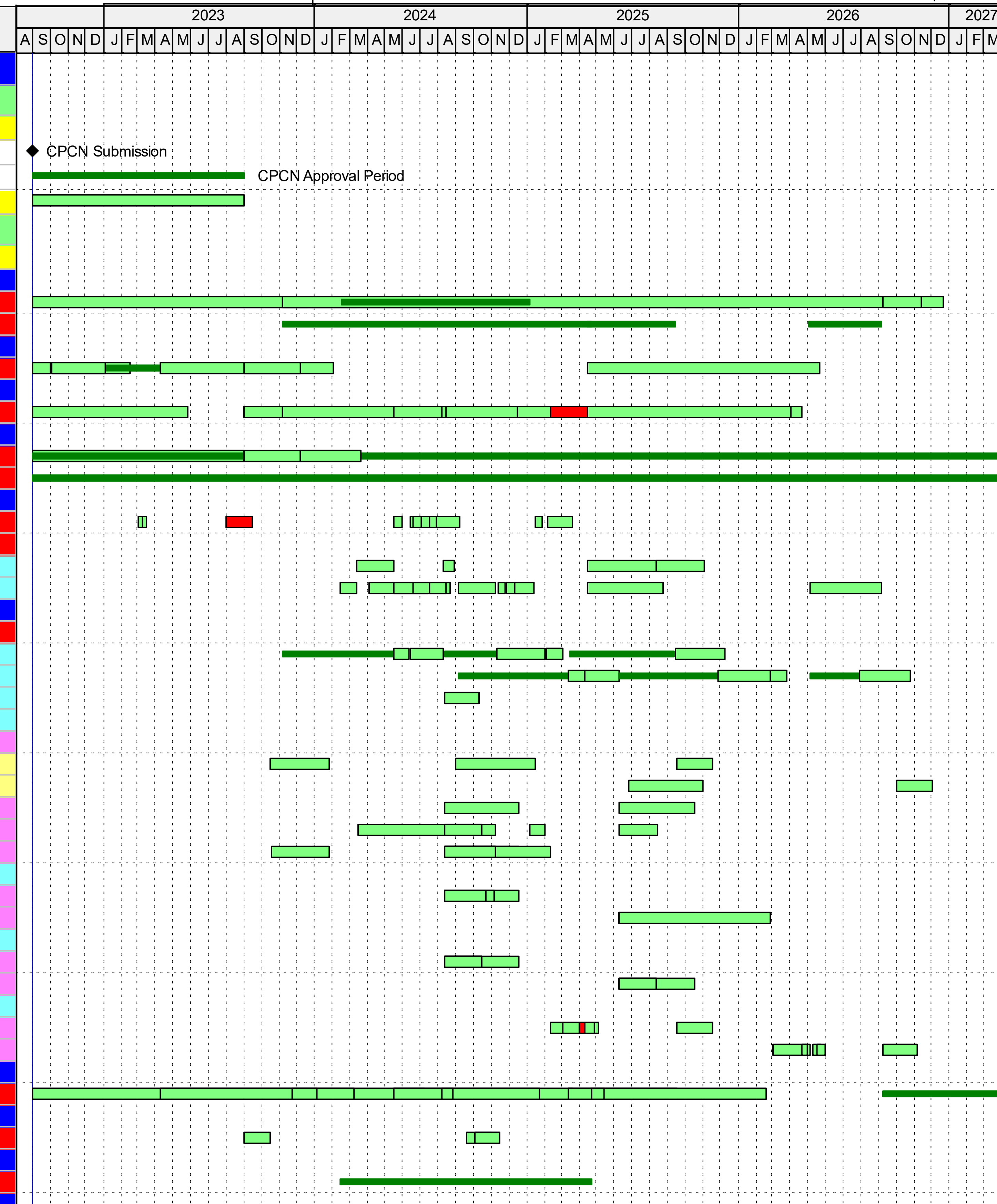
Appendix I

MASTER SCHEDULE

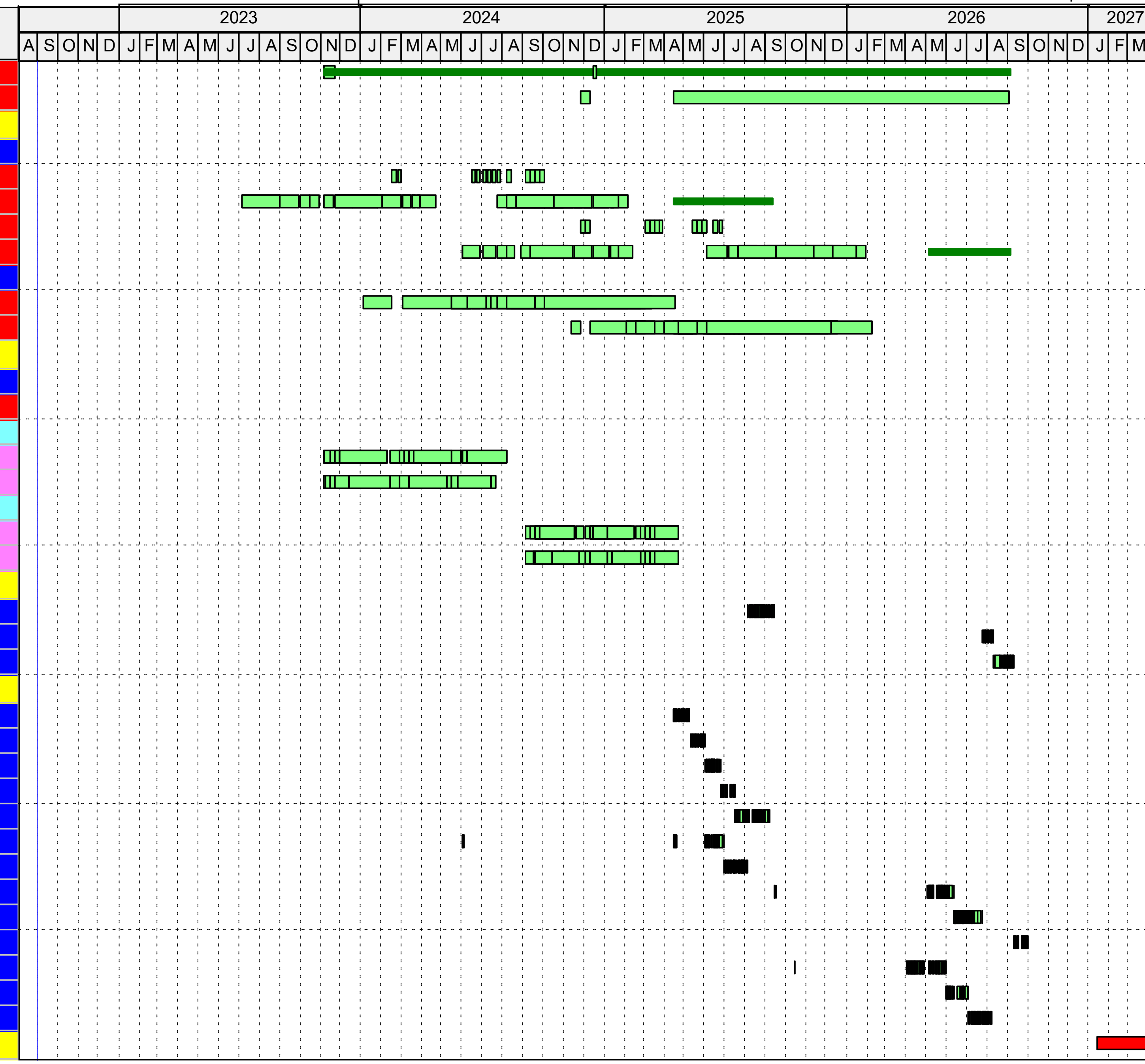
Activity ID	Activity Name	Remaining Duration	Start	Finish
M-0002 FORTIS - ITS TIMC - Master Schedule		1195d	31-Aug-22	31-Mar-27
M-0002.5 ITS TIMC CPCN APPLICATION		247d	31-Aug-22	31-Aug-23
M-0002.5.A APPLICATION		247d	31-Aug-22	31-Aug-23
TIMC-3-FEED-1780	CPCN Submission	0d		31-Aug-22
TIMC-3-FEED-1790	CPCN Approval Period	247d	01-Sep-22	31-Aug-23
M-0002.5.3 BCUC Review & Approval		247d	01-Sep-22	31-Aug-23
M-0002.8 ITS TIMC CAPITAL EXECUTION		1195d	01-Sep-22	31-Mar-27
M-0002.8.A PROJECT SERVICES		1195d	01-Sep-22	31-Mar-27
M-0002.8.A.1 PROJECT MANAGEMENT		1123d	01-Sep-22	21-Dec-26
M-0002.8.A.1.1 INTERNAL PM-FEI		1123d	01-Sep-22	21-Dec-26
M-0002.8.A.1.2 EXTERNAL PM-Consultant		739d	07-Nov-23	04-Sep-26
M-0002.8.A.3 COMMUNITY RELATIONS		916d	01-Sep-22	22-May-26
M-0002.8.A.3.1 Internal Comm Rel-FEI		916d	01-Sep-22	22-May-26
M-0002.8.A.4 INDIGENOUS RELATIONS		892d	01-Sep-22	20-Apr-26
M-0002.8.A.4.1 Internal Ind Rel-FEI		892d	01-Sep-22	20-Apr-26
M-0002.8.A.5 COMMUNICATIONS		1139d	01-Sep-22	31-Mar-27
M-0002.8.A.5.1 Internal Comm-FEI		1139d	01-Sep-22	31-Mar-27
M-0002.8.A.5.2 External Comm-Consultant		1139d	01-Sep-22	31-Mar-27
M-0002.8.A.6 ENVIRONMENTAL/ARCHAEOLOGIC		871d	02-Mar-23	04-Sep-26
M-0002.8.A.6.1 Internal Env/Arch-FEI		505d	02-Mar-23	21-Mar-25
M-0002.8.A.6.2 External Env/Arc-Consultant		636d	14-Feb-24	04-Sep-26
M-0002.8.A.6.2.1 External Environmental - Consultant		406d	14-Mar-24	04-Nov-25
M-0002.8.A.6.2.2 External Archaeological - Consultant		636d	14-Feb-24	04-Sep-26
M-0002.8.A.7 REGULATORY & PERMITTING		817d	16-Oct-23	01-Dec-26
M-0002.8.A.7.1 Internal Reg/Per-FEI		817d	16-Oct-23	01-Dec-26
M-0002.8.A.7.1.6 Phase 1 - 2024		546d	07-Nov-23	09-Dec-25
M-0002.8.A.7.1.7 Phase 2 - 2025		557d	05-Sep-24	26-Oct-26
M-0002.8.A.7.1.1 Federal Permits		42d	12-Aug-24	10-Oct-24
M-0002.8.A.7.1.2 Provincial Permits		777d	16-Oct-23	01-Dec-26
M-0002.8.A.7.1.2.1 Oil and Gas Commission		777d	16-Oct-23	01-Dec-26
M-0002.8.A.7.1.2.1.1 Phase 1 (2024)		513d	16-Oct-23	17-Nov-25
M-0002.8.A.7.1.2.1.2 Phase 2 (2025)		362d	27-Jun-25	01-Dec-26
M-0002.8.A.7.1.2.2 Agricultural Land Commission		291d	12-Aug-24	17-Oct-25
M-0002.8.A.7.1.2.3 Ministry of Forests, Lands, Natural Resource Operations and Rural Development		348d	15-Mar-24	14-Aug-25
M-0002.8.A.7.1.2.4 Ministry of Transportation and Infrastructure		319d	19-Oct-23	11-Feb-25
M-0002.8.A.7.1.4 Third Party Permits		375d	12-Aug-24	24-Feb-26
M-0002.8.A.7.1.4.1 Phase 1 - 2024		90d	12-Aug-24	18-Dec-24
M-0002.8.A.7.1.4.2 Phase 2 - 2025		174d	10-Jun-25	24-Feb-26
M-0002.8.A.7.1.3 Municipal Permits		291d	12-Aug-24	17-Oct-25
M-0002.8.A.7.1.3.1 Phase 1 - 2024		90d	12-Aug-24	18-Dec-24
M-0002.8.A.7.1.3.2 Phase 2 -2025		90d	10-Jun-25	17-Oct-25
M-0002.8.A.7.1.5 Pre-Construction Notifications		438d	11-Feb-25	05-Nov-26
M-0002.8.A.7.1.5.1 Phase 1 - 2024		192d	11-Feb-25	17-Nov-25
M-0002.8.A.7.1.5.2 Phase 2 - 2025		178d	03-Mar-26	05-Nov-26
M-0002.8.A.8 PROPERTY SERVICES		1195d	01-Sep-22	31-Mar-27
M-0002.8.A.8.1 Internal Prop Svcs-FEI		1195d	01-Sep-22	31-Mar-27
M-0002.8.A.9 LEGAL		298d	01-Sep-23	15-Nov-24
M-0002.8.A.9.1 Internal Legal-FEI		298d	01-Sep-23	15-Nov-24
M-0002.8.A.10 OPERATIONS SUPPORT		291d	14-Feb-24	22-Apr-25
M-0002.8.A.10.1 Internal Ops Supp-FEI		291d	14-Feb-24	22-Apr-25
M-0002.8.A.11 HEALTH AND SAFETY		699d	07-Nov-23	04-Sep-26



Remaining Level of Effort | Remaining Work | Critical Remaining Work
Actual Work | WBS Summary | ◆ Milestone

TASK filter: ITS TIMC.

Activity ID	Activity Name	Remaining Duration	Start	Finish
M-0002.8.A.11.1	Internal H&S-FEI	699d	07-Nov-23	04-Sep-26
M-0002.8.A.11.2	External H&S-Consultant	438d	26-Nov-24	02-Sep-26
M-0002.8.B	PROCUREMENT	827d	06-Jul-23	04-Sep-26
M-0002.8.B.3	Internal Proc-FEI	784d	06-Jul-23	04-Sep-26
M-0002.8.B.3.1	PHASE 1 - MATERIALS	158d	16-Feb-24	02-Oct-24
M-0002.8.B.3.6	PHASE 1 - CONTRACTS	538d	06-Jul-23	12-Sep-25
M-0002.8.B.3.2	PHASE 2 - MATERIALS	140d	27-Nov-24	27-Jun-25
M-0002.8.B.3.3	PHASE 2 - CONTRACTS	561d	03-Jun-24	04-Sep-26
M-0002.8.B.4	External Proc-Consultant	547d	05-Jan-24	09-Feb-26
M-0002.8.B.4.1	PHASE 1 - MATERIALS (EXT)	336d	05-Jan-24	18-Apr-25
M-0002.8.B.4.4	PHASE 2 - MATERIALS (EXT)	300d	13-Nov-24	09-Feb-26
M-0002.8.C	ENGINEERING	354d	07-Nov-23	22-Apr-25
M-0002.8.C.1	DESIGN	354d	07-Nov-23	22-Apr-25
M-0002.8.C.1.2	EXTERNAL DESIGN - CONSULTANT	354d	07-Nov-23	22-Apr-25
M-0002.8.C.1.2.1	DETAIL DESIGN (PHASE 1)	183d	07-Nov-23	06-Aug-24
M-0002.8.C.1.2.1.1	PIPELINE DESIGN	183d	07-Nov-23	06-Aug-24
M-0002.8.C.1.2.1.2	FACILITIES DESIGN	173d	07-Nov-23	22-Jul-24
M-0002.8.C.1.2.2	DETAIL DESIGN (PHASE 2)	150d	05-Sep-24	22-Apr-25
M-0002.8.C.1.2.2.1	PIPELINE DESIGN	150d	05-Sep-24	22-Apr-25
M-0002.8.C.1.2.2.2	FACILITIES DESIGN	150d	05-Sep-24	22-Apr-25
M-0002.8.E	PIPELINE CONSTRUCTION/AREA	402d	05-Aug-25	10-Sep-26
M-0002.8.E.1	SAV VER 323, EVENT 1 (CHERRY CREEK) - CREW #2 - 2024	41d	05-Aug-25	14-Sep-25
M-0002.8.E.2	KIN PRI 323, EVENT 31 - CREW #1 - 2025	17d	25-Jul-26	10-Aug-26
M-0002.8.E.3	KIN PRI 323, EVENT 29 - CREW #1 - 2025	31d	11-Aug-26	10-Sep-26
M-0002.8.F	FACILITIES CONSTRUCTION/AREA	818d	01-Jun-24	30-Sep-26
M-0002.8.F.1	SALMON ARM TAP - CREW #1 - 2024	25d	16-Apr-25	10-May-25
M-0002.8.F.2	VERNON SN-6-1 - CREW #1 - 2024	23d	11-May-25	02-Jun-25
M-0002.8.F.3	KAMLOOPS SN-3 - CREW #1 - 2024	23d	03-Jun-25	25-Jun-25
M-0002.8.F.4	SAVONA COMPRESSOR STATION - CREW #1 - 2024	21d	26-Jun-25	16-Jul-25
M-0002.8.F.5	VERNON SN-7 - CREW #1 - 2024	52d	17-Jul-25	06-Sep-25
M-0002.8.F.6	KAMLOOPS SN-4 - CREW #2 - 2024	361d	01-Jun-24	30-Jun-25
M-0002.8.F.7	PENTICTON GATE STATION - CREW #2 - 2024	35d	01-Jul-25	04-Aug-25
M-0002.8.F.8	GRAND FORKS SN-15 - CREW #1 - 2025	270d	15-Sep-25	11-Jun-26
M-0002.8.F.9	PRINCETON CROSSOVER CONTROL STATION - CREW #1 - 2025	43d	12-Jun-26	24-Jul-26
M-0002.8.F.10	KINGSVALE CONTROL STATION - CREW #1 - 2025	20d	11-Sep-26	30-Sep-26
M-0002.8.F.11	OLIVER Y CONTROL STATION - CREW #2 - 2025	228d	15-Oct-25	30-May-26
M-0002.8.F.12	TRAIL LATERAL TAP SN-17 - CREW #2 - 2025	34d	31-May-26	03-Jul-26
M-0002.8.F.13	EAST KOOTENAY EXCHANGE - CREW #2 - 2025	35d	04-Jul-26	07-Aug-26
M-0002.8.7	CLOSEOUT	55d	14-Jan-27	31-Mar-27



Remaining Level of Effort | Remaining Work | Critical Remaining Work
Actual Work | WBS Summary | ◆ Milestone

TASK filter: ITS TIMC.

Appendix J

FINANCIAL SCHEDULES FOR PREFERRED ALTERNATIVE

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Appendix K

ENVIRONMENTAL OVERVIEW ASSESSMENT REPORT

FortisBC Interior Transmission System Transmission Integrity Management Capability Project

Environmental Overview Assessment Rev 04
Interior, BC
Project # VE21506

Prepared for:

FortisBC Energy Inc.
16705 Fraser Hwy.
Surrey, BC V4N 0E8
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Prepared by:

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19 May 2022

FortisBC Interior Transmission System Transmission Integrity Management Capability Project

Environmental Overview Assessment Rev 04
Interior, BC
Project # VE21506

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19 May 2022

Revision/Quality Review Log

Date	Version	Author	Reviewer
September 13, 2021	1.0	Rob Gavan	Duncan Hendricks
October 28, 2021	2.0	Rob Gavan	Duncan Hendricks
December 13, 2021	3.0	Rob Gavan	Duncan Hendricks
May 19, 2022	4.0	Rob Gavan	Duncan Hendricks

Prepared by: ______________________
Rob Gavan

Reviewed by: ______________________
Duncan Hendricks, R.P.Bio.

wood.

Executive Summary

This report describes the results of an Environmental Overview Assessment (EOA) carried out by Wood Environment & Infrastructure Solutions (Wood) for FortisBC Energy Inc. (FEI). The proponent is proposing upgrades at 15 existing components of their Interior Transmission System (ITS) to support ongoing delivery of energy to FEI customers. The purpose of this EOA is to describe environmental or land use resources or constraints that are present within or adjacent to the Project areas, potential adverse effects on environmental or land use resources, and mitigation measures that could be used for environmental protection. To achieve this goal, a detailed desk study of biophysical characteristics and areas of potential environmental concern carried out on FEI Facility and Pipeline Event. This subsequently led to associated field assessment as a means of ground-truthing data and identifying environmental characteristics not present online sources.

The surrounding land use for the proposed TIMC Project components comprised mainly agricultural land. Six of the FEI Facilities are as such, found in Agricultural Land Reserve (ALR); SN 4, SN 6-1, Salmon Arm Tap, SN 7, Princeton Crossover Station and SN 15. The remaining facilities are present within a more urban setting and surrounded by either residential or industrial land.

The biophysical desk study identified that the TIMC Project intersected 11 separate biogeoclimatic communities. As such the Project had the potential to affect 59 ecological communities, 101 vascular plants and 23 non-vascular plants of conservation concern. Of these communities and species of conservation concern, three separate communities and one vascular plant species was found to be present within 1 km of the Project. An additional assessment of invasive plants determined that six separate species, all of which are listed on the BC Weed Control Regulations were present either within or immediately adjacent to FEI Facilities.

In relation to wildlife, there were a total of 205 species of conservation concern identified as having potential to interact with the Project. Of these, there were known occurrence records for 43 species within 5 km of Project. Several Masked Occurrence Records were also present across the Project. Following correspondence with BC Conservation Data Centre it was assessed that the proposed construction activities associated with the TIMC Project would have no adverse effects to any of the listed sensitive species.

Field surveys did not occur at Pipeline Events KIN PRI 29 and 31. This was due to either access constraints or desk study data identifying no sensitive biophysical feature in proximity to the site. The results of the field data did not identify any TIMC Project component as being of high risk to an environmental resource. It was identified, however, that the spread of noxious weeds was of moderate concern for each of the visited TIMC Project components. Incidental loss and disturbance to nesting birds was of moderate concern for six FEI facilities, whilst modification to fish habitat or direct impacts to fish were also of moderate for SAV VER Event 1, which crosses Cherry Creek. It was concluded that the proposed works were of negligible or low risk to all other environmental resources.

The desktop review of Areas of Potential Environmental Concern (APECs) and subsequent field surveys identified five FEI facilities with links to historic or current, off-site, or onsite potential sources of contamination. APECs were identified at the following locations:

- Savona Compressor Station
- Penticton Gate Station
- Oliver Y Control Station
- Kingsvale Control Station

- East Kootenay Exchange

For each project facility a project specific Environmental Management Plan (EMP) should be prepared to address site specific conditions and provide the appropriate actions and mitigation measures.

At a minimum the EMP should include standard operating procedures that:

- provide detailed actions when contaminated soils are encountered;
- provide detailed actions when contaminated groundwater is encountered;
- provide detailed actions when soils and or groundwater are to be exported offsite;
- provide operational procedures that minimize the environmental impact of higher risk project activities (equipment fuelling and waste management); and
- provide required reporting procedures when environmental incidents occur during project activities.

Table of Contents

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List of Acronyms and Abbreviations

ALC	Agricultural Land Commission
APEC	Area of Potential Environmental Concern
BC	British Columbia
BC List	BC Conservation Data Centre Status
BC MOE	BC Ministry of Environment and Climate Change
BCUC	British Columbia Utilities Commission
BTEX	Benzene, toluene, ethylbenzene, xylenes
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPCN	Certificate of Public Convenience and Necessity
CSR	Contaminated Sites Regulation (BC)
DBH	Diameter at breast height
EMAT	Electro-Magnetic Acoustical Transducer
EOA	Environmental Overview Assessment
ERIS	Environmental Risk Information Services
ESC	Erosion and sediment control
EVR	Environmentally Valuable Resources
FEI	FortisBC Energy Inc.
HEPH	Heavy extractable petroleum hydrocarbons
ILI	In-Line Inspection
ITS	Interior Transmission System
LEPH	Light extractable petroleum hydrocarbons
MTBE	Methyl tert-butyl ether
NOIR	Notice of Independent Remediation
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCOC	Potential contaminants of concern
PFAS	Per- and polyfluoroalkyl substances
PPA	Provincially Protected Area
ROW	Right-of-way
SARA	Species at Risk Act
TIMC	Transmountain Integrity Management Capability
TNRD	Thompson-Nicola Regional District
TWS	Temporary workspace
VOC	Volatile organic compounds
VPH	Volatile petroleum hydrocarbons
WMA	Wildlife Management Area

1.0 Introduction

This report describes the results of an Environmental Overview Assessment (EOA) carried out by Wood Canada Limited (Wood) for FortisBC Energy Inc. (FEI). The proponent is proposing upgrades at 15 existing components of their Interior Transmission System (ITS) to support ongoing delivery of energy to FEI customers. The completion of the EOA consisted of a desktop study of relevant biophysical and contaminant information, and where possible, field surveys at selected FEI components. This report summarizes the results of this work to assess the biophysical and contaminant risks present at each locality. This has subsequently been used to provide recommendations to mitigate possible adverse environmental effects from the proposed upgrades.

2.0 Project Description

As part of the ITS Transmission Integrity Management Capability (TIMC) Project, modifications will made to FEI pipelines and facilities to allow the use of Electro-Magnetic Acoustical Transducer (EMAT) technology by In-Line Inspection (ILI) tools. These tools are used during pigging, the practice of using pipeline inspection gauges (pigs) to perform maintenance operations, such as cleaning and inspection, without stopping the flow of product in the line. Operations involve inserting the pig into a pig launcher in the pipeline, closing the launcher, and allowing the pressure-driven flow of the product to push the pig down the pipeline until it reaches the pig trap or receiver.

FEI identified the need for alterations to three sections of pipeline and 12 facilities which are shown on Figure 1. The proposed works include the following:

1. Pipeline alterations: modifications to pipelines in locations where velocity excursions may occur and where the EMAT ILI tool may not be able to pass through the pipeline; and
2. Facilities alterations: modifications to pig launchers and receivers to allow for longer EMAT ILI tools, and to add pressure regulating and/or flow control capabilities where required.

The TIMC Project requires a Certificate of Public Convenience and Necessity (CPCN) from the British Columbia Utilities Commission (BCUC) as per section 45(1) and 46(1) of the *Utilities Commission Act* prior to commencing construction. This EOA will be used by FEI in support of the CPCN application. As such, the objectives of this assessment are as follows:

- A review of biophysical and land use resources that are present within or adjacent to the Project areas;
- An assessment of the potential effects on biophysical and/or land use resources; and
- A prescription of mitigation measures that could be used for required environmental protection.

The TIMC Project has been separated into two parts, for engineering and logistical purposes: pipeline mitigation events and facilities. FEI is proposing pipeline mitigation works on two pipeline segments within the Interior Transmission System:

- Savona to Vernon segment (SAV VER); and
- Kingston to Princeton segment (KIN PRI).

A total of three discrete pipeline modification areas ("events") are proposed for pipeline mitigation works for the TIMC Project (Table 1). All events are in FEI's existing statutory right-of-way (ROW).

Table 1: Description of TIMC Project Pipeline Events

Pipeline Segment	Length (m)	Regional District	Activity Description
SAV VER Event 1	180	Thompson-Nicola	Replace heavy wall water crossing (Cherry Creek) and bends on either side of the crossing. Replacement pipe and fittings to match upstream and downstream line pipe wall thickness.
KIN PRI Event 29	290	Okanagan-Similkameen	Replace two ~2.5 m sections of heavy wall pipe. Replacement pipe to match upstream and downstream line pipe wall thickness.
KIN PRI Event 31	150	Okanagan-Similkameen	Replace heavy wall above-ground valve assembly at KO-3. Replacement to match upstream and downstream line pipe wall thickness. This includes replacement of bends, fittings and other heavy wall features that cause velocity excursions.

Work is also proposed to occur at 13 FEI existing facilities (Table 2). Each of the Pipeline Events and 10 facilities; Savona Compressor Station, SN 3, SN 4, SN 6-1, Salmon Arm Tap, SN 7, Princeton Crossover Control Station, SN 15, SN 17 Valve Assembly, Kingsvale Control Station and East Kootenay Exchange would require temporary workspaces (TWS) outside the fence line for equipment and materials storage and access to the facility.

Table 2: Description of TIMC Project Facilities

FEI Facility	Regional District	Municipality	Associated Pipelines	Activity Description
Savona Compressor Station	Thompson-Nicola	NA	SAV VER 323	Modification to one pig barrel.
SN 3	Thompson-Nicola	Kamloops	SAV VER 323	Addition of a clamp-on ultrasound flowmeter and telemetry.
SN 4	Thompson-Nicola	NA	SAV VER 323	Modification of valve assembly and installation of a temporary pressure reducing station
SN 6-1	North Okanagan	Armstrong	SAV VER 323	Replace an existing insertion flowmeter with clamp-on ultrasonic flowmeter.

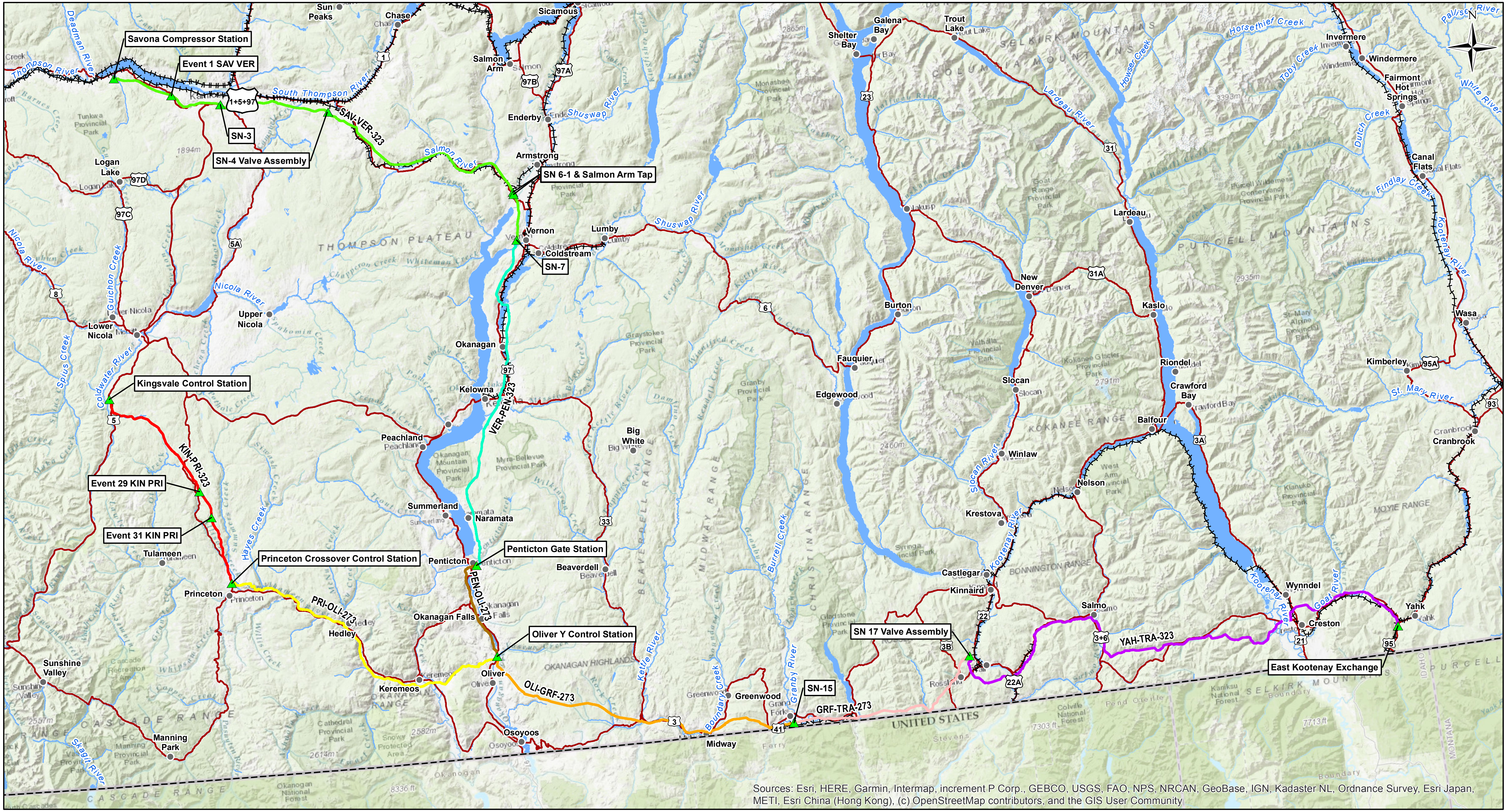
FEI Facility	Regional District	Municipality	Associated Pipelines	Activity Description
Salmon Arm Tap	North Okanagan	Armstrong	SAV VER 323	Replace an existing insertion flowmeter with clamp-on ultrasonic flowmeter.
SN 7	North Okanagan	Vernon	SAV VER 323 VER PEN 323	Modification to two pig barrels, addition of flow control capability.
Penticton Gate Station	Okanagan-Similkameen	Penticton	VER PEN 323 PEN OLI 273	Modification to two pig barrels, addition of flow control capability.
Oliver Y Control Station	Okanagan-Similkameen	Oliver	PEN OLI 273 PRI OLI 323 OLI GRF 273	Modification to three pig barrels.
Princeton Crossover Control Station	Okanagan-Similkameen	Princeton	PRI OLI 323 KIN PRI 323	Modification to two pig barrels, addition of flow control capability.
Kingsvale Control Station	Thompson-Nicola	Kingsvale	KIN PRI 323	Modification to one pig barrel.
SN 15	Kootenay Boundary	Grand Forks	OLI GRF 273 GRF TRA 273	Modification to two pig barrels, addition of flow control capability.
SN 17 Valve Assembly	Kootenay Boundary	Trail	GRF TRA 273 YAH TRA 323	Modification to two pig barrels.
East Kootenay Exchange	Central Kootenay	Yahk	YAH TRA 323	Modification to one pig barrel, addition of pressure regulating capability.

Detailed maps of proposed events and facilities are provided in Figure 2 and Figure 3.

The general sequence of works at each event will be to mobilize equipment and materials, clear vegetation, strip topsoil and grade the work area, dig ditches, modify pipes or pipe items, backfill, and site restoration (Table 3). Some works will not be applicable to each of the events, such as hydrovacing, which will only be required if features such as tree roots are obscuring the excavation.

Table 3: General Sequencing of Works at Each Event or Facility

Activity	Description of Equipment and Planned Activity
Equipment, Materials and Mobilization	Required equipment and materials will be transported directly to site. Contractor equipment shall arrive at site steam cleaned and in sound mechanical condition free of leaks or defects.
Clearing	Topsoil, trees, brush, and other vegetation will be cleared from the ROW, including TWS, if applicable. TWS are anticipated to be within the statutory ROW or on FEI-owned land. The contractor will install temporary crossings, power line markers and road signage, and will build ramps and approaches to roads over operating pipelines (hot lines) as required. Most vegetation encountered in the events will be chipped.
Topsoil Stripping and Grading	Graders, bulldozers, and backhoes will be used to strip and stockpile topsoil (surface organic material and upper mineral soil in vegetated areas). Organic layer(s) will be stripped to specified depths and widths in agricultural lands and to a standard depth in urban lands. It is assumed that full ROW stripping will be required for agricultural lands and that stripping in urban areas will be either full ROW or ditch and spoil side only. Subsoil will only be excavated at locations where required to access the pipeline. The organic material will be stripped and piled separately from any grading subsoil or trench spoil and will be in accordance with the Environmental Protection Plan (EPP) to be developed for the TIMC Project. Facilities have been assumed to lack topsoil and to have a gravel layer above a fill soil layer.
Ground Disturbance	Ditch works are expected to be completed via excavators and backhoes. The ditch width at the bottom will depend on pipe size and will be identified during Detailed Design. Some areas may require hydrovacing or airvacing to expose the pipeline where there are likely to be large tree roots within the dig area. All below-ground work in facilities will use hydrovacing.
Backfilling	The ditches will be backfilled using the excavated native ditch spoil. If necessary, engineered backfill, such as sand, will be imported where native ditch spoil is deemed to be potentially detrimental to the pipe and/or coating. Local imported engineered backfill sources will be selected by the contractor and approved by FEI. A combination of backhoes and bulldozers will be used for backfilling. Rock shield or similar products will be used where required.
Site Restoration and Reclamation	All clean-up work shall be completed as soon as practicable after completion of the pipeline construction activities. Following backfill, the pipeline contractor will be responsible for returning the grade to its original contour and re-establishing natural drainage across the ROW. The ROW and TWS will be seeded or will allow for natural revegetation after construction, depending on the requests of the landowners or site-specific conditions. Garbage will be collected on an ongoing basis and disposed of at an approved location, in compliance with local regulations. Final cleanup to return the land to an acceptable condition and address any landowner concerns or damages will occur during the following season. Areas that were originally grassed will be reseeded and will be restored to a condition as good as, or better than, their original state.



Legend

- Event
- GRF TRA 273
- KIN PRI 323
- OLI GRF 273
- PEN OLI 273
- PRI OLI 323
- SAV VER 323
- VER PEN 323
- YAH TRA 323
- Populated Place
- International Boundary
- Railway
- Highway
- Road
- Watercourse
- Waterbody

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References:
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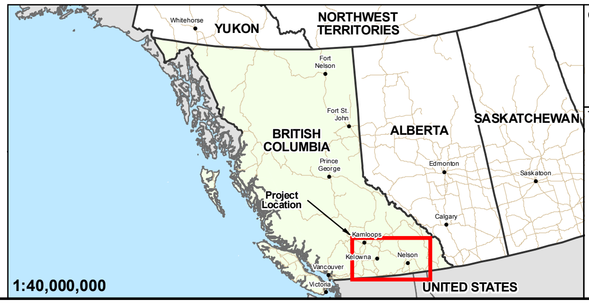

CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Project Overview	DATE: May 5, 2022 · ANALYST: BB · QA/QC: RG · Figure 1
	GIS FILE: 01-01-002_enviro_contaminant_overview.mxd
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3.0 Methods

This EOA was informed by a desktop review and field surveys. A desktop review was completed for each of the three events and 13 facilities to identify potential biophysical or land use issues, constraints, or concerns. Field surveys were then completed at the project locations for which potential environmental and/or land use issues, constraints, or concerns were identified. The methods for the desktop review and field surveys are described in the following subsections.

3.1 Desktop Review

The desktop Study Area was defined as the facility boundary, or in the case of events, affected pipeline length, with a generated buffer of an appropriate size to meet the requirements of the specific biophysical and land use assessments. The size of the Study Area is relative to the likelihood of project works affecting or being affected by the following environmental or human factors:

- Known occurrences of wildlife of conservation concern (5 km radius).
- Know occurrences of plants and ecological communities of conservation concern (1 km radius).
- Known occurrences of noxious weeds (0.5 km radius).
- Contamination risk records (0.25 km radius).
- Mapped watercourses (0.1 km).
- Land Use, soils and biogeoclimatic information (immediately surrounding facilities and events).

In order to facilitate the desktop review, publicly available information sources were reviewed and are listed in Table 4 below.

Table 4: Desktop Review Information Sources

Data Category	Data Source	Date of Data Access
Soil Survey	British Columbia Soil Information Finder Tool (Ministry of Agriculture and Ministry of Environment & Climate Change, 2021)	May 2022
Species and ecological communities at risk	BC Conservation Data Centre (BC CDC) Species and Ecosystem Explorer (BC CDC 2021), masked and unmasked occurrences	May 2022
Nest locations for heron, bald eagle, osprey, and other raptors	Wildlife Tree Stewardship Atlas as part of the Wildlife Tree Stewardship Program (2021)	May 2022
Biogeoclimatic Ecosystem classification map	iMap (Data BC, 2021)	May 2022
Noxious weed occurrences	Invasive Alien Plant Program (IAPP), Database & Map Display	May 2022
Parks and protected areas	BC Data Catalogue	May 2022

Data Category	Data Source	Date of Data Access
Watercourse locations and fish observations	Habitat Wizard (Data BC 2021)	May 2022
Waterbody Report	Fisheries Inventories Data Queries (Province of British Columbia 2020b)	June 2021
Agricultural Land Reserve Areas	Provincial Agricultural Land Commission	May 2022
City of Kamloops Community Plan	Kamloops Official Community Plan (KAMPLAN)	June 2021
City Kelowna Community Plan	Official Community Plan (OCP), City of Kelowna	June 2021
The Corporation of the Township of Spallumcheen	Township of Spallumcheen OCP	August 2021
The Corporation of the City of Vernon	The City of Vernon OCP	August 2021
The Corporation of the City of Penticton	City of Penticton, Bylaw Directory	August 2021
Town of Oliver	Town of Oliver OCP	August 2021
Town of Princeton	Town of Princeton Bylaw Services	June 2021
City of Grand Forks	City of Grand Folks Document Library	August 2021
City of Trail	Inside City Hall – City of Trail	August 2021

3.1.1 Biophysical Environment

The assessment methods followed the terms of reference for bio-inventory in Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia (MFLNRO 2014) to the extent possible. The objective of this assessment was to identify Environmentally Valuable Resources (EVRs) within the Study Area and provide recommendations for protection of these resources.

An initial list of species of conservation concern and legally designated species that potentially occur in the Study Area were gathered from BC Conservation Data Center Species and Ecosystems Explorer online application (2020).

Once this initial list was compiled, the following information sources were reviewed for known occurrence records and habitat information:

- iMapBC (DataBC 2020a);
- Invasive Alien Plant Program (IAPP 2020);
- E-Fauna (Klinkenberg 2017);
- BC Species Summaries (BC CDC 2020); and
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports.

The known distribution and habitat requisites of each species was reviewed and the probability of occurrence within the Study Area assessed. This assessment was based on the mobility of the species, the proximity of known occurrences, and by comparing habitat requisites of individual species with the habitat suitability at the Study Area. Each listed species was then assigned a low, moderate, or high probability of occurrence, based on the following definitions:

- *Low probability*: those species whose known range does not correspond to the Study Area and/or those species whose habitat requisites are absent from the Study Area (e.g., grassland, estuary, tundra);
- *Moderate probability*: those species whose range and habitat requisites are present in the Study Area but are not known within 5 km of the Study Area (based on the BC CDC [2016b] and professional knowledge of the Study Area); and
- *High probability*: those species whose range and habitat requisites are present in the Study Area and are known to the general area surrounding the Study Area.

Assessment of vegetation at risk were based solely on the habitat suitability of the site and areas of high potential for rare plants were identified. The BC Invasive Alien Plan Program (IAPP 2020) was queried for known records of invasive species that may occur in or around the Study Area.

The municipalities in the TIMC Project area have different watercourse classifications. Since the BC Oil and Gas Commission will be the primary regulator for FEI's *Water Sustainability Act* permit approvals, watercourse classifications in Section 22 of the *Environmental Protection and Management Regulation* were adopted (Table 5).

Table 5: Watercourse Classifications

Class	Description
S1A	A fish stream or stream in a community watershed that averages over 1-km in length and a stream width or an active flood plain width of 100 m or greater.
S1B	A fish stream or stream in a community watershed with a width greater than 20 m.
S2	A fish stream or stream in a community watershed with a width greater than 5 m and less than 20 m.
S3	A fish stream or stream in a community watershed that is not less than 1.5 m but less than 5 m.
S4	A fish stream or stream in a community watershed with a width less than 1.5 m.
S5	A stream that is not a fish stream and is located outside a community watershed with a width greater than 3 m.
S6	A stream that is not a fish stream and is located outside a community watershed with a width equal to or less than 3 m.
NCD	Non-classified drainage (poorly defined channel and banks, no evidence of scour, not continuous for greater than 100 m, no connection to downstream fish habitats; not fish-bearing).

3.1.2 Land Use

Where possible municipal official community plans were reviewed to identify surrounding land use. Where this was not possible, a review of available ortho-imagery was carried out and most appropriate surrounding land use designated. In addition, the Provincial Agricultural Land Commission database was reviewed to assess whether TIMC Project components intersected Agricultural Land Reserve Areas. Land Management Regions were also reviewed using The Crown Land Registry (Tantalis). This was to identify all listed municipally, provincially, or nationally designated ecologically significant areas with 5 km of TIMC Project components.

3.1.3 Soils

Soils within the Study Area of pipeline events were assessed using British Columbia Soil Information Finder Tool (Ministry of Agriculture and Ministry of Environment & Climate Change, 2018). Soil types were not reviewed for associated facilities which did not require TWSs; since the soil was assumed to be non-native fill materials imported during construction.

3.1.4 Contaminants

Environmental Risk Information Services (ERIS) was used to summarize the findings of an environmental database search. The database summary was provided in individual site reports, using a 250 m radius around the proposed FEI properties and Pipeline Events to create the Study Area. Reports included an inventory of surrounding businesses of concern, non-compliance records, environmental monitoring stations, listed contaminated sites and historic contamination incidents. These were assessed by Wood to identify areas of potential environmental concern (APECs) where contaminated media, such as soils, sediment, or vapour, may be present, and could potentially affect the proposed work areas.

3.2 Field Survey

3.2.1 Biophysical Environment

A site reconnaissance was conducted by Kim Poupard, R.P.Bio., in August 2021. Each of the FEI properties and Pipeline Events were traversed on foot. Specific attention was paid to potential occurrences of the following:

- Habitats likely to support species at risk (e.g., wetlands, riparian, old growth forest);
- Ecosystems at risk;
- Species at risk;
- Invasive plants;
- Wildlife habitat features (e.g., wildlife trees, stick nests, dens and burrows);
- Important wildlife habitat (e.g., wetlands, riparian, old growth forest);
- Watercourses; and
- Potential apparent adverse environmental effects from activities on the properties.

A general description of the vegetation communities within each of the properties was compiled. Note that the field reconnaissance was limited to visual observations of land cover types and chance encounters; no species-specific inventories were conducted. Note that the timing of the assessment was too late in the season for compiling comprehensive vegetation lists.

A geo-referenced PDF on a handheld GPS enabled device was used to navigate the properties. Observations were recorded with photographs and field notes.

3.2.2 Contaminants

Site field surveys were conducted by Erin Torry, BSc., EPt, in August 2021. Properties were selected for field surveys after a desktop study identified the potential for contamination at a site. Site operations and activities (historical and current) as well as operations and activities of properties (historical and current) within a 250 m radius were evaluated. Six FEI facility properties were selected for field survey.

Each site was evaluated for the following potential effects:

- Site operations;
- Waste generation;
- Fuel, chemical, and waste storage;
- Exterior site condition observations including wells; and
- Potential offsite sources of contamination.

Note that the field surveys did not include entrance to the sites but were limited to an external evaluation of the site from the accessible boundaries. Neighbouring properties were evaluated from publicly accessible locations.

4.0 Biophysical Desk Study Results

The following sections detail the environmental overview of the TIMC Project and its relation to ecological communities, plants, wildlife and fish habitat. The desktop review of the assessed Study Areas identified 11 separate biogeoclimatic communities, as listed in Table 6 below.

Table 6: Biogeoclimatic Zones Intersected by the TIMC ITS Project

ITS TIMC Component	Biogeoclimatic Community
Savona Compressor Station	Bunchgrass – Thompson Very Dry Hot (BGxh2)
SN 3	Ponderosa Pine – Thompson Very Dry Hot (PPxh2)
SN 4	Ponderosa Pine – Thompson Very Dry Hot (PPxh2)
SN 6-1	Interior Douglas-fir – Okanagan Dry Hot (IDFxh1)
Salmon Arm Tap	Interior Douglas-fir – Okanagan Dry Hot (IDFxh1)
SN 7	Interior Douglas-fir – Okanagan Dry Hot (IDFxh1)
Penticton Gate Station	Ponderosa Pine – Okanagan Very Dry Hot (PPxh1)
Oliver Y Control Station	Bunchgrass – Okanagan Very Dry Hot (BGxh1)
Princeton Crossover Control Station	Ponderosa Pine – Okanagan Very Dry Hot (PPxh1)
Kingsvale Control Station	Interior Douglas-fir – Okanagan Dry Hot (IDFxh1)
SN 15	Ponderosa Pine – Kettle Very Dry Hot (PPxh3)
SN 17 Valve Assembly	Interior Cedar-Hemlock Very Dry Warm (ICHxwa)

ITS TIMC Component	Biogeoclimatic Community
East Kootenay Exchange	Interior Cedar-Hemlock West Kootenay Dry Warm (ICHdw1)
SAV VER 323 Event 1	Bunchgrass – Thompson Very Dry Hot (BGxh2)
KIN PRI 323 Event 29	Interior Douglas-fir – Thompson Dry Cool (IDFdk1)
KIN PRI 323 Event 31	Interior Douglas-fir Cascade Dry Cool (IDFdk2) and Montane Spruce – South Thompson Dry Mild (MSdm2)

4.1 Ecological Communities and Plant Species

The desktop review of the identified biogeoclimatic zones present within the Study Areas found the following provincial plant species and ecological communities of conservation concern (blue- or red-listed): 59 ecological communities, 101 vascular plants and 23 non-vascular plants. Of the identified plant species (vascular and non-vascular); 24 were listed in Schedule 1 of the federal *Species at Risk Act* (SARA) (Appendix A).

4.1.1 Pipeline Mitigation Events

The desktop study identified no ecological communities or plant species of conservation concern within 1 km of the proposed pipeline events.

A review of the IAPP Database within the Study Areas of Pipeline Events identified five records, comprising three species listed in Part I, Schedule A of the BC *Weeds Control Regulation*. One event (KIN PRI / 31) had two listed noxious weeds immediately adjacent (within 10 m) to the proposed work area. The results of said search are listed in Table 7 below.

Table 7: Known Occurrences of Weeds Classified as Noxious

Pipeline Event	Common Name	Scientific Name	Distance from Event (m)	Provincial Status
KIN PRI 323 / 29	Hound's-tongue	*Cynoglossum officinale*	Within 500 m	Noxious
KIN PRI 323 / 31	Canada thistle	*Cirsium arvense*	Within 10 m	Noxious
	Hound's-tongue	*Cynoglossum officinale*	Within 10 m	Noxious
	Spotted knapweed	*Centaurea maculosa*	Within 500 m	Noxious
SAV VER 323	Spotted knapweed	*Centaurea maculosa*	Within 500 m	Noxious

4.1.2 Facilities

The desktop study identified two facilities (SN 7, and SN17 Valve Assembly) that were within 1 km of a mapped ecological community of conservation concern. It was also identified that one facility (Princeton Crossover Station) was within 1 km a plant species of conservation concern, as shown in Table 8 below.

Table 8: Species and Ecological Communities of Conservation Concern

FEI Facilities	Common Name	Scientific Name	Distance from Facility (km)	Conservation Status
SN 7	Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	1.0	Red Listed
Princeton Crossover Station	White western groundsel	Senecio integerrimus var. ochroleucus	0.9	Red Listed
SN17 Valve Assembly	Common cattail Marsh	*Typha latifolia* Marsh	0.3	Blue Listed
	Black cottonwood / common snowberry - roses	*Populus trichocarpa / Symphoricarpos albus - Rosa spp.*	0.1	Red Listed

A review of the IAPP Database within the Study Areas of FEI facilities identified 52 records, comprising 17 species listed in Schedule A of the BC *Weeds Control Regulation*. Four facilities (East Kootenay Exchange Station, Kingvale Control Station, Penticton Gate Station, and Savona Compressor Station) had listed noxious weeds immediately adjacent (within 10 m) to the proposed work area and/or site access. The results of said search are listed in Table 9 below, with a full list of noxious weeds within 500 m of facilities provided in Appendix D.

Table 9: Known Occurrences of Weeds Classified as Noxious

FEI Facilities	Common Name	Scientific Name	Distance from Facility	Provincial Status
Savona Compressor Station	Canada thistle	*Cirsium arvense*	Within 10 m	Noxious
SN 4	Spotted knapweed	*Centaurea maculosa*	Within 10 m	Noxious
	Diffuse knapweed	*Centaurea diffusa*	Within 10 m	Noxious
Penticton Gate Station	Puncture Vine	*Tribulus terrestris*	Within 10 m	Noxious in Okanagan-Similkameen
Kingsvale Control Station	Spotted knapweed	*Centaurea maculosa*	Within 10 m	Noxious
East Kootenay Exchange	Canada thistle	*Cirsium arvense*	Within 10 m	Noxious
	Spotted knapweed	*Centaurea maculosa*	Within 10 m	Noxious
	Common tansy	*Tanacetum vulgare*	Within 10 m	Noxious in Central Kootenay
	Diffuse knapweed	*Centaurea diffusa*	Within 10 m	Noxious

4.2 Wildlife

Due to the extensive number of data records generated for wildlife species, FEI facilities and Pipeline Events were assessed concurrently. Fish species, which included both bivalves and ray-finned species are discussed in Section 4.3 *Fish and Riparian Habitat*.

The desktop study of the identified biogeoclimatic zones present within the Study Areas found the following provincial species of conservation concern: 146 blue listed species, 69 red listed species and two species listed in the BC *Wildlife Act*. There were additional federal species of conservation concern, which included 87 species listed in Schedule 1 of the federal *Species at Risk Act* and two species listed in Schedule 3 of the federal *Species at Risk Act* (Appendix A).

Of the listed species of conservation concern, 43 were identified within 5 km of the proposed FEI facilities and pipeline events. These species included two amphibians, 13 birds, two gastropods, six insects, three mammals, three reptiles and one turtle. Each species was subject to the 'likelihood of occurrence' assessment, which drew on a combination of desk and field data to determine potential interactions between wildlife and the Project, the results of which are available in Appendix B. Of the 43 wildlife species, 19 were designated a moderate or high probability of occurrence across the Project, as shown in Table 10 below. Due to access constraints at KIN PRI Events 29 and 31, only data collected through desktop studies were used to inform assessments at these sites.

It was identified during the Desk Study review that several Masked Occurrence Records intersected both FEI Facilities and Pipeline Events as displayed on Figure 2. These species are too sensitive to retain in the public domain due to factors such as public persecution. Following correspondence with BC Conservation Data Centre, it was assessed that the proposed construction activities associated with the TIMC Project would have no adverse effects to any of the listed sensitive species. As such no specific mitigation requirements associated with the listed sensitive species would be required.

Table 10: Wildlife Species of Conservation Concern Identified Within 5 km the TIMC

Species type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
Amphibians	Blotched Tiger Salamander	*Ambystoma mavortium*	Red Listed	E	E	Inhabit almost any terrestrial habitat as long as it includes the required aquatic breeding habitat, such as a lake, reservoir, permanent and ephemeral pond, or stream pool.	**High** at Event 1 SAV VER
	Great Basin Spadefoot	*Spea intermontana*	Blue Listed	T	T	Inhabit mainly sagebrush flats, semi-desert shrublands, pinyon-juniper woodland. It breeds in temporary or permanent water, including rain pools, pools in intermittent streams, and flooded areas along streams.	**High** at EVENT 1 SAV VER, Savona Compressor Station **Moderate** at Princeton Gate Station and SN 4
	Western Toad	*Anaxyrus boreas*	Yellow listed	SC	SC	Western Toads breed in a variety of natural and artificial aquatic habitats, with or without tree or canopy cover, coarse woody debris, or emergent vegetation. They disperse widely and use a range of habitat types; they prefer damp conditions, and will either dig their own burrows, or take shelter in small mammal burrows, beneath logs and within crevices: they hibernate in burrows below the frostline, up to 1.3 metres below ground.	**High** at EVENT 1 SAV VER, Savona Compressor Station, Trail Lateral Tap, Yahk Valve Station, Oliver Y Control, Princeton Crossover Control Station **Moderate** at East Kootenay Exchange, Kingsvale Control, SN 7, SN 6-1, Salmon Arm Tap, SN 15, SN 3, SN 4, Kingsvale Control Station
Birds	Bobolink	*Dolichonyx oryzivorus*	Blue Listed	T	T	Occurs in tall grass areas, flooded meadows, prairie and hayfields. This species generally selects habitat with moderate to tall vegetation.	**Moderate** at Oliver Y Control and SN 15
	Brewer's Sparrow, brewer subspecies	*Spizella breweri breweri*	Blue Listed	-	-	Occurs in a range of grass- and scrub- land	**Moderate** at Oliver Control
	Common Nighthawk	*Chordeilies minor*	Yellow Listed	SC	T	Habitats include mountains and plains in open and semi-open areas: open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns. Nesting occurs on the ground on a bare site in an open area. In some areas, this species also nests on flat gravel roofs of buildings, perhaps related to prey availability at artificial lights.	**High** at Event 1 SAV VER, Savona Compressor Station, SN 3, SN 4, Oliver Control, Princeton Crossover Control Station, SN 15 **Moderate** at SN 6-1, Salmon Arm Tap, SN 7
	Great Blue Heron, Herodias subspecies	*Ardea herodias herodias*	Blue Listed	-	-	Diverse range of habitats with frequent use of cultivated, wooded, riparian and grassland.	**High** at Event 1 SAV VER **Moderate** at Savona Compressor Station
	Lewis's Woodpecker	*Melanerpes lewis*	Blue Listed	T	T	Occurs in open forest and woodland, often logged or burned, riparian woodland and orchards.	**High** at SN 3
	Western Screech-Owl, macfarlaneisubspecies	*Megascops kennicottii macfarlanei*	Blue Listed	T	T	Can occupy a diverse range of habitats with frequent use of cultivated, wooded, riparian and grassland.	**High** at Oliver Y Control and SN 17
Insects	Behr's Hairstreak	*Satyrium behrii*	Red Listed	E	E	Occurs on dry slopes and canyons where sagebrush and pinyon-juniper are available.	**Moderate** at Oliver Y Control Room
	Mormon Metalmark	*Apodemia mormo*	Red Listed	E	E	Inhabits hillsides, slopes and embankments with sandy or gravelly soils and moderate to high densities of rabbitbrush (*Erigoneum nauseosus*) and snow buckwheat (*Erigonium niveum*).	**Moderate** at Oliver Y Control **Not assessed** at other sites
Mammals	American Badger	*Taxidea taxus*	Red Listed	E	E	Prefers open areas and may also frequent brushlands with little groundcover.	**High** at Oliver Y Control, Event 1 SAV VER, Savona Compressor Station, SN 3, SN 4, Trail Lateral Tap

Species type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
							Moderate at SN 15, SN 6-1, Salmon Arm Tap
	Columbia Plateau Pocket Mouse	*Perognathus parvus*	Blue Listed	-	-	Inhabits arid valley bottoms and open slopes on hillsides.	**High** at Oliver Y Control
	Mountain Beaver	*Aplodontia rufa*	Yellow Listed	SC	SC	Occupies forested areas from near sea level to timberline. It is common in damp ravines and shaded hillsides in coastal and montane forests with an abundance of herbaceous ground cover, typically in riparian habitat in moist coniferous forests.	Only potential habitat is at Event 29 and 31 but **not assessed** in the field
	Nuttall's Cottontail	*Sylvilagus nuttallii*	Blue Listed	SC	SC	It is associated with shrub-steppe with Antelope-Bush and Big Sage. Sagebrush and the presence of rocky outcrops are important habitat attributes.	**High** at Oliver Y Control
	Western Harvest Mouse	*Reithrodontomys megalotis*	Blue Listed	E	E	It inhabits dry gullies with dense shrub cover bordering grassland and shrub-steppe rangeland.	**Moderate** at Oliver Y Control and SN 7
Reptiles	Desert Nightsnake	*Hypsiglena chlorophaea*	Red Listed	E	E	It dens in talus slopes and crevices in rock outcrops. Most of their active time is thought to be spent in rugged areas where thermal gradients occur and prey (e.g., Western Skink) is abundant.	**Moderate** at Oliver Y Control
	Gopher Snake, deserticola subspecies	*Pituophis catenifer deserticola*	Blue Listed	T	T	This species occurs in a wide range of habitats, extending from lowlands to mountains.	**Moderate** at SN 7, Savona Compressor Station, Princeton Crossover, Event 1 SAV VER, Oliver Y Control, SN 3, SN 4
	North American Racer	*Coluber constrictor*	Blue Listed	SC	T	This species occurs in a wide range of habitats, extending from lowlands to mountains.	**High** at Oliver Y Control, SN 15, SN 7 and SN 17, Event 1 SAV VER, Savona Compressor **Moderate** at SN 6-1, SN 4, SN 3, Princeton Crossover, Kingsvale Control
	Northern Rubber Boa	*Charina bottae*	Yellow Listed	SC	SC	This species favours woodlands, forest clearings, meadows, and grassy savannas, generally not far from water. It is generally found in rotting logs, rock crevices and dead fallen trees.	**Moderate** at Savona Compressor, Event 1 SAV VER, SN 3, SN 3-1, SN 15, Princeton Crossover
	Western Rattlesnake	*Crotalus oreganus*	Blue Listed	T	T	Occupies a wide diversity of habitats, from shrubby coastal dunes to timberline, from shrubby basins and canyons to open mountain forests	**Moderate** at Savona Compressor, Event 1 SAV VER, SN 3, SN 4, SN 15, Princeton Crossover
	Western Skink	*Plestiodon skiltonianus*	Blue Listed	SC	SC	This species is partial to open wooded foothills and is usually associated with rocks, under which it takes shelter	**High** at Oliver Y Control **Moderate** at SN 15

Notes:
[1] COSEWIC = Committee on the Status of Endangered Wildlife in Canada.
[2] BC List = BC Conservation Data Centre Status.
[3] SARA = Species at Risk Act.
SC = Special Concern; T = Threatened; E = Endangered; NAR = Not At Risk; XT = Extinct.

4.3 Fish and Riparian Habitat

The Desk Study identified five watercourses associated with the combined FEI Facilities and Pipeline Events. These watercourses were varied in nature and ranged from non-classified drainage channels to major rivers with active floodplains. They have been listed and classified in accordance with the *Environmental Protection and Management Regulation* in Table 11 below.

Table 11: Identified Watercourses Associated with Facilities and Pipeline Events

Associated FEI Facility or Pipeline Event	Watercourse Name	Freshwater Atlas Watershed Code/s	Proximately to Proposed Work Area (nearest location)	Downstream Watercourse	Order / Classification
KIN PRI Event 29	Allison Creek	310-367800-60900	Immediately adjacent south	Allison Lake	4 / Not Assessed
Oliver Y Control Station	Okanagan River	310	68 m west	Columbia River	1 / S1B
Savona Compressor Station	Un-named stream	120-768100-03500-58802	80 m west	Kamloops Lake	1/ S6
Savona Compressor Station	Un-named stream	120-768100-03500-58802-2816	Immediately adjacent north	Kamloops Lake	1 / S6
SAV VER Event 1	Cherry Creek	120-86200	Immediately adjacent west	Kamloops Lake	4 / S2
SN 7	Un-named streams	310-939400-06377	Immediately adjacent southwest	Vernon Creek	NVC
		310-939400-06377-59134	30 m west	Vernon Creek	NCD
		310-939400-06377-60987	100 m west	Vernon Creek	NCD

Notes:

* Stream classification is per the BC OGC Environmental Protection and Management Guideline (OGC 2018).
NVC = No Visible Channel, NCD = Non-classified Drainage

In review of know occurrences of fish and bivalve species of conservation concern, Rocky Mountain Ridged Mussel (*Gonidea angulata*) was identified within 2 km of Oliver Y Control Station and SN 7. This species is provincially red listed in the *BC Wildlife Act* and listed on Schedule 1 of the SARA.

It should be noted that Columbia Sculpin (*Cottus hubbsi*) was identified within 3 km of KIN PRI Event 31 and Speckled Dace (*Rhinichthys osculus*) was identified within 1 km of SN 15. Both these species are provincially blue listed species and further listed on Schedule 1 of the SARA. As there are no watercourses associated with either KIN PRI Event 31 or SN 15, they were discounted further from this assessment.

4.4 Land Use

The surrounding land use for the proposed TIMC Project components comprises mainly agricultural land. Five of the FEI Facilities are as such, found in Agricultural Land Reserve; SN 4, SN 6-1, Salmon Arm Tap, SN 7, Princeton Crossover Station and SN 15 (See Figure 2). The remaining facilities are present within a more urban setting and surrounded by either residential or industrial land, as listed in Table 12 below.

Table 12: Surrounding Land Use and Field Survey Size for FEI Facilities

FEI Facility	Surrounding Land Use			Field Survey Size (m^2)
	Industrial	Residential/ Urban	Agricultural/ Rural	
Savona Compressor Station			x	13,000
SN 3		x		2,500
SN 4			x	2,500
SN 6			x	6,000
Salmon Arm Tap			x	6,000
SN 7			x	4,000
Penticton Gate Station	x			3,200
Oliver Y Control Station		x		30,000
Princeton Crossover Station			x	5,100
Kingvale Control Station			x	16,0000
SN - 15			x	4,000
SN17 Valve Assembly			x	4,200
East Kootenay Exchange			x	5,000

Each of the Pipeline Events are more remote and whilst SAV VER is surrounded by agricultural land, both KIN PRI Events 29 and 31 are present in what is considered wildlands. These are listed in Table 13 below. Wildlands are areas of land that are uncultivated or have no propensity for cultivation.

Table 13: Surrounding Land Use and Field Survey Size for Pipeline Events

Pipeline Segment	Event	Surrounding Land Use		Field Survey Size (m^2)
		Agricultural/ Rural	Park/ Wildlands	
Kin Pri 323	29		x	NA
Kin Pri 323	31		x	NA
SAV VER 323	1	x		60,000

Eight facilities and two Pipeline Events are present within 5 km of listed municipally, provincially, or nationally designated ecologically significant areas. These are listed below and included in Figure 2.

FEI Facilities

- Savona Compressor Station: Located approximately 4 km from two provincial parks; Steelhead Park and Mount Savona Park and approximately 4.5 km from one Provincially Protected Area (PPA); Six Mile Hill.
- SN 4: Located approximately 2.5 km from one Provincially Protected Area; Buse Lake and approximately 4 km from one provincial park; Monte Creek Park
- SN 7: Located approximately 4.2 km from one WMA; Swan Lake.
- Penticton Gate Station: Located approximately 1.8 km from one WMA; McTaggart-Cowain/ Nsek'Iniw't and 2.2 km from one Provincial Park; Skaha Bluffs Park.
- Oliver Y Control Station: Located approximately 0.6 km and 0.8 km from Vaseux PPA and White Lake Grasslands PPA respectively. It is also present approximately 1.1 km from South Okanagan WMA and 2.2 km from Inkaneep Provincial Park.
- East Kootenay Exchange: Located approximately 4 km from Yahk Provincial Park.

Pipeline Events

- SAV VER Event 1: Located approximately 5 km from one Wildlife Management Area (WMA); Tranquille WMA and one PPA; Lac Du Bois Grasslands.
- Kin PRI Event 29: Located approximately 2.8 km from Allison Lake Provincial Park.

In assessing viable pathways from FEI facilities and Pipeline Events, it is not expected that the proposed works associated with the TIMC Project will have any effect on any of the listed ecologically significant areas. This result is predominantly due to proposed works being confined to pre-existing site boundaries and/or the distance between Facilities or Pipeline Events is too great for a viable pathway to exist.

5.0 Soils

The proposed events and facilities which require TWSs as part of the construction process are within a range of soil types (Table 14). Soil types were not reviewed for the facilities not requiring any works beyond the boundary of the fenced property line since the soil was assumed to be non-native fill materials imported to the facilities during their construction.

Table 14: Soil Information for TIMC Components

Pipeline Segment	Soil Name	Soil Texture	Drainage
SAV VER Event 1	Timber	Sandy Loam	Well Drained
	Glimpse	Sandy Loam	Rapid
KIN PRI Event 29	Steepland 2	Sandy Loam	Rapid
KIN PRI Event 31	Wilbert	Sandy Loam	Well Drained
Savona Compressor Station	Trapp Lake	Silt Loam	Well Drained

Pipeline Segment	Soil Name	Soil Texture	Drainage
SN 3	Cavanaugh	Loamy Sand	Well Drained
SN 4	Timber	Sandy Loam	Well Drained
SN 6-1	Spallumcheen	Clay	Moderately Well Drained
Salmon Arm Tap	Spallumcheen	Clay	Moderately Well Drained
SN 7	Kalamalka	Loam	Well Drained
Princeton Crossover Control Station	Princeton	Sandy Loam	Well Drained
SN 15	Rutland	Sandy Loam	Rapidly Drained
SN 17 Valve Assembly	Bonnington	Sandy Loam	Well Drained
Kingsvale Control Station	Connaly	Sandy Loam	Well Drained
East Kootenay Exchange	Glenlily	Sandy Loam	Well Drained

6.0 Contaminants Desk Study Results

To complete the desktop review, Wood reviewed environmental database reports (dated May 31, 2021) provided by Environmental Risk Information Services (ERIS). The ERIS reports summarized the findings of environmental database searches of sites within a 250 m radius of the FEI pipelines requiring mitigation works. Within the database reports, several properties (most of which were in urban settings) were identified as areas of potential environmental concern (APECs) where operational activities have or could potentially impact the soils, sediment, water, or vapour of the local environment affecting the proposed work areas. These properties are all located within 125 m of one or more proposed facility works. Wood also reviewed current aerial photographs of each event and facility and identified several additional APECs where contaminated media due to operational activities may be present (specifically in the neighbouring areas surrounding the Penticton Gate Station).

Current or historical migration of contamination from these APECs to the proposed FEI facility locations may have impacted the soils, sediment, water, and vapour, requiring additional mitigation and/or management measures during the proposed works. The APECs were identified based on their proximity (distance and elevation) to mitigation works, presence of historical or current contamination on the property, as well as historical and current property use.

To determine the applicable soil and groundwater quality standards for the proposed events, the following site conditions were considered:

- The land use for each proposed event or facility;
- Drinking water use standards are applicable at all sites in BC, unless precluding conditions are met, per BC Ministry of Environment and Climate Change Strategy (BC ENV) Protocol 21 for Contaminated Sites: Water Use Determination, or unless a BC ENV Director approves otherwise;
- Contaminated Sites Regulation (CSR) soil matrix numerical standards for human health protection for the intake of contaminated soil are applicable at all sites in BC;
- CSR soil matrix numerical standards for environmental protection for toxicity to invertebrates and plants are applicable to all sites in BC;

- Distance to aquatic environments; and
- If any irrigation or livestock watering from groundwater is used within 500 m of the site;

For disposal purposes, all site conditions for all land and water uses are considered applicable (as soil disposal locations are not yet know for certain). Based on the current unknown classification of disposal facilities, the applicable standards are as follows:

- BC CSR Schedule 3.1, Part 1 - Matrix Numerical Soil Standards (All land uses and site-specific factors);
- BC CSR Schedule 3.1, Part 2 - Generic Numerical Soil Standards to Protect Human Health (All land uses);
- BC CSR Schedule 3.1, Part 3 - Generic Numerical Soil Standards to Protect Ecological Health (All land uses); and
- BC CSR Schedule 3.2 - Generic Numerical Groundwater Standards (All water uses).

Therefore, the most stringent standard for all land and water uses may be applied, unless a specific land or water use has been determined not applicable.

Based on the findings of the desktop review, APECs were identified within 125 m of one or more proposed facility works. The results are provided in Table 15 below.

Table 15: Desk Study Assessment of APECs for the TIMC Project

Associated FEI Facility Event	APEC Address	Distance from Facility	Description of Potentially Contaminated Site
Savona Compressor Station	Tunkwa Lake Road, Savona	Onsite	• Compressor station. • 1998: Remediation of hydrocarbon contaminated soil. • 2011: Hazardous waste generator (flammable liquids).
Penticton Gate Station	401 Warren Avenue E, Penticton	Onsite	• 1994: Remediation of soils containing mercury.
Penticton Gate Station	402 Warren Avenue E	Offsite Approximately 32 m south	• Manufacturer: Hardwood veneer and plywood (Structurlam). • 1995: PCB storage (Greyback Construction). • 1997: PCB storage (Kenyon & Co Ltd.).
Penticton Gate Station	445 Warren Avenue E	Offsite East Adjacent	• 2014: Waste storage of paints, enamels, lacquers, thinners and oily water sludge, waste oil filter cake, aluminum, sand (Acklands Grainger).
Penticton Gate Station	465 Warren Avenue E	Offsite Approximately 35 m east	• 1988: Manufacture of travel trailers and campers – sheet metal work (Alphil Industries). • 2012: Site profile registered. Property activities included appliance/ equipment or engine repair, reconditioning, cleaning, salvaging and truck, rail or marine bulk freight handling. Above ground storage tanks were identified on property. (2060 Government Street was also identified on the same site profile).
Penticton Gate Station	485 Warren Avenue E	Offsite Approximately 46 m northeast	• 1987: Manufacture of industrial and commercial machinery and equipment (Waycon Manufacturing – machine shop).
Penticton Gate Station	1945 Government Street	Offsite Approximately 98 m northwest	• 2013: Certificate of Compliance issued by the Ministry for a former service or bulk station owned by Imperial Oil. Property contained aboveground or underground petroleum product tanks.
Penticton Gate Station	#1-2025 Government Street	Offsite Approximately 20 m northwest	• 1995: Waste generation. Antifreeze-waste, waste oil, waste oil filters, waste batteries (wet acid).
Penticton Gate Station	#5- 2025 Government Street	Offsite Approximately 45 m northwest	• 1986: Non-ferrous foundry, metal product manufacturing, machinery manufacturing, wiring device manufacturing (Alcast Foundry).
Penticton Gate Station	2060 Government Street	Offsite North Adjacent	• Manufacturer: Structural wood products and other plate work (AccuTruss Industries (1996) Ind.). • 2012: Site profile registered. Property activities included appliance/ equipment or engine repair, reconditioning, cleaning, salvaging and truck, rail, or marine bulk freight handling. Above ground storage tanks were identified on property. (465 Warren Avenue E was also identified on the same site profile).
Penticton Gate Station	2130 Government Street	Offsite Approximately 60 m south	• 1987: Manufacturer of stainless steelware, silverware and plated ware (Thor-Cast Inc).
Penticton Gate Station	2170 Government Street	Offsite Approximately 90 m south	• 1989: Manufacturer of metal products, fasteners (buttons, pins), jewellery, electroplating, polishing, anodizing and grey and ductile foundries (Silver Shop Casting & Plating). • Manufacturer of jewellery and silverware (Thor Cast Inc). • 2000: Manufacture of jewellery, silverware, and watch wholesaler and other plastic products (Thor Cast).

Associated FEI Facility Event	APEC Address	Distance from Facility	Description of Potentially Contaminated Site
Penticton Gate Station	1980 Barnes Street	Offsite Approximately 125 m northeast	• 2007: Notice of Independent Remediation Completion (no additional information).
Penticton Gate Station	2000 Barnes Street	Offsite Approximately 115 m northeast	• 1995: Waste generator. Waste not listed. (Pederson Metals & Salvage).
Penticton Gate Station	#102-2001 Barnes Street	Offsite Approximately 25 m northeast	• 2008: Manufacturer of non-ferrous metal rolling, drawing, extruding and alloying and ornamental and architectural metal product.
Penticton Gate Station	380 Cherry Avenue	Offsite Approximately 50 m northwest	• 1999: Waste generation. Waste oil.
Penticton Gate Station	444 Okanagan Avenue E	Offsite Approximately 94 m north	• 2011: Waste generator. Leachable toxic oil, compression oil, gear oil, hydraulic oil, grease, Aquacent premium solvent. Oily water sludge/debris, ceramic beads, waste oil filter cake, aluminum sand. • 2013: Waste generator. Oily water sludge/debris, ceramic beads, waste oil filter cake, aluminum sand. Leachable toxic waste cartridges. Flammable liquids and aerosols. • 2014: Waste generator. Oily water sludge/debris, ceramic beads, waste oil filter cake, aluminum sand. Waste oil (absorbent pads, rags), carbon contaminated with oil, waste oil and absorbent mixture.
Penticton Gate Station	466 Okanagan Avenue E	Offsite Approximately 104 m northeast	• 1992 1993: Site remediation complete (partial- only where the USTs were located) and permission to dispose of excavated soils letter (granted). (Petro Canada Bulk Plant Facility) • 1995: Waste generator. Gasoline and petroleum. • Retail fuel storage. Fuel.
Oliver Y Control Station	8702 & 8704 Highway 97, Oliver	Onsite	• Control station. • 2012: Waste generator of batteries (wet acid). • 2012: Waste generator of paints, enamels, lacquers, stains, shellac, varnish, polishes, fillers and thinners. • 2012: Waste generators of corrosive liquids N.O.S. • 2012: Waste generators of waste oil, carbon contaminated with oils and waste oil and absorbent mixtures.
SN 17 Valve Assembly	NA	Onsite	• Valve Assembly. • 2015: Sweet natural gas spill reported to the BC Oil and Gas Commission.
Kingsvale Control Station	Suttie Road	Onsite	• Natural gas control station.
Kingsvale Control Station	Suttie Road	Offsite Approximately 15 m, 44 m and 68 m north (depending on facility)	• Enbridge Kingsvale compressor station and facilities. Natural gas operations.

7.0 Biophysical Field Survey Results

Desktop study data were used to inform the need for field surveys. Thirteen FEI Facilities and one Pipeline Event (SAV VER Event 1) were visited. A summary of the field findings is provided in the following subsections. Pipeline Events 29 and 31 could not be accessed due to access constraints. The sites appear to be accessed through private lands and roadways, there were a number of locked gates and rough roads requiring an ATV to access safely. These sites should be assessed with proper equipment and access permissions.

7.1 SN 6-1

A field assessment of the SN 6-1 station occurred on August 4, 2021. The site is located amongst active agricultural lands. It is situated along a row of mature Ponderosa Pine (*Pinus ponderosa*) (Photo 1) that divide the properties, along with a fence to the south side of the treeline. Access roads are present on either side of these boundary features. The property to the north appears to be an experimental conifer farm composed of topped Douglas-fir (*Pseudotsuga menziesii*), with the southern area used as a traditional fruit orchard. The proposed works encroach slightly into both areas. The station is on level ground, and drainage is expected to be easily contained.

Scattered native species indicative of the pre-disturbance ecosystem include Saskatoon (*Amelanchier alnifolia*), black cottonwood (*Populus balsamifera*) and purple peavine (*Lathyrus nevadensis*). Two species of wildlife were noted on the site: Red-breasted Nuthatch (*Sitta canadensis*) and Mourning Dove (*Zenaida macroura*). Both are common species not of conservation concern. Ground cover within the station is bare gravel with scattered weeds.

The site hosts minor weeds including one species listed under the provincial *Weed Control Act*: spotted knapweed (*Centaurea stoebe* ssp. *maculosa*). Knapweed was also noted along the access road into the site on the north side of the fence. Other nuisance species that are not listed by the *Weed Control Act* include yellow salsify (*Tragopogon dubius*), sow thistle (*Sonchus arvensis*), and yellow hawkweed (*Pilosella giomerata*).

There were no native ecosystems, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment and potential adverse effects associated with poor soil handling, such as processes of compaction and/or admixing.

Suitable breeding bird habitat is limited, although the mature coniferous treeline may provide suitable nesting habitat. The orchard and coniferous tree-farm were of low suitability.

The site and surrounding agricultural area presented low suitability for each of the species at risk identified during the background biophysical review, with the exception of Common Nighthawk (*Chordelies minor*), which may use the gravel substrate within the station for nesting.

7.2 Salmon Arm Tap

A field assessment at the Salmon Arm Tap occurred on August 4. The site was located south of the SN 6-1 valve assembly on the north side of St. Annes Rd adjacent to an agricultural field. The site was on level ground and the direction of drainage was difficult to determine. There was no road ditch along the southern edge of the site and no trees or remnant native ecosystems in the area. A number of weed species were noted, primarily spotted knapweed along the road edge. The ground within the fence is partially vegetated with colonising herb species and grasses. This is generally poor wildlife habitat but does provide marginal suitability for Common Nighthawk nesting.

7.3 SN 7

A field assessment of SN 7 was conducted on August 4, 2021. The site was situated amongst active agricultural areas of apple orchards and vegetable gardens. Adjacent to the site to the southwest, and downslope, is an area of bare ground with occasional herbs, that was used for vehicle parking (Photo 2). This is also the primary access to the site. The remaining sides of the site were neighboured by orchard trees. There were no remnants native ecosystems in the area.

The station has been constructed on level fill; and native ground in the area drained to the southwest. Ground cover within the station was limited to scattered yellow sweet-clover (*Melilotus officinalis*). The area immediately outside the fence hosts a number of nuisance weeds, though none listed under the provincial *Weed Control Act* were noted. Nuisance species included field bindweed (*Convolvulus arvensis*), sow thistle, yellow salsify, common groundsel (*Senecio vulgaris*), cheatgrass (*Bromus tectorum*), and yellow hawkweed. Additionally, common burdock (*Arctium spp.*), which is listed under the *Weed Control Act* for the North Okanagan Regional District, was noted along the paved portion of Davis Road. This road provides access to the site.

Suitable breeding bird habitat was very limited. The orchard trees were generally of low suitability, whilst the site and surrounding agricultural area was of low suitability for all species at risk identified during the background review. Common Nighthawk is the exemption to this, which may use gravel or bare soil areas for nesting.

There were no native ecosystems, species at risk, important habitat features, or watercourses within the proposed project footprint at the time of the field assessment. The stream identified during the background review could not be located and has likely been diverted upstream. Environmental sensitivities are limited to increased weed encroachment on and off the site.

7.4 Penticton Gate Station

A field assessment of the Penticton Gate Station was conducted on August 4, 2021. The site was situated in an industrial setting within the city limits of Penticton. There were no remnants of native ecosystems in the area and very little vegetation on the site. The site drains southeast into the city stormwater system.

No wildlife was noted, and the site is not expected to be suitable for any species at risk. The industrial setting is likely to preclude use by Common Nighthawk.

No weeds were noted within the fence; however, diffuse knapweed (*Centaurea diffusa*), which is listed under the *Weed Control Act*, was noted along Government Street and along the boundary with the property directly to the east of the site (Photo 3). Cheatgrass was also noted along the fence line.

There were no native ecosystems, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment, on and off the site.

7.5 Oliver Y Control Station

A field assessment of the Oliver Y Control Station was conducted on August 5, 2021. The site is situated on the edge of a suburban area to the south and native forest to the north. The Okanagan River is located approximately 100 m to the west of the site. There is an old railway bed between the river and the site. The rail line is raised and forms a continuous berm between the site and the river. The site appears generally level, but it is expected to drain slightly to the northwest.

Native ecosystems in the area are present to the north of the site and include an open canopy of mature Ponderosa Pine (*Pinus ponderosa*) with an understory of antelope-brush (*Purshia tridentata*), tall Oregon-grape (*Mahonia aquifolium*), Saskatoon (*Amelanchier alnlifolia*), with scattered prickly pear cactus (*Opuntia fragilis*) (Photo 4). A considerable amount of poison ivy (*Toxicodendron rydbergii*) was present west of the site and increases with proximity to the river.

The Okanagan River flows south-southwest. There was a large side channel along the reach nearest the station. The railway berm is expected to buffer any potential effects from project activities at the site and preclude the risk of runoff from the site entering the river. Both the mainstem and the side channel had moderate flows during the site assessment. The mainstem had a channel width of approximately 20 m directly west of the site, whilst the side channel was approximately 11 m wide. Both had large channel morphology.

The Vasseux River passes east to west approximately 230 m south of the station. It was dry at the time of the assessment, and no interactions with the project are anticipated given the distance and land use between the station and this stream.

Wildlife species noted near the site included Eastern Kingbird (*Tyrannus tyrannus*), Black-capped Chickadee (*Poecile atricapilus*), and California Quail (*Callipepia californica*). The latter had young.

A number of weed species were noted near the site and along the fence line including two species listed under the *Weed Control Act*: spotted and diffuse knapweed. Nuisance species included Cheatgrass, Russian thistle (*Salsola tragus*) and baby's breath (*Gypsophila* sp.).

As it appears that all the proposed construction activities are located within the fenced station, effects to native ecosystems are not expected from the proposed works. There were no species at risk, important habitat features, or watercourses noted within the proposed project footprint at the time of the field assessment. The site may be suitable for nesting Common Nighthawk, whilst the area directly to the north of the site had a high potential for nesting birds and may support a range of wildlife species at risk such as Lewis's Woodpecker (*Melanerpes lewis*), Olive-sided Flycatcher (*Contopus cooperi*), Sage Thrasher (*Oreoscoptes montanus*), Williamson's Sapsucker (*Sphyrapicus thyroideus*), Yellow-breasted Chat (*Icteria virens*), Gopher Snake (*Pituophis catenifer*), Rubber Boa (*Charina bottae*), Western Skink (*Plestiodon skiltonianus*), and Western Rattlesnake (*Crotalus oreganus*).

7.6 SN 15

This site was assessed on August 5, 2021. This is a relatively small station located along a rural road amongst agricultural land. It was noted that the area to the east of the existing station, along the pipeline RoW, had already been grubbed.

The station was on level ground and no vegetation was noted within the fence. Ground cover within the fence appeared to be clean gravel. Agricultural land adjacent to the station was utilised for silage and it is assumed that the grubbed area hosted the same.

One nuisance species was noted in trace amounts among the grass crop: black medic (*Medicago lupulina*).

Two wildlife species were observed Chipping Sparrow (*Spizella passerina*) and American Robin (*Turdus migratorius*). The area has low suitability for nesting birds and is unlikely to support any species at risk. There was a row of maturing Douglas-fir trees on the opposite side of Como Road that may support nesting.

There were no native ecosystems, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment or reduced soil capability due to poor handling.

7.7 SN 17 Valve Assembly

This site was assessed on August 5, 2021. The site was situated within a rural area among a mature, multistoried, mixed forest dominated by black locust (*Robinia pseudoacacia*), an introduced tree common in the region. Trembling aspen (*Populus tremuloides*), black cottonwood (*Populus trichocarpa*), Douglas-fir and western white pine (*Pinus monticola*) were also present (Photo 6).

Fill has been placed to level the station, but it is situated on a relatively steep northeast aspect and is expected to drain to the northeast. There were numerous areas of exposed bedrock suggesting shallow soils. The terrain drops off steeply beyond the northeast corner of the site. The area was checked for watercourses within 100 m; none were noted.

There was almost no vegetation within the fence and the ground cover was predominantly bare gravel. Spotted knapweed, a noxious species, was noted around the site, particularly along the eastern fence. It was also prevalent along the access road and vehicles entering the site may drive through the species, spreading the seeds. Other nuisance species detected along the road included night-flowering catchfly (*Silene noctiflora*) and trace amounts of bull thistle (*Cirsium vulgare*).

A small flock of wild turkeys (*Meleagris gallopavo*) were noted along the access, approximately 70 m south of the site. Scat of American black bear (*Ursus americanus*) was also noted along the access road. The multistoried, mixed forest around the site is excellent nesting habitat for birds and likely hosts a range of species during the breeding season, including species at risk.

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site and potential interactions with breeding birds if vegetation clearing is required during the breeding season. The overhanging vegetation likely precludes use of the gravel areas by Common Nighthawk. There is potential for interactions with the rooting zone for trees along the eastern boundary of the site. The trees included a few maturing black locust and one veteran black cottonwood, which was approximately 0.7 m diameter at breast height (DBH).

7.8 East Kootenay Exchange

The East Kootenay Exchange was assessed on August 5, 2021. The site was within a rural area on level terrain and situated within a cleared right-of-way. There was another station immediately to the south. The surrounding area hosted young mixed forest dominated by lodgepole pine (*Pinus contorta*) and trembling aspen. Prickly rose (*Rosa acicularis*) and spreading dogbane (*Apocynum androsaemifolium*) was common in the understory (Photo 7).

Wildlife observations included a Sapsucker (*Sphyrapicus* sp.) and Chipping Sparrow. The adjacent forest was of moderate suitability for nesting birds. The site itself comprised bare gravel that might be suitable for ground nesters, including Common Nighthawk.

A considerable number of weeds were noted around the site, though they did appear to be contained within the right-of-way. Spotted knapweed was present along the fence line and access road as well as along the right-of-way north of the site. Oxeye daisy (*Leucanthemum vulgare*) has a scattered distribution along both the access road and right-of-way, whilst Common tansy (*Tanacetum vulgare*) is dominant along the edges of the access road. Both are nuisance species.

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site and potential interactions with breeding birds. There is potential for interactions with the rooting zone of lodgepole pine present in the southwest corner.

7.9 Princeton Crossover Control Station

The Princeton crossover control station was assessed on August 6, 2021. The site was located along the edge of Highway 5A within an expanse of grassland (Photo 8). The site was level, with a slight northwest aspect. Runoff from the site is expected to be to the northwest. There was a dry ditch between the highway and the west boundary of the site. Within the site the ground cover is bare gravel.

No wildlife species were noted, the area hosted limited habitat for breeding birds and with suitability restircted to ground nesting species.

Weeds noted around the site are common rangeland species including noxious spotted knapweed and diffuse knapweed as well as nuisance species yellow salsify, tall tumble mustard (*Sisymbrium altissimum*) and common groundsel.

There were no ecosystems at risk, species at risk, important habitat features, or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site as well as a low likelihood of interactions with ground nesting birds if work occurs during the breeding season.

7.10 Kingsvale Control Station

The site was assessed on August 6, 2021. The site was located on a moderate slope with a southwest aspect, the ground within the fence has been levelled with fill. The site was present at the south end of a larger complex. The site has been previously cleared and no further vegetation clearing is expected to be required. Native forest around the site is composed of young Douglas-fir and lodgepole pine with Saskatoon and a variety of grasses in the understory (Photo 9).

No wildlife species were noted, the cleared area around the station hosts limited habitat for breeding birds and is restricted to ground nesting species. Scattered conifers were occasional, which may provide limited nesting habitat. The adjacent forest was of moderate suitability for nesting birds.

A considerable number of weeds were present within the cleared area including listed noxious species: Spotted knapweed; which was prevalent across the site, and Canada thistle (*Cirsium arvense*); which was noted along the western boundary of the site. Blueweed (*Echium vulgare*) was noted with scattered distribution around the site. This species is considered noxious within the Thomson-Nicola Regional District.

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site as well as a low likelihood of interactions with nesting birds if work occurs during the breeding season.

7.11 Savona Compressor Station

The Savona Compressor Station was assessed on August 7, 2021. The site was situated within open rangeland and agricultural land in a rural setting. The mapped drainages around this site were bulrush (*Schoenoplectus americanus*) dominated wetlands. These were expansive to the north and west of the site. The wetland to the north was within 20 m of the fence. The road acts as a buffer between the site and the wetlands to the west.

The site was on gently sloping terrain with a northwest aspect and drainage is expected to be to the northwest (Photo 10). Site runoff is expected to run into the road ditch along the west side of the site, which drains into the northern wetland and then traverses west-ward through a 600 mm culvert. The culvert was positioned under the Tunkwa Lake Road and links to a large expanse of wetland to the west.

Within in the confines of the site fence the ground was mostly bare gravel with a few scattered summer cypress (*Kochia scoparia*) plants. Around the boundary on the outside of the fence, weeds were substantial and dominant. Summer cypress is the dominant species and forms a dense monoculture along the eastern fence line. A large patch of Canada thistle was noted on a fill pile at the northeast corner of the site. Trace burdock plants were also noted. Spotted knapweed, curly-cup gumweed (*Grindelia squarrosa*), Russian thistle (*Salsola tragus*) and white and yellow (*M. officinalis*) sweet-clover were also noted.

Wildlife observations included Clay-colored Sparrow (*Spizella pallida*), Western Meadowlark (*Sturnella neglecta*), Yellow Warbler (*Setophaga petechial*), and Song Sparrow (*Melospiza melodia*).

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. The adjacent bulrush wetlands likely meet the criteria of a 'hard-stemmed bulrush - deep marsh' which is a blue-listed ecosystem. This wetland may provide habitat for a range of birds and amphibians, including species at risk such as Great basin spadefoot toad (*Spea intermontana*) and western toad (*Anaxyrus boreas*). Dry upland areas may support other species at risk such as Western Rattlesnake and Gophersnake (*Pituophis catenifer*). Management of site runoff will be required to avoid adverse effects to the wetland areas. The risk of weed encroachment on and off the site is also high. Interactions with breeding birds during the nesting season is likely restricted to potential ground nesting species within the site perimeter, including Common Nighthawk.

7.12 SN 3

The SN 3 valve assembly was assessed on August 7, 2021. The site was on the boundary between suburban homes and a city park within the City of Kamloops (Photo 11). The site was gently sloping with a southeast aspect. Residential housing is located to the southeast and Kenna Cartwright Park was located to the north.

Native ecosystems around the site were dominated by open Ponderosa pine and big sagebrush with rabbit brush (*Chrysothamnus viscidiflorus*) and a grass-dominated understory. A few scattered weeds were noted including summer cypress, spotted knapweed, and yellow salsify.

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site as well as a low likelihood of interactions with ground nesting birds if work occurs during the breeding season.

7.13 Pipeline Event 1 SAV VER 323

The SAV VER 323 site was assessed on August 7, 2021. The site was located on gently sloping terrain with a northeast aspect and is situated within rural rangeland. Evidence of use by cattle was prevalent at the crossing location.

Cherry Creek was at medium stage at the time of the assessment. At the proposed crossing location, the stream channel measured 8.5 m with a wetted width of 2.6 m (Photo 12). The slope is approximately 4%. There was a vegetated island at the crossing location that measured approximately 2 m wide, when the wetted region is excluded. The island hosts large woody debris, green alder (*Alnus viridis*), prickly rose, Canada thistle and bull thistle. The latter two species being noxious and nuisance species respectively.

The stream reach along the proposed crossing was noted to be erosion prone with high eroding banks (to 5 m high) both upstream and downstream of the crossing (Photo 13). Rip-rap and grading of the banks at the crossing location appeared to have stabilized the channel at that location. The stream substrate was dominated by sands and cobles with trace gravels. Generally, the surveyed section had very low cover for fish and is generally poor habitat based on a lack of structure, a shallow riffle morphology, lack of cover and poor riparian vegetation. The banks and stream substrate have been heavily impacted by cows, and a considerable amount of green algae was noted within the stream.

There is a small tributary that runs just upslope on the east side of the stream and joins Cherry Creek downstream of the crossing (Figure 3). A fish barrier at the downstream end of the tributary was present at the confluence with Cherry Creek.

The tributary had a poorly defined channel at the time of the assessment and more closely resembles a sloping, sedge-dominated wetland. Large rip-rap has been placed along the right bank. A small amount of water could be heard moving through the area but there was no evidence of a defined channel. Only organic substrate was noted on the reach downstream of the highway. The slope was measured at approximately 9%. There is an access road to the site that comes down from Rodeo Dr. and crosses the tributary. A culvert could not be seen, and a French drain may have been installed. It does, however, appear to be passing water.

Upstream, the tributary crosses under Highway 1 via a 900 mm culvert. A more defined channel was evident on the upstream side of the highway (Photo 14) but it was dry at the time of the assessment. A small spring was noted just on the high side of the highway that appeared to be feeding the sloping wetland below.

A number of wildlife species were noted in the area including Mourning Dove, American Robin, Violet-green Swallow (*Tachycineta thalassina*), Cedar Waxwing (*Bombycilla cedrorum*), Western Meadowlark, Eastern Kingbird, Northern Flicker (*Colaptes auratus*) and Yellow Warbler. No species at risk were observed; however, the site may support species at risk, in particular Great Basin Spadefoot, Western Toad, and Gopher Snake. All of which may be vulnerable to project interactions if the species are encountered at the site.

The surrounding ecosystem has been heavily modified by range use and a number of weeds are present including abundant Canada thistle, sow thistle (*Sonchus sp.*), cheatgrass, and spotted knapweed. Russian olive (*Elaeagnus angustifolia*), a naturalized species in the region, is also present along the riverbanks. Field bindweed, an extremely invasive nuisance species, was noted on the highway fill just northeast of the crossing location.

Native ecosystems in the area appeared to be bunchgrass dominated with occasional big sagebrush (*Artemisia tridentata*). The riparian area adjacent to the stream hosted red-osier dogwood (*Cornus sericea*) and alder. Crested wheatgrass (*Agropyron cristatum*) has been planted on the disturbed soils of previous crossing works.

The proposed crossing area was in a degraded condition; however, a number of potential sensitives exist. Based on the channel morphology and the size of the bedload substrate (up to 35 cm), it must be assumed that high-flow and flooding events regularly occur within the channel. Management of flows around the work area will be key in meeting environmental objectives. As the stream is fish bearing, complete isolation of the worksite and a subsequent fish salvage will likely be required.

Though no species at risk were identified on site, the site had a moderate potential to support a range of species at risk. The open shrubby habitat along the stream provided good nesting habitat for breeding birds. The sloping wetland may support breeding or overwintering amphibians. Works at the site will require the clearing of scattered, tall shrub and riparian vegetation including one tall alder within the stream channel. In addition, there will also likely be interactions with Russian olive, alder, willow, and aspen trees above the left bank of the stream along the RoW.

7.14 SN 4

The SN 4 valve assembly was assessed on 6 May 2022. The site resided adjacent to horse grazed pasture to the east and a small Poderosa pine dominated woodland to the north, with open grassland and occasional brush to the west. The site is gently sloping with a southeasterly aspect. This slope becomes more exegeted to the northwest, where it forms a small hillock.

One wildlife species was noted in the area: Hairy Woodpecker (*Leuconotopicus villosus*). As the vast majority of habitat adjacent to the FEI asset was cleared open grassland it was of restricted potential to only ground nesting species. The coniferous woodland, which exists to the north of the site, is separated from the station by a 50 m section of open grassland and transitional habitat. The woodland contained mature specimens and occasional snags of moderate potential for nesting and roosting species.

Native ecosystems around the site were dominated by open Ponderosa pine with frequent western red cedar and occasional spruce (*Picea sp.*). The understory and open shrubland contained clusters of big sagebrush, rabbit brush and common juniper (*Juniperus communis*). Herbs were occasional and included Oregon grape, western stoneseed (*Lithospermum ruderale*), woolly sunflower (*Eriophyllum lanatum*), with frequently scattered introduced species including musk thistle (*Cardus nutans*), dandelion (*Taraxacum sp.*) and great mullein (*Verbascum Thapsus*). Of these introduced species, the basal leaves of a knapweed (*Centaurea* sp.) were identified, which belongs to a genus listed under the *Weed Control Act*.

There were no ecosystems at risk, species at risk, important habitat features or watercourses within the proposed project footprint at the time of the field assessment. Environmental sensitivities are limited to increased weed encroachment on and off the site as well as a low likelihood of interactions with ground nesting birds if work occurs during the breeding season.

8.0 Contaminants Field Survey Results

The contaminated sites field survey focused on six proposed facilities, which following the desktop study, warranted further investigation. Field surveys identified site activities and surrounding land uses that may result in the presence of contamination, the results of which are displayed in Table 16. The Pipeline Events were not located in proximity to urban areas, and it is assumed a field survey would provide no additional information beyond what has been gathered during the desk study.

APECs identified during the combined desktop review and field survey may require additional attention and investigation prior to environmental media (soil, sediment, and water) removal activities. A summary of identified APECs is provided in Table 17 and displayed in Figure 4. Wood understands that facility alterations may include varying depths of soil excavations, and that groundwater may be encountered within some of the works. If dewatering must be completed at an event, groundwater disposal will be required. For this reason, APECs and potential contaminants of concern (PCOC) for both soil and groundwater have been considered applicable for the purposes of this review.

Table 16: Contamination Field Survey Observations

Associated FEI Facility or Pipeline Event	Field Survey Observations
Savona Compressor Station	• The station was relatively flat and surfaced with gravel. The station was largely clear of clutter. No on-site surficial staining was observed. • Waste storage compounds were not observed onsite. – Two sealed unlabelled barrels (approximately 200 L volume, unknown contents) were located along the west side of site. The barrels appeared to have some corrosion (one more corroded than the other); however, the surrounding gravels didn't appear to have staining. • The facility had a pesticide notice posted on the site fencing. Details of herbicide application were unknown as the ink in the notice had faded. • Two offsite pole mounted transformers were located adjacent to Tunkwa Lake Road approximately 50 and 58 m southwest of site. The transformers appeared to be in good condition with no sign of leaks. Transformer oil PCB concentration labels were not observed. • Three offsite pole mounted transformers were located north adjacent to the northeast corner of site. The transformers appeared to be in good condition with no sign of leaks. Transformer oil PCB concentration labels were not observed. • No surficial staining was observed on the surrounding properties.
Penticton Gate Station	• The station was relatively flat and surfaced with gravel. The station was largely clear of clutter and did not appear to have any fuel, chemical, or waste storage compounds. No onsite surficial staining was observed. • The facility was treated with pesticides on 2 June 2021 by DJ Silviculture according to a noticed posted on the facility gate. The herbicides applied were listed as Banvel, VP480, and Arsenal Powerline. • Bulk fuel storage and Petro Canada fuel cardlock approximately 104 m N of Site (466 Okanagan Ave). • Vehicle and heavy machinery service and repair shops were present neighbouring the facility. – Integrity Auto Repair approximately 18 m W (#103- 2071 Government St) – Simpson Innovations Inc. approximately 35 m E (#201 - 465 Warren Ave) – OK Tires approximately 46 m E (#101 485 Warren Ave E) – G & C Automotive Service approximately 60 m NW (# 1- 2025 Government St) – Wal-Kat Equipment approximately 115 m E (2000 Barnes St) • Manufacturing companies were present neighbouring the facility. – Kieson Fabrication and Machine Ltd. approximately 25 m E (#102-2001 Barnes St) – Structurlam approximately 55 m S (2176 Government St – distance to yard) • FEI property with paved equipment storage yard approximately 94 m N (444 Okanagan Ave) containing electrical equipment and a bulk tank. • Unpaved storage yards containing mobile machinery (excavators, semi tractor trailers etc.) and materials such as fuel tanks. – Unknown owner: commercial vehicles, recreational vehicles, boats, camper trailers adjacent and north of site on Cherry Ave – Greyback Construction storage yard: mobile equipment, fuel tanks approximately 40 m SE (402 Warren Avenue) – Berry & Smith Trucking storage yard: semi tractor trailers, some observed surficial staining approximately 72 m SW (370 Warren Ave) • Pole mounted transformer (1) located south and adjacent to the SW corner of site. Transformer label indicated a presence of < 2 ppb of PCB within the transformer oil. • Pole mounted transformers neighbouring site: One (1) located approximately 17 m south of site (Warren Ave) and three (3) located approximately 28 m N of site (Government St) all had labels which indicated < 2 ppb of PCB within the transformer oil.

Associated FEI Facility or Pipeline Event	Field Survey Observations
Oliver Y Control Station	• The station was relatively flat and surfaced with gravel. The station was largely clear of clutter; however, an outside storage area was present within the northwest corner of the station. No on-site surficial staining was observed. • Pad mounted transformer was located mid-facility along the north border. The transformer looked to be in good condition. Transformer oil labels were not observed. • Barrels were located within the facility (approximately 200 L volume): – Sixteen metal barrels were in the northwest corner. Seven are stored on their side and are inferred to be empty and nine are stored upright on timbers laid on gravel; contents unknown. All 16 barrels are unlabelled and sealed shut with lids. No stained gravel was observed. – One plastic barrel (approximately 200 L volume) was located next to the Office building. It was sealed with a lid and appeared to be labelled. Contents could not be determined as I was evaluating the facility from outside of the station. No staining was observed on the underlying concrete. – One metal barrel (approximately 200 L volume) and one metal bucket (approximately 15 L volume) were in the northeast corner siting on gravel. Both appeared unlabelled and sealed with lids. No surficial staining of the gravels was observed. Some corrosion was observed on the metal bucket. • Waste bins were located on the facility. The contents of the bins could not be determined due to the distance of the observer. – Some waste bins were located on a concrete slab located west and adjacent to the Office building. The area appeared tidy and no staining was observed. – One waste bin, which appeared to hold recyclable materials (wood or metal) was present within the southeast quadrant of site. The surrounding area appeared to be tidy with no sign of soil staining. – Two waste bins (one garbage bin and one recycling bin) were present at the station entrance gate. The area was tidy and no staining was observed. • The facility was treated with pesticides on 25th May 2021 by DJ Silviculture according to a noticed posted on the facility gate. The herbicides applied were listed as Banvel and VP480. • One pole mounted transformer was located adjacent to the facility near the southeast corner. The transformer was affixed with a "TESTED" label, which indicated that the transformer oil had been tested for PCBs. The concentration of PCBs present (if any) was not readily discernable from the ground. The transformer appeared in good condition with no signs of leakage. • One pole mounted transformer was located adjacent to the facility near the northeast corner. No labels indicating the presence or testing of PCBs were observed. The transformer appeared in good condition with no signs of leakage. • One pad mounted transformer associated with a pumphouse was located approximately 150 m southwest of the facility next to the Okanagan River. The transformer did not show signs of leakage. • An unpaved recreational vehicle, boat, and vehicle storage yard was located approximately 40 m west and south of the facility. The storage yard was used by the adjacent residential community. No soil staining was observed. • A small orchard (possibly a hobby farm) is located approximately 24 m east of Site across Highway 97 (8703 Hwy 97). Seasonal application of pesticides is suspected.
SN17 Valve Assembly	• The facility was relatively flat except along the east fence border and a small northern of near the north fence line portion which were sloped to the north. Much of the facility ground cover was gravel, however some bare earth patches were observed as well as a partially vegetated area near the facilities north. • The extension area located south of the facility was higher in elevation that the SN17 facility and was sloped to the north. The extension area was sparsely vegetated. • No soil staining was observed either with the SN17 facility or on the proposed extension area. • An herbicide notice was posted on the southern facility fence. The writing on the notice, however; had faded and the date of application and type of herbicides applied could not be discerned. • Visual signs of contamination were not observed within the surrounding area.

Associated FEI Facility or Pipeline Event	Field Survey Observations
East Kootenay Exchange	• The facility was relatively flat and surfaced with gravel. The station was tidy and largely clear of clutter. No surficial staining was observed. • The extension area was relatively flat and was gravelled with some vegetated on the road leading to the facility. The remainder of the extension appeared to be vegetated with grasses. No surficial staining was observed. • The facility was treated with herbicides on 15 July 2021 by DJ Silviculture according to a noticed posted on the facility gate. The herbicides applied were listed as Banvel VM and Vision Max. • One PVC pipe, inferred to be a monitoring well, was located in the SE corner of the extension area. • Two offsite pole mounted transformers were present southwest of the facility and extension. – One pole mounted transformer was located approximately 18 m south of the extension area. The transformer label indicated a presence of < 2 ppb of PCB within the transformer oil. – One pole mounted transformer was located approximately 47 m southwest of the extension area. There was no observed transformer label indicating the PCB concentration. • Trans Canada East Kootenay Exchange facilities were present approximately 6 and 35 m south of the Facility and extension area. – One above ground fuel tank was present on the eastern portion of the Trans Canada facility approximately 61 m south of the site extension. The tank appeared to be secured to a concrete slab. The slab had some discolouration, indicating possible leakage or drips and spills during tank fuelling. – Other than the previously mentioned concrete slab, the Trans Canada facilities had no observed surficial staining. • Neighbouring FEI East Kootenay Exchange Facilities were present approximately 62 m and 117 m north of the FEI facility. – One pad mounted Cummins generator (inferred to be diesel powered) was observed approximately 145 m north of Site. No observed staining on the pad or surrounding surface soils was observed. – Two bulk odorant tanks of unknown volume were present approximately 145 m north. The tanks are inferred to contain mercaptan. – No surficial staining was observed within the neighbouring FEI facilities. • Several vehicles (standard cars and trucks) as well as snowmobiles and campers were observed to be parked approximately 175 m southwest of the site. The vehicles appeared to be in various stages of repair. The grass that the vehicles were parked in obscured the ground and potential soil staining could not be ascertained. This area was observed to be lower in elevation than site.
Kingsvale Control Station	• The station was relatively flat and surfaced with gravel. The station was largely clear of clutter. Materials such as cables, wire, dunnage, pallets, and metal were largely stored in the facilities southeast corner or along the eastern fence line. No on-site surficial staining was observed. • The extension area consisted of a pre-existing roadway located west and adjacent to the facility. No surficial stains were observed. • Waste storage compounds were not observed onsite. – One sealed barrel labelled as waste (approximately 200 L volume, unknown contents) was located in the northeast corner of site. The barrel appeared to have some corrosion; however, the surrounding gravels did not appear to have staining. – General garbage and recycling materials appeared to be disposed of in a white metal bin located next to the facility Control Building (mid-site) or a silver standard sized garbage can was located south on site. Its contents were unknown. • The facility was treated with pesticides on 10th July 2021 by DJ Silviculture according to a noticed posted on the facility gate. The herbicides applied were listed as Banvel and Glyphosate. • Three pole mounted transformers were present on site along the southern border. The transformers appeared to be in good condition with no sign of leaks. Transformer oil PCB concentration labels were not observed. • One capped PVC pipe was observed within the southeast corner of the facility. It was inferred to be a monitoring well. • Neighbouring properties to the north and northwest consisted of natural gas Enbridge compressor station and associated facilities. – One fuel tank was observed approximately 83 m north of Site. Its contents are unknown. No staining or signs of tank leakage were observed. • No surficial staining was observed on the surrounding properties.

Table 17: Potential Contaminants of Concern at Proposed FEI Facilities

Facility	APEC	Distance from Facility (m)	Potential Contaminants of Concern
Savona Compressor Station	(APEC 1) Site operational activities Historical hazardous waste generator (flammable liquids)	Onsite	• Light and heavy extractable petroleum hydrocarbons (LEPH/HEPH) • Polycyclic aromatic hydrocarbons (PAHs) • Benzene, toluene, ethylbenzene, xylenes (BTEX) • Volatile petroleum hydrocarbons (VPH) • Volatile organic compounds (VOCs) • Metals
Penticton Gate Station	(APEC1) Site operational activities Historical remediation of mercury contaminated soil	Onsite	• Mercury
Penticton Gate Station	(APEC 2) Historical waste storage (APEC 3) Historical operations and above ground storage tanks (APEC 4) Automotive repair shops and vehicle/ machinery servicing and use of fuel and waste storage tanks (APEC 5) Current/ historical metal product fabrication or machine shops (APEC 6) Current/ historical manufacture of structural wood (APEC7) Current/ historical fuel facilities. Use of fuel storage tanks and known soil remediation activities. (APEC 8) Unpaved storage yard with heavy machinery, above ground storage tanks, gas and diesel powered construction equipment Known historical storage of PCBs. (APEC 9) Historical remediation conducted. Remediation method and contaminants unknown) (APEC 10) Historical waste generators.	Offsite East adjacent North adjacent 18 m west, 35 m east, 46 m east, 60 m northwest 25 m east, 35 m east, 45 m Northwest, 60 m south North adjacent, 32 m and 55 m south 98 m northwest, 104 m northeast 40 m southeast, 115m northeast, 50 m northwest, 94 m north	• LEPH/HEPH • PAHs • BTEX • VPH • VOCs • Metals • Glycols • Methyl tert-butyl ether (MTBE) • Polychlorinated biphenyl (PCBs)

Facility	APEC	Distance from Facility (m)	Potential Contaminants of Concern
	(APEC 11) Paved storage yard contains electrical equipment and one bulk storage tank. (APEC 12) Unpaved storage yards with parked recreational vehicles, watercraft, commercial transport vehicles, trailers. Surficial staining observed at one yard.	94 m north North adjacent, 72 m southwest	
Oliver Y Control Station	(APEC 1) Site operational activities Historical waste generation (APEC 2) Chemical and/ or waste storage area (suspected) (APEC 3) Waste containers, some unlabeled (APEC 4) Pad mounted transformer, PCB contents unknown	Onsite	• LEPH/HEPH • PAH • BTEX • VPH • VOCs • metals • PCBs
Oliver Y Control Station	(APEC 5) Unpaved storage yard storing parked recreational and standard vehicles, and boats (APEC 6) Fruit orchard	40 m west 24 m east	• LEPH/HEPH • PAH • BTEX • VPH • VOCs • Glycols • Metals • Pesticides
East Kootenay Exchange	(APEC 1) TransCanada East Kootenay Exchange operational activities. Above ground fuel tank secured to a stained concrete pad	6 m and 35 m south	• LEPH/HEPH • PAH • BTEX • VPH • VOCs
Kingsvale Control Station	(APEC 1) Waste barrel (exterior corrosion) (APEC 2) Pole mounted transformers with unknown PCB concentrations	Onsite	• PCBs

9.0 Legislative Overview

This section lists and describes applicable legislation and regulations that may apply to the TIMC Project.

9.1 Federal Legislation

9.1.1 Fisheries Act

The Canadian *Fisheries Act* protects fish and fish habitat throughout Canada. A request for review may be required for activities occurring in or adjacent to watercourses or waterbodies that could result in harmful alteration, disruption or destruction of fish habitat. A request for review may not be required if the activities for a project can follow the measures to protect fish and fish habitat.

If death of fish or the harmful alteration, disruption or destruction of fish habitat will likely result from a project, there is a requirement to obtain an authorization from the Fisheries and Oceans Canada (DFO) as per Paragraph 34.4(2)(b) or 35(2)(b) of the *Fisheries Act* Regulations.

9.1.2 Migratory Bird Convention Act

The *Migratory Birds Convention Act* protects species of migratory birds in Canada by prohibiting the taking of migratory bird nests and the deposition of harmful substances in waters or areas used by migratory birds. Because the BC *Wildlife Act* protects most bird species, including migratory birds, recommended mitigation measures pursuant to the *Wildlife Act* and requirements under the *Wildlife Act* are anticipated to encompass the requirements of the *Migratory Bird Convention Act*.

9.1.3 Species at Risk Act

The federal *Species at Risk Act* provides legal protection for wildlife species at risk. The Act establishes Schedule 1, which is the official list of wildlife species at risk. The Act prohibits killing, harming, harassing, taking, and possessing endangered, threatened, and extirpated species listed in Schedule 1. The prohibitions apply to federal lands or lands under the authority of some federal agencies, all migratory birds listed in Schedule 1 and the *Migratory Birds Convention Act*, and all endangered, threatened, and extirpated aquatic species listed in Schedule 1 anywhere they occur (Government of Canada 2020).

9.2 Provincial Legislation

9.2.1 BC Weed Control Act

Invasive plants, also known as weeds, are responsible for reducing crop yield and quality and often lead to environmental degradation, resulting in loss of native plant and animal habitat. Some invasive plants also harbour crop diseases, reduce property values, spoil aesthetics of natural landscapes and many can be harmful to humans, livestock and wildlife (Invasive species Council of BC, 2021). The BC *Weed Control Act* imposes a duty on all land occupiers to control designated noxious plants. The purpose for the Act is to protect the province's economy, natural resources, and society from the adverse effects of invasive weeds.

9.2.2 Environmental Management Act

Contamination in BC is governed by the *Environmental Management Act,* administered by the Ministry of Environment and Climate Change Strategy via the BC Contaminated Sites Regulation (CSR). The Act and CSR set out general principles for identification, assessment, and remediation of contaminated sites. These principles include liability for contaminated sites. With certain exceptions, both current and former owners and operators of sites are considered absolutely, retroactively, and jointly and separately liable for remediation costs, which include site investigation costs. In BC, a contaminated site is defined as an area of land in which the soil or underlying groundwater, soil vapour, or sediment contains a prescribed substance in quantities or concentrations exceeding prescribed risk-based or numerical criteria, standards, or conditions. Specific provisions are set out in the CSR, (BC Reg. 375/96 including 13 stages of amendments up to BC Reg. 13/2019, January 24, 2019) which is the enabling regulation of the Act with respect to contaminated sites.

The CSR numerical soil standards are divided into the categories of matrix numerical standards (Schedule 3.1 Part 1) and generic numerical standards (Schedule 3.1 Part 2 and Part 3). Generic standards are intended to protect human and ecological health at any site without consideration of site-specific factors other than land use.

The matrix numerical standards are applied according to land use (wildlands, agricultural, urban park, residential, commercial or industrial), and also according to site-specific factors, which include the following:

- (Human) intake of contaminated soil;
- Toxicity to soil invertebrates and plants;
- Livestock ingesting soil and fodder;
- Major microbial functional impairment;
- Groundwater used for drinking water;
- Groundwater flow to surface water used by aquatic life (freshwater and marine);
- Groundwater used for livestock watering; and
- Groundwater used for irrigation watering.

The CSR specifies groundwater standards for drinking, aquatic life, irrigation, and livestock watering water uses. The CSR contains requirements to ensure that groundwater at a site is suitable for current and future uses and is of adequate quality to protect adjacent water uses. Applicable groundwater standards are determined in accordance with the BC ENV Protocol 21 for Contaminated Sites Water Use Determination (P21) (BC ENV, 2017).

9.2.3 Wildlife Act

The BC *Wildlife Act* protects many vertebrate animal species from direct harm, except where allowed by regulation. Salvage of wildlife from harm that may occur during construction activities, such as those that would occur for the TIMC Project, requires a permit under section 19 of the Act. The *Wildlife Act* also protect birds, nests, and eggs.

Pre-construction nest surveys are also recommended for events near potential bird nesting habitat. Subsequent setbacks and alterations of work timing may be recommended by a qualified professional to avoid the incidental take of a bird nest (i.e., nest abandonment), which is prohibited by the *Wildlife Act*.

9.2.4 Water Sustainability Act

BC's *Water Sustainability Act* (WSA) provides the regulatory framework for managing the diversion and use of water resources throughout BC. This Act is complex legislation with four current regulations and more regulations proposed for the future. Section 11 of the WSA requires approval for making "changes in and about a stream."

9.2.5 Agricultural Land Commission Act

The *Agricultural Land Commission Act* sets the legislative framework for the establishment and administration of agricultural land preservation in BC (Provincial Agricultural Land Commission, 2014). In the Act, land is designated in the ALR, which places a strict emphasis on soil handling methods that will maintain the agricultural capabilities of the land. Six FEI Facilities are located in Agricultural Land Reserve areas; SN 4, SN 6-1, Salmon Arm Tap, SN 7, Princeton Crossover Station and SN 15. Each of these sites have proposed temporary workspaces outside the facility perimeter and it is assumed that an application to the ALC will be required.

9.3 Regional

The TIMC Project traverses the Regional Districts of Thompson-Nicola, Columbia-Shuswap, North Okanagan, Central Okanagan, Okanagan-Similkameen, Kootenay Boundary and Central Kootenay. With the exception of District Bylaws associated with the Thompson-Nicola Region, no other District Bylaws were directly applicable to the TIMC Project.

9.3.1 Regional Districts of Thompson-Nicola

Two District Bylaws for the Thompson-Nicola Region (TNRD) were deemed applicable to the TIMC Project:

<u>Noise control</u>

The TNRD Noise Control Bylaw (Bylaw No. 2480) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. This entails, no construction works on any day before 7 am or after 9:30 pm. This will be applicable to SN 4 which falls outside the City of Kamloops Municipal boundary.

<u>Invasive Plant Control</u>

The TNRD Invasive Plant Control Bylaw (Bylaw No. 2529) mirrors requirements outlined in the BC *Weed Control Act*, in that it prohibits the accumulation and/or spread of noxious weeds and requires the occupier to clear any identified species listed in Schedule A of the Act.

9.4 Municipal Bylaws

Municipal bylaws have been reviewed for their applicability to the proposed TIMC Project and are summarized below.

9.4.1 City of Kamloops

Four City of Kamloops Bylaws were deemed to be applicable to the TIMC Project:

<u>Tree Protection</u>

The City of Kamloops Tree Protection Bylaw (Bylaw No. 50-1) prohibits the cutting or damaging of a tree (defined as greater than or equal to 10 cm DBHand at least 5 m tall), including activities in the dripline, that could compromise or cause the death of the tree. The provisions of this Bylaw do not apply to work carried out under the authority of the City. If works are not carried out under the authority of the City, potential Bylaw exemptions, which are applicable to the TIMC Project, include:

- Removal of trees deemed to be hazardous and there is immediate danger to human safety
- Removal of trees of any of the following invasive species:
  - Russian olive (*Elaeagnus angustifolia*)
  - Siberian elm (*Ulmus pumila*); or

- Tree of Heaven (*Ailanthus altissima*)

<u>Earthworks</u>

The City of Kamloops Earthworks Bylaw (Bylaw No. 4-19) prohibits the movement, deposit or removal of soils without first obtaining a permit. Soil removal will be required at one facility within the City of Kamloops (SN 3) as all below-groundwork in facilities will require hydrovacing. This will also apply to Pipeline Event SAV VER 32, where earthworks are required. It is therefore expected that Earthwork permits are required by the TIMC Project

<u>Noise Control</u>

The City of Kamloops Noise Control Bylaw (Bylaw No. 49-1) sets specific regulations for construction hours and engine idling, which the TIMC Project will be expected to adhere to. This entails, no construction works on any day before 7 am or after 10 pm, and no engine shall be left idling for longer than three minutes.

<u>Watercourse Regulations</u>

The City of Kamloops Watercourse Regulation Bylaw (Bylaw 17-6) prohibits the pollution, obstruction, or impediment of waterways, including ditches, drains, and sewers. The bylaw also prohibits the storage of deleterious materials to be placed or stored on the bank of a watercourse. It is anticipated that best management practices for soil erosion and water quality will be adopted on the TIMC Project. Through adherence to these practices the Project will be compliant with this Bylaw.

9.4.2 The Corporation of the City of Vernon

Three City of Vernon Bylaws were deemed to be applicable to the TIMC Project:

<u>Tree Protection</u>

The City of Vernon Tree Protection Bylaw (No. 4152) prohibits a person to damage, destroy or remove any tree, the stem of which exceeds a DBH of 8 cm without a permit to do so. An exception to this Bylaw, which may be applicable to the TIMC Project includes:

- Removal of trees that may be Hazardous Trees and the damage is done by a utility company.

<u>Noise Control</u>

The City of Vernon Good Neighbour Bylaw (Bylaw No. 4980) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. This entails, no construction works on any day before 7 am or after 9 pm.

<u>Rubbish Removal</u>

The City of Vernon Good Neighbour Bylaw (Bylaw No. 5784) requires the removal of all rubbish from footpaths and sidewalks that border a property within 24 hours.

<u>Soil Removal and Deposition</u>

The City of Vernon Soil Removal and Deposition Bylaw (Bylaw No. 5259) prohibits the movement, deposition and/or removal of soils without first obtaining a permit. Soil removal will be required at facility SN 7. The TIMC Project would be except from this permit requirement if soil removal involves less than 50 m^3 of soil per calendar year.

<u>Weed Control</u>

The City of Vernon Good Neighbour Bylaw (Bylaw No. 4980) prohibits the accumulation and/or spread of noxious weeds on or from a property and its surrounding lanes and boulevards.

9.4.3 The Corporation of the City of Penticton

Two City of Penticton Bylaws were deemed to be applicable to the TIMC Project:

Earthworks

The City of Penticton Earthworks Bylaw (Bylaw No. 2006-65) makes it unlawful for any Person to engage in Earthwork within the City without first having applied for and obtained a Permit. No Bylaw exclusion apply for the proposed works. As earthworks are required for Facility SN 9, it expected that the TIMC Project will apply for a permit.

Noise control

The City of Penticton Good Neighbour Bylaw (Bylaw No. 2012-5050) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. This entails, no construction works on any day before 7 am or after 9 pm.

Property Maintenance

The City of Penticton Good Neighbour Bylaw (Bylaw No. 2012-5050) sets specific regulations for property maintenance, three of which may apply to the TIMC Project:

- It is prohibited to let rubbish, garbage and discarded material accumulate on a property;
- It is prohibited to let water collect or accumulate for a period of time with which it can become stagnant as this may permit breeding of mosquitoes which may result in the spread of West Nile virus or other harmful disease-bearing insects; and
- It is prohibited to let accumulation of dead landscaping, vegetation, noxious weeds or other growths to occur and/or to remain on a property.

Each of these Bylaw stipulations can be mitigated through the adoption of best management practices during construction.

9.4.4 The Town of Oliver

One Town of Oliver Bylaw was deemed to be applicable to the TIMC Project:

Noise Regulations

The Town of Oliver Good Neighbour Bylaw (Bylaw No. 1357) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. It is prohibited to generate construction noise before 7 am or after 8 pm Monday through Saturday or before 8 am or after 8 pm on Sunday.

Property Maintenance

The Town of Oliver Good Neighbour Bylaw (Bylaw No. 1357) prohibits water, rubbish, and noxious weeds to collect or accumulate on a property. The TIMC Project can mitigate these bylaw stipulations through the adoption of best management practices during construction.

9.4.5 The Town of Princeton

One Town of Oliver Bylaw was deemed to be applicable to the TIMC Project:

Noise Regulations

The Town of Oliver Noise Regulation Bylaw (Bylaw No. 923) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. It is prohibited to generate construction noise before

7 am or after 8 pm Monday through Friday, or before 8 am or after 8 pm on Saturday. It is prohibited to generate construction noise on Sunday.

9.4.6 City of Grand Folks

Three City of Grand Folks Bylaw was deemed to be applicable to the TIMC Project:

Noise Regulations

The Town of Oliver Noise Regulation Bylaw (Bylaw No. 923) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. It is prohibited to generate construction noise before 7 am or after 8 pm. It is also prohibited to generate noise from a parked diesel vehicle for a period of greater than 15 minutes between the hours of 10 pm and 7 am.

9.4.7 City of Trail

One City of Trail Bylaw was deemed to be applicable to the TIMC Project:

Garbage and Waste

The City of Trail Garbage and Waste Bylaw (Bylaw No. 2662) prohibits the disposal of any garbage, building waste, yard and garden waste, or any other noxious weeds to any location other than an appropriate landfill site.

Noise Control

The City of Trail Noise Control Bylaw (Bylaw No. 2433) sets specific regulations for construction hours, which the TIMC Project will be expected to adhere to. It is prohibited to generate construction noise before 7 am or after 11 pm.

10.0 Potential Environmental Effects and Mitigation

10.1 Biophysical Features

The TMIC Project may result in adverse effects to environmental resources. Mitigation proposed herein is provided to reduce the risk and magnitude of these effects. A project specific Environmental Management Plan (EMP) should be prepared to further address project-specific risk and site-specific mitigation measures. General measures to address environmental resources identified during the background and field assessment are provided in Table 18. A residual risk category is assigned qualitatively to each resource based on the following criteria:

- Negligible: insignificant or undetectable;
- Low: detectable but within the range of natural variation and below regulatory thresholds;
- Moderate: detectable but may approach or meet regulator thresholds; and
- High: beyond regulator threshold and limits of natural variation.

Table 18: Potential Environmental Effects, Proposed Mitigation and Residual Risk Rating

Environmental Resource	Potential Adverse Effect	Applicable Event / Facility	Proposed Mitigation	Residual Effect
Agricultural Land	Reduced agricultural capability due to soil degradation from improper handling.	SN 4 SN 6-1 Salmon Arm Tap SN 7 Princeton Crossover Station SN 15	• Ensure proper soil handling procedures are applied. • Strip and store topsoil (A horizon) separate from mineral soil. • Avoid admixing. • Where clay is present, use rig-mats or light, tracked equipment to avoid compaction of clay soils. • Do not work in saturated conditions.	Low
Plant Species of Conservation Concern	No plants of conservation concern or habitat with a high likelihood of supporting such species were identified within the footprint. Effects are limited to degradation of nearby supporting habitat due to surface runoff or spills.	SAV Compressor Oliver Y Control Station SAV VER Event 1	• Manage surface drainage so that no turbid water enters adjacent habitats. • Have a spill response plan in place and ensure proper handling of deleterious substances. • No known records of plant species of conservation concern were identified within 1 km of FEI Facilities and Pipeline Events. However, in the event that a plant species of conservation concern is identified, or the project may impact suitable habitat, conduct a species-specific pre-clearing survey, salvage and relocate species.	Low
Ecological Communities of Conservation Concern	No ecological communities of concern were identified within the project footprint, potential interactions due to adjacency only.	SN 17	• Ensure adequate work site containment so that turbid runoff or deleterious substances do not migrate off site. • See mitigation for weeds. • Restore disturbed areas quickly after construction.	Negligible
Trees	Loss or decline in health of trees along perimeter of proposed works due to damage to tree roots or soil compaction.	SN 17 SAV VER Event 1 East Kootenay Exchange	• Avoid damaging tree roots by keeping excavations outside of the tree root plate (drip line), to the extent practicable. • Ensure limit of construction are clearly demarcated on the ground prior to commencing work.	Low
Noxious Weeds and Invasive Species	Increase spread of noxious weeds onto site and/or into the wider landscape.	All facilities and events, in particular: SN 4 Oliver Control Station SN 17 East Kootenay Exchange Princeton Crossover Control Station Kingsvale Control Station Savona Compressor Station SAV VER Event 1	• Prepare a weed management plan for the project that includes removal of noxious species from the sites, prior to commencing construction. • Ensure machinery both entering and departing sites are clean and free of soil and plant material, implement vehicle cleaning station, as necessary.	Moderate
Wildlife and Wildlife Habitat	Temporary degradation and loss of wildlife habitat including sensory effects within adjacent habitats.	Oliver Y Control Station SAV VER Event 1 Savona Compressor Station SN 17	• Avoid ground disturbing work in wildlife habitat, where practicable. • Restore disturbed areas as quickly as possible. • Contain the worksite to limit sensory effects to adjacent habitat. • If work or access is being conducted outside of the fence at Savona Compressor Station, conduct pre-clearing surveys for species at risk.	Low

Environmental Resource	Potential Adverse Effect	Applicable Event / Facility	Proposed Mitigation	Residual Effect
Breeding Birds	Incidental loss and disturbance to nests and nesting species.	SN 6-1 Salmon Arm Tap SN 7 Oliver Y Control Station SN 17 East Kootenay Exchange Princeton Crossover Control Station Kingsvale Control Station Savona Compressor Station SN 3 SN 4 SAV VER Event 1 KIN PRI Event 29 KIN PRI Event 31	• Undertake clearing and work outside of the breeding bird nesting period (Environment Canada 2021). Be aware of sensory effects to adjacent habitat and required buffers for active nests (generally 30 m but species-specific buffers exist to 1 km). • If clearing occurs within the nesting period, conduct a pre-clearing nesting bird survey to determine the risk of non-conformance with the MBCA. • Where Common Nighthawk nesting may occur, conduct a pre-work survey of work areas. • Where interaction with nesting species may occur, engage a qualified professional to provide site specific recommendations and mitigation.	Moderate
Fish and Fish Habitat	Modification to, or destruction of fish habitat. Direct impacts to fish.	SAV VER Event 1	• Prepare a site-specific EMP that includes: – a diversion and dewatering plan; – fish salvage, as required; – spill response and hazardous material management plan; and – sediment and erosion control plan. • Have an Environmental Monitor on site during all instream works. • Observe the Thompson Region instream work window. • Minimize the duration of instream works. • Restore stream banks and riparian areas soon after construction.	Moderate
Water Quality	Impacts to surface water quality due to inadvertent introduction of deleterious substances.	Savona Compressor Station SAV VER Event 1	• Manage site run-off so that turbid water does not enter a watercourse. • Install sediment and erosion control measures to contain the worksite. • Suspend earth work during saturated soil conditions or torrential rain events. • Develop a spill response and hazardous material management plan. • Restore the site as soon after construction as practicable.	Low

10.2 Contaminants

The TMIC Project may encounter APECs and potential contaminants of concern (PCOCs) which have migrated to site, originated on site, or otherwise affected proposed work areas. APECs were identified at the following locations (Table 17, Figures 4.1 – 4.6):

- Savona Compressor Station
- Penticton Gate Station
- Oliver Y Control Station
- Kingsvale Control Station
- SN 17 Valve Assembly
- East Kootenay Exchange

For each project facility a project specific Environmental Management Plan (EMP) should be prepared to address site specific conditions and provide the appropriate actions and mitigation measures.

At a minimum the EMP should include standard operating procedures that:

- provide detailed actions when contaminated soils are encountered;
- provide detailed actions when contaminated groundwater is encountered;
- provide detailed actions when soils and or groundwater are to be exported offsite;
- provide operational procedures that minimize the environmental effects of higher risk project activities (equipment fuelling and waste management); and
- provide required reporting procedures when environmental incidents occur during project activities.

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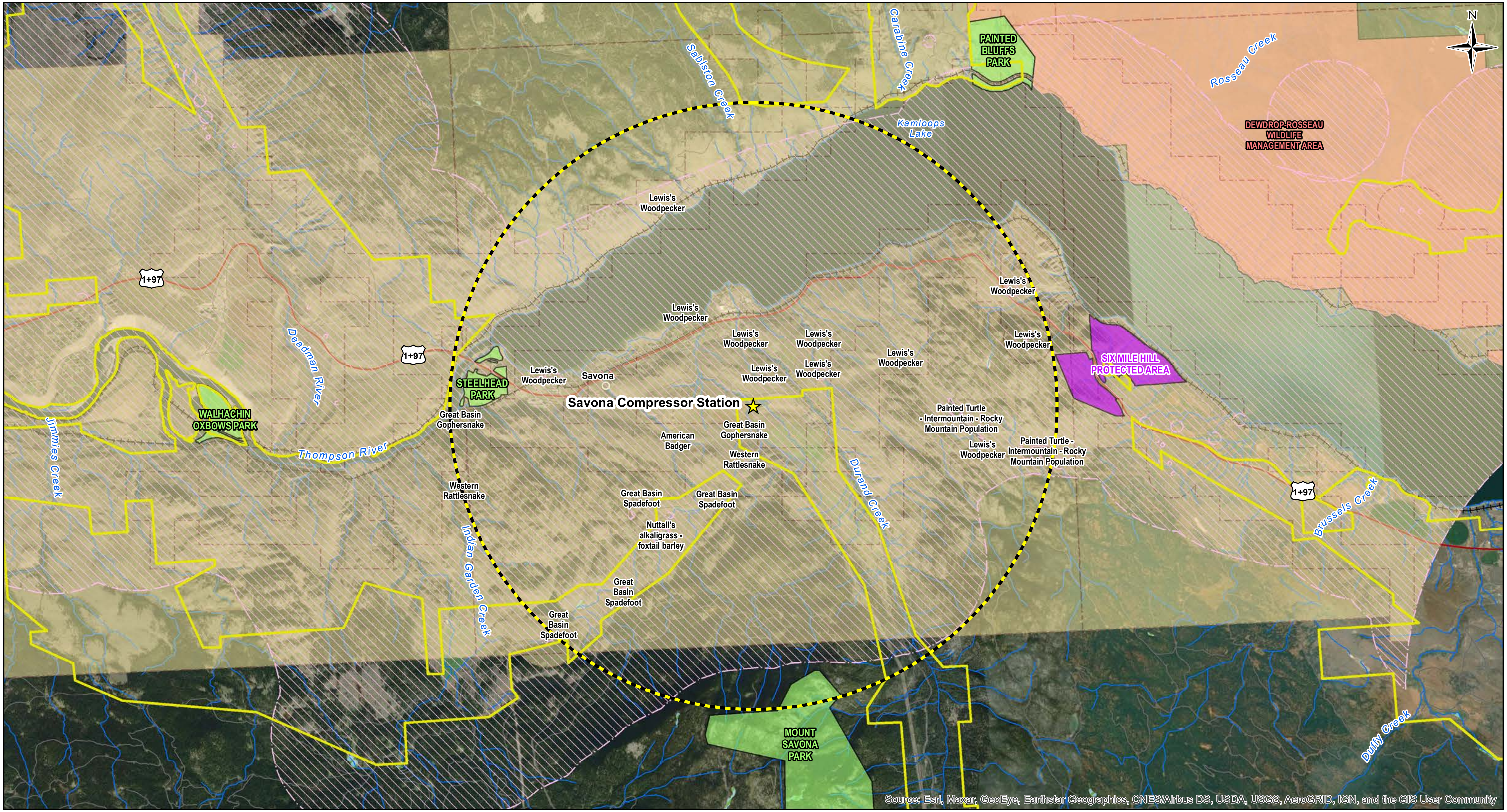
Appendix A – Map Book



Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

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Kilometers
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References:
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(http://www.data.gov.bc.ca/)
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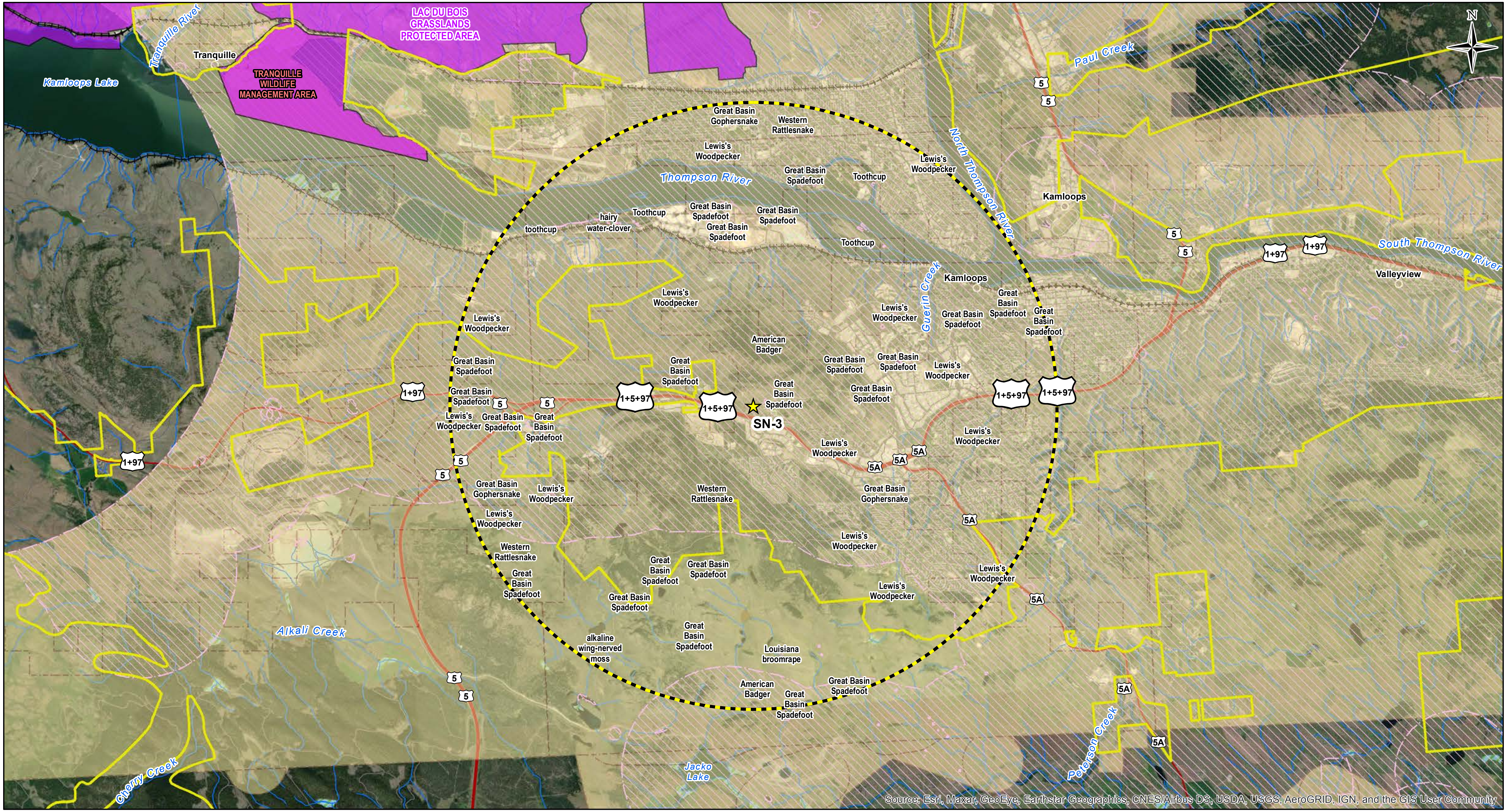

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- ☆ Site Location
- Site Location Buffer (5 km)
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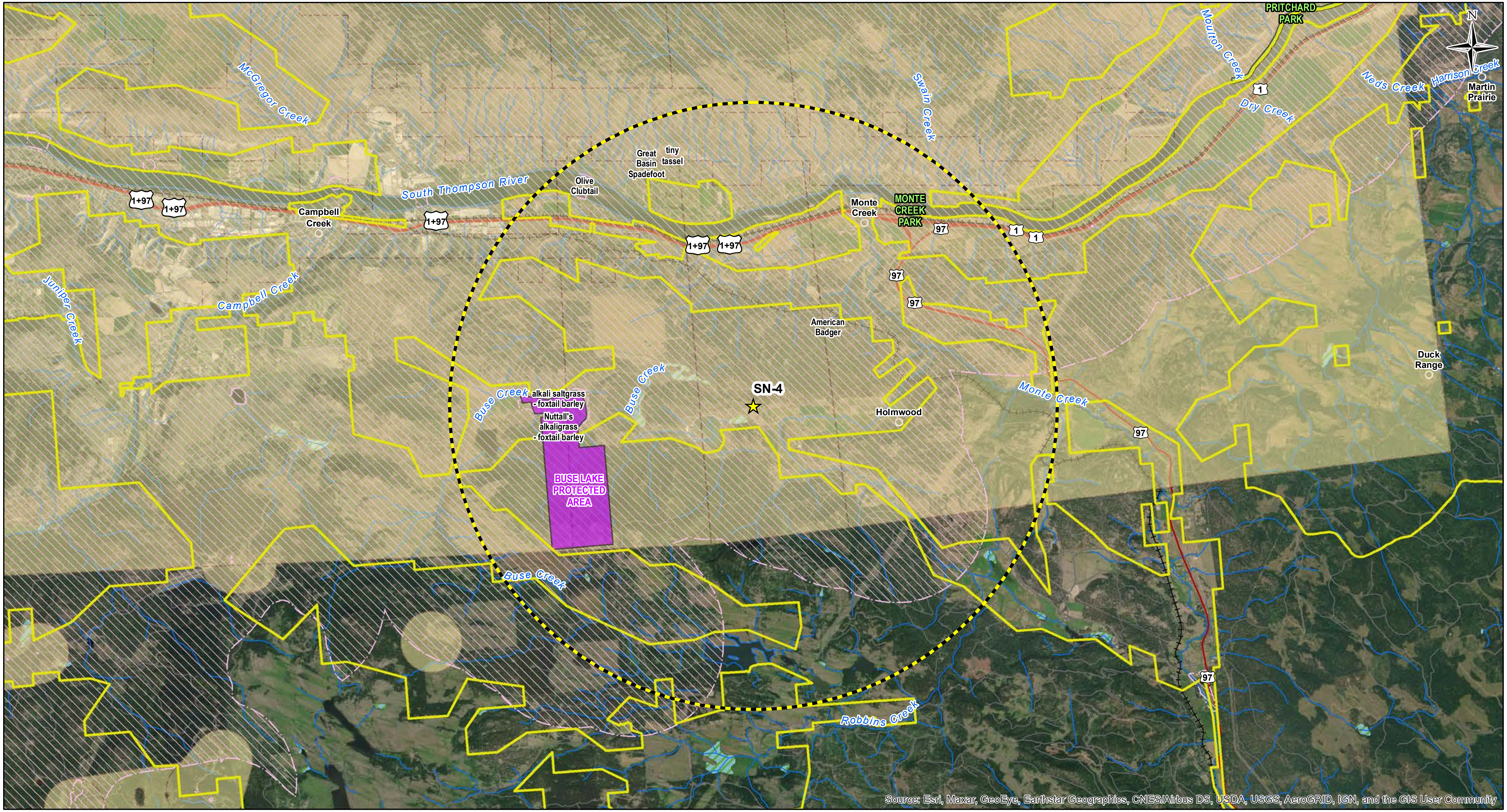

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- ☆ Site Location
- Site Location Buffer (5 km)
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Kilometers
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CLIENT:	PROJECT:
Prepared for FortisBC	FortisBC ITS TIMC EOA

TITLE: Biophysical Desk Study Results - SN-4

DATE:	ANALYST:	QA/QC:	
May 6, 2022	BB	RG	Figure 2.3

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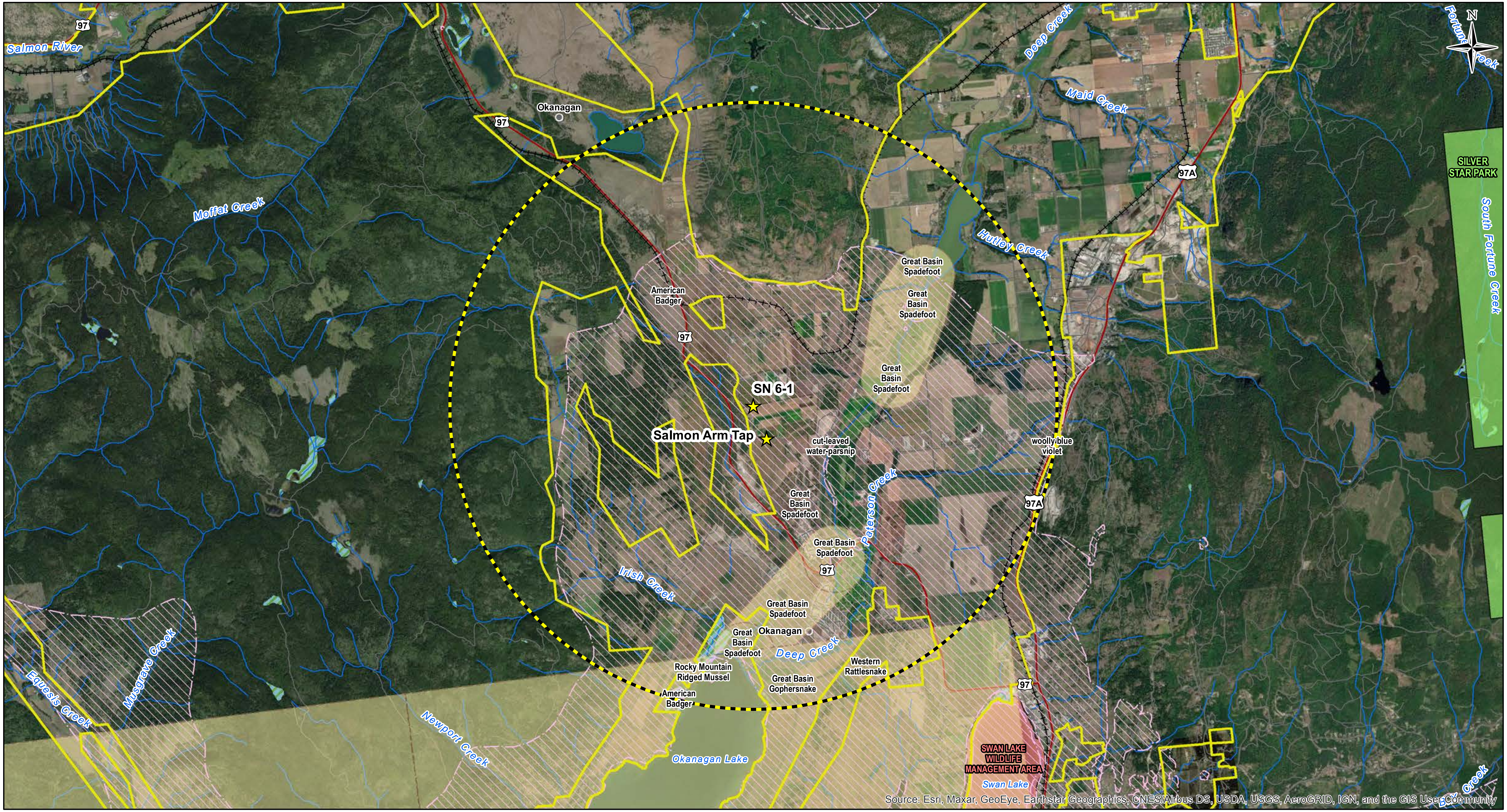

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- Site Location Buffer (5 km)
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Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - SN 6-1	DATE: May 6, 2022 · ANALYST: BB · QA/QC: RG · Figure 2.4
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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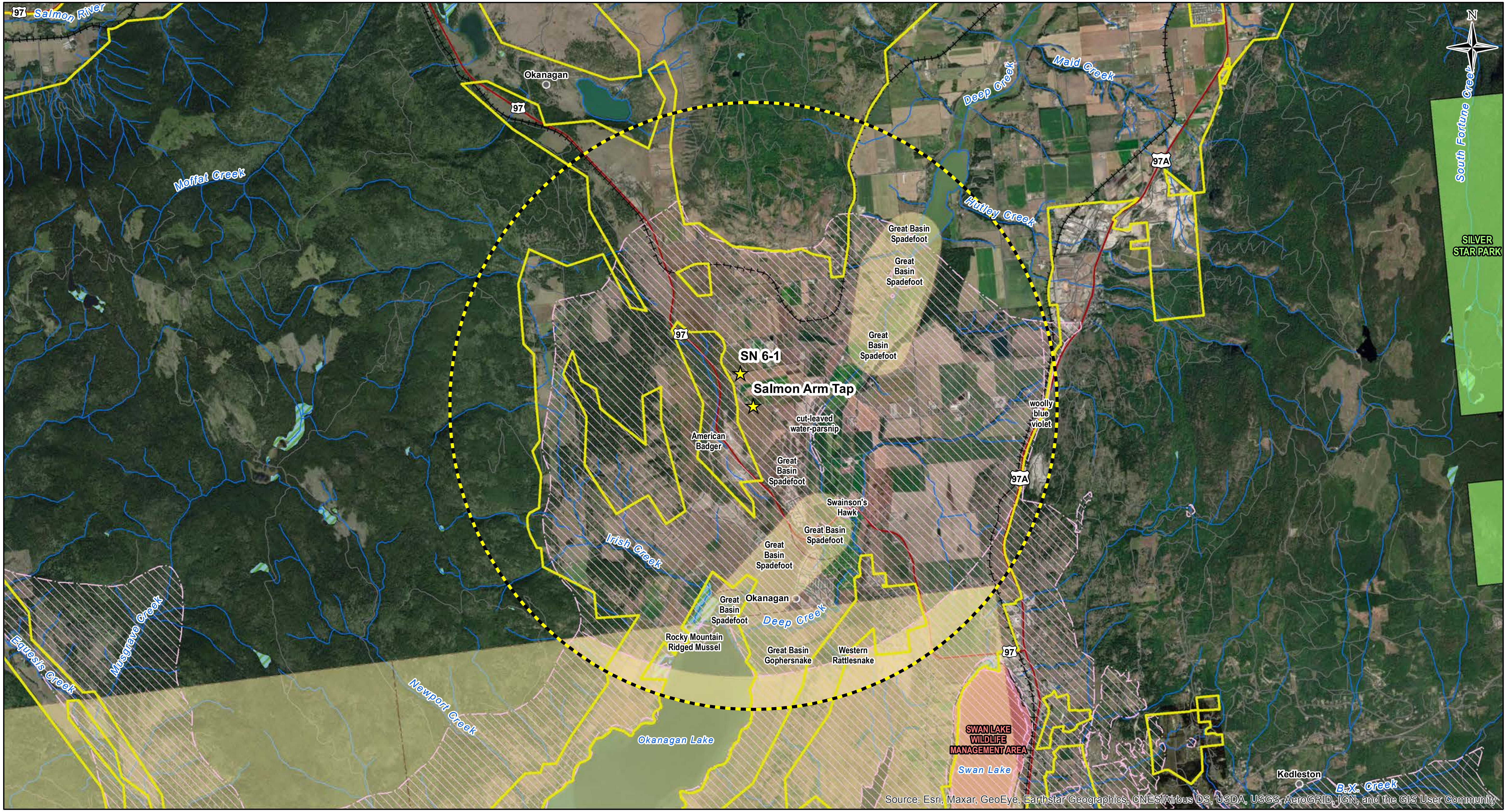

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - Salmon Arm Tap	DATE: May 6, 2022 — ANALYST: BB — QA/QC: RG — **Figure 2.5**
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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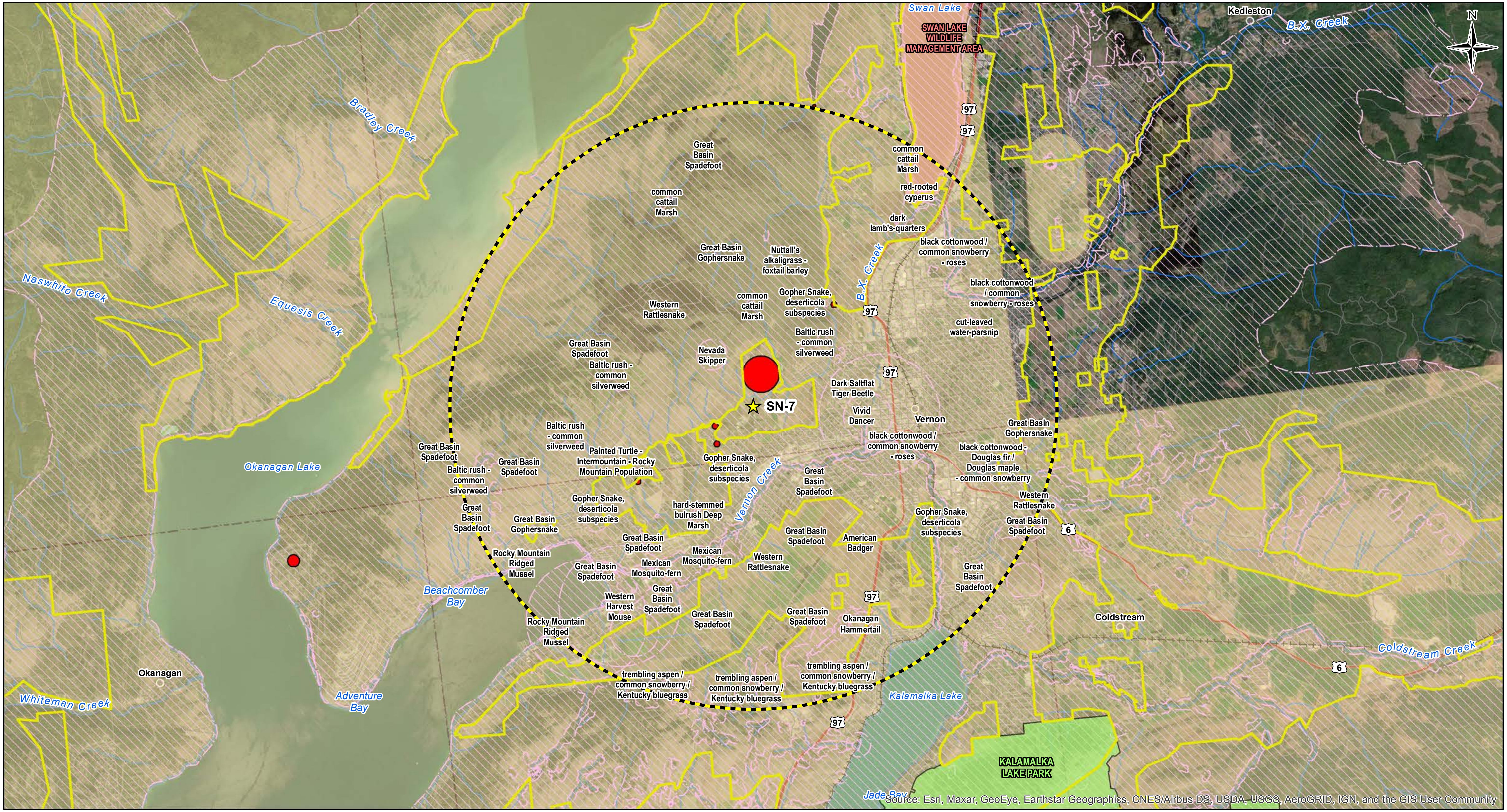

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - SN-7	DATE: May 6, 2022 · ANALYST: BB · QA/QC: RG · **Figure 2.6**
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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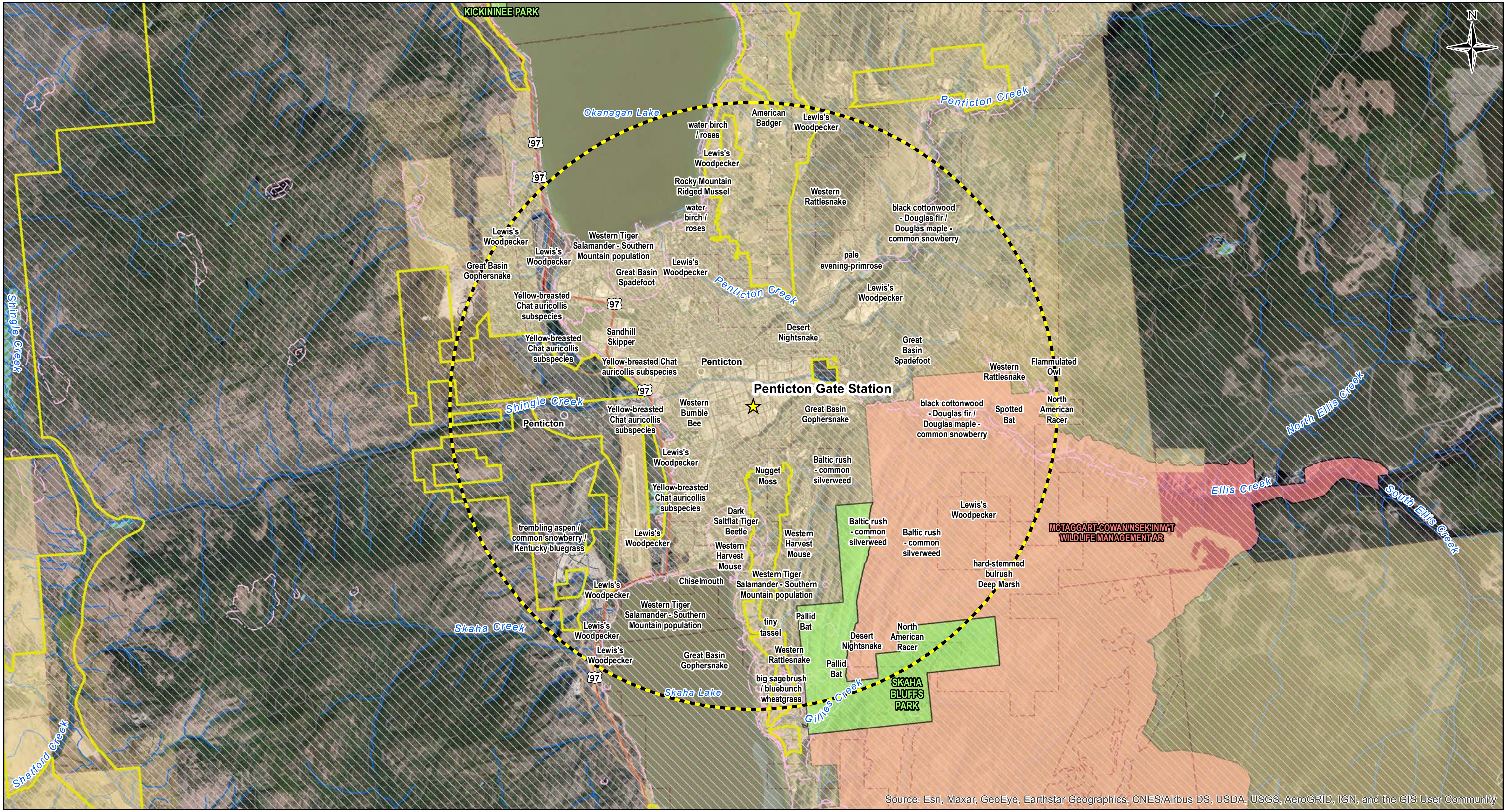

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT:	PROJECT:
Prepared for FortisBC	FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - Penticton Gate Station	DATE: May 6, 2022; ANALYST: BB; QA/QC: RG; Figure 2.7
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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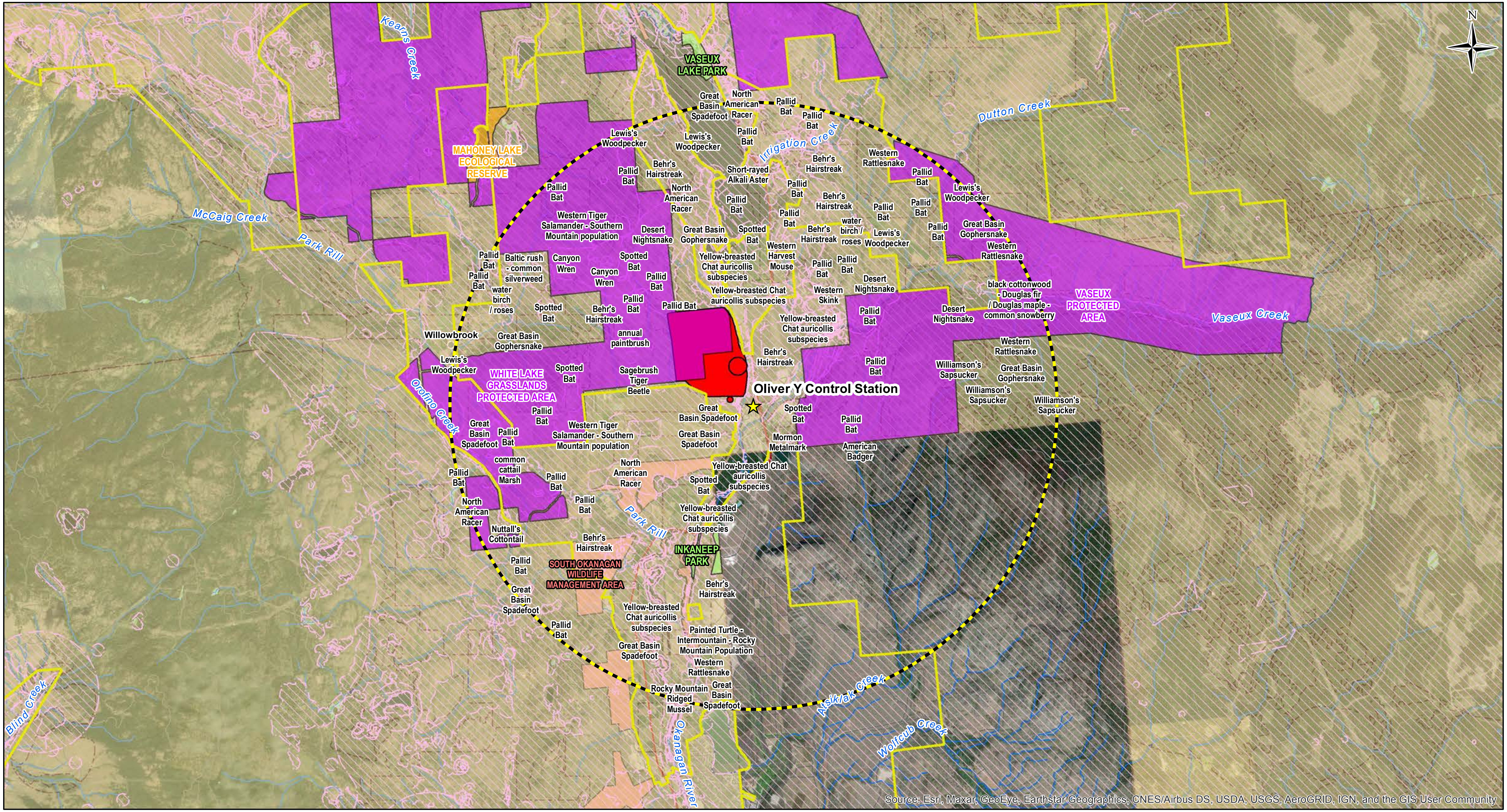

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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TITLE: Biophysical Desk Study Results - Oliver Y Control Station	DATE: May 6, 2022	ANALYST: BB	QA/QC: RG	Figure 2.8
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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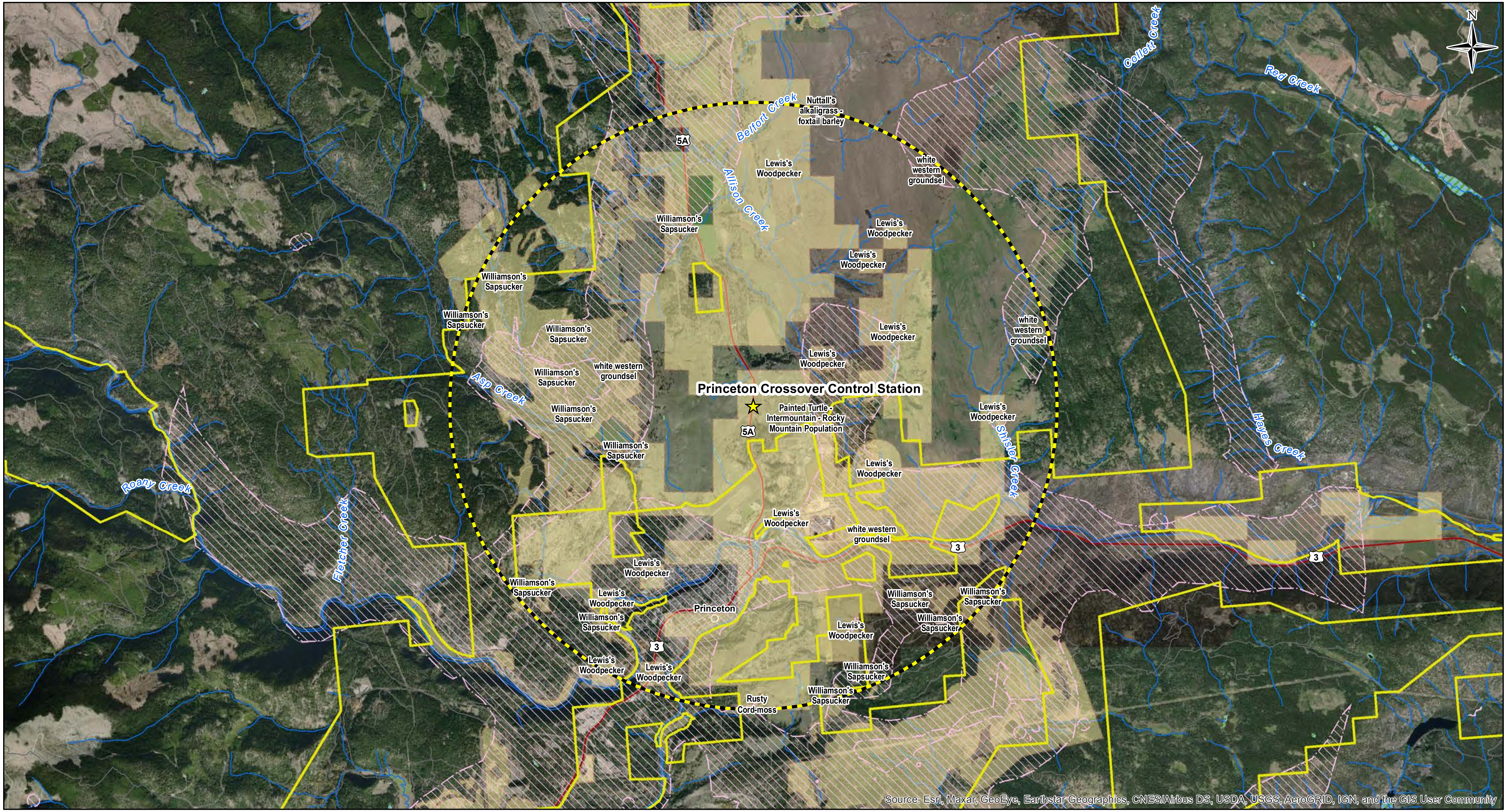

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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TITLE: Biophysical Desk Study Results - Princeton Crossover Control Station	DATE: May 6, 2022	ANALYST: BB	QA/QC: RG	Figure 2.9
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd			
	JOB No: VE21506			wood.
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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PROJECT:
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TITLE:
Biophysical Desk Study Results - Kingsvale Control Station

DATE: May 6, 2022
ANALYST: BB
QA/QC: RG
Figure 2.10

GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
JOB No: VE21506
COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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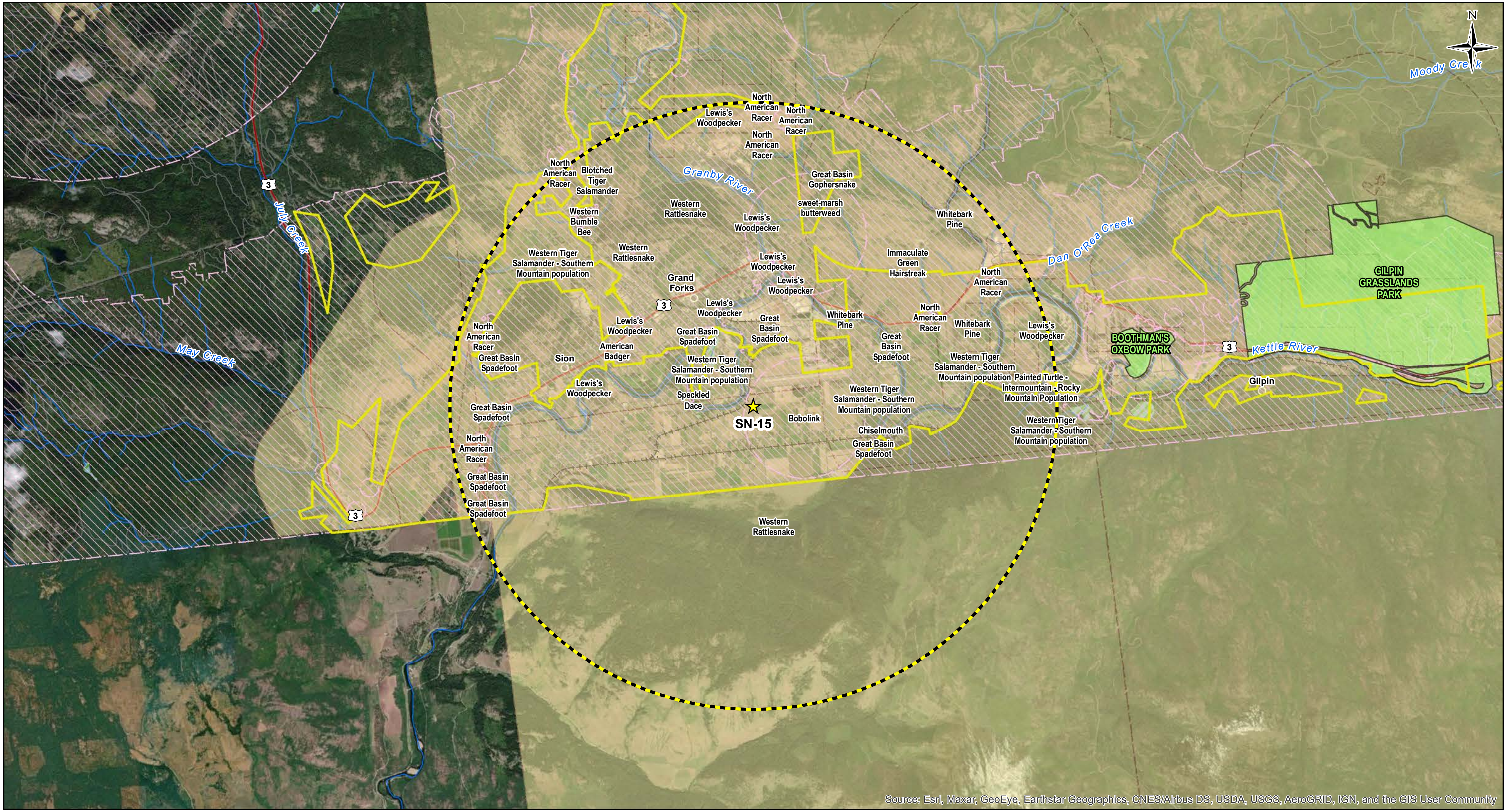

Legend

- ★ Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - SN-15	DATE: May 6, 2022 · ANALYST: BB · QA/QC: RG · **Figure 2.11**
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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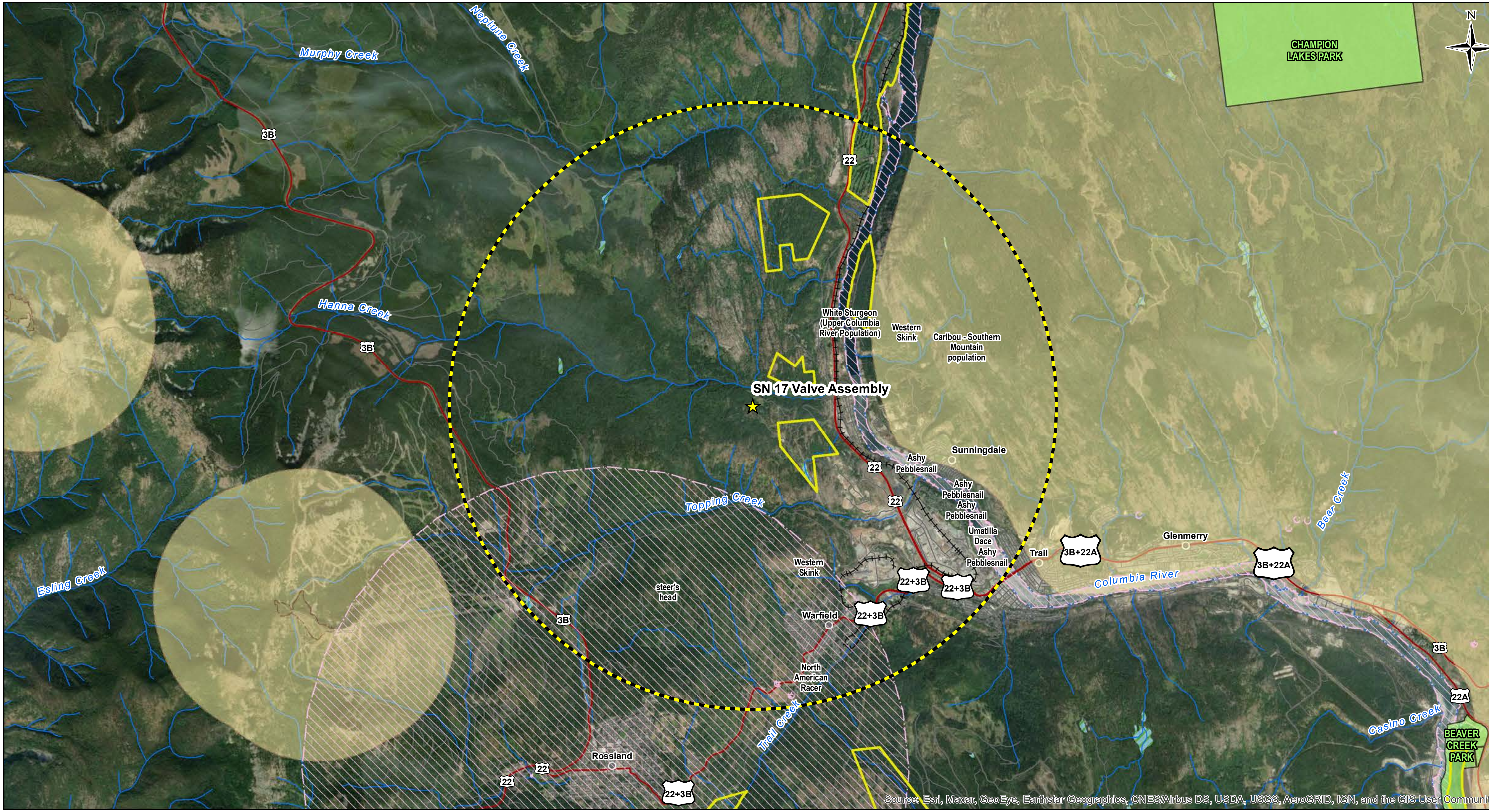

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Biophysical Desk Study Results - SN 17 Valve Assembly	DATE: May 6, 2022; ANALYST: BB; QA/QC: RG; Figure 2.12
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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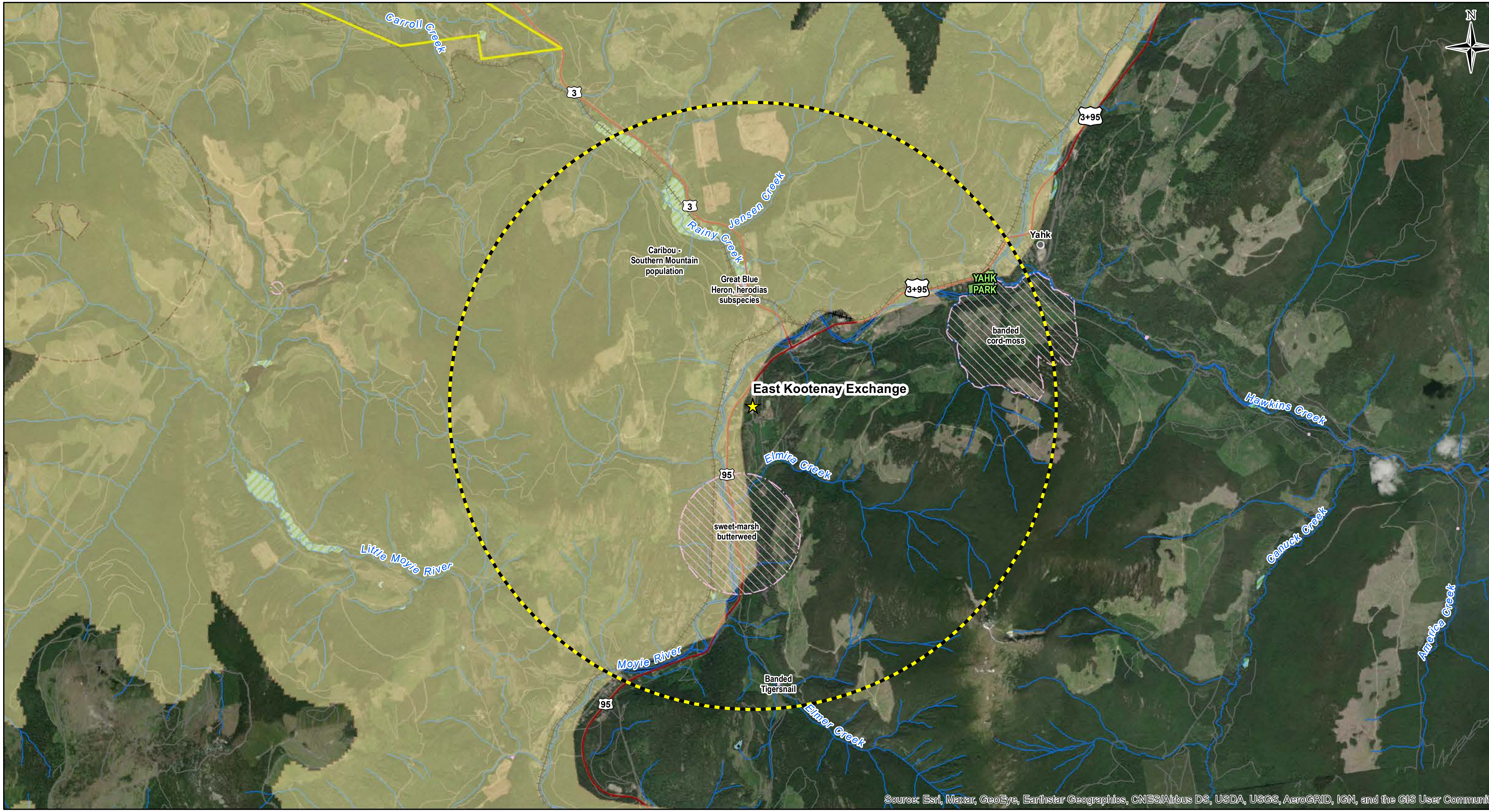

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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PROJECT:
FortisBC ITS TIMC EOA

TITLE:
Biophysical Desk Study Results - East Kootenay Exchange

DATE:	ANALYST:	QA/QC:	
May 6, 2022	BB	RG	**Figure 2.13**

GIS FILE:
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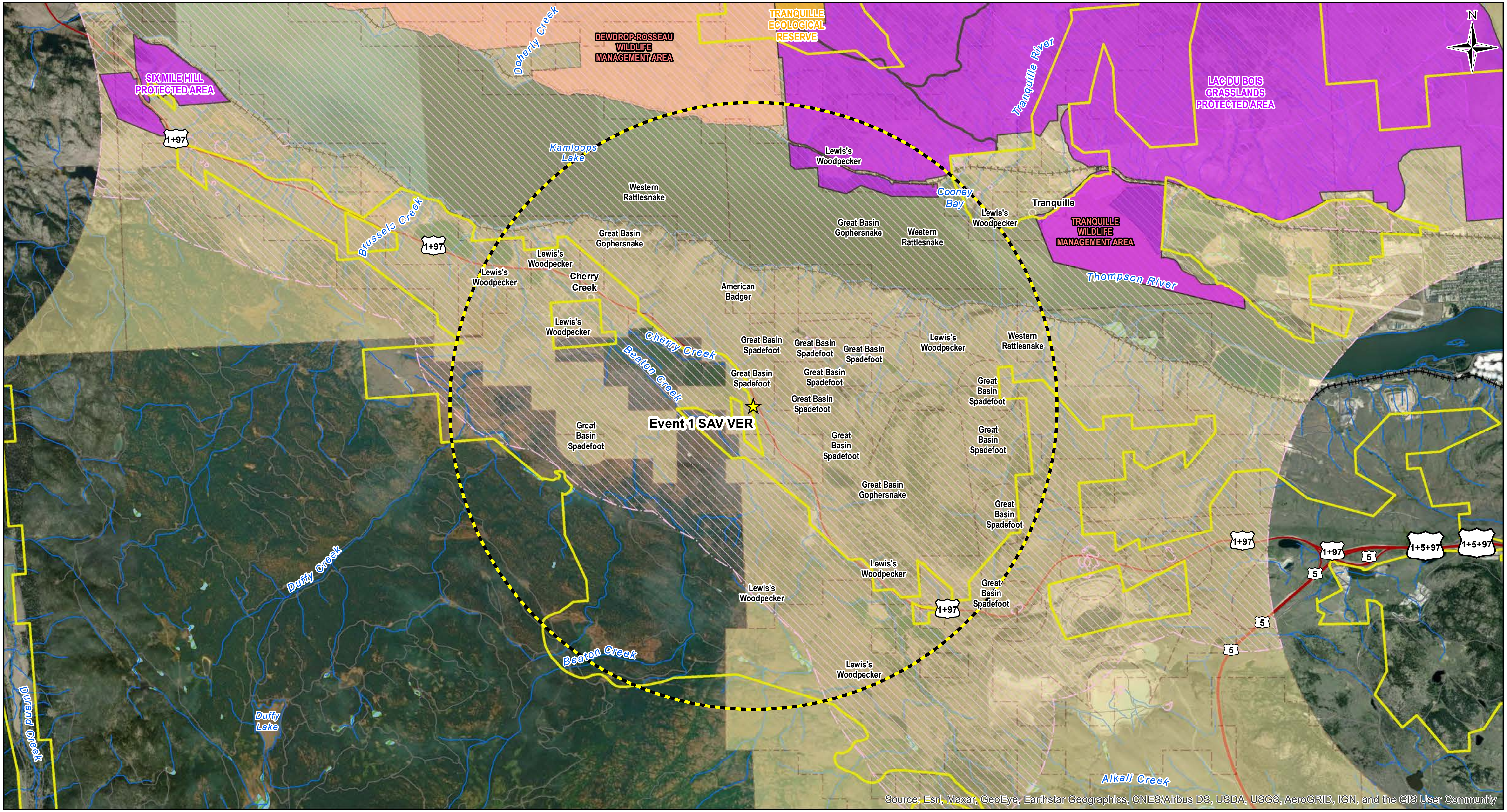

Legend

- ☆ Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA			
TITLE: Biophysical Desk Study Results - Event 1 SAV VER	DATE: May 6, 2022	ANALYST: BB	QA/QC: RG	Figure 2.14
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd			
	JOB No: VE21506			wood.
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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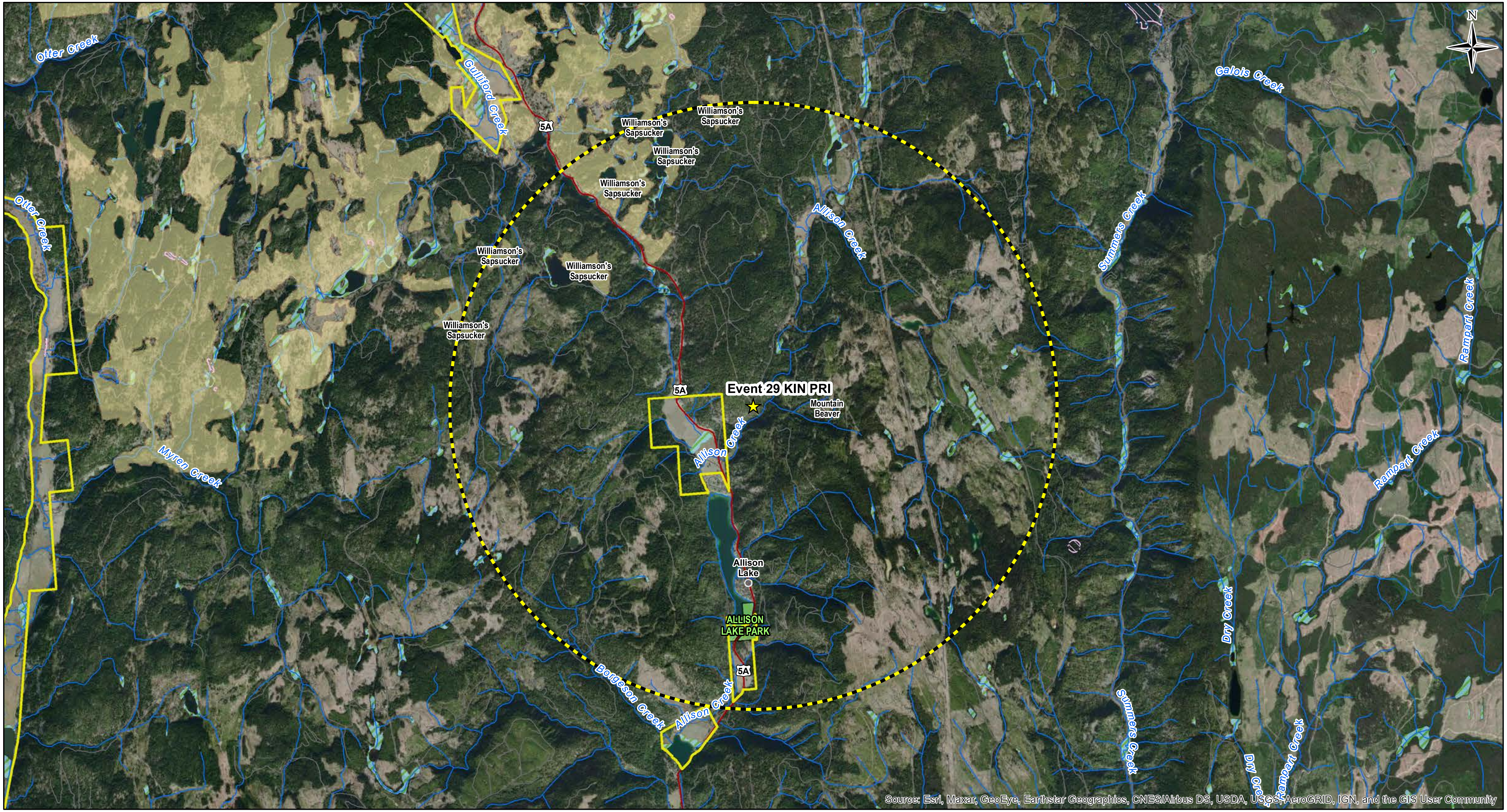

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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CLIENT:	PROJECT:
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TITLE:	DATE:	ANALYST:	QA/QC:	
Biophysical Desk Study Results - Event 29 KIN PRI	May 6, 2022	BB	RG	Figure 2.15
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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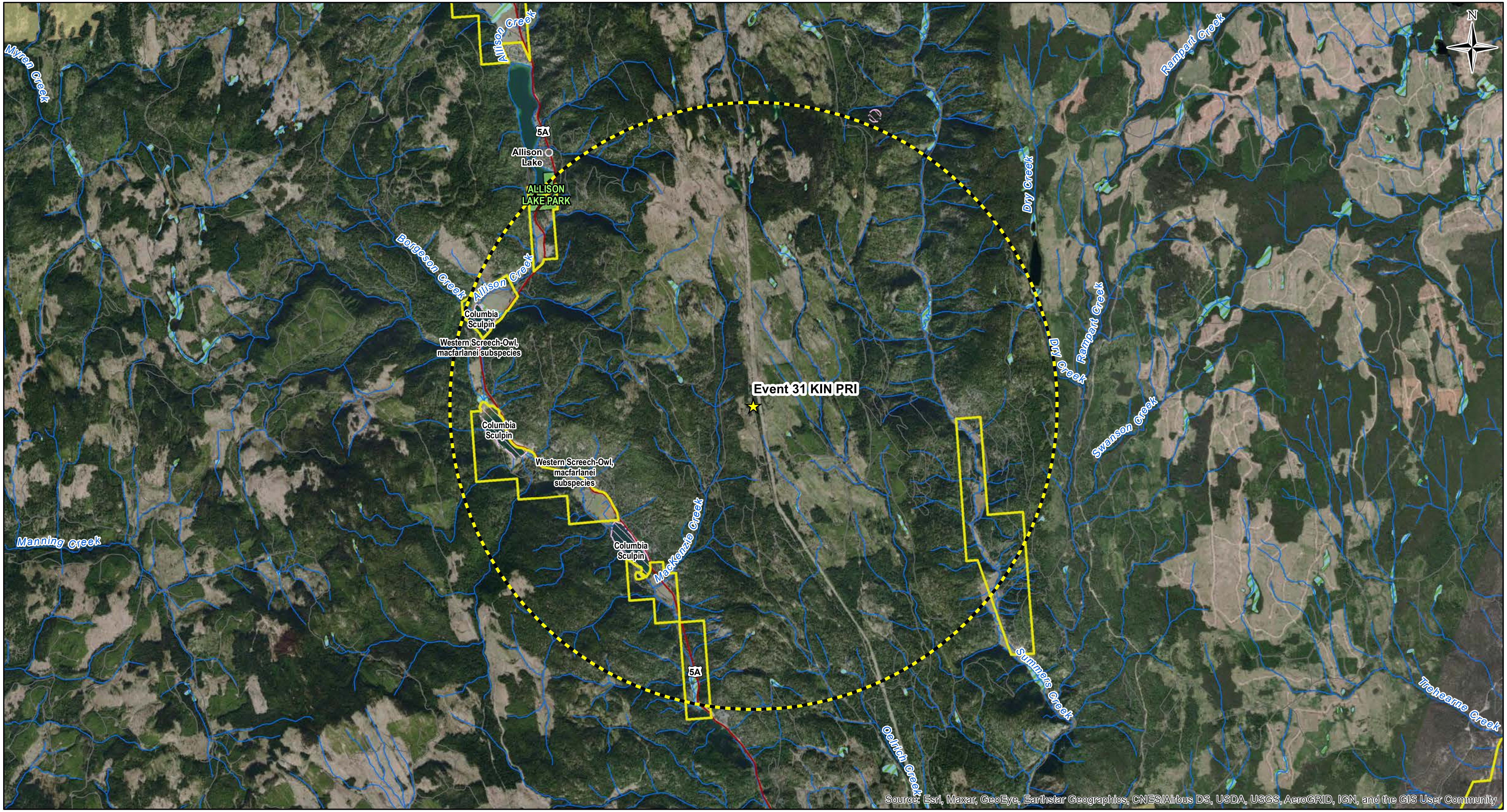

Legend

- Site Location
- Site Location Buffer (5 km)
- ALR
- Conservancy Areas - Tantalis
- Ecological Reserves - Tantalis
- Protected Areas - Tantalis
- Provincial Parks - Tantalis
- CDC Masked Occurrences
- CDC Non-Sensitive Occurrences
- SARA Critical Habitat
- Wildlife Management Areas - Tantalis
- Populated Place
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 0.5 1
Kilometers
Scale: 1:60,000

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TITLE:	DATE:	ANALYST:	QA/QC:	
Biophysical Desk Study Results - Event 31 KIN PRI	May 6, 2022	BB	RG	Figure 2.16
	GIS FILE: 01-01-003_biophysical_desk_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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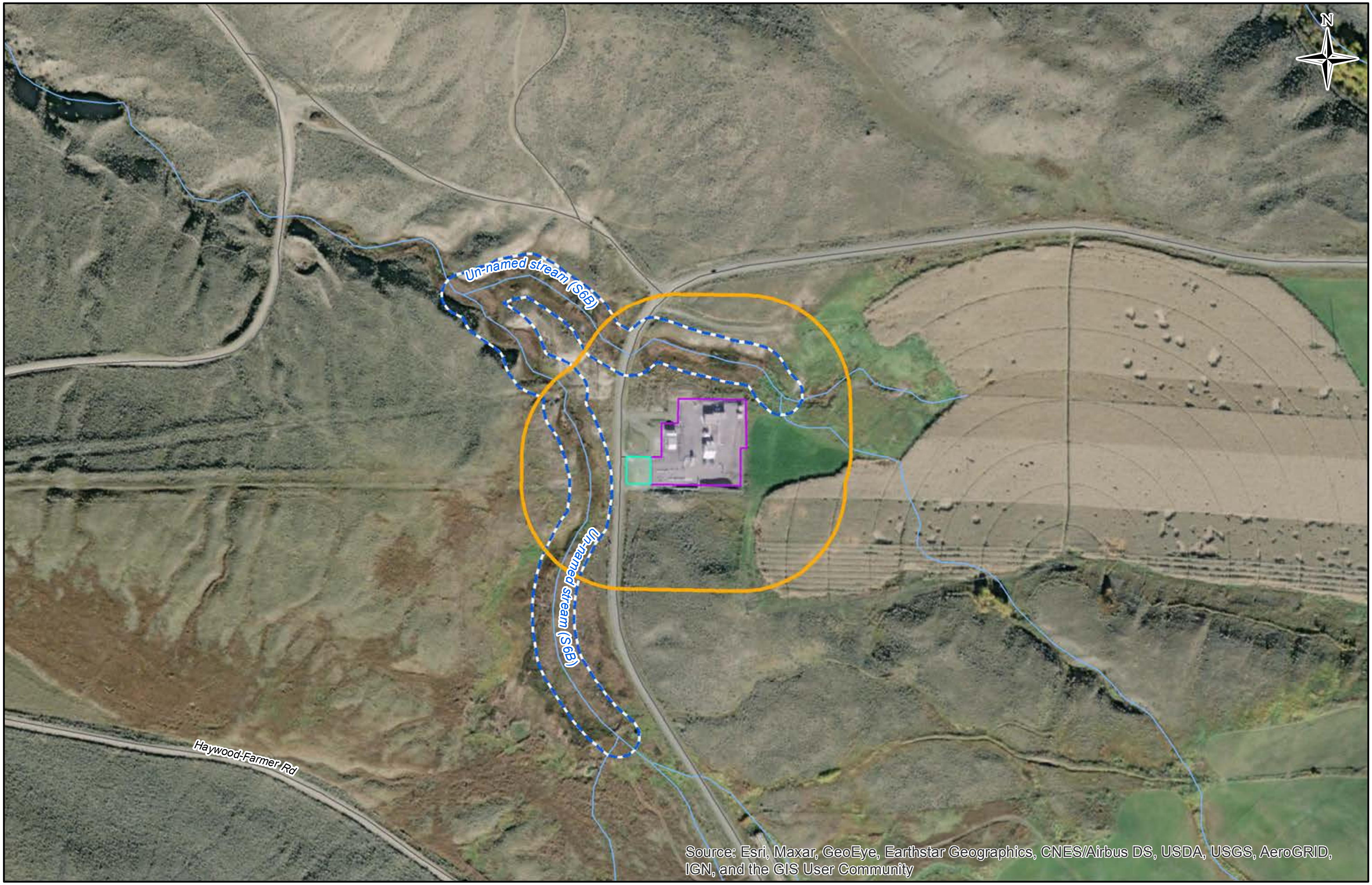

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT:
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PROJECT:
FortisBC ITS TIMC EOA

TITLE:
Watercourses and Biophysical Field Data - Savona Compressor Station

DATE: May. 9, 2022
ANALYST: BB
QA/QC: RG
Figure 3.1

GIS FILE: 01-01-004_biophysical_field_study_results.mxd
JOB No: VE21506
COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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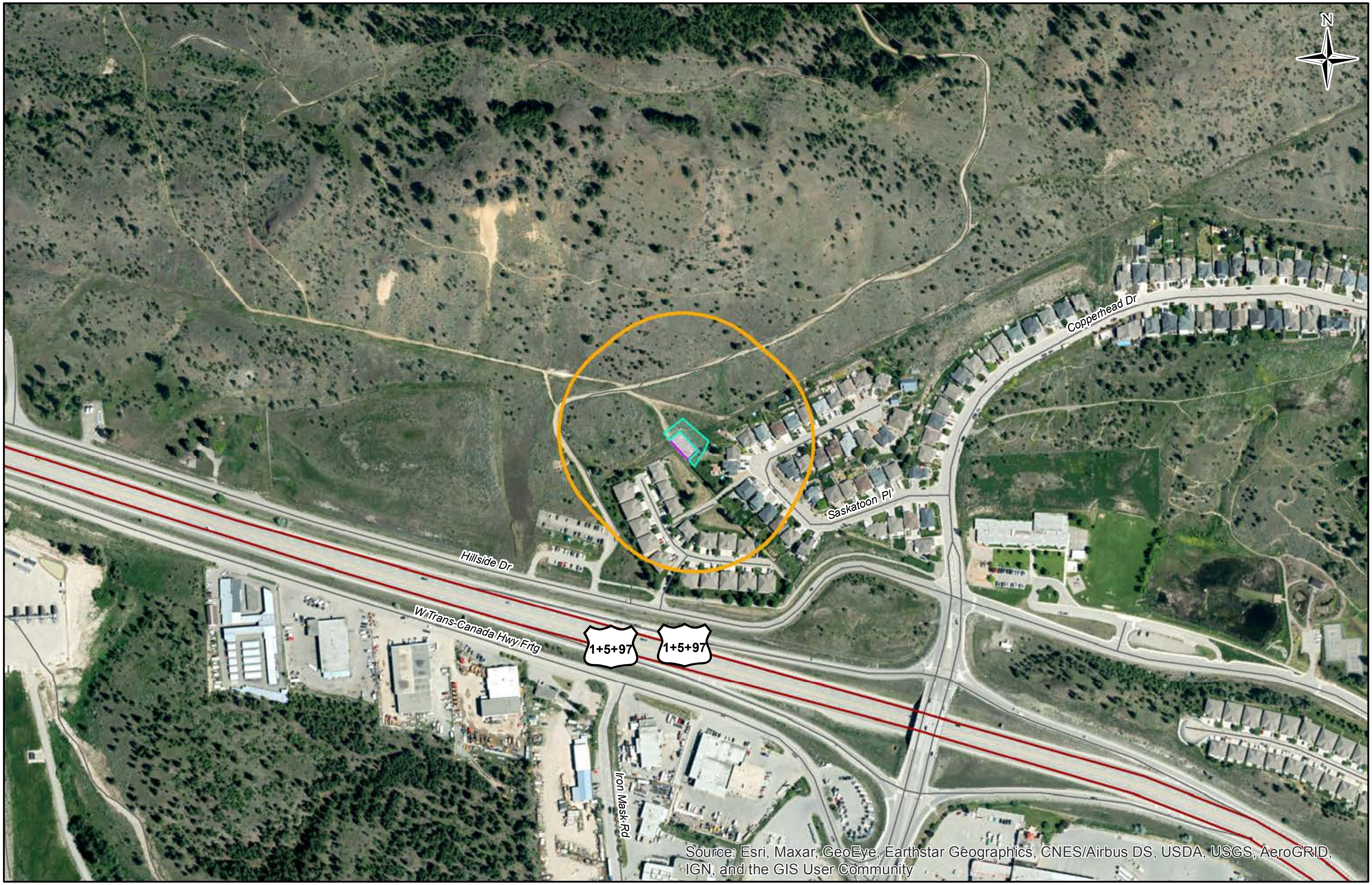

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - SN-3	DATE: May. 9, 2022 · ANALYST: BB · QA/QC: RG · **Figure 3.2**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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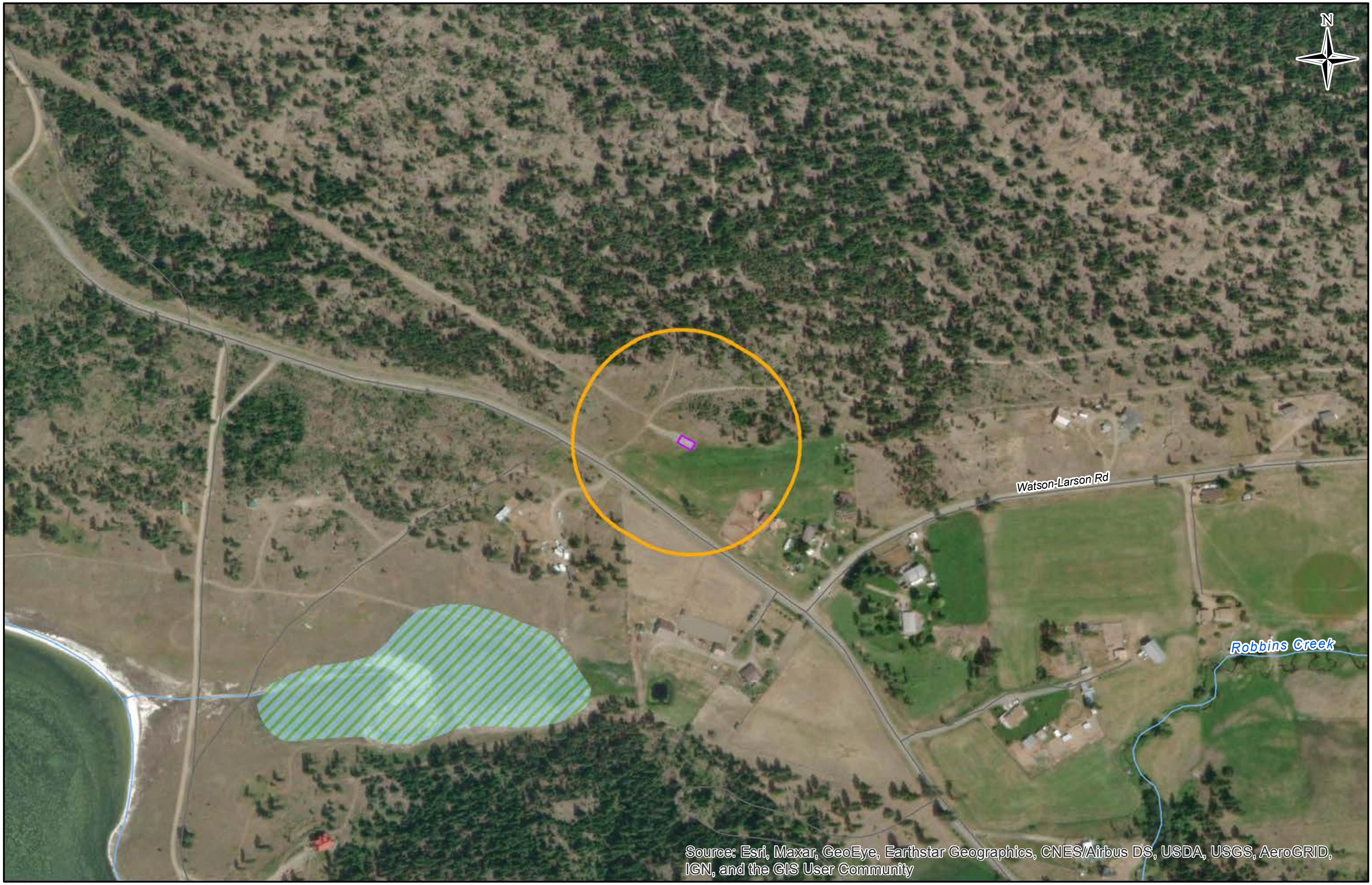

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC

PROJECT: FortisBC ITS TIMC EOA

TITLE: Watercourses and Biophysical Field Data - SN-4

DATE: May. 9, 2022
ANALYST: BB
QA/QC: RG

Figure 3.3

GIS FILE: 01-01-004_biophysical_field_study_results.mxd
JOB No: VE21506
COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - SN 6-1 & Salmon Arm Tap	DATE: May. 9, 2022; ANALYST: BB; QA/QC: RG; **Figure 3.4**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

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TITLE: Watercourses and Biophysical Field Data - SN-7	DATE: May. 9, 2022 · ANALYST: BB · QA/QC: RG · **Figure 3.5**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA			
TITLE: Watercourses and Biophysical Field Data - Penticton Gate Station	DATE: May. 9, 2022	ANALYST: BB	QA/QC: RG	**Figure 3.6**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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Last updated by benjamin.brown2

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - Oliver Y Control Station	DATE: May. 9, 2022 / ANALYST: BB / QA/QC: RG / **Figure 3.7**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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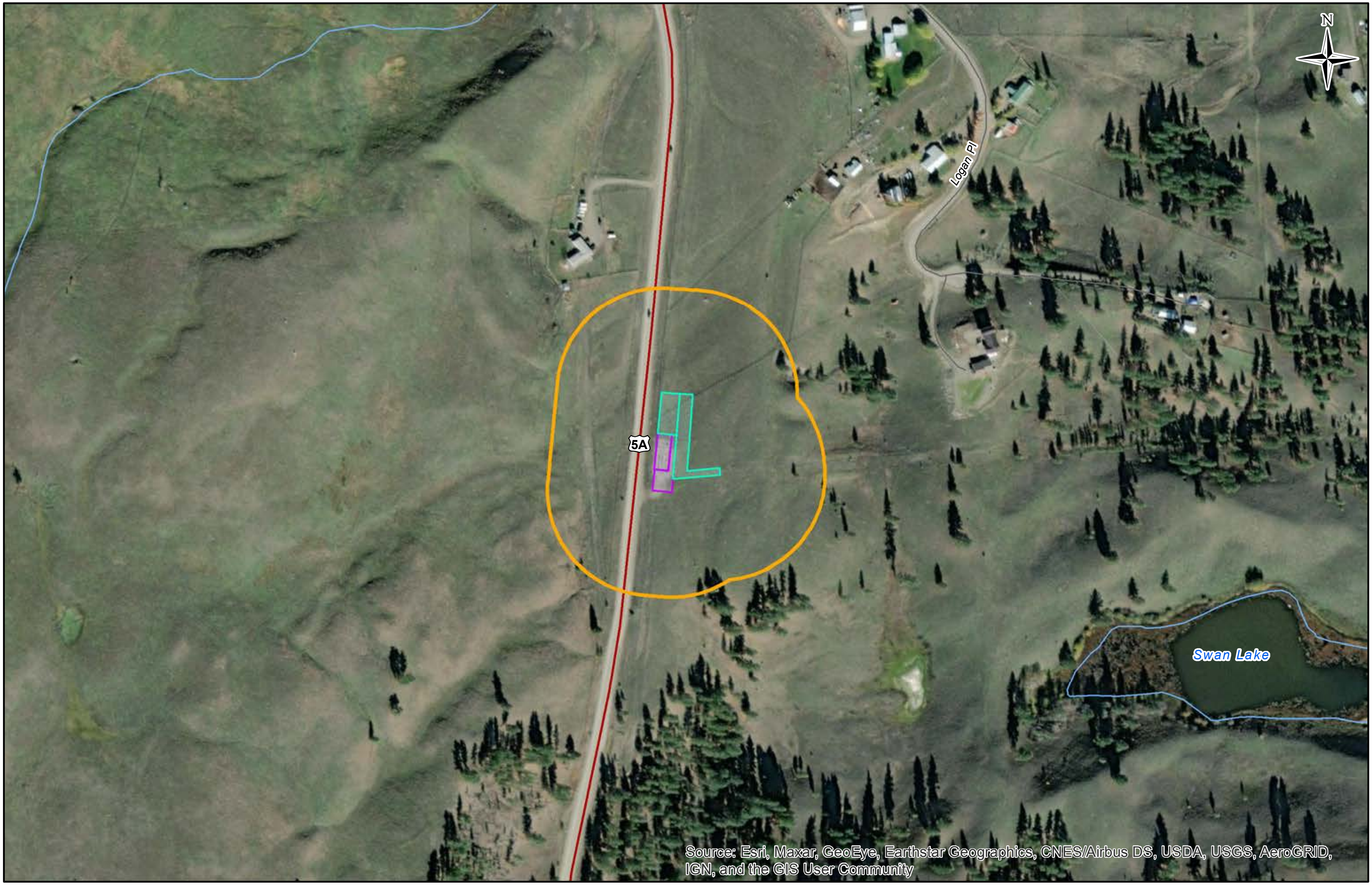

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - Princeton Crossover Control Station	DATE: May. 9, 2022 / ANALYST: BB / QA/QC: RG / **Figure 3.8**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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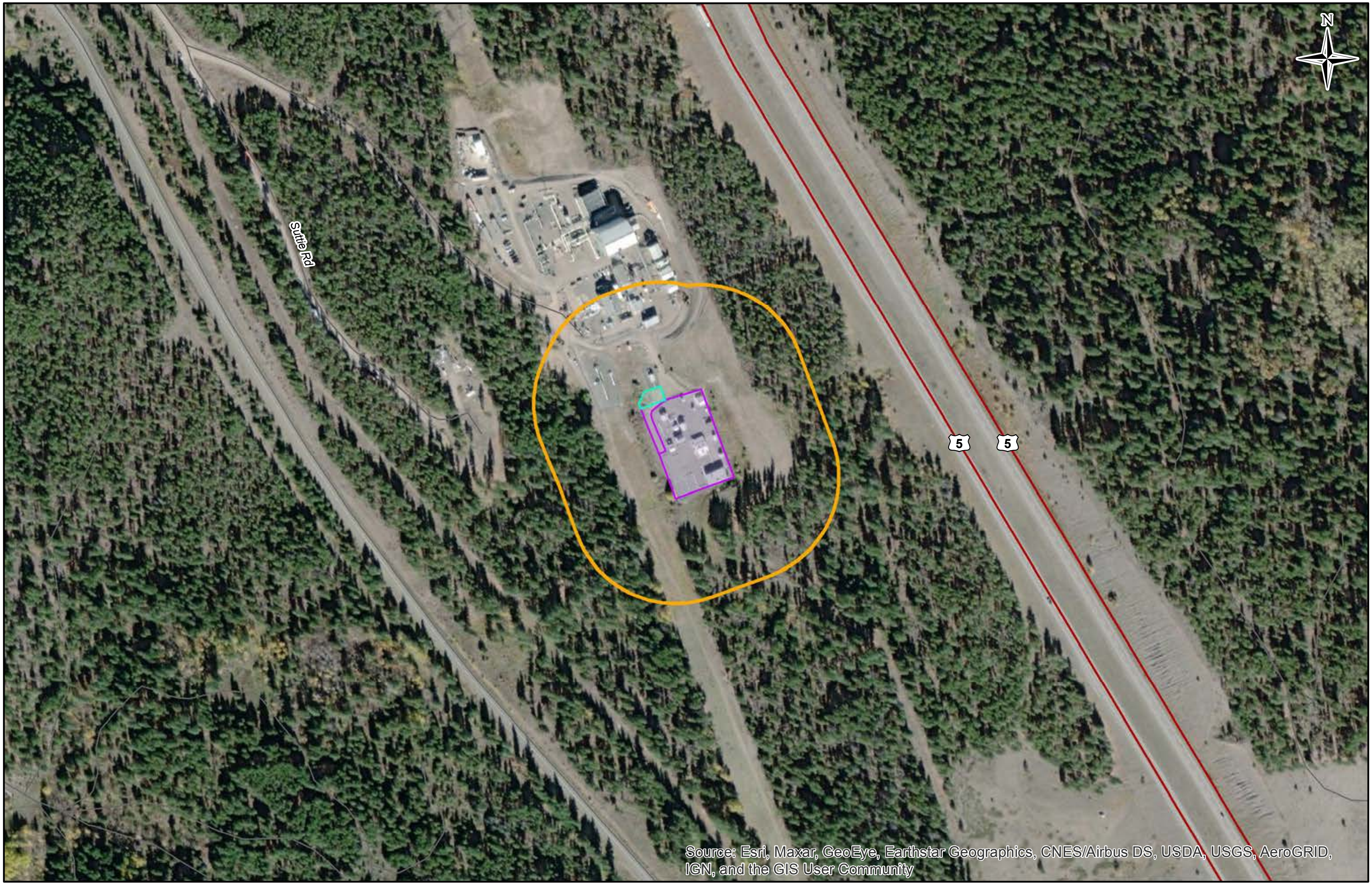

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA			
TITLE: Watercourses and Biophysical Field Data - Kingsvale Control Station	DATE: May. 9, 2022	ANALYST: BB	QA/QC: RG	Figure 3.9
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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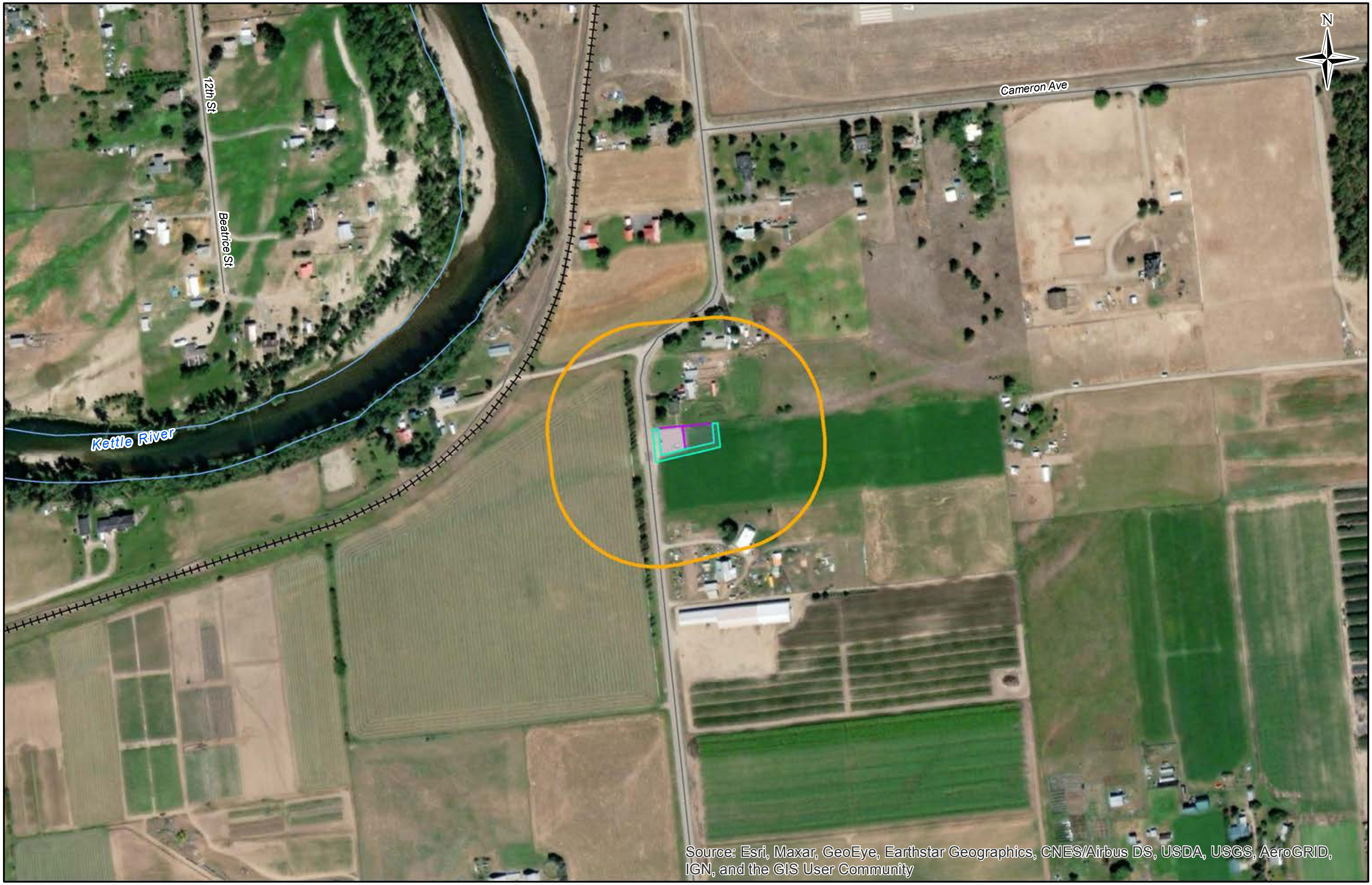

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT:	PROJECT:		
Prepared for FortisBC	FortisBC ITS TIMC EOA		
TITLE: Watercourses and Biophysical Field Data - SN-15	DATE: May. 9, 2022	ANALYST: BB	QA/QC: RG
	Figure 3.10		
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd		
	JOB No: VE21506		
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers		

wood.

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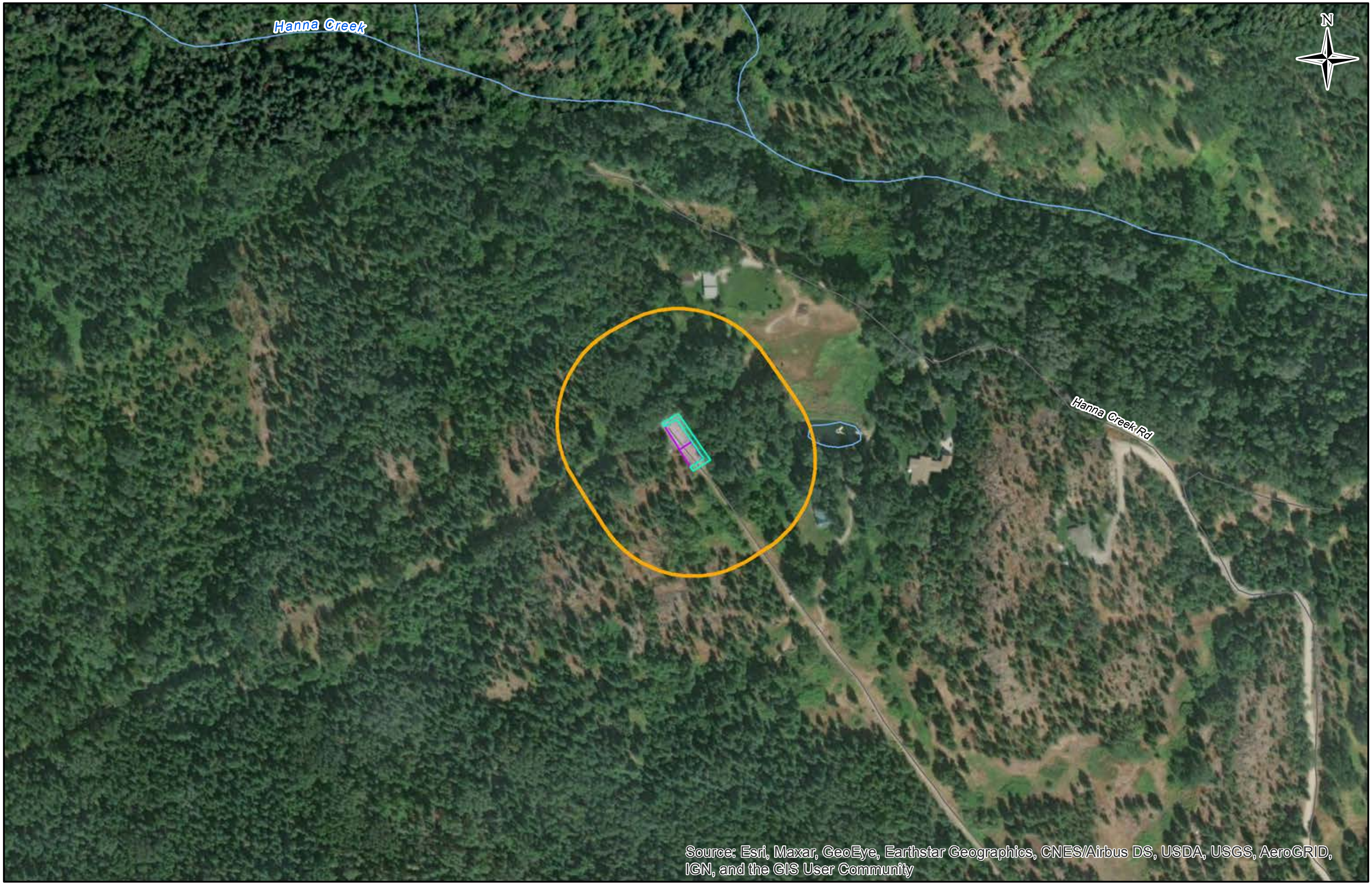

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC

PROJECT: FortisBC ITS TIMC EOA

TITLE: Watercourses and Biophysical Field Data - SN 17 Valve Assembly

DATE:	ANALYST:	QA/QC:	
May. 9, 2022	BB	RG	**Figure 3.11**

GIS FILE: 01-01-004_biophysical_field_study_results.mxd

JOB No: VE21506

COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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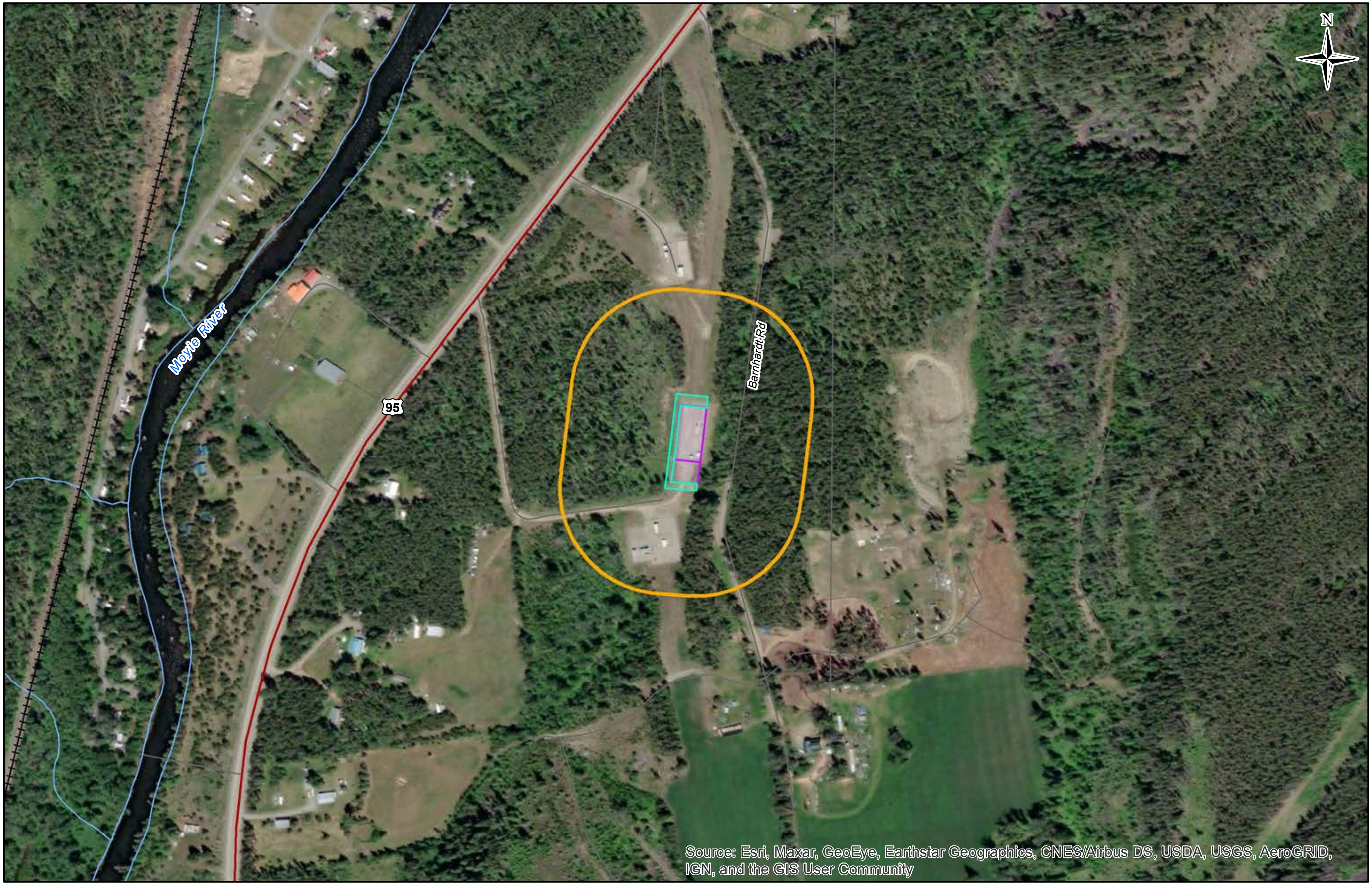

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT:	PROJECT:			
Prepared for FortisBC	FortisBC ITS TIMC EOA			
TITLE:	DATE: May. 9, 2022	ANALYST: BB	QA/QC: RG	**Figure 3.12**
Watercourses and Biophysical Field Data - East Kootenay Exchange	GIS FILE: 01-01-004_biophysical_field_study_results.mxd			wood.
	JOB No: VE21506			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - Event 1 SAV VER	DATE: May. 9, 2022; ANALYST: BB; QA/QC: RG; **Figure 3.13**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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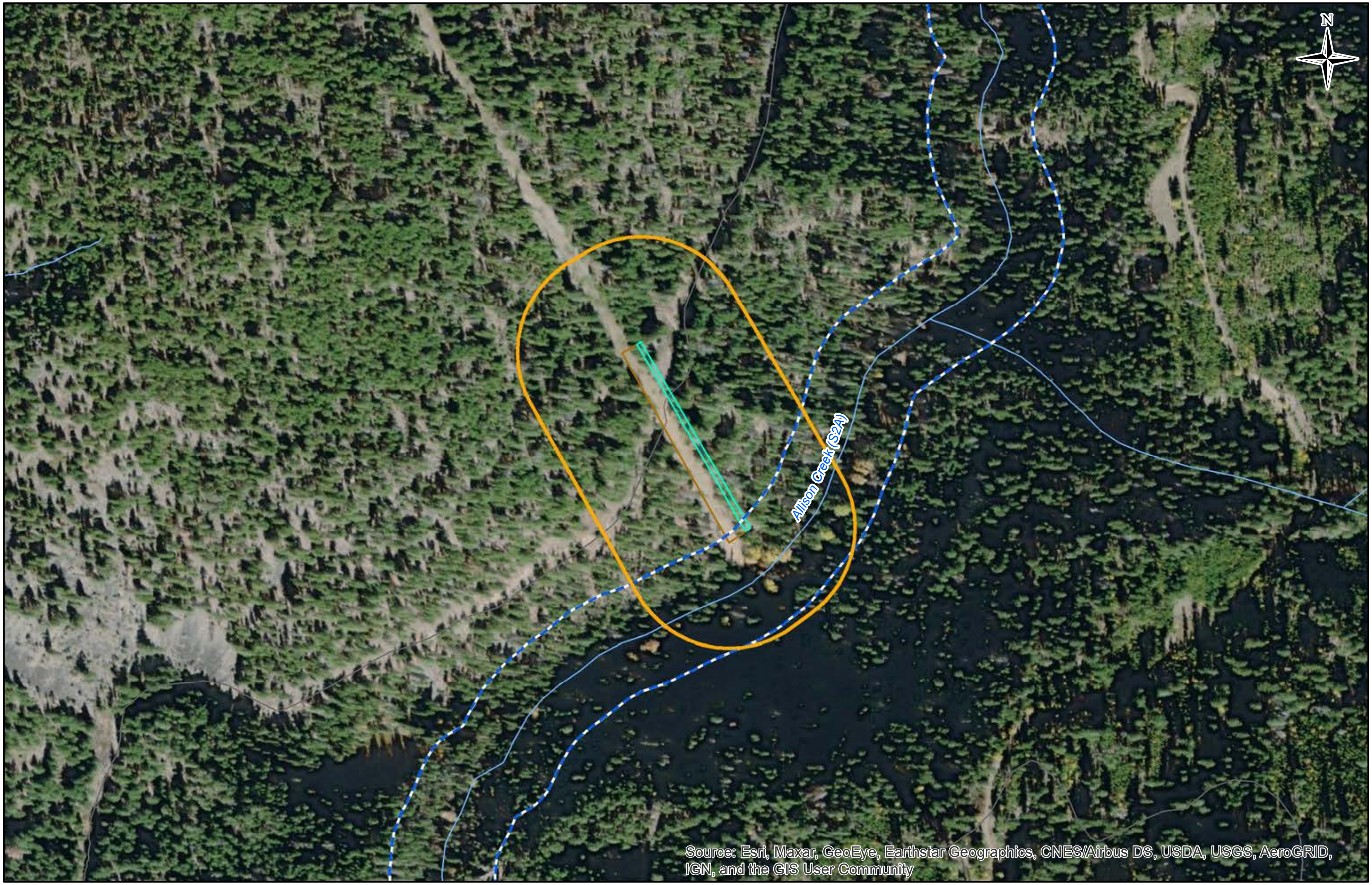

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC

PROJECT: FortisBC ITS TIMC EOA

TITLE: Watercourses and Biophysical Field Data - Event 29 KIN PRI

DATE:	ANALYST:	QA/QC:	
May. 9, 2022	BB	RG	**Figure 3.14**

GIS FILE: 01-01-004_biophysical_field_study_results.mxd

JOB No: VE21506

COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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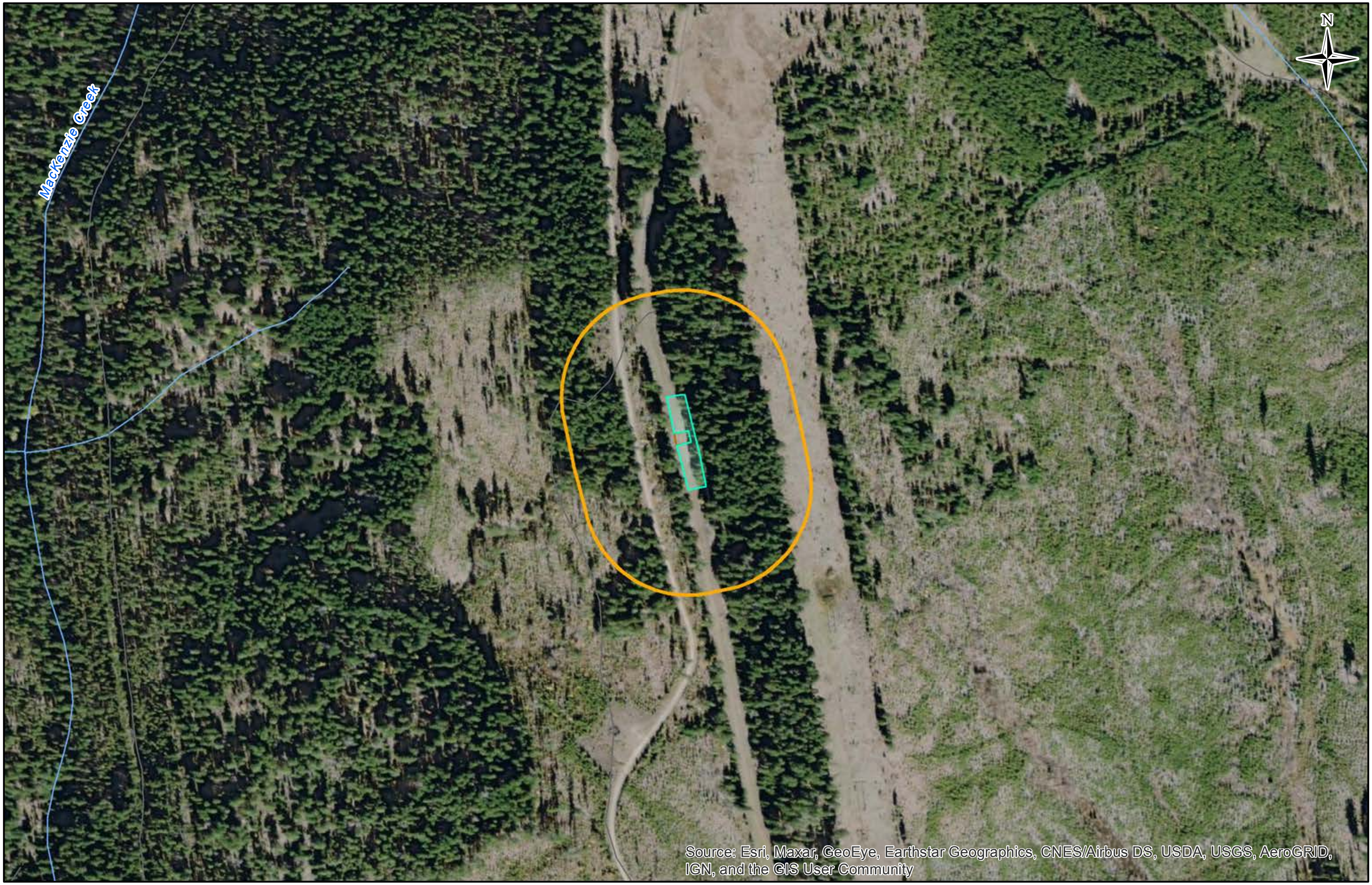

Legend

- Seep
- Riparian Management Area (RMA)
- Facility
- Work Area
- TWS
- Facility / Pipeline Buffer (100 m)
- Railway
- Highway
- Road
- Watercourse
- Waterbody
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Watercourses and Biophysical Field Data - Event 31 KIN PRI	DATE: May. 9, 2022 / ANALYST: BB / QA/QC: RG / **Figure 3.15**
	GIS FILE: 01-01-004_biophysical_field_study_results.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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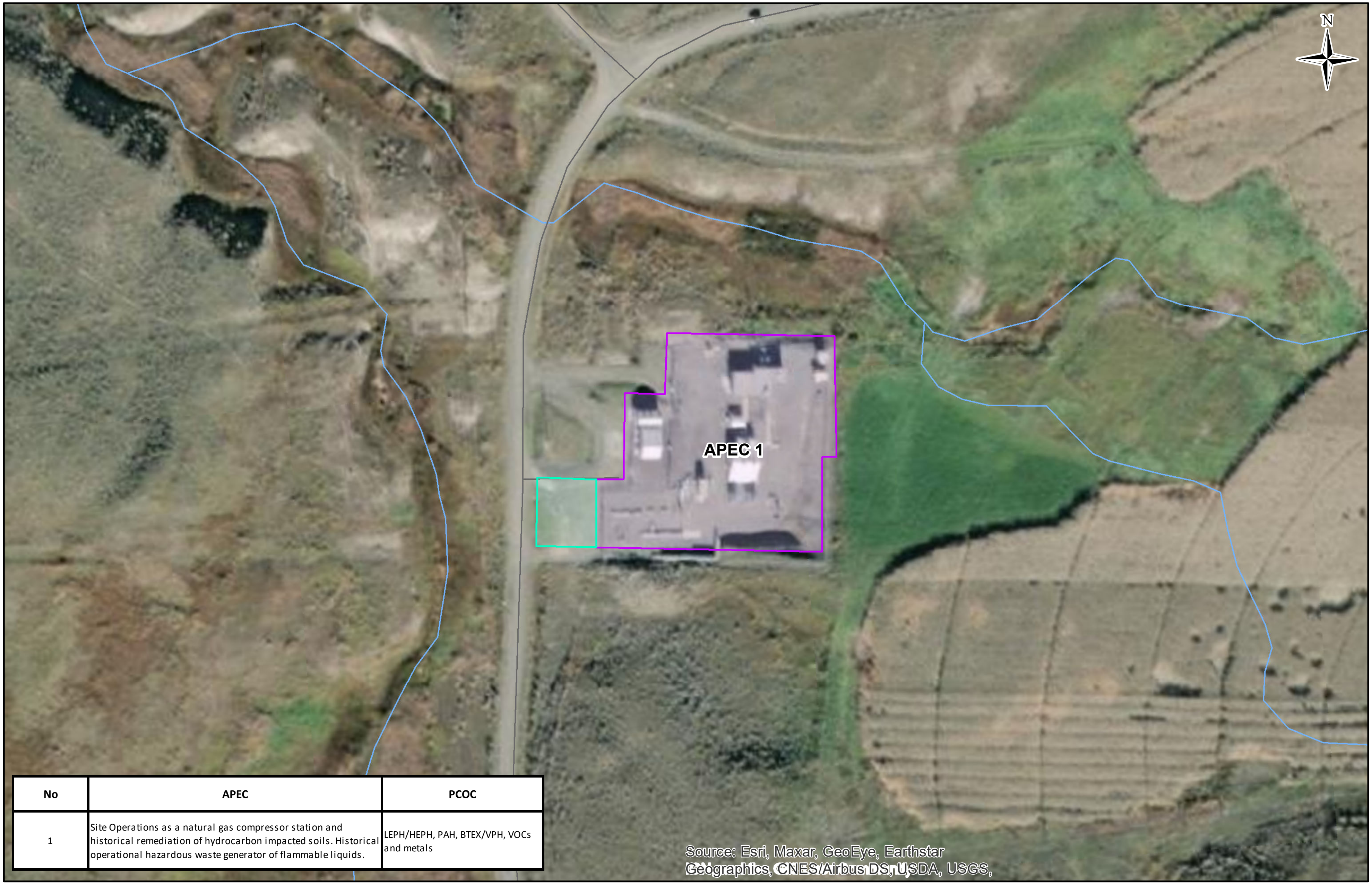

No	APEC	PCOC
1	Site Operations as a natural gas compressor station and historical remediation of hydrocarbon impacted soils. Historical operational hazardous waste generator of flammable liquids.	LEPH/HEPH, PAH, BTEX/VPH, VOCs and metals

Legend

- Facility
- TWS
- Road
- Watercourse

0 20 40
Meters
Scale 1:2,000

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CLIENT:
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PROJECT:
FortisBC ITS TIMC EOA

TITLE:
Savona Compressor Station - APEC

DATE: Sep. 10, 2021
ANALYST: PK
QA/QC: ET

Figure 4.1

GIS FILE: 01-01-005_contaminant_savona_apec.mxd
JOB No: VE21506
COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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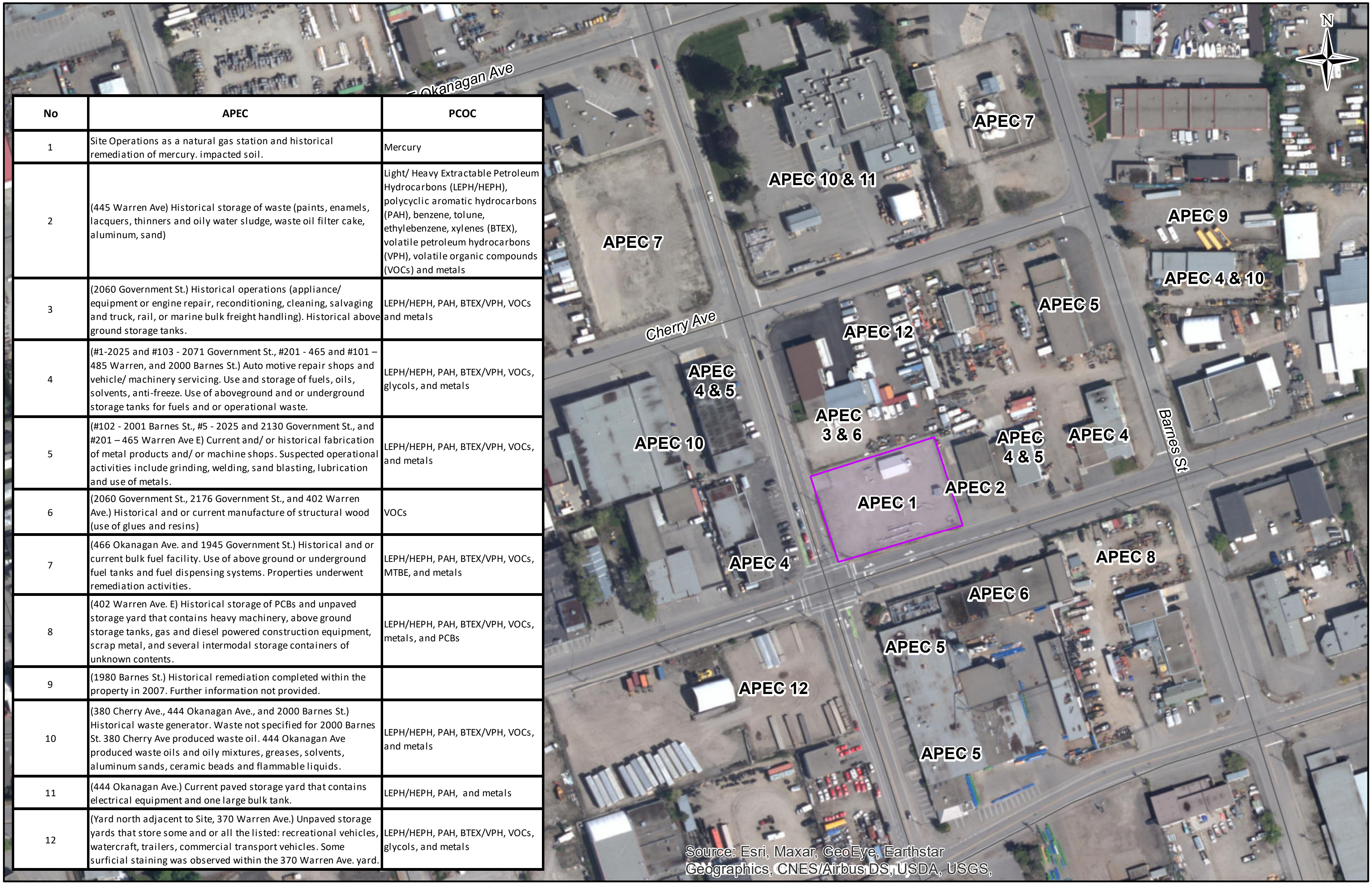
Last updated by paul.kwon

No	APEC	PCOC
1	Site Operations as a natural gas station and historical remediation of mercury. impacted soil.	Mercury
2	(445 Warren Ave) Historical storage of waste (paints, enamels, lacquers, thinners and oily water sludge, waste oil filter cake, aluminum, sand)	Light/ Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH), polycyclic aromatic hydrocarbons (PAH), benzene, tolune, ethylebenzene, xylenes (BTEX), volatile petroleum hydrocarbons (VPH), volatile organic compounds (VOCs) and metals
3	(2060 Government St.) Historical operations (appliance/ equipment or engine repair, reconditioning, cleaning, salvaging and truck, rail, or marine bulk freight handling). Historical above ground storage tanks.	LEPH/HEPH, PAH, BTEX/VPH, VOCs and metals
4	(#1-2025 and #103 - 2071 Government St., #201 - 465 and #101 – 485 Warren, and 2000 Barnes St.) Auto motive repair shops and vehicle/ machinery servicing. Use and storage of fuels, oils, solvents, anti-freeze. Use of aboveground and or underground storage tanks for fuels and or operational waste.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, glycols, and metals
5	(#102 - 2001 Barnes St., #5 - 2025 and 2130 Government St., and #201 – 465 Warren Ave E) Current and/ or historical fabrication of metal products and/ or machine shops. Suspected operational activities include grinding, welding, sand blasting, lubrication and use of metals.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, and metals
6	(2060 Government St., 2176 Government St., and 402 Warren Ave.) Historical and or current manufacture of structural wood (use of glues and resins)	VOCs
7	(466 Okanagan Ave. and 1945 Government St.) Historical and or current bulk fuel facility. Use of above ground or underground fuel tanks and fuel dispensing systems. Properties underwent remediation activities.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, MTBE, and metals
8	(402 Warren Ave. E) Historical storage of PCBs and unpaved storage yard that contains heavy machinery, above ground storage tanks, gas and diesel powered construction equipment, scrap metal, and several intermodal storage containers of unknown contents.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, metals, and PCBs
9	(1980 Barnes St.) Historical remediation completed within the property in 2007. Further information not provided.	
10	(380 Cherry Ave., 444 Okanagan Ave., and 2000 Barnes St.) Historical waste generator. Waste not specified for 2000 Barnes St. 380 Cherry Ave produced waste oil. 444 Okanagan Ave produced waste oils and oily mixtures, greases, solvents, aluminum sands, ceramic beads and flammable liquids.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, and metals
11	(444 Okanagan Ave.) Current paved storage yard that contains electrical equipment and one large bulk tank.	LEPH/HEPH, PAH, and metals
12	(Yard north adjacent to Site, 370 Warren Ave.) Unpaved storage yards that store some and or all the listed: recreational vehicles, watercraft, trailers, commercial transport vehicles. Some surficial staining was observed within the 370 Warren Ave. yard.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, glycols, and metals



Legend

Facility
Road
TWS

0 20 40
Meters
Scale 1:2,500

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA
TITLE: Penticton Gate Station - APEC	DATE: Sep. 12, 2021 / ANALYST: PK / QA/QC: ET / **Figure 4.2**
	GIS FILE: 01-01-006_contaminant_penticton_apec.mxd
	JOB No: VE21506
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Last updated by paul.kwon

No	APEC	PCOC
1	Site Operations as a natural gas control station and historical waste generation of batteries, paints, enamels, lacquers, stains, shellac, polishes, fillers and thinners, corrosive liquids, oil waste and oily waste mixtures.	LEPH/HEPH, PAH, BTEX/VPH, VOCs and metals
2	Onsite chemical or waste storage area (suspected) located at the northwest corner of site. Nine (9) unlabeled sealed 200 L metal barrels were observed.	Unknown
3	Onsite suspected sealed waste containers. One (1) plastic barrel of unknown contents (label was obscured) was located next to the Office building. Two (2) unlabeled sealed containers (a metal barrel and a metal bucket) with unknown contents were present in the northeast corner of site.	Unknown
4	Onsite pad mounted transformer observed along the northern site boundary. Poly-chlorinated biphenyl (PCB) identification labels were not observed.	PCBs
5	Offsite unpaved storage yard located approximately 40 m west. Stored recreational vehicles, boats, family vehicles.	LEPH/HEPH, PAH, BTEX/VPH, VOCs, glycols, and metals
6	Offsite orchard located approximately 24 m east.	Pesticides

Legend

- Facility
- Highway
- Road
- Watercourse

0 20 40
Meters
Scale 1:2,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA				
TITLE: Oliver Y Control Station - APEC	DATE: Sep. 10, 2021	ANALYST: PK	QA/QC: ET	**Figure 4.3**	
	GIS FILE: 01-01-007_contaminant_oliver_apec.mxd				wood.
	JOB No: VE21506				
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers				

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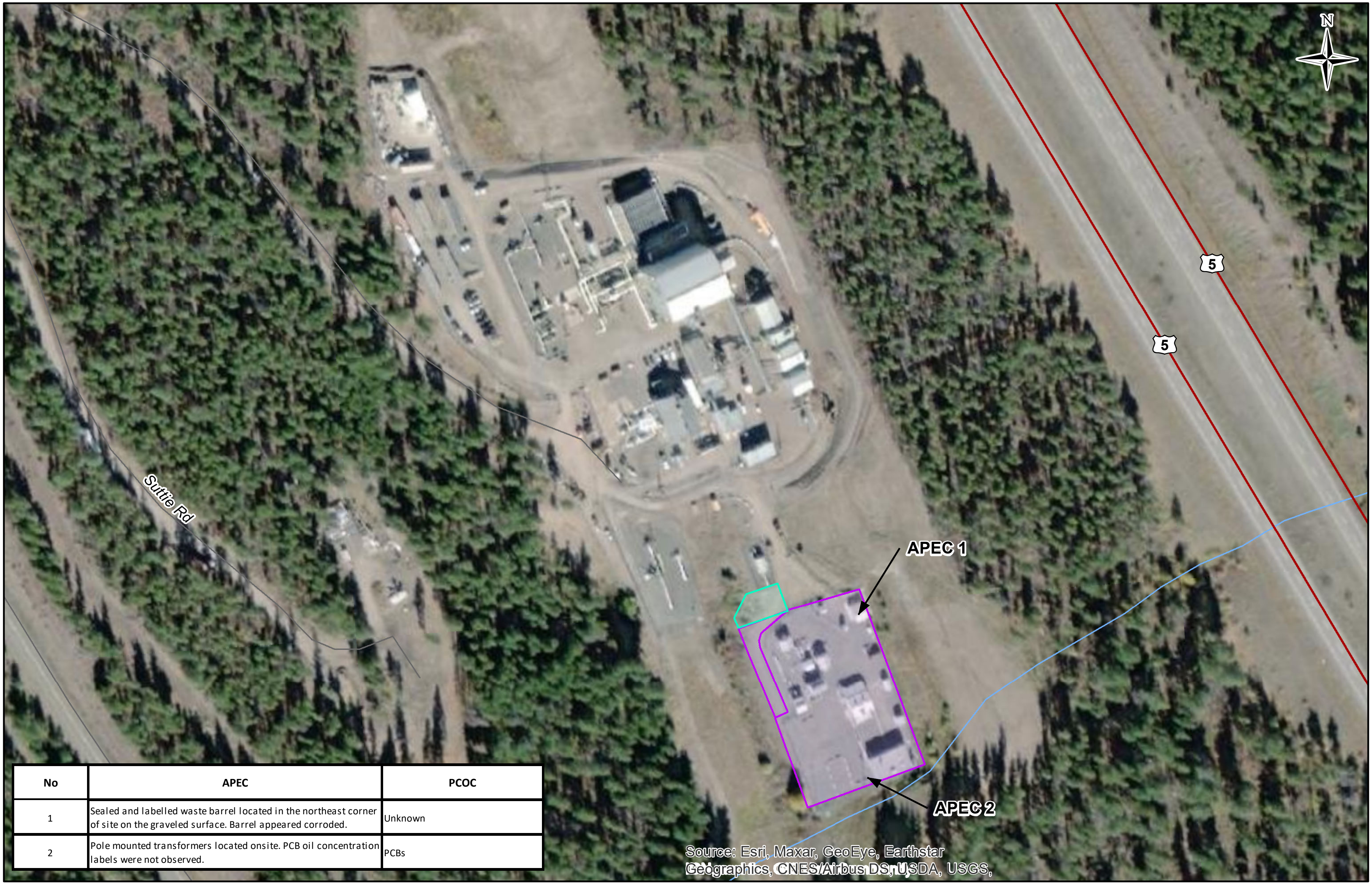

No	APEC	PCOC
1	Sealed and labelled waste barrel located in the northeast corner of site on the graveled surface. Barrel appeared corroded.	Unknown
2	Pole mounted transformers located onsite. PCB oil concentration labels were not observed.	PCBs

Legend

- Facility
- TWS
- Highway
- Road
- Watercourse

0 25 50
Meters
Scale 1:2,500

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC EOA			
TITLE: Kingsvale Control Station - APEC	DATE: October 21, 2021	ANALYST: PK	QA/QC: ET	**Figure 4.4**
	GIS FILE: 01-01-008_contaminant_kingsvale_apec.mxd			
	JOB No: VE21506			wood.
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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No	APEC	PCOC
1	Offsite TransCanada East Kootenay Exchange natural gas facilities. An aboveground fuel tank (suspected to be diesel fuel) secured to a stained concrete slab. Staining is suspected to have originated from leaks or drips during regular operational refueling.	LEPH/HEPH, PAH, BTEX/VPH, VOCs

Legend

- Facility
- TWS
- Highway
- Road

0 25 50
Meters
Scale 1:2,000

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CLIENT:
Prepared for FortisBC

PROJECT:
FortisBC ITS TIMC EOA

TITLE:
East Kootenay Exchange - APEC

DATE: October 21, 2021
ANALYST: PK
QA/QC: ET

Figure 4.5

GIS FILE: 01-01-009_contaminant_eke_apec.mxd
JOB No: VE21506
COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Appendix B – BC CDC Ecosystems Explorer Search Results

Scientific Name	English Name	Ecosystem Group	BC List
Achnatherum richardsonii Herbaceous Vegetation	spreading needlegrass Herbaceous Vegetation	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg)	Blue
Aristida purpurea - Hesperostipa comata - Erigeron filifolius	red three-awn - needle-and-thread grass - thread-leaved daisy	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg)	Red
Artemisia tridentata / Pseudoroegneria spicata	big sagebrush / bluebunch wheatgrass	Terrestrial Realm - Grassland Group (G): Shrub Steppe Class (Gs)	Red
Artemisia tridentata / Pseudoroegneria spicata - Balsamorhiza sagittata	big sagebrush / bluebunch wheatgrass - arrowleaf balsamroot	Terrestrial Realm - Grassland Group (G): Shrub Steppe Class (Gs)	Red
Betula nana / Carex aquatilis	scrub birch / water sedge	Wetland Realm - Peatland Group: Fen Wetland Class (Wf)	Blue
Betula occidentalis / Rosa spp.	water birch / roses	Terrestrial Realm - Flood Group (F): Low Bench Flood Class (Fl)	Red
Bolboschoenus maritimus var. *paludosus* Alkali Marsh	seacoast bulrush Alkali Marsh	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Red
Carex lasiocarpa / Drepanocladus aduncus	slender sedge / common hook-moss	Wetland Realm - Peatland Group: Fen Wetland Class (Wf)	Blue
Carex pellita - Juncus arcticus	woolly sedge - arctic rush	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Red
Distichlis spicata - Hordeum jubatum	alkali saltgrass - foxtail barley	Terrestrial Realm - Grassland Group (G): Alkaline/Saline Meadow Class (Ga)	Blue
Eleocharis quinqueflora / Drepanocladus spp.	few-flowered spike-rush / hook-mosses	Wetland Realm - Peatland Group: Fen Wetland Class (Wf)	Red
Equisetum fluviatile - Carex utriculata	swamp horsetail - beaked sedge	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Blue
Juncus balticus - Carex praegracilis	Baltic rush - field sedge	Terrestrial Realm - Grassland Group (G): Alkaline/Saline Meadow Class (Ga)	Red
Juncus balticus - Potentilla anserina	Baltic rush - common silverweed	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Red
Juniperus communis / Pseudoroegneria spicata	common juniper / bluebunch wheatgrass	Terrestrial Realm - Subalpine Shrub Group (S): Krummholz Class (Sk)	Red
Menyanthes trifoliata - Carex lasiocarpa	buckbean - slender sedge	Wetland Realm - Peatland Group: Fen Wetland Class (Wf)	Blue
Picea engelmannii x glauca / Equisetum spp. / *Mnium* spp.	hybrid white spruce / horsetails / leafy mosses	Terrestrial Realm - Forest: Coniferous - moist/wet; Wetland Realm - Mineral Wetland Group: Swamp Wetland Class (Ws)	Blue
Picea engelmannii x glauca / Ribes lacustre - Oplopanax horridus	hybrid white spruce / black gooseberry - devil's club	Terrestrial Realm - Forest: Coniferous - moist/wet	Blue
Pinus ponderosa - Populus trichocarpa / Toxicodendron rydbergii	ponderosa pine - black cottonwood / poison ivy	Terrestrial Realm - Forest: Mixed - moist/wet	Red
Pinus ponderosa / Aristida purpurea var. *longiseta*	ponderosa pine / red three-awn	Terrestrial Realm - Forest: Coniferous - dry	Blue
Pinus ponderosa / Pseudoroegneria spicata	ponderosa pine / bluebunch wheatgrass	Terrestrial Realm - Forest: Coniferous - dry	Blue
Pinus ponderosa / Pseudoroegneria spicata - Festuca campestris	ponderosa pine / bluebunch wheatgrass - rough fescue	Terrestrial Realm - Forest: Coniferous - mesic	Red
Pinus ponderosa / Rhus glabra	ponderosa pine / smooth sumac	Terrestrial Realm - Forest: Coniferous - mesic	Red
Populus tremuloides / Philadelphus lewisii	trembling aspen / mock-orange	Terrestrial Realm - Forest: Broadleaf - dry; Terrestrial Realm - Rock Group (R): Talus Class (Rt)	Red
Populus tremuloides / Symphoricarpos albus / Osmorhiza berteroi	trembling aspen / common snowberry / mountain sweet-cicely	Terrestrial Realm - Forest: Broadleaf - moist/wet	Red
Populus tremuloides / Symphoricarpos albus / Poa pratensis	trembling aspen / common snowberry / Kentucky bluegrass	Terrestrial Realm - Flood Group (F): Middle Bench Flood Class (Fm); Terrestrial Realm - Forest: Broadleaf - moist/wet	Red
Populus trichocarpa - Pseudotsuga menziesii / Acer glabrum - Symphoricarpos albus	black cottonwood - Douglas fir / Douglas maple - common snowberry	Terrestrial Realm - Flood Group (F): Middle Bench Flood Class (Fm)	Red
Populus trichocarpa - Pseudotsuga menziesii / Symphoricarpos albus - Cornus sericea	black cottonwood - Douglas-fir / common snowberry - red-osier dogwood	Terrestrial Realm - Flood Group (F): Middle Bench Flood Class (Fm); Terrestrial Realm - Forest: Broadleaf - moist/wet	Red
Populus trichocarpa / Toxicodendron rydbergii - Rosa spp.	black cottonwood / poison ivy - rose spp.	Terrestrial Realm - Flood Group (F): Middle Bench Flood Class (Fm)	Red
Pseudoroegneria spicata - Balsamorhiza sagittata	bluebunch wheatgrass - arrowleaf balsamroot	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg)	Blue
Pseudoroegneria spicata - Koeleria macrantha	bluebunch wheatgrass - junegrass	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg)	Blue
Pseudotsuga menziesii - Pinus ponderosa / Calamagrostis rubescens	Douglas-fir - ponderosa pine / pinegrass	Terrestrial Realm - Forest: Coniferous - dry; Terrestrial Realm - Forest: Coniferous - mesic	Blue
Pseudotsuga menziesii - Pinus ponderosa / Ceanothus velutinus	Douglas-fir - ponderosa pine / snowbrush	Terrestrial Realm - Forest: Coniferous - dry	Blue
Pseudotsuga menziesii - Pinus ponderosa / Festuca idahoensis	Douglas-fir - ponderosa pine / Idaho fescue	Terrestrial Realm - Forest: Coniferous - mesic	Blue
Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata	Douglas-fir - ponderosa pine / bluebunch wheatgrass	Terrestrial Realm - Forest: Coniferous - dry	Blue
Pseudotsuga menziesii - Pinus ponderosa / Pseudoroegneria spicata - Calamagrostis rubescens	Douglas-fir - ponderosa pine / bluebunch wheatgrass - pinegrass	Terrestrial Realm - Forest: Coniferous - dry	Blue
Pseudotsuga menziesii / Acer glabrum - Cornus sericea	Douglas-fir / Douglas maple - red-osier dogwood	Terrestrial Realm - Forest: Coniferous - moist/wet	Red
Pseudotsuga menziesii / Berberis aquifolium / Cryptogramma acrostichoides	Douglas-fir / tall Oregon-grape / parsley fern	Terrestrial Realm - Forest: Coniferous - dry	Red

Pseudotsuga menziesii / Symphoricarpos albus - Amelanchier alnifolia	Douglas-fir / common snowberry - saskatoon	Terrestrial Realm - Forest: Coniferous - mesic; Terrestrial Realm - Forest: Coniferous - moist/wet	Red
Pseudotsuga menziesii / Symphoricarpos albus - Spiraea betulifolia	Douglas-fir / common snowberry - birch-leaved spirea	Terrestrial Realm - Forest: Coniferous - moist/wet	Blue
Puccinellia nuttalliana - Hordeum jubatum	Nuttall's alkaligrass - foxtail barley	Terrestrial Realm - Grassland Group (G): Alkaline/Saline Meadow Class (Ga)	Red
Purshia tridentata / Hesperostipa comata	antelope-brush / needle-and-thread grass	Terrestrial Realm - Grassland Group (G): Shrub Steppe Class (Gs)	Red
Salix maccalliana / Carex utriculata	MacCalla's willow / beaked sedge	Wetland Realm - Mineral Wetland Group: Swamp Wetland Class (Ws)	Blue
Schoenoplectus pungens var. *longispicatus* Alkali Marsh	long-awned three-square bulrush Alkali Marsh	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Red
Symphoricarpos albus - Rosa woodsii	common snowberry - prairie rose	Terrestrial Realm - Flood Group (F): Fringe Flood Class (Ff)	Blue
Thuja plicata - Picea engelmannii x *glauca / Lonicera involucrata / Carex disperma*	western redcedar - hybrid white spruce / black twinberry / soft-leaved sedge	Terrestrial Realm - Forest: Coniferous - moist/wet	Red
Thuja plicata - Pseudotsuga menziesii / Maianthemum racemosum	western redcedar - Douglas-fir / false Solomon's seal	Terrestrial Realm - Forest: Coniferous - moist/wet	Red
Trichophorum cespitosum / Campylium stellatum	tufted clubrush / golden star-moss	Wetland Realm - Peatland Group: Fen Wetland Class (Wf)	Blue
Tsuga heterophylla / Symphoricarpos albus	western hemlock / common snowberry	Terrestrial Realm - Forest: Coniferous - mesic	Red
Typha latifolia Marsh	common cattail Marsh	Wetland Realm - Mineral Wetland Group: Marsh Wetland Class (Wm)	Blue
Pinus ponderosa / Pseudoroegneria spicata - Lupinus sericeus	ponderosa pine / bluebunch wheatgrass - silky lupine	Terrestrial Realm - Forest: Coniferous - mesic	Red
Pinus ponderosa / Symphoricarpos albus / Poa spp.	ponderosa pine / common snowberry / bluegrasses	Terrestrial Realm - Forest: Mixed - moist/wet	Red
Populus tremuloides - Populus trichocarpa / Symphoricarpos albus / Equisetum arvense	trembling aspen - black cottonwood / common snowberry / common horsetail	Terrestrial Realm - Flood Group (F): Middle Bench Flood Class (Fm); Terrestrial Realm - Forest: Broadleaf - moist/wet	Red
Pseudotsuga menziesii - Pinus ponderosa / Physocarpus malvaceus	Douglas-fir - ponderosa pine / mallow ninebark	Terrestrial Realm - Forest: Coniferous - mesic	Red
Selaginella densa - Pseudoroegneria spicata - Collinsia parviflora	compact selaginella - bluebunch wheatgrass - small-flowered blue-eyed Mary	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg); Terrestrial Realm - Rock Group (R): Rock Outcrop Class (Ro)	Blue
Leymus cinereus Herbaceous Vegetation	giant wildrye Herbaceous Vegetation	Terrestrial Realm - Grassland Group (G): Grassland Class (Gg)	Red

Name Category	Scientific Name	English Name	BC List	SARA Schedule	SARA Status
Bryophyte	*Barbula convoluta var. eustegia*		Red		
Bryophyte	*Bartramia halleriana*	Haller's apple moss	Red	1	Threatened
Bryophyte	*Bryobrittonia longipes*		Blue		
Bryophyte	*Bryoerythrophyllum columbianum*	Columbian carpet moss	Blue	1	Special Concern
Bryophyte	*Bryum gemmiparum*		Blue		
Bryophyte	*Bryum uliginosum*		Blue		
Bryophyte	*Campylium calcareum*		Red		
Bryophyte	*Campylium radicale*		Blue		
Bryophyte	*Coscinodon cribrosus*		Red		
Bryophyte	*Crossidium seriatum*	tiny tassel	Blue	1	Special Concern
Bryophyte	*Didymodon brachyphyllus*		Red		
Bryophyte	*Encalypta intermedia*		Blue		
Bryophyte	*Encalypta mutica*		Blue		
Bryophyte	*Encalypta spathulata*		Blue		
Bryophyte	*Entosthodon fascicularis*	banded cord-moss	Blue	1	Special Concern
Bryophyte	*Entosthodon rubiginosus*	rusty cord-moss	Blue	1	Endangered
Bryophyte	*Funaria muhlenbergii*		Blue		
Bryophyte	*Grimmia plagiopodia*		Red		
Bryophyte	*Hilpertia velenovskyi*		Red		
Bryophyte	*Hygrohypnum alpinum*		Blue		
Bryophyte	*Hygrohypnum norvegicum*		Red		
Bryophyte	*Meesia longiseta*		Blue		
Bryophyte	*Microbryum vlassovii*	nugget moss	Red	1	Endangered
Bryophyte	*Mnium arizonicum*		Blue		
Bryophyte	*Oreas martiana*		Red		
Bryophyte	*Orthotrichum hallii*		Red		
Bryophyte	*Orthotrichum pallens*		Blue		
Bryophyte	*Orthotrichum rivulare*		Blue		
Bryophyte	*Philonotis marchica*		Blue		
Bryophyte	*Philonotis yezoana*		Blue		
Bryophyte	*Physcomitrella patens*		Red		
Bryophyte	*Physcomitrium pyriforme*		Blue		
Bryophyte	*Plagiobryum demissum*		Red		
Bryophyte	*Platyhypnidium riparioides*		Blue		
Bryophyte	*Pohlia elongata*		Blue		
Bryophyte	*Pterygoneurum kozlovii*	alkaline wing-nerved moss	Blue	1	Threatened
Bryophyte	*Pterygoneurum lamellatum*		Red		
Bryophyte	Pylaisia intricata		Red		
Bryophyte	*Schistidium heterophyllum*		Blue		
Bryophyte	*Schistidium robustum*		Blue		
Bryophyte	*Scouleria marginata*	margined streamside moss	Red	1	Endangered
Bryophyte	*Seligeria tristichoides*		Blue		
Bryophyte	*Sphagnum jensenii*		Red		
Bryophyte	*Sphagnum wulfianum*		Blue		
Bryophyte	*Tortula obtusifolia*		Blue		
Bryophyte	*Tortula protobryoides*		Red		
Bryophyte	*Tripterocladium leucocladulum*		Blue		
Bryophyte	*Ulota curvifolia*		Blue		
Bryophyte	*Warnstorfia tundrae*		Red		
Bryophyte	*Weissia brachycarpa*		Blue		
Lichen	*Arctoparmelia subcentrifuga*	abrading ring	Blue		
Lichen	*Cladonia cyanipes*	blue-footed pixie	Blue		
Lichen	*Cladonia parasitica*	fence-rail pixie	Red		
Lichen	*Collema flaccidum*	flaking tarpaper	Red		
Lichen	*Dermatocarpon intestiniforme*	quilted stippleback	Blue		
Lichen	*Evernia divaricata*	mountain oakmoss	Blue		
Lichen	*Fulgensia desertorum*	desert sulphur	Blue		
Lichen	*Hypogymnia dichroma*		Blue		
Lichen	*Leptogium schraderi*	collapsing vinyl	Red		
Lichen	*Lobothallia praeradiosa*		Red		
Lichen	*Massalongia microphylliza*	chopped liver	Blue		
Lichen	*Neofuscelia loxodes*	blistered toad	Blue		
Lichen	*Neofuscelia subhosseana*	erupting toad	Blue		
Lichen	*Nephroma isidiosum*	pebbled paw	Blue		
Lichen	*Peltula euploca*	powder-lined rock-olive	Red		
Lichen	*Phaeophyscia ciliata*	greater eye shadow	Blue		
Lichen	*Physcia dimidiata*	exuberant rosette	Blue		
Lichen	*Platismatia wheeleri*		Red		
Lichen	*Xanthomendoza borealis*		Red		
Vascular Plant	*Achnatherum thurberianum*	Thurber's needlegrass	Blue		
Vascular Plant	*Acorus americanus*	American sweet-flag	Blue		
Vascular Plant	*Ammannia robusta*	scarlet ammannia	Red	1	Endangered
Vascular Plant	*Antennaria flagellaris*	stoloniferous pussytoes	Red	1	Endangered
Vascular Plant	*Aphyllon ludovicianum*	Louisiana broomrape	Red		
Vascular Plant	*Astragalus microcystis*	least bladdery milk-vetch	Blue		
Vascular Plant	*Astragalus sclerocarpus*	The Dalles milk-vetch	Red		
Vascular Plant	*Astragalus spaldingii*	Spalding's milk-vetch	Red		
Vascular Plant	*Azolla mexicana*	Mexican mosquito fern	Blue	1	Threatened
Vascular Plant	*Berula erecta*	cut-leaved water-parsnip	Blue		

Vascular Plant	*Boechera cascadensis*	Cascade rockcress	Blue		
Vascular Plant	*Boechera paupercula*	tiny suncress	Red		
Vascular Plant	*Bolboschoenus fluviatilis*	river bulrush	Blue		
Vascular Plant	*Botrychium michiganense*	Michigan moonwort	Blue		
Vascular Plant	*Brickellia grandiflora*	large-flowered brickellia	Red		
Vascular Plant	*Calochortus lyallii*	Lyall's mariposa lily	Blue	1	Special Concern
Vascular Plant	*Castilleja minor* var. *exilis*	annual paintbrush	Red		
Vascular Plant	*Castilleja rupicola*	cliff paintbrush	Blue	1	Threatened
Vascular Plant	*Castilleja tenuis*	hairy paintbrush	Red		
Vascular Plant	*Clarkia rhomboidea*	common clarkia	Blue		
Vascular Plant	*Claytonia cordifolia*	heart-leaved springbeauty	Blue		
Vascular Plant	*Collomia tenella*	slender collomia	Red	1	Endangered
Vascular Plant	*Crataegus atrovirens*	dark-green hawthorn	Blue		
Vascular Plant	*Crataegus chrysocarpa* var. *vernonensis*	fireberry hawthorn	Blue		
Vascular Plant	*Crataegus enderbyensis*	Enderby hawthorn	Blue		
Vascular Plant	*Crataegus macracantha*	large-thorned hawthorn	Blue		
Vascular Plant	*Crataegus okanaganensis* var. *okanaganensis*	Okanagan hawthorn	Blue		
Vascular Plant	*Crataegus tenuior*	slender red hawthorn	Blue		
Vascular Plant	*Crepis atribarba* ssp. *atribarba*	slender hawksbeard	Blue		
Vascular Plant	*Crepis modocensis* ssp. *modocensis*	low hawksbeard	Red		
Vascular Plant	*Crepis modocensis* ssp. *rostrata*	western low hawksbeard	Red		
Vascular Plant	*Crepis occidentalis* ssp. *pumila*	gray hawk's-beard	Red		
Vascular Plant	*Cryptantha watsonii*	Watson's cryptantha	Blue		
Vascular Plant	*Delphinium bicolor* ssp. *bicolor*	Montana larkspur	Blue		
Vascular Plant	*Eleocharis engelmannii*	Englemann's spike-rush	Blue		
Vascular Plant	*Eleocharis geniculata*	bent spike-rush	Red	1	Endangered
Vascular Plant	*Elymus curvatus*	beardless wildrye	Blue		
Vascular Plant	*Erigeron leibergii*	Leiberg's daisy	Red		
Vascular Plant	*Erigeron poliospermus* var. *poliospermus*	cushion daisy	Blue		
Vascular Plant	*Eriogonum heracleoides* var. *leucophaeum*	parsnip-flowered buckwheat	Red		
Vascular Plant	*Erysimum capitatum var. purshii*	Pursh's wallflower	Blue		
Vascular Plant	*Erythranthe suksdorfii*	Suksdorf's monkey-flower	Blue		
Vascular Plant	*Festuca washingtonica*	Washington fescue	Blue		
Vascular Plant	*Gayophytum ramosissimum*	hairstem groundsmoke	Blue		
Vascular Plant	*Gentiana affinis* var. *affinis*	prairie gentian	Red		
Vascular Plant	*Gilia sinuata*	shy gilia	Red		
Vascular Plant	*Glycyrrhiza lepidota*	wild licorice	Blue		
Vascular Plant	*Hackelia diffusa* var. *diffusa*	spreading stickseed	Blue		
Vascular Plant	*Hesperochiron pumilus*	dwarf hesperochiron	Red		
Vascular Plant	*Isoetes minima*	Columbia quillwort	Red		
Vascular Plant	*Isoetes* x *marensis*	Mara Lake quillwort	Red		
Vascular Plant	*Lappula fremontii*	Fremont's stickseed	Red		
Vascular Plant	*Leptosiphon harknessii*	Harkness' linanthus	Red		
Vascular Plant	*Lewisia columbiana* var. *columbiana*	Columbia lewisia	Blue		
Vascular Plant	*Lindernia dubia* var. *dubia*	yellowseed false pimpernel	Blue		
Vascular Plant	*Lipocarpha micrantha*	small-flowered lipocarpha	Red	1	Endangered
Vascular Plant	*Lupinus sulphureus*	sulphur lupine	Blue		
Vascular Plant	*Marsilea vestita*	hairy water-clover	Blue		
Vascular Plant	*Mertensia oblongifolia*	oblong-leaved bluebells	Red		
Vascular Plant	*Navarretia intertexta*	needle-leaved navarretia	Blue		
Vascular Plant	*Navarretia propinqua*	near navarretia	Blue		
Vascular Plant	*Neoholmgrenia andina*	Andean evening-primrose	Red		
Vascular Plant	*Oenothera pallida* ssp. *pallida*	pale evening-primrose	Red		
Vascular Plant	*Oenothera suffrutescens*	scarlet gaura	Red		
Vascular Plant	*Olsynium douglasii* var. *inflatum*	satinflower	Red		
Vascular Plant	*Oreocarya glomerata*	cock's-comb cryptantha	Blue		
Vascular Plant	*Orthocarpus barbatus*	Grand Coulee owl-clover	Red	1	Endangered
Vascular Plant	*Phacelia heterophylla* var. *virgata*	varied-leaf phacelia	Blue		
Vascular Plant	*Phacelia ramosissima* var. *ramosissima*	branched phacelia	Red	1	Endangered
Vascular Plant	*Phlox speciosa* ssp. *occidentalis*	showy phlox	Red	1	Threatened
Vascular Plant	*Pinus albicaulis*	whitebark pine	Blue	1	Endangered
Vascular Plant	*Pinus flexilis*	limber pine	Blue		
Vascular Plant	*Poa fendleriana* ssp. *fendleriana*	mutton grass	Red		
Vascular Plant	*Polemonium californicum*	California Jacob's ladder	Red		
Vascular Plant	*Polygonum engelmannii*	Engelmann's knotweed	Red		
Vascular Plant	*Polystichum scopulinum*	mountain holly fern	Red	1	Threatened
Vascular Plant	*Potentilla glaucophylla* var. *perdissecta*	diverse-leaved cinquefoil	Blue		
Vascular Plant	*Psilocarphus brevissimus* var. *brevissimus*	dwarf woolly-heads	Red	1	Endangered
Vascular Plant	*Rotala ramosior*	toothcup	Red	1	Endangered
Vascular Plant	*Salix amygdaloides*	peach-leaf willow	Blue		
Vascular Plant	*Salix exigua* var. *hindsiana*	Hinds' willow	Red		
Vascular Plant	*Sandbergia whitedii*	Whited's fissurewort	Blue		
Vascular Plant	*Schoenoplectiella saximontana*	Rocky Mountain clubrush	Red		
Vascular Plant	*Scirpus pallidus*	pale bulrush	Red		
Vascular Plant	*Scrophularia lanceolata*	lance-leaved figwort	Blue		
Vascular Plant	*Scutellaria angustifolia* ssp. *micrantha*	small-flowered skullcap	Blue		
Vascular Plant	*Senecio hydrophiloides*	sweet-marsh butterweed	Blue		
Vascular Plant	*Senecio hydrophilus*	alkali-marsh butterweed	Red		
Vascular Plant	*Senecio integerrimus* var. *ochroleucus*	white western groundsel	Red		
Vascular Plant	*Sidalcea oregana* ssp. *oregana*	Oregon checker-mallow	Red		

Vascular Plant	*Sisyrinchium idahoense* var. *occidentale*	Idaho blue-eyed grass	Red		
Vascular Plant	*Solidago gigantea* var. *shinnersii*	smooth goldenrod	Blue		
Vascular Plant	*Spiranthes diluvialis*	Ute lady's tresses	Red		
Vascular Plant	*Sporobolus airoides*	hairgrass dropseed	Blue		
Vascular Plant	*Symphyotrichum frondosum*	short-rayed aster	Red	1	Endangered
Vascular Plant	*Taraxia breviflora*	short-flowered evening-primrose	Red		
Vascular Plant	*Thalictrum dasycarpum*	purple meadowrue	Blue		
Vascular Plant	*Triglochin concinna* var. *debilis*	slender arrow-grass	Blue		
Vascular Plant	*Valeriana edulis* var. *edulis*	edible valerian	Red		
Vascular Plant	*Viola sororia*	woolly blue violet	Blue		
Vascular Plant	*Zeltnera exaltata*	western centaury	Red		

Name Category	Scientific Name	English Name	BC List	Prov Wildlife Act	COSEWIC	SARA Schedule	SARA Status
amphibians	*Ambystoma mavortium*	Blotched Tiger Salamander	Red		Endangered	1	Endangered
amphibians	*Anaxyrus boreas*	Western Toad	Yellow		Special Concern	1	Special Concern
amphibians	*Ascaphus montanus*	Rocky Mountain Tailed Frog	Blue		Threatened	1	Threatened
amphibians	*Ascaphus truei*	Coastal Tailed Frog	Yellow		Special Concern	1	Special Concern
amphibians	*Lithobates pipiens*	Northern Leopard Frog	Red		Endangered	1	Endangered
amphibians	*Plethodon idahoensis*	Coeur d'Alene Salamander	Yellow		Special Concern	1	Special Concern
amphibians	*Spea intermontana*	Great Basin Spadefoot	Blue		Threatened	1	Threatened
birds	*Accipiter gentilis atricapillus*	Northern Goshawk, *atricapillus* subspecies	Blue		Not at Risk		
birds	*Aechmophorus occidentalis*	Western Grebe	Red		Special Concern	1	Special Concern
birds	*Aeronautes saxatalis*	White-throated Swift	Blue				
birds	*Ammodramus savannarum*	Grasshopper Sparrow	Red				
birds	*Antigone canadensis*	Sandhill Crane	Yellow		Not at Risk		
birds	*Ardea herodias herodias*	Great Blue Heron, *herodias* subspecies	Blue				
birds	*Asio flammeus*	Short-eared Owl	Blue		Threatened	1	Special Concern
birds	*Athene cunicularia*	Burrowing Owl	Red	Endangered	Endangered	1	Endangered
birds	*Bartramia longicauda*	Upland Sandpiper	Red				
birds	*Botaurus lentiginosus*	American Bittern	Blue				
birds	*Branta bernicla*	Brant	Blue				
birds	*Buteo lagopus*	Rough-legged Hawk	Blue		Not at Risk		
birds	*Buteo platypterus*	Broad-winged Hawk	Blue				
birds	*Buteo regalis*	Ferruginous Hawk	Unknown		Threatened	1	Threatened
birds	*Buteo swainsoni*	Swainson's Hawk	Red				
birds	*Butorides virescens*	Green Heron	Blue				
birds	*Calcarius pictus*	Smith's Longspur	Blue				
birds	*Catherpes mexicanus*	Canyon Wren	Blue		Not at Risk		
birds	*Centrocercus urophasianus*	Greater Sage-Grouse	Red		Extirpated	1	Extirpated
birds	*Chondestes grammacus*	Lark Sparrow	Blue				
birds	*Chordeiles minor*	Common Nighthawk	Yellow		Special Concern	1	Threatened
birds	*Coccothraustes vespertinus*	Evening Grosbeak	Yellow		Special Concern	1	Special Concern
birds	*Coccyzus americanus*	Yellow-billed Cuckoo	Red				
birds	*Contopus cooperi*	Olive-sided Flycatcher	Blue		Special Concern	1	Threatened
birds	*Coturnicops noveboracensis*	Yellow Rail	Red		Special Concern	1	Special Concern
birds	*Cypseloides niger*	Black Swift	Blue		Endangered	1	Endangered
birds	*Dolichonyx oryzivorus*	Bobolink	Blue		Threatened	1	Threatened
birds	*Dryobates albolarvatus*	White-headed Woodpecker	Red		Endangered	1	Endangered
birds	*Empidonax wrightii*	Gray Flycatcher	Blue		Not at Risk		
birds	*Eremophila alpestris merrilli*	Horned Lark, *merrilli* subspecies	Blue				
birds	*Euphagus carolinus*	Rusty Blackbird	Blue		Special Concern	1	Special Concern
birds	*Falco mexicanus*	Prairie Falcon	Red		Not at Risk		
birds	*Falco peregrinus*	Peregrine Falcon	No Status		Special Concern	1	Special Concern
birds	*Falco peregrinus anatum*	Peregrine Falcon, *anatum* subspecies	Red		Not at Risk	1	Special Concern
birds	*Falco rusticolus*	Gyrfalcon	Blue		Not at Risk		
birds	*Hirundo rustica*	Barn Swallow	Blue		Special Concern	1	Threatened
birds	*Hydroprogne caspia*	Caspian Tern	Blue		Not at Risk		
birds	*Icteria virens*	Yellow-breasted Chat	Red		Endangered	1	Endangered
birds	*Larus californicus*	California Gull	Blue				
birds	*Limnodromus griseus*	Short-billed Dowitcher	Blue				
birds	*Limosa haemastica*	Hudsonian Godwit	Red		Threatened		
birds	*Megascops kennicottii*	Western Screech-Owl	No Status		Threatened	1	Threatened
birds	*Megascops kennicottii macfarlanei*	Western Screech-Owl, *macfarlanei* subspecies	Blue		Threatened	1	Threatened
birds	*Melanerpes lewis*	Lewis's Woodpecker	Blue		Threatened	1	Threatened
birds	*Melanitta perspicillata*	Surf Scoter	Blue				
birds	*Numenius americanus*	Long-billed Curlew	Blue		Special Concern	1	Special Concern
birds	*Nycticorax nycticorax*	Black-crowned Night-heron	Red				
birds	*Oreoscoptes montanus*	Sage Thrasher	Red		Endangered	1	Endangered
birds	*Patagioenas fasciata*	Band-tailed Pigeon	Blue		Special Concern	1	Special Concern
birds	*Pelecanus erythrorhynchos*	American White Pelican	Red	Endangered	Not at Risk		
birds	*Phalacrocorax auritus*	Double-crested Cormorant	Blue		Not at Risk		
birds	*Phalaropus lobatus*	Red-necked Phalarope	Blue		Special Concern	1	Special Concern
birds	*Pluvialis dominica*	American Golden-Plover	Blue				
birds	*Podiceps nigricollis*	Eared Grebe	Blue				
birds	*Progne subis*	Purple Martin	Blue				
birds	*Psiloscops flammeolus*	Flammulated Owl	Blue		Special Concern	1	Special Concern
birds	*Recurvirostra americana*	American Avocet	Blue				
birds	*Setophaga castanea*	Bay-breasted Warbler	Red				
birds	*Setophaga tigrina*	Cape May Warbler	Blue				
birds	*Setophaga virens*	Black-throated Green Warbler	Blue				
birds	*Sphyrapicus thyroideus*	Williamson's Sapsucker	Blue		Endangered	1	Endangered
birds	*Sphyrapicus thyroideus nataliae*	Williamson's Sapsucker, *nataliae* subspecies	No Status		Endangered	1	Endangered
birds	*Sphyrapicus thyroideus thyroideus*	Williamson's Sapsucker, *thyroideus* subspecies	No Status		Endangered	1	Endangered
birds	*Spizella breweri breweri*	Brewer's Sparrow, *breweri* subspecies	Blue				
birds	*Sterna forsteri*	Forster's Tern	Red		Data Deficient		
birds	*Strix occidentalis*	Spotted Owl	Red		Endangered	1	Endangered
birds	*Tringa incana*	Wandering Tattler	Blue				
birds	*Tympanuchus phasianellus columbianus*	Sharp-tailed Grouse, *columbianus* subspecies	Blue				
birds	*Tyto alba*	Barn Owl	Red		Threatened	1	Threatened
bivalves	*Gonidea angulata*	Rocky Mountain Ridged Mussel	Red		Endangered	1	Special Concern
bivalves	*Musculium partumeium*	Swamp Fingernailclam	Blue				
bivalves	*Musculium transversum*	Long Fingernailclam	Blue				
bivalves	*Pisidium fallax*	River Peaclam	Blue				
bivalves	*Sphaerium occidentale*	Herrington Fingernailclam	Blue				
bivalves	*Sphaerium striatinum*	Striated Fingernailclam	Blue				
gastropods	*Anguispira kochi*	Banded Tigersnail	Blue		Not at Risk		
gastropods	*Cryptomastix mullani*	Coeur d'Alene Oregonian	Blue				
gastropods	*Fisherola nuttalli*	Shortface Lanx	Red		Endangered		
gastropods	*Fluminicola fuscus*	Ashy Pebblesnail	Red				
gastropods	*Galba bulimoides*	Prairie Fossaria	Blue				
gastropods	*Galba dalli*	Dusky Fossaria	Blue				
gastropods	*Galba obrussa*	Golden Fossaria	Blue				
gastropods	*Galba truncatula*	Attenuate Fossaria	Blue				

gastropods	*Gastrocopta holzingeri*	Lambda Snaggletooth	Red		
gastropods	*Gyraulus crista*	Star Gyro	Blue		
gastropods	*Hemphillia camelus*	Pale Jumping-slug	Blue		
gastropods	*Kootenaia burkei*	Pygmy Slug	Blue	Special Concern	1 Special Concern
gastropods	*Lymnaea atkaensis*	Frigid Lymnaea	Blue		
gastropods	*Magnipelta mycophaga*	Magnum Mantleslug	Blue	Special Concern	1 Special Concern
gastropods	*Oreohelix subrudis*	Subalpine Mountainsnail	Blue		
gastropods	*Physella columbiana*	Rotund Physa	Red		
gastropods	*Physella propinqua*	Rocky Mountain Physa	Blue		
gastropods	*Physella virginea*	Sunset Physa	Blue		
gastropods	*Planorbula campestris*	Meadow Rams-horn	Blue		
gastropods	*Pristiloma arcticum*	Northern Tightcoil	Blue		
gastropods	*Promenetus umbilicatellus*	Umbilicate Sprite	Blue		
gastropods	*Stagnicola apicina*	Abbreviate Pondsnail	Blue		
gastropods	*Stagnicola caperata*	Wrinkled Marshsnail	Blue		
gastropods	*Stagnicola traski*	Widelip Pondsnail	Blue		
gastropods	*Valvata humeralis*	Glossy Valvata	Red		
gastropods	*Valvata tricarinata*	Threeridge Valvata	Red		
gastropods	*Zacoleus idahoensis*	Sheathed Slug	Blue	Special Concern	1 Special Concern
insects	*Aeshna constricta*	Lance-tipped Darner	Blue		
insects	*Apodemia mormo*	Mormon Metalmark	Red	Endangered	1 Endangered
insects	*Argia emma*	Emma's Dancer	Blue		
insects	*Argia vivida*	Vivid Dancer	Blue	Special Concern	1 Special Concern
insects	*Boloria alberta*	Albert's Fritillary	Blue		
insects	*Boloria astarte distincta*	Astarte Fritillary, *distincta* subspecies	Blue		
insects	*Bombus occidentalis*	Western Bumble Bee	Blue	Threatened	
insects	*Callophrys affinis*	Immaculate Green Hairstreak	Blue		
insects	*Calopteryx aequabilis*	River Jewelwing	Blue		
insects	*Chlosyne hoffmanni*	Hoffman's Checkerspot	Red		
insects	*Cicindela decemnotata*	Badlands Tiger Beetle	Red		
insects	*Cicindela hirticollis*	Hairy-necked Tiger Beetle	Blue		
insects	*Cicindela parowana*	Dark Saltflat Tiger Beetle	Red	Endangered	1 Endangered
insects	*Cicindela pugetana*	Sagebrush Tiger Beetle	Blue		
insects	*Colias meadii*	Mead's Sulphur	Blue		
insects	*Colias skinneri*	Skinner's Pelidne Sulphur	Blue		
insects	*Copablepharon absidum*	Columbia Dune Moth	Red	Data Deficient	
insects	*Cupido comyntas*	Eastern Tailed Blue	Blue		
insects	*Danaus plexippus*	Monarch	Red	Endangered	1 Special Concern
insects	*Efferia okanagana*	Okanagan efferia	Red	Endangered	1 Endangered
insects	*Enallagma civile*	Familiar Bluet	Red		
insects	*Enallagma clausum*	Alkali Bluet	Blue		
insects	*Epargyreus clarus*	Silver-spotted Skipper	Blue		
insects	*Epargyreus clarus clarus*	Silver-spotted Skipper, *clarus* subspecies	Blue		
insects	*Erebia magdalena*	Magdalena Alpine	Blue		
insects	*Erynnis afranius*	Afranius Duskywing	Red		
insects	*Erythemis collocata*	Western Pondhawk	Blue		
insects	*Euphydryas gillettii*	Gillette's Checkerspot	Blue		
insects	*Euphyes vestris*	Dun Skipper	Blue	Threatened	1 Threatened
insects	*Euptoieta claudia*	Variegated Fritillary	Blue		
insects	*Hemileuca nuttalli*	Nuttall's Sheepmoth	Red	Endangered	
insects	*Hesperia nevada*	Nevada Skipper	Blue		
insects	*Ischnura damula*	Plains Forktail	Red		
insects	*Libellula pulchella*	Twelve-spotted Skimmer	Blue		
insects	*Limenitis archippus*	Viceroy	Red		
insects	*Lycaena dione*	Dione Copper	Red		
insects	*Lycaena hyllus*	Bronze Copper	Blue		
insects	*Lycaena nivalis*	Lilac-bordered Copper	Blue		
insects	*Macromia magnifica*	Western River Cruiser	Blue		
insects	*Oeneis jutta chermocki*	Jutta Arctic, *chermocki* subspecies	Blue		
insects	*Ophiogomphus occidentis*	Sinuous Snaketail	Blue		
insects	*Papilio indra*	Indra Swallowtail	Red		
insects	*Papilio machaon dodi*	Old World Swallowtail, *dodi* subspecies	Red		
insects	*Papilio machaon hudsonianus*	Old World Swallowtail, *hudsonianus* subspecies	Red		
insects	*Parnassius clodius pseudogallatinus*	Clodius Parnassian, *pseudogallatinus* supspecies	Blue		
insects	*Phanogomphus graslinellus*	Pronghorn Clubtail	Blue		
insects	*Pholisora catullus*	Common Sootywing	Blue		
insects	*Polites sabuleti*	Sandhill Skipper	Red		
insects	*Polites sonora*	Sonora Skipper	Blue	Not at Risk	1 Special Concern
insects	*Polites themistocles themistocles*	Tawny-edged Skipper, *themistocles* subspecies	Blue		
insects	*Pyrgus communis*	Checkered Skipper	Blue		
insects	*Satyrium behrii*	Behr's Hairstreak	Red	Endangered	1 Endangered
insects	*Satyrium californica*	California Hairstreak	Blue		
insects	*Satyrium semiluna*	Half-moon Hairstreak	Red	Endangered	1 Endangered
insects	*Somatochlora brevicincta*	Quebec Emerald	Blue		
insects	*Somatochlora forcipata*	Forcipate Emerald	Blue		
insects	*Somatochlora kennedyi*	Kennedy's Emerald	Blue		
insects	*Speyeria aphrodite manitoba*	Aphrodite Fritillary, *manitoba* subspecies	Blue		
insects	*Speyeria aphrodite whitehousei*	Aphrodite Fritillary, *whitehousei* subspecies	Blue		
insects	*Speyeria mormonia erinna*	Mormon Fritillary, *erinna* subspecies	Red		
insects	*Speyeria mormonia eurynome*	Mormon Fritillary, *eurynome* subspecies	Red		
insects	*Stylurus olivaceus*	Olive Clubtail	Red	Endangered	1 Endangered
mammals	*Antrozous pallidus*	Pallid Bat	Red	Threatened	1 Threatened
mammals	*Aplodontia rufa*	Mountain Beaver	Yellow	Special Concern	1 Special Concern
mammals	*Corynorhinus townsendii*	Townsend's Big-eared Bat	Blue		
mammals	*Euderma maculatum*	Spotted Bat	Blue	Special Concern	1 Special Concern
mammals	*Gulo gulo*	Wolverine	No Status	Special Concern	1 Special Concern
mammals	*Gulo gulo luscus*	Wolverine, *luscus* subspecies	Blue	Special Concern	1 Special Concern
mammals	*Lepus townsendii*	White-tailed Jackrabbit	Red		
mammals	*Myodes gapperi galei*	Southern Red-backed Vole, *galei* subspecies	Blue		
mammals	*Myotis ciliolabrum*	Western Small-footed Myotis	Blue		
mammals	*Myotis lucifugus*	Little Brown Myotis	Yellow	Endangered	1 Endangered

mammals	*Myotis septentrionalis*	Northern Myotis	Blue	Endangered	1 Endangered
mammals	*Myotis thysanodes*	Fringed Myotis	Blue	Data Deficient	3
mammals	*Neotamias ruficaudus simulans*	Red-tailed Chipmunk, *simulans* subspecies	Blue		
mammals	*Oreamnos americanus*	Mountain Goat	Blue		
mammals	*Ovis canadensis*	Bighorn Sheep	Blue		
mammals	*Pekania pennanti*	Fisher	No Status		
mammals	*Perognathus parvus*	Columbia Plateau Pocket Mouse	Blue		
mammals	*Rangifer tarandus*	Caribou	No Status		
mammals	*Rangifer tarandus* pop. 1	Caribou (Southern Mountain Population)	Red	Endangered	1 Threatened
mammals	*Reithrodontomys megalotis*	Western Harvest Mouse	Blue	Endangered	1 Special Concern
mammals	*Sorex merriami*	Merriam's Shrew	Red		
mammals	*Sorex preblei*	Preble's Shrew	Red		
mammals	*Sylvilagus nuttallii*	Nuttall's Cottontail	Blue	Special Concern	1 Special Concern
mammals	*Synaptomys borealis artemisiae*	Northern Bog Lemming, *artemisiae* subspecies	Blue		
mammals	*Taxidea taxus*	American Badger	Red	Endangered	1 Endangered
mammals	*Thomomys talpoides segregatus*	Northern Pocket Gopher, *segregatus* subspecies	Red		
mammals	*Ursus arctos*	Grizzly Bear	Blue	Special Concern	1 Special Concern
ray-finned fishes	*Acipenser transmontanus*	White Sturgeon	No Status	Endangered / Threatened	1 Endangered
ray-finned fishes	*Acipenser transmontanus* pop. 1	White Sturgeon (Upper Kootenay River Population)	Red	Endangered	1 Endangered
ray-finned fishes	*Acipenser transmontanus* pop. 2	White Sturgeon (Upper Columbia River Population)	Red	Endangered	1 Endangered
ray-finned fishes	*Acipenser transmontanus* pop. 4	White Sturgeon (Lower Fraser River Population)	Red	Threatened	
ray-finned fishes	*Acipenser transmontanus* pop. 5	White Sturgeon (Upper Fraser River Population)	Red	Endangered	1 Endangered
ray-finned fishes	*Catostomus platyrhynchus*	Mountain Sucker	Blue	Special Concern	1 Special Concern
ray-finned fishes	*Cottus confusus*	Shorthead Sculpin	Blue	Special Concern	1 Special Concern
ray-finned fishes	*Cottus hubbsi*	Columbia Sculpin	Blue	Special Concern	1 Special Concern
ray-finned fishes	*Lota lota* pop. 1	Burbot (Lower Kootenay Population)	Red		
ray-finned fishes	*Oncorhynchus clarkii clarkii*	Cutthroat Trout, *clarkii* subspecies	Blue		
ray-finned fishes	*Oncorhynchus clarkii lewisi*	Cutthroat Trout, *lewisi* subspecies	Blue	Special Concern	1 Special Concern
ray-finned fishes	*Oncorhynchus tshawytscha*	Chinook Salmon	No Status	Endangered / Threatened / Special Concern / Data Deficient / Not at Risk	
ray-finned fishes	*Rhinichthys osculus*	Speckled Dace	Blue	Endangered	1 Endangered
ray-finned fishes	*Rhinichthys umatilla*	Umatilla Dace	Red	Threatened	3
ray-finned fishes	*Salvelinus confluentus*	Bull Trout	Blue	Special Concern	
reptiles	*Charina bottae*	Northern Rubber Boa	Yellow	Special Concern	1 Special Concern
reptiles	*Coluber constrictor*	North American Racer	Blue	Threatened	1 Special Concern
reptiles	*Crotalus oreganus*	Western Rattlesnake	Blue	Threatened	1 Threatened
reptiles	*Hypsiglena chlorophaea*	Desert Nightsnake	Red	Endangered	1 Endangered
reptiles	*Phrynosoma douglasii*	Pygmy Short-horned Lizard	Red	Extirpated	1 Extinct
reptiles	*Pituophis catenifer*	Gopher Snake	No Status		1 Extinct / Threatened
reptiles	*Pituophis catenifer deserticola*	Gopher Snake, *deserticola* subspecies	Blue	Threatened	1 Threatened
reptiles	*Plestiodon skiltonianus*	Western Skink	Blue	Special Concern	1 Special Concern
turtles	*Chrysemys picta*	Painted Turtle	No Status	Endangered / Special Concern	1 Endangered / Special Concern
turtles	*Chrysemys picta* pop. 2	Painted Turtle - Intermountain - Rocky Mountain Population	Blue	Special Concern	1 Special Concern

Appendix C – Likelihood of Occurrence Analysis Results

Species Type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
Amphibians	Blotched Tiger Salamander	*Ambystoma mavortium*	Red Listed	E	E	Inhabit almost any terrestrial habitat as long as it includes the required aquatic breeding habitat, such as a lake, reservoir, permanent and ephemeral pond, or stream pool.	**High** at Event 1 SAV VER **Low** everywhere else
	Great Basin Spadefoot	*Spea intermontana*	Blue Listed	T	T	Inhabit mainly sagebrush flats, semi-desert shrublands, pinyon-juniper woodland. It breeds in temporary or permanent water, including rain pools, pools in intermittent streams, and flooded areas along streams.	**High** at EVENT 1 SAV VER, Savona Compressor Station **Moderate** at Princeton Gate Station and SN 4 **Low** everywhere else
	Western Toad	*Anaxyrus boreas*	Yellow listed	SC	SC	Western Toads breed in a variety of natural and artificial aquatic habitats, with or without tree or canopy cover, coarse woody debris, or emergent vegetation. They disperse widely and use a range of habitat types; they prefer damp conditions, and will either dig their own burrows, or take shelter in small mammal burrows, beneath logs and within crevices: they hibernate in burrows below the frostline, up to 1.3 metres below ground.	**High** at EVENT 1 SAV VER, Savona Compressor Station, Trail Lateral Tap, Yahk Valve Station, Oliver Y Control, Princeton Crossover Control Station **Moderate** at East Kootenay Exchange, Kingsvale Control, SN 7, SN 6-1, Salmon Arm Tap, SN-15, SN-3, SN 4, Kingsvale Control Station **Low** everywhere else
Birds	American Avocet	*Recurvirostra americana*	Blue Listed	-	-	Nests on open flats or areas with scattered tufts of grass on islands or along lakes.	**Low**
	Bobolink	*Dolichonyx oryzivorus*	Blue Listed	T	T	Occurs in tall grass areas, flooded meadows, prairie and hayfields. This species generally selects habitat with moderate to tall vegetation.	**Moderate** at Oliver Y Control and SN-15 **Low** everywhere else
	Brewer's Sparrow, *breweri* subspecies	*Spizella breweri breweri*	Blue Listed	-	-	Occurs in a range of grass- and scrub-land	**Moderate** at Oliver Control **Low** everywhere else
	Canyon Wren	*Catherpes mexicanus*	Blue Listed	-	NAR	Inhabits cliffs, steep-sided canyons, rocky outcrops and boulder piles, usually in arid regions.	**Low**

Species Type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
	Flammulated Owl	*Psiloscops flammeolus*	Blue Listed	SC	SC	Occurs in montane forest, usually with some brush or saplings. The species shows a strong preference for "yellow pine".	**Low**
	Grasshopper Sparrow	*Ammodramus savannarum*	Red Listed	-	-	Prefer grasslands of intermediate height and are often associated with clumped vegetation interspersed with patches of bare ground.	**Low**
	Great Blue Heron, *Herodias* subspecies	*Ardea herodias herodias*	Blue Listed	-	-	Diverse range of habitats with frequent use of cultivated, wooded, riparian and grassland.	**High** at Event 1 SAV VER **Moderate** at Savona Compressor Station **Low** everywhere else
	Lewis's Woodpecker	*Melanerpes lewis*	Blue Listed	T	T	Occurs in open forest and woodland, often logged or burned, riparian woodland and orchards.	**High** at SN 3 and SN 4 **Low** everywhere else
	Swainson's Hawk	*Buteo swainsoni*	Red Listed	-	-	Inhabits savanna, open pine-oak woodland and cultivated lands with scattered trees. The species tolerates extensive cultivation in nesting area which does not provide suitable foraging habitat.	No interaction with project anticipated
	Western Screech-Owl, *macfarlanei* subspecies	*Megascops kennicottii macfarlanei*	Blue Listed	T	T	Can occupy a diverse range of habitats with frequent use of cultivated, wooded, riparian and grassland.	**High** at Oliver Y Control and SN 17
	White-headed Woodpecker	*Dryobates albolarvatus*	Red Listed	E	E	Inhabits woodland with abundance of mature pines of species that produce large cones and abundant large seeds.	**Low**
	White-throated Swift	*Aeronautes saxatalis*	Blue Listed	-	-	Occurs in primarily mountainous country, especially near cliffs and canyons where breeding occurs; forages over forest and open situations.	**Low**
	Williamson's Sapsucker	*Sphyrapicus thyroideus*	Blue Listed	E	E	Habitat includes middle to high elevation montane and subalpine coniferous forest,	**Low**
Gastropods	Banded Tigersnail	*Anguispira kochi*	Blue Listed	-	NAR	Inhabits moist, well-vegetated forests, often near shores of lakes and streams	**Low**
	Pygmy Slug	*Kootenaia burkei*	Blue Listed	SC	SC	All of its inhabited sites are forested and adjacent to a perennial water body.	**Low**

Species Type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
						Found on forest floor mostly, either on or under woody debris, mats of moss, or deciduous tree leaves	
Insects	Behr's Hairstreak	*Satyrium behrii*	Red Listed	E	E	Occurs on dry slopes and canyons where sagebrush and pinyon-juniper is available.	**Moderate** at Oliver Y Control Room
	Dark Saltflat Tiger Beetle	*Cicindela parowana*	Red Listed	E	E	No information available	Not assessed, lack of information
	Immaculate Green Hairstreak	*Callophrys affinis*	Blue Listed	-	-	Occurs in dry gullies within sagebrush and meadow habitats, brushland, woods and scrub.	Not assessed
	Mormon Metalmark	*Apodemia mormo*	Red Listed	E	E	Inhabits hillsides, slopes and embankments with sandy or gravelly soils and moderate to high densities of rabbitbrush (Erigoneum nauseosus) and snow buckwheat (Erigonium niveum).	**Moderate** at Oliver Y Control Not assessed at other sites
	Nevada Skipper	*Hesperia nevada*	Blue Listed	-	-	Occurs in open grassland and roadsides where meadowlike qualities are present.	Not assessed
	Okanagan efferia	*Efferia okanagana*	Red Listed	E	E	Occurs in the Pacific Northwest Bunchgrass type of intermontane grasslands.	Not assessed
	Olive Clubtail	*Stylurus olivaceus*	Red Listed	E	E	Breeds along warm streams and lakeshores with sandy or muddy edges.	Not assessed
	Sandhill Skipper	*Polites sabuleti*	Red Listed	-	-	Inhabits a complex variety of habitats from coastal dunes and salt marshes, alkali grasslands to moist mountain meadows and lawns.	Not assessed
	Vivid Dancer	*Argia vivida*	Blue Listed	SC	SC	Associated with cool or hot springs.	Not assessed
	Western Bumble Bee	*Bombus occidentalis*	Blue Listed	T	T	Rangewide, habitats for this species include forests, meadows, and along, gardens and agricultural areas.	Not assessed

Species Type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
Mammals	American Badger	*Taxidea taxus*	Red Listed	E	E	Prefers open areas and may also frequent brushlands with little groundcover.	**High** at Oliver Y Control, Event 1 SAV VER, Savona Compressor Station, SN 3, SN 4, Trail Lateral Tap **Moderate** at SN-15, SN 6-1, Salmon Arm Tap **Low** everywhere else
	Columbia Plateau Pocket Mouse	*Perognathus parvus*	Blue Listed	-	-	inhabits arid valley bottoms and open slopes on hillsides.	**High** at Oliver Y Control **Low** everywhere else
	Mountain Beaver	*Aplodontia rufa*	Yellow	SC	SC	Occupies forested areas from near sea level to timberline. It is common in damp ravines and shaded hillsides in coastal and montane forests with an abundance of herbaceous ground cover, typically in riparian habitat in moist coniferous forests.	Potential habitat is possible at Event 29 and 31
	Nuttall's Cottontail	*Sylvilagus nuttallii*	Blue Listed	SC	SC	It is associated with shrub-steppe with Antelope-Bush and Big Sage. Sagebrush and the presence of rocky outcrops are important habitat attributes.	**High** at Oliver Y Control **Low** everywhere else
	Pallid Bat	*Antrozous pallidus*	Red Listed	T	T	Habitats include mountainous areas, intermontane basins, and lowland desert scrub arid deserts and grasslands.	No interaction with the project anticipated, therefore not assessed
	Spotted Bat	*Euderma maculatum*	Blue Listed	SC	SC	This species occurs in various habitats from desert to montane coniferous stands.	No interaction with the project anticipated, therefore not assessed
	Western Harvest Mouse	*Reithrodontomys megalotis*	Blue Listed	E	E	It inhabits dry gullies with dense shrub cover bordering grassland and shrub-steppe rangeland.	**Moderate** at Oliver Y Control and SN 7 **Low** everywhere else
Reptiles	Desert Nightsnake	*Hypsiglena chlorophaea*	Red Listed	E	E	It dens in talus slopes and crevices in rock outcrops. Most of their active time is thought to be spent in rugged areas where thermal gradients occur and prey (e.g. Western Skink) is abundant.	**Moderate** at Oliver Y Control **Low** everywhere else

Species Type	Common Name	Scientific Name	Conservation Status			Habitat Requirements (taken from BC Conservation Data species summaries)	Likelihood of Occurrence
			BC List[1]	SARA[2]	COSEWIC[3]		
	Gopher Snake, deserticola subspecies	*Pituophis catenifer deserticola*	Blue Listed	T	T	This species occurs in a wide range of habitats, extending from lowlands to mountains.	**Moderate** at SN 7, Savona Compressor Station, Princeton Crossover, Event 1 SAV VER, Oliver Y Control, SN 3, SN 4 **Low** everywhere else
	North American Racer	*Coluber constrictor*	Blue Listed	SC	T	This species occurs in a wide range of habitats, extending from lowlands to mountains.	**High** at Oliver Y Control, SN-15, SN 7 and SN 17, Event 1 SAV VER, Savona Compressor **Moderate** at SN 6-1, SN 4, SN 3, Princeton Crossover, Kingsvale Control **Low** everywhere else
	Northern Rubber Boa	*Charina bottae*	Yellow Listed	SC	SC	This species favours woodlands, forest clearings, meadows, and grassy savannas, generally not far from water. It is generally found in rotting logs, rock crevices and dead fallen trees.	**Moderate** at Savona Compressor, Event 1 SAV VER, SN 3, SN 4, SN 15, Princeton Crossover **Low** everywhere else
	Western Rattlesnake	*Crotalus oreganus*	Blue Listed	T	T	Occupies a wide diversity of habitats, from shrubby coastal dunes to timberline, from shrubby basins and canyons to open mountain forests	**Moderate** at Savona Compressor, Event 1 SAV VER, SN 3, SN 4, SN 15, Princeton Crossover **Low** everywhere else
	Western Skink	*Plestiodon skiltonianus*	Blue Listed	SC	SC	This species is partial to open wooded foothills and is usually associated with rocks, under which it takes shelter	**High** at Oliver Y Control **Moderate** at SN 15 **Low** everywhere else
Turtle	Painted Turtle - Intermountain - Rocky Mountain Population	*Chrysemys picta pop. 2*	Blue Listed	SC	SC	Occupies a wide range of aquatic habitats including, but not limited to lakes, fens, marshes and urban ponds.	No interaction with project anticipated, no suitable habitat adjacent to any sites

Appendix D – Noxious Species List

Facilities	Common Name	Scientific Name	Distance from Facility	Provincial Status
Savona Compressor Station	Canada thistle	*Cirsium arvense*	Immidiately Adjacent	Noxious weed
	Diffuse knapweed	*Centaurea diffusa*	Within 500m	Noxious weed
	Spotted knapweed	*Centaurea maculosa*	Within 500m	Noxious weed
	Burdock Sp.	*Arctium sp*	Within 500m	Noxious in Thompson-Nicola
SN 3	Spotted knapweed	*Centaurea maculosa*	Within 500m	Noxious weed
	Diffuse knapweed	*Centaurea diffusa*	Within 500m	Noxious weed
	Common reed	*Phragmites australus*	Within 500m	Noxious weed
	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in Thompson-Nicola
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
SN 4	Hound's-tongue	*Cynoglossum officinale*	Within 500m	Noxious weed
	Spotted knapweed	*Centaurea maculosa*	Within 10m	Noxious weed
	Diffuse knapweed	*Centaurea diffusa*	Within 10m	Noxious weed
SN 6 - 1	Leafy spurge	*Euphorbia esula*	Within 500m	Noxious weed
	Rush skeletonweed	*Chondrilla junca*	Within 500m	Noxious weed
	Diffuse knapweed	*Centaurea diffusa*	Within 500m	Noxious weed
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in North Okanagan
	Scotch thistle	*Onopordum acanthium*	Within 500m	Noxious in North Okanagan
	Hound's-tongue	*Cynoglossum officinale*	Within 500m	Noxious weed
	Spotted knapweed	*Centaurea maculosa*	Within 500m	Noxious weed
Salmon Arm Tap	Rush skeletonweed	*Chondrilla junca*	Within 500m	Noxious weed
	Leafy spurge	*Euphorbia esula*	Within 500m	Noxious weed
	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in North Okanagan
	Spotted knapweed	*Centaurea maculosa*	Within 500m	Noxious weed
	Scotch thistle	*Onopordum acanthium*	Within 500m	Noxious in North Okanagan
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
SN 7	Rush skeletonweed	*Chondrilla junca*	Within 500m	Noxious weed
	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in North Okanagan
	Spotted knapweed	*Centaurea maculosa*	Within 500m	Noxious weed
	Scotch thistle	*Onopordum acanthium*	Within 500m	Noxious in North Okanagan
	Puncture Vine	*Tribulus terrestris*	Immediately Adjacent	Noxious in Okanagan-Similkameen
Oliver Y Control Station	Diffuse knapweed	*Centaurea diffusa*	Within 500m	Noxious weed
	Puncture Vine	*Tribulus terrestris*	Within 500m	Noxious in Okanagan-Similkameen

	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in Okanagan-Similkameen
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
Princeton Crossover Control Station	Suphur cinquefoil	*Potentilla recta*	Within 500m	Noxious in Okanagan-Similkameen
Kingsvale Control Station	Spotted knapweed	*Centaurea maculosa*	Immediately Adjacent	Noxious weed
	Oxeye daisy	*Leucanthemum vulgare*	Within 500m	Noxious in Thompson-Nicola
	Burdock Sp.	*Arctium sp*	Within 500m	Noxious in Thompson-Nicola
	Blueweed	*Echium vulgare*	Within 500m	Noxious in Thompson-Nicola
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
SN 15	Hoary alyssum	*Berteroa incana*	Within 500m	Noxious in Kootenay-Boundary
	Dalmation toadflax	*Linaria dalmatica*	Within 500m	Noxious weed
	Canada thistle	*Cirsium arvense*	Within 500m	Noxious weed
East Kootenay Exchange	Canada thistle	*Cirsium arvense*	Immediately Adjacent	Noxious weed
	Spotted knapweed	*Centaurea maculosa*	Immediately Adjacent	Noxious weed
	Common tansy	*Tanacetum vulgare*	Immediately Adjacent	Noxious in Central Kootenay
	Diffuse knapweed	*Centaurea diffusa*	Immediately Adjacent	Noxious weed

Appendix E – Photographs

Appendix E.1 – Biophysical Field Study Photographs

Photo 1: **SN 6-1 valve assembly and surrounding area, facing southeast.**

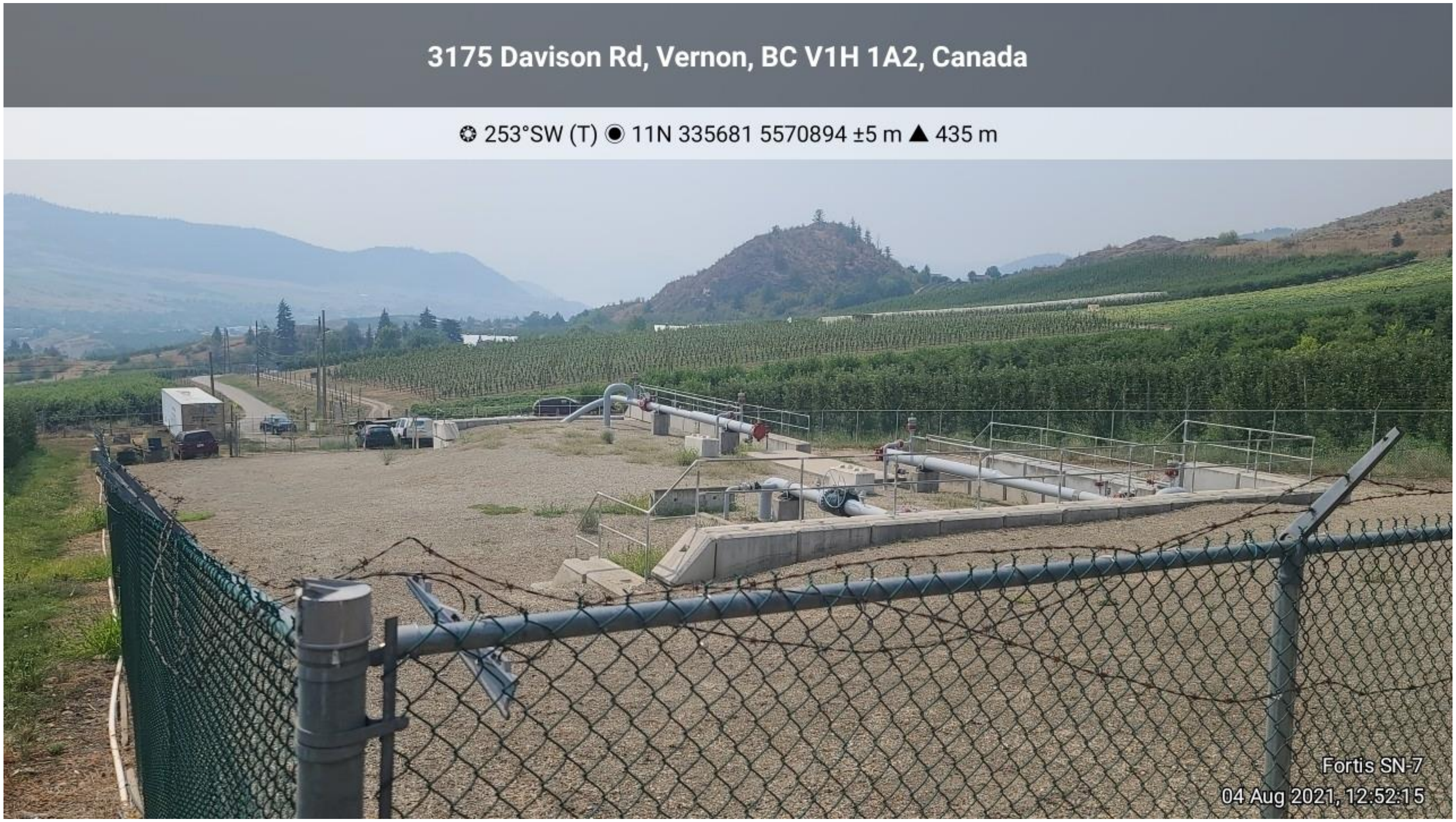

Photo 2: **Facing south over the SN 7 station, note the parking area in the background is the site access as well as the receiving environment for site drainage.**

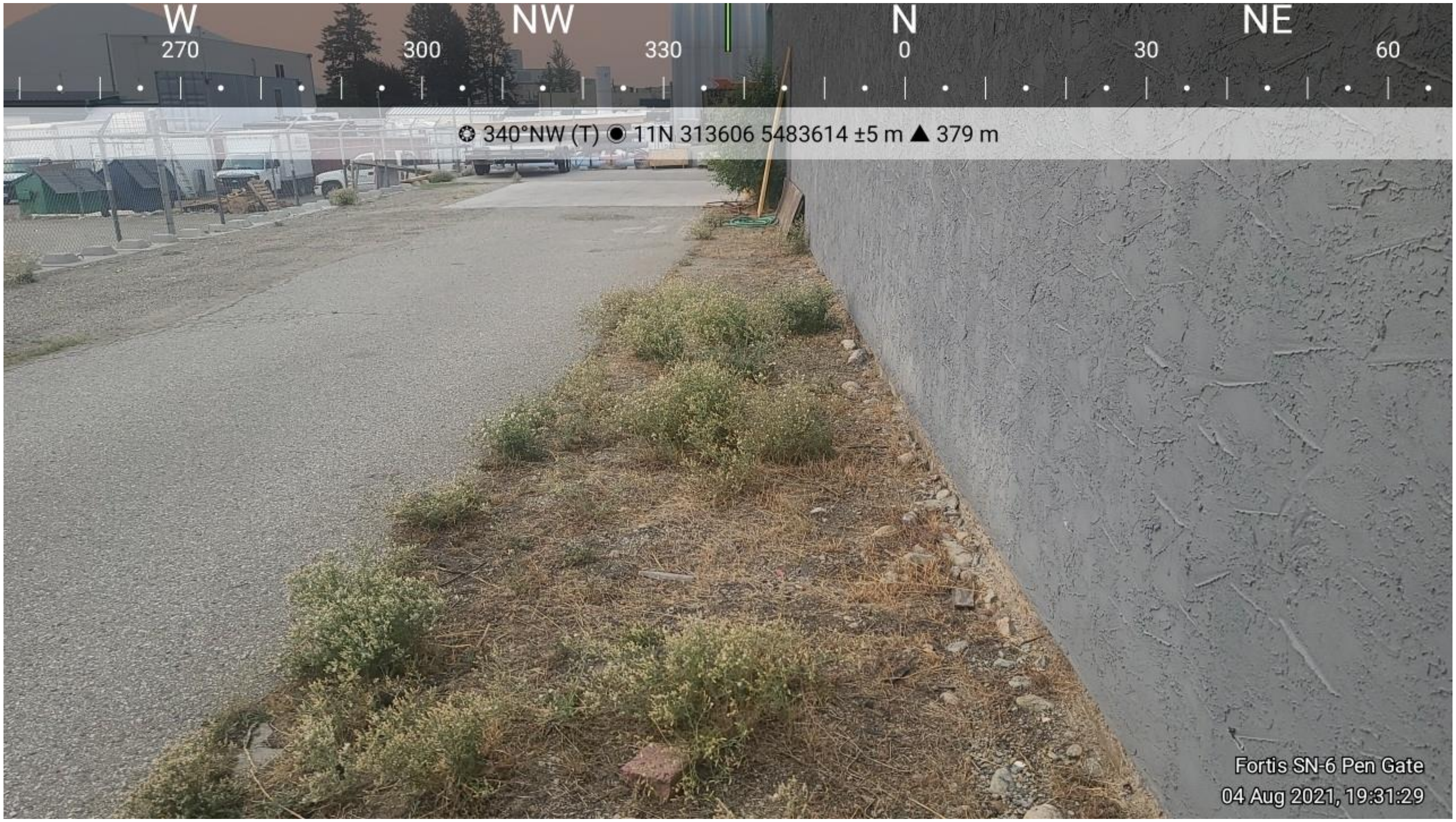

Photo 3: **Diffuse knapweed located between the fence and roadway at the Penticton Gate station.**

Photo 4: Showing native ecosystem likely to support breeding birds and species at risk (foreground) on the north side of the Oliver control station (background), facing southeast.

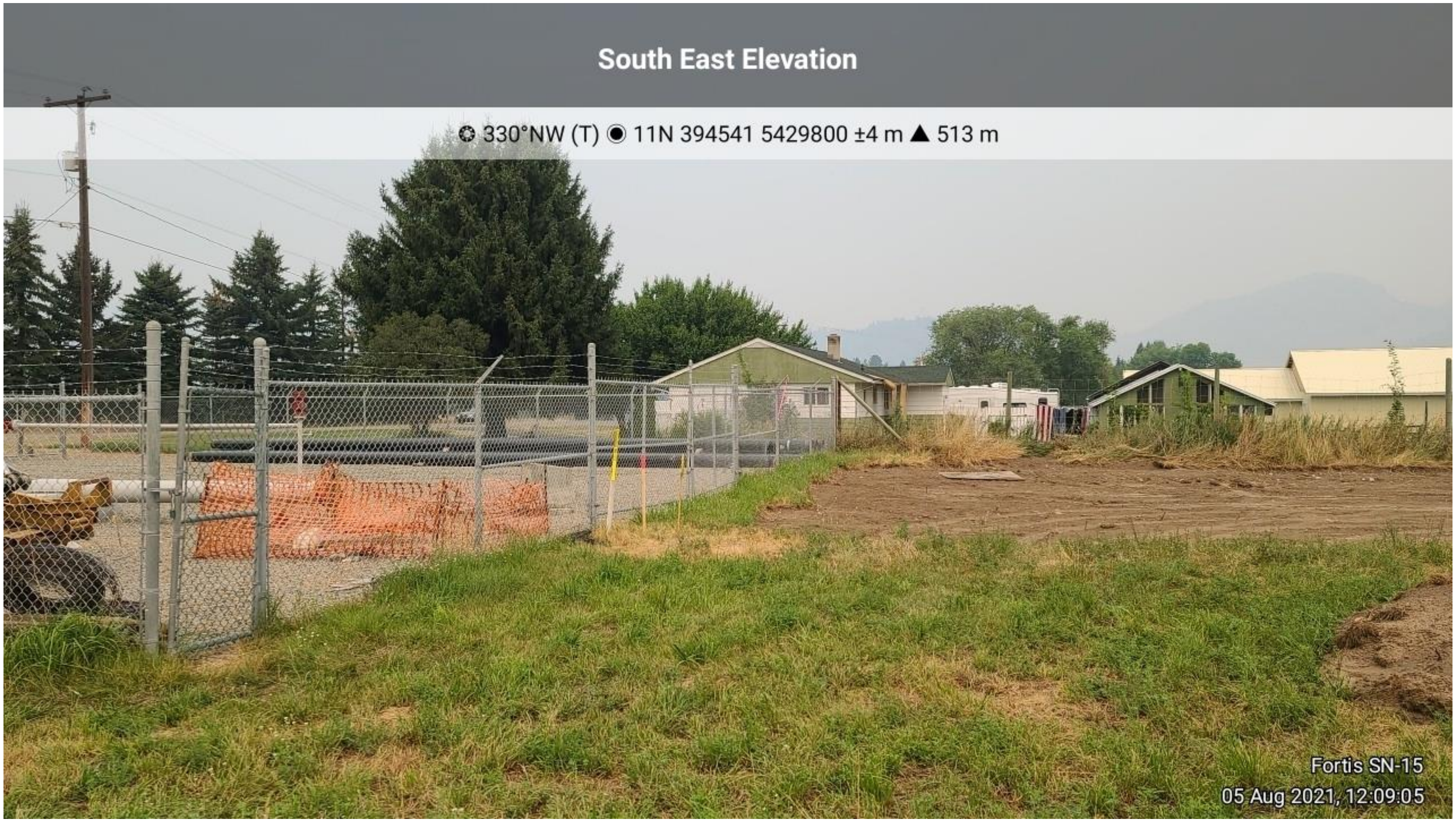

Photo 5: Showing grubbed area on the east side of the SN 15 valve assembly (at left).

Photo 6: **SN 17 Valve assembly is on a moderate northeast aspect among mature mixed forest.**

Photo 7: Facing north-northeast over the Yahk valve assembly, looking up the right-of-way beyond.

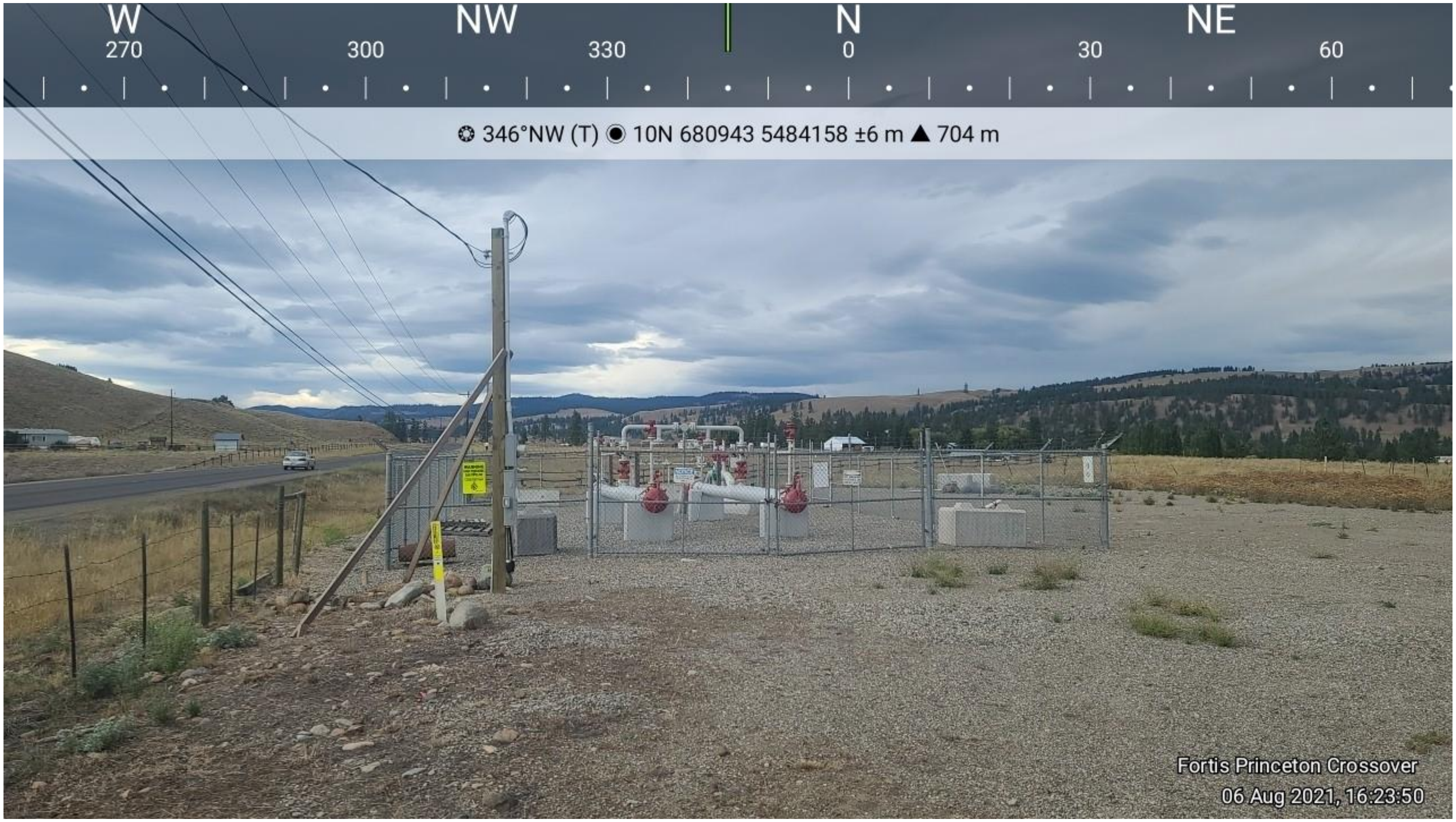

Photo 8: Facing north over the Princeton crossover control station, note the highway at left and weedy compact soil and gravel around the site.

Photo 9: **Facing north over the Kingsvale control station. Note the open area around the site and maturing coniferous forest beyond.**

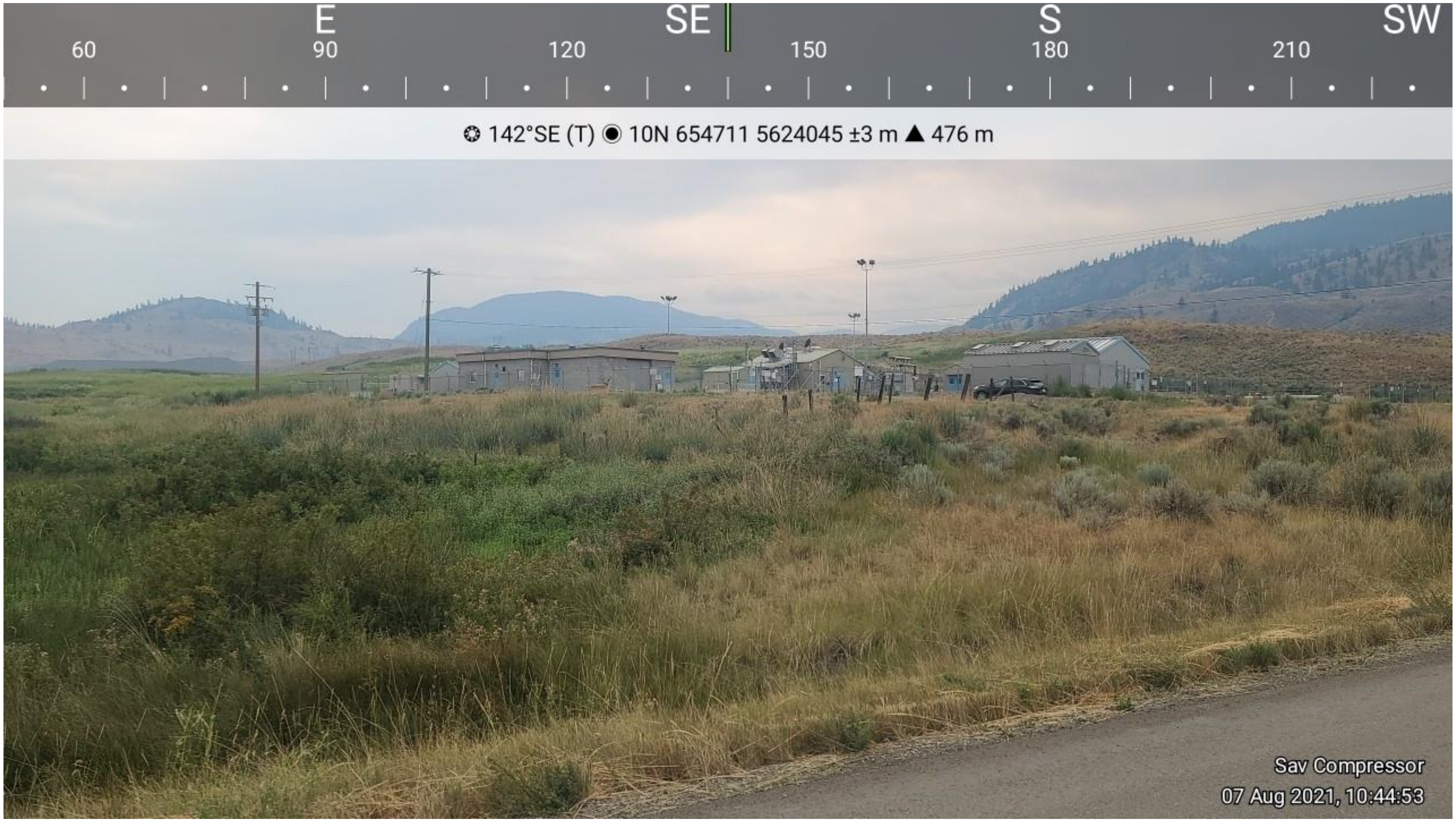

Photo 10: Showing the Savona Compressor station (at center right) and the adjacent ecosystems, including a rush-dominated wetland along the northern boundary (at left).

Photo 11: Facing southeast over the SN 3 valve assembly, note the residential area beyond.

Photo 12: Facing west over the Cherry Creek crossing location, note the vegetated island just left of center.

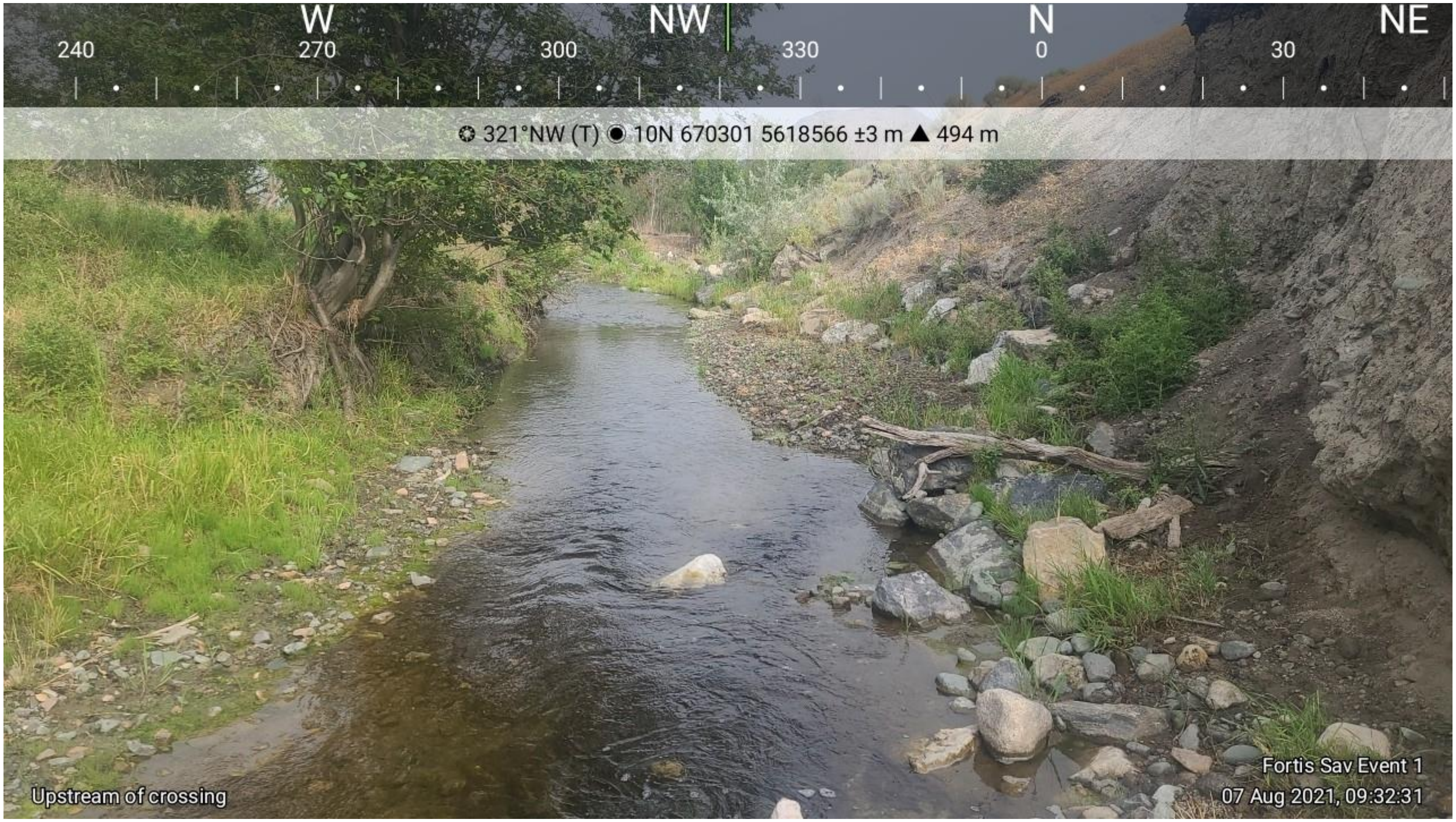

Photo 13: Representative habitat along the Cherry Creek reach, just downstream of the crossing location, facing downstream (north). Note the high eroding bank at right.

Photo 14: Drainage channel on the east side of the highway that feeds the tributary (sloping wetland), facing south. The culvert is at center and the spring is just to the left of the culvert, also at the center of this photograph.

Photo 15: Facing southeast over SN 4 valve assembly, note the pasture and agricultural buildings in the background and Ponderosa pine woodland to the north.

Appendix E.2 – Contaminant Field Study Photographs

Photo 1: **Savona Compressor Station. APEC 1: Site. View looking SE across the Site from the NW corner.**

Photo 2: Penticton Gate Station. APEC 1: Site. View looking SE across the Site from the NW corner.

Photo 3: Penticton Gate Station. View looking NE across Site from the SW corner. Adjacent properties 2060 Government St. (APEC 2) and 445 Warren Ave (APECs 3 and 6) are located right and left of Site.

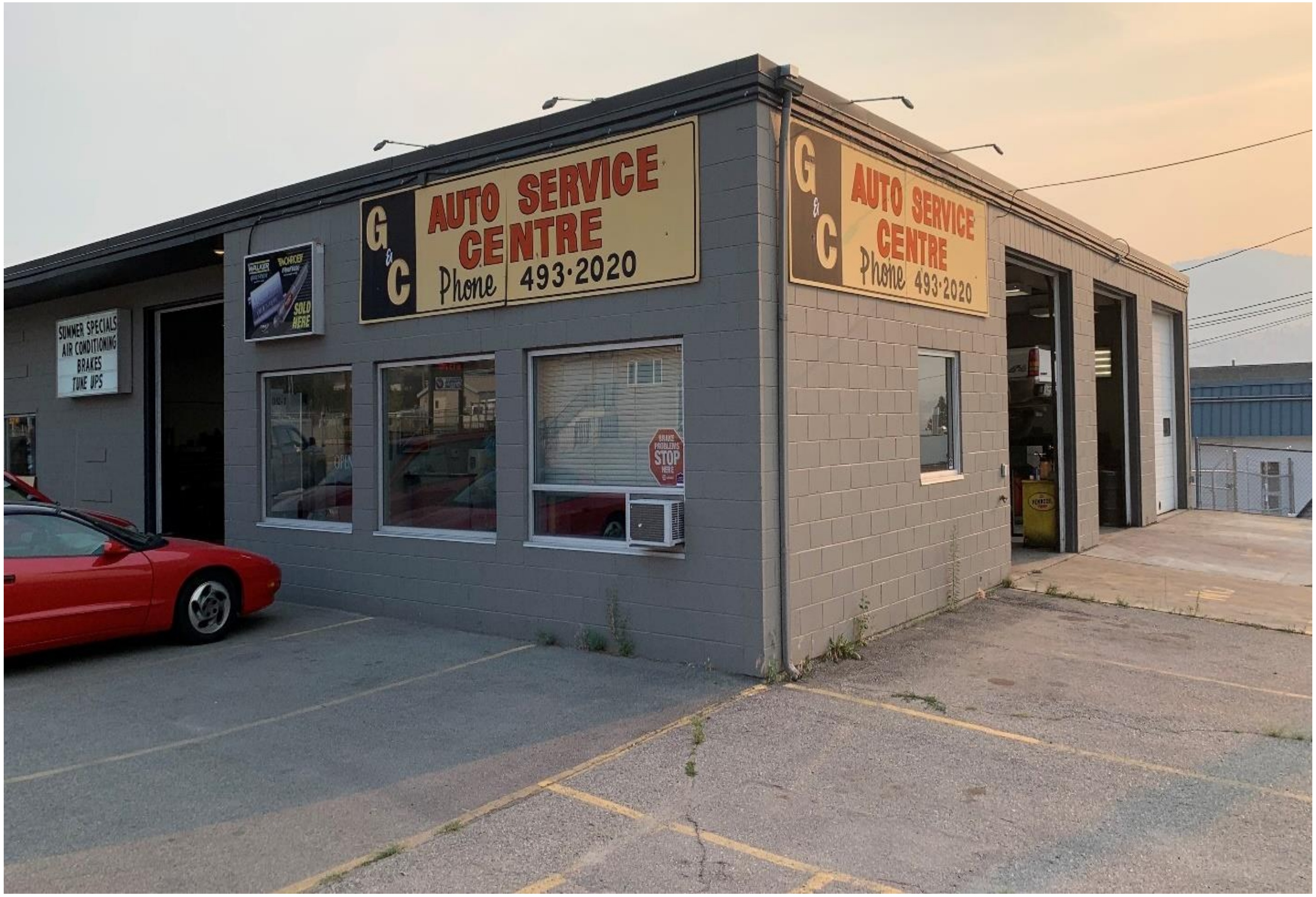

Photo 4: Penticton Gate Station. Automotive service shop located on neighbouring property 2025 Government St. (APECs 4 and 5). View looking SW from the intersection of Cherry Ave and Government St.

Photo 5: Penticton Gate Station. Above ground bulk fuel tanks on neighbouring property 466 Okanagan Ave (APEC 7). View looking N from the S property boundary.

Photo 6: Penticton Gate Station. Semi-tractor and trailer unpaved storage yard on neighbouring property 370 Warren Ave (APEC 12). View looking E along the N boundary.

Photo 7: Oliver Y Control Station. APEC 1: Site. View looking W from the E site boundary. Pad mounted transformer (APEC 4) is in the background to the right on Site.

Photo 8: Oliver Y Control Station. Waste and chemical storage area (suspected) (APEC 2) located in the NW corner of Site. View looking S along the west boundary from the NW corner.

Photo 9: Oliver Y Control Station. Stored recreational vehicles within an unpaved yard (APEC 5) located west of Site. View looking W from the NE corner.

Photo 10: SN 17 Valve Assembly. APEC 1: Site. View looking NW from the S boundary.

Photo 11: East Kootenay Exchange Station. APEC 1: Site. View looking NE from the S boundary.

Photo 12: East Kootenay Exchange Station. Site extension area in the foreground and the neighbouring TransCanada East Kootenay Exchange (APEC 2) in the background. View looking S from the S boundary of Site.

Photo 13: East Kootenay Exchange Station. Fuel tank attached to stained concrete pad on neighbouring TransCanada East Kootenay Exchange Station (APEC 2). View looking W from the E property boundary.

Photo 14: Kingsvale Control Station. APEC 1: Site. View looking SE from the north boundary.

Photo 15: Kingsvale Control Station. Corroded labelled waste barrel (APEC 2) located in the NE corner of Site. View looking SW from the NW corner.

Photo 16: Kingsvale Control Station. Neighbouring Enbridge Kingsvale Control Station (APEC 4). View looking N from the NE corner of Site.

Appendix L

ARCHAEOLOGICAL ASSESSMENT REPORT

FortisBC Interior Transmission System Transmission Integrity Management Capability Project

Archaeological Overview Assessment
Project # VE21506

Prepared for:

FortisBC
16705 Fraser Hwy.
Surrey, BC V4N 0E8
Canada

Prepared by:

Wood Environment and Infrastructure Solutions
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18 May 2022

FortisBC Interior Transmission System Transmission Integrity Management Capability Project

Archaeological Overview Assessment
Southern Interior, BC
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18 May 2022

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All personnel are affiliated with Wood.

Executive Summary

This report describes the results of an Archaeological Overview Assessment (AOA) carried out by Wood Environment & Infrastructure (Wood) for FortisBC Energy Inc. (FEI). The proponent is proposing upgrades at 15 existing components (named facilities or events) of their Interior Transmission System (ITS) to support ongoing delivery of energy to FEI customers. The AOA consisted of a review of relevant environmental, ethnographic, historical, and archaeological information and, in some cases, a preliminary field reconnaissance (PFR). Revisions to the report are anticipated following further PFRs. A description of the regional setting is provided in Section 3, while the detailed component-specific information is provided in Section 4.

None of the facilities or pipeline sections considered in this report conflicts with a recorded archaeological site. The following table summarizes the archaeological potential for each of the components and provides recommendations for further archaeological work to mitigate possible impacts from the proposed upgrades.

Component	Archaeological Potential	Recommendation
Savona Compressor Station	Moderate	Pre-construction testing
Event 1 SAVE VER 323	High	Pre-construction testing
SN 3	Moderate	Pre-construction testing
Salmon Arm Tap & SN 6-1-1	Moderate	Pre-construction testing
SN-7	Moderate	Pre-construction testing
SN-4 Valve Assembly	Moderate	PFR to determine further work
Penticton Gate Station	Moderate	Concurrent monitoring
Oliver Y Control Station	High	Pre-construction testing
Princeton Crossover Station	Moderate to High	Pre-construction testing
Kingsvale Control Station	Low to Moderate	PFR to determine further work
SN 15	High	Pre-construction Testing
SN-17 Valve Station	Low	Chance Find Procedure
East Kootenay Exchange	High	Pre-construction testing
Event 29 KIN PRI 323	Low to Moderate	PFR to determine further work
Event 31 KIN PRI 323	Low to Moderate	PFR to determine further work

It is also recommended that:

- Local Indigenous communities be consulted regarding the cultural sensitivity of the components and to solicit input during the development of an archaeological impact assessment strategy.
- A chance-find procedure be prepared for the project and heritage awareness training given to all the contractors in advance of ground disturbance activities.
- Where an AIA is recommended in the form of subsurface testing or concurrent monitoring during construction, the methodology will follow those methods specified in the Archaeological Impact Assessment Guidelines (Archaeology Branch 1998).

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Revision/Quality Review Log

Date	Version	Reviewer	Affiliation
August 31, 2021	1.0	Diana Alexander / Erin Hannon	Wood
September 01, 2021	2.0	Chris Wylie	Fortis
October 28, 2021	3.0	Diana Alexander / Patrick Dolan	Wood
May 18, 2022	4.0	Christopher Verral	Wood

1.0 Introduction

This report describes the results of an Archaeological Overview Assessment (AOA) carried out by Wood Environment & Infrastructure (Wood) for FortisBC Energy Inc. (FEI). The proponent is proposing upgrades at 15 existing components (assessment areas surrounding named events or facilities, and any necessary expansions and temporary work spaces [TWS]) of their Interior Transmission System (ITS) to support ongoing delivery of energy to FEI customers. None of the components considered in this report conflicts with a recorded archaeological site. The AOA consisted of a review of relevant environmental, ethnographic, historical and archaeological information and, in some cases, a preliminary field reconnaissance (PFR). This report summarizes the results of this work to assess the archaeological potential of each component and provide recommendations to mitigate possible impacts from the proposed upgrades.

1.1 Project Description

FEI is seeking to obtain a Certificate of Public Convenience and Necessity (CPCN) from the British Columbia Utilities Commission (BCUC) to undertake necessary system alterations and upgrades to their Interior Transmission System (ITS) to support ongoing delivery of energy to FEI customers. As part of the ITS Transmission Integrity Management Capability (TIMC) Project, modifications will made to FEI pipelines (events) and facilities to allow the use of Electro-Magnetic Acoustical Transducer (EMAT) technology by In-Line Inspection (ILI) tools. These tools are used during pigging, the practice of using pipeline inspection gauges (pigs) to perform maintenance operations, such as cleaning and inspection, without stopping the flow of product in the line. Operations involve inserting the pig into a pig launcher in the pipeline, closing the launcher, and allowing the pressure-driven flow of the product to push the pig down the pipeline until it reaches the pig trap or receiver.

FEI identified the need for alterations to three sections of pipeline (events) and 12 facilities (Table 1, Figure 1), including:

1. Pipeline alterations: modifications to pipelines in locations where velocity excursions may occur and where the EMAT ILI tool may not be able to pass through the pipeline; and
2. Facilities alterations: modifications to pig launchers and receivers to allow for longer EMAT ILI tools, and to add pressure regulating and/or flow control capabilities where required.

As part of the CPCN submission for these planned alterations, FEI is required to complete an AOA. As defined in the *British Columbia Archaeological Overview Assessment Guidelines* (Archaeology Branch 2009) AOAs should include the following:

- A review of all known archaeological sites near the component;
- A review of all previous archaeological investigations near the component;
- A review of relevant information from published and unpublished sources, such as local and regional history, prehistory, and ethnography;
- A review of geomorphological and paleoenvironmental data to assess environmental conditions that are likely to have influenced cultural adaptations of ancestral Indigenous peoples;
- A review of historical aerial photographs; and

An AOA may also include:

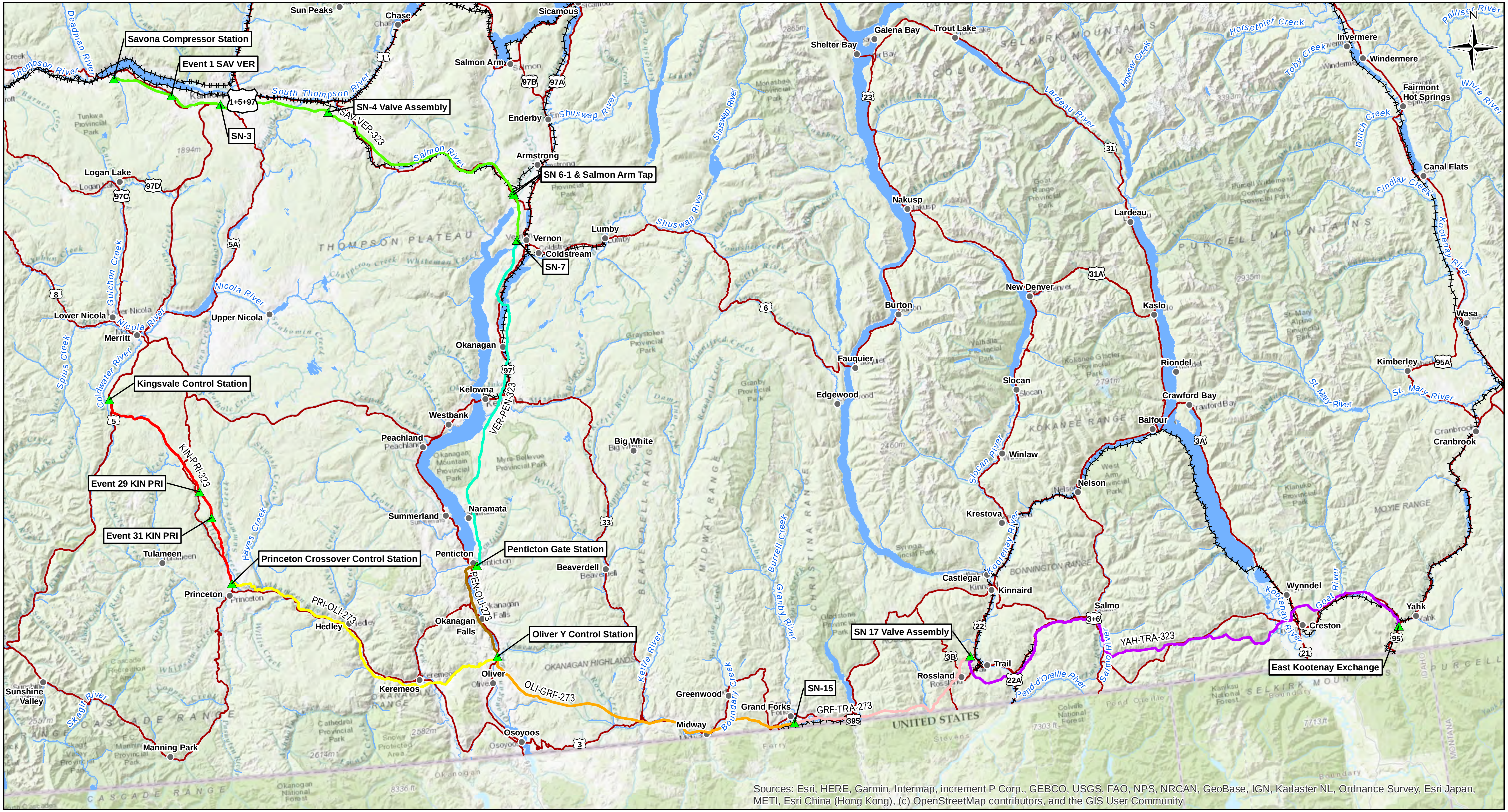
- Direct consultation with organizations and individuals knowledgeable about the distribution and frequency of archaeological resources near the component, as appropriate, including First Nations; and
- A preliminary field reconnaissance (PFR) to make in-field assessments of site potential within the component.

The above list is not exhaustive; other data sources and techniques may be examined and employed.

Table 1: Summary of proposed upgrades

Component	Pipeline	Municipality	Scope
Savona Compressor Station	SAV VER 323	Savona	Modification to one pig barrel, requiring a 590 m^2 temporary work space (TWS)
Event 1	SAV VER 323	Savona	Replace heavy wall water crossing (Cherry Creek) and bends on either side of the crossing. (Several options are possible, all with substantial TWS)
SN-3	SAV VER 323	Kamloops	Addition of clamp-on ultrasonic flowmeter and telemetry requiring a 640 m^2 TWS
Salmon Arm Tap and SN-6-1	SAV VER 323	Armstrong	Replace two existing insertion flowmeters with clamp-on ultrasonic flow-meters requiring two ca. 50 m^2 extensions, and three TWS totaling 1,350 m^2
SN-7	SAV VER 323 VER PEN 323	Vernon	Modification to two pig barrels, addition of flow control capability requiring a 1,030 m^2 TWS
SN-4 Valve Assembly	VER PEN 323	Kamloops	Modify SN-4 valve assembly to accommodate temporary installation of Bypass Station 12
Penticton Gate Station	VER PEN 323 PEN OLI 273	Penticton	Modification to two pig barrels, addition of flow control capability
Oliver Y Control Station	PEN OLI 273 PRI OLI 323 OLI GRF 273	Oliver	Modification to three pig barrels
Princeton Crossover Control Station	PRI OLI 323 KIN PRI 323	Princeton	Modification to two pig barrels, addition of flow control capability requiring a 545 m^2 component expansion and two work spaces totaling nearly 1,900 m^2
Kingsvale Control Station	KIN PRI 323	Kingsvale	Modification to one pig barrel requiring a 365 m^2 expansion and a 310 m^2 TWS
SN-15	OLI GRF 273 GRF TRA 273	Grand Forks	Modification to two pig barrels, addition of flow control capability requiring a 570 m^2 expansion and a 600 m^2 TWS
SN-17 Valve Station	GRF TRA 273 YAH TRA 323	Trail	Modification to two pig barrels, requiring a nearly 300 m^2 expansion and a 360 m^2 TWS

East Kootenay Exchange	YAH TRA 323	Yahk	Modification to one pig barrel, addition of pressure regulating capability, requiring a 540 m^2 expansion and a 915 m^2 TWS
Event 29	KIN PRI 323	Okanagan-Similkameen	Replace two ~2.5 m sections of heavy wall pipe, requiting a ca. 4,700 m^2 TWS
Event 31	KIN PRI 323	Okanagan-Similkameen	Replace heavy wall above-ground valve assembly at KO-3, requiring a 1,500 m^2 TWS



Last updated by Sarah

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Legend

- Event
- GRF TRA 273
- KIN PRI 323
- OLI GRF 273
- PEN OLI 273
- PRI OLI 323
- SAV VER 323
- VER PEN 323
- YAH TRA 323
- Populated Place
- International Boundary
- Railway
- Highway
- Road
- Watercourse
- Waterbody

0 10 20
Kilometers
Scale: 1:1,000,000

References:
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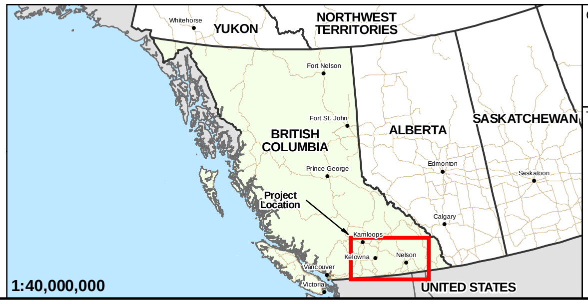

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	GIS FILE: 07-01-001_Figure1_Project_Overview_AOA.mxd		
	JOB No: VE21506		
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers		

wood.

1.2 Relevant Legislation

Archaeological sites in British Columbia are protected by the *Heritage Conservation Act (*RSBC 1996) (*HCA*) which states that no site, nor any part of a site, may be altered or disturbed in any way without a permit issued by the Archaeology Branch. Sites are protected by the *HCA* whether located on public or private lands. Provincial guidelines are also commonly applied to sites on federal lands. The *HCA* confers automatic protection upon archaeological sites that pre-date, or could pre-date, AD 1846. Sites automatically protected in BC include:

- Archaeological sites occupied or used before AD 1846;
- Indigenous rock art with historical or archaeological value;
- Burial places with historical or archaeological value;
- Heritage ship and aircraft wrecks; and
- Sites of unknown attribution that could have been occupied prior to AD 1846.

Protected archaeological sites may not be altered or disturbed in any manner without permits issued under Sections 12.2 and 12.4 of the *HCA*. Additionally, archaeological sites may be subject to interpretations of the Supreme Court of Canada decision in *Delgamuukw* vs British Columbia (1997), regarding the fiduciary responsibility of provincial governments to protect Aboriginal cultural heritage.

Furthermore, heritage sites of Indigenous origin not automatically protected by the *HCA* may nevertheless be sites on which Indigenous groups require consultation, prior to the commencement of development activities. In 2019 the BC government passed legislation to implement the *United Nations Declaration on the Rights of Indigenous Peoples* (*UNDRIP*), which includes the right to self-determined development and free, prior and informed consent on lands not covered by a treaty, such as the lands covered by this report. Proponents are encouraged to begin consultations with First Nations as part of the conceptual design phase of a project (Province of British Columbia 2021).

As this report makes heritage management recommendations, permits were requested from those First Nations that request permit applications as part of the assessment process, including: 1) Adams Lake Indian Band; 2) Lower Similkameen Indian Band; 3) Little Shuswap Lake Indian Band; 4) Neskonlith Indian Band; 5) Okanagan Indian Band; 6) Penticton Indian Band, and; 7) Westbank First Nation.

2.0 Methods

2.1 Desktop Review

This study includes a summary of background information for the 15 components identified by FEI. This desktop overview research involved a review of the following:

- The Provincial Heritage Register (PHR) via the Remote Access to Archaeological Data (RAAD) online application, to obtain geospatial and other information about documented archaeological and historical heritage sites in proximity to the project components;
- The number and extent of previous archaeological studies near each component through a review of documents available via the Provincial Archaeological Report Library (PARL), academic sources, and unpublished literature available in the Wood Archaeology Library, including review of available archaeological overviews and potential models, results of archaeological impact assessments, inventories, and other field studies; and published records of ethnographic and ethnohistoric traditional land use, place names, and settlement patterns;
- Topographical and environmental data for each component with reference to landscape integrity over time, including review of historical documents such as historical aerial photographs obtained from the Geographic Information Centre at the University of British Columbia, historical surveys, and documentary records;
- Modern and past bio-geophysical landscape characteristics to evaluate micro-environmental landscape attributes indicative of archaeological potential based on documented perceived and historical vegetation and wildlife values, proximity to traditional resources, and proximity to modern and past landscape features, such as streams, levees, alluvial fans, and wetlands; and
- Historic survey documents to evaluate geological/geomorphological data on long-term and short-term landscape development;

PFR surveys were conducted for seven of the fourteen components (i.e., SN 6-1, Salmon Arm Tap, SN-7, SN-15, SN-17 Valve Station, and the East Kootenay Exchange) based on availability of First Nations and accessibility (principally due to constraints imposed by BC’s 2021 wildfire season). Due to wildfires a proposed second field sessions, comprising the Thompson-Nicola and Kamloops-area components (e.g., Event 29 and Event 30, the Savona Compressor Station, and SN-3) was not executed. The SN-4 Valve Assembly was added to the scope of the project in 2022; a PFR was not completed. The PFRs were conducted by one Wood archaeologist and up to two First Nation community members and consisted of pedestrian survey of accessible portions of these components. No subsurface testing occurred although exposures were examined for buried materials, trees were examined for evidence of cultural modification, and bedrock exposures were examined for modification. The results of the PFRs are discussed in Section 4.

2.2 Archaeological Resource Potential

Following a review of the background information, the archaeological potential of each component was assessed. Archaeological potential is defined as the capability of a landscape (or landform) to have supported the kinds of traditional activities in the past which would have resulted in the formation and preservation of archaeological remains. As used herein, potential ratings do not predict the probability of sites but rather classify lands based on the breadth of topographic and biophysical attributes they possess that are supportive of traditional cultural activities that should be examined by archaeologists in response to proposed land-altering activities. Some types of traditional activities did not result in the formation of physical remains, and such activities usually cannot be considered in the context of an assessment of archaeological potential. A Traditional Use Study (TUS) or Cultural Heritage Overview Assessment (CHOA) usually is the appropriate study to address this data gap.

The assessment of archaeological resource potential is based upon a consideration of the locations of documented archaeological sites, ethnographic and historical information, traditional place name data, and topographical and biophysical characteristics that favourably influence the preservation and distribution of archaeological sites. Because archaeological site locations are often correlated with particular micro-environmental attributes, the presence or absence of these variables can be used to identify lands with greater or lesser archaeological potential.

The principal environmental and cultural variables considered for this overview study included:

- Modern vegetation/forest cover;
- Proximity to documented archaeological resources;
- Proximity to aquatic features;
- Current understanding of traditional resource use and settlement by Indigenous peoples;
- Contemporary and paleo-environmental settings of documented archaeological sites in the area; and
- Integrity of the modern landscape as a reflection of historical land use practices.

Lands that could be affected by proposed development activities are categorized as having "High", "Moderate", or "Low" archaeological resource potential (though some GIS-based potential models only exhibit "High" and "Low" categories). The varying classes of potential ratings affect the scope and level of effort recommended as follow-up actions. In general, the higher the potential class, the greater is the level of effort expected by regulatory authorities. For the present study, the potential values are defined as follows:

- **High Potential**: Lands exhibiting considerable topographic and biophysical attributes supportive of traditional cultural activities in the past that would have left archaeological evidence. These lands exhibit the highest archaeological sensitivity within a particular landscape. Further field investigations are usually recommended for lands rated as "High".
- **Moderate Potential**: Lands exhibiting fewer attributes that would have supported traditional cultural activities, than the preceding category. Further field investigations are frequently recommended for lands rated as "Moderate," usually preceded by additional desktop review of advanced design plans.
- **Low Potential**: Lands that exhibit few characteristics supportive of traditional cultural activities. Further field investigations are generally not recommended for lands rated as "Low."

3.0 Background Information

This section summarizes the environmental, cultural, historical, and archaeological information for the regional study area (RSA) – a large portion of the southern BC interior that encompasses all the components. More detailed component-specific data is provided in Section 4.

3.1 Biophysical Setting

Environmental conditions, both past and present, govern the availability of natural resources for human utilization, and as such, are important factors determining land use, settlement, and the subsistence patterns of Indigenous and other peoples. In this section, background information on past and present resource characteristics that may influence human occupation and land use is summarized to provide the framework for assessing archaeological resource potential at each component.

The RSA encompass two of Canada's seven physiographic regions (Government of Canada 2021). Physiographic regions are areas that share broadly similar landforms and topography, the result of eons of shaping by similar geomorphic processes acting upon broadly similar geological deposits (Government of Canada 2021). This in turn shapes the formation of forests and associated biota capable of living there (Church and Ryder 2007), and therefore the sort of cultural patterns humans develop around resource acquisition. The western portion of the RSA encompasses large portions of the Thompson Plateau, itself a subdivision of the southern Interior Plateau physiographic region. The eastern portion of the RSA is within the Columbia Mountain physiographic region, which is generally subdivided, west to east, into mountains of the Monashee, Selkirk, and Purcell ranges. As a result, the landscapes within the RSA are diverse: some components are within river valleys on (geologically) recent terraces that have been foci for human use and settlement for thousands of years, others are in high elevation settings that typically see less intense use pre-historically.

In 1985, the Ministry of Environment adopted the Ecoregion Classification System (Demarchi 2011). This interpretative framework is a hierarchical structure that allows a detailed understanding of the habitat diversity in the province (Demarchi 2011), and a basic understanding of this system is germane to discussions of archaeological potential.

The Ecoregion Classification System divides BC into seven ecodivisions, which are broad areas of physiographic and climactic uniformity (Demarchi 2011). The western portion of the RSA is within the Semi-Arid Steppe Highlands ecodivision, and the eastern within the Humid Continental Highlands ecodivision. These are generally configured to the Interior Plateau and Columbia Mountain physiographic regions, respectively.

Several levels below ecodivisions are biogeoclimatic zones/units, which denote classes of ecosystems within the same regional climate (Demarchi 2011). The current classification recognizes 14 biogeoclimatic zones/units within BC, with 76 subzones (Demarchi 2011). Numerous subzones are present within the RSA. Broadly speaking, biogeoclimatic zones indicate the types of resources available for human usage and their seasonality. The FortisBC components are located within five distinct biogeoclimatic zones, with a total of 11 subzones represented.

Bunchgrass zone (BG) Zone

In this zone, grasslands are the climax vegetation. Typically present from valley bottoms to as much as 1,000 mASL (meters Above Sea Level), these drought resistant plants have adapted to arid conditions (Nicholson *et al.* 1991). Trees are rare but may occur in moist settings configured to glacial outwash plains (Nicholson *et al.* 1991). This zone often grades into the higher-elevation Ponderosa Pine (PP) zone, as well as the Interior Douglas-Fir (IDF) zone (Nicholson *et al.* 1991). Soils in the BG zone typically consist of a veneer of aeolian silts and fine sands up to 10 cm thick atop glacial till (Nicholson *et al.* 1991). Classified as

Chernozemic (literally, 'black soil'), soils tend to be acidic and favour carbonate precipitation (Canadian Society of Soil Science 2020). Acidic soils tend to destroy perishable archaeological materials (*e.g.,* textiles, wood, bone and antler tools), though this may be somewhat ameliorated by the arid conditions of the region. Soil acidity has no appreciable impact on the preservation of lithic artifacts. As the thin soils freeze for part of the year, frost-heaving of artifacts may occur. Artifacts subjected to multiple cycles of frost-heaving tend to orient towards the vertical (Johnson *et al.* 1977), though it is unclear how soil thickness may affect this.

Two facilities are present within the Bunchgrass Zone:

- Oliver Y Control Station (BGxh1)
- Savona Compressor Station (BGxh2)

BGxh1 is the Okanagan very dry hot subzone, typified by over-grazing and a resultant expansion of big sagebrush (Lloyd *et al.* 1990). Antelope-brush and threetip sage are also present (Lloyd *et al.* 1990). The BGxh1 is typically configured to low-elevation fluvial and lacustrine settings (Lloyd *et al.* 1990). BGxh2 is the Thompson very hot dry subzone. Less precipitation occurs here than in the BGxh1. Configured to valley bottoms of the Fraser, Nicola and Thompson river systems, big sagebrush dominates climax sites, though climax sites are rare due to livestock over-grazing (Lloyd *et al.* 1990). Antelope-brush and threetip sage are absent (Lloyd *et al.* 1990). As with BGxh1, BGxh2 is typically configured to low-elevation fluvial and lacustrine settings (Lloyd *et al.* 1990).

Interior Cedar-Hemlock (ICH) Zone
The ICH possesses the greatest tree diversity of all zones in the province (Ketcheson *et al.* 1991). Present at elevations between 400-1,500 mASL (metres above sea level), this zone is typically configured to mountain slopes (Ketcheson *et al.* 1991). As such, bogs and wetlands are rare, though swamps dominated by skunk cabbage may be present along drainage channels (Ketcheson *et al.* 1991).

A wide range of soils occur within the ICH and may extend more than one metre below surface (Ketcheson *et al.* 1991). The primary variety are podzol soils, which develop atop glacio-fluvial materials: these soils tend to be visually striking and highly acidic (Canadian Society of Soil Science 2020). Acidic soils tend to destroy perishable archaeological materials (*e.g.,* textiles, wood, bone and antler tools) though they have no appreciable impact on the preservation of lithic artifacts. Temperatures are below freezing for up to five months a year (Ketcheson *et al.* 1991), meaning frost-heaving of artifacts may occur. While artifacts subjected to multiple cycles of frost-heaving tend to orient towards the vertical (Johnson *et al.* 1977), it is unclear if vertical orientations are typical in the sloped settings common to the ICH, or if the artifacts ultimately orient perpendicular to the ground angle.

Two components are present in the Interior Cedar-Hemlock Zone:

- East Kootenay Exchange (ICHdw)
- SN-17 Valve Station (ICHxw)

ICHdw is the dry warm subzone, typically present in valley bottoms and lower mountain slopes (Ketcheson *et al.* 1991). ICHxw is the very dry warm subzone. The driest of all ICH subzones, it is present in only a few areas of southeastern BC (Ketcheson *et al.* 1991). The ICHxw tends to have greater plant diversity than the ICHdw, though perhaps counterintuitively, is also tends to have less mean plant cover (Ketcheson *et al.* 1991). While areas with numerous plants were undoubtedly attractive to Indigenous people, areas of high plant diversity were likely particularly so.

Interior Douglas Fir (IDF) Zone

The IDF is typically configured to valleys and rolling terrain, from 350 mASL to as much as 1,450 mASL, though the influence of latitude means upper elevations may not exceed 900 mASL (Hope *et al.* 1991). Climax forests are open-canopy and dominated by Douglas-fir, whose thick bark offer protection from the fires that historically influenced tree distribution and frequency (Hope *et al.* 1991). Lodgepole pine, another fire-adapted species, is also common. Fires once produced extensive, localized grasslands, but many of these have been reduced through a combination of fire control and over-grazing (Hope *et al.* 1991). Unforested wetlands are common, though bogs are rare (Hope *et al.* 1991). Forest fires burn not just trees, but their roots. Known as "root burn", these natural features require careful examination by a qualified archaeologist to differentiate them from archaeological features. Likewise, ash and charcoal from past forest fires will be common, and archaeological investigations may discern the difference between naturally-produced charcoal and charcoal that results from deliberate human agency.

Soils in this zone tend to develop on moraines consisting of volcanic bedrock, which tend to be basic rather than acidic (Hope *et al.* 1991), and sometimes neutral (Canadian Society of Soil Science 2020). Basic and neutral soils tend to facilitate the preservation of perishable archaeological remains. However, both basic and acidic soils may be found in proximity to each other (Canadian Society of Soil Science 2020). Temperatures are below freezing for up to five months a year and frosts can occur year-round (Hope *et al.* 1991), meaning frost-heaving of artifacts may occur. Artifacts subjected to multiple cycles of frost-heaving tend to orient towards the vertical (Johnson *et al.* 1977).

Five components are present in the Interior Douglas Fir Zone, in three subzones:

- Event 29 (IDFdk1)
- Salmon Arm Tap (IDFdk1)
- SN-7 (IDFdk1)
- Kingsvale Control Station (IDFxh1)
- Event 1 (IDFxh2)

IDFdk1 is the Thompson Dry Cool subzone and typically occurs on the Thompson Plateau at 800 mASL or higher. It possesses fewer herbaceous species and Douglas-fir regeneration tends to be more consistent than in other subzones (Hope *et al.* 1991). IDFxh1 is the Okanagan very hot dry subzone. Generally configured to low-elevation valleys, it lacks lodgepole pine and possess a sparse shrub layer (Hope *et al.* 1991; Lloyd *et al.* 1990). IDFxh2 is the Thompson Very Dry Hot subzone. It is similar to DFxh1, though geographically it exists within the valleys and lower slopes of the Fraser and Thompson rivers and possess a well-developed moss layer (Lloyd *et al.* 1990).

Montane Spruce (MS) Zone

This zone occurs in dry, middle-(~1,000 mASL) to high-elevation (~1,700 mASL)-settings (Hope *et al.* 1991a). Historically, wildfire played a vital role in forest regeneration within this zone. Being both fire- and drought-resistant and possessing serotinous cones (that is, the cones are sealed with resin, which requires intense heat to melt), lodgepole pine is the dominant tree species within mature forests in this zone, though hybrid white spruce and subalpine fir are common in many areas (Hope *et al.* 1991a). Douglas-fir is rare (while more fire resistant than lodgepole pine when mature, it requires wetter conditions and a longer maturation period), and Ponderosa pine, western redcedar and western hemlock are absent (Hope *et al.* 1991a). Grasslands are rare, though wetlands may exist where flatter terrain exists (Hope *et al.* 1991a).

As with the Interior Douglas Fir Zone, soils within the MS Zone tend to form atop morainal deposits derived from volcanic materials (Hope *et al.* 1991a). Soils range from acid to base, with wetter settings tending towards acid (Hope *et al.* 1991a). Temperatures are below freezing for five months, meaning frost-heaving of artifacts may occur. As with the ICH Zone, it is unclear if vertical orientations for frost-heaved artifacts are typical in the sloped settings common to the MS. If the terrain is level enough to allow the formation of wetlands, it is likely that vertically oriented artifacts may occur.

Only one component, KIN PRI 323 Event 31, is present in the MS Zone. It is located in the MSdm2 (South Thompson dry mild) subzone. This zone occurs on the lee side of mountains and plateaus (Hope *et al.* 1991a).

Ponderosa Pine (PP) Zone
This zone is generally restricted to low elevation valleys in the southeast of the province (Hope *et al.* 1991b). The rainshadow cast by the Coast Mountains prohibits extensive moisture from entering the region and as much as 40% of the mean annual precipitation (280-500 mm) falls as snow (Hope *et al.* 1991b). As suggested by the zone's name, Ponderosa pine dominates the canopy, though Douglas-fir and trembling aspen are present in wetter areas (Hope *et al.* 1991b). There is little in the way of shrubby understory; instead, extensive grasslands have developed, and some regions of the PP Zone present as open parkland (Hope *et al.* 1991b). Fires once played a vital role in the establishment and maintenance of this zone (Hope *et al.* 1991b), and careful archaeological examination may be needed to differentiate between natural vs human created fire features.

Soils range from slightly basic to slightly acidic Brunisols and may derive from glacio-fluvial and till deposits dominated by igneous rock (Canadian Society of Soil Science 2020). Areas dominated by grasslands typically possess Chernozemic soils, which tend to be acidic and favour carbonate precipitation; these soils have likely developed from glacio-fluvial materials (Canadian Society of Soil Science 2020). Seasonal alkaline ponds may be found in basins or depressions (Hope *et al.* 1991b); when these dry out, an alkali crust may be visible.

Nine components are present within the Ponderosa Pine Zone, spread across three subzones.

- Penticton Gate Station (PPxh1)
- Princeton Crossover Control Station (PPxh1)
- SN-3 (PPxh1)
- SN-4 Valve Assembly (PPxh2)
- SN-6-1 (PPxh2)
- Salmon Arm Tap (PPxh2)
- SN-15 (PPxh3, formerly PPdh1)

PPxh1 is the Okanagan very dry hot subzone, PPxh2 is the Thompson very dry hot subzone and PPxh3 (until recently classified as PPdh1) is the Kettle dry hot subzone. The presence and absence of certain wildflowers species (e.g., slender hawksbeard), shrubs (i.e., rabbits-brush) and wild-flowers (e.g., silky lupine, orange arnica), and particularly geography (PPxh1 is within the Okanagan, PPxh2 is on the Thompson Plateau and PPxh3 is restricted to the Kettle Valley) are the primary defining features of these subzones.

3.1.1 Ancient Environments

Broadly speaking, the Interior Plateau is a trough bracketed by the Coast Mountains to the west and the Columbia Mountains to the east (Waddington 1995). Numerous glacial advances have occurred in the region over the last 2.6 million years, each one re-shaping both the bedrock formations and the deposits left by previous glaciers. The contemporary watersheds of central British Columbia have been sculpted by the complex interaction of multiple valley glaciers advancing, coalescing and then retreating, as well as by the isostatic pressures created and released by the sheer weight of the ice (Waddington 1995). The most recent glacial advance—the Fraser Glaciation—began ca. 30,000 years ago and peaked about 15,000 years ago (Church and Ryder 2007). Thereafter, the glaciers melted at an extremely rapid pace: within 5,000 years, the ice was present only in the mountains, and in quantities and distributions similar to contemporary times (Church and Ryder 2007).

The action of glaciers and their subsequent rapid melting resulted in the creation of glacial landscape features throughout the Interior Plateau: kettles (depressions created by blocks of stagnant ice), kames (a mound of glacially deposited sediment, often associated with kettles), eskers (a long ridge of glacial sediments) and moraines (unconsolidated deposits of glacial material) (Church and Ryder 2007). Due to ice remaining active within the mountains, the Columbia Mountain region possess proglacial outwash deposits (well-sorted, stratified deposits placed by meltwater from the terminal portion of a glacier) and few moraines and kames (Church and Ryder 2007). In the mountainous portions at the west of the RSA, such as near Kingsvale Control Station, geological studies suggest that most relatively gentle slopes are the result of glacial erosion, whereas steep-walled ravines derive from post-glacial fluvial action (Esh-Kn-Am Cultural Resources Management Services 2009). A similar pattern may exist in the Columbia Mountains on the east side of the RSA, where East Kootenay Exchange is situated, though less is known about the geomorphology of that region.

The immediate post-glacial environment would have been inhospitable, lacking the vegetation necessary to support animals or to stabilize the wind-blown silt and sand deposits left by the meltwaters, which had filled basins to create numerous, highly dynamic glacial lakes. Ice dams were not uncommon, and some of the contemporary drainage patterns resulted from ice dam bursts, whose sudden release of tremendous volumes of water carved entirely new channels (Esh-Kn-am Cultural Resources Management Services 2009). Forest tundra (open stands of spruce, larch, and poplar species), herb tundra (treeless areas dominated by bare ground and a sparse herb layer) and alpine tundra (similar to previous but at higher elevations) had begun to re-colonize small pockets of southern latitude lands within the region by 12,000 BP (Dyke 2005). Revegetation of the region may have been adversely affected by the Younger Dryas period, during which temperatures dropped sharply and glaciers readvanced, at least in the Pacific Northwest (Kovanen 2002).

By 10,000 BP, whitebark pine, spruce, fir and lodgepole pine were present and had expanded to exceed modern elevations in mountainous regions; this expansion was seen across southeastern BC for roughly 1,000 years after the Younger Dryas (Dyke 2005). Many of these trees have poor fire resistance (Hood *et al.* 2018), suggesting that fire was not yet a key variable in the spread of these pioneer forests. On the Interior Plateau, conifer forests dominated by lodgepole pine were establishing themselves (Dyke 2005). Contemporary associations of plants and animals (and therefore, near-modern environmental conditions) were generally present in the RSA by roughly 6,000 BP (Dyke 2005). The frontier lodgepole pine dominated forests of the Interior Plateau had been superseded by mosaics of Douglas-fir, lodgepole pine, whitebark pine and Ponderosa pine, alongside poorly fire-resistant species such as western hemlock, Engelmann spruce, Sitka spruce and cedar (Dyke 2005; Hood *et al.* 2018). Mountainous regions possessed subalpine forests composed of various fir, spruce and pine species (Dyke 2005). Changes have continued to occur since 6,000 BP but are less pronounced. For example, at ca. 3,000 BP, treelines were somewhat higher than at present, falling in response to subsequent advances of local glaciers; in the southeast portion of RSA, western hemlock expanded into subalpine zones starting *ca*. 3,500 BP and mountain hemlock appeared sometime after 2,100 BP, denoting slightly wetter and cooler conditions prevailed (Dyke 2005). These cooler conditions have been linked to greater salmon productivity in the Columbia River (Pouley 2010).

3.2 Ethnographic Setting

The ethnographic record for this region begins in the nineteenth century, reflecting the late date at which foreigners arrived in what is now south-central and southeastern British Columbia. The mid- to late-nineteenth century was a tumultuous era for the region, as discussed below, and by the time ethnographers had arrived in the region, rapid change had already occurred in Indigenous lifeways. When Simon Fraser was guided down the river that now bears his name in 1808, he noted the presence of guns and horses, as well as smallpox (McMillan 1995).

In the western and northern portions of the RSA were traditionally and continue to be inhabited by the Nlaka'pamux and Secwépemc peoples, members of the Interior Salish linguistic group. Their populations center on the Fraser and Thompson rivers, and the salmon that once ascended the river canyons allowed for some of the highest Indigenous population numbers anywhere in what is now Canada (McMillan 1995). Descriptions of Nlaka'pamux and Secwépemc traditional culture can be found in Hill-Tout (1899, 1978), Ray (1939), and Teit (1898, 1900, 1909, 1912).

Traditionally, the Nlaka'pamux and Secwépemc were hunters, gatherers, and fishers who took advantage of the resources of their territory by shifting residency on a seasonal basis. From early spring to late autumn, small family groups moved to utilize the landscape, harvesting fish, land mammals, waterfowl, and plants as they became available in different areas. Mat or bark lodges were also used, as these structures could be quickly constructed. In winter, groups would normally gather at permanent villages situated in major river valleys or around lakes where shelter, firewood, and drinking water were plentiful. Winter homes were semi-subterranean, circular pithouses with conical roofs covered with earth. Food for winter was stored on elevated platforms or in underground pits lined with bark. Food was preserved for winter storage using a variety of methods. Berries were sun dried or made into cakes. Roots were also sun dried or cooked in earth ovens. Fish and meat were dried by the sun, wind, heat from a fire, hot air in sweat houses, or smoked indoors. Salmon roes were buried in bark wrappers. Bone marrow and salmon oil were also stored.

During pre-contact and early contact times, chinook were the most abundant salmon species in the regional river system (Ignace 1998). Other fish, including several species of salmon and trout, were caught throughout the year. Fishing nets were made from Indian hemp or cedar bark (Teit 1909). Fishing weirs and traps were also used. The Nlaka'pamux and Secwépemc people hunted several species of animals as part of their seasonal round. Large game focused on wapiti and deer, but bears, bighorn sheep, and mountain goats were also hunted when and where available. Smaller mammals such as rabbits, beaver, ground squirrel, marmot, and porcupine were hunted as opportunity afforded, occasionally as food supplements but more typically for their fur. Birds that were hunted included upland species, like grouse, and waterfowl, such as ducks, and geese.

A wide variety of plants was used for subsistence, medicine, tools, and snowshoes (Ignace 1998). The most important food plants were rice-root (*F.camschatcensis*), balsamroot (*Balsamorhiza sagittata*), "wild carrot" (*Sium suave*) and biscuitroot (*Lomatium spp*.), chokecherry (Prunus virginiana), Saskatoon berry (Amelanchier alnifolia), and soapberry (Soopolallie/*Shepherdia canadensis*), together with numerous other, less-favoured varieties of food plants. Trees were utilized for timber and firewood, and bark slabs were used for covering winter lodges. Cottonwood trees were used for making dugout canoes and paper birch bark was used as a construction material for utilitarian items. Other plants, such as rushes and tall grasses, were necessary for manufacture of woven artifacts, and a diverse assortment of additional species were exploited for medicinal purposes.

Material culture was distinguished by tools of wood, bone and antler, and chipped and ground stone. Other artifacts include basketry, tule rush mats, and birch bark containers. The bow and arrow were the primary hunting weapon in late pre-contact times (that is, the period before contact with European societies).

The traditional winter dwelling was the distinctive semi-subterranean pithouse, or *kekuli*, which after abandonment and natural infilling, leaves sub-rectangular to circular depressions. Small to large village clusters of pithouses were often located near main waterways or fishing stations. During other seasons of the year, the Secwepemc resided in temporary pole-and-tule mat structures called matlodges. Matlodges would usually have been found along lake shores, on the banks of rivers, or associated with seasonal resource procurement camps. Other constructed features used in the day-to-day life of Nlaka'pamux and Secwépemc people included hearths, storage pits, and food roasting ovens.

The eastern and central portions of the RSA are within a poorly defined interaction sphere (*cf*. Walker, Jr. 1998) between Indigenous people often—but not exclusively—lumped into the either the Northern Okanagan, Lakes and Colville group or the Ktunaxa group. Prior to the onset of Euro-Canadian immigration in the 1860s, this area was utilized by three groups of First Nations' people: Okanagan, Sinixt, and Ktunaxa. The Okanagan and Sinixt spoke different languages of the Interior Salish division of the Salishan language family, whereas the Ktunaxa language is unique, related to no other language family in the Pacific Northwest. Salmon runs were much lower than those found in the Fraser and Thompson Rivers, and the canyons less amenable to fishing techniques employed to the north and west, and so Indigenous populations were likewise smaller (McMillan 1995).

A generalized summary of traditional Plateau cultures is found in Ray (1936). British Columbian ethnologist James Teit (1930) included the Sinixt people in his ethnographic descriptions of the Okanagan, and extensive research has been carried out among them in more recent years (Bouchard and Kennedy 1985; Kennedy and Bouchard 1998). Chamberlain (1892) published an early summary of Ktunaxa culture, and a standard ethnography was published by Turney-High (1941), while Brunton (1998) is a recent summary. Specialized Ktunaxa subsistence studies were published by Schaeffer (1940) and Smith (1984). The following discussion is based upon the work of the above authors and is generally applicable to the entire RSA.

Culture was characterized by a mobile life-style dependent upon hunting, supplemented by fishing and gathering. Typically, an emphasis on fishing and hunting was commonly ascribed by early ethnographers, but more recent ethnobotanical studies (*e.g*., Deur and Turner 2005) emphasize the importance of traditional knowledge of useful plants and their management. Society was loosely stratified into three classes: "chiefs", perhaps better thought of as "headwomen/men", whose positions were influenced by both genealogy and their suitability as deemed by the community. While society was loosely stratified, the fundamental political unit was the village (Ray 1936). Political integration expanded somewhat with the introduction of the horse (Walker, Jr. 1998). Plateau groups tended to have close relations with people of the Northwest Coast (the culture area to the west), but once the horse was adopted, they also had increased contact with the people of the Plains cultural group to the east (Walker, Jr. 1998).

Settlement patterns tended to be linear, configured to geographical features (Walker, Jr. 1998). Winter villages were typically located along rivers and in valley bottoms, though upland areas were regularly visited for seasonal resources. Winter villages were composed of related families, under the nominal leadership/guidance of a headwoman/man; most villages seldom exceeded six structures, at least for the non-Ktunaxa groups (Kennedy and Bouchard 1998). Pithouses, typically holding no more than two families, were used in the winter by the Interior Salish groups. Even in winter, however, the mat-lodge was more common than the pithouse, in the later pre-contact period. Two lodge-forms were utilized, one conical, one square-topped, the latter being more commonly employed in the winter, when a semi-subterranean excavation might accompany it. Mat-covered lean-tos were also employed. In contrast, the Ktunaxa never adopted the pithouse, and as far as anthropologists have been able to determine, always lived in matlodges or tipis (a later introduction from the Plains culture area). Summer villages were typically smaller, consisting of no more than two families, and more dispersed throughout the landscape. According to Kennedy and Bouchard (1998), at least 20 winter village sites have been recorded by ethnographers, and Ray (1936) presents a map denoting 43 seasonal and permanent villages.

Several species of animals were hunted as part of the seasonal round. Large game predominantly included moose, wapiti and deer, but black bears and mountain goats would have been hunted when and where available. Ktunaxa are known to have made yearly trips to the eastern slope of the Rocky Mountains for bison hunts, at least prior to the virtual extirpation of the bison in the 1870s. Smaller mammals such as rabbits, beaver, ground squirrel, marmot, and porcupine were hunted as opportunity afforded, occasionally as food supplements but more typically for their fur or quills. Birds that were hunted included upland species like grouse and waterfowl such as ducks, geese, and swans, and wetland complexes along the Kootenay River were foci for their harvest.

Fishing was an important activity in this region. In the Kootenay River and its tributaries, as well as low-elevation lakes, resident rainbow trout, bull trout, sturgeon, and coarse fish were available, though were never as important as salmon. Fish were trapped or netted in streams and rivers and fished with harpoons and hooks in deeper waters. Fishing technology of the region was complex and bore similarities to those used in the Northwest Coast culture area (Walker, Jr. 1998).

Many plant resources were utilized. The more important food plants in this region included soapberry, saskatoon berry, chokecherry, avalanche lily, rice-root; all of these species are present in the region today, together with numerous other, less-favoured varieties of food plants. Douglas-fir, paper birch, and redcedar trees were utilized for timber and bark. In mid-to-late spring, cambium was gathered from lodgepole and ponderosa pine trees. In some years, this provided a sweet delicacy and welcome dietary variation, but in others, it was a vital food source that was edible just as food stores were exhausted. Other plants, such as rushes and tall grasses, were necessary for manufacture of textiles, and a diverse assortment of additional species were exploited for medicinal purposes. Plants were typically harvested by women, who controlled their distribution (Conrad and Finkel 2002).

Plateau material culture was typified by tools of wood, bone and antler, and chipped and ground stone. Fibre artifacts, such as basketry, tule-rush mats, and birch bark containers were abundant. Dugout canoes were manufactured from Ponderosa pine or cottonwood logs and a distinctive style of "sturgeon-nosed" pine-bark canoe was used to navigate the extensive waterways of the East Kootenay's. The bow and arrow was the primary hunting weapon in late pre-contact times; earlier, darts propelled by throwing-sticks (or "atlatls") and spears would have been used. In alpine settings, alignments of stone cairns were constructed to assist in hunting bighorn sheep (Hanna *et al* 1992).

It is important to note that not all aspects of traditional Indigenous cultures may be recorded in the anthropological and ethnographic literature. Additional knowledge of traditional culture and lifeways still exist in many contemporary First Nation communities. Furthermore, Indigenous societies underwent significant changes as a result of their engagement with Europeans and some cultural aspects reported in the early ethnographic literature may not accurately reflect cultural aspects that were present prior to contact.

3.3 Historical Setting

This historical summary is provided as context for understanding changes to the Indigenous settlement patterns as a result of contact with non-indigenous peoples, to identify the potential for historic sites in the RSA, and to assess the potential impacts from historic development on the landscape.

While a few Europeans hired Indigenous people to guide their explorations of the region in the early 1800s to establish trading posts (Bilsland 1955) and a handful of itinerant missionaries sought converts, no significant European or Asian populations were present in the RSA until gold was discovered in the Fraser Canyon, near present day Lytton, in the winter or spring of 1858. By mid-summer, some 30,000 people had immigrated to the area, seeking their fortune (Fraser Valley Regional District 2009). This led to the establishment of the Colony of British Columbia (Conrad and Finkel 2002).

The Fraser River became a critical access point to Yale, which became the river's north-most steamboat terminal, and later, the southern terminal of the Cariboo Wagon Road by 1864. Those features enabled access to the interior of the province as far northeast as the Cariboo, and southwest to the Pacific Ocean. As gold fields were exhausted—or, for most, simply never located—miners generally pushed north and east into what is now British Columbia from the Fraser Canyon. Logging operations (in forested areas, at least), generally began with the arrival of miners, who frequently became farmers and ranchers when their dreams of "striking it rich" failed to materialize.

The effects of immigration were disastrous for Indigenous people. The newcomers claimed the lands and resources belonging to Indigenous populations and brought deadly diseases (McMillan 1995). The small-pox epidemic of 1862-63 killed an estimated 33 percent of all Indigenous peoples in the colony (McMillan 1995). In the Fraser Canyon, many of the newcomers razed Indigenous villages to the ground (Conrad and Finkel 2002). Enraged and traumatized, the survivors pushed back, but ultimately were outnumbered and opposed by a colonial system that viewed Indigenous peoples as obstacles to be overcome (Conrad and Finkel 2002; McMillan 1995). Some groups, such as the majority of the Sinixt, moved their homes south to Washington State (McMillan 1995), though some continued to live, and many continued to hunt, within their traditional territory. The (Indigenous) depopulated landscape fed into myths subsequent immigrants adopted: that the areas they entered were untouched wilderness and they were therefore pioneers (Conrad and Finkel 2002).

Railway development was underway by the late nineteenth century, which facilitated faster travel than the steamboats imported to the region during the height of the gold rush (Bilsland 1955). The railways often facilitated the creation of towns (*i.e.,* Revelstoke), though in some cases, the railway was stationed in an existing town (*i.e.,* Nelson) that required a transportation network to ship and sell valuable resources (Bilsland 1955; Wood 2021). Changes accelerated in the twentieth century. In 1913, blasting for a railway in the Fraser Canyon sent millions of tons of rocks into the Fraser River, blocking salmon from reaching their spawning grounds: salmon populations have never recovered (McMillan 1995). Hydroelectric projects proliferated and river valleys were drowned by dams to create reservoirs, further displacing Indigenous peoples who had signed no treaties (McMillan 1995), particularly in the central and eastern portions of the RSA.

Archaeological sites in the RSA may contain evidence of these early historic activities by both Indigenous and non-Indigenous peoples. Although not always protected under the *HCA*, they represent an important part of the province's early history and should be recorded where encountered. In some components, these activities and more recent developments have resulted in impacts to the natural setting and the loss or disturbance of the archaeological sites. The potential for significant historic sites and the effects of historical development are discussed in Section 4 for each component.

3.4 Archaeological Setting

Sections 3.4, 3.5 and 3.6 of the report provide a summary of the archaeological site types and cultural chronology for this large RSA. Given the size of the region and the large volume of previous studies, information on available archaeological studies is only provided for the individual components in Section 4.

An archaeological site is a geographic place that contains physical evidence of past human activities. Most archaeological sites in British Columbia are attributed to pre-contact Indigenous settlement and land use. Some traditional activities, such as berry gathering and the collection of medicinal plants, leave little or no archaeological remains and thus are more appropriately addressed by a Traditional Use Study (TUS). As such, the boundary of an archaeological site may not constrain the spatial extent of traditional activities associated with that site. Archaeological sites in BC are recorded in the PHR, maintained by the Archaeology Branch (Site Inventory Section), the provincial government agency responsible for management of archaeological resources in accordance with the *HCA*.

Archaeological sites in Canada are numbered according to the Borden Site Designation Scheme (Borden 1952). This scheme is based on the maps of the National Topographic System and uses latitude and longitude to identify a site's location. The four-alternating upper- and lower-case letters (*e.g*., DhQv) denote a unique "Borden unit" measuring 10' latitude by 10' longitude. Sites are numbered sequentially within each Borden unit, based (usually) on their date of discovery (*i.e.,* DhQv-6 would be the sixth site identified within the DhQv Borden unit).

3.5 Archaeological Site Types

Archaeological sites are defined by the types of archaeological remains (*i.e*., artifacts and cultural features) present, and according to the types of traditional activities presumed to have taken place at the site. Artifacts are any object made or used by human activity and include a diverse array of material remains such as stone, wood, or bone tools, ceremonial objects, and clothing. Features are objects that cannot be collected or otherwise altered without a loss of information. These include post molds, hearths, burials, rock art, culturally modified trees, structures, trails, roads, and the remains of industrial activities. A particular site can be comprised of one or more of these types of archaeological remains, and it is expected that larger sites will be more complex than smaller ones.

The most common kinds of archaeological resources documented from or likely to be present proximate to the components include:

- **Artifact Scatters**: These sites are usually comprised exclusively of stone artifacts, representing transitory occupation of riparian or inland environmental settings, oriented toward the exploitation of resources. The most common archaeological remains at such sites are chipped or ground stone tools, along with the waste products of stone-tool manufacture or maintenance ("debitage"). Artifact scatters may be found on the surface or buried beneath the surface. Many of these sites tend to be small, represented by a low-density scatter covering a small area, or even a single, isolated find. However, some lithic scatters, especially those associated with basecamps or quarry workshops, are much larger and can be hectares in extent. Small scatters are usually dominated by one lithic raw material type, but seasonal camps could have many different types of lithic materials present. Fire-altered rocks and localized spreads of charcoal and ash from cooking fires are sometimes present.
- **Cultural Depressions**: These are the results of excavation by ancestral First Nations and include: (i) housepits (remnants of semi-subterranean pithouses); (ii) sidehill platforms (remnants of summer matlodges or perhaps sweat lodges); and (iii) subsistence features (such as cache pits for storing and preparing plant and other resources and roasting pits used for cooking). The functional interpretation of these features is dependent on a number of factors, including size, associated artifacts, and the presence or absence of cultural materials, such as fire-altered rocks and charcoal-stained soils. Housepits are circular to sub-rectangular depressions and, in this region, are typically between 5-16 m in diameter (or along its longest axis). Housepits often occur in small villages clusters and are typically in association with smaller pits used for food

preparation and storage, butchered animal bones, and artifacts. Housepits are typically found in environmental settings with good sun exposure, protection from winter winds, and proximity to water, although secluded locations were sometimes selected for defensive reasons. Subsistence features are usually present in locations traditionally used to harvest and process resources and are often also associated with villages. Cache or storage pits are the most common types of subsistence feature depressions. These appear as circular depressions between 1-3 m in diameter, frequently in closely spaced clusters and in proximity to housepits. Cooking features are another characteristic subsistence feature in this region. These may be small charcoal-filled depressions or level platforms covered with black charcoal-stained soil but can be considerably larger than cache pits (Lepofsky and Peacock 2004).

- **Fish Weirs**: These are wooden structures built to capture fish in marine environments or inland waters. In the field, fish weirs are defined by the presence of wooden stake remnants in backwater channels, sloughs, or on river foreshores. Fish weirs are generally rare in the archaeological record, but they have been documented in the region, such as DhQv-58, in the Okanagan River.
- **Pictographs and Petroglyphs**: Colloquially referred to as "rock art", pictographs (paintings) or petroglyphs (rock carving/etching) are typically found on bedrock outcrops or large boulders. These sites are often found on prominent rock features along rivers and lakes, as well as along trails. Examples in prominent locations may indicate territorial boundaries or refer to key events from a Nation's past. Examples in secluded locations may be associated with seeking spiritual power, or even shamanism.
- **Burial places**: The lack of soil development in many parts of the Southern Interior meant that subsurface interments were not always possible. In other places, soils were present but were frozen for up to five months a year, making excavation all but impossible during the winter. In some locations, cairns were therefore placed atop the decedent. In other areas, bodies were buried in talus slopes without any obvious grave marker.
- **Quarry sites**: These areas possess rocks that were a preferred stone tool material. They may be identified by copious first-stage lithic reduction remains and a general lack of final stage lithic reduction remains (often referred to as workshop sites) as Indigenous people transformed stone nodules into tool blanks or preforms, which were often refined into finished tools elsewhere. On the Interior Plateau, fine-grained volcanic rocks (FGVR) such as basalt, dacite, rhyodacite and trachyandesite were commonly used, as were various sedimentary rocks, such as chert and mud/siltstone, and metamorphic rocks such as quartzite and slate. Other rock-types were also used but were more geographically restricted; the presence of such rocks found at some distance from their quarry may be the result of trade. Several primary toolstone sources and quarrying sites are reported for the Thompson River drainage (Rousseau 2015[1]), and the FortisBC components in Kamloops and Vernon, as well as those south of Merritt, are in proximity to some of these quarry sites.
- **Rock shelters**: Caves or boulders were sometimes used to provide protection from the elements. These sites may be recognized by a surface scatter of artifacts, carbon staining on an overhang or panel (from a hearth fire), subsurface deposits, and occasionally even by rock art. Many rock shelters are known in the RSA. These are often located near a trail but are also found away from transportation networks, such as in processing areas associated with opportunistic hunting or gathering.

[1] Rousseau (2015) also reports that minimally 25 secondary toolstone quarries are known for the same region but are relatively localized.

- **Trails**: These linear sites are routes used in pre-contact or historical times to provide access to portages between waterways, or landward access to resource-procurement locations or villages. Culturally-modified trees (CMTs) (discussed below) and rock art sites are characteristically found within a short distance of traditional and more recent trails. Some of these overland routes were known as 'grease trails', a referring to the fact that eulachon oil, a highly prized trade commodity, was transported along them. Some modern roads were constructed atop Indigenous trails (Duffield 2001).
- **Forest utilization sites**: Contain one or more CMTs that have been altered by Indigenous people as part of their traditional use of the forest. The characteristic type of CMT in the Southern Interior of BC are lodgepole pine trees from which a section of bark was cut to collect the inner bark or cambium. Other kinds of CMTs are frequently associated with traditional trails and functioned as trail markers. Bark was also removed from other tree species, especially paper birch, western redcedar, and yellow cedar, as raw material for baskets, cooking containers, roofing material, and as gummy pitch for medicinal and adhesive purposes (Archaeology Branch 2001). Blazed trees are trees that show scarring or tool marks from metal tools for activities other than bark harvesting or Indigenous logging. Although blazed trees can originate from traditional activities (i.e., trail marking) and may pre-date 1846 AD, many are associated with post-1858 historical mining and forestry activities.
- **Historical Sites**: These sites are comprised of post-contact remains, including artifacts, structures, and features of Euro- or Asian-Canadian manufacture, and denote settlement and land use in the recent (historical) period. In the RSA, few will pre-date 1858.

3.6 Regional Cultural Chronology

The project area spans both the Interior Plateau and Columbia basin. The cultural chronologies for both are summarized separately, below.

3.6.1 Interior Plateau

The Interior Plateau geographic region correlates with the Canadian Plateau cultural region identified by Richards and Rousseau (1987) as distinct from the Columbia Plateau of Washington and Idaho (Andrefsky 2004). While this division is somewhat arbitrary (based on the imposition of an international boundary that only recently created an administrative barrier to Indigenous peoples), it also recognizes that the Canadian portion typically has only members of the Interior Salish nations, whereas additional ethnic groups are present in the USA. In addition, some authorities have assigned parts of the Kootenay region to the "Central Plateau" (Roll 1982), the "Northern Rocky Mountains" (Choquette 1987a, 1993), the "Eastern Plateau" (Roll and Hackenburger 1998), or the "Upper Columbia" (Goodale *et al.* 2004).

Chatters and Pokotylo (1998) summarize the archaeological correlates of Plateau culture throughout the Pacific Northwest, while Pokotyolo and Mitchell (1998) summarize localized pre-contact sequences for the Fraser River Basin. Other works that synthesize various aspects of Canadian Plateau cultural history include Fladmark (1982), Prentiss and Kuijt (2004), Richards and Rousseau (1987), Rousseau (2004), Stryd and Rousseau (1996), and Wright (1995a, 1995b, 1999). Excavations at many pre-contact sites throughout the Plateau resulted in a reasonably reliable model of regional culture history. The summary below (Table 2) is adapted from Richards and Rousseau (1987) and Stryd and Rousseau (1996).

Table 2: Generalized Culture Chronology of the Interior Plateau

Period	Horizon	Dates (BP)*	Representative Cultural Characteristics
Early	Old Cordilleran	10,000 – 7000	• associated with warmer/drier environmental conditions • subsistence reliance on hunting and a broad foraging spectrum with some exploitation of plants and small animals • often associated with mid-elevation Holocene grassland environments • low-elevation valley settings away from rivers and lakes would have been extremely arid, and some modern game species may have been absent • no evidence for social ranking • no evidence of permanent villages or habitation structures
Middle	Early Nesikep	7,000 – 6,000	• coincides with onset of cooler, moister conditions, correlated with the 6900 BP ashfall from Mt. Mazama (Bacon and Lanphere 2006; Zdanowicz *et al*. 1999) • subsistence still based primarily on hunting game animals and gathering plant foods, although salmon populations available in some watersheds and freshwater mussels are more important in sites of this age than at later times (Prentiss and Kuijt 2004) • Lochnore Phase represents a riverine-adapted society able to exploit stabilized salmon populations • no evidence for ranked social organization • no evidence for presence of resource storage • a few permanent houses known (*e.g.,* South Thompson River; Columbia River) • a few burial places known, but rare
	Lehman	6,000 – 4,400	
	Lochnore	5,500 – 3,500	
Late	Shuswap	3,500 – 2,400	• Plateau Pithouse Tradition represents a more sedentary way of life focused on resource mass- harvesting and systematic food storage • subsistence activities identical to those recorded by ethnographers

Period	Horizon	Dates (BP)*	Representative Cultural Characteristics
	Plateau	2,400 – 1,200	• semi-subterranean pithouse in general use as winter residence • matlodges may begin to replace pithouses in late pre-contact times • permanent villages present, some of large size • artifacts identical or similar to those used by ethnographic communities • long-range trading networks present; acquisition of horses from Columbia Plateau occurred toward end of this period (Schalk and Cleveland 1983) • burial places within pithouse floors (Shuswap Horizon), prominent landscape features, talus slopes (winter interments), and occasionally within cairns or cists
	Kamloops	1,200 – *ca.* 200	
Historical (Ethno-historic) Period	Unnamed	*ca.*200 – present	• abandonment of traditional house styles and artifact types occurs quickly, possibly related to smallpox epidemics that swept the area before extensive Euro-Asian immigration began • adoption of European house styles and tools • subsistence activities become oriented to European cash economies

* Expressed in radiocarbon years Before Present, where Present = AD 1950

3.6.2 Upper Columbia

The eastern periphery of the Interior Plateau and the Upper Columbia Basin remain understudied, both archaeologically and geologically. While a precise chronology of human occupation based on both archaeological and geological data has not yet been established for this region, a generalized temporal framework is available (Choquette 1996). Pouley (2010) also provides a specific temporal framework for the Kettle Falls along the Columbia River, in Washington State, though it relies heavily on data from just one locality, Hayes Island. Hayes Island is in a reservoir drawdown zone, meaning excavations are limited to less-than-ideal excavation windows, in a setting that has been flooded since 1941 (Pouley 2010). It is currently unclear if Pouley's (2010) 4-part period framework (Coyote [8,000-4,800 BP], Salmon [4,800-3,500 BP], Eagle [3,500-2,200 BP], and Turtle [2,200-200 BP]) can be extended as far north as the project area. An overview of cultural heritage resources in the Kootenays (Nelson Forest Region) was prepared by Choquette (1993).

The initial human occupation of the Upper Columbia basin probably commenced between ca. 11,000 and 10,000 BP, with people moving into a recently-deglaciated environment from the south (Choquette 1993). These migrations appear to have involved peoples belonging to at least two different archaeological traditions (Chance and Chance 1985; Choquette 1993, 1996; but *cf.* Pouley 2010). During the Early Period (11,000 to 7,500 BP), the cold, wet climatic conditions prevailing during the terminal glacial period were gradually replaced by hot and dry conditions, resulting in the development of arid grasslands in the southern river valleys and forests throughout much of the remainder of the Kootenay-Columbia region. The post-glacial lakes in the region were probably drained by about 10,000 BP, by which time salmon were ascending the rivers, as evidenced by land-locked sockeye salmon in Kootenay Lake (Choquette 1985, 1987b, 1996). Choquette (1985, 1987b, 1993) asserts that this period was accompanied by the maximum recession of alpine glaciers in the Columbia River basin and expansion of alpine-subalpine grasslands, a habitat unique to rounded mountain summits of the eastern Purcell Mountains. During this period, a reliance on hunting, and a subsistence pattern characterized by an ever-broadening foraging spectrum involving greater and more efficient exploitation of small plants and animals, is inferred (Choquette 1993).

Table 3 summarizes the archaeological correlates of the cultural periods defined for the Eastern Plateau/Upper Columbia region. The selected cultural characteristics presented have been adapted to suit what is currently known for this understudied area. Archaeological phases/Horizons have been removed and replaced with the broader unit of "period", as the known phases of the region lack temporal boundaries (e.g., Choquette 1996), or apply to archaeological cultures west, east, and south of the project area. The table has been adapted from Richards and Rousseau (1987), Stryd and Rousseau (1996), and Choquette (1996).

Table 3: Preliminary Cultural Chronology for the Upper Columbia

Period	Dates (BP)*	Cultural Characteristics (selected)
Early	10,000 to 7,000 years BP	• Generally associated with warmer/drier environmental conditions, though the earliest occupations appear to have occurred when cool, arid conditions dominated • subsistence pattern characterized by a reliance on a broad hunting and foraging spectrum, with increasingly efficient exploitation of small animals • often associated with mid-elevation Holocene grassland environments • low-elevation valley settings away from rivers and lakes would have been extremely arid, and some modern game species may have been absent, though bison and perhaps pronghorn antelope were present • no evidence for social ranking • no evidence of permanent villages or habitation structures
Middle	7,000 to 3,500 years BP	• coincides with onset of cooler, moister conditions, correlated with the 6,800 BP ashfall from Mt. Mazama (Westgate *et al.* 1970) • subsistence was still based primarily on hunting game animals and gathering plant foods, although salmonid populations available in some watersheds, freshwater mussels are more important in sites of this age than at later times (Prentiss and Kuijt 2004) • no evidence for ranked social organization • no evidence for presence of resource storage - some permanent dwellings known in the Columbia Basin (*e.g.*, lower Okanagan River valley) • a few burial places known, but rare

Period	Dates (BP)*	Cultural Characteristics (selected)
Late	3,500 to 200 years BP	• subsistence activities similar to those recorded by early settler observations • semi-subterranean pithouse in general use as winter residence, inferred to indicate a more sedentary way of life focused on resource mass-harvesting and systematic food storage • matlodges may begin to replace pithouses in latest pre-contact times • permanent villages present • artifacts similar to those used by ethnographic communities • long-range trading networks present • achieved status present, evidence for ascribed status equivocal • burial places within pithouse floors, prominent landscape features, talus slopes (winter interments), occasionally within cairns or cists
Historical Period	~ 200 years BP to present	• gradual abandonment of traditional house styles and artifact types • adoption of European house styles and tools • subsistence activities become oriented to European cash economies

* Expressed in radiocarbon years Before Present, where Present = AD 1950

4.0 Results

The results of each potential assessment and, where conducted, PFR are discussed in the subsections below. Historic aerial photo observations mentioned below are detailed more fully in Appendix B and selected photos displayed in Appendix C.

4.1 Savona Compressor Station

Savona Compressor Station is a roughly 7,000 square metre component south of the community of Savona at the west end of Kamloops Lake (Appendix A: Figure 2). It overlooks the southern shore of the lake from the foot of Mount Savona at 500 mASL, less than a kilometre west of Durand Creek. Built sometime between 1969 and 1974, the station is responsible for maintaining fuel pressure along a section of the SAV VER 323 pipeline (See Appendix B for a complete review of aerial photos). A PFR was not conducted for component.

The station is built on a wedge-shaped veneer of glaciolacustrine silts at the mouth of Durand Creek (Fulton 1975). These deposits were laid down during one of the several phases of post Fraser proglacial lake formation in the lower Thompson River drainage. Lake levels higher than those of today are likely responsible for stranding Durand Creek terrace deposits on the upslope edge of the wedge. The creek provides a natural corridor from the lake up to Mount Savona (a known jasper source), Mounts Durand and Anne, and Tunkwa Lake. Ephemeral streams have incised deep gullies to the north and west of the station. Below the station, their courses appear to be relatively stable, but above the station, review of historic aerial photos suggest the northern arm was somewhat more complex prior to construction of the station between 1969 and 1974. In 1949, the eastern half of the station component appears to have been under cultivation or at least well-watered. Construction of the station may, therefore, have required southeastern artificial expansion of a dry knoll at the confluence of these two gullies. Subsequent land alterations appear to have focused primarily on realignment of the Tunkwa Lake Road.

No potential model is available for this component, but nearly two-dozen archaeological sites have been recorded nearby, most around Steelhead Park at the inlet of the Thompson River (Table 4). Eighteen are artifact scatters, many dense accumulations of non-diagnostic tools and waste flakes, often of fine-grained volcanics from downstream sources. The nearest site, EeRn-49, sits at the mouth of Durand Creek on a small delta that protrudes into the lake. Shovel testing produced a range of lithics, fauna, and fire-altered rock that, in the absence of recorded habitation features, suggests a hunting and fishing camp. The next nearest sites are two artifact scatters situated on the left side of the Durand Creek valley, some 2 km upstream of the station. EeRn-48, the nearer of the two, consists of an isolated exhausted chert core, while the EeRn-47 is a tight scatter of waste flakes and a few non-diagnostic tools. Unfortunately, reports for these sites are unavailable. Major occupations appear to be concentrated around Steelhead Park, to the west. EeRf-1 and EeRf-4 together have evidence of Middle Period (ca. 3500 to 7000 BP) occupations including Nesikep, Lochnore, and Lehman projectile point types (Bussey 1995:155-161).

A remarkable series of petroform sites have been recorded on the north shore of Kamloops Lake. At roughly the same elevation as the component, these features are comprised of linear, curvilinear, and geometric stone alignments. Typically, only a single course high, they are too short to have been effective hunting blinds or drives. The scatter of precontact artifacts found around them, however, demonstrates they are archaeological. Similar structures appear to have been associated with the pursuit of vision quests in the recent past (Markey in Nichols 1999:37), suggesting a ritual rather than economic or domestic function for these features. These are subtle, easily destroyed features only detectable through intensive systematic survey and may be more common than would appear in the PHR. Although none have been detected on the southern shore of the lake, this may reflect the dearth of investigation or the difficulty in differentiating these sites from recent stone alignments in the absence of precontact artifacts.

Table 4: Recorded Archaeological Sites Reviewed for the Savona Compressor Station

Borden Designation	Site type	Reference
EeRe-6	Pictograph	2002-np; 1974-01
EeRe-7	Artifact scatter	1974-01
EeRe-46	Artifact scatter	2013-230
EeRe-47	Artifact scatter	2013-230
EeRe-48	Artifact scatter	2013-230
EeRe-49	Camp site	2015-239
EeRf-1	Settlement	1994-35
EeRf-4	Settlement	1978-08
EeRf-5	Artifact scatter	1985-np
EeRf-22	Cultural depression	1978-08
EeRf-35	Artifact scatter	1985-np
EeRf-53	Artifact scatter	1992-20
EeRf-54	Artifact scatter	1992-20
EeRf-57	Artifact scatter	1999-140
EeRf-58	Artifact scatter	1999-140
EeRf-59	Artifact scatter	1999-140
EeRf-60	Petroform	1999-140
EeRf-61	Artifact scatter	1999-140
EeRf-62	Petroform	1999-140
EeRf-63	Artifact scatter	1999-140

In the absence of a PFR, the Savona Compressor Station has been assessed as having moderate archaeological potential. It is situated on gently sloping glaciolacustrine deposits within or near the Durand Creek valley. A string of large settlements is documented around the western shoreline of Kamloops Lake and studies on the northern shore document artifact scatters and petroform sites continue up into mid-elevations. Mount Savona, south of the project, is a well-known source of lithic raw material (jasper) and it should be expected that Durand Creek was one of the more direct routes to its base.

4.2 Event 1 SAV VER 323

Event 1 is a roughly 1 km section of SAV VER 323 in the community of Cherry Creek, west of Kamloops (Appendix A: Figure 3). The intention is to straighten the section of the pipeline to allow pipeline inspection instruments safe passage from Savona to Kamloops. The pipeline was construction by 1959, and there has been little alteration to the immediate landscape except for highway improvements and residential development (See Appendix B for a complete review of aerial photos). A PFR was not conducted for this component.

Event 1 is constructed at the head of a lens-shaped veneer of glaciolacustrine silts on Cherry Creek (Fulton 1975). Like Savona, these deposits were likely laid down at the close of the Fraser Glaciation, when ice dams turned the Thompson River into a lake. Pre-Fraser sediments underlie these deposits west of Cherry bluff and Roper Hill. The creek provides a natural corridor from the lake towards Sugarloaf Hill and surrounding environs.

Table 5: Recorded archaeological sites reviewed for Event 1 Component

Borden Designation	Site type	Reference
EeRd-4	Cairn	1978-008
EeRd-15	Settlement	2005-143
EeRd-16	Artifact scatter	1998-331
EeRd-17	Camp site	1998-331
EeRd-18	Camp site	1998-331
EeRd-19	Artifact scatter	1998-331
EeRd-20	Artifact scatter	1998-331
EeRd-21	Artifact scatter	2005-117
EeRd-22	Artifact scatter	2007-013
EERd-23	Artifact scatter	2007-013
EeRd-31	Artifact scatter	2007-045
EeRd-32	Artifact scatter	2007-045

No potential model is available for the component, but at least a dozen archaeological sites have been recorded in the vicinity, almost exclusively along the shoreline of Kamloops Lake (Table 5). Eight are artifact scatters. At least one of these contains evidence of microblade production but most of the remainder are culturally non-diagnostic. The nearest site is EeRd-04, a little over a kilometre south of the component. It consists of four petroforms. Rousseau and Howe (1978:20) argue the stone alignments are historic, but they are recorded as precontact sites in the PHR and it is not possible determine whether this is a difference of opinion or a clerical error from the site information form. Rousseau and Howe's coarse mapping (at least what is available on RAAD) precludes comparison to Nichols' (1999) features.

In the absence of a PFR, Event 1 is considered to have high archaeological potential. Few sites have been recorded in the Cherry Creek valley between the lake and Sugarloaf Mountain, but this appears to reflect an absence of investigation more than a demonstrated lack of archaeological resources.

4.3 SN-3

SN-3 is a nearly-350 square metre component east of Kamloops at the foot of Dufferin Hill, north of the Trans-Canada Highway (Appendix A: Figure 4). According to a review of historic aerial photos, the component was built sometime between 1974 and 1981 on the SAV VER 323 pipeline and expanded around 1995 (See Appendix B for a complete review of aerial photos). A PFR was not conducted for this component.

SN-3 sits on undifferentiated Fraser Glaciation sediments at 720 mASL, roughly 20 m above the valley bottom. These sediments form a low saddle between Dufferin Hill and the community of Dufferin. Hummocky terrain, principally remnant glacial kames and eskers form an apron around the slopes of Dufferin.

Ten archaeological sites have been recorded in the vicinity of the component, several on or around Dufferin Hill (Table 6). The two nearest sites to the project are EdRc-3 and EeRc-138. EeRc-138, approximately 1 km northwest of the project, is a low, oblong cairn consisting of 33 small boulders. Testing immediately adjacent to the petroform failed to identify additional stones, suggesting the feature is artificial rather than natural. Unlike petroforms found in the vicinity of Savona, additional cultural materials were not encountered either on the surface or in subsurface tests. Immediately across the Trans-Canada, EdRc-3 is a legacied artifact scatter beneath what is now the weigh scales for eastbound trucks. No diagnostic artifacts were encountered, but several non-diagnostic tools (e.g., notches and retouched flakes) of basalt and white chert were recovered. To the north of the component, Stantec (nd) has encountered isolated flakes (EeRc-112) and small scatters of surface lithic materials (EeRc-111) during intensive pedestrian survey on the slopes of Dufferin Hill. Although subsurface testing has not generated additional finds, these surface scatters do not appear to be disturbed.

Table 6: Recorded archaeological sites reviewed for SN 3 Component

Borden Designation	Site type	Reference
EdRc-3	Artifact scatter	1988-025
EeRc-73	Artifact scatter	2009-np
EeRc-77	Burial	2014-097
EeRc-85	Artifact scatter	2013-165
EeRc-111	Artifact scatter	2015-258
EeRc-112	Artifact scatter	2015-258
EeRc-122	Artifact Scatter	2015-258
EeRc-138	Cairn	2015-258

Several previous studies situated on or around Dufferin Hill have not been fully reported at the present time. The nearest to SN-3 is Stantec's assessment of the Trans Mountain Expansion Project, which extends from the Trans-Canada weigh scales, north over the hill, and on to Kamloops Lake near EeRc-85. As discussed above, several years of systematic survey have recorded two scatters (EeRc-111 and EeRc-112) and a petroform (EeRc-138) in landscape positions similar (although not identical to) the component.

Slightly further away, Terra (2018) conducted pedestrian survey and judgemental shovel testing along the southern side of the Trans-Canada Highway for improvements to the Afton Mine, west of Kamloops. Terra's (2018: Appendix A) description of the terrain reveals that disturbance from construction of the highway was intermittent and that natural kame and esker landforms remained in several sections. Nevertheless, intensive investigations encountered no archaeological materials in the portions of the project near the SN-3.

In the absence of a PFR, the component has been assessed as having moderate archaeological potential. Intensive investigations on Dufferin Hill have recorded sites in similar landscape settings, although typically without subsurface cultural material.

4.4 Salmon Arm Tap and SN-6-1

The Salmon Arm Tap and SN-6-1 are between the communities Vernon and Armstrong, overlooking the eastern bank of Gurney Creek (Appendix A: Figure 5). SN-6-1 is a 1,000 square metre component on an access road east of St Annes Road, between the PRT-Armstrong tree nursery to the north and orchards to the south. The Salmon Arm Tap is a 650 square metre component less than a kilometre south. The SAV-

VER 323 pipeline was installed as early as 1958, but a review of historic aerial photos suggests these two components were built closer to the 1990s (See Appendix B for a complete review of aerial photos).

The components sit on kettle terrace terrain overlooking a glacial meltwater channel extending from Deep Creek to the community of Glenemma (Fulton 1975) that is the present route for the Okanagan Highway. Wasting of isolated fragments of glacial ice during the Terminal Pleistocene created a number of lakes on this landform, most notably Round, Madeline, and Heart Lakes more 2 km north of SN-6-1. The absence of similar lakes nearer the components may be due to the vagaries of deglaciation. The southern end of the landform is ringed by a number of gravel mining operations, taking advantage of the easily accessed unconsolidated sediments adjacent to the highway.

Table 7: Recorded archaeological sites reviewed for SN 6-1 and the Salmon Arm Tap Components

Borden Designation	Site type	Reference
EcQt-7	Settlement	1967-06
EcQu-1	Burial	2010-np; 2011-np
EcQu-2	Artifact scatter	2013-np

Only three archaeological sites are recorded on the east side of the Okanagan Highway, all within the Okanagan Indian Reserve #1 (Table 7). EcQt-7, 5 km away on the north shore of Round Lake at the mouth of Round Creek, is the nearest. Recorded by Grabert (1968) during his survey of the Upper Okanagan Valley, it, at that time, consisted of at least seven cultural depressions strung out along the shoreline. Unfortunately, it receives no more than passing mention (Grabert 1968:65) and has not been officially revisited since. EcQu-1 and EcQu-2 are situated somewhat further away along the eastern shore of Heart Lake, both recorded by Wood (AMEC 2013) during assessment or monitoring of power system upgrades. EcQu-1 consists of at least two burials and associated grave goods, including a piece of rolled copper, and lithic artifacts. EcQu-2, just south of EcQu-1, is comprised of a buried lithics, fauna, and fire-altered rock, suggesting a short-term campsite.

The Okanagan Timber Supply AOA (Arcas 1997) assigned the SN-6-1 and Salmon Arm Taphigh and moderate potential, respectively (Appendix A: Figure 6). A relatively intricate model, it is difficult to determine exactly which variables contributed to the potential assessment and why the two locations differ in their assessed potential.

Patrick Dolan, with Steve Isaac (Okanagan Indian Band) and Lawrence Williams (Splats'in) visited the components on July 29, 2021. Both LSAs are on level terrain overlooking Highway 97 to the south and west. The Salmon Arm Tap is on the grassy northern edge of St Annes Road, while SN-6-1 is on an access road between an orchard to the south and a tree farm to the north. Native Ponderosa pine parkland is restricted to the west and south side of St Annes Road. Neither LSA is near the edge of the terrace, but there is no evidence of extensive ground disturbance beyond the footprints of the buried pipelines. Survey was limited to publicly accessible lands. No archaeological remains were observed.

The archaeological potential of SN 6-1 and the Salmon Arm Tap are assessed as moderate. No archaeological sites are recorded nearby, but this appears to reflect a lack of attention more so than an absence of archaeological resources given the proximity of sites in similar settings. The components are set well back from the edge of the slope overlooking Gurney Creek where potential would be higher, but there is little landscape differentiation to suggest occupations would have been concentrated immediately along the slope edge. Current and past land use produced relatively little ground disturbance and few opportunities to bring buried artifacts to the surface. Only a portion of the components could be visually inspected during the PFR; however, modern land use provides no reason to expect that the assessment of potential does not also extend to the entire components.

Photo 1: Panorama of SN 6-1, looking from north (left) to south (right)

4.5 SN-7

SN-7 is a 2800 square metre component on the southern slopes of the O'Keefe Range Lands above Vernon Creek (Appendix A: Figure 7). The station was built between 1956 and 1963 and appears to have been little modified since (See Appendix B for a complete review of aerial photos).

SN-7 sits on morainal sediments deposited at the foot of the O'Keefe Range Lands during the Fraser Glaciation. The landscape contains a number of drumlinoid features, likely the product of glacial ice descending over the bedrock hill that rises to the north. Turtle Mountain, a part of this hill, overlooks the component from the northeast across an unnamed ephemeral creek fed by a small upland lake. Below the component, glaciolacustrine sediments, possibly from Glacial Lake Penticton, fill the valley between the Range and Predator Ridge. The persistence of drumlinoid features suggests this landform has been relatively stable over the last several thousand years.

Six archaeological sites are recorded in the vicinity of this component (Table 8). EbQu-6, EbQu-61, and EbQu-62 form a cluster consisting of lithics, and fauna at the mouth of Vernon Creek in or near the Priest Valley Reserve. Plateau and Kamloops Horizon projectile points were recovered from the latter two sites, indicating long-term occupation of this portion of the lakeshore. Inland, nearer the component, the three remaining sites consist of a non-diagnostic lithic scatter (EbQt-37), an isolated chert flake (EbQt-144), and ancestral remains (EbQt-19; the Kopp Site). Nearly 150 lithic artifacts were recovered from EbQt-37, situated just east of the component, including several formed tools and numerous waste flakes. Based on its setting, the recorders suggest it was a hunting lookout (Golder 2007:9-10), although this would not seem to fully account for the range of artifact types present. Most of the artifacts were encountered while monitoring, implying that the landscape is sufficiently active to bury materials to depths of more than 40 cm below surface. The site was first recorded during pedestrian survey of a much larger parcel, covering a substantial portion of the south face of Turtle Mountain.

Table 8: Recorded archaeological sites reviewed for SN-7 Component

Borden Designation	Site type	Reference
EbQt-19	Burial	1988-01
EbQt-37	Artifact scatter	2007-089
EbQt-144	Artifact scatter	2018-np
EbQu-6	Artifact scatter (Camp site?)	1973-028
EbQu-61	Artifact scatter (Camp site?)	2018-103
EbQu-62	Artifact scatter (Camp site?)	2019-415

The Okanagan Timber Supply AOA (Arcas 1997) assigned the component moderate potential (Appendix A: Figure 8). A relatively intricate model, it is difficult to determine exactly which variables contributed to the potential assessment, although proximity to water and relatively gentle slope likely played a role.

Patrick Dolan along with Steve Isaac (Okanagan Indian Band) and Lawrence Williams (Splats'in) conducted a PFR of SN-7on July 29, 2021. However, as the crew was unable to secure access to either the component or the surrounding land, the PFR consisted of visually examining the fenced area and surrounding terrain from the component gate. It sits on gently-descending south-facing terrain surrounded by orchards. Only the right-of-way approaching the component was accessible at the time of the visit, the private landowners to the east, north, and west were not available to give their permission to access the surrounding lands. A portion of the footprint has been leveled, but much of it still follows the natural slope. No native vegetation remains in the vicinity. Turtle Mountain ascends to the north and northeast.

The potential of SN-7 is assessed as being moderate. Although situated well back from the lake, archaeological materials have been encountered on the O'Keefe Range Lands, especially on Turtle Mountain, just east of the component. The setting would have provided an excellent view of the surrounding valley, and the unnamed creek east of the project would have provided a ready source of fresh water as well as access to the kettle lakes above. Archaeological deposits in the area may consist of artifact scatters and include buried cultural material.

Photo 2: Panorama of SN-7, from the west (left) to east (right)

4.6 SN-4 Valve Assembly

The SN-4 Valve Assembly is a roughly 100 square metre component north of the intersection of Barnhartvale Road and Watson Larson Road near the community of Holmwood, east of Kamloops (Appendix A: Figure 9). The station is not present in open access imagery until June 2019. Prior to this, the location was undeveloped and bordering the northwest corner of an agricultural field. The original development footprint includes, minimally, access and vegetation clearing, which expanded to the north-northeast by 2021, although the built structure does not appear to have expanded.

The valve assembly location is 3km south of the South Thompson River at the base of a rise in a generally level to gently southeast-sloping area facing the steep-sloping terrain above Buse Lake, which is located to the south. The predominate soil is a well-drained sandy loam formed through glaciofluvial processes. The geologic setting is generally within the Monte Lake Formation of the Kamloops group, which largely consists of flat-lying volcanic (basaltic-andesite) flows and flow-top breccia (Ewing 1981). Nearer to SN-4, the flows pass into the Buse Hill volcanic cone structures, with the Buse Hill pinnacle to the southwest. Several wetlands are in the immediate vicinity, as is Robbins Creek (~540 m to the southeast), an unnamed lake (~500 m southwest), and intermittent feeder streams from the surrounding uplands.

There are no archaeological sites in the immediate vicinity of SN-4, nor do any archaeological potential models overlap with the location. The nearest archaeological sites are at least 2.5 km north and are associated with the South Thompson River.

In the absence of a PFR, the SN-4 Valve Assembly location was assessed as having moderate potential based on its level terrain, proximity to the several freshwater sources, surrounding volcanic geology which may have provided efficient access to suitable toolstone, and the general lack of surrounding development. The potential may be lower given the component's location outside environmental zones that typically contain settlements and camps, the scarcity of trees large enough to be culturally modified in the vicinity, a setting beyond the high potential zone of the Esh-Kn-Am (2009) model, and a systematic pedestrian survey not far away with no sites recorded. The extent of landscape modification and the potential for landforms or cultural features of interest in proximity to the station could be effectively addressed by a PFR.

Photo 3: View northeast toward the SN-4 valve assembly location, via Google Earth Street View (approximate location indicated by red arrow)

4.7 Penticton Gate Station

The Penticton Gate Station is a 2,800 square m component at the intersection of Government Street and Warren Avenue in Penticton (Appendix A: Figure 10). The station services the municipality, reducing pressure from transmission to distribution levels, introducing an odorant, and measuring levels of use. The station appears to have been built around 1963 and has operated continuously since (See Appendix B for a complete review of aerial photos). A PFR was not conducted for the Penticton Gate Station.

The station is built on the Ellis Creek fan, one of three coalescent fluvial landforms that separate Okanagan from Skaha Lake. The fan deposits appear to have originated primarily from Ellis Canyon, a 6-km-long steep-walled canyon just east of town. Below the canyon mouth, they are bounded to the north and south by raised terraces, deposited during the late glacial, and to the west by the floodplain of the Okanagan River. Fan formation appears to have begun soon after deglaciation, as early deposits are graded to a lake level intermediate between Glacial Lake Penticton and modern Okanagan and Skaha Lakes (Nasmith 1962:23).

The fan appears to have formed largely as a result of spring floods bringing sediment down and out of the canyon. Prior to the first of many efforts to control Ellis Creek in 1921, abundant spring runoff (the watershed covers more than 150 square km) readily entrained rocky sediments from these slopes, depositing it west of the canyon mouth. Clasts are size-grade by distance from the mouth of the canyon, the finest (and most easily transported) sediments forming an apron that, until it was channelized in the 1950, was reworked by the Okanagan River.

Prior to channelization in the 1950s, the creek readily migrated across the fan. Half a dozen relatively recent stream channels are visible between the main channel and the late glacial terrace to the south. Newspaper reports published during the May 1921 flood, resulting from failure of the new Ellis Creek No. 3 dam caused by spring storms and freshet, describe several old courses none of which were deep enough to contain the creek during flood. The course would regularly clog with debris and deflect in a new direction. The natural frequency and severity of these floods has not been determined. The May 1921 floods were certainly exacerbated by the failure of the dam. Stands of conifers along the banks of the Ellis' main channel in 1938 may indicate flooding was aggrading rather than eroding the fan (Golder 2013:14).

Twenty-eight recorded archaeological sites are located on or near the Okanagan River between Okanagan and Skaha Lakes (Table 10). Most are on the west side of the valley, partly representing the degree of historic development on the east side, but also apparently reflecting more intensive use. Sixteen are isolated artifacts or scatter, mostly non-diagnostic lithics but at least two bear Plateau Horizon style projectile points. They are concentrated along the west bank of the Okanagan River, low on the shores of Skaha Lake, or high on the ridges overlooking the lake, reflecting unsurprisingly intensive use of the floodplain between the two lakes.

Table 9: Recorded archaeological sites reviewed for the Penticton Gate Station Component

Borden Designation	Site type	Reference
DiQv-1	Burial	1952-np
DiQv-4	Burial	1983-013
DiQv-5	Settlement	2010-179
DiQv-6	Burial	1970-np
DiQv-8	Artifact scatter	1937-np
DiQv-9	Burial	1937-np
DiQv-10	Artifact scatter	1974-001
DiQv-11	Artifact scatter	1974-np
DiQv-32	Burial	1975-014
DiQv-33	Burial	1975-014
DiQv-47	Artifact scatter	1998-55
DiQv-48	Artifact scatter	1998-55
DiQv-49	Artifact scatter	1998-55
DiQv-50	Artifact scatter	1998-55
DiQv-51	Artifact scatter	1998-55
DiQv-52	Artifact scatter	1998-55

DiQv-61	Settlement	2014-np
DiQv-66	Stockpile (from DiQv-61)	np
DiQv-67	Stockpile (from DiQv-61)	np
DiQv-68	Artifact scatter	2016-??
DiQv-92	Artifact scatter	2017-264
DiQv-93	Artifact scatter	2017-264
DiQv-94	Artifact scatter	2017-264
DiQv-95	Artifact scatter	2017-215
DiQv-96	Artifact scatter	2017-215
DiQv-97	Artifact scatter	2017-172
DiQv-98	Artifact scatter	2017-172

At least seven sites are comprised of one or more burials or burial features. Several were excavated in the 1950s and earlier and, consequently, possess less-than-complete records. These partially recorded sites include four or five cairn burials identified at DiQv-1, DiQv-9, and perhaps DiQv-3 (a site with no details, but likely a burial site if other lower Borden numbered sites are any indicator). In 1975, two additional burial sites were recorded on Penticton Reserve, one evidently containing a number of historic interments believed to represent smallpox victims (Baker1975a).

Systematic excavations have revealed a large multicomponent site registered as DiQv-5. No radiocarbon dates were submitted, but artifact cross-dating indicates an intensive occupation during the Plateau Pithouse Tradition. Two features identified while monitoring may represent house pit deposits. Wall exposures show steep-sided cuts filled with high densities of cultural material. The original dimensions could not be reconstructed, and neither was subject to systematic excavation once identified. The location of the site corresponds to an ethnographically recorded village location on the left bank of the Okanagan. The same ethnographic records (Barlee in Golder 2013:19) indicate a fishing camp on the left bank of Ellis Creek below the canyon, approximately north of the component.

The Okanagan Timber Supply AOA (Arcas 1997) assigned the component high potential (Appendix A: Figure 11). A relatively intricate model, it is difficult to determine exactly which variables contributed to the potential assessment, although proximity to water and relatively gentle slope likely played a role.

The Penticton Gate Station is assessed as having moderate archaeological potential. It is south of Ellis Creek, overlooking heavy precontact occupation of the Okanagan River between Skaha and Okanagan Lakes. Sites in similar settings are scarce in Penticton, although this may represent a dearth of investigations away from the Okanagan River rather than a scarcity of archaeological evidence. Certainly, if Golder (2014:13) are correct and the Ellis has aggraded through much of the Holocene, the potential for rapid burial of temporary surface sites increases, although this must be moderated by historic records of the creek jumping its banks and flooding the town. The extent of historic disturbance should not be underestimated, but intact archaeological deposits have been encountered beneath heavily developed properties elsewhere in Penticton.

4.8 Oliver Y Control Station

The Oliver Y Control Station shares a 14,000 square metre footprint with several other facilities on the left (east) bank of the Okanagan River beneath McIntyre Bluff, north of the community of Oliver (Appendix A: Figure 12). The area was undeveloped rangeland before roughly 1963 when the first residences were built on the site. The original station component was built between 1967 and 1975, but only occupied the south-central third of the modern station footprint. It appears only in the last few decades that station upgrades brought the complex to its current configuration. A PFR of the component was not conducted during this AOA.

The complex sits atop alluvial deposits laid down by the Okanagan River and, perhaps, Vaseux Creek (Nasmith 1962). While these landforms are relatively unstable, the Vaseux Creek fan appears to have done a fairly good job of confining the Okanagan River to the foot of McIntyre Bluff. The fan on the other hand, shows clear evidence of periodic flooding and avulsion in aerial photos predating the 1960s. The stream above it is heavily braided, implying a considerable sediment load, in the photo from 1957. Surficial geological mapping does not show when the fan began to impinge on the river but raised beaches higher up on the eastern wall of the valley imply the fan has been building for some time.

Historically, a major salmon fishery existed in the Okanagan River. This fishery was concentrated at Okanagan Falls but extended downriver for several kilometres and included the area around McIntyre Bluff and below. According to Lerman (1952 – 1954), salmon were caught using dip nets around McIntyre Bluff. Fish weirs and traps were also used in some sections of the Okanagan River -- Lerman (1952 - 1954) reported there were "four fish traps [located] from Oliver to the north" although he did not clarify just how far north, they extended.

McIntyre Bluff (*Nʕaylintn* or *sngaylintn* [Arcas 1993:12]) figures prominently in Okanagan oral traditions in which Coyote, failing to heed his daughter's warnings, makes the perilous trip to her home on top of the bluff alone. Nearly reaching the summit, he is frightened by the sound of her two Grizzly Bear guardians and, losing his footing, falls to the rocks below. The trail he took is still visible in a crack that runs up the bluffs (Shuttleworth in Arcas 1993:15).

Fifteen sites fall within 1.5 km of the component, including burial cairns (DhQv-5), cache pits (DhQv-58, DhQv-59, DhQv-60, and DhQv-61), rock shelters (DhQv-22, DhQv-32, DhQv-47, DhQv-59, and DhQv-79), pictographs (DhQv-21, DhQv-32, DhQv-62, and DhQv-103), housepits (DhQv-59), and a number of artifact scatters (Table 11). Many of these are situated on more stable lands on the opposite bank of the Okanagan River, or north or south of the component, but at least one nearby site, DhQv-81, is situated on the Vaseux Creek fan on the eastern side of the valley. DhQv-81 consists of two cultural depressions tentatively identified as earth ovens directly dated to between 1460 and 1660 cal BP (Kutenai West Heritage Consulting 2004:4).

The Okanagan Timber Supply AOA (Arcas 1997) assigned the component high potential (Appendix A: Figure 13). A relatively intricate model, it is difficult to determine exactly which variables contributed to the potential assessment, although proximity to water and relatively gentle slope likely played a role.

Table 10: Recorded archaeological sites reviewed for the Oliver Y Control Station Component

Borden Designation	Site type	Reference
DhQu-7	Rock shelter	1974-006
DhQv-5	Burial	1968-008
DhQv-21	Pictograph	1974-006
DhQv-22	Rock shelter	1974-006
DhQv-23	Rock shelter, pictograph, hearth	2014-np
DhQv-32	Rock shelter and pictograph	1974-006
DhQv-46	Sweat lodge	1974-006

wood.

DhQv-47	Rock shelter	1976-007
DhQv-58	Cache pit and weir	1976-007
DhQv-59	Settlement	1976-007
DhQv-60	Cache pit	1976-007
DhQv-61	Cache pit	1976-007
DhQv-63	Artifacts	1975-np
Dhqv-81	Cultural depression	2003-378
DhQv-103	*ncaylintin*/McIntyre Bluff	2014-np

The Oliver Y Control Station has high potential for unrecorded archaeological sites, being situated near a well-known fishery on the Okanagan River, several locations of ethnic significance, and a remarkable density of archaeological remains.

4.9 Princeton Crossover Control Station

The Princeton Crossover Control Station is a 2,900 square metre component on the east side of the Princeton-Kamloops Highway, roughly 2.5 km north of the vehicle bridge over the Tulameen River, at the east end of the community of Princeton (Appendix A: Figure 14). The area was rangeland until roughly 1976, when both the pipeline and the original station are visible in historic aerial photos. The station remained relatively unchanged until roughly 2000, when it expanded to the north and south, reaching its modern configuration. No PFR was conducted for this component.

The control station sits on a kettled glacial outwash plain at the confluence of the Tulameen and Similkameen Rivers (Green and Lord 1979). Isolated blocks of glacial ice wasted in place following the Fraser Glaciation, producing several kettle lakes in the vicinity. The most prominent and nearest are Swan, Martin, and Rainbow Lakes, just east of the component. The landform surrounding the station has probably been relatively stable for some time, but sediments underlying it are fairly gravelly.

The Enloe Dam has prevented salmon from spawning in the Similkameen since the 1920s, but it is possible that salmon never spawned in great numbers in this river due to the natural barrier created by the reportedly 9-m-high Squanlten Falls (upon which the dam was built) (Copp 2006:37). Instead, fisheries likely concentrated on trout, northern pikeminnow (*Ptychocheilus oregonensis*), suckers, and sculpins, the latter in the lower reaches of the Tulameen and Similkameen and their tributaries. Weirs, targeting several varieties of these whitefish, were constructed across stream mouths as well as some outlets of upland lakes (Copp 2006).

Teit (1930 in Copp 2006:54) recorded a Similkameen community on the left (north) bank of the Tulameen at its confluence with the Similkameen, just south of the component. Named *Zu'tsamEn*, translated as "red paint" (and colloquially known as the Vermillion Band according to Teit), it appears to have maintained some level of control over well-known ochre sources further upstream. Copp (2006:49) reports evidence that traders may have had to negotiate access to this ochre source with residents, as few other sources were available nearby.

Twenty-two recorded archaeological sites have been reported within 1.5 km of this component (Table 12). The lithic diversity present at numerous sites, as well as the presence of sites on multiple terraces, suggests long-term repeated use of the region. The majority of these sites are configured to landscape features associated with paleo and contemporary water features, such as Martin Lake, Rainbow Lake and Allison Creek. The nearest sites are DiRc-20 and DiRc-50, recorded by Vivian (1989). These two sites are located near the eastern and western shores, respectively, of Swan Lake and consist of scatters of Allenby red chert flakes. Neither is culturally diagnostic, and, according to Vivian (1989:27 & 43) the slow pace of aeolian deposition limits the likelihood of buried materials.

Table 11: Recorded archaeological sites reviewed for the Princeton Crossover Control Station Component

Borden Designation	Site type	Reference
DiRc-11	Artifact scatter	1987-009
DiRc-17	Artifact scatter	1987-009
DiRc-18	Artifact scatter	1987-009
DiRc-19	Artifact scatter	1987-009
DiRc-20	Artifact scatter	1987-009
DiRc-21	Artifact scatter	1987-009
DiRc-23	Artifact scatter	1987-009
DiRc-24	Artifact scatter	1987-009
DiRc-25	Artifact scatter	1987-009
DiRc-27	Artifact scatter	1987-009
DiRc-28	Cultural depression	1987-009
DiRc-29	Artifact scatter	1987-009
DiRc-40	Artifact scatter	1987-009
DiRc-41	Artifact scatter	1987-009
DiRc-42	Artifact scatter	1987-009
DiRc-43	Artifact scatter	1987-009
DiRc-50	Artifact scatter	1987-009
DiRc-51	Artifact scatter	1987-009
DiRc-52	Artifact scatter	1987-009
DiRc-53	Artifact scatter	1987-009
DiRd-04	Artifact scatter	1987-009

This component is rated as having high archaeological potential by the Merritt TSA/Upper Similkameen Archaeological Overview Assessment (Appendix A: Figure 15) Unfortunately, this overview has not been made available by the Branch and it is unclear which variables contributed to the high potential of the study and the moderate potential of the surrounding landscape to the west.

The Princeton Crossover Control Station has moderate to high potential for unrecorded archaeological sites. Ethnographically, this area was inhabited by one or more Indigenous communities that would have been able to take full advantage of both the Tulameen and Similkameen Rivers, their tributaries, and several kettle lakes, in addition to being a nexus along several important travel corridors. Vivian (1989) suggests little aeolian deposition has occurred here, but it is not clear that this conclusion was backed up with shovel testing at lithic scatter sites. If correct, this may lower the likelihood of encountering remains beneath the station if it has been excavated into underlying glacial outwash materials but would not necessarily alter the potential of surrounding terrain. Additionally, the scarcity of sites along the

Okanagan-Kamloops Highway corridor may, therefore, reflect a lack of investigation more than the absence of archaeological resources.

4.10 Kingsvale Control Station

The Kingsvale Control Station is a roughly 5,500 square metre component at 900 mASL overlooking the Coldwater River, some 5 km north of the community of Kingsvale (Appendix A: Figure 16). The valley bottom is roughly 140 m below the station. The area was forested prior the station's construction in the 1960s, around the time of the construction of this section of the KIN PRI 323 pipeline. Upgrades occurred around 1969, 1981, and 1996 when it achieved its modern configuration. No PFR was conducted for this component.

The station sits on fine-textured (loams and clay loams) till deposits laid down during the Fraser Glaciation on the slopes of Selish Mountain (Lord and Green 1974). To the west, the component overlooks lacustrine deposits possibly laid down around the same time, and more recent alluvial deposits along the valley bottom. Voght Creek, in Kingsvale, provides access east towards Kane Valley, while the Coldwater River heads north towards Merritt and south towards its headwaters beneath Guanaco Peak.

Recorded archaeological sites are scarce around the component. The nearest sites form two clusters, one in the Coldwater River Valley near Merritt (EaRf-3, EaRf-4, and EaRf-21), roughly 12 km northeast, and the other in near Maka Creek, west of the Coldwater Valley, near Kingsvale (DlRg-2, DlRg-3, and DlRg-6), roughly 8 km southwest. The lack of recorded archaeological sites in proximity to the component is not entirely the result of a lack of investigation as the Trans Mountain Expansion Pipeline (CH2M Hill 2016) component falls less than 200 m west of the station. No archaeological resources were observed during pedestrian survey through this section of the TMEP component (CH2M Hill 2014:4-373).

Table 12: Recorded archaeological sites reviewed for the Kingsvale Control Station Component

Borden Designation	Site type	Reference
DlRg-2	Artifact scatter	2008-034
DlRg-3	Artifact scatter	2008-034
DlRg-6	Artifact scatter	2008-034
EaRf-3	Cache pit	1973-028
EaRf-4	Cache pit	1973-028
EaRf-21	Artifact scatter	2015-np

Esh-Kn-Am (2009) rated the valley below the project as having high archaeological potential for settlements, base camps, and fishing stations. The area above the lower valley wall scored lower on elevation, slope, and distance to water, and was considered more likely a context for CMTs than settlements (although see Esh-Kn-Am 2009:21 for instances when settlements may be found at higher elevations).

In the absence of a PFR, the Kingsvale Control Station was assessed as having moderate potential based on its proximity to the Coldwater River and level terrain. The potential may be lower given the component's location outside environmental zones that typically contain settlements and base camps, the scarcity of trees large enough to be culturally modified in the vicinity, a setting beyond the high potential zone of the Esh-Kn-Am (2009) model, and a systematic pedestrian survey not far away with no sites recoded. The extent of landscape modification and the potential for landforms of interest in proximity to the station could be effectively addressed by a PFR.

4.11 SN-15

SN-15 is a 1,700 square metre component on Como Road in Grand Forks (Appendix A: Figure 17). Long preceded by the pipeline, SN-15 appears to have been built in 1988 and upgraded around 2000. Upgrades to the lines entering the component are ongoing, and an area of the farmed field to the east was stripped of vegetation during Wood's PFR.

The component sits on fluvial sands overlying glaciofluvial outwash gravels (Sprout and Kelley 1964:37-39) laid down during the retreat of the Fraser Glaciation and subsequent overbank flooding of the Kettle River. In the component, fluvial deposits tend to be fine sandy loams while gravel outwash sediments have considerable coarse clasts, which cultivation and other forms of soil disturbance have sometimes raised to the surface. The entire area is under cultivation. Historic aerial photos show these deposits are comparatively stable. The earliest photos, from 1951, show numerous cut-offs, side-channels, and oxbows, but these are generally restricted to the more recent alluvial deposits of the Saunier soil complex (Sprout and Kelley 1964).

A distinctive waterfall on the Kettle River, known locally as "Cascade Falls," is situated not far from the component. These falls are located just south of Highway 395 where the bridge crosses the river, south of the Christina Lake junction. There was a significant traditional sockeye salmon fishery, the only salmon species that ascended the Kettle River this far upstream. Bouchard and Kennedy (in Arcas 2004: Appendix 1), recorded several additional place names of above the Cascade Falls. The named localities of *selexwlexwlhtswix* and *swiyntsdtn* were two camp sites above the falls, although neither could be mapped. The area was said to be a good place to winter, as there was little snow.

Seventeen archaeological sites are recorded in the vicinity of the component, almost all on or near the modern banks of the Kettle River where they are most visible in its eroding cutbanks. Unfortunately, review of Friesinger's (1979) survey of the Kettle Valley revealed numerous transpositions of Borden designations, site contents, and site locations in RAAD that could not be satisfactorily resolved. As a result, our review of the archaeological record focuses solely on post-Friesinger sites. Only two are situated on the right (south) bank between the Danville border crossing and Ruckle Creek: DlQu-32, a non-diagnostic lithic scatter composed of two waste flakes, and DlQu-33, a scatter of faunal remains and a possible lithic perforator.

The Boundary Forest District Archaeological Overview Assessment (Kutenai West Heritage Consulting 1997) rates much of the component as having high archaeological potential exclusively due to its proximity to the Kettle River (Appendix A: Figure 18). Adjacent lands are rated in this model as having low potential.

Patrick Dolan conducted a PFR on July 27, 2021. The component is accessed via Como Road. It is situated on level terrain, surrounded on three sides by private yards and farmland (Photo 4). There is no native vegetation in the vicinity of the project. The terrain extends south, towards the international border, and east, north, and west towards the Kettle River. Fortis has already stripped a 15-m-wide, 40-m-long swath of farmland vegetation extending east of the currently fenced area of the component. Intensive survey of exposed sediments revealed no archaeological materials. Exposed sediments are light brown loams. Large quantities of sub-rounded to rounded pebbles are exposed within the footprint of a buried irrigation utility. One of the landowners indicated these gravellier sediments are common encountered roughly 1 m below surface. Outside of the stripped area, ground visibility is poor. There is no reason to believe component construction or prior agricultural activity would reduce the potential of the project footprint, although no sites were identified during survey.

In spite of the observed absence of archaeological materials during the PFR in the stripped area to the east, SN-15 is assessed as having high archaeological potential. Friesinger's (1979) early site records still make up the bulk of the recorded sites in the region and it is clear he was relying on surface expression, cooperative landowners, and erosional surfaces to detect and identify sites. The area on the right (south) bank of the Kettle River remains extremely poorly understood. Historically, the Kettle and Cascade Falls were the major salmon fisheries on the river, both immediately east of Grand Forks suggesting a high potential for sites in the area. It is expected that more intensive investigation on the right bank will reveal greater precontact occupation than is currently known.

Photo 4: Panorama of SN-15, from east (left) to west (right)

Photo 5: Panorama of SN-17 Valve Station, from east (left) to west (right)

4.12 SN-17 Valve Station

The SN-17 Valve Station is a 1,000 square metre component overlooking Hanna Creek north of the community of Trail, on the Columbia River (Appendix A: Figure 19). The station appears to have been built around 1961, followed by the nearby Warfield component somewhat later. Unlike most of the assessments conducted for this study, there are no recorded archaeological sites in similar setting within several kilometres, likely the result of a lack of investigation. Given the lack of archaeological sites to date, the assessment of potential relies heavily on observations made during a PFR and the results of Kutenai West Heritage Consulting's (1996) regional AOA, which rates the archaeological potential of the component as low (Appendix A: Figure 20).

Patrick Dolan conducted a PFR on July 26, 2021. Ktunaxa Nation was invited but unable to attend. The SN-17 Valve Station is accessed via the Warfield Facility and a right-of-way through private land. The component is built upon an artificial gravel pad set on a steep, east-facing slope with bedrock exposures west and southwest of the pad. Black cottonwood surrounds the component, but the typical vegetation on adjacent bluffs is Ponderosa pine parkland punctuated by upland meadows of purple aster. No sites were identified in a walk around component.

The component is considered to have low potential for either surficial or buried archaeological deposits based on setting, with the station appearing to have been built directly on a steep bedrock slope that descends to the northeast. As identified by Kutenai West (1997), nearby level terrain has a greater likelihood of precontact sites being buried and thus preserved for archaeologists to encounter.

4.13 East Kootenay Exchange

The East Kootenay Exchange is a 2,700 square metre component on the left (east) bank of the Moiye River, south of the community of Curzon (Appendix A: Figure 21). Before 1969 and the construction of what is today the YAH OLI 610 pipeline, the area was forested. The YAH TRA 323 pipeline was constructed through the component soon after. The former appears relatively unchanged until 2000 when historic aerial photos display fresh ground disturbance along the entire right-of-way heading north from the component. The component itself does not appear in aerial photos prior to 2005.

The station sits at the foot of an alluvial terrace that overlooks the modern Moyie River floodplain. Excavators working in the modern floodplain have found that alluvial sediments are largely confined to the upper 30 cm of the profile and sit atop outwash gravels deposited during the end of the Fraser Glaciation (e.g., Bussey 2001:43). A similar, if deeper, sequence appears to hold for the upper terraces (which may be contiguous with the terrace adjacent to the site) (Choquette 1982:22-33).

According to both Choquette (1982:10) and Bussey (2001) ethnographic descriptions of the use of the Moiye River is overshadowed by traditional activities on the Kootenay River, 25 km west, where inhabitants procured a range of fish, waterfowl, ungulates, and carnivores. It appears likely a subset of activities took place along the Moyie River where fish could be taken in the river and cervids hunted individually in the surrounding hills and mountains.

Six archaeological sites are recorded in proximity to the confluence of the Moyie River and Rainy Creek (Table 14). Most consist of non-diagnostic waste flake assemblages, but at least two have been systematically excavated: DgQa-4, by Bussey (2001) on the west side of the river; and DgQa-6, by Choquette (1982) on the east side. Artifact assemblages from each site consist largely of waste flakes, small, typically expedient tool assemblages, and small numbers of faunal remains. Features have not been identified. Interpretations are thereby limited to questions of lithic procurement (often local, but sometimes regional) and production (both expedient and formal tools appear in the collections). Radiocarbon dates push the occupation of DgQa-6 into the Middle Period (locally, coincident with the Inissimi Complex), while inferences from geomorphology and assemblages from better dated sites suggest the earliest occupations predate 8600 BP (Choquette 1982:82). Occupations at DgQa-4, lower down and closer to the river than DgQa-6, are not well-dated, although would appear to be more recent. A thorough debitage analysis there revealed exploitation of a wide variety of raw materials, some from more than 50 km away, for the production of expedient and formal tool technologies.

Photo 6: East Kootenay Exchange, from west (left) to east (right).

Table 13: Recorded archaeological sites reviewed for the East Kootenay Exchange Component

Borden Designation	Site type	Reference
DgQa-02	Artifact scatter	1974-001
DgQa-03	Artifact scatter	1974-001
DgQa-04	Base camp	1999-179
DgQa-05	Artifact scatter	2008-276
DgQa-06	Base camp	1982-28
DgQa-18	Artifact scatter	2009-138

Patrick Dolan conducted a PFR on July 26, 2021. Ktunaxa Nation was invited but unable to attend. The component is situated on level terrain in a clearing below a 5 m high terrace of the Moyie River. It is surrounded by second growth aspen, ponderosa pine, and young hemlock. Ground cover is predominantly bracken fern and purple lupin. The clearing continues north and south to two additional facilities. No sites were identified while walking the perimeter.

Archaeological potential of the East Kootenay Exchange is assessed as high based on proximity to known sites and a level setting close to the river., Several large archaeological sites are proximate to the project, including DgQa-6 (the Levesque site) where Choquette (1982) conducted systematic excavation of a multicomponent camp with radiocarbon dates extending to the Middle to Late Period transition (ca. 3500 BP) and perhaps much earlier. Similar sites may occur at the component if impacts from the construction of the component as well as the YAH OLI 610 and YAH TRA 323 pipelines have not removed what might be relatively shallow archaeological deposits.

4.14 Event 29 KIN PRI 323 and Event 31 KIN PRI 323

Events 29 and 31 are two roughly 200 m long sections of the KIN PRI 323 pipeline in a remote mountainous region in the vicinity of Allison Lake, between Kingsvale (Appendix A: Figure 22) and Princeton (Appendix A: Figure 24). The intention is to straighten the sections of to allow instrumentation safe passage. The pipeline was constructed by 1979, and there has been little subsequent alteration to the immediate landscape. Unlike most of the assessments conducted for this study, there are no recorded archaeological sites in similar setting within several kilometres, likely the result of a lack of investigation. Given the lack of archaeological sites to date, the assessment of potential relies heavily on the results of Upper Similkameen Indian Band potential model (nd) regional AOA, which rates the archaeological potential of Event 29 as moderate (Appendix A: Figure 23) and Event 31 moderate and high (Appendix A:

Figure 25) as discussed in Section 4.9, the Merritt TSA/Upper Similkameen Archaeological Overview Assessment. Unfortunately, this overview has not been made available by the Branch and it is unclear which variables contributed to the potential assessment.

Event 29 sits atop steep (>30 degrees), west-facing terrain at roughly 1,100 mASL. Terrain was so steep it was unmapped by the BC Soil Survey in the 1970s (Lord and Green 1974). The sedimentary origin of these deposits is unclear, but could include a combination of bedrock, regisol, outwash, and till subsequently altered by fluvial and colluvial processes. The pipeline spans Allison Creek which feeds Allison Lake. Event 31, east of Dry Lake, sits on degraded forest soils formed on undifferentiated glacial deposits. The grade is much lower than Event 29.

Limited ethnographic information is available for on the valley and adjacent uplands near Events 29 and 31. However, Allison and nearby lakes are, today, well-known locations for sport fishing, primarily trout after non-sport varieties were intentionally killed off in the late 1960s (Department of Recreation and Conservation 1969:27). Traditional fisheries could have taken the same variety of fish (sucker, minnow, and pikeminnow) ethnographically captured from the Tulameen and its tributaries around Princeton (Copp 2006). Adjacent uplands would have provided good hunting for deer and, depending on forest closure, elk.

In the absence of a PFR, specific ethnographic information, and records of nearby archaeological sites or archaeological investigations, the potential of Event 29 and Event 31 components is rated as low to moderate. A PFR may assist in clarifying the history of land use that would impact these assessments of potential.

5.0 Recommendations

None of the facilities reviewed here conflicted with a documented heritage site. However, all possess some potential for the presence of undocumented archaeological resources that are vulnerable to alteration and are protected by the *HCA*. Alterations can take a variety of forms, both direct (the "immediate demonstrable" [Archaeology Branch 2009:15] outcomes of project-related activities), and indirect (the long-term impacts not caused by the project, but contingent on it having occurred). The long history of development at all the LSAs means there have already been opportunities for alteration. In the following section, we summarize the preceding assessments and recommend mitigating measures.

5.1 Archaeological Management Recommendations

A summary of preliminary component-specific potential assessments and recommendations are found in the following table. Wood's recommendation is to avoid impacting archaeological resources whenever possible. However, in the context of this project, where recorded sites are not present and project redesign is not an option, appropriate management measures are based on the assessment of archaeological potential at each component. The greater the likelihood of encountering archaeological remains at a component, the greater the investment in mitigative measures recommended.

Where archaeological potential is **high**, as at Event 1, Oliver Y, Princeton Crossover Station, SN-15, and the East Kootenay Exchange, we recommend preconstruction testing to identify and delimit any archaeological sites that are present and provide recommendations on how best to avoid or, if necessary, mitigate impacts. Where archaeological potential is **moderate**, as at six of the components, we recommend either pre-construction testing where feasible or concurrent monitoring by a qualified archaeologist and First Nation representatives. The monitoring crew will be on hand to properly document archaeological materials should they be encountered during construction. Where archaeological potential is **low** (one component), we recommend implementation of a Chance Find Protocol, a set of guidelines that make construction crews aware of the types of archaeological resources that may be present, how to recognize them, and establish appropriate responses when they are encountered. A PFR is recommended for one facility (SN-4 Valve Assembly and Kingsvale Control Station) and two events (Event 29 KIN PRI 323 and Event 31 KIN PRI 323) to better assess archaeological potential prior to making further recommendations.

Table 14: Preliminary assessments of potential and recommendations for further work

Component	Archaeological Potential	Recommendation
Savona Compressor Station	Moderate	Pre-construction testing
Event 1 SAVE VER 323	High	Pre-construction testing
SN-3	Moderate	Pre-construction testing
Salmon Arm Tap & SN-6-1	Moderate	Pre-construction testing
SN-7	Moderate	Pre-construction testing
SN-4 Valve Assembly	Moderate	PFR to determine further work
Penticton Gate Station	Moderate	Concurrent monitoring
Oliver Y Control Station	High	Pre-construction testing
Princeton Crossover Station	Moderate to High	Pre-construction testing
Kingsvale Control Station	Low to Moderate	PFR to determine further work
SN-15	High	Pre-construction Testing

Component	Archaeological Potential	Recommendation
SN-17 Valve Station	Low	Chance Find Procedure
East Kootenay Exchange	High	Pre-construction testing
Event 29 KIN PRI 323	Low to Moderate	PFR to determine further work
Event 31 KIN PRI 323	Low to Moderate	PFR to determine further work

6.0 Limitations and Closure

Information on archaeological resources and resource potential in the project area presented in this report are based on a time-limited review of relevant documents, a search of relevant databases housing recorded sites-specific data, and an historical aerial photograph review. Efforts were made to verify the accuracy of the data produced or provided by others and extracted from the literature and databases.

This assessment of archaeological potential is based on current understanding of the distribution of archaeological resources (sites and artifacts) in the general study area. Wood acknowledges that data and interpretations which shape the understanding of the archaeological record continues to be produced, and that as such, ideas about site locations and distribution may change over time.

The findings and conclusions documented in this report have been prepared for the specific application to this project and have been developed in a manner consistent with that level of care customarily exercised by archaeological professionals currently practising under similar conditions in this region. This study was conducted without prejudice to First Nations treaty negotiations, Aboriginal rights, or Aboriginal title. Participation by Indigenous communities in this study does not indicate support of the proposed project by those communities.

We trust that this report has provided you with the information you require. If you have any questions or comments, please contact Archaeology Lead Christopher Verral at 604-295-4093 or christopher.verral@woodplc.com, citing Wood project number VE21506.

Sincerely,

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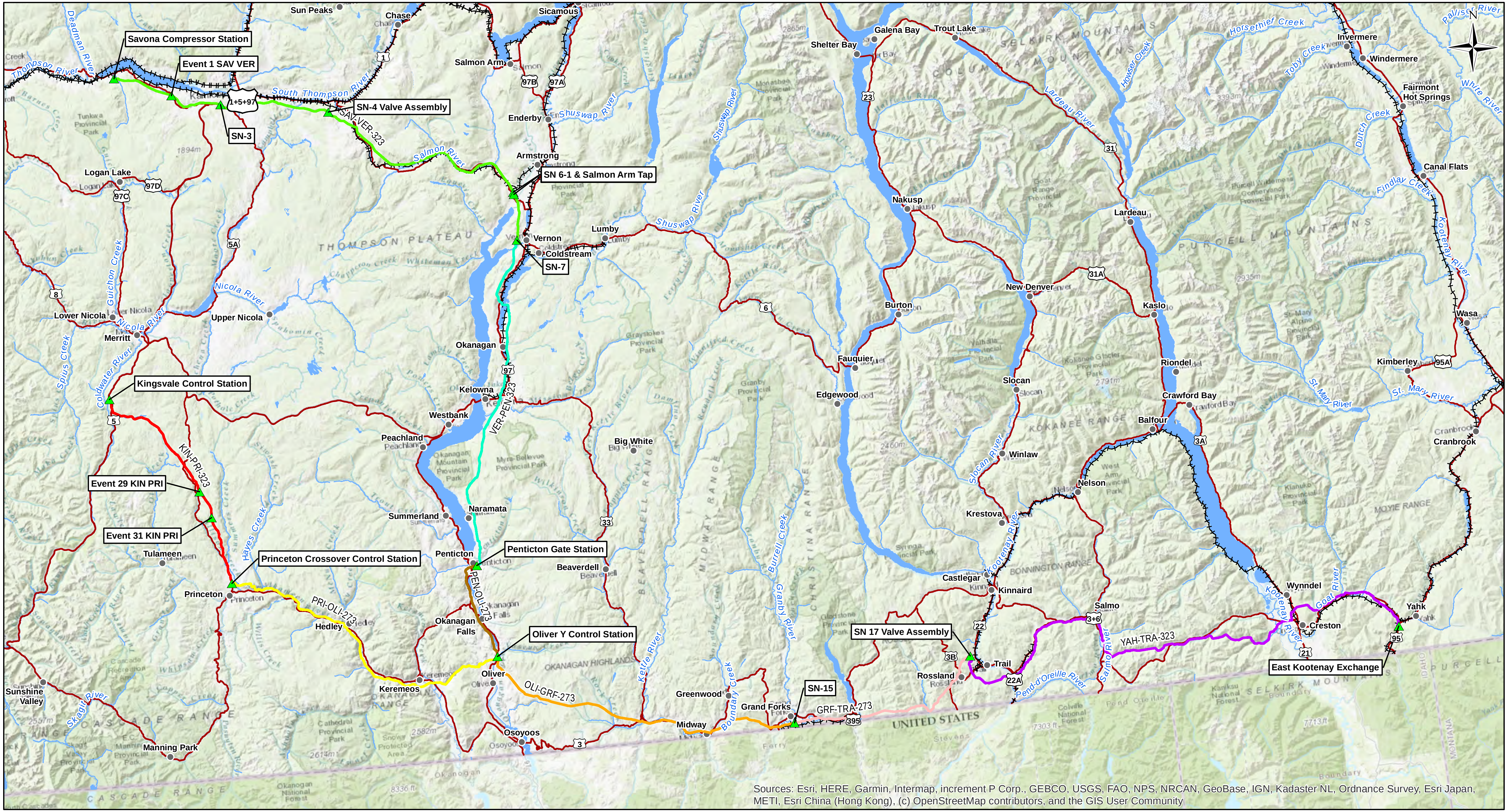
8.0 Appendix A – Maps



Legend

- Event
- GRF TRA 273
- KIN PRI 323
- OLI GRF 273
- PEN OLI 273
- PRI OLI 323
- SAV VER 323
- VER PEN 323
- YAH TRA 323
- Populated Place
- International Boundary
- Railway
- Highway
- Road
- Watercourse
- Waterbody

0 10 20
Kilometers
Scale: 1:1,000,000

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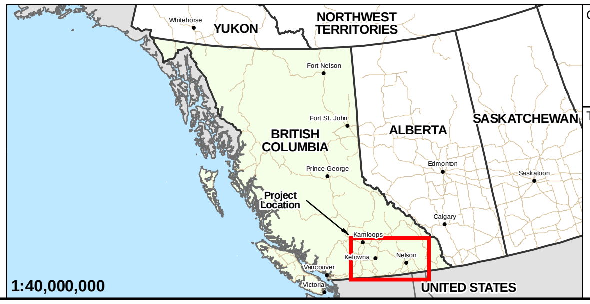

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	JOB No: VE21506			wood.
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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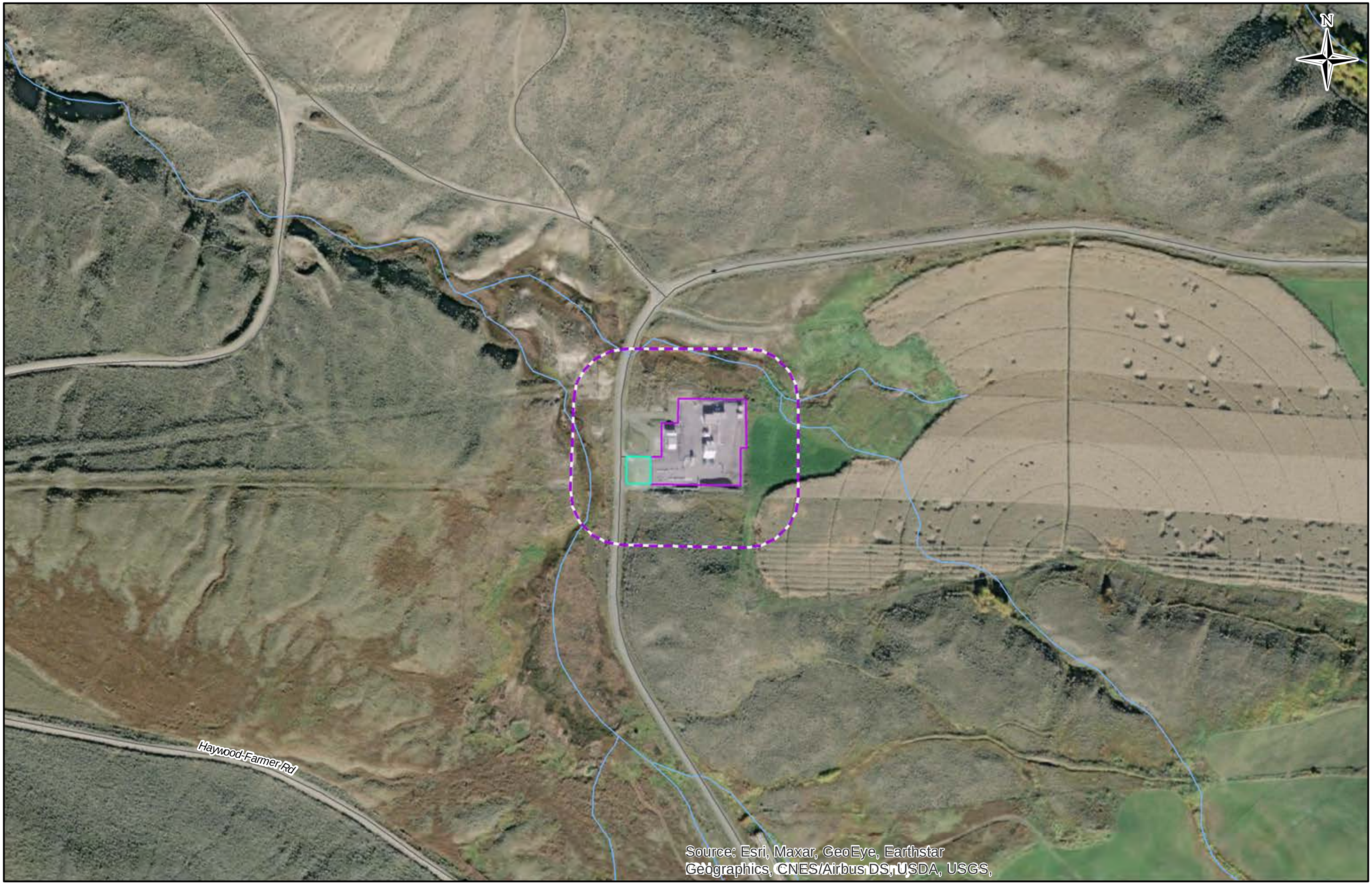

Legend

- Facility
- TWS
- Study Area
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
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	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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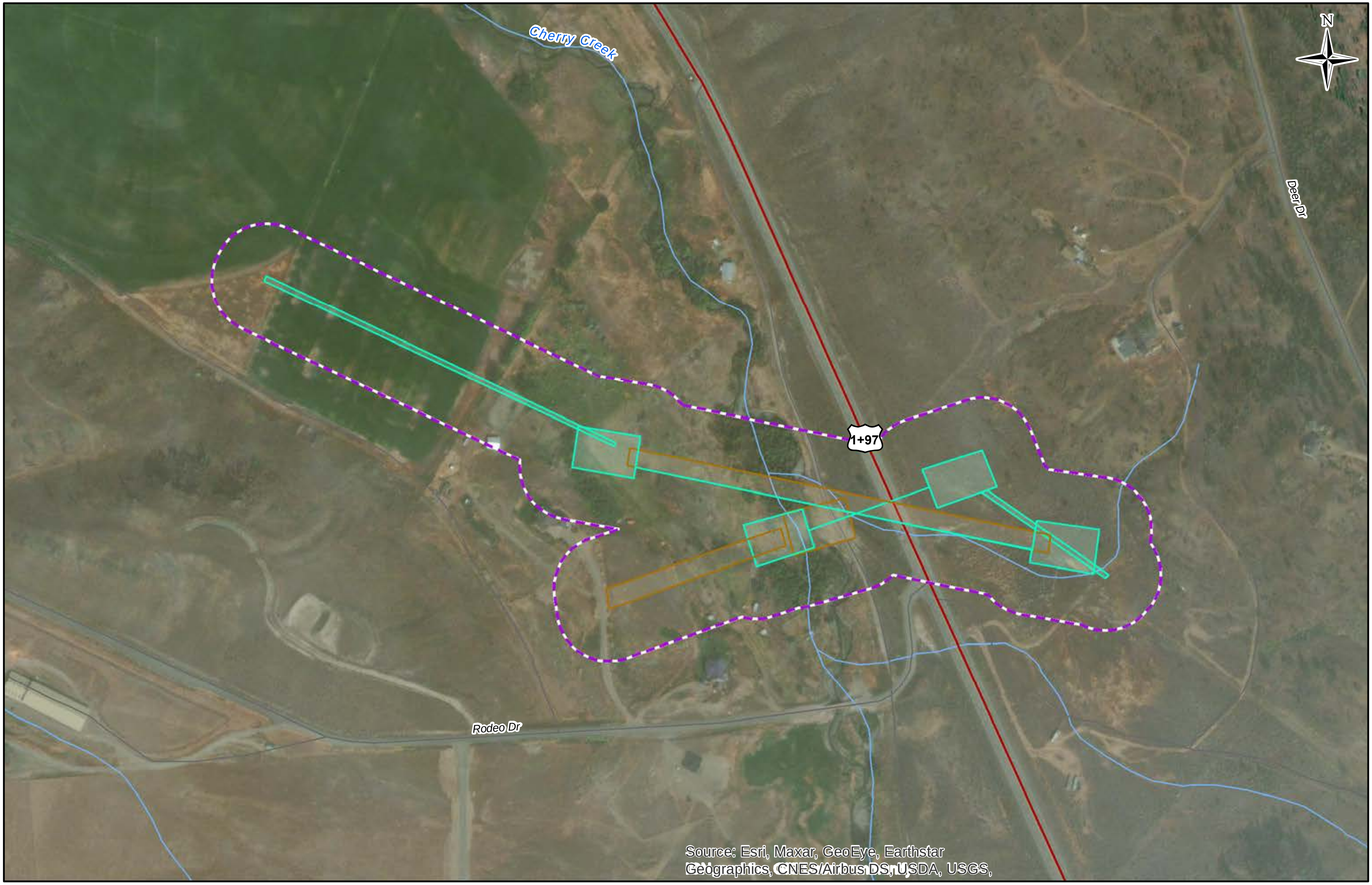

Legend

- Work Area
- TWS
- Study Area
- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - Event 1 SAV VER	DATE: October 20, 2021 · ANALYST: PK · QA/QC: PD · **Figure 3**
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wood.

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Legend

- Facility
- TWS
- Study Area
- Highway
- Road

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - SN-3	DATE: October 20, 2021 — ANALYST: PK — QA/QC: PD — **Figure 4**
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Legend

- Facility
- TWS
- PFR Survey
- Study Area
- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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PROJECT:
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TITLE:
Midrange Map -
SN 6-1 & Salmon Arm Tap

DATE: October 20, 2021
ANALYST: PK
QA/QC: PD
Figure 5

GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
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COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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Legend

- Facility
- TWS
- Study Area

Okanagan TSA AOA Model

- High
- Moderate

- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT:	PROJECT:		
Prepared for FortisBC	FortisBC ITS TIMC AOA		
TITLE: Archaeological Potential - SN 6-1 & Salmon Arm Tap	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD
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	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd		
	JOB No / PERMIT No: VE21506 / XXXX-XXXX		
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers		

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Legend

- Facility
- TWS
- Study Area
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
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wood.

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Legend

- Facility
- TWS
- Study Area
- Road
- Watercourse

Okanagan TSA AOA Model

- High
- Moderate

0 25 50
Meters
Scale 1:3,000

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TITLE: Archaeological Potential - SN-7	DATE: October 20, 2021; ANALYST: PK; QA/QC: PD; **Figure 8**
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	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

Legend

- Facility
- Study Area
- Road
- Watercourse
- Wetland

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - SN-4 Valve Assembly	DATE: May 12, 2022 · ANALYST: SR · QA/QC: CV · **Figure 9**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA_May2022.mxd
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	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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Legend

- Facility
- Study Area
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - Penticton Gate Station	DATE: October 20, 2021 · ANALYST: PK · QA/QC: PD · **Figure 10**
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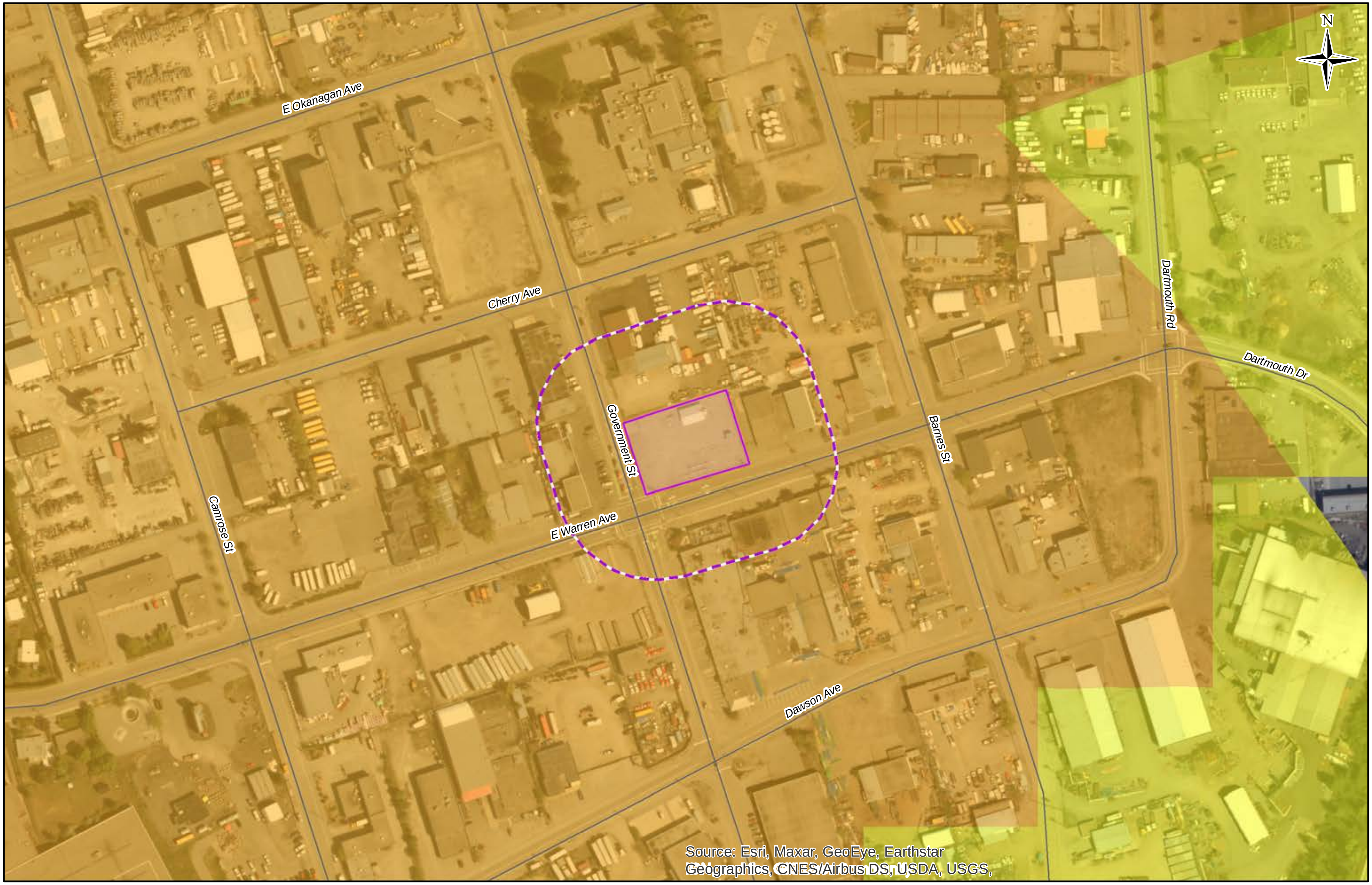

Legend

Facility

Study Area

Okanagan TSA AOA Model

High

Moderate

Road

0 25 50
Meters
Scale 1:3,000

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CLIENT: Prepared for FortisBC		PROJECT: FortisBC ITS TIMC AOA	
TITLE: Archaeological Potential - Penticton Gate Station	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD
	Figure 11		
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd		
	JOB No / PERMIT No: VE21506 / XXXX-XXXX		
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers		

wood.

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Legend

- Facility
- Study Area
- Previously Recorded Archaeological Site
- Previously Recorded Historic Site (Protected)
- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - Oliver Y Control Station	DATE: October 20, 2021; ANALYST: PK; QA/QC: PD; **Figure 12**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
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	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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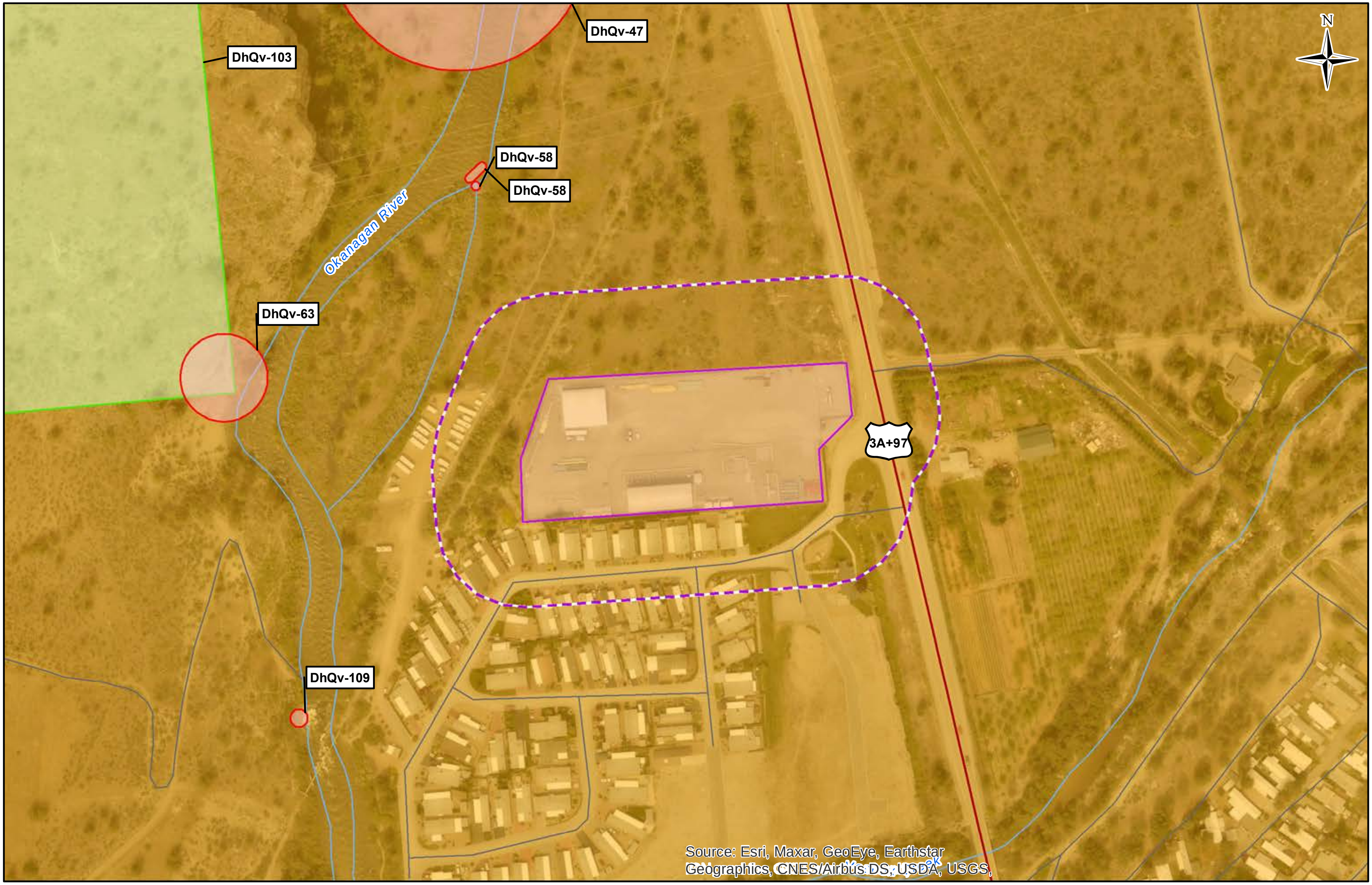

Legend

- Facility
- Study Area
- Previously Recorded Archaeological Site
- Previously Recorded Historic Site (Protected)

Okanagan TSA AOA Model

- High
- Highway
- Road
- Watercourse

0 25 50
Meters
Scale 1:3,000

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CLIENT:	PROJECT:			
Prepared for FortisBC	FortisBC ITS TIMC AOA			
TITLE: Archaeological Potential - Oliver Y Control Station	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD	**Figure 13**
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd			wood.
	JOB No / PERMIT No: VE21506 / XXXX-XXXX			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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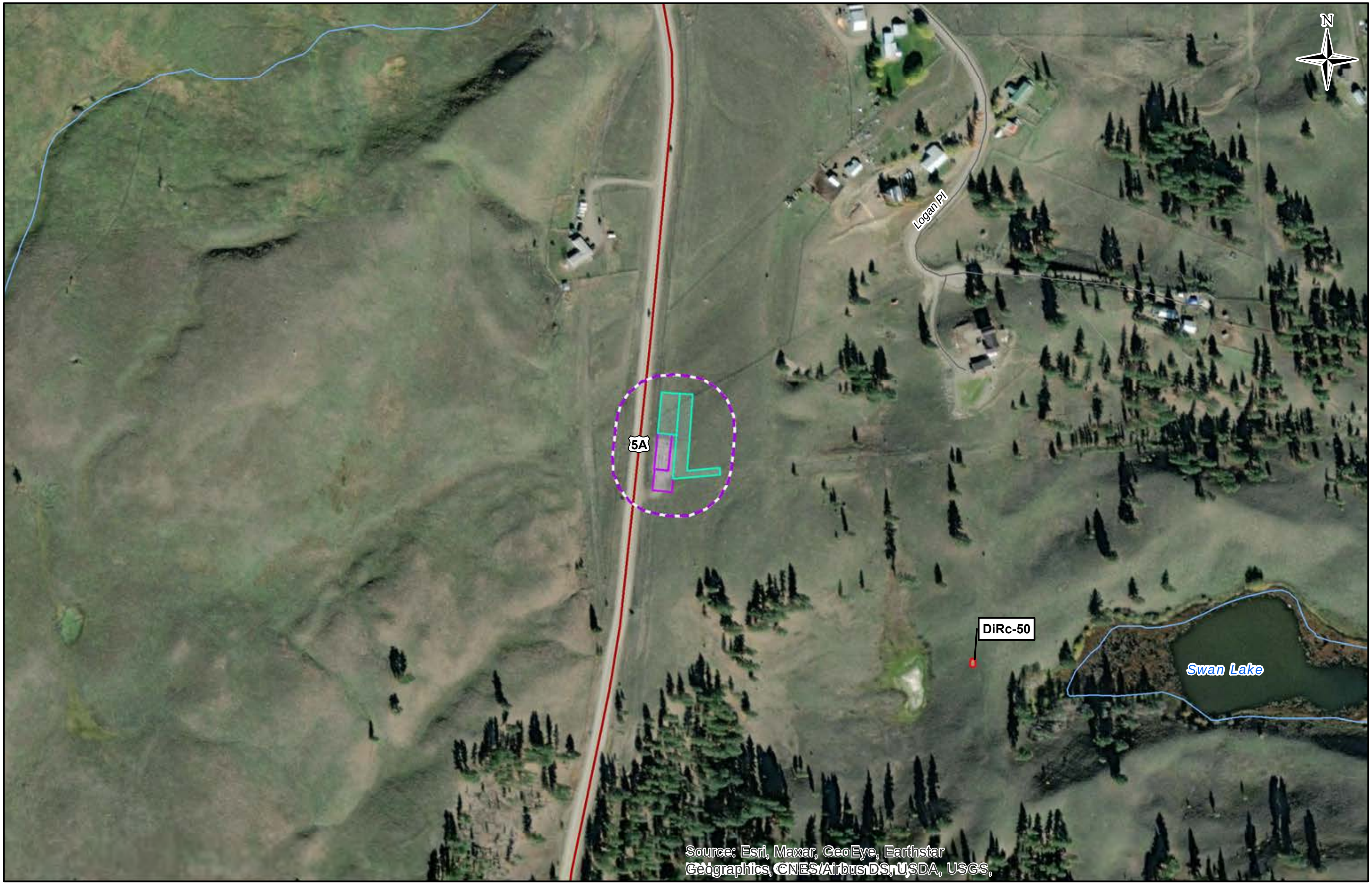

Legend

- Facility
- TWS
- Study Area
- Previously Recorded Archaeological Site
- Highway
- Road
- Watercourse
- Waterbody

0 50 100
Meters
Scale 1:5,000

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PROJECT:
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TITLE:
Midrange Map -
Princeton Crossover Control Station

DATE: October 20, 2021
ANALYST: PK
QA/QC: PD
Figure 14

GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
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COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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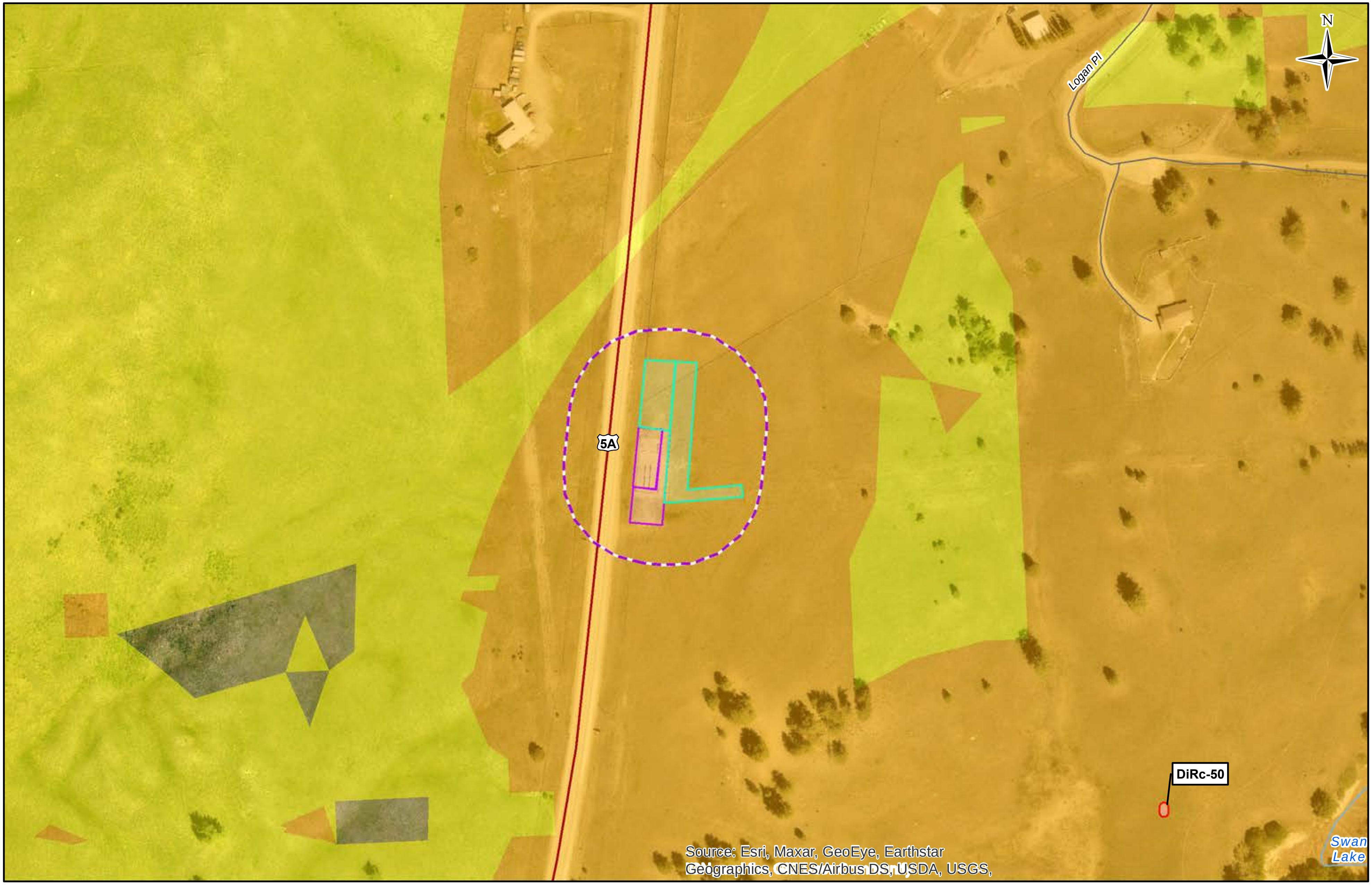

Legend

- Facility
- TWS
- Study Area
- Previously Recorded Archaeological Site

Merritt TSA / Upper Similkameen AOA Model

- High
- Moderate

- Highway
- Road
- Waterbody

0 25 50
Meters
Scale 1:3,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA			
TITLE: Archaeological Potential - Princeton Crossover Control Station	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD	Figure 15
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd			wood.
	JOB No / PERMIT No: VE21506 / XXXX-XXXX			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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Legend

- Facility
- TWS
- Study Area
- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT:	PROJECT:			
Prepared for FortisBC	FortisBC ITS TIMC AOA			
TITLE: Midrange Map - Kingsvale Control Station	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD	**Figure 16**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd			wood.
	JOB No / PERMIT No: VE21506 / XXXX-XXXX			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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Legend

- Facility
- TWS
- PFR Survey
- Study Area
- Railway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
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	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

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Legend

- Facility
- TWS
- Study Area

Boundary TSA AOA Model

- High
- Moderate

- Railway
- Road
- Watercourse

0 25 50
Meters
Scale 1:3,000

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TITLE: Archaeological Potential - SN-15	DATE: October 20, 2021; ANALYST: PK; QA/QC: PD; **Figure 18**
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Legend

- Facility
- TWS
- PFR Survey
- Study Area
- Road
- Watercourse
- Waterbody

0 50 100
Meters
Scale 1:5,000

References:
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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - SN 17 Valve Assembly	DATE: October 20, 2021 / ANALYST: PK / QA/QC: PD / **Figure 19**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Legend

- Facility
- TWS
- Study Area

Arrow TSA AOA Model

- High
- Moderate

- Road
- Watercourse
- Waterbody

0 25 50
Meters
Scale 1:3,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Archaeological Potential - SN 17 Valve Assembly	DATE: October 20, 2021 · ANALYST: PK · QA/QC: PD · **Figure 20**
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Legend

- Facility
- TWS
- PFR Survey
- Study Area
- Previously Recorded Archaeological Site
- Railway
- Highway
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA			
TITLE: Midrange Map - East Kootenay Exchange	DATE: October 28, 2021	ANALYST: PK	QA/QC: PD	**Figure 21**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd			wood.
	JOB No / PERMIT No: VE21506 / XXXX-XXXX			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

Legend

- Work Area
- TWS
- Study Area
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Midrange Map - Event 29 KIN PRI	DATE: October 20, 2021 / ANALYST: PK / QA/QC: PD / **Figure 22**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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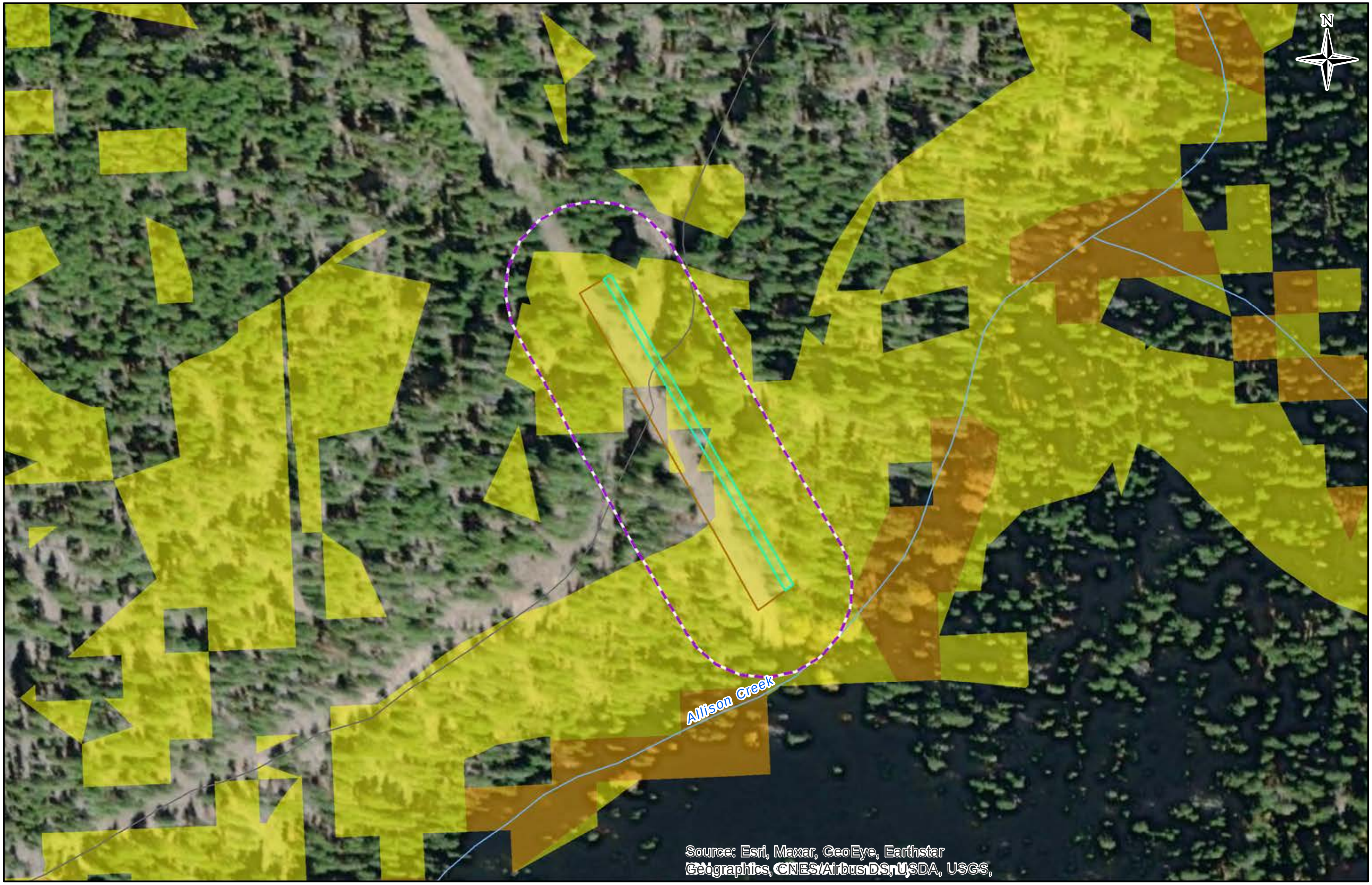

Legend

Work Area
TWS
Study Area
Merritt TSA / Upper Similkameen AOA Model
High
Moderate

Road
Watercourse

0 25 50
Meters
Scale 1:3,000

References:
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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA
TITLE: Archaeological Potential - Event 29 KIN PRI	DATE: October 20, 2021 · ANALYST: PK · QA/QC: PD · **Figure 23**
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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Legend

- Work Area
- TWS
- Study Area
- Road
- Watercourse

0 50 100
Meters
Scale 1:5,000

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TITLE: Midrange Map - Event 31 KIN PRI	DATE: October 20, 2021; ANALYST: PK; QA/QC: PD; **Figure 24**
	GIS FILE: 07-01-002_Figure_Project_Midrange_AOA.mxd
	JOB No / PERMIT No: VE21506 / XXXX-XXXX
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers

wood.

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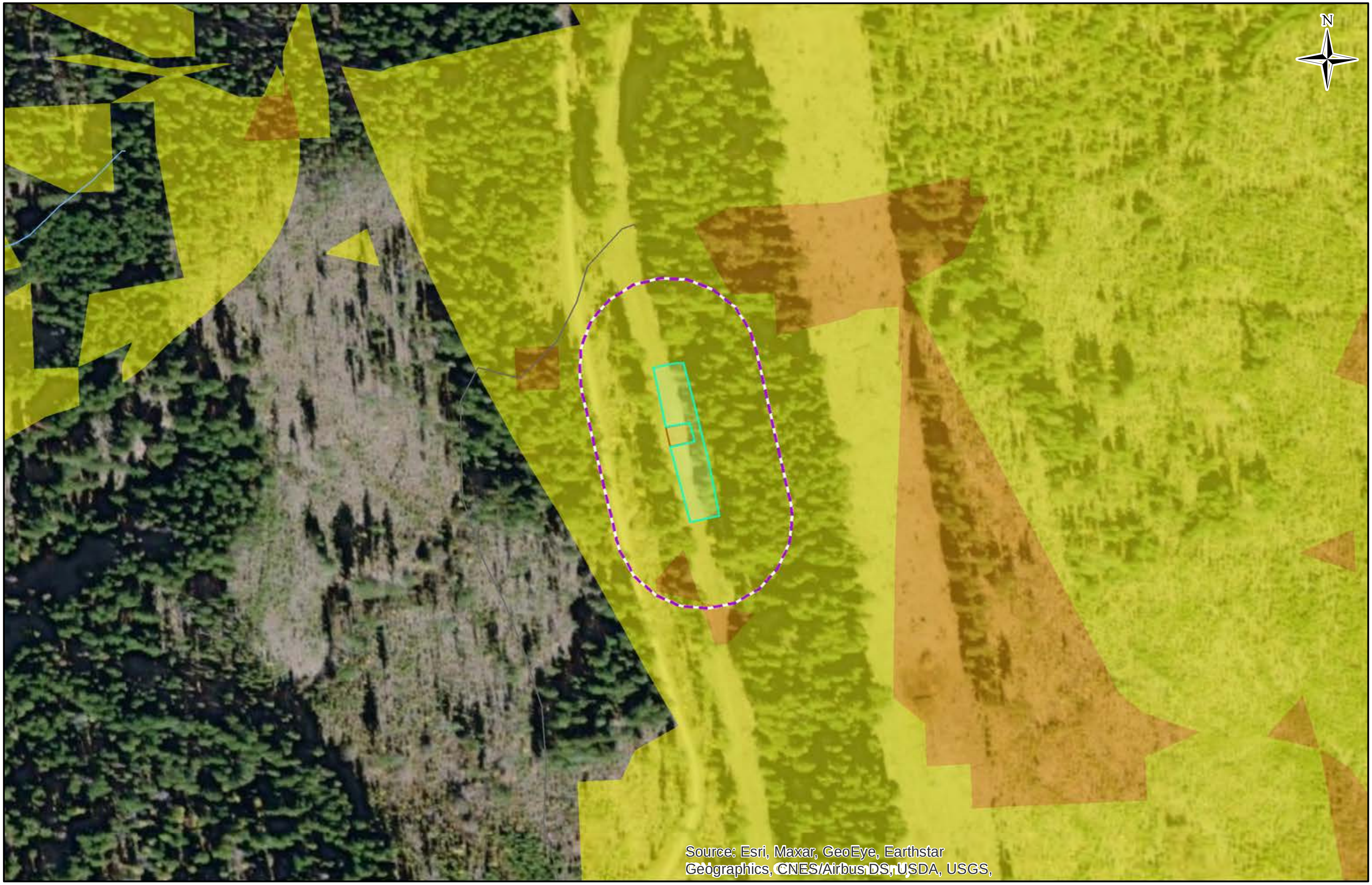

Legend

- Work Area
- TWS
- Study Area

Merritt TSA / Upper Similkameen AOA Model

- High
- Moderate
- Road
- Watercourse

0 25 50
Meters
Scale 1:3,000

References:
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CLIENT: Prepared for FortisBC	PROJECT: FortisBC ITS TIMC AOA			
TITLE: Archaeological Potential - Event 31 KIN PRI	DATE: October 20, 2021	ANALYST: PK	QA/QC: PD	Figure 25
	GIS FILE: 07-01-003_Figure_Arch_Potential_AOA.mxd			wood.
	JOB No / PERMIT No: VE21506 / XXXX-XXXX			
	COORDINATE SYSTEM: NAD 1983 BC Environment Albers			

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9.0 Appendix B – Historic Aerial Photo Review

Table B-1: Savona Compressor Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1948	BC612: 63-64	High	Tunkwa Lake Road (running through the modern location of component), Haywood Farmers Road and portions of Guichon Creek Forest Service Road present. Area to west and south of current component appears to be unmodified aside from road development. Unnamed drainage runs through center of current footprint. Agricultural development within and to east of current footprint
1951	A13246: 87-88	High	Same as 1948
1959	BC2651: 39-40	Medium	Pipeline corridor extending from west of the current component. Continued agricultural use within area to east and southeast of current component
1966	BC4369: 48-49	Medium	Tunkwa Lake Road realigned approximately 20 m west from original alignment (inside current component) to adjacent to current component. Continued agricultural use
1969	BC7127: 59-60	Medium	Continued agricultural use, little change
1974	BC7693: 12-13	Low	Original footprint for Savona Compressor Station component present consisting of 4 buildings (including a fuel gas system, generator and compressor unit). Area is cleared and paved.
1986	30BC86038: 155-156	Low	Small amounts of regrowth near component. Tunkwa Road realigned to north of modern component to modern alignment
1992	30BCC92006: 208-209	Low	No changes to component
2000	30BCC00006: 190-191	High	Compressor Station expanded to north and west, more buildings on the lot now, reached modern/current footprint
2004	15BCC04029 :46-47	High	Same as 2000
2012	Google Earth Satellite Imagery	n/a	Same footprint, one more building observed on property
2014	Google Earth Satellite Imagery	n/a	Agricultural field extends up the eastern edge of modern component footprint, in use
2019	Google Earth Satellite Imagery	n/a	No changes to component

Table B-2: SN 3 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1948	BC616: 67	High	Southern Yellowhead Highway present. SN 3 area undeveloped. South of highway is forested moderately, north of highway sparsely forested
1953	BC1745: 29-30	High	Small dirt road possibly present through area, otherwise largely unchanged. Small developments in surrounding area including start of Trans Mountain Oil Substation.
1959	BC2644: 52-53	Medium	Tower road and associated dirt roads present through modern footprint. Area still forested. Further development south of the highway
1966	BC4411: 190-1991	Medium	Increased associated dirt roads leading NE from modern footprint of SN 3. Pipeline corridor cleared to NE and NW
1974	BC7693: 93-94	Low	Parking lot/pull out SW of SN 3 along highway has been constructed and is in use. Hillside Drive cleared and paved
1981	30BC81018: 221-222	Low	Original footprint of SN 3 present. Urban and industrial development increasing to south, east and west
1986	30BC86021: 36-37	Medium	Urban and industrial development increasing to south, east and west. Copperhead drive under construction
1991	15BC91094: 249-250	Medium	Copperhead drive overpass completed. Urban and industrial development increasing to south, east and west
1995	30BCC95041:68-69	Medium	SN 3 under construction, expanding. Urban and industrial development increasing to south, east and west
2000	15BCC04029: 112 30BCC00009: 77-78	High	SN 3 in modern/current footprint. Residential developments increasing, now adjacent SN 3 to east and south
2008	ME08480: 174-175	Low	Little change
2012	Google Earth Satellite Imagery	n/a	Area in future component area cleared and fencing taken down, fencing removed
2016	Google Earth Satellite Imagery	n/a	Fencing reinstalled with more buildings and components present
2017-2019	Google Earth Satellite Imagery	n/a	Little change

Table B-3: Salmon Arm Tap and SN 6-1 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1938	BC 85: 69-71	Medium	Component area is active farm field with small dirt road running through it. St Anne's Road and Okanagan highway are present. Area is forested to west of St Anne's Road
1949	BC745: 7-8	High	No changes to component area
1951	BC1297: 24-25	Medium	No changes to component area, still active farm field
1958	BC5001: 170-171	Medium	No changes to component area, still active farm field Small building built in the area to the northwest of the component. Pipeline through Salmon Arm Tap area now present, trending north/south., component at modern extent
1963	BC4183: 20-21	Medium	No changes to component area, still active farm field Building to northwest has been removed Small buildings present to the east and southeast of the component area. Regrowth on Salmon Arm Tap area
1969	BC4133: 104-106	Medium	No changes to component area, still active farm field building development north of St. Anne's Road
1974	BC7675: 197-198	Medium	No changes to component area, still active farm field
1980	15BC80111: 198-199	Medium	No changes to component area, still active farm field Additional building adjacent to building north of St. Anne's road
1984	30BC84046: 16-17	Medium	No changes to component area, still active farm field
1990	30BCC90083: 43-44	Medium	SN 6-1 now present
1994	30BCC94054: 5-6	Medium	No changes to component area, still active farm field Some regrowth
2001	15BCC0102: 72-73	Medium	No changes to component area, still active farm field
2007	15BCC07015:82-83	High	Access road running through component area widened and paved
2012-2016	Google Earth Satellite Imagery	n/a	No changes to component area, still active farm field

Table B-4: SN-7 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1938	BC89: 60-61	Medium	Davison Road, Sandon Drive and Bella Vista Road present and paved. Component area is in active farm field
1949	BC744: 67-68	High	No change to component area, remains active farm field
1951	BC1297: 29-30	High	No change to component area, remains active farm field
1956	BC2150: 14-15	High	No change to component area, remains active farm field Building development increases to south of component area, south of Davison Road
1963	BC4185: 134-135	High	SN-7 footprint present in modern location
1967	BC5236: 195-196	High	No change to component area, remains active farm field
1975	BC5651: 86-87	Medium	No change to component area, remains active farm field
1981	15BC81024: 92-93	Low	No change to component area, remains active farm field
1984	30BC8404: 59-60	Medium	No change to component area, remains active farm field
1990	30BCC90080: 186-187	Low	No change to component area, remains active farm field
1994	30BCC94043: 177-178	Medium	No change to component area, remains active farm field Small building located right at bend in Davison Road (approx. 50 m south of current footprint)
2001	15BCC01027: 18-19	High	No changes within modern footprint, remains active farm field in surrounding area
2007	15BCC07002: 184-185	Medium	Small building to south extended. One more small building present to south of current footprint. No changes within modern footprint, remains active farm field in surrounding area. Increased traffic/ parking of cars adjacent to modern footprint
2012-2016	Google Earth Satellite Imagery	n/a	No changes within modern footprint, remains active farm field in surrounding area. Increased traffic/ parking of cars adjacent to modern footprint

Table B-5: Penticton Gate Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1938	BC104: 65-66	Medium	Component area is undeveloped flood plain, presence of sparce but mature trees. Agricultural field present to the west (approx. 400 m) and south (approx. 500 m) Main Street and Lake Road present
1950	BC1111: 64-65	Medium	No change to component area. Drive-in movie theatre built to the west along Main Street
1959	A16664: 10-11	High	Component area under construction, appears cleared. Dartmouth Rd, Warren Ave E, Cherry Ave, Okanagan Ave E, Barnes St, Government St, and Camrose St present. Increase in industrial and commercial developments in the area (second drive-in movie theatre built to the northwest)
1963	BC4171: 139-140	Medium	One building present on component footprint. Dawson Ave complete, Government St extended. Area across Warren Ave has a building present. Area north of component has buildings. East and west of component have not been cleared but appear to have minor developments in process. Increased industrial developments in surrounding area
1967	BC5229: 166-167	Medium	Component area remains the same. Building across Warren Ave to south has been extended. Increased industrial developments
1975	BC5654: 152-153	Low	Component area remains the same, appears to be storage of construction materials present on west side of property Area to west across Government St now completely developed. Building south of Warren expanded more Increased industrial developments in surrounding area Western Drive-In movie theatre developed into residential homes
1980	15BC80054: 70-71	Medium	Component area footprint remains the same, increased number of buildings present on northeast portion Area immediately adjacent to east developed, paved lot and building present. Increased industrial developments in surrounding area
1985	30BCC362: 100-101	Low	Component area remains the same. Increased industrial and residential developments in surrounding area
1988	30BCC858: 173-174	Medium	Component area remains the same. Increased industrial and residential developments in surrounding area

1992	30BCC92085: 26-27	Medium	Component area remains the same. Area directly adjacent to NE of component is in development. Increased industrial and residential developments in surrounding area
1996	30BCC96045: 22-23	Medium	Component area remains the same. Area directly adjacent to NE of component is completely development
2001	15BCC01028: 13-14	High	Component area remains the same. Some buildings from NE have been removed
2007	BCD07025: 19-20	High	Component area remains the same

Table B-6: Oliver Y Control Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1938	BC99: 82-83	High	Component footprint undeveloped, sparsely forested Okanagan Highway (3A) present. Railway present immediately adjacent to component area to northwest; railway has a bridge crossing Vaseux Creek to the southwest
1950	BC1110: 60-61	High	No change
1957	BC2093: 44-45	High	Component area cleared. Transmission line corridor running north south through the east portion of the component area
1963	BC4184: 103-104	High	1 building in the centre and 2 buildings in the east portion of component footprint, some growth of vegetation throughout Unnamed road directly adjacent to south end of component is present, extends west from Highway 97. Increasing residential development in the surrounding area
1967	BC5229: 152-153	Medium	Increased about of buildings within component footprint concentrated on highway. Area southwest and south of component area is and under construction. West side of tracks cleared. Increasing residential development
1975	BC5656: 44-45	Medium	Western portion of component area has buildings, buildings in the southeast corner have been removed. Gas component yard constructed in middle of component area. Increasing residential development in the surrounding area
1981	30BCC287: 183	Low	Increase development of western portion of component footprint, more buildings and cars present. East/west running transmission line present 130 m north of component
1985	30BCC345: 119-120	High	Little change to component footprint, some regrowth of vegetation. Increasing residential development
1990	BCC90028: 7-8	Medium	Smaller buildings on the northeast side along highway have been replaced with a larger building within the component footprint. Increasing residential development
1996	30BCC96024: 21-22	High	Southern portion of component footprint appears to be under construction. Building in northeast corner of component footprint has an extension and second building present. Parts of Deer Park Estates present directly south and abutting the component footprint

Date	Flight and Frame	Altitude	Subject Property Observations
2000	30BCB00001: 74-75	Medium	Northwest buildings removed and absent from northwest corner on component property, area has been cleared Deer Park Estates continues development continues
2007	BCD07039: 40-41	High	Yard cleared and paved, buildings from northeast corner removed. Long building present along sound boundary within component area. Modern extent of component area
2010	Google Earth Satellite Imagery	n/a	Large building now presents in component area in northwest corner, modern configuration within component reached

Table B-7: Princeton Crossover Control Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1947	BC337: 30-31	High	Princeton-Kamloops Highway (5A), Airport Road, and Laurie Currie Way present. Component area undeveloped, no trees in area. Airport to southwest present
1959	A16843: 24-25	High	Small frontage road present on opposite side of highway, to west of component modern extent. No changes to component area
1967	BC443: 166-167	Medium	No changes to component area
1976	BC5742: 203	Low	Pipeline present through middle of component area, coming to a T at the highway and continuing northeast, north northwest and south southwest out of footprint, cleared and vegetation starting to grow back
1979	15BC79015:238-239	Medium	No change to component
1985	30BCC345: 27-28	Medium	Small building to north of pipeline T-junction present within component footprint. Sunflower Estates Road and Logan Place present to the north and northeast. Increased residential use in surrounding area
1991	30BCC91013: 42	Medium	Small building to north of pipeline T-junction present within component footprint
1996	30BCC96045: 136-137	Medium	No change to component. Increased residential use in surrounding area. Fences marking parcel boundaries to north of component present (20 m north at closest point)
2000	30BCC00116: 112-113	Medium	Component area cleared, pipes and fencing installed directly next to highway, building removed. Large and small building now present 180 m northwest across highway on old frontage road
2004	15BCC04038: 36-37	Medium	No change to component. Increased residential use in surrounding area
2008-2013	Google Earth Satellite Imagery	n/a	No change to component
2020	Google Earth Satellite Imagery	n/a	Component lot expanded to east and south, modern extent of footprint

Table B-8: Kingsvale Control Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1947	BC478: 87-88	Medium	Largely undeveloped area. Kettle Valley Railway present along Coldwater River
1951	R13251: 215	Low	No change to component area. Small road present, possibly portion of modern-day Peterson Road
1960	BC2881: 49-50	Medium	Pipeline right-of-way to and running through component area cleared, running North-South. Dirt road or pipeline corridor cleared, running parallel to parts of the future Coldwater Road and Suttie Road (approx. 150 m southwest from component footprint)
1966	BC5206: 95-96	Low	Component area cleared, possibly has building present (unclear in photo). Small rectangular area cleared to approx. 95 m west of component area. Coldwater Road and Suttie Road present
1969	BC7197: 177-178	Low	Component area extended, cleared to north and south, component now has multiple buildings associated. Building present on rectangular area to approx. 95 m west of component area
1976	BC5727: 67-68	Medium	No change to component area. Some regrowth of vegetation Coldwater Road, Suttie Road intersection appears to have been widened
1981	30BC81115: 256-257	Medium	Component area extended to south with pipeline corridor extending from south end
1986	30BC86037 :40-41	Medium	No change to component area. Coquihalla Highway (Hwy 5) construction completed 105 m to the east, area cleared including larger patches 350 m southeast of component
1991	30BCC91014: 75-76	Medium	No change to component area
1996	30BCC96036: 97-98	Medium	Consistent with modern day component footprint Component directly to north is expanding north along dirt access road
2004	15BCC04023: 13-14	Medium	Consistent with modern day component footprint and configuration, component to north expanded in size in all directions
2005-2019	Google Earth Satellite Imagery	n/a	No change to component area

Table B-9: SN 15 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1951	BC1324: 34-35	Medium	Area previously cleared, active agricultural fields. 100 m south of future component area is developed with a series of buildings including barns. Como Road is present and paved with dirt access roads branching off to fields and the railway Railway along Kettle River
1960	BC2859: 54-55	Medium	Area cleared and developed directly north from future component area, one building present (approx. 15 m north) No changes to component area, still active farm field
1966	BC4366: 22-23	Medium	No changes to component area, still active farm field. More development directly north of component area, 2 buildings now. Development 100 m south of component area expands with more buildings present
1974	BC7591: 14-15	High	No changes to component area, still active farm field. Development 60 m south of component area expands with more buildings present
1979	30BC79023: 11-12	Medium	No changes to component area, still active farm field
1983	30BC83032: 73-74	High	No changes to component area, still active farm field
1988	15BC88098: 18-19	Low	Southern portion of component area developed with 1 metering pipeline present
1993	30BCC93018: 111-112	High	No changes to component area, some regrowth present
2000	30BCB00004: 18-19	Medium	Component expanded to north, now consists of two. Metering lines and a small building, fenced between building and tightly near the two lines
2005	30BCC05015: 204-205	High	No changes to component area
2005-2010 (May)	Google Earth Imagery	n/a	No changes to component area, regrowth on northern most portion outside of fence
2010 (Sept)	Google Earth Satellite Imagery	n/a	Component footprint and fence expanded to modern configuration
2011-2016	Google Earth Satellite Imagery	n/a	No changes to component area, modern extent

Table B-10: SN-17 Valve Station Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1945	A7662: 3-4	High	Component area undeveloped. Very little development present in Rivervale. Hanna Drive and railway present running relatively parallel to Columbia River. Appears to be seismic line to south
1951	BC1327: 70	Medium	Possibly pipeline running through component area, air photo unclear. possible dirt access roads near by future component area
1961	BC2986: 54	Medium	Intersecting northwest/southeast and northeast/southwest running pipelines developed, overlapping with future component footprint. Modern footprint of component reached rectangular yard
1963	BC5352: 53-54	High	Small house present 100 m north. Regrowth near component
1973	BC7461: 45-46	Medium	No changes to component area, regrowth nearby
1979	15BC79134: 262-263	Low	No changes to component area. Component approx. 660 m to southeast of component begins development, 3 buildings present
1983	30BC83027: 71-72	High	No changes to component area. Building approx. 220 m east developed
1990	30BC90033: 147-148	High	No changes to component area
1999	30BCB99021: 64-65	High	No changes to component area, more regrowth nearby
2004	15BCC04031:43-44	High	No changes to component area, more regrowth nearby
2004-2020	Google Earth Satellite Imagery	n/a	No changes to component area, more regrowth nearby In 2007 a house with green roof is observed 100 m to southeast

Table B-11: East Kootenay Exchange Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1945	A9516: 22	Medium	Component area undeveloped, forested. Highway 95 and Barnhardt Road present. Active agricultural fields 200 m to the south
1958	BC2460: 45-46	Medium	Pipeline west of Barnhardt Road present through future component footprint, small building present and small area cleared
1969	BC5346: 50-51	High	No changes to component area. Area 350 m to southwest cleared along the edge of Highway 95
1972	BC7434: 82-83	Medium	No changes to component area. Small area cleared to east of Barnhardt Road
1977	15BC77034: 156-157	Medium	Component to southwest of component developed with two buildings present. Horse-shoe shaped dirt access road cleared through component area
1981	30BC81034: 77-78	Medium	No changes to component area, with exception of regrowth of vegetation
1988	30BCC838: 153-154	Medium	No changes to component area
1993	30BCB93018: 84	Medium	No changes to component area
2000	30BCB00002: 255-256	High	Component area re-cleared. Component adjacent to south expanded. Area 100m north of component adjacent to Highway 95 cleared
2005	15BCC05001: 33-34	High	Component reaches modern configuration, fenced and with buildings present
2005-2020	Google Earth Imagery	N/A	No changes to component area, regrowth of vegetation

Table B-12: Event 1 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1948	BC702: 40-41	High	Component area appears undeveloped aside from intersecting with Highway 1. Strip of forested area present on west side of Highway 1. Agricultural fields west of Cherry Creek
1951	A13246: 70-71	High	Cherry Creek Road present transecting future component area
1959	BC2643: 68-69	Low	Component pipeline present and finished, running east/west across Highway 1 and Cherry Creek Road and cornering on the east end to a northwest/southeast orientation Agricultural fields to west continue to expand
1966	BC4359: 166-167	Medium	No changes to component area. Second near parallel pipeline approximately 180 m south
1974	BC7693: 106-107	Low	No changes to component area
1977	30BCC163:28-29	Medium	No changes to component area
1982	15BC82046: 68-69	Medium	No changes to component area, regrowth in the area
1986	30BC86032: 143-144	Medium	No changes to component area, regrowth in the area
1992	30BCB92010: 167-168	Medium	No changes to component area, regrowth in the area
2000	30BCC0009: 42-43	Medium	No changes to component area. Rodeo Drive connects with Cherry Creek Road and Highway 1
2004	15BCC04029: 115-116	High	No changes to component area
2011	Google Earth Satellite Imagery	n/a	No changes to component area. House built ~ 140 m southwest and 220 m west northwest with associated dirt roads
2017	Google Earth Satellite Imagery	n/a	No changes to component area. Small buildings approximately 75 m southwest
2017-2020	Google Earth Satellite Imagery	n/a	No changes to component area

Table B-13: Event 29 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1947	BC338: 14-15	High	Component area appears undeveloped and forested Highway 5A present. Agricultural fields with buildings present at the north end of Allison Lake
1960	BC2728: 44-45, and 154	Medium	Component area appears undeveloped and forested. Possible dirt access roads or trails nearby
1967	BC4429:155	Medium	Logging road trenching north south through future. Component area present
1979	30BC79048: 261-262	Medium	Component pipeline area cleared and developed running northwest/southwest, modern extent reached
1985	30BCC360: 97-98	Medium	No changes to component area, some regrowth of vegetation
1991	30BCC91012: 37-38	Medium	No changes to component area, some regrowth of vegetation
1996	30BCC96070: 133-134	Medium	No changes to component area, some regrowth of vegetation Transmission corridor 2.4 km east of the component area visible
2000	30BCC00037: 135-136	Medium	No changes to component area
2004	15BCC04011: 258-259	High	No changes to component area
2012-2020	Google Earth Satellite Imagery	n/a	No changes to component area

Table B-14: Event 31 Historical Aerial Photo Review Observations

Date	Flight and Frame	Altitude	Subject Property Observations
1947	BC345: 105-106	Medium	Component area undeveloped and forested Highway 5A present along Mackenzie Lake
1960	BC2727: 55-56	Medium	No changes to component area
1967	BC4430: 9-11	Medium	No changes to component area. Agricultural fields present at north end of Mackenzie Lake, 3 km west
1979	30BC79048: 151-152	Medium	Component pipeline present, cleared, and developed. Transmission line corridor cleared and present adjacent to component area. Dirt access road present 0.75 km south of component area, cleared
1987	30BCC694:196-197	Low	No change to component area, regrowth of surrounding vegetation
1991	30BCC91011: 151-152	Low	No change to component area, regrowth of surrounding vegetation. Un-named dirt road now present trending east/west 2.3 km south of component
1996	30BCC96029: 151-152	Medium	No change to component area, regrowth of surrounding vegetation. Parcels of land stripped to the northeast (0.5 km), east (0.8 km) and southeast (0.8 km) on the other side of the transmission line
2004	15BCC04011: 133-134	Medium	No change to component area, regrowth of surrounding vegetation. New north/south trending dirt road running parallel and adjacent to the west of the component
2012-2020	Google Earth Imagery	High	No change to component area, regrowth of surrounding vegetation. Additional clearing directly adjacent to component to west, and on other side of transmission line 0.14 km east

10.0 Appendix C – Selected Historic Aerial Photos

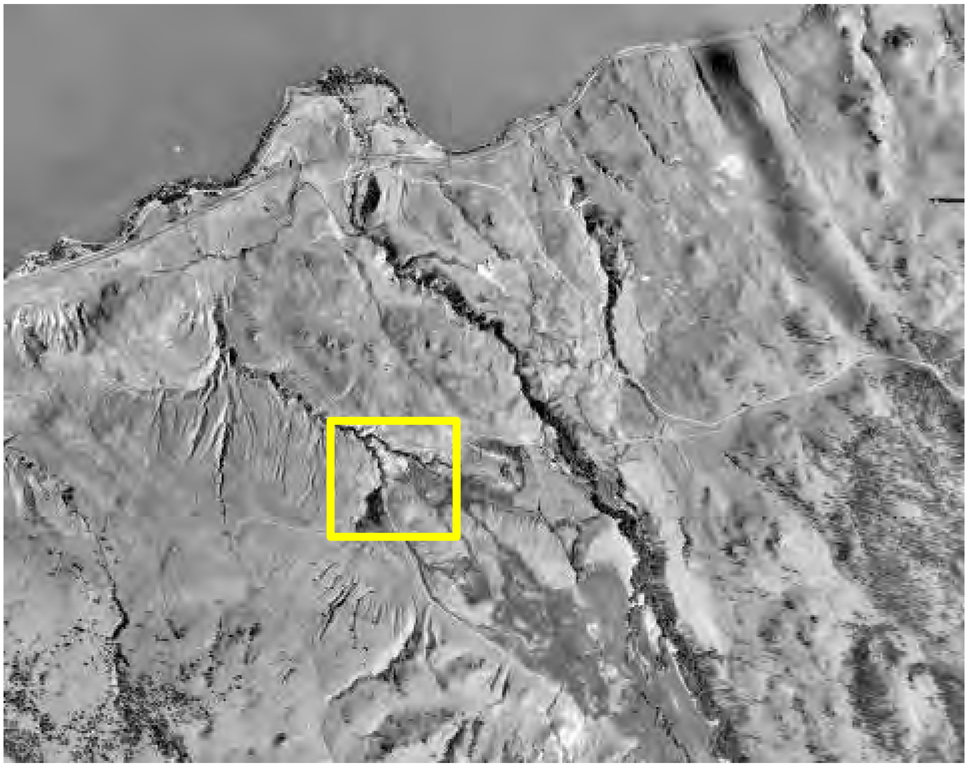


Photo 7: Savona Compressor Station, 1948 (BC612 Frame 63).

Photo 8: Savona Compressor Station, 1974 (BC7693 Frame 13).

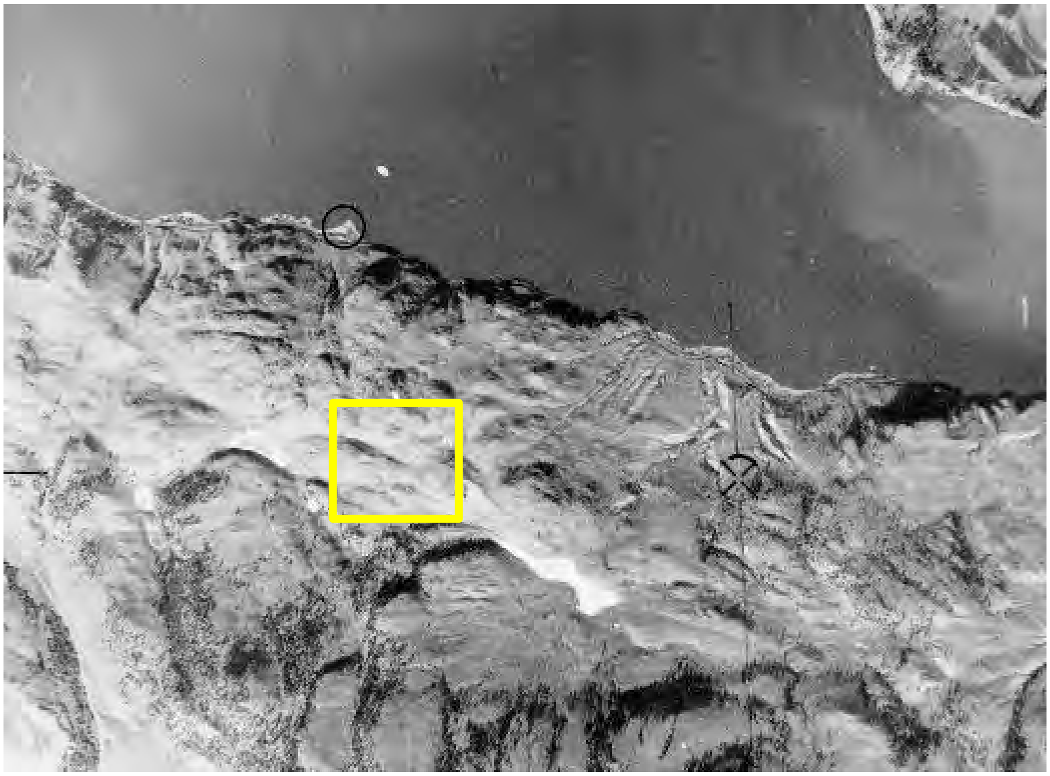


Photo 9: Event 1 SAV VER 323, 1948 (BC702, Frame 40).

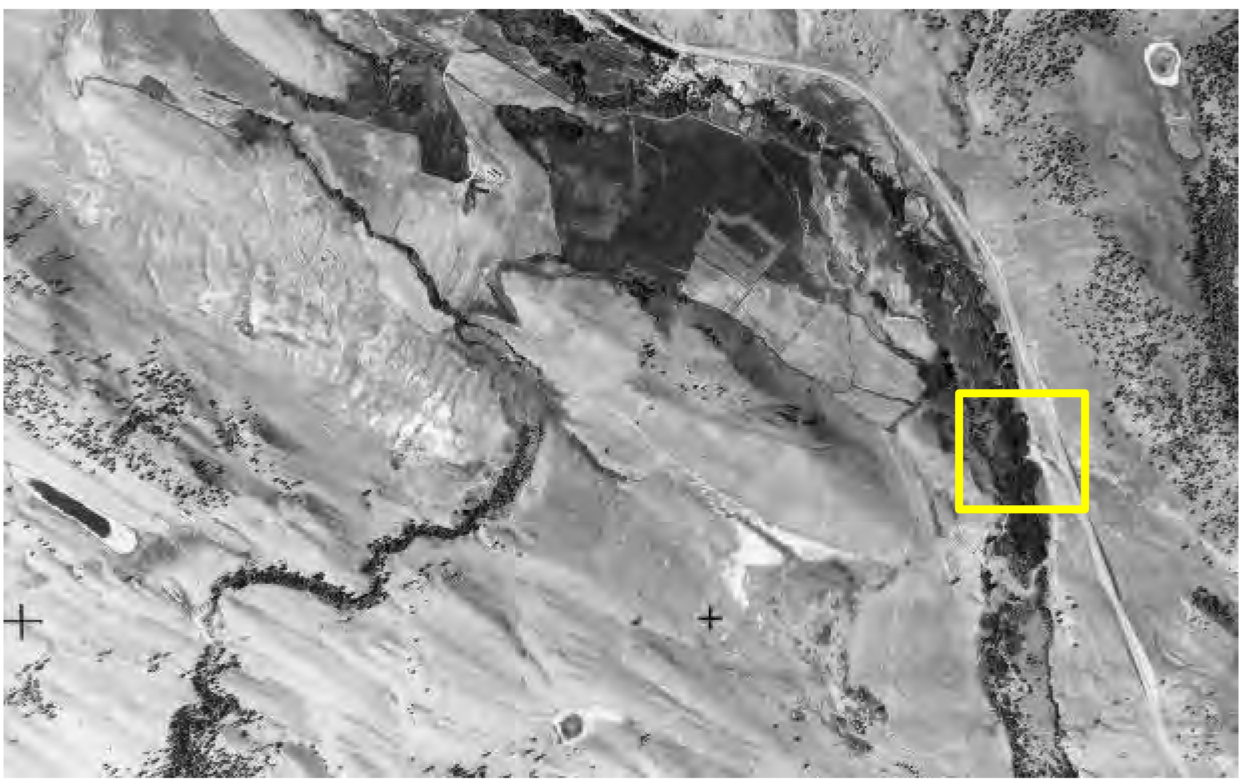


Photo 10: Event 1 SAV VER 323, 1959 (BC2643, Frame 40).

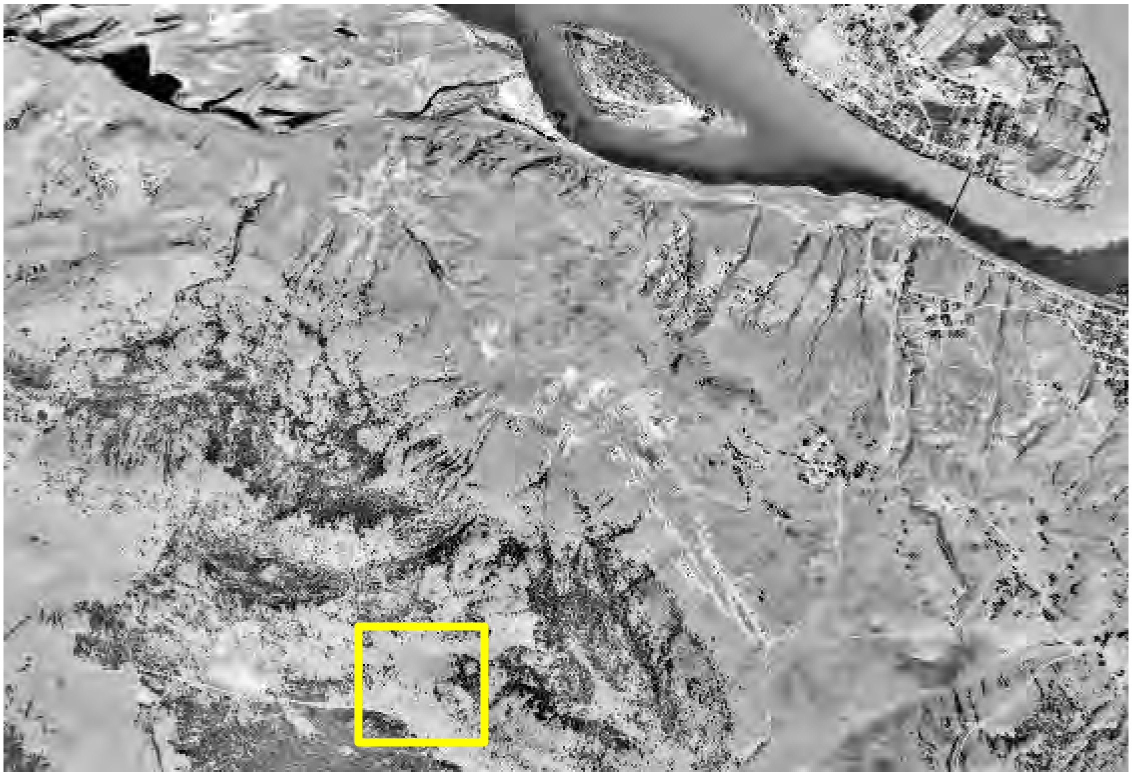


Photo 11: SN 3, 1948 (BC616, Frame 67).

Photo 12: SN 3, 1981 (30BC81018, Frame 221).

Photo 13: Salmon Arm Tap and SN 6-1, 1938 (BC85, Frame 70).

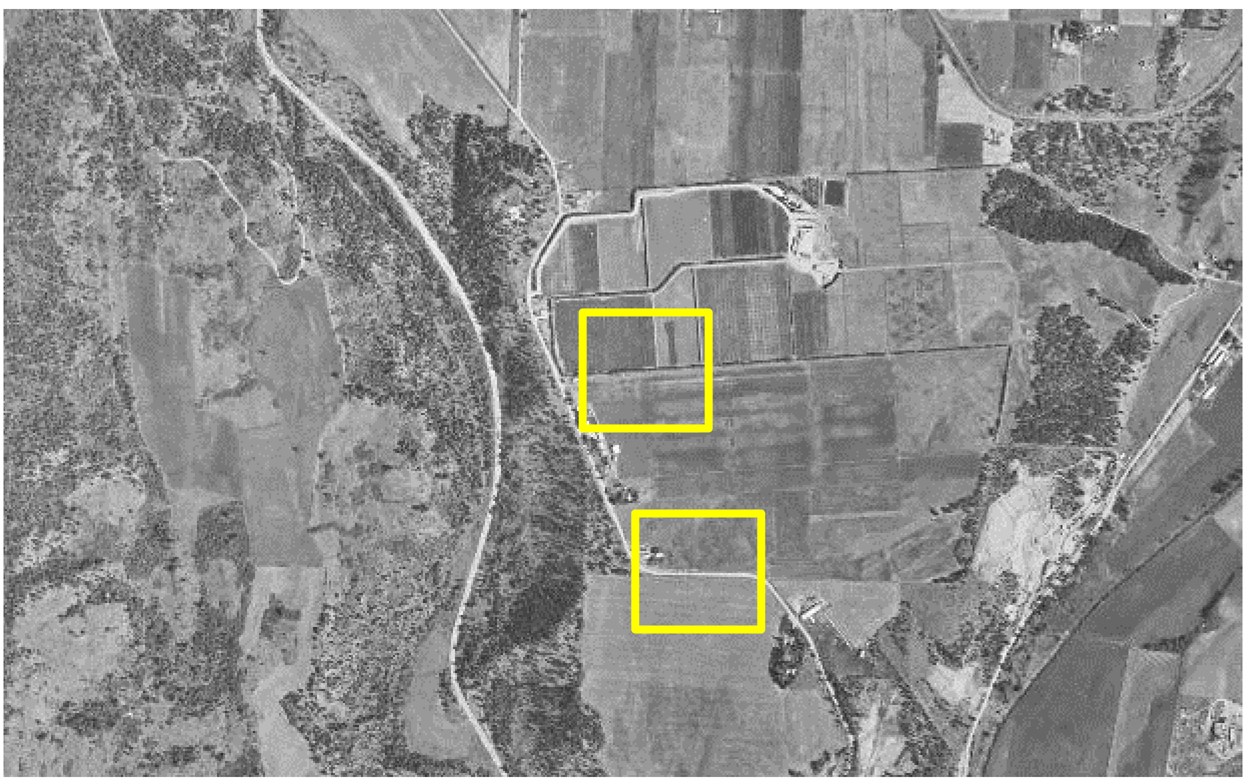


Photo 14: Salmon Arm Tap and SN 6-1, 1994 (30BCC94054, Frame 5).

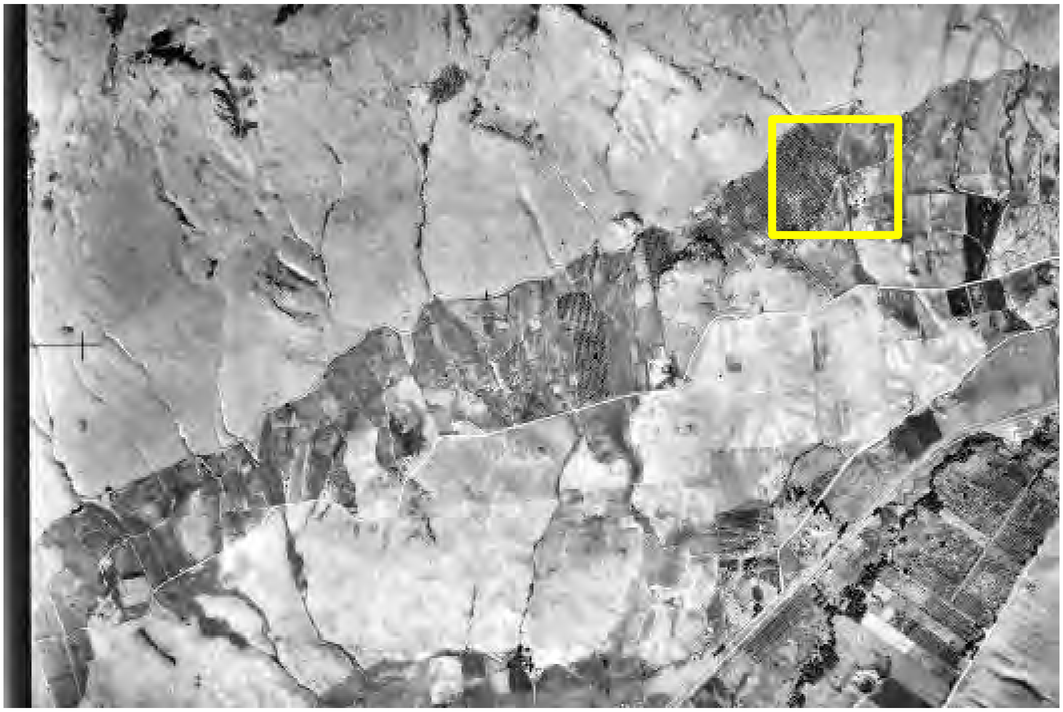


Photo 15: SN-7, 1938 (BC89, Frame 60).

Photo 16: SN-7, 1963 (BC4185, Frame 135).

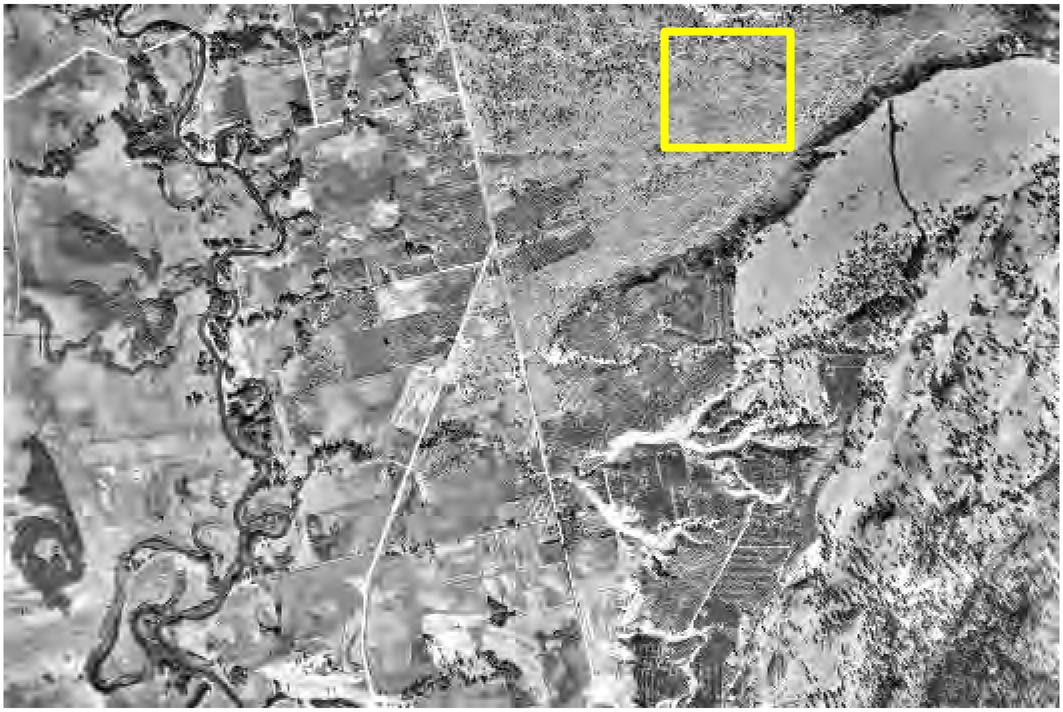


Photo 17: Penticton Gate Station, 1938 (BC105, Frame 65)

Photo 18: Penticton Gate Station, 1975 (BC5654, Frame 153)

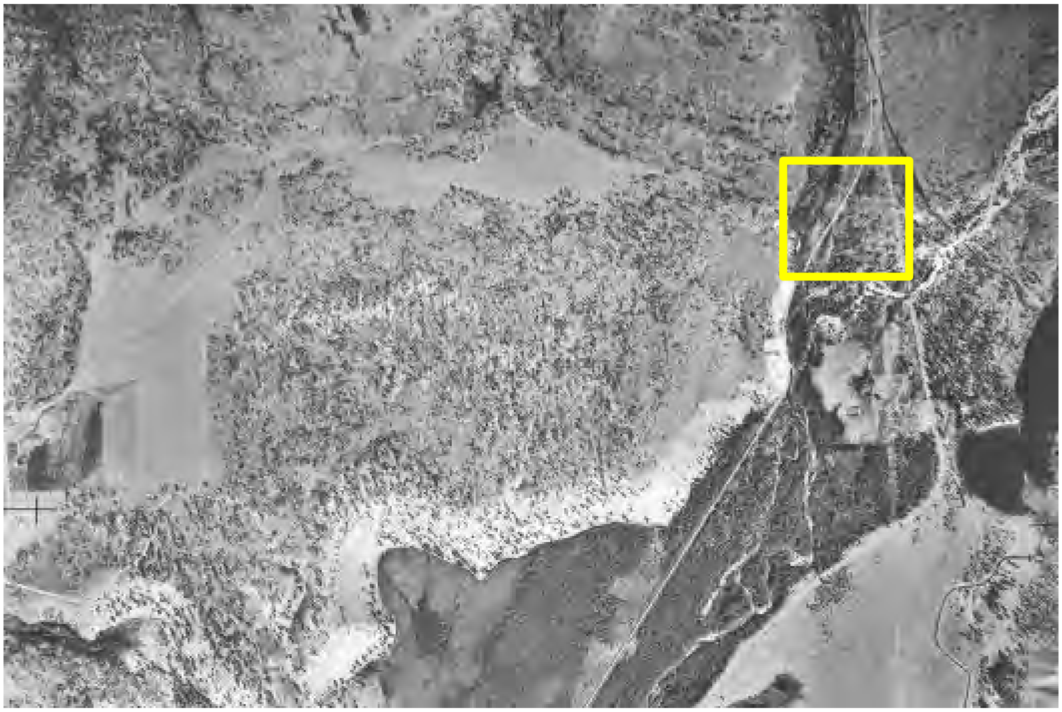


Photo 19: Oliver Y Control Station, 1938 (BC99, Frame 82).

Photo 20: Oliver Y Control Station, 1990 (BC90028, Frame 7).

Photo 21: Princeton Crossover Control Station, 1947 (BC337, Frame 30).

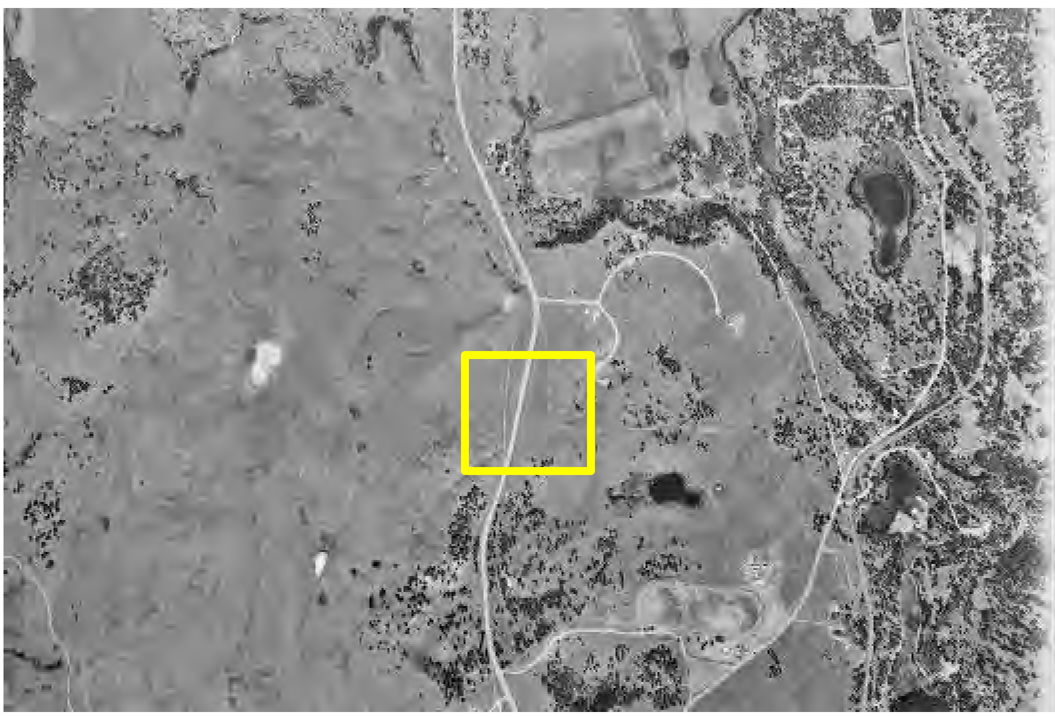


Photo 22: Princeton Crossover Control Station, 1985 (30BCC345, Frame 27).

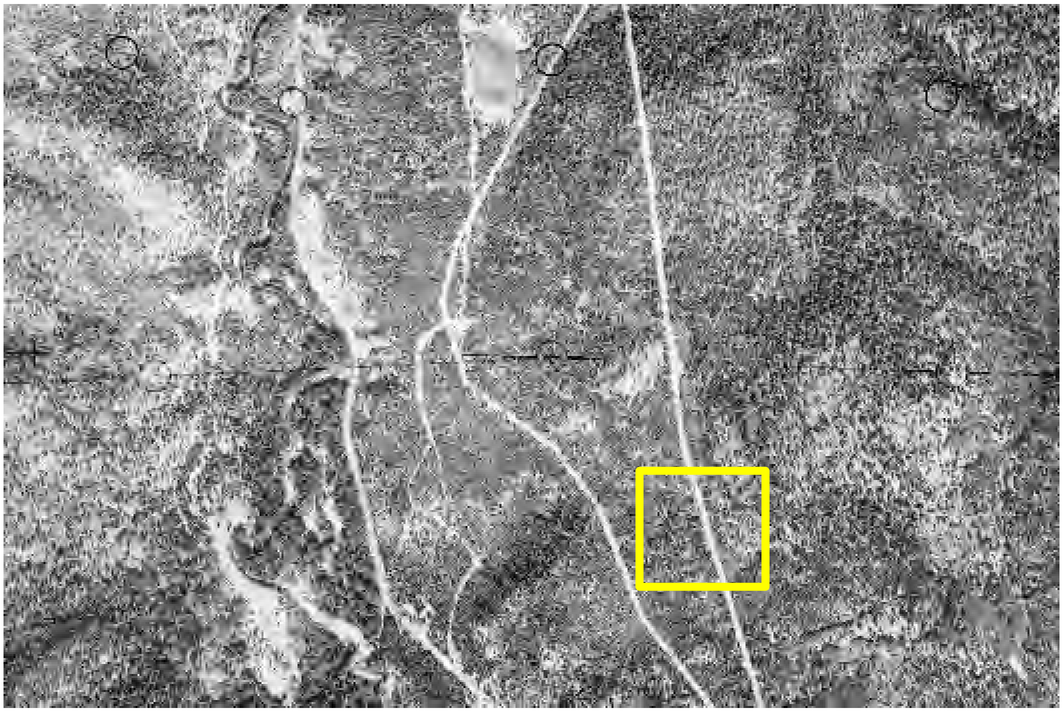


Photo 23: Kingsvale Control Station, 1960 (BC2881, Frame 49).

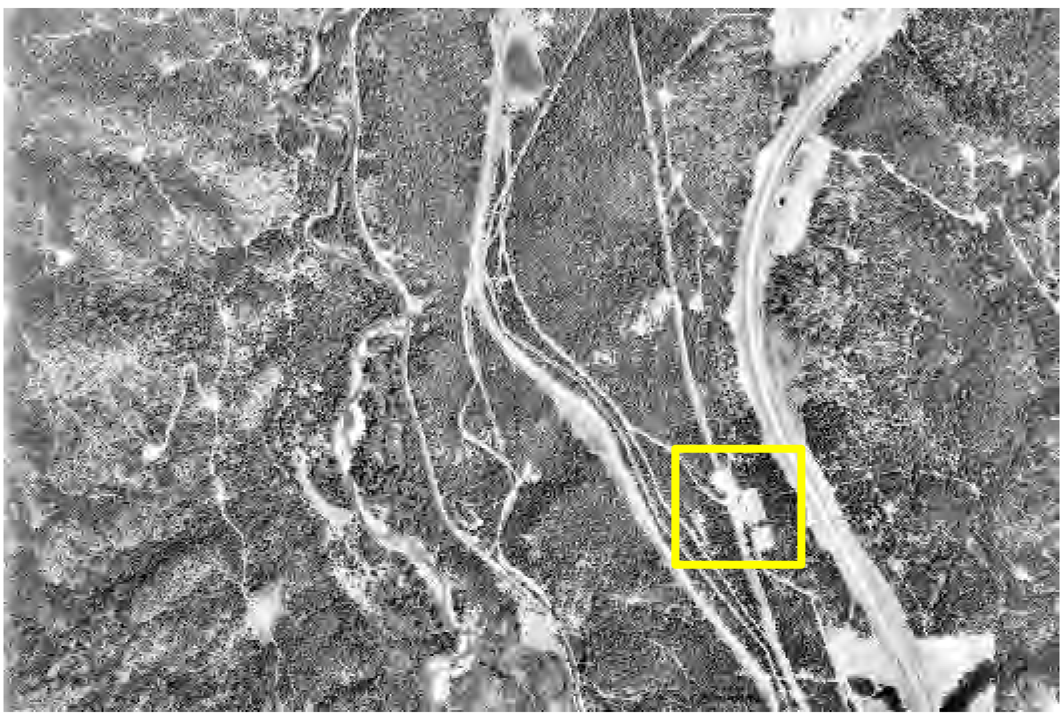


Photo 24: Kingsvale Control Station, 1986 (30BC86037, Frame 41).

Photo 25: SN 15, 1951 (BC1324, Frame 35).

Photo 26: SN 15, 1988 (15BC88098, Frame 18).

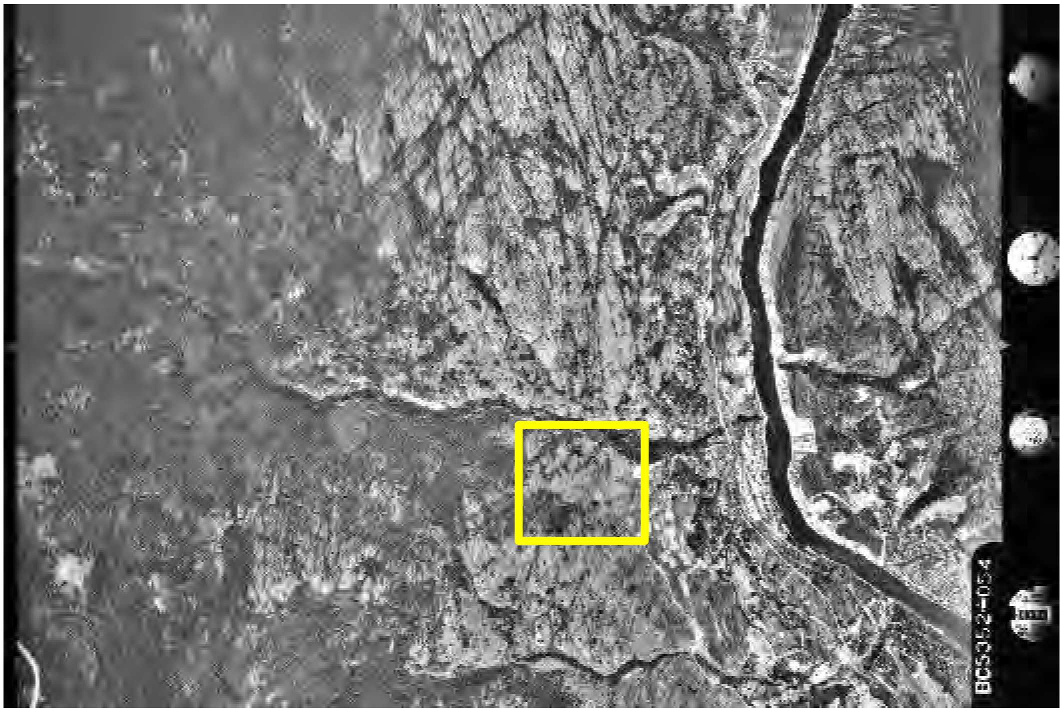


Photo 27: SN-17 Valve Station, 1963 (BC5352, Frame 54).

Photo 28: SN-17 Valve Station, 1999 (30BCB99021, Frame 64).

wood.

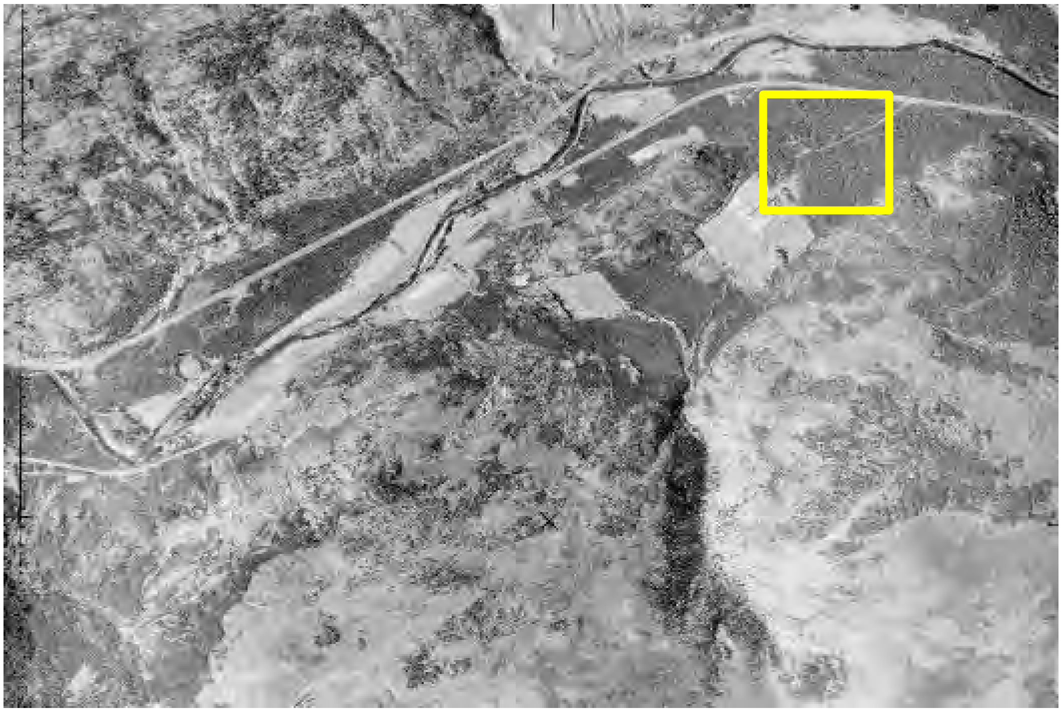


Photo 29: East Kootenay Exchange, 1947 (A9516, Frame 22).

Photo 30: East Kootenay Exchange, 1988 (30BCC838, Frame 153).

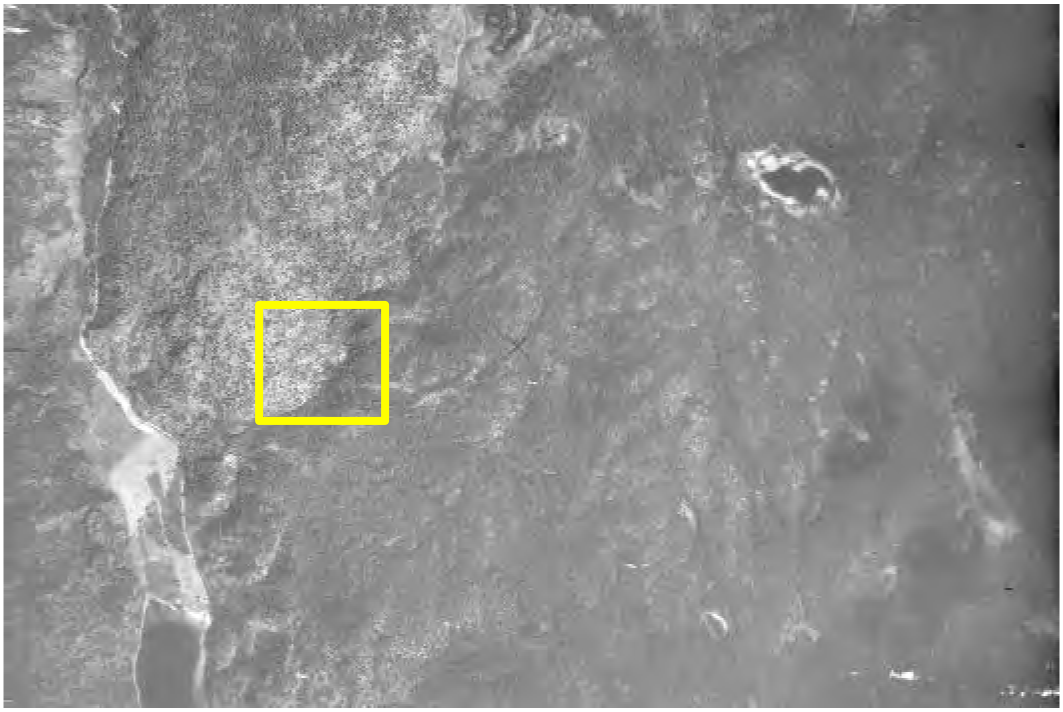


Photo 31: Event 29, 1947 (BC338, Frame 14)

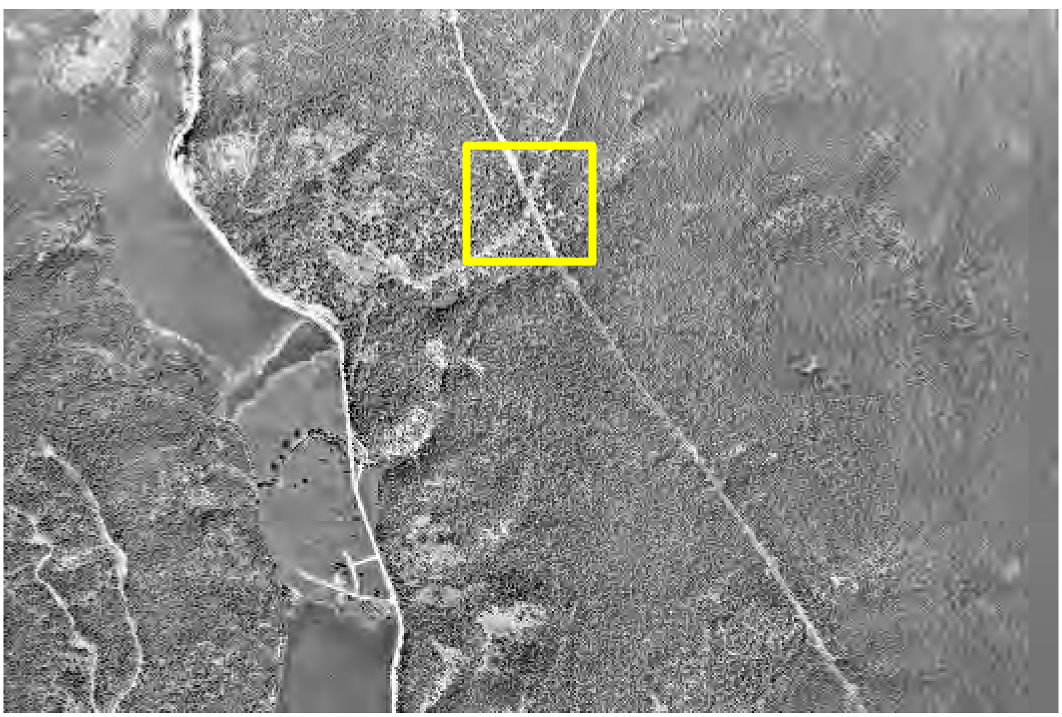


Photo 32: Event 31, 1991 (30BCC91012, Frame 37).

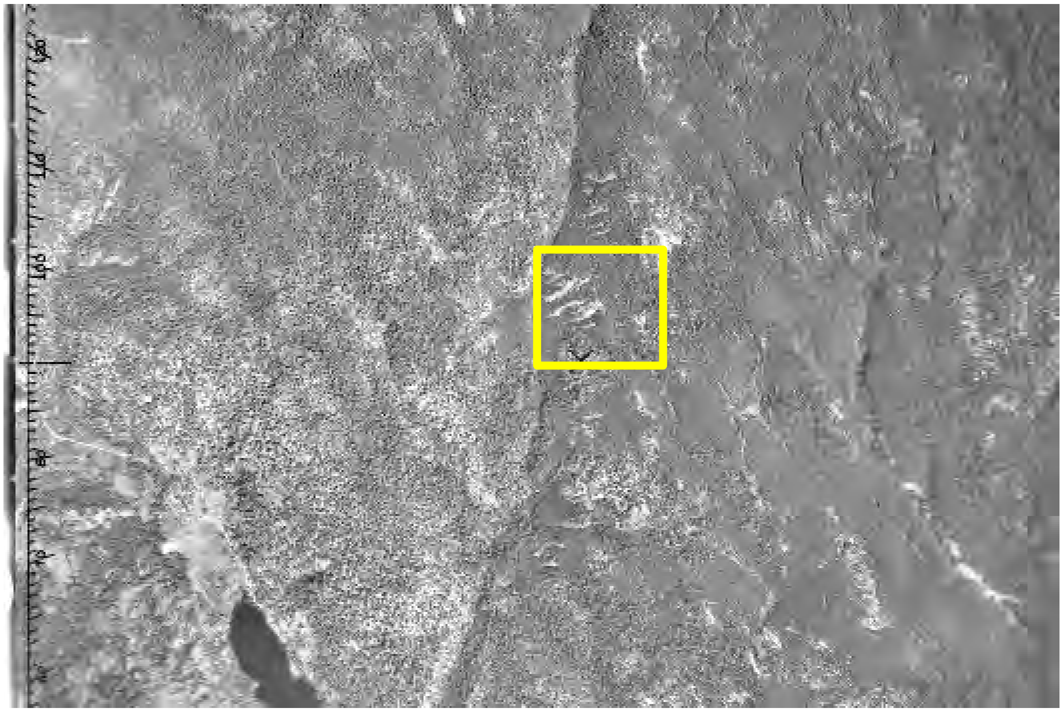


Photo 33: Event 31, 1947 (BC345, Frame 105).

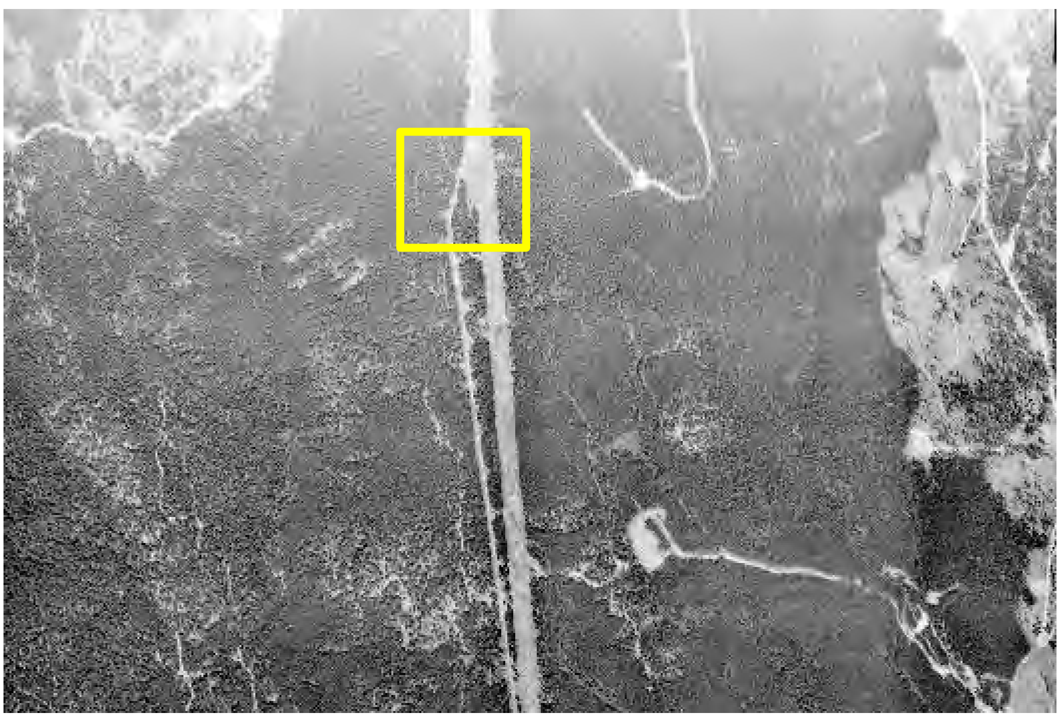


Photo 34: Event 31, 1987 (30BCC694, Frame 196).

Appendix M

CONSULTATION AND ENGAGEMENT

Appendix M-1

CONSULTATION AND ENGAGEMENT PLAN

Introduction

This document outlines FortisBC's (FEI) Consultation and Engagement Plan for the Interior Transmission System (ITS) Transmission Integrity Management Capabilities (TIMC) Project. For the purposes of the regulatory submission, the project is referred to as ITS TIMC.

The purpose of the Consultation and Engagement Plan is to ensure that local Indigenous groups and stakeholders are informed about the project, have access to project information, and have opportunities to ask questions and provide feedback.

The following consultation and engagement plan is organized as follows:

- Project Overview
- COVID-19 Considerations
- Public Consultation
    - Consultation Objectives
    - Stakeholders
    - Sequence of Consultation Activities
- Indigenous Engagement
    - Engagement Objectives
    - Indigenous groups
    - Sequence of Engagement Activities

A similar integrity project to ITS TIMC is currently planned on our Coastal Transmission System (CTS), the Transmission Integrity Management Capabilities (TIMC) Project. This project is known as CTS TIMC for regulatory purposes.

For clarity in external communications, consultation and engagement, FEI is referring to the ITS TIMC and CTS TIMC projects as:

- ITS TIMC: Interior Transmission System Upgrades (ITSU)
- CTS TIMC: Coastal Transmission System Upgrades (CTSU)

Project Overview

ITS TIMC is an integrity-driven project to ensure the safety and reliability of FEI's transmission pressure gas lines. FEI has identified issues relating to crack-like imperfections and potential hazards on four of the pipelines that comprise the ITS. The project will include upgrades to a number of gas lines and facilities in the Thompson, Okanagan and Kootenay regions. These upgrades will accommodate new electro-magnetic in-line inspection technology (EMAT). This technology will help detect further issues and maintain the integrity of the system.

FEI's analysis of the ITS to-date indicates the need for work on two pipelines. This work includes replacing pipes, fittings and bends on three sections of gas line, ranging in size from about 2.5 to 50 meters on existing rights of way, and making modifications at 13 facilities to allow those facilities to accommodate the EMAT tool. Once work is complete, FEI will run the EMAT tool through the ITS system allowing it to detect any further defects.

Work is expected to take place on existing rights of way and within FEI premises located near 35 Indigenous groups, six regional districts and seven municipalities. If approved, the work will take place in 2024-2025 in preparation for the line inspections that will take place 2025-2030.

COVID-19 Considerations

As with many other critical service providers, FEI has adapted to the challenges of COVID-19. This means continuing to advance critical projects, including ITS TIMC, to meet the energy needs of customers and communities.

FEI has adapted its approach to consultation and engagement to respect the guidance of public health authorities. For example, rather than in-person meetings FEI is consulting and engaging with interested parties via telephone, email, meetings and presentations. Various communications tactics have been adopted to support these activities, including proactively developing a project webpage, bill insert, creating a dedicated project phone number and email address.

Public Consultation

Consultation Objectives

FEI identified a number of objectives that set the framework for this project's public consultation including:

- ensure balanced and objective information is provided to all affected and interested stakeholders
- communicate the project benefits (e.g. reliability and integrity of FEI's system), and potential positive socio-economic impacts to communities as a result of construction activities
- provide opportunities for stakeholders to give feedback and to understand their concerns through an ongoing dialogue
- where possible, incorporate stakeholder feedback, and report back to stakeholders how feedback was incorporated

Stakeholders

FEI identified the following stakeholders:

Stakeholders	
Municipalities & Regional Districts	**Public**
• City of Kamloops • City of Kelowna • City of Penticton • City of Vernon • Regional District Central Kootenay, Area B • Regional District Kootenay Boundary, Area B • Regional District Kootenay Boundary, Area D • Regional District Okanagan Similkameen, Area H • Thompson-Nicola Regional District, Area J • Thompson-Nicola Regional District, Area N • Town of Oliver • Town of Princeton • Township of Spallumcheen	• Residents and businesses along the rights of way • Residents and businesses nearby the rights of way and worksites • FEI's natural gas customers • Rights holders along the rights of way

Sequence of Consultation Activities

The following table outlines the sequence of consultation activities:

Activities
Pre-CPCN Filing Consultation starting May 2021
• Consult with local government in support of the BCUC application   • Email project information letters

• Public outreach in support of the BCUC application
    • Create a dedicated web page with project details and proactive messages on potential "hot button" topics like cumulative rate impacts and moving to a lower-carbon future
    • Set up a project specific phone number and email address
    • Monitor and respond to inquiries

• Develop a plan to ensure local stakeholder socio-economic benefits are being maximized, and risks mitigated; tracking and reporting means to be developed
Post-CPCN Filing Proposed Construction 2024 - 2025
• Notify local government and landowners of the CPCN filing with the BCUC • Customer rate impact awareness as part of BCUC application (bill insert late 2022)
• Create and maintain pre-CPCN filing communication material (e.g. webpage)

• Stakeholder and local government notifications ahead of construction

• Consult with residents and businesses nearby the rights of way and worksites
  • Distribute project information letters
  • Respond to questions

• Outreach to affected communities ahead of construction to raise project awareness and respond to inquiries in advance of, and throughout construction
• Ongoing contractor/project team support to ensure positive customer and community interactions
• General outreach to thank communities where work has been completed

Indigenous Engagement

Engagement Objectives

The following objectives will inform FEI's engagement approach and activities:

- ensure balanced and objective information is provided to all affected and interested Indigenous groups prior to the CPCN filing and commencement of work activities
- engage meaningfully with Indigenous groups through transparent, frequent dialogue
- Identify issues, concerns, and shared interests early on and focus engagement on mutually agreeable solutions
- be a leader in the development of strong, mutually beneficial relationships with Indigenous groups
- build and nurture effective relationships with Indigenous groups across the province, while ensuring that FEI has the structure, resources and skills necessary to maintain these relationships
- be informed by FEI's Statement of Indigenous Principles and ensure these principles will continue to guide FEI throughout the lifecycle of this project

Indigenous Groups

FEI identified the following 35 Indigenous groups with asserted rights in the project as per the B.C. Government Consultative Areas Database (CAD) Spatial Overview Engine (SOE) Report.

Indigenous groups		
Adam's Lake Band	Lytton First Nation	Shuswap Indian Band
Ashcroft Indian Band	Neskonlith Band	Siska First Nation
Bonaparte First Nation	Scw'exmx Tribal Council	Skeetchestn Indian Band
Boothroyd Indian Band	Nicomen Band	Skuppah Indian Band

Boston Bar First Nation	Nlaka'pamux Nation Tribal Council	Splats'in First Nation
Coldwater Indian Band	Nooaitch Band	Spuzzum First Nation
Cook's Ferry Indian Band	Okanagan Indian Band	SSN (Stk'emlupsemc te Secwepemc)
Esh-kn-am Cultural Resource Management	Okanagan Nation Alliance	Tk'emlups Band
Ktunaxa Nation Council	Oregon Jack Creek Indian Band	Upper Nicola Band
Little Shuswap Lake Band	Osoyoos Indian Band	Upper Similkameen Indian Band
Lower Nicola Band	Penticton Indian Band	Westbank First Nation
Lower Similkameen Indian Band	Shackan Indian Band	

Sequence of Engagement Activities

The following table outlines the sequence of Indigenous engagement activities.

Activities
Pre-CPCN filing **Indigenous engagement started May 2021**
• Introduce project via letter with maps and spatial files (send via email) • Follow up through phone calls and email, or existing touchpoints with communities • Host virtual meetings with Indigenous groups upon request • Notify specific Indigenous groups of field work for EOA and geotechnical work as necessary
Post-CPCN Filing **Proposed Construction 2024 - 2025**
• Notify Indigenous groups of CPCN filing and share results of AOA and EOA • Ongoing engagement with Indigenous groups to identify potential effects on their interests and seek opportunities to mitigate, through collaborative, transparent and ongoing dialogue
• Support FEI contractors to ensure they are upholding FEI's standards of Indigenous Engagement
• Implementation of measures to ensure Indigenous and other local socio-economic benefits are being maximized, and risks mitigated; tracking and reporting ongoing
• Support the inclusion of Indigenous and other local businesses to work on the project
• Develop capacity funding agreements to support the involvement of interested Indigenous groups
• Develop a plan to ensure Indigenous socio-economic benefits are being maximized, and risks mitigated; tracking and reporting means to be developed

Appendix M-2

STAKEHOLDER CONSULTATION LOG

TIMC Consultation Log

Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
12-Apr-21	Email	Laura Branswell	Bryan Hansen, Permitting	MOTI	Inquiring on requirements for geotech work
13-Apr-21	Email	Laura Branswell	Bryan Hansen, Permitting	MOTI	Inquiring on requirements for geotech work
13-Apr-21	Email	Laura Branswell	Bryan Hansen, Permitting	MOTI	Inquiring on requirements for geotech work
19-Apr-21	Email	Juliet Spalding	Bryan Hansen, Permitting	MOTI	Inquiring on requirements for geotech work
21-Apr-21	Email	Juliet Spalding	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
21-Apr-21	Email	Juliet Spalding	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
22-Apr-21	Email	Tran TN Development Service	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
26-Apr-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
26-Apr-21	Email	Brandon	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
26-Apr-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
5-May-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
11-May-21	Emailed Project Information Letter	Herb Graham, Electoral Director	Matt Mason, External Relations	Thompson Nicola Regional District, Area N	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Jen Fretz, Civic Operations Director	Matt Mason, External Relations	City of Kamloops	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Ronaye Elliott, Electoral Director	Matt Mason, External Relations	Thompson Nicola Regional District, Area J	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Duncan Redfearn, CAO	Blair Weston, External Relations	City of Grand Forks	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Linda Worley, Electoral Director	Blair Weston, External Relations	Regional District Kootenay Boundary, Area B	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Mark Anderson	Blair Weston, External Relations	Regional District Kootenay Boundary, Area B	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Tanya Wall, Electoral Director	Blair Weston, External Relations	Regional District Central Kootenay, Area B	Sent introductory project information letter and KMZ map.
11-May-21	Emailed Project Information Letter	Stuart Horn	Blair Weston, External Relations	Regional District Central Kootenay, Area B	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Bob Coyne, Electoral Director	Shelley Martens, External Relations	Regional District Okanagan Similkameen, Area H	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Lyle Thomas, CAO	Shelley Martens, External Relations	Town of Princeton	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Cathy Cowan, CAO	Shelley Martens, External Relations	Town of Oliver	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Michael Hodges, Development Infrastructure Manager	Shelley Martens, External Relations	City of Penticton	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Doug Gilchrist, CAO	Shelley Martens, External Relations	City of Kelowna	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	James Rice, Manager, Public Works	Shelley Martens, External Relations	City of Vernon	Sent introductory project information letter and KMZ map.
14-May-21	Emailed Project Information Letter	Tyler McNeill, Manager of Operations	Shelley Martens, External Relations	Township of Spallumcheen	Sent introductory project information letter and KMZ map.
21-Jun-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
21-Jun-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
23-Jun-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
30-Jun-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	MOTI requirements for work at Event 1 - Cherry Creek Crossing
6-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
7-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
8-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
8-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
15-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
15-Jul-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
15-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing

TIMC Consultation Log

Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
15-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
21-Jul-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
21-Jul-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
27-Jul-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
27-Jul-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
28-Jul-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
3-Aug-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
5-Aug-21	Email	Darren Feltren	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
5-Aug-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
5-Aug-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
5-Aug-21	Email	Jennifer Powers	Bryan Hansen, Permitting	MOTI	Confirming alignment of boreholes at Cherry Creek Crossing
26-Aug-21	Email	Patrick Grzelak	Bryan Hansen, Permitting	TELUS	Confirming permit requirements
27-Aug-21	Email	Marc Vere	Bryan Hansen, Permitting	City of Penticton	Building Permit Requirements
27-Aug-21	Email	buildinginfo@penticton.ca	Bryan Hansen, Permitting	City of Penticton	Building Permit Requirements
27-Aug-21	Email	cao@princeton.ca	Bryan Hansen, Permitting	Princeton	Building Permit Requirements
27-Aug-21	Email	developmentservicesinfo@kelowna.ca	Bryan Hansen, Permitting	Kelowna	Building Permit Requirements
27-Aug-21	Email	info@grandforks.ca	Bryan Hansen, Permitting	Grandforks	Building Permit Requirements
27-Aug-21	Email	David Bruce	Bryan Hansen, Permitting	Grandforks	Building Permit Requirements
27-Aug-21	Email	Phil Savill	Bryan Hansen, Permitting	Vernon	Building Permit Requirements
8-Sep-21	Email	David Bruce	Bryan Hansen, Permitting	Grandforks	Building Permit Requirements
8-Sep-21	Email	Marc Vere	Bryan Hansen, Permitting	City of Penticton	Building Permit Requirements
8-Sep-21	Email	Phil Savill	Bryan Hansen, Permitting	Vernon	Building Permit Requirements
8-Sep-21	Email	David Bruce	Bryan Hansen, Permitting	Grandforks	Building Permit Requirements
9-Sep-21	Email	Marc Vere	Bryan Hansen, Permitting	City of Penticton	Building Permit Requirements
9-Sep-21	Email	Phil Savill	Bryan Hansen, Permitting	Vernon	Building Permit Requirements
17-Nov-21	Emailed Project Information Letter	Danna O'Donnell, Electoral Director	Blair Weston, External Relations	Regional District Kootenay Boundary, Area D	Sent introductory project information letter and KMZ map.
17-Nov-21	Emailed Project Information Letter	Mark Andison, CAO	Blair Weston, External Relations	Regional District Kootenay Boundary, Area D	Sent introductory project information letter and KMZ map.
29-Jul-21	Emailed Project Information Letter	Shelley and Michael Nohels	Cristina Vieira, Lands Department	City of Kamloops, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Jason and Crystal Hughes	Cristina Vieira, Lands Department	City of Kamloops, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Joan Tomlin	Cristina Vieira, Lands Department	City of Kamoops, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Glenn Keltie and Christine McManus	Cristina Vieira, Lands Department	City of Kamloops, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	PRT Growing Services Ltd.	Cristina Vieira, Lands Department	Township of Spallumcheen, Business Owner	Notification of upcoming field investigation studies

TIMC Consultation Log

Date	Consultation Type	External Representative	FEI Representatives	Stakeholder	Consultation Summary
29-Jul-21	Emailed Project Information Letter	AM Sandher Farms Ltd.	Cristina Vieira, Lands Department	Township of Spallumcheen, Business Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Kaleb Harris	Cristina Vieira, Lands Department	City of Armstrong, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Kevin and Laura Shaw	Cristina Vieira, Lands Department	City of Armstrong, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	George and Velma Davis	Cristina Vieira, Lands Department	City of Vernon, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Dawn and Karl Kastor	Cristina Vieira, Lands Department	Town of Princeton, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Craig Lemottee and Renee Willis	Cristina Vieira, Lands Department	Town of Princeton, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Westcoast Energy Inc. C/O Spectra Energy Corporation	Cristina Vieira, Lands Department	City of Merritt, Business Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Mary and Jon Jaggers	Cristina Vieira, Lands Department	City of Grand Forks, Property Owner	Notification of upcoming field investigation studies
29-Jul-21	Emailed Project Information Letter	Antonius and Theresa Niers	Cristina Vieira, Lands Department	City of Trail, Property Owner	Notification of upcoming field investigation studies
16-Jun-21	Emailed Project Information Letter	Shelley and Michael Nohels	Cristina Vieira, Lands Department	City of Kamloops, Property Owner	Notification of upcoming field investigation studies on their property
16-Jun-21	Emailed Project Information Letter	Joan Tomlin	Cristina Vieira, Lands Department	City of Kamloops, Property Owner	Notification of upcoming field investigation studies on their property
16-Jun-21	Emailed Project Information Letter	George and Velma Davis	Cristina Vieira, Lands Department	City of Vernon, Property Owner	Notification of upcoming field investigation studies near their property
16-Jun-21	Emailed Project Information Letter	Westcoast Energy Inc. C/O Spectra Energy Corporation	Cristina Vieira, Lands Department	City of Merritt, Business Owner	Notification of upcoming field investigation studies on their property
16-Jun-21	Emailed Project Information Letter	Mary and Jon Jaggers	Cristina Vieira, Lands Department	City of Grand Forks, Property Owner	Notification of upcoming field investigation studies on their property
16-Jun-21	Emailed Project Information Letter	Antonius and Theresa Niers	Cristina Vieira, Lands Department	City of Trail, Property Owner	Notification of upcoming field investigation studies on their property

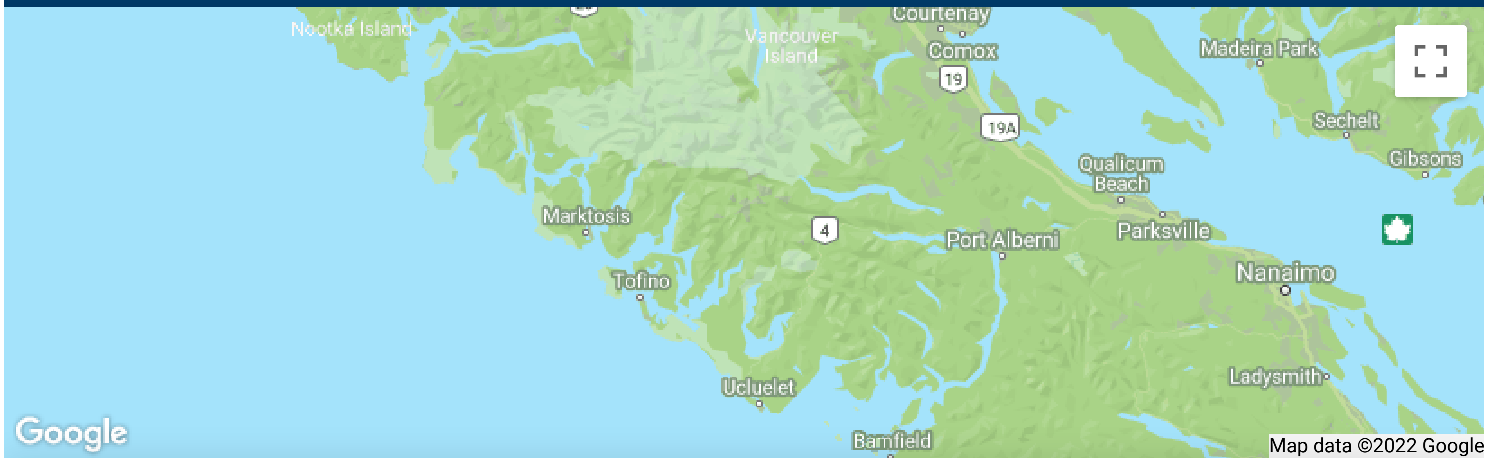
Appendix M-3

PROJECT WEBPAGE

FORTIS BC Energy at work

TRANSMISSION SYSTEM UPGRADES

Interior Transmission System Upgrades



Overview Updates Q&A's Community

About this project

We're planning work on our natural gas system at a number of locations throughout the interior of British Columbia as part of our Interior Transmission System Upgrades project. Similar to the Coastal Transmission System Upgrades project, this work will further enhance the safety and reliability of the system we use to supply natural gas to more than 195,000 homes and businesses. Much of our work throughout Interior BC will take place at rural locations and will have minimal impact on residents and businesses.

Why we're upgrading these gas lines

Our Interior Transmission System includes more than 700 kilometres of gas lines and facilities that move gas throughout BC's southern interior to communities in the West Kootenay, Okanagan Valley and South Thompson Valley. These lines have an excellent record for both safety and reliability because of the ongoing maintenance work we conduct.

The work planned as part of the Interior Transmission System Upgrades project will enhance our ability to monitor the condition of our lines by allowing us to use new, advanced inspection tools. We will build on our

Construction overview

In-line inspection tools are already in use to inspect the inside of gas lines at numerous location in our system, including here near Penticton.

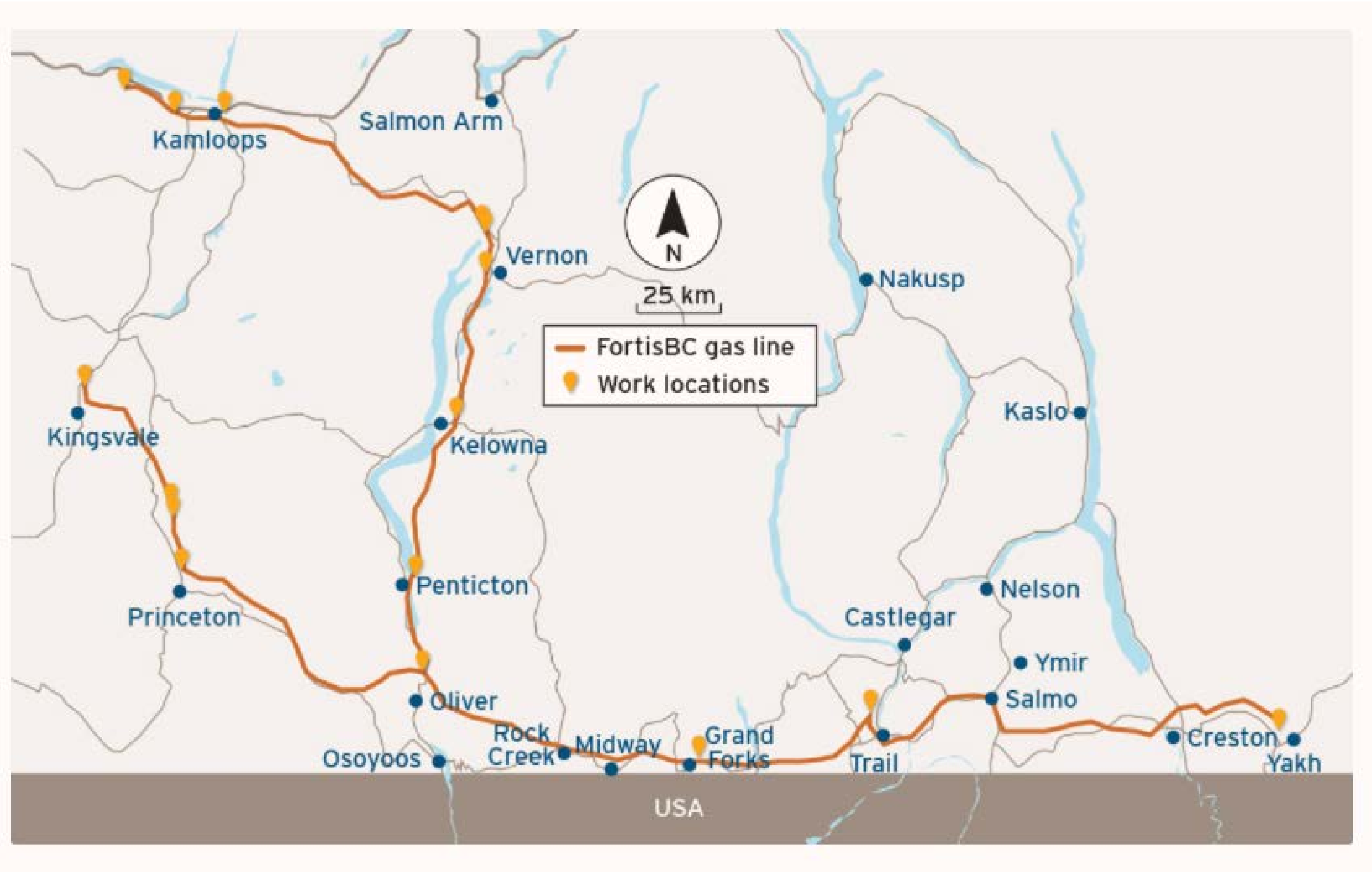
We'll be replacing sections of our gas lines and upgrading facilities to allow us to use new inspection tools in our Interior Transmission System. We expect worksites to range in size from about 2.5 metres to 50 metres long. This work will take place at 16 locations on and near existing FortisBC rights of way and facilities in BC's interior.

Some work may impact nearby roads and paths. We will work directly with stakeholders, Indigenous groups, and nearby homes and businesses to identify and minimize disruptions.

FORTIS BC Energy at work

place 2025-2030.

Construction locations



City of Kamloops

Facility work

- upgrades to our facility off Saskatoon Place

City of Kelowna

Facility work

- upgrades to our facility at the corner of Cary Road and Enterprise Way

City of Penticton

- upgrades to our facility on Warren Avenue West and Government Street

City of Vernon

Facility work

- upgrades to our facility along Davidson Road, off Bella Vista Road

Regional District Central Kootenay, Area B

Facility work

- upgrades to our facility off Highway 95 near Barnhardt Road

Regional District Kootenay Boundary, Area B

Facility work

- upgrades to the gas line west of Highway 22, near Riverdale

Regional District Kootenay Boundary Area D

Facility work

- upgrades to our facility along Como Road

Regional District Okanagan Similkameen, Area H

Gas line work

- replace two small sections of gas line within the existing right of way just off Highway 5A northwest of Allison lake
- replace a valve assembly off Highway 5A southeast of Allison Lake

Regional District of Thompson-Nicola, Area J

Gas line work

Facility work

- upgrades to our facility along Tunkwa Lake Road

Regional District of Thompson-Nicola, Area N

Facility work

- upgrades to our facility on Suttie Road, off Coldwater Road

Town of Oliver

Facility work

- upgrades to our facility on Highway 97, near Gallagher Lake

Town of Princeton

Facility work

- upgrades to our facility along Highway 5A, near Sunflower Estates Road

Township of Spallumcheen

Facility work

- upgrades to our two facilities on St. Annes Road

Project timelines and next steps

We're in the early planning stages of this project and engaging with local municipalities, Indigenous groups, landowners and local residents. We will continue to provide engagement opportunities throughout the project, and can be contacted directly at 1-888-486-0138 and interiortransmission@fortisbc.com.

Engagement began

2022

BCUC application filing expected

2023

BCUC decision expected

2024-2026

Construction

2025-2030

Gas line inspections complete

CALL US

1-888-486-0138

EMAIL US

interiortransmission@fortisbc.com

ASK US

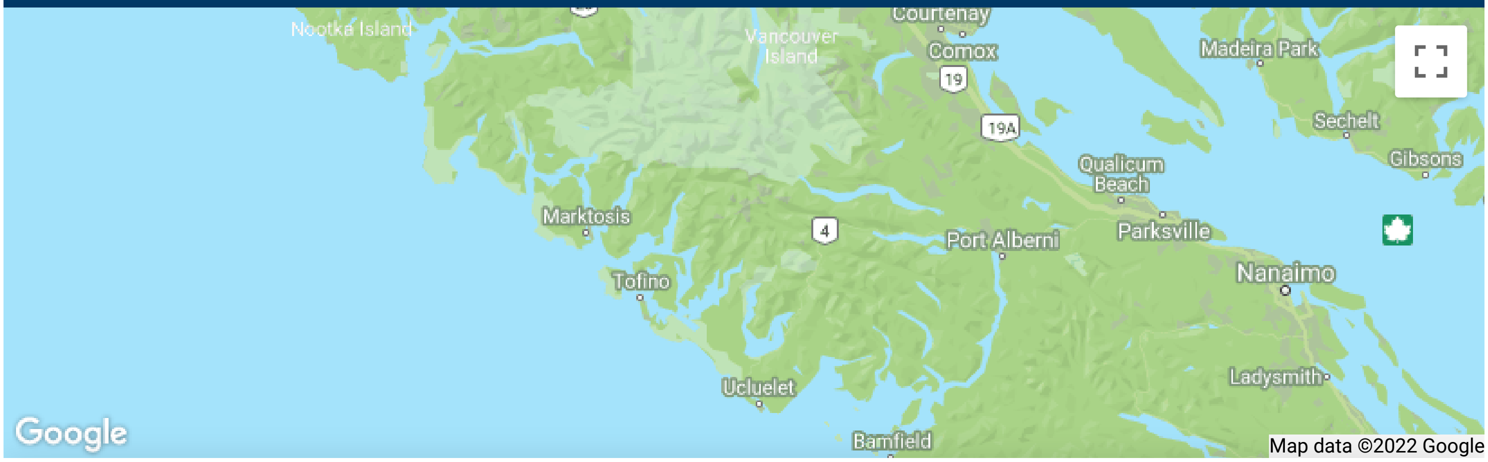
Ask a question

Privacy Policy

FORTIS BC Energy at work

TRANSMISSION SYSTEM UPGRADES

Interior Transmission System Upgrades



Overview | **Updates** | Q&A's | Community

SEPTEMBER 30, 2021

Engagement underway to support project planning

We've started engaging with stakeholders, Indigenous groups and those living and working near the project worksites to gather feedback that will help us prepare our application for the British Columbia Utilities Commission (BCUC). We expect to submit our application to the BCUC in 2022. If approved, the construction will occur in 2024-2026 in preparation for line inspections that will take place 2025-2030.

Before construction takes place, we'll work with communities, Indigenous groups, stakeholders and municipalities to minimize local disruptions.

If you want to know more, ask questions or provide feedback, call us at 1-888-486-0138 or interiortransmission@fortisbc.com.

READ LESS

CALL US

1-888-486-0138

EMAIL US

interiortransmission@fortisbc.com

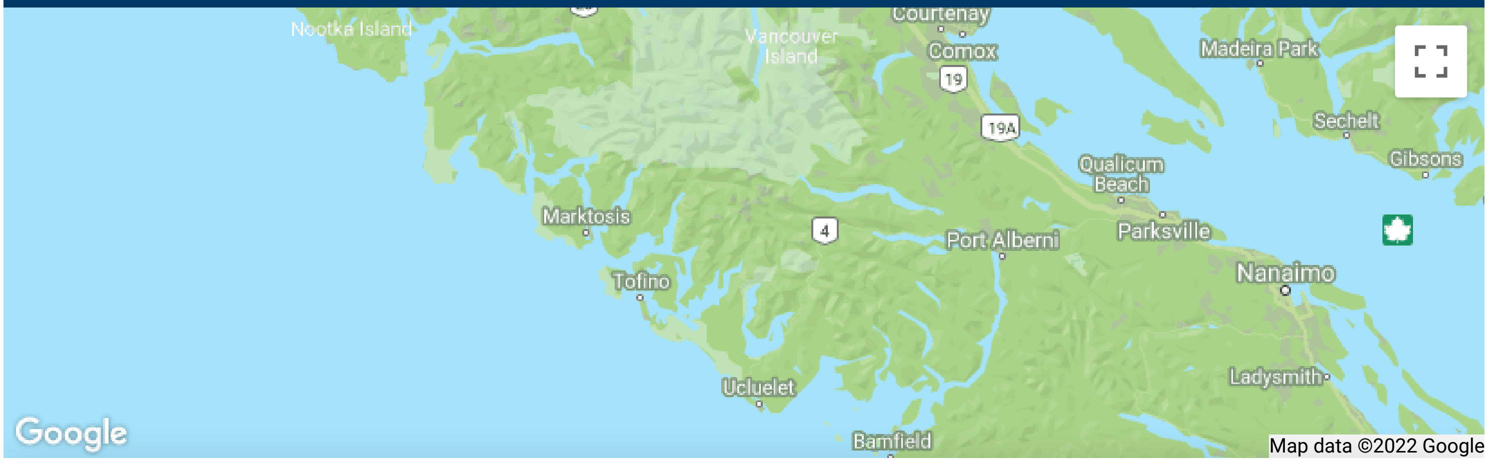
ASK US

Ask a question

FORTIS BC Energy at work

TRANSMISSION SYSTEM UPGRADES

Interior Transmission System Upgrades



Overview Updates **Q&A's** Community

Search

Search

SORT BY:

Featured and recent

FILTER BY:

All topics

Displaying 10 out of 10 questions and answers.

What is the purpose of the Interior Transmission System Upgrades project?

PROJECT INFO SAFETY BENEFITS

The Interior Transmission System Upgrades project will enhance the safety and reliability of the system we use to supply natural gas to hundreds of thousands of homes and businesses. The work will enhance our ability to monitor the condition of our gas lines by allowing us to use new, advanced in-line inspection provide safe, reliable service for many decades to come.

READ LESS

ANSWERED ON:

Sep 30, 2021

Why are you working in the community during a pandemic?

PROJECT INFO SAFETY

As an essential service, we're continuing to move projects forward that support the energy needs of our customers while adapting to the challenges of the COVID-19 pandemic. These upgrades are part of this critical work, so we can continue providing the reliable service residents and businesses count on.

Safety is at the heart of everything we do. While working in the community, our crews will continue to take appropriate physical distancing measures to ensure their safety, as well as the safety of area residents.

On the rare occasion physical distancing isn't possible, our crews will have access to additional personal protective equipment such as respiratory, eye and hand protection, to further reduce the risk of infection.

Learn more about how we're working safely during the pandemic.

READ LESS

ANSWERED ON:

Sep 30, 2021

Will I lose my natural gas service when this work is taking place?

PROJECT INFO COMMUNITY ENGAGEMENT CONSTRUCTION

We will work with our contractor to ensure gas service is maintained to all customers throughout construction on this project.

FORTIS BC Energy at work

READ LESS

ANSWERED ON:

Sep 30, 2021

Is FortisBC planning any other work in my area?

PROJECT INFO COMMUNITY ENGAGEMENT CONSTRUCTION

We regularly maintain our infrastructure to ensure the safe and reliable delivery of our energy to our customers. This includes upgrading gas and electricity lines – which may require crews to work along roads – as well as managing vegetation near our facilities and rights of way. Learn more about the work planned for your neighbourhood.

We appreciate your patience and co-operation as we try to minimize disruptions and complete the work in your neighbourhood as quickly and safely as possible.

READ LESS

ANSWERED ON:

Sep 30, 2021

How can I stay updated on the project?

PROJECT INFO COMMUNITY ENGAGEMENT CONSTRUCTION

We'll keep this project webpage updated with the latest news as the project progresses. You can also sign up for our Talking Energy newsletter that includes updates on the Interior Transmission System Upgrades project.

READ LESS

ANSWERED ON:

Sep 30, 2021

FORTIS BC Energy at work

Who do we contact if we have questions about the project?

PROJECT INFO | COMMUNITY ENGAGEMENT | CONSTRUCTION

If you have any questions about the project, we're happy to speak with you. Please call us at 1-888-486-0138 or interiortransmission@fortisbc.com.

ANSWERED ON:

Sep 30, 2021

Why is FortisBC still investing in natural gas instead of exploring cleaner energy solutions?

PROJECT INFO | ENVIRONMENT

We're exploring cleaner energy solutions like Renewable Natural Gas (RNG) and hydrogen. However, we expect natural gas will continue playing an important role in moving BC towards a lower-carbon future.

We're focused on keeping affordable natural gas available to our customers, while lowering the carbon footprint of natural gas by increasing the amount of carbon neutral RNG. RNG is interchangeable with conventional natural gas. We can inject it into our natural gas distribution system, reducing the amount of conventional natural gas needed.

We're aiming to produce 15 per cent of our natural gas supply with RNG by 2030. Sustainable energy sources like renewable gases will play a big part in helping us meet our 30BY30 target to reduce our customers' greenhouse gas emissions 30 per cent by 2030. Check out more about what we're doing to partner for climate action.

READ LESS ▲

ANSWERED ON:

Sep 30, 2021

PROJECT INFO CONSTRUCTION

If approved, project construction work will occur in 2024-2026 in preparation for the line inspections that will take place 2025-2030.

ANSWERED ON:

Sep 30, 2021

Are there employment opportunities with this project?

PROJECT INFO CONSTRUCTION

If you are a contractor or vendor interested in providing goods or services to the Interior Transmission System Upgrades project or for other ongoing work, please complete our procurement form.

If you are interested in career opportunities, please visit our careers site.

READ LESS

ANSWERED ON:

Sep 30, 2021

Have you spoken with residents, local government and Indigenous communities about this project?

PROJECT INFO COMMUNITY ENGAGEMENT

We began engagement on the Interior Transmission System Upgrades project earlier in 2021 and will continue throughout the duration of the project. We are reaching out to residents, local governments, Indigenous communities and anyone else who holds interest in the areas of the Interior Transmission System Upgrades project.

addressing any feedback or questions that may arise.

READ LESS

ANSWERED ON:

Sep 30, 2021

CALL US

1-888-486-0138

EMAIL US

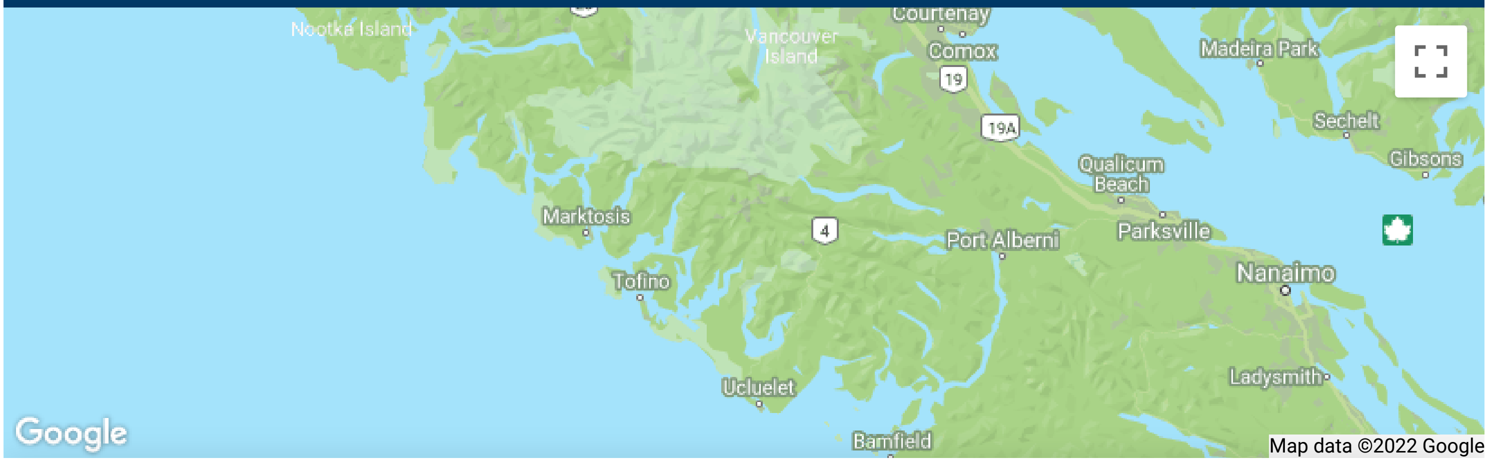
interiortransmission@fortisbc.com

ASK US

Ask a question

TRANSMISSION SYSTEM UPGRADES

Interior Transmission System Upgrades



Our commitment

We believe serving the community is a privilege. That's why we're committed to engaging with Indigenous groups, local communities and other stakeholders as we move forward with planning for the Interior Transmission System Upgrades. We'll keep you informed every step of the way.

Work is planned for the following communities:

- City of Kamloops
- City of Kelowna
- City of Penticton
- City of Vernon
- Regional District of Central Kootenay
- Regional District of Kootenay Boundary
- Regional District of Okanagan Similkameen

- Town of Oliver
- Town of Princeton
- Township of Spallumcheen

CALL US

1-888-486-0138

EMAIL US

interiortransmission@fortisbc.com

ASK US

Ask a question

Privacy Policy

Appendix M-4

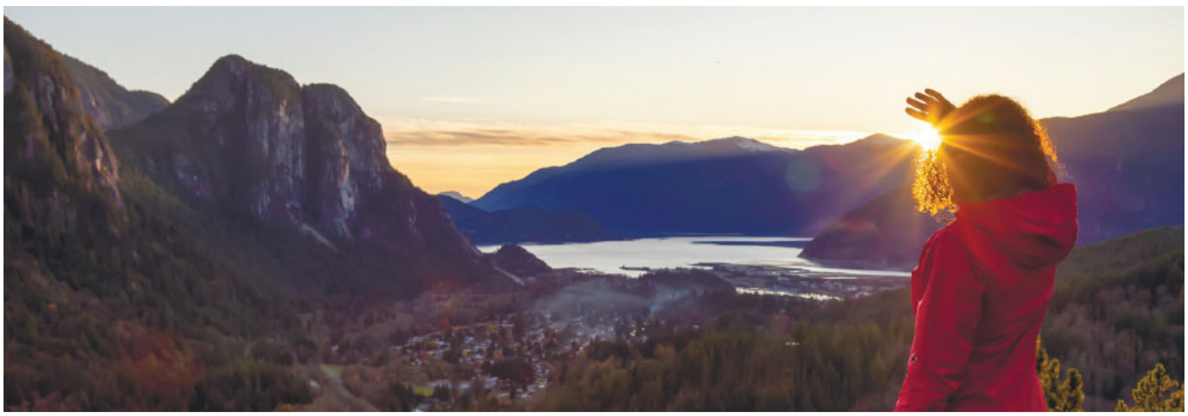
TALKING ENERGY NEWSLETTER

2021-12-1

FORTIS BC™
Energy at work

Talking Energy

Your source for key project updates



2021 in review: our project highlights and milestones

We've kept the momentum going on critical energy infrastructure projects this year to ensure our customers have the energy they need now and in the future. Read an overview of some of this year's project highlights and milestones, what's coming up in 2022 and how we've raised awareness, and kept communities informed, about our projects.

5 reasons we're investing in gas as part of the climate solution

Could investing in our gas system support the Clean BC Roadmap to 2030? Yes! We see a future where BC's existing natural gas and electricity systems are both working to reduce greenhouse gas emissions and meet climate action targets—delivering carbon-neutral energy like Renewable Natural Gas and hydrogen gas to millions of British Columbians. In fact, our goal is for the gas in our system to be 75 per cent renewable by 2050.

This diversified approach to decarbonized energy will give you the reliable, affordable energy you need for your home or business.

Find out how we're investing in our gas system today in support of a lower-carbon tomorrow.

FortisBC contributes to CleanBC

FortisBC is part of a CleanBC project that's turning emissions from a Vancouver landfill into carbon-neutral Renewable Natural Gas (RNG). This RNG will be incorporated into our system, helping reduce emissions for the region. Learn more about the project and the importance of RNG in a lower-carbon future.

Working in environmentally sensitive areas

Whenever we work on our gas system, we take steps to protect environmentally sensitive areas. For the Pattullo Gas Line Replacement project in Burnaby, protecting the watercourses, greenspaces, fish and wildlife near our project site is an ongoing focus for our team. Learn more about how we're working to protect and minimize impact to Burnaby's natural environment.

Supporting local businesses provides benefits for entire community

When companies hire local suppliers for their projects, it can help provide economic and employment benefits for entire communities. The expansion of the Tilbury LNG facility in Delta is an example of that. More than 350 BC businesses have worked on the expansion to date, including Surrey-based engineering firm Solaris Management Consultants Inc. Read more about natural gas specialist

Solaris and its work on our projects including the expansion of our Tilbury facility, as well as some of the other local companies we've hired to work on the project.

Continuing our legacy of pipeline safety

FortisBC has safely owned and operated gas pipelines for more than 60 years. We're continuing our legacy of pipeline safety with a proposed 47-kilometre expansion of our gas pipeline system in the Squamish area, and a further three kilometres just outside of Coquitlam's Westwood Plateau. Find out how safety will be embedded into the Eagle Mountain – Woodfibre Gas Pipeline project at every stage—from design to operation and every step in between.

Partnership makes safety internship possible

Investing in local and Indigenous communities where our projects are located is important to us. One of the ways we do that is to help develop local talent. That's why we partnered with Cranbrook-based ProActive Safety & First Aid to create an intern field safety officer position for Ktunaxa Nation member Shane Gravelle. Read about how ProActive Safety & First Aid is providing safety solutions for our Inland Gas Upgrades project worksites in southeastern BC and how its mentorship made this talent development initiative possible.

Interior Transmission System Upgrades

We're planning work on our gas system at a number of locations throughout the interior of BC. This work will further enhance the safety and reliability of the system we use to supply gas to more than 195,000 homes and businesses. If our regulatory application is approved by the BC Utilities Commission, we expect project construction work to occur in 2024-2026. Visit our project page to learn more.

Connect with us

16705 Fraser Hwy, Surrey, BC V4N 0E8

Appendix M-5

PROJECT NOTIFICATION LETTERS TO MUNICIPALITIES

[redacted]
City of Kamloops
[redacted]

May 11, 2021

Re: Interior Transmission System Upgrades project

FortisBC would like to notify you of the proposed Interior Transmission System Upgrades project that may occur in your community.

We are planning upgrades to our Interior Transmission System, which provides natural gas to the Okanagan, Kootenays, and portions of the Thompson at three (3) sections along our natural gas lines and at twelve (12) facilities. The upgrades will allow us to run specialized in-line inspection tools through our transmission system, improving our ability to monitor the condition of our gas lines.

This inspection method provides detailed information about the condition of each line, allowing us to better plan and manage maintenance work. Some of this work will require us to replace gas lines or fittings. In other locations, work will be limited to mechanical improvements and other modifications within our existing stations.

Work within the City of Kamloops
We are planning work at two (2) of our facilities in the City of Kamloops, as part of this project. The work locations are included in the attached map and indicated below. We are also carrying out early engagement activities with Indigenous groups and landowners on rights of way who may be impacted by this project.

- SN 3-1 - Addition of clamp-on ultrasonic flowmeter and telemetry
- SN 3 - Addition of clamp-on ultrasonic flowmeter and telemetry

Regulatory process
FortisBC is required to apply for a Certificate of Public Convenience and Necessity (CPCN) from our regulator, the BC Utilities Commissions (BCUC), in order to proceed with this project. As a regulated utility, FortisBC requires a CPCN from the BCUC for major projects that may affect rates paid by FortisBC customers. This requires us to demonstrate the need for the project, as well as provide evidence that planning and engagement has been completed in a satisfactory manner, including engaging with those living, working and representing the areas where work is planned to take place.

We are planning to submit our CPCN application to the BCUC in early 2022. If approved, construction is anticipated to take place from 2024-2025.

Next steps
It is important to us that we work with the community to identify any concerns and to answer questions. If you have any questions, please contact me directly at 250.717.0815 or by email at matt.mason@fortisbc.com. Additionally, if you would like to be kept informed of the project's progress please let me know.

Sincerely,

Matt Mason
Community & Indigenous Relations Manager

Appendix M-6

PROJECT NOTIFICATION LETTERS TO PROPERTY OWNERS

FortisBC Energy Inc.
16705 Fraser Hwy
Surrey, BC V4N 0E8
www.fortisbc.com

July 29, 2021

«Owner_Name_and_Address»

Re: Transmission System Upgrades - «Property_Location»

FortisBC is planning work on our natural gas system at a number of locations in the Interior as part of our Transmission System Upgrades. This multi-year project will improve our ability to monitor the condition of our gas lines by allowing us to use advanced in-line inspection tools, as well as complete related maintenance. The intention is that this work will occur at locations within the Interior on and near existing FortisBC rights-of-way and facilities.

The above referenced property has been identified as one of the locations that may be included in the scope of this project. As part of the early planning of the upgrades, FortisBC will be carrying out field studies which may include geotechnical, environmental and archeological assessments. Although the actual construction work won't be undertaken for a couple of years, the preliminary field studies will start as early as the week of August 19th. To support these studies, we will require access to your property. Please note, the crew will be following all COVID related safety protocols, including wearing masks, physical distancing and hand hygiene, please respect their workspace and avoid any close contact with them.

We will do our best to reach you by telephone prior to accessing your property. If you have contact information you wish to provide, instructions with regard to accessing the property or questions, please contact the writer at cristina.vieira@fortisbc.com or (604) 576-7254.

We appreciate your patience and cooperation during this process.

Sincerely,

FortisBC Energy Inc.

CVieira

Cristina Vieira
Land Representative
FortisBC Energy Inc.

Appendix N

INDIGENOUS ENGAGEMENT

Appendix N-1

STATEMENT OF INDIGENOUS PRINCIPLES

Statement of Indigenous Principles

FortisBC is committed to building effective Indigenous relationships and to ensuring we have the structure, resources and skills necessary to maintain these relationships.

To meet this commitment, the actions of the company and its employees will be guided by the following principles:

- *FortisBC companies acknowledge, respect and understand that Indigenous Peoples have unique histories, cultures, protocols, values, beliefs and governments.*
- *FortisBC supports fair and equal access to employment and business opportunities within FortisBC companies for Indigenous Peoples.*
- *FortisBC supports fair and equal access employment and business opportunities within FortisBC companies for Indigenous Peoples.*
- *FortisBC will develop fair, accessible employment practices and plans that ensure Indigenous Peoples are considered fairly for employment opportunities within FortisBC.*
- *FortisBC will strive to attract Indigenous employees, consultants and contractors and business partnerships.*
- *FortisBC is committed to dialogue through clear and open communication with Indigenous communities on an ongoing and timely basis for the mutual interest and benefit of both parties.*
- *FortisBC encourages awareness and understanding of Indigenous issues within its work force, industry and communities where it operates.*
- *To achieve better understanding and appreciation of Indigenous culture, values and beliefs, FortisBC is committed to educating its employees regarding Indigenous issues, interests and goals.*
- *FortisBC will ensure that when interacting with Indigenous Peoples, its employees, consultants and contractors demonstrate respect, and understanding of Indigenous Peoples' culture, values and beliefs.*
- *To give effect to these principles, each of FortisBC's business units will develop, in dialogue with Indigenous communities, plans specific to their circumstances.*

FORTIS BC

Appendix N-2

SPATIAL OVERVIEW ENGINE REPORT

SOE Report

Report Name: GRF-TRA Event 7

Report Date: Thu Mar 25 17:01:36 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Osoyoos Indian Band
Contact Title	OIB Referrals
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	2504983444

Contact Fax	2504986577
Contact Email	referrals@oib.ca
Public Contact Comment	

Contact Name	x
Contact Title	x
Contact Organization	x
Contact Address	x
Contact City	x
Contact Province	x
Contact Postal Code	V0G 2J0
Contact Phone	
Contact Fax	
Contact Email	test
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3

Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Contact Name	Splats'in First Nation
Contact Title	Chief and Council
Contact Organization	Splatsin First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	2508386496
Contact Fax	2508382131
Contact Email	referrals@splatsin.ca
Public Contact Comment	

Contact Name	Shuswap Band
Contact Title	Referrals
Contact Organization	Shuswap Indian Band
Contact Address	RR#2 3A - 492 Arrow Rd
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	
Contact Fax	
Contact Email	referrals@shuswapband.ca
Public Contact Comment	

Contact Name	Dwayne Spence
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC

Contact Postal Code	V0A 1K2
Contact Phone	2503413678
Contact Fax	5879999500
Contact Email	dspence@shuswapband.ca
Public Contact Comment	

Contact Name	Ktunaxa Nation Council
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council Society
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	2504892464
Contact Fax	2504895760
Contact Email	referrals@ktunaxa.org
Public Contact Comment	Contact information for Ktunaxa Nation Council at the main office in Cranbrook, BC. The office is located at 220 Cranbrook Street North (2nd Street North).

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. The Contacts for First Nation Consultation Area Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

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SOE Report

Report Name: KIN PRI Event 29

Report Date: Thu Mar 25 17:11:03 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Boston Bar First Nation
Contact Title	Chief and Council
Contact Organization	Boston Bar First Nation
Contact Address	P.O. Box 369
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K1C0
Contact Phone	6048678844
Contact Fax	6048679317
Contact Email	tray69770@msn.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0

Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC

Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft

Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19

Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Upper Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Upper Similkameen Indian Band
Contact Address	PO Box 220
Contact City	Hedley
Contact Province	BC
Contact Postal Code	V0X 1K0
Contact Phone	2502928733
Contact Fax	2502928753
Contact Email	referrals@usib.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band

Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: KIN PRI Event 31

Report Date: Thu Mar 25 17:12:29 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Boston Bar First Nation
Contact Title	Chief and Council
Contact Organization	Boston Bar First Nation
Contact Address	P.O. Box 369
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K1C0
Contact Phone	6048678844
Contact Fax	6048679317
Contact Email	tray69770@msn.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0

Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC

Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft

Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19

Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Upper Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Upper Similkameen Indian Band
Contact Address	PO Box 220
Contact City	Hedley
Contact Province	BC
Contact Postal Code	V0X 1K0
Contact Phone	2502928733
Contact Fax	2502928753
Contact Email	referrals@usib.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band

Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-PEN Event 46

Report Date: Thu Mar 25 16:40:23 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154

Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519

Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band

Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council

Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band

Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band
Contact Title	Chief and Council
Contact Organization	Little Shuswap Lake Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	referrals@lslib.com
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. The Contacts for First Nation Consultation Area Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

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SOE Report

Report Name: OLI GRF Event 2

Report Date: Thu Mar 25 16:49:45 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154

Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519

Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band

Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council

Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Osoyoos Indian Band

Contact Title	OIB Referrals
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	2504983444
Contact Fax	2504986577
Contact Email	referrals@oib.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: GRF TRA Event 2

Report Date: Thu Mar 25 16:56:05 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have

multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Osoyoos Indian Band
Contact Title	OIB Referrals
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	2504983444
Contact Fax	2504986577
Contact Email	referrals@oib.ca
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761

Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Contact Name	Splats'in First Nation
Contact Title	Chief and Council
Contact Organization	Splatsin First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0

Contact Phone	2508386496
Contact Fax	2508382131
Contact Email	referrals@splatsin.ca
Public Contact Comment	

Contact Name	Shuswap Band
Contact Title	Referrals
Contact Organization	Shuswap Indian Band
Contact Address	RR#2 3A - 492 Arrow Rd
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	
Contact Fax	
Contact Email	referrals@shuswapband.ca
Public Contact Comment	

Contact Name	Dwayne Spence
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	2503413678
Contact Fax	5879999500
Contact Email	dspence@shuswapband.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: GRF-TRA Event 3

Report Date: Thu Mar 25 16:59:54 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council

Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Osoyoos Indian Band
Contact Title	OIB Referrals
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	2504983444
Contact Fax	2504986577
Contact Email	referrals@oib.ca
Public Contact Comment	

Contact Name	x
Contact Title	x
Contact Organization	x
Contact Address	x
Contact City	x
Contact Province	x
Contact Postal Code	V0G 2J0
Contact Phone	
Contact Fax	
Contact Email	test
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Upper Nicola Band

Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Contact Name	Splats'in First Nation
Contact Title	Chief and Council
Contact Organization	Splatsin First Nation
Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	2508386496
Contact Fax	2508382131
Contact Email	referrals@splatsin.ca
Public Contact Comment	

Contact Name	Shuswap Band
Contact Title	Referrals
Contact Organization	Shuswap Indian Band
Contact Address	RR#2 3A - 492 Arrow Rd
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	
Contact Fax	
Contact Email	referrals@shuswapband.ca
Public Contact Comment	

Contact Name	Dwayne Spence
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	2503413678
Contact Fax	5879999500
Contact Email	dspence@shuswapband.ca
Public Contact Comment	

Contact Name	Ktunaxa Nation Council
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council Society
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	2504892464
Contact Fax	2504895760
Contact Email	referrals@ktunaxa.org
Public Contact Comment	Contact information for Ktunaxa Nation Council at the main office in Cranbrook, BC. The office is located at 220 Cranbrook Street North (2nd Street North).

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is

possible for a contact to show
up in the list more than once.

Disclaimer:

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SOE Report

Report Name: GRF-TRA Event 7

Report Date: Thu Mar 25 17:01:36 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton

Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Osoyoos Indian Band
Contact Title	OIB Referrals
Contact Organization	Osoyoos Indian Band
Contact Address	1155 Sen Pok Chin Blvd
Contact City	Oliver
Contact Province	BC
Contact Postal Code	V0H 1T8
Contact Phone	2504983444
Contact Fax	2504986577
Contact Email	referrals@oib.ca
Public Contact Comment	

Contact Name	x
Contact Title	x
Contact Organization	x
Contact Address	x
Contact City	x
Contact Province	x
Contact Postal Code	V0G 2J0
Contact Phone	
Contact Fax	
Contact Email	test
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way

Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Contact Name	Splats'in First Nation
Contact Title	Chief and Council
Contact Organization	Splatsin First Nation

Contact Address	PO Box 460, 5775 Old Vernon Road
Contact City	Enderby
Contact Province	BC
Contact Postal Code	V0E 1V0
Contact Phone	2508386496
Contact Fax	2508382131
Contact Email	referrals@splatsin.ca
Public Contact Comment	

Contact Name	Shuswap Band
Contact Title	Referrals
Contact Organization	Shuswap Indian Band
Contact Address	RR#2 3A - 492 Arrow Rd
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	
Contact Fax	
Contact Email	referrals@shuswapband.ca
Public Contact Comment	

Contact Name	Dwayne Spence
Contact Title	Referrals Coordinator
Contact Organization	Shuswap Indian Band
Contact Address	RR2 3A-492 Arrow Road
Contact City	Invermere
Contact Province	BC
Contact Postal Code	V0A 1K2
Contact Phone	2503413678
Contact Fax	5879999500
Contact Email	dspence@shuswapband.ca
Public Contact Comment	

Contact Name	Ktunaxa Nation Council
Contact Title	Ktunaxa Lands and Resources Agency
Contact Organization	Ktunaxa Nation Council Society
Contact Address	7468 Mission Rd
Contact City	Cranbrook
Contact Province	BC
Contact Postal Code	V1C 7E5
Contact Phone	2504892464
Contact Fax	2504895760
Contact Email	referrals@ktunaxa.org
Public Contact Comment	Contact information for Ktunaxa Nation Council at the main office in Cranbrook, BC. The office is located at 220 Cranbrook Street North (2nd Street North).

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-VER Event 10

Report Date: Thu Mar 25 16:04:11 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154

Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519

Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band

Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council

Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band

Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-VER Event 11

Report Date: Thu Mar 25 16:06:20 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca

Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC

Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt

Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940

Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band

Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr

Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV PEN Event 16

Report Date: Thu Mar 25 16:18:11 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0

Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC

Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton

Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178

Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-PEN Event 22

Report Date: Thu Mar 25 16:20:21 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0

Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC

Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft

Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318

Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc

Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: SAV-PEN Event 23

Report Date: Thu Mar 25 16:22:10 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219

Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0

Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC

Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona

Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: SAV-PEN Event 24

Report Date: Thu Mar 25 16:24:19 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291

Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410

Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0

Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC

Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona

Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. The Contacts for First Nation Consultation Area Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

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SOE Report

Report Name: SAV-PEN Event 25

Report Date: Thu Mar 25 16:26:41 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539

Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211

Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1

Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-PEN Event 26

Report Date: Thu Mar 25 16:27:38 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management

Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219

Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098

Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: SAV-PEN Event 27

Report Date: Thu Mar 25 16:29:00 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539

Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211

Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1

Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. The Contacts for First Nation Consultation Area Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

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SOE Report

Report Name: SAV-PEN Event 34

Report Date: Thu Mar 25 16:32:50 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management

Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219

Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098

Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band
Contact Title	Chief and Council
Contact Organization	Little Shuswap Lake Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	referrals@lslib.com
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: SAV-PEN Event 39

Report Date: Thu Mar 25 16:37:45 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management

Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219

Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098

Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band
Contact Title	Chief and Council
Contact Organization	Little Shuswap Lake Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	referrals@lslib.com
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: SAV-PEN Event 40

Report Date: Thu Mar 25 16:38:56 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management

Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219

Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098

Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band
Contact Title	Chief and Council
Contact Organization	Little Shuswap Lake Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	referrals@lslib.com
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

These contacts are based on knowledge currently available to the Province. Those choosing to provide information and involve First Nations early in a proposed project have the opportunity to develop mutual understanding of the interests around the project. This can be important to successful business planning and project development. The Contacts for First Nation Consultation Area Public Map Service users are encouraged to explore making this contact prior to submitting an application for government authorization. This approach gives support to the Provincial consultation process and the goals of the New Relationship.

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SOE Report

Report Name: SAV-PEN Event 46

Report Date: Thu Mar 25 16:40:23 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management

Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	paulmitchellbanks@gmail.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	sts@siskaband.ca
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	donna@nicomenband.com
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219

Contact Email	Heather.fader@shackan.ca
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band
Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098

Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0

Contact Phone	2506793295
Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Qwelminte Secwepemc
Contact Title	Qwelminte Secwepemc
Contact Organization	Qwelminte Secwepemc
Contact Address	200-345 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289761
Contact Fax	2503730025
Contact Email	swapconnect.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band
Contact Title	Mike Anderson
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	referrals@skeetchestn.ca
Public Contact Comment	

Contact Name	Tk'emlups Band
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	referrals@kib.ca
Public Contact Comment	

Contact Name	SSN (Skeetchestn/Tk'emlups te Secwepemc)
Contact Title	Travis Marr
Contact Organization	Tk'emlups te Secwepemc
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC

Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band
Contact Title	Chief and Council
Contact Organization	Little Shuswap Lake Band
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	referrals@lslib.com
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: VER-PEN Event 5

Report Date: Thu Mar 25 15:34:34 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999

Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

The Contacts for First Nation Consultation Areas Public Map Service Report provides preliminary contact information for First Nations who may have with aboriginal interests identified within the area queried.

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SOE Report

Report Name: VER-PEN Event 7

Report Date: Thu Mar 25 15:36:10 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band

Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council

Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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Relationship.

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SOE Report

Report Name: VER-PEN Event 8

Report Date: Thu Mar 25 15:37:52 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org

Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990

Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: VER-PEN Event 9

Report Date: Thu Mar 25 15:44:39 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)

Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: VER-PEN Event 16

Report Date: Thu Mar 25 15:46:12 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net

Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: VER-PEN Event 19

Report Date: Thu Mar 25 15:47:54 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation

Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Disclaimer:

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SOE Report

Report Name: VER-PEN Event 20

Report Date: Thu Mar 25 15:49:32 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have

multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance
Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342

Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council
Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: VER-PEN Event 23

Report Date: Thu Mar 25 15:51:00 PDT 2021

Shape Name: unnamed

Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Penticton Indian Band
Contact Title	Referrals Coordinator
Contact Organization	Penticton Indian Band
Contact Address	RR 2 Site 80 Comp 19
Contact City	Penticton
Contact Province	BC
Contact Postal Code	V2A 6J7
Contact Phone	2504930048
Contact Fax	2504932882
Contact Email	referrals@pib.ca
Public Contact Comment	

Contact Name	Okanagan Nation Alliance
Contact Title	Tribal Council
Contact Organization	Okanagan Nation Alliance

Contact Address	#101, 3535 Old Okanagan Hwy
Contact City	Westbank
Contact Province	BC
Contact Postal Code	V4T 3L7
Contact Phone	2507070095
Contact Fax	2507070166
Contact Email	referrals@syilx.org
Public Contact Comment	

Contact Name	Westbank First Nation
Contact Title	Chief and Council
Contact Organization	Westbank First Nation
Contact Address	201-515 Hwy 97
Contact City	Kelowna
Contact Province	BC
Contact Postal Code	V1Z 3J2
Contact Phone	2507694999
Contact Fax	2507692443
Contact Email	referrals@wfn.ca
Public Contact Comment	

Contact Name	Upper Nicola Band
Contact Title	Chief and Council
Contact Organization	Upper Nicola Band (UNB)
Contact Address	P.O. Box 3700
Contact City	MERRITT
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503503342
Contact Fax	2503503311
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Lower Similkameen Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Similkameen Indian Band
Contact Address	1420 Hwy 3
Contact City	Cawston
Contact Province	BC
Contact Postal Code	V0X 1C3
Contact Phone	2504995528
Contact Fax	2504995538
Contact Email	nicole.mack@lsib.net
Public Contact Comment	

Contact Name	Okanagan Indian Band
Contact Title	Chief and Council

Contact Organization	Okanagan Indian Band
Contact Address	12420 Westside Road
Contact City	Vernon
Contact Province	BC
Contact Postal Code	V1H 2A4
Contact Phone	2505424328
Contact Fax	2505424990
Contact Email	okibreferrals@okanagan.org
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation boundary may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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SOE Report

Report Name: SAV-VER Event 4
Report Date: Thu Aug 11 14:38:46 PDT 2022
Shape Name: unnamed
Adjacency Buffer: 10.0

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation consultation area may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

Conflicting Features:

Contact Name	Nooaitch Indian Band
Contact Title	Chief and Council
Contact Organization	Nooaitch Indian Band
Contact Address	2954 Shackelly Rd
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1N9
Contact Phone	2503786141
Contact Fax	2503783699
Contact Email	reception@nooaitchband.ca
Public Contact Comment	

Contact Name	Esh-kn-am Cultural Resource Management
Contact Title	Esh-kn-am Cultural Resource Management
Contact Organization	Esh-kn-am Cultural Resources Management Services
Contact Address	#311-230th Street - Coldwater IR 1 PO Box 2159
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2504582224
Contact Fax	2503150084
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Boothroyd Indian Band
Contact Title	Chief and Council
Contact Organization	Boothroyd Indian Band
Contact Address	PO Box 70
Contact City	Boston Bar
Contact Province	BC
Contact Postal Code	V0K 1C0
Contact Phone	6048679211
Contact Fax	6048679747
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Coldwater Indian Band
Contact Title	Chief and Council
Contact Organization	Coldwater Indian Band

Contact Address	PO Box 4600, 2249 Quilchena Avenue
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503786174
Contact Fax	2503785351
Contact Email	lspahan@coldwaterband.org
Public Contact Comment	

Contact Name	Siska First Nation
Contact Title	Chief and Council
Contact Organization	Siska First Nation
Contact Address	PO Box 519
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552219
Contact Fax	2504552539
Contact Email	frontdesk@siskaband.ca
Public Contact Comment	

Contact Name	Skuppah Indian Band
Contact Title	Chief and Council
Contact Organization	Skuppah Indian Band
Contact Address	P.O. Box 548
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K2S1
Contact Phone	2504552279
Contact Fax	2504552772
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Lower Nicola Indian Band
Contact Title	Chief and Council
Contact Organization	Lower Nicola Indian Band (LNIB)
Contact Address	181 Nawishaskin Lane
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 0A7
Contact Phone	2503785157
Contact Fax	2503786188
Contact Email	fileclerk@lnib.net
Public Contact Comment	

Contact Name	Oregon Jack Creek Indian Band
Contact Title	Chief and Council
Contact Organization	Oregon Jack Creek Band
Contact Address	PO Box 940
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539098
Contact Fax	2504539097
Contact Email	nntc.referrals@nntc.ca

Public Contact Comment	

Contact Name	Nicola Tribal Association
Contact Title	Administration
Contact Organization	Scw'exmx Tribal Council (STC)
Contact Address	P.O. Box 188 Stn Main
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K1B8
Contact Phone	2503784235
Contact Fax	2503789119
Contact Email	referrals@scwexmxtribal.org
Public Contact Comment	

Contact Name	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Title	Chief and Council
Contact Organization	Nlaka'pamux Nation Tribal Council (NNTC)
Contact Address	1632 St. Georges Road
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552711
Contact Fax	2504552565
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Shackan Indian Band
Contact Title	Chief and Council
Contact Organization	Shackan Indian Band
Contact Address	PO Box 1360
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B8
Contact Phone	2503785410
Contact Fax	2503785219
Contact Email	sibchief@shackan.ca
Public Contact Comment	

Contact Name	Cook's Ferry Indian Band
Contact Title	Chief and Council
Contact Organization	Cook's Ferry Indian Band
Contact Address	P.O. Box 2159 311 - 230th Street Coldwater IR 1
Contact City	Merritt
Contact Province	BC
Contact Postal Code	V1K 1B9
Contact Phone	2504582224
Contact Fax	2504582312
Contact Email	eshknam.arch@gmail.com
Public Contact Comment	

Contact Name	Nicomen Band
Contact Title	Chief and Council
Contact Organization	Nicomen Indian Band
Contact Address	P.O. Box 670

Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K1Z0
Contact Phone	2504552514
Contact Fax	2504552517
Contact Email	bandmanager@nicomenband.com
Public Contact Comment	

Contact Name	Ashcroft Indian Band
Contact Title	Chief Greg Blain
Contact Organization	Ashcroft Indian Band
Contact Address	PO Box 440
Contact City	Ashcroft
Contact Province	BC
Contact Postal Code	V0K 1A0
Contact Phone	2504539154
Contact Fax	2504539156
Contact Email	gblain43715@yahoo.ca
Public Contact Comment	Send consultation to Chief and Band Manager

---

Contact Name	Spuzzum First Nation
Contact Title	Chief and Council
Contact Organization	Spuzzum First Nation
Contact Address	36500 Main Road
Contact City	Yale
Contact Province	BC
Contact Postal Code	V0K 2S1
Contact Phone	6048632395
Contact Fax	6048632218
Contact Email	info@spuzzumnation.com; chief@spuzzumnation.com; receptionist@spuzzumnation.com; sdmb@spuzzumnation.com
Public Contact Comment	

Contact Name	Lytton First Nation
Contact Title	Chief and Council
Contact Organization	Lytton First Nation
Contact Address	PO box 20
Contact City	Lytton
Contact Province	BC
Contact Postal Code	V0K 1Z0
Contact Phone	2504552304
Contact Fax	2504552291
Contact Email	nntc.referrals@nntc.ca
Public Contact Comment	

Contact Name	Neskonlith Indian Band
Contact Title	Chief and Council
Contact Organization	Neskonlith Indian Band
Contact Address	PO Box 318
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506793295

Contact Fax	2506795306
Contact Email	referrals@neskonlith.net
Public Contact Comment	

Contact Name	Travis Marr
Contact Title	SSN
Contact Organization	Stk'emlupsemc te Secwepemc Nation (SSN)
Contact Address	PO Box 188
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503730023
Contact Fax	
Contact Email	travis@stkemlupsemc.ca
Public Contact Comment	

Contact Name	Skeetchestn Indian Band - referrals
Contact Title	Skeetchestn Indian Band - referral staff
Contact Organization	Skeetchestn Indian Band
Contact Address	PO Box 178
Contact City	Savona
Contact Province	BC
Contact Postal Code	V0K 2J0
Contact Phone	2503732493
Contact Fax	2503732494
Contact Email	https://nationsconnect.ca/
Public Contact Comment	Skeetchestn Indian Band is connected to the https://nationsconnect.ca/ portal, please use the portal.

Contact Name	Tk'emlups Band - referrals
Contact Title	Natural Resource Department
Contact Organization	Tk'emlups te Secwepemc
Contact Address	200 - 330 Chief Alex Thomas Way
Contact City	Kamloops
Contact Province	BC
Contact Postal Code	V2H 1H1
Contact Phone	2508289700
Contact Fax	2503728833
Contact Email	http:\\nationsconnect.ca
Public Contact Comment	

Contact Name	Adams Lake Indian Band
Contact Title	Chief and Council
Contact Organization	Adams Lake Indian Band
Contact Address	6453 Hillcrest Rd, PO Box 588
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M0
Contact Phone	2506798841
Contact Fax	2506798813
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Contact Name	Little Shuswap Lake Band

Contact Title	Referral staff
Contact Organization	Skw'lax
Contact Address	1886 Little Shuswap Lake Road
Contact City	Chase
Contact Province	BC
Contact Postal Code	V0E 1M2
Contact Phone	2506793203
Contact Fax	2506793220
Contact Email	https://nationsconnect.ca/
Public Contact Comment	

Layers Queried Successfully:

Contacts for First Nation Consultation Areas contact information for the area that was queried is displayed below. Note that a single First Nation consultation area may have multiple contacts. As a result it is possible for a contact to show up in the list more than once.

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Appendix N-3

PROJECT NOTIFICATION LETTERS TO INDIGENOUS GROUPS

Shelley Martens
Community & Indigenous Relations

FortisBC Energy Inc.
1975 Springfield Road
Kelowna, BC
Tel: 250-868-4525
Shelley.Martens@fortisbc.com

May 7, 2021

[redacted]
Adam's Lake Band
[redacted]

Attention: [redacted]
https://nationsconnect.ca/

Re: Transmission System Upgrades

FortisBC would like to notify Adam's Lake Band of the proposed Transmission System Upgrades project which has been identified to potentially occur within your traditional territory.

We are planning upgrades at three (3) sections along our natural gas line and at twelve (12) FortisBC facilities. The upgrades will allow us to run specialized in-line inspection tools through our transmission system which will improve our ability to monitor the condition of our gas lines.

We have included maps to show proposed work locations that have been identified within your traditional territory. FortisBC is planning excavation activities with our existing right of way for the work proposed along our natural gas line. Work planned within our existing facilities will be limited to mechanical upgrades.

Regulatory process

FortisBC is required to submit a Certificate of Public Convenience and Necessity (CPCN) application to our regulator, the BC Utilities Commissions (BCUC) in order to proceed with this project. As a regulated utility, FortisBC requires a CPCN from the BCUC for major projects that may affect rates paid by FortisBC customers. This involves FortisBC demonstrating the need for the project, as well as providing evidence that planning and engagement activities have been completed in a satisfactory manner, including engaging with those living, working and representing the areas where work is proposed.

We are planning to submit our CPCN application to the BCUC by early 2022. If approved, construction would take place from 2024-2025.

Next steps

Prior to submitting our CPCN application, we will be completing an Archaeological Overview Assessment (AOA) and Environmental Overview Assessment (EOA) and have contracted Wood Environment and Infrastructure Solutions to conduct both. Please be advised that our consultant may contact you about this work.

FortisBC values your input and knowledge of the traditional land use and cultural history you would be willing to share and would be open to meeting with you to discuss the project in more detail.

Prior to filing the CPCN application, we also expect to complete field studies in support of the EAO and geotechnical work to support of engineering design.

If you have any questions regarding this matter, please contact me directly at 250-868-4525 or by email at Shelley.Martens@fortisbc.com. Additionally, if you would like to be kept informed of the project's progress please let me know.

Sincerely,

Shelley Martens
Community & Indigenous Relations Manager

Enclosed: Maps, .KMZ files

N
SN 3-1
Rose Hill Rd
© 2021 Google
Image City of Kamloops
232 ft
Google Earth
1985
Imagery Date: 12/31/2015
50°39'38.46" N 120°17'58.67" W elev 1857 ft
eye alt 2859 ft

Appendix N-4

INDIGENOUS GROUPS ENGAGEMENT LOG

TIMC Indigenous Groups Engagement Log		
FEI Representatives	**Indigenous Group**	**Summary**
Matt Mason, Community & Indigenous Relations Manager	Bonaparte First Nation	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Little Shuswap Lake Band	Project Notification Letter and KMZ maps sent via email
Matt Mason, Community & Indigenous Relations Manager	Skeetchestn Indian Band	Project Notification Letter and KMZ maps sent via email
Matt Mason, Community & Indigenous Relations Manager	SSN (Skeetchestn/Tk'emlups te Secwepemc)	Project Notification Letter and KMZ maps sent via email
Matt Mason, Community & Indigenous Relations Manager	Tk'emlups te Secwepemc	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Adam's Lake Band	Project Notification Letter and KMZ maps sent via NationsConnect
Shelley Martens, Community & Indigenous Relations Manager	Ashcroft Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Boston Bar First Nation	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Coldwater Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Esh-kn-am Cultural Resource Management (includes Cooks Ferry First Nation)	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Lower Nicola Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Lower Similkameen Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Neskonlith Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Nicomen Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Nlaka'pamux Nation Tribal Council (NNTC) - Includes Boothroyd, Lytton, Oregon Jack Creek, Skuppah, and Spuzzum	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Nooaitch Band	Project Notification Letter and KMZ maps sent via email

TIMC Indigenous Groups Engagement Log

FEI Representatives	Indigenous Group	Summary
Shelley Martens, Community & Indigenous Relations Manager	Nooaitch Band	FEI received a call in response to the project notification letter sent by email. During the discussion, additional information on facility location work was requested. FEI was advised that they are not familiar with the environmental and archaeological consultant FEI was working with and requested further information on the company. Onsite monitors during construction were requested two event locations were identified as sensitive grizzly bear habitat area; expressed concerns with impacts from road density due to temporary access roads; expressed interest in supporting FEI's restoration plans for temporary roads and procurement opportunities.
Shelley Martens, Community & Indigenous Relations Manager	Okanagan Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Okanagan Nation Alliance	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Osoyoos Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Penticton Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Scw'exmx Tribal Council (STC)	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Shackan Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Siska First Nation	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Splats'in First Nation	Project Notification Letter and KMZ maps sent via NationsConnect
Shelley Martens, Community & Indigenous Relations Manager	Upper Nicola Band	Project Notification Letter and KMZ maps sent via NationsConnect
Shelley Martens, Community & Indigenous Relations Manager	Upper Similkameen Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Westbank First Nation	Project Notification Letter and KMZ maps sent via email
Blair Weston, Community & Indigenous Relations Manager	Ktunaxa Nation Council	Project Notification Letter and KMZ maps sent via email
Blair Weston, Community & Indigenous Relations Manager	Shuswap Indian Band	Project Notification Letter and KMZ maps sent via email
Shelley Martens, Community & Indigenous Relations Manager	Nooaitch Band	FEI responded by email providing information on the consultant and confirming their request for onsite monitoring and access road restoration opportunity was passed on to FEI's Environment department

TIMC Indigenous Groups Engagement Log

FEI Representatives	Indigenous Group	Summary
Shelley Martens, Community & Indigenous Relations Manager	Upper Similkameen Indian Band	FEI received a referral response letter from the USIB Natural Resources Department asking to be kept informed throughout AOA and EOA process; requested copies of all reports and documents be provided. Advised they will require a USIB monitor to be present during field work and construction activities
Shelley Martens, Community & Indigenous Relations Manager	Lower Nicola Band	FEI received an email advising of LNIB traditional uses, which have or do occur, at or near all the sites listed in our notification and that potential archaeological sites are located within 1 km of station facilities. LNIB provided a link to their Cultural Heritage Policy and requested it be provided to the consultant. FEI shared the link with the consultant for review and reference.
Matt Mason, Community & Indigenous Relations Manager Brianna Ure, Indigenous Leadership Program Intern Aubin Merat, Project Manager Susie Sengupta, Project Director	Skeetchestn Indian Band	FEI met with representatives from Ckukutusem Utility Services (CUS) and discussed project opportunities (environment, archaeology and construction), and upcomming planned works.
Matt Mason, Community and Indigenous Relations Manager; Brianna Ure	Skeetchestn Indian Band	FEI received a response from Ckukutusem Utility Services (CUS) providing insight into business capacity. Overall, meeting was a positive interaction to explore further business opportunities between CUS and FEI.
Shelley Martens, Community & Indigenous Relations Manager	Westbank First Nation	FEI received a response letter advising of conditional approval of the project following an archaeology assessment. Information was provided to FEI's consultant who confirmed WFN had been contacted for onsite field monitoring
Shelley Martens, Community & Indigenous Relations Manager	Esh-kn-am Cultural Resource Management (includes Cooks Ferry First Nation)	FEI recieved a response letter requesting onsite Field Tech monitoring during the Archeological Impact Assessment due to potential for unrecorded archaeological sites
Shelley Martens, Community & Indigenous Relations Manager	Scw'exmx Tribal Council (STC) Tmix^{w} Research provides technical work on behalf of Nooaitch and Shackan First Nations	FEI received a response letter advising that Tmix^{w} Research (TR); completed a preliminary assessment of two events and two facilities that are located in areas of cultural use. FEI provided the information to the consultant to follow up and was advised that field tech attendance was coordinated
Matt Mason, Community & Indigenous Relations Manager Brianna Ure, Indigenous Leadership Program Intern Scott Bartlett, Project Director Erinn Mah, Indigenous Talent Specialist	Tk'emlups te Secwepemc	FEI provided a high level project overview specific to local work to Tk'emlups te Secwepemc (Pre-CPCN). More information will be provided to TteS as the project develops.

TIMC Indigenous Groups Engagement Log

FEI Representatives	Indigenous Group	Summary
Matt Mason, Community & Indigenous Relations Manager Brianna Ure, Indigenous Leadership Program Intern	Skeetchestn Indian Band	FEI Provided a high level project overview specific to local work of ITS TIMC to Skeetchestn Indian Band leadersihp, updates included current project status (pre-CPCN) and the exploration of further business opportunities between CUS and FEI.

Appendix O

DYNAMIC RISK

Appendix O-1

DYNAMIC RISK ASSESSMENT REPORT

bcuc
British Columbia
Utilities Commission

Patrick Wruck
Commission Secretary

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June 15, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-1

Ms. Diane Roy
Vice President, Regulatory Affairs
FortisBC Energy Inc.
16705 Fraser Highway
Surrey, BC V4N 0E8
gas.regulatory.affairs@fortisbc.com

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Independent Expert Report

Dear Ms. Roy:

Commission staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Independent Report on the FortisBC Energy Inc.
Application for Approval of a Certificate of Public Convenience and Necessity
for the Coastal Transmission System Transmission Integrity Management Capabilities Project
June 15, 2021

Sincerely,

Original signed by:

Patrick Wruck
Commission Secretary

AJ/dg
Enclosure

Independent Report on the FortisBC Energy Inc. Application for Approval of a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project

Date	June 15, 2021
Draft status	Final Report
Revision	1
Prepared for	British Columbia Utilities Commission
Prepared by	Dynamic Risk Assessment Systems, Inc.

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This document contains 52 pages.

Revision Log

Rev.	Date	Description of Revision
1	June 15, 2021	Final Report

Signatures

Prepared for	**Company Name**
Contributing Author	Signature Ammad Farooq, P. Eng Integrity Engineer, Dynamic Risk Assessment Systems Inc.
Contributing Author	Signature Mike Westlund, BSc. Principal Consultant, Dynamic Risk Assessment Systems Inc.
Contributing Author	Signature Phillip Nidd, M.Sc., P.Eng. VP, Technical Services, Dynamic Risk Assessment Systems Inc.
Approved by	Signature Trevor MacFarlane, M.Sc., P.Eng. President, Dynamic Risk Assessment Systems Inc.

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APEGA Permit #P08193

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A Introduction and Summary of Opinion

A.1 Background

The British Columbia Utilities Commission (BCUC) is an independent regulatory agency of the Provincial Government that operates under and administers the Utilities Commission Act. The BCUC's primary responsibility is the regulation of British Columbia's natural gas and electricity utilities. The BCUC is responsible for ensuring that ratepayers receive safe, reliable, and non-discriminatory energy services at fair rates from the utilities it regulates, and that shareholders of those utilities are afforded a reasonable opportunity to earn a fair return on their invested capital.

FortisBC Energy Inc. (FEI) is an investor-owned gas distribution company that is indirectly wholly owned by its parent company Fortis Inc. FEI owns and operates approximately 50,000 kilometers of natural gas transmission and distribution pipelines serving over one million customers in British Columbia. The FEI system also includes two liquefied natural gas (LNG) storage facilities. FEI is regulated by the BCUC and its rates are currently set within a framework that combines cost of service and performance-based regulation.

FEI filed its Application for a Certificate of Public Convenience and Necessity (CPCN) for the Coastal Transmission System (CTS) Transmission Integrity Management Capabilities (TIMC) Project in February 2021 pursuant to Sections 45 and 46 of the Utilities Commission Act. The CTS TIMC CPCN Application is characterized by FEI as a pipeline integrity project (Project). FEI is seeking to address environmental cracking threats on its pipelines by altering the pipelines to be able to adopt electro-magnetic acoustic transducer (EMAT)[1] in-line inspection (ILI) tools.

The Project includes required alterations to pipelines and related facilities to ready the eleven (11) susceptible CTS pipelines for EMAT ILI. The Project also includes installation of a pressure regulating station (PRS) on a single segment of one of the pipelines where EMAT ILI is not possible.

A.2 Scope

The BCUC has retained Dynamic Risk Assessment Systems Inc. (Dynamic Risk) as an external independent pipeline integrity expert consultant to review the application and submit an independent report on FEI's pipeline integrity management planning with respect to the threat of Stress Corrosion Cracking (SCC).

The scope of this review has been developed by BCUC to include an assessment of the FEI's approach to the project, supporting information and studies, and industry standard integrity management detection and mitigation.

The scope of work, which is further defined in Appendix A to Exhibit A-5[2], includes the following:

[1] Pipeline operators rely on a variety of tools and technologies to manage threats to their pipeline assets. For natural gas pipelines, the management of Stress Corrosion Cracking (SCC) has benefited from the introduction and evolution of in-line inspection (ILI) technologies, specifically Electro-Magnetic Acoustic Transducer (EMAT) technology, that can reliably detect, identify and size cracking anomalies.

[2] Exhibit A-5 FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Submissions regarding Independent Consultant.

Dynamic Risk will attend FEI's virtual workshop, examine the submitted materials regarding the non-exhaustive matters listed below and produce an independent report to address the following:

- FEI's assessment of its pipeline assets' susceptibility to SCC.
- FEI's assessment of the probability of a rupture due to SCC and the magnitude of consequences of such a rupture.
- The use of EMAT ILI tools as an SCC mitigation method, compared to other methods, to address the risk of rupture due to SCC.
- The need to perform the proposed pipeline alterations in order for the EMAT tool to travel within its optimal velocity range.
- The supporting studies and analyses that are inputs into development of the Project, including Qualitative Risk Assessment, etc.

The Report shall also include:

- The capabilities of all commercially available EMAT tools suitable for the FEI CTS system.
- A broader analysis of industry standard detection and mitigation practices for the threat of SCC.
- Any additional matters the consultant considers pertinent to the BCUC's review of the Application.

The consultant is expected to provide:

- Expert knowledge on sound industry practices and alternatives utilized in other jurisdictions and how they compare to FEI's methodologies and proposals.
- Expert knowledge of pipeline risk assessment and reliability.
- Expert knowledge of EMAT ILI tools.

A.3 Summary of Opinions

SCC is a form of environmentally assisted cracking; wherein small surface cracks can form and grow over time as a result of stress and the local environmental conditions at the pipe surface. Cracks that continue to grow will frequently overlap and/or coalesce to become the equivalent of a large single crack in terms of their effect on the pressure carrying capacity of the pipe. Eventually such overlapping and coalescence can create a crack of sufficient size to cause the pipeline to leak or rupture. It is the independent pipeline integrity expert panel's view that SCC is a credible threat for FEI that if left unmitigated, could lead to pipeline rupture.

FEI operates eleven (11) pipe segments within the CTS considered as susceptible to SCC, which has been validated through results of opportunistic excavations, where pipe examinations have confirmed the presence of SCC. Currently, there is a gap in the existing FEI integrity management practices to address the threat of SCC, as opportunistic excavations alone are not sufficient to fully characterize, detect and manage the threat. The results of the quantitative risk assessment (QRA) demonstrate the risk of SCC to be highest on the CTS pipeline segments and it is the independent pipeline integrity expert panel's view that EMAT ILI is the most appropriate response and mitigation action to reduce risk and strengthen the overall integrity management program.

To successfully utilize the EMAT ILI, the tool velocity must be maintained within the vendor specified range to acquire accurate and acceptable inspection results. FEI has recognized this critical variable and proactively identified areas of the pipeline segments where speed excursions may occur. Facility modifications are required to safely launch and receive the EMAT ILI tools and pipeline modifications are necessary to control the tool speed within appropriate limits during the inspection. Although the risk of speed excursions will be minimized with facility and pipeline modifications, the risk of degraded data during ILI still exists. FEI has addressed this through a process to investigate blind spots caused by EMAT ILI data degradation, which includes additional analysis to determine the severity of degraded data and the conditions of the pipeline in the degraded areas. The goal is to determine if areas of degraded data need further investigation by pipeline replacement or exposure and recoat. This process of investigating for potential SCC in areas of EMAT data degradation is essential to the crack management program.

It is the independent pipeline integrity expert panel's view that the pipeline modifications proposed are necessary to ready the susceptible segments for EMAT ILI, which is a reliable technology that can detect the SCC features previously found through opportunistic excavations. The EMAT ILI tool, when used in parallel with a robust targeted excavation and validation program, is appropriate to manage the threat of SCC on the CTS.

B Qualifications

B.1 Experience

To complete this project, Dynamic Risk has assembled a multi-disciplinary project team to meet the competencies, expertise and experience required to ensure the best technical expertise is leveraged to successfully execute this review. The project team has a strong working knowledge of SCC management, risk management and EMAT ILI tools.

The project team has direct experience in supporting gas transmission pipeline operators in developing SCC Management programs based on EMAT ILI. This experience includes expertise in the EMAT ILI technology and its capabilities, the development of EMAT ILI tool performance validation plans, feature response plans, excavation strategies and re-inspection interval approaches that provide for appropriate margins of safety.

B.2 Project Team Biographies

Trevor MacFarlane – President

Trevor has 27 years of technical and management experience and recognized as one of the industry's most respected leading advisors in the development of pipeline integrity management programs. He has gained extensive experience in all technical aspects of pipeline reliability and risk management. Trevor has authored papers and/or presentations at more than 25 technical conferences, industry associations and workshops on the subjects of integrity management and has testified as an expert witness in this field. He is a Subject Matter Expert (SME) in Engineering and Pipeline Integrity Management, Reliability-based Design, Quantitative Risk Modeling, Hazard and Threat Analysis, Pipeline failure analysis and fracture mechanics and Enterprise Risk Management. Mr. MacFarlane was also a key contributor to the industry recognized CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking standard.

Phillip Nidd – Vice President, Technical Services

Phillip has 35 years of technical and management experience in asset risk management, having served in pipeline integrity senior management positions for a major pipeline operator and several large engineering consulting companies. As Vice President, Technical Services for Dynamic Risk in Houston, Phillip has responsibility for overall company engineering operations and providing technical leadership in the specific areas of failure investigation, management systems and regulatory support. Originally from Canada, Phillip has worked extensively in Russia, Ecuador, Brazil, Argentina, the Middle East and the USA, providing litigation support and acting in a management capacity on major investigation root cause investigation and litigation support projects, including the Bellingham Pipeline failure in 1999, the Deepwater Horizon explosion in 2010 - 2012, the San Bruno pipeline Failure in 2012-2013 and the Grand Marsh pipeline failure in 2013-2014.

Phillip has co-authored several industry papers that provide focus on Management Systems and Root Cause Analysis, including "IPC 2014- Back to The Future Using Root Cause Analysis as A Proactive Risk Management Tool; IPC2016- Chasing Perfection - The Proactive IMP PDCA (+E) Review; and "PPIM2017- ALARP' and Zero Leak Tolerance- Applications For The Pipeline Industry.

Mike Westlund – Principal Consultant, Technical Services

As a Principal Consultant with Dynamic Risk, Mike has 20 years of experience in various pipeline integrity-related roles. He provides guidance, mentoring and technical oversight to our project teams, conducts engineering studies and investigations, prepares and present findings and recommends information to report to our client's senior leadership. Previously, Mr. Westlund was with Baker Hughes GE for 12 years, where he held progressive roles as a Project Manager, Integrity Services Team Leader and then ultimately the Global Ultrasonic ILI Analysis Manager (which included EMAT technology). Previously he focused on pipeline integrity, data analysis and R&D for the first generation EMAT ILI tool. Mike also possesses a significant amount of field experience including SCC integrity excavations, environmental studies, and cathodic protection. Additionally, he holds a BSc from the University of Calgary and holds a Level II Cathodic Protection Technician designation with NACE International.

Ammad Farooq – Integrity Engineer, Technical Services

Ammad Farooq is an Integrity Engineer at Dynamic Risk with over 9 years of pipeline industry experience. He is a highly analytical pipeline integrity engineer with a proven track record of producing designs and results in an organized and timely manner to satisfy both company and client approval. In recent years, Ammad has been heavily involved in the EMAT tool validation and verification projects. Ammad has been writing Engineering Assessment Reports for the threat of SCC on various projects. Ammad advises clients how to plan and execute assessment activities (ILI and/or DA) in accordance with the Company's Integrity Management Plan. He has a strong background on risk assessment, and pipeline integrity and in line inspection analysis. Ammad is a graduate from the University of New Brunswick and is a registered engineer with the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

C Duty of Independence

Dynamic Risk has been retained to provide an independent consultant team to review the materials submitted by FEI and produce a report on FEI's pipeline integrity management planning with respect to the threat of SCC. Dynamic Risk will act as an independent consultant to assist the BCUC by reviewing the application, is not an advocate for any party and is bound by a "Duty of Independence". Dynamic Risk has prepared this report independently in accordance with the duty of independence and the project team has no actual, apparent, or perceived conflict of interest with FEI or the BCUC.

D Issues

SCC is defined as the cracking of a material produced by the combined action of corrosion and tensile stress (residual or applied)[3]. The CTS TIMC project is required for the FEI to manage the threat of SCC and continue to operate eleven (11) of its CTS pipelines safely. Within the application, FEI has confirmed that the CTS pipelines are susceptible to SCC and through a risk assessment, demonstrated the risk of cracking failure to be the highest contributor to safety on the CTS pipelines. FEI has identified the need to perform modifications to the CTS pipelines to ready the eleven (11) pipelines for EMAT ILI. The proposed pipeline modifications will allow a successful EMAT ILI program and decrease the risk of degraded inspection data due to ILI tool speed excursions. FEI has also assessed alternative methods to manage the threat of SCC and has determined the EMAT ILI program is most technically and financially feasible option.

EMAT ILI is a reliable technology for managing the threat of SCC and capable of detecting and sizing the crack features on the CTS that were previously discovered through opportunistic excavations. The EMAT ILI technology has been successfully used by pipeline operators for managing the threat of SCC on gas pipelines.

These issues identified are discussed in detail in Section E.

E Discussion

E.1 SCC Threat

SCC is a form of environmentally assisted cracking, wherein small surface cracks can form and grow over time. In SCC, multiple small individual cracks will typically form adjacent to one another in an array. Two forms of SCC have been observed in carbon steel transmission pipelines: "high pH SCC", and "near-neutral pH SCC". High pH SCC is characterized by tight cracking that proceeds along steel grain boundaries (inter-granular cracking) and tends to form within a narrow cathodic potential range and at a local pH[4] over 9. Near-neutral pH SCC is characterized by wide, corroded, trans-granular[5] attack at a local pH of 5.5 to 7.5, and is associated with mild concentrations of CO_2 in groundwater.

Regardless of the form of SCC, three conditions must be present for SCC to occur: a susceptible material, a conducive environment, and a tensile stress.

[3] CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015.

[4] pH is the measure of the relative acidity or alkalinity of the electrolyte. It is defined as the negative log (base 10) of the hydrogen ion concentration. Water with a pH of 7 is neutral; lower pH levels indicate an increasing acidity, while pH levels above 7 indicate increasingly basic solutions.

[5] Transgranular SCC – A form of SCC associated with a near-neutral pH electrolyte in which the crack growth or crack path is through or across the grains of a metal. Typically, this form of cracking has limited branching and is associated with corrosion of the crack walls and sometimes of the pipe surface.

1. *Material*—All commonly used line pipe steels are susceptible, though susceptibility may vary considerably from one material to another. The guidelines from CEPA note that the coating type is the primary SCC susceptibility factor as SCC can only occur when the coating disbonds[6] from the pipe and ground water (electrolyte) can contact the pipe surface. The nature and condition of the pipeline coatings is, therefore, the primary factor on which the susceptibility to SCC can be assessed.
2. *Environment*—Specific forms of SCC are associated with specific terrain and soil types, particularly those having alternating wet-dry conditions and those that tend to damage or disbond coatings. Thus, pipe coating type and condition can be an important factor. Nevertheless, SCC can occur in almost any soil type since the local electrochemistry at the pipe surface may be isolated from the surrounding conditions.
3. *Stress Level*—Susceptibility to SCC increases with stress level, and pipelines that are operated at stress levels above 60% of the specified minimum yield strength (SMYS)[7] appear to be the most susceptible. There is thought to be a lower-bound threshold stress level below which SCC will not occur, but the threshold has not been firmly established and is likely to be situation dependent. SCC has been identified in one case in a pipeline being operated at hoop stress level of 47% of SMYS. Conducive stress levels may occur at local structural discontinuities (e.g. weld toes) or sites of deformation due to outside forces (e.g. rock dents). Some amount of stress cycling can promote SCC growth by breaking the oxide film that forms on the crack surface, re-exposing the crack tip to the environment. Cyclic loading seems to be an important factor in the initiation of SCC.

Beyond the above, each form of SCC has its own susceptibility factors, with high pH SCC being associated with higher operating temperatures – typically above 104°F, and near-neutral pH SCC being more commonly associated with coatings that shield CP current (e.g., polyethylene tape coatings).

E.2 Risk Assessment

A baseline system-level safety QRA[8] was conducted to estimate the current level of safety risk for FEI[9] transmission pressure mainline pipelines. The risk was assessed for all FEI's transmission pressure, mainline pipe in the CTS, Interior Transmission System (ITS) and Vancouver Island Transmission System (VITS) regions. QRA is an assessment of the threats to the pipeline and allows the operator to identify the risk drivers and determine if mitigation activities are necessary. QRA is the preferred method for risk assessment as it is not subjective, decisions are based on

[6] Disbondment is the failure of a coating to adhere to the pipeline or a loss of adhesion between the coating and the pipeline surface.

[7] Specified minimum yield stress (SMYS) is s the minimum stress that will cause a pipe to permanently deform.

[8] A semi-quantitative assessment produces risk results as a product of estimated failure frequency (failures/km*yr) and consequence levels (e.g. 1-100); while a quantitative assessment produces risk results as a product of estimated failure frequency (failures/km*yr) and consequence (e.g. litres, dollars or number of people impacted), and a qualitative assessment produces risk results as a product of failure probability score (0-10) and consequence score (0-10).

[9] FortisBC Energy Inc. (FEI) is a permit holder with the BC Oil and Gas Commission (Commission). As a permit holder, FEI has certain obligations to maintain its pipeline infrastructure to accord with legislative, regulatory and code requirements, including: Oil and Gas Activities Act, [SBC 2008], c. 36 37(1) A permit holder, an authorization holder and a person carrying out an oil and gas activity must (a) Prevent spillage.

mathematical risk evaluation and is compliant with the Canadian Standards Association (CSA Z662-19)[10] requirement for operators to implement a risk management process.

The primary objective of a quantitative risk assessment is to review the attributes for all potential threats to a pipeline system in consideration of the status of the materials, design, construction and operational variables that are associated with the pipeline system of interest. Through this review, the relevance and severity of each threat can be assessed in the context of the operating environment for the pipeline being reviewed. In the process of undertaking a risk assessment, all threat attributes are discussed in terms of their relevance as well as in terms of data availability. Specific data sets are required to employ a reliability approach to failure likelihood estimation, and the availability and type of data that are available will dictate the specific approach that can be adopted. Therefore, the other primary goal of a risk assessment is to establish candidate approaches for estimating failure likelihood based on the availability, quality, and completeness of the data attributes for each threat.

For the transportation of natural gas by high-pressure transmission pipeline, the hazard of greatest concern to regulators and the public is the potential for loss of pipeline containment and the subsequent ignited release of natural gas. The likelihood for a loss of containment (failure likelihood) is related to the influence on the pipeline of recognized industry threats (potential causes of loss of containment) that may apply within a given pipeline segment.

The objective of the QRA, as stated in the report[11], was to inform the urgency and priority of addressing cracking threats, assess the significance of the cracking threats in terms of their contribution to overall risk, allow for prioritization of pipelines based on risk and frequency of failure for possible mitigation of cracking threats and continue the efforts of FEI in moving to a quantitative risk-based approach to pipeline integrity management.

The QRA performed on the three (3) transmission systems is in alignment and follows the approach defined in the CSA Z662-19 with hazard identification, frequency and consequence analysis, and risk estimation. The results show the CTS to have the highest risk as compared to the other systems (ITS and VITS). The top risk driver is SCC for nine (9) of the eleven (11) segments that are susceptible to SCC Within the CTS. For the remaining two (2) susceptible segments, SCC is the second and fourth risk driver.

The results of the QRA are as expected due to the CTS segments proximity to populated areas and the lack of crack ILI data to be incorporated into the risk model. In the absence of EMAT ILI data, the risk model for SCC relies on an analysis of industry historical failure data and the susceptibility factors for SCC. Based on the results of the QRA, FEI has appropriately determined that performing an EMAT ILI on the eleven (11) pipeline segments in the CTS is required to reduce the risk on the CTS.

E.3 SCC Susceptibility on the CTS System

FEI conducted a study to assess the susceptibility of the pipelines to SCC and determined the CTS pipelines are susceptible to SCC which can lead to failure by rupture. It was concluded that eleven

[10] CSA Z662:2019, Oil and Gas Pipeline Systems.

[11] B-1 FORTISBC ENERGY INC. (FEI) - Certificate of Public Convenience and Necessity (CPCN) for the Coastal Transmission System Transmission Integrity Management Capabilities Project (CTS TIMC Project) dated February 11, 2021.

(11) of the CTS pipeline segments are susceptible to SCC and cracking threats pose a credible integrity hazard that needs to be addressed through active integrity management.

Guidance for SCC susceptibility is outlined by the Canadian Energy Pipeline Association (CEPA) in the "Recommended Practices for Managing Near neutral pH Stress Corrosion Cracking 3rd edition" and by the American Society of Mechanical Engineers (ASME) in the B31.8S standard "Managing System Integrity of Gas Pipelines". CEPA is an industry association representing major Canadian transmission pipeline companies and the recommended practices are based on the current best practices employed by CEPA companies. The susceptibility factors outlined in the two aforementioned documents are widely accepted, based on engineering knowledge, and serve as the industry best practices for assessing SCC susceptibility.

The susceptibility criteria, based on guidelines from CEPA and the ASME standard, include an assessment of pipeline segments based on factors such as:

- Coating type (All coating types with the exception of FBE are susceptible)
- Girth weld coating or repair coating type
- Operating stress level (per cent SMYS)
- Age of pipeline
- Historical excavation records and SCC findings
- Operating temperature
- Distance of segment from compressor station discharge <32 km (20 miles)
- Pressure Cycles
- Temperature Cycles
- Long seam weld type
- Pipe manufacturer
- Pipeline geometry (bends, slopes)

The factors listed above, other than coating type, are considered secondary factors that can be used to determine segments of similar susceptibility or used to further prioritize the susceptible line segments. Secondary factors are used to perform a more in-depth assessment of susceptibility and used to further prioritize the susceptible segments for assessment such as scheduling of EMAT ILI.

FEI has determined the eleven (11) CTS segments are susceptible to SCC based on an evaluation of coating type, age of pipeline and long seam type, which is in alignment with the SCC susceptibility guidelines provided by CEPA and ASME noted above.

The coating type of the eleven (11) susceptible pipeline segments is coal tar enamel or shrink sleeves on girth welds and the coating type of the two (2) lines that are deemed "low" susceptibility are coated with fusion bonded epoxy (FBE). This is in alignment with the industry experience as SCC has been found beneath coal tar and girth weld shrink sleeves, no SCC has been documented for FBE coated pipelines.

The CTS system was also evaluated based on pipeline age as pipeline coating damage is more likely to occur with increasing age. The age criteria within ASME B31.8S is pipelines older than 10 years are susceptible to SCC due to coating degradation. CEPA notes that pipelines constructed prior to

1980 are considered more susceptible. This is based on SCC failures for eight major North American gas pipeline operators[12]. Ten (10) of the eleven (11) pipelines in the CTS system that are deemed susceptible have construction dates of prior to 1977. One (1) of the segments deemed susceptible is constructed in 1981 however, is still considered susceptible to SCC based on the primary factor of the coating type (coal tar enamel). The two (2) CTS line segments that are deemed "low" susceptibility are coated with FBE and were constructed after 1991.

FEI has also evaluated the CTS pipeline segments for susceptibility to seam weld cracking and have considered pipelines manufactured prior to 1970 as susceptible to seam weld cracking. Pipelines installed prior to 1970 are generally considered vintage pipelines and may contain a variety of manufacturing related flaws associated with the seam weld such as lack of fusion, selective seam corrosion and hook cracks[13]. Seam weld manufacturing improvements and the requirement to hydrotest following pipeline construction was implemented in 1970[14]. The two (2) CTS pipeline segments that are considered "low" susceptibility for SCC are constructed after 1970, coated with FBE and therefore considered to have "low" susceptibility to seam weld cracking.

The susceptibility of the CTS pipeline segments to SCC is further confirmed by the discovery and presence of SCC on the system, which has been found during previous integrity excavations performed. SCC has been found on six (6) of the eleven (11) CTS pipeline segments that are considered susceptible within thirty-three (33) previous integrity excavations that contained cracks. These features would be reported by the EMAT ILI if they are above the minimum detection thresholds of the tool[15].

It should be noted that the susceptibility criteria within the ASME B31.8S standard states that pipelines operating at greater than 60% of the SMYS are susceptible to SCC. It is also noted in the FEI application that the majority of the pipeline segments in the CTS operate at hoop stress levels between 45% to 50% of SMYS. Although the CTS pipeline segments operate at less than 60% SMYS, SCC has been found on the CTS pipelines and is a credible threat that could potentially lead to failure. Industry data shows that susceptibility to SCC increases with stress level pipelines that are operated at stress levels above 60 % of SMYS appear to be most susceptible, and pipeline failures due to SCC have occurred in pipelines that operate at less than 50% SMYS[16,17].

E.4 Required Pipeline Modifications

FEI has assessed the CTS pipeline segments to evaluate if the system is suitable for EMAT ILI. The following was considered in the assessment:

1. Can the EMAT ILI tools be introduced into the pipelines using existing infrastructure?

[12] CEPA Recommended Practices for Managing Near-neutral pH Stress Corrosion Cracking 3rd edition", Canadian Energy Pipeline Association (CEPA), 2015 (Section 1.4.2 and Section 2.3.1.2.1).

[13] TTO Number 5 – Low Frequency ERW and Lap Welded Longitudinal Seam Evaluation. Baker, 2004 (Section 5.4)

[14] The INGAA Foundation, Inc. – Integrity Characteristics of Vintage Pipelines. E. B. Clark, B. N. Leis Battelle and R. J. Eiber, 2005.

[15] Linear features, such as cracks, detected by EMAT must be above the detection threshold (typically 1-2 mm in depth and 30-50 mm in length).

[16] API RP 1160 - Managing System Integrity for Hazardous Liquid Pipelines - THIRD EDITION, February 2019. Section A.5.1.

[17] PHMSA Incident data - https://www.phmsa.dot.gov/data-and-statistics/pipeline/gas-distribution-gas-gathering-gas-transmission-hazardous-liquids

2. Can the EMAT ILI tools successfully navigate these pipelines? Are there any locations on these pipelines where a certain feature or pipeline geometric feature can stop the tool from navigating through them?
3. Can the EMAT ILI tools, which are dependent on the gas flow for propulsion, navigate through these pipelines within its optimal velocity range?
4. If an integrity concern is detected by the EMAT ILI survey, is the system ready to ensure safe continued operation while meeting FEI's obligation to provide gas to its customers?

Based on this assessment FEI has identified six (6) pipeline segments within the CTS that require modification and thirteen (13) facilities that require modification prior to inspection with EMAT ILI. The proposed pipeline alterations are shown in Table E-1, the proposed facility modifications are shown in Table E-2.

Table E-1: Pipeline Modifications

Pipeline Segment Short Name	Length (km)	Number of Modifications	Summary of Alterations
HUN ROE 1067	55.7	1	Replacement of heavy wall valve assembly
HUN NIC 762	56.4	2	Replacement of heavy wall valve assemblies
LIV COQ 323	34.9	1	Replacement of heavy wall crossing pipe
CPH BUR 508	17.0	5	Replacement of heavy wall valve assembly, station pipe, crossing pipe and forged elbow
TIL FRA 508	9.6	2	Replacement of heavy wall valve assembly, station pipe and crossing pipe
TIL BEN 323	5.9	2	Replacement of heavy wall forged elbows
LIV PAT 457	29.8	None	N/A
NIC FRA 610	24.3	None	N/A
ROE TIL 914	12.8	None	N/A
NIC PMA 610	4.9	None	N/A
TIL LNG 323	1.7	None	N/A

Table E-2: Facility Modifications

Facility Name	Scope of Modifications
Huntingdon Control Station	Modification to pig barrels, station piping and upgrades to pressure regulating capability
Livingstone Regulating Station	Modification to pig barrel, station piping and equipment
Nichol Valve Station	Modification to pig barrels, station piping and addition of pressure and flow regulating capability, including backflow prevention
Roebuck Valve Station	Modification to pig barrels, station piping and addition of pressure regulating capability
Port Mann Valve Station	Modification to pig barrel, station piping and addition of flow control capability
Tilbury Regulating Station	Modification to pig barrels, station piping and addition of flow control capability
Tilbury LNG Plant Station	Modification to pig barrel and station piping
Benson Regulating Station	Modification to pig barrel and station piping
Fraser Gate Station	Modification to pig barrels, station piping and addition of flow control capability
Cape Horn Valve Station	Modification to pig barrel and station piping
Coquitlam Gate Station	Modification to pig barrels, station piping and addition of pressure regulating capability

Facility Name	Scope of Modifications
Noons Creek Valve Station	Modification to station piping and addition of pressure regulating capability
Anmore Regulating Station	Upgrades to pressure regulating capability
Pattullo Regulating Station	N/A
Burrard Thermal Regulating Station	N/A
Belcara Regulating Station	N/A
Ioco Regulating Station	N/A

The goals of the proposed modifications to the pipelines and facilities are to accommodate the launch and receive of the EMAT ILI tools and enable the EMAT ILI tool to travel within the optimal velocity range during inspection.

Maintaining a tool velocity within the specified range is critical to achieving a successful EMAT inspection. If the tool travels outside of the specified velocity range, the data collected will be degraded and reduce the tool performance specifications or potentially create blind spots along the pipeline. The data quality associated with EMAT inspection tools is particularly sensitive to tool velocity. Sections of pipeline that contain wall thickness transitions or unique geometry, such as elbow type bends, will impact the tool velocity. The modifications to the six (6) pipelines by removing restrictions noted in Table E-1 are necessary to reduce the potential for speed excursions or tool stoppages to occur during the EMAT ILI.

The current ILI program on the CTS pipelines consists of inspections using magnetic flux leakage (MFL) and Geometry ILI tools, which are typically shorter than EMAT ILI tools, and less sensitive to speed excursions. Modifications to the facilities noted in Table E-2 are necessary to accommodate the length of the EMAT tool, which can be up to 10 metres in some cases. The extended launch and receive barrels will allow the tool to be safely launched and received. The modifications to control flow and pressure regulation are required to enable the tool to be launched at the desired tool velocity and reduce the potential for speed excursions.

Although FEI has proposed pipeline modifications to reduce the risk of speed excursions, the potential for blind spots due to degraded data still exists[18]. FEI has considered this and outlines an additional post ILI procedure for an "in-ditch inspection of EMAT ILI tool blind spots". This process will evaluate sections of degraded data through further analysis to determine if additional actions, such as excavations, are required to mitigate the risk of SCC at these locations. The in-ditch inspection of EMAT ILI tool blind spots outlined by FEI is used to manage the potential for false negatives (features not detected by the tool due to degraded data)[19]. Managing the potential for false negatives due to overspeed or data degradation is considered best practice and essential to the overall crack management program.

The six (6) locations where pipeline restrictions are to be removed were determined using an analysis of previous ILI speed behaviour to predict potential locations where speed excursions with the EMAT may occur. This analysis was confirmed during the EMAT inspection pilot project where an EMAT tool with speed control (variable bypass) was used. Although EMAT ILI tools with variable bypass are used to further reduce the potential for speed excursions, not all available EMAT ILI tools

[18] Degraded data can be caused by speed excursions, sensor failure, sensor lift-off due to weld geometry or debris in the pipeline.

[19] False negative refers to when the ILI process has not detected/identified an indication, and indications above the tool detection threshold are found.

are equipped with the variable bypass functionality. When using an EMAT ILI without variable bypass, the operator must work closely with the ILI vendor to assess the specific pipeline conditions that will potentially cause speed excursions (flow rate, elevation changes, pipeline geometry and wall thickness changes). Optimizing the tool configuration by adding bypass or changing the drive cups may be necessary to achieve the desired ILI tool velocity[20].

E.5 Use of EMAT vs. Alternative SCC Mitigation Methods

E.5.1 Alternative SCC Mitigation Methods

FEI examined six (6) alternatives to manage the threat of SCC, which were evaluated on technical and financial feasibility. The alternatives are shown in Table E-3.

Table E-3: Summary of Alternative Crack Management Methods

Method	Technically Feasible	Financially Feasible
1. Stress Corrosion Cracking Direct Assessment (SCCDA)	Not Feasible	
2. Pressure Regulating Station (PRS)	Not Feasible	
3. Hydrostatic Test Program (HSTP)	Not Feasible	
4. Electro-Magnetic Acoustic Transducer In-Line Inspection (EMAT ILI)	Feasible	Feasible
5. Pipeline Replacement (PLR)	Potentially Feasible	Not Feasible
6. Pipeline Exposure and Recoat (PLE)	Potentially Feasible	Not Feasible

Based on the evaluation, FEI determined that EMAT ILI is the sole option which is both technically and financially feasible and is therefore the preferred alternative for the CTS TIMC Project.

E.5.2 Stress Corrosion Cracking Direct Assessment

SCCDA is an integrity management approach developed by the National Association of Corrosion Engineers (NACE) International[21]. The approach involves several steps including:

- Pre-assessment
- Indirect Inspection
- Direct Examination
- Post Assessment
- SCCDA Records

By performing indirect inspections as part of the SCCDA process, the operator is directed to areas of potential cracking and coating imperfections where SCC may be present. The pipeline would then be

[20] CEPA Recommended Practices for Managing Near neutral pH Stress Corrosion Cracking 3rd edition, 2015 (Section E.1.1.6).

[21] NACE Standard SP0204-2015 - Stress Corrosion Cracking (SCC) Direct Assessment Methodology.

exposed at the potential SCC sites to confirm the presence or absence of SCC. The limitation of the SCCDA approach is that the areas identified are potential areas of SCC and no information about the significance of SCC is provided. The SCCDA method does not allow the operator to know the exact location of the cracks or the significance[22]. EMAT ILI is a direct assessment tool that will reliably determine the location and size of cracks on the pipelines. EMAT ILI will allow FEI to address any significant features detected and manage the threat of SCC more effectively going forward.

While SCCDA is a suitable method for determine a pipeline's potential susceptibility to SCC, this method will not reliably identify or size the cracking on the CTS pipelines and should therefore not be considered as an alternative to EMAT ILI.

E.5.3 Pressure Regulating Station

The installation of a pressure regulating station (PRS) would effectively manage the threat of SCC by reducing the operating pressure below 30% of the SMYS and reduce the potential for rupture[23,24]. This alternative causes capacity limitations in the pipeline and as noted by FEI, would lead to a significant reduction in the capacity available to customers. To meet the demand while operating at reduced pressure the pipeline would require system looping.

Utilizing the EMAT ILI tool and having a robust validation program, as outlined in Section E.7, has allowed gas pipeline operators to successfully manage the threat of SCC while operating the pipelines without system wide pressure reduction[25].

E.5.4 Hydrostatic Test Program

A hydrostatic testing program (HSTP) involves taking the pipeline out of service, introducing water into the pipeline and pressurizing the line to confirm the integrity. As noted by FEI in the application, hydrotesting is a complex process that involves significant operational, community and environmental challenges in an urban environment. This method is effective to manage the threat of SCC, however, only significant features that are close to leak or rupture (near critical) will be detected and repaired. The hydrotest confirms the integrity of the pipeline but offers no information on the cracks that survived the hydrotest, which can continue to grow under normal operations following the test.

The EMAT ILI tool is significantly less disruptive to the operations of the pipeline and provides location and sizing information on both the near critical flaws and sub critical flaws[26]. This allows the operator to repair any near critical features, perform an assessment on the sub critical flaws to plan future excavations and re-inspection intervals[27].

Although hydrotest is not a preferred option, in some cases, operators have performed select and targeted hydrostatic testing of pipeline sections (typically short segments of less than 5 km) as a

[22] CEPA Recommended Practices for Managing Near neutral pH Stress Corrosion Cracking 3rd edition, 2015 (Section A.1.4).

[23] INGAA Integrity Characteristics of Vintage Pipelines, 2005 (Appendix B. Low-Stress Pipelines).

[24] TTO Number 5 Low Frequency ERW and Lap Welded Longitudinal Seam Evaluation Final Report (Revision 3), Michael Baker, April 2004 (Figure 4.1).

[25] K. Spencer, D. Williams, J. Phlipot, D. Whaley, S. Rapp, "Managing an EMAT ILI Program to Achieve Appropriate Margins of Safety in Natural Gas Pipelines", Pipeline Pigging and Integrity Management Conference (PPIM), Houston, USA, 2021.

[26] Sub-critical flaws must be above the detection threshold of the EMAT ILI tool to be identified and sized.

[27] CEPA Recommended Practices for Managing Near neutral pH Stress Corrosion Cracking 3rd edition, 2015 (Table 2.4).

supplemental input to the EMAT ILI survey validation. These pipeline sections are selected, either due to high susceptibility to SCC, prior history of SCC or failures, high concentration of SCC featured detected, and severity of EMAT ILI calls or due to the risk associated with a failure during operation.

E.5.5 Electro-Magnetic Acoustic Transducer In-Line Inspection

Based on the results of the alternatives evaluation from FEI, EMAT ILI is the sole option that is both technically and financially feasible and is therefore the preferred alternative to achieve the project objectives.

The evolution of EMAT technology has allowed for the reliable detection, identification and sizing of crack anomalies and has increasingly provided an effective basis for managing the threat of SCC to an appropriate safety level. When evaluated against other SCC assessment approaches, EMAT ILI exhibits the distinct advantage of providing information on both critical and sub-critical flaws[25].

The EMAT ILI program involves pipeline modifications to ready the system, periodically running EMAT ILI and targeted repairs based on the results. Utilizing the EMAT ILI along with a robust validation process (as outlined in Section E.7) is considered a reliable approach to managing the threat of SCC on natural gas pipelines.

E.5.6 Pipeline Replacement of Pipeline Exposure and Recoat

Although pipeline replacement or a full pipeline recoat would effectively manage the threat of SCC, these options are associated with high costs and significant societal impact and would result in taking the line out of service for replacement or operating at a reduce pressure during recoat[27]. As noted in the application from FEI, these methods were deemed cost prohibitive as compared to EMAT ILI and therefore not considered financially feasible. The EMAT ILI is the preferred method to manage the threat of SCC as it is significantly less disruptive to the CTS.

E.6 Current EMAT Capabilities

E.6.1 Background Information on EMAT

An EMAT ILI tool consists of sensors with a coil in a magnetic field placed at the internal surface of the pipe wall. Alternating current (AC) placed through the coil induces a current in the pipe wall using either Lorentz forces[28], magnetostriction[29], or a combination of both. The result is an ultrasound wave generated in the pipe wall that travels from the “sending” portion of a sensor to a “receiving” portion of another nearby sensor. If there is an axially aligned feature between the sender and receiver (such as a crack), a portion of the ultrasound wave will be interrupted and reflected back towards the sending sensor. The reflected ultrasound wave is then detected, and the signal strength is used to determine the size of the indication. Figure E-1 is an illustration of Lorentz force and magnetostriction, Figure E-2 shows ultrasound wave generation in a pipe wall by EMAT technology travelling uninterrupted from the “sending” portion of the sensor to the “receiving” portion of another sensor. The type and configurations of the transducer used define the type and

[28] Lorentz force is the combination of electric and magnetic force acting on moving charges in magnetic fields.

[29] Magnetostriction is a property of ferromagnetic materials which causes them to expand or contract in response to a magnetic field. This effect allows magnetostrictive materials to convert electromagnetic energy into mechanical energy.

modes of generated ultrasound and the characteristics of its propagation through the pipe wall. EMAT is fundamentally different from other similar ultrasonic ILI technologies such as ultrasonic crack detection (UTCD), in that the sound waves are generated in the pipe material by a pulsing electromagnetic system, thus no steel surface couplant is needed, making it an effective technique for dry natural gas pipelines.

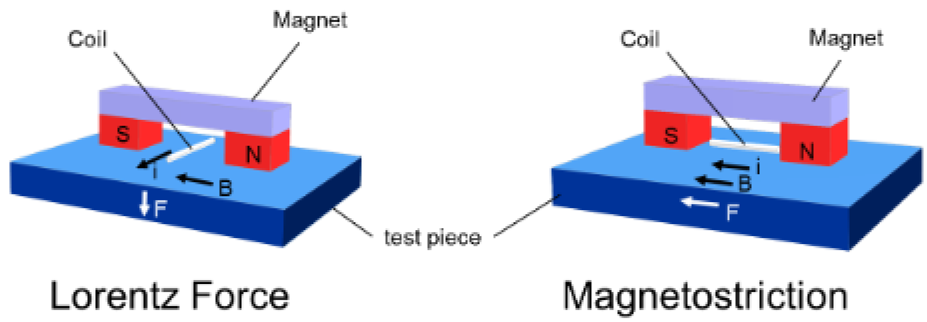

Figure E-1: Illustration of Lorentz force and Magnetostriction[30]

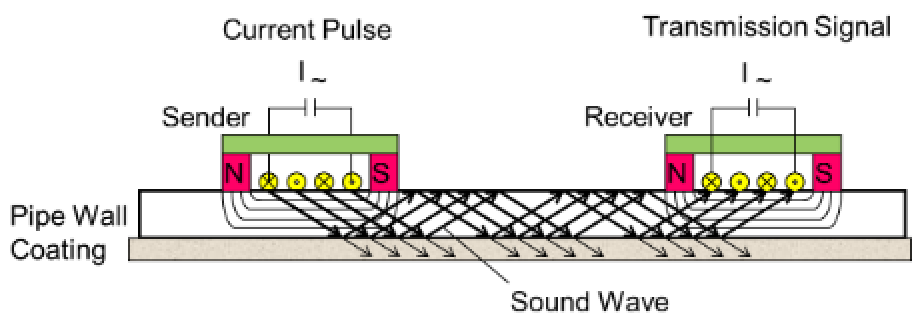

Figure E-2: Illustration of Sound Wave Generation by EMAT Technology

The EMAT technology has proven to be effective in the detection and sizing of axially oriented anomalies, as the sound waves generated by EMAT in ILI surveys are circumferentially oriented and are more sensitive to defects that are located axial (parallel) to the pipe surface. EMAT ILI surveys do not typically report metal loss, dents or deformations, or circumferentially oriented anomalies. The EMAT technology capabilities include:

- Detection and sizing of longitudinal seam weld anomalies such as lack of fusion, toe cracks, fatigue cracks and hook cracks.
- Detection and sizing of longitudinally oriented pipe body cracks such as SCC.
- Detection and sizing of coating disbondment (in certain situations, as wave propagation of ultrasonic tools is affected by the presence and type of coating).

[30] https://www.rosen-group.com/global/company/explore/we-can/technologies/measurement/emat.html

E.6.2 EMAT Detection and Sizing Capabilities

EMAT ILI technology has evolved significantly since its initial application during the 1990's and the 2000's. Table E-4 provides the typical specifications for EMAT ILI technology available for pipeline operators. The specifications listed in Table E-4 are a general overview of the EMAT capabilities and may vary slightly by ILI vendor or tool diameter. EMAT ILI vendors will provide a more detailed EMAT specification that is specific to the pipeline being inspected during the tool selection process, where the EMAT technology specifications need to be considered.

Table E-4: Typical ILI Specifications for EMAT Crack Detection Technology[31,32]

Typical Specifications: EMAT Crack Detection Tools	
Axial resolution:	1.5 to 3 mm
Circumferential resolution:	6.0 to 10 mm
Wall thickness range	4 to 20 mm
Diameter range	NPS 10 to NPS 42
Minimum bend radius	1.5D*
Inspection speed range	0 - 2.5 m/s**
Crack alignment	±10° from pipe axis
Base metal (POD 90%)[33]	Minimum crack depth 1.0 mm; Minimum crack length 30 mm;
Base metal (80% certainty)	Depth sizing accuracy ±0.15t*, Length sizing accuracy ±10mm; Width sizing accuracy ±50mm
Longitudinal weld (POD 90%)	Minimum crack depth 2.0 mm; Minimum crack length 30 mm
Longitudinal weld (80% certainty)	Depth sizing accuracy ±0.15t*, Length sizing accuracy ±10mm; Width sizing accuracy ±50mm
Location accuracy:	Axial (relative to closest girth weld): ± 0.1 m Circumferential: ± 10°

*D is pipeline diameter; t is pipeline wall thickness.
**Tool velocity outside the specified range will impact the performance specifications of the ILI tool.

E.6.3 EMAT Validation in Natural Gas Pipelines

The performance of the EMAT ILI technology has been evaluated through many published articles and research projects since it's introduction in the early 2000's. The validation of the technology has been completed by EMAT ILI vendors working closely with natural gas pipeline operators during

[31] CEPA Recommended Practices for Managing Near neutral pH Stress Corrosion Cracking 3rd edition, 2015 (Table E.1).

[32] NACE Publication 35100 – In-Line Inspection of Pipelines, 2016 (Table B4).

[33] Probability of detection (POD) is defined as the probability of an anomaly being detected by an ILI technology.

validation excavations, completing pull testing on pipe samples with crack features removed from service and through studies that continually monitor the performance specifications of EMAT ILI[34,35,36,37]. The successful validation of each EMAT ILI relies on a partnership that needs to be established with EMAT ILI vendors to set up effective communication and consultation channels.

E.6.4 Use of EMAT on CTS Pipeline Segments

FEI has determined that eleven (11) CTS pipeline segments are susceptible to the threat of SCC that can lead to failure by rupture and has proposed to use EMAT ILI tools to enhance the integrity management.

Currently vendors offer EMAT ILI technology ranging from NPS 10 to NPS 42, suitable for all of the CTS pipeline segments. The eleven (11) CTS pipeline segments proposed for EMAT range in diameter from NPS 12 to NPS 42 and are listed in Table E-4.

The EMAT ILI tools have a maximum distance range and can inspect pipeline segments up to 330 km in length. The longest pipeline segment in the CTS is 56.4 km (Table E-4) which is significantly below the maximum inspection distance. All the currently available EMAT ILI tools are capable of inspecting the CTS segments based on their pipeline segment length and diameter.

Table E-5: FEI CTS Pipelines Considered for EMAT ILI

Pipeline Segment Short Name	Length (km)	Diameter (inch)	EAMT Diameter Availability	Inspection Distance <330 km
HUN ROE 1067	55.7	42	✓	✓
HUN NIC 762	56.4	30	✓	✓
LIV COQ 323	34.9	12	✓	✓
CPH BUR 508	17.0	20	✓	✓
TIL FRA 508	9.6	20	✓	✓
TIL BEN 323	5.9	12	✓	✓
LIV PAT 457	29.8	18	✓	✓
NIC FRA 610	24.3	24	✓	✓
ROE TIL 914	12.8	36	✓	✓
NIC PMA 610	4.9	24	✓	✓
TIL LNG 323	1.7	12	✓	✓

[34] S. Tandon, M. Gao and R. Krishnamurthy, "Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience Phase I and II) SCC-3-7", PRCI Catalog No. PR-328-083501-R01, September 27, 2017

[35] R. Kania, S. Klein, J. Marr, G. Rosca and E. SanJuan Riverol, "Validation of EMAT technology for EMAT for Gas Pipeline Inspection Technology", 9th International Pipeline Conference, September 24th – 28th 2012, Calgary, AB, Canada, IPC 2012-90240.

[36] D. Katz, S. Potts, T. Beuker, J. Grillenberger and R. Weber, "EMAT for A Comprehensive System Wide Crack Management Program", 12th International Pipeline Conference, September 29th – October 3rd 2014, Calgary, AB, Canada, IPC 2018-78346.

[37] K. Spencer, D. Williams, J. Phlipot, D. Whaley, S. Rapp, "Managing an EMAT ILI Program to Achieve Appropriate Margins of Safety in Natural Gas Pipelines", Pipeline Pigging and Integrity Management Conference (PPIM), Houston, USA, 2021.

The EMAT ILI tools are capable of detecting and sizing the following:

- longitudinally oriented pipe body cracks such as SCC.
- longitudinal seam weld anomalies such as lack of fusion, hook cracks and toe cracks.

These types of crack features have previously been found on the CTS system through opportunistic excavations and during the EMAT pilot project. Inspecting the CTS pipeline segments with EMAT will allow FEI to know the location, monitor and mitigate the SCC going forward.

E.7 Industry Experience Using EMAT

E.7.1 Introduction

Pipeline operators rely on a variety of tools and technologies to manage threats to their pipeline assets. For natural gas pipelines, the management of SCC has benefited from the introduction and evolution of ILI technologies, specifically EMAT technology, that can reliably detect, identify, and size cracking anomalies. Since it's introduction in the early 2000's, the performance of EMAT technology has been evaluated and documented through many industry research projects and published articles that describe operational experience.

This section provides the industry shared knowledge on the EMAT verification and validation process with practical insights into effectively using EMAT ILI validated data as a key input to the SCC management plan.

E.7.2 Overview of EMAT Verification and Validation Process

Guidance for the acceptance and validation of ILI surveys is provided in API 1163[38] and CEPA[39] documents. A summary of the overall ILI process is presented in Figure E-3, which is taken from API 1163.

[38] API 1163 – In-line Inspection Systems Qualification – Reaffirmed 2018. This standard is an umbrella document that provides performance-based requirements for ILI systems, including procedures, personnel, equipment, and associated software.

[39] CEPA - Metal Loss In-line inspection Tool Validation Guidance Document, 1st Edition 2016

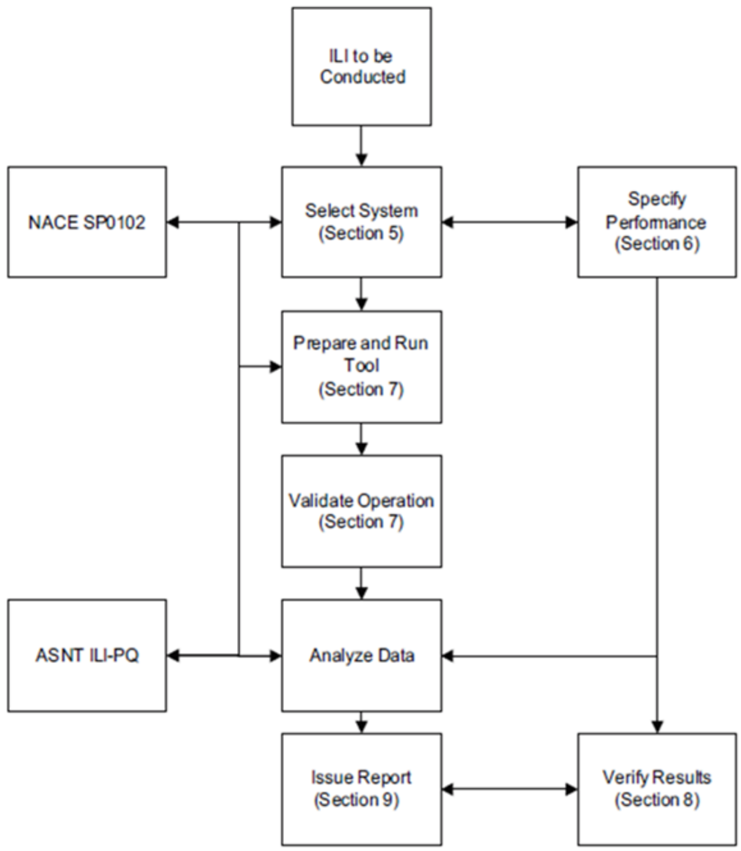

Figure E-3: In-Line Inspection Process Flow Diagram (API 1163)

Note: This figure is from API 1163-2018, the section numbers refer to the specific sections within the API document.

The EMAT verification and validation program is organized into three (3) distinct levels: System Selection, Inspection Verification, and Performance Validation. Each is described below:

i) System Selection – Review and documentation of the EMAT technology selection process.

ii) Tool Run Verification Process – The check of the procedures and operations to ensure that all aspects of the inspection have been conducted according to existing standards and best practices. A successful ILI should result as a consequence of following proper procedures and operations.

iii) Tool Run Validation Process - The check that results of the inspection (by comparison to field measurement, previous ILI or other independent source of information) are consistent with stated ILI performance specifications.

The EMAT performance validation program is performed holistically where information from each inspection is continuously aggregated and reviewed to inform the complete validation process. Field excavations will be conducted throughout the course of the EMAT validation program and results will be continuously updated and analyzed over time.

E.7.2.1 System Selection

CSA Z662:19[40] states that the pipeline integrity management program shall include procedures to monitor for conditions that can lead to failures. Non-mandatory Annex N provides guidance on the selection of monitoring methods and suggests, "Consideration shall be given to using in-line inspection equipment to detect cracks".

ASME B31.8S[41] states that an integrity assessment shall be conducted for a susceptible pipeline segment, "The integrity assessment methods that can be used are inline inspection, pressure testing, direct assessment, or other methodologies". The fourth item, "other methodologies", recognizes that technologies are evolving and allows for their use provided the pipeline operator "be diligent in confirming and documenting the validity of this approach to confirm that a higher level of integrity or integrity assurance was achieved".

API 1663 notes that in selecting an in- line inspection system, the requirements in NACE SP0102[42] can be followed.

Table E-6 is based on NACE SP0102 and summarizes the detection capabilities of various metal loss, crack detection and deformation ILI tools. Based on this summary, operators will select EMAT as the appropriate ILI tool for crack detection in gas transmission pipelines because EMAT:

- can detect and size SCC in gas pipelines without a liquid coupling.
- can detect and size long seam features including cracks and lack of fusion in gas pipelines without a liquid coupling; and
- in certain situations, can detect and size coating disbondment in gas pipelines without a liquid coupling.

[40] CSA Z662:2019, Oil and Gas Pipeline Systems.

[41] ASME B31.8S-2018, Managing System Integrity of Gas Pipelines.

[42] NACE SP0102-2017, In-line Inspection of Pipelines.

Table E-6: Pipeline ILI Compatibility Assessment

Anomaly	Imperfection/Defect/Feature	Metal Loss tools			Crack Detection Tools		Deformation tools
		Axial MFL	USWM	Circ MFL	Liquid coupled	EMAT	Caliper
Crack-like							
	Stress corrosion cracking (SCC)	No Detection	No Detection	No Detection	Detection, sizing	Detection, sizing	No Detection
	Fatigue cracks	No Detection	No Detection	No Detection	Detection, sizing	Detection, sizing	No Detection
	Long Seam Cracks (toe & hook cracks, incomplete fusion)	No Detection	No Detection	Detection, limited sizing	Detection, sizing	Detection, sizing	No Detection
	Circumferential cracking	Limited Detection	No Detection	No Detection	Detection, sizing	No Detection	No Detection
	Hydrogen Induced cracking (HIC)	No Detection	Detection, sizing	No Detection	No Detection	No Detection	No Detection
Weld defects							
	Lack of Fusion (LSW)	No Detection	No Detection	Limited Detection, sizing	Detection, sizing	Detection, sizing	No Detection
	Lack of Fusion (GW)	Detection, sizing	No Detection	No Detection	No Detection	No Detection	No Detection
	Girth Weld anomaly (voids, offsets, lack of fill etc.)	Detection, sizing	Detection, sizing	No Detection	No Detection	No Detection	No Detection
Misc. Damage							
	Laminations	No Detection	Detection, sizing	Limited Detection	No Detection	No Detection	No Detection
	Inclusions	No Detection	Detection, sizing	Limited detection	Limited detection	Limited detection	No Detection
	Grind Marks	Limited Detection	Detection	Limited detection	Detection	Detection	No Detection
	External Coating disbondment	No Detection	No Detection	No Detection	No Detection	Detection, sizing	No Detection

E.7.2.2 Tool Run Verification Process

E.7.2.2.1 Vendor Partnership

EMAT verification and validation processes are based on established essential partnerships with EMAT ILI tool vendors through regular collaboration. A “client profile” is a document used define the requirements and expectations for reporting format, reporting timelines, analysis and documentation required by the operator. The client profile should be established for each vendor to ensure consistent reporting that meets the specific data requirements of the operator. This would also include the requirements for pre-run, post-run and the Data Quality Assessment (DQA) checks and associated DQA report. The client profile can also specify any special or unique requests for providing additional information (i.e., on non-reportable features or indications below specification, that can be used for integrity assessment and validation).

E.7.2.2.2 Essential Variables

Essential variables are the key pipeline and inspection parameters that need to be considered for each pipeline segment prior to an EMAT ILI (i.e., line length, diameter, wall thickness, etc.). Prior to the EMAT ILI, a review of the essential variables is established through vendor consultation. A summary of the essential variables analysis is shown in Table E-7.

Table E-7: Essential Variable Analysis

Essential Variable	Acceptability of Essential Variable Range for EMAT Validation Assessment
Line Length	✓ Vendor identifies tool battery life requirements based on pipeline length
Diameter	✓ Current EMAT available diameters range from NPS 10 to NPS 42
Vintage	✓ Vendor identifies any unique manufacturer or vintage segments that potentially create DQA issues.
Manufacturer	
Coating	✓ Attenuation range of Medium to High is acceptable (asphalt-tape); FBE sections considered non-susceptible to SCC
Wall Thickness	✓ Vendor to identify if pipe thickness is in optimum range for EMAT.
Seam Type	✓ Vendor identifies any unique manufacturer or vintage segments that potentially create DQA issues.
Speed – extent of elevation change	✓ Where elevation differences (or other causes) create speed excursions, those over speed areas are reviewed separately
ILI Configuration (sensor, tool generation)	✓ Vendor specifies tool configuration (tool length, sensor configuration) based on assessment of essential variables.

E.7.2.2.3 Inspection Verification

The inspection verification process consists of three parts:

i. the ILI tool used in the inspection is appropriately selected to assess the threat(s) and has a history of successful runs.
ii. the actual running of the ILI tool and analysis of the data were conducted according to existing standards and Guidelines; and

iii. the results of the ILI data are consistent with expected results considering the age, condition and history of the pipeline.

The results of the inspection verification will be documented, an example of this is provided in Table E-8 which allows the operator to classify the ILI results as a “pass”, “conditional pass” or “fail”. Where a result is shown as a “conditional pass”, the explanation and justification basis for acceptability will be logged as part of the verification check. The required documentation regarding pre-inspection and post-inspection checks is now provided as part of the standard ILI Report deliverable and should be outlined as a requirement in the client profile. In some cases, for historical runs, all details may not be available. The example of the run verification checklist provided Table E-8 is based on the CEPA Metal Loss Inline Inspection Tool Validation Guidance Document. It is highlighted that although this was developed for metal loss inspections the framework is also valid for EMAT ILI verification.

Table E-8: Run Verification Checklist

Category	Score (Pass, Conditional Pass, Fail)	Comment (include any comments, observations, or demonstration of acceptability of any Conditional Passes)
Tool Selection		
Historical performance of the inspection system		
Planning		
Pre-run Function Check		
Pre-run Mechanical Check		
Procedure execution (pigging procedure, tool speed, etc.)		
Post Run Mechanical Check		
Post Run Function Check		
Field Data Quality Check		
Data Analysis Processes: Quality Checks		
Cumulative Assessment		

E.7.2.3 Tool Run Validation Process

E.7.2.3.1 EMAT Inspection Response on Operator’s Crack Severity Criteria

Anomalies identified by EMAT may be evaluated based on one or more of the following criteria:

1. Anomalies that require response[43] as per operator's crack severity criteria[44]. The response time could be determined based on the failure pressure ratio and location of the anomaly.
2. Additional excavations based on the following:
   a. Previous excavation or EMAT ILI findings;
   b. SCC susceptibility and risk factors;
   c. Pipelines sharing right of way (ROW)[45] (i.e., when reportable SCC was found on the parallel line co-incident with non-high-performance coating on the subject line); or,
   d. Joints of interest in the overspeed and degraded data areas.

It is prudent to select at least one or more excavation locations for validation for every EMAT survey. If the EMAT ILI reveals no reportable features, IBS features should be requested from the vendor.

E.7.2.3.2 Examine the Potential for False Negatives

False negatives are conditions when the ILI has not reported a crack-like anomaly but a crack-like anomaly above the ILI technology detection threshold is found. Examination for false negatives should be performed when there are no anomalies reported in an EMAT survey and also in the case of overspeed or data degradation. Examining the potential for false negatives involves overlapping multiple datasets to improve decision making. The following datasets may be used to examine the potential for false negatives:

- Consult with vendor on indications below specifications (IBS).
- Review previous EMAT and MFL findings.
- Review previous excavation findings/history.
- Review SCC susceptibility (NACE SP0204-15[46]) and risk (location of anomaly) factors.
- Results of other validation digs (determine "joints of interest").

E.7.2.3.3 Response to Overspeed and Degraded Data

An overspeed area from an EMAT survey is defined as the portion of the survey where the ILI tool is propelled through the pipeline at velocities that are above the velocity range in which the ILI tool performance specifications are established. High flow conditions, bypass failure of the ILI tool,

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[43] Field examination of EMAT anomalies using non-destructive examinations (NDE) should include full circumference magnetic particle inspection of the exposed pipe, phased array ultrasonic testing (PAUT) examination of isolated cracking and for certain crack fields, time of flight diffraction (TOFD) or PAUT for deep and narrow corrosion on the long seam. Grinding or buffing is the most appropriate evaluation method for shallow crack fields in the pipe body.

[44] EMAT vendors could provide a crack prioritization list to generate a list of high priority crack anomalies.

[45] These are called proximal digs. Due to same environment, SCC could be present if the pipelines are parallel to each other.

[46] SP0204-2015-SG, "Stress Corrosion Cracking Direct Assessment Methodology (SCCDA)". This standard provides guidance for managing SCC by selecting potential pipeline segments, selecting dig sites within those segments, inspecting the pipe and collecting and analyzing data during the dig, establishing a mitigation program, defining the re-evaluation interval, and evaluating the effectiveness of the SCCDA process.

elevation changes, heavier wall thickness at appurtenances (valves) could lead to overspeed. Other sources of data degradation i.e. high noise in the EMAT signals could be caused by debris, faulty sensors, sensor lift off, loss of power or other mechanical failures.

It is possible that the EMAT technology may not meet the stated performance specifications in the overspeed or data degradation areas[47]. Therefore, additional evaluation will be required in areas of overspeed or data degradation. Pipeline operators should work with the EMAT technology vendor to perform a case-by-case evaluation of such areas. Factors to be considered in such evaluations are:

- Extent of overspeed (% above the maximum limit to meet specifications and distance of overspeed).
- Location of overspeed (high consequence area, susceptible pipe coating, results of previous excavations).
- Anomalies reported in the overspeed/degraded data area in both the current and previous EMAT ILI survey
- Consider the most recent MFL ILI survey to assess areas of higher metal loss as a proxy for potential coating damage.
- SCC susceptibility (NACE SP0204-15) and risk (location of anomaly) factors.
- The indications below specification (request ILI vendor to provide IBS data from current EMAT ILI and request IBS anomalies from previous EMAT survey (if performed)).

The following steps could be taken to address overspeed and data degradation areas:

- Perform a growth assessment of the IBS features in the affected area from previous EMAT survey and evaluate response schedule.
- Apply size corrections increase the dimensions to features reported in the overspeed and data degradation areas and evaluate response schedule.
- Identify joints of interest to perform validations digs. This step should be performed in collaboration with the ILI vendor. Previous excavation findings/history, SCC susceptibility, IBS, and risk factors may be used to identify joints of interest.
- Characterize the impact of overspeed in consultation with the EMAT vendor; in many cases the vendor can still effectively analyze the signals in overspeed areas and there has been no signal degradation.
- Overspeed or degraded data may not be applicable in areas such as FBE coated (non-susceptible) areas and these can be quickly eliminated from the analysis.

E.7.2.3.4 EMAT Tool Performance

The key measures to evaluate ILI technology performance as provided in API 1163 are in terms of probability of detection (POD), probability of identification (POI) and probability of sizing (POS). Operators should exercise caution while using NDE findings to validate EMAT results and consider accounting for NDE sizing errors during the validation process.

[47] In certain cases, field validation may not find any major discrepancy in dimensions of EMAT anomalies reported in the overspeed areas.

Industry related research of NDE sizing accuracy has determined the NDE depth sizing error to be within ±1 mm. The same research also found that for complex SCC colonies, overall depth errors were larger and not all NDE participants can measure depth within ±1mm accuracy (highly NDE operator dependent). The NDE sizing error was evaluated in the work performed by the Pipeline Research Council International (PRCI) under PRCI project NDE-2-2 (Performance and Application of Various In-the-Ditch Tools and their Impact on Pipeline Integrity), initiated in conjunction with PRCI project SCC-3-7 (Study on Reliability of In-ditch NDE for SCC Anomalies).

Crack length sizing reported from in-ditch NDE can be significantly different when compared to EMAT reported lengths, due to the absence of a consistent protocol for length sizing by in-ditch NDE. When permissible, grinding or buffing to a point of removal should be considered preferable to verify the EMAT results. It is advised to account for anomaly growth between the EMAT survey and the time of excavation and include an error of +0.25 mm to account for overgrinding, when using grinding or buffing as the reference[48]. Results of the EMAT validation are used to determine the following:

- Actual as run EMAT performance[49].
- Adjustments required to EMAT response.
- Significant outliers.
- Inspection validity.

Probability of Detection (POD)

Probability of detection (POD) is defined as the probability of an anomaly being detected by an ILI technology. All anomalies above the detection threshold of the EMAT technology are expected to be reported in the EMAT survey report. Field excavation results are reviewed to identify reportable anomalies and are then compared to the ILI data with NDE tolerances and potential growth considerations where applicable. The following definitions related to the POD are often used:

- True Positive (TPs): EMAT detected a SCC/crack-like indication, and a SCC/crack-like indication is found.
- False Positive (FPs): EMAT detected a SCC/crack-like indication, and a SCC/crack-like indication is not found.
- False Negative (FNs): EMAT has not detected a SCC/crack-like indication and SCC/crack-like indications above the tool detection threshold are found.
- True Negative (TNs): EMAT has not detected a SCC/crack-like indication and SCC/crack-like indications above the tool detection threshold are not found.

POD could be calculated from “True Positives” and “False Negatives”, using the following equation:

[48] Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience, SCC-3-7, Pipeline Research Council International, Inc., September 13, 2017.

[49] During validation of EMAT results, Field NDE may report anomalies with longer lengths as compared to the EMAT results. In such cases, review of the actual crack profile (river bottom profile) from the field NDE results may reveal a very small part of the crack had a depth above the detection threshold of EMAT (e.g., 2.0 mm). Error tolerance of the NDE method may need to be accounted for while using field NDE results for EMAT validation.

$$POD(specific\ defect\ type\ and\ size) = \frac{No.of\ times\ a\ defect\ of\ that\ type\ and\ size\ has\ been\ detected}{NO.of\ opportunities\ to\ detect\ a\ defect\ of\ that\ type\ and\ size} = \frac{TPs}{TPs + FNs}$$

Probability of Identification (POI)

Probability of identification (POI) refers to the probability of correct identification of anomalies, components, or characteristics that are detected by an ILI tool. POI is calculated from "True Positives", "True Negatives", "False Negatives" and "False Positives using the equation:

$$POI(specific\ defect\ type) = \frac{No.of\ correct\ identifications}{NO.of\ opportunities\ to\ classify\ a\ defect} = \frac{TPs + TNs}{TPs + FNs + FPs + TNs}$$

Where,

- True Positive: EMAT identified SCC/crack-like and SCC/crack-like is found.
- False Positive: EMAT identified SCC/crack-like and SCC/crack-like is not found.
- False negative: EMAT has identified a non-SCC/non-crack-like indication and SCC/crack-like indications above tool tolerance are found.
- True Negative: EMAT has identified a non-SCC/non-crack-like indication and SCC/crack-like indications above tool tolerance are not found.

A key component of POI calculation is common and consistent terminology between validation teams. Validation teams utilize a POI matrix based on each ILI vendor and potential field findings (see example in Table E-9).

Table E-9: Example of POI MATRIX

Feat. Type	Associated with Weld	Field Finding	POI
Crack Field	N	SCC	TRUE POSITIVE
Crack Field	N	Stringers	FALSE POSITIVE
Crack Field	N	Inclusion	FALSE POSITIVE
Crack Field	N	Laminar indication/Lamination	FALSE POSITIVE
Crack Field	Y	No Indications found	FALSE POSITIVE

Probability of Sizing (POS)

Probability of sizing (POS) is the probability that the reported dimensions are within the specified tolerances (e.g., +/- 1.1 mm for depth). POS is expressed as a tolerance and certainty (e.g., +/- 1.1mm @ 80% certainty). POS can be calculated as follows:

$$POS = \frac{No. of\ correlated\ anomalies\ within\ sizing\ specifications}{Total\ number\ of\ correlated\ anomalies}$$

Outliers

Outliers are features identified during the validation process that are either outside the tool tolerance sizing range, any false negative or any POI misclassification. These features need to be investigated on a case-by-case bases to determine root cause and any follow up actions. Figure E-4 is an example of an EMAT Validation Workflow:

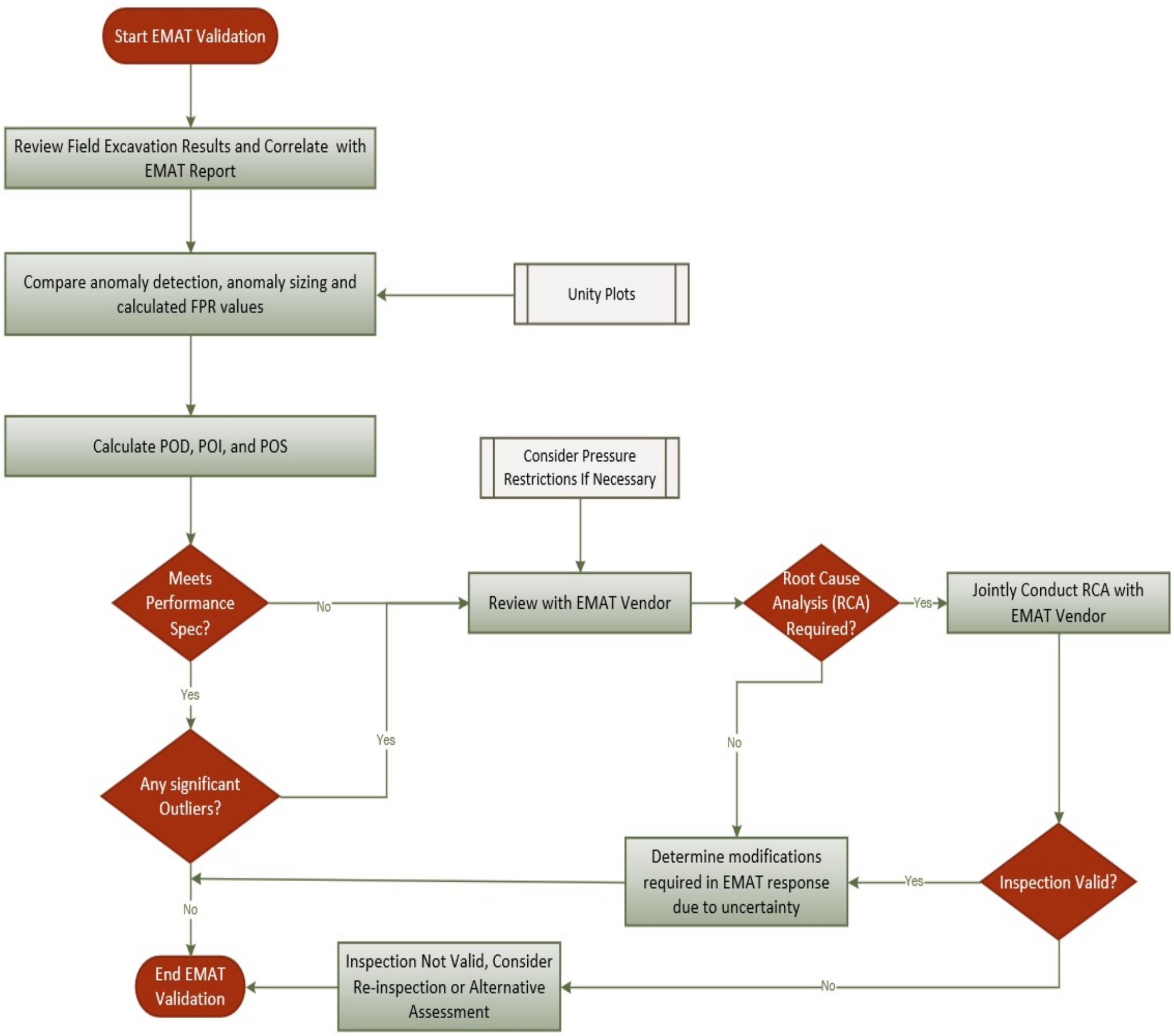

Figure E-4: EMAT Validation Workflow

E.7.3 Industry Lessons Learned

Based on industry experience, this section lists observation and findings from the EMAT ILI program:

- Significant elevation changes, heavier wall thickness at appurtenances (valves) can create segments where the inspection tool travels at speeds outside of the required velocity range. These areas should be reviewed separately.
- Large variability can be found in the number of anomalies reported by EMAT survey:
  - If EMAT survey reports a large number of anomalies, operators should work with the EMAT ILI vendor to understand the various anomaly descriptions/characteristics of reported anomalies. Field validation results should be used to understand what to expect in the field for the remaining anomalies.
  - When EMAT surveys results in minimal reported anomalies, an effective strategy to address such instances should include, at least one to two validation excavations.
- Operators should monitor their EMAT program performance using a depth-based unity plot along with a pressure based unity plot, that incorporates growth of anomalies from the time of inspection to the excavation date. This step is performed to ensure the program is performing satisfactorily and providing reliable estimations of remaining strength of anomalies[50].
- Consideration for threat interaction[51] is required by ASME B31.8S, as it could increase the possibility of failure associated with each of the individual threat. Operators should consider setting threat interaction criteria between cracking detected by EMAT and corrosion or dents detected by the MFL survey.

E.7.4 Discussion

EMAT is a highly sensitive technology and the current industry validation data seems to corroborate that EMAT POD has a high success rate[52]. However, the POI results have not been as successful (almost 80% success rate with 80% confidence)[53]. The POI results could also be relatively lower in the seam weld when compared to the POI results in the pipe body. In some cases, the lower POI results could be attributed to the seam weld geometry affecting the EMAT performance. The high POD success rate indicates a very low possibility of non-detected anomalies, but the high sensitivity of EMAT technology and the relatively lower POI success rate also highlights the possibility of false positives. EMAT vendors are using supporting MFL data (i.e., circumferential MFL data and in where applicable, axial MFL data), to cross reference EMAT results and reduce the number of false calls.

Current industry efforts have reduced the number of false calls, but it is very common to have a large number of linear anomalies reported after an EMAT survey. Linear indications reported by an

[50] For additional guidance on unity plot please refer to API 1163 Annex C.

[51] “Two or more threats acting on a pipeline that increase the probability of failure to a level greater than the effects of the individual threat acting alone”. Improving Models to Consider Complex Loadings, Operational Considerations, and Interactive Threats, US Department of Transportation, DTPH56-14-H-00004, December 30,2016.

[52] Majority of the data evaluated consisted of body of pipe SCC anomalies on large diameter pipelines.

[53] Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience, SCC-3-7, Pipeline Research Council International, Inc., September 13, 2017.

EMAT ILI survey may be sub-divided into eight to ten categories or more such as “linear Indication-Axial Cracklike-Permeability Change”, “Linear Indication - Axial Cracklike-Associated with Seam Variation”, Or “Linear Indication - Axial Cracklike - Possible Coating Disbondment”. This makes it necessary to prioritize the anomalies based on anomaly type and associated descriptions. In most cases, anomalies characterized as cracks or crack groups should be given higher priority over anomalies where the characterization is not certain. It is essential to have continuous communication between the operator and the EMAT vendor until all required activities for EMAT response have concluded. It is in the operator’s best interest to share field validation data with the ILI vendor and request re-evaluation if necessary.

Linear anomalies reported as surface breaking or associated with a high change in permeability should be given preference over anomalies reported as non-surface breaking or laminations. It is beneficial to revisit the sub-categories of linear indications based on field validation results. Using the field excavation findings, the operator should be on continuous lookout for mis-characterized sub-categories of linear anomalies. In such cases, the operator could adjust the response for the sub-categories appropriately.

In some cases, operators have performed select and targeted hydrostatic testing of pipeline sections (typically short segments of less than 5 km) as a supplemental input to the EMAT ILI survey validation. These pipeline sections are selected, either due to high susceptibility to SCC, prior history of SCC or failures, high concentration of SCC featured detected, and severity of EMAT ILI calls or due to the risk associated with a failure during operation. Operators have also adopted more onerous measures such as back-to-back EMAT inspections using different EMAT vendors to validate the operator’s EMAT program. While excavation of EMAT ILI anomalies and calculation of POD, POI and POS against the performance specification forms the foundation for the EMAT validation program, such measures (while costly) can provide additional confidence in confirming that the EMAT technology is finding critical flaws.

F Conclusion

SCC is a form of environmentally assisted cracking; wherein small surface cracks can form and grow over time. Cracks that continue to grow will frequently overlap and/or coalesce to become the equivalent of a large single crack in terms of their effect on the pressure carrying capacity of the pipe. Eventually such overlapping and coalescence can create a crack of sufficient size to cause the pipeline to leak or rupture. It is the independent pipeline integrity expert panel’s view that SCC is a credible threat for FEI that if left unmitigated, could lead to pipeline failure.

FEI operates eleven (11) pipe segments within the CTS considered as susceptible to SCC, which has been validated through results of opportunistic excavations, where pipe examinations have confirmed the presence of SCC. Currently, there is a gap in the existing FEI integrity management practices to address the threat of SCC, as opportunistic excavations alone are not sufficient to fully characterize, detect and manage the threat. The results of the quantitative risk assessment (QRA) demonstrate the risk of SCC to be highest on the CTS pipeline segments and it is the independent pipeline integrity expert panel’s view that EMAT ILI is the most appropriate response and mitigation action to reduce risk and strengthen the overall integrity management program.

To successfully utilize the EMAT ILI, the tool velocity must be maintained within the vendor specified range to acquire accurate and acceptable inspection results. FEI has recognized this critical variable and proactively identified areas of the pipeline segments where speed excursions may occur. Facility modifications are required to safely launch and receive the EMAT ILI tools and pipeline modifications are necessary to control the tool speed within appropriate limits during the inspection. Although the risk of speed excursions will be minimized with facility and pipeline modifications, the risk of degraded data during ILI still exists. FEI has addressed this through a process to investigate blind spots caused by EMAT ILI data degradation, which includes additional analysis to determine the severity of degraded data and the conditions of the pipeline in degraded areas. The goal is to determine if areas of degraded data need further investigation by pipeline replacement or exposure and recoat. This process of investigating for potential SCC in areas of EMAT data degradation is essential to the crack management program.

It is the independent pipeline integrity expert panel's view that the pipeline modifications proposed are necessary to ready the susceptible segments for EMAT ILI, which is a reliable technology that can detect the cracking features previously found through opportunistic excavations. The EMAT ILI tool, when used in parallel with a robust validation program, is appropriate to manage the threat of SCC on the CTS.

Appendix A Abbreviations

Abbreviation	Complete Term
AC	Alternating current
API	American Petroleum Institute
ALARP	As Low as Reasonably Practicable
APEGA	Association of Professional Engineers and Geoscientists of Alberta
BCUC	British Columbia Utilities Commission
CEPA	Canadian Energy Pipeline Association
CSA	Canadian Standards Association
CPCN	Certificate of Public Convenience and Necessity
CTS	Coastal Transmission System
DQA	Data Quality Assessment
Dynamic Risk	Dynamic Risk Assessment Systems, Inc.
EMAT	Electro-Magnetic Acoustic Transducer
FN	False Negative
FP	False Positive
FEI	FortisBC Energy Inc.
HSTP	Hydrostatic Test Program
ILI	In Line Inspection
IBS	Indications Below Specification
IMP	Integrity Management Plan
ITS	Interior Transmission System
IPC	International Pipeline Conference
LNG	Liquefied Natural gas
MFL	Magnetic Flux Leakage
NACE	National Association of Corrosion Engineers
NDE	Non-Destructive Examination
PAUT	Phased Array Ultrasonic Testing
PLE	Pipeline Exposure and Recoat
PPIM	Pipeline Pigging & Integrity Management Conference
PLR	Pipeline Replacement
PDCA	Plan Do Check Act

Abbreviation	Complete Term
PRS	Pressure Regulating Station
POD	Probability of Detection
POI	Probability of Identification
POS	Probability of Sizing
QRA	Quantitative Risk Assessment
ROW	Right of Way
SMYS	Specified Minimum Yield Stress
SCC	Stress Corrosion Cracking
SCCDA	Stress Corrosion Cracking Direct Assessment
SME	Subject Matter Expert
ASME	The American Society of Mechanical Engineers
TOFD	Time of Flight Diffraction
TIMC	Transmission Integrity Management Capabilities
TN	True Negative
TP	True Positive
UTCD	Ultrasonic Crack Detection
VITS	Vancouver Island Transmission System

Appendix B Dynamic Risk CV's

Trevor MacFarlane, M.Sc., P.Eng.

Senior Asset Integrity Advisor

Professional Profile

Mr. MacFarlane is one of the industry's most respected leading advisor in the development of pipeline integrity management programs and has extensive experience in all technical aspects of pipeline reliability and risk management. Trevor has authored papers and/or presentations at more than 25 technical conferences, industry associations and workshops on the subjects of integrity management and has testified as an expert witness in this field.

Areas of Expertise

- 25 years of experience in engineering and pipeline integrity management
- Reliability-based Design
- Quantitative Risk Modeling
- Hazard and Threat Analysis
- Pipeline failure analysis and fracture mechanics
- Enterprise Risk Management

Professional Experience

President

Dynamic Risk Assessment Systems, Inc.

2008 - Present

Vice President, Engineering

Dynamic Risk Assessment Systems, Inc.

2000 - 2008

Manager, New Ventures

TransCanada Pipelines Ltd.

1998 - 2000

Project Leader, Integrity

TransCanada Pipelines Ltd.

1996 – 1998

Metallurgical Engineer

TransCanada Pipelines Ltd.

1993 – 1996

Project Experience

Enterprise Risk Management for Large Liquids Transmission System

- Technical lead for the development of an enterprise risk management solution that considered all business risks and impacts the company.
- Results from the analysis highlighted key vulnerable facilities that required capital investment.
- Investment justification was completed using quantitative modeling and cost-benefit analysis.

Quantitative Risk Analysis (QRA) for a New Crude Oil Pipeline

- Technical lead for the analysis and regulatory approval for a key new crude oil pipeline.
- QRA approaches were employed to determine the risk profile of a newly proposed pipeline.
- Risk mitigation benefits were quantified to enable the creation of an optimal risk-based design.
- Regulatory approval was awarded on the basis of this approach.

Field Integrity Audit and Regulatory Compliance

- Technical lead for the completion of over 100 individual operating field integrity audits.
- Review of operations and integrity management activities to ensure total clarity on the condition of operating assets.
- System-wide risk assessment completed to identify pipelines that posed the greatest safety concerns.
- Enabled the operator to achieve full regulatory compliance in all fields and dramatically reduce overall system risk through optimized maintenance programs.

Designed and Implemented Data Integration Strategy

- Designed and Implemented Data Integration Strategy
- Reviewed and designed a total integration strategy for an operator with several disparate non-integrated data sources.
- Results enabled a system-wide review of all data elements in consideration of their interdependencies.
- Integrity management activities were them optimized based on the total integrated view.

Education

Bachelor of Science in Metallurgical Engineering, Honors

Queen's University 1991

Master of Science in Materials and Metallurgical Engineering

Queen's University 1993

Quantum Shift

Ivey School of Business – Western University 2016

Professional Affiliations

- Registered Professional Engineer, since 1994 in Alberta, Saskatchewan and British Columbia
- National Association of Corrosion Engineers
- Canadian Institute of Mining, Metallurgy and Petroleum
- Past Vice-Chair of CSA Subcommittee on Operations and System Integrity, CSA Z662 "Oil and Natural Gas Pipeline Systems"
- Past Member of Materials Sub-Committee, CSA Z662 "Oil and Natural Gas Pipeline Systems"
- Past Member of Pipeline Integrity Sub-Committee, CSA Z662 "Oil and Natural Gas Pipeline Systems"
- Southern Gas Association; Associate Member and Presenter (2006 – 2009) SGA Operating Conference
- International Pipeline Conference 2008 Risk Assessment Track Chair
- Pipeline Pigging and Integrity Management 2019 Technical Track Chair

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24. T. MacFarlane, P. Vieth, “The Future of Pipeline Risk Management”, American Petroleum Institute, Pipeline Information Exchange (PIX), Houston, Texas, April 2014
25. T. MacFarlane, “Pipeline Risk Management – An Industry Perspective”, Pipeline and Hazardous Materials Safety Administration (PHMSA), Risk Model Work Group, Houston, Texas, July 15th, 2017.
26. T. MacFarlane, “Engineering Communications: Using Technology to Engage Stakeholders”, PODS Annual Meeting, Pipeline Week, Houston, Texas, October 5th, 2017.
27. T, MacFarlane, Advisory Board, Pipeline and Pigging Integrity Management (PPIM), Risk Management Conference, March 2020.

Phillip George Nidd

Vice President, Technical Services

Professional Profile

Over 35 years of technical and management experience in the oil and gas asset integrity business, having served in Asset Integrity senior management positions for a major pipeline operator and several large engineering consulting companies. As Vice President, Technical Services for Dynamic Risk reporting to the President, Mr. Nidd has ultimate responsibility for all technical consulting projects, and works closely with clients in the areas of account management and strategy development. Mr. Nidd provides specific project technical leadership in the areas of Failure and Regulatory Response, Management System and Root Cause Investigations, Risk Management Initiatives, and Pipeline System Process Audits.

Phillip's project experience includes the Bellingham Pipeline failure in 1999, where he led the post failure ILI and integrity programs, the Deepwater Horizon explosion in 2010, where he co-managed the 2-year blow-out preventer (BOP) root cause analysis programs and the San Bruno pipeline failure in 2010, where he led the post failure IMP and technical procedure review and improvement process.

Mr. Nidd has working knowledge of both Canadian and U.S.A. oil and gas industry regulations and NACE, API and ASME pipeline standards, including DOT 195, DOT 192, ASME B31.8s, NEB OPR 99, CSA Z662-15, and has published several articles and presentations relating to Asset Integrity matters, Failure Prevention and Process Management.

Professional Experience

Vice President, Technical Services

Dynamic Risk Assessment Systems, Inc.

2012 – Present

As Vice President, Technical Services for Dynamic Risk in Houston, Phillip has responsibility for overall company engineering operations and providing technical leadership in the specific areas of incident root cause investigations, integrity program reviews and management system audits.

Deputy Director, DNV Litigation

Det Norske Veritas (DNV)

2009 – 2012

As Deputy Director of the DNV Litigation Group, Phillip had responsibility for market development, directing large-scale litigation projects, attorney communication, providing asset integrity management technical support, daily project coordination and coaching / mentoring staff. Phillip acted as Manager for several large DNV investigation projects relating to:

- 2010-2012- Reporting to U.S. Dept. of Energy- Forensic examination of the Deepwater Horizon blowout preventer (BOP), (Co-Project Manager), was responsible for project day to day operations involving 500 project participants and communications with attorneys representing involved parties and the U.S. Bureau of Ocean Energy Management, Regulation and Enforcement.
- 2012-2014 - Following the San Bruno incident, was responsible for development and implementation of several large pipeline integrity management and risk assessment continuous improvement projects.

Director, Pipeline Technical and Litigation Services

Intertek-Aptech

2005 – 2009

As Director of Pipeline and Litigation Services was fully responsible for pipeline fitness-for-service assessment programs, pipeline rehabilitation management, pipeline integrity management plan development and management of large-scale pipeline related litigation technical support projects. In addition, provided training to engineers in the area of Pipeline Integrity and Project Management and directed the development of document management systems for large scale litigation support projects.

Litigation Project Management -Led a multi-disciplined litigation engineering support team offering technical support regarding pipeline failure litigation proceedings:

- 2009- Oleoducto de Crudos Pesados (OCP, Ecuador)- Technical Lead- Pipeline Failure - Causal Investigation
- 2009- USA Dept. of Justice - Technical Lead- 2008 Alaska Pipeline Failure- Causal Investigation
- 2009- CNRL – Technical Lead- Pipeline Coating Failure - Causal Investigation
- 2008 - VRS- Vericlaim - (Insurance claim)- Technical Lead- Liquid bulk Terminal Failure - Kinder Morgan Fire Damaged Pit and Wing Manifold Pipeline and Component Assessment and Replacement Program
- 2008 - Gulf South - Technical Lead - Wellbore Fracture & Leak - Causal Investigation
- 2008- Kerotest - Technical Lead - Valve Failure Investigation – Causal Investigation.

Vice President, Operations

Amec Pipeline Professionals

1997 – 2005

Responsible for leading a diverse technical team providing a complete “turn-key” pipeline integrity management service, including all aspects of pipeline integrity assessment, regulatory compliance, in-line inspection, pipeline rehabilitation and repair, risk mitigation program management, and related engineering support.

- Pipeline Rehabilitation Program- Managed the field engineering and technical requirements involved in a response to a major pipeline failure including pipeline assessment programs, pipeline rehabilitation, regulatory communications, community program updates, establishment of procedures and criteria for repair.
- Pipeline Performance Testing Program- Reporting to the Ecuadorian Oil Ministry, managed all aspects of the Pipeline Performance Testing Program implemented to validate the pipeline construction practices, quality control and pressure and capacity performance aspects.
- Construction Quality Assessment Program- Managed quality control program and established assessment and removal criteria for pipeline dents created during construction of the Pipeline in Ecuador, SA.
- 20” Pipeline Rehabilitation Program- Was a member of a team that managed the technical aspects of a major cross country pipeline assessment and rehabilitation program involving in line inspection, hydrostatic testing and over 1000 excavations and pipe examinations.

Director, Pipeline Integrity

Encana

1992 – 1997

Development and implementation of the Company's USA and Canadian system pipeline integrity management program, which included over 2500 miles of in line inspection and over 3500 specific pipeline integrity excavations along with related defect assessment and repair. Development and implementation of the Company's Stress Corrosion Cracking and corrosion susceptibility and risk assessment models.

- Pipeline Assessment and Rehabilitation - Development and implementation of the Company's USA and Canadian system pipeline integrity management program, which included over 2500 miles of in line inspection and over 3500 specific pipeline integrity excavations along with related defect assessment and repair.
- Pipeline Integrity Procedure Development - Development of the Company's procedures for all pipeline integrity activities, including Nondestructive Examination, clock spring applications, defect assessment, defect repair methodologies, coating selection, in line inspection.
- Stress Corrosion Cracking Investigation - Development and implementation of the Company's Stress Corrosion Cracking and corrosion susceptibility and risk assessment models. Development of the Company's Stress Corrosion Cracking Research Program and implementation of pipeline integrity data management systems.

Previous Work History

Independent Consultant – Pipeline Risk and Integrity Management – 1982- 1992

Integrity Management Group consultant – Nova Transmission (Now TCPL) – 1975-1982

Education

Engineering College in Canada- Mount Royal College 1971-1974
NACE Corrosion Course Training – 1975/1976
ASM – Metallurgical Levels 1-3 - 1976/1977

Professional Affiliations

National Association of Corrosion Engineers (NACE)

American Society for Metals (ASM)

American Society of Certified Engineering Technicians (ASCET)- Member – 01876Y American Society for Quality (ASQ) - Member

American Society of Non-Destructive Testing (ASNT) - Member

Recognized Industry Activities

1. September 2018- Co-instructor – Tutorial – Root Cause Analysis of Pipeline Failures, 2016 11th International Pipeline Conference, Calgary Alberta / Co- instructor – Tutorial – In-Line Inspection, 2016 11th International Pipeline Conference, Calgary Alberta
2. February 27 – March 2, 2017 - “ALARP and Zero Leak Tolerance- Applications For The Pipeline Industry”, 2017 Pipeline Pigging & Integrity Management Conference (Paper emphasized the importance of Management Systems and Enterprise Risk Management)
3. September 26 – September 30, 2016 – Co- instructor – Tutorial – In-Line Inspection, 2016 11th International Pipeline Conference, Calgary Alberta
4. September 26 – September 30, 2016 – Co-instructor – Tutorial – Root Cause Analysis of Pipeline Failures, 2016 11th International Pipeline Conference, Calgary Alberta
5. September 26 – September 30, 2016 – Co- Author- “Chasing Perfection - The Proactive Imp PDCA (+E) Review”, 2016 11th International Pipeline Conference, Calgary, Alberta
6. September 29 – October 3rd, 2014 – Co-Author- “Back to The Future Using Root Cause Analysis As A Proactive Risk Management Tool”, 2014 10th International Pipeline Conference, Calgary, Alberta
7. November 2011- Two-day training course relating to Integrity Management for Pipelines” held in Johannesburg, South Africa
8. September 2010- Two-day training course relating to "Pipeline Integrity Management Choices” held in Doha, Qatar.
9. September 2009- Two-day training course relating to “Pipeline Corrosion Control and Integrity Management” held in Bangkok, Thailand.
10. May 6-8, 2008- One-day “Pipeline Integrity Training” seminar at the Africa/Middle East Oil & Gas Flow Assurance Summit held in Cairo, Egypt.
11. May 6-8, 2008- “Control of Black Dust; Presentation of Case Studies”- Middle East Oil and Gas Flow Assurance Summit held in Cairo, Egypt.
12. October 2007 - “OCP in Line Inspection Program: Technical Challenges and Unique Contractual Approaches” - Rio Pipeline Conference
13. June and September 2007- (Co-Author) Two-part magazine article: Pipeline Oil and gas Journal, “Litigation Consequences of Pipeline Integrity Management Choices.”

Mike Westlund, B.Sc.

Principal Consultant

Professional Profile

As a Principal Consultant at Dynamic Risk, Mike is responsible for providing guidance, mentoring and technical oversight to our project teams. He is a hands-on professional that conducts engineering studies and investigations and prepares and present findings and recommendations which are reported to our client's senior leadership.

Mr. Westlund performs technical assessments in the areas of pipeline integrity and risk management and is responsible for producing high-quality technical reports. Further he actively participates in the preparation of proposals, budgets, bids, and contracts as well as providing technical review and approval of the work of others. He also leads client engagements, acting as the client's trusted advisor, ensuring the technical requirements of the engagement are fulfilled using both internal and external resources.

Prior to joining Dynamic Risk, Mr. Westlund was the Lead for a Global Analysis Team, managing a large global team of integrity engineers and data analysts. He holds a B.Sc. from the University of Calgary, NACE International - Level II Cathodic Protection Technician and Level II Non-Destructive Examination.

Professional Experience

Principal Consultant

Dynamic Risk Assessment Systems, Inc.

2019 – Present

- Performs technical assessments in the areas of pipeline integrity and risk management and is responsible for producing high-quality technical reports.
- Develop and prepare integrity and excavation plans based on engineering assessment of ILI data.
- Work with software engineers to develop and continuously improve IRAS software used to assess ILI data (ILIAnalyst).
- Actively participates in the preparation of proposals, budgets, bids, and contracts.
- Provides technical review and approval of the work of others.
- Maintains expertise on regulatory requirements and pipeline industry advancements.
- Leads client engagements, acting as the client's trusted advisor, ensuring the technical requirements of the engagement are fulfilled using both internal and external resources.
- Maintains and improves the technical standards for engineering projects and consulting services and act as a subject matter expert.
- Provides input regarding the development and implementation of policies, standards and procedures for the engineering and technical work performed in the department.
- Actively participates in creating company awareness and identifying client opportunities.
- As required, provides guidance to manage client issues and expectations.

- Promotes a safety leadership culture and strives to ensure that all project leaders uphold the principles of a positive safety culture.
- Represents Dynamic Risk on key industry committees.

Global Ultrasonic ILI Analysis Manager

Baker Hughes / General Electric Oil & Gas

2014 – 2019

- Effectively manage a large global team of integrity engineers and ILI data analysts to achieve business goals.
- Responsible for ultrasonic analysis and reporting including EMAT, USWM and UTCD.
- Drive business metrics: HSE, customer satisfaction, on time delivery, ready to serve.
- Lead RCA, implement and drive continuous improvement.
- Support global sales team for ILI order intake, technical presentations, costing, proposals and scope of work definition.
- Improve ILI and analysis processes through optimization, automation and software development.
- Support pipeline operators during regulatory audits.
- Representative as a technical expert during pipeline failure investigations.
- Provide continuous customer support, manage customer feedback and implement corrective actions.

Integrity Services Team Leader

Baker Hughes / General Electric Oil & Gas

2011 - 2014

- Develop new products and software including GIS, PIMS and ILI assessment software using a collaborative approach with customers.
- Prepare and provide training to regulators, customers, global team and students.
- Perform, review and interpret results from various integrity assessments including; ILI, fitness for service assessments, corrosion growth assessments, risk assessments, pipeline crack management, bending strain and cathodic protection surveys.
- Perform integrity assessments for pipelines located world-wide using relevant assessment codes, standards and best practices.

Project Manager

Baker Hughes / General Electric Oil & Gas

2008 - 2011

- In Line Inspection and integrity verification project management.

Pipeline Integrity Designer

Cimarron Engineering (now Stantec)

2003 – 2008

- Prepare technical reports and deliver final report presentations.
- Perform water crossing surveys, depth of cover surveys and right of way surveys.
- Supervise pipeline integrity field activities, coordinate office and field activities.
- In Line Inspection, integrity verification, suspension and abandonment project management.
- Perform corrosion analysis and pipeline stress calculations.
- Provide recommendations regarding pipeline integrity and environmental issues.
- Initiate new client relations, follow up calls and prepare sales seminars.
- Evaluate NDE data including magnetic particle inspection, X-ray and ultrasonic inspection data.
- Perform hydraulic modeling using Pipeline Simulation software.
- Evaluate cathodic protection systems, trouble shooting and annual surveys.
- Collect and manage GPS data using GIS.

Research and Development / Data Analyst

General Electric Oil and Gas

2001 – 2003

- Member of a research team developing EMAT ultrasonic inspection tools for pipelines.
- Design pull tests and validate results.
- Work closely with clients to achieve development milestones.
- Analyze in line inspection data and prepare technical reports.

Soil Scientist / NDE Technician

Marr Associates

1999 - 2001

- Perform site selection for environmentally assisted cracking (SCC) on pipelines.
- Perform soil classification, testing and sampling.
- Identify geotechnical hazards along pipelines.
- Non-Destructive testing on pipelines.
- Analyze soil models, preparation of technical reports.

Education

Bachelor of Science

University of Calgary 1999

Professional Affiliations

- NACE International - Level II Cathodic Protection Technician.

Ammad Farooq

Pipeline Integrity Engineer

Professional Profile

Ammad Farooq is an Integrity Engineer at Dynamic Risk with over 9 years of pipeline industry experience. He is a highly analytical pipeline integrity engineer with a proven track record of producing designs and results in an organized and timely manner to satisfy both company and client approval. In recent years, Ammad has been heavily involved in the EMAT tool validation and verification projects. Ammad has been writing Engineering Assessment Reports for the threat of SCC on various projects. Ammad advises clients how to plan and execute assessment activities (ILI and/or DA) in accordance with the Company's Integrity Management Plan. He has a strong background on risk assessment, and pipeline integrity and in line inspection analysis. Ammad is a graduate from the University of New Brunswick and is a registered engineer with the Association of Professional Engineers and Geoscientists of Alberta (APEGA).

Professional Experience

Pipeline Integrity Engineer

Dynamic Risk Assessment Systems, Inc.

2014 – Present

- Prepare integrity and excavation plan based on engineering assessment of inspection data.
- Involved in reviewing the Crack program and validating and verifying the EMAT tool.
- Involved in corrosion program with reviewing, analyzing and verifying the data.
- Review and analyze integrity threat related to pipeline and recommend mitigation plan.
- Worked on various Engineering Assessment related to class location, valve spacing, cracking and EMAT tool validation and verification process.
- Experience with Regulatory environment such as CER.
- Experience working with engineering codes CSA Z662, API 1163 and ASME B31.8
- Focused on pipeline outflow modelling project that involved worst case outflow volume calculations, outflow reduction analysis and valve optimization.
- Prepared technical reports for clients for various outflow projects and conducted peer reviews of completed engineering projects.
- Facilitated on onboarding of new employees by preparing training materials and providing one on one training.
- Provided technical support to clients regarding projects and reports delivered.
- Interaction with the ILI vendor on daily basis on items related to inline inspection data.
- Verified data sets through various applications including ArcGIS and Excel.
- Represented client and actively participate in industry groups/ committees/workshops.

Area Technical Service Specialist

Weatherford Oil Field Services (Grand Prairie, AB)

2012 – 2013

- Developed pipeline risk assessment reports using the Weatherford Risk Assessment tool for various clients such as Devon, Progress Energy and Tourmaline Oil Corporation.
- Responsible for designing and reviewing oilfield chemical programs to address production issues and protect assets. In addition, developed Process Flow Diagrams of the chemical program in the field for various clients such as Devon, Tourmaline and Progress Energy.
- Visited client facilities to provide them with technical support to problems with scaling, corrosion, emulsion and padding issues. Developed programs for demulsification, corrosion inhibition, scale control and wellbore stimulation.
- Developed field reviews and used Abadata for field mapping and product batching calculations.
- Created Program Administration Manuals for various clients.

Technical Skills

- Microsoft Office
- IRAS Dynamic Risk Software
- Fluid Mechanics
- Mass and Energy Balance.
- ARC GIS
- ABADATA
- Microsoft Project.

Education

Bachelor of Science in Chemical Engineering

University of New Brunswick 2004 - 2010

Professional Affiliations

- APPEGA-Peng
- YPAC- Young Pipeliner's Association of Canada

Appendix O-2

DYNAMIC RISK ASSESSMENT RESPONSES TO INFORMATION REQUESTS

Patrick Wruck
Commission Secretary

Commission.Secretary@bcuc.com
bcuc.com

Suite 410, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
P: 604.660.4700
TF: 1.800.663.1385
F: 604.660.1102

July 27, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-2

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to BCUC Information Request

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to British Columbia Utilities Commission Information Request No. 1
dated July 27, 2021

Sincerely,

Original signed by Ian Jarvis for:

Patrick Wruck
Commission Secretary

/dg
Enclosure

July 27, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 1 From British Columbia Utilities Commission (BCUC).

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 1 from the BCUC on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.
July 22, 2021

1.0 Reference INDEPENDENT EXPERT REPORT Exhibit A2-1 (Independent Expert Report), Section A.3, p. 3 Proactive Pipeline Modifications

On page 3 of the Independent Report on the FortisBC Energy Inc. Application for Approval of a Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project (Independent Expert Report), Dynamic Risk Assessment System, Inc. (Dynamic Risk) states:

> To successfully utilize the EMAT [Electro-Magnetic Acoustic Transducer] ILI [In Line Inspection], the tool velocity must be maintained within the vendor specified range to acquire accurate and acceptable inspection results. FEI has recognized this required variable and proactively identified areas of the pipeline segments where speed excursions may occur. Facility modifications are required to safely launch and receive the EMAT ILI tools and pipeline modifications are necessary to control the tool speed within appropriate limits during the inspection.

1.1 Please explain whether Dynamic Risk is aware of any examples of pipeline operators who have similarly modified pipelines to avoid the occurrence of EMAT ILI tool speed excursions in advance of undertaking any EMAT ILI tool runs.

Response:

ILI vendors work with operators to perform a pipeline compatibility assessment prior to each EMAT ILI to ensure the pipeline segment is appropriate for the ILI tool. During the assessment, parameters such as wall thickness, internal diameter transitions, bends, launch/receive facilities, and product flow conditions are assessed. Any obstacles in the pipeline that can cause damage to the ILI tool, would potentially stop the tool or cause speed excursions are identified during the assessment. The pipeline ILI compatibility assessment is outlined in NACE SPO102-2017 Section 4[1].

Dynamic Risk is not aware of specific operators making modifications to avoid speed excursions however, the pipeline compatibility assessment is based on industry best practice and is being performed prior to each ILI in collaboration with the vendor.

1.1.1 Please discuss the benefits and drawbacks of proactively modifying pipelines (heavy wall sections) to avoid speed excursions in comparison to modifying pipelines to address actual speed excursions identified after an EMAT ILI tool run.

Response:

Speed excursions of the EMAT tool beyond ILI vendor specifications are to be avoided as exhibiting a potential to cause degraded data, impacting the minimum detection length and probability of identification (POI) of features. Proactively assessing and modifying

[1] NACE International, In-Line Inspection of Pipelines, NACE SPO102-2017, March 10, 2017

pipelines to avoid the impact variability of speed excursions prior to EMAT ILI provides the following benefits:

- Reduces the potential for a "failed" or incomplete EMAT inspection resulting in a requirement for a scheduled re-survey and delayed receipt of ILI data necessary to drive timely risk program decision making,
- Reduces the potential for "blind spots" and uncertainty within the ILI data, resulting in decreased excavations and pipe examinations being required for feature analysis
- Reduces the potential for the presence of false negatives (non-detected or mis-identified crack defects) to cause risk program uncertainty.

Proactively modifying the pipeline prior to EMAT ILI exhibits the following drawbacks:

- Construction related activities to replace pipe sections extend the ILI EMAT program preparation time required and have a potential to negatively impact on program scheduling.

Modifying pipelines to address actual speed excursions identified following an EMAT ILI tool run exhibits the following drawbacks:

- Increases the potential for an EMAT re-survey being required to capture missing or degraded data within overspeed areas, resulting in delayed risk program decision making.
- Identified EMAT tool overspeed areas will require additional investigation in alignment with the procedure, "in-ditch inspection of EMAT ILI tool blind spots". Areas of overspeed, depending on location may need to be excavated and subjected to NDE (non-destructive examination) for additional analysis.

1.1.2 Please explain, based on Dynamic Risk's assessment of the information presented in the Application, whether there is an urgency to mitigating the risk of stress corrosion cracking (SCC) on CTS pipelines that would justify foregoing proactive pipeline modifications and would alternatively have FEI pursue EMAT ILI tool runs as soon as modified launching facilities are constructed.

Response:

The potential for SCC colonies to grow to failure was assessed by JANA in conjunction with the University of Alberta. The assessment used actual operating data and pipe material properties characteristic of the FEI system and a range of crack dimensions considered to be reasonable approximations of what could be anticipated to be present on the FEI system (based off SCC dimensions found during FEI integrity digs). The analysis concluded that cracks on the FEI system can grow under current operating conditions, and a range of potential remaining lifetimes was determined to extend from 5 to 85 years.

Based on this SCC growth assessment, and in alignment with the SCC risk model, the eleven (11) lines selected to be inspected have been prioritized to be addressed within an optimized and acceptable time frame. Foregoing the pipeline modifications, while providing for an enhanced EMAT inspection program schedule (depending on EMAT tool availability and other variables) may however, result in program completion delays due to degraded data, leading to the need for additional data analysis and extensive pipeline excavations and pipe examinations to reduce data uncertainties.

1.1.3 Please explain what tolerances or differences in wall thicknesses (with examples from the FortisBC Energy Inc Coastal Transmission System CSS TIMC Project) an EMAT ILI tool can tolerate before exceeding the optimum velocity.

Response:

As stated in the NACE [1] document under section 4 (Pipeline ILI Compatibility Assessment), heavy wall sections and wall thickness transitions do contribute to speed excursions. Dynamic Risk is not aware of a specific tolerance or difference in wall thickness that the EMAT ILI tool can tolerate before exceeding the optimum velocity. It is likely that pipeline specific variables such as the nature and impact of wall thickness transitions, pipeline diameter, pressure, velocity and product volumes would preclude the development of an EMAT standard acceptance for wall thickness change. The inner diameter changes and wall thickness transitions specific to each pipeline to be inspected need to be evaluated by the ILI vendor prior to the EMAT inspection as part of the compatibility assessment.

The tool velocity of the previous MFL inspections was used to predict the areas where the EMAT tool would potentially exceed the optimum velocity. The performance of the EMAT tool used during the FEI pilot project inspections was analyzed and found to behave similar to the MFL-C with regards to tool velocity. Using this assessment approach gives greater confidence in capturing the highest priority restrictions that could result in a velocity excursion.

1.1.4 Please explain if Dynamic Risk is aware of any examples of pipeline operators who have made some of the same heavy wall pipe modifications to avoid the occurrence of EMAT ILI tool speed excursions.

1.1.4.1 If yes, please explain if there were any issues or concerns that arose before or after the modifications.

Response:

Dynamic Risk is not directly aware of any pipeline operators who have undertaken heavy wall pipe modifications specifically to avoid speed excursions. Such decisions and the necessity for proactive removal of wall thickness restrictions would be pipeline specific and in accordance with the nature and impact of wall thickness transitions, pipeline diameter, product velocity and product volumes.

2.0 Reference INDEPENDENT EXPERT REPORT Exhibit A2-1, Section E.6.1, p. 15 ILI Tool Technology

On page 15 of the Independent Expert Report, Dynamic Risk states:

> The EMAT technology has proven to be effective in the detection and sizing of axially oriented anomalies, as the sound waves generated by EMAT in ILI surveys are circumferentially oriented and are more sensitive to defects that are located axial (parallel) to the pipe surface. EMAT ILI surveys do not typically report metal loss, dents or deformations, or circumferentially oriented anomalies.

2.1 Please clarify whether pipeline operators who use EMAT technology to detect axially orientated anomalies continue to require the use of other ILI technologies to detect metal loss, dents or deformations, or circumferentially oriented anomalies.

Response:

The EMAT ILI tools are capable of detecting and sizing the following:

- Longitudinally oriented pipe body cracks such as SCC.
- Longitudinal seam weld anomalies such as lack of fusion, hook cracks and toe cracks.

The application of ILI technologies is threat specific. As part of the FEI integrity management plan, the application of additional ILI technologies to manage other threats such as corrosion or mechanical damage, may still need to occur. The types of ILI tools and their inspection purposes (threats detected) are outlined in NACE[1] Table 1.

2.1.1 Please explain whether the pipeline modifications proposed in the Application to optimize the running of EMAT ILI tools have any impact on the ability to run other ILI tools.

Response:

The proposed pipeline modifications will not impact FEI's ability to perform ILI with other tools.

3.0 Reference INDEPENDENT EXPERT REPORT Exhibit A2-1, Section E.7.2.3.3, p. 25 Impact of ILI Tool Overspeed

On page 25 of the Independent Expert Report, Dynamic Risk lists steps which can be taken to address overspeed and data degradation. The list of steps includes the following option:

> Characterize the impact of overspeed in consultation with the EMAT vendor; in many cases the vendor can still effectively analyze the signals in overspeed areas and there has been no signal degradation.

3.1 Please elaborate on the ability of EMAT vendors to characterize the impact of overspeed by describing the process a vendor may take to analyze the signals in overspeed areas and to determine that no signal degradation has occurred.

Response:

During the data quality assessment (DQA) phase, which occurs directly after the inspection, the velocity profile will be created and any overspeed areas will be quantified. The ILI vendor will then review the data to assess the ultrasonic signal to noise ratio in the overspeed areas to determine if the data can be analyzed. It is noted while the ILI vendor can effectively analyze such data, a modified (reduced) performance specification (minimum detection length, reduced POD/POI and POS) would have to be applied for areas of degraded data.

The minimum detection length of linear features will increase with tool velocities outside the specified range and the potentially increased noise levels in overspeed areas will impact the classification and sizing of the features. The overspeed sections are analyzed on a case-by-case basis to determine the impact on the performance specifications. Areas of reduced data quality are quantified in the ILI vendor DQA report, which is typically delivered two (2) weeks after the EMAT inspection.

3.1.1 Please clarify whether signal degradation occurs gradually as the EMAT tool begins to exceed its optimal velocity range. Is there a typical range of velocities which exceed the optimal tool velocity which still allow for effective assessment of SCC in the pipe?

Response:

The noise levels in the data will increase gradually but with significant variability, as the tool begins to travel outside the optimum velocity range. Noise levels in the data due to overspeed are analyzed by the vendor on a case-by-case basis to determine if the stated performance specifications can be met or if a reduced specification applies.

Although the data in overspeed areas can be analyzed, the minimum detection length of features detected will always be impacted. The optimum tool velocity for EMAT is less than 2 m/s; velocity levels between 2 and 5 m/s will result in degraded data as the minimum detection length of features will be affected. In some cases, at approximately 5 m/s the data exceeds analysis limits. The negative impact on performance specifications associated with overspeed increases the potential for a false negative (missed crack feature). To effectively manage the SCC threat, the overspeed areas need to be considered as blind spots potentially requiring excavation, (“in-ditch inspection of EMAT ILI tool blind spots”)

3.1.2 Please explain, when there is a speed excursion, how long it takes (in time and distance) for an EMAT tool to return to the optimum speed range again for a) a tool with speed control; and b) a tool without speed control.

Response:

> The speed excursion is dependent on variables such as elevation, pressure, flow rate, internal diameter change, bends etc. For the tool to return to optimum speed is dependent on all these variables and would vary on a case by case basis.

4.0 Reference INDEPENDENT EXPERT REPORT Exhibit A2-1, Section F, p. 30 Project Need

On page 30 of the Independent Export Report, Dynamic Risk states:

> SCC is a form of environmentally assisted cracking; wherein small surface cracks can form and grow over time. Cracks that continue to grow will frequently overlap and/or coalesce to become the equivalent of a large single crack in terms of their effect on the pressure carrying capacity of the pipe. Eventually such overlapping and coalescence can create a crack of sufficient size to cause the pipeline to leak or rupture. It is the independent pipeline integrity expert panel's view that SCC is a credible threat for FEI that if left unmitigated, could lead to pipeline failure.

4.1 Please explain, based on Dynamic Risk's assessment of the information presented in the Application, when the SCC threat on FEI's system needs to be mitigated (i.e. immediately, in five years, in ten years).

Response:

> The potential for SCC colonies to grow to failure was assessed by JANA in conjunction with the University of Alberta. The assessment used actual operating data and pipe material properties characteristic of the FEI system and a range of crack dimensions considered to be reasonable approximations of what could be anticipated on the FEI system, based off SCC dimensions found during FEI integrity digs. The analysis concluded that cracks on the FEI system can grow, and a range of potential remaining lifetimes was determined to extend from 5 to 85 years. Based on this SCC growth assessment, and in alignment with the SCC risk model, the eleven (11) lines selected to be inspected have been prioritized to be addressed within an optimized and acceptable time frame.

4.2 Please discuss whether FEI's CTS TIMC Project addresses the SCC threat on FEI's system in a timely manner.

Response:

> The potential for SCC colonies to grow to failure was assessed by JANA in conjunction with the University of Alberta. The assessment used actual operating data and pipe material properties characteristic of the FEI system and a range of crack dimensions considered to be reasonable approximations of what could be anticipated on the FEI system, based on SCC dimensions found during FEI integrity digs. The analysis concluded that cracks on the FEI system can grow, and a range of potential remaining lifetimes was determined to extend from 5 to 85 years. Based on this SCC growth assessment, and in alignment with the SCC risk model, the eleven (11) lines selected to be inspected have been prioritized to be addressed within an optimized and acceptable time frame.

4.3 Please explain whether the project could be delayed (i.e. for five years, or ten years, etc.) and the benefits and drawbacks of such an approach.

Response:

Based on the growth study performed in 2019, the minimum remaining life was found to be 5 years. The CTS is located in a populated area with high societal risk and high consequence of rupture. Extended ILI program delay increases the likelihood for pipeline failure to occur.

5.0 Reference INDEPENDENT EXPERT REPORT Exhibit A2-1, Section E.7.1, p. 18 Industry Experience Using EMAT

On page 18 of the Independent Expert Report, Dynamic Risk states:

> For natural gas pipelines, the management of SCC has benefited from the introduction and evolution of ILI technologies, specifically EMAT technology, that can reliably detect, identify, and size cracking anomalies. Since it's introduction in the early 2000's, the performance of EMAT technology has been evaluated and documented through many industry research projects and published articles that describe operational experience.

5.1 Please a provide examples of where EMAT technology has been used in other Canadian or North American gas utility pipelines.

Response:

EMAT technology has been widely used by various operators in Canada and North America.

As an example, one of the major ILI Vendors, Rosen, has worked with many operators worldwide and to date has inspected more than 80,000 km of pipelines with EMAT tools varying in diameter from NPS 10 to NPS 48.

For additional information regarding the EMAT technology and it's use by pipeline operators to manage the threat of SCC, please refer to the following papers:

1) K. Spencer, D. Williams, J. Phlipot, D. Whaley, S. Rapp, "Managing an EMAT ILI Program to Achieve Appropriate Margins of Safety in Natural Gas Pipelines", Pipeline Pigging and Integrity Management Conference (PPIM), Houston, USA, 2021.

2) K. Spencer, D. Williams, J. Phlipot, D. Whaley, S. Rapp, "Managing an EMAT ILI Program to Achieve Appropriate Margins of Safety in Natural Gas Pipelines", Pipeline Pigging and Integrity Management Conference (PPIM), Houston, USA, 2021.

3) R.B. Thompson, G.A. Alers and M.A. Tennison, "Application of Direct Electromagnetic Lamb Wave Generation to Gas Pipeline Inspection", 1972 Ultrasonics Symposium Proceedings, IEEE Cat. #73 CHO807-8SU, p 91 (1972).

4) G.A. Alers, "Non-contact Ultrasonic Testing with Electromagnetic Transducers", Handbook of Intelligent Sensors for industrial Automation, Nello Zuech, Adison-Wesley Publishing Co. New York, NY, Chapter 11, pp 285-306, 1992.

5) T. Beuker et al, "SCC Detection and Coating Disbondment Detection Improvements Using The High Resolution EMAT ILI-Technology", 5th International Pipeline Conference, October 4th-8th 2004, Calgary, AB, Canada, IPC04-0697.

6) M. Klann and T. Beuker, "Pipeline Inspection with the High Resolution EMAT ILI-Tool: Report on Full Scale Testing and Field Trials", 6th International Pipeline Conference, September 25th – 29th 2006, Calgary, AB, Canada, IPC 2006-10156.

7) S. Limon-Tapia, D. Katz, T. Beuker, C. Döscher and B. Brown, "A Framework for Managing The Threat of SCC and other Cracking In pipeline Using In-Line inspection", 7th International Pipeline Conference, September 29th – October 3rd 2008, Calgary, AB, Canada, IPC 2008- 64090.

8) D. Katz, S. Potts, T. Beuker, J. Grillenberger and R. Weber, "EMAT for A Comprehensive System Wide Crack Management Program", 12th International Pipeline Conference, September 29th – October 3rd 2014, Calgary, AB, Canada, IPC 2018-78346.

9) R. Kania, S. Klein, J. Marr, G. Rosca and E. SanJuan Riverol, "Validation of EMAT technology for EMAT for Gas Pipeline Inspection Technology", 9th International Pipeline Conference, September 24th – 28th 2012, Calgary, AB, Canada, IPC 2012-90240.

10) R. Kania, R. Weber and S.. Klein, "On the Assessment of Low-Frequency ERW Line Pipe Defects By EMAT and CMFL ILI", PPIM 2014, February 10th – 13th, 2014, Houston, TX.

11) T. Fore, S. Klein, C. Yoxall and S. Cone, "Validation of EMAT for Management of Stress Corrosion Cracking In Natural Gas Pipelines", 10th International Pipeline Conference, September 26th -30th 2016, Calgary, AB, Canada, IPC 2014-33545.

12) M. Tomar, T. Fore, M. Baumeister, C. Yoxall and T. Beuker, "Graded EMAT Performance Specification Validated in Blind Test", 10th International Pipeline Conference, September 26th -30th 2016, Calgary, AB, Canada, IPC 2016-64481.

13) O. Goncalves, B. Kerrigan, T. Beuker and C. Rosemann, "A Framework To Develop Effective Crack Management Strategies for Gas Transmission Pipelines", IBP 2064-17, Rio Pipeline Conference, October 24th -26th, 2017.

14) S. Tandon, M. Gao and R. Krishnamurthy, "Evaluation of EMAT Tool Performance and Reliability by Monitoring Industry Experience (Phase I and II) SCC-3-7", PRCI Catalog No. PR328-083501-R01, September 27, 2017.

15) R.R. Fessler, A.D. Batte and M. Hereth, "Joint Industry Project addressing the integrity management of stress corrosion cracking in gas transmission pipelines", JIP Phase II final Report, September 2013 (to be published by ASME).

16) A. D. Batte, et al, "Managing the Threat of SCC in Gas Transmission Pipelines", 9th International Pipeline Conference, September 24th-28th 2012, Calgary, AB, Canada, IPC2012-90231.

5.2 Please provide examples of projects similar to FEI's CTS TIMC Project undertaken by other Canadian or North American gas utilities, including a discussion of project costs and scope.

Response:

Dynamic Risk did not review any other projects similar to FEI CTS TIMC Project undertaken by other Canadian or North Gas Utilities nor did Dynamic Risk review any project costs as part of the project scope.

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Commission Secretary

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July 27, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-3

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to RCIA Information Request

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to Residential Consumer Intervener Association Information Request No. 1
dated July 27, 2021

Sincerely,

Original signed by Ian Jarvis for:

Patrick Wruck
Commission Secretary

/dg
Enclosure

Dynamic Risk

July 27, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 1 From Residential Consumer Intervener Association (RCIA)

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 1 from the RCIA on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

DYNAMIC RISK
SUITE 1110, 333 11TH AVENUE SW CALGARY, AB T2R 1L9
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1.0 Reference Exhibit A2-1 p.7; Exhibit B-1 p.105

"The objective of the QRA, as stated in the report, was to inform the urgency and priority of addressing cracking threats, assess the significance of the cracking threats in terms of their contribution to overall risk, allow for prioritization of pipelines based on risk and frequency of failure for possible mitigation of cracking threats and continue the efforts of FEI in moving to a quantitative risk-based approach to pipeline integrity management."

FEI expects to be complete the construction phase of the TIMC project by November 2024 and will presumably be ready to perform the EMAT ILI runs in Spring 2025.

1.1 Provide Dynamic's view of the urgency of completing the EMAT ILIs. For example, would it be reasonable for FEI to undertake two or three ILIs each year? If Dynamic does not consider this a reasonable schedule, explain why not.

Response:

The appropriateness of the FEI EMAT ILI program schedule was not assessed and is considered outside of the Dynamic Risk project scope, however the eleven (11) segments to be inspected within the program are relatively short with the total km's to be inspected at 254 km (segments range from 2 km to 56 km). It is considered reasonable as an industry metric, for FEI to undertake three (3) or more EMAT programs per year (as determined by the risk model and ILI EMAT tool availability).

2.0 Reference Exhibit A2-1 p. 8; Exhibit B-1 p. 27 (Footnote 10, Canadian Energy Pipeline Association Recommended Practices for Managing Near-neutral pH SCC, 3rd edition, p. 17)

"The susceptibility criteria, based on guidelines from CEPA and the ASME standard, include an assessment of pipeline segments based on factors such as:

• Coating type (All coating types with the exception of FBE are susceptible)"

"As of December 2014, there were over 800 colonies in the NEB 'significant SCC' database dating back to 1997. Of the crack colonies for which coating information was provided, 89% occurred on single- or double-wrapped polyethylene tape coating, 11% were associated with asphalt coating, and only a single case of 'significant SCC' was found on a coal-tar coated line."

2.1 Provide Dynamic's assessment of the preponderance of SCC by coating type: PE tape coated lines compared with coal tar enamel coated lines compared with shrink sleeves. Is Dynamic's view aligned with the findings described in the CEPA Recommended Practices quote above?

Response:

Dynamic Risk is aligned with the industry findings noted on the NEB database.

2.1.1 In light of the quoted passage from the CEPA Recommended Practices, provide Dynamic's view of susceptibility of FEI's CTS coal tar enamel-coated pipelines to SCC. If possible, characterize the degree of susceptibility to SCC of FEI's CTS pipelines.

Response:

Ten (10) of the eleven (11) susceptible pipeline segments in the CTS are coated with coal tar and one (1) segment is coated with shrink sleeves on the girth welds. The CTS segments are considered susceptible, (degree of susceptibility due to coating type is not addressed), to SCC based on coating type and more importantly, the presence of SCC (actual findings of SCC through opportunistic digs). While it is recognized that the coating type is considered within the industry as the primary factor in SCC threat susceptibility, it is also noted that the SCC threat susceptibility level is not generally established solely based on application of coating type.

3.0 Reference Exhibit A2-1 pp. 6, 9

"Stress Level—Susceptibility to SCC increases with stress level, and pipelines that are operated at stress levels above 60% of the specified minimum yield strength (SMYS) appear to be the most susceptible. There is thought to be a lower-bound threshold stress level below which SCC will not occur, but the threshold has not been firmly established and is likely to be situation dependent. SCC has been identified in one case in a pipeline being operated at hoop stress level of 47% of SMYS."

"It should be noted that the susceptibility criteria within the ASME B31.8S standard states that pipelines operating at greater than 60% of the SMYS are susceptible to SCC. It is also noted in the FEI application that the majority of the pipeline segments in the CTS operate at hoop stress levels between 45% to 50% of SMYS. Although the CTS pipeline segments operate at less than 60% SMYS, SCC has been found on the CTS pipelines and is a credible threat that could potentially lead to failure. Industry data shows that susceptibility to SCC increases with stress level pipelines that are operated at stress levels above 60 % of SMYS appear to be most susceptible, and pipeline failures due to SCC have occurred in pipelines that operate at less than 50% SMYS."

The link in footnote 17 is a link to PHMSA's website which provides access to Annual Reports (not incident reports) from transmission pipeline operators but does not appear to have information about SCC or failure incidents.

3.1 Clarify the link or source of the data supporting Dynamic's statement that: "susceptibility to SCC increases with stress level pipelines that are operated at stress levels above 60 % of SMYS appear to be most susceptible, and pipeline failures due to SCC have occurred in pipelines that operate at less than 50% SMYS."

Response:

To clarify the reference for susceptibility increasing at stress levels above 60%, the following is an excerpt from API Recommended Practice 1160 Managing System Integrity for Hazardous Liquid Pipelines, Third Edition, February 2019.:

Stress Level—Susceptibility to SCC increases with stress level, and pipelines that are operated at stress levels above 60 % of SMYS appear to be most susceptible, although SCC has been identified in pipelines operated at lower stress levels typically associated with localized phenomena such as dents or gouges. SCC has been identified at points of stress concentration such as weld toes and mechanical damage. Residual stresses from pipe forming or welding can also contribute to susceptibility.

The PHMSA website link that was provided in the Dynamic Risk report (footnote 17) leads to the annual report data for gas gathering and gas transmission pipelines (as noted above). The following PHMSA website link, leads to "Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data" and should have been provided in the reference for footnote 17:

https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data

3.2 Is the single failure of a pipeline operating at 47% of SMYS the only SCC related failure in Dynamic's data? If not, how many failures of pipelines operating at stresses less than 50% SMYS have occurred due to SCC?

Response:

From the alternate link provided in the response to 3.1, the incident data can be downloaded from the "Related Links" section of the page and filtered for SCC failures/ruptures on gas pipelines. When the four (4) files related to "Gas Transmission & Gathering Incident Data" from 1970 to present are opened and filtered for records that indicate an SCC failure, they can be summarized as follows:

- Incidents from 1970 to mid-1984,
  - There are three (3) incidents labeled as "stress corrosion cracking" or "stress corrosion" as the cause on lines coated with coal tar however, the wall thickness data is missing and therefore the % SMYS cannot be calculated.
- Incidents from mid-1984 to 2001,
  - There are thirteen (13) incidents with "crack" or "SCC" as the cause.
  - Two (2) were operating at less than 50% SMYS, based on the MAOP.
- Incidents from 2002 to 2009,
  - There are twelve (12) incidents with "stress corrosion cracking" as the cause.
  - None were operating below 50% SMYS however, three (3) were operating between 50% and 55% SMYS.
- Incidents from 2010 to present,
  - There are twenty-one (21) incidents with "stress corrosion cracking" as the

cause.

- Five (5) were operating below 50% SMYS, based on the MAOP.

3.3 In light of the operating pressure of FEI's CTS, provide Dynamic's view on the urgency with which FEI should be addressing the risk of SCC.

Response:

Based on the SCC crack growth assessment performed by JANA in conjunction with the University of Alberta, the EMAT ILIs should commence immediately following the pipeline modifications in 2025. The eleven (11) lines to be inspected should be prioritized based on the SCC risk model, using the analysis performed in the SCC growth study, with actual operating conditions of each pipeline segment.

4.0 Reference Exhibit A2-1 pp. 8, 17

"The susceptibility criteria, based on guidelines from CEPA and the ASME standard, include an assessment of pipeline segments based on factors such as:

- Coating type (All coating types with the exception of FBE are considered susceptible)
- Girth weld coating or repair coating type
- Operating stress level (per cent SMYS)
- Age of pipeline
- Historical excavation records and SCC findings
- Operating temperature
- Distance of segment from compressor station discharge <32 km (20 miles)
- Pressure Cycles
- Temperature Cycles
- Long seam weld type
- Pipe manufacturer
- Pipeline geometry (bends, slopes)"

"FEI has determined that eleven (11) CTS pipeline segments are susceptible to the threat of SCC that can lead to failure by rupture and has proposed to use EMAT ILI tools to enhance the integrity management."

4.1 Confirm whether Dynamic independently assessed the susceptibility of FEI's CTS pipelines to SCC using the criteria on page 8, or whether it accepted FEI's assessment. If so, provide Dynamic's assessment.

Response:

Dynamic Risk reviewed the results of the susceptibility assessment that determined the eleven (11) CTS segments considered susceptible to SCC based on an evaluation of coating type, age of pipeline and long seam type. This assessment is in alignment with the SCC susceptibility guidelines provided by CEPA and ASME.

Dynamic Risk did not review the factors as would be necessary to independently assess the susceptibility of FEI's CTS pipelines however, the presence of SCC (actual findings of SCC through opportunistic digs) confirms the segments are susceptible.

4.2 Confirm whether Dynamic assessed the susceptibility of FEI's CTS pipelines to circumferential stress corrosion cracking ("CSCC"). If so, provide Dynamic's assessment.

4.2.1 Provide Dynamic's assessment of whether CSCC is a credible threat to FEI's CTS that should be mitigated.

4.2.2 If CSCC is a credible threat to the CTS, provide Dynamic's recommended mitigation steps.

Response:

Dynamic Risk did not assess the susceptibility of FEI's CTS pipelines to CSCC as this form of SCC was not addressed by FEI as an element within the SCC susceptibility program and was therefore not addressed within the Dynamic Risk scope of work.

5.0 Reference Exhibit B-4 Workshop Presentation p. 12; Workshop Transcript 2021-May-13 p. 26, rosen-group.com/global/solutions/services/service/rocorr-mfl-c.html

In the May 13, 2021 workshop, FEI described the types of ILI tools commercially available and that it has used, including MFL-C (magnetic flux leakage – circumferential). Rosen Group explains the capabilities of its MFL-C tool on its website, including: "A precise and detailed identification of metal loss and in particular axial oriented anomalies like narrow corrosion, gouging, channeling, crack like features and preferential seam weld corrosion is a basic element for the integrity management of oil and gas pipelines. Our RoCorr MFL-C service is a reliable and effective means of managing your pipeline integrity especially for concerns related to the long seam (e.g. pre-1970 ERW)." And: "Precise long seam categorization and assessment using magnetic saturation in circumferential direction."

5.1 In Dynamic's experience, how effective is MFL-C at characterizing the integrity of long seam welds?

Response:

In Dynamic Risk's experience, the MFL-C is considered to be effective within POI and POD stated tolerances, at detecting and sizing narrow axial corrosion features in the pipe body and seam weld. These features include preferential seam corrosion, internal and external corrosion, gouging and channeling. The MFL-C is a useful tool to help manage the features associated with the long seam however is not suitable for assessment of all cracks (the features must be volumetric and have a width typically greater than 0.1 mm to be detected). The MFL-C tool has a reduced POD tolerance and is unable to detect tight cracks that do not meet the minimum width requirement.

The types of ILI tools and their inspection purposes are outlined fully in Table 1 of NACE SP0102-2017, In-Line Inspection of Pipelines[1].

5.2 In Dynamic's experience, how effective is MFL-C at characterizing stress corrosion cracking, or axial cracking in general?

Response:

MFL-C is typically not used for detection and sizing of SCC or axial cracking as the features require a minimum crack opening to be detected. SCC is comprised of multiple small tightly spaced individual cracks that typically form adjacent to one another and over time will grow and subsequently coalesce.

5.3 What are the limitations of MFL-C technology when assessing axial cracks and seam weld features?

Response:

The MFL-C is a magnetic flux tool that will detect axial features that are volumetric (have a width or crack opening greater than 0.1 mm). Features associated with seam welds such as lack of fusion, toe cracks, hook cracks or long seam cracks that do not exhibit a width greater than 0.1 mm, will not be detected and sized with MFL-C.

5.4 While EMAT may be a superior technology to assess axial cracking in pipelines, does Dynamic expect that FEI's prior MFL-C ILI runs will generally inform the presence of severe cracking and seam weld features (even if unable to accurately size these features), or indicate the likelihood of finding severe cracking and seam weld features with EMAT tools? If not, explain why not.

Response:

MFL-C technology can be useful to identify the presence of severe cracking, if the feature is volumetric and has a width or crack opening greater than 0.1 mm. Tightly spaced SCC cracks, that can coalesce and grow over time, will generally not be detected, or identified within MFL-C tolerances. Similarly, features in the seam weld, such as lack of fusion or hook cracks that do not meet the required width, will generally not be detected or identified within MFL-C tolerances.

[1] NACE International, In-Line Inspection of Pipelines, NACE SP0102-2017, Table 1.

6.0 Reference Exhibit A2-1 pp.11, 25

"Although FEI has proposed pipeline modifications to reduce the risk of speed excursions, the potential for blind spots due to degraded data still exists." "It is possible that the EMAT technology may not meet the stated performance specifications in the overspeed or data degradation areas. Therefore, additional evaluation will be required in areas of overspeed or data degradation. Pipeline operators should work with the EMAT technology vendor to perform a case-by case evaluation of such areas."

6.1 What is the percentage of data successfully captured in a typical MFL (corrosion) inline inspection of gas transmission pipelines? What is the percentage of data successfully captured in a typical geometry inline inspection of gas transmission pipelines?

Response:

Degraded data is generally caused by debris in the pipeline, tool speeds outside the specified range and sensor malfunction. Typically, an MFL or geometry tool will capture data to provide greater than 95% coverage of the pipeline.

6.2 What percentage of data capture would Dynamic deem to constitute a successful EMAT inline inspection?

Response:

Acceptance criteria for an EMAT ILI should be defined prior to the inspection for each CTS segment. The inspection data can then be assessed against the acceptance criterion developed by FEI for the specific line segment. Typically, a successful EMAT inspection would capture data to provide 100% coverage of the pipeline within the susceptible areas (non FBE coated sections). Any areas of degradation due to debris or overspeed would then be further overlaid with other data sets such as high consequence areas, previous ILI or proximity to crossings (as defined in the acceptance criteria) to determine if any reduced ILI performance specifications can be tolerated in those areas.

6.3 Provide Dynamic's view of the prudence of FEI deferring the 13 modifications to the CTS pipelines and foregoing the ability to capture data in these locations, considering:

- the opportunity for FEI to perform the modifications in the future if significant SCC or seam weld cracking is found on the initial EMAT ILIs;
- the cost of the modifications; and
- the value of the additional data that would be obtained from completing the modifications for the initial EMAT ILI runs.

Response:

The pipeline modifications are required to minimize the risk of a failed EMAT inspection due to overspeed. Inspection with EMAT prior to the pipeline modifications will likely lead to blind spots and/or areas of data analyzed subject to a reduced ILI performance specification. The condition of the pipeline, with regards to crack features, in these areas would be unknown and require further investigation (excavation and inspection with NDE).

6.4 In Dynamic's view, if FEI did not modify the CTS pipelines to remove the 13 heavy wall sections, would FEI still obtain sufficient data to assess the integrity of the CTS and mitigate the threat of SCC? Explain why or why not.

Response:

FEI would obtain data to manage the threat of SCC in areas where the EMAT tool is operating within the specified velocity range and no data degradation has occurred. Additional analysis and excavations (pipeline exposure and NDE testing) in the areas of overspeed or degraded data would be required to effectively manage the threat of SCC.

7.0 Reference Exhibit B-1 pp.87, 89

FEI proposes to install four new pressure control stations which can be used to decrease the operating pressure and reduce the risk of failure on individual pipelines in the event that the EMAT ILI identifies serious defects which are too numerous for FEI to repair prior to the winter peak season. From the EMAT ILI pilot program, FEI found:

LIV PAT 457: "The Preliminary Report has been received, and while there was no severe cracking identified that warranted urgent repair work, the following features that had not been identified by FEI's current integrity management practices were reported:

- 5 crack features located in the seam weld
- 7 crack features located in the pipe, and
- 1 crack group"

CPH BUR 508: "While there was no severe cracking identified that warranted urgent repair work, the following features that had not been identified by FEI's current integrity management practices were identified, and five initial integrity digs are scheduled for 2021:

- 4 linear indications
- 1 crack group"

7.1 Considering the amount and severity of crack features identified by the pilot EMAT ILI runs, provide Dynamic's view of whether FEI is likely to discover cracking features on the remaining CTS pipelines which are severe enough to cause FEI to implement an immediate pressure reduction and numerous enough to preclude completing all repairs prior to the winter peak season.

Response:

The current status of cracking (number of features and severity) on the susceptible CTS segments without EMAT ILI is unknown.

7.2 Considering the amount and severity of crack features identified by the pilot EMAT ILI runs, provide Dynamic's view of the urgency with which FEI should be completing the EMAT ILI runs.

Response:

Based on the SCC crack growth assessment performed by JANA in conjunction with the University of Alberta, the EMAT ILIs should commence immediately following the pipeline modifications in 2025. The eleven (11) lines to be inspected should be prioritized based on the SCC risk model, using the analysis performed in the SCC growth study, with actual operating conditions of each pipeline segment.

8.0 Reference Exhibit A2-1 pp. 30

"Currently, there is a gap in the existing FEI integrity management practices to address the threat of SCC, as opportunistic excavations alone are not sufficient to fully characterize, detect and manage the threat. The results of the quantitative risk assessment (QRA) demonstrate the risk of SCC to be highest on the CTS pipeline segments and it is the independent pipeline integrity expert panel's view that EMAT ILI is the most appropriate response and mitigation action to reduce risk and strengthen the overall integrity management program."

8.1 If EMAT inspection technology was not available, would Dynamic recommend that FEI perform hydrotests on all of its susceptible CTS pipelines within the next five years in order to address the gap in FEI's integrity management practices? If not, what would Dynamic recommend?

Response:

Prior to EMAT technology, the threat of SCC on pipelines was optimally managed through hydrotests. If EMAT technology were not available, subject to operational and environmental considerations, Dynamic Risk would advocate for an "SCCDA" assessment approach along with targeted hydrotests.

Patrick Wruck
Commission Secretary

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July 27, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-4

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to CEC Information Request

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to Commercial Energy Consumers Association of British Columbia Information Request No. 1
dated July 27, 2021

Sincerely,

Original signed by Ian Jarvis for:

Patrick Wruck
Commission Secretary

/dg
Enclosure

Dynamic Risk

July 27, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 1 From Energy Consumers Association of British Columbia (CEC). (BCOAPO)

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 1 from the CEC on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

1.0 Reference Exhibit A2-1, page 31

It is the independent pipeline integrity expert panel's view that the pipeline modifications proposed are necessary to ready the susceptible segments for EMAT ILI, which is a reliable technology that can detect the cracking features previously found through opportunistic excavations. The EMAT ILI tool, when used in parallel with a robust validation program, is appropriate to manage the threat of SCC on the CTS.

1.1 Is it fair to say that Dynamic Risk reviewed the Project for need, justification, appropriateness, and adequacy, but did not review the project design or proposed implementation for cost effectiveness and other potential optimizations? Please explain.

Response:

The review performed by Dynamic Risk did not include a review of the project design or proposed implementation for cost effectiveness and other potential optimizations.

2.0 Reference Exhibit A2-1, page 3

To successfully utilize the EMAT ILI, the tool velocity must be maintained within the vendor specified range to acquire accurate and acceptable inspection results. FEI has recognized this critical variable and proactively identified areas of the pipeline segments where speed excursions may occur. Facility modifications are required to safely launch and receive the EMAT ILI tools and pipeline modifications are necessary to control the tool speed within appropriate limits during the inspection. Although the risk of speed excursions will be minimized with facility and pipeline modifications, the risk of degraded data during ILI still exists. FEI has addressed this through a process to investigate blind spots caused by EMAT ILI data degradation, which includes additional analysis to determine the severity of degraded data and the conditions of the pipeline in the degraded areas. The goal is to determine if areas of degraded data need further investigation by pipeline replacement or exposure and recoat. This process of investigating for potential SCC in areas of EMAT data degradation is essential to the crack management program.

It is the independent pipeline integrity expert panel's view that the pipeline modifications proposed are necessary to ready the susceptible segments for EMAT ILI, which is a reliable technology that can detect the SCC features previously found through opportunistic excavations. The EMAT ILI tool, when used in parallel with a robust targeted excavation and validation program, is appropriate to manage the threat of SCC on the CTS.

2.1 Please confirm or otherwise explain that FEI's mitigation plans for mitigating potential speed excursions will capture all areas where information degradation could occur, and will adequately correct for that situation.

Response:

FEI has proactively identified areas of potential speed excursions based on the behavior of other ILI tools in the line. The results of the pilot project confirmed the behaviour of the EMAT tool with regards to the velocity is comparable to that of the MFL. This approach is based on best engineering judgement and will minimize the likelihood of degraded data due to speed excursions.

3.0 Reference Exhibit A2-1, page 7

The objective of the QRA, as stated in the report, was to inform the urgency and priority of addressing cracking threats, assess the significance of the cracking threats in terms of their contribution to overall risk, allow for prioritization of pipelines based on risk and frequency of failure for possible mitigation of cracking threats and continue the efforts of FEI in moving to a quantitative risk-based approach to pipeline integrity management.

The QRA performed on the three (3) transmission systems is in alignment and follows the approach defined in the CSA Z662-19 with hazard identification, frequency and consequence analysis, and risk estimation. The results show the CTS to have the highest risk as compared to the other systems (ITS and VITS). The top risk driver is SCC for nine (9) of the eleven (11) segments that are susceptible to SCC Within the CTS. For the remaining two (2) susceptible segments, SCC is the second and fourth risk driver.

The results of the QRA are as expected due to the CTS segments proximity to populated areas and the lack of crack ILI data to be incorporated into the risk model. In the absence of EMAT ILI data, the risk model for SCC relies on an analysis of industry historical failure data and the susceptibility factors for SCC. Based on the results of the QRA, FEI has appropriately determined that performing an EMAT ILI on the eleven (11) pipeline segments in the CTS is required to reduce the risk on the CTS.

3.1 Please provide FEI’s actual SCC realized risk of failure/rupture for the last 10 years.

Response:

The review performed by Dynamic Risk did not include a risk program performance review or the previous calculations in application with risk of failure/rupture for the last 10 years. The scope provided for Dynamic Risk was to review the risk results and approach proposed specific to the threat of SCC .

4.0 Reference Exhibit A2-1, page 21-22

E.7.2.2.1 Vendor Partnership

EMAT verification and validation processes are based on established essential partnerships with EMAT Ill tool vendors through regular collaboration. A "client profile" is a document used define the requirements and expectations for reporting format, reporting timelines, analysis and documentation required by the operator. The client profile should be established for each vendor to ensure consistent reporting that meets the specific data requirements of the operator. This would also include the requirements for pre-run, post-run and the Data Quality Assessment (DQA) checks and associated DQA report. The client profile can also specify any special or unique requests for providing additional information (i.e., on non-reportable features or indications below specification, that can be used for integrity assessment and validation).

4.1 Did Dynamic Risk evaluate FEI's Vendor Partnerships for appropriateness, cost effectiveness, or other metrics?

4.1.1 If yes, please provide Dynamic Risk's evaluation.

4.1.2 If no, please explain why not.

Response:

An evaluation of the vendor partnership was not in the scope of the review performed by Dynamic Risk. Multiple vendor partnerships with FEI have likely been established through previous ILI activities as part of the integrity management plan. Sufficient material to evaluate the partnership was not provided as part of the application material (such as vendor key performance metrics, ILI procedures or ILI reporting specification documents).

4.2 Please provide a brief discussion of the proprietary aspects of vendor partnerships. To what extent is a company using a specific EMAT ILI technology beholden to the vendor partnership?

Response:

Vendor partnerships include proprietary information such as:

- Pricing for services
- ILI Tool specifications
- Previous ILI data
- Pipeline parameters and operating conditions
- Key performance metrics (such as first time run success, on time delivery, reporting timelines)

An operator can have a collaborative working relationship (partnership) with multiple ILI vendors as each vendor is able to provide services that address unique inspection challenges, such as multi diameter inspections, speed control, debris management, or specialized technologies (EMAT). Partnerships are not typically based on exclusivity of service or technology; operators are typically free to obtain the best technology to address specific threats outside of the partnership.

5.0 Reference Exhibit A2-1, pages 29-30

E.7.4 Discussion

EMAT is a highly sensitive technology and the current industry validation data seems to corroborate that EMAT POD has a high success rate. However, the POI results have not been as successful (almost 80% success rate with 80% confidence). The POI results could also be relatively lower in the seam weld when compared to the POI results in the pipe body. In some cases, the lower POI results could be attributed to the seam weld geometry affecting the EMAT performance. The high POD success rate indicates a very low possibility of non-detected anomalies, but the high sensitivity of EMAT technology and the relatively lower POI success rate also highlights the possibility of false positives. EMAT vendors are using supporting MFL data (i.e., circumferential MFL data and in where applicable, axial MFL data), to cross reference EMAT results and reduce the number of false calls.

Current industry efforts have reduced the number of false calls, but it is very common to have a large number of linear anomalies reported after an EMAT survey. Linear indications reported by an EMAT ILI survey may be sub-divided into eight to ten categories or more such as "linear Indication-Axial Cracklike-Permeability Change", "Linear Indication - Axial Cracklike-Associated with Seam Variation", Or "Linear Indication - Axial Cracklike - Possible Coating Disbondment". This makes it necessary to prioritize the anomalies based on anomaly type and associated descriptions. In most cases, anomalies characterized as cracks or crack groups should be given higher priority over anomalies where the characterization is not certain. It is essential to have continuous communication between the operator and the EMAT vendor until all required activities for EMAT response have concluded. It is in the operator's best interest to share field validation data with the ILI vendor and request re-evaluation if necessary.

5.1 Please provide further elaboration of the effects of lower Probability of Identification (POI) and the need for MFL data to cross-reference the results. How difficult is it to generate this information?

Response:

As part of FEI's ongoing integrity management plan referenced in the application, FEI has performed axial and circumferential MFL inspections. The information from the existing MFL inspections can be leveraged and integrated with the EMAT ILI data. Also, it is common practice with certain EMAT ILI vendors to perform a circumferential MFL in conjunction with an EMAT ILI to help overcome POI challenges. The circumferential MFL data collected is used to aid the analysis of the EMAT data and is included as a service with the EMAT inspection. This approach of using an MFL-C and integrating the MFL-A data can help to overcome the POI challenges and reduce the number of unnecessary excavations to confirm feature identification following an EMAT survey.

5.2 Would Dynamic Risk expect that the technology will continue to evolve such that current issues with POI or other limitations of the EMAT ILI may be resolved in the future? Please explain why or why not.

Response:

EMAT was introduced in the early 2000's, the current tools have undergone improvements to allow for absolute depth sizing (previously depth ranges provided), improved sensors to discriminate non injurious lamination features (POI improvement), addition of speed control, more diameters available and shortening of tools. ILI vendors are continuously improving technology to meet the pipeline industry demands and challenges, it is expected that the EMAT technology will continue to improve as additional pipeline operator learnings are obtained and communicated to the ILI vendors.

5.3 At what stage of technology development would Dynamic Risk consider the EMAT ILI technology to be? Please explain.

Response:

EAMT ILI is an established technology that is currently used by multiple gas pipeline operators to successfully manage the threat of SCC. The EMAT technology was developed in the early 2000's and has improved significantly since it's introduction (as noted in the response to 5.2). Although the EMAT is an established inspection technology, it is not as mature when compared to the MFL technology, which was developed during the 1960's. Pipeline operators who continue to utilize EMAT, establish vendor partnerships and create continuous improvement feedback loops are essential to the continued refinement of the EMAT ILI technology.

6.0 Reference Exhibit A2-1 page 30 and 31

To successfully utilize the EMAT ILI, the tool velocity must be maintained within the vendor specified range to acquire accurate and acceptable inspection results. FEI has recognized this critical variable and proactively identified areas of the pipeline segments where speed excursions may occur. Facility modifications are required to safely launch and receive the EMAT ILI tools and pipeline modifications are necessary to control the tool speed within appropriate limits during the inspection. Although the risk of speed excursions will be minimized with facility and pipeline modifications, the risk of degraded data during ILI still exists. FEI has addressed this through a process to investigate blind spots caused by EMAT ILI data degradation, which includes additional analysis to determine the severity of degraded data and the conditions of the pipeline in degraded areas. The goal is to determine if areas of degraded data need further investigation by pipeline replacement or exposure and recoat. This process of investigating for potential SCC in areas of EMAT data degradation is essential to the crack management program.

6.1 Please provide a brief description of the EMAT ILI vendor market. Are there multiple vendors, or a single vendor?

Response:

The current EMAT market consists of three (3) vendors.

6.1.1 If there are multiple vendors, please provide Dynamic Risk's general assessment of each vendor's specializations and unique capabilities.

Response:

The EMAT specifications provided by the three (3) vendors are similar as the sensor technology is generally applying common ultrasonic principles with slight differences in sensor configuration and design. The EMAT ILI technology capabilities with regards to POD/POI/POS and sensitivity to speed excursions in gas pipelines is also similar, however subject to modifications and improvements applied within the ILI vendor continuous improvement processes.

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Commission Secretary

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July 27, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-5

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to BCOAPO Information Request

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to British Columbia Old Age Pensioners' Organization et al. Information Request No. 1
dated July 27, 2021

Sincerely,

Original signed by Ian Jarvis for:

Patrick Wruck
Commission Secretary

/dg
Enclosure

Dynamic Risk

July 27, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 1 From British Columbia Old Age Pensioners' Organization (BCOAPO)

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 1 from the BCOAPO on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

1.0 Reference Exhibit A2-1

1.1 Please provide a complete list of Dynamic Risk's clients. In the list please clearly identify clients that are pipeline owners, commissions or regulators, or customers of pipelines.

Response:

Dynamic Risk works with 75% of Canadian Pipeline Transmission/Midstream operators and 50% of US pipeline operators to provide industry leading consulting, engineering assistance and technology solutions by optimizing risk-informed decisions making.

A selected summary of Dynamic Risk's customers was provided to the BCUC at the time of the qualification process as the basis for the qualification.

1.2 Please confirm that no Fortis entity is a client of Dynamic Risk, nor has been a client of Dynamic Risk for the last 5 years. If not confirmed, please provide a list of all relationships with any Fortis entity.

Response:

A list of Dynamic Risk's customers regulated by the BCUC, along with a summary of the related projects were both provided to the BCUC as an element within the Dynamic Risk qualification process.

2.0 Reference Exhibit A2-1

2.1 Please fully explain Dynamic Risk's risk targets and goals. In the response, please fully explain if it is Dynamic Risk's view that FEI's goal should be to take all risks to zero.

2.2 Please discuss Dynamic Risk's understanding of the relationship between decreasing utility risks and utility costs with a particular focus on that relationship should a utility seek to reduce its risk to zero.

Response:

The scope of the Dynamic Risk's work was to apply subject matter expertise to review the approach proposed by FEI with regard to assessment and mitigation of the threat of SCC. It was not within the Dynamic Risk project scope to review and provide commentary on FEI risk targets and the relationship to utility costs.

3.0 Reference Exhibit A2-1 Section E7.3

3.1 Please fully explain what work Dynamic Risk did to compare FEI's existing practices to industry practices. Would Dynamic Risk characterize FEI as an industry best performer, an average performer, or a poor performer when comparing FEI's management of its pipeline integrity prior to the implementation of EMAT ILI to that of the industry.

Response:

The scope of the Dynamic Risk's work was to apply subject matter expertise to review the approach proposed by FEI with regard to assessment and mitigation of the threat of SCC. It was not within the Dynamic Risk project scope to benchmark FEI pipeline integrity performance and practices against those of other operators.

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October 15, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-6

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to RCIA Information Request No. 2

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to Residential Consumer Intervener Association Information Request No. 2
dated October 15, 2021

Sincerely,

Original signed by:

Patrick Wruck
Commission Secretary

/dg
Enclosure

Dynamic Risk

October 15, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 2 From Residential Consumer Intervener Association (RCIA)

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 2 from the RCIA on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

9. Reference: Exhibit A2-3, Dynamic Responses to RCIA IR 1, IRs 6.2, 6.4, 8.1

IR 6.2: "What percentage of data capture would Dynamic deem to constitute a successful EMAT inline inspection?"

Response:
Acceptance criteria for an EMAT ILI should be defined prior to the inspection for each CTS segment. The inspection data can then be assessed against the acceptance criterion developed by FEI for the specific line segment. Typically, a successful EMAT inspection would capture data to provide 100% coverage of the pipeline within the susceptible areas (non FBE coated sections). Any areas of degradation due to debris or overspeed would then be further overlaid with other data sets such as high consequence areas, previous ILI or proximity to crossings (as defined in the acceptance criteria) to determine if any reduced ILI performance specifications can be tolerated in those areas.

IR 6.4: "In Dynamic's view, if FEI did not modify the CTS pipelines to remove the 13 heavy wall sections, would FEI still obtain sufficient data to assess the integrity of the CTS and mitigate the threat of SCC? Explain why or why not."

Response:
FEI would obtain data to manage the threat of SCC in areas where the EMAT tool is operating within the specified velocity range and no data degradation has occurred. Additional analysis and excavations (pipeline exposure and NDE testing) in the areas of overspeed or degraded data would be required to effectively manage the threat of SCC.

IR 8.1: "Prior to EMAT technology, the threat of SCC on pipelines was optimally managed through hydrotests. If EMAT technology were not available, subject to operational and environmental considerations, Dynamic Risk would advocate for an 'SCCDA' assessment approach along with targeted hydrotests."

9.1. The response to IR 6.2 recommends assessment of other data sets to determine whether a degraded data set from the EMAT ILI is acceptable. The response to IR 6.4 indicates that additional analysis would be required to manage the threat of SCC. Is the additional assessment and analysis recommended by Dynamic similar to the pre-assessment step of NACE SP0204-2015 SCC Direct Assessment? Please explain.

Response:
The additional analysis required in areas of degraded EMAT data refers to the process of investigating for false negative features (potential missed cracks) due to overspeed or otherwise degraded EMAT data. This additional analysis would include a data review by the ILI vendor and validation excavations in areas of EMAT overspeed or degraded data. The pre-assessment step defined in NACE SP0204-2015 can be used to further prioritize the validation excavation sites.

9.2. Would SCC Direct Assessment applied in the areas of degraded EMAT ILI data allow FEI to effectively manage the cracking threats to the CTS in these areas? If not, please explain why not.

Response:
No, the SCCDA approach may not address all pipeline conditions that contribute to the initiation and progression of SCC and therefore may not fully assess the potential significance of the SCC threat.

9.3. Would the availability of extensive EMAT ILI data for the majority of the pipeline provide an enhanced data set to be used for the SCC Direct Assessment of areas where the EMAT ILI returned degraded data (blind spots)? If not, explain why not.

Response:
If degraded areas or blind spots occur at locations along the pipeline that are susceptible to SCC, the only way to confirm the presence or significance of a crack feature is to perform an assessment such as pipeline excavation, potential re-run of the EMAT ILI, or hydrotest. The SCCDA approach could be used to confirm SCC susceptibility, assess the coating condition in degraded areas and prioritize excavation sites.

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October 15, 2021

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FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-7

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to CEC Information Request No. 2

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to Commercial Energy Consumers Association of British Columbia Information Request No. 2
dated October 15, 2021

Sincerely,

Original signed by:

Patrick Wruck
Commission Secretary

/dg
Enclosure

Dynamic Risk

October 15, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 2 From Energy Consumers Association of British Columbia (CEC).

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 2 from the CEC on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

DYNAMIC RISK
SUITE 1110, 333 11TH AVENUE SW CALGARY, AB T2R 1L9
PHONE: (403) 547-8638 dynamicrisk.net

7. Reference: Exhibit A2-4, CEC IR 1.4.1.2 to Dynamic Risk

7.1. Please provide an order of magnitude estimate of the time and cost that would be required to evaluate the appropriateness of FEI's vendor partnership(s).

Response:

An evaluation of the vendor partnerships would be completed as an audit of the integrity management plan specific to ILI. The estimated effort would be 2 weeks (approximately $30,000 CAD) and would require interviews with FEI staff, access to the integrity management procedures, ILI related documentation, vendor agreements and communications.

8. Reference: Exhibit A2-4, CEC IR 1.4.2 and 1.5.2 to Dynamic Risk

8.1. Would Dynamic Risk expect that any improvements or changes to the EMAT technologies in the future could negatively impact the value of the capital investments proposed to be made by FEI at this time? Please explain why or why not.

Response:

No, EMAT technology is the only ILI technology that can reliably detect cracks in natural gas pipelines and the specific operational challenges of performing an EMAT ILI (slower tool speed and overall tool length) are not expected to be fully addressed with near term tool improvements.

9. Reference: Exhibit A2-4, CEC IR 1.5.3 to Dynamic Risk

9.1. Would Dynamic Risk expect EMAT ILI costs to ultimately decline as the technology matures? Please explain why or why not.

Response:

EMAT is a highly specialized ultrasonic technology that is continuing to evolve and only provided by three ILI vendors. It is expected that the EMAT ILI vendors will be required to invest significant funding in ILI technology improvements over the long term to remain competitive and satisfy customer requirements. Based on the expected investment requirements, Dynamic Risk believes the cost to perform EMAT ILI is not expected to decline.

9.2. Would Dynamic Risk characterize older technologies such as MFL and other options for pipeline integrity inspections to be 'on the way out' and likely to be replaced by EMAT technology in the future?

Response:

No, EMAT technology was specifically developed to address the threat of cracking in natural gas pipelines and is not designed to evaluate the threat of corrosion or replace the MFL technology. It is expected that EMAT will continue to be used as an inspection technique specifically to address the threat of cracks and MFL will continue to be used to address the threat of corrosion.

9.3. Would Dynamic Risk expect that, if FEI were to invest in older technologies at this time, there would be a risk of the investment becoming obsolete as EMAT technology becomes more developed and established? Please explain.

Response:

No, operators investing in the current EMAT technology by performing inspections utilizing the services of ILI vendors provide necessary support to further the development and improve the capabilities of EMAT technology. As the ILI vendors continue to improve the EMAT technology, such technology improvements are incorporated and made available to the pipeline operators.

10. Reference: Exhibit B-7, CEC 1.30.1 and Exhibit B-5, BCUC 1.12.1

> 12.1 Please discuss at what cost FEI would no longer consider the EMAT ILI alternative financially feasible.
>
> **Response:**
>
> As set out in Table 4-4 and further explained in Section 4.5 of the Application, FEI considers a Project alternative with an NPV of $1.8 billion or more to be cost prohibitive. FEI considers an alternative with a NPV of $307 million to be a reasonable level of expenditure to mitigate the risk posed by cracking threats on the CTS.
>
> FEI has not identified a threshold between these two points where an EMAT ILI alternative would be considered financially non-feasible. Ultimately, numerous factors contribute to FEI's determination of feasibility, including the amount of risk reduction, the capital cost of improvements versus the rate base value of the installed assets, the technical feasibility, environmental and archaeological impacts and impacts to the public and Indigenous groups.

10.1 FEI is not able to provide a threshold at which it considers EMAT ILI to be cost prohibitive. Please provide any metrics that Dynamic Risk is aware of that have been used in other jurisdictions to determine cost-effectiveness and quantify the $ value range of cost effectiveness where possible (e.g., cost/km, or cost/identified risk).

Response:

As noted by FEI, numerous factors and assumptions would need to be considered to fully address and quantify ILI program cost effectiveness and corresponding risk reduction. The industry is moving towards developing such metrics to better quantify integrity program cost effectiveness and quantify risk reduction.

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October 15, 2021

Sent via eFile

FEI CTS TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT EXHIBIT A2-8

To: All Registered Parties

Re: FortisBC Energy Inc. – Certificate of Public Convenience and Necessity for the Coastal Transmission System Transmission Integrity Management Capabilities Project – Project No. 1599185 – Response to BCOAPO Information Request No. 2

British Columbia Utilities Commission Staff submit the following document for the record in this proceeding:

Dynamic Risk Assessment Systems, Inc.
Response to British Columbia Old Age Pensioners' Organization et al. Information Request No. 2
dated October 15, 2021

Sincerely,

Original signed by:

Patrick Wruck
Commission Secretary

/dg
Enclosure

October 15, 2021

Attention:

Patrick Wruck

Commission Secretary

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

Re: FortisBC Energy Inc. – Application for a Certificate of Public Convenience and Necessity for the Coastal Transmission System – Transmission Integrity Management Capabilities - Response to Information Request No. 2 From British Columbia Old Age Pensioners' Organization (BCOAPO)

Dear Mr. Wruck,
Please find enclosed Dynamic Risk's response to IR No. 2 from the BCOAPO on the above noted application.

Sincerely,

Phillip Nidd
VP, Technical Services, Dynamic Risk Assessment Systems Inc.

4. Reference: Exhibit A2.5, response to IR 1.2,

Preamble: In question 1.2, the BCOAPO asked:
Please confirm that no Fortis entity is a client of Dynamic Risk, nor has been a client of Dynamic Risk for the last 5 years. If not confirmed, please provide a list of all relationships with any Fortis entity.

To which Dynamic Risk responded:
A list of Dynamic Risk's customers regulated by the BCUC, along with a summary of the related projects were both provided to the BCUC as an element within the Dynamic Risk qualification process.

In asking that question, BCOAPO was seeking information necessary to assess the independence of the consulting organization: a relevant ratepayer concern where the evidence of that consulting organization is being relied upon as evidence in a process, the outcome of which will have implications that affect both ratepayer cost and service. Further, BCOAPO does not understand why Dynamic Risk would not provide such information and Dynamic failed to avail itself of a reasonable opportunity to do so on the record.

As such, the BCOAPO will ask the question again:

4.1. Please confirm that no Fortis entity is a client of Dynamic Risk, nor has been a client of Dynamic Risk for the last 5 years. If not confirmed, please provide a list of all relationships with any Fortis entity.

Response:

The relationships with Dynamic Risk and Fortis were provided in the Request for Proposal (RFP) to the British Columbia Utilities Commission (BCUC) within Appendix C - Conflict of Interest Disclosure. As per the requirement of the RFP, a summary of projects completed with the BCUC's regulated entities in the previous 2-3 years was included.

Through the RFP process, the BCUC determined that Dynamic Risk demonstrated the requisite qualifications (see Exhibit A-5 Letter dated May 7, 2021 – BCUC request for submissions regarding independent consultant). Dynamic Risk has completed the Ethical Screen Agreement, which provides for independent project execution.

The table below includes the projects completed for Fortis BC within a 5-year period.

BCUC Regulated Entity	Year	Project Detail
FortisBC Energy Inc. / FortisBC Inc.	2018	Whistler MOP Upgrade Assessment
	2019	None
	2020	Risk based design of tunneling options for the Eagle Mountain Pipeline
	2021	Reactivation Feasibility Study for the Brenda Mine Pipeline
	Current Project Bids	RFP technical evaluation support for the Eagle Mountain Pipeline
		In-Line Inspection Management Software Solution

Appendix P

FEI'S RESPONSES TO BCUC PANEL IRS- CTS TIMC PROCEEDING

Diane Roy
Vice President, Regulatory Affairs

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February 18, 2022

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

Attention: Mr. Patrick Wruck, Commission Secretary

Dear Mr. Wruck:

Re: FortisBC Energy Inc. (FEI)

Project No. 1599185

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Coastal Transmission System Transmission Integrity Management Capabilities Project (Application)

Response to the British Columbia Utilities Commission (BCUC) Panel Information Request (IR) No. 1

On February 11, 2021, FEI filed the Application referenced above. On February 4, 2022, BCUC staff responded by email with BCUC Panel IR No. 1. FEI respectfully submits the attached response to BCUC Panel IR No. 1. FEI would be pleased to respond to any further questions from the Panel.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Registered Parties

1.0 Reference: DESCRIPTION AND EVALUATION OF ALTERNATIVES

Exhibit B-1 (Application), pp. 65, 76; Exhibit B-5, BCUC IR 2.9.1; FEI Comprehensive Review and Application for a Revised Renewable Gas Program, Exhibit B-11,

pp. 76–78, 81–82

Hydrogen Blending

On page 65 of the CTS TIMC Application, FEI states:

> This pipeline replacement (PLR) alternative involves replacing the existing pipeline in its entirety with a new pipeline coated with a high integrity coating that is not conducive to the formation of SCC.

On page 76 of the CTS TIMC Application, FEI provides the following high level financial analysis of the electro-magnetic acoustic transducer in-line inspection (EMAT ILI), PLR and pipeline exposure and recoat (PLE) alternatives:

Table 4-4: NPV Cost Comparison of Three Remaining Alternatives (2020$)

	Alternative 4: EMAT ILI ($ millions)	Alternative 5: PLR ($ millions)	Alternative 6: PLE ($ millions)
NPV of Capital Cost	$225	$1,818	$1,909
NPV of O&M Costs (Savings)	$82	$(7)	$(7)
NPV of Total Capital and O&M Costs	$307	$1,811	$1,902

In response to BCUC Information Request (IR) 2.9.1, FEI stated:

> FEI is still evaluating the impact of an increasing concentration of hydrogen in FEI's natural gas system on the risks posed by stress corrosion cracking, including SCC crack growth behaviour, and is unable to provide discussion at this time.

On pages 76-77 of the Comprehensive Review and Application for a Revised Renewable Gas Program (Renewable Gas Program Review), FEI stated:

> [H]ydrogen presents a significant opportunity to complement RNG in decarbonizing the provincial gas supply. There is strong policy support to develop hydrogen as a low-carbon fuel within the energy mix to meet long-term decarbonization goals. For instance, the BC Hydrogen Strategy states: "Large-scale deployment of renewable and low-carbon hydrogen will play an essential role in reducing B.C.'s emissions."
>
> FEI is involved with multiple national and international joint initiatives that aim to rapidly develop a hydrogen ecosystem capable of producing and distributing hydrogen affordably as part of a lower carbon energy supply. Through its involvement, FEI intends to learn best practices from pioneering hydrogen projects

> that may be applied in BC. As FEI's understanding of hydrogen production, distribution and end-use applications develops, FEI will pilot projects that will test the use of hydrogen in closed systems. FEI is currently progressing to pre-feasibility planning and technical analyses for introducing hydrogen into the gas distribution network before 2025 and is evaluating large-scale projects for the centralized production and distribution of hydrogen.

On page 81 of the Renewable Gas Program Review, FEI stated:

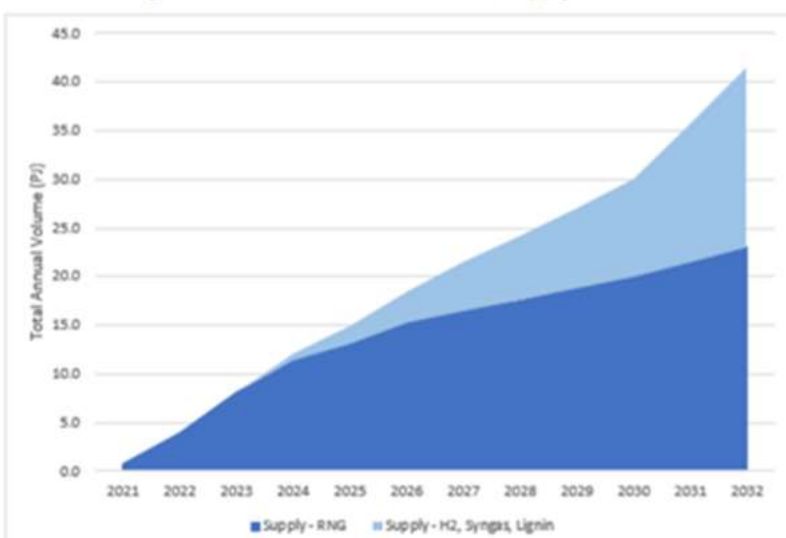
> There are technical and regulatory barriers to integrating alternate forms of Renewable Gas, such as hydrogen, into the gas system. These barriers could delay the use of hydrogen, synthesis and lignin to provide FEI's customers with low carbon energy services. FEI is undertaking steps to ensure that the existing gas pipeline system can accommodate other forms of Renewable Gas and, as applicable, that there are alternative methods to deliver these gases to customers. [Emphasis added]

On page 82 of the Renewable Gas Program Review, FEI stated:

> Assessing the blending of hydrogen into the gas supply, including a technical readiness evaluation. FEI is also in the process of testing how hydrogen interacts with pipeline materials, components and other equipment on its system, enabling hydrogen transport as a blend in the gas system, and the feasibility of hydrogen transport via repurposed high pressure transmission pipelines with a long-term goal of repurposing segments of existing natural gas networks for the delivery of 100 percent hydrogen gas. [Emphasis added]

On page 78 of the Renewable Gas Program Review, FEI provided the following 10-year renewable gas supply forecast:

Figure 6-3: 10-Year Renewable Gas Supply Forecast



1.1 Please provide an update regarding FEI's evaluations into the impacts of blending increasing concentrations of hydrogen into its natural gas transmission and distribution systems.

Response:

FEI continues to advance a range of activities to study, test, and verify that hydrogen is safe to use in the existing gas system and to identify any changes that may be required to ensure the continued safe operation of the gas system. As FEI discusses in the responses to these IRs, regardless of these activities, the data collected by EMAT ILI is necessary to allow FEI to identify and address any cracking threats on the CTS pipelines today. FEI's CTS pipelines will continue to be used and useful as they are capable of safely transporting a blend of hydrogen and large scale replacement of the CTS is neither expected nor cost-effectively feasible. As FEI has an obligation to provide safe service to its customers, FEI cannot defer the CTS TIMC Project due to the potential for hydrogen-related developments on its system.

The following provides background regarding blending hydrogen in pipelines and describes FEI's ongoing activities to investigate doing so.

Hydrogen-ready pipe is well understood

Hydrogen gas has been safely stored and transported in high-pressure steel tanks and pipelines for many decades. As such, the engineering challenges are well understood. Pipelines that are considered fully hydrogen-ready have been specified, designed, and constructed from their outset to transport pure hydrogen. As such, consideration is given to materials, components, and procedures (e.g., pipeline steel, welds, gaskets/seals, valves, etc.) that are known to be able to operate in a pure hydrogen environment.[1] However, even pipe that was not designed and constructed from the outset for hydrogen service can still transport meaningful quantities of hydrogen, in some cases with little to no modifications, as FEI explains below.

Preliminary analysis shows FEI's CTS can transport a blend of hydrogen

FEI has completed preliminary analysis to understand the admissible limits for hydrogen blending for its existing natural gas infrastructure and end-use customer equipment and applications. The analysis was informed by current industry knowledge and indicates that the existing transmission pressure pipelines in the Lower Mainland can transport a blend of hydrogen and natural gas. This is consistent with industry experience from hydrogen blending pilot projects around the world that have consistently demonstrated that steel pipelines can accommodate low hydrogen concentrations (approximately 10 percent or less) with no negative effects.

[1] https://h2tools.org/.

EMAT ILI will be a valuable input to establishing an upper limit for hydrogen blending

While FEI is confident that it can safely transport low concentrations of hydrogen in the CTS, there is no industry-accepted "bright-line" demarcation between hydrogen percentages that are considered acceptable versus unacceptable. This is because every pipeline configuration is different, including the pipe material (e.g., grade and thickness of the steel), operating pressure, gas composition, etc. Even pipe that was not designed from the outset to be hydrogen-ready may still be determined to be capable of transporting hydrogen in higher concentrations. This is done by conducting an engineering assessment which considers a range of factors such as the pipeline design, asset records, and operating history to determine what level of hydrogen blending can be accommodated without negative impacts to the pipeline. One of the inputs to this assessment is data collected from various inline inspection tools including MFL, C-MFL and EMAT. As such, the EMAT ILI data to be collected by the CTS TIMC Project will form a valuable input into determining the allowable concentration of hydrogen in each of the CTS pipelines.

FEI is investigating methods to mitigate risks of higher hydrogen blends

Hydrogen has different chemical properties compared to methane. The most significant concern in the context of steel pipelines is variously known as "hydrogen embrittlement" or "hydrogen-induced cracking". Hydrogen gas is made up of hydrogen molecules which can dissociate into hydrogen atoms on the inside surface of steel pipe and, because hydrogen is the smallest atom, it has some propensity to adsorb into the steel lattice comprising the pipe body and welds. This can degrade the mechanical properties of the steel, and, in simple terms, can cause it to become more brittle and result in the formation or growth of cracks. This is why the data collected by EMAT ILI, which will allow FEI to identify and address any cracking threats on the CTS pipelines, will also help FEI evaluate the safe operation of the CTS pipeline under various hydrogen blending scenarios in the future. FEI is also investigating emerging industry solutions to inhibit hydrogen embrittlement, such as the presence of small quantities of oxygen. Further research and technical assessment is ongoing to analyze if the levels at which the oxygen is present would be sufficient to mitigate the risk of embrittlement if high concentrations of hydrogen were added to the CTS pipelines.

Update on FEI activities

FEI provides an update below on the following ongoing activities:

1. Gas system readiness, system-planning and deployment strategy;
2. Industry collaboration, research and development, feasibility work;
3. Pilot and demonstration project development; and
4. Codes, Standards and Regulations.

1. Gas System Readiness, System Planning and Deployment Strategy

In 2021, FEI completed the scope definition and budget and schedule planning for a project to confirm the admissible limits for hydrogen blending for its existing natural gas infrastructure and end-use customer equipment and applications in British Columbia. This project will start in 2022 and focus on the following key objectives to be completed by 2024:

- Develop a system-wide hydrogen impact assessment to determine the acceptable range of hydrogen content throughout the gas system and confirm hydrogen blend level targets in the gas system that would be suitable for safe long-term operation;
- Determine longer-term increases to the hydrogen blend targets that would be feasible with continuing research, regulatory amendments and codes and standards development, mitigation measures, and network upgrades;
- Identify existing locations throughout FEI's gas service areas with the capability to support initial clusters of hydrogen production and distribution to initiate and grow market demand;
- Develop a hydrogen deployment roadmap to address the technical uncertainties, overlapping project requirements, and any limitations on system capacity to optimize for larger-scale hydrogen production, distribution and use; and
- Develop a deployment strategy to manage change and address safety, training, and education for internal operations and supply chain stakeholders, and the wider societal perceptions and considerations.

2. Industry Collaboration, Research and Development, Feasibility Work, Sector Specific Approaches:

FEI has been a member of various ongoing joint industry partnerships with both private industry and university institutions since 2017 that are in the process of testing how hydrogen interacts with pipeline materials, components, and other gas system equipment using hydrogen blend concentrations in natural gas from 5 percent up to 100 percent by volume. The key objectives of these activities include:

- Advance the adoption of new ways and means to distribute hydrogen and new end-use applications;
- Evaluate the technical and economic feasibility of large-scale projects for the centralized production and distribution of hydrogen;
- Advance involvement with multiple international joint initiatives that aim to share scientific knowledge and technical guidance to rapidly develop the ecosystems that can affordably produce and distribute fuels such as hydrogen as a clean energy supply;
- Engage industry expertise to research the feasibility of hydrogen transport via repurposed natural gas pipelines with a long-term goal of repurposing some segments of existing natural gas networks to 100 percent hydrogen service; and

- Continue to examine and learn best practices from pioneering hydrogen projects that can be applied in BC.

3. Pilot and Demonstration Project Development:

FEI's understanding of hydrogen production, distribution, and end-use applications continues to expand. As such, FEI has also begun developing pilot and pre-commercial demonstration projects to test hydrogen production and the use of these low-carbon fuels in a closed system. The key objectives of this activity are:

- Initiate hydrogen development and deployment through strategic demonstrations with university institutions and other development activities to scale supply and demand in key sectors;
- Demonstrate via hydrogen injection/blending pilot projects the viability and safety of hydrogen as a renewable fuel by addressing the technical uncertainties of introducing hydrogen into the existing gas network, and the potential impacts on end-users;
- Demonstrate a hydrogen micro-grid using hydrogen specific infrastructure to capture, clean, deliver and use byproduct hydrogen to decarbonize industry; and
- Pilot hydrogen separation to remove hydrogen from natural gas steam at locations where this may be necessary.

4. Codes, Standards and Regulations

FEI continues to engage with the various standards working groups to modify and develop safety and technical standards and set longer-term objectives to transition the regional natural gas network to adopt hydrogen. This includes hydrogen-ready infrastructure initiatives, including the certification of new appliances and equipment and the design of hydrogen-compatible natural gas infrastructure. The key objectives of this activity are:

- Harmonize codes and standards across jurisdictions (provincial and international) to ensure that best practices are applied across the domestic and international hydrogen economy.
- Work with the CSA Z662 *Oil and Gas Pipeline Systems* standard task force to review and update the requirements for gas pipelines. This will ensure that pipelines containing pure hydrogen, hydrogen blends, or biomethane blended with natural gas are fully aligned with or incorporated into the CSA Z662 and CSA Z245 *Steel Pipe* standards.
- Develop an FEI corporate hydrogen standard that will guide all aspects of hydrogen blending in the natural gas supply and that will allow FEI, or third-party suppliers, to blend hydrogen into the gas network.

1.2 Based on the 10-year renewable gas supply forecast reproduced above, what percentage (by energy) of the gas in the CTS will be hydrogen in: i) 2030; ii) 2040; and iii) 2050.

Response:

By 2030, FEI expects that there will be minimal hydrogen in the gas flowing in the CTS pipelines. FEI cannot know at this time what the precise percentage of hydrogen in the gas in each CTS pipeline will be in 2040 or 2050, but FEI expects that methane (whether from conventional or renewable sources) will continue to exceed 80 percent by volume of the gas transported by the CTS pipelines for at least 20 years. Additional amounts of hydrogen to support FEI's low-carbon diversified pathway may also be transported by other new or repurposed infrastructure.

1.3 Please explain whether there will be a need to replace existing pipeline segments of the CTS to accommodate the distribution of hydrogen. If so, please indicate the anticipated timing of such replacement.

1.4 Please explain whether there will be a need to repurpose existing pipeline segments of the CTS for the delivery of 100 percent hydrogen. If so, please indicate the anticipated timing of such replacement.

1.4.1 Please explain whether repurposing existing pipeline segments of the CTS would involve replacing the entire length of or portions of the selected pipeline segments with new hydrogen-tolerant piping.

1.5 Please explain whether any of the pipelines modified in the CTS TIMC Project will no longer be used or useful following the blending of increasing concentrations of hydrogen into the CTS. Please explain why or why not.

1.6 Please confirm that, had FEI proposed the PLR as its preferred alternative, the pipeline materials and/or the pipeline coatings would have been selected to ensure the CTS is hydrogen-tolerant. If confirmed, please provide any additional cost related to that selection and its impact on the net present value (NPV) of the PLR alternative.

Response:

While there is some uncertainty around the future pace of hydrogen adoption and distribution for FEI, this uncertainty has no impact on the need for the CTS TIMC Project. FEI expects that the CTS pipelines will continue to be used and useful.

In summary:

- The CTS pipelines will continue to be used and useful. They can accommodate a blend of hydrogen today and EMAT ILI will be a valuable input to establishing an upper limit for hydrogen blending.
- If 100 percent hydrogen distribution is pursued by FEI in the future, this may be done through retrofitting existing infrastructure, by new infrastructure, or by production of hydrogen closer to the point of use.
- EMAT ILI is a significantly more cost-effective solution as compared to PLR and will allow long-term operation of the CTS pipelines, even in a future where hydrogen blending is contemplated.
- The data collected by EMAT ILI is necessary to allow FEI to identify and address any cracking threats on the CTS pipelines today.

FEI expands upon each of these concepts below.

The CTS pipelines will continue to be used and useful

FEI's CTS pipelines will continue to be used and useful. As discussed in the response to BCUC Panel IR 1.1, FEI has completed preliminary analysis which indicates that the existing transmission pressure pipelines in the Lower Mainland can transport a blend of hydrogen and natural gas. This is consistent with industry experience from hydrogen blending pilot projects around the world which have consistently demonstrated that steel pipelines can accommodate low concentrations (approximately 10 percent or less) with no negative effects. While there is no industry-accepted "bright-line" demarcation between hydrogen percentages that are considered acceptable versus unacceptable, EMAT ILI information will be a valuable tool to help determine what level of hydrogen blending can be accommodate without negative impacts to the pipeline.

If 100 percent hydrogen distribution is pursued by FEI in the future, this may be done through retrofitting existing infrastructure, by new infrastructure, or by production of hydrogen closer to the point of use.

At this time, FEI does not know which, if any, of the segments of the CTS might need to be replaced or repurposed, nor the timing of this work. However, FEI does not envision that the CTS pipelines would be removed and replaced with new hydrogen-ready pipelines, as this would not be a cost-effective method to potentially support 100 percent hydrogen distribution. Instead, by 2030, FEI envisions that blending of hydrogen would expand across the low-pressure gas distribution system, with the potential for segments of the system around hydrogen hubs to be converted to 100 percent hydrogen. Between 2030 and 2050, as demand for hydrogen grows, FEI envisions that the existing gas system pipeline corridors would be retrofitted, upgraded, and expanded to transport an increasing share of hydrogen and (bio)methane in a progressively decarbonized gas system. Additional amounts of hydrogen to support FEI's low-carbon diversified pathway may also be transported by other new or repurposed infrastructure.

In all these potential scenarios, EMAT ILI will continue to be needed to address the risk of cracking threats on the CTS pipelines.

All of the pipeline segments modified by the CTS TIMC Project will be used and useful following the blending of increasing concentrations of hydrogen into the CTS

As explained in Section 5.4.2 of the Application, replacement of some pipeline segments is included within the scope of the CTS TIMC Project. During their design and construction, FEI will consider the potential for future use of these pipeline segments to transport increasing percentages of hydrogen. For clarity, these limited replacements may not make the overall pipeline capable of transporting high concentrations of hydrogen, but they may eliminate possible future bottlenecks and allow FEI to increase hydrogen blending concentrations in certain pipelines for little to no cost.

Including future pipeline replacement costs in the NPV analysis for the PLR alternative is not necessary

FEI confirms that had it proposed the PLR as its preferred alternative, the pipeline materials and/or the pipeline coatings would have been selected to ensure the CTS would be hydrogen-tolerant. However, the NPV financial analysis of the PLR alterative need not account for future costs to replace segments of the CTS with hydrogen-tolerant piping. As discussed in the Application and FEI's arguments filed in this proceeding, the PLR alternative is not financially feasible and EMAT ILI is the only feasible alternative to address the threat of cracking on the CTS. As shown in Table 3-9 of the Application, the CTS consists of approximately 254 km of pipeline and replacing all these pipelines would be highly impactful to customers and the public. Further, as shown in Table 4-4, the cost would be at least an order of magnitude higher than the CTS TIMC Project cost. The potential for hydrogen developments on the CTS does not change FEI's conclusion that PLR is not feasible.

CTS TIMC Project is needed now

The only prudent course of action at this time is to modify the existing CTS pipelines to allow them to be inspected using EMAT ILI. This will allow any existing cracking issues to be identified and addressed. Given that the CTS pipelines can carry a blend of hydrogen today, and replacement of the CTS to accommodate hydrogen is not reasonably contemplated, FEI's CTS pipelines will continue to be used and useful. As FEI has an obligation to provide safe service to its customers, FEI cannot defer the CTS TIMC Project due to the potential for hydrogen-related developments on its system.

The information gathered by EMAT ILI will also directly factor into FEI's analysis of determining what concentration of hydrogen each pipeline can safely accommodate in the future. In turn, this will allow FEI to determine a safe and cost-effective plan for transitioning to increased hydrogen distribution in the future. For example, EMAT ILI may identify that FEI could greatly increase the allowable concentration of hydrogen blending in a given pipeline by simply replacing short pipeline segments in limited areas. This would be cost effective for customers as it would allow for targeted upgrades to achieve higher levels of hydrogen concentration. The information provided by EMAT ILI is a necessary input to this determination.

Appendix Q

DRAFT ORDERS AND UNDERTAKING OF CONFIDENTIALITY

Appendix Q-1

DRAFT PROCEDURAL ORDER

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Utilities Commission

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ORDER NUMBER
G-xx-xx

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity for the Interior Transmission System Transmission Integrity Management Capabilities Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On September 20, 2022, FortisBC Energy Inc. (FEI) filed an application (Application) with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for FEI's Interior Transmission System (ITS) Transmission Integrity Management Capabilities (TIMC) Project (ITS TIMC Project) (Application);

B. In the Application, pursuant to sections 59-61 of the UCA, and consistent with the approved treatment of the deferred costs related to the Coastal Transmission System (CTS) TIMC application,[1] FEI is also requesting approval to transfer the balance of the TIMC Development Cost deferral account related to the ITS TIMC Application, estimated to be a credit of $0.574 million at December 31, 2023, from the existing non-rate base deferral account to the existing rate base TIMC Development Cost deferral account which has an approved amortization period of 5 years;

C. FEI states that the ITS TIMC Project is needed to enhance FEI's integrity management capabilities to mitigate cracking threats on 8 ITS pipelines where such cracking has the potential to lead to failure;

D. FEI explains that the ITS TIMC Project consists of the work necessary to ready 8 pipelines on the ITS for in-line-inspection (ILI) tools capable of detecting cracking on its pipelines. The components of the Project include:

    1. Replacing 3 heavy wall pipeline segments in two of the ITS pipelines to enable the ILI tools to travel within its optimal velocity range; and

[1] BCUC Decision and CPCN Order C-3-22, dated May 18, 2022.

2. Modifying 13 transmission pressure facilities on the ITS, to enable FEI to introduce the ILI tools and install the capability to regulate flow, pressure, and backflow in their associated pipelines;

E. FEI requests that Appendices B, G, H, and J to the Application relating to engineering, cost estimates, and risk assessments be treated as confidential due to their private and commercially sensitive nature and to maintain the safety and security of FEI's assets; and

F. The BCUC has commenced review of the Application and considers that the establishment of a written public hearing is warranted.

NOW THEREFORE the BCUC orders as follows:

1. A written public hearing is established for the review of the Application in accordance with the regulatory timetable as set out in Appendix A to this order (Regulatory Timetable).

2. By no later than October 28, 2022, FEI must publish the Application, this order, and the regulatory timetable on its website and provide a copy of this order and the Application, electronically where possible, to the following:

    a. Registered interveners in the FEI CTS TIMC CPCN Application proceeding; and

    b. Registered interveners in the FEI Annual Review for 2023 Delivery Rates proceeding.

3. FEI must publish the Public Notice, attached as Appendix B to this order, to its social media platforms, on or before Friday, October 28, 2022. FEI must also publish weekly reminder notices on each of its social media platforms until the conclusion of the intervener registration period on Thursday, November 17, 2022.

4. Appendices B, G, H, and J attached to the Application will be held confidential unless determined otherwise by the BCUC, due to their commercially sensitive nature and to maintain the safety and security of the FEI assets.

5. Parties who wish to actively participate in the proceeding are to register with the BCUC by completing a Request to Intervene Form, available on the BCUC's website at https://www.bcuc.com/get-involved/get-involved-proceeding.html, by the date established in the Regulatory Timetable, and in accordance with the BCUC's Rules of Practice and Procedure attached to Order G-178-22.

DATED at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)
Commissioner

Attachment

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity for the Interior Transmission System
Transmission Integrity Management Capabilities Project

REGULATORY TIMETABLE

Action	Date (2022)
FEI publishes notice of the Application	Friday, October 28
Intervener Registration	Thursday, November 17
BCUC Information Request No. 1	Tuesday, November 22
Intervener Information Request No. 1	Tuesday, November 29
FEI responses to BCUC and Intervener IR No. 1	Thursday, January 19
Action	**Date (2023)**
Submissions on Further Process	Thursday, February 2

bcuc
British Columbia
Utilities Commission

We want to hear from you

FEI APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE INTERIOR TRANSMISSION SYSTEM TRANSMISSION INTEGRITY MANAGEMENT CAPABILITIES PROJECT

On September 20, 2022, FortisBC Energy Inc. applied to the British Columbia Utilities Commission (BCUC) for approval of a Certificate of Public Convenience and Necessity for its Interior Transmission System (ITS) Transmission Integrity Management Capabilities (TIMC) Project. In the Application, FEI seeks approval to implement the ITS TIMC Project to enhance FEI's integrity management capabilities to mitigate cracking threats on 8 ITS pipelines, where such cracking has the potential to lead to failure. The ITS TIMC Project will ensure that FEI continues to provide safe, reliable and environmentally responsible delivery of gas to customers served on the ITS.

More information on the application can be found at **bcuc.com** on our "Current Proceedings" page, a hard copy of the application is also available for review at the BCUC's office and FEI's head office.

HOW TO PARTICIPATE

- **Submit a letter of comment**
- **Register as an interested party**
- **Request intervener status**

IMPORTANT DATES

1. **Thursday, November 17, 2022** – Deadline to register as an intervener or file a letter of comment with the BCUC.
2. **Thursday, November 29, 2022** – Deadline for interveners to submit information requests No. 1

For more information on how to participate, please visit our website (**www.bcuc.com/get-involved**) or contact us at the information below.

GET MORE INFORMATION

FortisBC Energy Inc. Regulatory Affairs

16705 Fraser Highway
Surrey, BC Canada V4N 0E8

E: gas.regulatory.affairs@fortisbc.com

P: 604.592.7664

British Columbia Utilities Commission

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Appendix Q-2

DRAFT FINAL ORDER

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ORDER NUMBER
C-xx-xx

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Energy Inc.
Application for Approval of a Certificate of Public Convenience and Necessity for the Interior Transmission System Transmission Integrity Management and Capabilities Project

BEFORE:
[Panel Chair]
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. On September 20, 2022, FortisBC Energy Inc. (FEI) filed an application (Application) with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to section 45 and 46 of the *Utilities Commission Act* (UCA) for FEI's Interior Transmission System (ITS) Transmission Integrity Management Capabilities (TIMC) Project (ITS TIMC Project) (Application);

B. In the Application, pursuant to sections 59-61 of the UCA, and consistent with the approved treatment of the deferred costs related to the Coastal Transmission System (CTS) TIMC application,[1] FEI is also requesting approval to transfer the balance of the TIMC Development Cost deferral account related to the ITS TIMC Application, estimated to be a credit of $0.574 million at December 31, 2023, from the existing non-rate base deferral account to the existing rate base TIMC Development Cost deferral account which has an approved amortization period of 5 years.

C. FEI states that the ITS TIMC Project is needed to enhance FEI's integrity management capabilities to mitigate cracking threats on 8 ITS pipelines where such cracking has the potential to lead to failure;

D. FEI explains that the ITS TIMC Project consists of the work necessary to ready 8 pipelines on the ITS for in-line-inspection (ILI) tools capable of detecting cracking on its pipelines. The components of the Project include:

    1. Replacing 3 heavy wall pipeline segments in two of the ITS pipelines to enable the in-line inspection tools to travel within its optimal velocity range; and

[1] BCUC Decision and CPCN Order C-3-22, dated May 18, 2022.

   2. Modifying 13 transmission pressure facilities on the ITS, to enable FEI to introduce the ILI tools and install the capability to regulate flow, pressure, and backflow in their associated pipelines;

E. FEI requests that Appendices B, G, H, and J to the Application relating to engineering, cost estimates, and risk assessments be treated as confidential due to their private and commercially sensitive nature and to maintain the safety and security of FEI's assets; and

F. By Order G-##-22 dated [DATE], the BCUC established a regulatory timetable for the review of the Application; and

G. The BCUC has reviewed the evidence in the proceeding and finds that approval is warranted.

NOW THEREFORE pursuant to sections 45 to 46 and 59 to 61 of the *Utilities Commission Act* and for the reasons set out in the decision issued concurrently with this order, the British Columbia Utilities Commission orders as follows:

1. FEI is granted a CPCN for the ITS TIMC Project.
2. FEI is approved to to transfer the balance of the TIMC Development Cost deferral account related to the ITS TIMC Application, estimated to be a credit of $0.574 million at December 31, 2023, from the existing non-rate base deferral account to the existing rate base TIMC Development Cost deferral account which has an approved amortization period of 5 years.
3. FEI is directed to comply with all directives outlined in the Decision issued concurrently with this order.

DATED at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)
Commissioner

Appendix Q-3

CONFIDENTIALITY DECLARATION AND UNDERTAKING FORM

Confidentiality Declaration and Undertaking Form

In accordance with the Commission's Rules of Practice and Procedure, please provide a completed form to the party who filed the confidential document and copy Commission Secretary at commission.secretary@bcuc.com. If email is unavailable, please mail the form to the address above.

Undertaking

I, _____________________________, am representing the party _______________________________ in the matter of

FortisBC Energy Inc. Application for a Certificate of Public Convenience and Necessity for the Interior Transmission System Transmission Integrity Management Capabilities Project

In this capacity, I request access to the confidential information in the record of this proceeding. I understand that the execution of this undertaking is a condition of an Order of the Commission, and the Commission may enforce this Undertaking pursuant to the provisions of the *Administrative Tribunal Act*.

Description of document:	Documents filed confidentially in the proceeding, in unredacted form.

I hereby undertake:

(a) to use the information disclosed under the conditions of the Undertaking exclusively for duties performed in respect of this proceeding;

(b) not to divulge information disclosed under the conditions of this Undertaking except to a person granted access to such information or to staff of the Commission;

(c) not to reproduce, in any manner, information disclosed under the conditions of this Undertaking except for purposes of the proceeding;

(d) to keep confidential and to protect the information disclosed under the conditions of this Undertaking;

(e) to return to the applicant, FortisBC Energy Inc., all documents and materials containing information disclosed under the conditions of this Undertaking, including notes and memoranda based on such information, or to destroy such documents and materials within fourteen (14) days of the Commission's final decision in the proceeding; and

(f) to report promptly to the Commission any violation of this Undertaking.

Signed at _________________________ this _________________________.

Signature: _________________________

Name (please print): ____________________________________

Representing (if applicable): ____

Appendix R

CTS COMPLIANCE FILING CONSIDERATIONS

APPENDIX R: CTS COMPLIANCE FILING CONSIDERATIONS

In its Decision and Order C-3-22 approving a Certificate of Public Convenience Necessity (CPCN) for the CTS TIMC Project, the BCUC expressed interest in developing "a robust process to assess the value of incremental improvements in risk to fully assess the cost and benefit to ratepayers of a proposed project", and determined that such a process was "worthy of future consideration".[1] In this Appendix, FEI provides its current response to this issue, but considers that fully assessing the value of incremental improvements in risk is more appropriately considered to be an ongoing conversation that can occur over future filings and, in particular, as part of CPCN applications. This conversation will also be informed by developments in the industry and the work of standards-making bodies to develop approaches to guide the analysis, assessment and quantification of risk.

FEI recognizes that assessing the costs and benefits of projects is integral to the BCUC's public interest-based determinations respecting proposed projects. While in some areas industry is moving towards more quantitative assessments of improvements in risks, FEI has not identified any single "silver bullet" process that can be used to assess and/or quantify the value of incremental improvements in risk for all projects. Rather, FEI considers that a variety of tools, methods and analysis are needed to assess the value of incremental improvements in risk as appropriate for each project.

Therefore, FEI considers that the process to analyze the incremental value of risk mitigation should remain open and flexible in order to adapt to the circumstances of each particular project, and developments in the industry and standards-making bodies. FEI further considers that the CPCN regulatory process remains the best forum for the BCUC to analyze the incremental value of risk mitigation aspects specific to a project, where applicable, and that the CPCN process should remain open to new and different approaches to analyzing risk that may develop over time or that may be appropriate for individual projects.

The remainder of this appendix is organized around the following points:

- Risk mitigation is only one of a number of potential project drivers.
- FEI is continually investigating new processes to analyze and evaluate risk mitigation.
- In some areas, industry is moving from a qualitative to a quantitative assessment of risks.
- Assessing incremental improvement in risks will vary by project.
- CPCN proceedings should remain open and flexible to different approaches to analyzing risk.

Risk Mitigation is Only One Potential Project Driver

As an initial comment, it is important to consider that risk mitigation is only one of a number of potential drivers for a project, and that there may be multiple types of drivers underlying the need

[1] CTS TIMC Project - BCUC Order C-3-22, p.12.

for a project. Examples of other potential drivers for a project include: (1) compliance with standards and industry regulations; (2) alignment to industry practices; (3) provision of adequate and reliable natural gas service to customers; and (4) response to third-party projects. Assessing the value of incremental improvements in the risk would not be required where risk mitigation is not a project objective. It may also not be a primary driver underlying the need for a project, thus necessitating a flexible assessment.

Further, the word "risk" can have many connotations and definitions including, but not limited to, public safety risk, employee safety risk, environmental risk, and risk of gas supply disruptions. Thus, the regulatory review process should be sufficiently flexible to include an appropriate discussion of the nature of the risk associated with the specific project.

FEI is Continually Investigating New Processes to Analyse and Evaluate Risk Mitigation

FEI regularly engages in discussions with other operators and participates in a number of industry groups where operators share emerging trends, approaches, policies and tools with respect to understanding and managing system risk. This includes regular attendance at industry conferences and participating in the technical committees (such as CSA[2]) who are tasked with developing new industry standards.

FEI's relationships with other operators and standards-making bodies allows it to continually remain informed of ongoing developments in risk assessment methods and processes. FEI is thus appropriately positioned to select and present recent and relevant methods to communicate risk, and to evolve as applicable for its subsequent regulatory proceedings.

In Some Areas, Industry is Moving Towards More Quantitative Assessments of Risk Improvement

FEI is aware that, in some areas, industry and standards-making bodies are moving from qualitative to quantitative estimates of risk improvement.

Most notably, and as has been discussed in FEI's evidence associated with recent integrity management projects, FEI has recognized this movement to quantitative methods and is implementing quantitative risk assessments (QRAs) of the safety risks posed by its transmission pipelines. At present, FEI's quantitative risk assessments will inform FEI's prioritization of safety-related integrity risks and selection of mitigation options for these assets. As further standards are developed by the CSA, and as industry practice evolves, FEI will evaluate opportunities to expand its use of QRA in integrity decision-making.

It is also important to note the limitations of QRA methods. The value of a QRA is dependent on factors such as the availability of quality data and inputs, and risk estimates can vary due to the models/methods themselves. High-quality asset condition data, such as EMAT data for cracking, improves probability of failure estimates due to particular hazards. With respect to the valuation of potential consequences, the Panel recognized in its Decision for the CTS TIMC Project that "it

[2] CSA refers to the Canadian Standards Association.

can be difficult to provide an economic analysis of some consequences of failure – for example human life or well-being."[3]

Need and Method to Assess Value of Incremental Risk Improvement Will Vary By Project

Where risk is a driver of the need for a project, FEI identifies and then undertakes a robust analysis to qualitatively or quantitatively assess and mitigate the risk identified. As no one project is the same, this leads to the variability in analyses.

As FEI explained in relation to the Inland Gas Upgrade (IGU) Project:[4]

> Ideally, the value of each of FEI's integrity management activities would be determined by modeling the achieved reduction in risk, and comparing the risk reduction as a ratio to dollars spent (thus providing a measure of risk reduction per dollar spent).

However, there are limits on FEI's ability to conduct such analysis for all projects, including availability of data.

This variety of analysis, along with the limitations on which analysis was useful and where, is demonstrated by the following projects:

1. **Inland Gas Upgrade Project:** In case of IGU Project, as explained in the response to BCUC IR2 36.1 in that proceeding, FEI did not need to conduct QRA for the following reasons:[5]

   > As risk is equal to the probability of an undesirable event occurring, multiplied by the consequences of that event occurring, a quantitative risk assessment requires reasonable estimates of both the probability and potential consequences of failure. Estimating the probability of a failure is typically more challenging than estimating the potential consequences because the estimated failure rates for transmission pipelines vary depending on the availability of high-quality asset condition data. If only low-quality, less-granular data is available, then assumptions must be made during the risk estimation, which is reflected in larger uncertainty or error bounds around the estimated failure rates.
   >
   > In the case of the 29 Transmission Laterals within the scope of the IGU project, the available asset condition data is low quality and not granular. This is due in particular to the absence of ILI data. There is also limited failure history available to differentiate between each of the 29 Transmission Laterals. While the 29 Transmission Laterals represent a range of pipeline ages, the attribute of age, in isolation, is not an accurate method for differentiating failure likelihood.
   >
   > The estimated failure rates for the 29 Transmission Laterals would therefore likely be based on generic historic failure rates developed from publicly-available failure databases (for pipeline systems that may or may not accurately reflect FEI's

[3] CTS TIMC Project - BCUC Order C-3-22, p.11.
[4] IGU Project – Exhibit B-2, BCUC IR1 12.2.
[5] IGU Project - Exhibit B-10, BCUC IR 2.36.1.

operating conditions), and would need to be caveated with large uncertainty or error bounds. For this reason, the failure rates would not have a sufficient level of accuracy to enable a meaningful differentiation of estimated quantitative risk of failure over the 5-year implementation timeline of the IGU Project.

Further to the above, FEI's engineering team assessed that the 29 Transmission Laterals are susceptible to failure due to external corrosion and that current measures to prevent such failure are not acceptable due to CP shielding. As such, FEI is obligated to undertake the IGU project to implement measures to prevent such failure or operate them under conditions determined by an engineering assessment to be acceptable. A QRA cannot relieve FEI of that obligation.

2. **TIMC Projects:** The CTS and ITS TIMC Projects are designed to improve safety risk related to the operation of its larger diameter pipelines for which EMAT ILI tools are available. The development of EMAT ILI tools means that pipeline operators (such as FEI) now have a feasible and cost-effective solution to monitor and detect cracks on its larger diameter pipelines. The movement of industry toward the adoption of these tools makes their adoption virtually mandatory for a prudent operator such as FEI. FEI undertook a safety QRA for these projects to inform their *priority* and *urgency*. The QRA was not used to determine the pipeline's *susceptibility* to these threats as this was done through JANA's Susceptibility Analysis[6] and ultimately informed FEI's need to mitigate the risk as a prudent operator. These combined works completed by JANA, and confirmed by Dynamic Risk, demonstrated that FEI's transmission pipelines are susceptible to cracking threats and estimated the safety risk on a quantitative basis.

3. **Tilbury Liquefied Natural Gas Storage Expansion (TLSE) Project:** The driver for the TLSE project is an event with a low *probability* of occurring, but a potentially catastrophic *consequence* to the public should it happen. A risk-based approach to dealing with this issue would be inappropriate, as discussed in the TLSE CPCN proceeding:[7]

> … [C]umulative probability of the possible consequences of undesirable events, multiplied by the consequences of each outcome if they occur … is not appropriate for managing the risk associated with low-probability but high-consequence incidents. For these events, applying this methodology will typically result in a bias towards ignoring the undesirable outcomes of plausible events based solely on their low probability of occurrence. This increases the vulnerability to events that, while they may be considered unlikely, have unacceptable outcomes.

[6] CTS TIMC Project, Exhibit B-1, Appendix B-2 – Analysis of Cracking Threats Report.
[7] TLSE Project, Exhibit B-26, BCUC IR2 68.11.

And further, in that proceeding, FEI explained:[8]

> "[Once] a risk event with a *possible catastrophic* outcome has been identified, risk management principles would suggest not discounting the need to mitigate that risk simply based on the low probability of it occurring. The recommended risk management approach that applies when the consequences of a known possible risk are catastrophic differs from the more common scenario where outcomes are undesirable but still tolerable; in the latter cases (which do not include the TLSE Project), the low probability nature of the outcome can support a probability-adjusted investment to mitigate the risk."

As discussed below, the CPCN process provides a forum by which the costs, benefits and risks of a project can be considered together and a judgement made by the BCUC on the public interest. These determinations are often complex, multi-faceted determinations, and therefore, are well-suited for analysis undertaken in as part of a CPCN proceeding.

The Cost and Benefits of Mitigating Risk is Addressed in CPCN Proceedings

As a means of furthering the conversation regarding incremental improvement in risk, FEI considers that the CPCN regulatory proceedings provide an effective and efficient process to assess and test the costs and benefits of a given project for ratepayers. The existing review of CPCN applications provides a fulsome opportunity for the BCUC and interveners to assess the need and justification of a project, alternatives to the project, and the project's costs and scoping. This assessment inherently incorporates considerations respecting risk mitigation, and importantly, the consequences of not undertaking incremental investments to address known risks.

While it is not always possible to quantify risk, the flexibility of a CPCN proceeding allows for a robust qualitative assessment which ensures that important, but difficult-to-quantify costs and benefits are still properly evaluated.

In particular, the CPCN process enables the ability to adapt to the circumstances of individual projects that have varying drivers and justifications. Similarly, the method by which a utility demonstrates that an incremental improvement in risk is justified, in order to assess the cost and benefits to ratepayers of a proposed project, will vary by project and by the type of risk(s) that it seeks to mitigate.

FEI considered possible processes to assess the value of incremental improvements in risk resulting from a given project and concludes that there is no "silver bullet" answer to the question of how to assess incremental improvement in risks, and that the CPCN regulatory process remains the best opportunity to assess and test the costs and benefits of a project for ratepayers, including the incremental value of risk mitigation as applicable.

[8] TLSE Project, Exhibit B-39, BCUC Panel IR1 4.1.

Appendix S

LIST OF ACRONYMS

Acronym	Definition
AFUDC	Allowance for Funds Used During Construction
AIA	Archaeological Impact Assessment
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
AOA	Archaeological Overview Assessment
APEC	Areas of Potential Environmental Concern
ASL	Average Service Life
ASME	American Society of Mechanical Engineers
BCOGC	British Columbia Oil and Gas Commission
BCUC	British Columbia Utilities Commission
CAD	Consultative Areas Database
CEPA	Canadian Energy Pipeline Association
CMFL	Circumferential Magnetic Flux Leakage
CP	Cathodic Protection
CPCN	Certificate of Public Convenience and Necessity
CPH BUR 508	Cape Horn-Burrard 20” Pipeline
CSA	Canadian Standards Association
CT	Cowichan Tribes
CTS	Coastal Transmission System
DBRS	Dominion Bond Rating Service

Acronym	Definition
DP	Distribution Pressure
DSAW	Double Submerged Arc Weld
EAA	British Columbia Environmental Assessment Act
ECDA	External Corrosion Direct Assessment
EMAT	Electro-magnetic Acoustic Transducer
EOA	Environmental Overview Assessment
ERW	Electric Resistance Welding
FCS	Flow Control Skid
FEED	Front End Engineering Design
FEI	FortisBC Energy Inc.
FLNRORD	The Ministry of Forests, Lands, Natural Resource and Operations and Rural Development
HCA	*Heritage Conservation Act*
HDD	Horizontal Directional Drill
HFERW	High Frequency Electric Resistance Welding
HSTP	Hydrostatic Testing Program
IGU	Inland Gas Upgrade
ILI	In-line inspection
IMP-P	Integrity Management Program - Pipeline
IP	Intermediate Pressure
IPC	International Pipeline Conference
ITS	Interior Transmission System

Acronym	Definition
JANA	JANA Corporation
LFERW	Low Frequency Electric Resistance Welding
LIV PAT 457	Livingston-Pattullo 18” Pipeline
LNIB	Lower Nicola Indian Band
LTGRP	Long Term Gas Resource Plan
MFL	Magnetic Flux Leakage
MFL-A	Magnetic Flux Leakage-Axial
MFL-C	Magnetic Flux Leakage-Circumferential
MIB	Musqueam Indian Band
MPI	Magnetic Particle Inspection
MOTI	Ministry of Transportation and Infrastructure
MRP	FEI’s Multi-Year Rate Plan for 2020 to 2024
MTO	Material Take-off
NACE	National Association of Corrosion Engineers
NIB	Nooaitch Indian Band
NPS	Nominal Pipe Size
NPV	Net Present Value
OGAA	*Oil and Gas Activities Act*
PDCA	Plan-Do-Check-Act
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLE	Pipeline Exposure and Recoat

Acronym	Definition
PLR	Pipeline Replacement
PRS	Pressure Regulating Station
QRA	Quantitative Risk Assessment
ROW	Right of Way
SAW	Single Submerges Arc Weld
SCC	Stress Corrosion Cracking
SCCDA	Stress Corrosion Cracking Direct Assessment
SIB	Skeetchestn Indian Band
SME	Subject Matter Expert
SMYS	Specified Minimum Yield Stress
SN	Station Name
SOE Reports	Spatial Overview Engine Reports
SRW	Statutory Rights-of-Way
STC	Scw’exmx Tribal Council
TIMC	Transmission Integrity Management Capabilities
TP	Transmission Pressure
TPIP	Transmission Pipeline Integrity Plan
T-South	Westcoast Energy’s T-South system
ITSU Project	Interior Transmission System Upgrades Project
UCA	*Utilities Commission Act*
UPI	Universal Pegasus International

Acronym	Definition
USIB	Upper Similkameen Indian Band
Validation Estimating	Validation Estimating LLC, USA
VITS	Vancouver Island Transmission System
WACC	Weighted Average Cost of Capital
Westcoast	Westcoast Energy Inc.
WFN	Westbank First Nation
YPCI	Yohannes Project Consulting Inc.