



FRASER VALLEY REGIONAL DISTRICT DEVELOPMENT PERMIT

Permit No.	2025-02	Folio No.	775.02616.000
Issued to:	Wladyslaw Wojcik		
Applicant:	Jamie Stirling, P.Geo. (Stirling Geoscience Ltd.)		
Site Address:	38482 Bell Road, Area G		

The lands affected by this permit are shown on Schedule A, Location Map, attached hereto which forms an integral part of this Permit and are legally described as the whole of:

LOT 4 EXCEPT: PARCEL "A" (REFERENCE PLAN 53267); SECTION 33 AND OF THE NORTH WEST QUARTER OF SECTION 34 TOWNSHIP 20 NEW WESTMINSTER DISTRICT PLAN 29269
PID: 009-064-885

LIST OF ATTACHMENTS:

Schedule A: Location Map

Schedule B: Site Plan

Schedule C: 38482 Bell Road, Deroche, BC – Flood Hazard Assessment and Development Permit Application, dated April 16, 2025, prepared by Jamie Stirling, P. Geo. of Stirling Geoscience Ltd.

Schedule D: Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 16, 2025, prepared by Jamie Stirling, P. Geo., of Stirling Geoscience Ltd. & Wladyslaw Wojcik, property owner.

Schedule E: Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 16, 2025, prepared by Sean Reilly, P. Eng., of Reilly Engineering Associates Ltd. & Wladyslaw Wojcik, property owner.

Schedule F: Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 15, 2025, prepared by Monte Anions, P.L. Geo., EP, CSAP, of Keystone Environmental Ltd. & Wladyslaw Wojcik, property owner.

Schedule G: Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 15, 2025, prepared by Jeremy Nilson, R.P. Bio., of Keystone Environmental Ltd. & Wladyslaw Wojcik, property owner.

AUTHORITY TO ISSUE

This Development Permit is issued pursuant to Part 14 - Division 7 of the Local Government Act. The above-noted property lies within DEVELOPMENT PERMIT AREA 1-G in Electoral Area G of the Fraser Valley Regional District. Pursuant to Section 488 of the *Local Government Act*, R.S.B.C., this area has been designated under the Official Community Plan for Electoral Area G Bylaw No. 0866, 20008 for the:

- ☐ (a) protection of the natural environment, its ecosystems and biological diversity
☒ (b) protection of development from hazardous conditions

- ___(c) protection of farming
- ___(d) revitalization of an area in which a commercial use is permitted
- ___(e) establishment of objectives for form and character of intensive residential development
- ___(f) establishment of objectives for form and character of commercial, industrial or multi-family residential development

BYLAWS SUPPLEMENTED OR VARIED BY THIS PERMIT:

None

SPECIAL TERMS AND CONDITIONS OF THIS PERMIT

1. If the holder of this permit does not substantially start any construction with respect to which the permit was issued within two (2) years after the date the permit is issued, the permit shall lapse.
2. Development of the site shall be undertaken strictly in accordance with the Site Plan attached hereto as Schedule B (area within red-dashed border). For the purposes of this permit, development only includes land alteration (soil placement).
3. All land alteration shall be in compliance with the recommendations of the April 16, 2025, Hazard Assessment Report (attached hereto as Schedule C), including
 - Development of the stormwater management measures (infiltration gallery).
4. **Post Construction Reporting.** The applicant has provided the FVRD with four Assurance and Commitment Letters (see attached Schedules D, E, F, and G). The letters provide assurance and commitment as outlined below:
 - a. Stirling Geoscience Ltd. (Jamie Stirling, P.Geo.) (Schedule D)
 - Overall fill project design including the infiltration gallery as detailed in the Issued for Development Permit drawings in Appendix G of the 38482 Bell Rd, Deroche – Flood Hazard Assessment and DP Application report by Stirling Geoscience Ltd. dated April 2025.
 - b. Reilly Engineering Associates Ltd. (Sean Reilly, P.Eng.) (Schedule E)
 - Geotechnical aspects of site preparation, fill placement, and site reclamation.
 - c. Keystone Environmental Ltd. (Monte Anions, P.L. Geo., EP, CSAP) (Schedule F)
 - Review of source and soil characterization information for soil to be imported to the property.
 - Evaluation of laboratory analytical results for soil samples compared to provincial standards for current and proposed future land (and water uses).
 - Summary report for soil characterization aspects of Post Construction Report.
 - d. Keystone Environmental Ltd. (Jeremy Nilson, R.P. Bio.) (Schedule G)
 - Clearing of vegetation to be completed outside of the applicable critical nesting period for birds (i.e., outside of March 1 to August 31) or only following completion of a nesting activity survey and only if that survey determines that no active nests will be harmed by the proposed clearing.
 - Jeremy Nilson is to be consulted prior to the start of clearing to confirm if a nesting activity is required. If necessary, Jeremy Nilson will arrange for a nesting activity survey, review the results, and advise as to whether clearing can be

initiated and if additional measures are required. The results of this determination will be provided to the Fraser Valley Regional District in writing prior to the start of clearing.

A post construction report shall be submitted to FVRD within 30 days of the completion of the works, or by May 15, 2027, whichever comes first. The report must:

- a. Certify all works have been completed in accordance with the Hazard Assessment Report;
 - b. Certify good practices have been followed; and,
 - c. Identify any deficiencies or changes in design that are required
5. No alteration to the natural drainage, construction or excavation shall be undertaken which might cause or contribute to hazardous conditions on the site or on adjacent lands.
 6. No alteration to the natural drainage, construction or excavation shall be undertaken on any portion of the subject property except areas identified on the Site Plan attached hereto as Schedule B.
 7. Any future development or land alteration will require a new development permit, supported by a geohazard assessment completed by a qualified professional. While the existing geohazard assessment is for the entirety of the property, the FVRD reserves the right to request additional reporting based on the specifics of the new application. The assessment must also evaluate risk transfer and determine whether previously placed soil is adequate to support the proposed development, considering factors such as structural integrity, soil composition and long-term stability.

GENERAL TERMS AND CONDITIONS

1. This Development Permit is issued Pursuant to Part 14 - Division 7 of the *Local Government Act*.
2. This Development Permit only authorizes the specific works in this permit. Other approvals may be required for these works. This Development Permit does not imply or constitute approval of any other aspect of any other proposed development.
3. A development permit shall not vary the permitted uses or densities of land use in the applicable zoning bylaw, except that permitted uses or densities may be varied where the land has been designated under the Official Community Plan for the protection of development from hazardous conditions pursuant to Section 488 of the *Local Government Act*.
4. Nothing in this permit shall waive the owner's obligation to ensure that the development proposal complies in every way with the statutes, regulations, requirements, covenants and licences applicable to the undertaking.
5. Nothing in this permit shall in any way relieve the owner's obligation to comply with all setback regulations for construction of structures or provision of on-site services pursuant to the *Public Health Act*, the *Fire Services Act*, the *Safety Standards Act*, and any other provincial statutes.
6. The owner of the subject property shall provide the general contractor and all professionals associated with this project with copies of this permit as issued by the Regional Board.

7. The owner of the subject property shall notify the Fraser Valley Regional District in writing of any intention to excavate, construct or alter the subject property or building site thereon.
8. The BC Archaeology Branch must be contacted (phone 250-953-3334) if archaeological material is encountered on the subject property. Archaeological material may be indicated by dark-stained soils containing conspicuous amounts of fire-stained or fire-broken rock, artefacts such as arrowheads and other stone tools, or human remains. If such material is encountered during demolition or construction, a Heritage Conservation Act Permit may be needed before further development is undertaken. This may involve the need to hire a qualified Archaeologist to monitor the work.

SECURITY DEPOSIT

1. As a condition of the issuance of this Permit, and pursuant to Section 502 of the Local Government Act, the Regional Board is holding the security set out below to ensure that development is carried out in accordance with the terms and conditions of this Permit.
2. Should the holder of this permit:
 - a. Fail to complete the works required to satisfy the landscaping conditions contained herein;
 - b. Contravene a condition of the permit in such a way as to create an unsafe condition;

The Regional Board may undertake and complete the works required to satisfy the landscaping conditions, or carry out any construction required to correct an unsafe condition at the cost of any excess to be returned to the holder of the permit.

3. Security Posted:
 - a. an irrevocable letter of credit in the amount of: \$ N/A.
 - b. the deposit of the following specified security: \$ N/A.

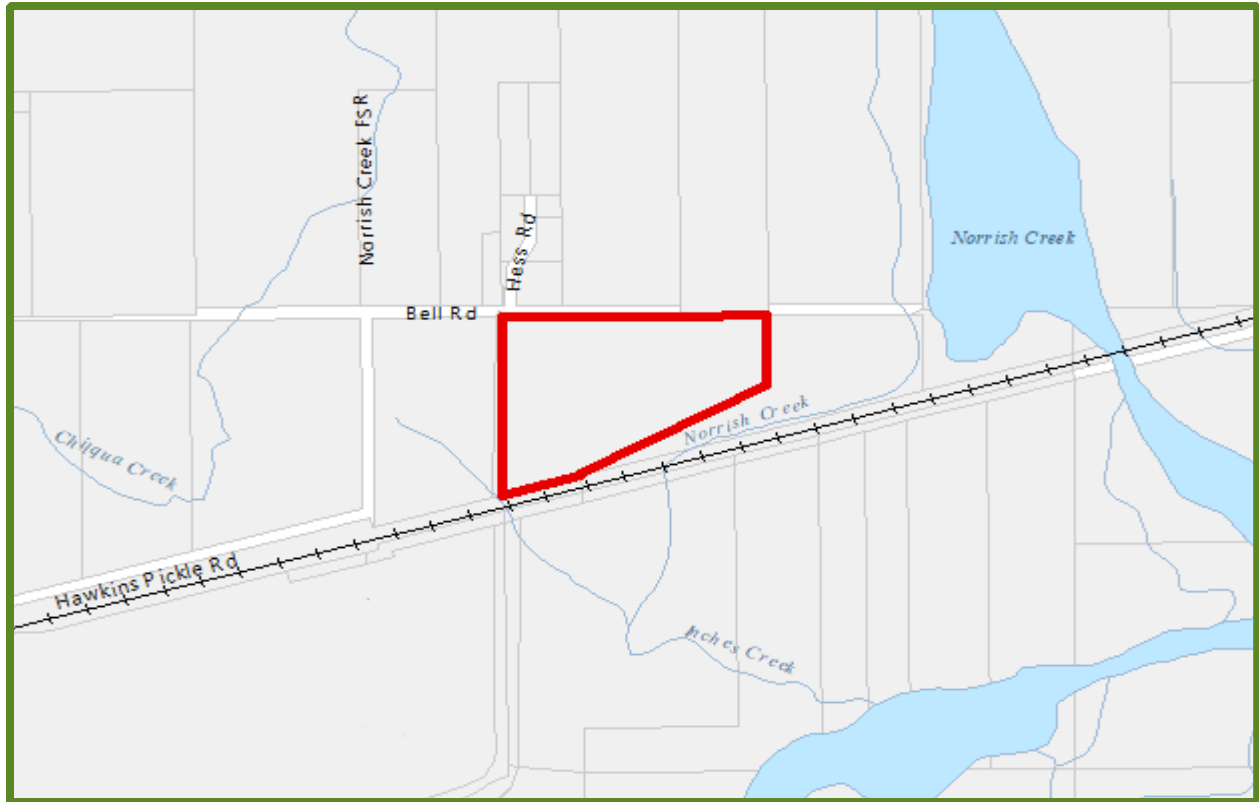
Note: The Regional District shall file a notice of this permit in the Land Title Office stating that the land described in the notice is subject to Development Permit Number 2025-02. The notice shall take the form of Appendix I attached hereto.

AUTHORIZING RESOLUTION PASSED BY THE ELECTORAL AREA SERVICES COMMITTEE OF THE FRASER VALLEY REGIONAL DISTRICT ON THE 15TH DAY OF MAY 2025.

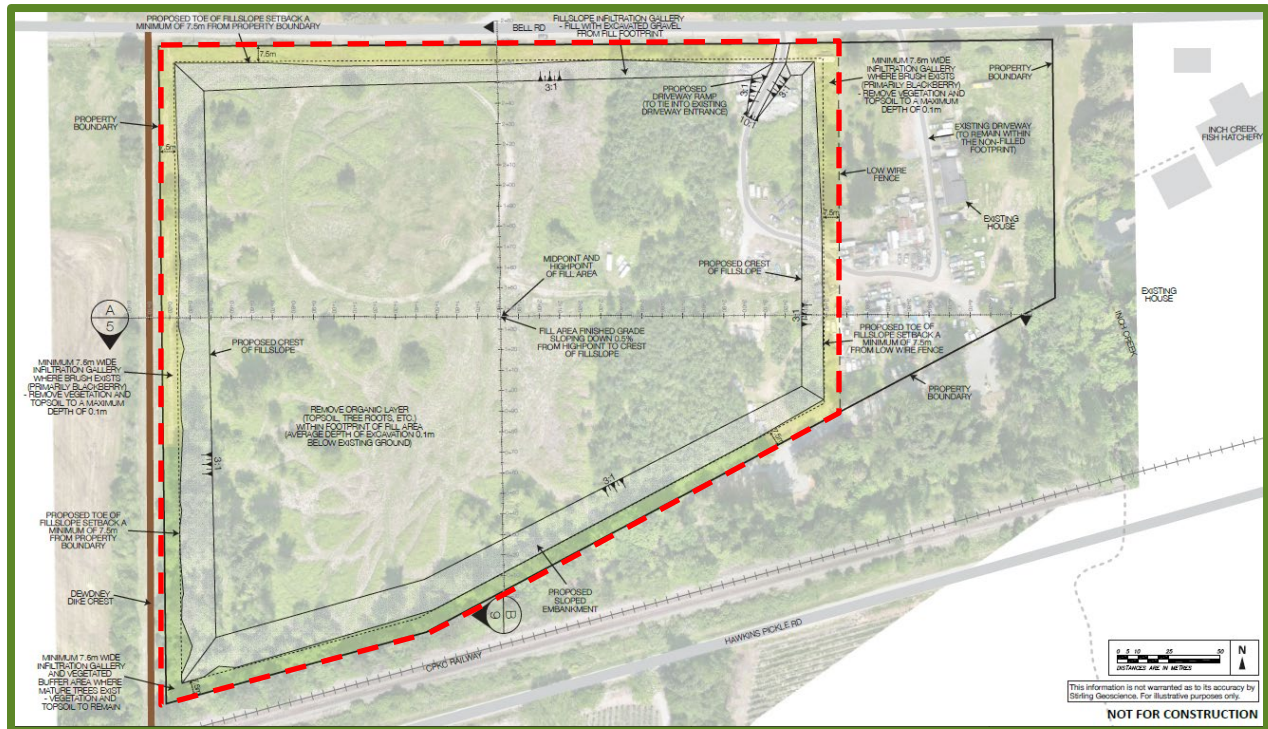
Chair, Electoral Area Services Committee

THIS IS NOT A BUILDING PERMIT

**DEVELOPMENT PERMIT 2025-02
SCHEDULE A - Location Map**



DEVELOPMENT PERMIT 2025-02
SCHEDULE B – Site Plan



DEVELOPMENT PERMIT 2025-02

SCHEDULE C

**38482 Bell Road, Deroche, BC – Flood Hazard Assessment and Development Permit Application,
dated April 16, 2025, prepared by Jamie Stirling, P. Geo. of Stirling Geoscience Ltd.**

April 16, 2025

22-13



Attention: Wladyslaw Wojcik

Cc: Peter Wojcik

Via email:



Subject: 38482 Bell Road, Deroche, BC - Flood Hazard Assessment and Development Permit Application

1 INTRODUCTION

Stirling Geoscience Ltd. (SGL) is pleased to submit this Flood Hazard Assessment (FHA) and Development Permit (DP) Application for 38482 Bell Road, Deroche, BC (the Subject Property or the Site). The Subject Property owner, Wladyslaw Wojcik, and the owner's representative, Peter Wojcik, are proposing to add up to 4 m of imported fill to a portion of the Site. The Site is within the Fraser River Regional District (FVRD) Electoral Area G.

This FHA report is an update to the Natural Hazards Assessment by SGL dated May 15, 2018. The 2018 report was for the same Site and property owner but was prepared for a Site-Specific Exemption application for a proposed industrial building. The proposed building did not proceed, and the Site remains mostly undeveloped.

This FHA report is intended to support the DP application to the FVRD for the proposed fill project. This FHA report also includes the DP application and supporting documentation. The FVRD DP application (Schedule A-4) signed by the property owner is provided in Appendix A. Separate to the DP, the owner plans to replace the existing house on the eastern portion of the Site at a later date and this FHA is also intended to support the DP and Building Permit (BP) for the proposed house.

2 BACKGROUND

The Subject Property is located on the right (north) bank floodplain of the Fraser River (the River) and the alluvial fan of Norrish Creek and is not protected by a standard diking system. Because the Site is on a floodplain and a fan, an FHA by a Qualified Professional (QP) is required for all proposed development. The FHA report is required to be in accordance with the Engineers and Geoscientists of British Columbia's (EGBC's) Appendix I of the Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC (Version 2.1, August 2018). Appendix I of the guidelines provides details of the Flood Assurance Statement, which is required to be signed by a QP. In this case the QP is required to state that the Site can be safely used for the intended use and that protection from the 1894 flood on the Fraser River can be achieved through an engineered design without reliance on a Standard Dike.

The FVRD Bylaws and Official Community Plan (OCP) require that where development is potentially affected by hazardous conditions, the applicant (i.e., property owner) wishing to develop shall provide, at their expense, a detailed report signed and sealed by a suitable QP. Such a report shall confirm that the proposed

development will not be subject to hazards (i.e., erosion, flooding, avulsions, etc.), and may be safely used for the use intended or specify those steps necessary to protect the proposed development from such geohazards and ensure that the proposed development may be safely used for the use intended. Additionally, if there are proposed mitigative works to address hazards, then the QP will be required to sign the FVRD Assurance and Commitment document for Undertaking Field Reviews and Post Construction Reporting. This is to ensure that the QP who designs the mitigative works will certify that the works have been completed to their design. Furthermore, the property owner would likely be required to enter a covenant absolving the FVRD of any liability with respect to flooding of the Site. The FVRD will determine if a covenant is required and identify the terms of the covenant.

Based on the type of proposed development, which is adding fill to a portion of the site, the risk of exposure of vulnerable populations warrants a Class 0 FHA as defined by the provincial flood assessment guidelines (EGBC, 2018). Class 0 is defined in the guidelines as a Building Permit (i.e., renovations, expansions, new single house, new duplex house). The other classes (1 to 4b) refer to subdivisions of various sizes and are not applicable to the proposed development. As recommended by EGBC's Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC (Version 2.1), SGL has completed a Class 0 FHA for the proposed development. The FVRD also requires that the FVRD Geohazards Assurance Statement for Development Approvals be completed by the QP.

The primary hazards addressed in this report are erosion and clear water flooding from the Fraser River and erosion, avulsions, and clear water flooding from Norrish Creek. This report summarizes the results of the FHA. The objective of the FHA is to identify and evaluate the natural hazards from the Fraser River and Norrish Creek that may affect the safe development and use of the Subject Property with respect to the proposed development as well as provide recommended mitigation if required. The QP for this FHA project is Jamie Stirling, M.Sc., P.Geo. of SGL. This FHA is based on the criteria specified by the:

- FVRD Bylaw No. 1669, 2022: a bylaw to establish regulations regarding floodplain management.
- FVRD Bylaw No. 0866, 2009: OCP Electoral Area G.
- FVRD Land Use and Subdivision Regulation Bylaw 559, 1992, Electoral Area G.
- FVRD Geohazards Assurance Statement for Development Approvals.
- FVRD Assurance and Commitment document for Undertaking Field Reviews and Post Construction Reporting.
- Engineers and Geoscientists of BC (EGBC) Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC, Version 2.1. August 28, 2018.

3 SUBJECT PROPERTY

3.1 General

The Subject Property is situated 3.1 km north of the Fraser River, east of Mission and west of Chilliwack (Figure 1) near Dewdney and east of Hatzic and west of Deroche. The Site is on the south side of Bell Road and north of Lougheed Highway (Hwy 7), Nicomen Slough (the Slough), Hawkins Pickle Road and the Canadian Pacific Kansas City (CPKC) Railway (the Railway) (Figure 2). The Site is located 600 m north of the Slough, and the Site is on the alluvial fan of Norrish Creek and the Floodplain of the Fraser River. The Subject Property is situated 500 m west of Norrish Creek, 320 m southeast of Chilqua Creek at its closest point and

immediately west of Inch Creek (Figures 3 to 6). It should be noted that some sources refer to Inch Creek as Inches Creek. The Subject Property is 24.4 acres, the Parcel Identifier (PID) is 009-064-885 and the Folio number 775.02616.000. The legal description of the Site is Lot 4 Except: Parcel A (Reference Plan 53267): Section 33 and of the Northwest quarter of Section 34 Township 20 New Westminster District Plan 29269.

3.2 Legal Issues

The search results from the Land Title Office identified that the Subject Property has no legal notations, no outstanding duplicate indefeasible titles, no transfers, and no pending applications. There are three items under the Charge, Liens and Interests section: 1) A statutory Right of Way (ROW) by the Dewdney Area Improvement District; 2) A covenant by the FVRD; and 3) An option to purchase by 1155097 BC Ltd. Regarding the ROW item, the Dewdney Dike is located along the western boundary of the Subject Property as shown on Figures 5 and 6. Regarding the FVRD covenant item, this was the covenant that was required after the site-specific exemption approval, per the Floodplain Management Bylaw. The 2019 site-specific exemption approval was related to the proposed industrial building supported by the 2018 report by SGL mentioned in Section 1 above. Regarding the option to purchase item, this was a five-year option for a public company subsidiary to purchase the Subject Property. This option was never exercised and expired on April 3, 2024. The State of Title Certificate is provided in Appendix B and was acquired by Peter Wojcik on January 6, 2025.

3.3 Geologic Setting

The Subject Property is located approximately 800 m south of the base of Dewdney Peak. The slopes of Dewdney Peak rise at an average slope of approximately 30° to an elevation of 930 m, approximately 2.5 km northwest of the Site. The surficial geology in the hillside of this area consists of Mesozoic and Upper Paleozoic bedrock including sedimentary, volcanic, granitic, and metamorphic rocks, mantled in 90 percent of the area by deposits, 1 to 5 m thick, of glacial, colluvial, and eolian sediments. The slopes of Dewdney Peak are heavily vegetated with second growth large stand conifers, as the area appears to and reported to have been logged in the past (Figure 2). Exposed bedrock was visible at or near the base of the slopes in the area north of the Site.

According to the 1980 Geological Survey of Canada Surficial Geology Map 1485A Mission (Figure 7), the Subject Property is entirely within: *SAo: Quaternary, Postglacial Salish Sediments: Slope deposits, colluvial sediments deposited by mass wasting processes; including fan and landslide gravel*. *SAo* also defines the area to the north and east of the Site while the area to the west of the Site is defined by: *SAb: Quaternary, Postglacial Salish Sediments: Bog, swamp, and shallow lake deposits; including low and peat organic silt loam and silty clay loam*. The area to the south of the Subject Property is defined by: *Fh: Fraser River Sediments: Channel fill and floodplain deposits, overlying and cutting estuarine sediments (Fe) and commonly overlain by overbank sediments*. Detailed descriptions of the surficial geology are provided in Figure 7.

3.4 Zoning

The FVRD website identifies the Site as zoned R-4: Rural Residential Use for lots at least 8.0 ha in lot area. There is no proposed zoning change associated with the proposed development of the Site. The FVRD OCP Area Designation for the Site is LU (Limited Use) as shown on Figure 8. As stated in the OCP, the LU Area Designation is intended to constrain development in areas with significant geological and flood hazards, limited road access, areas isolated from community services and areas which are environmentally sensitive. However, LU lands may

be re-designated if future studies show that an area can accommodate a broader range of uses without being affected by geological hazards or damaging environmentally sensitive areas, and where access and other requirements can be met.

The northeastern portion of the Subject Property is within Development Permit Area (DPA) 1-G as shown on Figure 9. DPA 1-G refers to area with potential geologic or stream hazards. A DP is required for any development within DPA 1-G. All of the Site is within DPA 2-G and 2-G includes all of Electoral Area G. DPA 2-G refers to Riparian Areas DPA. Because the Subject Property is within the Riparian Areas DPA an environmental assessment was carried out to support the proposed development and the DP application. The environmental assessment (Environmental Constraints Assessment) was prepared for the property owner by Keystone Environmental and is dated October 10, 2024.

The Site is not within the Agricultural Land Reserve (ALR) and nor are the properties to the north and east, however the properties to the south and west are part of the ALR. The Subject Property is mostly located on the Fraser River floodplain except for the northeast portion of the Site which is on the alluvial fan of Norrish Creek (Figures 5, 6 and 10). The FVRD OCP geologic and stream hazard map (Figure 10) identifies that the northeastern portion of the site is classified as PH/Af which refers to potential hazard/alluvial fan.

3.5 Dikes in the Vicinity of the Site

The Site is within undiked lands from the River as shown on Figure 11. The property to the west is protected by the Dewdney Dike, which is a Standard Dike, and the Norrish Creek Dike, which is a Non-Standard Dike, is to the east of the Site as shown on OCP Map 2 (Figure 11). Figure 12 shows the dikes in proximity to the Site based on the Provincial dike mapping. The Nicomen Island dike to the south of the Site is considered a Non-Standard Dike and is identified as a dike outside the local diking authority area (Figure 12).

A Standard Dike is a dike that meets government standards of design and construction and is owned and maintained by one or more levels of government. Such a dike, maintained by a diking authority can be relied upon to protect the area from the design event. A Non-Standard Dike (also referred to as an Orphan Dike) may or may not meet government standards of design and construction and is not currently maintained by a public authority and therefore cannot be relied upon to provide protection from the design event.

3.6 Fire Hazard

The northern 75% of the Subject Property is identified as being within moderate interface fire hazard as per the OCP (Figure 13). Because the Subject Property is within a moderate fire hazard area a wildfire hazard assessment was carried out to support the proposed development and the DP application. The wildfire hazard assessment and risk mitigation plan were prepared for the property owner by Forte Urban Forestry and is dated December 6, 2023.

3.7 Aquifers and Gravel Extraction

The Subject Property is situated on two aquifers, most of the Site is within the Nicomen Slough aquifer, and the eastern 15% of the Site is within the Norrish Creek aquifer as shown on Figure 14. The OCP sand and gravel deposit map shows current or historic aggregate extraction sites to the north and west of the Site and identifies the Norrish Creek area as in-stream sand and gravel deposits as shown on Figure 15. This map appears to be outdated as it doesn't identify the large gravel pit to the northeast of the Site shown on Figures 3 and 4.

3.8 Recent Drone Imagery

Drone imagery of the Subject Property was collected by SGL in May 2023 (Figure 16) and February 2024 (Figure 17) to capture the Site during spring and winter vegetation canopy conditions. These high-resolution images represent current conditions on the Site.

4 NORRISH CREEK AND THE NORRISH CREEK FAN

The Norrish Creek Dike provides some protection for the Subject Property from fan hazards. Potential fan hazards include flooding, erosion, debris floods, debris flows and avulsions. Due to the nature of alluvial fans, hazards from Norrish Creek exist at the Subject Property. These hazards are partially mitigated because of the armoured Norrish Creek Dike along the right (west) bank of Norrish Creek. The hazards are only partially mitigated because the dike is classified as a Non-Standard Dike and therefore cannot be relied upon to fully protect the Subject Property from creek hazards.

Norrish Creek has its source in Dickson Lake located at the bases of Mount Wardrop and Mount Catherwood. The watershed is 117 km² and Norrish Creek runs parallel to the Norrish Creek Forest Service Road (FSR) and is fed by numerous tributaries. Norrish Creek is used as a water supply by the City of Abbotsford and the intake and water treatment plant are located approximately 6 km upstream of the Subject Property. There were two Water Survey of Canada (WSC) stations on Norrish Creek. Station 08MH058 Norrish Creek near Dewdney, which is near the fan apex, operated from 1959 to 2007 and had a watershed area of 117 km². Station 08MH150 Norrish Creek above Rose Creek, which was near the water treatment plant operated from 1984 to 2006 and had a watershed area of 78.2 km². Norrish Creek experienced a large flood in 1984 estimated at 500 m³/s (NHC, 1988). The 100-year and 200-year instantaneous discharges are estimated to be 664 and 775 m³/s, respectively (NHC, 1999).

Norrish Creek from the fan apex to the Railway Bridge is 1.65 km long and drops 23 m in elevation from 32 m to 9 m Geodetic Datum (GD) for an average slope of 1.4%. The width of the Creek in this reach ranges from 50 to 175 m. Appendix C shows two LiDAR images of the Norrish Creek Fan, one is a hillshading image and the other shows 2 m contours. The LiDAR data is from 2008 and is from the Fraser Basin Council. The LiDAR images were provided by the FVRD. Both sides of the channel are constrained by dikes that were constructed in the 1980s in response to flooding on Norrish Creek. The Non-Standard right (west) bank dike is significantly longer and larger than the undocumented dike on the left (east) bank. The east dike only extends for a few hundred metres upstream of the Railway and appears as a thin black line on the Provincial dike map and is not classified (Figure 12). The Norrish Creek fan begins where the Creek emerges from a bedrock canyon. Just downstream of the apex, the fan is constrained on both sides by steep bedrock slopes to the west and by an elevated fluvial terrace and bedrock slopes to the east. The width of the fan in this area varies from 200 m to 400 m. South of this area the fan is unconstrained and widens considerably as it approaches the floodplain of the Fraser River (Figure 5). The fan extends west of Norrish Creek merging into the much smaller fan of Chilqua Creek west of the Norrish Creek FSR, about 1.2 km west of Norrish Creek and 400 m west of the northwest corner of the Subject Property (Figure 5 and Appendix C).

The gradient of the Norrish Creek fan ranges from 0% to 10% and there are several incised relic channels, which are up to 5 m wide and 3 m deep. Based on mature second growth trees and older stumps in the relic channels, significant flows have not occupied these channels within the last 200 years. No levee deposits are present along the edges of the relic channels, so it appears that they were formed by clear water flows that eroded into the existing fan sediments rather than by debris floods or debris flows (Westrek, 2013). Two

main relic side channels were documented by Westrek (2013). They are both west of the Norrish Creek Dike and one is downstream of the fan apex and the other is in proximity to the East Gravel Pit (Figure 3). It was noted that these channels sometimes contain pools or standing water or even ephemeral streamflow but there was no evidence of flow reaching as far downstream as Bell Road. Also, there are no drainage structures crossing under Bell Road. These relic channels can be clearly seen on the hillshading LiDAR image (Appendix C).

The bed sediment of Norrish Creek from the apex to the Railway bridge is primarily gravel-sized, ranging from boulders near the apex to mostly pebble to cobble-sized sediment in the lower fan. Historically, much of the fan was logged prior to and during the 1940s and large forest fires affected the area in the late 1860s and early 1940s.

5 INCH CREEK AND CHILQUA CREEK

Inch Creek flows south of, parallel to, and west of Norrish Creek and is groundwater fed from the Norrish Creek alluvial fan. Fisheries and Oceans Canada (DFO) operates a fish hatchery immediately east of the Subject Property. The alignment of Inch Creek is accurately identified on the drone images in Figures 16 and 17. Inch Creek daylights at the DFO hatchery and meanders south adjacent to the eastern boundary of the Subject Property. At its closest point, Inch Creek flows within approximately 5 m of the Subject Property where it takes a 90-degree bend approximately 75 m downstream from where the groundwater-fed creek daylights (Figures 16 and 17). It should be noted that several government maps of the area incorrectly show the alignment of Inch Creek and mislabel the creeks in the area as shown on Figures 5, 6, 12 and Appendix C. The other figures in this report correctly define the alignment of drainage features on the fan.

Chilqua Creek is located west of the Subject Property and flows south from the hillside before turning west between Bell Road and the Railway. From this point the Chilqua Creek flows west to Hatzic Prairie. At its closest point Chilqua Creek flows within 320 m from the northwest corner of the Subject Property (Figures 3, 5, 12 and Appendix C). Chilqua Creek has reportedly experienced debris flows in the past that have affected its fan (Westrek, 2013).

6 FIELD INVESTIGATIONS OF THE SUBJECT PROPERTY

Field investigations of the Subject Property were carried out by Jamie Stirling, M.Sc., P.Geo. of SGL on December 15, 2023, and January 23, 2024, and the Site was droned by a licensed drone pilot from SGL on May 17, 2023 (Figure 16) and February 4, 2024 (Figure 17). Ground photos of the Site from December 15, 2023, and January 23, 2024, are provided in the Photographs section of this report.

The Subject Property is fenced and occupied by tree cover, brush, and grass (Figures 16 and 17). The Railway is near the south boundary, Bell Road parallels the north boundary, Dewdney Dike parallels the west boundary, and the neighbouring DFO Inch Creek Hatchery is along the east boundary (Photos 1 to 11). Access to the site is near the northeast corner through Bell Road (Photos 12 to 16).

An additional field assessment by SGL occurred on April 26, 2024, to measure the water levels in the wells on the Site to identify groundwater levels. There are three wells on the Subject Property:

- Well Identification Number 29890. A Well Record exists for this well. This steel casing well is located adjacent to the western driveway and south of the northern property boundary. The water level was measured on April 26, 2024, to be 5.3 m below ground surface (bgs).
- Concrete well. A Well Record is not available for this well and the property owner does not have any installation information on this well. The well is located just south of the northern property boundary between the two driveways. The water level was measured on April 26, 2024, to be 5.4 m bgs. This is the current well for the house on the property.
- Old abandoned well. A Well Record is not available for this well and the property owner does not have any installation information on this well. This is the old well for the house. The bottom of the well is 3.5 m bgs, and on April 26, 2024, the well was pretty much dry with just a bit of water in the bottom, so this level likely does not represent the groundwater level.

The BC Well Records and Registration website shows one well on the Site located near the southern property boundary. A well does not exist on the Subject Property in this area so it is likely one of the several DFO wells in this area to the south and east of the Site that has been incorrectly mapped.

A site meeting occurred on June 12, 2024, with two staff from the FVRD and members of the project team including the owner's representative. The meeting was requested by the FVRD to walk the Site and discuss details of the reports prepared by the project team and details of the proposed project.

7 SURVEYS, TOPOGRAPHY AND SITE DRAINAGE

Axis Land Surveyors (Axis) carried out a topographic survey of the Subject Property and a plan of the survey dated March 29, 2018, is provided in Appendix D. Wade and Associates Land Surveying Ltd. (Wade) recently carried out a survey of the fence around the Subject Property and surveyed mature trees along the southern property boundary. The plan of the Wade survey is also provided in Appendix D. The Dewdney Dike ROW mentioned above in Section 3 is shown on the survey plan as being located along the western property boundary between the crest and the toe of the eastern side of the dike. The ROW is labelled 320.936 SRW EX. PLAN LMP47649 on the survey plan (Appendix D).

The topography of the Site has not changed since the Axis survey in 2018, and this survey still represents current topographic conditions. The survey shows that the Site is relatively flat with a gentle downslope away from Norrish Creek from the northeast to the southwest of approximately 1% (Appendix D). This topographic survey shows more detail than the LiDAR contours in Appendix C. Based on the topographic survey, the western half of the property averages from 8 to 9 m GD and the eastern half averages from 9 to 10.5 m GD. The lowest area on the property is in the southwest corner and averages approximately 7 m GD and the highest area is near the northeast corner averaging approximately 11 m GD. The Site currently has one residential building along the eastern part of the property (Figures 16 and 17).

The Subject Property drains from northeast to southwest and drainage is controlled on the south side by the Railway embankment and on the west side by the Dewdney Dike. The elevation of the crest of the Dewdney Dike varies from 10.0 m to 10.2 m GD as identified by the March 2018 topographic survey (Appendix D). The elevation of the Railway south of the property appears to be at a similar elevation to the dike crest based on visual observations during the field investigation and as shown on the LiDAR contour image (Appendix C). The crest of the Railway embankment was not surveyed as part of this project.

The Subject Property is located on the alluvial fan of Norrish Creek and the subsurface material is well-draining sand and gravel. In the unlikely event that surface water were to pool at the low point on the Subject Property, which is in the southwest corner, water could potentially drain through the Dewdney Dike floodbox which is a 450 mm concrete culvert (Photo 17). The invert of the inlet of this culvert is at 6.35 m GD and it is adjacent to the lowest point on the Site (Photo 18). Flow through this floodbox is controlled with a culvert gate and the wheel to manually adjust this gate is located near the crest of the Dewdney Dike (Photo 19). The outlet of the culvert is on the west side of the dike (Photo 20). The floodbox is identified on Figures 11, 12, 16 and 17. The culvert was dry at the time of the field investigations during the wet season in December/January (Photos 17 and 20) and visual inspection in the culvert identified that the gate was closed.

David Scott, operations manager of Dewdney Area Improvement District (DAID) was contacted during the preparation of this report. Mr. Scott confirmed that the floodbox gate always remains closed, and he is unaware of it ever needing to be opened. The Dewdney Dike is intended to keep floodwaters from inundating the area inside (west) of the dike. The gate would be opened during an extreme flood event on the Fraser River or Norrish Creek that results in trapping of water on the Site in the southwest corner due to the dike. Flow direction of floodwaters on the Site from both the Fraser River and Norrish Creek would generally be from east to west.

Although the Subject Property drains to the southwest corner, there are no ditches on the Site along the east toe of the Dewdney Dike (Photos 2 and 4) or the north toe of the Railway embankment. This would suggest that runoff and drainage on the Site are not issues. The low-lying area in the southwest corner of the Site (Photo 18) and the ground at the culvert inlet for the floodbox (Photo 17) do not show any evidence of runoff on the Site or into the floodbox culvert. This suggests that precipitation that falls on the Site goes subsurface and does not leave the Site via runoff. Ditches were also not observed on the Site along Bell Road (Photos 1, 12, and 14), along the eastern boundary (Photo 11) or along the southern boundary setback from the Railway (Photo 8). Hence, the primary purpose of the floodbox is not to address runoff from precipitation on the Subject Property but to help drain the Site in the unlikely event of inundation from the Fraser River or Norrish Creek.

Drainage under the Railway in proximity to the Subject Property occurs through a steel box culvert, which has a span of 2000 mm and a height of 1600 mm. This culvert conveys Inch Creek and is shown in Photo 21. A 600 mm diameter concrete culvert was located under the Railway adjacent to the middle of the Subject Property. The culvert outlet on the south side of the Railway embankment is shown in Photo 22 and the location is shown on Figures 16 and 17. There was no evidence of recent flow through the pipe or evidence of past flow in the ditch immediately downstream of the outlet. Daylight could not be seen through the pipe and the culvert inlet could not be located on the north side of the Railway embankment and there was no defined ditch adjacent to the inlet, suggesting this culvert does not provide drainage for the area during a flood.

The LiDAR images in Appendix C include a layer showing the location of watercourses and this information is likely taken from the BC Freshwater Atlas Stream Network Database. The field investigation confirmed that Chilqua Creek to the west of the Subject Property is accurately represented by the watercourse database, but Inch Creek is not. The alignment of Inch Creek is well represented on the LiDAR hillshading image from the Fish Hatchery and southward but the blue creek symbol from the watercourse database incorrectly shows Inch Creek flowing under the Railway through the 600 mm diameter culvert and not through the steel box culvert as shown on Figures 16 and 17. Although the hillshade image shows a well-defined channel south

of the 600 mm concrete culvert outlet and south of the Railway and Hawkins Pickle Road, which runs south of, and parallel to, the Railway (Appendix C and Figures 16 and 17), no culvert was found under Hawkins Pickle Road at this location to convey this potential drainage. Additionally, the blue creek symbol shows Inch Creek as a surface channel upstream of Bell Road, which is not accurate as Inch Creek is subsurface in this area. Finally, the blue creek symbol shows a creek passing the southwest corner of the Subject Property and there is no creek following this alignment. With respect to Norrish Creek, the watercourse symbol on the LiDAR images shows the low-lying area along the right bank at the end of Bell Road and just upstream of the Railway bridge as part of the active channel. However, this area is isolated from the mainstem by the Norrish Creek Dike as shown by the green line symbol. The low-lying area was one of the borrow sources for construction of the Norrish Creek Dike.

8 FIELD INVESTIGATION OF NORRISH CREEK AND THE NORRISH CREEK DIKE

The Norrish Creek Dike was visually assessed as part of this assessment. The entire length of the dike was walked during the field investigation. The dike extends along the right bank of the Creek from the apex of the fan to the Railway bridge (Photo 23) for a length of 1,630 m as measured in the field (Figure 3 and 12). The field investigation identified that the lower 680 m of the dike is continuously armoured and only portions of the upper 950 m are armoured.

The Norrish Creek Dike is setback from the active channel in most locations. The downstream 80 m is a river dike with the toe of the armoured dike in the active channel (Photo 24). The D_{50} of the dike riprap is 600 mm along this reach. The setback portion of the dike varies in distance from the active channel and is up to 75 m from the channel in some locations. Photos 25 and 26 show typical sections of the armoured setback dike 150 m and 800 m, respectively, upstream of the Railway bridge. The D_{50} of the dike riprap is 500 mm along these reaches. The riparian forest between the setback portion of the dike and the active channel is mature and well established. This forest would likely be effective in reducing flow velocity and bank erosion adjacent to the dike during flooding. Figures 3 and 4 show the mature forest area between the dike and the active channel and the LiDAR hillshade image (Appendix C) shows the right bank of the active channel defined as a shaded ridge but the blue watercourse shading shows the forested area as part of the active channel.

The height of the setback dike portion of the structure throughout the fan is approximately 2 m above the creek side floodplain (Photos 25 and 26). The height of the river dike portion of the structure is 3 to 4 m (Photos 24 and 27). The crest of the dike averages 8 to 12 m wide but is up to 20 m wide at the upstream end where the dike is not armoured (Photo 28).

The Norrish Creek Dike is a river dike for its upstream 270 m. Photo 27 shows a portion of the armoured dike adjacent to the active channel 250 m downstream of the fan apex. The D_{50} of the dike riprap is 300 mm along this reach. Although the riprap in this reach is smaller than that downstream, there is no evidence that this rock has been recently mobilized as it is well established with moss and there were no observed areas of failure or scour on the armoured slope.

A 30 m long section of the unarmoured portion of the dike is eroding along the right bank of the creek 130 m downstream of the fan apex (Figure 3) and the bank is approximately 3 m high along this reach (Photos 29 and 30). The dike crest is 20 m wide in the area adjacent to the erosion (Photo 28) and closer to 30 m wide at the toe of the dike. Westrek (2013) documented this eroding bank, and they identified that the face of the dike has eroded up to 3 m back when compared to the extent of the adjacent armoured section. Conditions observed by SGL during the March 28, 2018, and January 23, 2024, site investigations appear similar to that

observed by Westrek in 2013. A comparison of photos of the eroding bank suggests the condition of the bank has not noticeably changed over the 11-year period from 2013 to 2024. It is worth noting that the November 2021 Atmospheric River Event (ARE) occurred during this period. Amec prepared a dike inspection report in 2002 and identified this eroding bank. Kerr Wood Leidal (KWL, 2020) did an assessment of BC's orphan dikes and rated the Norrish Creek Dike as 'fair' and stated that the dike 'has at least 0.6 m of freeboard to the Q_{200} water level'. Details of the Westrek, Amec and KWL report findings are documented in Section 12.3.

An avulsion of the Creek is possible at this eroding location if erosion of this bank continues. However, the likelihood of an avulsion, especially during a single event is considered low due to the width of the dike in this area, the height of the dike, and the straight reach of the Creek at this location. Furthermore, the 2021 ARE did not result in an avulsion in this area or and notable erosion of the bank. If an avulsion were to occur in this area, the flow path would travel south and likely inundate the east and west gravel pits before reaching the Subject Property further downslope (Figures 3 and 4). The west pit is associated with 38447 Bell Road and the east pit is associated with 38555 Bell Road. These quarries are very large excavations on the fan and would likely represent a sediment trap for material and debris in the event of an avulsion. The quarries would also likely attenuate the avulsion flow before the water could potentially reach the Subject Property.

9 HISTORICAL AIR PHOTO ANALYSIS

A key objective of the FHA is to identify erosion and avulsion potential on the Norrish Creek fan and Nicomen Slough in proximity to the Site. Historical air photos and historical satellite imagery were assessed to document the changes to the Fan and the Slough over the past century. The photos and imagery also allow for the documentation of the history of development on the Site. Historical air photos for the area are available for 1938, 1949, 1952, 1963, 1974, 1986, 1990, 1996, 2004 and 2022. The air photos were borrowed from the Geographic Information Centre at the University of British Columbia. Satellite imagery was also reviewed and is available for most years from 2004 to 2022. Cropped images of the Site adjusted to the same scale are provided in Appendix E for the air photo years noted above and for satellite imagery for 2004 and 2022. These air photos and satellite imagery show historical development activities on and in proximity to the Site.

By 1938 logging had occurred in the area and Bell Road and the Railway was built. Channels can be seen on the fan west of Norrish Creek and north and east of the Site. Norrish Creek throughout the fan, especially on the lower portion of the fan, was very aggraded in 1938 as shown by the extensive sand and gravel bars and large channel width. The Subject Property was mostly cleared of forest by the 1938 except for the western portion of the Site.

The Norrish Creek FSR is shown in the 1949 photo and Hess Road, which is immediately to the north of the western property boundary, was constructed between 1949 and 1952. By 1974 the Site was mostly cleared except for a section near the northeast corner of the Site just to the west of the house which can be seen in 1974. The properties to the north and northwest of the Site had been developed by 1974 but not the properties to the west, east or northeast. The Norrish Creek Dike had been built by 1974 and the area to the west of the dike had been cleared. The images show that in general, the mountain slopes to the north of the Site have remained mostly unchanged over the past century, despite the extensive logging in the area. Large scale landslides were not identified in these photos. NHC (1999) documented the history of logging activity

and landslides related to logging activity throughout the Norrish Creek Watershed based on their assessment of historical air photos. Details of their assessment are provided in Section 12.3.

10 FIRST NATIONS CULTURAL RESOURCES

Electoral Area G is within the traditional territory of the Stó:lō people, and particularly the Leq'á:mel First Nation and Sumas First Nation. Archaeological sites, the physical evidence of how and where people lived in the past, are another aspect of First Nations' cultural heritage in the area. There are a number of documented archaeological habitation sites adjacent to the Fraser River and the sloughs on the north side of the River. The FVRD Cultural Resources Map 7 in the Area G Bylaw No. 0866, 2008 does not indicate any cultural resources within or in proximity to the Subject Property. A BC Archaeological Information Request was made by SGL regarding the Subject Property. The request was made to the Archaeology Branch of the Ministry of Forests. The purpose of the request was to ascertain whether there are any archaeological sites on the Subject Property. The results of the inventory search identified that there are no known archaeological sites recorded on the Subject Property. This information was provided to SGL in an email and the email is provided in Appendix F.

11 PROPOSED FILL PROJECT

The owner proposes to import fill to bring a portion of the site above the design flood construction level (FCL) for the Subject Property. Issued for Development Permit (DP) drawings for the proposed fill are provided in Appendix G. Sheets 2 and 4 in Appendix G show the plan with the May 2023 drone image as the basemap. The Subject Property is 10.23 ha, and the proposed development is 8.62 ha (the central and western portion of the site), with the remaining area being 1.61 ha (the eastern portion of the site) where the existing house is located.

The existing home site would continue to use the existing eastern driveway entrance, and the western driveway entrance would be used for the fill project. The owner plans to replace the existing house at a future date but this development is not part of the proposed fill project and the current DP application. After the house is demolished, fill would be added as per the recommended FCL, and a new mobile home would be placed, and parking space provided. The new home would be constructed within a similar footprint as the existing house. No other buildings or structures are proposed on the Subject Property.

The placement of the imported fill is for a proposed RV storage facility. The owner plans to submit a Temporary Use Permit (TUP) for the proposed facility after the proposed fill project has been completed. As the proposed facility is intended to be approved under the TUP, the long-term use of the facility is unknown at this time. To maximize the potential long-term uses of the filled area, the owner wishes to ensure that the quality of the fill and placement and compaction of the fill allows for a wide range of potential future uses including residential buildings. The proposed fill area is 7.60 ha (76,000 m²) and the estimated volume of imported fill is approximately 250,000 m³. The embankment slope around the perimeter of the facility would be a 3:1 slope (3 horizontal to 1 vertical). The estimated timeline for placement of this fill is approximately two years.

Natural drainage of the Site is from northeast to southwest, towards the floodbox culvert under the Dewdney Dike at the southwest corner of the Site. This natural drainage will remain around the fill area. The proposed fill is expected to be less permeable than the existing natural ground, and to account for this a

stormwater management plan has been developed for the fill area. The Subject Property is situated on the Norrish Creek alluvial fan and the underlying material below the organic layer is sand and gravel which is highly permeable. As shown on the drawings in Appendix G, the topsoil will be removed exposing the underlying sand and gravel followed by excavation and stockpiling in the order of 0.5 m of the natural sand and gravel. Following site stripping, import fill consisting of inorganic natural soils free from debris or other deleterious material shall be placed in lifts and adequately compacted. The excavated sand and gravel will be placed on top of the imported fill material to create a cap of clean, granular soil on the surface for trafficability, and to help manage silt/erosion while limiting water ponding on the surface. The finished surface of the fill will slope down at a 0.5% grade from a high point in the middle of the fill area to the outer edge of the fill area.

Runoff from the fill area will flow to the perimeter of the fill where it will enter the infiltration gallery installed around the perimeter of the fill area. The infiltration gallery has two parts: a filled portion and a non-filled portion. The filled portion is the 3H:1V sloped transition from the crest of the fill to the existing ground and the non-filled portion is the 7.5 m wide buffer zone around the fill area. The buffer zone (non-filled portion of the infiltration gallery) has two sections with the first section being the area dominated by brush (primarily blackberry) which will be stripped of its vegetation and topsoil to expose the underlying sand and gravel which will maximize infiltration from runoff from the imported fill area. As shown on the drawings this area is located along the northwest, north, and east sides of the fill area as indicated by the yellow shaded area. The finished surface elevation of the 7.5 m wide non-filled portion of the infiltration gallery (yellow shaded area) will be slightly below the elevation of the adjacent existing ground by approximately 0.1 m on average. This will prevent runoff from ponding beyond the limits of the infiltration gallery onto the adjacent area. The second portion of the 7.5 m buffer zone is where mature forest exists and in this area the vegetation and organic layer will be preserved. The area is located along the southwest side and the south side as shown by the green shaded area on the drawings. The area of the development footprint is 8.62 ha, the area of the infiltration gallery (sum of both the filled and non-filled area) is 2.36 ha and the area of the fill within the crest (e.g., filled area that is not part of the infiltration gallery) is 6.26 ha. Hence, the area of the infiltration gallery represents 38% of the filled area that will drain to the infiltration gallery.

Forte (2024) prepared a Windfirm Boundary Assessment and Tree Management Plan as part of the proposed development plan with respect to the proposed 7.5 m vegetated buffer. The FVRD and Forte recommend preserving this vegetated buffer along the southwest side and the south side of the fill area which totals 425 m in length. The mature trees along the southern property boundary were identified and tagged by Forte and surveyed by Wade as shown on Sheets 1 and 2 of the drawings in Appendix G. Wade also surveyed the fenceline located and along the perimeter of the Subject Property and identified that the fence accurately represents the property line adjacent to the proposed fill area.

As discussed in Section 7, the Subject Property slopes downward slightly to the southwest corner but neither runoff nor ponding water is an issue due to the predominantly sand and gravel ground material. During the November 2021 ARE there were no reported runoff or ponding water issues on the Site nor was it reported that the gate on the floodbox had to be opened during this extreme event. Since the area of the proposed infiltration gallery represents 38% of the filled area that will drain to the infiltration gallery, runoff or ponding water is expected to continue to not be an issue on the Site. In the unlikely event that excess runoff from the fill area is not absorbed in the infiltration gallery during an extreme precipitation event, water would flow to the floodbox in the southwest corner of the Site. This is currently where runoff would

potentially leave the Site as the Subject Property naturally drains from northeast to southwest and this would continue to be the potential runoff pathway under the proposed development. As discussed earlier, the field assessment did not identify any evidence of overland flow paths on the Subject Property approaching the inlet of the floodbox culvert suggesting precipitation that falls on the Site is absorbed into the ground locally and does not likely enter the floodbox.

FVRD Letters of Assurance and Commitment (LOACs) for Undertaking Field Reviews and Post Construction Reporting have been completed by the respective QPs on the project team so that quality control/quality assurance is undertaken to verify that the fill meets the required standards, and the project is completed as described in Section 11 and detailed in Appendix G. Four LOACs have been completed for the proposed fill project which include the following:

- Clearing of vegetation and bird nesting activity survey (Jeremy Nilson, R.P.Bio., Keystone Environmental)
- Overall fill project design including the infiltration gallery as detailed in the Issued for Development Permit drawings in Appendix G (Jamie Stirling, P.Geo., SGL)
- Geotechnical aspects of site preparation, fill placement, and site reclamation. (Sean Reilly, P.Eng., Reilly Engineering Associates Ltd.)
- Environmental soil characterization aspects of the imported fill (Monte Anions, P.L.Geo., Keystone Environmental)

Sealed versions of the four LOACs have been sent to the FVRD.

12 REVIEW OF BACKGROUND INFORMATION

12.1 General Regulatory Information

The following general regulatory documents have been relied upon in the preparation of this FHA:

- FVRD Land Use and Subdivision Regulation Bylaw 559, 1992, Electoral Area G.
- Hazard Acceptability Thresholds for Development Approvals by Local Government. BC Geological Hazards workshop Feb 20-21, 1991. Revised Nov. 1993. A paper by Dr. Peter Cave, Director of Planning, Regional District of Fraser-Chem.
- Flood Hazard Area Land Use Management (BC Ministry of Water, Land and Air Protection, 2004).
- FVRD Flood Hazard Area Land Use Management – Guidance for Selection of Qualified Professionals and Preparation of Flood Hazard Assessment Reports.
- FVRD Bylaw No. 0866, 2009: OCP Electoral Area G.
- Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use (BC MoE, 2011).
- Coastal Floodplain Mapping Guidelines and Specifications (FLNRO, 2011).
- Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures, Appendix D Alluvial Fan Flooding. (FEMA, 2012).

- Fraser River Design Flood Level Update – Hope to Mission, Final Report. FLNRO, Flood Safety Section, March 2014.
- Simulating the effects of Sea Level Rise and Climate Change on Fraser River Flood Scenarios, Final Report. FLNRO, Flood Safety Section, May 2014.
- Guide to Geo-Hazard - Assurance Statement for Development Approvals, APEGBC and FVRD.
- Geo-Hazard Assurance Statement for Development Approvals, APEGBC and FVRD.
- FVRD Hazard Acceptability Thresholds for Development Approvals. June 2017.
- Engineers and Geoscientist of BC (EGBC) Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC, Version 2.1. August 28, 2018.
- FVRD Bylaw No. 1669, 2022: a bylaw to establish regulations regarding floodplain management.
- FVRD Geohazards Assurance Statement for Development Approvals.
- FVRD Assurance and Commitment Document for Undertaking Field Reviews and Post Construction Reporting.

12.2 Site Specific Information

Information regarding flood hazards in proximity to the Subject Property is extensive with respect to the Fraser River and the Norrish Creek alluvial fan. Numerous site-specific hazard assessments have been carried out on properties on the Norrish Creek Fan and several reports on Norrish Creek and its watershed have also been completed. The most relevant documents were reviewed as part of this assessment and include:

- Norrish Creek Hydrology Study 1993-94 by Dayton and Knight Ltd. Stage 1 March 1993 and Stage 2 July 1994.
- 38740 Hawkins Pickle Road, Dewdney, BC by Levelton Associates July 27, 1994.
- Norrish Creek and Chehalis River Watershed Cutblock Assessments by Hay and Company Inc. September 1995.
- Sawdust Shed at 38447 Bell Road, Dewdney, BC by J. W. Wedler and Associates Ltd. November 7, 1997.
- Geomorphology and Hydraulics of Norrish Creek. Report to David Lund, Cascade Construction by Northwest Hydraulic Consultants Ltd. August 1999.
- Norrish Creek Supply of Gravel from the Upper Watershed. Report to CP Railway by Northwest Hydraulic Consultants Ltd. May 2001.
- Norrish Creek Dike – Norrish Creek by AMEC. March 22, 2002.
- Norrish Creek 2002 Gravel Removal. Report to CP Railway by Northwest Hydraulic Consultants Ltd. August 2002.
- Norrish Creek Future Gravel Removal Recommendations. Report to CP Railway by Northwest Hydraulic Consultants Ltd. June 1, 2004.

- Area G Official Community Plan, Hatzic Lake to Deroche, Geotechnical Hazard Overview. Report to FVRD by Thurber Engineering Ltd. September 2004.
- Geotechnical Hazard Assessment 38083 Hawkins Pickle Road, Dewdney, BC by Golder Associates. May 24, 2006.
- Geotechnical Hazard Site Assessment Report for 38275 Bell Road by Levelton Engineering Solutions. February 8, 2007.
- Geotechnical Hazard Site Assessment Report for 38205 Bell Road by Levelton Engineering Solutions. November 29, 2007.
- Supplemental Geotechnical Hazard Site Assessment Report for 38205 Bell Road by Levelton Engineering Solutions. April 25, 2008.
- Proposed Gravel Pit, 38447 Bell Road, Norrish Creek, FVRD Electoral Area G by Madrone Environmental Ltd. June 16, 2011.
- 38555 Bell Road, Dewdney, Norrish Creek Fan – Geotechnical Hazard Assessment, Westrek Geotechnical Services Ltd. April 30, 2013.
- Fraser River Design Flood Level Update – Hope to Mission, Final Report. FLNRO, Flood Safety Section, March 2014.
- Simulating the Effects of Sea Level Rise and Climate Change on Fraser River Flood Scenarios, Final Report. FLNRO, Flood Safety Section. May 2014.
- Geohazard Assessment for the Proposed Residence – 9708 Hess Road, Dewdney, BC by Fraser Valley Engineering Ltd. February 19, 2016.
- 38482 Bell Road, Deroche, BC - Natural Hazards Assessment. Prepared for WFS Pharmagreen Inc. Prepared by Stirling Geoscience Ltd. May 15, 2018.
- Revised Geohazard Assessment for the Proposed Storage Yard 38447 Bell Road, Dewdney, BC. Prepared by Fraser Valley Engineering Ltd. August 2, 2018.
- Geotechnical Hazard Assessment – 9518 Catherwood Road, Dewdney, BC. Prepared for Klood Construction. Prepared by Fraser Valley Engineering Ltd. August 31, 2018.
- Risk Assessment of BC's Orphan Dikes – Summary Report. Prepared for the Fraser Basin Council. Prepared by Kerr Wood Leidal. December 9, 2020.
- Proposed Barn – 9518 Catherwood Road, BC. Prepared for Klood Construction. Prepared by Fraser Valley Engineering Ltd. January 27, 2021.
- Geotechnical Hazard Assessment (Rev 0.0) Proposed Mobile Home. Project Site: 38093 Bell Road, FVRD, BC. Prepared by Fraser Valley Engineering Ltd. December 22, 2021.
- Statlu Environmental Consulting. Norrish Creek Watershed Assessment. Prepared for Teal-Jones Group and Western Canadian Timber Products Ltd. November 8, 2021.

- Keystone Environmental. Phase 1 Environmental Site Assessment – 38482 Bell Road, Dewdney, BC. Prepared for Wladyslaw Wojcik. August 16, 2023.
- Forte Urban Forestry. Wildfire Hazard Assessment and Risk Mitigation Plan – 38482 Bell Road, Dewdney, BC. Prepared for Peter Wojcik. December 6, 2023.
- Keystone Environmental. Environmental Constraints Assessment – 38482 Bell Road, Dewdney, BC. Revision 2. Prepared for Peter Wojcik. October 10, 2024.
- Forte Urban Forestry. Windfirm Boundary Assessment and Tree Management Plan – 38482 Bell Road, Dewdney, BC. Prepared for Peter Wojcik. October 10, 2024.

12.3 Summary of Key Reports

Relevant information pertaining to the FHA for the Subject Property from 1993 onward is summarized below.

Cave 1993

The Hazard Acceptability Thresholds for Development Approvals report has been adopted as the standard to gauge the acceptability of planned development for a site. The report lists several geotechnical and hydrotechnical hazards that the approving authority or the QP must account for and rate each one according to the probability of exceedance of occurring and affecting a site. The report lists several types of hazards a site may be exposed to: (1) Inundation by Flood Waters, (2) Debris Floods, (3) Mountain Stream Erosion and Avulsion, (4) Debris Flows and Debris Torrents, (5) Small-scale, Localized Landslip, (6) Snow Avalanche, (7) Rockfall - Small-Scale Detachment, (8) Major Catastrophic Landslide. The list is provided in a table in Section 19 where the probability is estimated for each item for the Subject Property.

NHC 1999

NHC's 1999 report is a gravel management plan on Norrish Creek to support excavation of gravel in proximity to the Railway bridge to maintain hydraulic capacity at the crossing. NHC carried out an analysis of historical air photos and documented the extensive logging history in the watershed and noted over 44 clearcuts and over 200 landslides related to historical logging activity. Many of these clearcuts had reforested but mass wasting was still contributing to the sediment in the main channel. The report noted that a 6 km reach of the mainstem located 10 km upstream of the Railway bridge was highly aggraded and this would continue to provide a significant sediment source for the fan area, especially the lower fan where the gradient flattens on the Fraser River Floodplain. Much of the sand and gravel deposition occurred downstream of the Railway bridge.

The historical air photos suggest that gravel removal and dike construction on Norrish Creek began on the fan between 1963 and 1979. As a result, the width of the creek had been reduced from approximately 200 m to 70 m. Initially the dikes were not armoured and were constructed by bulldozing the gravel in the channels to the sides. Excavation of gravel also occurred on the fan and floodplain. Dike and bank armouring occurred immediately upstream of the Railway bridge during the initial dike construction. The 1986 air photos show conditions after the 1984 flood. Dike construction on both banks expanded following the initial works and armouring of the dikes had occurred by 1986. Gravel extraction occurred in the channel in 1996 and the 1999 air photos show conditions following the removal where gravel had not yet infilled the extraction area.

The 1999 NHC report estimated that annual sediment supply to the Norrish Creek Fan was 12,000 m³ and recommended a similar annual removal to maintain capacity at the bridge. NHC estimated that the Railway bridge could pass a 1 in 35-year flood.

NHC 2001

NHC's 2001 report identified that Norrish Creek produced about 23,000 m³ of gravel annually, which was deposited upstream and downstream of the Railway bridge. This was a significant increase from the estimate in their 1999 report. Gravel traps with a capacity of 40,000 m³ were excavated upstream of the bridge. Documentation of gravel extraction began in 1951 and occurred in 1966, 1967, 1969, 1971, 1972, 1984-85, 1987, 1990, 1993, 1996 and 2000. Volumes are known for only seven of the 13 years and the total is 614,7000 m³ for the known years. The primary source of the gravel was identified as landslides in the Rose Creek tributary as well as Dickson Creek and East Norrish Creek. The landslides are attributed to logging which started in the 1950s. A total of 135 landslides were documented throughout the watershed. The report identifies that although the annual load could be 23,000 m³, large rainfall events can also contribute a slug of gravel computed to be 20,000 m³ over a five-day period. Therefore, the existing traps may only be adequate for the scenario of one large storm plus an annual load of gravel.

Amec 2002

Amec carried out a dike inspection in 2002 on the Norrish Creek Dike. The inspection identified that the dike was 960 m long, ran downstream from the fan apex, was constructed in 1984 and riprap was last added in 1990. The dike was built by CP Rail and the Province and continued from the apex to the Railway bridge. The report noted the large flood that occurred in 1963. Large amounts of gravel were removed from the channel following the 1984 flood to build the dikes. Following the 1990 flood and avulsion, large riprap was placed on the bank near the apex of the fan for a length of 160 m. The report documented the 30 m long erosion site immediately upstream of the riprap that was placed in 1990. The dike crest at this erosion site was approximately 15 m wide.

NHC 2002

Following NHC's 1999 report, CP Rail was permitted to excavate gravel from several traps upstream of the bridge to reduce the build-up of downstream gravel bars, which were found to create backwater at the bridge. Removal occurred at four pits in 2000 and high flows in the spring of 2002 resulted in extensive infilling of the gravel traps even though the flows had discharges with less than a 2-year return period. The 2002 NHC report quantified the extent of the trap infilling and provided future extraction recommendations. The sediment traps were identified as almost full, and it was recommended to re-excavate them. The sediment in the traps was primarily gravel having a D50 of about 45 mm and there was little sand within this material. The gravel bars downstream of the bridge had not changed but they were still causing backwatering and NHC recommended lowering the downstream creek bed.

NHC 2004

The NHC 2004 report summarized the performance and conditions of the works completed in 2003 as well as future recommendations for gravel removal. A flood occurred on Norrish Creek in October 2003 estimated to have a 5-year return period. The report documented that the 2003 excavation pits for storage of 40,000 m³ had filled in following this flood and recommended the new traps be increased to store a minimum of 50,000 m³. NHC estimated that approximately 59,000 m³ of material was deposited and 19,000

m³ was eroded resulting in a net deposition of approximately 40,000 m³ which was twice the previously estimated annual expected amount transported into this area.

Thurber 2004

The 2004 Thurber report noted that Norrish Creek is confined by dikes between the mountain front and the Railway so coarse sediment will continue to be deposited in channels below the bridge where creek flood back up effects are generated. A debris jam at the Railway bridge could cause the flooding creek to cut through the Railway grade and Hawkins Pickle Road or breach the creek dikes. If breaching occurs, floodwater could reach the lowest portions of the Norrish Creek fan to the east or west. In a worse-case scenario, the west dike would be breached during a 200-year Fraser River flood. This would cause extensive flooding in the Chilqua Slough area where the dike on the west margin of Nicomen Slough would be outflanked. Thurber states that in their judgment, debris loading and flood issues on Norrish Creek's lower channel are approaching a critical state. Although these issues warrant attention from a hazard perspective, this investigation was beyond the scope of their work. The Thurber 2004 report estimated the average annual probability of the Norrish Creek Dike to be breached or overtopped as 1:200. The Thurber 2004 report estimated that the Railway bridge was only capable of passing a 1 in 10-year flood, which is different from the 1 in 35-year event that NHC reported in 1999.

Golder 2007

The 2007 Golder hazard assessment was for 38083 Hawkins Pickle Road, which is 500 m west of the western edge of the Subject Property. The property is inside the Dewdney Dike and far enough from the hillside to not be affected by slope related hazards. The estimated risk for debris flow and debris flood was given a low probability at 1:500 to 1:10,000 but that the annual probability of avulsions from Norrish Creek was high at 1:10 to 1:100. They also note that the probability of occurrence of flooding from Chilqua Creek, which flows through the property, is moderate at 1:100 to 1:200. Mitigation for buildings should include scour protection with well-graded ($D_{50} = 350$ mm) riprap placed around proposed concrete foundation walls. The protection should extend to the base of the proposed foundation wall/footing. They recommend appropriate geotechnical inspections be carried out during site grading and construction of the foundation and scour protection.

Levelton 2007

Levelton prepared a hazard report dated February 2007 for a proposed soda ash facility on the property at 38275 Bell Road, which is immediately northwest of the Subject Property. The report considered four hazards: debris flow, debris flood, avulsion, and inundation by flood waters. The estimated risk for debris flow and debris flood was given a probability of 1:500 to 1:10,000. The probability for avulsion was determined as <1:500 and for inundation from flood waters was 1:200. Other hazards related to steep slopes were not considered as the site is far enough away from the mountainside slopes. Levelton concluded that the site is suitable for the support of the soda ash silo and that specific hazard mitigation to support the facility is unnecessary. They note that the probability of the site being impacted by debris flows, debris floods or avulsions is low but that these hazards cannot be completely eliminated based on the site location.

The November 2007 hazard assessment by Levelton was carried out in connection with the proposed sale of the property at 38205 Bell Road, which is the neighbouring property to the west of the Subject Property and inside the Dewdney Dike. The overview assessment concluded by stating that the site will be used for

agricultural purposes and no permanent structures are planned. Therefore, it was premature to provide a risk assessment and avoidance and mitigative measures for the hazards discussed in the report.

Levelton 2008

The 2008 Levelton hazard assessment was a follow up to the November 2007 report and included defining safe building sites on the property as per a request from the FVRD. As the property extends from Bell Road to the hillside to the north, the property was divided into three hazard zones; the hillside, the toe of the hillside as well as the creek fan area and the third area was the floodplain of the Fraser River. This most southern area (Area 1) would be similar to that of the Subject Property to the east. Levelton identified that this area is subject to flooding and soil liquefaction during a design basis earthquake (1:475 or 1:2,475 return period events). They note that amplification of ground motions may also occur during a design basis earthquake, resulting in more intense shaking of the structure(s) compared to buildings constructed on firm ground (Site Class C soils). They recommend a site-specific liquefaction assessment be conducted for any future permanent structures. They also recommend a site-specific dynamic analysis to assess the site response spectrum which may also be required for structures falling under Part 9 of the 2006 BC Building Code. The need for dynamic analysis will depend on the extent of liquefiable soils and the type of foundation system employed.

Area 2 is on the alluvial fan of Norrish Creek and Chilqua Creek and recommendations for this area include scour protection along the perimeter concrete foundations of any proposed buildings. This protection should be 0.6 m deep and 1.5 m wide and include $D_{50} = 150$ to 300 mm riprap wrapped in non-woven geotextile and the protection can be covered with 0.3 m of soil, grass and or landscaping.

Madrone 2011

The Madrone 2011 hazard assessment was for the development of a proposed gravel pit in the north portion of the property at 38447 Bell Road. This pit is shown as the eastern half of the West Gravel Pit on Figure 3. The report identified that the three upslope hazards (debris flow, small-scale landslide and rockfall) are only likely to affect terrain within 30 m of the base of the steep slopes north of the proposed pit. The report also identified that flooding on the Norrish Creek fan is likely to occur only if the existing dike along the west side of Norrish Creek is breached or overtopped. It was suggested to protect the proposed pit by constructing berms to divert water away from the pit.

Westrek 2013

Westrek Geotechnical Services Ltd. (Westrek) carried out a Geotechnical Hazard Assessment in 2013 at 38555 Bell Road, which is a neighbouring property to the northwest of the Subject Property. The assessment was for the development of a proposed 6.9 ha gravel pit in the north portion of the property at 38555 Bell Road (See East Gravel Pit on Figure 3). This report is similar to the 2011 Madrone report discussed above for the adjacent gravel pit but provides different estimated average annual probabilities for some of the hazards. The Westrek report is the most detailed and recent report documenting hazards on the Norrish Creek fan.

Air photos of the Norrish Creek fan were reviewed for their 2013 project for the years 1995, 1999, 2001, 2004, 2006 and 2009. Westrek had previously reviewed historical air photos for Norrish Creek for other assessments and relied on notes from those assessments for their 2013 project. The photos did not identify any specific noteworthy information that was reported in their 2013 report.

For the proposed gravel pit upslope of the Subject Property, Westrek considered each of the hazard categories identified in Cave (1993) which includes debris flows, debris floods, channel avulsions, inundation by floodwaters, snow avalanches, rockfalls, localized and large-scale landslides and earthquakes. Westrek identified that snow avalanches are not a hazard of concern and that the annual return frequency for large-scale landslides is $<1:10,000$ and that the probability of soil liquefaction following an earthquake is $<1:475$ for the lower Norrish Creek fan. The average annual probabilities of occurrence of rockfall or small-scale landslides is estimated as $<1:10,000$. These probabilities would be considered similar or lower for the Subject Property, which is downslope from the gravel pit.

Chilqua Creek has reportedly experienced debris flows in the past that have affected its fan (Westrek, 2013). The eastern edge of the Chilqua fan is 500 m from the gravel pit and Westrek estimated the average annual probability that debris flows in Chilqua Creek could reach the proposed pit is $<1:10,000$. This probability would likely be similar or slightly lower for the Subject Property as the northwest corner of the Subject Property is 400 m from Chilqua Creek and further downslope on the Norrish Creek fan than the gravel pit.

Debris flows and debris floods on Norrish Creek are not likely a concern and this is supported in the 2013 Westrek report. The watershed Melton Ratio (the ratio of relief to the square root of area) and watershed length used to classify fans suggest the Norrish Creek fan is subject to clear water floods and not debris flows or debris floods. For example, fans with Melton Ratios <0.4 and watershed lengths >3 km were subject to water flows and fans with ratios in the range 0.35 to 0.6 and lengths of 1.8 km to 10 km were subject to debris floods and ratios >0.6 and lengths <2.7 km were subject to debris flows.

The Melton Ratio for Norrish Creek is 0.13 and the length is 18 km suggesting Norrish Creek is well within the clear water range and well out of the debris flood and debris flow range. It is worth noting that Sally Creek is a steep tributary of Norrish Creek, which flows into Norrish Creek 0.5 km upstream of the fan apex. Sally Creek has a Melton Ratio of 0.44 and a length of 5.1 km and is known to have experienced both debris floods and debris flows. Westrek identified that historic debris flows from Sally Creek had not reached the Norrish Creek fan, and Westrek conservatively evaluated the average annual probability for debris flows to affect the proposed pit area, located 700 m downstream of the apex of the fan, at $<1:2,000$. The probability for the Subject Property, which is 1.5 km downstream of the fan apex, would likely be similar or less.

Westrek noted that the probability of hazards from debris floods, clear water floods and avulsions on Norrish Creek affecting the gravel pit depends on both the probability of the event occurring and the probability of the Norrish Creek Dike failing or overtopping. Failure or overtopping of the dike depends on dike maintenance and gravel removal from within the channel. Climate change may increase the probability of such hazards occurring but logging practices in the watershed have improved which may decrease the probability. This would also apply to the Subject Property.

If the dike were to breach or overtop it would likely occur at the erosion site and the flow would likely travel down the relic channel which would direct flow into the east gravel pit. With respect to the Subject Property, as mentioned above, these quarries would likely represent a sediment trap for material and debris in the event of an avulsion. The quarries would also likely attenuate the avulsion flow before the water could potentially reach the Subject Property. However, berms were proposed around the proposed pit by Westrek and it is understood that berms were currently in place on the existing pit to the west.

Westrek noted that a significant channel avulsion is unlikely to occur at the erosion site because the active channel is approximately 3 m lower than the surface of the fan. If the dike does fail at this point, then it is likely to occur during a period of high flow and not as a result of a complete channel avulsion through this

point. Westrek suggested that the breach could possibility accommodate up to about 1/5 to 1/4 of the total discharge in Norrish Creek, or up to about 100 m³/s as the Q₂₀₀ is in the 400 to 500 m³/s range.

If the bed of Norrish Creek were to rise several metres due to aggradation, then the potential for a complete channel avulsion is more likely. However, it is unlikely that a single event could raise the bed of the creek several metres resulting in a complete avulsion. This suggests that the probability of a complete channel avulsion is unlikely to increase unexpectedly such as during a single event but would occur over time.

Westrek identified that the present annual average probability that a debris flood or flood will breach or overtop the existing dike and cause flooding on the fan is presently about 1:200. They note that this probability is not random and depends on the rate of erosion of the dike at the erosion point and aggradation rates in excess of any gravel removal programs.

The 2013 Westrek report recommended the construction of berms along the boundary of the pit and adjacent access road so that floodwaters are temporarily impeded or diverted by the berm and directed back into Norrish Creek. Westrek noted that the berms are intended to reduce or delay flooding, not prevent flooding. They suggest the proposed pit will not increase downslope hazards as a result of its operation and that downslope hazards are likely to be reduced by the pit because it will act to intercept, delay or detain events, which might otherwise propagate downslope unrestricted.

The proposed east pit has been constructed as shown in Figure 3 and as observed during the field investigation by SGL, but the gravel pit property was not accessed to confirm if the proposed berms were built and if built, what their condition may be. Westrek noted that the recommended berms were not intended to be long-term flood protection, and they did not recommend scour protection or armouring of the berms.

FVEL 2016

Fraser Valley Engineering Ltd. (FVEL) conducted a geohazards assessment for the proposed residential development at 9708 Hess Road, which is 160 m north of the northwest corner of the Subject Property. Hess Road extends north immediately north of the Dewdney Dike (Figures 2, 3 and 4). The report provides a review of historical air photos.

FVEL considered the probabilities of occurrence of rockfalls and debris slides for the subject site to be <1:10,000. FVEL noted the relic channels west of the Norrish Creek Dike could provide preferential flow paths and that hazards from Norrish Creek with respect to debris flows, channel avulsions and flooding could occur if the dike were to fail or be overtopped. The report noted that the forested terrain between the subject site and the creek would help reduce the debris flow onto the property to a certain degree. FVEL conclude that the annual probability for debris flow or avulsion to affect the property is estimated to be <1:1,000. They also recommend that to minimize potential impact of debris flow on the proposed building, the reinforced concrete foundation wall should be extended at least 0.6 m above the exterior grade. FVEL noted that the proposed residential building may be used safely for the use intended in accordance with the Cave (1993) criteria.

SGL 2018

This is the report by SGL for the Subject Property that is mentioned in Section 1, and this FHA report is an update to that 2018 report. A portion of the information in this report is from the 2018 report.

FVEL August 2, 2018

This revised geohazard assessment is for a proposed storage yard at 38447 Bell Road which is located immediately north of the Subject Property on the north side of Bell Road. The report provides a review of historical air photos.

Debris slides occur when the thin soil veneer slides off of steep bedrock slopes. This hazard may not be ruled out given the steepness of the slopes in the order of 71%. However, the run-out from such events onto the subject property through the relatively flat gravel pit area with a travel distance of more than 350 m is unlikely. As such, FVEL considers that the annual probability of occurrence for a debris slide hazard is very low (<1:10,000).

Rockfall Hazard: No boulders were identified on the subject site at the time of the site reconnaissance. Based on aerial photo review, there are several bedrock outcrops in the mountain slopes above the Norrish Creek FSR. However, the boulder travel distance is expected to be limited given the average inclination (71%) of the lower slope and the buffering of the rough sand the gravel pit surface. Therefore, FVEL considers that the annual probability of occurrence for the rockfall hazard is very low (<1:10,000).

Flood and Debris Flow: The Fraser River flood construction level (FCL) in the Bell Road area is 9.9 m above sea level, corresponding to the 1 in 200-year flooding event. According to the hazard map, only a small area located in the southwest of the property of approximately 35 m by 150 m is within the 200-year floodplain area. The current ground elevation in the proposed storage yard area is approximately 14 m, which is above the FCL. Therefore, the annual probability of occurrence for the inundation hazard from the Fraser River is less than 1:200.

Hazards of debris flow, channel avulsion, and inundation by Norrish Creek would be caused by a failure or overtopping by floodwaters of the existing Norrish Creek dike. According to Madrone's report, there are two relict channels between the subject site and the Norrish Creek channel, which would be preferential pathways for flow in the event of a dike breach or overtopping. In addition, the forested terrain between the subject site and the Norrish Creek would help to reduce the debris flow onto the subject property to a certain degree. Therefore, the annual probability for debris flow or channel avulsion to affect the proposed storage yard development is estimated to be less than 1:1,000. To minimize potential impact of debris flow onto the proposed storage yard area, an earthen berm consisting of gravel, cobble and sand should be constructed along the north and east sides of the proposed storage yard area. The berm should be at least 3 ft (0.9 m) above the exterior grade. The berm is to decrease the velocity of the debris flow, to reduce the dynamic energy of the flow, and therefore minimize the potential damage to the proposed storage facility by the flow. By comparison with the alluvial fan, the size of the berm-protected yard area is negligible. Changes to the overall debris flow in terms of the flow volume caused by the protection berm are not expected. Therefore, it is FVEL's professional opinion that, the potential transfer of risk to other properties or infrastructure as a result of the mitigation works is unlikely.

FVEL August 31, 2018

This geotechnical hazard assessment is for a proposed barn at 9518 Catherwood Road. The barn would be adjacent to the east bank of a tributary channel to Chilqua Creek located 1.2 km west of the Subject Property. The report focuses on hazards from the tributary creeks that flow from the mountainside and join Chilqua Creek just west of Catherwood Road. These tributaries would not impact the Subject Property.

KWL 2020

This document is a summary report on the risk assessment of BC's orphan dikes also known as non-standard dikes. The Norrish Creek Dike is a non-standard dike and was included in the assessment. The report states that the dike is 1618 m long and is classified as a 'berm and bank protection' type. The condition assessment rating is 'fair' and the overtopping description is 'has at least 0.6 m of freeboard to the Q_{200} water level'. The people risk score, the mortality risk score, the economic risk score and the environmental risk score area all rated 'medium', the CI risk score and the cultural risk score are rated 'low', the estimated cost to upgrade the structure is \$19 M, and the land acquisition cost is \$17,000.

FVEL January 2021

This geotechnical hazard assessment was for a proposed barn at 9518 Catherwood Road. The barn would be adjacent to the east bank of a tributary channel near the confluence with Chilqua Creek located 1.2 km west of the Subject Property. The report recommended a setback of 15 m from Chilqua Creek and the tributary, an FCL of 1 m above surrounding ground and scour protection of 300 mm D_{50} riprap for the barn.

FVEL December 2021

This geotechnical hazard assessment was for a proposed mobile home at 38093 Bell Road which is located 600 m to the west of the Subject Property on the north side of Bell Road immediately to the west of Chilqua Creek. The report states that due to the low gradient nature of Chilqua Creek, and the presence of existing dikes along Fraser River and Norrish Creek, FVEL is of the opinion that the annual probability of flooding from the noted watercourses and the River is 1:40 to 1:200. The report suggests the annual probability of occurrence of a debris flood at that site is low (1:500 to 1:10,000).

After reviewing the referenced reports and FVRD's online GIS mapping and based on the distance of the proposed mobile house from the noted gullies, and Norrish Creek, FVEL considers the annual probability of occurrence of mountain stream erosion and avulsion due to the noted creek and stream to be 1:200 to 1:500. However, given the location of that site on the periphery of the alluvial fan, FVEL agrees with the Golder (2007) conclusion that the potential impact to the site is mainly inundation by flood waters rather than erosion by channelized flows. FVEL concludes that the annual probability of occurrence for debris flow hazard is very low (<1:10,000).

The Cave Report also identifies other hazards related to the natural terrain, namely Small-scale, Localized Landslip, Snow Avalanche, Rockfall – Small Scale Detachment, and Major Catastrophic Landslide. The site is on a flat area and therefore not subject to this type of hazard. However, FVEL states that the site's proximity to the elevated geologic feature to the north and the west needs to be explored as there is potential for that site to be affected by the four slope-related hazards. Moreover, the FVRD hazard map through their Web Map site does not include these slope-related hazard as factors to consider in assessing that site.

Combining the effects of heavy rainfall, non-permeability of the bedrock and the slope inclination, Small-scale and Localized Landslip (surficial) could pose some risk from this hazard to their site. However, FVEL states that based on their visual site review and the distance to the bottom of the slope from the proposed mobile house (more than 200 m) and preliminary slope stability analysis, it was their opinion that the probability of Small-scale Localized Landslip affecting the Property and the proposed development area is likely low with a probability of occurrence on the order of magnitude of <1:10,000 per annum.

A deep-seated, slip surface passing through the bedrock, slope stability analysis was done by FVEL. Based on their slope stability analysis, they do not expect any Major Catastrophic Landslide to impact their site. Also, FVEL did not identify any additional signs of hazard concerns such as slope instability in their review of the satellite imagery. They conclude that the probability of Rockfall – Small Scale Detachment and Major Catastrophic Landslide affecting the Property and the proposed development area is likely low with a probability of occurrence on the order of magnitude of <1:10,000 per annum.

FVEL also concludes that based on their information, it was their professional opinion that the probability of Snow Avalanche affecting their site is likely low with a probability of occurrence on the order of magnitude of <1:10,000 per annum.

Statlu 2021

This watershed assessment of Norrish Creek was prepared for logging companies, and the goal was to assess the cumulative hydrologic risks posed to the Norrish Creek watershed by past, present, and proposed future forest development, road building, and natural disturbances. The assessment includes both Norrish Creek Community Watershed and the lower portion of the Norrish Creek drainage downstream of the designated community watershed. The report was issued weeks before the November 2021 ARE.

The report identified that there had been no major channel-altering floods in Norrish Creek between 2016 and submission of the report, and only a few, relatively small landslides or debris flows. Sediment deposition on the fan of Norrish Creek has moved upstream, away from Nicomen Slough. In the low-gradient reach of Norrish Creek, upstream of the water treatment plant, and in the headwater sub-basins of East and West Norrish Creek, stream channels show signs of coarsening bed texture, bed elevation lowering, and continued vegetation of channel bars. These observations indicate that less sediment is being supplied to the channel of Norrish Creek and that fewer sediment-transporting, channel-altering floods are occurring than in past decades, and the channel is stabilizing as a result.

The report stated that the Equivalent Clearcut Area (ECA) is the lowest that it has been in the Norrish Creek watershed for decades and that the planned harvest represents low to very low hydrologic risk. At the ECA level, there is negligible likelihood that harvesting results in any detectable cumulative hydrologic effects on watershed hydrology.

Keystone Environmental 2023

Keystone Environmental prepared a Phase 1 Environmental Site Assessment for the owner of the Subject Property. The report concluded following: CSR Schedule 2 Activities were not identified for the Site. There is considered to be a low potential for contaminants of concern associated with on and off-Site activities to be present in the Site soil, groundwater, and/or vapour at concentrations greater than the current CSR standards. Further investigation is not warranted at this time.

Forte 2023

Forte prepared this wildfire hazard assessment and risk mitigation plan for the owner of the Subject Property as part of the FVRD requirements for the TUP application because the Site is within a moderate fire hazard rating area as discussed in Section 3 and shown in Figure 13. The report concluded that wildfire hazard within and around the Subject Property is low due to the presence of deciduous forest cover and wide open non-

forested areas. All residential building materials will be constructed with ignition-resistant or non-combustible materials which meet FireSmart™ recommended standards.

Keystone Environmental 2024

Keystone Environmental prepared an Environmental Constraints Assessment for the owner of the Subject Property. The report is intended to identify potential environmental constraints on the future development of the Site in the context of watercourses and species of management concern, describe applicable regulatory context in context of those constraints, and provide information to support senior agency environmental permitting applications.

The report states that any development of the Site must adhere to the restrictions and requirements of applicable senior agency legislation including the Provincial Wildlife Act, Water Sustainability Act, and Riparian Areas Protection Regulation (RAPR) as well as the federal Fisheries Act and Species at Risk Act. Consideration of wildlife habitat should include avoiding vegetation removal and/or clearing and grubbing during critical nesting periods for birds. Commercial, residential, or industrial development within 30 metres of either Inch Creek or Norrish Creek would typically require completion of an assessment report per the RAPR to be completed in advance of development.

In addition to the environmental assessment, Keystone Environmental completed a Provincial Site Disclosure Statement (SDS) for the Site and the SDS is provided in Appendix H.

Forte 2024

Forte prepared this Windfirm Boundary Assessment and Tree Management Plan as part of the proposed development plan with respect to the proposed 7.5 m vegetated buffer area which is discussed above in Section 11 and shown in Appendix G. The report identifies that the proposed buffer can provide sufficient protection against wind-related disturbances, thereby preserving the Subject Property's landscape and environmental stability.

13 EROSION HAZARDS

As mentioned in Sections 9 and 12.3, an analysis of historical air photos in proximity to the Subject Property dating back to the late 1930s has been carried out by others and SGL. The historical photos are useful in identifying lateral changes to the watercourses in proximity to the Site. This information can be used to determine rates of erosion over the period of record of the air photos which in this area spans almost a century. Although the Site is within the northern limit of the Fraser River floodplain (Figure 5) the mainstem of the River is 3.1 km to the south of the Site (Figure 2) and therefore erosion hazards from the River are considered very low. The Subject Property could be inundated during an extreme flood on the River but velocities at the Site would likely be low enough that the scour potential would be very low. Erosion at the Site from Nicomen Slough is also considered to be very low as the Slough is 1 km to the south (Figure 3) and the Slough is a low energy system with minimal potential for bank erosion. Also, the embankment of the Railway separates the Site from the Slough and the River. This embankment is not an armoured berm but would still be effective in decreasing erosion potential at the Site from the River and the Slough. Erosion hazards from Chilqua Creek are considered low as the creek is 320 m northwest of the Site at its closest point and the Dewdney Dike is between the Site and Chilqua Creek south of Bell Road (Figure 5). An avulsion on Chilqua Creek upstream of the Dewdney Dike and Bell Road could potentially reach the Subject Property but the likelihood of this avulsion reaching the Site and having a significant impact is considered low. Inch Creek

is located immediately east of the Site but erosion hazards from Inch Creek are considered low as the creek is a groundwater fed watercourse which daylights only 80 m east of the Subject Property (Figures 16 and 17). Inch Creek and Chilqua Creek are discussed in detail in Section 5.

The Subject Property is located on the Norrish Creek fan 500 m west of Norrish Creek, which represents a moderate erosion hazard to the Site. The Subject Property is partially protected by the Norrish Creek Dike, but the protection is limited as it is classified as a non-standard dike. The risk assessment of BC's orphan dikes by KWL (2020) rated the Norrish Creek Dike as 'fair' and 'has at least 0.6 m of freeboard to the Q₂₀₀ water level'. The field assessments of the dike by SGL in 2018 and 2024 did not note any concerns or deficiencies and the potential for an avulsion to occur through the dike is considered low. However, an avulsion is possible upstream of the dike just downstream of the fan apex where the bank is unarmoured and eroding. The likelihood of an avulsion, especially during a single event is considered low due to the width of the embankment in this area, the height of the embankment relative to the bed of the Creek, and the straight reach of the Creek at this location. Furthermore, the 2021 ARE did not result in an avulsion in this area and did not result in notable erosion of this unarmoured bank area. Norrish Creek is discussed in detail in Sections 4 and 8.

14 FLOOD HAZARDS

The Site is located along the northern edge of the right bank floodplain of the Fraser River and is not protected by any diking system (standard or non-standard) from the Fraser River and is therefore vulnerable to flooding from the River. Figure 5 shows that most of the Site lies within the floodplain and the Dewdney Dike located along the western property boundary protects the properties to the west and southwest but not the Site. The Subject Property is also vulnerable to flooding from Nicomen Slough. The embankment of the Railway is located between the Site and the River and the Slough, but this embankment is not a flood protection berm as it has two openings in proximity to the Subject Property: one at Norrish Creek (Photo 23) and the other at Inch Creek (Photo 21). The embankment would provide some attenuation effect and delay the onset of flooding on the Site from the River and the Slough but would not be considered flood protection. Therefore, flood hazards from the River and the Slough are considered moderate.

With respect to warning time during a flood on the Fraser River, the River is a large system and adequate warning time is expected for evacuating the Site as flood warnings and advisories are provided by the BC River Forecast Centre. The FVRD also has a Flood Response Plan for its community. Analysis of historic flood hydrographs on the Fraser River at Mission suggests that of the five largest floods on record the fastest rate of increase occurred during the 1948 flood at a rate of 2 cm/hour.

Flood hazards from Inch Creek and Chilqua Creek are considered low for the same reasons erosion hazards for these creeks are considered low, as discussed above in Section 13. Chilqua Creek has reportedly experienced debris flows in the past that have affected its fan (Westrek, 2013). However, it's unlikely that a debris flow on Chilqua Creek would reach the Site and have a significant impact.

Flood Hazards from Norrish Creek are considered moderate for the same reasons erosion hazards on Norrish Creek are considered moderate, as discussed in Section 13. There has been a long history of dredging in the Creek upstream of the Railway bridge to maintain flood capacity at the bridge (see Section 12.3). This dredging is carried out by CPKC Rail and was done recently as noted during the January 2024 field assessment by SGL. This regular dredging decreases the potential for an avulsion or dike overtopping to occur which could impact the Subject Property. Although this maintenance dredging cannot be relied upon

to provide flood protection to the Site, it is highly likely that CPKC Rail will continue to dredge the Creek as needed in the future.

As detailed in the above sections the Norrish Creek Dike is generally in fair to good condition but because it is a non-standard dike it does not meet current design standards. However, KWL (2020) identified that the dike 'has at least 0.6 m of freeboard to the Q_{200} water level'. Clearwater floods are the main flood concern on Norrish Creek. An assessment by Westrek (2013) concluded that the Norrish Creek fan is subject to clear water floods and not debris flows or debris floods. The Melton Ratio for Norrish Creek is 0.13 and the length is 18 km suggesting Norrish Creek is well within the clear water flood range and well out of the debris flood and debris flow range (Westrek 2013). The watershed Melton Ratio is the ratio of relief to the square root of drainage area. This ratio and the watershed stream length are used to classify a basin with respect to probability of generating clearwater, debris floods or debris flows.

15 HISTORIC FLOOD EVENTS

The Site is subject to flooding from the Fraser River in the spring during snowmelt conditions (i.e., freshet). Water levels generally increase in early April, peak in May/June and recede throughout the summer. Low flow is generally from December to March. The Fraser River flood of record occurred in 1894 and had an estimated peak flow of 17,000 m^3/s at Water Survey of Canada (WSC) Station 08MF005, Fraser River at Hope (Northwest Hydraulic Consultants Ltd. (NHC), 2020). This flow, corresponding to roughly a 500-year flood with an Annual Exceedance Probability (AEP) of about 0.2%, has been adopted by the Province as the design flood for the River. Most of the Fraser Valley was flooded at the time of the 1894 event but due to the lack of flood level information, the inundation depth at the Site is not known.

The WSC gauge 08MH024 Fraser River at Mission is situated on the right bank of the River, 11 km downstream of the Site, upstream of the Highway 11 Bridge and immediately downstream of the Railway bridge (Figure 1). Water levels are marked on the side of the WSC station to indicate the 1894 flood (25.75 ft), the 1948 flood (24.7 ft) and the 1972 flood (23.3 ft). Measurements are relative to the gauge height and the 1894 flood level was estimated by SGL to be approximately El. 7.9 m at the WSC station. Assuming an expected rise in water surface elevation of 1.47 m over the 11 km upstream to the Site (0.01%), the 1894 flood would have had a flood level of El. 9.37 m at the Site and hence would have inundated the southern half and the western half of the Site as the northern and eastern portion of the Site is above El. 9.37 m. The Railway had been constructed by the time of the 1948 flood (Appendix E) and the Railway embankment likely provided some attenuation of the flood peak on the Site but would not likely have protected the Site as the embankment is not a flood protection berm. The increase in water surface elevation of 1.47 m over 11 km (0.01%) is estimated from the 500-year event model results in MFLNRO (2014).

The second largest flood on the River occurred in 1948 and had a flow of 15,200 m^3/s at the Hope gauge (Figure 18), corresponding to a return period in the 200-year range with an AEP of 0.5%. In 1894, there were essentially no dikes along the River and the dikes that were in place in 1948 generally failed. Based on the marks on the Mission gauge, the 1948 flood was 1 foot or 0.3 m lower than the 1894 flood at the WSC station suggesting a flood level of El. 7.6 m at the WSC station and El. 9.07 m at the Site. This also would have inundated the southern and western portions of the Site at the time.

The third largest event was in 1972 and had a flow of 12,900 m^3/s at the Hope gauge (Figure 18), which had a return period of approximately 35 years. The Mission gauge dates back to 1965 and reported a flow of 14,400 m^3/s in 1972 (Figure 19) which had a return period of approximately 40 years. The 1972 event was

1.4 feet (0.42 m) lower than the 1948 flood at the Mission gauge suggesting a flood level of El. 7.2 m at the WSC station and a flood level of El. 8.65 m at the Site. This event would also have inundated the Site but just the western portion and the southern third of the Site. Many of the dikes on the Fraser River were in place during the 1972 flood but as discussed above, the Subject Property is not protected by dikes.

The fourth largest event of record on the River occurred in 1950 and had a flow of 12,500 m³/s at the Hope gauge (Figure 18) which was slightly less than the 1972 flood. The 1950 and 1972 floods did not result in dike failures or extensive flooding behind the dikes.

The fifth largest event of record on the River occurred in 2012 and had a maximum daily flow of 11,700 m³/s at the Hope gauge (Figure 18) and was the largest flood since the 1972 event. This discharge of 11,700 m³/s was between the estimated 10-year (11,103 m³/s) and 20-year (11,940 m³/s) return period events but closer to the 20-year event. The discharge at the Mission gauge during the peak of the 2012 freshet was 12,700 m³/s, which was the second largest flood since the 1972 event as the peak in 1974 was 13,100 m³/s (Figure 19). The 2012 discharge at the Mission Gauge of 12,700 m³/s had a return period of approximately 15 years.

It is worth noting that the return period values reported above are from the River Forecast Centre, which uses the maximum values from the HYDAT data base, which are maximum instantaneous flows. The values shown in Figures 18 and 19 are annual extremes which are maximum daily flows, which are slightly lower than the maximum instantaneous flows.

16 FLOODPLAIN SETBACK

Floodplain setbacks are detailed in the FVRD Bylaw No. 1669, 2022: a bylaw to establish regulations regarding floodplain management. As per the Bylaws, *floodplain setback means the required minimum distance from the Natural Boundary of a watercourse, lake, or other body of water to any landfill or structural support required to elevate a floor system or Pad above the Flood Construction Level, so as to maintain a floodway and allow for potential land erosion.* Also as per the Bylaws, *Natural boundary means the visible high watermark of any lake, river, stream, or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river, stream, or other body of water a character distinct from that of the banks thereof, in respect to vegetation, as well as in respect to the nature of the soil itself, (Land Act Section 1) and also includes the edge of dormant side channels of any lake, river, stream, or other body of water.*

The Bylaws specify that the floodplain setback shall be 60 m from the Natural Boundary of Norrish Creek. Inch Creek and Chilqua Creek are not listed in the Bylaws so a 15 m default setback would apply for these two creeks. The Bylaws also specify a 7.5 m setback from the toe of any dike or dike ROW used for flood protection.

With respect to the proposed fill on the Subject Property, the Site is more than 60 m from the Fraser River, Nicomen Slough, Chilqua Creek and Norrish Creek. Inch Creek is approximately 5 m from the eastern property boundary of the Site (Figures 16 and 17) so therefore within the 15 m setback requirement. However, the proposed fill would not extend to the eastern boundary of the Subject Property as shown in Appendix G. The existing house footprint and proposed house planned at a future date would be approximately 40 m from the eastern property boundary and 45 m from Inch Creek. The Bylaw requiring a 7.5 m setback from a dike, or a dike ROW would apply to the western boundary of the Site as the Dewdney

Dike is in this area. The Bylaws do not specify setback requirements with respect to non-building development such the proposed fill for the Subject Property.

It should also be noted that environmental setbacks may differ from the setbacks stated in the FVRD Bylaws or setbacks recommended in this FHA report. The 2024 Environmental Constraints Assessment by Keystone Environmental stated that commercial, residential, or industrial development within 30 metres of either Inch Creek or Norrish Creek would typically require completion of an assessment report per the RAPR to be completed in advance of development. As noted above, the proposed fill including the proposed house at a future date is not within 30 m of Inch Creek.

17 FLOOD CONSTRUCTION LEVELS

As defined in the FVRD Bylaw No. 1669, 2022, the Flood Construction Level (FCL) *means the Designated Flood Level (i.e., design flood level) plus Freeboard, or where a Designated Flood Level cannot be determined, a specified height above a Natural Boundary, Natural Ground Elevation, or any obstruction that could cause ponding.* In more general terms, the FCL refers to the minimum elevation that infrastructure should be built to for protection from flooding. The Designated Flood Level *means the observed or calculated water surface elevation for the Designated Flood, which is used in the calculation of the Flood Construction Level.* Freeboard *means a vertical distance added to a Designated Flood Level, used to establish a Flood Construction Level.* Freeboard is an extra height incorporated into the design as a factor of safety intended to account for variations or uncertainties in the calculated designated flood as well as to protect against waves and floating debris. Freeboard on the Fraser River is frequently set at 0.6 m.

With respect to fans, the Bylaws state that *all development on properties on alluvial fans must meet the FCL and setback as determined by a site-specific geohazard assessment by a Professional Engineer or Professional Geoscientist pursuant to Section 56 of the Community Charter and Section 302 of the Local Government Act and in accordance with the Provincial Flood Hazard Area Land Use Management Guidelines and subsequent amendments.*

The FCL for the Subject Property needs to account for flood hazards from several watercourses including the Fraser River, Nicomen Slough, Norrish Creek, Inch Creek and Chilqua Creek. The Bylaws state that the FCL for the Fraser River (including Nicomen Slough) at the Subject Property is El. 10.8 m as specified in Schedule A, Map 8a and 8b which are shown in Figures 5 and 6, respectively. The El. 10.8 m isoline transects through the western portion of the Site. With respect to Norrish Creek, Inch Creek and Chilqua Creek, these watercourses are not named in the Bylaws therefore the default FCL would be 1.5 m above the natural boundary of these creeks.

The Provincial floodplain and dike mapping from 2011 (Figure 20) shows that the Site is mid-way between the El. 10.5 m and El. 11.0 m flood profile points and these elevations include freeboard which is typically 0.6 m. The source of the Designated Flood Levels used in the Bylaws indicating El. 10.8 m is not identified but it is assumed that it is the Provincial floodplain mapping (Figure 20) as El 10.8 m is approximately mid-way between El. 10.5 m and El. 11.0 m.

The FVRD's Designated Flood Levels have been revised over time as more detailed flood level estimates have become available. The FVRD's Flood Bylaw suggests an FCL of El. 10.8 m is the current requirement for development (Figures 5 and 6). As discussed earlier, the western half of the Subject Property averages El. 8 to 9 m and the eastern half averages El. 9 to 10.5 m. The lowest area on the Site is in the southwest corner

and averages El. 7 m and the highest area is near the northeast corner averaging El. 11 m (Appendix D). Therefore, almost the entire Site except the northeast corner is below the FVRD's FCL of 10.8 m. The Fraser River flood profile plus freeboard shown on the Provincial mapping (Figure 20) is derived from the Fraser River Hydraulic Model Update Report by NHC (2008).

In March 2014, the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) released the Fraser River Design Flood Level Update – Hope to Mission, Final Report. This report provides updated Designated Flood Levels in the FVRD's Bylaws, and the Provincial 2011 mapping shown in Figure 20 which is based on modelling from 2007. The levels are based on MIKE11 1D hydraulic modelling. In 2012, the Association of Professional Engineers and Geoscientists of BC (APEGBC) issued Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. These guidelines were updated by EGBC in July 2018 (Version 2.0) and again in August 2018 (Version 2.1). The guidelines recommend that Climate Change (CC) impacts on peak flows and Sea Level Rise (SLR) be considered when carrying out flood hazard assessments. A 10% increase in peak flows is recommended to be applied to account for CC when detailed modelling has not been done that would consider CC. However, in the case of the Fraser River detailed modelling has been done.

In May 2014, MFLNRO released Simulating the Effects of Sea Level Rise and Climate Change on Fraser River Flood Scenarios, Final Report. Climate change is expected to not only increase ocean levels but also Fraser River extreme flood flows. At the Site, increases in ocean levels will have a moderate impact on flood levels. However, under a moderate climate change scenario, it is estimated that by the end of the century the design flow may increase by as much as 21% (MFLNRO, May 2014). Table 15 of this May 2014 report provides flood water levels from hydraulic model runs for various Annual Exceedance Probability (AEP) flows and different CC and SLR scenarios. From the 2014 MFLNRO reports, two cross sections transect through the Subject Property (Cross Sections 97348 and 97701). Cross Section 97701 is the upstream one and considered the more appropriate to represent the Site. Flood water levels at this location for various scenarios are shown in Table 1.

Table 1: Flood Levels at Cross Section 97701 in a 500-year Flood Event

Scenario	Climate Change	Sea Level Rise (m)	Flood Level (m)
Historical	No	No	9.89
SLR only	No	1.0	9.96
CC and SLR (Scenario A)	Moderate to Year 2100	1.0	11.35

Note that the effect of 1 m of SLR at the coast is only an additional 0.07 m at the Site. The recommended design event water level at the Site considering climate change and sea level rise is El. 11.35 m, not including freeboard.

The design water level of El. 11.35 m with the addition of a standard 0.6 m freeboard gives an FCL of El. 11.95 m or El. 12.0 m when rounded up. This is 1.2 m higher than the El. 10.8 m FCL from the FVRD's Bylaws. The 2019 NHC Fraser River 2D modelling project recommends adding 1.0 m freeboard to areas not protected by a Standard Dike (NHC, 2020). Hence, applying the NHC recommended freeboard would produce an FCL of

El. 12.35 m. An FCL of 12.35 m would be approximately 3.4 m above the average ground elevation of El. 9.0 m on the Site.

SGL is recommending an FCL for the proposed residential building of El. 12.0 m, which is 3 m above the average elevation of the Subject Property. The proposed house planned as a future project will be located where the existing house is situated and the ground around the house averages El. 10.6 m suggesting the recommended FCL is 1.4 m above the ground in proximity to the house. A standard freeboard of 0.6 m is recommended for this Site compared to the NHC recommended freeboard of 1.0 m. The standard 0.6 m freeboard is appropriate for this Site as it is located on the boundary of the Fraser River floodplain 3.1 km from the mainstem of the River and the Site is on the landward side of the Railway embankment.

This recommended Fraser River FCL of El. 12.0 m will provide flood protection from other watercourses in proximity to the Subject Property including Norrish Creek, Inch Creek and Chilqua Creek. As stated in the Bylaws the default FCL for these creeks is 1.5 m above the natural boundary of the creeks. Since the FCL of El. 12.0 m is 3 m above the average elevation on the Site, the recommended Fraser River FCL of El. 12.0 m would provide flood protection from the creeks.

Recent 2D modelling of the Fraser River has been carried out by NHC and this modelling may provide different design water levels for the Site compared to the levels provided in MFLNRO (March 2014) and MFLNRO (May 2014), but this recent 2D data is not available to the public. However, the FVRD may have access to this modelling information.

18 POTENTIAL TRANSFER OF FLOOD RISK REVIEW

It is important that developments on floodplains, especially where large areas of fill are proposed, consider the potential for transfer of flood risk to nearby properties because of the proposed development. Transfer of risk is identified in the EGBC FHA guidelines (EGBC, 2018) and item #13 of the Flood Hazard and Risk Assurance Statement specifically asks if the QP has “Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties”.

The width of the Fraser River floodplain as measured perpendicular to the River and transecting through the Subject Property is just over 4 km (Figure 20). The width of the Subject Property at its widest point at the western side of the Site is approximately 300 m (Figure 17). Therefore, the proposed fill on the Subject Property is not expected to result in a transfer of flood risk from the Fraser River to neighbouring properties. This is based on the dimensions of the Site relative to the width of the Fraser River floodplain, the direction of floodwaters during a large event on the Fraser River, the presence of the Dewdney Dike along the western boundary of the Site and the Railway embankment along the southern boundary of the Site.

Transfer of flood risk from floods on Inch Creek is not a concern as the flood hazard from this creek impacting the Subject Property is considered low as discussed in Sections 5, 12, 13 and 14. As noted in these sections Inch Creek is a groundwater fed watercourse which daylights 80 m east of the Subject Property at the DFO Inch Creek Fish Hatchery (Figures 16 and 17). Backwatering of Inch Creek could potentially occur onto the Subject Property and the DFO property if the steel box culvert under the Railway embankment were to become blocked. However, the likelihood of the culvert becoming blocked and backwatering onto the adjacent properties is low considering the size of the culvert (span of 2000 mm and rise of 1600 mm (Photo 21)) and the fact that the creek is groundwater fed and daylights only 230 m upstream of the culvert inlet as shown on Figures 16 and 17. Just 25 m downstream of the culvert is the Hawkins Pickle Road

crossing for Inch Creek (Figures 16 and 17) and this crossing is a bridge which has a wider span and rise than the culvert so is less likely to become obstructed and backwater compared to the culvert. Regarding Inch Creek and the proposed fill, the eastern edge of the fill would be 115 m from Inch Creek at its closest point and it would be 140 m from the inlet of the culvert at the Railway embankment to the southeast corner of the fill, as shown on Sheets 3 and 4 (Appendix G). Hence, the likelihood of the fill project transferring flood risk from Inch Creek is extremely low.

Transfer of flood risk from floods on Chilqua Creek is not a concern as the flood hazard from this creek impacting the Subject Property is considered low as discussed in Sections 5, 12, 13 and 14. As noted in these sections, at its closest point Chilqua Creek flows within 320 m from the northwest corner of the Subject Property (Figures 3, 5, 12 and Appendix C). Chilqua Creek has reportedly experienced debris flows in the past that have affected its fan (Westrek, 2013). However, south of Bell Road the Dewdney Dike separates Chilqua Creek from the Subject Property. An avulsion on Chilqua Creek upstream of the Dewdney Dike and Bell Road could potentially reach the Subject Property but the likelihood of this avulsion reaching the Site, having a significant impact and transferring flood risk is considered low.

Regarding Norrish Creek, potential transfer of flood risk to neighbouring properties is possible but considered unlikely in the event of a creek avulsion or a failure of the Norrish Creek Dike. If the right bank of Norrish Creek were to be breached, floodwaters would likely travel down the fan in a southwest direction possibly inundating the Subject Property. Under current conditions the water would flow across the Site and pool in the southwest portion of the Site due to the Dewdney Dike. There is a floodbox on the dike in this corner, but the culvert is only 450 mm (Photo 17). Under the proposed fill conditions, fill will not extend to the edge of Site and the proposed 7.5 m wide non-filled portion of the infiltration gallery will also act as a flood corridor along the perimeter of the Subject Property. The surface elevation of the 7.5 m wide non-filled portion of the infiltration gallery that is cleared will be slightly below the elevation of the adjacent existing ground by approximately 0.1 m on average. The northern perimeter infiltration gallery will be below the elevation of Bell Road. This will allow potential floodwaters from Norrish Creek to travel along the northern perimeter of the Site and then flow along the western property boundary adjacent to the Dewdney Dike toward the floodbox. The properties north of Bell Road adjacent to the Subject Property generally slope upward away from Bell Road as shown in Figure 6 and Appendix C. On Sheet 2 in Appendix C, the 10 m contour is at Bell Road adjacent to the Subject Property and the 12 m contour is shown approximately 80 m north of Bell Road. Hence, floodwaters would flow southwest and generally away from the properties on the north side of Bell Road. Alternatively, or in addition, floodwaters would travel along the eastern portion of the Site and enter Inch Creek or flow west along the southern property boundary adjacent to the Railway embankment to the floodbox.

With respect to potential transfer of flood risk related to site drainage and runoff (i.e., stormwater management) there is the potential for a decrease in permeability post-development throughout the filled portion of the Site. The existing organic forest floor soil that would be removed would likely have a greater water storage capacity than the imported structural fill. As a result, it is possible that there could be an increase in runoff from the Site. To mitigate for this potential increase, proposed stormwater infrastructure is incorporated as part the fill project. The drawings in Appendix G include an infiltration gallery around the perimeter of the fill area. The infiltration gallery has two parts: the first part is the 3H:1V sloped transition from the crest of the fill to the existing ground and the second part is the 7.5 m wide buffer zone around the fill area. Refer to Appendix G and Section 11 for details on the infiltration gallery.

Excess runoff not contained within the Site during extreme precipitation events could be discharged to either the floodbox in the southwest corner of the Site or to Inch Creek via the southeast corner of the Site. If the floodbox under the Dewdney Dike were to reach capacity and cause backwatering onto the Subject Property (regardless, if fill was added to the Site), excess water would enter Inch Creek and the Inch Creek culvert under the Railway embankment before spilling onto Bell Road and potentially impacting neighbouring properties. The lowest point on Bell Road adjacent to the Site is at the west end where the road elevation is El. 9.3 m at the north end of the Dewdney Dike (Appendix D) which is considerably higher than the elevation of Inch Creek at the inlet of the steel box culvert under the Railway embankment. The topographic survey of the Subject Property doesn't extend to Inch Creek but the contours on the LiDAR mapping in Appendix C suggest this area around the steel box culvert inlet is at approximately El. 8 m.

The flood storage volume on the Subject Property lost due to the proposed fill would be considered negligible. The spillover point in proximity to the perimeter of the Subject Property in the event that the floodbox culvert and the Inch Creek culvert reach capacity or become blocked is at Bell Road at the north end of the Dewdney Dike at El. 9.3 m. The volume within the fill footprint above the existing ground and below El. 9.3 m represents a negligible volume relative to the storage volume of the surrounding area. Based on the spot elevations shown on the topographic survey in Appendix D, a 9.3 m contour would transect in a northwest-southeast direction through the middle of the proposed fill area suggesting the area below El. 9.3 m occupies the southwestern half of the fill area. The spot elevations indicate the existing ground elevation in this area averages El. 8.5 m. Furthermore, additional flood storage capacity will be available within the 7.5 m wide non-filled portion of the infiltration gallery that is cleared and excavated below the elevation of the adjacent existing ground as discussed in Section 11.

19 SUMMARY OF NATURAL HAZARD PROBABILITIES

Table 2 below provides the estimated average annual probabilities for the natural hazards identified in Cave (1993). The Cave report is discussed in Section 12.3. SGL has divided the Cave hazards into three categories: flood hazards, slope hazards and earthquake hazards. These categories are discussed below.

Table 2: Summary of Natural Hazards Assessment

Natural Hazard	Estimated Average Annual Probability
Tsunami	n/a
Chilliwack River Valley Erosion or Avulsion	n/a
Debris Flow	<1:2,000
Debris Flood	Unmitigated <1:200 / Mitigated <1:500
Fraser River and Tributaries Flooding	Unmitigated <1:100 / Mitigated 1:500
Mountain Stream Erosion or Avulsion	Unmitigated <1:200 / Mitigated <1:500
Major Catastrophic Landslide	Unmitigated <1:10,000

Rockfall - Small Scale Detachment	Unmitigated <1:10,000
Slope Stability	Unmitigated <1:10,000
Small Scale Localized Landslide	Unmitigated <1:10,000
Snow Avalanche	Unmitigated <1:10,000
Seismic Effects / Liquefaction	Not assessed

19.1 Flood Hazards

The Cave hazards categorized as flood hazards include Tsunamis, Chilliwack River Valley Erosion or Avulsion, Debris Flows, Debris Floods, Fraser River and Tributary Flooding, and Mountain Stream Erosion or Avulsion. Hazards from the Chilliwack River do not apply to the Site and tsunamis will not impact the Site, hence these hazards are identified as n/a in Table 2. The other flood hazard probabilities are summarized below.

With regard to Norrish Creek, the Subject Property is vulnerable to hazards from clear water floods and avulsions from Norrish Creek. Debris flows and debris floods are unlikely to occur on Norrish Creek based on the Melton Ratio and the watershed length as discussed in Westrek (2013). Debris flows on tributaries of Norrish Creek have occurred but have not likely reached the fan area and debris floods are not likely on the mainstem of Norrish Creek (Westrek 2013). The Subject Property is partially protected from these hazards by the Norrish Creek Dike, but this protection cannot be relied upon as the dike is a non-standard dike and is therefore not maintained or protected by any government agency. Also, there is a section of the dike near the fan apex that is not armoured and is eroding. If an avulsion or overtopping of the dike were to occur, then it would likely happen at this location. However, a significant channel avulsion is unlikely to occur at the erosion site because the active channel is approximately 3 m lower than the surface of the fan. If the dike does fail at this point, then it is likely to occur during a period of high flow and not as a result of a complete channel avulsion through this point. Westrek (2013) suggested that the breach could possibility accommodate up to about 1/5 to 1/4 of the total discharge in Norrish Creek, or up to about 100 m³/s as the Q₂₀₀ is in the 400 to 500 m³/s range. If the bed of Norrish Creek were to rise several metres due to aggradation, then the potential for a complete channel avulsion is more likely. However, it is unlikely that a single event could raise the bed of the Creek several metres resulting in a complete avulsion. This suggests that the probability of a complete channel avulsion is unlikely to increase unexpectedly such as during a single event, but it could occur over time. Westrek (2013) identified that the present annual average probability that a debris flood or flood will breach or overtop the existing dike and cause flooding on the fan is presently about 1:200. Additionally, it should be noted that the 2021 ARE did not cause overbank flooding on Norrish Creek or notable damage to its dike or observable erosion of the right bank upstream of the dike. Furthermore, KWL (2020) noted that the dike ‘has at least 0.6 m of freeboard to the Q₂₀₀ water level’.

FVEL (2016 and August 2, 2018) noted that the annual probability for debris flows or avulsions to affect the property is estimated to be <1:1,000 for both 9708 Hess Road and 38447 Bell Road, which are near the Subject Property. For the property at 38093 Bell Road, which is located 600 m to the west of the Subject Property on the north side of Bell Road, FVEL (December 2021) considered the annual probability of occurrence for debris flow hazard to be very low (<1:10,000) and low (1:500 to 1:10,000) for a debris flood.

With respect to hazards from Mountain Stream Erosion and Avulsion, FVEL (December 2021) considered the annual probability of occurrence to be 1:200 to 1:500 per annum. Such hazards would be similar for the Site.

Chilqua Creek has reportedly experienced debris flows in the past that have affected its fan (Westrek, 2013). Westrek estimated the average annual probability that debris flows in Chilqua Creek could reach the gravel pit north of the Subject Property is <1:10,000. This probability would likely be similar or slightly lower for the Subject Property as the northwest corner of the Subject Property is 320 m from Chilqua Creek at its closest point and further downslope on the Norrish Creek fan than the gravel pit.

Westrek conservatively evaluated the average annual probability for debris flows from Norrish Creek to affect the proposed pit area, located 700 m downstream of the apex of the fan, at <1:2,000. The probability for the Subject Property, which is 1.5 km downstream of the fan apex, would likely be similar or less. Westrek identified that the present annual average probability that a debris flood or flood will breach or overtop the existing dike and cause flooding on the fan is presently about 1:200.

With respect to flood hazards from the Fraser River, the two FLNRO reports from March and May 2014 were relied upon for determining the flood levels and probabilities for the Fraser River for mitigated conditions.

19.2 Slope Hazards

The Cave hazards categorized as slope hazards include Major Catastrophic Landslides, Rockfall – Small Scale Detachment, Slope Stability, Small Scale Localized Landslides and Snow Avalanches. The slope hazard probabilities are discussed below and the slope hazard values in Table 2 for the Subject Property are based on assessments and values determined by others on properties in proximity to the Site. SGL did not perform any site-specific slope hazard analysis for the Subject Property.

Westrek (2013) identified the estimated average annual probability of steep slope related hazards to be <1:10,000 for the gravel pit property which is upslope from the Subject Property and near the toe of the mountainside slopes. Therefore, these hazards would likely have even lower probability at the Subject Property which is approximately 650 m from the toe of the mountain hillsides and is considered a safe distance from the toe.

For the property at 9708 Hess Road, which is 160 m north (upslope) of the northwest corner of the Subject Property, FVEL (2016) considered the probabilities of occurrence of rockfalls and debris slides to be <1:10,000. For the property at 38447 Bell Road, which is located immediately north (upslope) of the Subject Property on the north side of Bell Road, FVEL (August 2, 2018) considered the probabilities of occurrence of rockfalls and debris slides to be <1:10,000. Such hazards would be similar or less for the Subject Property which is further from the toe of the mountain site.

With respect to 38093 Bell Road, which is west and north (upslope) of the Subject Property, FVEL (December 2021) considers the probability of Small-scale Localized Landslip (surficial) to be low with a probability of occurrence of <1:10,000. A deep seated, slip surface passing through the bedrock, slope stability analysis was done by FVEL (December 2021) and they do not expect any major catastrophic landslide to impact that property. The probability of rockfall – small scale detachment and major catastrophic landslide is likely low with a probability of <1:10,000. The probability of snow avalanche is likely low at <1:10,000. Regarding slope stability hazards, the FVRD Web Map site does not include these slope-related hazard as factors to consider in assessing the site. All of these hazards would be less likely to impact the Subject Property as the Site is further from the toe of the mountain than 38093 Bell Road.

Westrek (2013) identified that snow avalanches are not a hazard of concern and that the annual return frequency for large-scale landslides is <1:10,000. The average annual probabilities of occurrence of rockfall or small-scale landslides is estimated as <1:10,000. These probabilities would be considered similar or lower for the Subject Property, which is downslope from the gravel pit.

19.3 Seismic Effects / Liquefaction

With respect to Cave earthquake hazard seismic effects / liquefaction, Levelton (2008) and Westrek (2013) note that for neighbouring properties to the Subject Property, the area is subject to soil liquefaction during a design basis earthquake (1:475 return period event). Levelton recommended a site-specific liquefaction assessment be conducted for any future permanent structures for the site they were assessing. They also recommended a site-specific dynamic analysis to assess the site response spectrum, which may also be required for structures falling under Part 9 of the 2006 BC Building Code. The need for dynamic analysis will depend on the extent of liquefiable soils and the type of foundation system employed.

20 CONCLUSIONS AND RECOMMENDATIONS

Typical mitigation measures implemented to reduce the effects of a hazardous flood can be generally divided into structural and non-structural measures. Structural mitigation measures include physical structures that separate the hazard from the area to be protected. Examples include dikes, floodwalls and seawalls, bank protection works, and elevated building pads or foundations. Examples of non-structural measures include planning and regulations to avoid the hazard, or to only allow activities and infrastructure that won't be damaged during flood events in flood-prone areas.

In general, all development on fans such as the Norrish Creek fan should have an FCL 0.6 m above the surrounding ground. This value is recommended in the absence of a 2D model that could identify flood depths on the fan from Norrish Creek in the event of an avulsion or breach of the dike. This recommendation of a FCL 0.6 m above the existing ground on fans is suggested in some of the site-specific reports in Section 12.3 and is also documented in a report prepared by FEMA (2012) titled *Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures, Appendix D Alluvial Fan Flooding*.

- The recommended Flood Construction Level (FCL) for the Site is El. 12.0 m. This is based on the 2014 data from MFLNRO, which is based on the 1:500 year water level in the Fraser River considering moderate climate change (Scenario A) to the year 2100 with sea level rise of 1 m. This FCL includes a standard freeboard of 0.6 m and applies to the proposed house, as part of a future development plan, that will be located on the eastern portion of the Site as shown in Appendix G. The recommended FCL is 3 m above the average elevation of the Subject Property and 1.4 m above the ground in proximity to the proposed house. As shown on the cross sections for the proposed fill project (Appendix G) the sloped fill area finished grade is above El. 12.0 m in all locations. This FCL is 1.2 m higher than the Fraser River FCL of El. 10.8 m specified in the FVRD Bylaws.
- The underside of any wooden or steel floor system, or the top of any concrete floor system for the proposed residential building shall be at or above the FCL. The storage of goods damageable by floodwater, or critical equipment and supplies including any electrical and mechanical equipment rooms and main switchgear shall also be at or above the FCL.
- A basement is not recommended for the proposed house on the Subject Property.

- Regarding recommended watercourse setbacks, the only setback that is applicable is that for Inch Creek which is located approximately 5 m from the eastern boundary of the Subject Property. The Site is within the 15 m setback requirement in the FVRD Bylaws for Inch Creek. However, the proposed fill project would not extend to the eastern boundary of the Subject Property. The proposed house would be approximately 40 m from the eastern property boundary and 45 m from Inch Creek. It is recommended that no buildings on the Site be located within 15 m of Inch Creek.
- The FVRD Bylaw requiring a 7.5 m setback from a dike, or a dike ROW would apply to the western boundary of the Site as the Dewdney Dike is located in this area. The Bylaws do not specify setback requirements with respect to non-building development such as the proposed fill for the Site.
- It should be noted that environmental setbacks may require greater setbacks from Inch Creek than those required in the FVRD Bylaws or recommended in this FHA report. The 2024 environmental assessment of the Site prepared by Keystone Environmental states that commercial, residential, or industrial development within 30 metres of Inch Creek would typically require completion of an assessment report per the RAPR to be completed in advance of development. As noted above, the proposed fill, including the proposed house, is not within 30 m of Inch Creek.
- With respect to site drainage and runoff (i.e., stormwater management) there is the potential for a decrease in permeability post-development throughout the fill portion of the Site. To mitigate this potential increase in runoff, proposed stormwater infrastructure is incorporated as part of the fill project. It is recommended that the proposed infiltration gallery around the perimeter of the fill area be implemented as detailed in Section 11 and Appendix G. Excess runoff not contained within the Site during extreme precipitation events would discharge to the floodbox in the southwest corner of the Site which is similar to existing conditions.
- Any flood or erosion protection works constructed on the Site shall not concentrate or direct flow towards adjacent properties. The development shall not transfer flood and erosion hazards to adjacent properties.
- Erosion and scour protection are not required for the proposed fill area.
- The proposed residential building should include erosion and scour protection along the perimeter concrete foundation. This will protect the building from scour from Norrish Creek during an avulsion or dike overtopping as well as scour from extreme flooding from the Fraser River. Potential scour from the River would likely be less than that from the Creek. Erosion and scour protection design should be carried out when the property owner decides to rebuild the house.
- Based on geotechnical assessments by others on properties near the Subject Property on the Norrish Creek fan, it is recommended to conduct a site-specific liquefaction assessment for the Subject Property with respect to the proposed residential building on the eastern portion of the Site.
- Prior to construction of the residential building a QP is to review the overall site layout and building designs to verify that the recommendations in this FHA report have been incorporated. Also, a QP is to inspect the site grading, and construction of building foundations during construction.
- Prior to fill placement a QP is to review detailed plans for the fill area to confirm that the plan meets the requirements of the FVRD and the recommendations in this FHA.

- Final site and building plans and as-built conditions are to be assessed and approved by a QP for compliance with the conditions specified herein.

21 EGBC AND FVRD GUIDELINES AND SAFE CERTIFICATION

This FHA was conducted following the Engineers and Geoscientist of BC (EGBC) 2018 Class 0 FHA guidelines. A summary of the EGBC criteria for such an assessment is presented in Table 3. The information in the component column is summarized from Table D-1: Types of FHA for Rainfall and Snowmelt-generated Floods and Ice Jam Floods (EGBC, 2018).

Table 3: Summary of EGBC Class 0 FHA methods and deliverables

EGBC FHA Component	Notes
<i>Typical Hazard Assessment Methods and Climate/Environmental Change Considerations</i>	
Site visit and qualitative assessment of flood hazard.	Completed by Stirling Geoscience Ltd. 2023-25. Additionally, relied on existing flood modelling scenarios on the Fraser River by others (FLNRO 2014).
Identify any very low hazard surfaces in the consultation area (i.e., river terraces).	Completed by Stirling Geoscience Ltd. 2023-25.
Estimate erosion rates along riverbanks.	Erosion and scour hazards on the Site are considered low to moderate. Historical air photos were reviewed. The Fraser River is 3.1 km from the Subject Property and the Site is on the northern edge of the Fraser River floodplain. Erosion hazards from the Fraser River are considered low. Erosion hazards from Chilqua Creek and Inch Creek are considered low. Erosion hazards from Norrish Creek are considered moderate and scour protection is recommended for the proposed house on the Site. Norrish Creek is 500 m from the Site and the right bank of the Creek is protected with the Norrish Creek Dike, however this dike is a non-standard dike and has been rated as 'fair' by KWL (2020). KWL noted that the dike 'has at least 0.6 m of freeboard to the Q ₂₀₀ water level'
<i>Typical Deliverables</i>	
Letter report or memorandum with at least water levels and consideration of scour and bank erosion.	Completed by Stirling Geoscience Ltd. 2023-25. Additionally, relied on existing flood modelling scenarios on the Fraser River by others (FLNRO 2014).

Additionally, as part of EGBC FHA guidelines a signed and authenticated Flood Hazard and Risk Assurance Statement from the Professional Practice Guidelines – Legislated Flood Assessment in a Changing Climate in BC Version 2.1 (EGBC, 2018) has been included. This assurance statement is provided in Appendix I.

The Flood Hazard Assessment has not assessed the Site for hazards related to groundwater, seismic issues, or wildfire hazards. No new modelling was carried out as part of this FHA. With respect to flood and erosion hazards from the Fraser River and creeks on the Norrish Creek fan, Stirling Geoscience Ltd. certifies that the Site is considered safe for the use intended if the recommendations in Section 20 are followed.

The FVRD requires that the proposed development meets requirements under Local Government Act (Sections 919.1 and 920) – Development Permit concerning development on land that is likely to be subject to geotechnical hazards. FVRD hazard acceptability criteria applicable to developments are presented in Cave (1993). Based on these criteria, approval with requirements for protective works to mitigate hazards is considered appropriate for the proposed development.

Using Cave's criteria, the land is therefore considered to be safe for the use intended, i.e. the proposed fill including replacing the existing house at a later stage, provided that the recommendations in Section 20 are implemented to mitigate the potential hazards. The FVRD Geohazards Assurance Statement for Development Approvals has been completed for this project and is included in Appendix J.

22 CLOSURE

This Flood Hazard Assessment report applies only to 38482 Bell Road (the Site) and is specific to the proposed development by the property owner provided in Appendix G and described in Section 11. The author trusts this work and report meets your current needs. If you have any questions or would like to discuss this report, please do not hesitate to contact Jamie Stirling by email (jamie@stirlinggeoscience.com) or by telephone (604) 349-7709.

Sincerely,

Stirling Geoscience Ltd.

Prepared by:



Jamie Stirling, M.Sc., P.Geo.
Principal Consultant
EGBC Permit to Practice Number: 1003742

Reviewed by:



Adrian Chantler, Ph.D., P.Eng.
Consulting Hydrotechnical Engineer
EGBC Permit to Practice Number: 1000910

DISCLAIMER

This document has been prepared by Stirling Geoscience Ltd. in accordance with generally accepted engineering and geoscience practices and is intended for the exclusive use and benefit of Wladyslaw and Peter Wojcik and their authorized representatives for specific application to the 38482 Bell Road, Deroche, BC – Flood Hazard Assessment. The information and data contained in this document represent Stirling Geoscience Ltd. best professional judgement in light of the knowledge and information available to Stirling Geoscience Ltd. at the time of preparation.

Except as required by law, the contents of this document are to be treated as confidential and may be used and relied upon only by Wladyslaw and Peter Wojcik and their authorized representatives. The document is not to be relied upon or used, in whole or in part, by or for the benefit of others without specific written authorization from Stirling Geoscience Ltd. Stirling Geoscience Ltd. denies any liability whatsoever to other parties who may obtain access to this document for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this document.

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- Association of Professional Engineers and Geoscientists of BC and the Fraser Valley Regional District. Geo-Hazard Assurance Statement for Development Approvals.
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FIGURES



Figure 1: Subject Property and the Fraser Valley (Basemap source: Google Earth, July 29, 2022).



Figure 2: Subject Property and surrounding area (Basemap source: Google Earth, July 29, 2022).

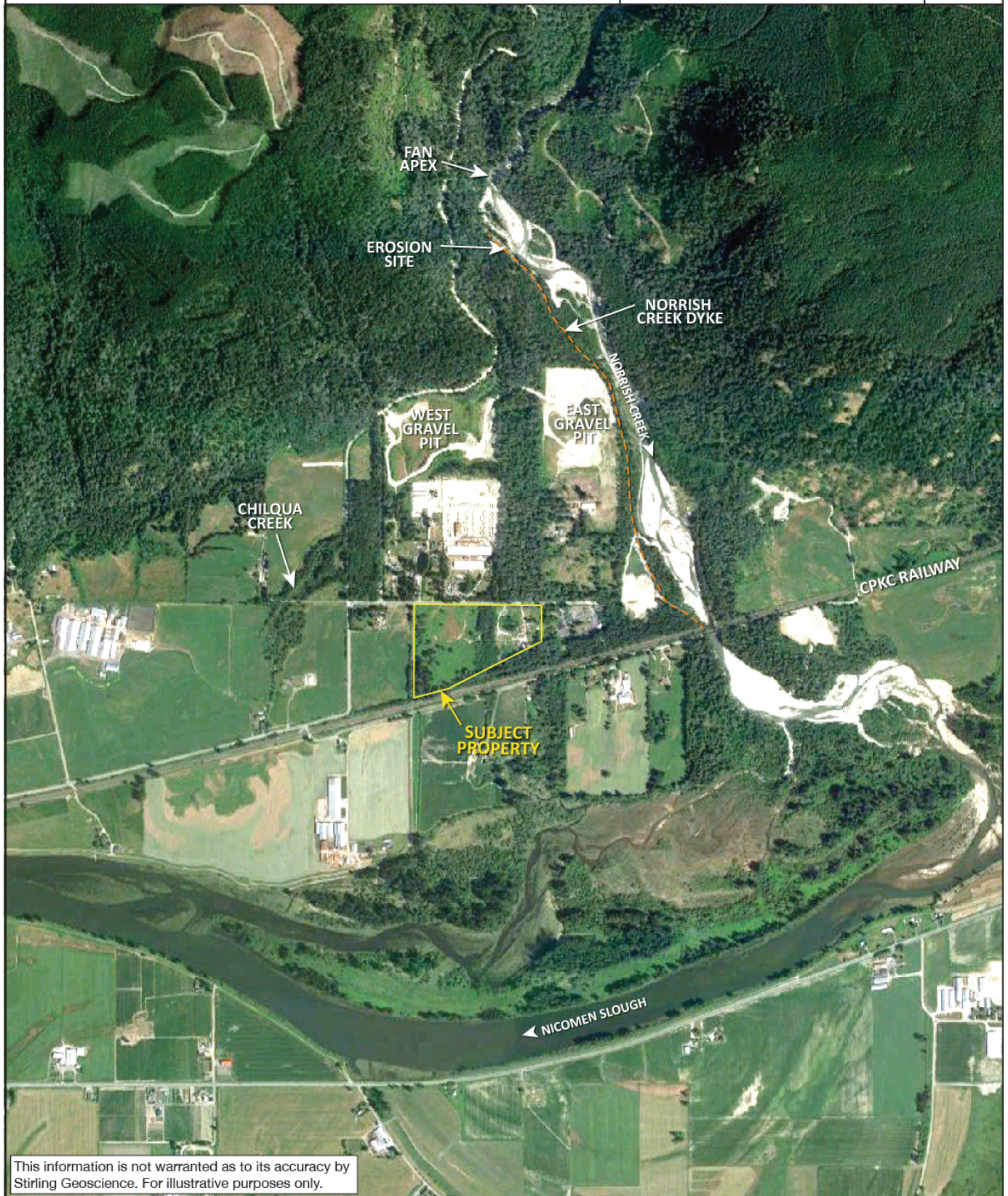


Figure 3: Subject Property and the Norrish Creek fan area (Basemap source: Google Earth, July 29, 2022).

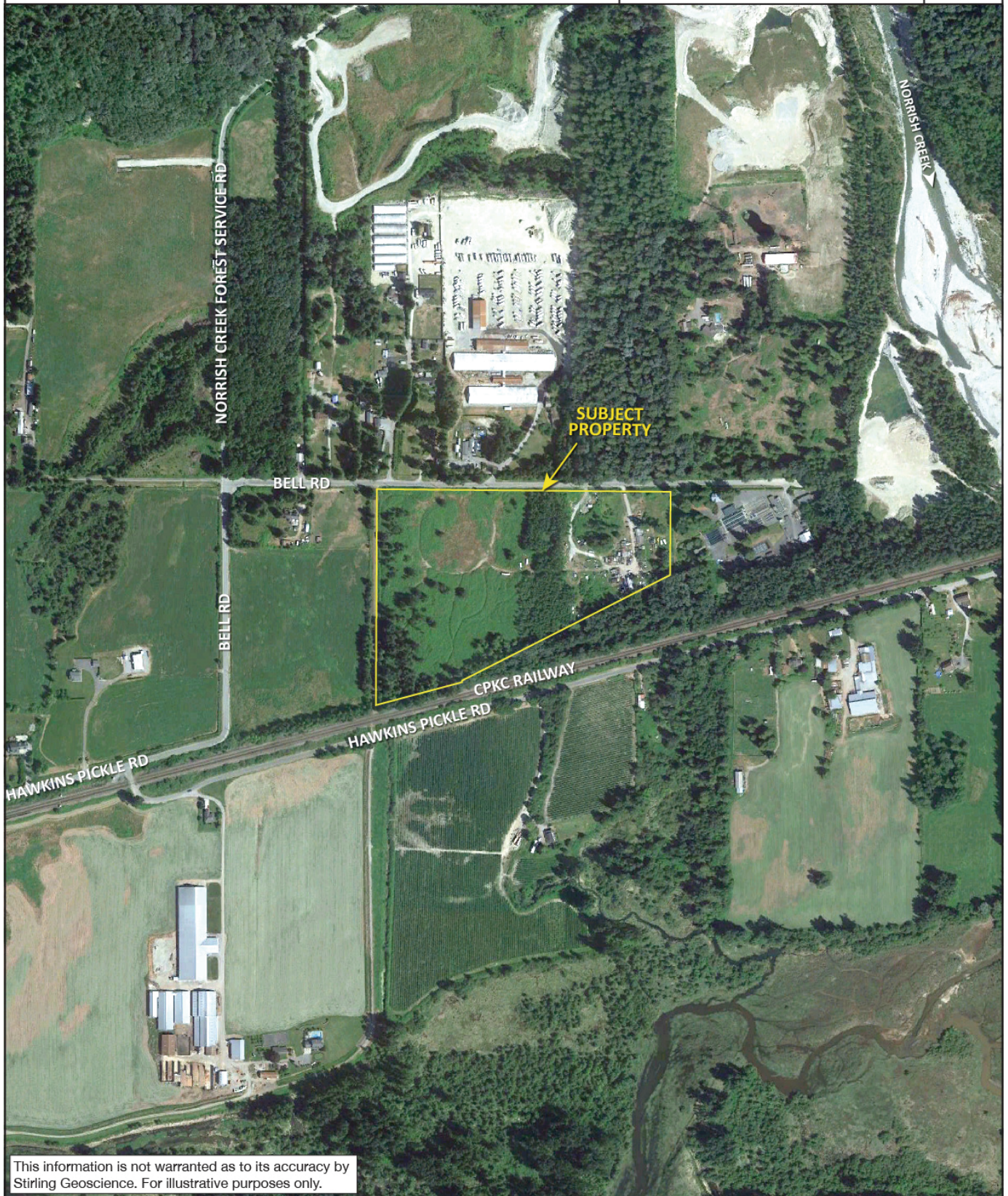


Figure 4: Subject Property and the surrounding properties (Basemap source: Google Earth, July 29, 2022).

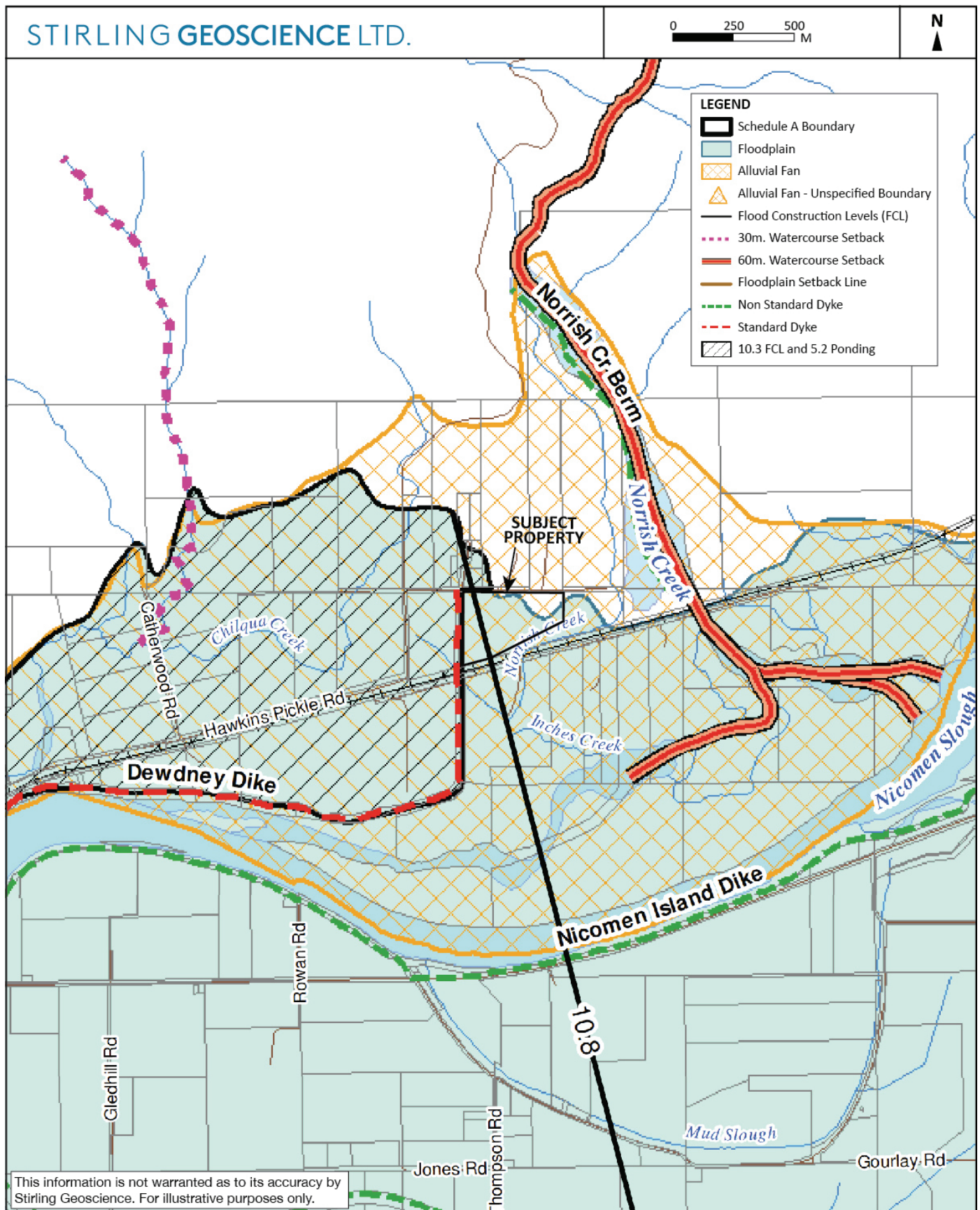
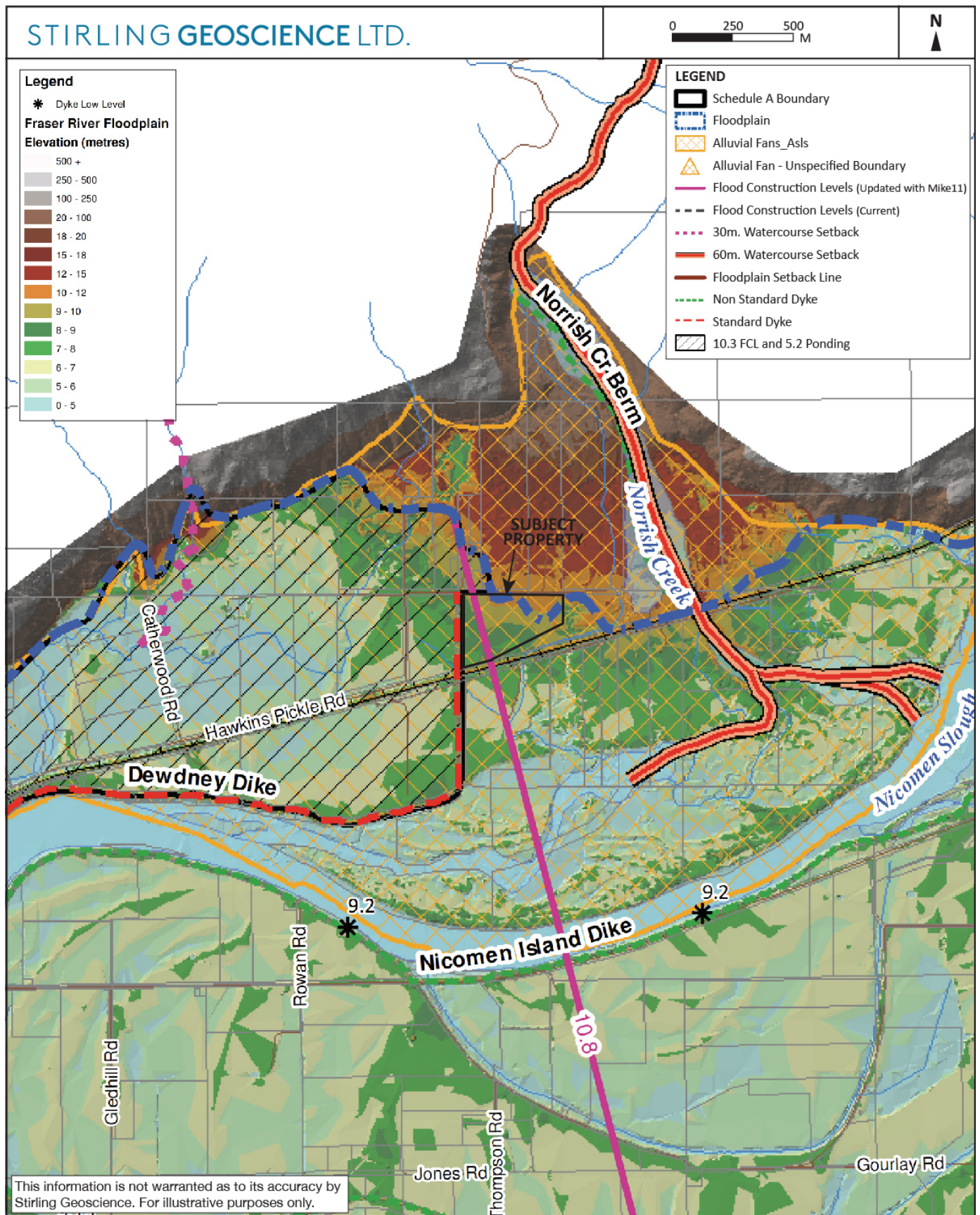


Figure 5: Flood hazards in proximity to the Subject Property (Basemap source: FVRD Floodplain Management Bylaw No. 1669-2022, Schedule A, Map 8a).



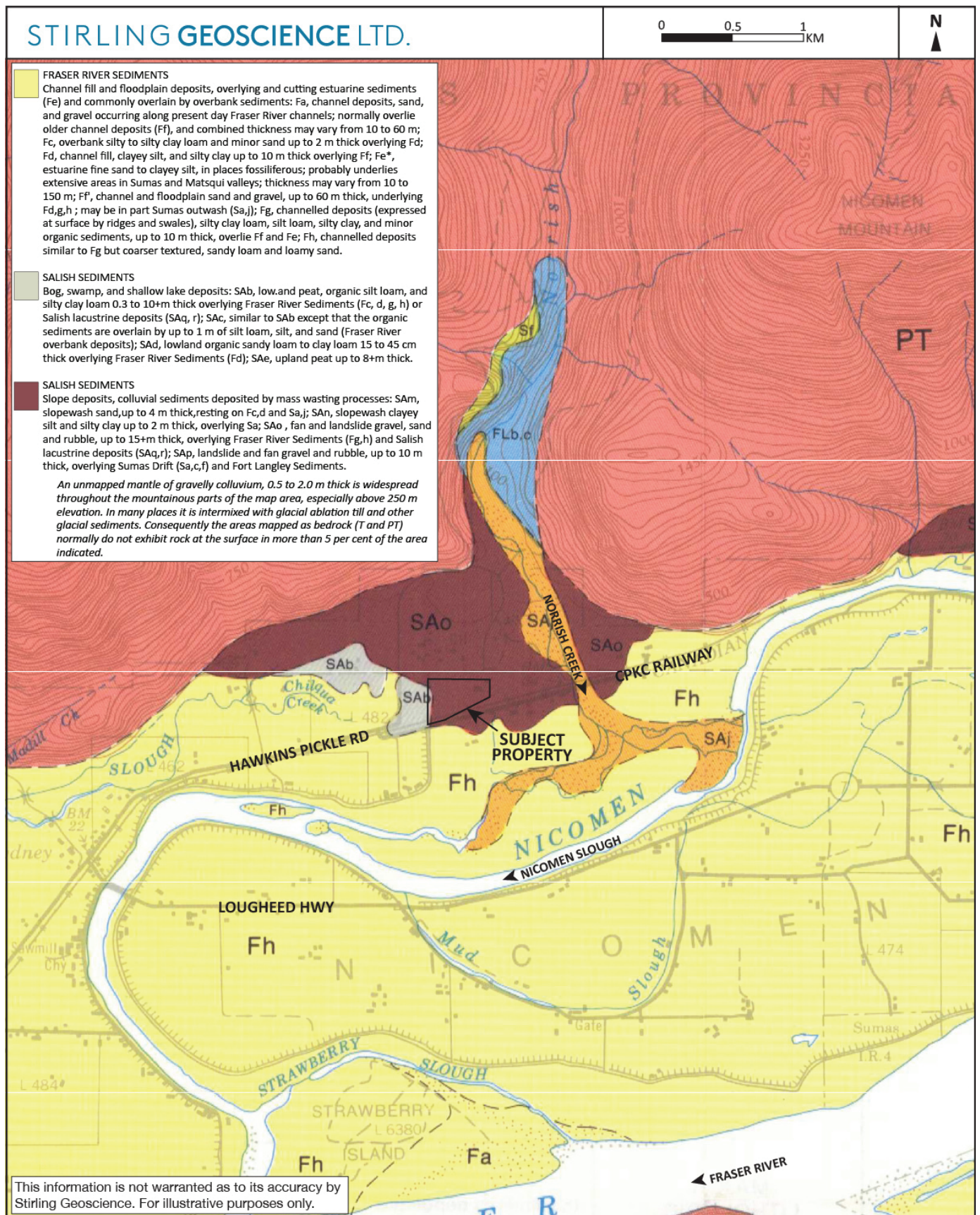


Figure 7: Surficial geology in proximity to the Subject Property (Basemap source: 1980 Geological Survey of Canada Surficial Geology Map 1485A Mission).

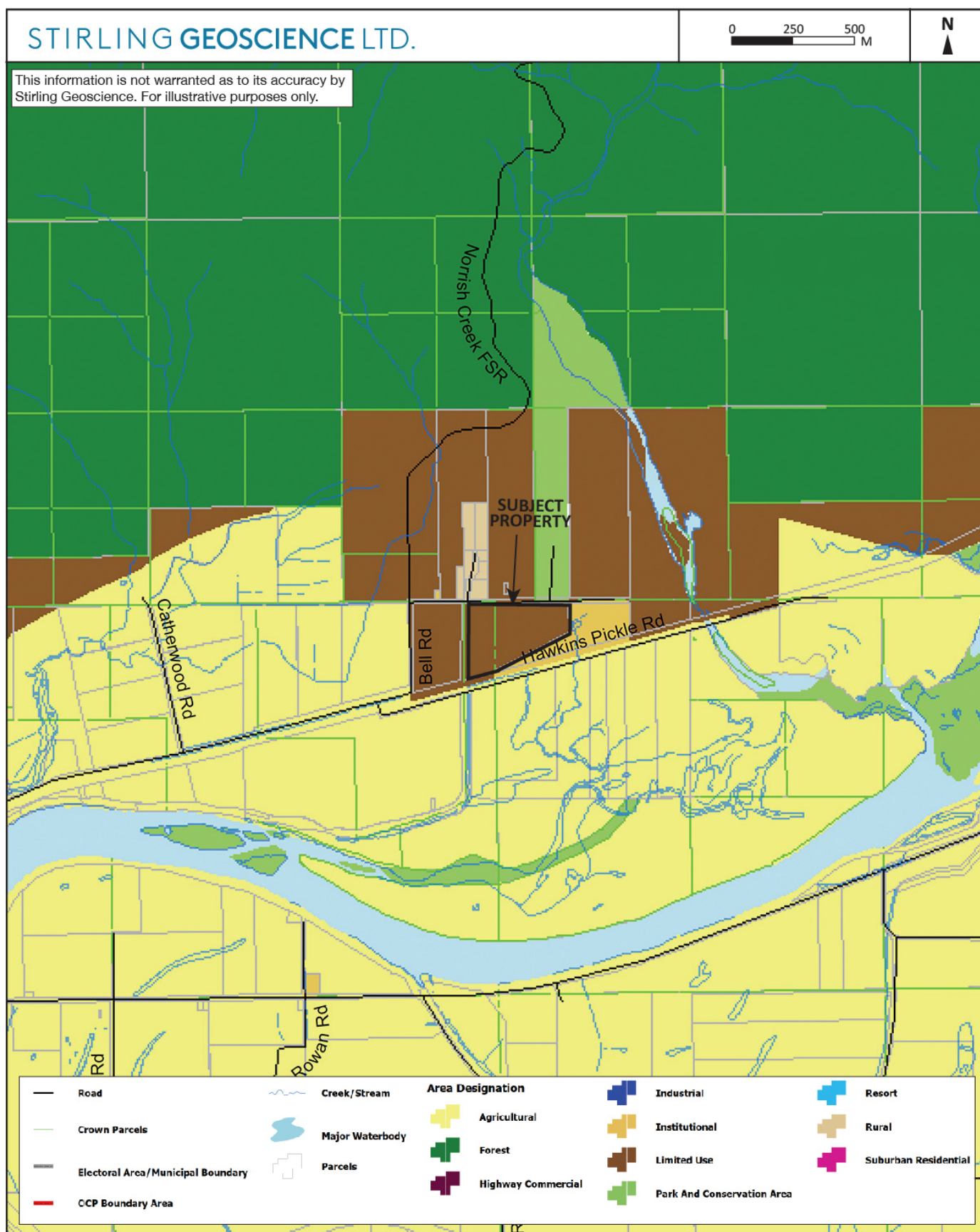


Figure 8: Area Designations in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Schedule 2).

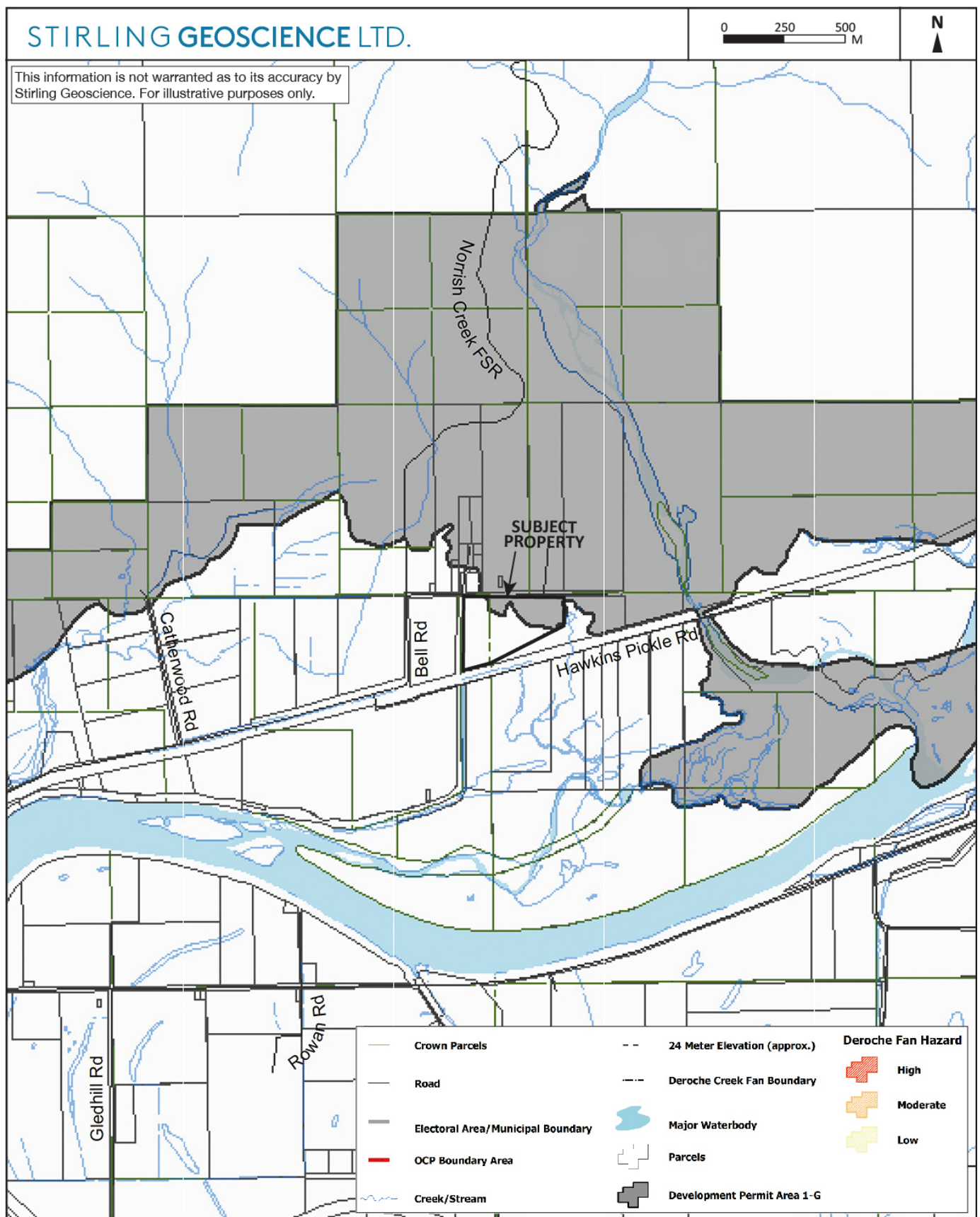


Figure 9: Development Permit Area 1-G in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Schedule 4).

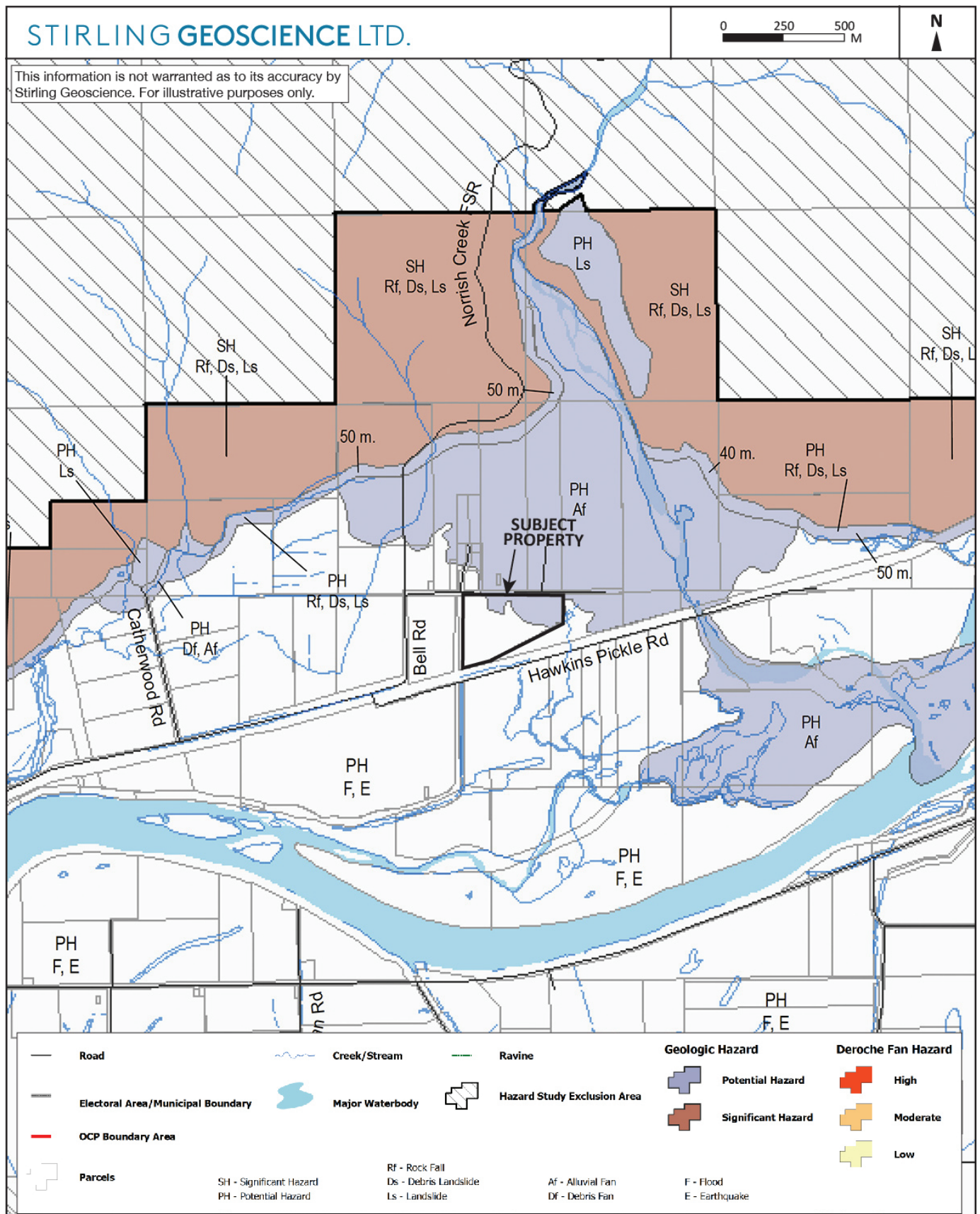


Figure 10: Geologic and stream hazards in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Map 8).

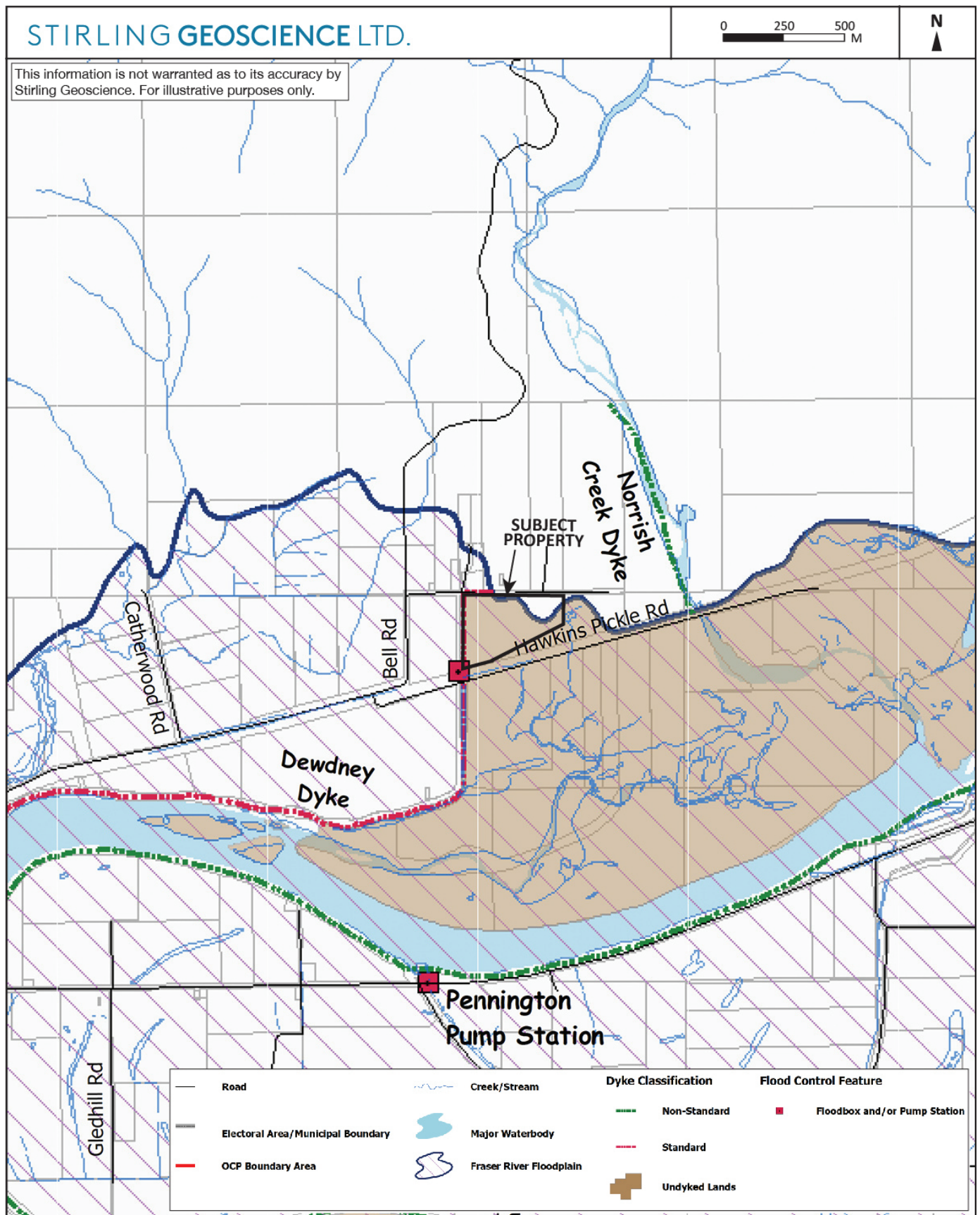


Figure 11: Fraser River floodplain and flood protection infrastructure in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Map 2).

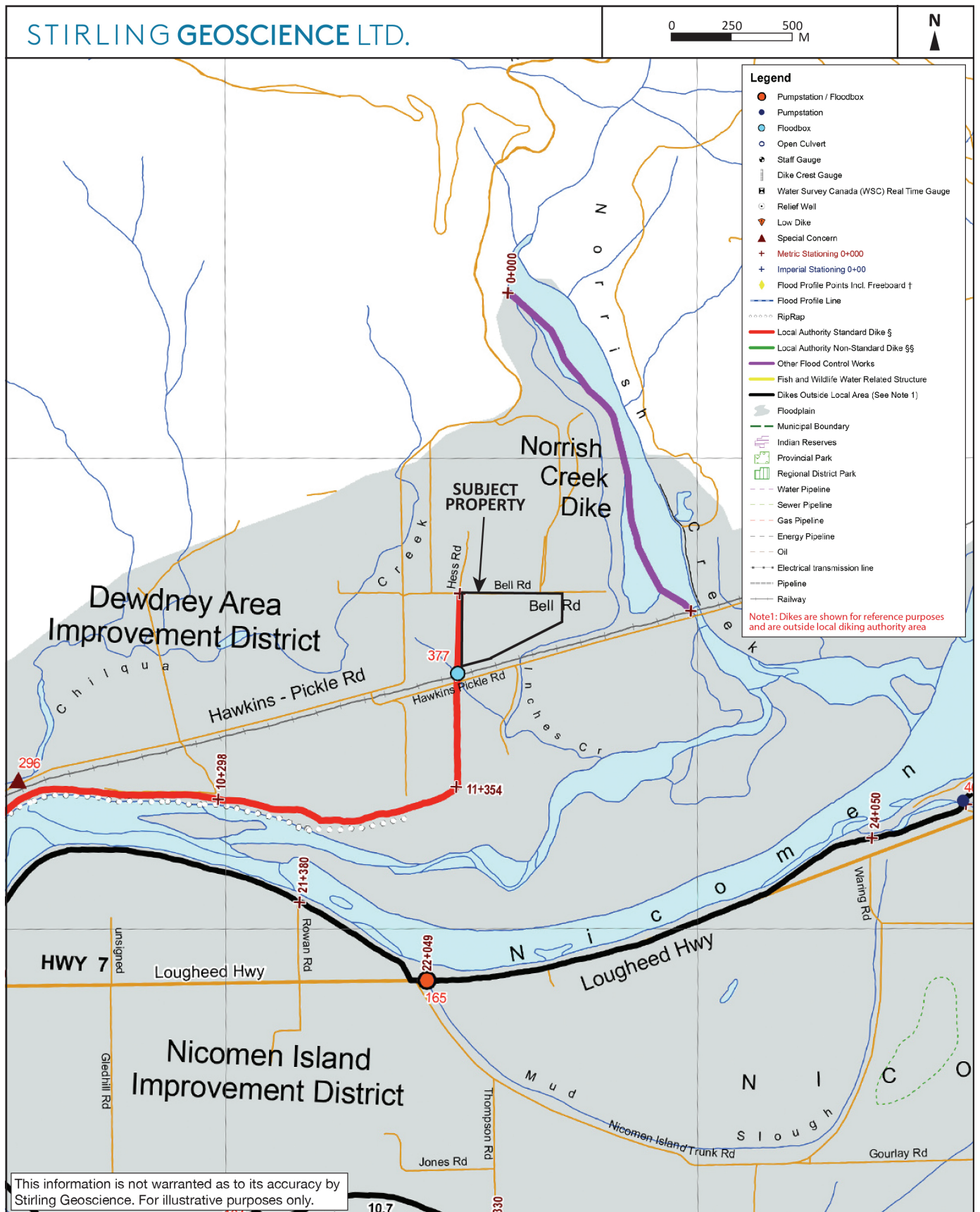


Figure 12: Provincial dike map in proximity to the Subject Property (Basemap source: Province of BC Lower Mainland Dike Inventory Maps, map dewdney_norrish_24, October 26, 2009).

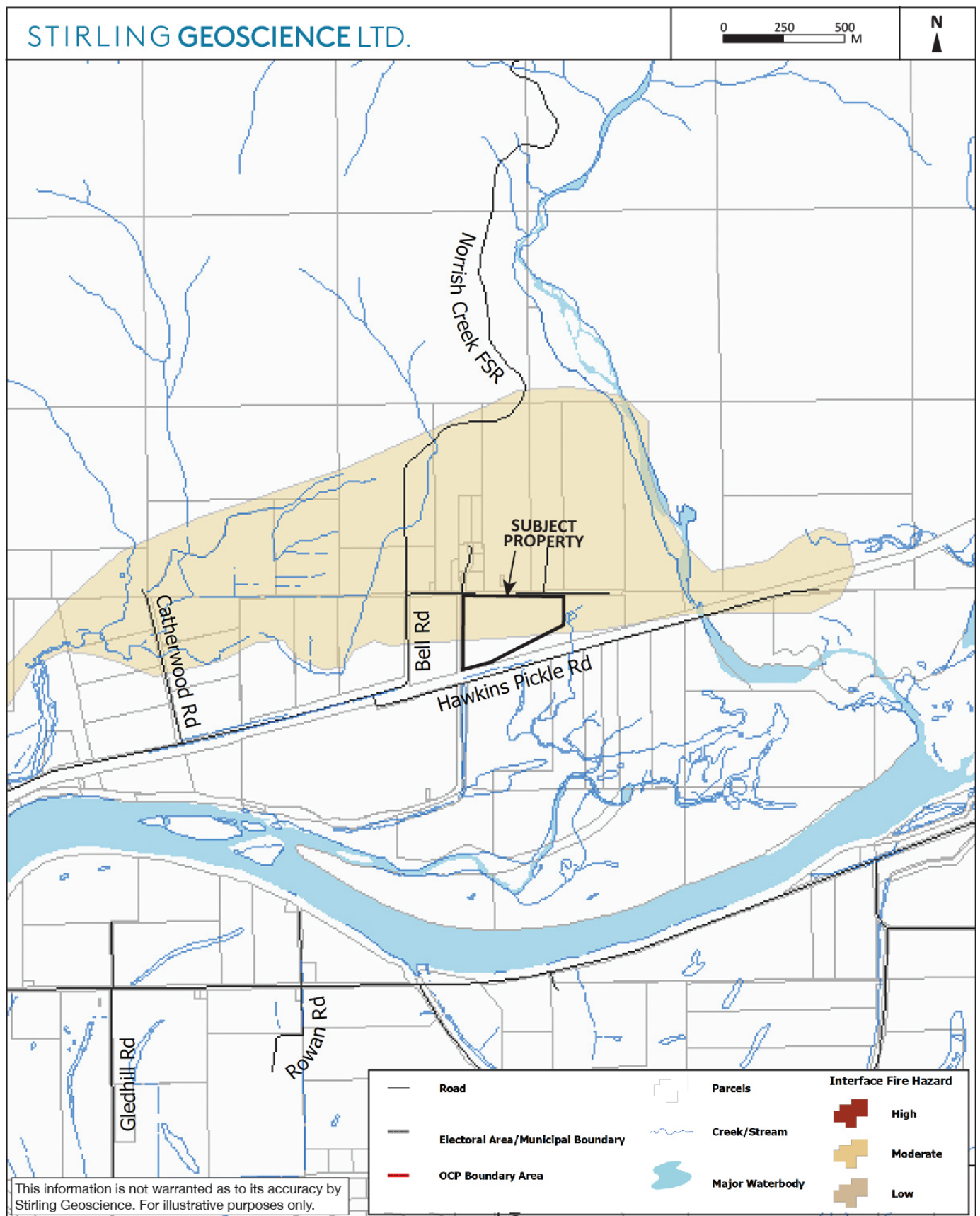


Figure 13: Interface fire hazards in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Map 9).

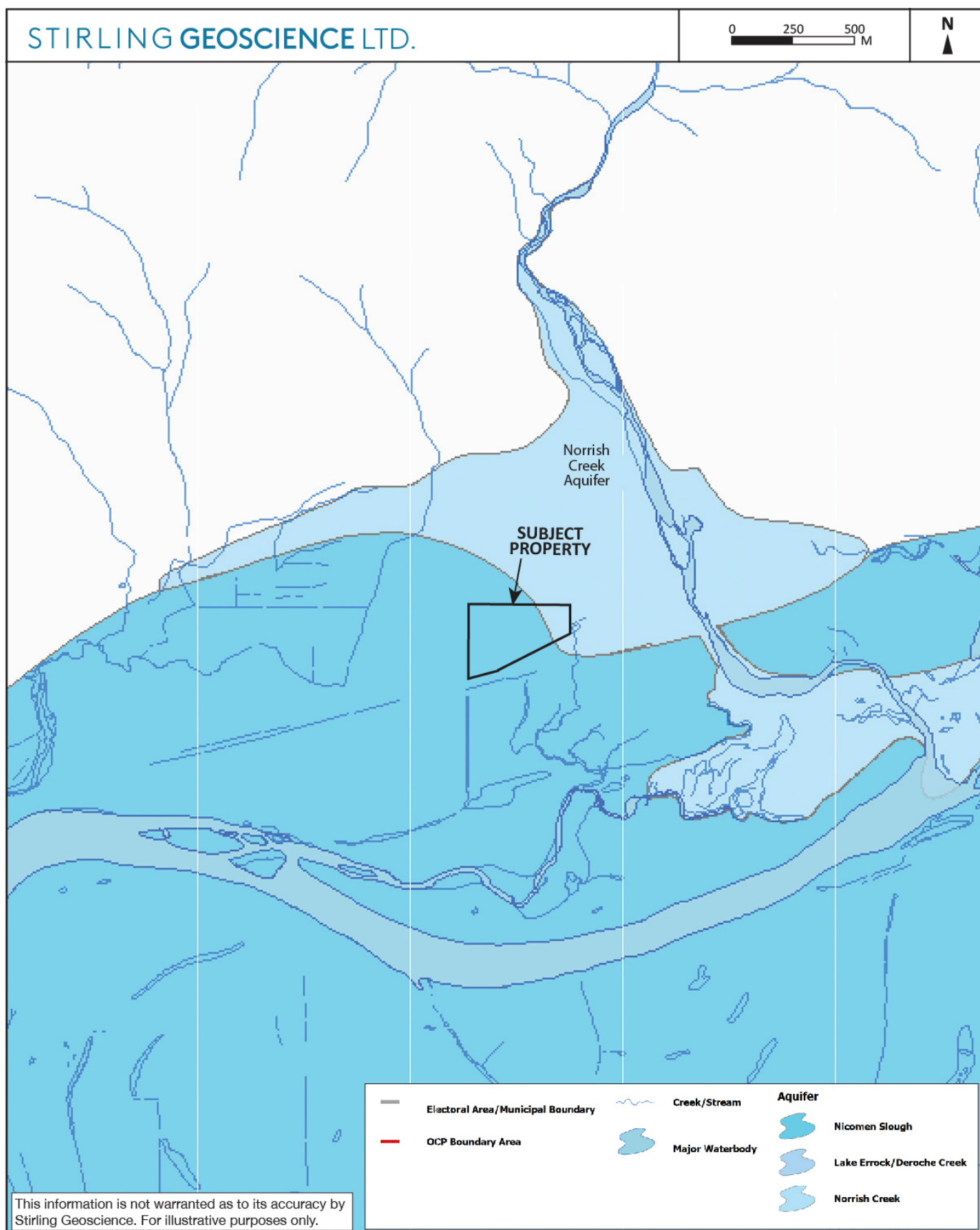


Figure 14: Aquifers in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Map 11).

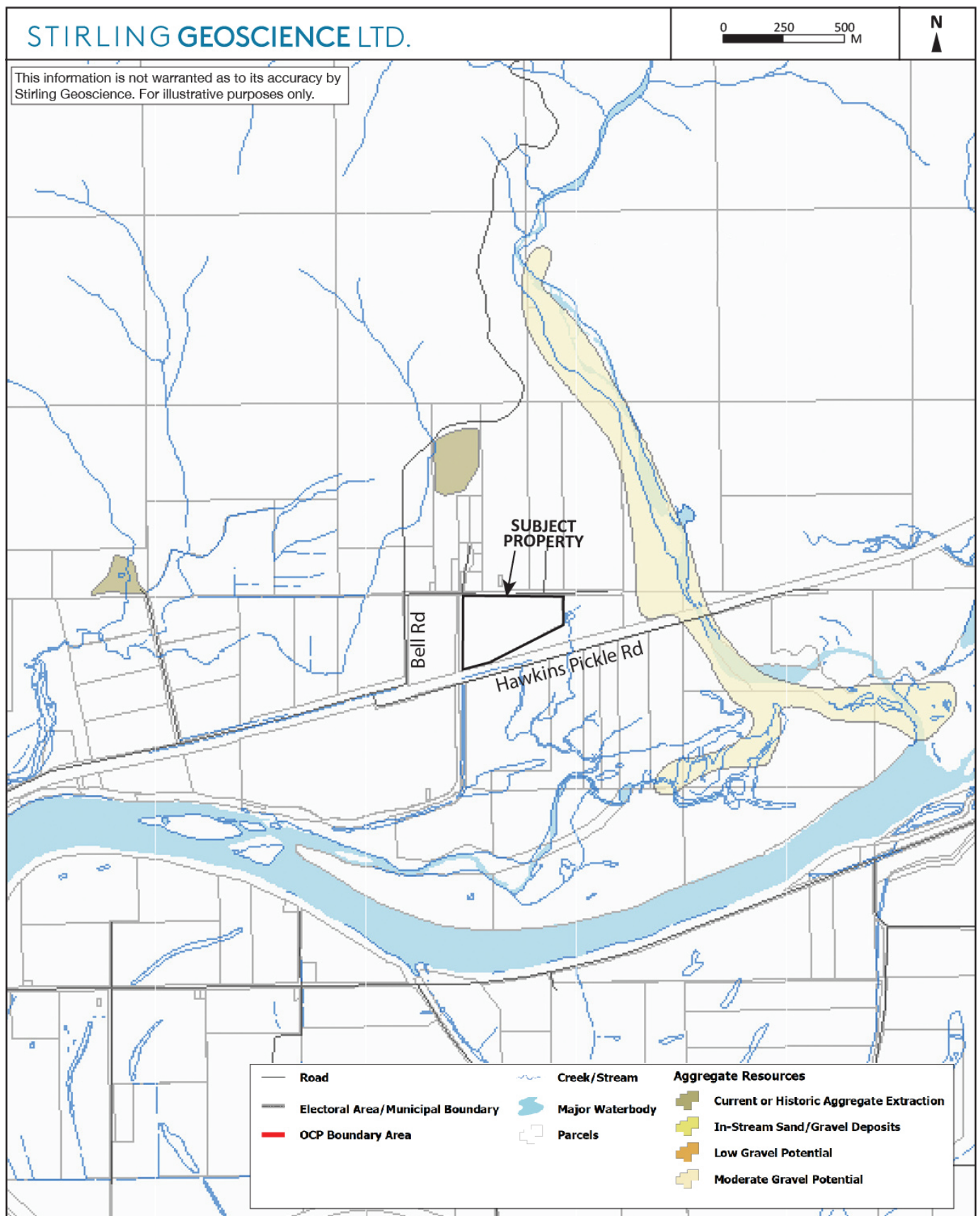


Figure 15: Sand and gravel deposits in proximity to the Subject Property (Basemap source: FVRD OCP for Electoral Area G, Bylaw No. 0866, 2008, Map 12).

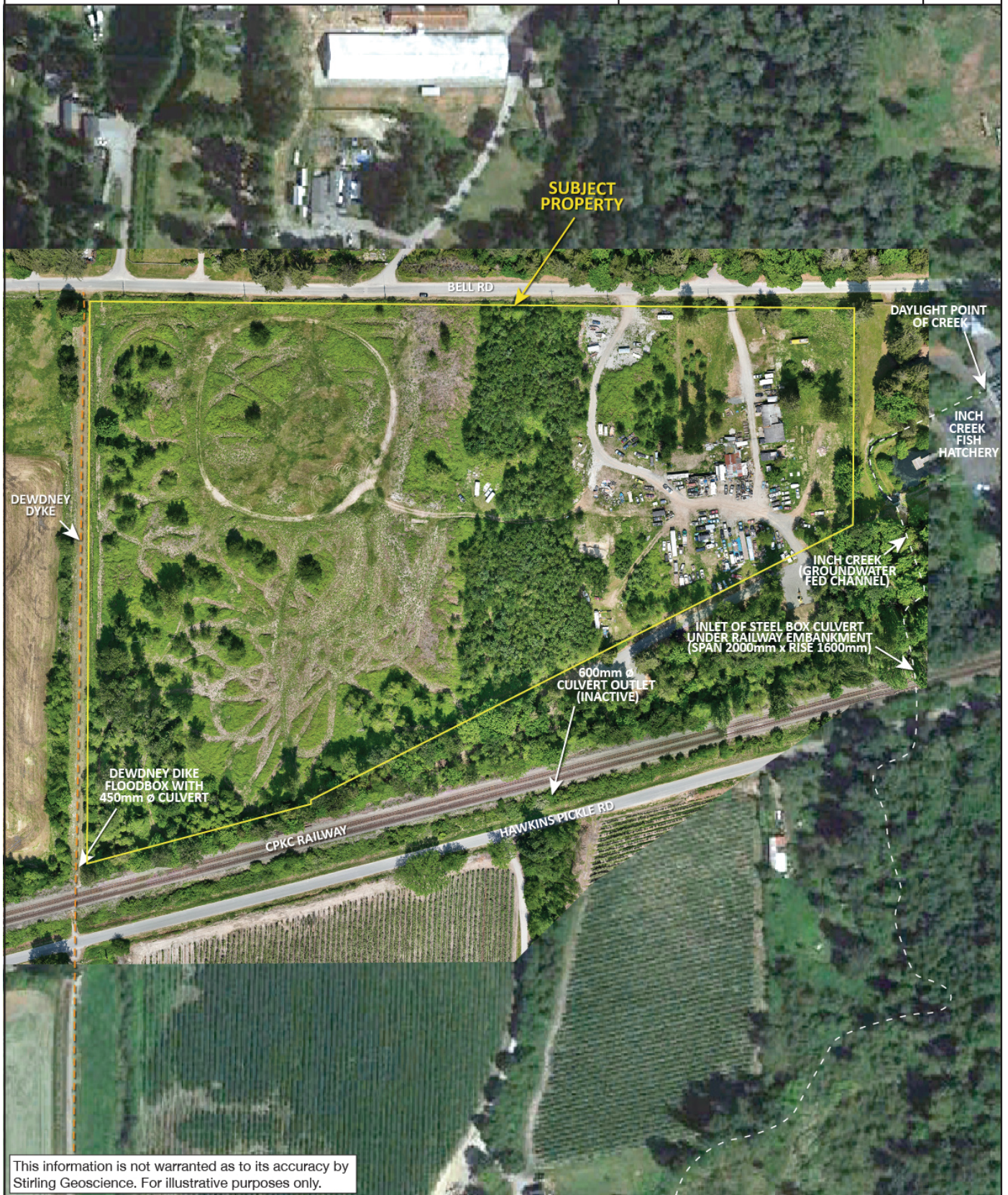
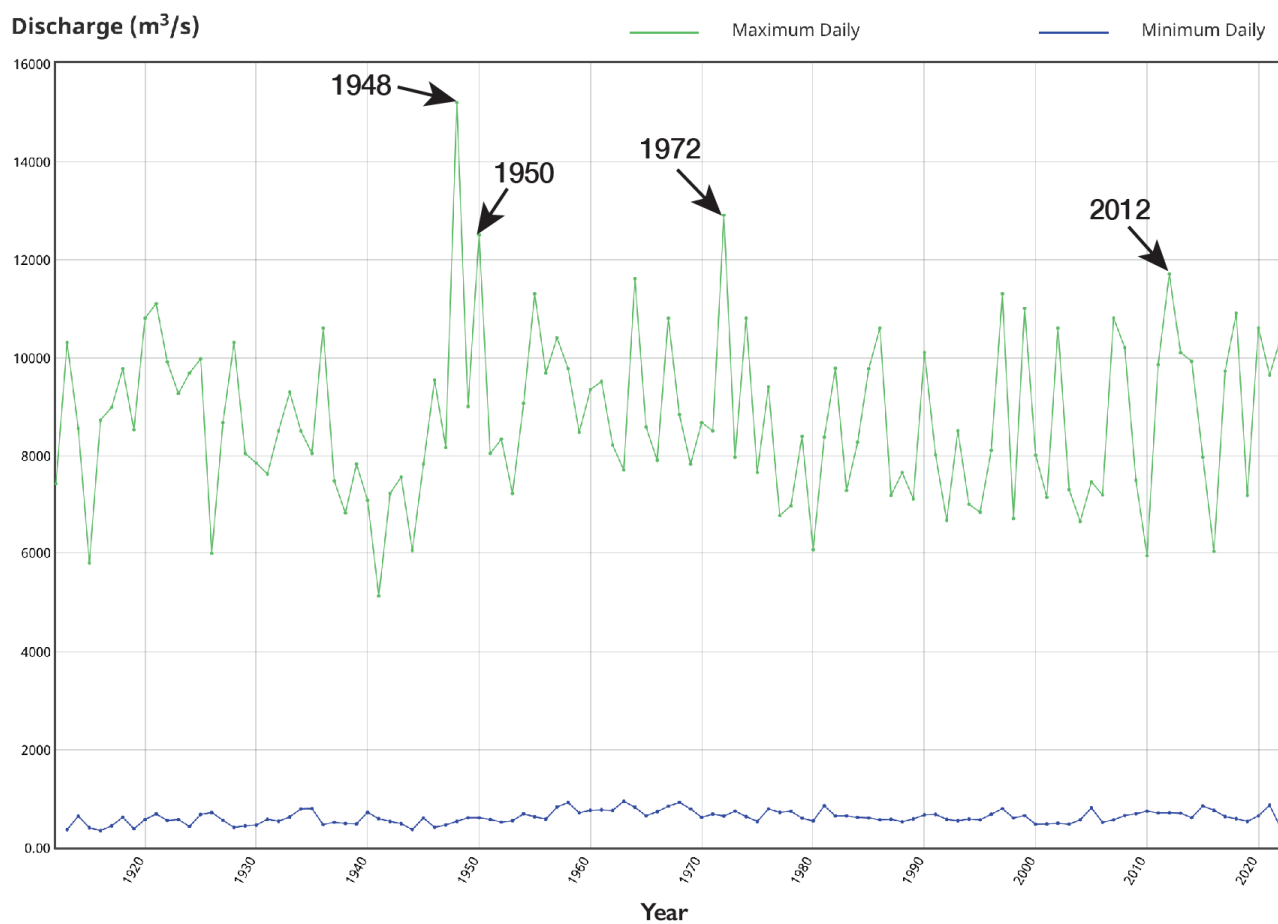


Figure 16: Drone image of the Subject Property from May 17, 2023 (Drone image from SGL and surrounding imagery from Google Earth July 29, 2022).



Figure 17: Drone image of the Subject Property from February 4, 2024 (Drone image from SGL and surrounding imagery from Google Earth July 29, 2022).

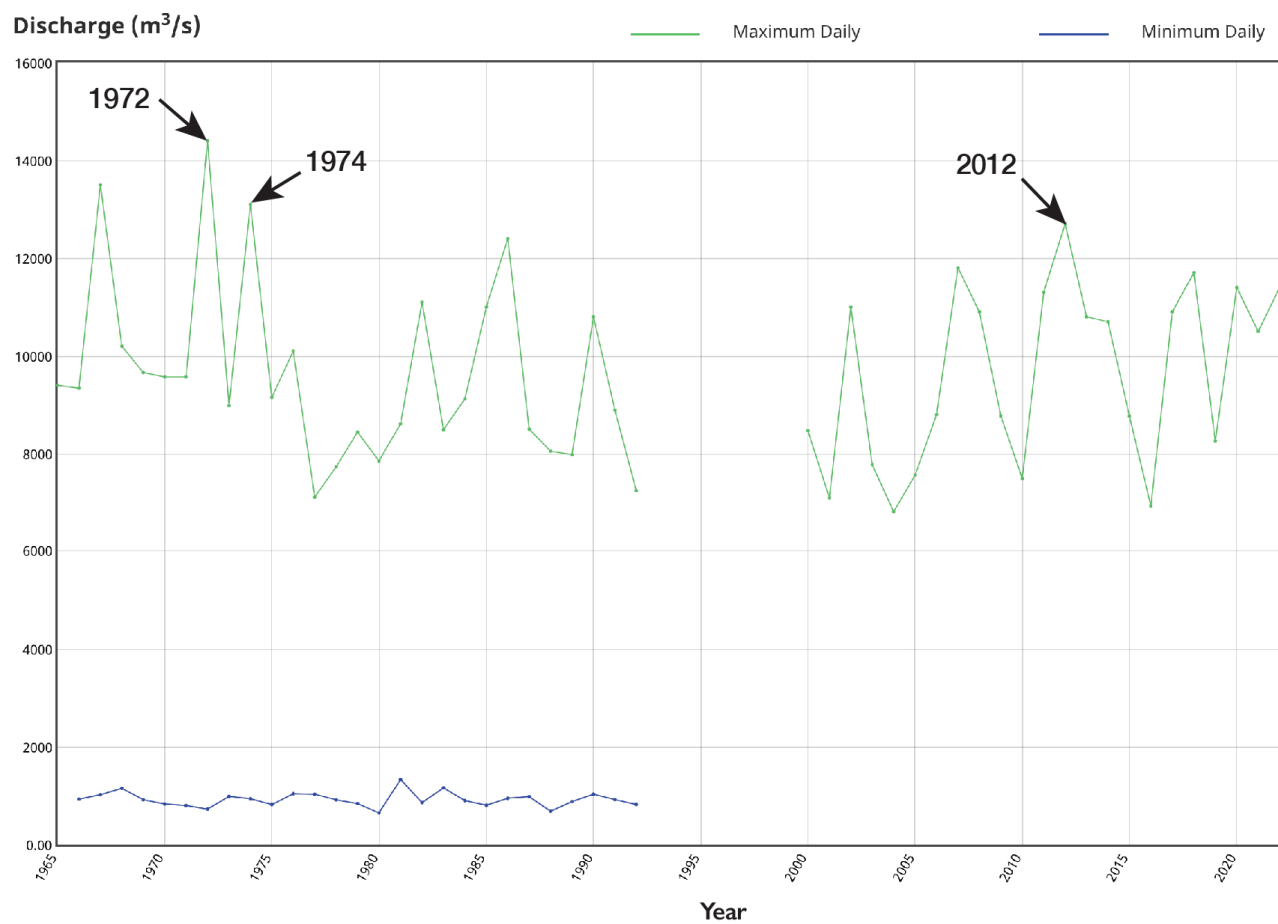
STIRLING GEOSCIENCE LTD.



This information is not warranted as to its accuracy by Stirling Geoscience. For illustrative purposes only.

Figure 18: Fraser River at Hope (Station 08MF005) annual maximum daily floods from 1912 to 2022 (Source: Water Survey of Canada, April 16, 2024).

STIRLING GEOSCIENCE LTD.



This information is not warranted as to its accuracy by Stirling Geoscience. For illustrative purposes only.

Figure 19: Fraser River at Mission (Station 08MH024) annual maximum daily floods from 1965 to 2022 (Source: Water Survey of Canada, April 16, 2024).

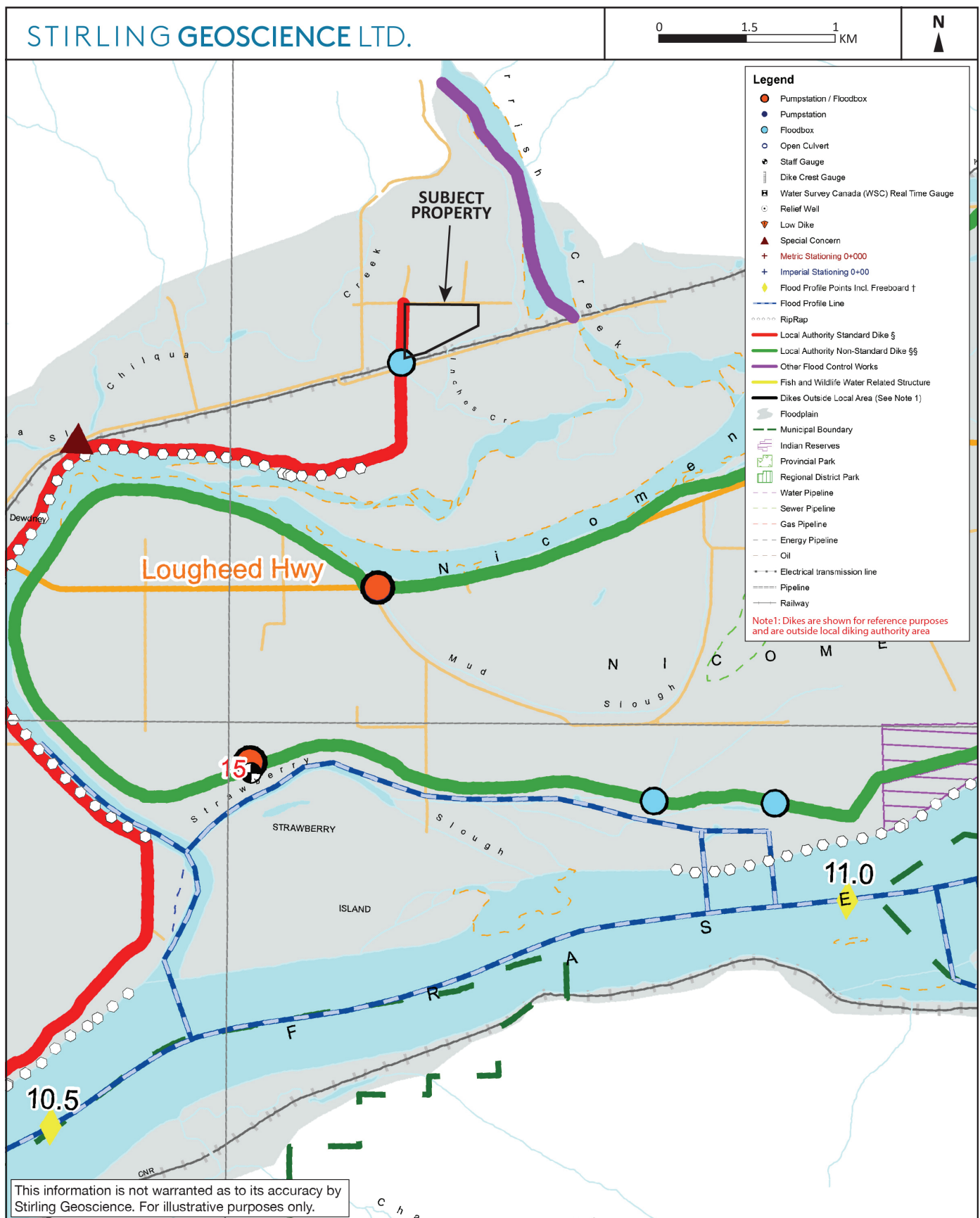


Figure 20: Provincial floodplain and dike mapping in proximity to the Site (Basemap source: Ministry of Forests, Lands and Natural Resource Operations, South Coast Region, June 1, 2011).

**FIELD ASSESSMENT PHOTOGRAPHS FROM DECEMBER 15, 2023, AND
JANAURY 23, 2024**



Photo 1: December 15, 2023. Looking east along Bell Road from the northwest corner of the Subject Property.



Photo 2: December 15, 2023. Looking south along the Dewdney Dike from the northwest corner of the Subject Property.



Photo 3: December 15, 2023. Looking southeast across the Site from the northwest corner of the Subject Property.



Photo 4: December 15, 2023. Looking north along the Dewdney Dike from the southwest corner of the Subject Property.



Photo 5: December 15, 2023. Looking northeast across the Site from the southwest corner of the Subject Property.



Photo 6: December 15, 2023. Looking northwest across the Site from the middle of the southern property boundary.



Photo 7: December 15, 2023. Looking northeast across the Site from the middle of the southern property boundary.



Photo 8: December 15, 2023. Looking west at the Site from the southeast corner of the Subject Property.



Photo 9: December 15, 2023. Looking north at the Subject Property from the southeast corner of the Site.



Photo 10: December 15, 2023. Looking south (downstream) on Inch Creek from the DFO Inch Creek fish hatchery bridge adjacent to the southeast corner of the Site.



Photo 11: December 15, 2023. Looking north (upstream) on Inch Creek and the fish hatchery from adjacent to the southeast corner of the Site.



Photo 12: January 23, 2024. Looking west along Bell Road from near the middle of the Subject Property.



Photo 13: January 23, 2024. Looking south across the Site from Bell Road from near the middle of the Subject Property.



Photo 14: January 23, 2024. Looking east along Bell Road from near the middle of the Subject Property.



Photo 15: January 23, 2024. Looking south from Bell Road at the driveway accessing the house located on the eastern portion of the Subject Property.



Photo 16: January 23, 2024. Looking south across the Site from Bell Road near the middle of the Subject Property.



Photo 17: January 23, 2024. Looking at the inlet of the 450 mm diameter concrete culvert as part of the Dewdney Dike floodbox. The inlet is at El. 6.35 m and is adjacent to the southwest corner of the Subject Property which is the lowest point on the Site.



Photo 18: January 23, 2024. Looking northeast from the floodbox culvert inlet adjacent to the southwest corner of the Subject Property which is the lowest area on the Site.



Photo 19: December 15, 2023. Looking at the floodbox manhole cover and wheel on the Dewdney Dike adjacent to the southwest corner of the Subject Property.



Photo 20: December 15, 2023. Looking at the outlet of the 450 mm diameter concrete culvert as part of the Dewdney Dike floodbox. The outlet is on the west side of the dike.



Photo 21: March 28, 2018. Looking downstream on Inch Creek at the inlet of the steel box culvert under the CP Railway. The culvert has a span of 2000 mm and a rise of 1600 mm (SGL 2018).



Photo 22: January 23, 2024. Looking at the outlet of the 600 mm concrete culvert located under the CP Railway adjacent to the middle of the Subject Property. This culvert does not convey flow, there is no defined channel, and the inlet is buried and could not be located.



Photo 23: January 23, 2024. Looking north (upstream) on Norrish Creek at the Railway bridge from the Hawkins Pickle Road bridge.



Photo 24: January 23, 2024. Looking north (upstream) on Norrish Creek at the armoured right bank river dike just upstream of the CP Railway.



Photo 25: January 23, 2024. Looking north (upstream) on Norrish Creek at the armoured right bank setback dike approximately 150 m upstream of the CP Railway.



Photo 26: January 23, 2024. Looking north (upstream) on Norrish Creek at the armoured right bank setback dike approximately 800 m upstream of the CP Railway.



Photo 27: January 23, 2024. Looking south (downstream) on Norrish Creek at the upstream end of the armoured right bank river dike near the fan apex.



Photo 28: January 23, 2024. Looking south at the top of the bank adjacent to the eroding right bank near the fan apex of the Norrish Creek fan.



Photo 29: January 23, 2024. Looking north (upstream) on Norrish Creek at the eroding right bank upstream of the dike near the fan apex.



Photo 30: January 23, 2024. Looking south (downstream) on Norrish Creek at the eroding right bank upstream of the dike near the fan apex. The upstream end of the armoured river dike is in the background.

APPENDIX A

FVRD Development Permit (DP) Schedule A-4 Application for the Proposed Development at 38482 Bell Road



SCHEDULE A-4

Permit Application

I / We hereby apply under Part 14 of the *Local Government Act* for a:

- ☐ Development Variance Permit
- ☐ Temporary Use Permit
- ☒ Development Permit

An Application Fee in the amount of \$ ³⁸⁰ as stipulated in FVRD Application Fees Bylaw No. 1560, 2019 must be paid upon submission of this application.

Civic Address 38482 Bell Road, Deroche, BC PID 009-064-885

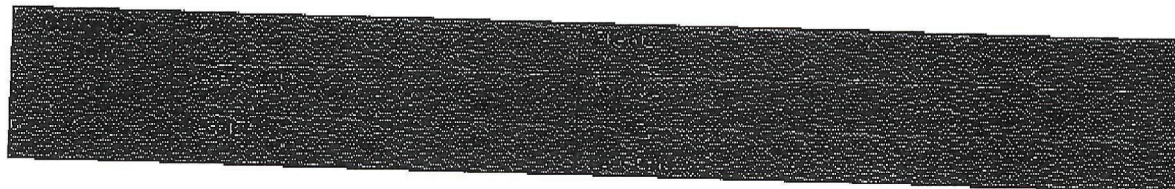
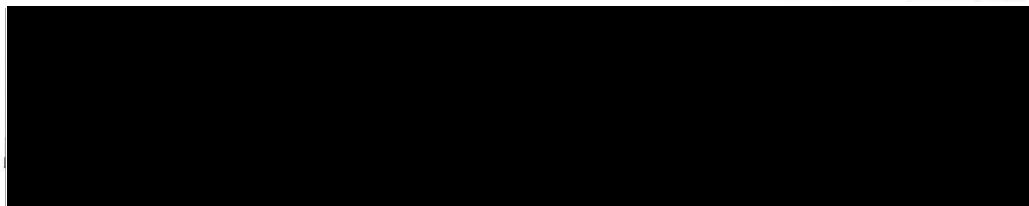
Legal Description Lot 4 Block _____ Section 33 Township 20 Range LD36 Plan NWP29269

The property described above is the subject of this application and is referred to herein as the 'subject property.' This application is made with my full knowledge and consent. I declare that the information submitted in support of the application is true and correct in all respects.

Owner's
Declaration

Name of Owner (print) Wladyslaw Wojcik	Signature of Owner <i>W. Wojcik</i>	Date <i>Feb 3, 2025</i>
Name of Owner (print)	Signature of Owner	Date

Owner's
Contact
Information



Agent

Jamie Stirling of Stirling Geoscience Ltd.

I hereby give permission to _____ to act as my/our agent in all matters relating to this application.

Only complete this section if the applicant is NOT the owner.

Signature of Owner	Date
Signature of Owner	Date

Agent's contact information and declaration

Name of Agent Jamie Stirling, M.Sc., P.Geo.		Company Stirling Geoscience Ltd.
Address [REDACTED]		City [REDACTED]
Email jamie@stirlinggeoscience.com		Postal Code [REDACTED]
Phone 604-349-7709	Cell	Fax

I declare that the information submitted in support of this application is true and correct in all respects.

Signature of Agent 	Date February 3 2025
---	-------------------------

Development Details

Property Size 24.4 acres Present Zoning R-4

Existing Use Rural residential (there is a single family dwelling on the eastern portion of the Site)

Proposed Development Add up to 4 m of fill to a portion of the Site

Proposed Variation / Supplement There are no proposed zoning changes associated
with the proposed development of the Site.

No buildings or structures are proposed at this time therefore a site-specific exemption is not required.

(use separate sheet if necessary)

Reasons in Support of Application The property owner wishes to raise the finished ground elevation of a portion of the property
to protect the site from flood hazards.

**Riparian
Areas
Regulation**

Please indicate whether the development proposal involves residential, commercial, or including vegetation removal or alteration; soil disturbance; construction of buildings and structures; creation of impervious or semi-pervious surfaces; trails, roads, docks, wharves, bridges and, infrastructure and works of any kind – within:

yes
☐

no
☒

30 metres of the high water mark of any water body

yes
☐

no
☒

a ravine or within 30 metres of the top of a ravine bank

“Water body” includes; 1) a watercourse, whether it usually contains water or not; 2) a pond, lake, river, creek, or brook; 3) a ditch, spring, or wetland that is connected by surface flow to 1 or 2 above.

Under the *Riparian Areas Regulation* and the *Fish Protection Act*, a riparian area assessment report may be required before this application can be approved.

**Contaminated
Sites Profile**

Pursuant to the *Environmental Management Act*, an applicant is required to submit a completed “Site Profile” for properties that are or were used for purposes indicated in Schedule 2 of the *Contaminated Sites Regulations*. Please indicate if:

yes
☐

no
☒

the property has been used for commercial or industrial purposes.

If you responded ‘yes,’ you may be required to submit a Site Profile. Please contact FVRD Planning or the Ministry of Environment for further information.

**Archaeological
Resources**

Are there archaeological sites or resources on the subject property?

yes
☐

no
☒

I don't know
☐

If you responded ‘yes’ or ‘I don’t know’ you may be advised to contact the Archaeology Branch of the Ministry of Tourism, Sport and the Arts for further information.

Required Information

When providing Application Forms to the applicant, Regional District staff shall indicate which of the following attachments are required for this application. **Additional information may also be required at a later date.**

	Required	Received	Details
Location Map			Showing the parcel (s) to which this application pertains and uses on adjacent parcels
Site Plan At a scale of: 1:_____			Reduced sets of metric plans
			North arrow and scale
			Dimensions of property lines, rights-of-ways, easements
			Location and dimensions of existing buildings & setbacks to lot lines, rights-of-ways, easements
			Location and dimensions of proposed buildings & setbacks to lot lines, rights-of-ways, easements
			Location of all water features, including streams, wetlands, ponds, ditches, lakes on or adjacent to the property
			Location of all existing & proposed water lines, wells, septic fields, sanitary sewer & storm drain, including sizes
			Location, numbering & dimensions of all vehicle and bicycle parking, disabled persons' parking, vehicle stops & loading
			Natural & finished grades of site, at buildings & retaining walls
			Location of existing & proposed access, pathways
			Above ground services, equipment and exterior lighting details
			Location & dimensions of free-standing signs
			Storm water management infrastructure and impermeable surfaces
			Other:
Floor Plans			Uses of spaces & building dimensions
			Other:
Landscape Plan Same scale as site plan			Location, quantity, size & species of existing & proposed plants, trees & turf
			Contour information (_____ metre contour intervals)
			Major topographical features (water course, rocks, etc.)
			All screening, paving, retaining walls & other details
			Traffic circulation (pedestrian, automobile, etc.)
			Other:
Reports			Geotechnical Report
			Environmental Assessment
			Archaeological Assessment
			Other:
Title Search			Provide one for each property included in an application, and dated within 30 days of submission. Obtain a title search through LTSa.ca

The personal information on this form is being collected in accordance with Section 26 of the *Freedom of Information and Protection of Privacy Act, RSBC 1996 Ch. 165* and the *Local Government Act, RSBC 2015 Ch. 1*. It will only be collected, used and disclosed for the purpose of administering matters with respect to planning, land use management and related services delivered, or proposed to be delivered, by the FVRD. Questions about the use of personal information and the protection of privacy may be directed to the FVRD Privacy Officer at 45950 Cheam Avenue, Chilliwack, BC V2P 1N6, Tel: 1-800-528-0061 FOI@fvrld.ca.

APPENDIX B

Title Search for 38482 Bell Road, acquired January 6, 2025

TITLE SEARCH PRINT

File Reference:

Declared Value \$800400

2025-01-06, 18:33:06

Requestor: Peter Wojcik

****CURRENT AND CANCELLED INFORMATION SHOWN******Land Title District**

Land Title Office

NEW WESTMINSTER

NEW WESTMINSTER

Title Number

From Title Number

CA7944760

CA6333066

Application Received

2019-12-20

Application Entered

2020-01-08

Registered Owner in Fee Simple

Registered Owner/Mailing Address:

WLADYSLAW WOJCIK, [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]**Taxation Authority**

New Westminster Assessment District

Description of Land

Parcel Identifier:

009-064-885

Legal Description:

LOT 4 EXCEPT: PARCEL "A" (REFERENCE PLAN 53267); SECTION 33 AND OF THE
NORTH WEST QUARTER OF SECTION 34 TOWNSHIP 20 NEW WESTMINSTER DISTRICT
PLAN 29269**Legal Notations**

NONE

Charges, Liens and Interests

Nature:

STATUTORY RIGHT OF WAY

Registration Number:

BP243596

Registration Date and Time:

2000-10-11 14:56

Registered Owner:

DEWDNEY AREA IMPROVEMENT DISTRICT

Remarks:

PLAN LMP47649

Nature:

COVENANT

Registration Number:

CA7350915

Registration Date and Time:

2019-02-15 11:40

Registered Owner:

FRASER VALLEY REGIONAL DISTRICT

TITLE SEARCH PRINT

2025-01-06, 18:33:06

File Reference:

Requestor: Peter Wojcik

Declared Value \$800400

Nature:

OPTION TO PURCHASE

Registration Number:

CA7428898

Registration Date and Time:

2019-04-03 13:07

Registered Owner:

1155097 B.C. LTD.
INCORPORATION NO. BC01155097**Duplicate Indefeasible Title**

NONE OUTSTANDING

Transfers

NONE

Pending Applications

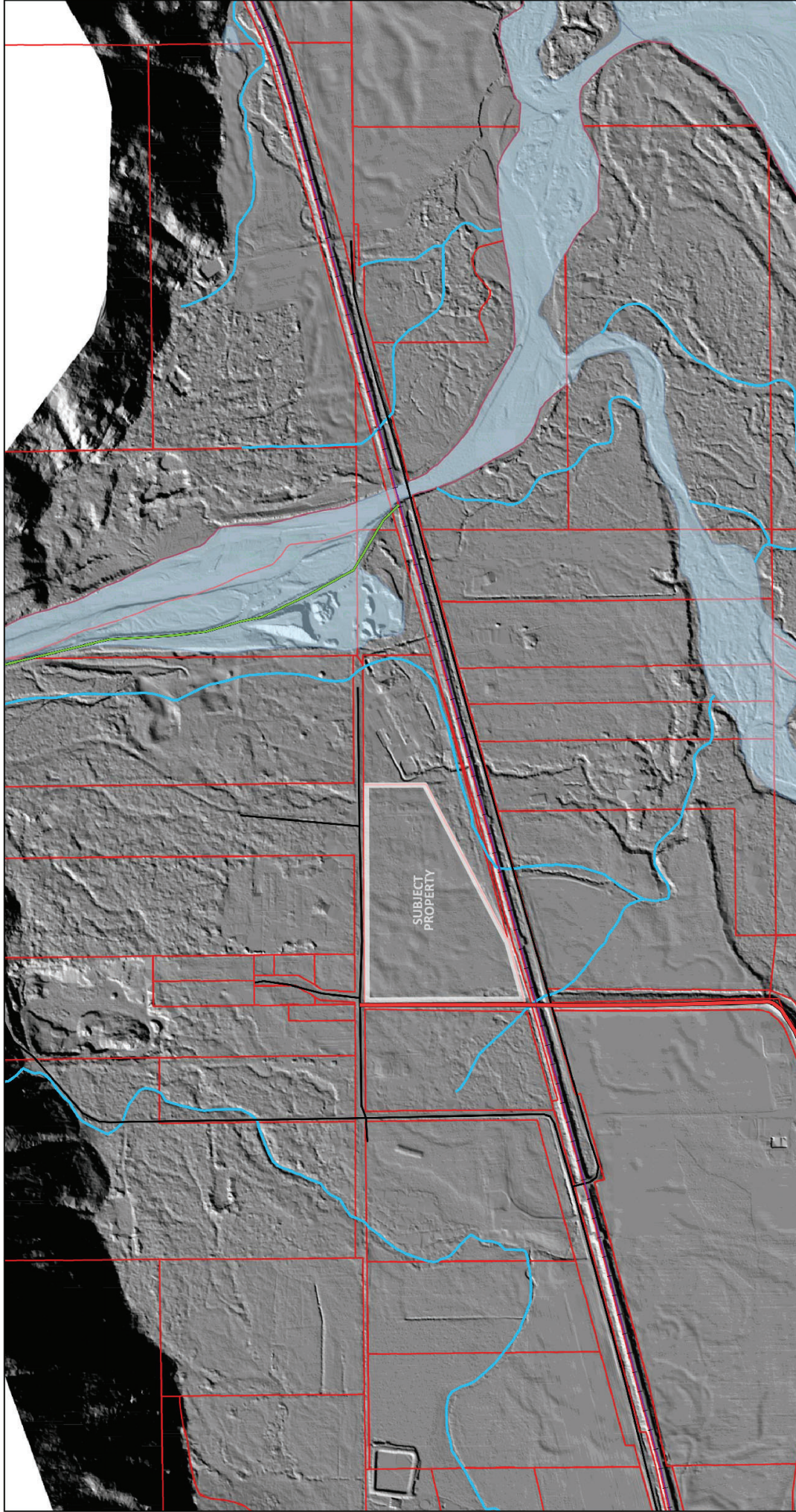
NONE

Corrections

NONE

APPENDIX C

LiDAR Images of the Norrish Creek Fan and Surrounding Area

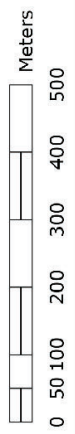


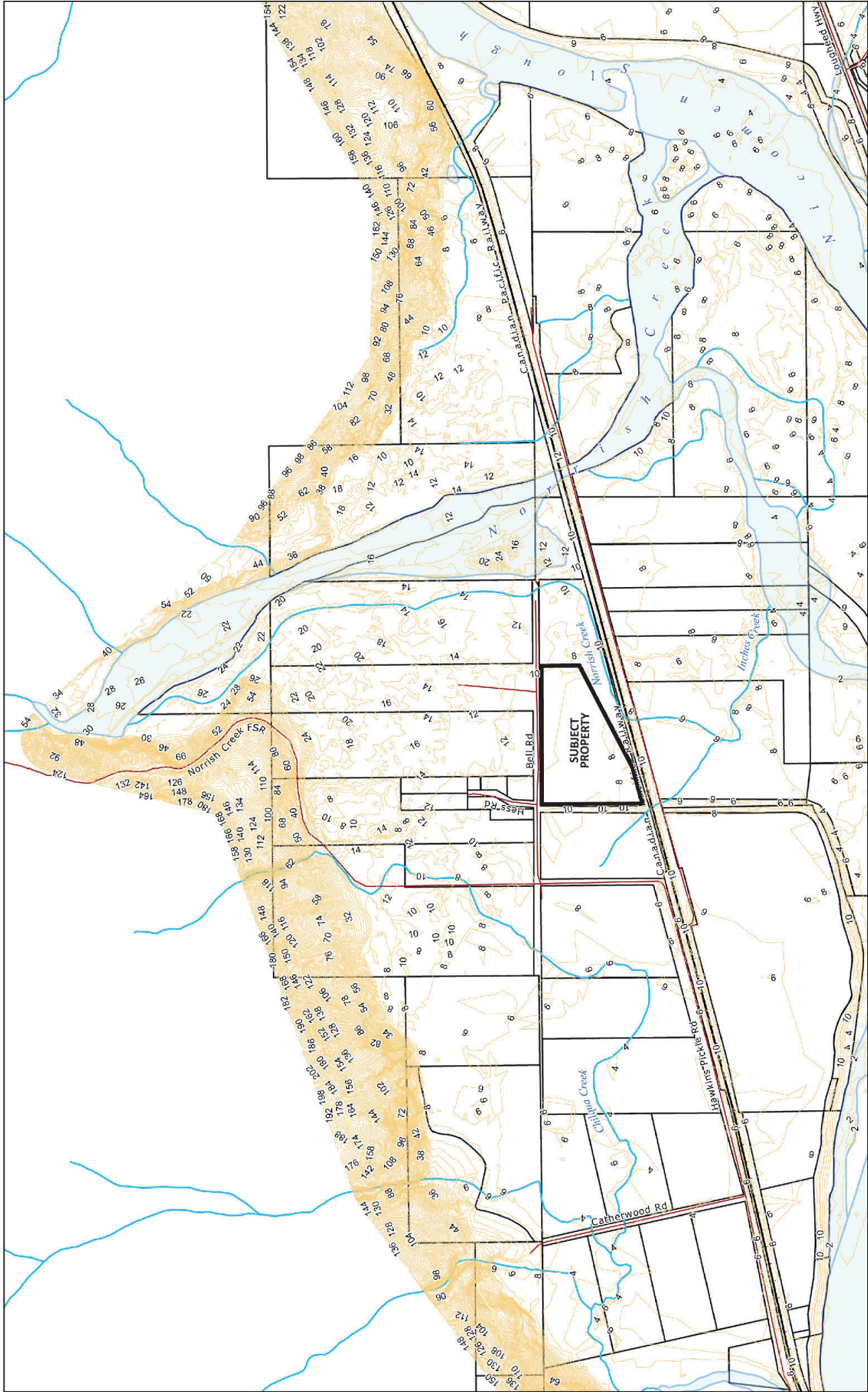
May 08, 2018

LiDAR & Contour Map 38482 Bell Rd

- Non Standard Dyke or Berm
- Streams
- Waterbodies
- Roads
- Railways
- Properties
- 2m Contours

Disclaimer: This map was compiled by the Fraser Valley Regional District, using data believed to be accurate; however, a margin of error is inherent in all maps. This product is distributed without warranties of any kind, either expressed or implied, including but not limited to warranties of suitability of particular purpose or use. This map utilizes an orthophoto captured in 2009 and provided by GeoBC.





2m. Contour Map

APPENDIX D

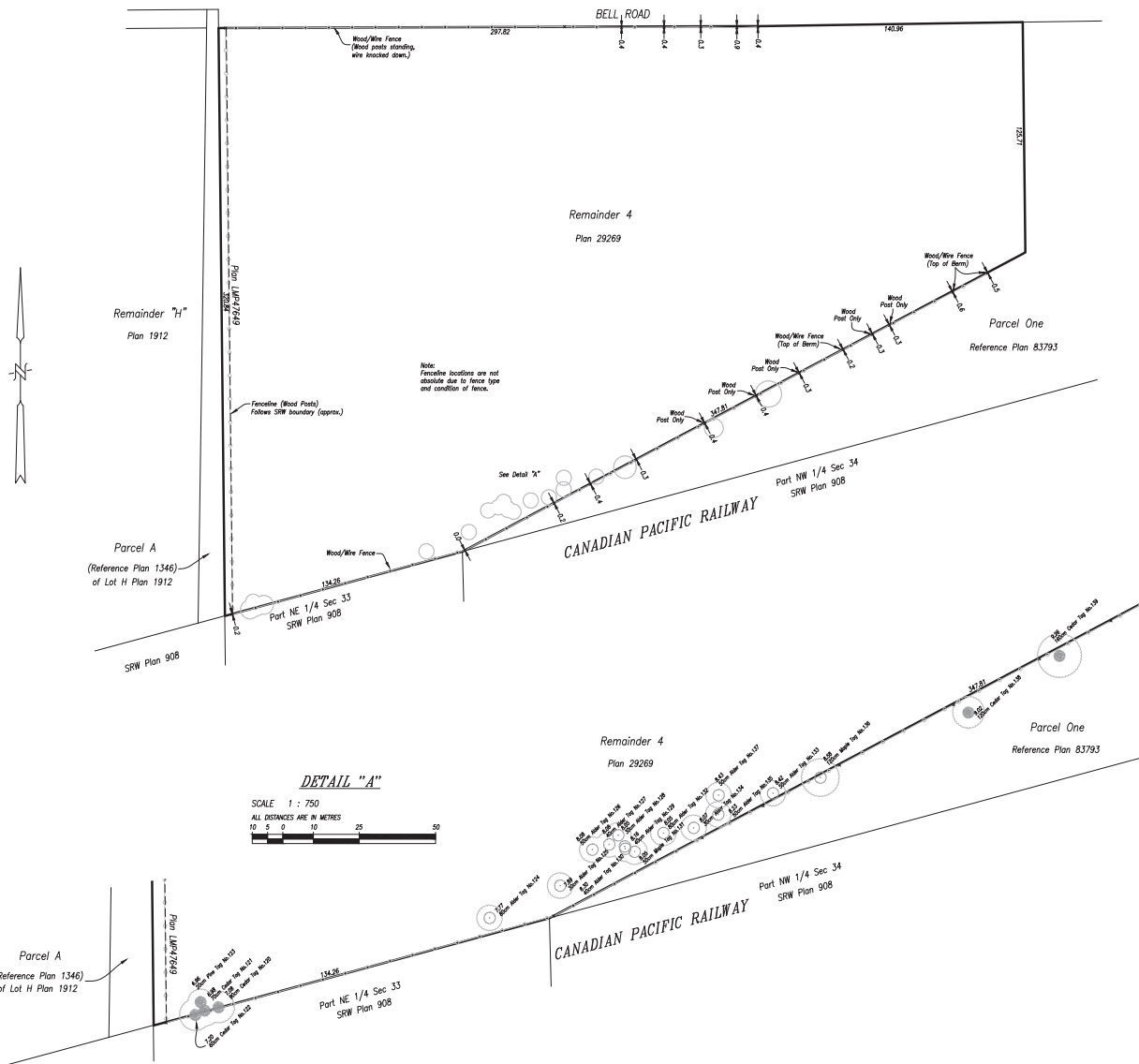
**Topographic Survey by Axis Land Surveying, March 29, 2018,
and
Property Boundary Fence and Southern Tree Survey by
Wade And Associates Land Surveying, October 10, 2024**

SKETCH OF SURVEY ON PART OF LOT 4
EXCEPT: PARCEL "A" (REFERENCE PLAN 53267);
SECTION 33 AND OF THE NORTH WEST QUARTER OF SECTION 34 TOWNSHIP 20
NEW WESTMINSTER DISTRICT
PLAN 29269

SCALE 1 : 1250

ALL DISTANCES ARE IN METRES
10 5 0 10 20 30

CIVIC ADDRESS: 38482 BELL ROAD, DEWONEY (FYRD)
PARCEL IDENTIFIER: 009-064-885



This document shows relative location of the surveyed structures and features with respect to the boundaries of the parcel described within this plan. This document shall not be used to define property lines or property corners.

Parcel boundary dimensions are derived from Plan 29269 & Reference Plan 53267 & field survey.

This plan is prepared for building permit purposes only and is exclusively for the use of the client.

Change(s) on file without reference to survey plans that may affect improvements:

02/25/2015: Consent

Legal notations(s) on title that may affect improvements:

N/A

Unregistered interests have not been included or considered.

Distances are in metres (Decimal).

Directions are derived from Whole Circle Bearing P1 No. 1637.

Direction = 8.68m.

Station = CG2028 (NAD2011).

SURVEYED:
OCTOBER 1 & 4, 2024
DATED THIS 9TH DAY OF OCTOBER, 2024

APPENDIX E

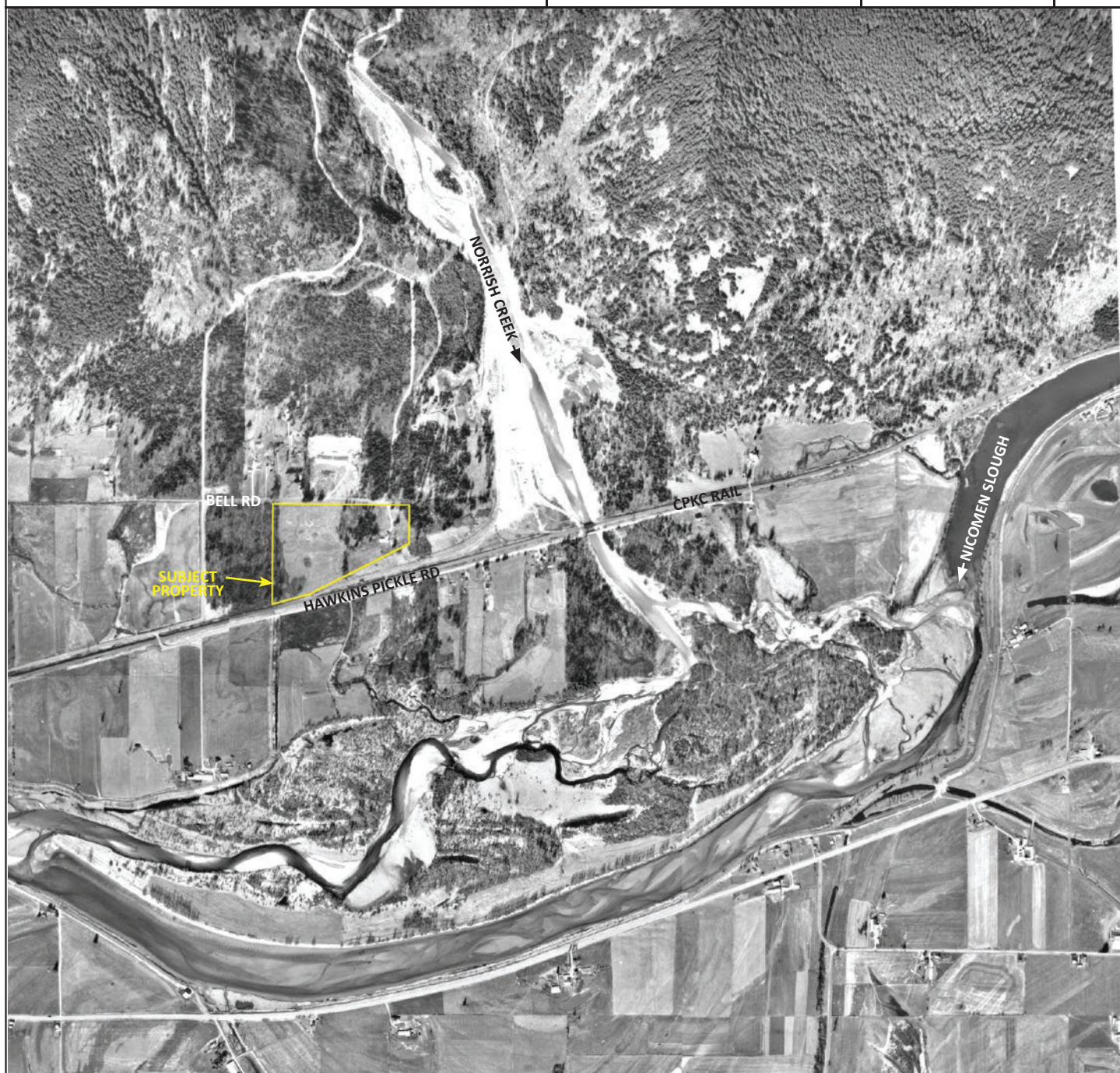
Historical Air Photos







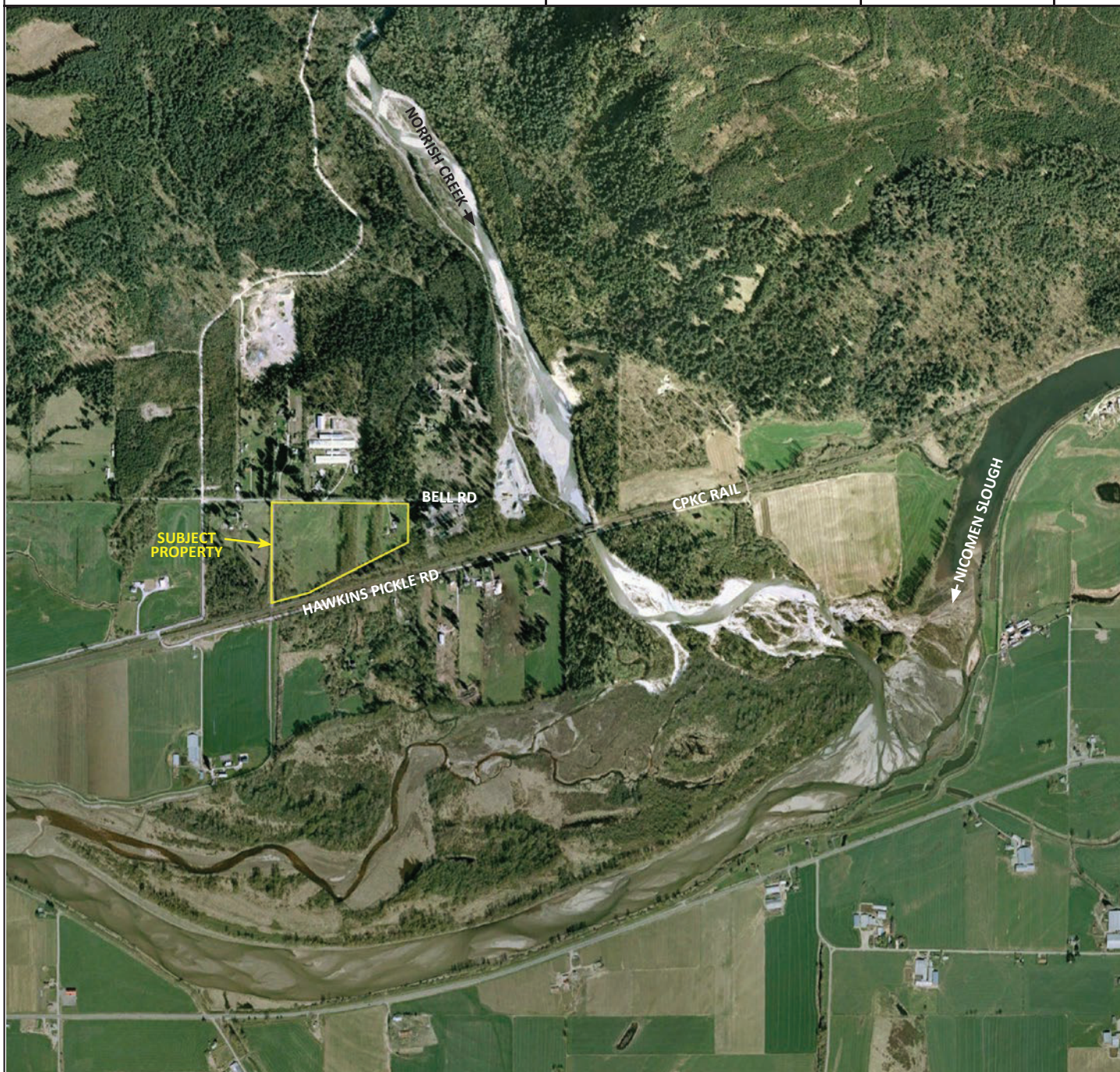


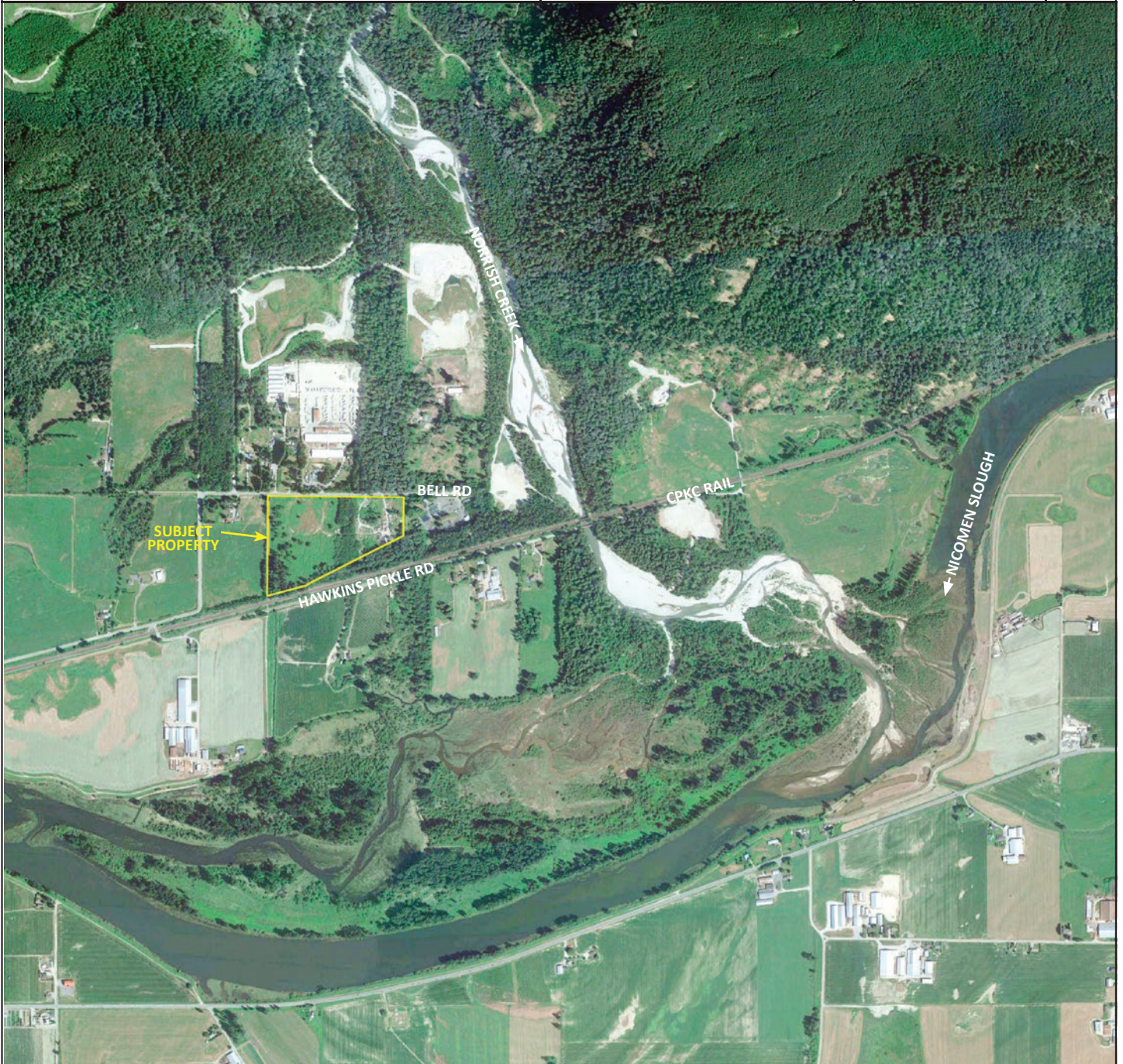












APPENDIX F

BC Archaeological Information Request Response for 38482 Bell Road

From: Arch Data Request FOR:EX ArchDataRequest@gov.bc.ca 
Subject: RE: Data Request: Jamie Stirling - Stirling Geoscience Ltd
Date: April 11, 2024 at 11:16 AM
To: Jamie Stirling jamie@stirlinggeoscience.com



Hello Jamie,

Thank you for your archaeological information request regarding 38482 Bell Road, Deroche, BC, PID: 009-064-885, Lot 4 Plan NWP29269 Section 33 Township 20 Land District 36 & OF NW 1/4 SEC 34; EXC PCL A REF PL 53267. Please review the screenshot of the property below (outlined in yellow) and notify me immediately if it does not represent the property listed in your information request.

Results of Provincial Archaeological Inventory Search

According to Provincial records, there are no known archaeological sites recorded on the subject property.

However, archaeological potential modelling for the area (shown as the purple areas in the screenshot below) indicates there is high potential for previously unidentified archaeological sites to exist on the property. Archaeological potential modelling is compiled using existing knowledge about archaeological sites, past indigenous land use, and environmental variables. Models are a tool to help predict the presence of archaeological sites and their results may be refined through further assessment.

Archaeology Branch Advice

If land-altering activities (e.g., home renovations, property redevelopment, landscaping, service installation) are planned on the subject property, a Provincial heritage permit is not required prior to commencement of those activities.

However, a Provincial heritage permit will be required if archaeological materials are exposed and/or impacted during land-altering activities. Unpermitted damage or alteration of a protected archaeological site is a contravention of the *Heritage Conservation Act* and requires that land-altering activities be halted until the contravention has been investigated and permit requirements have been established. This can result in significant project delays.

Therefore, the Archaeology Branch strongly recommends engaging an eligible consulting archaeologist prior to any land-altering activities. The archaeologist will review the proposed activities, verify archaeological records, and possibly conduct a walk-over and/or an archaeological impact assessment (AIA) of the project area to determine whether the proposed activities are likely to damage or alter any previously unidentified archaeological sites.

Please notify all individuals involved in land-altering activities (e.g., owners, developers, equipment operators) that if archaeological material is encountered during development, they **must stop all activities immediately** and contact the Archaeology Branch for direction at 250-953-3334.

If there are no plans for land-altering activities on the property, no action needs to be taken at this time.

Rationale and Supplemental Information

- There is high to moderate potential for previously unidentified archaeological deposits to exist on the property.
- Archaeological sites are protected under the *Heritage Conservation Act* and must not be damaged or altered without a Provincial heritage permit issued by the Archaeology Branch. This protection applies even when archaeological sites are previously unidentified or disturbed.
- If a permit is required, be advised that the permit application and issuance process takes approximately 20 to 40 weeks; the permit application process includes referral to First Nations and subsequent

engagement.

- The Archaeology Branch must consider numerous factors (e.g., proposed activities and potential impacts to the archaeological site[s]) when determining whether to issue a permit and under what terms and conditions.
- The Archaeology Branch has the authority to require a person to obtain an archaeological impact assessment, at the person's expense, in certain circumstances, as set out in the *Heritage Conservation Act*.
- Occupying an existing dwelling or building without any land alteration does not require a Provincial heritage permit.

How to Find an Eligible Consulting Archaeologist

An eligible consulting archaeologist is one who can hold a Provincial heritage permit to conduct archaeological studies. To verify an archaeologist's eligibility, ask an archaeologist if he or she can hold a permit in your area, or contact the Archaeology Branch (250-953-3334) to verify an archaeologist's eligibility. Consulting archaeologists are listed on the BC Association of Professional Archaeologists website (www.bcapa.ca) and in local directories. Please note, the Archaeology Branch cannot provide specific recommendations for consultants or cost estimates for archaeological assessments. Please contact an eligible consulting archaeologist to obtain a quote.

Questions?

For questions about the archaeological permitting and assessment process, please contact the Archaeology Branch at 250-953-3334 or archaeology@gov.bc.ca.

For more general information, visit the Archaeology Branch website at www.gov.bc.ca/archaeology.

Kind regards,

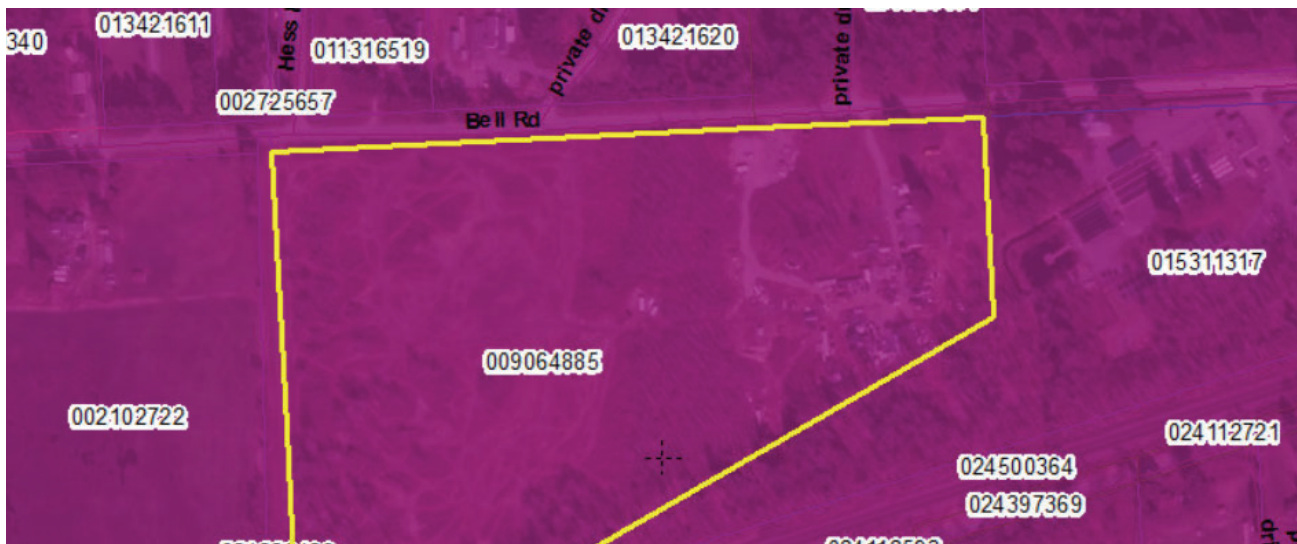


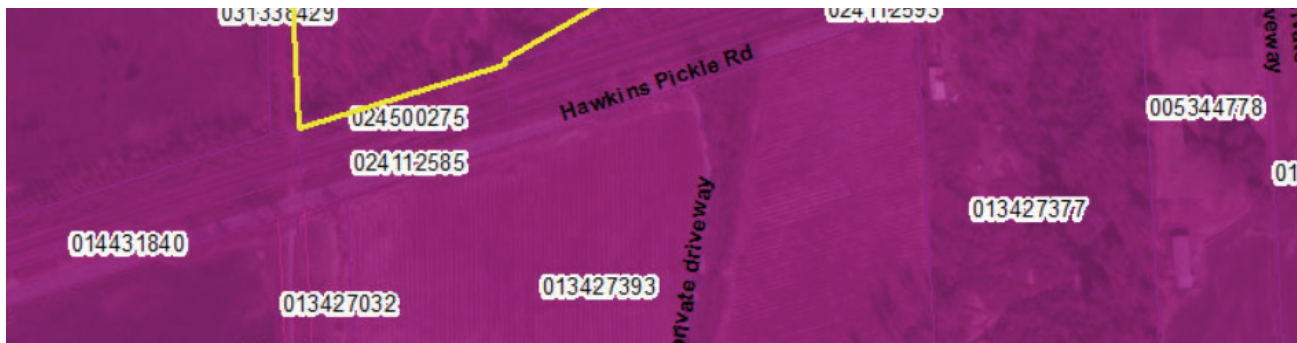
Archaeology Branch | Ministry of Forests

Phone: 1-250-953-3334

PO Box 9816 Stn Prov. Gov't, Victoria BC V8W 9W3

Visit our website at: www.gov.bc.ca/archaeology





*Please note that subject lot boundaries (yellow), and areas of archaeological potential (**purple = high potential**) indicated on the enclosed screenshot are based on information obtained by the Archaeology Branch on the date of this communication and may be subject to error or change. Archaeological site boundaries may not be identical to actual site extent. If you are experiencing difficulties viewing the layers in the above screenshot, please contact us.*

From: jamie@stirlinggeoscience.com <jamie@stirlinggeoscience.com> **On Behalf Of** ArchDataRequest@gov.bc.ca
Sent: Sunday, March 24, 2024 3:40 PM
To: Arch Data Request FOR:EX <ArchDataRequest@gov.bc.ca>
Subject: Data Request: Jamie Stirling - Stirling Geoscience Ltd

Terms and Conditions Accepted	Yes
Name	Jamie Stirling
Email	jamie@stirlinggeoscience.com
I am a	Contractor for Private Property (e.g., engineer, architect)
Affiliation	Stirling Geoscience Ltd
Address	[REDACTED]
City	[REDACTED]
Province	[REDACTED]
Postal Code	[REDACTED]
Phone Number	604-349-7709
Information Requested	<p>I request information and advice about archaeological sites on the properties described below (In the text box below, include the Parcel Identifier (PID), street address, and the legal description if available. If you have maps, please upload them to the File Attachments section near the end of the form.):</p> <p>38482 Bell Road, Deroche, BC PID is 009-064-885 The legal description of the Site is Lot 4 Plan NWP29269 Section 33 Township 20 Land District 36 & OF NW 1/4 SEC 34; EXC PCL A REF PL 53267.</p>
Why Site Information is Required	<p>Other (describe below):</p> <p>I am the consultant for the owner and this information is required by the Fraser Valley Regional District as part of the development permit application for the proposed development for the site by the owner</p>
Third Party Access	<p>The following person(s) may have access to this information (Include the person's full name and relationship to you below. If you would like them to be copied on our email reply containing property information, please also include their email address):</p> <p>The information will be shared with the property owner, the Fraser Valley Regional District and other consultants working on the proposed Development Permit application (e.g., environmental consultant, geotechnical engineer)</p>
Format Required	PDF, Map(s)
Who Prompted	Environmental consultant
File Attachment#1	Picture1.jpg
File Attachment#2	Picture2.jpg

File Attachment#2

Picture2.jpg

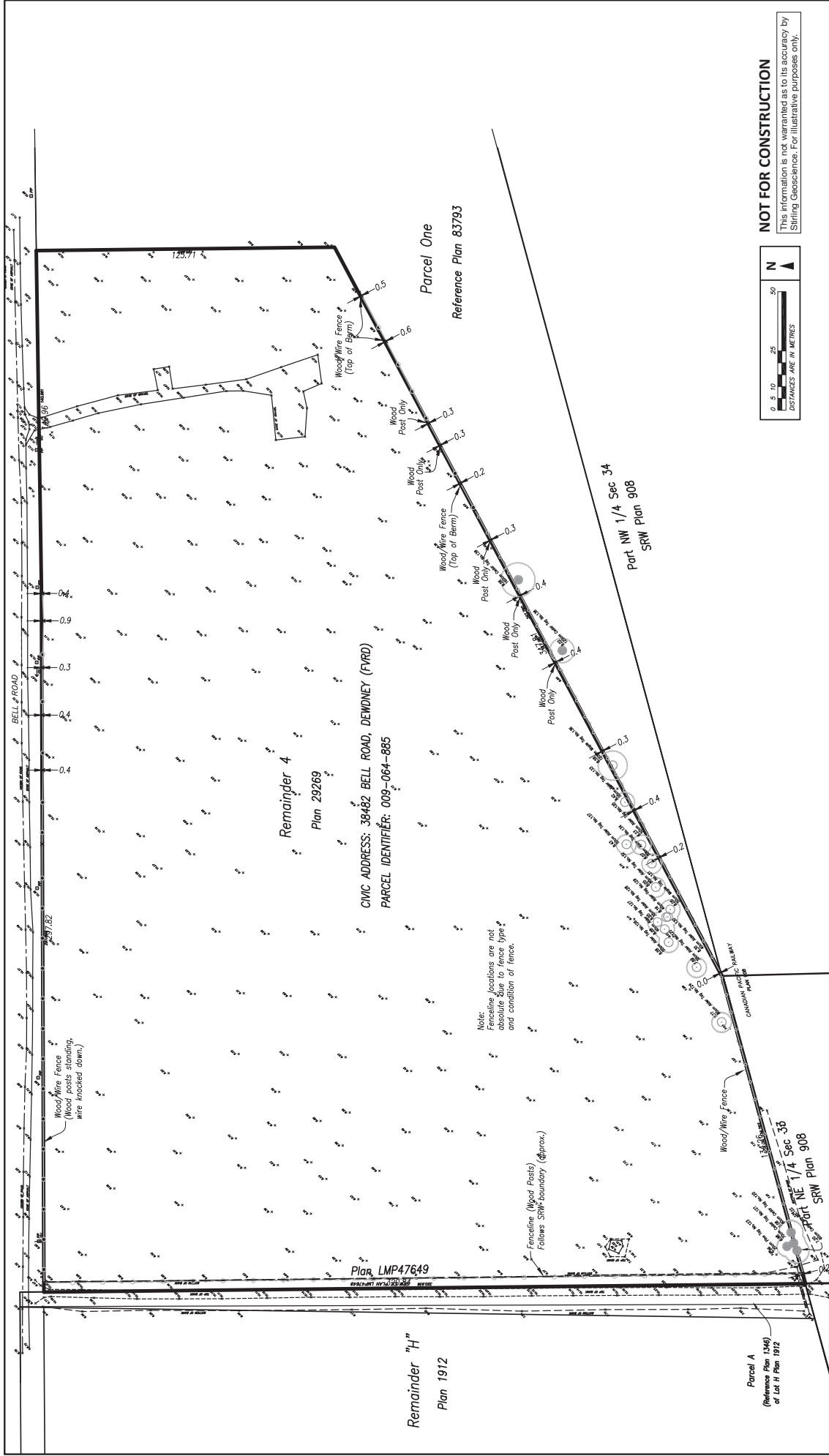
File Attachment#3

File Attachment#4

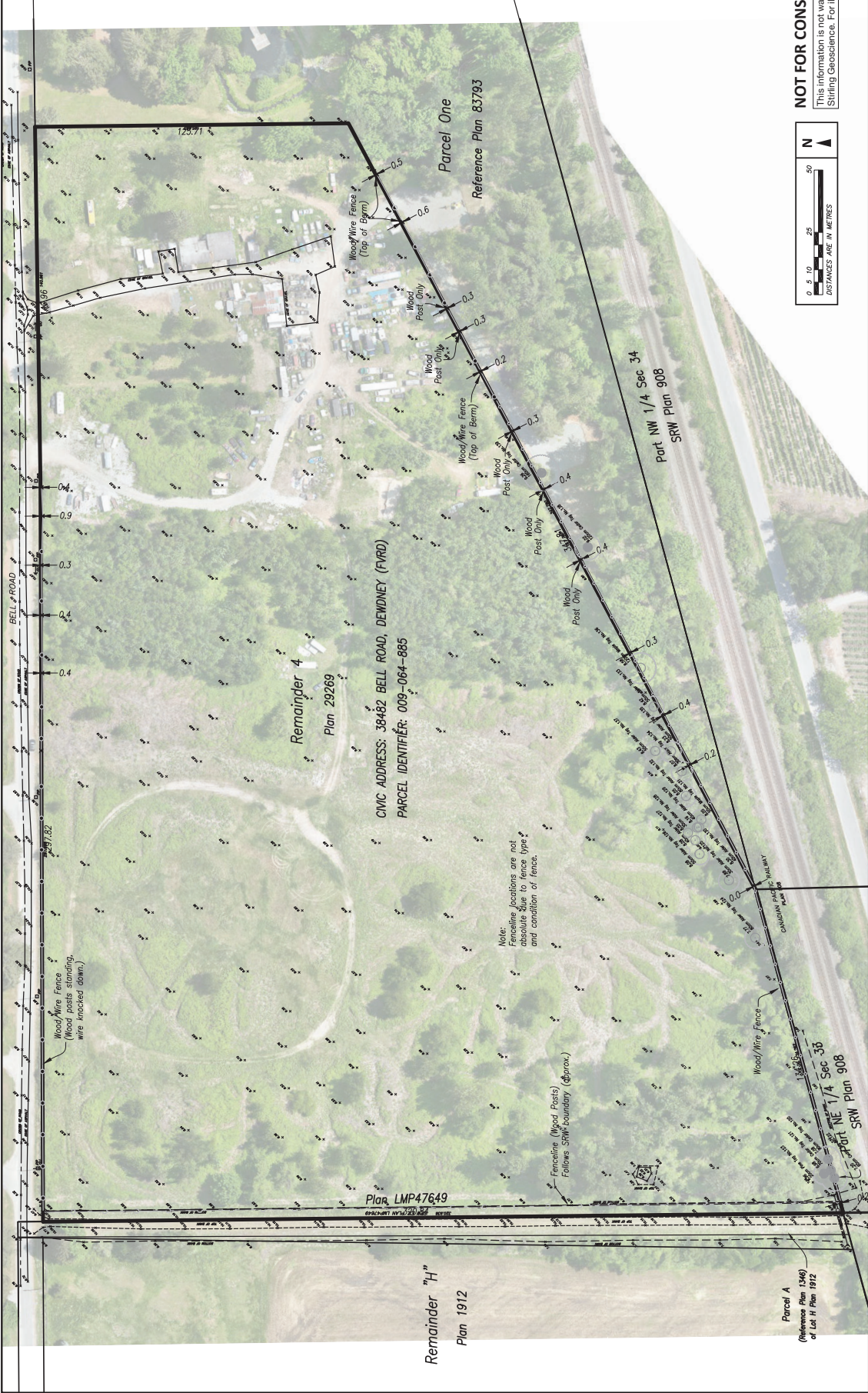
File Attachment#5

APPENDIX G

**Issued for Development Permit Drawings for the Proposed Fill Project at
38482 Bell Road by SGL, February 9, 2025**



STIRLING GEOSCIENCE LTD.			38482 BELL ROAD - IMPORTED FILL PROJECT		
REVISIONS			EXISTING CONDITIONS		
0	OCT 10, 2024	ISSUED FOR REVIEW	PROJECT	DATE	REVISION
A	OCT 23, 2024	ISSUED FOR REVIEW - REVISED	23-13	OCT 10, 2024	B
B	FEB 9, 2025	ISSUED FOR DEVELOPMENT PERMIT			
NOTES			DESIGN	DRAFT	APP
INTENDED FOR PRINTING ON 11X17 SIZED PAPER.			JFS	AGC	AGC
BACKGROUND DRONE IMAGE STIRLING GEOSCIENCE LTD. FEBRUARY 24, 2024					
TOPOGRAPHIC SURVEY BY AXIS LAND SURVEYING LTD. MARCH 29, 2018					
TREE AND FENCE LINE SURVEY BY WADE AND ASSOCIATES LAND SURVEYING LTD. OCTOBER 10, 2024					
AUTHENTICATION / PERMIT TO PRACTICE					



NOTES			38482 BELL ROAD - IMPORTED FILL PROJECT		
INTENDED FOR PRINTING ON 11X17 SIZED PAPER.			PLAN		
BACKGROUND DRONE IMAGE STIRLING GEOSCIENCE LTD. FEBRUARY 24, 2024			EXISTING CONDITIONS WITH DRONE IMAGE		
TOPOGRAPHIC SURVEY BY AXIS LAND SURVEYING LTD. MARCH 29, 2018			PROJECT	DATE	DESIGN
TREE AND FENCE LINE SURVEY BY WADE AND ASSOCIATES LAND SURVEYING LTD. OCTOBER 10, 2024			23-13	OCT 10, 2024	JFS
					APP
					AGG
					REVISION
					B



This information is not warranted as to its accuracy by Stirling Geoscience. For illustrative purposes only.

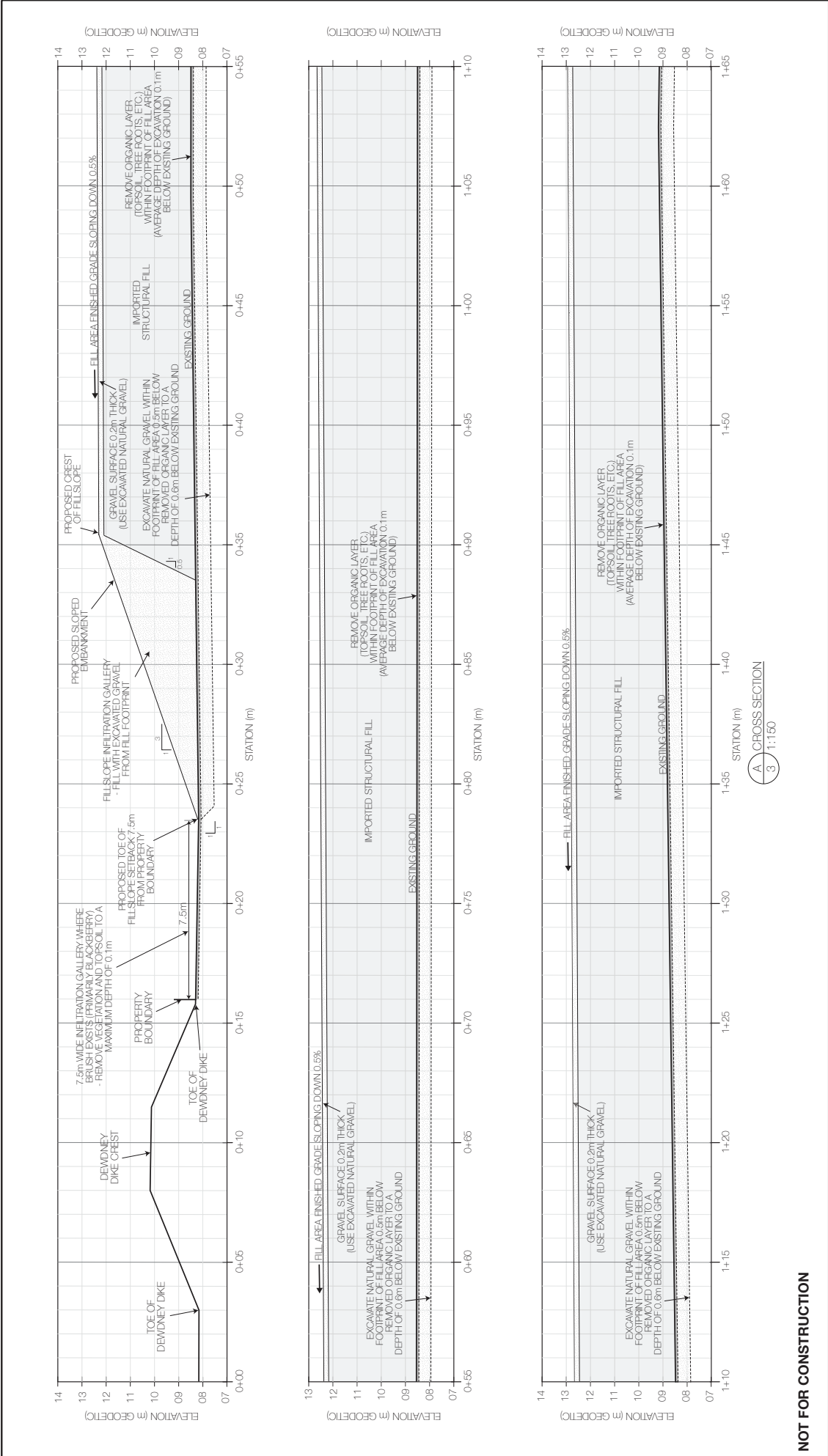
NOT FOR CONSTRUCTION

NOTES			38482 BELL ROAD - IMPORTED FILL PROJECT		
INTENDED FOR PRINTING ON 11X17 SIZED PAPER			PLAN OF PROPOSED IMPORTED FILL WITH DRONE IMAGE		
BACKGROUND DRONE IMAGE STIRLING GEOSCIENCE LTD. FEBRUARY 24, 2024			PROJECT 23-13		
TOPOGRAPHIC SURVEY BY AXIS LAND SURVEYING LTD. MARCH 29, 2018			DATE	DRAFT	DESIGN
TREE AND FENCELINE SURVEY BY WADE AND ASSOCIATES LAND SURVEYING LTD. OCTOBER 10, 2024			OCT 10, 2024	JUS	APP
					AGC
					REVISION
					B
AUTHENTICATION / PERMIT TO PRACTICE					

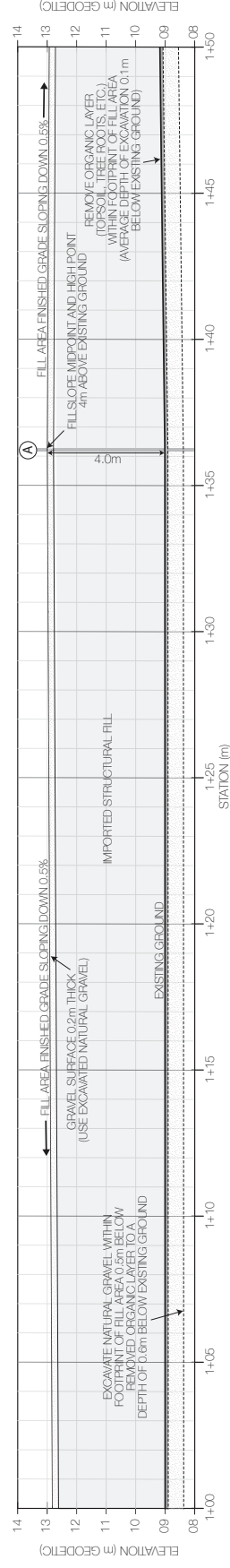
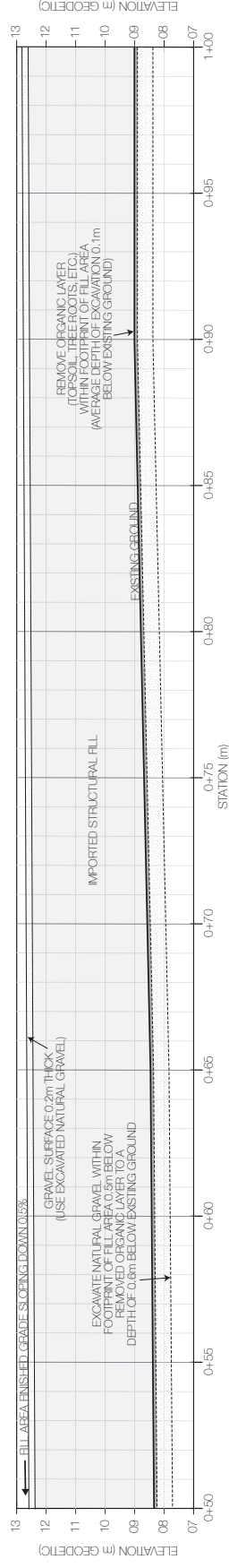
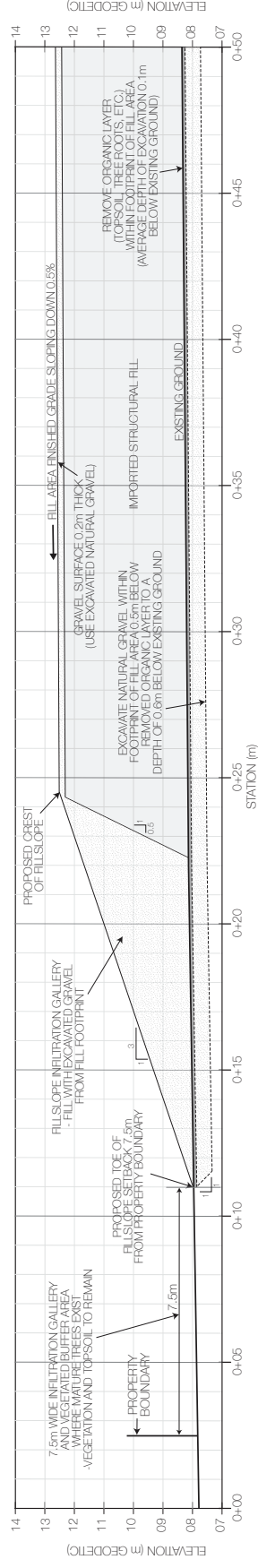
REVISIONS

0	OCT 10, 2024	ISSUED FOR REVIEW
A	OCT 23, 2024	ISSUED FOR REVIEW - REVISED
B	FEB 9, 2025	ISSUED FOR DEVELOPMENT PERMIT

STIRLING
GEOSCIENCE LTD.



38482 BELL ROAD - IMPORTED FILL PROJECT			NOTES			
CROSS SECTION A - SHEET 1 OF 3			INTENDED FOR PRINTING ON 11X17 SIZED PAPER.			
			BACKGROUND: DRONE IMAGE STIRLING GEOSCIENCE LTD. FEBRUARY 24, 2024			
			TOPOGRAPHIC SURVEY BY AXIS LAND SURVEYING LTD. MARCH 29, 2018			
			TREE AND FENCELINE SURVEY BY WADE AND ASSOCIATES LAND SURVEYING LTD. OCTOBER 10, 2024			
PROJECT 23-13			DATE OCT 10, 2024		SHEET 5 OF 9	
			DRAFT JUS		APP AGC	
					DESIGN JFS	
					REVISION B	

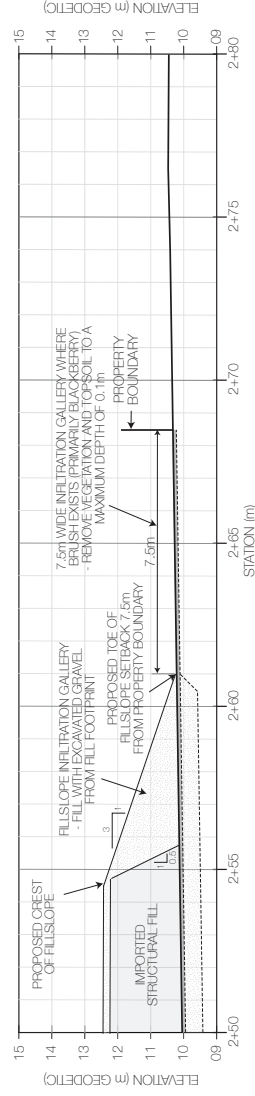
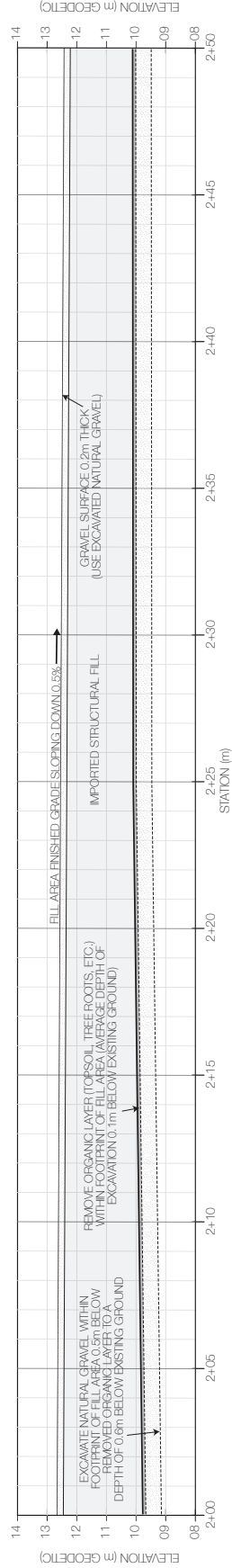
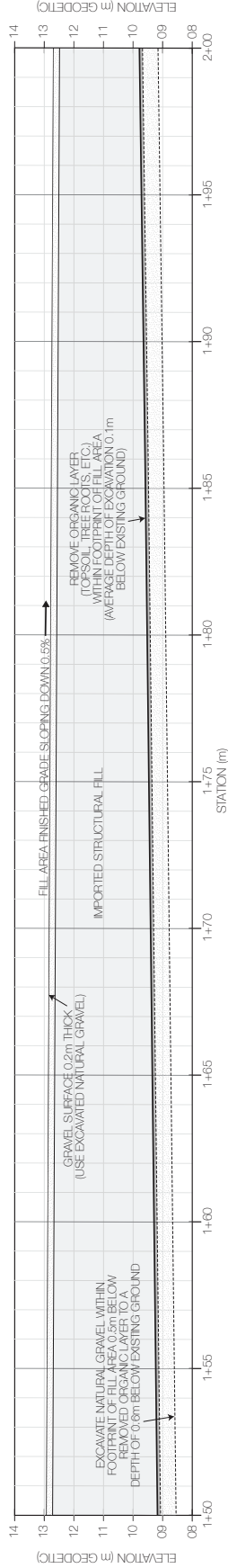


3 CROSS SECTION 1:150

NOT FOR CONSTRUCTION

STIRLING
GEOSCIENCE LTD.

[illegible]



B CROSS SECTION
3 1:150

NOT FOR CONSTRUCTION

STIRLING
GEOSCIENCE LTD.

38482 BELL ROAD - IMPORTED FILL PROJECT			NOTES			
CROSS SECTION B - SHEET 2 OF 2			INTENDED FOR PRINTING ON 11X17 SIZED PAPER.			
PROJECT 23-13			BACKGROUND DRONE IMAGE STIRLING GEOSCIENCE LTD. FEBRUARY 24, 2024			
DATE OCT 10, 2024			TOPOGRAPHIC SURVEY BY ANS LAND SURVEYING LTD. MARCH 29, 2018			
DRAFT JUS			TREE AND FENCELINE SURVEY BY WADE AND ASSOCIATES LAND SURVEYING LTD. OCTOBER 10, 2024			
DESIGN JFS			AUTHENTICATION / PERMIT TO PRACTICE			
APP AGC			REVISIONS			
SHEET 9 OF 9			0 OCT 10, 2024 ISSUED FOR REVIEW			
REVISION B			A OCT 23, 2024 ISSUED FOR REVIEW - REVISED			
			B FEB 9, 2025 ISSUED FOR DEVELOPMENT PERMIT			

APPENDIX H

Site Disclosure Statement for 38482 Bell Road

Site Disclosure Statement

All fields marked with an asterisk (*) are mandatory.

Has the site been used for any industrial or commercial uses described in [Schedule 2](#) of the Contaminated Sites Regulation? *

- ☐ Yes
- ☒ No

If you answered no to the question above, the form is not submitted to the ministry. As per Section 3.5 of the Contaminated Sites Regulation, a municipality or approving officer may still request a person to complete a site disclosure statement for their records.

^ Section I - Contact information

A: Site owners(s) or operators(s)

Last name *

Wojcik

First name *

Wladyslaw

Company, if applicable

Address *

City *

+ Add Another

Province *

Country *

Postal code *

Phone number *

Email *

B: Person completing site disclosure statement (leave blank if same as above)

Last name

First name

Company, if applicable

C: Person to contact regarding the site disclosure statement

Last name *

First name *

Company, if applicable

Keystone Environmental Ltd.

Address *

320-4400 Dominion Street

City *

Burnaby

Phone number *

604-430-0671

Email *

korso@keystoneenvironmental.ca

^ Section II - Site information

Coordinates for the centre of the site:

Latitude

Degrees *

49

Minutes *

10

Seconds *

31 N

Longitude

Degrees *

122

Minutes *

09

Seconds *

40 W

Attention:

A separate map with appropriate scale showing the location and boundaries of the site must be included.

☐ I will include a map with my submission *

Land ownership *

☒ Legally titled, registered property

☐ Untitled Crown land

For legally titled, registered property

Site address *

38482 Bell Road

City *

Deroche

Postal code *

n/a

PID *

009-064-885

Land description *

Lot 4 Except : Parcel "A" (Reference Plan 53267): Section 33 and of the Northwest quarter of Section 34 Township 2 0 New Westminster District Plan 29269



+ Add Another

^ **Section III - Specified industrial or commercial uses**

Indicate all the industrial or commercial uses described in the Contaminated Sites Regulation [Schedule 2](#) which have occurred or are occurring on this site.

Example Schedule 2 references and descriptions

E1. appliance, equipment, or engine maintenance, repair, reconditioning, cleaning or salvage

F10. solvent manufacturing, bulk storage, shipping and handling

Schedule 2 reference and description *

n/a

Select all that apply, choose "none" if no Schedule 2 uses apply.

^ Section IV - Additional information

1. Provide a brief summary of the planned activity and proposed land use at the site. *

Addition of fill to the Site and use the Site as outdoor storage space for RVs, cars, trucks and general storage.

If not applicable, type N/A

2. Indicate the information used to complete this site disclosure statement including a list of record searches completed. *

P1 Env Site Assess, 38482 Bell Rd, by Keystone Environmental, Aug 2023. Records reviewed include: site visit, interview, air photos, land title, water well search, street directories, topo maps, surficial geology maps and BC ENV Site Registry Search.

3. List any past or present government orders, permits, approvals, certificates or notifications pertaining to the environmental condition of the site: *

n/a

If not applicable, type N/A

^ Section V - Declarations

Where a municipal approval is not required, you must indicate the reason for submission directly to the registrar:

- ☐ Under order
- ☐ BIA proceedings
- ☐ Foreclosure
- ☐ Decommissioning
- ☐ CCAA proceedings
- ☐ Ceasing operations

By signing below, I confirm that the information in this form is complete and accurate to the best of my knowledge:

SIGNATURE


A large rectangular area with a heavy, grainy texture, likely a placeholder for a signature or a heavily redacted section.

Sign above

For agents completing this form, save to PDF then forward the form to the owner/operator to complete this section.

First and last name

Wladyslaw Wojcik

- ☐ Owner
- ☐ Operator

Date signed

Approving authority contact information

All fields in this section must be completed by the municipality (including regional districts) or approving officer prior to forwarding the form to the site registrar.

First and last name

Agency

Address

Phone number

Email

Reason for submission (Please check one or more of the following):

☐ Building permit

for an activity that will
likely disturb soil

☐ Subdivision

☐ Zoning

☐ Development
permit

for an activity that will
likely disturb soil

Date received by approving authority



Date submitted to registrar



APPENDIX I

EGBC Flood Assurance Statement for 38482 Bell Road

FLOOD ASSURANCE STATEMENT

Note: This statement is to be read and completed in conjunction with the current Engineers and Geoscientists BC *Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC* ("the guidelines") and is to be provided for flood assessments for the purposes of the *Land Title Act*, *Community Charter*, or the *Local Government Act*. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority

Date: Apr 16, 2025

Fraser Valley Regional District

45950 Cheam Avenue, Chilliwack, BC V2P 1N6

Jurisdiction and address

With reference to (CHECK ONE):

- ☐ *Land Title Act* (Section 86) – Subdivision Approval
- ☒ *Local Government Act* (Part 14, Division 7) – Development Permit
- ☐ *Community Charter* (Section 56) – Building Permit
- ☐ *Local Government Act* (Section 524) – Flood Plain Bylaw Variance
- ☐ *Local Government Act* (Section 524) – Flood Plain Bylaw Exemption

For the following property ("the Property"):

38482 Bell Road, Deroche. Lot 4 Except: Parcel A (Reference Plan 53267):
Section 33 and of the Northwest quarter of Section 34 Township 20 New Westminster District Plan 29269.

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a Qualified Professional and is a Professional Engineer or Professional Geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, sealed, and dated, and thereby certified, the attached Flood Assessment Report on the Property in accordance with the guidelines. That report and this statement must be read in conjunction with each other. In preparing that Flood Assessment Report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

- ☒ 1. Consulted with representatives of the following government organizations:
City of Chilliwack
- ☒ 2. Collected and reviewed appropriate background information
- ☒ 3. Reviewed the Proposed Development on the Property
- ☒ 4. Investigated the presence of Covenants on the Property, and reported any relevant information
- ☒ 5. Conducted field work on and, if required, beyond the Property
- ☒ 6. Reported on the results of the field work on and, if required, beyond the Property
- ☒ 7. Considered any changed conditions on and, if required, beyond the Property
- 8. For a Flood Hazard analysis I have:
 - ☒ 8.1 Reviewed and characterized, if appropriate, Flood Hazard that may affect the Property
 - ☒ 8.2 Estimated the Flood Hazard on the Property
 - ☒ 8.3 Considered (if appropriate) the effects of climate change and land use change
 - ☒ 8.4 Relied on a previous Flood Hazard Assessment (FHA) by others
 - ☐ 8.5 Identified any potential hazards that are not addressed by the Flood Assessment Report
- 9. For a Flood Risk analysis I have:
 - ☐ 9.1 Estimated the Flood Risk on the Property
 - ☐ 9.2 Identified existing and anticipated future Elements at Risk on and, if required, beyond the Property
 - ☐ 9.3 Estimated the Consequences to those Elements at Risk

FLOOD ASSURANCE STATEMENT

10. In order to mitigate the estimated Flood Hazard for the Property, the following approach is taken:
- ☒ 10.1 A standard-based approach
 - ☐ 10.2 A Risk-based approach
 - ☒ 10.3 The approach outlined in the guidelines, Appendix F: Flood Assessment Considerations for Development Approvals
 - ☐ 10.4 No mitigation is required because the completed flood assessment determined that the site is not subject to a Flood Hazard
11. Where the Approving Authority has adopted a specific level of Flood Hazard or Flood Risk tolerance, I have:
- ☒ 11.1 Made a finding on the level of Flood Hazard or Flood Risk on the Property
 - ☒ 11.2 Compared the level of Flood Hazard or Flood Risk tolerance adopted by the Approving Authority with my findings
 - ☒ 11.3 Made recommendations to reduce the Flood Hazard or Flood Risk on the Property
12. Where the Approving Authority has not adopted a level of Flood Hazard or Flood Risk tolerance, I have:
- ☐ 12.1 Described the method of Flood Hazard analysis or Flood Risk analysis used
 - ☐ 12.2 Referred to an appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk
 - ☐ 12.3 Made a finding on the level of Flood Hazard or Flood Risk tolerance on the Property
 - ☐ 12.4 Compared the guidelines with the findings of my flood assessment
 - ☐ 12.5 Made recommendations to reduce the Flood Hazard or Flood Risk
- ☒ 13. Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties
 - ☒ 14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections.

Based on my comparison between:

[CHECK ONE]

- ☒ The findings from the flood assessment and the adopted level of Flood Hazard or Flood Risk tolerance (item 11.2 above)
- ☐ The findings from the flood assessment and the appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk tolerance (item 12.4 above)

I hereby give my assurance that, based on the conditions contained in the attached Flood Assessment Report:

[CHECK ONE]

- ☐ For subdivision approval, as required by the *Land Title Act* (Section 86), “that the land may be used safely for the use intended”:

[CHECK ONE]

- ☐ With one or more recommended registered Covenants.
- ☐ Without any registered Covenant.
- ☒ For a development permit, as required by the *Local Government Act* (Part 14, Division 7), my Flood Assessment Report will “assist the local government in determining what conditions or requirements it will impose under subsection (2) of this section [Section 491 (4)]”.
- ☐ For a building permit, as required by the *Community Charter* (Section 56), “the land may be used safely for the use intended”:

[CHECK ONE]

- ☐ With one or more recommended registered Covenants.
- ☐ Without any registered Covenant.
- ☐ For flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* and the *Amendment Section 3.5 and 3.6* associated with the *Local Government Act* (Section 524), “the development may occur safely”.
- ☐ For flood plain bylaw exemption, as required by the *Local Government Act* (Section 524), “the land may be used safely for the use intended”.

FLOOD ASSURANCE STATEMENT

I certify that I am a Qualified Professional as defined below.

Apr 16, 2025

Date

Jamie Stirling, M.Sc. P.Geo.

Prepared by

Adrian Chantler, Ph.D. PEng.

Reviewed by

Jamie Stirling, M.Sc. P.Geo.

Name (print)

Signature

Address

[Redacted address line]

604-349-7709

Telephone

jamie@stirlinggeoscience.com

Email

Adrian Chantler, Ph.D. PEng.

Name (print)

Signature



(Affix PROFESSIONAL SEAL here)

If the Qualified Professional is a member of a firm, complete the following:

I am a member of the firm Stirling Geoscience Ltd.

and I sign this letter on behalf of the firm.

(Name of firm)

APPENDIX J

FVRD Geohazard Assurance Statement for Development Approvals for 38482 Bell Road

Geo-Hazard Assurance Statement

for Development Approvals

A. Project Information

Date April 16, 2025 FVRD File No. 3060-20 DP 2025-02

Property Information

Project Name & Description Add up to 4 m of fill to a portion of the Site

Legal Description Lot 4 Exc: Par A (Ref Plan 53267): Sec 33 and of the NW quarter of Sec 34 Township 20 NWD Plan 29269

Site Address 38482 Bell Road, Deroche, BC PID 009-064-885

Client Information

Name Wladyslaw Wojcik

Role ☒ Property Owner ☐ Developer ☐ Other

Client Address [REDACTED]

Qualified Professional Information

Name Jamie Stirling, M.Sc. P.Geo.

APEGBC Designation ☐ P.Eng. ☒ P. Geo. ☐ Eng.L ☐ Geo.L

Company Name Stirling Geoscience Ltd.

Mailing Address [REDACTED]

Email Address jamie@stirlinggeoscience.com Phone # 604-349-7709

Geo-Hazard Report Reference

Title 38482 Bell Rd, Deroche - Flood Hazard Assessment and DP Application Date April 16, 2025

Personal information on this form is being collected in accordance with Section 27 of the Freedom of Information and Protection of Privacy Act, RSBC 1996 Ch. 165; Part 9, Division 1 [Building Regulation] and Part 14 [Planning and Land Use Management] of the Local Government Act, RSBC 2015 Ch. 1; and Section 56 of the Community Charter, SBC 2003 Ch. 26 and will only be collected, used and disclosed for the purpose of administering geo-technical hazard reviews and assurance statements related to development approvals. Questions? Contact FVRD Privacy Officer at 45950 Cheam Avenue, Chilliwack, BC V2P 1N6; 604-702-5000 or 1-800-528-0061; or FOI@fvr.ca.



Geo-Hazard Assurance Statement

for Development Approvals

B. Assurance

Based on the contents of this Assurance Statement and the Report, I hereby give assurance that:

(check as applicable)

<input checked="" type="checkbox"/>	Development Permit	The Report will “assist the local government in determining what conditions or requirements under it will impose in the permit”, as required by the <i>Local Government Act</i> (Division 7)
<input type="checkbox"/>	Building Permit	
<input type="checkbox"/>	<input type="checkbox"/> Community Charter	“The land may be used safely for the use intended”, as required by the <i>Community Charter</i> (Section 56)
<input type="checkbox"/>	<input type="checkbox"/> Seismic Slope	The Report addresses the requirements of the BC Building Code 2006, 4.1.8.1.6 (8) and 9.4.4.4 (2), as detailed in the BC Building & Safety Policy Branch Information Bulletin B10-01, Jan 18, 2010
<input type="checkbox"/>	Floodplain Management Bylaw Exemption	“The land may be used safely for the use intended”, as required by the <i>Local Government Act</i> . (Section 524)
<input type="checkbox"/>	Subdivision	“The land may be used safely for the use intended”, as required by the <i>Land Title Act</i> (Section 86).
<input type="checkbox"/>	Other (e.g. Zoning Bylaw Amendment, Official Community Plan Amendment, Temporary Use Permit, etc.)	<Insert statement as appropriate>

C. APEGBC Professional Practice Guidelines

The Report and this Assurance Statement should be completed in accordance with the current version of one or both of the following Professional Engineers and Geoscientists of BC (APEGBC).

- *Legislated Flood Assessments in a Changing Climate in BC*
- *Legislated Landslide Assessments for Proposed Residential Development in British Columbia, (“APEGBC Landslide Guidelines”).*

These two documents are collectively referred to as the “APEGBC Guidelines”. The italicized words in this Assurance Statement are defined in the APEGBC Guidelines.

The Report has been prepared pursuant to the following APEGBC Guidelines (check one or both as applicable).

- ☒ APEGBC Flood Guidelines
- ☐ APEGBC Landslide Guidelines

Geo-Hazard Assurance Statement

for Development Approvals

If the Report is **not** prepared pursuant to either of the APEGBC Guidelines, please explain.

n/a

D. Background Information

Qualified Professionals **must** confirm and check that each item is included in the Report.

- ☒ 1. Property location map — 8.5 x 11 size
- ☒ 2. Development proposal site plan — 8.5 x 11 size. *If a subdivision, show the parent parcel and all lots to be created, including any remainder.*
- ☒ 3. Description of the proposed development project (including building use) to the extent this is known at the time of Report preparation.
 - ☐ residential
 - ☐ industrial
 - ☐ commercial
 - ☐ institutional
 - ☒ other Add up to 4 m of fill to a portion of the Site

Geo-Hazard Assurance Statement

for Development Approvals

E. Technical Requirements

Qualified Professionals **must** review, confirm and check completed items (as applicable).

Report Content

- ☒ 4. Relevant information pertaining to the Property and pertinent potential hazards from appropriate background sources, including the FVRD online library.
- ☒ 5. Time limitation or condition statement to describe extent the FVRD may rely on the Assurance Statement and Report for development approvals, and when resubmittal is recommended.
- ☒ 6. Maps, illustrations and diagrams to illustrate areas referred to in the Report.
- ☒ 7. Description of field work conducted on and, if required, beyond the Property.
- ☒ 8. Contact and consultation with the Fraser Valley Regional District. Provide name and title of contact.
Andrea Antifaeff, Planner II
- ☒ 9. Review of relevant FVRD bylaws and other statutory requirements.
- ☒ 10. Restrictive covenants registered against the Property title that pertain to geo-hazards (if registered, the Report provides relevant information about the covenants).
- ☒ 11. Notation of any visibly apparent natural hazards or other hazards identified in background reports, which are not identified and addressed in this Report. If yes, provide details in Section H: Geo-Hazard Summary Table.
 - ☐ Yes
 - ☐ No
- ☒ 12. Does the report rely on one or more supporting reports, each of which is independently reviewed, signed and sealed. If yes, provide details in Section H: Geo-Hazard Summary Table.
 - ☐ Yes
 - ☐ No
- ☐ 13. For subdivision approval, the Report addresses natural hazards for:
 - ☐ the parent parcel prior to subdivision
 - ☐ any lots to be created (including any remainder)

Geo-Hazard Assurance Statement

for Development Approvals

Geo-hazard Assessment, Risk Acceptability and Risk Transfer

- ☒ 14. In considering the above-noted potential hazards that may affect the property, I have:
- ☒ reviewed and characterized the potential hazard(s)
 - ☒ estimated the potential frequency and magnitude of the potential hazard(s)
 - ☒ relied on supporting reports as noted above
 - ☒ relied on a pre-existing assessment of hazard frequency and magnitude
 - ☒ considered the potential effects of climate change in the context identified in the Report
 - ☒ considered the potential effects of changed future conditions (upstream watershed changes, forestry activity, land use changes, sea level rise, etc.) in the context identified in the Report
- ☒ 15. This Assurance Statement pertains to all geo-hazards that are assessed in the Report and any supporting reports, and accurately reflects the contents of those documents.
- ☒ 16. The FVRD has adopted “Hazard Acceptability Thresholds for Development Approvals by Local Government”, which provides a specific level of hazard or risk tolerance. I have included a Hazard Summary Table which:
- ☒ lists all the potential hazards addressed by the Report and any supporting reports
 - ☒ provides an annual return frequency and acceptability threshold classification for the unmitigated condition
 - ☒ proposes mitigative measures to appropriately reduce the geo-hazard risk
 - ☒ provides an annual return frequency and acceptability threshold classification for the mitigated condition
- ☒ 17. The Report describes the potential transfer of natural hazard risk to other properties or infrastructure as a result of the proposed project (including any proposed *mitigation works*) and
- ☒ considered the potential for transfer of natural hazard risk
 - ☒ concludes that there is no significant transfer of natural hazard risk
 - ☒ identifies the potential transfer of natural hazard risk and proposes measures to offset such transfer of risk

Geo-Hazard Assurance Statement

for Development Approvals

Mitigation and Design Recommendations (if recommended)

The Report contains the following items:

- ☒ 18. Implementation steps for the identified structural mitigation works (in terms of design, construction and approval).
- ☒ 19. Clearly identified safe locations for building(s), ancillary structures, and onsite utility services (as applicable, such as a septic field) out of the natural hazard area as a preferred development alternative.
- ☒ 20. Commentary on the effectiveness of proposed structural mitigation works in terms of ability to reduce the potential hazard impact, and identification of any residual risk that would remain.
- ☒ 21. Proposed Flood Construction Level (FCL) for future development and including specification of an appropriate method of achieving the FCL.
- ☒ 22. Proposed watercourse setback, which is clearly referenced from the natural boundary, top of bank or another suitable basis.
- ☒ 23. Proposed operation and maintenance actions that will be necessary in order for the level of safety to be maintained in the future, with indications of who should be responsible for those actions and when.

Riparian Area Regulation (if applicable)

- ☒ 24. QP must review RAR assessment report to avoid conflict with Geo-Hazard Report recommendations.

F FVRD Supplemental Requirements

The following points are understood by the Qualified Professional when submitting a Report:

- ☒ 25. Permission is granted to the FVRD to use the Report in considering approval of the proposed development on the property, provided that such permission is limited only to the proposed development project for which the Report was prepared.
- ☒ 26. Methodology used in the Report is described in sufficient detail to facilitate a professional review of the study by the FVRD when necessary.
- ☒ 27. Professional liability insurance coverage of at least \$1 million per claim is carried by the QP.
- ☐ 28. Third party review or supplemental information may be required by the FVRD where complex development proposals warrant.
- ☒ 29. Permission is granted to the FVRD to include the Report in the online FVRD geo-hazard report library (as background information, not for other parties to rely).

Geo-Hazard Assurance Statement

for Development Approvals

G. Qualified Professional (QP)

Prepared by: (QP of Record)

Name Jamie Stirling, M.Sc. P.Geo.

Designation ☐ P.Eng. ☒ P. Geo. ☐ Eng.L ☐ Geo.L

Reviewed by:

Name Adrian Chantler, Ph.D., P.Eng.

Designation ☒ P.Eng. ☐ P. Geo.

The Report has received appropriate technical review which is consistent with both the APEGBC Professional Practice Guidelines, and APGBC Quality Management Guidelines. The name of the reviewer is noted in the Report and below.

Professional Seal, Signature and Date:



☒ I am a Qualified Professional as defined in the APEGBC Guidelines, and I fulfill the education, training and experience requirements as outlined in the APEGBC Guidelines

☒ I have signed, sealed, dated and thereby certify, this Assurance Statement and the attached report.

H. Geo-Hazard Summary Table

The geo-hazard report and/or any supporting reports addresses the following hazard types.

Geo-Hazard Type #1		Geo-Hazard Type #2	
Fraser River and tributaries flooding		Debris Flow and Debris Torrent	
Annual Return Frequency (Unmitigated) 1:100		Annual Return Frequency (Unmitigated) <1:2,000	
Acceptability Threshold Classification	5	Acceptability Threshold Classification	1
MITIGATION (if necessary)			
Proposed Mitigation Measures	Yes <input type="radio"/> No <input type="radio"/>	Proposed Mitigation Measures	Yes <input type="radio"/> No <input type="radio"/>
Annual Return Frequency (Mitigated) 1:500		Annual Return Frequency (Mitigated)	
Acceptability Threshold Classification	4	Acceptability Threshold Classification	N/A
Comments		Comments	
SUPPORTING REPORT			
Was this report prepared by others?	Yes <input type="radio"/> No <input type="radio"/>	Was this report prepared by others?	Yes <input type="radio"/> No <input type="radio"/>
If yes, list report name, date and author. Fraser River Design Flood Level Update, FLNRO, Mar 2014		If yes, list report name, date and author.	

Geo-Hazard Type #3		Geo-Hazard Type #4	
Debris Flood		Mountain Stream Erosion or Avulsion	
Annual Return Frequency (Unmitigated) <1:200		Annual Return Frequency (Unmitigated) <1:200	
Acceptability Threshold Classification	5	Acceptability Threshold Classification	5
MITIGATION (if necessary)			
Proposed Mitigation Measures	Yes <input type="radio"/> No <input type="radio"/>	Proposed Mitigation Measures	Yes <input type="radio"/> No <input type="radio"/>
Annual Return Frequency (Mitigated) <1:500		Annual Return Frequency (Mitigated) <1:500	
Acceptability Threshold Classification	4	Acceptability Threshold Classification	4
Comments		Comments	
SUPPORTING REPORT			
Was this report prepared by others?	Yes <input checked="" type="radio"/> No <input checked="" type="radio"/>	Was this report prepared by others?	Yes <input type="radio"/> No <input type="radio"/>
If yes, list report name, date and author.		If yes, list report name, date and author.	

Geo-Hazard Assurance Statement

for Development Approvals

Indicate which hazards were **NOT** reviewed:

- ☒ Chilliwack River Valley Erosion or Avulsion
- ☐ Debris Flow and Debris Torrent
- ☐ Debris Flood
- ☐ Fraser River & tributaries flooding
- ☐ Mountain Stream Erosion or Avulsion
- ☐ Major Catastrophic Landslide

- ☒ Seismic Effects/Liquefaction
- ☐ Rockfall - Small Scale Detachment
- ☐ Slope Stability
- ☐ Small Scale Localized Landslide
- ☐ Snow Avalanche
- ☒ Tsunami

Hazard Acceptability Thresholds Classification, as per Hazard Acceptability Thresholds for Development Approvals by Local Government dated November 1993 by Dr. Peter Cave.

- 1 Approval with conditions relating to hazards.
- 2 Approval, without siting conditions or protective works conditions, but with a covenant including "save harmless" conditions.
- 3 Approval, but with siting requirements to avoid the hazard, or with requirements for protective works to mitigate the hazard.
- 4 Approval as (3) above, but with a covenant including "save harmless" conditions as well as siting conditions, protective works or both.
- 5 Not approvable.

Additional Comments

DEVELOPMENT PERMIT 2025-02

SCHEDULE D

Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 16, 2025, prepared by Jamie Stirling, P. Geo., of Stirling Geoscience Ltd. & Wladyslaw Wojcik, property owner.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

Please complete this form in its entirety. If fields are left blank, the form will be returned.

A. Project Information

Date April 16, 2025 FVRD File No. 3060-20 DP 2025-02

Property Information

Project Name & Description Add up to 4 m of fill to a portion of the Site
Legal Description Lot 4 Exc: Par A (Ref Plan 53267): Sec 33 and of the NW quarter of Sec 34 Township 20 NWD Plan 29269
Site Address 38482 Bell Road, Deroche, BC PID 009-064-885

Client Information

Name Wladyslaw Wojcik
Role ☒ Property Owner ☐ Developer ☐ Other
Client Address [REDACTED]

Qualified Professional Information

Name Jamie Stirling, M.Sc. P.Geo. Professional Geoscientist registered and licensed to practice in BC (EGBC)
Designation ☐ Professional Engineer¹ registered or licensed to practice in British Columbia; or,
☐ Qualified Environmental Professional² registered or licensed to practice in British Columbia.
Company Name Stirling Geoscience Ltd.
Mailing Address [REDACTED]
Email Address jamie@stirlinggeoscience.com Phone # 604-349-7709

Report Reference

Title 38482 Bell Rd, Deroche - Flood Hazard Assessment and DP Application Date April 16, 2025
(herein after called "the report" and attached as Schedule A)

¹ "Professional Engineer" means a person who is registered or licensed and in good standing as a Professional Engineer in British Columbia under the *Engineers and Geoscientists Act*.

² "Qualified Environmental Professional" is a Registered Professional Biologist who is registered or licensed and in good standing as Registered Professional Biologist in British Columbia under the *College of Applied Biology Act*.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

B. Works

Description of the works for which the assurance and commitment for undertaking is being provided.

Overall fill project design including the infiltration gallery as detailed in the Issued for Development Permit drawings in Appendix G of the 38482 Bell Rd, Deroche - Flood Hazard Assessment and DP Application report by Stirling Geoscience Ltd. dated April 2025.

C. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I undertake and assume responsibility for undertaking all work necessary for conducting Field Reviews³ and for providing to the Fraser Valley Regional District (Regional District) a Post Construction Report⁴ within 30 days of the completion of the works respecting the works described above and in Schedule A attached hereto.
- 1.2. I understand that the Regional District will rely solely on my assurance and my commitment to conduct Field Reviews and to provide a Post Construction Report to ensure the works are completed according to good practices and in compliance with the report attached as Schedule A.
- 1.3. I certify that I have the means, qualifications and experience to provide the assurances and commitments contained herein.
- 1.4. In the case where the Professional Engineer or Qualified Environmental Professional is a member of a firm, I have been authorized to make the representations and assurances contained herein. I am a member of the firm of Stirling Geoscience Ltd. and I sign this document on behalf of the firm.

³ "Field Reviews" means such reviews of the construction at the project site (and/or the fabrication locations, where applicable) considered necessary by and at the discretion of the Professional Engineer or Qualified Environmental Professional to assure that the works constructed substantially comply in all respects with the design and with standards of good professional practice.

⁴ "Post Construction Report" means a report that certifies that all works have been completed and are in compliance with the report, good practices have been followed and identifies any deficiencies or any changes in design that are required.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

D. Qualified Professional (QP)

Prepared by: (QP of Record)

Name Jamie Stirling, M.Sc. P.Geo. Professional Geoscientist registered and licensed to practice in BC (EGBC)

Designation ☐ P.Eng. ☐ R.P.Bio.

Professional Seal, Signature and Date:



Personal information on this form is being collected in accordance with Section 27 of the Freedom of Information and Protection of Privacy Act, RSBC 1996 Ch. 165; Part 9, Division 1 [Building Regulation] and Part 14 [Planning and Land Use Management] of the Local Government Act, RSBC 2015 Ch. 1; and Section 56 of the Community Charter, SBC 2003 Ch. 26 and will only be collected, used and disclosed for the purpose of administering geo-technical hazard reviews and assurance statements related to development approvals. Questions? Contact FVRD Privacy Officer at 45950 Cheam Avenue, Chilliwack, BC V2P 1N6; 604-702-5000 or 1-800-528-0061; or FOI@fvr.ca.

Assurance & Commitment

of the property owner(s)

A. Property

I/we are the owners of the property located at 38482 Bell Road, Deroche, BC

B. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I am authorized to give these representations and assurances to the Regional District.
- 1.2. I acknowledge and understand that the Regional District has relied and is relying exclusively on the Assurance & Commitment for Undertaking Field Reviews and Post Construction Reporting to ensure the works are completed according to good practices and in compliance with the report as attached as Schedule A.
- 1.3. I have authorized, and am relying upon, the firm of Stirling Geoscience Ltd. to conduct all appropriate and necessary Field Reviews in respect of the works for which the assurance and commitment for undertaking is provided and to provide the Regional District with a Post Construction Report within 30 days of the completion of the work.
- 1.4. I have provided, the firm of Stirling Geoscience Ltd. with access to the property and the necessary resources, funding and permissions to conduct Field Reviews and provide the Regional District with a Post Construction Report.


C. Property Owners

Signature _____

Name of Property Owner Wladyslaw Wojcik

Mailing Address _____

Email Address _____ Phone # _____

Signature 

Name of Property Owner _____

Mailing Address _____

Email Address _____ Phone # _____

DEVELOPMENT PERMIT 2025-02

SCHEDULE E

Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 16, 2025, prepared by Sean Reilly, P. Eng., of Reilly Engineering Associates Ltd. & Wladyslaw Wojcik, property owner.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

Please complete this form in its entirety. If fields are left blank, the form will be returned.

A. Project Information

Date April 16, 2025 FVRD File No. 3060-20 DP 2025-02

Property Information

Project Name & Description Add up to 4 m of fill to a portion of the Site
Legal Description Lot 4 Exc: Par A (Ref Plan 53267): Sec 33 and of the NW quarter of Sec 34 Township 20 NWD Plan 29269
Site Address 38482 Bell Road, Deroche, BC PID 009-064-885

Client Information

Name Wladyslaw Wojcik
Role ☒ Property Owner ☐ Developer ☐ Other
Client Address [REDACTED]

Qualified Professional Information

Name Sean Reilly, P. Eng.
Designation ☒ Professional Engineer¹ registered or licensed to practice in British Columbia; or,
☐ Qualified Environmental Professional² registered or licensed to practice in British Columbia.
Company Name Reilly Engineering Associates Ltd.
Mailing Address 1-565 Kaslo Street, Vancouver, BC, V5K 3Z3
Email Address Sean@ReillyEngineering.ca Phone # [REDACTED]

Report Reference

Title 38482 Bell Rd, Deroche - Flood Hazard Assessment and DP Application Date April 16, 2025
(herein after called "the report" and attached as Schedule A)

¹ "Professional Engineer" means a person who is registered or licensed and in good standing as a Professional Engineer in British Columbia under the *Engineers and Geoscientists Act*.

² "Qualified Environmental Professional" is a Registered Professional Biologist who is registered or licensed and in good standing as Registered Professional Biologist in British Columbia under the *College of Applied Biology Act*.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

B. Works

Description of the works for which the assurance and commitment for undertaking is being provided.

Geotechnical aspects of site preparation, fill placement, and site reclamation.

C. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I undertake and assume responsibility for undertaking all work necessary for conducting Field Reviews³ and for providing to the Fraser Valley Regional District (Regional District) a Post Construction Report⁴ within 30 days of the completion of the works respecting the works described above and in Schedule A attached hereto.
- 1.2. I understand that the Regional District will rely solely on my assurance and my commitment to conduct Field Reviews and to provide a Post Construction Report to ensure the works are completed according to good practices and in compliance with the report attached as Schedule A.
- 1.3. I certify that I have the means, qualifications and experience to provide the assurances and commitments contained herein.
- 1.4. In the case where the Professional Engineer or Qualified Environmental Professional is a member of a firm, I have been authorized to make the representations and assurances contained herein. I am a member of the firm of Reilly Engineering Associates Ltd. and I sign this document on behalf of the firm.

³ "Field Reviews" means such reviews of the construction at the project site (and/or the fabrication locations, where applicable) considered necessary by and at the discretion of the Professional Engineer or Qualified Environmental Professional to assure that the works constructed substantially comply in all respects with the design and with standards of good professional practice.

⁴ "Post Construction Report" means a report that certifies that all works have been completed and are in compliance with the report, good practices have been followed and identifies any deficiencies or any changes in design that are required.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

D. Qualified Professional (QP)

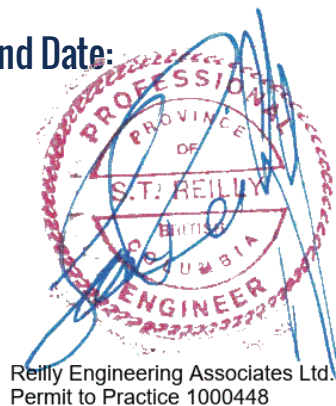
Prepared by: (QP of Record)

Name Sean Reilly, P. Eng.

Designation ☒ P.Eng.

☐ R.P.Bio.

Professional Seal, Signature and Date:



Personal information on this form is being collected in accordance with Section 27 of the Freedom of Information and Protection of Privacy Act, RSBC 1996 Ch. 165; Part 9, Division 1 [Building Regulation] and Part 14 [Planning and Land Use Management] of the Local Government Act, RSBC 2015 Ch. 1; and Section 56 of the Community Charter, SBC 2003 Ch. 26 and will only be collected, used and disclosed for the purpose of administering geo-technical hazard reviews and assurance statements related to development approvals. Questions? Contact FVRD Privacy Officer at 45950 Cheam Avenue, Chilliwack, BC V2P 1N6; 604-702-5000 or 1-800-528-0061; or FOI@fvrld.ca.

Assurance & Commitment

of the property owner(s)

A. Property

I/we are the owners of the property located at 38482 Bell Road, Deroche, BC

B. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I am authorized to give these representations and assurances to the Regional District.
- 1.2. I acknowledge and understand that the Regional District has relied and is relying exclusively on the Assurance & Commitment for Undertaking Field Reviews and Post Construction Reporting to ensure the works are completed according to good practices and in compliance with the report as attached as Schedule A.
- 1.3. I have authorized, and am relying upon, the firm of Reilly Engineering Associates Ltd. to conduct all appropriate and necessary Field Reviews in respect of the works for which the assurance and commitment for undertaking is provided and to provide the Regional District with a Post Construction Report within 30 days of the completion of the work.
- 1.4. I have provided, the firm of Reilly Engineering Associates Ltd. with access to the property and the necessary resources, funding and permissions to conduct Field Reviews and provide the Regional District with a Post Construction Report.

C. Property Owners

Signature _____

Name of Property Owner Wladyslaw Wojcik

Mailing Address _____

Email Address _____

Phone # _____

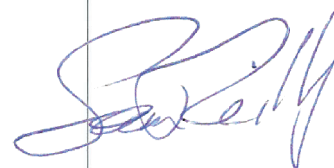
Signature _____

Name of Property Owner _____

Mailing Address _____

Email Address _____

Phone # _____



DEVELOPMENT PERMIT 2025-02

SCHEDULE F

Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 15, 2025, prepared by Monte Anions, P.L. Geo., EP, CSAP, of Keystone Environmental Ltd. & Wladyslaw Wojcik, property owner.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

Please complete this form in its entirety. If fields are left blank, the form will be returned.

A. Project Information

Date April 15, 2025 FVRD File No. 3060-20 DP 2025-02

Property Information

Project Name & Description Add up to 4 m of fill to a portion of the Site
Legal Description Lot 4 Exc: Par A (Ref Plan 53267): Sec 33 and of the NW quarter of Sec 34 Township 20 NWD Plan 29269
Site Address 38482 Bell Road, Deroche, BC PID 009-064-885

Client Information

Name Wladyslaw Wojcik
Role ☒ Property Owner ☐ Developer ☐ Other
Client Address [REDACTED]

Qualified Professional Information

Name Monte Anions, P.L.Geo., EP, CSAP
Designation ☐ Professional Engineer¹ registered or licensed to practice in British Columbia; or,
☒ Qualified Environmental Professional² registered or licensed to practice in British Columbia.
Company Name Keystone Environmental Ltd.
Mailing Address 320 - 4400 Dominion Street, Burnaby, BC V5G 4G3
Email Address manions@keystoneenvironmental.ca Phone # 604-430-0671

Report Reference

Title August 2023 Phase I ESA, March 2024 Site Disclosure Statement Date August 2023, March 2024
(herein after called "the report" and attached as Schedule A)

¹ "Professional Engineer" means a person who is registered or licensed and in good standing as a Professional Engineer in British Columbia under the *Engineers and Geoscientists Act*.

² "Qualified Environmental Professional" is a Registered Professional Biologist who is registered or licensed and in good standing as Registered Professional Biologist in British Columbia under the *College of Applied Biology Act*.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

B. Works

Description of the works for which the assurance and commitment for undertaking is being provided.

Review of source and soil characterization information for soil to be imported to the property.

Evaluation of laboratory analytical results for soil samples compared to provincial standards for current and proposed future land (and water uses).

Summary report for soil characterization aspects of Post Construction Report.

C. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I undertake and assume responsibility for undertaking all work necessary for conducting Field Reviews³ and for providing to the Fraser Valley Regional District (Regional District) a Post Construction Report⁴ within 30 days of the completion of the works respecting the works described above and in Schedule A attached hereto.
- 1.2. I understand that the Regional District will rely solely on my assurance and my commitment to conduct Field Reviews and to provide a Post Construction Report to ensure the works are completed according to good practices and in compliance with the report attached as Schedule A.
- 1.3. I certify that I have the means, qualifications and experience to provide the assurances and commitments contained herein.
- 1.4. In the case where the Professional Engineer or Qualified Environmental Professional is a member of a firm, I have been authorized to make the representations and assurances contained herein. I am a member of the firm of Keystone Environmental Ltd. and I sign this document on behalf of the firm.

³ "Field Reviews" means such reviews of the construction at the project site (and/or the fabrication locations, where applicable) considered necessary by and at the discretion of the Professional Engineer or Qualified Environmental Professional to assure that the works constructed substantially comply in all respects with the design and with standards of good professional practice.

⁴ "Post Construction Report" means a report that certifies that all works have been completed and are in compliance with the report, good practices have been followed and identifies any deficiencies or any changes in design that are required.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

D. Qualified Professional (QP)

Prepared by: (QP of Record)

Name Monte Anions, P.L.Geo., EP, CSAP

Designation ☐ P.Eng. ☐ R.P.Bio. ☒ P.L.Geo.

Professional Seal, Signature and Date:



2025-04-15

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I/we are the owners of the property located at 38482 Bell Road, Deroche, BC

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- 1.2. I acknowledge and understand that the Regional District has relied and is relying exclusively on the Assurance & Commitment for Undertaking Field Reviews and Post Construction Reporting to ensure the works are completed according to good practices and in compliance with the report as attached as Schedule A.
- 1.3. I have authorized, and am relying upon, the firm of Keystone Environmental Ltd. to conduct all appropriate and necessary Field Reviews in respect of the works for which the assurance and commitment for undertaking is provided and to provide the Regional District with a Post Construction Report within 30 days of the completion of the work.
- 1.4. I have provided, the firm of Keystone Environmental Ltd. with access to the property and the necessary resources, funding and permissions to conduct Field Reviews and provide the Regional District with a Post Construction Report.

C. Property Owners

Signature _____

Name of Property Owner Wladyslaw Wojcik

Mailing Address _____

Email Address _____ Phone # _____

Signature W. Wojcik

Name of Property Owner _____

Mailing Address _____

Email Address _____ Phone # _____

DEVELOPMENT PERMIT 2025-02

SCHEDULE G

Assurance & Commitment for Undertaking Field Reviews & Post Construction Reporting, dated April 15, 2025, prepared by Jeremy Nilson, R.P. Bio., of Keystone Environmental Ltd. & Wladyslaw Wojcik, property owner.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

Please complete this form in its entirety. If fields are left blank, the form will be returned.

A. Project Information

Date April 15, 2025 FVRD File No. 3060-20 DP 2025-02

Property Information

Project Name & Description Add up to 4 m of fill to a portion of the Site
Legal Description Lot 4 Exc: Par A (Ref Plan 53267): Sec 33 and of the NW quarter of Sec 34 Township 20 NWD Plan 29269
Site Address 38482 Bell Road, Deroche, BC PID 009-064-885

Client Information

Name Wladyslaw Wojcik
Role ☒ Property Owner ☐ Developer ☐ Other
Client Address [REDACTED]

Qualified Professional Information

Name Jeremy Nilson, R.P.Bio.
Designation ☐ Professional Engineer¹ registered or licensed to practice in British Columbia; or,
☒ Qualified Environmental Professional² registered or licensed to practice in British Columbia.
Company Name Keystone Environmental Ltd.
Mailing Address Suite 320 - 4400 Dominion Street, Burnaby, BC
Email Address jnilson@keystoneenvironmental.ca Phone # [REDACTED]

Report Reference

Title Environmental Constraints Assessment - Rev 2 Date Oct 10, 2024
(herein after called "the report" and attached as Schedule A)

¹ "Professional Engineer" means a person who is registered or licensed and in good standing as a Professional Engineer in British Columbia under the *Engineers and Geoscientists Act*.

² "Qualified Environmental Professional" is a Registered Professional Biologist who is registered or licensed and in good standing as Registered Professional Biologist in British Columbia under the *College of Applied Biology Act*.

Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

B. Works

Description of the works for which the assurance and commitment for undertaking is being provided.

Clearing of vegetation to be completed outside of the applicable critical nesting period for birds (i.e., outside of March 1 to August 31) or only following completion of a nesting activity survey and only if that survey determines that no active nests will be harmed by the proposed clearing.

Jeremy Nilson is to be consulted prior to the start of clearing to confirm if a nesting activity survey is required. If necessary, Jeremy Nilson will arrange for a nesting activity survey, review the results, and advise as to whether clearing can be initiated and if additional measures are required. The results of this determination will be provided to the Fraser Valley Regional District in writing prior to the start of clearing.

C. Assurance

By signing below, I hereby give assurance and commit to the following:

- 1.1. I undertake and assume responsibility for undertaking all work necessary for conducting Field Reviews³ and for providing to the Fraser Valley Regional District (Regional District) a Post Construction Report⁴ within 30 days of the completion of the works respecting the works described above and in Schedule A attached hereto.
- 1.2. I understand that the Regional District will rely solely on my assurance and my commitment to conduct Field Reviews and to provide a Post Construction Report to ensure the works are completed according to good practices and in compliance with the report attached as Schedule A.
- 1.3. I certify that I have the means, qualifications and experience to provide the assurances and commitments contained herein.
- 1.4. In the case where the Professional Engineer or Qualified Environmental Professional is a member of a firm, I have been authorized to make the representations and assurances contained herein. I am a member of the firm of Keystone Environmental Ltd. and I sign this document on behalf of the firm.

³ "Field Reviews" means such reviews of the construction at the project site (and/or the fabrication locations, where applicable) considered necessary by and at the discretion of the Professional Engineer or Qualified Environmental Professional to assure that the works constructed substantially comply in all respects with the design and with standards of good professional practice.

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Assurance & Commitment

for Undertaking Field Reviews & Post Construction Reporting

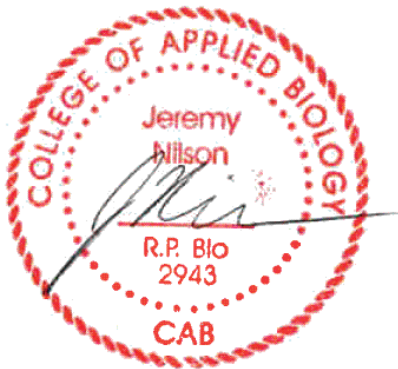
D. Qualified Professional (QP)

Prepared by: (QP of Record)

Name Jeremy Nilson, R.P.Bio.

Designation ☐ P.Eng. ☒ R.P.Bio.

Professional Seal, Signature and Date:



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C. Property Owners

Signature _____

Name of Property Owner Wladyslaw Wojcik

Mailing Address _____

Email Address _____

Phone # _____

Signature _____

Name of Property Owner _____

Mailing Address _____

Email Address _____

Phone # _____