

REGIONAL DISTRICT OF NORTH OKANAGAN

BYLAW No. 2940

A bylaw to amend the Electoral Area “F” Official Community Plan Bylaw No. 2702, 2016 and amendments thereto.

WHEREAS pursuant to Section 472 [Authority to adopt a bylaw] of the *Local Government Act*, the Board of the Regional District of North Okanagan may, by Bylaw, adopt one or more official community plans;

AND WHEREAS the Board has enacted the “*Electoral Area “F” Official Community Plan Bylaw No. 2702, 2016*” as amended to provide a statement of objectives and policies to guide decisions on planning and land use management, within the area covered by the plan;

AND WHEREAS, pursuant to Section 460 [Development approval procedures] of the *Local Government Act*, the Board must, by bylaw, define procedures under which an owner of land may apply for an amendment to an Official Community Plan and must consider every application for an amendment to the plan;

AND WHEREAS the Board has enacted the “*Regional District of North Okanagan Development Application Procedures and Administrative Fees Bylaw No. 2677, 2018*” as amended to establish procedures to amend an Official Community Plan, a Zoning Bylaw, or a Rural Land Use Bylaw, or to issue a Permit:

AND WHEREAS the Board has received an application to amend the Official Community Plan designation;

NOW THEREFORE, the Board of the Regional District of North Okanagan in an open meeting assembled, hereby **ENACTS AS FOLLOWS**:

CITATION

1. This Bylaw may be cited as “***Electoral Area “F” Official Community Plan Amendment Bylaw No. 2940, 2022***”.

AMENDMENTS

2. The land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area “F” is hereby changed on Schedule “C” of the Electoral Area “F” Official Community Plan Bylaw No. 2702, 2016 from Non-Urban to Country Residential.

Read a First Time this 21st day of September, 2022

Bylaw considered in conjunction with the Regional District Financial Plan and Waste Management Plan this 21st day of September, 2022

Read a Second Time this 15th day of November, 2023

Advertised on this 22nd day of December, 2023
this 2nd day of January, 2024

Delegated Public Hearing held this 11th day of January, 2024

Read a Third Time this day of , 2024

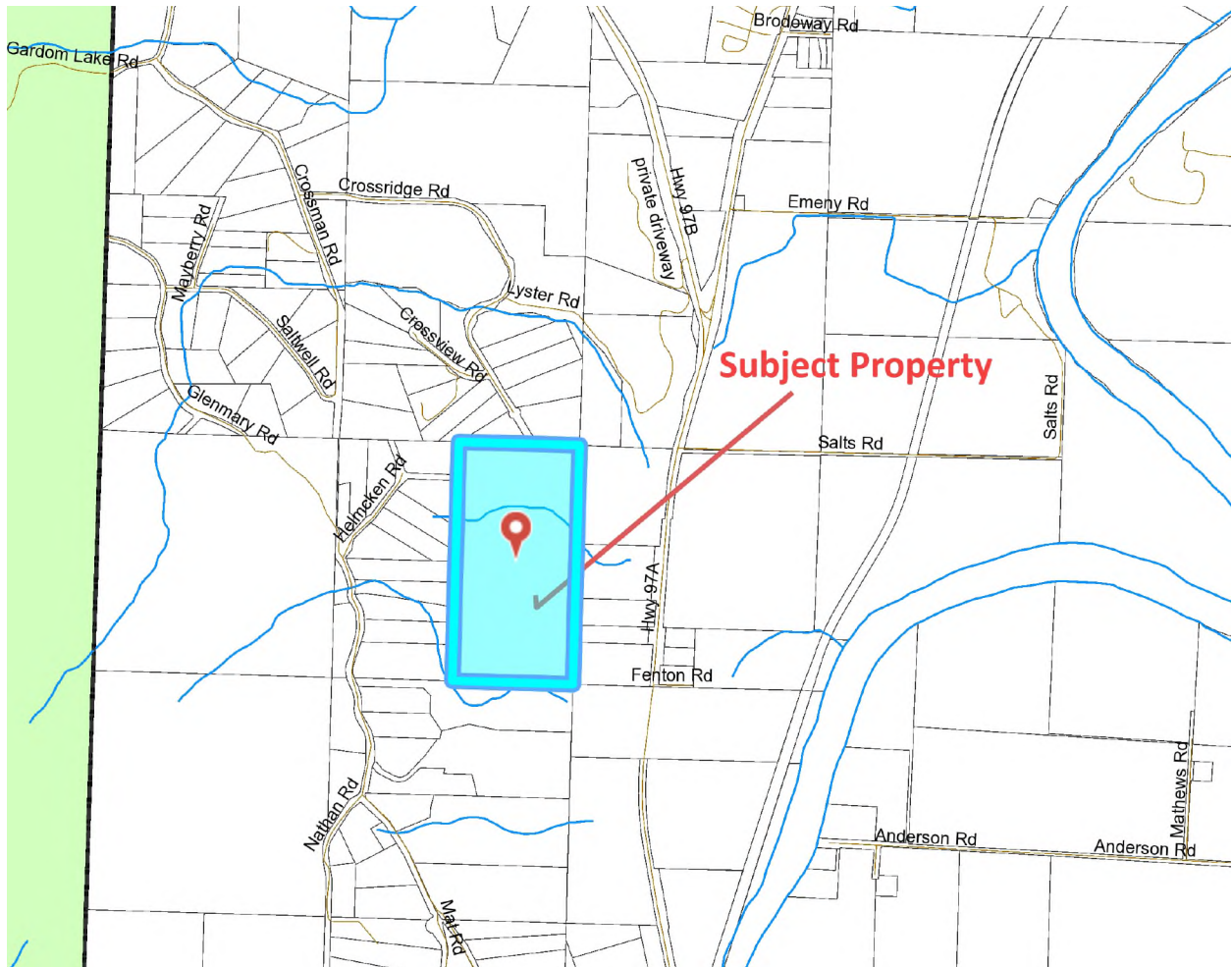
ADOPTED this day of , 2024

Chair

Deputy Corporate Officer

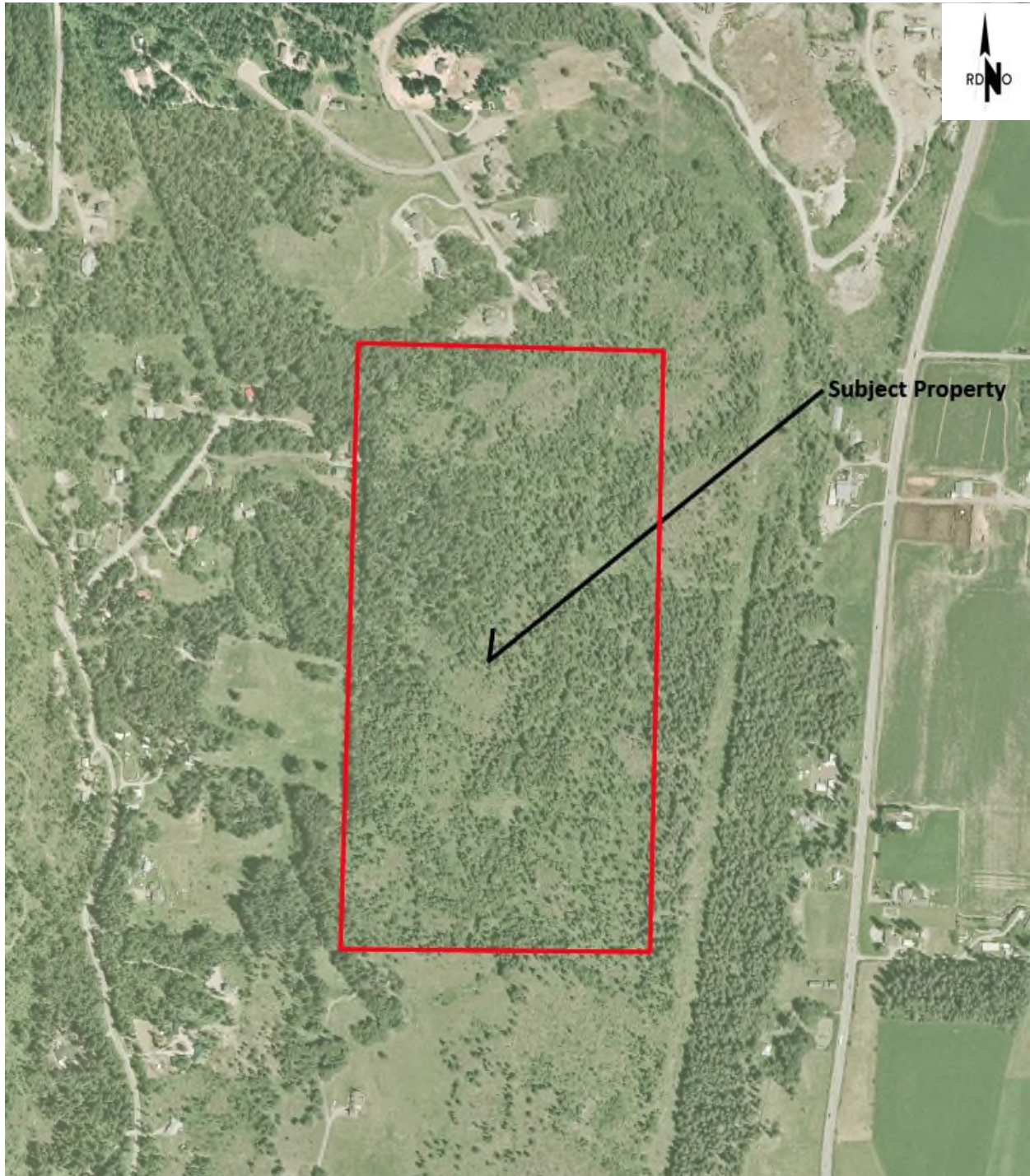
SUBJECT PROPERTY MAP OCP / REZONING

File: 22-0199-F-OR
Location: 150 Crossridge Road



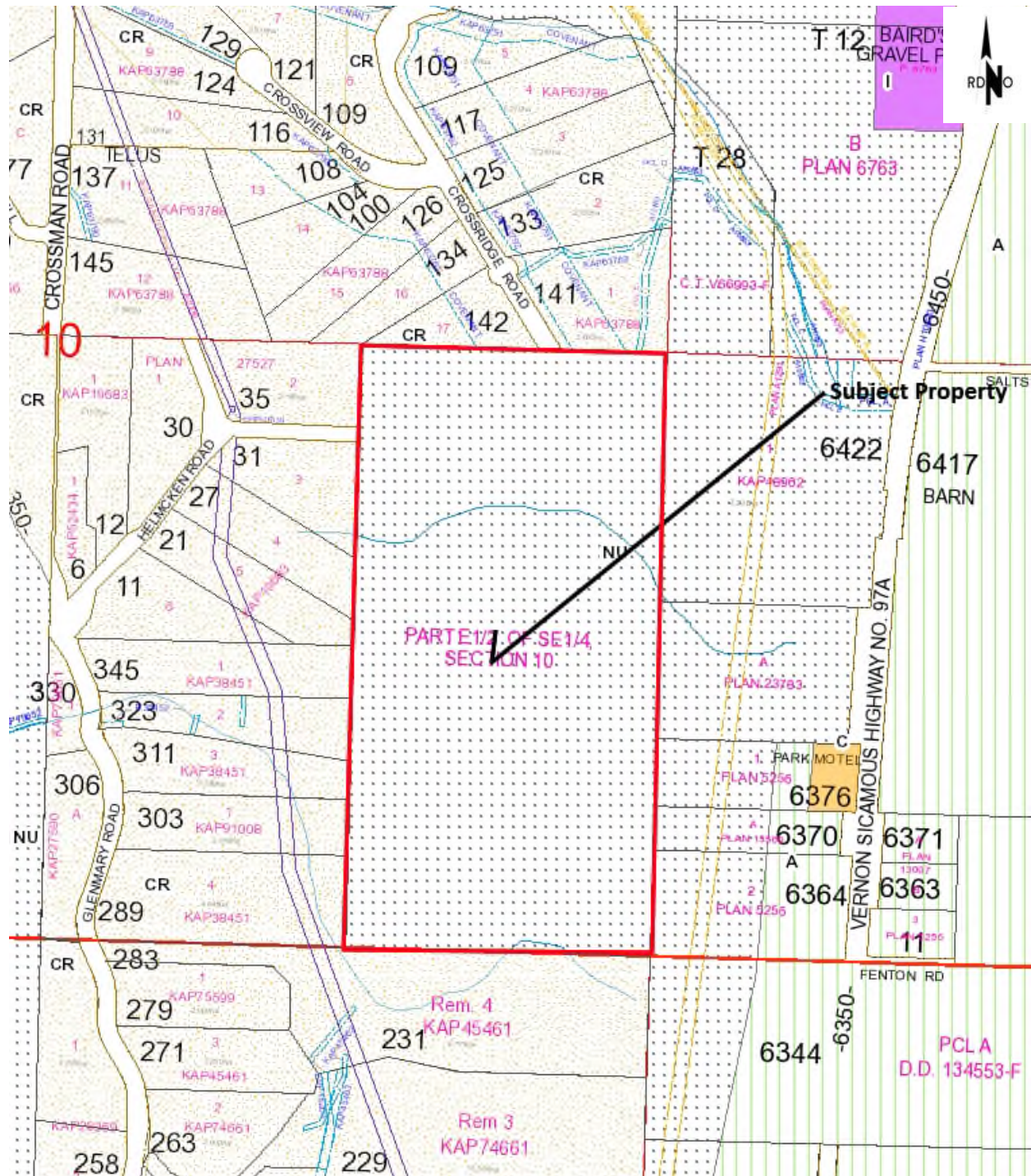
SUBJECT PROPERTY MAP ORTHOPHOTO OCP / REZONING

File: 22-0199-F-OR
Location: 150 Crossridge Road



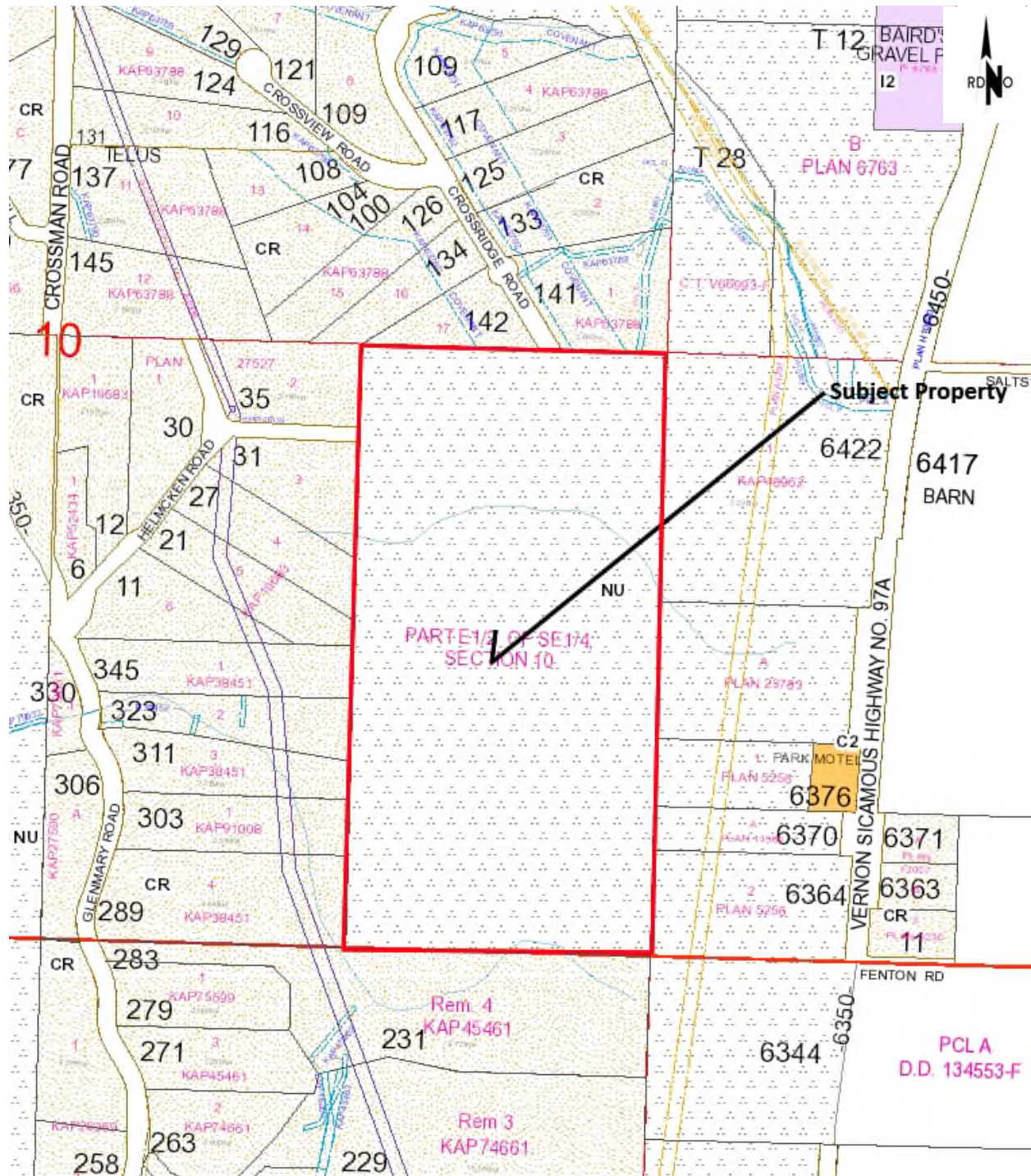
SUBJECT PROPERTY MAP OCP DESIGNATION OCP / REZONING

File: 22-0199-F-OR
Location: 150 Crossridge Road

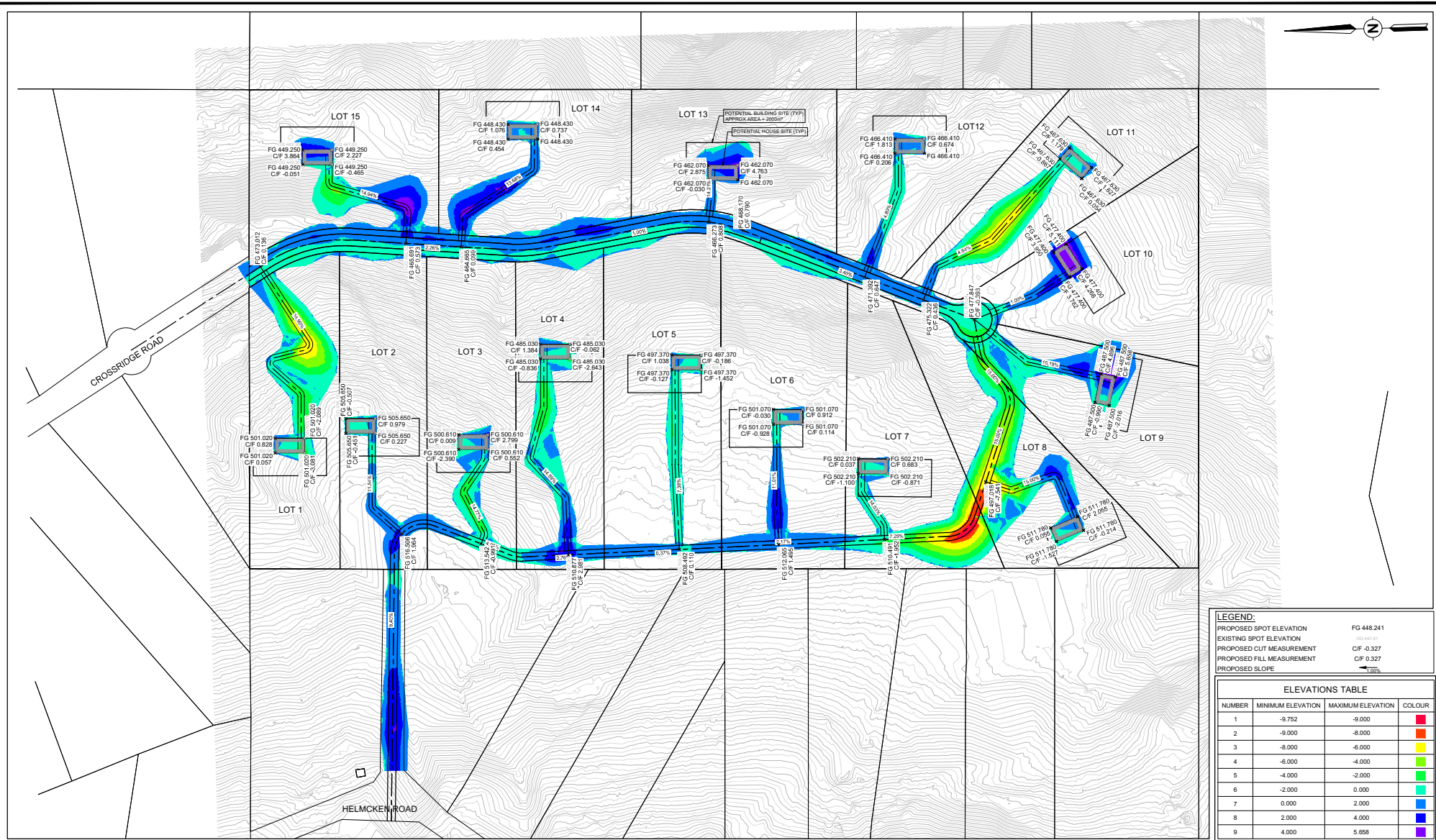


SUBJECT PROPERTY MAP ZONING OCP / REZONING

File: 22-0199-F-OR
Location: 150 Crossridge Road



McElhannay A6810 11.1516 - Crossridge Road - Enderby BC - 2023-05-11
 McElhannay A6810 11.1516 - Crossridge Road - Enderby BC - 2023-05-11



LEGEND:

PROPOSED SPOT ELEVATION	FG 448.241
EXISTING SPOT ELEVATION	CG 447.91
PROPOSED CUT MEASUREMENT	C/F -0.327
PROPOSED FILL MEASUREMENT	C/F 0.327
PROPOSED SLOPE	1:100

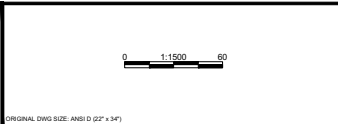
ELEVATIONS TABLE			
NUMBER	MINIMUM ELEVATION	MAXIMUM ELEVATION	COLOUR
1	-9.752	-9.000	Red
2	-9.000	-8.000	Orange
3	-8.000	-6.000	Yellow
4	-6.000	-4.000	Light Green
5	-4.000	-2.000	Green
6	-2.000	0.000	Cyan
7	0.000	2.000	Blue
8	2.000	4.000	Dark Blue
9	4.000	5.658	Purple

Rev	Date	Description	Drawn	Checked	App'd
2	2023-05-23	UPDATED GRADES CIW CUT / FILL	CA	CA	RL
1	2023-03-28	UPDATED GRADES CIW CUT / FILL	CLS	CLS	RL
0	2023-01-11	ISSUED FOR DISCUSSION	CLS	CLS	RL

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McElhannay

2281 Hunter Road
Kelowna BC
Canada V1X 7C5
T 250 861 8783

**PRELIMINARY
NOT FOR
CONSTRUCTION**

MARK LEWIS
49 EAST POIRER ROAD, MARA BC

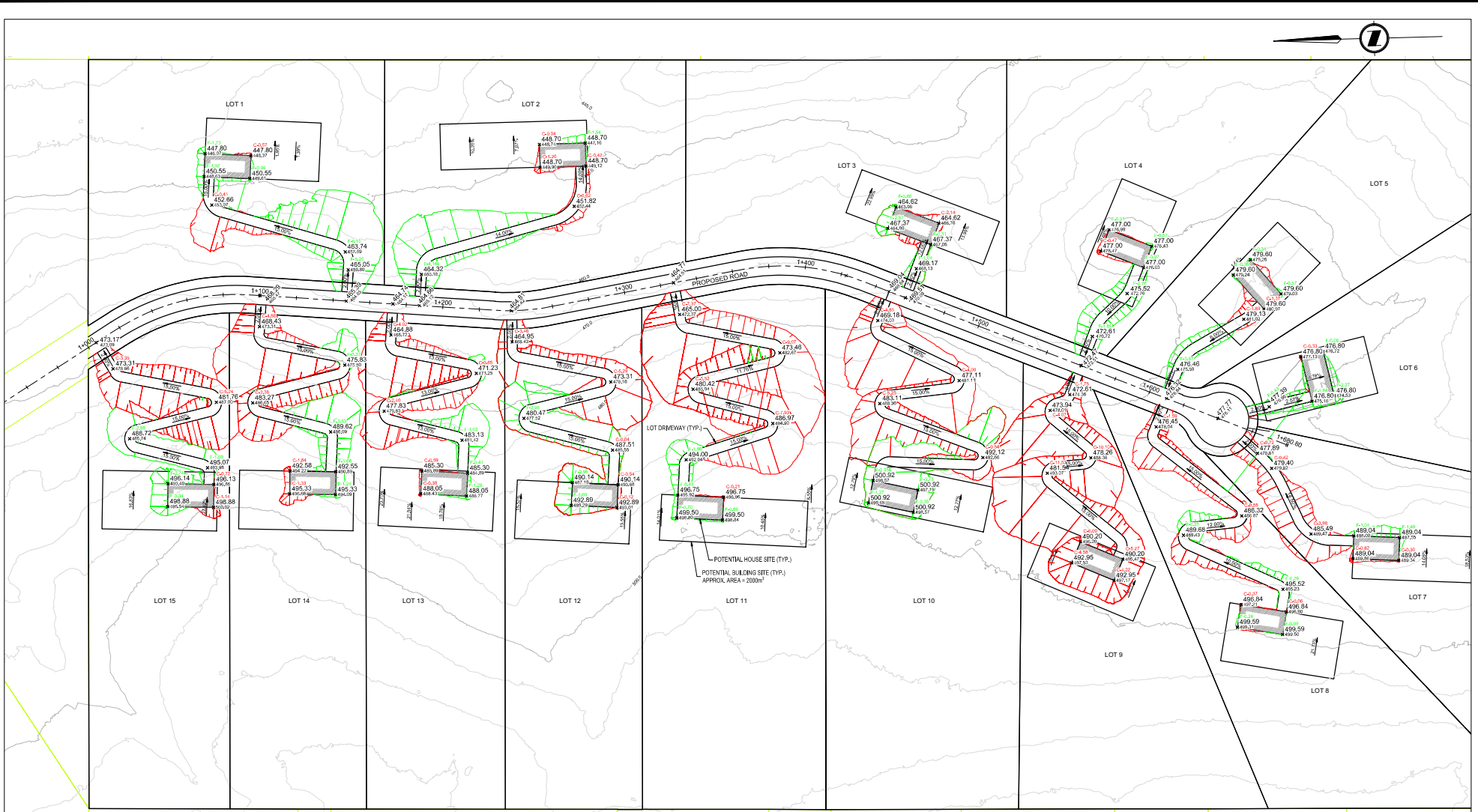
150 CROSSRIDGE ROAD, ENDERBY BC
RE-ZONING / SUBDIVISION
DRIVEWAY GRADING PLAN

Drawing No. **C-003**

Project Number 2451-2061-011

Rev. **2**

THIS DRAWING HAS NOT BEEN APPROVED AND MAY CONTAIN ERRORS AND OMISSIONS



- LEGEND:**
- x 470.00 PROPOSED SPOT ELEVATION
 - x 470.00 EXISTING SPOT ELEVATION
 - 15.00% PROPOSED SLOPE
 - EXISTING SLOPE
 - PROPOSED DRIVEWAY
 - POTENTIAL BUILDING SITE BOUNDARY
 - PROPOSED 2(H):1(V) FILL SLOPE
 - PROPOSED 2(H):1(V) CUT SLOPE
 - POTENTIAL HOUSE SITE
 - x PROPOSED CUT MEASUREMENT
 - x PROPOSED FILL MEASUREMENT

Rev	Date	Description	Drawn (Design)	App'd
1	2023-03-28	UPDATED GRADES C/W CUT / FILL	CLS	CLS
0	2023-07-11	ISSUED FOR DISCUSSION	CLS	CLS

THE ENGINEER HAS REVIEWED THE INFORMATION PROVIDED AND HAS CONSIDERED THE INFORMATION RECEIVED FROM THE CLIENT AND THE INFORMATION RECEIVED FROM THE CLIENT'S REPRESENTATIVES. THE ENGINEER HAS CONSIDERED THE INFORMATION RECEIVED FROM THE CLIENT AND THE INFORMATION RECEIVED FROM THE CLIENT'S REPRESENTATIVES. THE ENGINEER HAS CONSIDERED THE INFORMATION RECEIVED FROM THE CLIENT AND THE INFORMATION RECEIVED FROM THE CLIENT'S REPRESENTATIVES.

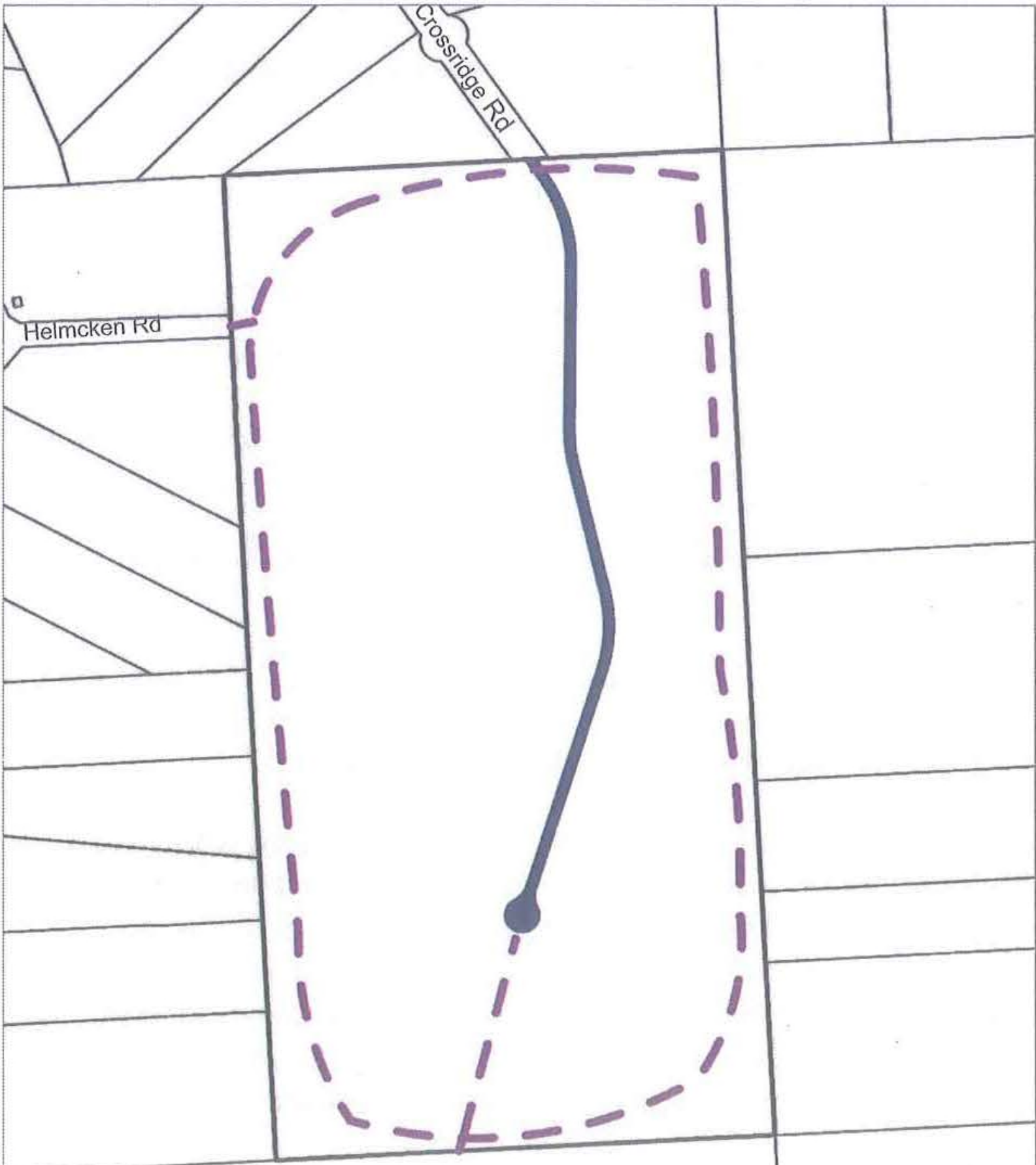
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McElhanney
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PRELIMINARY
 NOT FOR CONSTRUCTION

MARK LEWIS
 49 EAST POIRER ROAD, MARA BC
150 CROSSRIDGE ROAD, ENDERBY BC
RE-ZONING / SUBDIVISION
DRIVEWAY GRADING PLAN

Drawing No.
C-003
 Project Number
 2061-011
 Rev.
 0



- Main Vehicular Circulation
- Secondary Emergency Circulation



REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the

Board of Directors

Held on

Wednesday, December 20, 2023

Official Community Plan / Rezoning Application

**LAND FIRST ADAPTIVE DEVELOPMENT c/o LI, RUIBIN [File No. 22-0199-F-OR]
150 Crossridge Road, Electoral Area "F"**

Moved and seconded

That as recommended by the Electoral Area Advisory Committee, Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940, 2022 which proposes to amend the Electoral Area "F" Official Community Plan land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" be forwarded to a public hearing without Zoning Amendment Bylaw No. 2941, 2022 which proposes to rezone the same property from the Non-Urban (N.U) zone to the Country Residential (C.R) zone; and further,

That the existing conditions of adopting Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940 and Zoning Amendment Bylaw No. 2941 only apply to the adoption of a new Zoning Amendment Bylaw that would replace Zoning Amendment Bylaw No. 2941; and further

That further consideration of a Zoning Amendment Bylaw for the subject property not be given until after Zoning Bylaw No. 3000 and Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940 are adopted and consideration is given to a new Zoning Amendment Bylaw that would replace Zoning Amendment Bylaw No. 2941.

CARRIED

Moved and seconded

That as recommended by the Electoral Area Advisory Committee, the Public Hearing for Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940, 2022 be delegated to the Electoral Area Advisory Committee.

CARRIED

REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the

Board of Directors

Held on

Wednesday, November 15, 2023

Official Community Plan / Rezoning Application

**LAND FIRST ADAPTIVE DEVELOPMENT c/o LI, RUIBIN [File No. 22-0199-F-OR]
150 Crossridge Road, Electoral Area "F"**

Moved and seconded

That Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940, 2022, which proposes to amend the Electoral Area "F" Official Community Plan Bylaw No. 2702, 2016 by changing the land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from Non-Urban to Country Residential, be given Second Reading and be forwarded to a Public Hearing; and further,

That Zoning Amendment Bylaw No. 2941, 2022, which proposes to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of the property legally described as the E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from the Non-Urban (N.U) zone to the Country Residential (C.R) zone, be given Second Reading and be forwarded to a Public Hearing.

CARRIED

Moved and seconded

That the Public Hearing for Bylaw No. 2940 and Bylaw No. 2941 be delegated to the Electoral Area Advisory Committee under Section 231 of the *Local Government Act*.

CARRIED

Moved and seconded

That Final Adoption of Bylaw No. 2940 and Bylaw No. 2941 be withheld until a covenant has been registered on the title of the subject property which:

1. requires a phased approach to development commencing with an initial phase of 8 lots while groundwater levels in multiple wells onsite continue to be monitored to develop a better understanding of seasonal groundwater fluctuations and aquifer recharge. The monitoring data would be used as the basis for a decision to allow future phases of development to proceed;
2. states that the property may not be subdivided until a professional hydrologist has verified that all wells proposed to service all new lots are proven to meet the quantity and quality standards of the Regional District Subdivision Servicing Bylaw and that the extraction of water from the wells will not negatively impact the water supply of neighbouring wells;
3. states that the observed drainages on the property must be maintained and protected as they may provide valuable recharge to the underlying bedrock Aquifer 107;

4. requires the property to be developed in accordance with the recommendations in the report from Landmark Solutions Ltd. dated March 15, 2023, including the requirement to construct a secondary emergency access route at the time of subdivision which connects to Helmcken Road and to register an easement over the route which saves harmless the Regional District in the event that damage to property may occur as a result of a wildfire; and
5. states that the property may not be subdivided unless a road reserve is registered on the title of the property in a location and alignment that would connect the future extension of Crossridge Road with the property located to the south in accordance with Ministry of Transportation and Infrastructure (MOTI) standards and to the satisfaction of the Regional District and the MOTI.

CARRIED

TO: Board of Directors

File No: 22-0199-F-OR

FROM: Planning Department

Date: October 18, 2023

SUBJECT: OCP Amendment Bylaw No. 2940 and Zoning Amendment Bylaw No. 2941

RECOMMENDATION:

That Electoral Area “F” Official Community Plan Amendment Bylaw No. 2940, 2022, which proposes to amend the Electoral Area “F” Official Community Plan Bylaw No. 2702, 2016 by changing the land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area “F” from Non-Urban to Country Residential, be given Second Reading and be forwarded to a Public Hearing; and further,

That Zoning Amendment Bylaw No. 2941, 2022, which proposes to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of the property legally described as the E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area “F” from the Non-Urban (N.U) zone to the Country Residential (C.R) zone, be given Second Reading and be forwarded to a Public Hearing; and further,

That the Public Hearing for Bylaw No. 2940 and Bylaw No. 2941 be delegated to the Electoral Area Advisory Committee under Section 231 of the *Local Government Act*; and further,

That Final Adoption of Bylaw No. 2940 and Bylaw No. 2941 be withheld until a covenant has been registered on the title of the subject property which:

1. requires a phased approach to development commencing with an initial phase of 8 lots while groundwater levels in multiple wells onsite continue to be monitored to develop a better understanding of seasonal groundwater fluctuations and aquifer recharge. The monitoring data would be used as the basis for a decision to allow future phases of development to proceed;
2. states that the property may not be subdivided until a professional hydrologist has verified that all wells proposed to service all new lots are proven to meet the quantity and quality standards of the Regional District Subdivision Servicing Bylaw and that the extraction of water from the wells will not negatively impact the water supply of neighbouring wells;
3. states that the observed drainages on the property must be maintained and protected as they may provide valuable recharge to the underlying bedrock Aquifer 107;
4. requires the property to be developed in accordance with the recommendations in the report from Landmark Solutions Ltd. dated March 15, 2023, including the requirement to dedicate and construct a secondary emergency access route at the time of subdivision which connects to Helmcken Road, and which saves harmless the Regional District in the event that damage to property may occur as a result of a wildfire; and
5. states that the property may not be subdivided unless a road reserve is registered on the title of the property in a location and alignment that would connect the future extension of Crossridge Road with the property located to the south in accordance with Ministry of Transportation and Infrastructure (MOTI) standards and to the satisfaction of the Regional District and the MOTI.

BACKGROUND:

This report relates to an application to amend the Official Community Plan (OCP) land use designation and zoning of the 32.46 ha property located at 150 Crossridge Road in Electoral Area "F" from Non-Urban to Country Residential. If approved, the applicant is proposing to subdivide the property into 15 lots. At the Regular Meeting held on August 17, 2022, the Board of Directors considered the application and resolved that staff be directed to prepare an OCP Amendment Bylaw and a Zoning Amendment Bylaw for First Reading. The Board also resolved that Second Reading of the Bylaws be withheld until:

1. comments have been received from: RDNO Community Services (Parks and Protective Services) Departments, Fire Department and First Nations;
2. the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide;
3. the applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that the subject property is safe for the intended use;
4. a water supply study which takes into consideration the potential to service the proposed lots and the impact it could have on the water supply in the area;
5. plans prepared by a BC Land Surveyor or Professional Engineer which show the building sites and driveways on the proposed lots including their existing and proposed grades and the cuts and fill required to achieve those grades;
6. the applicant has submitted a study prepared by a professional Geotechnical Engineer which evaluates the subject property and provides recommendations for potential on-site septic sewage disposal associated with the proposed development; and,
7. the applicant has submitted a report prepared by a Registered Professional Forester which assesses the proposed development and provides recommendations to minimize the risk of wildfire hazard including recommendations related to vehicle access routes and FireSmart principles.

At the Regular Meeting held on September 21, 2022, the Board considered the application and gave First Reading to the associated Electoral Areas "F" Official Community Plan Amendment Bylaw No. 2940, 2022 and Zoning Amendment Bylaw No. 2941, 2022.

REFERRAL COMMENTS:

Since the subject Bylaws received First Reading, the following comments have been received from the RDNO Community Services (Parks) Department, RDNO Community Services (Protective Services) Department, Fire Department and Splantsin.

RDNO Parks Department

The Parks Department indicated they have no comments as there doesn't appear to be any park interests in the area.

RDNO Protective Services Department

The Protective Services Department provided the following comments:

- Second means of egress must be established with unrestricted access, constructed to MOTI specs, grades and radii also to conform to BCBC and BCFC and good engineering practice, max grade <8%. Maintained for public egress. This egress required at onset of the development.
- The proposed land falls into an equivalent risk class 6-9 of WUI fire risk analysis comparing data, photos etc of comparable land rated by the province. Firesmart fuel mitigation must be completed for the proposed project.

- Proposed development fall outside the ten min response distance for FD, Fire resistive materials recommended for exterior surfaces of all buildings.
- No fire suppression water source exists, recommend water collection and storage for wildfire structural protection capability.
- Overland water flood issues unknown, a creek is shown on RDNO mapping, further assessment recommended.
- The following conditions are necessary with respect to regional protective services:
 - Ensure public or shared road access within the development complies with BCBC, BCFC and good engineering practice (road width, grade, maintenance, load bearing, turnaround).
 - Ensure road access on private lots comply with BCBC, BCFC and good engineering practice (road width, grade, maintenance, load bearing, turnaround).
 - Consider Wildland urban interface area, has a hazard assessment been completed. Even if not a provincial Gov. designated WUI, are fire fuel conditions of equal risk.
 - Escape route from Development.
 - Firesmart fire protection controls and fuel mitigation.

Fire Department

The Fire Department indicated they have no concerns or objection to this application.

Splatsin

On July 14, 2022, Splatsin requested a status update on the subject application. On July 18, 2022, staff provided Splatsin with an update stating that the application would be considered by the Board in August or September and that their comments were still welcomed. No additional communications have been received from Splatsin.

PUBLIC INFORMATION MEETING:

In follow-up to the Board's direction, the applicant held a Public Information Meeting (PIM) on Wednesday, November 30, 2022 beginning at 1:00 p.m. The PIM was held at the Enderby Legion Hall located at 909 Belvedere Street in Enderby, BC. In accordance with the requirements of the Regional District Public Information Meeting Guide, the applicant submitted a report to staff regarding the PIM including the following information:

- photos of the meeting notification sign posted on the property on November 15, 2022;
- copies of the advertisement that was run in the November 10th and 17th editions of the Okanagan Advertiser newspaper;
- a copy of the mail-out that was delivered to surrounding property owners including the following:
 - date, time, and purpose of the Public Information Meeting;
 - website with Zoom link and locations required to join the Public Information Meeting;
 - address of the subject property;
 - site plan of the property;
 - contact information for the applicant and for the Regional District of North Okanagan;
 - a description of the proposed OCP and Zoning amendments; and
 - a comment sheet inviting recipients to submit written comments to the Regional District.
- Minutes of the PIM indicate the following:
 - the attendees expressed concerns about further development in their area, groundwater availability, noise and increased use of recreational vehicles (ATMs/Snowmobiles), increased traffic, an increase in crime, wildfire and the 'one way in one way out' community, slope stability, blasting during construction/development.

- 25 members of the public signed in that they attended the PIM; however the applicant indicated 30 persons attended.

Two written comments regarding the proposal were submitted to the applicants after the meeting. One expressed concerns regarding water but welcomed owner to the neighbourhood. The second written comment expressed support for the proposal. One written comment regarding the proposal was received by the Planning Department. The submission was not in support of the proposal and noted concerns related to groundwater availability, provisions of an emergency access route and the 'one way in one way out' community, wildfire danger, and questions regarding the proposed road through the property (servicing, snow clearance, surfacing and size).

TECHNICAL REPORTS:

In follow-up to the Board's resolution, the applicant has provided the following information:

Geotechnical Report:

The applicant has provided a report and follow up addendum report from Fletcher Paine Associates Ltd. dated March 8, 2023 and August 21, 2023 (Attachment A). The addendum report states:

- The proposed residential development will involve changes to the existing topography, which may also include the creation of both cut and fill slopes for which the above criteria may not apply. Consequently, any such works should be reviewed by the geotechnical engineer of record for each lot development prior to their construction so that suitable construction procedures can be assured and the stabilities of newly created topography properly assessed.
- The potential for landslip hazards may be mitigated within conflict areas by methods such as re-grading of perceived hazardous slopes to achieve safe gradients, constructing reinforced soil slopes using commercially available products, building earth or rock retaining berms or walls. Detailed recommendations, supervision and certifications related to specific methods of hazard mitigation within conflict areas should be provided by the geotechnical engineer of record for each lot development.
- Erosion protection should be provided for permanent earthen slopes, and overburden removal and/or scaling should be provided for permanent rock slopes.
- Provided the above recommendations in relation to SBL criteria are adhered to when defining safe building locations, the likelihood of a life threatening slope stability failure has an estimated probability of less than 0.5 percent in 50 years (1 in 10,000 years). The estimated likelihood of a slope stability failure occurring and causing a damaging event has a probability of occurrence of less than 10 percent in 50 years (1 in 475 years).
- It is concluded that, from a geotechnical point of view, the property can be safely used as intended provided the recommendations made in this report are followed. It is recommended that:
 - The items contained in Section 3.0 of this report are followed.
 - The geotechnical engineer inspect all soils and soils related construction on the project to assure that:
 - all soils conditions are as good or better than those inferred in this report, and that
 - all soils and soils related construction conforms to this report, designs provided, and appropriate specifications for the work.
 - Any design(s) or other work for soils or for soils related structures connected with this project and prepared by others be submitted to the geotechnical engineer for review regarding conformity to the project requirements and intent of this report.

Hydrogeological Study:

The applicant has provided a report from Ecoscape Environmental Consults Ltd. Associates Ltd. dated April 12, 2023 (Attachment B). The report states:

- Based on our field observations and the available geological and hydrogeological data, in our professional opinion groundwater resources are available to develop water supplies on each of the 15 lots proposed for the Site capable of producing the RDNO Bylaw rate of 6,550 L/day.
- High estimated recharge to the aquifer coupled with favourable reported well yields in nearby well logs indicate appropriately spaced domestic wells on future Site lots with groundwater extraction at the Bylaw flow rate is feasible and should not result in significant impacts to local groundwater users. Bearing this in mind, groundwater potential from bedrock can vary, depending on the number of water-bearing fractures, and the size and extent of these fractures, which may or may not be present at any given drilling location. However, and importantly; numerous nearby wells completed in bedrock Aquifer 107 produce water at rates above the minimum Bylaw flow rate, with an average reported well yield of 18.5 L/min (4.9 US GPM or 26,710 L/day).
- Based on our findings, we provide the following recommendations:
 - Test drilling and pumping tests should be conducted at the subdivision stage in accordance with the Bylaw requirements, to properly assess the groundwater resource potential across the Site. We recommend that future lots be at least 2 ha in area.
 - Future subdivision and lot development should occur in phases, with the first phase comprising no more than 8 lots (i.e., half of the proposed number of lots at full build-out). Water level loggers should be installed and maintained in select wells drilled as part of the first phase and used to monitor groundwater level fluctuations for a 1 to 2 year period. This groundwater level data can be used to inform subsequent development at the Site.
 - Observed drainages on the Site should be maintained and protected, as they may provide valuable recharge to the underlying bedrock Aquifer 107.

Building Sites and Driveways

- The applicant has provided plans prepared by a BC Land Surveyor or Professional Engineer which show the potential building sites and driveways including their grades and the cuts and fill required to achieve those grades.
- The applicant has also provided a plan which indicates a proposed private access road that would connect with Helmcken Road including the grades and the cuts and fill required to achieve those grades. This plan also indicates the grades and the cuts and fill for driveways for Lots 1-8 which could be constructed from the access road.

On-Site Septic

- The applicant has provided a report from Franklin Engineering Ltd. dated May 8, 2023 (Attachment C). The report states:
 - Our assessment of the feasibility of providing onsite septic services to the proposed 15 lot subdivision is based on a design flow of 1600 L/D (352 IGPD) per lot, which is based on use by a 4-bedroom single family residence. With regards to sizing and design consideration, we have referenced the Sewerage System Standard Practices Manual, Version 3.
 - Based on our findings, Type 1 septic service that adheres to the applicable standards and regulations is feasible.
 - Given the variable soil structures and depths, we recommend using Type 1 sand mound disposal systems. We suggest an infiltration loading rate of 40 L/m²/Day on Mound Sand for a typical configuration and a basal area loading rate of 15 L/m²/Day.

Registered Professional Forester Report

- The applicant has provided a report from Landmark Solutions Ltd. dated March 15, 2023 (Attachment D). The report identifies five areas of hazard and makes several recommendations and suggestions related to each hazard. The report makes general recommendations which should be followed to reduce the current and long term fire hazard for the property and any future sub-divisions. Specifically in regards to the proposed subdivision and secondary vehicular access, the report states:
 - Hazard:
 - The property is in close proximity to multiple roads. This can be beneficial as resources are able to quickly access the property in the event of a fire however, there is also an increased risk of a human caused fire due to the amount of activity associated with the roads. Highway 97A is of most concern due to the amount of activity on that road and the fact that it is directly downslope of the property.
 - Recommendations:
 - Maintain the proposed secondary emergency circulation route so that this route is accessible for potential firefighting activities. Future sub-divided properties must not block this route. Any fences that intercept this route must be gated so that emergency vehicles can pass through.
 - The combination of the secondary emergency circulation route and the main access road will provide access/egress and act as fireguards.
 - Minimize vegetation within 5 m of the access road and secondary emergency circulation route.
 - Trees within 5 m of the access route secondary emergency circulation route must be pruned to 3 m. Vegetation underneath the drip line of these trees that could potentially act as a ladder fuel must be cleared. The intent is to reduce the amount of combustible material immediately adjacent to the trail so that it is a more effective fire guard.

DISCUSSION:

The following outlines how the above noted conditions of Second Reading of the subject Bylaws have been addressed and how the Board of Directors could advance the Bylaws for further consideration.

Comments from RDNO Community Services (Parks and Protective Services) and Fire Department

The Parks and Fire Departments have advised that they have no comments or concerns regarding the application.

Protective Services noted concerns regarding the wildfire risk for the subject property and recommended a secondary road access be provided as Crossridge Road is a no-through road. The Planning Department notes that the subject property at the end of a ±1570 m long no-exit road network. Should the subject application and proposed subdivision be approved, there is potential that the proposed development may remain at the end of a no-through road for an indefinite period of time. No-exit roads are a concern with respect to public safety in the event that if the roadway becomes blocked, access for police, ambulance, or fire vehicles, and egress for residents during an emergency, may be compromised. For reference, the Transportation Association of Canada (TAC) "Supplement to TAC Geometric Design Guide" recommends that a cul-de-sac should be not more than 150 m in length.

In consideration of the above, it is recommended that a road reserve covenant be registered on the title of the subject property to facilitate a future connection to Crossridge Road which would provide potential for a future second route of access/egress. Staff note the properties located to the south are designated Country Residential in the OCP and as such have development potential. A road extension in this area

would provide a loop for existing and future development in the area. This recommendation is supported by Section 5.2.14.g of the OCP which states: Access via no-thru roads in excess of 150 m in length and/or no-thru roads without an adequate turnaround is not supported. Staff recommend that the covenant state that the property may not be subdivided unless a road reserve is registered on the title of the property in a location and alignment that would connect the future extension of Crossridge Road with the property located to the south in accordance with Ministry of Transportation and Infrastructure standards and to the satisfaction of the Regional District and the Ministry of Transportation and Infrastructure.

Staff also note that the Board resolved that Second Reading of the Bylaws be withheld until the applicant has submitted a report prepared by a Registered Professional Forester which assesses the proposed development and provides recommendations to minimize the risk of wildfire hazard including recommendations related to vehicle access routes and FireSmart principles. The applicant has provided a report from Landmark Solutions Ltd. dated March 15, 2023. Staff recommend that a covenant be registered on the property's title to ensure the property is developed in accordance with the recommendations of the Registered Professional Forester including the requirement to dedicate and construct a secondary emergency circulation route at the time of subdivision which connects to Helmcken Road. It is also recommended that the covenant save harmless the Regional District in the event that damage to property may occur as a result of a wildfire. It is also noted that the OCP designates the property as being located within a Development Permit Area for the protection of development from hazardous (wildfire) conditions. Development on land within a Wildfire Hazard DP Area requires a DP prior to issuance of the proposed subdivision.

Comments from First Nations

On July 14, 2022, Splatsin requested a status update on the subject application. On July 18, 2022, staff provided Splatsin with an update stating that the application would be considered by the Board in August or September and that their comments were still welcomed. No additional communications have been received from Splatsin.

No further actions are recommended in this regard.

Public Information Meeting

As directed by the Board, the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide. The comments received at the meeting are outlined above.

No further actions are recommended in this regard.

Geotechnical Report

The applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that a landslip hazard assessment has determined that the subject property is safe for the intended use provided the recommendations of the report are followed. Staff note that at the subdivision approval stage, the Provincial Approving Officer can require that the recommendations of a Geotechnical Engineer be addressed.

Staff note that the applicant has not provided an assessment of potential flooding or high water table hazards. In this regard the applicant has stated that the property is not prone to flooding or damage from a water table and that it is approximately 130 m above the flood plain elevation on the side of a mountain.

Staff note the property is not within a designated floodplain area and the studies submitted by the applicant do not identify or indicate that the property has a high water table. The Geotechnical report identified a surficial water channel that was partially dry. No other groundwater seepage or surficial water was observed at this site, including the large gully located at the northwest corner of the site.

Hydrogeological Study

As directed by the Board, the applicant has submitted a hydrogeological study which takes into consideration the potential to service the proposed lots and the impact it could have on the water supply in the area. The report indicates that appropriately spaced domestic wells on future lots with groundwater extraction at the Bylaw flow rate is feasible and should not result in significant impacts to local groundwater users. The report also indicates that in their professional opinion groundwater resources suitable for residential use in terms of quality and quantity are available to support the 15 lot development proposed for the site capable of producing the Subdivision Servicing Bylaw rate of 6,550 L/day.

The report recommends test drilling and pumping tests should be conducted at the subdivision stage in accordance with the Bylaw requirements and a phased approach to development commencing with an initial phase of 8 lots while groundwater levels in multiple wells onsite continue to be monitored to develop a better understanding of seasonal groundwater fluctuations and aquifer recharge. The monitoring data would be used as the basis for a decision to allow future phases of development to proceed.

Given the findings of the report and to ensure the property is developed in accordance with the recommendations, staff recommend that Final Adoption of Bylaw No. 2940 and Bylaw No. 2941 be withheld until a covenant is registered on the property's title which:

1. states that the property may not be subdivided until a professional hydrologist has verified that all wells proposed to service all new lots are proven to meet the quantity and quality standards of the Regional District Subdivision Servicing Bylaw and that the extraction of water from the wells will not negatively impact the water supply of neighbouring wells;
2. requires a phased approach to development commencing with an initial phase of 8 lots while groundwater levels in multiple wells onsite continue to be monitored to develop a better understanding of seasonal groundwater fluctuations and aquifer recharge. The monitoring data would be used as the basis for a decision to allow future phases of development to proceed; and
3. states that the observed drainages on the property should be maintained and protected as they may provide valuable recharge to the underlying bedrock Aquifer 107.

Alternatively, the Board could resolve to only support rezoning a portion of the property consistent with the recommendation of the hydrogeological reports. The remainder of the property could be rezoned once the owner submits a hydrogeological report with water supply data that demonstrates the potential to service the full-build out potential of the property.

Building Sites and Driveways

The applicant has submitted a site plan which demonstrates that the lots could be developed with driveway and building sites that meet the requirement of the Zoning Bylaw. The plan demonstrates that significant cuts and fills would be required to achieve the proposed driveway grades.

No further actions are recommended in this regard.

On-Site Septic

As directed by the Board, the applicant has provided confirmation in writing from a qualified professional which states there is potential for on-site septic sewage disposal associated with the proposed development.

No further actions are recommended in this regard.

Registered Professional Forester Report

Staff recommend that a covenant be registered on the property's title to ensure the property is developed in accordance with the recommendations of the Registered Professional Forester including the requirement to dedicate and construct a secondary emergency circulation route at the time of subdivision which connects to Helmcken Road. It is also recommended that the covenant save harmless the Regional District in the event that damage to property may occur as a result of a wildfire.

The report also indicated that there is a storage outbuilding with a RV trailer in it currently being used as a residence and various other outbuildings on the property. As there are no Building Permits for these buildings and the use of an RV as a residence does not comply with the requirements of the Zoning Bylaw, the applicant and the Building Inspections Department have been notified in writing of these contraventions.

Attachments

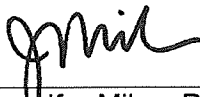
Attachment A – Fletcher Paine Associates Ltd., Addendum #1, Geotechnical Investigation and Report dated August 21, 2023.

Attachment B – Ecoscape Environmental Consultants Ltd., Revised Groundwater Resource Potential Assessment dated April 12, 2023.

Attachment C – Franklin Engineering Ltd., Onsite Septic Disposal Assessment dated May 8, 2023.

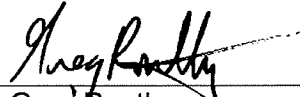
Attachment D – Landmark Solutions Ltd., Wildfire Hazard Assessment dated March 15, 2023

Submitted by:



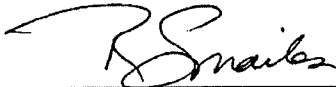
Jennifer Miles, RPP, MCIP
Planner II

Reviewed by:



Greg Routley
Deputy Planning Manager

Endorsed by:



Rob Smailes, RPP, MCIP
General Manager, Planning and Building

Approved for Inclusion:



David Sewell
Chief Administrative Officer

Fletcher Paine Associates Ltd.

Consulting Geotechnical and Materials Engineers

Vernon Office:
2250 11 Avenue
Vernon, B.C.
V1T7X8

Kelowna Office:
544 Bernard Avenue
Kelowna, B.C.
V1Y 6P1

File 6865

August 21, 2023

Land First Development
150 Crossridge Road
Enderby, B.C.
V0E 1V3

Attention: Mark Lewis

Dear Mr. Lewis,

Addendum #1 for
Geotechnical Investigation and Report
Proposed 15 Lot Residential Subdivision
150 Crossridge Road, RDNO Area "F"
Revised from 03Jan2023

1.0 INTRODUCTION

The contents of this document are intended to supplement the original Fletcher Paine Associates Ltd. File No. 6865 geotechnical report entitled, "*Geotechnical Investigation and Report; Proposed 15 Lot Residential Subdivision; 150 Crossridge Road, RDNO Area "F"; Revised from 03Jan2023*", dated March 8, 2023 (The Report). This document should be read in conjunction with The Report and is subject to the same qualifications and general conditions, and terms of engagement, which are both attached.

In June 2023, the Regional District provided comment related to the proposed subdivision application and requested additional information to determine if the proposal complies with the Rural Land Policies of their Official Community Plan document, in that the proposed lots would not be subject to flooding, high water table or terrain instability.

The scope of this addendum is to provide preliminary geotechnical engineering recommendations related to a landslip hazard assessment for the subject property. The

soil and groundwater information used for the assessment in this document were obtained by Fletcher Paine Associates Ltd. and summarized in The Report.

2.0 INVESTIGATIONS

2.1 Desktop Review

2.1.1 Historic Aerial Photography and Satellite Imagery

Based on available historic aerial photography and satellite imagery, the subject site has predominantly remained undeveloped thru the investigated time-frame, with the exception of some minor trails throughout the site boundaries.

There are signs of some possible logging on the east side of the site in the late 1960's and early 1970's. Some minor earthworks for a driveway, trail and building area were observed on the north half of the site in 2018.

No concerns related to geotechnical landslip hazards were identified in the available photography.

2.1.2 Subdivision Contour Plan

McElhanney provided a contour plan for the subject property and surrounding area on July 28, 2023. The contour plan shows typical on site slope gradients of 2.0H:1V or flatter, with some small sections near the south end of the site where slope gradients on the order of 1.5H:1V were measured. The contour plans show signs of natural channels in the northwest portion of the subject property.

The hill slopes below and southeast of the subject property are steeper than those encountered on the property, with some discrete slope gradients as steep as 1.2H:1V. The steepest sections of this hill are approximately 60 m to 140 m east of the subject property, over the south half. There are also signs of natural channels west of, and above, the subject site.

2.1.3 Seismic Hazard Characteristics

A peak ground acceleration (PGA) value of 0.0797g was provided by the 2020 National Building Code of Canada for the subject site, for a 2% in 50 year (0.000404 per annum) probability of exceedance. The PGA value was provided for a seismic Site Class C designation.

2.2 Site Reconnaissance

A site reconnaissance was carried out by the author of this report on July 31, 2023 for the purposes of a preliminary, surficial geotechnical hazard assessment related to the

proposed residential subdivision development. A summary of observations related to the hazard assessment are provided below. Lot descriptions are shown on the attached Subdivision Contour Plan, Figure 6865-2, and are based on the lot descriptions provided on The Report's Figure 6865-1.

2.2.1 General Observations

In general the site was undeveloped and covered in mature trees and short shrubs. There were multiple recent and old pathways for vehicles, mostly aligned north-south. Some sections of the more recently constructed pathways had loose or disturbed surfaces.

Cabins and other residential shelters/ancillary areas were observed on Lot 2 and Lot 15, and one building was currently at the excavation and ground preparation phase during the site reconnaissance, located on Lot 6. A waterline was observed on the surface approximately between Lot 2/Lot 3.

Access to the site was available from the north using Crossridge Road, and from the northwest using Helmcken Road. Fill was placed over the existing gully to provide access from Helmcken Road. On the south side, access was available to the site from the neighbouring property.

2.2.2 Surficial Soils and Rock

Surficial soils and rock were observed at various locations where existing cuts were made for pathway constructions. In general, the surficial soils encountered at these locations consisted of a thin topsoil layer, underlain by compact, silty, gravelly sands or bedrock.

These soils were consistent with the soils encountered during the subsurface investigation made for The Report.

Near surface rock, rock outcrops and talus were observed in many areas of the site. At locations where talus was encountered, it appeared to be close to the source rock outcrop and the weathering was consistent with an older rock fall.

2.2.3 Surficial Water and Groundwater

Surficial water was encountered in a natural channel near the west side of Lot 4 and appeared to collect from off site sources. The same natural channel was dry when observed at locations near the centre and east areas of Lot 4.

No other groundwater seepage or surficial water was observed at this site, including the large gully located at the northwest corner of the site.

The standpipe piezometers installed at the locations of TP 6, TP 9 and TP 11 were dry when checked again during the site reconnaissance. At the location of TP 2, groundwater was measured in the standpipe piezometer at a depth of 3.5 m below the existing ground surface.

2.2.4 Landslip and Erosion Observations

Although there were occasionally trees with pistol-butted or jack-strawed trunks near the crests of steeper areas with near surface rock, which may indicate some surficial creep of the in situ soils, most of the mature trees showed no sign of landslip.

On site slope gradients matched the previously noted contour plan with natural grades on the order of 2.0H:1V or flatter, with some steeper sections between Lots 9 and 10, with slope gradients on the order of 1.6H:1V; however, this section primarily consisted of near surface rock. There were some localized over-steepened sections where previous pathway constructions were cut into existing slopes, and some natural rock bluffs less than 1.5 m high.

The steepest slopes observed during the site reconnaissance were outside the property boundaries to the south east, with average slope gradients on the order of 1.5H:1V. Shallow rock was observed in these areas as well.

There were no signs of soil erosion during the site reconnaissance. Erosion of rock, in the form of talus was observed; however, the talus encountered was stable on the ground surface near the rock source.

3.0 GEOTECHNICAL HAZARD ASSESSMENT

3.1 Criteria for Hazard Assessment

The landslip hazard assessments for slope stability used in this report were provided in an email correspondence from the British Columbia Ministry of Transportation and Infrastructure (MoTI) representative dated June 26, 2023.

3.2 Landslip Hazard Assessment

3.2.1 General

The guidelines used for the slope stability assessment made in this report follow the most recent version of the EGBC Guidelines for Legislated Landslide Assessments for Residential Developments in BC.

3.2.2 Slope Stability Assessment

The Report provides shear strength and internal angle of friction parameters for the soils encountered during the geotechnical subsurface investigation. The Report also provides groundwater information at the investigated locations.

Based on the available information, including, but not limited to, encountered soil and groundwater conditions, investigation and site reconnaissance findings, and available contour mapping on the subject property and neighbouring properties, there are several localized areas with natural and developed slopes that are considered, using computer modelling, to be over-steepened, where an over-steepened slope is defined to have a Factor of Safety less than 1.5 during static conditions, and less than 1.125 during seismic conditions.

Whereas these over-steepened slopes do not currently show signs of instability, there remains the risk that development activities could result in changes to existing topography and local surface drainage patterns that could lead to instability. For these reasons Safe Building Lines (SBL) should be used to define restrictions to locations of habitable construction above and below such slopes.

3.2.3 Criteria for Establishing Safe Building Lines

Using the definitions for over-steepened slopes noted above, the following criteria are in reference only to existing slopes at the site and should be adhered to in establishing SBLs for such slopes within the proposed development. The following preliminary criteria may not be suitable for general application to newly constructed cut or fill slopes at the site (see Section 5.2.4 for more information).

Further, the slopes and crests noted in the below section may start on site within the proposed development, or off site within neighbouring properties.

Soil Slopes:

- a) For construction above existing soil slopes at the subject site, imaginary lines with slope gradients of 2H:1V, or flatter, should start at the toe of the slope and be projected upwards until they intersect a horizontal plane defined by the foundation base level for the structure that is proposed for construction on that particular property. The SBL is then located at least a horizontal distance of 5.0 m behind the line of intersection defined in the last sentence. All habitable constructions and attached structures, if any, above soil slopes must be confined to areas behind the up-slope side of the defined SBL.
- b) For construction below existing soil slopes at the subject site, imaginary lines with gradients of 2.0H:1V, or flatter, should start at the crest of the slope and continue downwards until they intersect a horizontal plane defined by the ground surface on the lower property. The SBL is then located on the ground surface at least a horizontal distance of 5.0 m in front of the line of intersection described in the last sentence. All

habitable construction below soils slopes must be done below / in front of the down-slope side of the defined SBL.

Rock Slopes and Slopes with less than 300 mm of overburden:

c) For construction above bedrock slopes, imaginary lines with gradients of 1.0H:1V, or flatter, should start at the toe of the rock slope and continue upwards until they intersect a horizontal plan defined by the foundation base level for the structure that is proposed for construction on that particular property. The SBL is then located at least a horizontal distance of 2.0 m behind the line of intersection defined in the last sentence. All habitable constructions and attached structures, if any, above rock slopes must be confined to areas behind the up-slope side of the defined SBL.

d) For construction below rock slopes, imaginary lines with gradients of 2.0H:1V, or flatter should start at the crest of the rock slope and continue downwards until they intersect a horizontal plan defined by the ground surface on the lower property. The SBL is then located on the ground surface at least a horizontal distance of 5.0 m in front of the line of intersection described in the last sentence, or at least a horizontal distance of 5.0 m in front of any observed rock-fall debris, whichever is further from the rock slope. All habitable construction below rock slopes must be done below / in front of the down-slope side of the defined SBL.

3.2.4 Assessment of Newly Constructed Cut and Fill Slopes

The proposed residential development will involve changes to the existing topography, which may also include the creation of both cut and fill slopes for which the above criteria may not apply. Consequently, any such works should be reviewed by the geotechnical engineer of record for each lot development prior to their construction so that suitable construction procedures can be assured and the stabilities of newly created topography properly assessed.

3.2.5 Land Covenants and SBL Certification

The exact locations of required SBLs should be determined and marked in the field by a British Columbia Land Surveyor (BCLS) using the above criteria. The SBL locations and elevations, as determined in the field, should be plotted on a drawing by the BCLS and provided to the geotechnical engineer.

Any requirements regarding covenants and/or SBL certification required by the BC MoTI and/or RDNO, in relation to geotechnical hazards at the site, and their assessment, should be directed to the geotechnical engineer.

3.2.6 Landslip Hazard Mitigation

The potential for landslip hazards may be mitigated within conflict areas by methods such as re-grading of perceived hazardous slopes to achieve safe gradients, constructing

reinforced soil slopes using commercially available products, building earth or rock retaining berms or walls. Detailed recommendations, supervision and certifications related to specific methods of hazard mitigation within conflict areas should be provided by the geotechnical engineer of record for each lot development.

Erosion protection should be provided for permanent earthen slopes, and overburden removal and/or scaling should be provided for permanent rock slopes.

3.2.7 Landslip Assessment Assurance Statement

Provided the above recommendations in relation to SBL criteria are adhered to when defining safe building locations, the likelihood of a life threatening slope stability failure has an estimated probability of less than 0.5 percent in 50 years (1 in 10,000 years). The estimated likelihood of a slope stability failure occurring and causing a damaging event has a probability of occurrence of less than 10 percent in 50 years (1 in 475 years).

The attached Landslide Assessment Assurance Statement has been completed and is relevant to site conditions as they exist at the time of preparation of this report.

4.0 CONCLUSIONS AND RECOMMENDATIONS

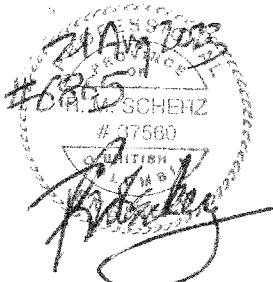
It is concluded that, from a geotechnical point of view, the property can be safely used as intended provided the recommendations made in this report are followed.

It is recommended that:

- a) The items contained in Section 3.0 of this report are followed.
- b) The geotechnical engineer inspect all soils and soils related construction on the project to assure that:
 - i) all soils conditions are as good or better than those inferred in this report, and that
 - ii) all soils and soils related construction conforms to this report, designs provided, and appropriate specifications for the work.
- c) Any design(s) or other work for soils or for soils related structures connected with this project and prepared by others be submitted to the geotechnical engineer for review regarding conformity to the project requirements and intent of this report.

We trust that the contents of this report are appropriate for your immediate needs. If you should have any questions please call our office at your convenience.

Yours truly,
Fletcher Paine Associates Ltd.



EG-BC PTP#
109303

Robert M. Scherz, P.Eng.
Geotechnical Engineer

Ryan C. Stearns, P.Eng.
Review Engineer

STATEMENT OF QUALIFICATIONS AND GENERAL CONDITIONS

1. Standard of Care

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area. No other warranty, expressed or implied, is made.

2. Basis of the Report

This report has been prepared for the specific site, design objective, development and purpose that was described to Fletcher Paine Associates Ltd. (FPA) by the client and summarized in this letter. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the report are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to FPA, unless FPA was specifically requested by the Client to review and revise the report in light of such alteration or variation.

3. Uses of the Report

The information and opinions expressed in this report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THIS REPORT OR ANY PORTION THEREOF WITHOUT FPA'S EXPRESS WRITTEN CONSENT. FPA WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS APPROVED USERS. The ownership and copyright of this report remain the property of FPA, who authorizes only the Client and Approved Users to make copies of the report, and only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make available the report or any portion thereof, or any copy of the report or portion thereof, to any other party without the express written permission of FPA.

4. Complete Report

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to FPA by the Client, communications between FPA and the Client, and to any other reports prepared by FPA for the Client relative to the specific site described in the report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS, AND OPINIONS EXPRESSED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. FPA CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

5. Interpretation of the Report

a) Nature and Exactness of Soil Description: Classification and identification of soils, rocks, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from these systems have been used they are specifically mentioned. Classification and identification of the type and condition of soils, rocks and geologic units are judgmental in nature. Accordingly, FPA cannot warrant or guarantee the exactness of the descriptions of in situ ground conditions set forth in the Report.

b) Logs of Test Holes, Pits, Trenches, etc.: The test hole logs are a record of information obtained from field observations and laboratory testing of selected samples as well as an interpretation of the likely subsurface stratigraphy at the test holes sites. In some instances normal sampling procedures do not recover a complete or any sample. Soil, rock or geologic zones have been interpreted from the available data. The change from one zone to another, indicated on the logs as a distinct line, may be transitional. The same limitations apply to test pit and other logs.

c) Stratigraphic and Geologic Sections: The stratigraphic and geologic sections indicated on drawings contained in this report are interpreted from logs of test holes, test pits or other available information. Stratigraphy is inferred only at the locations of the test holes or pits to the extent indicated by items 5. a) and b) above. The actual geology and stratigraphy, particularly between these locations, may vary considerably from that shown on the drawings. Since natural variations in geologic conditions are inherent and a function of the historic site environment, FPA does not represent or warrant that the conditions illustrated are exact and the user of the report should recognize that variations may exist.

d) Groundwater Conditions: Groundwater conditions shown on logs of test holes and test pits, and/or given within the text of this report, record the observed conditions at the time of their measurement. Groundwater conditions may vary between test hole and test pit locations and can be affected by annual, seasonal, and special meteorological conditions, or by tidal conditions for sites near the seas. Groundwater conditions can also be altered by construction activity. These types of variation need to be considered in design and construction.

e) Changes of Exposed Ground: Many geologic materials deteriorate rapidly upon exposure to climatic elements. Deterioration may be caused by precipitation, sunshine and/or the action of frost. Therefore, site conditions may vary

considerably from the time of the making of the tests performed for preparation of the report and the time of actual construction.

f) **Influence of Construction Activity:** Construction activities can alter and damage the in situ ground conditions. The influence of all anticipated construction activities on the geologic environment should be considered in formulating and implementing the final design and construction techniques.

Wherever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, the client and any other users of this report should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

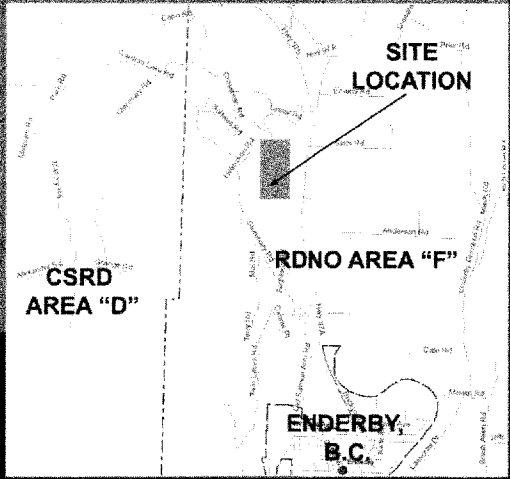
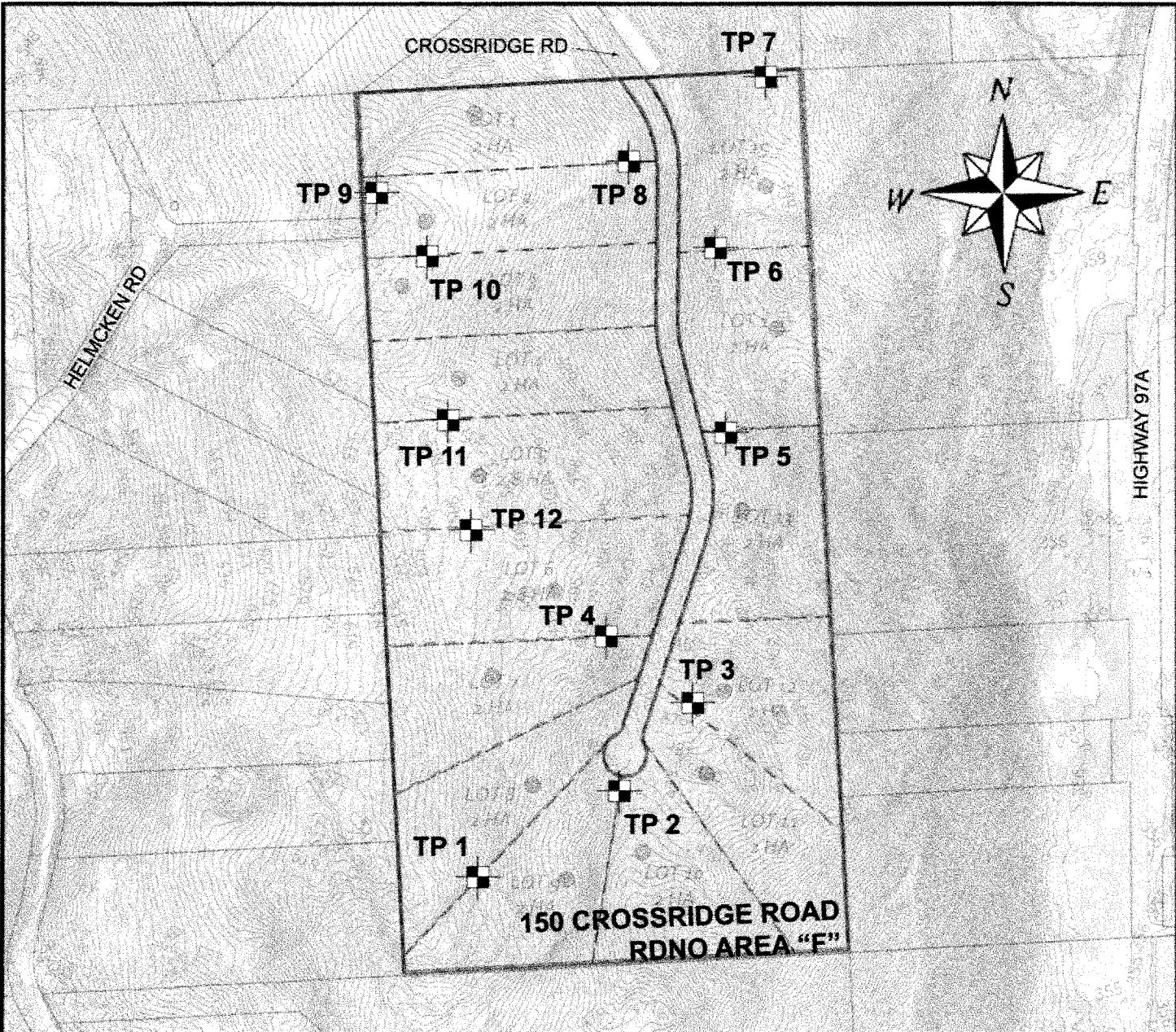
6. **Observations during Construction**

Observations of geologic conditions should be carried out during the site preparation, excavation and construction to verify the conditions predicted by the report. Such observations should be communicated to FPA to allow for confirmation and/or alteration of the geotechnical recommendations or design guidelines presented in the report.

Whenever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, then the client should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

7. **Samples**

FPA normally disposes of all unused soil and rock samples after 90 days of completing the testing program for which the samples were obtained. Further storage or transfer of samples can be made at the owner's expense upon written request.



Base Plan Provided By: McElhanney Ltd. and RDNO Map Viewer

Subdivision Contour Plan

Figure: 6865-2

Date: 10-Aug-2023 | Scale: nts

LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

Notes: This statement is to be read and completed in conjunction with the Engineers and Geoscientists BC *Professional Practice Guidelines – Landslide Assessments in British Columbia* ("the guidelines") and the current *BC Building Code (BCBC)*, and is to be provided for Landslide Assessments (not floods or flood controls), particularly those produced for the purposes of the *Land Title Act*, *Community Charter*, or *Local Government Act*. Some jurisdictions (e.g., the Fraser Valley Regional District or the Cowichan Valley Regional District) have developed more comprehensive assurance statements in collaboration with Engineers and Geoscientists BC. Where those exist, the Qualified Professional is to fill out the local version only. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority (or Client)

Date: 21 Aug 2023

Regional District of / Ministry of Transportation
North Okanagan / and Infrastructure
Jurisdiction/name and address

With reference to (CHECK ONE):

- A. *Land Title Act* (Section 86) – Subdivision Approval
- B. *Local Government Act* (Sections 919.1 and 920) – Development Permit
- C. *Community Charter* (Section 56) – Building Permit
- D. Non-legislated assessment

For the following property (the "Property"):

150 Crossbridge Road, R2NO Area "F"
Civic address of the Property

The undersigned hereby gives assurance that they are a Qualified Professional and a professional engineer or professional geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, authenticated, and dated, and thereby certified, the attached Landslide Assessment Report on the Property in accordance with the guidelines. That report must be read in conjunction this statement.

In preparing that report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

- 1. Collected and reviewed appropriate background information
- 2. Reviewed the proposed Residential Development or other development on the Property
- 3. Conducted field work on and, if required, beyond the Property
- 4. Reported on the results of the field work on and, if required, beyond the Property
- 5. Considered any changed conditions on and, if required, beyond the Property
- 6. For a Landslide Hazard analysis or Landslide Risk analysis, I have:
 - 6.1 reviewed and characterized, if appropriate, any Landslide that may affect the Property
 - 6.2 estimated the Landslide Hazard
 - 6.3 identified existing and anticipated future Elements at Risk on and, if required, beyond the Property
 - 6.4 estimated the potential Consequences to those Elements at Risk
- 7. Where the Approving Authority has adopted a Level of Landslide Safety, I have:
 - 7.1 compared the Level of Landslide Safety adopted by the Approving Authority with the findings of my investigation
 - 7.2 made a finding on the Level of Landslide Safety on the Property based on the comparison
 - 7.3 made recommendations to reduce Landslide Hazards and/or Landslide Risks

LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

8. Where the Approving Authority has **not** adopted a Level of Landslide Safety, or where the Landslide Assessment is not produced in response to a legislated requirement, I have:

- 8.1 described the method of Landslide Hazard analysis or Landslide Risk analysis used
- 8.2 referred to an appropriate and identified provincial, national, or international guideline for Level of Landslide Safety
- 8.3 compared those guidelines (per item 8.2) with the findings of my investigation
- 8.4 made a finding on the Level of Landslide Safety on the Property based on the comparison
- 8.5 made recommendations to reduce Landslide Hazards and/or Landslide Risks

9. Reported on the requirements for future inspections of the Property and recommended who should conduct those inspections

Based on my comparison between:

[CHECK ONE]

- the findings from the investigation and the adopted Level of Landslide Safety (item 7.2 above)
- the appropriate and identified provincial, national, or international guideline for Level of Landslide Safety (item 8.4 above)

Where the Landslide Assessment is not produced in response to a legislated requirement, I hereby give my assurance that, based on the conditions¹ contained in the attached Landslide Assessment Report:

A. SUBDIVISION APPROVAL

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

[CHECK ONE]

- with one or more recommended additional registered Covenants
- without an additional registered Covenant(s)

B. DEVELOPMENT PERMIT

- For a development permit, as required by the *Local Government Act* (Sections 488 and 491), my report will "assist the local government in determining what conditions or requirements it will impose under subsection (2) of [Section 491]"

[CHECK ONE]

- with one or more recommended additional registered Covenants
- without an additional registered Covenant(s)

C. BUILDING PERMIT

- 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 additional registered Covenants
- without any additional registered Covenant(s)

¹ When seismic slope stability assessments are involved, Level of Landslide Safety is considered to be a "life safety" criteria, as described in Commentary JJJ of the *National Building Code of Canada (NBC) 2015*, Structural Commentaries (User's Guide – NBC 2015: part 4 of division B). This states:

"The primary objective of seismic design is to provide an acceptable level of safety for building occupants and the general public as the building responds to strong ground motion; in other words, to minimize loss of life. This implies that, although there will likely be extensive structural and non-structural damage, during the DGM (design ground motion), there is a reasonable degree of confidence that the building will not collapse, nor will its attachments break off and fall on people near the building. This performance level is termed 'extensive damage' because, although the structure may be heavily damaged and may have lost a substantial amount of its initial strength and stiffness, it retains some margin of resistance against collapse."

LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

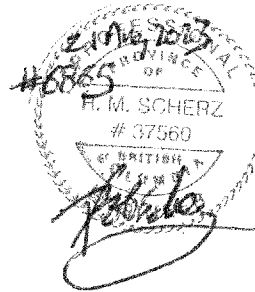
Robert M. Scherz
Name (print)

21 Aug 2023
Date

2250-11 Avenue, Vernon, B.C.
Address

250-542-0377
Telephone

Fletcher-paine@shawlink.ca
Email



(Affix PROFESSIONAL SEAL and signature here)

The Qualified Professional, as a registrant on the roster of a registrant firm, must complete the following:

I am a member of the firm Fletcher Paine Associates Ltd.
(Print name of firm)

with Permit to Practice Number 1001305
(Print permit to practice number)

and I sign this letter on behalf of the firm.

TERMS OF ENGAGEMENT

1. General

Fletcher Paine Associates Ltd. (FPA) shall render its services to the Client for this project with that degree of care, skill and diligence normally provided in the performance of services for projects of a similar nature to that contemplated.

In rendering services to the Client, FPA may, at its discretion and at any stage, engage subconsultants to FPA to carry out its duties and responsibilities as set forth.

2. Compensation

Charges for the services rendered will be made in accordance with our Schedule of Fees in effect at the time the work is performed. All charges will be made in, and will be payable in, Canadian Dollars. Invoices will be due and payable on receipt without holdback. A monthly service charge will be applicable to invoices remaining unpaid after 30 days.

3. Notices

FPA will designate a project manager who shall be responsible for the project. The Client shall designate an authorized representative to act with respect to the project.

4. Termination

Either party may terminate this engagement with cause upon seven (7) days notice in writing. The Client shall forthwith pay for all services performed, including all expenses and other charges payable that are associated with obligations incurred by FPA for this project.

5. Environment and Pollution

The FPA field investigation, laboratory testing and engineering recommendations are not intended to address or evaluate pollution of soil or pollution of groundwater. When practical, FPA will cooperate with the Client's environmental consultant during the field work phase of the investigation.

6. Professional Responsibility

FPA will provide the standards of care, skill and diligence normally provided by a Professional Engineer in the performance of engineering services as contemplated for this project.

7. Limitations of Liability

FPA shall not be responsible for:

- a) The failure of a Contractor to perform work in accordance with the relevant contract documents for the Project;
- b) The design of, or defects in, equipment provided by or on behalf of the Client by others, for incorporation into the Project;
- c) Any damage to subsurface structures or utilities; resulting from subsurface investigations for the Project;
- d) Any cross-contamination of ground or groundwater resulting from subsurface investigations for the Project;
- e) Any costs incurred for stopping the flow of artesian water from test holes in the event that such conditions are encountered during any field investigation for the Project;
- f) Any decisions made by the Client in relation to the Project that are inconsistent with, or contrary to, the advice provided by FPA;
- g) Any consequential loss, injury, or damages suffered by the Client, including but not limited to loss of use, loss of earnings, or business interruption;
- h) The distribution of any document or report prepared for the Client by or on behalf of FPA for the Project without express authorization by FPA.

Notwithstanding anything to the contrary, the aggregate liability of FPA, including liability for professional negligence and fundamental breach of contract, shall be limited to the amount of Professional Liability insurance carried by FPA.

The Client's failure to accept the professional recommendations and advice of FPA with respect to the geotechnical conditions at the Project shall relieve FPA of and from any and all legal liability, whether in contract or in tort, to the Client for all manner of loss and damage accruing to the Client, including consequential loss and damage, which may arise out of the FPA services.

8. Personal Liability

The Client agrees that FPA's principals and employees have no personal liability to the Client in respect of a claim whether in contract, tort, and/or any other cause of action in law, and expressly agrees that it will bring no proceedings and take no action in any court of law against any of FPA's principals or employees in their personal capacities.

9. Third Party Liability

This report was prepared by FPA for the Client and the material presented in it reflects the opinions and judgements of FPA as based upon the information available at the time of its preparation. Any use(s) made of this report by a third party is/are the sole responsibility of such third parties. FPA will not accept any responsibility for damages suffered by any third party as a result of decisions made or actions taken that are ostensibly based upon this report. Any use or reliance upon this report by a third party must be authorized in writing by FPA

10. Documents

All of the Documents prepared by FPA in connection with the Project are instruments of service for the execution of the Work. FPA retains the property and copyright in those Documents, whether the Project is executed or not. These Documents may not be used on any other project without prior written agreement and remuneration.

11. Field Services

Where applicable, the field services recommended are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with the intent of our recommendations. Any reduction from the level of services recommended will result in FPA providing qualified opinions regarding the adequacy of the work.

12. Confirmation of Professional Liability Insurance

As required by the Association of Professional Engineers and Geoscientists of British Columbia, it is required that our firm advise whether or not Professional Liability Insurance is held. It is also required that a space for you to acknowledge this information is provided. Accordingly, this notice serves to advise you that FPA carries professional liability insurance. If you wish to acknowledge receipt of this information please sign and return a copy of this form.

Revised Groundwater Resource Potential Assessment
150 Crossridge Road, Enderby, BC



Prepared By:
Ecoscape Environmental Consultants Ltd.

Prepared For:
Mark Lewis
April 12, 2023

150 Crossridge Road, Enderby, BC

REVISED GROUNDWATER RESOURCE POTENTIAL ASSESSMENT

Prepared For:

Mark Lewis
150 Crossridge Road,
Enderby, BC
VOE 1V3

Prepared By:

Ecoscape Environmental Consultants Ltd.
#102 – 450 Neave Court
Kelowna, B.C.
V1V 2M2



EGBC Permit to Practice Number: 1002638

April 12, 2023

Version 1.2

File No. 22-4427

Version Control and Revision History				
Version	Date	Prepared By	Reviewed By	Notes/Revisions
A	October 24, 2022	MPS	LR	Draft for Internal Review
0	October 24, 2022	MPS	LR	Draft for Client Review
1	December 16, 2022	MPS	LR	Final Report
1.1	March 15, 2023	MPS	LR	Revised Final Report
1.2	April 12, 2023	MPS	LR	Revised Final Report

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1.0 INTRODUCTION

Ecoscape Environmental Consultants Ltd. (Ecoscape) has been retained by Mark Lewis (the Client) to provide this groundwater resource potential assessment of a property located at 150 Crossridge Road, Enderby, BC (the Site). The Site is located within the Regional District of North Okanagan (RDNO) Electoral Area “F” and is legally described as Part E1/2 of SE1/4, Section 10, Township 19, Range 9, West of the 6th Meridian, Land District 25, KDYD (PID: 013-905-244). The Site is approximately 32.4 ha in area.

The Client intends to rezone the Site from Non-Urban to Country Residential and/or Small Holdings to support a future subdivision of the Site. Given that subdivision planning is still in its preliminary stages, detailed road and lot layout plans are not yet available. **We understand that up to 15 lots are proposed at this time.** The Client anticipates that each future lot will be serviced by a private onsite drilled well. The RDNO *Subdivision Servicing Bylaw No. 2600*, stipulates that each well must have the capacity to provide potable water at a sustainable yield of 6,550 L/day (1.2 US GPM) year-round, and that operation of each well at the minimum rate will not reduce the amount available for any neighbouring wells.

The Client recently constructed a well at the north end of the Site **which provides a good starting point for understanding available groundwater resources on the Site.**

The main objective of this assessment was to provide the RDNO with a professional opinion regarding the potential for suitable domestic groundwater supply for each future lot to support decision-making around the Client’s rezoning application.

Written confirmation to complete this assessment was provided by the Client on September 22, 2022. A detailed set of terms and conditions pertaining to this report are provided in Appendix A.

This report is a revision of and supersedes Ecoscape’s submitted *Groundwater Resource Potential Assessment* report dated December 16, 2022 (the Original Report), and the *Revised Groundwater Resource Potential Assessment* report (the Version 1.1 Revised Report) dated March 15, 2023. This revision addresses comments made by RDNO Staff and provides additional clarification on groundwater quantity with regards to the specific number of lots proposed as part of future Site development. Changes from the Original Report are highlighted in black bold text in this report, and changes from the Version 1.1 Revised Report are bolded in blue.

2.0 PROJECT APPROACH

Ecoscope completed the following hydrogeological assessment tasks to assess the Site's groundwater resource availability:

1. Conducted a field reconnaissance of the Site and nearby surrounding area;
2. Assembled and reviewed available hydrologic, geologic and hydrogeologic data and reports relevant to the local area;
3. Assessed local groundwater availability based on this information; and,
4. Prepared this report which documents the findings.

3.0 SITE DESCRIPTION

3.1. Climate and Biogeoclimatic Zones

The Site is located within the Interior Cedar-Hemlock Very Dry Mild (ICHxm1) forest subzone. The ICH zone has an interior, continental climate dominated by easterly moving air masses that produce warm, dry summers and cool, wet winters (Meidinger and Pojar, 1991).

Environment Canada's (EC) Salmon Arm Airport climate station (STN 1166R45), situated approximately 11 km northwest of the Site, provides recent climatic data for the Site and nearby surrounding area. Based on data collected between 1981 and 2010, average annual total precipitation at the Salmon Arm Airport was 653 mm, ranging from 33.9 mm/month in February to 82.4 mm/month in November. Mean annual temperature at the Salmon Arm Airport was 7.4 °C, ranging from -3.7°C in January to 19.1°C in July (Environment Canada, 2022)

More recent climate data, perhaps more reflective of the warmer, drier summers and wetter winters recently observed and projected by climate models, is provided by the Pacific Field Corn Association (<https://farmwest.com/climate/et>). Based on measurements of annual precipitation compared to evapotranspiration (ET) at the EC Salmon Arm station, the Site and nearby surrounding area has a significant net water deficit, particularly during the summer months. For 2021, effective precipitation¹ at the Salmon Arm station was 118 mm while ET was 929 mm, resulting in a soil moisture deficit

¹ Effective Precipitation (EP) is the amount of precipitation that is actually added and stored in the soil. During drier periods less than 5mm of daily rainfall would not be considered effective, as this amount of precipitation would likely evaporate from the surface before soaking into the ground.

of about 811 mm, with most occurring between April and October. The historical average water deficit for the area is about 853 mm/year (Farmwest, 2022).

3.2. Site Setting, Physiography and Hydrology

The Site located at the south end of Crossridge Road, approximately 5 km north of Enderby (Figure 1) and is situated on the east side of a ridge which separates the Deep Creek and Shuswap River valleys. The Site surface slopes approximately 15 to 20% east towards the Shuswap River valley bottom, with elevations ranging from 519 masl along the west Site boundary down to 437 masl at the east.

The Site is currently forested except for areas cleared for access roads and small buildings, while nearby surrounding properties are generally developed as large rural residential lots.

According to the BC Water Resources Atlas (WRA), no Provincially mapped watercourses traverse the Site. Several small drainages were observed on the property during the Site reconnaissance: the first stems from Robinson Spring west of the Site and flows eastward through the north half of the Site, while the second is an ephemeral stream locally referred to as Rob's Brook which flows southeast through the southwest Site corner.

These drainages may provide recharge to local aquifer(s).

Gardom Lake is situated approximately 2.5 km northwest of and approximately 30 m higher than the Site. Gardom Lake drains into Gardom Creek which flows east to northeast into the Shuswap River.

3.3. Regional Geology

The BC Geological Survey (BCGS) maintains a province-wide repository of bedrock geological maps. In its current edition, bedrock geology is amalgamated from original maps at scales ranging from 1:250,000 to 1:50,000 (Cui et al., 2017). These scales are low resolution at the lot scale, and as such, Site geology may be different than BCGS mapping.

Based on the published BCGS mapping, the northeastern two-thirds of the Site is underlain by Proterozoic to Paleozoic-aged mudstone, siltstone, shale and/or other fine-clastic sedimentary rocks of the Mount Ida Assemblage's Silver Creek Formation. The southwestern third of the Site was mapped as Cretaceous-aged granodiorite, quartz diorite and quartz monzonite (Cui et al., 2017). Consistent the BCGS mapping, some nearby drillers' logs make note of quartz-bearing rock. A normal fault was mapped approximately 1.8 km northeast of the Site (Cui et al., 2017); however, no information was readily available regarding this fault's influence on the Site.

According to published Quaternary geological mapping (Fulton, Berti and Smith, 1974) the Site is likely underlain by near-surface bedrock and morainal deposits comprising till, sand, gravel and silt. Soils recorded in nearby drillers' logs for nearby wells included

varying thicknesses of sand and gravel, till and clay over bedrock, with thickest overburden deposits generally noted near the Shuswap River valley bottom.

3.4. Regional Hydrogeology

The WRA indicates five (5) Provincially mapped aquifers occur within 1 km of the Site; however, none of these were mapped beneath the Site. A summary of information collected at the time of mapping nearby aquifers is provided in Table 1, and aquifer locations are shown on Figure 1.

Table 1: Nearby Aquifer Information Summary						
Aquifer ID	Aquifer Type	Production Material	Uses	Vulnerability	Productivity	Demand
107	Fractured Crystalline Bedrock	Bedrock	Domestic Waterworks	Moderate	Low (Median = 9.6 L/min)	Moderate
108	Unconfined Unconsolidated Aquifer	Medium to Coarse sand and gravel	Domestic Waterworks Irrigation Livestock Industrial Commercial	High	Moderate (Median = 30 L/min)	Moderate
109	Confined Unconsolidated Aquifer	Gravel and fine to coarse sand	Domestic Irrigation Livestock Industrial Commercial	Moderate	Moderate (Median = 46 L/min)	Low
111	Unconfined Unconsolidated Aquifer	Gravel and medium to coarse sand	Domestic Waterworks Irrigation Livestock Industrial Commercial	Moderate	Moderate (Median = 57 L/min)	Low
1225	Confined Unconsolidated Aquifer	Fine to medium sand with some gravel	Domestic Irrigation Livestock	Moderate	Moderate (Median = 119 L/min)	Not Listed
1226	Confined Unconsolidated Aquifer	Sand	Domestic Livestock	Low	High	Not Listed

Lithological information presented in the onsite and nearby well logs, observed and documented local topography, and inferred Site geology indicated that Aquifer 107 may extend beneath the Site, and that existing and future onsite wells are and will likely be completed in the bedrock aquifer. Unconfined sand and gravel Aquifer 108 was mapped near the north Site boundary and was possibly encountered while drilling nearby wells WTN 76236 and WTN 76240; however, surrounding wells did not encounter saturated

sediments, which indicated these wells were completed in a localized unconfined sand and gravel water-bearing unit perched atop bedrock. Confined sand and gravel Aquifer 109 was also mapped near the north Site boundary, but is unlikely to extend beneath the Site given the absence of confined water-bearing sediments in the onsite and nearby well logs.

According to the WRA mapping report, Aquifer 107 is approximately 21.4 km² in area, spanning the upland areas between Shuswap River and Deep Creek from Gardom Lake to Enderby. The fractured crystalline bedrock aquifer is primarily confined by unconsolidated layers of alluvium, and lacustrine and morainal deposits, but is unconfined where bedrock outcrops. The aquifer is likely recharged by direct precipitation and infiltration into rock fractures with eventual downslope discharge in valley bottom aquifers and springs. Seepage loss from Gardom Lake may also contribute to aquifer recharge. The permeability of the bedrock aquifer is likely low and groundwater flow is largely fracture controlled.

Groundwater flow direction is not listed in the aquifer mapping report; however, hydrogeological principles indicate that groundwater will follow topography and flow radially outward from nearby topographically elevated recharge areas. Groundwater flow direction beneath the Site is likely eastward towards the Shuswap River. No water quantity or quality concerns were noted in the aquifer at time of mapping (ENV, 2022).

The depth to groundwater beneath the Site likely varies depending on season, sediment characteristics and depth to bedrock. It is likely that, where present, local overburden contains groundwater from precipitation recharge and snowmelt during the spring and early summer, which then dries out in the late summer and fall. Some localized saturated areas may occur along onsite drainages. Nearby well logs indicate that static water levels near the Site vary from flowing artesian to 55 m below ground surface (mbgs), with most static levels occurring within 15 m of the ground surface (ENV, 2022).

Many seeps and springs are also present near the Site (primarily upslope of the Site) and are used for domestic, livestock, or irrigation water supplies. Seeps and springs generally occur where groundwater directly intersects the ground surface. These groundwater sources may originate from overburden, fractured bedrock, or both. These springs often discharge downslope as a small surface drainage. The following springs, brooks and creeks were mapped near the Site (Figure 1 and 2):

- Robinson Spring
- Settle Spring
- Diana Spring
- Bear Spring
- Hett Spring

- Birrell Spring
- Garnett Spring
- Pseudotsuga Spring
- Hairpin Spring
- Mohr Spring
- Baird Spring

3.5. Onsite Well Construction and Nearby Wells

A well was recently drilled and constructed at the north end of the Site (Figure 2) by Dan-Gare Drilling Ltd. of Armstrong, B.C. (B.C. Registered Well Driller 08042501). The well drillers encountered 1.5 m of “clay and rocks” over bedrock. A summary of well information is listed on Table 2:

Well ID	Completion Date	Total Depth	Static Water Level*	Production Material	Reported Well Yield
67272	June 23, 2022	49.7 m (163 ft)	10.4 m (34 ft)	Fractured Bedrock	22.7 L/min (6 US GPM)

The well was completed in bedrock (assumed to be Aquifer 107), with a 150 mm (6 inches) diameter casing down to 5.5 m (18 ft), and a 102 mm (4 inches) diameter PVC liner from 5.8 m (19 ft) to the well bottom. The liner is perforated from 37.5 m (123 ft) to the well bottom. Well construction information reported on the driller’s log also indicate that the well was constructed in accordance with the B.C. *Groundwater Protection Regulation* (GWPR) in that:

- The well is equipped with a surface seal that extends from the surface to a depth of at least 5 m;
- The well has an attached identification plate;
- The well casing extends a minimum of 0.3 m above the ground surface; and
- The well is equipped with a proper, vermin-proof well cap.

Based on air-lifting results, the well produced sufficient water during drilling to meet the Bylaw requirement of 4.5 L/minute (1.2 US GPM or 6,500 L/day). A copy of the well driller’s log is attached as Appendix B.

A search of the WRA indicated 35 wells were mapped within 500 m of the Site boundary. Available completion and production information for nearby wells are summarized in Table 3 below. Detailed drillers logs are available for download using the Provincial Well Search tool (<https://apps.nrs.gov.bc.ca/gwells/>).

Table 3: Nearby Well Information Summary								
Well Tag No.	Completion Date	Well Depth (m)	Static Water Level (m)	Water Column (m)	Production Material	Inferred Aquifer	Reported Well Yield (US GPM)	Approx. Location Relative to Site
76262	1998-10-30	91.44	5.79	85.65	Bedrock	107	1.5	20 m N
76243	1998-03-07	85.34	Flowing	85.34	Bedrock	107	1	40 m N
9114	1950s	2.74	Flowing	2.74	Unconsolidated	Unknown	Not listed	95 m SE
76244	1998-03-10	18.90	0.30	18.60	Bedrock	107	4	110 m N
18034	1963-04-01	13.11	Not listed	-	Unconsolidated	111	Not listed	115 m E
76242	1998-02-23	60.96	Not listed	-	Bedrock	107	1.5	165 m NW
83241	Not listed	5.49	Not listed	-	Unconsolidated	111	Not listed	195 m E
69924	1993-07-09	68.28	13.72	54.56	Bedrock	107	6	200 m SW
109044	2014-05-28	12.50	Flowing	12.50	Unconsolidated	111	2.5	210 m SE
121905	2020-10-22	13.72	0.61	13.11	Unconsolidated	111	7	235 m E
76245	1998-03-16	24.99	3.05	21.95	Bedrock	107	2.5	255 m NW
2093	1940s	2.74	0.61	2.13	Unconsolidated	111	Not listed	265 m SE
76240	1998	17.37	Flowing	17.37	Unconsolidated	Unmapped	5	270 m NW
76263	1998	48.77	Surface	48.77	Bedrock	107	2.5	275 m NW
76238	1997-11-20	13.41	4.57	8.84	Bedrock	107	4	295 m NW
124192	Not listed	91.44	5.18	86.26	Bedrock	107	1	295 m NW
15559	1958-01-01	5.03	4.57	0.46	Unconsolidated	111	Not listed	315 m E
34413	1976-03-01	8.53	3.35	5.18	Unconsolidated	111	5	320 m E
76236	1997-11-18	7.01	4.57	2.44	Consolidated	Unmapped	4	325 m NW
34412	1976-03-01	36.58	Not listed	-	Unconsolidated	111	Not listed	330 m E
62468	1993-05-27	41.15	16.46	24.69	Bedrock	107	15	340 m SW
76274	1998	111.25	10.97	100.28	Bedrock	107	6.5	345 m N
76237	1997-11-19	31.70	4.57	27.13	Bedrock	107	1.3	355 m NW
76250	1998	84.73	Not listed	-	Bedrock	107	1.75	355 m NW
76251	1998	111.25	18.29	92.96	Bedrock	107	1.5	355 m SW
76271	1999-06-09	36.58	Not listed	-	Bedrock	107	10	355 m SW
76226	1997-05-26	91.44	3.05	88.39	Bedrock	107	1.25	380 m W
76241	1998	90.22	Not listed	-	Bedrock	107	3	395 m NW
119453	1975-06-02	3.96	Not listed	-	Unconsolidated	111	Not listed	420 m E
62466	1991-06-10	85.34	3.05	82.29	Bedrock	107	2.4	470 m SW
15044	1957-01-01	5.49	4.27	1.22	Unconsolidated	108	Not listed	475 m NE
76248	1998-05-04	71.63	Not listed	-	Bedrock	107	20	485 m NW
124574	2021-07-06	42.67	9.14	33.53	Bedrock	107	10	485 m SW
124959	1959	3.66	Not listed	-	Unconsolidated	Unmapped	Not listed	500 m NE

As shown in Table 3, twenty (20) of the wells within 500 m were completed in bedrock (presumably Aquifer 107), most of which are situated cross- to upslope of the Site. The average reported well yield for these wells (including the onsite well) is **4.9 US GPM**.

Remaining wells listed in Table 3 were completed in unconsolidated sediments and generally occur downslope of the Site in valley bottom unconsolidated aquifer(s).

Reported and mapped well locations may differ from actual locations as the Province did not historically field locate well locations. Furthermore, until recently, filing of water well records with the Province was voluntary, so it is possible that additional wells not identified during this assessment are present in the area.

3.6. Nearby Surface Water Use

Eleven (11) points of diversion mapped within 500 m of the Site at the time of this report, five (5) of which are servicing active surface water licenses. These surface water intakes (points of diversion) are situated on various springs and brooks in the area as summarized in Table 4 and mapped on Figure 2.

Table 4: Nearby Licensed Surface Water Intakes					
License Number	License Status	Licensed Use	Source	Licensed Quantity	Approx. Location Relative to Site
C108162	Active	Irrigation	Robinson Spring	955 m ³ /yr	30 m W
C108795	Active	Livestock	Rob's Brook	2.27 m ³ /day	50 m S
C066210	Abandoned	Irrigation	Hett Spring	22 202 m ³ /yr	125 m W
C066452	Active	Domestic	Bear Spring	4.55 m ³ /day	160 m W
C108819	Abandoned	Domestic Livestock	Mohr Spring	2.27 m ³ /day 2.27 m ³ /day	165 m NE
C066248	Active	Domestic Irrigation	Diana Spring	2.27 m ³ /day 4 934 m ³ /yr	195 m W
C108819	Abandoned	Domestic Livestock	Baird Spring	2.27 m ³ /day 2.27 m ³ /day	205 m NE
C066137	Abandoned	Domestic	Diana Spring No. 2	2.27 m ³ /day	240 m W
C066209	Abandoned	Domestic	Birrell Spring	4.55 m ³ /day	265 m W
F108784	Abandoned	Domestic	Settle Spring	2.27 m ³ /day	295 m W
C125503	Active	Domestic	Garnett Spring	2.27 m ³ /day	500 m W

4.0 FIELD RECONNAISSANCE

On October 19, 2022, Mike Schutten, P.Geo. conducted a field reconnaissance to assess the Site for surface-based hydrogeological characteristics that may influence groundwater availability, such as shallow bedrock and the presence of groundwater discharge areas.

The Site was accessed from the south end of Crossridge Road and was generally undeveloped at the time of the reconnaissance with mature conifers and underbrush vegetation. The Site is surrounded by sparsely developed rural properties.

Soil observed along road cuts on and near the Site generally comprised poorly sorted sandy silt with some gravel. Scattered hydrophilic trees, commonly indicative of wetter soil conditions, were present in some low-lying areas. Bedrock outcrops were observed throughout the Site, indicating the underlying bedrock aquifer may be partially confined.

Two ephemeral streams were observed on the Site: one near the northwest corner draining northwest, which was dry during the Site visit, and a second bisecting the north half of the Site, draining east. Both streams appeared to originate from offsite groundwater seepages/springs, and neither appeared to be suitable as a potable water source for future Site lots.

5.0 WATER POTABILITY

No water quality concerns were reported for Aquifer 107 at the time of mapping; however, a nearby well log listed “noticeable amounts of iron” in the well water. Ecoscape understands that, in general, wells completed in bedrock aquifers in the BC Interior commonly have elevated iron and manganese concentrations above Aesthetic Objective (AO) concentrations established under the *Guidelines for Canadian Drinking Water Quality* (GCDWQ). In samples where parameters are found to exceed AOs, the water is considered to be potable, but treatment may be desired to address taste or odor concerns.

6.0 AQUIFER RECHARGE AND WATER AVAILABILITY

Aquifer recharge is a primary consideration when evaluating sustainable groundwater use. Recharge of Aquifer 107 occurs via the vertical migration of precipitation and snowmelt, with a likely lag time of two to three months before infiltrated water becomes aquifer recharge. Climate normal data indicates annual precipitation in the area is about 653 mm/year, including snowfall (Environment Canada, 2022). Conservatively assuming

5% of the precipitation would infiltrate the subsurface, annual recharge to the 21.4 m² aquifer may be as high as 698,710 m³/year².

Annual groundwater usage in the aquifer is not well documented; however, the Province's summary page for Aquifer 107 indicates that approximately 110 domestic wells and one (1) community supply well (4,500 m³/year) occur within the aquifer's bounds (ENV, 2022). The Province's BC Aquifer Stress Tool indicates groundwater withdrawal in the aquifer is around 235,000 m³/year, based on national, provincial, and municipal scale statistical data. Conservatively assuming 200 domestic wells are completed within the aquifer (to account for undocumented wells) withdrawing at the Bylaw rate of 6,550 L/day (2,390.75 m³/year), annual groundwater usage in bedrock Aquifer 107 could be upwards of 482,650 m³/year, including the community supply well. As such, somewhere between 216,060 m³ and 463,710 m³ of groundwater recharge is estimated to remain available in Aquifer 107 on an annual basis.

Proposed groundwater extraction from Aquifer 107 is 35,861 m³/year, assuming 15 domestic wells are drilled and completed in Aquifer 107 and pumped at the Bylaw rate, which amounts approximately 7 to 16% to of available recharge.

7.0 EFFECTS OF POTENTIAL WELL INTERFERENCE AND SEASONAL ELEVATION VARIATIONS

Well interference can occur when wells are completed close together. Pumping in one well can lower the water level in the other, resulting in reduced performance in both. When well interference becomes excessive, the overall yield of the affected wells may decrease (Driscoll, 1987). However, this effect is reduced by distance and pumping rate.

The closest wells are located on the northwest side of the Site, with WTN 76262 situated approximately 110 m from the onsite well. Per Table 2, this well was reported to produces more than the Bylaw rate, and has a substantially thick water column.

Each future lot will be at least 2 ha in size which should allow for ample well spacing. Given the expected distance between these wells, and between these wells and the closest adjacent wells, it is unlikely that groundwater use at the Bylaw flow rate at each future lot will significantly affect groundwater supplies on and near the Site.

Groundwater levels commonly seasonally vary, with highest levels in the spring and early summer and the lowest levels observed in the fall and winter. BC ENV maintains an observation well network across the province; however, no observation wells are located near the Site or in Aquifer 107, which underlies the Site. Therefore, no seasonal water level variation data for nearby aquifers is available. Like most bedrock aquifers, seasonal

² 21,400,000 m² x 0.653 m x 0.05 = 698,710 m³

water level variations in Aquifer 107 are expected to be minimal and likely range between 1 and 2 m, and as shown in Table 2, most nearby wells completed in Aquifer 107 show a static water column of more than 20 m and some cases over 80 m in thickness. As such, seasonal groundwater level variations near the Site are not likely to affect the local groundwater supply.

8.0 DISCUSSION ON GROUNDWATER RESOURCE POTENTIAL AND RECOMMENDATIONS

Based on our field observations and the available geological and hydrogeological data, in our professional opinion groundwater resources are available to develop water supplies on each of the 15 lots proposed for the Site capable of producing the RDNO Bylaw rate of 6,550 L/day.

Specific findings and comments include:

- The Site is situated located atop locally important bedrock Aquifer 107, which will likely be used as a domestic groundwater source for future lots.
- Aquifer 107 was assessed with moderate vulnerability and low productivity at the time of mapping. Groundwater recharge primarily occurs via infiltration of precipitation and snowmelt. Regional groundwater flow in the aquifer has not been accurately mapped, but hydrogeological principles infer groundwater flow is topographically driven, flowing from elevated recharge areas to downslope discharge areas. The Site is situated at the downslope end of the aquifer, and is thus likely situated in or near a groundwater discharge area, as demonstrated by relatively shallow static water levels and artesian conditions noted in nearby wells.
- **Several small drainages were observed on the property during the Site reconnaissance: the first stems from Robinson Spring west of the Site and flows eastward through the north half of the Site, while the second is an ephemeral stream locally referred to as Rob's Brook which flows southeast through the southwest Site corner. These drainages may provide recharge to Aquifer 107.**
- Depths of wells completed in Aquifer 107 are highly variable, ranging from approximately 13 to 111 mbgs. This indicates that groundwater flows through complex network of fractures, in which the presence, depth and number of water-bearing fractures may vary from one location to the next.
- Annual precipitation in the area is about 653 mm/year. Conservatively assuming 5% of the precipitation would infiltrate the subsurface, annual aquifer recharge may be as high as 698,710 m³/year. Deeper groundwater resources not of meteoric origin (water perennially recharged by precipitation) and groundwater leakage from streams and Gardom Lake may provide additional recharge but were not considered.

- The Province's Aquifer 107 summary page indicates that approximately 110 domestic wells and one (1) community supply well (4,500 m³/year) are situated within the aquifer's bounds).
- Groundwater withdrawal from the aquifer is estimated to be between 235,000 and m³/year, based on national, provincial, and municipal scale statistical data, and conservative estimates using available well data.
- Proposed groundwater extraction from Aquifer 107 is 35,861 m³/year, assuming 15 domestic wells are drilled and completed in Aquifer 107 and pumped at the Bylaw rate, amounts approximately 7 to 16% to of available recharge.
- Seasonal groundwater fluctuations in Aquifer 107 are not expected to affect long-term water availability at the Site.
- Each future lot will be at least 2 ha in size which should allow for ample well spacing, thus mitigating the potential for well interference.
- General water quality issues, such as elevated iron and manganese that may affect wells on the future lots are treatable with standard residential water treatment methods.
- High estimated recharge to the aquifer coupled with favourable reported well yields in nearby well logs indicate appropriately spaced domestic wells on future Site lots with groundwater extraction at the Bylaw flow rate is feasible and should not result in significant impacts to local groundwater users. **Bearing this in mind**, groundwater potential from bedrock can **vary**, depending on the number of water-bearing fractures, and the size and extent of these fractures, which may or may not be present at any given drilling location. **However, and importantly**; numerous nearby wells completed in bedrock Aquifer 107 produce water at rates above the minimum Bylaw flow rate, with an average reported well yield of 4.9 US GPM (18.5 L/min or 26,710 L/day).

Based on our findings, we provide the following recommendations:

- Test drilling and pumping tests **should be conducted at the subdivision stage in accordance with the Bylaw requirements**, to properly assess the groundwater resource potential across the Site. We recommend that future lots be at least 2 ha in area.
- **Future subdivision and lot development should occur in phases, with the first phase comprising no more than 8 lots (i.e., half of the proposed number of lots at full build-out). Water level loggers should be installed and maintained in select wells drilled as part of the first phase and used to monitor groundwater level fluctuations for a 1 to 2 year period. This groundwater level data can be used to inform subsequent development at the Site.**
- **Observed drainages on the Site should be maintained and protected, as they may provide valuable recharge to the underlying bedrock Aquifer 107.**

- This assessment pertains the Site's ability to supply water per the RDNO's Bylaw requirements and assumes that each well will be used for domestic purposes. Any well used for purposes other than private domestic water supply will require a new-use groundwater license under the BC *Water Sustainability Act*.
- Ecoscape should be given the opportunity to provide additional hydrogeological review should any wells be used for purposes other than domestic use.
- On-site treatment and disposal systems for domestic wastewater are likely necessary for each lot. **The systems should be designed and installed by either a Registered Onsite Wastewater Practitioner or a Professional Engineer in accordance with Version 3 of the BC Sewerage System Manual.** The system dispersal fields must be located greater than 30 m away from the wells to meet the *Sewerage System Regulation* setback requirements and minimize effects on groundwater quality from system operations.
- This report should be submitted to the RDNO in support of the rezoning application for the Site.

9.0 LIMITATIONS

This report has been prepared by Ecoscape Environmental Consultants Ltd. (Ecoscape) and is intended for the sole and exclusive use of Mark Lewis (the Client) and the RDNO, for the purposes set out in this report. Ecoscape has prepared this report with the understanding that all available information on the past, present, and proposed conditions of the Site have been disclosed. Ecoscape has relied upon personal communications with the Client and other information sources to corroborate the documents and other records available for the Site. The Client has also acknowledged that in order for Ecoscape to properly provide the professional service, Ecoscape is relying upon full disclosure and accuracy of this information.

This assessment has been completed in accordance with generally accepted geoscience and environmental practice. Please note, no hydrogeological investigation can wholly eliminate uncertainty regarding the potential for unrecognized conditions in connection with an aquifer or subsurface materials.

Nothing in this report is intended to constitute or provide a legal opinion. Ecoscape makes no representation as to the requirements of compliance with environmental laws, rules, regulations or policies established by federal, provincial or local government bodies. Revisions to the regulatory standards referred to in this report may be expected over time. As a result, modifications to the findings, conclusions and recommendations in this report may be necessary

Any use of this report by a third party, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Ecoscape accepts no responsibility for damages, if any, suffered by any third party as a result of actions or decisions made based on this report.

The findings and conclusions of this report are valid only as of the date of the report. If additional information becomes available that is inconsistent with the information provided herein, or if the assumptions stated in this report are not met, Ecoscape should be contacted to reassess the conclusions provided in this report

Please be advised that Mike Schutten and Lee Ringham are members in good standing in the Professional Engineers and Geoscientists of British Columbia (EGBC) and are acting within their area of expertise.

10.0 CLOSURE

We trust that this report satisfies the present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted

Ecoscope Environmental Consultants Ltd.,

Written By:



Mike Schutten, M.A.Sc, P.Geo
Hydrogeologist
Direct Line: (778) 940-1964

Reviewed By:



Lee Ringham, M.Sc., P.Geo.
Senior Hydrogeologist
Chinook Arch Geoscience Inc.
Direct Line: (403) 860-2925

Attachments: References

Figures

Appendices

REFERENCES

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- Environment Canada. 2022. Canadian Climate Normals. Available online: https://climate.weather.gc.ca/climate_normals/index_e.html
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- Province of British Columbia. 2022. Groundwater Wells and Aquifers. Available online: <https://apps.nrs.gov.bc.ca/gwells/>

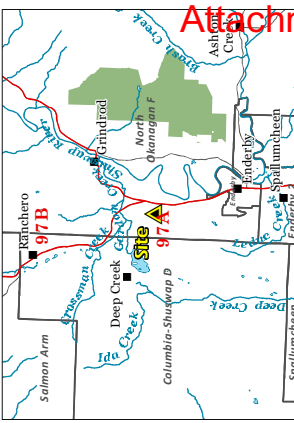
FIGURES

FIGURE 1 Site Location

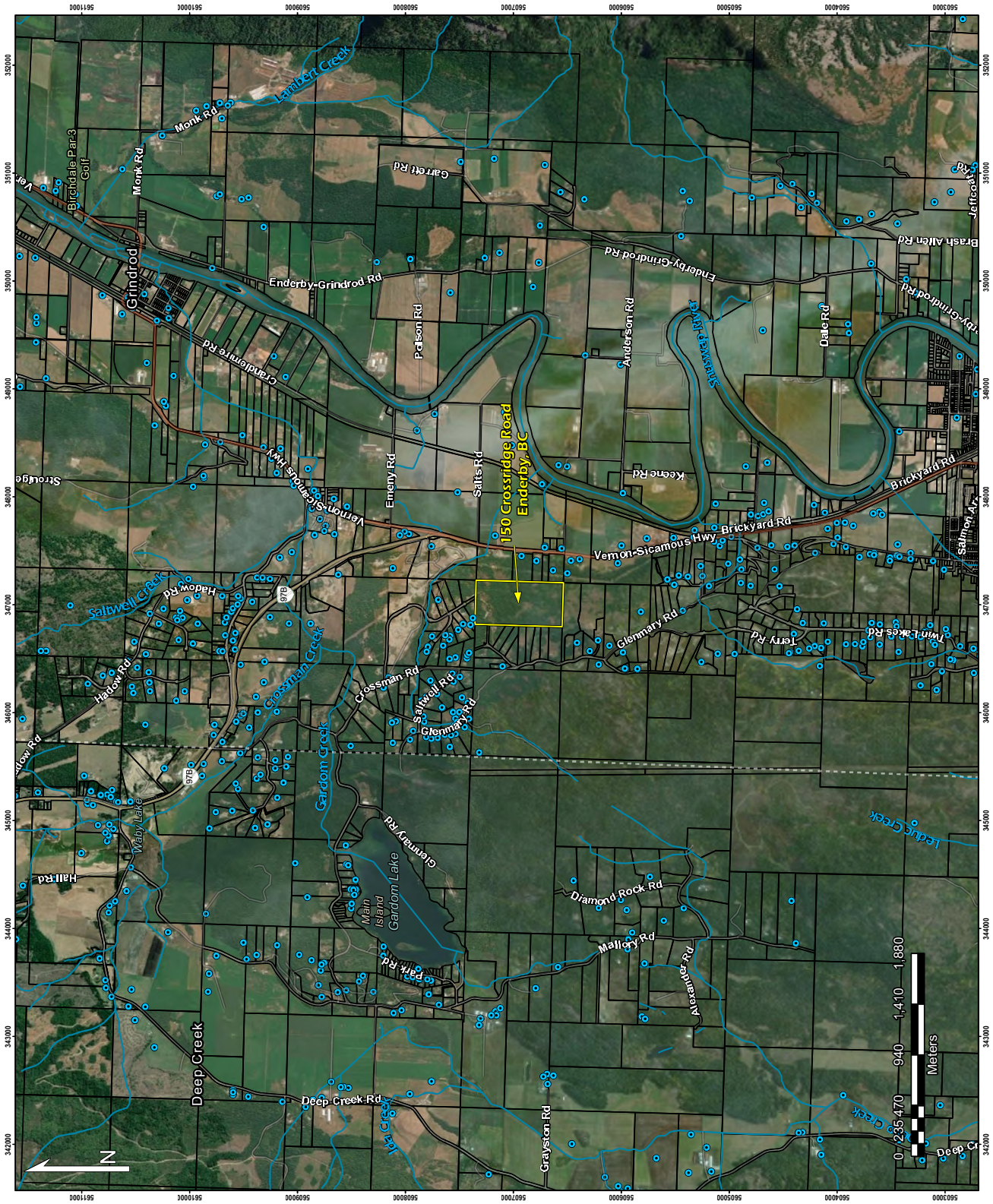
Project: GW Quantity and Quality Assessment
 Location: RDNO
 Project No.: 22-4450
 Prepared for: Ecoscape Environmental Consultants Ltd.
 Prepared by: Mike Schuttler, M.A.Sc., P.Geo
 Coordinate System: NAD83-UTM Zone 11
 Imagery: ESRI World Imagery
 Map Date: October 19, 2022

- LEGEND**
- Site
 - Streams
 - ENV-Mapped Well
 - Cadastre

Regional Location of Site



DISCLAIMER
 The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data and legal survey will supersede any data presented herein.





DISCLAIMER
 The data displayed is for conceptual purposes only and should not be interpreted as a legal survey or for legal purposes. If discrepancies are found between the data presented here and the data presented in the legal survey will supersede any data presented herein.

FIGURE 2
Site and Nearby Well Locations

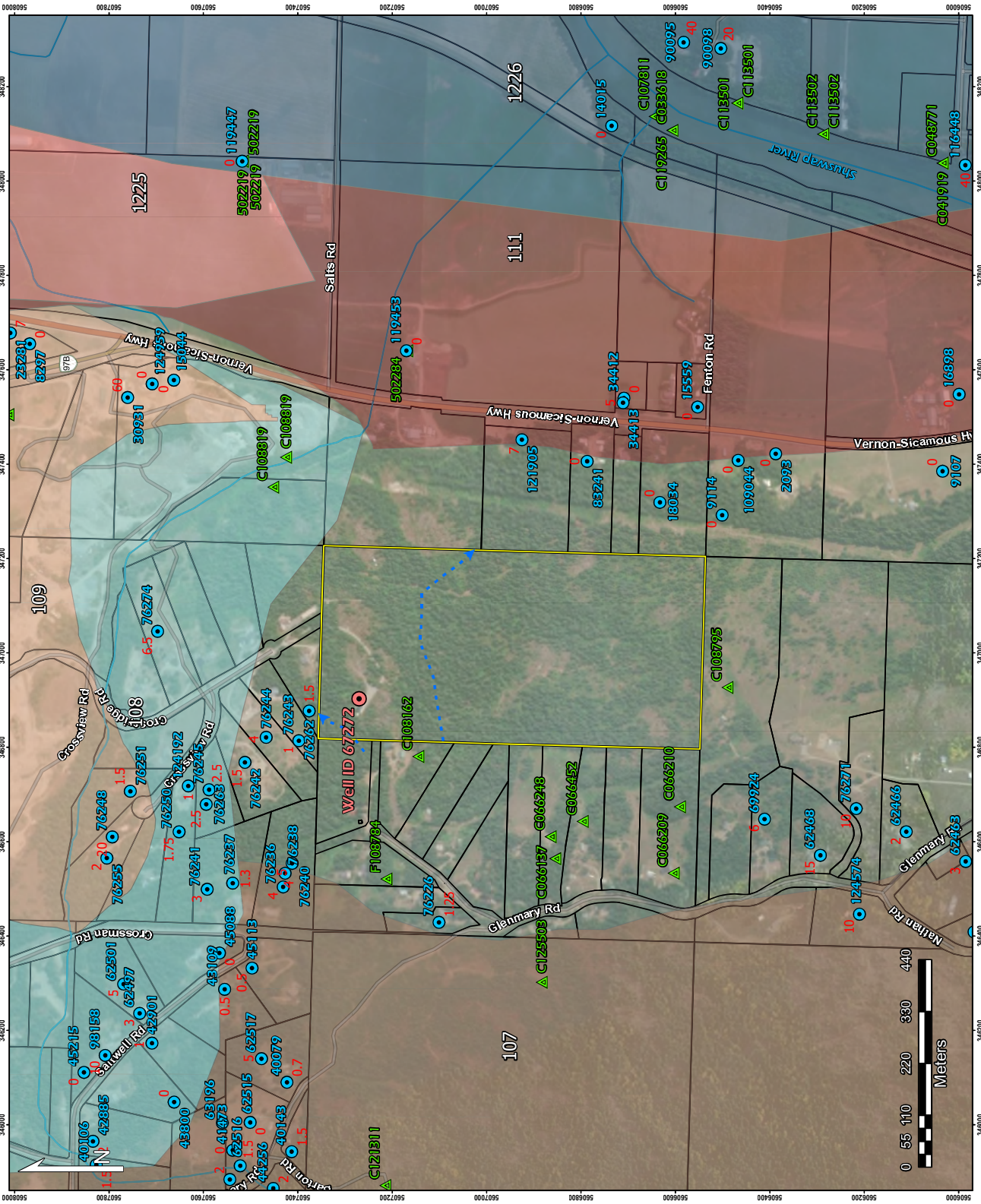
Project: Groundwater Resource Potential Assessment
 Location: RDNO
 Project No.: 22-4427
 Prepared by: Lewis
 Prepared by: Ecoscape Environmental Consultants Ltd.
 Coordinate System: NAD83-UTM Zone 11
 Prepared by: Mike Schuttgen, M.A.Sc., P.Geo
 Imagery: ESRI World Imagery
 Map Date: October 19, 2022

LEGEND

- Ephemeral Stream (approx.)
- ▲ Licensed Surface Water Intake
- Newly Drilled Onsite Well
- ENV-Mapped Well (Well Tag No. and Rpt Well Yield [USGPM])
- Stream
- Site
- Cadastre

ENV Aquifer ID

107
108
109
111
1225
1226



APPENDIX A: General Conditions

GENERAL CONDITIONS

This report applies and is subject to these "General Conditions".

1.0 Use of Report

This report concerns a specific site and a specific scope of work, and is therefore not applicable to any other sites or any other developments not referred to in the report. Any deviation from the specific site or scope or work would require a supplementary investigation and assessment.

Conclusions and recommendations contained in this report are solely intended for the use of Ecoscape's client. Ecoscape bears no responsibility for the accuracy of information, the analysis of data or recommendations contained or referenced in this report when the report is utilized by or relied upon by any party other than Ecoscape's client, unless otherwise authorized in writing by Ecoscape. Any unauthorized application of this report is at the discretion and sole risk of its user.

This report is subject to copyright, and therefore shall not be reproduced in part or in whole without prior written consent by Ecoscape. Additional copies of this report may be available upon request, if required, and will be supplied after receipt of payment for expenses associated with report production.

2.0 Limitations of Report

This report was derived solely from the conditions that were present on site during Ecoscape's investigation. The client, and any other parties making use of this report with the express written consent of the Ecoscape and the client, are aware that conditions affecting the environmental condition of the site can vary both temporally and spatially, and that the conclusions and recommendations included in this report are temporally sensitive.

The client, and any other parties making use of this report with the express written consent of the Ecoscape and the client, are also aware that conclusions and recommendations included within this report emanate from limited observations and information, and that both on-site and off-site conditions may vary, which in turn could affect the conclusions and recommendations that were made.

The client is aware that Ecoscape is not qualified to, nor is it making any recommendations in terms of purchase, sale, investment or development of the subject property, as such decisions are the sole responsibility of the client.

2.1 Information Provided to Ecoscape by Others

During the extent of the preparation and work carried out in this report, Ecoscape may have relied upon information provided by parties other than the client. While Ecoscape strives to validate the accuracy of such information when instructed to do so by the client, Ecoscape accepts no responsibility for the validity of such information which may affect the report.

3.0 Limitation of Liability

The client acknowledges that property containing hazardous wastes and contaminants poses a high risk of claims brought by third parties stemming from the presence of those materials. Accounting for these risks, and in consideration of Ecoscape providing the requested services, the client agrees that Ecoscape's liability to the client, with respect to any issues relating to hazardous wastes or contaminants located on the subject property shall be limited to the following:

- (1) With respect to any claims brought against Ecoscape by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to Ecoscape under this Agreement, whether the action is based on breach of contract or tort;
- (2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject property, the client agrees to indemnify, defend and hold harmless Ecoscape from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by Ecoscape, whether the claim be brought against Ecoscape for breach of contract or tort.

4.0 Disclosure of Information by Client

The client agrees to fully cooperate with Ecoscape with respect to the provision of all available information on the past, current, or proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for Ecoscape to properly provide the service, Ecoscape is relying on full disclosure and accuracy of any such information. Ecoscape does not accept any responsibility for conclusions drawn from erroneous, invalid, or inaccurate data provided to us by another party and used in the preparation of this report.

5.0 Standard of Care

Services performed by Ecoscape for this report have been completed in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgement has been applied in developing the conclusions and/or recommendations made in this report. No warranty or guarantee, express or implied, is made concerning the results, comments, recommendations, or any other portion of this report.

6.0 Notification of Authorities

The client acknowledges that in certain instances the discovery of hazardous materials, contaminants or conditions and materials may require that regulatory agencies and other parties be informed and the client agrees that notification to such parties or persons as required may be done by Ecoscape in its reasonably exercised discretion. Further, Ecoscape reserves the right to notify Provincial agencies when rare or endangered flora or fauna are observed, whether the species classifications are identified as such at the local, Provincial, or Federal levels of government.

7.0 Ownership of Instruments of Professional Service

The client acknowledges that all reports, plans, and data generated by Ecoscape during the performance of the work and other documents prepared by Ecoscape are considered its professional work product and shall remain the copyright property of Ecoscape.

8.0 Alternate Report Format

Where Ecoscape submits both an electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Ecoscape's instruments of professional service), the client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by Ecoscape shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the client agrees and waives all future right to dispute that the original hard copy signed version archived by Ecoscape shall be deemed to be the overall original for the Project.

The client agrees that both electronic file and hard copy versions of Ecoscape's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party other than Ecoscape. The client warrants that Ecoscape's instruments of professional service will be used only and exactly as submitted by Ecoscape.

The client recognizes and agrees that electronic files submitted by Ecoscape have been prepared and submitted using specific software and hardware systems. Ecoscape makes no representation about the compatibility of these files with the client's current or future software and hardware systems.

APPENDIX B: Onsite Well Log





- Well Construction Report
- Well Alteration Report

Dan-Gare Drilling Ltd
 Box 722
 Armstrong, BC V0E 1B0
 1-888-549-3130

WTN 12669 X
 Attachment B
 Ministry Well ID Plate Number: _____
 Where ID Plate is attached: Stickup
 Ministry Well Tag Number: _____

See reverse for notes & definitions of abbreviations.

Well Class: Class of well (see note 2): Water Supply Sub-class of well: Domestic
 Water supply wells: indicate intended water use: private domestic water supply system irrigation commercial or industrial other (specify): _____
Start date of work (YYYY/MM/DD): 2022/06/23 **End date of work** (YYYY/MM/DD): 2022/06/23

Person Responsible for Work (print clearly): Name (first, last) (see note 3): Logan Flett
 Person who completed the work: Logan **Registration no.** (see note 4): 08042501
 Consultant (if applicable; name and company): _____

DECLARATION: Well construction, well alteration or well decommission, as the case may be, has been done in accordance with the requirements in the Water Sustainability Act and the Ground Water Protection Regulation.

Signature of Person Responsible: Logan Flett

Owner name: Land First Development
Mailing address: 49 East River Rd. Town Maize Prov. B.C. Postal Code V0E 2K0
Well Location (see note 6): Address: Street no. 150 Street name Crossridge Rd. Town Endicott
 or Legal description: Lot _____ Plan _____ D.L. _____ Block _____ Sec. _____ Twp. _____ Rg. _____ Land District _____
 or PID: 013-95-214 and Description of well location (attach sketch, if nec.): _____

Well Location:
 NAD 83: Zone: 11U and UTM Easting: 346903 m or Latitude (see note 8): _____
 (see note 7) UTM Northing: 5607270 m or Longitude: _____
Method of drilling: air rotary dual rotary cable tool mud rotary auger driving jetting other (specify): _____
Orientation of well: vertical horizontal Ground elevation: 1684 ft (asl) Method (see note 9): GPS

Lithologic description (see notes 10-15)

From ft (bgl)	To ft (bgl)	Material Description	Moisture			Colour							Hardness							Observations (e.g. other geological materials (e.g. boulders), est. water bearing flow (USgpm))						
			Dry	Damp	Moist	Wet	Black	Blue	Brown	Green	Grey	Var-coloured	Red	Tan	White	Dense	Hard	Loose	Medium		Soft	Sliff	Very Hard	Very Soft		
0	5	Clay's Rocks																								
5	46	Bedrock (Dark Grey)																								
46	68	Bedrock (Light Grey)																								
68	122	Bedrock (Dark Grey)																								
122	137	Bedrock (Light Grey)																								
137	149	Bedrock																								
149	163	Bedrock (Dark Grey/White)																								

Casing Details:

Type: Surface Production Open Hole Steel Removed

From ft (bgl)	To ft (bgl)	Dia in	Casing Material/Open Hole (see note 16)	Wall Thickness in	Drive Shoe
12	18	6	Steel	0.219	Yes

Screen details:

From ft (bgl)	To ft (bgl)	Dia in	Type (see note 17)	Slot Size

Surface seal: Type: Bentonite Depth: 18 ft
 Method of installation: Poured Pumped Thickness: 1 in
 Backfill: Type: _____ Depth: _____ ft
 Liner: PVC Other (specify): _____
 Diameter: 4 in Thickness: 0.250 in
 From: 19 ft (bgl) To: 163 ft (bgl)
 Perforated: From: 123 ft (bgl) To: 163 ft (bgl)

Intake: Screen Open bottom Uncased hole
 Screen type: Telescope Pipe size
 Screen material: Stainless steel Plastic Other (specify): _____
 Screen opening: Continuous slot Slotted Perforated pipe
 Screen bottom: Ball Plug Plate Other (specify): _____
 Filter pack: From: _____ ft To: _____ ft Thickness: _____ in
 Type and size of material: _____

Developed by: Air lifting Bailing Jetting Pumping Surging Other (specify): _____ Total duration: _____ hrs
 Notes: _____

Well yield estimated by: Pumping Air lifting Bailing Other (specify): _____
 Rate: 6 USgpm Duration: _____ hrs SWL before test: _____ ft (btoc) Drawdown: _____ ft (btoc)
 Hydro-fracturing: Yes No Increase in Well Yield due to Hydro-fracturing: _____ USgpm

Water Quality: Water sample collected: Yes No
 Date (YYYY/MM/DD) _____ Water quality odour: _____
 Characteristics: Clear Cloudy Fresh Gas Salty Sediment Other (specify): _____
 Colour: Black Black flecks Brown Clear/none Grey
 Slight colour/milky Orange Other (specify): _____

Final well completion data:
 Total depth drilled: 163 ft Finished well depth: 163 ft (bgl)
 Final casing stick up: 28 in Depth to bedrock: 5 ft (bgl)
 SWL: 34 ft (btoc) Estimated well yield: 6 USgpm
 Artesian flow: _____ USgpm, or Artesian pressure: _____ ft
 Type of well cap: Aluminum Well disinfected: Yes No

Comments: _____

- Confirmation/alternative specs. attached
- Original well construction report attached

May 08, 2023

TO: Planning Department
Regional District of the North Okanagan

Subject: **Onsite Septic Disposal Assessment of the Proposed Subdivision of:**

150 Crossridge Rd

Roll: 20-789-03118.000

PID: 013-905-244

Legal: PART E1/2 OF SE1/4, SECTION 10, TOWNSHIP 19, RANGE 9, MERIDIAN W6,
KAMLOOPS DIV OF YALE LAND DISTRICT

This letter, the included Site Plan, and geotechnical report are intended to address the above noted proposed subdivision in regard to onsite wastewater disposal feasibility. We conducted a detailed assessment of the subject property to determine the onsite septic capabilities for the newly created lots. Based on our findings, Type 1 septic service that adheres to the applicable standards and regulations is feasible.

Our assessment of the feasibility of providing onsite septic services to the proposed 15 lot subdivision is based on a design flow of 1600 L/D (352 IGD) per lot, which is based on use by a 4-bedroom single-family residence. With regards to sizing and design consideration, we have referenced the Sewerage System Standard Practices Manual, Version 3.

Native soils are generally dense silty sand with some gravelly sand and some hard clay soils, nearer to the poor structure and consistency category for septic disposal. Twelve test pits, as marked on the attached plans, returned variable but similar subsurface conditions with some excavations terminated due to bedrock encountered. The soils are suitable for onsite effluent disposal with a loading rate of 15 L/m²/Day in a typical field configuration. Given the variable soil structures and depths, we recommend using Type 1 sand mound disposal systems. We suggest an infiltration loading rate of 40 L/m²/Day on Mound Sand for a typical configuration and a basal area loading rate of 15 L/m²/Day.

Site Plan, attached, illustrates the property, proposed septic disposal area and backup area as designed. This shows that it is feasible to provide onsite septic disposal for this development, under a conventional design that follows the Sewerage System *Standard Practice Manual* and conforms to relevant siting and design requirements.

Please contact us if you have any questions or comments.

Prepared by,

Clinton Kallies



Reviewed by,

Jayne Franklin, P.Eng.








Attachments: Site Plan, Geotechnical Report

SEWAGE DISPOSAL SYSTEM FOR:
 PART 1/2 OF SE1/4, SECTION 10, TOWNSHIP 19, RANGE 9, MERIDIAN
 W6, KAMILOOPS DIV OF YALE LAND DISTRICT
 ASSESSMENT ROLL NUMBER:
 20-789-03118.000
 P.I.D.:
 013-905-244

DESIGN CALCULATIONS:
 A. PEAK DAILY DESIGN FLOW = 1600 L/D (352 IGPD) BASED ON A 4-BEDROOM HOME ON EACH LOT.
 B. EACH DISPOSAL AREA CONSISTS OF A SAND MOUND WITH 5 LATERALS SPACED THREE FEET APART. EACH LATERAL CONSISTS OF 11 QUICK4 E.O. TOTALING 4.6' (1.4M) INCLUDING END CAPS AND A COMBINED LATERAL LENGTH OF 230' (70M) FOR EACH FIELD.
 C. INFILTRATION AREA PEAK HYDRAULIC LOADING RATE = 40 L/M²

LEGEND

-  PROPOSED DISPOSAL FIELD
-  BACKUP DISPOSAL FIELD LOCATION
-  TEST PIT LOCATION
-  PROPOSED WELL
-  30m WELL SETBACK



DATE: 2025-03-20
 DRAWN BY: JLF
 CHECKED BY: JLF
 DATE: 23-05-23

DESIGN NO: 23-02
 TOWN: JLF
 LTV: JLF
 REV: 1 OF 1
 SHEET: 0



FRANKLIN ENGINEERING LTD

Mark Lewis

150 Crossridge Rd

SITE PLAN

Fletcher Paine Associates Ltd.

Consulting Geotechnical and Materials Engineers

Vernon Office:
2250 11 Avenue
Vernon, B.C.
V1T7X8

Kelowna Office:
544 Bernard Avenue
Kelowna, B.C.
V1Y 6P1

File 6865

March 8, 2023

Land First Development
150 Cross Ridge Road
Enderby, B.C.
V0E 1V3

Attention: Mark Lewis

Dear Mr. Lewis,

Geotechnical Investigation and Report
Proposed 15 Lot Residential Subdivision
150 Crossridge Road, RDNO Area "F"
Revised from 03Jan2023

1.0 INTRODUCTION

1.1 Authorization

The work reported upon in this document was authorized by Mark Lewis on behalf of Land First Development (The Client) on September 2, 2022.

1.2 Qualifications

Use of this report is subject to the Statement of Qualifications and General Conditions, which is attached. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

This report has been prepared exclusively for the client listed above, for the use of other consultants on their design team and for the relevant approving authorities provided that all Fletcher Paine Associates Ltd. (FPA) recommendations are adhered to as outlined in this document and its attachments.

1.3 Terms of Engagement

The terms under which our services are provided are attached.

2.0 SCOPE OF THE REPORT

The contents of this report are intended to provide preliminary geotechnical engineering recommendations related to a proposed subdivision located at 150 Crossridge Road within the Regional District of North Okanagan (RDNO) Area “F”. The legal description for the property is Part E ½ of SE ¼, Section 10, Township 19, Range 9, Meridian W6, KDYD.

The project is currently at the conceptual design stage such that detailed design drawings are not available. On the basis of conceptual plans, prepared by McElhanney Ltd., and dated March 17, 2022, the proposed residential subdivision will include the creation of 15 lots for single family homes, ranging between 2.0 hectares and 2.8 hectares, and approximately 620 m of road construction.

According to The Client representative, site grades will not be modified such that the lots will likely be maintained in their existing state.

This report addresses the following specific items:

- a) Site description and surficial geology
- b) Geotechnical field and laboratory investigations carried out for the project
- c) The engineering properties and characteristics of the subsoils at the site
- d) Preliminary recommendations for foundations and ground preparation for foundations
- e) Frost protection for foundations
- f) Recommendations for site grading

3.0 SITE DESCRIPTION AND SURFICIAL GEOLOGY

3.1 Site Description

The site is located 150 Crossridge Road, RDNO Area “F”, as shown on the attached Test Pit Location Plan, Figure 6865-1. The rectangular property is approximately 32 hectares in area and is generally undeveloped and covered with mature trees. At the time of the investigation, some narrow forest trails existed throughout the site, and there were

existing residential structures near the north end of the property. The site is generally surrounded by large, rural residential lots.

The proposed subdivision site is situated on the west side of the Shuswap River Valley, with areal grades sloping down towards the east at approximate 5H:1V slope gradients. The site is accessed from Crossridge Road, to the north, and Helmcken Road, to the west. On site grades range between approximately 2.5H:1V and 10H:1V, with some steeper near-vertical sections at localized rock outcrops.

3.2 Surficial Geology

Available surficial geology mapping indicates that the surficial soils encountered at the site are undifferentiated morainal deposits consisting of till with minor sand, gravel, and silt, with nearby rock outcrops and areas of near-surface rock.

The materials encountered during the field investigation were consistent with the above descriptions, including some minor lacustrine deposits encountered on the east side of the site.

4.0 INVESTIGATIONS

4.1 Field Investigation

A subsurface field investigation was carried out on November 4, 2022 and utilized a tracked excavator owned and operated by The Client. The field investigation consisted of making 12 test pits at the locations shown on the attached Figure 6865-1. The purposes of the investigation were to identify the stratigraphy of the subsoils at the test pit (TP) locations and to recover disturbed samples of the soils for further classification and testing in the laboratory. Standpipe piezometers were installed at select test pit locations to monitor static groundwater levels, if any, within the investigated extents.

The test pit investigation program was limited due to access difficulties through the mature forest at the time of the investigation, especially on the east and south sides of the property.

With the exception of TP 9, topsoil was encountered on the surface of the test pits to depths ranging between 0.2 m and 0.3 m below the existing ground surface. At the location of TP 9, loose fill, consisting of silty sand, was encountered to a depth of 0.6 m below the existing ground surface. Topsoil was encountered below the fill at the location of TP 9 to a depth of 0.8 m below the existing ground surface.

The in-situ and undisturbed soils encountered below the topsoil and fill at the test pit locations generally consisted of compact to dense silt and sand, silty sand, sand, and gravelly sand soils, and hard, highly plastic clay soils. The test pits were terminated within the in-situ, undisturbed soils at depths ranging between 0.3 m and 3.7 m below the

existing ground surface. TP 1, TP 5, TP 8, TP 10, TP 11 and TP 12 were terminated due to excavator refusal on bedrock at depths ranging between 0.3 m and 1.8 m below the existing ground surface. TP 6 was terminated due to excavator reach in a confined area at a depth of 2.7 m below the existing ground surface. TP 7 was terminated due excavator refusal on possible bedrock encountered at 2.7 m below the existing ground surface.

Standpipe piezometers were installed at the locations of TP 2, TP 6, TP 9 and TP 11. When checked on November 14, 2022, the standpipes were dry.

Detailed test pit logs are provided on the attached Records of Exploration.

4.2 Laboratory Investigation

The laboratory investigation consisted of natural moisture content determinations on all of the recovered samples, five grain size distribution tests on select samples of the native coarse-grained soils and one Atterberg liquid and plastic limit determination on a select sample of the native fine-grained soils.

The results of the laboratory testing are shown on the attached Records of Exploration, and on the attached Grain Size Distribution and Atterberg Liquid Limit and Plastic Limit Determination test reports.

5.0 ENGINEERING PROPERTIES AND CHARACTERISTICS OF THE SUBSOILS

5.1 Topsoil and Fill

No engineering properties can be reasonably assigned to the topsoil and fill materials encountered at the test pit locations due to their organic, non-homogeneous, and/or indeterminate quality and compaction encountered throughout the project site.

5.2 Undisturbed In Situ Soils

The undisturbed in situ soils encountered at the site can provide satisfactory support for engineered fill related to the proposed constructions, provided that all foundation soil preparation, and other, recommendations made in this report are followed.

5.2.1 Shear Strength

The in situ, undisturbed coarse grained soils encountered at the site are considered to generally range between compact and dense in terms of relative density, and have estimated effective friction angles ranging between 32° and 36°.

The in situ, undisturbed fine grained soils encountered at the site are considered to be hard in terms of consistency, and have estimated undrained shear strength of 200 kPa.

5.2.2 Settlement Potential

The in situ, undisturbed coarse grained soils encountered at the site are characterized as generally ranging between compact and dense in terms of relative density. Provided the recommendations made in this report are adhered to, these materials are expected to experience negligible settlement when subjected to the potential loading from the structures and/or expected site grade increases.

5.2.3 Allowable Bearing Capacity

Shallow foundations set on engineered fill placed above the undisturbed and competent in situ granular soils could be provided a preliminary allowable bearing capacity ranging between approximately 100 kPa and 150 kPa. Engineered fill placement recommendations are provided in Section 6.4 of this report.

The allowable bearing capacity for each structure during lot development should be provided by the geotechnical engineer of record for the subject property. The geotechnical engineer of record for the individual property should provide specific recommendations for sites where shallow foundations are to be set on clay, rock or native granular soils.

5.2.4 Frost Susceptibility

The soils encountered at this site are considered to be moderately to highly frost susceptible.

5.2.5 Swell Potential

Based on the laboratory test results and groundwater conditions encountered at the site, the in situ high plastic clay soils have a very high potential for volume change (shrink/swell) with changes in moisture contents.

6.0 PRELIMINARY RECOMMENDATIONS FOR FOUNDATIONS AND GROUND PREPARATION FOR FOUNDATIONS AND SLABS

6.1 General Foundation Considerations

This report provides general comments on soil engineering properties for soils encountered at the site during the sub surface investigation, and the suitability of house constructions based on soil types encountered. Each building construction will require site specific recommendations by a geotechnical engineer.

Shallow foundation systems, such as strip and pad footings, should be an appropriate foundation method for the proposed single family residential buildings at this site.

6.2 Clay Soil and Rock Considerations

Highly swelling clay soils and bedrock were encountered during the subsurface investigation. General recommendations are provided in this report for structures supported by these materials; however, the geotechnical engineer of record for each residential building should provide specific recommendations in the event that these materials exist below the proposed structure.

6.3 Geotechnical Hazard Review

The scope of this report did not include a geotechnical hazard assessment of the site. The geotechnical engineer of record for each residential building should identify potential related geotechnical hazards specific to each subdivided lot during the design stage and may need to provide recommendations for safe building setbacks from identified hazards.

6.4 Preliminary Ground Preparation For Foundation Soils Below Footings and Slabs

The following general foundation soil preparation recommendations are provided for residential structures founded on concrete footings being supported by undisturbed, in situ granular soils, and engineered fill:

- a) Excavations for foundation soil preparation must conform to WorkSafe BC regulations and guidelines.
- b) All existing uncontrolled fill, soft and/or loose and/or frozen materials, or any other deleterious materials must be removed within the entire structure footprint, including below interior slab-on-grades, to expose the natural, sound, competent, undisturbed in situ granular soils and/or rock.
- c) The outside edge at the base of excavation should be located outside the building footprint by a horizontal distance that is at least equal to the vertical difference between the base of excavation and underside of the proposed foundations, or at least 1.0 m, whichever is greater.
- d) The geotechnical engineer of record will specify the minimum depth of excavation required below foundations and slabs; however, for preliminary purposes, the minimum depth should be at least 300 mm below the base of foundation where the in situ soils are compact to dense granular soils.
- e) At locations where a soil embankment must be constructed to support the proposed foundations, the extents of the base of excavation should be further widened to a horizontal distance defined by the point of intersection between an imaginary 2H:1V line, extending downward and away from a point located at least 2.0 m horizontally outside the building foundation, and the approved, undisturbed native soils.

- f) At locations where bedrock is encountered partially below the proposed structure, the bedrock should be removed to a depth of at least 300 mm below, and at least 500 mm horizontally outside, the base of foundation elevation/location.
- g) The geotechnical engineer should confirm that all unacceptable materials have been removed before proceeding beyond the excavation stage.
- h) The excavation should be replaced to the underside of foundation and slab elevations with clean (less than 7 percent passing the 0.075 mm diameter sieve), well-graded 75 mm(-) engineered sands and gravels that are moisture conditioned and compacted in 300 mm thick lifts to 100 percent of Standard Proctor Density in accordance with ASTM D-698, and in accordance with the recommendations provided by the geotechnical engineer.
- i) Site drainage recommendations, including surficial, foundation perimeter and roof, should be addressed by the geotechnical engineer of record for the residential building.

6.5 Preliminary Ground Preparation For Highly Plastic Swelling Clays Below Footings and Slabs

Foundation soil recommendations will differ where highly plastic swelling clay soils are encountered below footings and slabs. This minimum excavation depth may be significantly deeper where these soils are encountered and may require a full removal of the clay soils. The geotechnical engineer of record for each residential building should provide specific recommendations in the event that this material exists below the proposed structure.

6.6 Preliminary Ground Preparation For Bedrock Below Footings and Slabs

Foundation soil recommendations will differ where bedrock is fully encountered below footings and slabs, and will depend on local bedrock topography and formation, among other things. The geotechnical engineer of record for each residential building should provide specific recommendations in the event that bedrock exists below the proposed structure.

7.0 FROST PROTECTION

Adequate frost protection for structural foundations and non-heated slab-on-grades will require at least 900 mm of ground cover above foundations, at least 900 mm of non frost-susceptible soils below foundations or slabs, or a combination of the above. Frost protection should be provided at least 900 mm horizontally outside of structures.

8.0 PRELIMINARY RECOMMENDATIONS FOR SITE GRADING

A finished site grading plan was not available at the time of this report preparation; however, in discussion with The Client representative, it is understood that minimal changes to existing grades was proposed. The following general guidelines for site grading should be considered in the event that some earthworks occur at locations outside of structures.

Unless otherwise directed or approved by the geotechnical engineer, embankment construction gradients should not be steeper than 2.0H:1V and cut slopes should not be steeper than 2.0H:1V. Soil cut and fill slopes should be provided with erosion protection.

Embankment construction on existing slopes should be done in accordance with BC MoTI construction specifications, which states that the construction "...shall be terraced in a continuous series of steps a minimum of 1.5 m wide as the embankment rises".

If the above cut and fill slope recommendations are not feasible, over steepened slopes may require mechanical stabilization that may include soil retention structures. A qualified geotechnical engineer should be consulted for recommendations related to slope stability prior to any construction taken place.

At locations where rock is encountered, a qualified rock specialist professional should be consulted with respect to final cut slopes and safe building setbacks near rock cuts.

9.0 CONCLUSIONS AND RECOMMENDATIONS

It is concluded that, from a geotechnical point of view, the proposed constructions on the subject property are safe for their intended use, provided the recommendations made in this report are followed.

It is recommended that:

- a) The items contained in Sections 6.0 to 8.0, inclusive, of this report are followed.
- b) The geotechnical engineer inspect all soils and soils related construction on the project to assure that:
 - i) all soils conditions are as good or better than those inferred in this report, and that
 - ii) all soils and soils related construction conforms to this report, designs provided, and appropriate specifications for the work.

- c) Any design(s) or other work for soils or for soils related structures connected with this project and prepared by others be submitted to the geotechnical engineer for review regarding conformity to the project requirements and intent of this report.

We trust that the contents of this report are appropriate for your immediate needs. If you should have any questions please call our office at your convenience.

Yours truly,
Fletcher Paine Associates Ltd.

EGBC
PTP # 1001303



Robert M. Scherz, P.Eng.
Geotechnical Engineer



Ryan C. Stearns, P.Eng.
Review Engineer

STATEMENT OF QUALIFICATIONS AND GENERAL CONDITIONS

1. Standard of Care

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area. No other warranty, expressed or implied, is made.

2. Basis of the Report

This report has been prepared for the specific site, design objective, development and purpose that was described to Fletcher Paine Associates Ltd. (FPA) by the client and summarized in this letter. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the report are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to FPA, unless FPA was specifically requested by the Client to review and revise the report in light of such alteration or variation.

3. Uses of the Report

The information and opinions expressed in this report are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THIS REPORT OR ANY PORTION THEREOF WITHOUT FPA's EXPRESS WRITTEN CONSENT. FPA WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS APPROVED USERS. The ownership and copyright of this report remain the property of FPA, who authorizes only the Client and Approved Users to make copies of the report, and only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make available the report or any portion thereof, or any copy of the report or portion thereof, to any other party without the express written permission of FPA.

4. Complete Report

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to FPA by the Client, communications between FPA and the Client, and to any other reports prepared by FPA for the Client relative to the specific site described in the report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS, AND OPINIONS EXPRESSED IN THE REPORT, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. FPA CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

5. Interpretation of the Report

a) Nature and Exactness of Soil Description: Classification and identification of soils, rocks, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from these systems have been used they are specifically mentioned. Classification and identification of the type and condition of soils, rocks and geologic units are judgmental in nature. Accordingly, FPA cannot warrant or guarantee the exactness of the descriptions of in situ ground conditions set forth in the Report.

b) Logs of Test Holes, Pits, Trenches, etc.: The test hole logs are a record of information obtained from field observations and laboratory testing of selected samples as well as an interpretation of the likely subsurface stratigraphy at the test holes sites. In some instances normal sampling procedures do not recover a complete or any sample. Soil, rock or geologic zones have been interpreted from the available data. The change from one zone to another, indicated on the logs as a distinct line, may be transitional. The same limitations apply to test pit and other logs.

c) Stratigraphic and Geologic Sections: The stratigraphic and geologic sections indicated on drawings contained in this report are interpreted from logs of test holes, test pits or other available information. Stratigraphy is inferred only at the locations of the test holes or pits to the extent indicated by items 5. a) and b) above. The actual geology and stratigraphy, particularly between these locations, may vary considerably from that shown on the drawings. Since natural variations in geologic conditions are inherent and a function of the historic site environment, FPA does not represent or warrant that the conditions illustrated are exact and the user of the report should recognize that variations may exist.

d) Groundwater Conditions: Groundwater conditions shown on logs of test holes and test pits, and/or given within the text of this report, record the observed conditions at the time of their measurement. Groundwater conditions may vary between test hole and test pit locations and can be affected by annual, seasonal, and special meteorological conditions, or by tidal conditions for sites near the seas. Groundwater conditions can also be altered by construction activity. These types of variation need to be considered in design and construction.

e) Changes of Exposed Ground: Many geologic materials deteriorate rapidly upon exposure to climatic elements. Deterioration may be caused by precipitation, sunshine and/or the action of frost. Therefore, site conditions may vary

considerably from the time of the making of the tests performed for preparation of the report and the time of actual construction.

f) **Influence of Construction Activity:** Construction activities can alter and damage the in situ ground conditions. The influence of all anticipated construction activities on the geologic environment should be considered in formulating and implementing the final design and construction techniques.

Wherever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, the client and any other users of this report should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

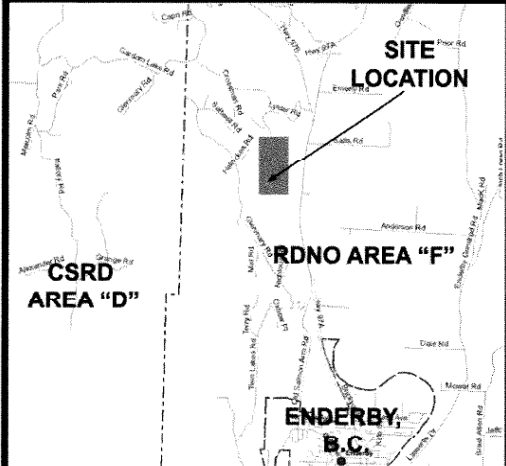
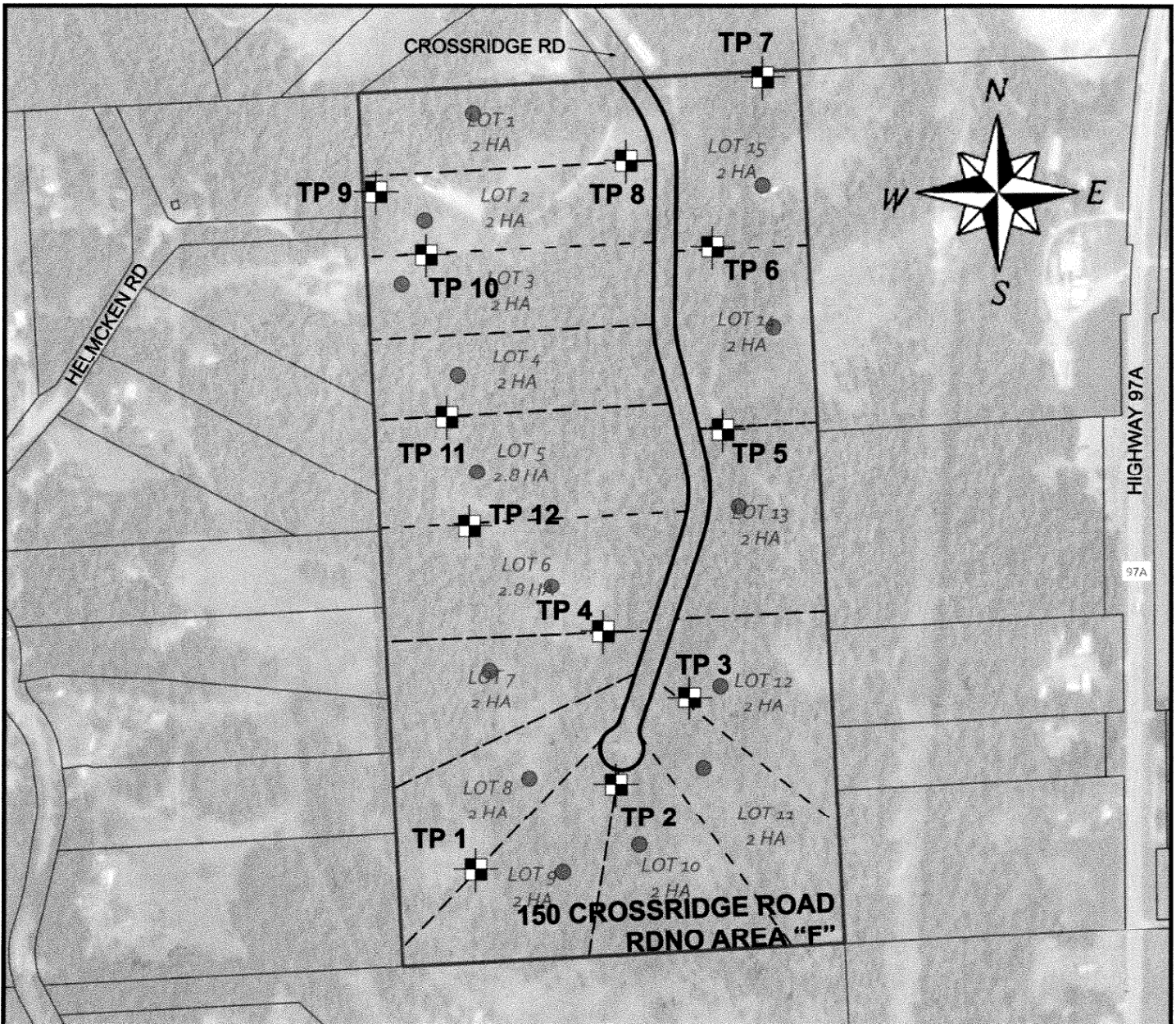
6. **Observations during Construction**

Observations of geologic conditions should be carried out during the site preparation, excavation and construction to verify the conditions predicted by the report. Such observations should be communicated to FPA to allow for confirmation and/or alteration of the geotechnical recommendations or design guidelines presented in the report.

Whenever changes in the site occur after the preparation of the report or conditions are observed which indicate results clearly incompatible with the test results on which the report is based, then the client should notify FPA as soon as possible so that FPA will be able to provide necessary revisions to its report prior to any commencement of or alteration in design and construction.

7. **Samples**

FPA normally disposes of all unused soil and rock samples after 90 days of completing the testing program for which the samples were obtained. Further storage or transfer of samples can be made at the owner's expense upon written request.



Base Plan Provided By: McElhanney Ltd. and RDNO Map Viewer

Test Pit Location Plan

Figure: 6865-1

Date: 07-Nov-2022

Scale: nts

Record of Exploration - Test Pit No. 1

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road


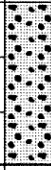
Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						•	20	40		60	80
0		Ground Surface									
		TOPSOIL									
		SAND gravelly, some silt, occasional cobbles, compact to dense, brown, dry to damp	1	G		•					
1		BEDROCK End of test pit at 0.8 m due to excavator refusal on bedrock. No groundwater seepage observed.									
2											
3											
4											

Fletcher Paine Associates Ltd.

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Vernon, B.C. V1T 7X8

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This Record of Exploration forms a part of the report referenced by the above Fletcher Paine Associates Ltd. project number. It should not be read or interpreted on a stand-alone basis and dissemination of the information is limited as outlined in the referenced report.

Record of Exploration - Test Pit No. 2

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road

Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE		SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)				
						20	40		60	80
		Ground Surface								
0	[Symbol]	TOPSOIL							Standpipe Data November 14, 2022 Dry	
		CLAY highly plastic, hard, brown/grey, dry to wet								
			1	G	>450	●	23			
1										
			2	G	>450	●	38			
2										
3										
		End of test pit at 3.7 m.								
4										

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Record of Exploration - Test Pit No. 3

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road


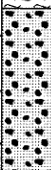


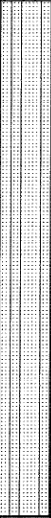
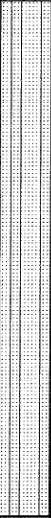
Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE		SAMPLE		TESTING		Standpipe Data	
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed		Moisture Content (%)
							• 20 40 60 80 •
0		Ground Surface					
		TOPSOIL					
		SAND gravelly, some silt, compact to dense, brown, damp	1	G		• ⁸	
		CLAY highly plastic, hard, brown/grey, dry to wet					
			2	G	>450	• ²⁶	
		SILT AND SAND some gravel, occasional cobbles, compact to dense, brown, damp					
			3	G		• ¹²	
4		End of test pit at 3.7 m. No groundwater seepage observed.					

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Record of Exploration - Test Pit No. 4

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road


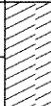
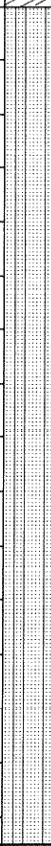
Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						•	20	40		60	80
0		Ground Surface									
		TOPSOIL									
		CLAY highly plastic, hard, brown/grey, dry to moist									
		SILT AND SAND some gravel, occasional cobbles, compact to dense, brown, damp									
1			1	G		• ¹¹					
2											
3			2	G		• ⁹					
4		End of test pit at 3.7 m. No groundwater seepage observed.									

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Record of Exploration - Test Pit No. 5

Project No: 6865

Project: Residential Subdivision - 150 Crossridge Road

Client: Land First Development


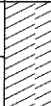
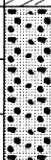
Project Location: RDNO Area "F"

Test Pit Location: See Figure 6865-1

Excavation Contractor: Land First Development

Excavation Date: November 4, 2022

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data	
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)				
						20	40	60		80
Ground Surface										
0		TOPSOIL								
		CLAY highly plastic, hard, brown/grey, dry to moist								
1		SAND gravelly, some silt, occasional cobbles, compact to dense, brown, damp	1	G		8				
2		BEDROCK End of test pit at 1.2 m due to excavator refusal on bedrock. No groundwater seepage observed.								
3										
4										

Fletcher Paine Associates Ltd.

2250 - 11th Avenue

Vernon, B.C. V1T 7X8

Ph. (250) 542-0377 Fax. (250) 542-1220

Email: fletcherpaine@shawlink.ca

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Record of Exploration - Test Pit No. 6

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road


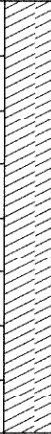
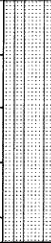
Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE		SAMPLE		TESTING				Standpipe Data			
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						●	20		40	60	80
Ground Surface											
0		TOPSOIL									
		CLAY highly plastic, hard, brown/grey, dry to moist									
1			1	G	>450	● ³²					
2		SILT AND SAND some gravel, compact to dense, brown, damp									
			2	G		● ¹⁶					
3		End of test pit at 2.7 m due to excavator reach.									
4											

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Record of Exploration - Test Pit No. 7

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road


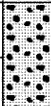

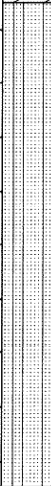
Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE		SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)				
						20	40		60	80
Ground Surface										
0		TOPSOIL								
		SAND gravelly, some silt, compact to dense, brown, damp								
		CLAY highly plastic, hard, brown/grey, dry to moist								
1		SILT AND SAND trace gravel, occasional cobbles, boulder inclusions, dense, brown, dry to damp	1	G	6					
2			2	G	7					
3		End of test pit at 2.7 m due to excavator refusal on boulder or possible bedrock. No groundwater seepage observed.								
4										

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Record of Exploration - Test Pit No. 8

Project No: 6865

Project: Residential Subdivision - 150 Crossridge Road

Client: Land First Development


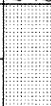
Project Location: RDNO Area "F"

Test Pit Location: See Figure 6865-1

Excavation Contractor: Land First Development

Excavation Date: November 4, 2022

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						•	20	40		60	80
0		Ground Surface									
		TOPSOIL									
		RIPPABLE ROCK sand, some gravel, some silt, occasional cobbles, dense, brown, dry to damp									
1		BEDROCK End of test pit at 0.6 m due to excavator refusal on bedrock. No groundwater seepage observed.									
2											
3											
4											

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Record of Exploration - Test Pit No. 9

Project No: 6865

Project: Residential Subdivision - 150 Crossridge Road

Client: Land First Development

Project Location: RDNO Area "F"

Test Pit Location: See Figure 6865-1

Excavation Contractor: Land First Development

Excavation Date: November 4, 2022

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						●	20	40		60	80
Ground Surface											
0	[Symbol]	FILL sand, silty, loose, brown, dry to damp									Standpipe Data November 14, 2022 Dry
		TOPSOIL									
1		SAND silty, loose to compact, brown, dry to damp									
2			1	G		●					
3		CLAY highly plastic, hard, brown/grey, dry to moist									
4			2	G			●				
4		End of test pit at 3.7 m.									

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Record of Exploration - Test Pit No. 10

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road

Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data		
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)					
						•	20	40		60	80
0		Ground Surface									
		TOPSOIL									
		RIPPABLE ROCK sand, some gravel, some silt, occasional cobbles, dense, brown, damp									
1		BEDROCK End of test pit at 0.3 m due to excavator refusal on bedrock. No groundwater seepage observed.									
2											
3											
4											

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Record of Exploration - Test Pit No. 11

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road




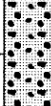

Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE		SAMPLE		TESTING				Standpipe Data				
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)						
						●	20		40	60	80	●
Ground Surface												
0		TOPSOIL										Standpipe Data November 14, 2022 Dry
		SAND gravelly, some silt, compact, brown, damp										
		CLAY highly plastic, hard, brown/grey, dry to moist										
1		SAND gravelly, trace silt, compact, brown, damp										
		RIPPABLE ROCK sand, some gravel, some silt, occasional cobbles, dense, brown, dry to damp	1	G		● ⁴						
2		BEDROCK End of test pit at 1.8 m due to excavator refusal on bedrock.										
3												
4												

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Record of Exploration - Test Pit No. 12

Project No: 6865

Test Pit Location: See Figure 6865-1

Project: Residential Subdivision - 150 Crossridge Road





Excavation Contractor: Land First Development

Client: Land First Development

Excavation Date: November 4, 2022

Project Location: RDNO Area "F"

Excavation Method: Metal-tracked excavator

SUBSURFACE PROFILE			SAMPLE		TESTING				Standpipe Data	
Depth (m)	Symbol	Description	Number	Sample Type	qu (kPa), p.p. disturbed	Moisture Content (%)				
						20	40	60		80
0		Ground Surface								
		TOPSOIL								
		RIPPABLE ROCK sand, some gravel, some silt, occasional cobbles, dense, brown, damp								
		BEDROCK End of test pit at 0.3 m due to excavator refusal on bedrock. No groundwater seepage observed.								
1										
2										
3										
4										

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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Residential Subdivision - 150 Crossridge Road

Project No: 6865

Client: Land First Development

Sample Date: 04-Nov-2022

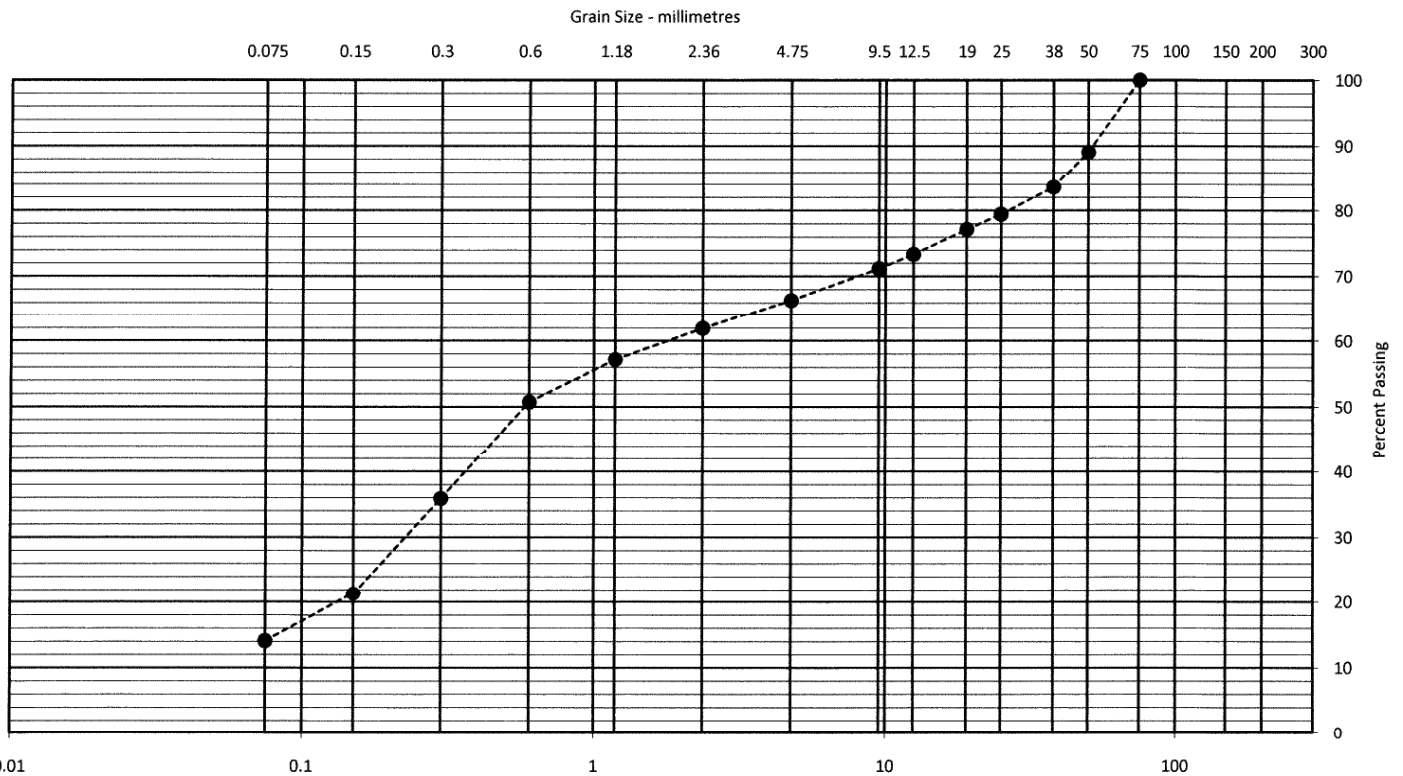
Location: RDNO Area "F"

Sampled By: RMS

Material: Sand, gravelly, some silt

Sample: Test Pit 3, Sample 1, Depth 0.6 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
300		12.5	73.4
200		9.5	71.2
150		4.75	66.4
100		2.36	61.9
75	100	1.18	57.2
50	89.1	0.6	50.7
38	83.6	0.3	35.9
25	79.5	0.15	21.4
19	77.1	0.075	14.0



Reporting of this test result constitutes testing services only. Engineering interpretation or evaluation of the test result is provided only upon written request. Data presented in this report is for the exclusive use of the Client listed above. F.P.A. will not take any responsibility for any unauthorized use.



GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Residential Subdivision - 150 Crossridge Road

Project No: 6865

Client: Land First Development

Sample Date: 04-Nov-2022

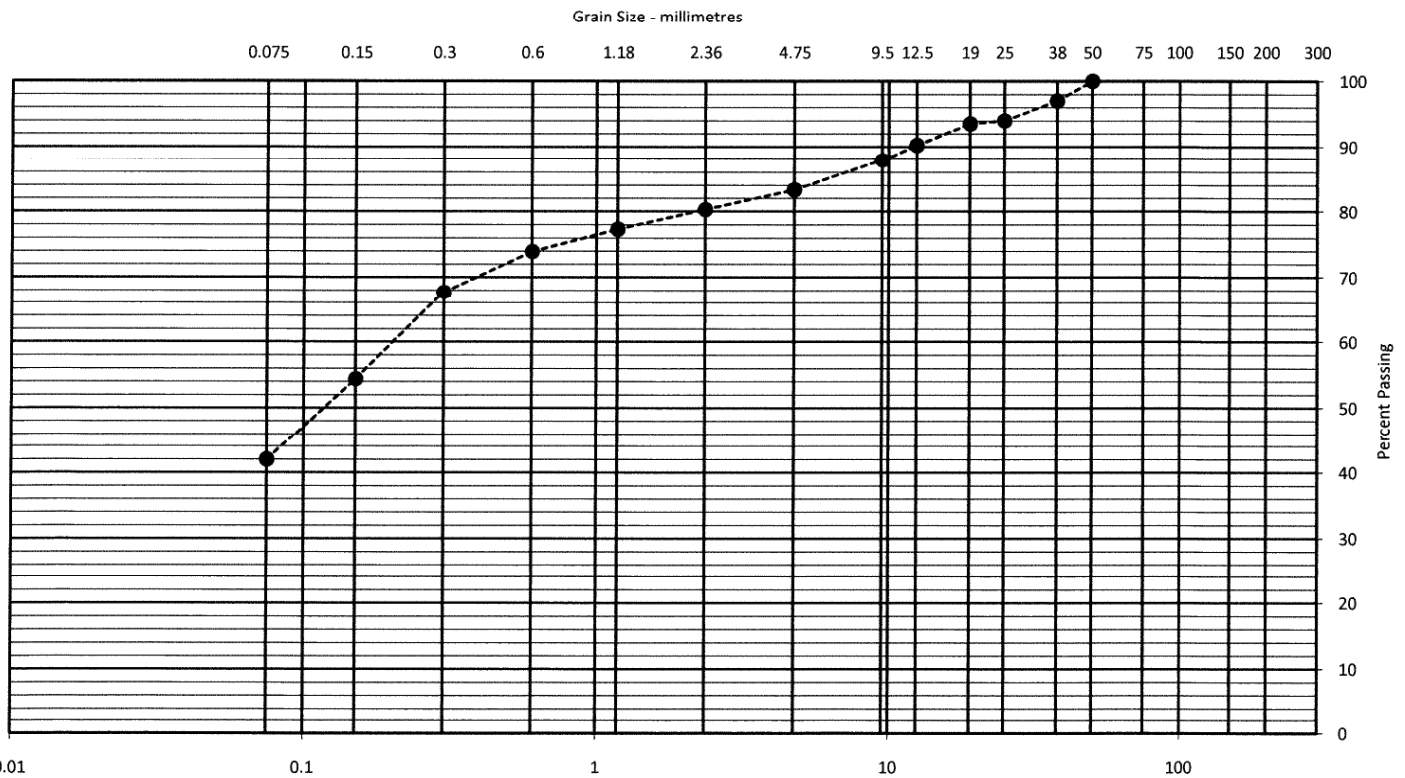
Location: RDNO Area "F"

Sampled By: RMS

Material: Silt and Sand, some gravel

Sample: Test Pit 6, Sample 2, Depth 2.5 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
300		12.5	90.3
200		9.5	87.9
150		4.75	83.3
100		2.36	80.3
75		1.18	77.3
50	100	0.6	74.0
38	97.0	0.3	67.7
25	94.0	0.15	54.4
19	93.5	0.075	42.0



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Residential Subdivision - 150 Crossridge Road

Project No: 6865

Client: Land First Development

Sample Date: 04-Nov-2022

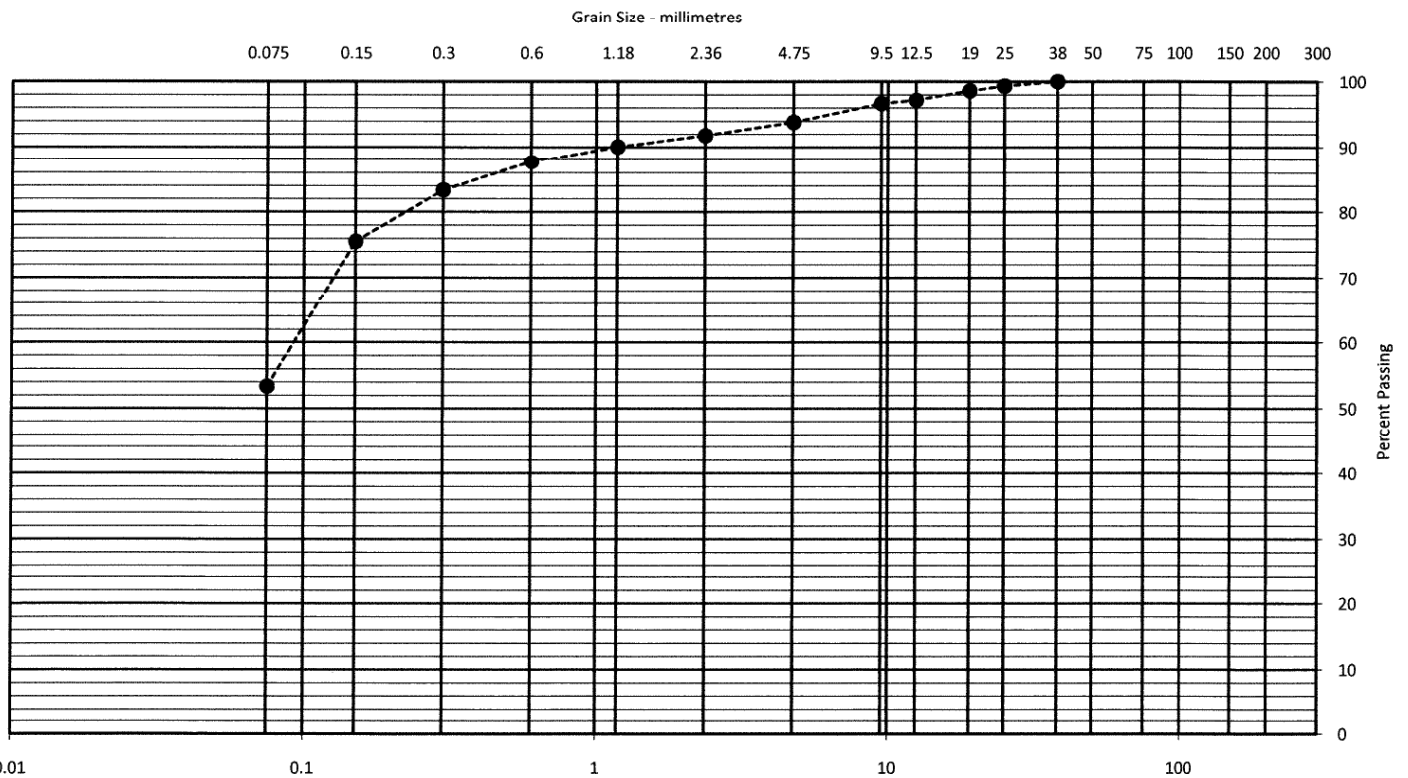
Location: RDNO Area "F"

Sampled By: RMS

Material: Silt and Sand, trace gravel

Sample: Test Pit 7, Sample 1, Depth 1.2 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
300		12.5	97.2
200		9.5	96.7
150		4.75	93.8
100		2.36	91.8
75		1.18	90.1
50		0.6	87.7
38	100	0.3	83.3
25	99.3	0.15	75.5
19	98.6	0.075	53.4



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Residential Subdivision - 150 Crossridge Road

Project No: 6865

Client: Land First Development

Sample Date: 04-Nov-2022

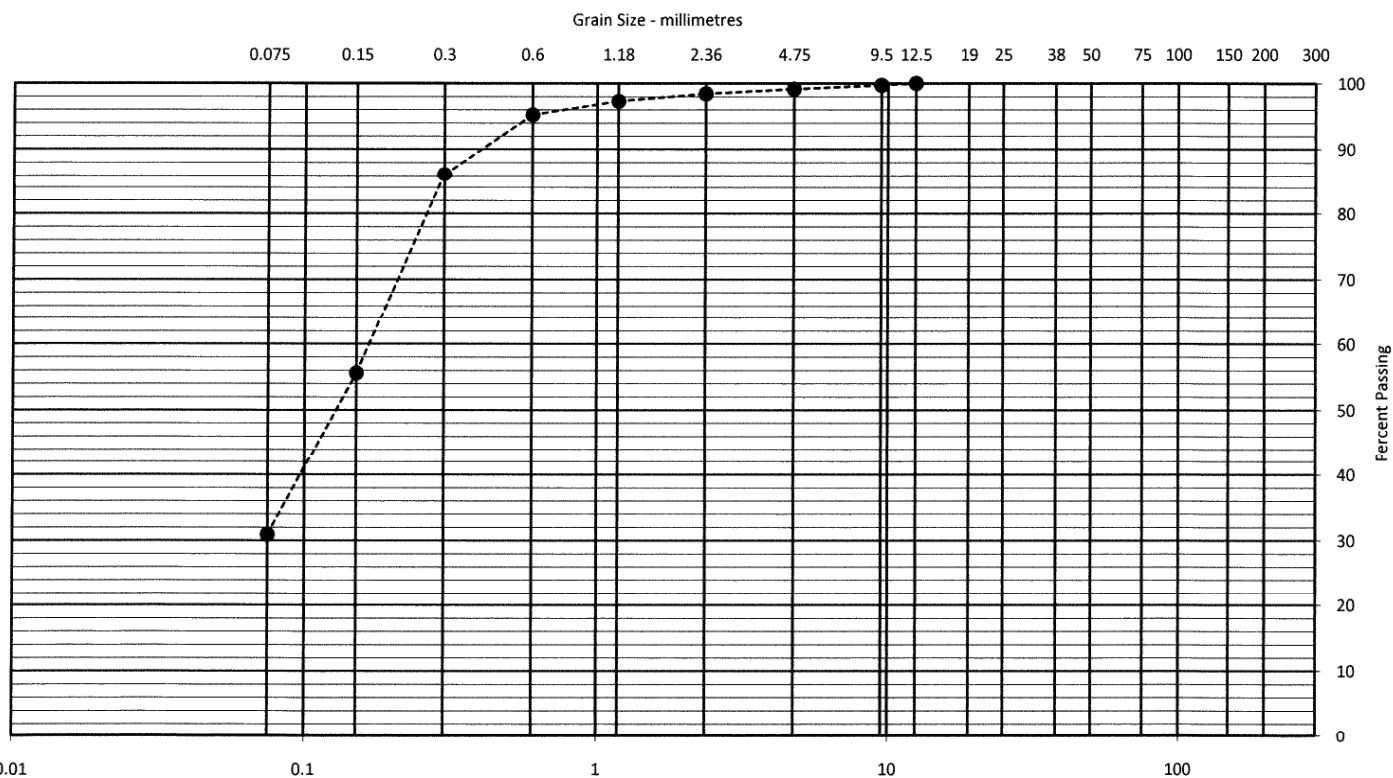
Location: RDNO Area "F"

Sampled By: RMS

Material: Sand, silty

Sample: Test Pit 9, Sample 1, Depth 1.8 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
300		12.5	100
200		9.5	99.7
150		4.75	99.1
100		2.36	98.4
75		1.18	97.3
50		0.6	95.2
38		0.3	86.1
25		0.15	55.6
19		0.075	30.9



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GRAIN SIZE DISTRIBUTION

ASTM C136, C117

Project: Residential Subdivision - 150 Crossridge Road

Project No: 6865

Client: Land First Development

Sample Date: 04-Nov-2022

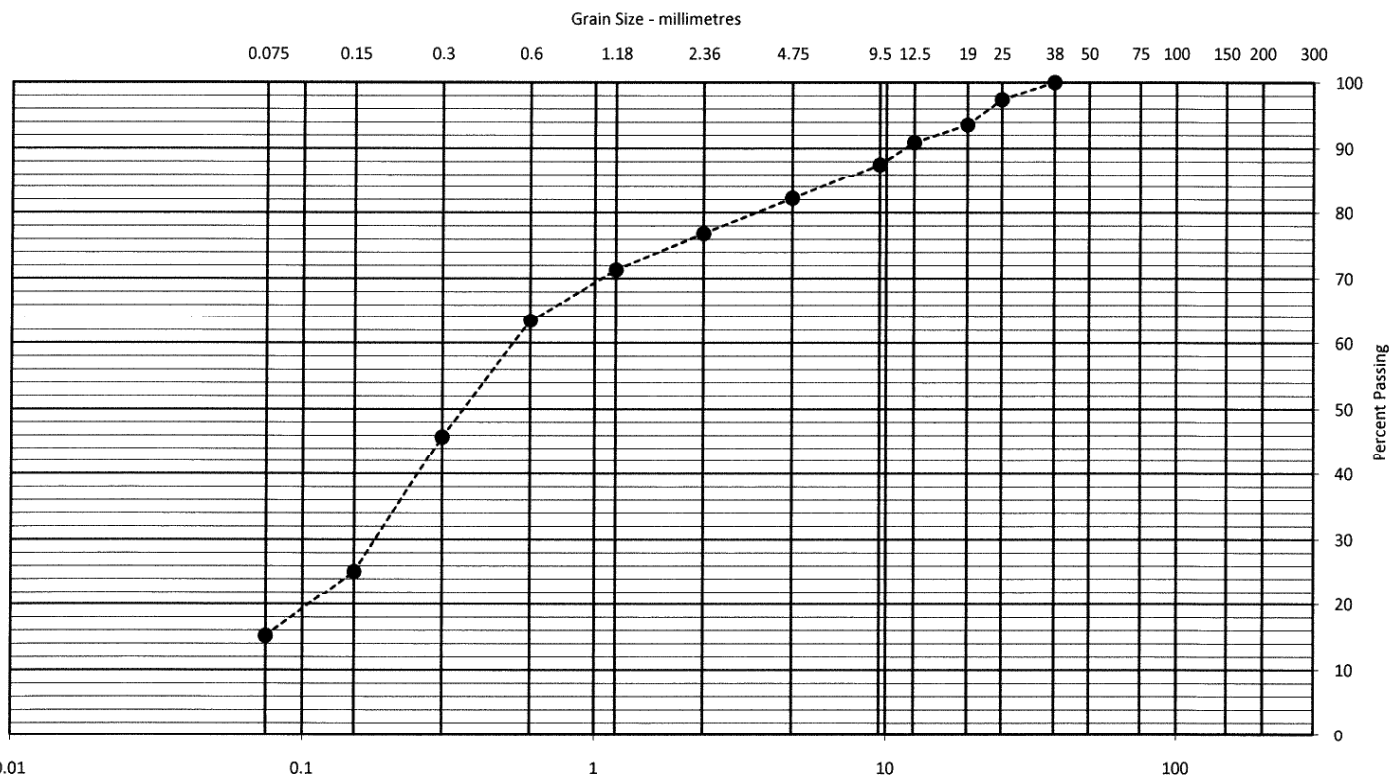
Location: RDNO Area "F"

Sampled By: RMS

Material: Sand, some gravel, some silt

Sample: Test Pit 11, Sample 1, Depth 1.2 m

Wash Analysis			
Sieve (mm)	% Passing	Sieve (mm)	% Passing
300		12.5	90.9
200		9.5	87.5
150		4.75	82.2
100		2.36	76.9
75		1.18	71.3
50		0.6	63.5
38	100	0.3	45.7
25	97.4	0.15	25.1
19	93.6	0.075	15.2



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ATTERBERG LIQUID LIMIT AND PLASTIC LIMIT DETERMINATION

ASTM D 4318

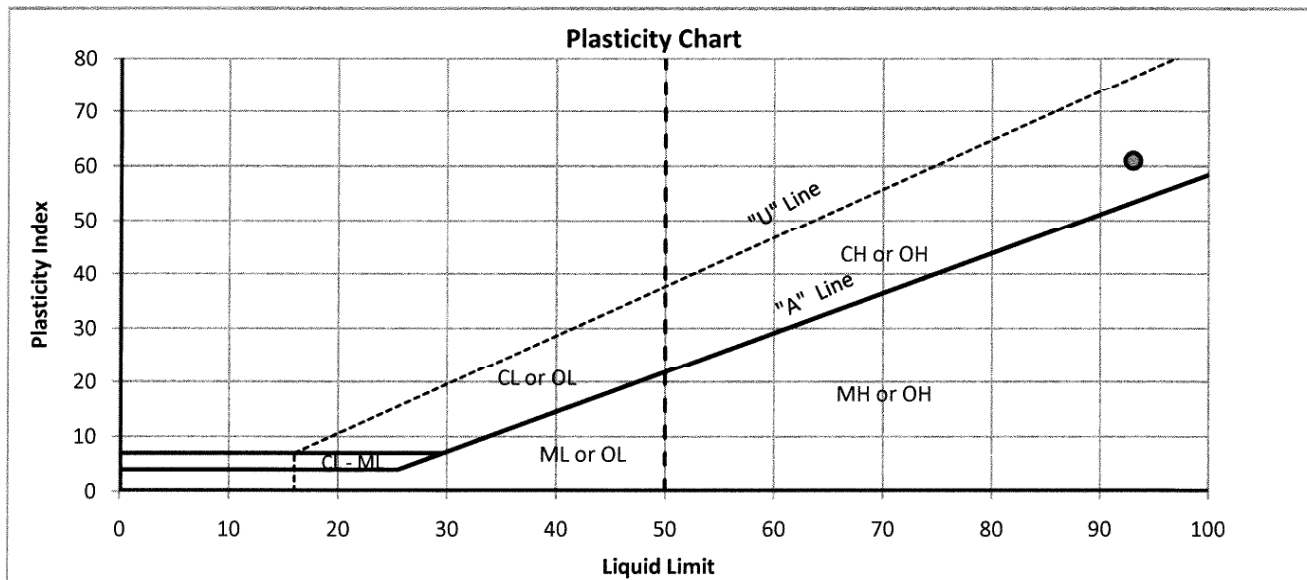
Project:	Residential Subdivision - 150 Crossridge Road	Project No:	6865
Client:	Land First Development	Sample Date:	04-Nov-2022
Location:	RDNO Area "F"	Sampled By:	RMS
Sample:	Test Pit 2, Sample 2, Depth 2.4 m		

Sample Preparation: Wet preparation method

Test Equipment: Liquid Limit - mechanical device, multi-point method, plastic grooving tool
 Plastic Limit - hand rolled

Natural Moisture Content: 38%
Estimated % retained on 0.425 mm sieve: 0%

Liquid Limit: 93
Plastic Limit: 32
Plasticity Index: 61
USCS Classification: CH Inorganic clays of high plasticity



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TERMS OF ENGAGEMENT

1. General

Fletcher Paine Associates Ltd. (FPA) shall render its services to the Client for this project with that degree of care, skill and diligence normally provided in the performance of services for projects of a similar nature to that contemplated.

In rendering services to the Client, FPA may, at its discretion and at any stage, engage subconsultants to FPA to carry out its duties and responsibilities as set forth.

2. Compensation

Charges for the services rendered will be made in accordance with our Schedule of Fees in effect at the time the work is performed. All charges will be made in, and will be payable in, Canadian Dollars. Invoices will be due and payable on receipt without holdback. A monthly service charge will be applicable to invoices remaining unpaid after 30 days.

3. Notices

FPA will designate a project manager who shall be responsible for the project. The Client shall designate an authorized representative to act with respect to the project.

4. Termination

Either party may terminate this engagement with cause upon seven (7) days notice in writing. The Client shall forthwith pay for all services performed, including all expenses and other charges payable that are associated with obligations incurred by FPA for this project.

5. Environment and Pollution

The FPA field investigation, laboratory testing and engineering recommendations are not intended to address or evaluate pollution of soil or pollution of groundwater. When practical, FPA will cooperate with the Client's environmental consultant during the field work phase of the investigation.

6. Professional Responsibility

FPA will provide the standards of care, skill and diligence normally provided by a Professional Engineer in the performance of engineering services as contemplated for this project.

7. Limitations of Liability

FPA shall not be responsible for:

- a) The failure of a Contractor to perform work in accordance with the relevant contract documents for the Project;
- b) The design of, or defects in, equipment provided by or on behalf of the Client by others, for incorporation into the Project;
- c) Any damage to subsurface structures or utilities; resulting from subsurface investigations for the Project;
- d) Any cross-contamination of ground or groundwater resulting from subsurface investigations for the Project;
- e) Any costs incurred for stopping the flow of artesian water from test holes in the event that such conditions are encountered during any field investigation for the Project;
- f) Any decisions made by the Client in relation to the Project that are inconsistent with, or contrary to, the advice provided by FPA;
- g) Any consequential loss, injury, or damages suffered by the Client, including but not limited to loss of use, loss of earnings, or business interruption;
- h) The distribution of any document or report prepared for the Client by or on behalf of FPA for the Project without express authorization by FPA.

Notwithstanding anything to the contrary, the aggregate liability of FPA, including liability for professional negligence and fundamental breach of contract, shall be limited to the amount of Professional Liability insurance carried by FPA.

The Client's failure to accept the professional recommendations and advice of FPA with respect to the geotechnical conditions at the Project shall relieve FPA of and from any and all legal liability, whether in contract or in tort, to the Client for all manner of loss and damage accruing to the Client, including consequential loss and damage, which may arise out of the FPA services.

8. Personal Liability

The Client agrees that FPA's principals and employees have no personal liability to the Client in respect of a claim whether in contract, tort, and/or any other cause of action in law, and expressly agrees that it will bring no proceedings and take no action in any court of law against any of FPA's principals or employees in their personal capacities.

9. Third Party Liability

This report was prepared by FPA for the Client and the material presented in it reflects the opinions and judgements of FPA as based upon the information available at the time of its preparation. Any use(s) made of this report by a third party is/are the sole responsibility of such third parties. FPA will not accept any responsibility for damages suffered by any third party as a result of decisions made or actions taken that are ostensibly based upon this report. Any use or reliance upon this report by a third party must be authorized in writing by FPA.

10. Documents

All of the Documents prepared by FPA in connection with the Project are instruments of service for the execution of the Work. FPA retains the property and copyright in those Documents, whether the Project is executed or not. These Documents may not be used on any other project without prior written agreement and remuneration.

11. Field Services

Where applicable, the field services recommended are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with the intent of our recommendations. Any reduction from the level of services recommended will result in FPA providing qualified opinions regarding the adequacy of the work.

12. Confirmation of Professional Liability Insurance

As required by the Association of Professional Engineers and Geoscientists of British Columbia, it is required that our firm advise whether or not Professional Liability Insurance is held. It is also required that a space for you to acknowledge this information is provided. Accordingly, this notice serves to advise you that FPA carries professional liability insurance. If you wish to acknowledge receipt of this information please sign and return a copy of this form.



WILDLIFE HAZARD ASSESSMENT

150 CROSSRIDGE ROAD

STEVE GIESBRECHT, RPF

LANDMARK SOLUTIONS LTD.

5350 46th Ave SE

Salmon Arm, BC – V1E 4N2

Ph: 250.804.0332



INTRODUCTION

As requested by Mark Lewis of Land First Development, Landmark Solutions Ltd. (Landmark) has completed a Wildfire Hazard Assessment for the property at 150 Crossridge Road (PID 013-905-244). The assessment is to be used as part of a Wildfire Hazard Development Permit submission for the property.

The assessment focused on the existing wildfire risk of the property and proposed subdivision and provides recommendations to minimize the risk of wildfire hazard while considering other ecological values in the area.

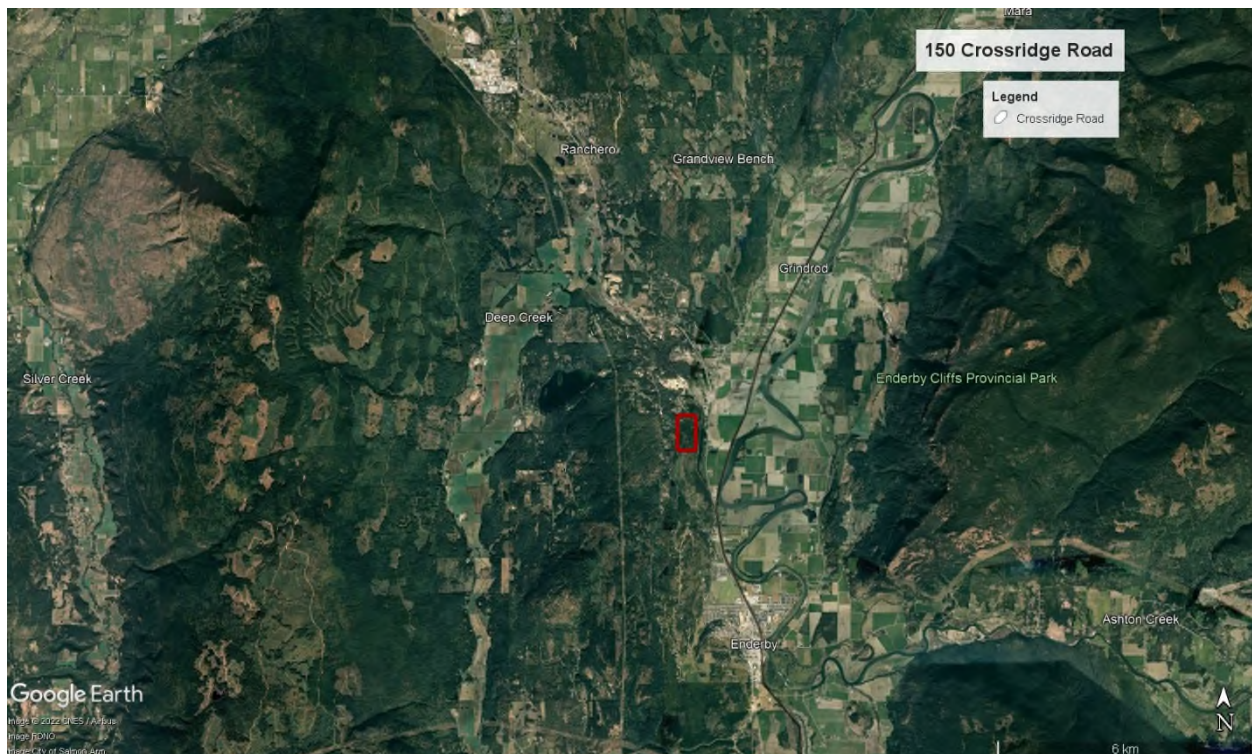
Known elements at risk on the property include

- An storage outbuilding with a RV trailer in it currently being used as a residence,
- Various other outbuildings,
- Timber.

It is assumed that if a subdivision is granted there will be additional residential and outbuildings structures constructed on the property.

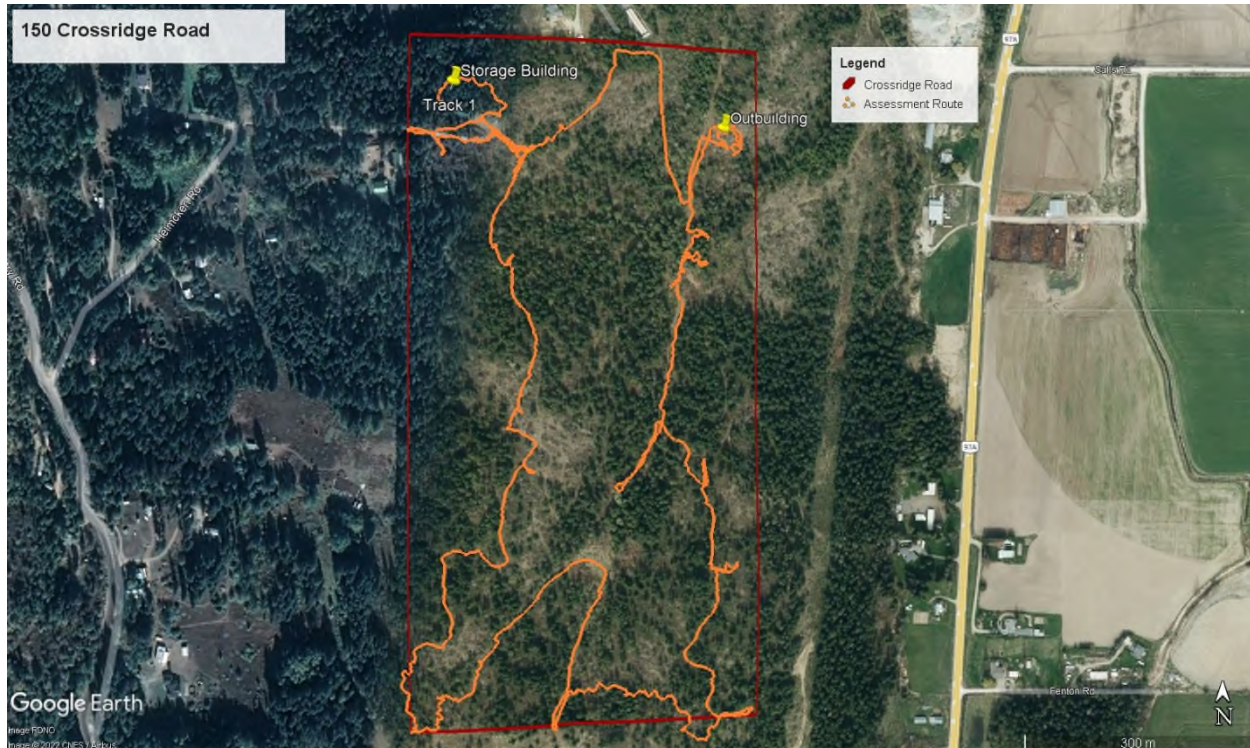
SITE DESCRIPTION

The property is located ~5 kilometers north of Enderby. It is bound by adjacent private land in all directions. Highway 97A is ~300m east of the property along the entire eastern (downslope) boundary.



Access to the property is excellent via Crossridge Road to the north or Helmken Road (via Glenmary Road) to the west. There are additional access points from the private land parcel to the south and from the powerline right of way to the east. Once on the property, there are various roads and trails throughout the property.

The existing title is ~33ha with the tentative subdivision plan to subdivide into a 15 2-3ha polygons that would be accessed from a central road location accessed via Crossridge Road. Currently, the improvements on the property are located on the northernmost lots Lot1 and 2 (large storage building with residential RV) and Lot 15 (Wood Outbuilding).



CLIMATE

The property is located in the traditional Interior Douglas Fir moist warm (IDFmw1) variant biogeoclimatic ecosystem classification (BEC) subzone. According to the Land Management Handbook 23, the IDFmw1 variant occurs at low elevations of the Okanagan Highlands. The IDF zone is characterized by a warm, dry climatic regime and with a relatively long growing seasons in which moisture deficits are common, particularly on south aspects. The IDFmw1 is warmer, has a longer growing season and is slightly drier than the IDFmw2. It receives about 54 cm of precipitation annually. Snow packs rarely exceed 35-50 cm on south aspects and 50-75 cm on north aspects. Growing season moisture deficits are common, particularly on south aspects.

VEGETATION

The majority of the property has trees growing on it. The timber is dominated by Douglas fir throughout the property with Western Red Cedar in lesser amounts on moisture receiving sites. There are also minor amounts of birch, pine and larch dispersed throughout.

The stand density varies from tight, closed canopy area with very little understory to relatively open grown areas that have been harvested previously. Many of the trees have branches that extend all the way to the ground. The understory is intermittent and consists of younger conifers and alder with minor amounts of Oregon grape, falsebox and snowberry. There is a stream present on the west side of the property but it dissipates into the ground and is not obvious on the downslope east side of the property.

Within the IDFW1, fire history and human disturbance have led to the widespread development of successional stands dominated by Douglas Fir (Fd), Lodgepole Pine (Pl), Larch (Lw), Birch (Ep) and Aspen (At). Cedar (Cw) occurs in variable amounts on mesic and wetter sites. On drier sites Cw is absent or restricted to the lower canopy and shrub layers. Ponderosa Pine (Py) occasionally occurs on dry ridge crests and steep south aspects. Dry south slopes are typically dominated by open Fd stands. Climax stands are rare and most stands have been selectively logged once or twice. In the IDFW1 wildfires are complete stand destroying events, although the presence of a few large diameter Fd trees in many successional stands is a testament to its fire resistance. A large proportion of the IDFW1 landscape is dominated by stands that range in age from 60-120 years suggesting a fire return interval of similar frequency. Stand maintaining underburns may occur on drier site series with more open stand structures.

TOPOGRAPHY

The property has relatively gentle slopes less than 30%. There are some isolated steeper pitches where the slope increases to ~50% but these areas are relatively localized.

ADJACENT LAND

The adjacent private land is relatively similar to the subject property. Immediately adjacent to the subject property, there are 2 parcels to the north, 5 parcels to the east, 1 parcel to the south and 9 parcels bordering the western property line. All properties are a mix of coniferous forest and cleared land.

The properties to the east are of most significant concern. These properties are adjacent to Hwy 97A, relatively steep and are currently mostly forested. Any fire activity associated with the highway could be expected to quickly move through these parcels towards the subject property.

The nearby crown land is Wildland Urban Interface (WUI) risk Class 1 which is relatively high risk.

The Provincial Strategic Threat Analysis (PSTA), which is the quantification of wildfire threat components at the provincial scale — including “likelihood” (of fire occurrence) and “severity” (weather conditions and fuel type) is generally class 7-8 (high) with areas of 9-10 (extreme) in the general vicinity.

It can be assumed that any fire classification on the adjacent crown land would be applicable to the subject property.

HAZARDS AND RECOMMENDATIONS

The property was field reviewed on November 17th 2022. Several potential hazards were identified. For each hazard there are recommendations which should be considered mandatory actions.

Hazard:

- The current residence and outbuildings are located in relatively close proximity to coniferous vegetation and other combustible materials. These buildings are a mix of combustible and non-combustible materials.

Recommendations:

- Vegetation within 1.5m of the residence is to be removed. Do not plant or cultivate vegetation within 1.5m of any new buildings.
- Ensure woodpiles and other combustible material is stored >10m from residence.
- Mature coniferous trees within 30m of residence to be pruned such that branches are >3m from the ground.
- Immature coniferous trees within 10m of residence to be removed.
- Immature coniferous trees 10m-30m from residence should be spaced 3 crown widths and pruned to the greater of 3m or 40% of their live crown.
- Juniper, if present within 10m of residence to be removed.



The area adjacent to the structure is mostly cleared with only a few mature trees nearby.



Conifers close to the residence.

Hazard:

- The outbuilding is located in relatively close proximity to coniferous vegetation and other combustible materials. These buildings are a mix of combustible and non-combustible materials.

Recommendations:

- Do not stack wood against the building. Ensure woodpiles and other combustible material is stored >10m from residence.
- Prune the ponderosa pine tree such that there are no branches below 3m. Mature coniferous trees within 30m of the building to be pruned such that branches are >3m from the ground.
- Vegetation within 1.5m of the residence is to be removed. Do not plant or cultivate vegetation within 1.5m of any new buildings.
- Immature coniferous trees within 10m of residence to be removed.
- Immature coniferous trees 10m-30m from residence should be spaced 3 crown widths and pruned to the greater of 3m or 40% of their live crown.
- Juniper, if present within 10m of residence to be removed.



Firewood stacked against the building.



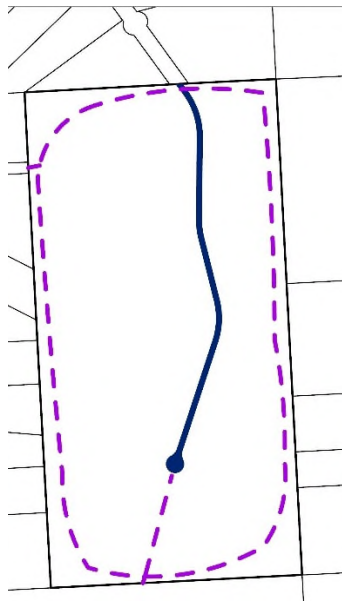
Ponderosa Pine tree to be pruned.

Hazard:

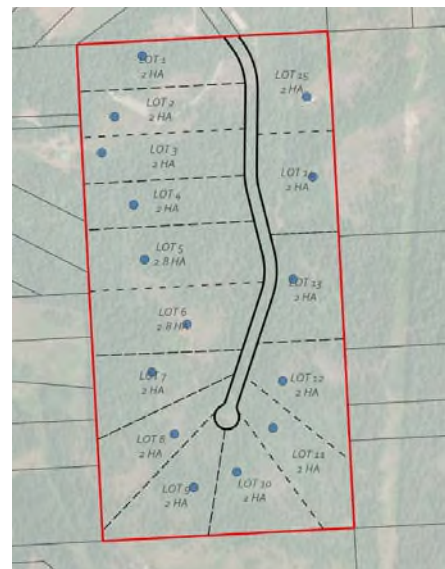
- The property is in close proximity to multiple roads. This can be beneficial as resources are able to quickly access the property in the event of a fire however, there is also an increased risk of a human caused fire due to the amount of activity associated with the roads. Highway 97A is of most concern due to the amount of activity on that road and the fact that it is directly downslope of the property.

Recommendations:

- Maintain the proposed secondary emergency circulation route so that this route is accessible for potential firefighting activities. Future sub-divided properties must not block this route. Any fences that intercept this route must be gated so that emergency vehicles can pass through.
- The combination of the secondary emergency circulation route and the main access road will provide access/egress and act as fireguards.
- Minimize vegetation within 5m of the access road and secondary emergency circulation route.
- Trees within 5m of the access route secondary emergency circulation route must be pruned to 3m. Vegetation underneath the drip line of these trees that could potentially act as a ladder fuel must be cleared. The intent is to reduce the amount of combustible material immediately adjacent to the trail so that it is a more effective fire guard.



Secondary emergency circulation route displayed as purple dashed line.



Proposed sub-division plan

Hazard:

- There are several debris pile on the property from previous harvesting. These piles are an accumulation of fuel that should be managed.

Recommendations:

- Dispose of debris pile as soon as practicable.



Debris pile to be disposed



Debris pile to be disposed

Hazard:

- Portions of the property are relatively consistent conifer-dominant forest. There is a thick understory of conifers that would potentially act as a ladder fuel if a ground fire were to occur on the property. Due to the density of the stand, the amount of understory coniferous regeneration and the fact that many of the mature trees have relatively low branches, these stands have a fairly continuous horizontal and vertical fuel complexity.

Recommendations:

- N / A

Suggestions:

- When clearing trees for subdivision and building sites, ensure sufficient combustible material is cleared such that future residential infrastructure will be consistent with current FireSmart recommendations.
- Consider additional tree removal throughout the property targeting an average of at least 1 crown width spacing between the crowns of the trees that are retained.
- Pile and burn deadfall material.
- Limb blowdown such that it will lay flat on the ground.
- Prune retained conifers up to 3m.
- Reduce conifer density of the understory and overstory of the forest such that if a fire approaches it will drop from a crown fire to a ground fire.



Typical forest.



Cedar with branches to the ground.

GENERAL RECOMMENDATIONS

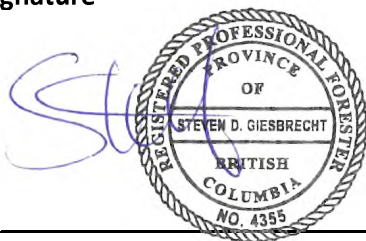
The following recommendations should be followed to reduce the current and long term fire hazard for the property **and any future sub-divisions**:

- **Review and understand BC FireSmart resources. (<https://firesmartbc.ca/>). Follow all current BC FireSmart recommendations for homeowners. Refer to current FireSmart guidelines and the FireSmart Home Ignition Zone Assessment Scorecard.**
- Maintain existing access/egress routes currently on the property.
- Annual clearing of combustible material from the roof and gutters and from within 10m of the buildings,
- Landscape using low, non-coniferous vegetation and green grass within 10m of the buildings,
- Landscape using rock rather than bark mulch within 10m of the buildings,
- Prune coniferous trees within 30m of the future buildings to the greater of 3m off the ground or 40% of their height,
- Remove “Ladder Fuels” such as firewood piles, lumber, and coniferous vegetation from underneath of mature conifers within 30m of the buildings,
- Keep wooden fences and wood piles at least 15m from the buildings,
- Ensure address signs are visible at entrance to driveways,
- Maintain outside taps and hoses long enough to reach 15m around the buildings,
- Maintain hand fire tools such as shovels, pulaskis, picks, hoes and rakes to combat small ground fires during fire season.

CONCLUSION

The current property is susceptible to wildfire activity. Applying general FireSmart guidelines (<https://firesmartbc.ca/>) and following the recommendations and suggestions in this Assessment will aid in reducing the susceptibility to a wildfire.

Signature



R.P.F. SIGNATURE AND SEAL

March 15, 2023

DATE

Steve Giesbrecht

R.P.F.'S NAME

I certify that the work described herein fulfills the standards expected of a registrant of the Association of British Columbia Forest Professionals and that I did personally supervise the work.

REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the

Board of Directors

Held on

Wednesday, September 21, 2022

**Bylaw 2940 - Electoral Area "F" Official Community Plan Amendment
Bylaw 2941 - Zoning Amendment
LAND FIRST ADAPTIVE DEVELOPMENT c/o LI, RUIBIN [File No. 22-0199-F-OR]
150 Crossridge Road, Electoral Area "F"**

Moved and seconded

That Electoral Area "F" Official Community Plan Amendment Bylaw No. 2940, 2022, which proposes to amend the Electoral Area "F" Official Community Plan Bylaw No. 2702, 2016 by changing the land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from Non-Urban to Country Residential be given First Reading; and further,

That Zoning Amendment Bylaw No. 2941, 2022, which proposes to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of the property legally described as the E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from the Non-Urban (N.U) zone to the Country Residential (C.R) zone be given First Reading.

CARRIED

REGIONAL DISTRICT OF NORTH OKANAGAN

Extract from the Minutes of a Meeting of the

Board of Directors

Held on

Wednesday, August 17, 2022

Official Community Plan / Rezoning Application

LAND FIRST ADAPTIVE DEVELOPMENT c/o LI, RUIBIN [File No. 22-0199-F-OR]

150 Crossridge Road, Electoral Area "F"

Moved and seconded

That the application to amend the Electoral Area "F" Official Community Plan Bylaw No. 2702, 2016 by changing the land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from Non-Urban to Country Residential to permit a 15 lot rural residential subdivision be supported in principle and staff be directed to prepare an Official Community Plan Amendment Bylaw for First Reading only; and further,

That the application to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of the property legally described as the E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from the Non-Urban (N.U) zone to the Country Residential (C.R) zone be supported in principle and staff be directed to prepare a Zoning Amendment Bylaw for First Reading only; and further,

That the referral process outlined in the Planning Department report dated July 15, 2022 be considered appropriate consultation for the purpose of Sections 475 and 476 of the *Local Government Act*; and further,

That in accordance with Section 477 of the *Local Government Act*, the Official Community Plan Amendment Bylaw be considered in conjunction with the Regional District of North Okanagan's Financial Plan and the Regional Solid Waste Management Plan; and further,

That Second Reading of the proposed Official Community Plan and Zoning Amendment Bylaws be withheld until:

1. comments have been received from: RDNO Community Services (Parks and Protective Services) Departments, Fire Department and First Nations;
2. the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide;
3. the applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that the subject property is safe for the intended use;
4. a water supply study which takes into consideration the potential to service the proposed lots and the impact it could have on the water supply in the area;

5. plans prepared by a BC Land Surveyor or Professional Engineer which show the building sites and driveways on the proposed including their existing and proposed grades and the cuts and fill required to achieve those grades;
6. the applicant has submitted a study prepared by a professional Geotechnical Engineer which evaluates the subject property and provides recommendations for potential on-site septic sewage disposal associated with the proposed development; and,
7. the applicant has submitted a report prepared by a Registered Professional Forester which assesses the proposed development and provides recommendations to minimize the risk of wildfire hazard including recommendations related to vehicle access routes and FireSmart principles.

CARRIED



PLANNING DEPARTMENT INFORMATION REPORT

OFFICIAL COMMUNITY PLAN / REZONING APPLICATION

DATE:	July 15, 2022
FILE NO.:	22-0199-F-OR
OWNER/APPLICANT:	Land First Adaptive Development c/o Ruibin Li
LEGAL DESCRIPTION:	The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD
P.I.D.#	013-905-244
CIVIC ADDRESS:	150 Crossridge Road
PROPERTY SIZE:	32.46 ha
SERVICING:	On-site septic sewage disposal and groundwater wells
PRESENT ZONING:	Non-Urban (N.U)
PROPOSED ZONING:	Country Residential (C.R)
PRESENT O.C.P. DESIGNATION:	Non-Urban
PROPOSED O.C.P. DESIGNATION:	Country Residential
PROPOSED USE:	15 lot rural residential subdivision

PLANNING DEPARTMENT RECOMMENDATION:

That the application to amend the Electoral Area "F" Official Community Plan Bylaw No. 2702, 2016 by changing the land use designation of the property legally described as The E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from Non-Urban to Country Residential to permit a 15 lot rural residential subdivision be supported in principle and staff be directed to prepare an Official Community Plan Amendment Bylaw for First Reading only; and further,

That the application to amend the Regional District of North Okanagan Zoning Bylaw No. 1888, 2003 by changing the zoning of the property legally described as the E ½ of the SE ¼ of Sec 10, Twp 19, R9, W6M, KDYD and located at 150 Crossridge Road, Electoral Area "F" from the Non-Urban (N.U) zone to the Country Residential (C.R) zone be supported in principle and staff be directed to prepare a Zoning Amendment Bylaw for First Reading only; and further,

That the referral process outlined in the Planning Department report dated July 15, 2022 be considered appropriate consultation for the purpose of Sections 475 and 476 of the *Local Government Act*; and further,

That in accordance with Section 477 of the *Local Government Act*, the Official Community Plan Amendment Bylaw be considered in conjunction with the Regional District of North Okanagan's Financial Plan and the Regional Solid Waste Management Plan; and further,

That Second Reading of the proposed Official Community Plan and Zoning Amendment Bylaws be withheld until:

1. comments have been received from: RDNO Community Services (Parks and Protective Services) Departments, Fire Department and First Nations;
2. the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide;
3. the applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that the subject property is safe for the intended use;
4. a water supply study which takes into consideration the potential to service the proposed lots and the impact it could have on the water supply in the area;
5. plans prepared by a BC Land Surveyor or Professional Engineer which show the building sites and driveways on the proposed including their existing and proposed grades and the cuts and fill required to achieve those grades; and
6. the applicant has submitted a study prepared by a professional Geotechnical Engineer which evaluates the subject property and provides recommendations for potential on-site septic sewage disposal associated with the proposed development.

SUMMARY:

This report relates to an application to amend the Official Community Plan (OCP) land use designation and zoning of the 32.46 ha property located at 150 Crossridge Road in Electoral Area "F" from Non-Urban to Country Residential. If approved, the applicant is proposing to subdivide the property into 15 lots.

The Planning Department recommends that the proposal be given favourable consideration as the proposed subdivision is generally consistent with the Electoral Area "F" Official Community Plan Rural Lands Policies. Staff also recommend that Second Reading be withheld until the applicant submits information related to slopes, water supply, a Public Information Meeting is held and comments are received from affected agencies.

BACKGROUND:

Site Context and Proposal

The subject property is located at the south end terminus of Crossridge Road and the east end terminus of Helmcken Road. The constructed portions of Crossridge Road and Helmcken Road end before the subject property. The property is currently vacant and is not serviced with a water supply or septic. The property slopes moderately down towards the east side of the property, with approximate elevations that range from 519 to 437 metres. Certain areas within site include steep slopes, some of which exceed 30% grade. Two watercourses are located on the property which are located in the northwest corner of the property and through the northern third of the property.

The applicant is proposing to amend the OCP land use designation and zoning of the 32.46 ha property from Non-Urban to Country Residential. If approved, the applicant is proposing to subdivide the property into 15 lots. An extension of Crossridge Road would be constructed south to a turnaround (cul-de-sac). The applicant has also indicated that an internal emergency access road would be constructed to link the properties to Helmcken Road as a secondary emergency access only. The lots would range from 2.0 ha to 2.8 ha in size.

The subject property is designated Non-Urban in the Electoral Area "F" Official Community Plan and is zoned Non-Urban (N.U). The property is not in the ALR. The attached maps show the OCP land use designation and zoning of the subject and surrounding properties. The following orthophoto of the subject and surrounding properties was taken in 2016.

Current Official Community Plan / Zoning Amendment Applications

As directed by the Board of Directors, applications for OCP amendments are to be considered in batches so that the cumulative effect they will have on the area can be better analyzed.

In June 2022, the Regional District received an application to change the OCP land use designation of and zoning of a 4.05 ha property legally described as District Lot 2415, ODYD, Except Plans 2024 & KAP81665 and located at the end terminus of Parkway Road in Electoral Area "F". The applicant proposes to amend the OCP land use designation of the subject property from Future Park to Commercial and to change the zoning of the property from Non-Urban (N.U) to Recreation Commercial (C.5). If approved, the applicant proposes to develop the property as a 20 site campground and a 10 unit rental cabin accommodation development.

Previous OCP / Zoning Amendment Applications

An overview of OCP amendment applications received in Electoral Area "F" over the past 10 years is provided below:

- 1) In March 2012, the Regional District received an application involving two properties located north of the City of Enderby. The applicant (North Enderby Timber) proposed to change the OCP land use designation of a 4.9 ha portion of the 39.2 ha property, located approximately 1.6 km north of the City of Enderby, at 6314 Highway 97A from Agricultural to Industrial and to change the zoning of the same portion of the property from Large Holdings (L.H) to General Industrial (I.2). The application also proposed to change the OCP land use designation of a 4.9 ha portion of the 8.1 ha property, located approximately 5.4 km north of the City of Enderby, at 91 Crandlemire Road from Industrial to Agricultural and to change the zoning of the same portion of that property from General Industrial (I.2) to Large Holding (L.H). The applicant proposed to subdivide the rezoned 4.9 ha portion of the property located at 6314 Highway 97A and to use it for log storage and lumber mill purposes and to subdivide and rehabilitate the rezoned 4.9 ha portion of the property located 91 Crandlemire Road to allow the same portion of the property to be used for agricultural purposes. The OCP and Zoning Bylaw Amendments were adopted in November 2014.
- 2) In March 2018, the Regional District received an application to amend the OCP land use designation of a 3.16 ha portion of a 20.57 ha property located at 3315 Enderby Mabel Lake Road from Non-Urban and Agricultural to Commercial and to rezone the same part of the property from Non-Urban (N.U) to Service Commercial (C.4). The applicant proposed to develop a storage facility and a caretaker's residence. Conditions of Adoption included provision of a \$30,000.00 amenity contribution offered by the applicant to the RDNO and

registration of a covenant to restrict the use of the C.4 zoned area to a mini storage facility and one dwelling unit. The OCP and Zoning Amendments were adopted in September 2018.

- 3) In December 2018, the Regional District received an application to amend the OCP land use designation and zoning of a 22.5 ha portion of a 65.7 ha property located on Edgar Road from Non-Urban to Country Residential. If successful, the applicant proposed to apply to subdivide the property into a total of 12 lots. The OCP and Zoning Amendment bylaws were given First Reading by the Board of Directors in September 2019. In November 2020 the applicant directed staff to close the file as his plans for the property had changed.
- 4) In October 2021, the Regional District received an application to amend the OCP land use designation of the property located at 6402 Highway 97A, from Non-Urban to Industrial and to change the zoning of the property from Non-Urban (N.U) to Light Industrial (I.1). If approved, the applicants propose to construct a truck service and repair shop with a caretaker's residence and a commercial storage facility including a mini storage building and outdoor storage area for RVs and boats. The Board resolved that further consideration of the application be withheld until a comprehensive plan which addresses how the proposed development of the subject property may form part of a larger area of existing and potential future industrial land use, including but not limited to consideration of the potential for public road access to be dedicated and/or upgraded to accommodate the potential development while protecting the safety and efficient function of Highway 97A. The Planning Department is currently working on the Electoral Area "F" Industrial & Service Commercial Lands Study as an ongoing project.

PLANNING ANALYSIS:

The applicant is proposing to amend the OCP land use designation and zoning of the 32.46 ha property from Non-Urban to Country Residential. If approved, the applicant is proposing to subdivide the property into 15 lots.

The Planning Department recommends that the proposal be supported in principal as it represents a rural residential land use that is consistent with the Electoral Area "F" land use designation of the subject property and surrounding properties. Additional information is required related to determine if the proposal complies with the Rural Land Policies in that the proposed lots would:

- a. not be subject to flooding, high water table or terrain instability;
- b. have the potential to accommodate suitable building sites and private driveways meeting the standards of the Zoning Bylaw;
- c. have the potential to be and are currently serviced with on-site sewage disposal systems as each proposed lot would be 2 ha larger and the terrain would be suitable for such services;
- d. have access to a public road system which meets the standards of the Ministry of Transportation and Infrastructure and would not require the extension or construction of new roads;
- e. that a study of the subsurface groundwater resource should be undertaken to verify the land use designations as a prerequisite to rezoning;
- f. give consideration to the fire protection issues in the local area with particular respect to wildfire interface areas.

To address these concerns, staff recommend that Second Reading of the proposed Official Community Plan and Zoning Amendment Bylaws be withheld until:

1. comments have been received from: RDNO Community Services (Parks and Protective Services) Departments and First Nations;

2. the applicant has held a Public Information Meeting in accordance with the Public Information Meeting Guide;
3. the applicant has provided confirmation in writing from a qualified professional Geotechnical Engineer that the subject property is safe for the intended use;
4. a water supply study which takes into consideration the potential to service the proposed lots and the impact it could have on the water supply in the area;
5. plans prepared by a BC Land Surveyor or Professional Engineer which show the building sites and driveways on the proposed including their existing and proposed grades and the cuts and fill required to achieve those grades; and
6. the applicant has submitted a study prepared by a professional Geotechnical Engineer which evaluates the subject property and provides recommendations for potential on-site septic sewage disposal associated with the proposed development.

REGIONAL GROWTH STRATEGY:

The Regional Growth Strategy designates the subject property as being within a Rural Protection Area. The following definition has been provided for Rural Protection Areas:

“RURAL PROTECTION AREAS: are areas that will not have access to water and sewer infrastructure, consist of large lot sizes and are associated with rural uses. Rural Protection Areas are intended to provide for a variety of rural land uses, including low density rural residential development, natural resources, and agricultural and existing small scale neighbourhood commercial uses. Rural Protection Areas help protect rural landscapes and agricultural lands, prevent unsuitable urban development and densities, limit water and sewer infrastructure extensions beyond the Rural Protection Boundary and maintain rural lifestyle options. Natural lands, open spaces, agricultural lands and environmentally sensitive lands that are unsuitable for residential development are included within the Rural Protection Areas, including: the Agricultural Land Reserve, watersheds, conservation areas, natural habitats, grasslands, forests, wetlands, major parks and recreation areas. Rural developments around drinking water sources and reservoirs should be restricted to protect water quality and quantity.”

The Regional Growth Strategy (RGS) outlines the regional policies that are to be considered by the Board of Directors when reviewing an OCP/Rezoning Amendment application. The following RGS policies apply with respect to this application:

Urban Containment and Rural Protection

- UC-2.1: Designate Rural Protection Boundaries, consistent with the Regional Growth Strategy, within Official Community Plans for the purpose of protecting lands within the Rural Protection Area. Lands designated as Rural Protection Areas are intended to accommodate low density development on larger (1 hectare and greater) parcels of land that are not serviced with both community water and sewer systems.
- UC-2.5: Designate lands as Rural Protection Areas: This designation will protect, and at the same time enhance, the rural landscape by encouraging development that is compatible with the rural character of the North Okanagan.
- UC-2.7: Protect the character of rural areas: Rural Protection Areas contain a variety of lands with natural resource value including agriculture and forestry. These lands have historically played a significant role in shaping North Okanagan character and identity, offering rural lifestyle choice, as well as providing important economic benefits. Their long term viability and productivity is increasingly threatened by urban encroachment and the spread of incompatible land uses.

UC-2.8: Coordinate with provincial agencies on future land use decisions within the Community/Crown Interface Zone designation of the Okanagan Shuswap Land and Resource Management Plan.

Water Stewardship

WS-1.1: Develop policies that will evaluate proposed developments based upon local hydrological conditions, access to long term water supply, an adherence to the precautionary principle and impact on supply to existing users.

WS-1.3: Develop lot size policies based on local groundwater conditions so that the cumulative effects of development do not compromise the sustainability of the community.

Environment and Natural Lands

ENV-2.4: Identify a system of linked wildlife corridors and areas of habitat connectivity, in partnership with the province and relevant parties, which will inform planning decisions with the goal to avoid further fragmentation.

ENV-2.10: Designate and protect significant open spaces and environmentally sensitive areas in Official Community Plans and through other planning mechanisms.

OFFICIAL COMMUNITY PLAN:

The Official Community Plan designates the land use of the subject property as Non-Urban. The following OCP Policies are applicable to the application:

Rural Lands Policies

1. Population projections and a vacant land inventory prepared in conjunction with the 2015 Official Community Plan review indicate that the existing land use designations can accommodate projected population growth and associated housing needs in Electoral Area "F" over the 2016-2026 time period.
2. Rural lands may have the potential for resource extraction and may not be suitable for development due to limitations of elevation, slope, water, accessibility, disruption of existing resource or agricultural uses, or interference with watershed conservation.
3. Upon receipt of an OCP Amendment and/or Rezoning application for any Rural development, the Board of Directors will give consideration to the fire protection issues in the local area with particular respect to wildfire interface areas.
4. Subdivision of rural residential lands shall be in a manner that will conform to the site characteristics and retain a sense of rural identity and community.
5. Official Community Plan and Zoning amendment applications should include information maps showing how the rezoning area can be developed under the proposed zoning including (as applicable) the location of any new roads, environmental protection measures, lot layouts, and any community amenities.
6. The following information and considerations are relevant to the review of the subject application which may or may not be approved by the Board of Directors:
7. Because of the importance of an adequate water supply in rural areas and the uncertainty about water supply in some areas, in conjunction with an OCP amendment and/or rezoning application assurance about the proposed water supply should be provided and the Board of Directors may request that a hydrogeological study be provided to determine impacts, if any, of the proposed development on the water supply of existing users in the surrounding area and the underlying aquifer.

8. Property proposed for development should not be subject to flooding, high water table, or terrain instability.
9. A proposed development should not require excessive public expenditures for services such as roads, utilities, and school busing.
10. Terrain should be suitable for development whereby each new lot would have a building site and driveway access in compliance with the Zoning Bylaw.
11. Each new lot shall have area suitable for on-site sewage disposal including area for a reserve on-site sewage disposal area.
12. Each new lot shall have access to a public road system meeting Ministry of Transportation and Infrastructure standards in which emergency egress must be considered.
13. Access via no-thru roads in excess of 150 m in length and/or no-thru roads without an adequate turnaround is not supported.
14. Natural features or other sensitive environmental attributes should not be negatively impacted by a proposed development.
15. Information other than that cited in this Section may be necessary in order to adequately evaluate Official Community Plan and Zoning amendment applications.
16. Notwithstanding the policies of this Section, the Regional District will be guided by all relevant community goals, objectives, and policies cited in this Plan as may be appropriate in the consideration of any application.
17. The Board of Directors may direct that an Official Community Plan amendment application be presented at a Public Information Meeting to be hosted in the community by the applicant prior to scheduling of a Public Hearing.

Transportation Policies

1. Through the development process, support the provision of public pedestrian and vehicular access to lands beyond and to navigable waters where practical and reasonable.
2. Cooperate with residents and organizations to identify on and off road pedestrian / cycling routes and to assist with developing acquisition and capital cost strategies.
3. Proposed new roads, road extensions, and upgrading of existing roads shall have a right-of-way width in accordance with the requirements of the Ministry of Transportation.
4. Development for which road upgrading would be required should not be permitted to proceed until roads adequate for the development are in place.
5. The Board of Directors may direct that an Official Community Plan amendment application be presented at a Public Information Meeting to be hosted in the community by the applicant prior to scheduling of a Public Hearing.

Public Facilities & Services

1. Continue to recognize that Electoral Area "F" is a rural area where residents acknowledge and accept that beyond the Shuswap Fire Protection District, fire protection services are not provided.
2. Because of the importance of an adequate water supply in rural areas and the uncertainty about water supply in some areas, in conjunction with an OCP amendment and/or rezoning application assurance about the proposed water supply should be provided and the Board of Directors may request that a hydrogeological study be provided to determine impacts, if any, of the proposed development on the water supply of existing users in the surrounding area and the underlying aquifer.
3. Development is encouraged to provide adequate drainage works, consistent with the "Land Development Guidelines for the Protection of Aquatic Habitat (1992)", to ensure that erosion and siltation of receiving water bodies is prevented.

4. Encourage measures to limit the volume and velocity of storm water runoff to minimize the release of substances harmful to the environment and to prevent damage to other properties, including agricultural land.

Environment and Natural Areas Policies

1. Encourage the protection, preservation, enhancement and management of sensitive ecosystems or land contiguous to sensitive ecosystems through the following methods:
 - a. donation of areas to the Regional District or provincial government;
 - b. donation of areas to a Land Trust or conservation organization;
 - c. creation of Conservation Covenants in favour of local or provincial government, or private conservation organizations;
 - d. establishment of statutory rights-of-way under the *Land Title Act* for relevant areas;
 - e. establishment of long-term leases for sensitive areas (i.e. privately owned land may be leased the province to manage for conservation purposes);
 - f. voluntary land stewardship and conservation by private landowners;
 - g. consideration of alternative development standards such as lot size averaging;
 - h. designation of Development Permit Areas for the protection of the natural environment, its ecosystems, and biodiversity;
 - i. consideration of Development Variance Permits to vary conditions, other than use or density, in a manner that would facilitate conservation of environmentally sensitive areas.
2. All development within the Regional District shall be undertaken in compliance with the provincial Riparian Areas Regulation.

Parks, Trails, and Recreation Policies

1. Support the health and wellness of the community by ensuring that parks and trails are well-maintained, accessible, and improved as resources permit, to meet a diversity of user interests, age groups and activities.
2. Improve connectivity between parks through the development of pedestrian and cycling trails.
3. Where applicable, as a condition precedent to subdivision, parkland or money in lieu of parkland shall be provided to the Regional District pursuant to Section 510 of the *Local Government Act*.
4. In the acquisition and development of open spaces, quality of the recreation experience should be considered the number one priority in the planning process as well as in the management of the site in the future. The focus should be on the values of specific additions to the present opportunities which should not compromise areas of high environmental value.

Community, Heritage, Arts & Culture Policies

1. The Regional District recognizes:
that heritage and cultural values should be identified, celebrated, and retained through community partnerships and engagement.
2. The Regional District regards the natural and built heritage of Electoral Area "F" as a community asset which is central to its multi-faceted character and will seek to integrate heritage conservation, and awareness about heritage into planning, policies, and decision-making.
3. Areas of special importance by virtue of their scientific, scenic, and historical values, including but not necessarily limited to the following, shall be protected and their significance explained to the public:
Shuswap River watershed.

Development Permit Areas

All Riparian Assessment Areas within Electoral Area “F” are designated as Riparian Development Permit (DP) Areas. Unless an exemption applies, development on land within a Riparian DP Area will require a DP prior to issuance of a Building Permit, subdivision, or land alteration.

The OCP designates the property as being located within a Development Permit Area for the protection of development from hazardous (wildfire) conditions. Unless an exemption applies, development on land within a Wildfire Hazard DP Area will require a DP prior to issuance of a Building Permit, subdivision, or land alteration. The following guidelines apply to Wildfire Hazard Development Permit application:

1. Prior to the approval of subdivision within the Wildfire Hazard Development Permit Area:
 - a. a report prepared by a Registered Professional Forester shall be required that assesses the proposed development,
 - b. provides recommendations that may form the basis of Development Permit conditions, to minimize the risk of wildfire hazard but are also congruent with Environment and Natural Areas Objectives and considers ecological values specifically wildlife, soil conservation and riparian habitat; and
 - c. a Section 219 Restrictive Covenant shall be required to be registered under the Land Title Act as a priority charge against the Title of the subject property for all areas determined by the Registered Professional Forester to be at risk of wildfire. The covenant must incorporate the recommendations of the Registered Professional Forester and indemnify the Regional District of North Okanagan in the event of any losses or damage to property which may occur as a result of a wildfire.
2. Developers of new subdivisions should consider the integration of trails, roads and cleared park land around development which may serve as fire breaks, and/or provide vehicle access routes to facilitate fire suppression in interface areas.
3. It will be a condition of each Development Permit that the land be developed and maintained in accordance with the approved Development Permit.
4. Each Wildfire Hazard Development Permit issued shall bear a notation indicating that additional information on the protection of development from wildfire hazard conditions is available in the “Home Owners FireSmart Manual” provided by the Forest Protection Branch of the BC Forest Service.

ZONING BYLAW:

Permitted Uses, Buildings Per Lot, and Minimum Lot Area for Subdivision

The subject property is zoned Non-Urban (N.U). The uses permitted in the Non-Urban (N.U) zone include single and two family dwellings, manufactured homes, ancillary single family dwellings, secondary suites, accessory buildings and structures, accessory farm sales, bed and breakfast uses, boarding house uses, community care facilities, fruit and produce pickers’ cabins and work force housing units, home occupations, intensive and limited agricultural uses, medical marijuana production facilities (in the ALR), packing houses, public parks and playgrounds, rapid infiltration and spray irrigation of treated effluent, resource uses, veterinary clinics, wineries and cideries.

Given the size of the subject property (34.2 ha) under the provisions of the Non-Urban (N.U) zone, the number of dwellings permitted on the subject property would be:

- one single family dwelling or one two family dwelling or one manufactured home; and
- two additional single family dwellings; and
- one secondary suite within one single family dwelling provided the lot does not contain a detached suite, an ancillary dwelling, a two family dwelling, or a temporary residence, or

- one detached suite provided the lot does not contain a secondary suite, an ancillary dwelling, a two family dwelling, or a temporary residence, or
- one ancillary single family dwelling provided the lot does not contain a secondary suite, a detached suite, a two family dwelling or a temporary residence.

Lots that are proposed to be subdivided in the Non-Urban (N.U) zone must have an area of not less than 7.2 ha.

The applicant proposes to rezone a portion of the subject property from Non-Urban (N.U) to Country Residential (C.R). The uses permitted in the C.R zone are similar to the uses permitted in the N.U zone except that rapid infiltration and spray irrigation of effluent is not a permitted use, intensive agricultural use is only permitted in the ALR, and resource use is limited. The number of dwellings per lot permitted in the C.R zone would be:

- one single family dwelling or one two family dwelling or one manufactured home; and
- one additional single family dwelling on lots 4 ha or larger; and
- one secondary suite within one single family dwelling, or one detached suite, or one ancillary single family dwelling provided the lot does not contain a two family dwelling or a temporary residence.

Lots that are proposed to be subdivided in the Country Residential (C.R) zone must have an area of not less than 2.0 ha.

Frontage

Lots that are proposed to be subdivided within either the C.R or the N.U zone must have lot frontage of not less than one-tenth of the perimeter of the lot.

Building Sites and Private Driveway Access

All lots created within the C.R or the N.U. zone must contain a contiguous area of land 2,000 m² or larger in size to serve as a suitable building site. Building sites must be less than 30% natural slope and be accessible from a public highway in accordance with the following private access driveway design standards:

Commencing at the edge of the finished road surface:

- driveways must be as close to right angles as practicable to the finished road surface for a minimum distance of 6 m; and
- have a minimum width of 5.5 m for a distance of 6 m with a 4 m minimum width thereafter; and
- have a maximum slope of 2% from the ditch line for a minimum distance of 10 m with a maximum slope of 15% thereafter.

REFERRAL COMMENTS:

The application was referred for comments to the following:

- 1. Community Services Manager (Protective Services)**
- 2. Community Services Manager (Parks)**
- 3. Community Services Manager (Solid Waste)**
- 4. RDNO Chief Financial Officer**
- 5. Ministry of Forests, Lands, Natural Resource Operations, and Rural Development**
- 6. Ministry of Environment**
- 7. Okanagan Indian Band**
- 8. Splotsin**

9. School District Nos. 22 & 83

10. Interior Health Authority

Interior Health provided the following comments:

It is our understanding that the application is to amend the Electoral Area F OCP designation for the property (150 Crossridge Road) from NU – Non Urban to CR – Country Residential and rezone the property from Non Urban to Country Residential zoning. The applicant is proposing these changes to facilitate the subdivision of 14 properties with a minimum size of 2 hectares that would be serviced by onsite sewerage and a onsite drinking water source.

A file review has been conducted and while we have no concerns with the OCP amendment and Rezoning from a healthy community development perspective, however the following is noted and should be given consideration:

- It appears that there is a proposed road extension with a cul-de-sac for this parcel. This proposed design can restrict connectivity to other neighbourhoods which may limit people walking or cycling for recreational and transportation purposes. Additionally, cul-de-sacs can also limit escape routes during the event of a fire. We encourage designing the road network to have through roads and connections where possible.
- It was noted in the referral package that the wildfire hazard rating is moderate risk for this parcel. With the recent wildfire seasons and anticipated climate change affects in the future, careful consideration should be given to whether it is prudent to add new development to areas of wildfire interface.

Interior Health is committed to working collaboratively with the Regional District of North Okanagan to support healthy, sustainable land use planning and policy creation. Please feel free to contact me directly if you have any further questions or comments.

11. Ministry of Transportation and Infrastructure

The Ministry provided the following comments:

Preliminary Approval is granted for the rezoning for one year pursuant to section 52(3)(a) of the Transportation Act. Please forward a copy of the bylaw to myself, after third reading, for endorsement.

12. Building Inspection Department

The Building Department indicated the proposal to comply with the RDNO building bylaw and the current BC Building Code.

13. Fire Department

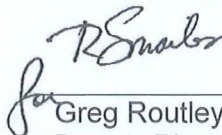
The Fire Department noted no concerns with this proposal.

Submitted by:



Jennifer Miles, RPP, MCIP
Planner II

Reviewed by:



Greg Routley
Deputy Planning Manager

Endorsed by:



Rob Smailes, RPP, MCIP
General Manager, Planning and Building

Approved for Inclusion:



David Sewell
Chief Administrative Officer