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City of
Kelowna
DEVELOPMENT PLANNING



AGRICULTURAL ASSESSMENT 840 Curtis Road, Kelowna, BC



Prepared For:
Frances & Christina Bowers

Prepared By:
Ecoscape Environmental Consultants Ltd.

August 2022



840 CURTIS ROAD, KELOWNA, BC

PLAN EPP28406 LOT 2 SECTION 10 & 3 TOWNSHIP 23

Agricultural Assessment

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TABLE OF CONTENTS

1.0	INTRODUCTION	- 4 -
1.1	Background	- 4 -
1.2	Proposed Works.....	- 4 -
1.3	Land Use of Surrounding Properties.....	- 5 -
2.0	SITE ASSESSMENT AND METHODOLOGY	- 6 -
2.1	Soil Sample Results	- 6 -
3.0	AGRICULTURAL CAPABILITY AND SOIL CHARACTERISTICS.....	- 8 -
3.1	Land Capability Classification for Agriculture in British Columbia.....	- 8 -
3.2	Soil Classification.....	- 9 -
4.0	CLIMATE	- 10 -
5.0	DRAINAGE & TOPOGRAPHY	- 10 -
6.0	FARM PLAN	- 11 -
7.0	POTENTIAL environmental IMPACTS OF FILL PLACEMENT	- 11 -
8.0	BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES	- 11 -
8.1	General Requirements	- 12 -
8.2	Monitoring	- 13 -
8.3	Disturbance Limits	- 14 -
8.4	Site Clearing and Grubbing	- 14 -
8.5	Topsoil Management	- 15 -
8.6	Subgrade Preparation	- 16 -
8.7	Soil Replacement	- 17 -
8.8	Erosion and Sediment Control	- 18 -
8.9	Drainage/Water Management.....	- 20 -
8.10	Air Quality & Dust Management.....	- 20 -
8.11	Noise and Vibration Management.....	- 21 -
8.12	Emergency Spill Response.....	- 22 -
8.13	Site Clean Up.....	- 23 -
8.14	Invasive Plant Management and Site Restoration.....	- 23 -
9.0	SUMMARY AND CONCLUSION	- 26 -
10.0	CLOSURE.....	- 28 -
11.0	REFERENCES	- 29 -

FIGURES

FIGURE 1	Site Location
FIGURE 2	Proposed Works
FIGURE 3	Soils & Agricultural Capability
FIGURE 4	Digital Elevation Model Analysis

APPENDICES

APPENDIX A.....	ALC NOI 60660
APPENDIX B.....	Agrologist Report by Pearl Agricultural Consulting
APPENDIX C.....	A & L Canada Laboratories Inc. Results
APPENDIX D.....	Site Photos

1.0 INTRODUCTION

1.1 Background

Ecoscape Environmental Consultants Ltd. (Ecoscape) has been retained by Frances & Christina Bowers (client) to complete an agricultural assessment (“*Agrologist Report*”) at 840 Curtis Rd, Kelowna, BC (subject property), to fulfill the requirements of an Agricultural Land Commission (ALC) Notice of Intent (NOI) application for fill placement for the purposes of farm use.

The subject property is 18.483 acres (7.5 ha), legally described as Plan EPP28406 Lot 2 Section 10 & 3 Township 23, PID: 029-111-048 (**Figure 1**), located within the municipality of the City of Kelowna (COK), bounded by Curtis Road to the southeast, Robert Lake to the northeast, and rural residential agricultural properties to the north, south, east and west. COK municipal zoning of the subject property is A1 (agriculture) and mapping provided by the ALC indicates the property is located entirely within the Agricultural Land Reserve (ALR). There is an existing single-family residence, pastures, stables, and sheds on the subject property, and agricultural use currently includes horses and pastures, including: 17 horses, 1 full stable, 1 storage barn with ¼ used for stabling, 12 pastures, and a hobby vegetable garden.

A previous ALC NOI (60660) (**Appendix A**) had been issued under previous ownership for the subject property and neighbouring property at 950 Curtis Rd, for fill placement to raise the grade of the driveway at 950 Curtis Rd to prevent recurrent flooding from Robert Lake, and subsequently develop land on the border of both properties for a hay pasture. Fill placement under this NOI was completed in May 2021 and a closure report was sent to the ALC. The subject property was purchased by the current landowner, the client, in November 2021. The hay pasture is currently an empty field, as the field flooded in the fall of 2021.

Robert Lake is approximately 20 - 30 meters from the subject property boundary, depending on lake levels. It is an alkaline lake with a history of recurrent flooding on the property, therefore there is a likelihood of high salinity and pH in the soils, as evidenced by recent photographs and a previous agricultural assessment produced by Pearl Agricultural Consulting (**Appendix B**). As part of the previous assessment, soil samples were taken from three (3) locations on the subject property and laboratory analysis indicated high pH and water saturation, particularly in the bottom low portions of the proposed fill area (**Appendix C; Figure 2**).

1.2 Proposed Works

The client intends to cultivate approximately 17,335 m² (1.7 ha) of the subject property which is currently a vacant field (**Figure 2**) for wine grapes (*Vitis vinifera*) and sweet cherries (*Prunus avium*), and requires the importation of additional fill material to improve the soil conditions and textures, as recommended by Pearl Agriculture, raise the grade to prevent future flooding from Robert Lake, reduce frost pockets, and reduce salinity and pH as well as water saturation in areas prone to flooding.

The purpose of this report is to satisfy the ALC NOI application and City of Kelowna Soil Development Permit requirements for the importation of additional fill on the subject property. This report provides an overview of existing conditions on the subject property and a farm plan for

the proposed fill placement and remediation works, as described below. The proposed fill placement area is shown on **Figure 2**. The proposed works entail the following:

1. Placement of approximately **21,135 m³** of fill material, up to a maximum of **2 m** in depth, within a placement area of approximately **17,335 m²**. The proposed fill material will be clean fill, suitable for agricultural cultivation, with a soil texture ranging from sandy loam to silt loam, free of contaminants and foreign materials, and must not include heavy clays or excessively stony soils.
2. Retention of existing topsoil on the property, where feasible. For example, it is not recommended that topsoil with high pH, salinity, or heavy clays is retained.
3. Reseeding of any disturbed areas or exposed slopes which are not proposed for cultivation, using an agricultural grass seed mix, to prevent invasive species and noxious weed growth within the subject property. The seed mix must include only species which are native to the Okanagan and non-invasive.
4. Screening of the top 15 cm of fill to remove rocks.
5. Fill placement is planned to commence as soon as possible upon the receipt of the appropriate permits and approvals, and is expected to complete by December 2023.
6. Fill will be transported by 13-yard dump trucks, with access to the property off of Curtis Rd. Trucking records will be maintained to include truck operator (name and business license), date of fill placement, volume of fill, and source location. Heavy equipment (i.e. graders) will be used to distribute the fill material.
7. Dust suppression practices and/or restrictions on the placement of fill and related vehicle traffic must be applied when necessary to minimize air-borne dust from traffic on the access road.
8. All fill sources will be sampled and analyzed by an ISO/IEC17025:2017 accredited lab according to the BC Contaminated Sites Regulation (CSR) standards for agriculture and the ALC Bylaw No.2 and evaluated by a Qualified Professional in Agrology (P.Ag.) to ensure fill meets the CSR and ALC standards prior to fill placement. Approved Phase I or Phase II ESA studies conducted recently by a qualified professional will also be acceptable in addition to a soil inspection by a P.Ag.
9. Planting of wine grapes (*Vitis vinifera*) and sweet cherries (*Prunus avium*), will commence following completion of fill placement and establishment of an irrigation system. Plants will be sourced from Bylands Nursery.

1.3 Land Use of Surrounding Properties

Land use in the surrounding area is largely rural, with neighboring agricultural operations and residential homes on private lands (**Table 1**).

TABLE 1. Land use of surrounding properties.

Direction	Zoning*	Ownership	Land Cover/Use
North	A1	Private	Agriculture/Rural Residential
South	A1	Private	Agriculture/Rural Residential
East	A1	Private	Agriculture/Rural Residential
West	A1	Private	Agriculture/Rural Residential

*A1 = Agriculture

2.0 SITE ASSESSMENT AND METHODOLOGY

A site inspection of the subject property and review of surrounding lands was carried out by Theresa Loewen, M.Sc., P.Ag., on August 3, 2022. Site photos are included in **Appendix D**. During the site visit, a soil stockpile was sampled for laboratory analysis. One (1) composite soil sample was collected.

The soil sample was collected using pre-labelled, sealed bottles designed for sampling trace metals with the appropriate preservatives pre-measured in vials. Bottles were provided by CARO Analytical Services, an ISO/IEC17025:2017 accredited lab. No visible evidence of contamination, debris, sediment sloughing, or runoff was observed at the time of the site visit. All field sample preservation methods prescribed by CARO were observed. The collected sample was immediately placed in a cooler with ice packs and delivered to CARO within 2 hours of the sampling event.

2.1 Soil Sample Results

The soil sample was processed by CARO Analytical Services, an ISO/IEC17025:2017 accredited lab, and analyzed against the standards of the BC Contaminated Sites Regulation (CSR) for Agriculture. Parameters analyzed included common contaminants and metals, according to the BC Contaminated Sites Regulation (CSR) standards for residential and agricultural properties.

The results are displayed below in **Table 2**. The results show that the sample is slightly in exceedance of CSR agricultural parameters for arsenic and iron. Arsenic in soils is commonly from human use, such as pesticides or waste disposal. It is possible that within the history of the property, such human use has contributed to the exceedance given its agricultural use. Iron is a common element found in soils and many naturally occurring factors can contribute to excess iron.

The soil texture is silty clay, and soil pH is 7.51. A value of 7 is neutral, less than 7 acidic and greater than 7 alkaline. According to vineyard extension resources from Washington State University (2021), a soil pH in the range 5.5 to 6.5 is considered optimum for grapes and generally has better nutrient balance for plant growth than soils that are more acidic or alkaline. Vines will grow from pH 4.0 to 8.5, but a pH below 5.5 and above 8 will depress yields and create vine problems. Soil pH affects the availability of nutrients and microbial activity in the soil. The availability of many micronutrients (Mn, Cu, Zn and B, for example) decreases as soil pH increases. Soil pH often drifts down over time with the use of fertilizers and sulfur. Soil amendments may need to be made to adjust soil texture, pH, and nutrient levels. For tree fruits, soil pH targets are slightly higher, between 6.8 – 7.2 (Pearl Agricultural Consulting, 2021). Native soils on the property have a pH in the range of 7.7 – 8.5 (Pearl Agricultural Consulting, 2021).

TABLE 2. Soil Sample Results from 840 Curtis Rd.

Analyte	Units	MRL	CSR AL Standard	Results
General Parameters				
Moisture	% wet	1	N/A	3.6
pH (1:2 H2O Solution)	pH units	0.1	N/A	7.51
Texture	-	-	-	Silty Clay
Polycyclic Aromatic Hydrocarbons (PAH)				
Acenaphthene	mg/kg	0.05	950	<0.050
Acenaphthylene	mg/kg	0.05	N/A	<0.050
Anthracene	mg/kg	0.05	2.5	<0.050
Benz(a)anthracene	mg/kg	0.05	0.1	<0.050
Benzo(a)pyrene	mg/kg	0.05	5	<0.050
Benzo(b)fluoranthene	mg/kg	0.05	N/A	<0.050
Benzo(b+j)fluoranthene	mg/kg	0.05	0.1	<0.050
Benzo(g,h,i)perylene	mg/kg	0.05	N/A	<0.050
Benzo(k)fluoranthene	mg/kg	0.05	0.1	<0.050
2-Chloronaphthalene	mg/kg	0.05	1500	<0.050
Chrysene	mg/kg	0.05	200	<0.050
Dibenz(a,h)anthracene	mg/kg	0.05	0.1	<0.050
Fluoranthene	mg/kg	0.05	50	<0.050
Fluorene	mg/kg	0.05	600	<0.050
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	0.1	<0.050
1-Methylnaphthalene	mg/kg	0.05	250	<0.050
2-Methylnaphthalene	mg/kg	0.05	60	<0.050
Naphthalene	mg/kg	0.05	0.6	<0.050
Phenanthrene	mg/kg	0.05	0.1	<0.050
Pyrene	mg/kg	0.05	0.1	<0.050
Quinoline	mg/kg	0.05	2.5	<0.050
Strong Acid Leachable Metals				
Aluminum	mg/kg dry	40	40000	26000
Antimony	mg/kg dry	0.1	20	0.48
Arsenic	mg/kg dry	0.3	10	15.2
Barium	mg/kg dry	1	350	214
Beryllium	mg/kg dry	0.1	1	0.78
Boron	mg/kg dry	2	8500	5.2
Cadmium	mg/kg dry	0.04	1	0.278
Chromium	mg/kg dry	1	100	54.2
Cobalt	mg/kg dry	0.1	25	16.8
Copper	mg/kg dry	0.4	75	43.2
Iron	mg/kg dry	20	35000	36500
Lead	mg/kg dry	0.2	120	43.8
Lithium	mg/kg dry	0.1	30	22.6
Manganese	mg/kg dry	0.4	2000	710

Analyte	Units	MRL	CSR AL Standard	Results
Mercury	mg/kg dry	0.04	10	<0.040
Molybdenum	mg/kg dry	0.1	3	0.86
Nickel	mg/kg dry	0.6	70	47.6
Selenium	mg/kg dry	0.2	1	0.32
Silver	mg/kg dry	0.1	20	0.16
Strontium	mg/kg dry	0.2	9500	89.4
Thallium	mg/kg dry	0.1	2	0.26
Tin	mg/kg dry	0.2	5	1.01
Tungsten	mg/kg dry	0.2	15	<0.20
Uranium	mg/kg dry	0.05	15	1.19
Vanadium	mg/kg dry	1	100	64.3
Zinc	mg/kg dry	2	150	100

Notes:

Criteria from the BC Contaminated Sites Regulation (CSR), enacted in 1997, and includes up to Stage 11 Amendments

AL = Agricultural Standards

MRL = method reporting limit

✘ Indicates parameter exceeds BC CSR AL Standards

3.0 AGRICULTURAL CAPABILITY AND SOIL CHARACTERISTICS

3.1 Land Capability Classification for Agriculture in British Columbia

The British Columbia Soil Information Finder Tool (BC SIFT) was accessed on August 17, 2022 to query soil survey and agricultural capability data for the subject property. Agricultural capability polygons present within the subject property can be seen in **Table 3** and **Figure 3**.

TABLE 3. Agricultural capability ratings within the subject property (BC SIFT, 2022).

Polygon	Unimproved Class ¹	Subclass 1 ²	Subclass 2	Improved Class	Composition
Westbank	4	A	D	3D	100%

¹ Class 1 land has minimal limitations when associated with the most amenable climates in the Province. In Class 2 to Class 5, the limitations increase. Class 6 lands have limitations that preclude arable agricultural activities yet are capable of sustaining native and/or perennial uncultivated agriculture. Class 7 lands have limitations that preclude all arable and natural grazing agricultural systems, regardless of the climate.

² A = soil moisture deficiency, D = undesirable soil structure

In BC, agricultural capability ratings and limitations are assessed through a classification system which describes seven land capability classes for agriculture (Classes 1 to 7)¹. The land capability classification for agriculture has two main components: the capability class and the capability subclass, where the class identifies the potential for agriculture, and the subclass identifies limitations or special management practices needed to improve the soil, such as topography, stoniness, soil moisture deficiency, low fertility, etc. The best agricultural lands are rated Class 1 because they have the ideal climate and soil to allow a farmer to grow the widest range of crops.

¹ [Agricultural Land Commission](#) June 2022.

Class 7 is considered non-arable, with no potential for soil bound agriculture. As the class numbers increase from Class 1 to Class 7, the range of crops decreases. Regular management practices required to make land productive include, drainage, irrigation, stone picking, fertilization etc¹.

100% of the subject property is classified as Westbank soils of Class 4 (limitations that require special management practices or severely restrict the range of crops, or both), with limitations of soil moisture deficiency (A) and undesirable soil structure (D) (**Figure 3**). Improved ratings include Class 3 with limitations of undesirable soil structure.

Given the history of flooding from alkaline Robert Lake and potential high water table in the area, it is recommended that additional limitations consider inundation (I), salinity (N), and excess water (groundwater) (W).

3.2 Soil Classification

Several glacial advances and retreats together with glaciofluvial action have produced a variety of deposits and sediments that form most of the soil parent materials within the area (Wittneben, 1986).

The British Columbia Soil Information Finder Tool (SIFT) was accessed on August 17, 2022 to query the soil survey data, and the following information for surficial deposits within the area of the subject property is listed below in **Table 4**.

Soil Name	Texture	Drainage	Deposition Mode	Classification	Percent Composition
Westbank	Silty Clay	Moderately Well Drained	Glaciolacustrine	Orthic Gray Luvisol	100%
Westbank	Heavy Clay	Well Drained	Glaciolacustrine	Orthic Gray Luvisol	100%

The Westbank Soil Group²

Westbank soils are classified as Orthic Gray Luvisol, with common horizons of LFH, Ae, AB, Bt, C, or Ck. These soils have the properties specified for the Luvisolic order and the Gray Luvisol great group. They have well-developed Ae and Bt horizons and usually have organic surface horizons. Faint mottling may occur immediately above or within the Bt horizon. Orthic Gray Luvisol have an Ae horizon with a chroma of less than 3 unless the chroma of the parent material is 4 or more, and a Bt horizon, but lack a Bf horizon and a fragipan. They may have a dark-colored, mineral-organic surface horizon (Ah or Ahe) less than 5 cm thick. They may have an Ap horizon, but its dry color value must be 5 or higher. They have distinct mottling, that indicates gleying does not occur within 50 cm of the mineral surface. Prominent mottling does not occur at depths of 50-100 cm.

² British Columbia Soil Information Finder Tool (BC SIFT), 2022

Westbank soils are generally characterized by native soil profiles undisturbed by agriculture with 0% coarse fragments by volume, where the water table is present in the soil during an unspecified period. Root restrictions occur in the third layer with an undifferentiated restriction.

Parent materials are glaciolacustrine deposits which can be found where there is evidence that the lacustrine materials were deposited in contact with glacial ice (kettles or an otherwise irregular surface that is neither simply the result of normal settling and compaction in silt nor the result of piping; slump structures resulting from loss of support caused by melting of retaining ice; presence of numerous ice-rafted stones in the lacustrine silts). The deposits are calcareous and saline.

According to Wittneben (1986), Westbank soils consist of fine to moderately fine textured glaciolacustrine deposits. Surface and subsurface textures are silty clay loam, clay loam, or clay. Subsoil textures are clay or heavy clay but may become sandy below about 200 cm. Westbank soils are moderately well drained, slowly pervious, and have high water holding capacity. Soils are moderately suited for agriculture, although dense, clayey subsoils inhibit root growth and water movement. Tree fruits, grapes, and hay or pasture are most commonly cultivated in these soils. Pudding and structure degradation can occur if the soils are cultivated when wet.

4.0 CLIMATE

The subject property occurs within the Okanagan Very Dry Hot Ponderosa Pine (PPxh1) biogeoclimatic zone that is described by the Biogeoclimatic Ecosystem Classification (BEC) program (Lloyd et al. 1990). The PPxh1 is the driest forested zone in British Columbia, occurring only at lower elevations in the southern valleys of BC, at the northern extent of a much larger range than runs through eastern Washington and Oregon. Areas of the PPxh1 zone have cool winters with low snowfall, and hot, dry, summers with growing-season moisture deficits resulting in a mosaic of open forest and grassland ecosystems (Haney & Iverson, 2012).

Climate data for the subject property indicates the site is well suited for agricultural development, with 169 frost free days, an average of 2,236 growing degree days above 5 °C, mean annual precipitation of 341 mm, and summer heat moisture index of 132 (BC SIFT, 2022).

5.0 DRAINAGE & TOPOGRAPHY

Drainage within the subject property is moderately well drained, where water is removed from the soil somewhat slowly in relation to supply. Excess water is removed somewhat slowly due to low perviousness, shallow water table, lack of gradient, or some combination of these. Soils have intermediate to high water storage capacity (5-6 cm) within the control section and are usually medium to fine textured. Precipitation is the dominant water source in medium to fine textured soils; precipitation and significant additions by subsurface flow are necessary in coarse textured soils.

The subject property has slopes between 0 – 80% (**Figure 4**). Within the proposed fill placement area, slopes are approximately 0 – 8%. Fill placement in this area is meant to raise the grade to reduce potential flooding from Robert Lake, and improve existing soil conditions to support tree fruit and grape production.

6.0 FARM PLAN

Previous fill was placed on the subject property under ALC NOI 60660 to develop the land for a hay pasture. Property ownership changed hands in November 2021, and the new landowner intends to cultivate approximately 17,335 m² (1.7 ha) of the subject property for wine grapes (*Vitis vinifera*) and sweet cherries (*Prunus avium*), and requires the importation of additional fill material to improve the soil conditions and textures, raise the grade to prevent future flooding from Robert Lake, reduce frost pockets, and reduce salinity and pH as well as water saturation in areas prone to flooding.

7.0 POTENTIAL ENVIRONMENTAL IMPACTS OF FILL PLACEMENT

Ecoscope has not completed an environmental impact assessment for this project. Ecoscope anticipates that, with due diligence and the appropriate mitigation measures in place, the risks for adverse impacts from fill placement to the environment and surrounding area can be appropriately mitigated.

Ecoscope recognizes that the proposed works could result in the following potential impacts:

- Potential for the release of deleterious substances (e.g., fuel, oil, concrete, hydraulic fluid) to the environment during the proposed works or as a result of improper storage, equipment re-fueling, and/or poorly maintained equipment.
- Potential for the release of sediment due to improper containment measures or lack of attention to detail during the placement of materials using heavy equipment.
- Disturbance beyond the proposed footprint if not clearly marked or identified before and during the works. Clear and visible fencing or flagging around the site will aid in preventing disturbance outside of the proposed works area.
- Potential for the establishment of invasive plant species during disturbance of land within the study area. An agricultural seed mix should be used to revegetate any disturbed area from the proposed works and must not include any invasive grass species or species not native to the Okanagan.
- Potential for sediment accumulation on road surfaces and noise disturbances to surrounding residents from fill placement traffic.

The following Best Management Practices and Mitigation Measures should be adhered to in order to protect potential aquatic and terrestrial life.

8.0 BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Recommendations to avoid or minimize the potential impacts that may arise during the proposed fill placement works are summarized below and based on Best Management Practices of the Province of BC and the Agricultural Land Commission.

Best Management Practices (BMPs) must be adhered to throughout construction to mitigate the risk associated with the proposed works. The most relevant best management practices that should be adhered to during the proposed works include:

- All works should generally conform to the Develop with Care Guidelines (2014) and other standard Best Management Practices for British Columbia found at: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/laws-policies-standards-guidance/best-management-practices/develop-with-care>
- All applicable ALC bylaws and policies, including but not limited to: Bylaw No.2, Policies P-10, P-13 and L-23.
- All municipal bylaws as they relate to soil deposition.

8.1 General Requirements

- **Copies of all appropriate permits and/or approvals must be kept onsite at all times for reference.**
- All conditions outlined within this report and the ALC Approval Letter must be followed throughout the entirety of the proposed works period.
- All fill sources must be sampled and analyzed by an ISO/IEC17025:2017 accredited lab according to the BC Contaminated Sites Regulation (CSR) standards for agriculture and the ALC Bylaw No.2 and evaluated by a Qualified Professional in Agrology (P.Ag.) to ensure fill meets the CSR and ALC standards **prior to fill placement**. Approved Phase I or Phase II ESA studies conducted recently by a qualified professional will also be acceptable.
- **Trucking records must be maintained** to include truck operator (name and business license), date of fill placement, volume of fill, and source location.
- The release of fine sediments, construction debris or other substances deleterious to the environment or watercourses must be prevented at all times.
- Ensure that onsite machinery is in good operating condition, clean and free of leaks, excess oil or grease.
- No works may take place in or around a stream, as defined by the *Water Sustainability Act*, without a Provincial permit in-hand. An EM must be onsite full time during any instream works.
- Road surfaces adjacent to the project area must be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed (i.e., swept or scraped) on a regular basis and disposed of appropriately.
- Existing topsoil must be retained where possible, stockpiled outside the fill placement area, tarped, and kept free of invasive species establishment. Topsoil must be replaced after fill placement has completed.

- Soil must not be salvaged, moved, stockpiled, or replaced during conditions of adverse soil moisture content including when the soil is frozen (to prevent slumping) or powdery dry.
- Compaction must be minimized by selecting soil materials with low clay contents for replacement in the root zone.
- The use of native material (salvaged topsoil and overburden) is preferable to the use of materials sourced from off site to avoid potential issues with drainage and excessive stoniness in the upper soil profile.
- Surface drainage from the reclaimed area must be maintained at all times in order to prevent erosion, flooding, siltation or other degradation of soils, adjacent lands or waterways.
- Any run-off must be diverted into catchment ponds or silt traps prior to discharge into natural watercourses or road ditches.

8.2 Monitoring

On-site supervision by a qualified registered professional with expertise in soils and reclamation is required during the soil salvaging, stockpiling, storage and soil replacement process. A Qualified Professional in Agrology (P.Ag.) should be retained for monitoring (EM) to oversee fill activities and conduct site inspections to document compliance with the ALC requirements, BMPs, permit conditions, and other recommendations. In the event that greater disturbance occurs due to unforeseen circumstances, the EM will recommend further measures to protect or restore the natural integrity of the site.

- A pre-construction meeting should be held between the EM and the contractor(s) undertaking the work onsite to ensure a common understanding of the ALC guidelines, mitigation measures and best practices required for the project. The EM will attend other routine meetings, as required.
- It is the contractor's responsibility to provide the EM with a detailed construction schedule and inform the EM of any changes to that schedule.
- The EM will be an approved Qualified Professional in Agrology (P.Ag.) authorized to halt construction activities should an incident arise that is causing undue harm (unforeseen or from lack of due care) to terrestrial, aquatic, or riparian resource values.
- A copy of this report describing mitigation measures and BMPs will be kept readily available at the site for reference while the work is being conducted.
- Reports will be submitted to the ALC at a frequency outlined in the Approval Letter based on volume of material placed. A final report will be generated upon the substantial completion of construction works summarizing the project activities and listing any deficiencies noted throughout the works.

8.3 Disturbance Limits

- Disturbance limits should be clearly delineated before the start of works. Disturbance beyond the identified development footprint must not occur without further assessment.
- Native vegetation, including trees, shrubs, and groundcover, must be retained as much as possible to mitigate the establishment of additional invasive plant species.
- Material stockpiling must not take place within the drip line of trees.
- In the event that land and/or natural vegetation is disturbed or damaged beyond the development footprint area, these areas should be restored and/or replanted with plant material native to the area under the direction of the EM.

8.4 Site Clearing and Grubbing

- Disturbance beyond the identified development footprint must not occur without further assessment.
- Native vegetation, including trees, shrubs, and groundcover, must be retained as much as possible to mitigate the establishment of invasive plants and to maintain the existing ecological value within the study area.
- In the event that land and/or natural vegetation is disturbed or damaged beyond the development footprint area, these areas must be restored and/or replanted with plant material indigenous to the area under the direction of the EM.
- Whenever possible, equipment/machinery used must not be operated or stored within the drip line of trees and equipment must not come into contact with trees outside of the marked limits of disturbance, which could result in physical damage to the bark or limbs.

Avian nesting timing windows should be considered if trees are to be removed, to protect nesting birds within and adjacent to the proposed work area. The general nesting period of migratory birds in Canada within Zone A1a and A2 is March 31st to August 15th (BC MoFLNRORD 2020). The following methods should be implemented in relation to nesting bird work windows:

- Section 6 of the Federal Migratory Birds Convention Regulation protects both the nests and eggs of migratory birds. The project area falls within the Canadian Avian Nesting Zone A1 (MECCS 2020). The general avian nesting period for migratory birds within this zone is March 26th to August 9th. Section 34 of the Provincial Wildlife Act protects all birds and their eggs, and Section 34(c) protects their nests while they are occupied by a bird or egg. The project area falls within the Northern Okanagan Basin ecodistrict. **The avian nesting period for all birds within this ecodistrict is February 1st to September 14th (Birds Canada 2021).**
- If vegetation clearing activities are required during the identified avian nesting period, pre-clearing nesting surveys may be required by an Environmental Monitor (EM) to identify active nests.

- If active nests are found within the construction limits, a buffer will be established around the nest until such time that the environmental monitor (EM) can determine that nest has become inactive. The size of the buffer will depend on the species and nature of the surrounding habitat. Buffer sizes will generally follow provincial BMP guidelines or other accepted protocol (e.g., Environment Canada). In general, a minimum 20 m buffer will be established around songbird nests or other non-sensitive (i.e., not at risk) species.
- Clearing and other construction activities must be conducted within **72 hours** following the completion of any pre-clearing nest surveys. If works are not conducted in that time, the nest surveys are considered to have expired and a follow-up survey will be completed to ensure that no new nests have been constructed.
- Wherever possible, trees with high wildlife value, such as veteran trees and large snags, must be conserved. Hazardous trees with wildlife value within the vicinity of the construction works should be assessed by a certified wildlife/danger trees assessor to determine levels of risk.
- Best management practices relating to raptors and their nests can be found in Guidelines for Raptor Conservation during Urban and Rural Land Development in BC (2013).

8.5 Topsoil Management

Prior to any extraction, all existing topsoil must be salvaged under the direction of the qualified registered professional for use during reclamation. Additional salvaging of subsoil and overburden may be necessary on sites where backfill sourced from off-site is not readily available, topsoil is shallow or where there is limited overburden available. The recommendations for soil handling procedures are as follows:

- Soil must be salvaged from all of the following areas:
 - the proposed pit or quarry area;
 - the access roads; and,
 - the proposed stockpile areas for the subsoil and overburden.
- Topsoil, subsoil and any overburden must be salvaged and stored separately. o
 - Separation between piles should be no less than 3 m.
- Topsoil must be salvaged using an excavator with a clean-out bucket.
- Materials must be transported to an appropriately designated storage area that will not be disturbed by extraction activities in order to avoid double handling of materials.
- A uniform layer of bark mulch or sawdust should be laid down on the storage surface prior to placement of any salvaged material.

- The areas required for stockpile storage must be based on estimates of initial soil salvaging volumes.
- Stockpiled soils must be windrowed and located in an area where they will not be disturbed and will not impede site drainage.
- Drainage from, onto and around the stockpiles must be controlled by ditches, drains or intercepts as required.
- Stockpiled soil must not be removed from the property without written permission from the Commission.
- Salvage piles should be limited in height (2 to 3 meters). Higher piles must not exceed a 3H:1V slope (horizontal: vertical).
- Stockpiles must be seeded and established with an appropriate plant cover or other suitable soil erosion control measure must be applied to protect the stockpiles from wind or water erosion.

8.6 Subgrade Preparation

The Commission frequently requires the backfilling of pits to ensure that the final elevation is consistent with adjacent land and the property's relative original elevation. Therefore, once all extraction activities are complete, the pit should be filled with suitable material that consists of either the stockpiled overburden and/or fill sourced from offsite. Subgrade preparation must proceed as follows:

- If imported fill is used to backfill, the fill must have the following characteristics:
 - must be of mineral origin only (organic soils are not permitted as fill material but can be used as a top-dress);
 - have a coarse fragment content less than 5% with no boulders >25 cm in the top 1 metre of the soil profile; and,
 - the texture of the soil must be no coarser than loamy sand and no finer than silt loam.
- The following are prohibited materials in the ALR and must not be used as fill:
 - concrete or demolition waste, including masonry rubble, concrete, cement, rebar, drywall, and wood waste;
 - asphalt;
 - glass;
 - synthetic polymer;
 - treated wood; and,
 - unchipped lumber.
- The final contours of the subgrade must be gently sloping in such a manner as to conform to the surrounding landscape.

- Depending on the site topography, any permitted side slopes and/or benches should be recontoured so that slopes are no steeper than 3.5H:1V (horizontal: vertical) to allow for use of farm equipment on the slopes. Steeper slopes may be allowed in some cases depending on the configuration of the field in order to maximize the amount of flat land (e.g., long narrow extraction pits).
- To avoid severe erosion of topsoil, land that is intended for the production of annual crops should have slopes no greater than 20H:1V or 5% slope (Class 1).
- In the Lower Fraser Valley and Metro Vancouver, the slopes must be less than 1% on cropland to minimize sheet and rill erosion.
- If necessary, upon completion of backfilling, the subgrade should be chisel plowed to a minimum depth of 60 cm in two directions at right angles.

8.7 Soil Replacement

Once the subgrade materials have been regraded, available topsoil and/or other suitable soil materials must be used to provide a rooting bed for crops.

General Recommendations

- Any stockpiled soils must be replaced in the reverse order from which they were removed.
- The recommended soil profile should consist of (from surface to at depth):
 - 20 – 30 cm of topsoil;
 - 30 cm of subsoil;
 - 50 cm of free draining subgrade; and,
 - Overburden or backfill (variable thickness).
- The placement of stakes, flagged to the desired replacement thickness, must be employed to assist the machine operator.
- Soil materials should be end dumped and leveled with low ground pressure equipment, such as tracked bulldozers.
- Vehicles and equipment must be restricted to designated roads or routes, so that ripping and subsoiling activities can be limited to these specific areas.
- Random, repeated running of equipment over leveled areas must be minimized wherever possible.

Subsoil Placement:

- If subsoil has been retained, the subsoil must be replaced in one lift.
- If fill is used as subsoil, then the fill must have a coarse fragment (fragments >2 mm diameter) content of less than 5% and must not contain any boulders (rock fragments >25 cm).

- Once the subsoil is in place, roughening the subsoil surface is required to hold topsoil in place following initial placement.
- If compaction does occur, rip the affected areas to a depth of 60 cm or more with shanks spaced 60 cm apart and then cross rip perpendicular to the first direction.

Topsoil Placement:

- Topsoil thickness should be equivalent to what was present before disturbance.
- Coarse fragments must not be introduced in the top 25 cm of the soil profile.
- Prior to replacement of the topsoil, soils must be screened separately to remove coarse fragments.
- Where the percentage of the coarse fragment content by volume is less than 5%, screening is not necessary. The qualified registered professional must determine if screening is necessary.
- Screening must be carried out under appropriate soil moisture conditions.
- Topsoil should not be replaced in areas such as roads or wet depressions that will not be used for productive agriculture unless required for grass establishment for erosion control.
- If the native topsoil has been removed, then a 20 - 30 cm lift of imported topsoil must be uniformly spread over the disturbance area. The texture of the soil must be no coarser than loamy sand or finer than silt loam.
- A suitable organic matter should be top-dressed over the reclamation area. This organic matter may be added in the form of animal or poultry manure or as a cereal or forage cover crop and turned into the soil.

8.8 Erosion and Sediment Control

The following section details the mitigations and recommendations related to erosion and sediment control (ESC) that must be adhered to throughout the duration of the project where applicable.

- Stockpile locations, staging and equipment storage areas, and environmentally sensitive areas should be delineated at the start of construction.
- Works involving ground disturbance should not be conducted during heavy rains wherever feasible to reduce the potential for sediment and erosion issues. Exposed soils along slopes must be stabilized and covered where appropriate using erosion control blankets (ECB), poly sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, seepage, or other unexpected causes.
- Silt fence and other appropriate ESC measures should be installed prior to the start of construction in appropriate locations as identified by the EM. Silt fence must be

installed between the proposed development and any areas of potential migration to mitigate the risks to resources associated with runoff and sediment transport. Silt fencing must be installed as directed by the EM in a field-fit manner. Silt fence must be staked into the ground and trenched a minimum of 15 cm to prevent flow underneath the fence and must remain taut to prevent material from moving over the fence. Silt fencing should contain sufficient storage capacity to collect runoff and sediment deposition during storm events. Silt fencing will be monitored on a regular basis and any damages or areas where the integrity and function of the fencing has been compromised should be repaired or replaced promptly. Silt fence must remain in place where required until the completion of the project;

- If erosion becomes a problem during construction and there is a risk of siltation to the adjacent naturally vegetated areas and watercourses (i.e. during heavy rain events), silt fence must be installed immediately adjacent to the development footprint to mitigate for potential sediment transport and erosion downslope of the works. Silt fence must be staked into the ground and trenched to prevent flow underneath the fence.
- ESC recommendations by the EM must be implemented within 24 hours.
- It is the contractor's responsibility to inspect all mitigation measures daily and additional measures will be installed, maintained, and repaired or replaced as required using a field-fit, adaptive approach.
- Road surfaces adjacent to the project area must be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed (i.e., swept or scraped) on a regular basis and disposed of appropriately.
- The release of silt, sediment, sediment-laden water, or any other deleterious substance into any ditch, watercourse (creek, river, lake, wetland), ravine, or other drainage feature must be prevented at all times. Similarly, there is to be no sediment release into areas of vegetation growth or sensitive areas in levels that would adversely alter growing or hydraulic conditions.
- No equipment refueling can take place within 30 m of a watercourse;
- It is the contractor's responsibility to regularly monitor weather forecasts and adjust ESC measures or proposed construction activities as required based upon the existing conditions of the site.
- ESC should incorporate the measures described below to mitigate risks during construction works. The plan is generally based upon provincial BMPs and other specifications and includes the following principles:
 - Construction works should be conducted during periods of warm, dry weather with no forecasted precipitation;
 - Construction works should be scheduled to reduce the overall amount of time soils are exposed;

- Natural drainage patterns should be maintained where possible;
 - Existing native vegetation should be retained where possible; and,
 - Stormwater and sediment-laden runoff should be directed away from exposed soils within the construction area.
- Exposed soils along slopes should be stabilized and covered where appropriate using geotextile fabric, polyethylene sheeting, tarps, or other suitable materials to reduce the potential for erosion resulting from rainfall, seepage, or other unexpected causes; and,
 - Adjacent roadways should be kept clean and free of fine materials. Sediment accumulation upon the road surfaces must be removed and disposed of appropriately.

8.9 Drainage/Water Management

A drainage plan must be prepared for the site by a qualified registered professional to ensure that water is appropriately managed on and offsite. Prior to the installation, drainage plans must be submitted to the Commission for review and approval. The following drainage and erosion control measures should be considered when designing the plan; however, this will vary depending on specific site conditions:

- Interceptor drains and grassed water runs to slow the velocity of runoff water and prevent erosion.
- Placement of toe slope drains to collect and remove seepage from the subsoil.
- Use of temporary diversion drainage on new areas of topsoil and seeded areas.
- Sedimentation impoundments to protect water quality in downstream areas. The size and location of impoundments is determined by runoff volumes, erosion rates, and required retention times.
- Installation of a soil drainage system (subsurface drainage as needed). This will depend on the end use and agricultural capability.
- Installation of a layer of porous drainage material to reduce the amount of water in the soil.
- The drainage must be installed upon completion of rehabilitation of each phase and prior to establishing any perennial crops other than forage.
- The reclaimed area must be monitored by the qualified professional following re-seeding to determine if sufficient drainage has been provided. If poorly drained areas persist, it may be necessary to install additional drainage structures.

8.10 Air Quality & Dust Management

Air quality standards must be met at all times during the project. Dust control can be achieved by reducing the spatial extents and amount of time that soils are exposed to construction activities.

Reducing traffic speed and volume can also reduce dust concerns. Surface and air movement of dust during project activities can be mitigated through preventive measures and design criteria.

Dust generating activities include dust from wheels of vehicles and machinery and stockpiling and movement of soil.

Avoidance, containment, and suppression of dust and dusty processes must be ensured by the following measures, where applicable:

- Exposed soils will be watered as required to suppress dust. Sediment-laden runoff must not be conveyed to any watercourses or surface water drainages. Oil and other petroleum products will not be used for dust suppression. Alternative dust suppressants will be approved by the EM prior to application;
- All road surfaces must be kept clean and free of fine materials (i.e., swept or scraped) regularly to prevent the increase of airborne particulate matter;
- Road sweeping/cleaning of entrance and access;
- All material leaving site in fully enclosed trailers (tarping);
- Wetting of material prior to disturbance (if appropriate);
- Provision and use of water truck with sprayers over vehicle entrance and onsite haul routes/roads;
- Provision and use of water truck with sprayers provided in strategic positions in working area and stockpiles as appropriate to conditions;
- Reduction of speed by vehicles onsite;
- Closing down various or all operations during severe wind events;
- Operator procedures i.e. good housekeeping to keep clean and tidy site;
- Transport management; and
- Additional measures may include cleaning, dampening of haul roads and limiting site speeds, and further onsite restrictions as required.

At all times during fill placement, dust will be monitored by visual assessments. The contractor is responsible for the operation of the dust management plan and all site operatives will be trained and required to take necessary mitigation action. They will also be required to take preventative action to avoid dust.

8.11 Noise and Vibration Management

- Works will generally be conducted in accordance with City of Kelowna bylaws, within business hours (i.e. 7:00AM to 7:00PM, Monday to Friday).
- Idle time of construction equipment and contractor vehicles must be kept to a minimum to reduce noise and the release of greenhouse gases. The contractor will inform and educate employees and sub-contractors on the importance of minimizing idling time and

develop guidelines to direct the practice of reducing unnecessary idling. In general, contractor vehicles and equipment will be turned off when not in use.

8.12 Emergency Spill Response

Spills of deleterious substances can be prevented through awareness of the potential for negative impacts and with responsible housekeeping practices onsite. Maintenance of a clean site and the proper use, storage, and disposal of deleterious liquids and their containers are important to mitigate the potentially harmful effects of spills and/or leaks. The following BMPs are adapted from Chilibeck et al. (1992) to provide guidance in the control of deleterious substances.

- Construction debris and stockpiled material must be removed from the site regularly and disposed of appropriately.
- All potential wildlife attractants, including food, beverages, and other strong smelling or perfumed materials must be removed from the site daily.
- The contractor will ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.
- No equipment refueling or servicing is to be undertaken within 30 m of a watercourse whenever possible.
- All spill events will be recorded and reported to the site supervisor and EM. In the event of a spill, the site supervisor will be immediately notified by workers onsite. The supervisor will then be responsible for contacting a mechanic (if necessary), the Project Manager and the EM.
- Spills occurring on dry land will be contained, scraped and disposed of appropriately. Contaminated material will be stored on tarps and covered to prevent mobilization and will be disposed of in accordance with the *Environmental Management Act*.
- Spills shall be contained, absorbed, and disposed of in accordance with the regulations outlined in the *Environmental Management Act* and using the following general steps:
 - Assess, monitor and prevent the hazard or threat;
 - Stabilize, contain, remove and clean up the hazard or threat;
 - Evacuate persons;
 - Recover and rehabilitate wildlife;
 - Restore wildlife habitat;
- Take other steps to address the long-term impacts resulting from the spill.
- Copies of contact phone numbers for notification of all of the required authorities in the event of a spill/emergency response should be posted and clearly visible at the site.
- Spill containment kits must be kept readily available onsite during construction in case of the accidental release of a deleterious substance to the environment. Any

spills of a toxic substance should be immediately reported to the **Emergency Management BC 24-hour hotline at 1-800-663-3456**.

8.13 Site Clean Up

Site cleanup and restoration refers to activities used to return disturbed areas within the subject property to a state resembling the natural state. Note that protection of existing ecosystems is generally much more efficient than ecosystem enhancement and restoration following construction. The following recommendations apply to the site cleanup efforts:

- Silt fencing, snow fence and other temporary mitigation features must be removed upon substantial completion of works when the risk of surface erosion and sediment transport has been adequately mitigated with other permanent measures.
- All equipment, supplies, waste, concrete, and other non-biodegradable materials must be removed from the site following the substantial completion of construction activities.

8.14 Invasive Plant Management and Site Restoration

Any areas of exposed soils, slopes, or general disturbance where agricultural planting is not proposed should be reseeded with an agricultural grass seed mix native to the Okanagan, to prevent the establishment of invasive species. Should further restoration be required, plant species selected should be native to the area and suitable to the growing conditions where the plantings have been proposed.

- Grass seed mixes must be approved by the EM before purchase and use. Restoration grass mixes cannot include species considered invasive within BC;
- All seed mixes will be submitted to a certified seed testing laboratory for germination and purity analysis. Seed analysis certificates are to be provided prior to purchase;
- Grass seed should be broadcast and hand-raked into the soil. For steep slopes or large areas, hydroseed may be used; and,
- Grass seed mixes should be suitable for the environmental conditions seen in **Table 5** below. These conditions may be given to a seed provider to determine the most appropriate species to provide.

TABLE 5. Recommended Native Grass Seed Mix for Disturbed Areas.

Common Name	Scientific Name	Percent
Tall wheatgrass	<i>Thinopyrum ponticum</i>	25%
Slender wheatgrass	<i>Elymus trachycaulus</i>	15%
Blue bunch wheatgrass	<i>Elymus spicatus</i>	25%
Rough Fescue	<i>Festuca campestris</i>	10%
Idaho Fescue	<i>Festuca idahoensis</i>	11%
Perennial rye	<i>Lolium perenne</i>	10%
Sandberg bluegrass	<i>Poa secunda</i>	2%
Junegrass	<i>Koeleria macrantha</i>	1%
Canada bluegrass	<i>Poa compressa</i>	1%

The timing of grass seeding is critical to optimize success and it is recommended that seeding should occur in spring between April and June or fall between September and October. Over seeding may be required in concurrent growing seasons to obtain adequate coverage and reduce competition by invasive plant species.

Watering should occur for the first two growing seasons, until grass is established. Spring and fall irrigation should be timed to water every 3 or 4 days. In summer, watering should be deep, but infrequent – occurring once per week. Irrigation should be timed to augment rainfall and a rainfall sensor would help to reduce water consumption. Hand watering and drip irrigation are both acceptable methods. Care should be taken during watering to ensure that overland flows do not result in sedimentation to neighboring properties. A target of 80% plant survival is recommended after two years.

Weed control must be practiced at all times.

- Weeds must be controlled before seed set. The most common practices include:
 - Cultural methods such as reseeding with an appropriate vegetative mix that can out-compete weeds;
 - Mechanical methods such as tillage, mowing, mulching or use of black plastic sheeting; and,
 - Chemical methods such as the use of herbicides.
- All newly reclaimed areas must be reseeded as soon as possible after soil replacement.

Special care should be taken to minimize the presence of non-native and invasive species. Prevention of the spread of non-native and invasive species can be achieved by limiting disturbance to soils and native vegetation where possible. Areas that have previously been disturbed should be restored with native plantings or grass seeding. Infestation areas should be controlled with regular removal of weeds. The basic principles of weed control include:

- Suppression of weed growth;

- Prevention or suppression of weed seed production;
- Reduction of weed seed reserves in the soil; and
- Prevention or reduction of weed spread.

Exotic plants are those which are not native to BC, but have been introduced to the area through human activity. Invasive plants are exotic plants that are able to reliably outcompete native species, spreading into native areas and eroding the functionality of native ecosystems. Invasive plants must be managed as part of works. *Successful management of invasive plants during the construction phase improves the success rate of the maintenance phase.* Due to disturbed nature of the property, a concerted effort must be made to reduce invasive species. Any areas where invasive species are removed, and ground is disturbed, must be reseeded.

There is a duty to control noxious weeds under the BC *Weed Control Act*. As per Section 2 of the act, “In accordance with the regulations, an occupier must control noxious weeds growing or located on land and premises, and on any other property located on land and premises, occupied by that person.” Consequently, these species should be given highest priority for management. A comprehensive list of plants designated as noxious weeds, both regionally and throughout BC, can be seen in Schedule A of the BC *Weed Control Regulation*.

Management Strategies and Activities:

- Removing Whole Plants (*ex. Manual Removal, Grubbing with Hoes, Scuffle Hoeing, Severing Roots, Whole Plant Removal with Large Equipment*)
- Cutting (*ex. Bladed Hand Tools, Pruners, Loppers, Shears, and Saws, Brushcutters and Stringtrimmers, Chainsaws, Mowing/Cutting with Larger Equipment, Stump Grinding*)
- Covering with Sheet Barriers (*ex. Mulching, tarping, solarizing*)
- Community-Scale Control (*ex. Competitive planting, burning, grazing, mechanized tilling*)
- Biocontrol
- Chemical control (*ex. Herbicide*) - *A BC-licensed herbicide applicator should be consulted as to the legal requirements for application of herbicide on site.*

Types of Invasive Plants:

- Some invasive plant species are annuals – meaning they only live for one year and die off over the winter. The seeds they drop are required to maintain the population into the next year. In a population of annual species, mowing, string-trimming, and other mechanical means may be used to cut the plants above the roots.
- Some invasive plant species are biennials – meaning they live for two years and die off before their third. Their first year is often focused on growth and does not produce seeds. During this time, it can often be recognized as a flat, radial growth of leaves called a “rosette”. Because of this low growth habit, rosettes must be

removed by hand and cannot be mowed or string-trimmed. In their second year they typically grow a tall stock which produces flowers and then seeds. In this second year, the plant can be removed mechanically as normal, or, in some species, only the seed stalk can be cut, leaving the rest of the plant in the ground.

- Some invasive plant species are perennials – meaning they live for multiple years. In this case, the entire plant must be removed or it will continue to produce and drop seeds and continue to increase the size of the population. In this case, *mowing and string-trimming will be ineffective at removing the population.*
- Some species, such as *Cirsium arvense* (Canada thistle) or *Rumex crispus* (curled dock), have specific management requirements, which can be communicated by the environmental monitor once these species have been identified.
- In areas sufficiently far from watercourses, herbicide may be used. Consult a BC-registered herbicide applicator for application services and best management practices around herbicide application.

Timing:

- *It is important that invasive plants be removed before they have gone to seed.* Depending on the species, individual plants can produce thousands of seeds. Allowing these seeds to develop and enter the soil can prolong the restoration period.
- Invasive plant management visits should be documented. The labour required during each visit should decrease as invasive plant populations are removed.

Ongoing invasive species control will be required within any areas with exposed/disturbed soils and restoration areas in the first few years until vegetation becomes established. Species that are aggressive have the potential to outcompete native species.

The contractor will ensure that all equipment and vehicles are washed and free of weed seeds prior to mobilization and de-mobilization. Vehicles and equipment should not be stored, parked, or staged within weed infested areas if possible. Contractor clothing should also be inspected daily for signs of weed seeds. If found, weed seeds should be disposed of in a contained refuse bin for offsite disposal.

Invasive plant species must be disposed of in a landfill; however, invasive species material must not be composted in the yard waste section of the landfill. Invasive plant species must not be transported to or deposited in other natural areas.

9.0 SUMMARY AND CONCLUSION

The purpose of this report is to satisfy the ALC NOI application and City of Kelowna Soil Development Permit requirements for the importation of additional fill on the subject property. This report provides an overview of existing conditions on the subject property, soil sample results, and a farm plan for the proposed fill placement activities, including developing approximately

17,335 m² (1.7 ha) of the subject property for wine grapes (*Vitis vinifera*) and sweet cherries (*Prunus avium*).

Imported fill must meet the ALC standards of clean fill, free of contaminants and foreign materials, suitable for cultivation of tree fruits or grapes, with a soil texture of sandy loam to silt loam, and must not include heavy clays or excessively stony soils.

An assessment of the subject property revealed it is suitable for agricultural development with the appropriate improvements, such as fill importation with soil textures of sandy loam to silt loam, fill placement to raise the grade of low-lying areas to prevent future flooding from Robert Lake and reduce frost pockets, and soil amendments to reduce salinity and pH. With these improvements, it is Ecoscape's opinion that agricultural capability ratings may be improved from Class 4 to Classes 2 or 3.

Ecoscape anticipates that with due diligence and the appropriate mitigation measures in place as laid out in this report, the risks for adverse impacts to the agricultural capability, environment, and surrounding area can be appropriately mitigated.

10.0 CLOSURE

This report has been prepared by Ecoscape and is intended for the sole and exclusive use of the client 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 subject property 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 subject property. Ecoscape presents facts, assumptions, and opinions in this report, based on information where applicable including but not limited to information provided by the client, publicly available information sources and data, field observations, laboratory data, and professional assessment. 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.

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.

If you have any questions or comments, please contact the undersigned at your convenience.

Respectfully Submitted,
ECOSCAPE Environmental Consultants Ltd.

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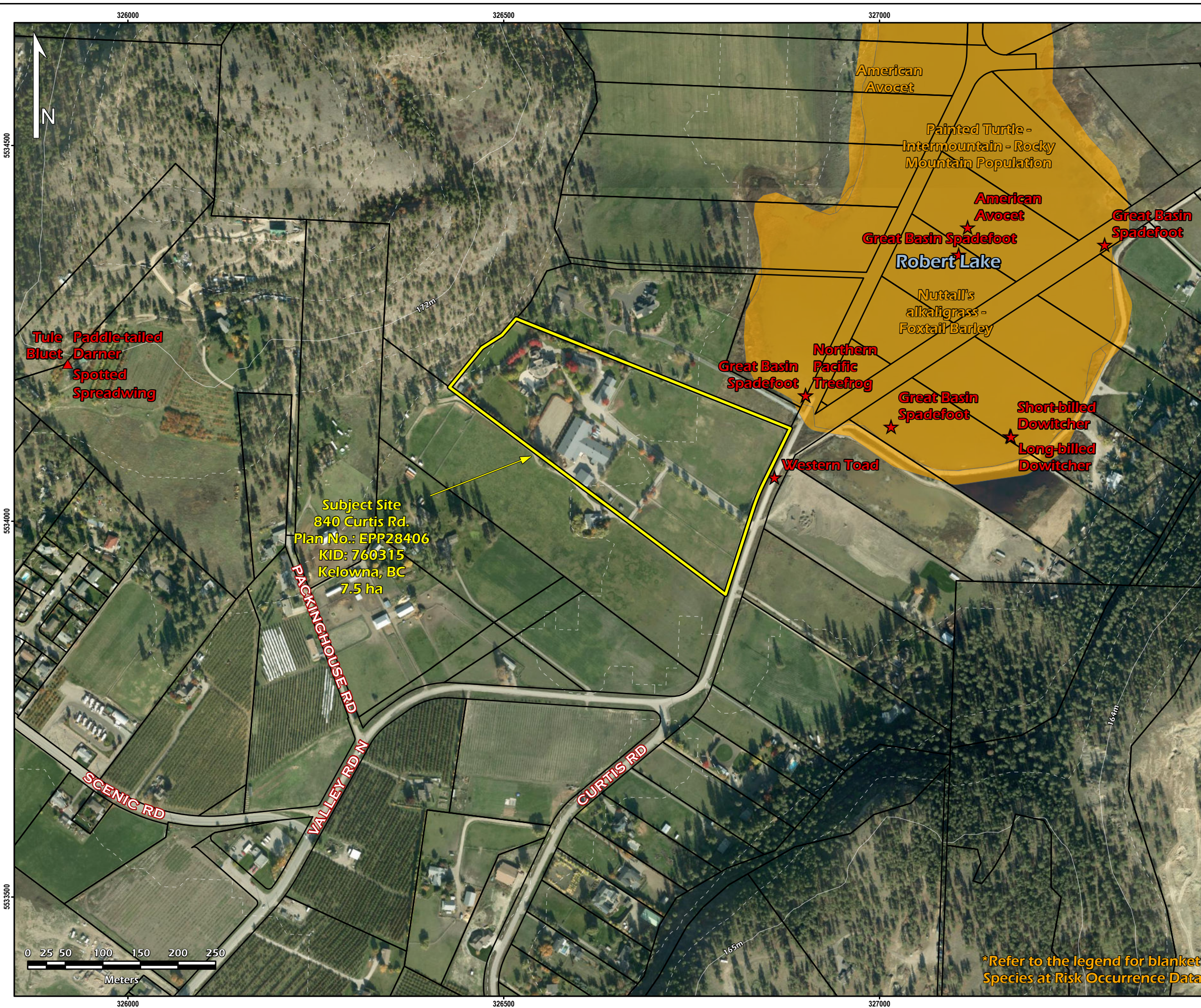


FIGURE 1
Site Location and Species at Risk Occurrences

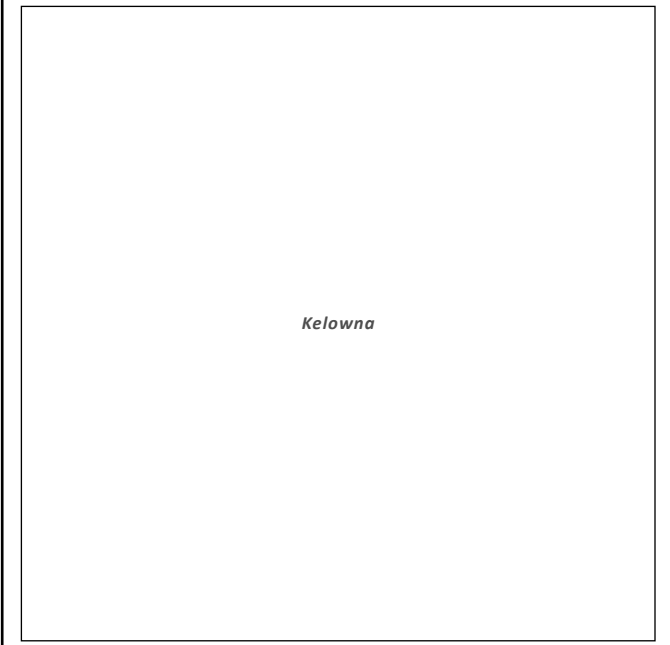
Project: Agricultural Capability Assessment
 Location: 840 Curtis Rd., Kelowna
 Project No.: 22-4398
 Prepared for: Frances & Christina Bowers
 Prepared by: Ecoscape Environmental Consultants Ltd.
 Dan Austin, GIS Specialist
 Coordinate System: NAD83-UTM Zone 11
 Imagery: RDCO 2021
 Field Visit: April 19, 2022
 Map Date: August 17, 2022

LEGEND


- ▲ WSI Survey
- ★ WSI Incidental
- Streams
- Subject Property
- Cadastre
- Okanagan Critical Habitat (Species at Risk)*
- BC Conservation Data Center (CDC) Polygons

*A large Okanagan Critical Habitat polygon covers the entire map and subject property area representing the following wildlife species but is not shown on this figure:
 -American Badger (*Taxidea taxus*)

Regional Location of Subject Property



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 portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.



*Refer to the legend for blanket Species at Risk Occurrence Data

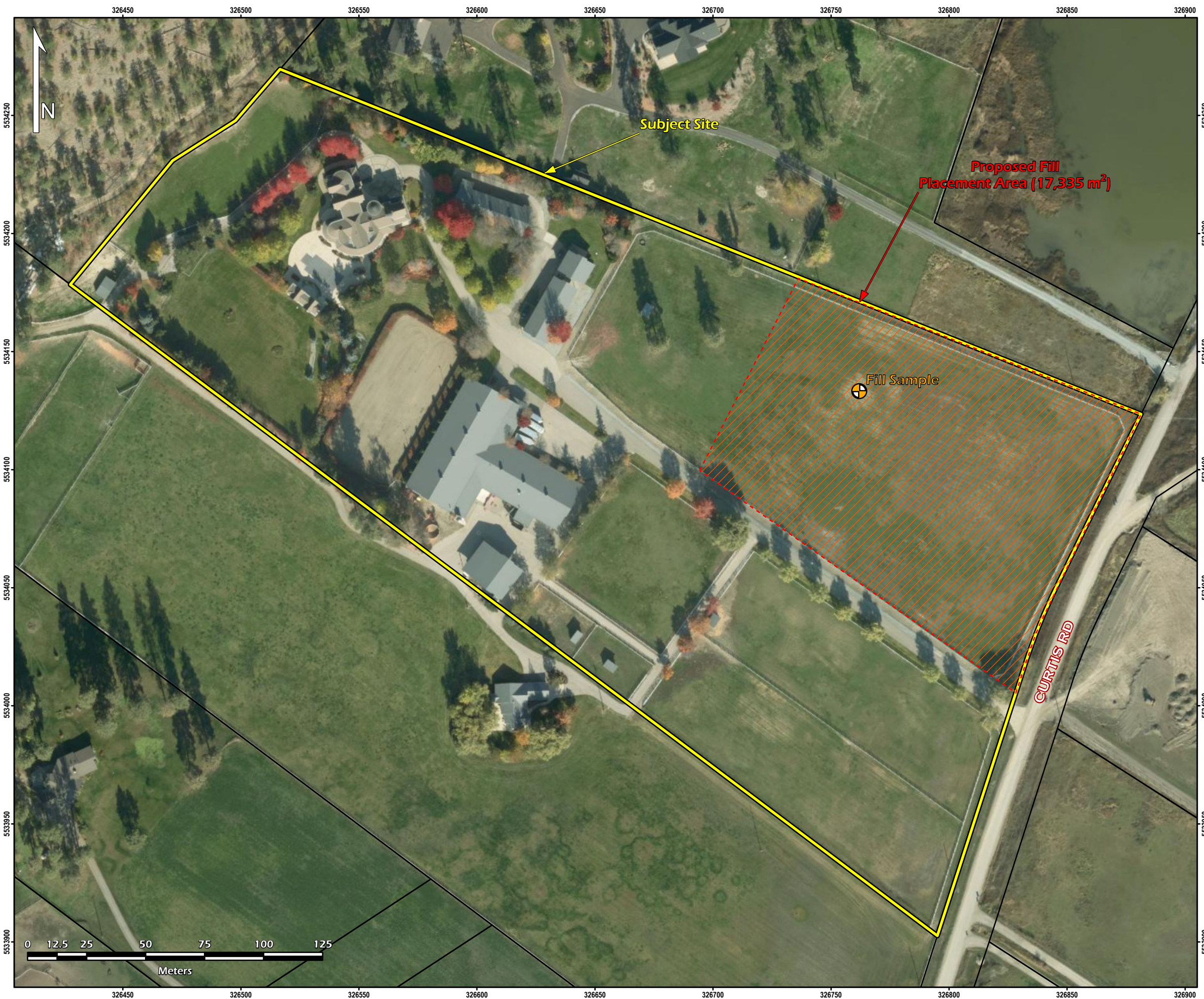




FIGURE 2 Proposed Works

Project: Agricultural Capability Assessment
Location: 840 Curtis Rd., Kelowna
Project No.: 22-4398
Prepared for: Frances & Christina Bowers
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Imagery: RDCO 2021
Field Visit: April 19, 2022
Map Date: August 17, 2022

LEGEND

-  Soil Sample Location
-  Streams
-  Proposed Fill Placement Area
-  Subject Property
-  Cadastre

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 portrayed in this report and that of a legal survey, the legal survey will supersede any data presented herein.





FIGURE 3
Agricultural Capability

Project: Agricultural Capability Assessment
 Location: 840 Curtis Rd., Kelowna
 Project No.: 22-4398
 Prepared for: Frances & Christina Bowers
 Prepared by: Ecoscape Environmental Consultants Ltd.
 Dan Austin, GIS Specialist

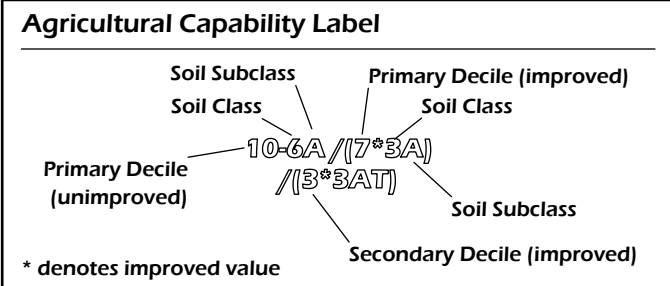
Coordinate System: NAD83-UTM Zone 11
 Imagery: RDCO 2021
 Field Visit: April 19, 2022
 Map Date: August 17, 2022

LEGEND

- Subject Property
- Cadastre
- Agricultural Capability

Soil Name

- HARRLAND
- OPEN WATER
- SUMMERLAND
- WESTBANK



Class	Description
1	Land in this class either has no or only very slight limitations that restrict its use for the production of common agricultural crops.
2	Land in this class has minor limitations that require good ongoing management practises or slightly restrict the range of crops, or both.
3	Land in this class has minor limitations that require good ongoing management practises or slightly restrict the range of crops, or both.
4	Land in this class has limitations that require special management practises or severely restrict the range of crops, or both.
5	Land in this class has limitations that restrict its capability to producing perennial forage crops or other specially adapted crops
6	Land in this class is nonarable but is capable of producing native and or uncultivated perennial forage crops.
7	Land in this class has no capability for arable or sustained natural grazing.

Subclasses	Description
A & M	Soil moisture deficiency
C	Adverse climate (excluding precipitation)
D	Undesirable soil structure
E	Erosion
F	Low fertility
I	Inundation (flooding by streams, etc.)
N	Salinity
P	Stoniness
R	Shallow soil over bedrock and/or bedrock outcroppings
T	Topography
W	Excess water (groundwater)
S & X	Cumulative and minor adverse conditions

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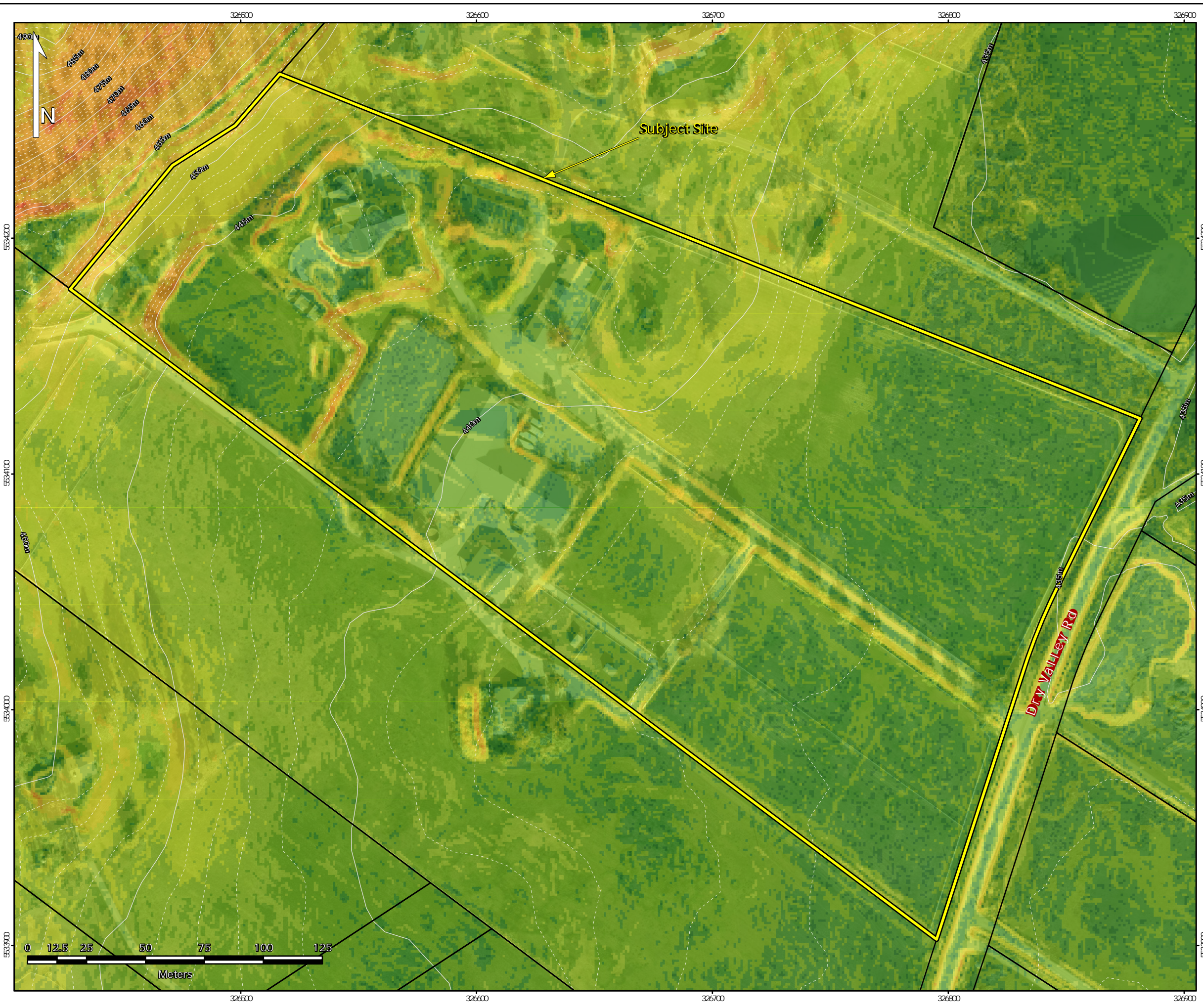


FIGURE 4
Digital Elevation Model Analysis

Project: Agricultural Capability Assessment
 Location: 840 Curtis Rd., Kelowna
 Project No.: 22-4398
 Prepared for: Frances & Christina Bowers
 Prepared by: Ecoscape Environmental Consultants Ltd.
 Dan Austin, GIS Specialist
 Coordinate System: NAD83-UTM Zone 11
 Imagery: RDCO 2021
 Field Visit: April 19, 2022
 Map Date: August 30, 2022

LEGEND


- Streams
- Subject Property
- Cadastre

Slope Class (percent)

- Level (<0.5)
- Nearly Level (0.5 - 1.9)
- Very Gentle Slope (1.9 - 5.2)
- Gentle Slope (5.2 - 8.8)
- Moderate Slope (8.8 - 15)
- Strong Slope (15.0 - 29.6)
- Very Strong Slope (29.6 - 44.5)
- Extreme Slope (44.5 - 70)
- Steep Slope (70.0 - 100)
- Very Steep Slope (>100.001)

Slope	MIN	MAX	MEAN	STD
Subject Property	0.0	79.9	5.6	7.0

DISCLAIMER
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APPENDIX A: ALC NOI 60660



Agricultural Land Commission
201 – 4940 Canada Way
Burnaby, British Columbia V5G 4K6
Tel: 604 660-7000
Fax: 604 660-7033
www.alc.gov.bc.ca

July 28, 2020

ALC File: 60660

SENT BY E-MAIL: gainsworth@hotmail.com

Garrett Ainsworth
950 Curtis Rd
Kelowna, BC V1V 2C9

Dear Mr. Ainsworth,

**Approval Subject to Limits and Conditions Under Section 20.3(2)(b)(ii) of the
Agricultural Land Commission Act**

Re: Amendment to Notice of Intent to place fill on Land in the Agricultural Land Reserve

Property 1:
PID: 004-362-373
Legal Description: Lot 2 Section 10 Township 23 Osoyoos Division Yale District Plan 29311
Civic Address: 950 Curtis Rd, Kelowna, BC

Property 2:
PID: 029-111-048
Legal Description: Lot 2 Sections 3 and 10 Township 23 Osoyoos Division Yale District Plan EPP28406
Civic Address: 840 Curtis Rd, Kelowna, BC

(together, the “Properties”)

On April 7, 2020 the Chief Executive Officer (CEO) of the Agricultural Land Commission received a Notice of Intent (NOI) pursuant to section 20.3(1)(c) of the *Agricultural Land Commission Act* (ALCA) for the proposed placement of fill on the Property (the Proposed Fill Placement Activities). The CEO also received a fee of \$150 with respect to the NOI pursuant to subsection 20.3(1)(c)(ii).

Permission to proceed with the Proposed Fill Placement Activities was granted by the ALC delegate CEO on April 24, 2020 subject to limits and conditions and a term ending October 24, 2020. On July 1, 2020, the agent contacted the ALC by email requesting an amendment to expand the fill placement beyond the approved fill placement area and to increase the volume of fill. The proposed expansion would include the property located at 840 Curtis Rd, Kelowna, BC (Property 2).

As delegate CEO pursuant to subsection 20.3(6) of the ALCA, I understand the following about the Proposed Fill Placement Activities from the NOI, accompanying documents, and further information supplied on/after July 1, 2020:

- The landowners of Property 1, located at 950 Curtis Rd, Kelowna are Garrett Paul Ainsworth and Chantel Marguerite Katherine Ainsworth;
- The landowners of Property 2, located at 840 Curtis Rd, Kelowna are Norman Clark Sazwan and Denise Lynn Sazwan;
- Garrett Paul Ainsworth has been appointed as agent for the Proposed Fill Placement Activities;
- The purpose of the Proposed Fill Placement Activities is to raise the land to protect the existing driveway from the flooding associated with Robert's Lake and to plant fruit trees;
 - The Proposed Fill Placement Activities will extend onto Property 2 in order to feather the fill out to grade;
- The previously approved fill placement area was 0.8 ha (8,000 m²), which was located solely on Property 1;
- The proposed expanded fill placement area is now 1.2 ha (12,000 m²), which will now include Property 2;
 - Proposed fill placement area on Property 1 – 0.4 ha;
 - Proposed fill placement area on Property 2 – 0.8 ha;
- The type of material proposed to be placed on the Property is clean fill suitable for growing fruit trees;
- The amended proposed volume of materials to be placed on the Properties is 10,000 m³ (an increase from 7,500 m³);
- The proposed maximum depth of material to be placed on the Properties is 1 m; and
- The proposed duration of the Proposed Fill Placement is one (1) month.

Upon review of the Notice of Intent and accompanying documents, I hereby approve the Proposed Fill Placement Activities subject to the attached Schedule A: Limits and Conditions (Amended) under section 20.3(2)(b)(ii) of the Act.

This approval is only for the Proposed Fill Placement Activities. This approval does not constitute approval for any other activity on the Properties for which CEO or Commission approval would otherwise be required. This approval does not relieve you of your obligation to comply with all applicable Acts, regulations, bylaws of local government, and decisions and orders of any person or body having jurisdiction over the land under an enactment.

Further correspondence with respect to this letter should be directed to Jenny Huynh at ALC.soil@gov.bc.ca.

Sincerely,



Avtar S. Sundher
Delegate of the Chief Executive Officer

Enclosure: Schedule A: Limits and Conditions (Amended)
 Schedule B: Decision Map
 Schedule C: ALC Criteria for Technical Reports Submitted by Consultants



cc: City of Kelowna (ALCapplications@kelowna.ca)

60660d2

Schedule A:

Limits and Conditions on the Proposed Fill Placement Activities (Amended)

GENERAL

1. The Proposed Fill Placement Activities must be conducted in compliance with the limits and conditions set out in this NOI decision;
2. The Proposed Fill Placement Activities are restricted to the 1.2 ha area shown in the Schedule B: Decision Map attached to this NOI decision;
3. The total allowed volume of material to be placed is limited to 10,000 m³;
4. Approval for placement of fill on the Properties is granted for the sole benefit of the Applicant and is non-transferable without the written approval of the ALC;

PRIOR TO CONDUCTING PROPOSED FILL PLACEMENT ACTIVITIES

Oversight by a Qualified Registered Professional

5. The Proposed Fill Placement Activities must be overseen by a qualified registered professional as outlined in [ALC Policy P-10](#), with specific knowledge of soils, drainage, fill placement and land reclamation, who must complete the status report and a final closure report.
6. Theresa Loewen is the qualified registered professional associated with the NOI. If Theresa Loewen is replaced by any other qualified registered professional, the ALC must review and approve the change and all Proposed Fill Placement Activities must be conducted in compliance with the information submitted with the NOI and conditions set out in this decision.
7. The qualified registered professional must notify the ALC that they understand the terms and conditions in this approval and that he or she agrees to act as the registered qualified professional to ensure that all site activities will be conducted in compliance with the information submitted with the Application and conditions set out in this decision. **Site work cannot proceed until this notification has been received by the ALC;**
8. The qualified registered professional is responsible for notifying the ALC if status reports and/or the closure report are not provided to the ALC as per the schedule indicated in

condition “15” and “20”. If the ALC does not receive the reports in a timely manner, a stop work order will be issued;

CONDUCTING PROPOSED FILL PLACEMENT ACTIVITIES

Vehicular Traffic

9. Access and egress of all vehicle traffic associated with the Proposed Fill Placement Activities and other related activities, must be restricted to a single access road onto the Properties;
10. Dust suppression practices and/or restrictions on Proposed Fill Placement Activities related vehicle traffic must be applied when necessary to minimize air-borne dust from traffic on the access road;
11. The landowner must maintain trucking records. The trucking records must indicate the truck operator (name and business license), date and time of fill placement, volume of fill, description of fill, and the source location. These records must be provided to the ALC at the completion of all filling activities;

Fill Material

12. As per Section 36 of the *Agricultural Land Reserve Use Regulation*, prohibited fill must not be placed on the Properties. Prohibited fill includes:
 - (a) construction or demolition waste, including masonry rubble, concrete, cement, rebar, drywall and wood waste;
 - (b) asphalt;
 - (c) glass;
 - (d) synthetic polymers;
 - (e) treated wood;
 - (f) unchipped lumber;

Weed Control

13. Appropriate weed control must be practiced on all disturbed areas;

Sediment and Erosion Control

14. Appropriate sediment and erosion control must be practiced on all disturbed areas to prevent sediment from entering drainage/ditches and Robert's Lake;

Status Reports

15. Status reports must be submitted after every 3,750 m³ or every 3 months (whichever comes first) to update the ALC on the progress of the Proposed Fill Placement Activities;
 - The status report must include, but is not limited to:
 - Confirmation that operations are in compliance with the terms and conditions set by the ALC;
 - Evidence that fill quality meets the conditions of this NOI (supported by photographs, site and soils field data);
 - A record of fill volume and fill source locations;
 - Confirmation that no contaminated materials have been brought onto the site (i.e. Phase 1 Environmental Site Assessment reports from fill source locations). The ALC may request soil samples be sent to laboratories for analysis or may collect samples for analysis. A monitoring fee of will be charged to the Applicant as per the fee outlined in the Regulation, Section 33.1 (1);
16. The qualified registered professional is responsible for notifying the ALC if status reports and/or the closure letter are not provided to the ALC as per the schedule indicated in condition "15" and "20." If the ALC does not receive the reports in a timely manner, a stop work order will be issued;

COMPLETION OF THE PROPOSED FILL PLACEMENT ACTIVITIES

CLOSURE LETTER

17. A final letter, prepared by the qualified registered professional, prepared as per [ALC Policy P-10](#) and Schedule C: Criteria for Technical Reports Submitted by Consultants, for the ALC's review and approval, must be submitted to the ALC upon completion of the

Proposed Fill Placement Activities. The final letter must include, but is not limited to, the following:

- A written description of the completed Proposed Fill Placement Activities; and
- Evidence that the Proposed Fill Placement Activities have been completed as required.

18. The closure letter must be completed by the qualified professional identified in this NOI decision;
19. The qualified registered professional is responsible for notifying the ALC if the status report and/or the closure letter are not provided to the ALC as per the schedule indicated in condition “15” and “20”. If the ALC does not receive the reports in a timely manner, a stop work order will be issued.
20. The closure letter must be submitted to the ALC no more than six (6) months after the completion of the Proposed Fill Placement Activities and no later than **April 27, 2021**.

Security Deposit

21. To ensure the successful reclamation of the Proposed Fill Placement area and appropriate oversight should you cease to consult with a qualified registered professional, a security deposit in the amount of \$8,000 has been posted with the Minister of Finance c/o the Agricultural Land Commission ALC and received by the ALC on July 27, 2020. The security deposit is to ensure the Proposed Fill Placement Activities are conducted in accordance with the information submitted with the NOI and the conditions of this decision;

For greater clarity, some or all of the security deposit will be accessible to and used by the ALC upon the failure of the operator to comply with any or all aspects of the conditions of approval contained herein.

Release of the security deposit will be dependent on receipt of evidence that the Proposed Fill Placement Activities are completed to a standard deemed satisfactory by the ALC. In this regard, the ALC will consider the status reports and final letter that must

be prepared by a qualified registered professional and submitted to the ALC in fulfillment of condition "15" and "17";

DECISION TERM

The Proposed Fill Placement Activities must be completed by **October 27, 2020**.

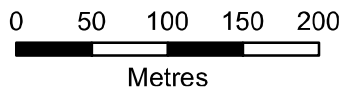
NOTE: Unless the ALC first approves an NOI made under section 20.3(5) of the *Agricultural Land Commission Act (ALCA)* as described in the cover letter, proceeding with the Proposed Fill Placement Activities other than in accordance with the above limits and conditions contravenes the ALCA and is subject to compliance and enforcement measures under sections 49-54 of the ALCA.

This approval does not relieve you of your obligation to comply with all applicable Acts, regulations, bylaws of local government, and decisions and orders of any person or body having jurisdiction over the land under an enactment.



ALC FILE NO: 60660	
MAP PRODUCED: July 24, 2020	
MAP SCALE: 1:5,000	MAP BY: BM
DATA SOURCES & NOTES: ALC, BCGW and City of Kelowna. Contains information licensed under Open Government License - British Columbia.	
Map for reference only. Accuracy not guaranteed.	

- Subject Property (840 & 950 Curtis Rd, Kelowna, BC)
- Previously Approved Fill Placement Area
- Approved Fill Placement Area (Total 1.2 ha)
- Agricultural Land Reserve
- PMBC Parcel Cadastre





PROVINCIAL AGRICULTURAL LAND COMMISSION

REMOVAL AND/OR FILL PLACEMENT PROPOSALS CRITERIA FOR TECHNICAL REPORTS SUBMITTED BY CONSULTANTS

The Agricultural Land Commission (ALC) requires consistency in the quality and format of technical reports submitted to the Commission by applicants (owners) and their agent(s). The ALC requires a technical report containing the following information for all resource extraction and/or fill placement proposals.

All reports must follow the criteria for field work and reporting as established in Policy P-10 Criteria for Agricultural Capability Assessments (attached).

LAND REHABILITATION REPORTS FOR SOIL REMOVAL OR FILL PLACEMENT

All technical reports submitted in support of applications and/or notices of intent involving land rehabilitation must meet the general requirements listed above and contain the following:

- A detailed soil survey and agricultural capability analysis of the land(s) under application, including potential soil bound crop options, and any affected or potentially affected neighbouring properties at an appropriate scale (see Policy P-10).
- All existing resource information such as government soil survey and agricultural capability mapping must be included and discussed in the context of the detailed survey.
- An inventory and description of existing land use on the subject land(s) and surrounding lands must be included.
- An assessment of existing surface and subsurface drainage conditions on the subject land(s) and surrounding lands should be included. In particular, possible drainage improvements apart from the proposed works must be assessed.
- A detailed operating and reclamation plan must be prepared and include, but not be limited to, the following elements:
 - a) plans and cross-sections showing existing conditions, interim and final grades, and slope gradient (%) drawn at an appropriate scale and prepared by a Professional Engineer or Registered BC Land Surveyor;
 - b) a topsoil management plan addressing stripping, storage and replacement issues;
 - c) an operating, phasing and rehabilitation plan for the interim non-farm use activity;
 - d) fill certification procedures and site control measures to ensure that only clean soil material is accepted at any site proposed for import of soil from off site;
 - e) erosion control measures;
 - f) weed management plan;
 - g) plan for crop/vegetation establishment;
 - h) detailed drainage plans for the rehabilitated site to ensure optimum surface and subsurface drainage conditions;
 - i) schedule of monitoring procedures and reporting;

- j) final proposed agricultural capability; and
 - k) closure procedures and certification of the work.
- 1.2 A discussion of any agricultural improvement to the land, or any loss of opportunity, which might be attributable to the proposed works described in the report.



**Agricultural Land
Commission Act**

Policy P-10

October 2017

CRITERIA FOR AGRICULTURAL CAPABILITY ASSESSMENTS

This policy is intended to provide information for professional agrologists submitting agricultural capability assessment reports (a “Report”) as part of an exclusion, subdivision, non-farm use application, or as required through a compliance and enforcement action to ensure that they: 1) are providing sufficient information and evidence to support their assessment; 2) are qualified to complete this work; and 3) perform their work on the Reports in accordance with the Code of Ethics of the British Columbia Institute of Agrologists (the “Code of Ethics”). The submission of a Report as part of an application is optional; however, one is recommended if low agricultural capability is the primary reason for the application.

CRITERIA FOR FIELD WORK AND REPORTING:

A detailed soil survey must be completed in order to support the agricultural capability assessment and to confirm or revise existing published capability mapping. The soil survey must be conducted at a Survey Intensity Level 1 (in accordance with the Soil Inventory Methods of BC) at a density of one detailed test pit for every one to five hectares. The surveyor must use their discretion in the field to determine how many test pits are required to accurately assess the site. Detailed test pits must include the following information:

- Horizon designations
- Horizon depths
- Colour (Munsell Colour Chart)
- Texture
- Structure
- Consistence
- Coarse fragment content by percent volume for gravel, cobbles and stones
- Presence and depth of mottles (size, abundance, colour)
- Drainage class
- Rooting depth/root restricting layer

Other information that must be collected as necessary includes:

- laboratory data to revise fertility ratings and salinity;
- clinometer readings for slope gradients; and,
- revisions to soil moisture deficits that are supported by local climate data and evapotranspiration rates corrected for site specific texture and coarse fragment content

Test pits must be excavated into the C horizon or to auger refusal. The surveyor must include a soil profile photograph with each test pit (including a tape measure for scale) as well as a landscape photo of the test pit area.

The Report must include a map indicating the location of the test pits and any new capability delineations not previously mapped (polygons). If the site has multiple agricultural capability ratings, the Report must also include a table of the unimproved and

improved agricultural capability ratings and area in hectares of each polygon. The Report must provide a discussion of crop suitability as well as non-soil bound agricultural suitability (e.g., greenhouses, poultry barns). Soil survey information and photos for each detailed test pit must be appended to the Report.

If any agricultural limitations are not considered improvable due to site specific considerations, the Report must provide evidence to support this claim. For example, if access to irrigation water is an issue that may limit agricultural capability of a property, the agrologist must calculate the agricultural water demand for a suitable crop compared to available water from various water sources. The Commission considers surface water licences, groundwater, dugouts, and purchasing water from water licence holders as viable options. If these are not considered viable, the agrologist must provide sufficient evidence as to why it is not.

Other information provided in the Report beyond these requirements is considered supplemental to the agricultural capability assessment. Examples of additional information include economic feasibility studies, planning considerations, access to markets, etc.

QUALIFICATIONS:

Agrologists who are submitting Reports to the Commission must provide a bio of their qualifications. The minimum requirements include:

- a bachelor's degree in Agriculture (preferred soils), physical geography, geology, civil or geological engineering, or equivalent;
- completion of upper level courses in agriculture and soil survey/soil genesis;
- completion of at least two full field seasons working under the supervision of a soil surveyor/pedologist;
- demonstrated knowledge of soil survey, soil mapping and agricultural capability classification according to the established methodology (see Methods below);
- registration with the British Columbia Institute of Agrologists in at least one of the following areas of practice:
 - soil and land conservation, reclamation planning and management;
 - soil and terrain classification, mapping and land evaluation; or,
 - arable land evaluation, conservation planning and management.

If the agrologist is unsure if they meet these minimum requirements or believe they have other training/education than those listed above, they should contact Commission Staff.

Reports will be reviewed by the Commission Staff for consistency with these requirements. Any Reports that are deficient in information may be sent back to the author for revision or may not be given the same weight as compliant Reports. The application will be put on hold while the Report is being revised.

CODE OF ETHICS:

It is extremely important that Reports not only comply with the requirements set out above but also that Reports must comply with the Code of Ethics. In particular, the following sections of the Code of Ethics are relevant and important:

1) Section 1

“In discharging their responsibilities to the public, members must:

- (f) ensure that they distinguish between facts, assumptions and opinions in the preparation of reports or other materials; and

- (g) ensure that they clearly state that a report or other materials constitutes an opinion and identifies the limitations within which the opinion is provided.
- 2) Section 2
 - “In discharging their responsibilities to the public, members must:
 - (f) decline any retainers, employment or assignments that would give rise to a conflict of interest.
 - 3) Section 3
 - “In discharging their responsibilities as expert witnesses before courts and tribunals, members must:
 - (e) ensure that they provide an objective expert opinion and not an opinion that advocates for their client or employer or a particular partisan position.”

The Commission is a “tribunal” under the *Administrative Tribunals Act*.

Members should be aware that, all else being equal, Reports that, in the opinion of the Commission, are not compliant with the Code of Ethics will not be given the same weight as Reports that are compliant with the Code of Ethics. This may adversely affect the application for which the Report has been prepared.

TERMS:

Agricultural capability assessment – means an assessment conducted as per the Land Capability Classification for Agriculture in BC (Kenk, 1983) to determine, confirm, or reassess the agricultural capability classification rating of agricultural land.

METHODS:

Agricultural Capability

Kenk, E. 1983. Land Capability Classification for Agriculture in BC. MOE Manual 1. Ministry of Environment. Victoria.

RAB. 1972. Climatic Capability for Agriculture in BC. Resource Analysis Branch Technical Paper 1. Province of BC. Victoria.

Soil Classification and Survey

Agriculture Canada Expert Committee on Soil Survey. 1987b. Soil Survey Handbook- Volume 1. Land Resource Research Centre, Contribution No. 85-30. Technical Bulletin 1987-9E. Agriculture Canada, Ottawa.

Agriculture and Agri-Food Canada, Soil Classification Working Group. 1998. The Canadian System of Soil Classification. Agriculture Canada. Research Branch. Ottawa.

Luttmerding, H.A., D.A. Demarchi, E.C. Lea, D.V. Meidinger and T.Vold (eds.). 1990. Describing Ecosystems in the Field - 2nd. Edition. MOE Manual 11, Ministry of Environment and Ministry of Forests. Victoria, B.C. 213pp.

Mapping Systems Working Group. 1981. A Soil Mapping System for Canada: Revised. Land Resource Research Institute, Contribution No. 142. Agriculture Canada, Ottawa. 94 pp.

Resources Inventory Committee. 1995 Soil Inventory Methods for British Columbia.

APPENDIX B: Agrologist Report by Pearl Agricultural Consulting



Site Assessment – 840 Curtis Road, Kelowna, BC

Soil samples were taken on the agricultural property at 840 Curtis Road by Pearl Agricultural Consulting, Inc. During the site visit, the hay fields on the north-east portion of the property were walked by the Agronomist and three soil samples for chemical analysis were taken. Please refer to the attached map to see the location of the samples, labelled as 1. Top Hill North, 2. Middle Hill and 3. Bottom Low on the report. The following report provides a summary of the key findings from the soil samples.

Site and Soil Management

My general observation is that there is potential for the sloped land represented samples (1-2) to be utilized for tree fruit production – including apple or cherry production. The success of this area depends largely on climactic factors, especially the risk of spring frost. Frost could potentially be mitigated through the choice of later blooming cultivars, the installation of wind machines or crop covers; however, these measures do not guarantee a crop under all circumstances. The other risk to be aware of in the heavier Glenmore soils is the potential for a higher risk of winter injury in that the heavier soils may hold more water and nutrients, making it difficult to achieve full winter dormancy prior to fall frost.

Another important factor to note is the potential for high ground water. To this effect, the lower portion of the field (represented by sample 3) appears to be less than ideal for tree fruit production. The soil was observed to be heavy texture and already saturated with water, even following a drought year. It is my opinion that cherry trees would struggle to grow and establish in the heavy, wet soil. The low area would also be a difficult site for other tree fruits likely leading to lower than desired tree establishment, a higher risk of fungal pathogens and ultimately less than desired yields.

In general, the soil samples indicate an acceptable presence of organic matter for tree fruits (2-3 % organic matter is generally accepted as adequate). The soil pH is higher than desired for tree fruit production. Our general target is a soil pH 6.8-7.2. Interestingly, the soil sulfur content is also high, which is generally the nutrient that would be used to drop the pH level. The soil samples also indicate that in general phosphorus and nitrogen are limiting in these samples. Soil boron is also limited for tree fruits and an application to amend this micronutrient would be recommended.

Organic Matter

Generally, for orchard soils I like to work with a minimum of 3% organic matter on the soil chemical analysis. The samples range from 2.3-3.8% organic matter. It would appear as though horses were likely present in the top-middle of the paddock at one time, contributing manure to the area and increasing the general organic matter content.

If the site is to be planted in tree fruits, you could plan to incorporate up to 1 T per acre prior to planting or topdressing after planting with 3-4 inches of compost or composted manure. Some examples of products, other than what may be available on site are: Glenmore Gro or Corfe's chicken manure compost – very smelly! The addition of soil organic matter will provide for an increase in biological activity in the soil and increase the availability and efficiency of these nutrients.

Soil pH

Generally, the soil pH is alkaline which would normally be addressed through additions of sulfur; however, the sulfur levels in Samples 1 and 3 are already reasonably high. If the paddocks have long been



un-irrigated, perhaps starting with irrigation of the blocks and monitoring soil pH after a lighter application of Sulfur would be a good starting point. The optimum soil pH for cherry production is 6.8-7.2. Other also tree fruits perform well in pH close to 7.

Soil Boron

Boron levels are consistently low across the three samples. I would recommend a soil boron application prior to or at planting. This can be done using a granular or sprayed application post planting. It is generally easiest to apply boron through fertigation or to use the weed sprayer to drench the soil with 10-12 lbs of Solubor (20% Boron) per treated acre. Soil boron applications may need to be revisited every 2-3 years, depending on results of the future soil analysis.

Phosphorus

Phosphorus is an important nutrient for root development, especially in new orchard plantings. The soil report indicates that all samples are relatively low in available phosphorus and most fertilizer phosphorus is insoluble. This can be amended by considering high phosphorus fertilizer at the time of planting. Using 11-52-0 in the planting holes or trench is helpful to establishing young trees. Post planting, it may be beneficial to revisit the soluble phosphorus applications made with 10-52-10 or a similar, soluble fertilizer blend. Generally soluble phosphorus fertilizer is most efficiently used in warm soils of at least 8-10 degrees Celsius.

Nitrogen

There are several ways to increase nitrogen prior to planting an orchard, including applications of manure and/or compost, as previously discussed or by sowing a legume cover crop for green manure. A mix of red clover, rye grass and vetch has been successfully used as a green manure crop prior to planting orchards in the area. Otherwise, applications of chemical fertilizer post-planting are recommended. Depending on the crop planted you may need up to 50-60 lbs of actual N per season while growing the trees, and potentially more depending on the crop yield at maturity.

Sample 3

The chemical analysis and in-field observations make the area where the soil in Sample 3 was taken undesirable for planting tree fruits. The organic matter is relatively low and the pH is too high – combined with already high sulfur values and extremely high sodium values, it would appear that this soil is sodic or “alkali” soil, which can prove difficult to remediate for cropping. The characteristics of a sodic soil are soils saturated with water below the surface while the top is found to be dry and hard. This was my observation of much of the land near the pond and roadway at the east end of the property. It is strongly recommended to avoid planting fruit trees in this area.

Molly Thurston, MSc, P.Ag.



Lake Country, BC, Canada



(250) 864 - 8640



mollyadairthurston@gmail.com

840 Curtis Road, Kelowna B.C.



Soil Samples taken on October 26, 2021:

#1- Top Hill (North)

#2- Middle Hill – in 80' below the cross fence

#3- Bottom Low area

APPENDIX C: A & L Canada Laboratories Inc. Results

Report Number: C21307-10249
 Account Number: 00650

A & L Canada Laboratories Inc.

2136 Jetstream Road, London, Ontario, N5V 3P5
 Telephone: (519) 457-2575 Fax: (519) 457-2664



C21307-10249



To: GROWERS SUPPLY CO
 2605 ACLAND RD
 KELOWNA, BC V1X 7J4

For: PEARL AGRICULTURE/TED BOWERS

Farm: 840 CURTIS

250-765-4545

Grower Code: CE392631

Reported Date: 2021-11-05 Printed Date: Nov 5, 2021

SOIL TEST REPORT

Page: 1 / 2

Sample Number	Legal Land Descpt:	Depth	Lab Number	Organic Matter	Phosphorus - P ppm Bicarb Bray-P1	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	pH	CEC meq/100g	Percent Base Saturations				
									pH Buffer		% K	% Mg	% Ca	% H	% Na
1	Top Hill N	0	18055	3.8	23 M 46 M	342 VH	503 H	3580 H	7.7	23.2	3.8	18.0	77.1		1.4
2	Middle Hill	0	18056	3.8	14 L 21 L	659 VH	560 H	3370 M	8.1	23.6	7.2	19.8	71.4		2.0
3	Bottom Low	0	18057	2.3	13 L 19 L	312 VH	848 H	3210 L	8.5	29.4	2.7	24.1	54.7		18.9

Sample Number	Sulfur S ppm lbs/ac	Nitrate Nitrogen NO3-N ppm lbs/ac	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Soluble Salts mmhos/cm	Saturation %P	Aluminum Al ppm	Saturation %Al	K/Mg Ratio	ENR	Chloride Cl ppm	Sodium Na ppm
1	60 H	14 M	3.5 M	37 H	70 VH	1.7 H	0.7 M		4 M	190	0.0 G	0.21	50		73 H
2	59 M	15 M	2.6 L	70 VH	60 VH	2.3 H	0.7 M		9 H	290	0.0 G	0.36	50		106 VH
3	782 VH	2 VL	2.3 L	54 VH	54 VH	2.3 H	0.6 M		9 H	274	0.0 G	0.11	35		1275 VH

VL = VERY LOW, L = LOW, M = MEDIUM, H = HIGH, VH = VERY HIGH, G = GOOD, MA = MARGINAL, MT = MODERATE PHYTO-TOXIC, T = PHYTO-TOXIC, ST = SEVERE PHYTO-TOXIC

SOIL FERTILITY GUIDELINES (lbs/ac)

Sample Number	Previous Crop	Intended Crop	Yield Goal	Lime Tons/Acre	N	P2O5	K2O	Mg	Ca	S	Zn	Mn	Fe	Cu	B
1	Grass - Hay	Cherry	cwt	0.0	55	40	30	0	0	0	3.0	0	0	0	1.5
2	Grass - Hay	Cherry	cwt	0.0	55	65	30	0	0	0	4.0	0	0	0	1.5
3	Grass - Hay	Apple Trees	600 bu	0.0	60	100	35	0	0	0	5.5	0	0	0	2.0

1 CHERRIES - Nitrogen recommendations are basic guidelines only. Rates may vary with differences in variety, tree age, planting density, soil, etc.

2 CHERRIES - Nitrogen recommendations are basic guidelines only. Rates may vary with differences in variety, tree age, planting density, soil, etc.

* Recs are based on building nutrients to a level to maintain soil health. Banding and/or precision placement techniques can be utilized to increase fertilizer efficiency.

* If this report contains soil in excess of 7500 ppm Ca it may or may not effect the calculated Cation Exchange Capacity. Excessive seed placed fertilizer can cause injury.

The results of this report relate to the sample submitted and analyzed.

* Crop yield is influenced by a number of factors in addition to soil fertility.

No guarantee or warranty concerning crop performance is made by A & L.

Results Authorized By:

Ian McLachlin, Vice President

Report Number: C21307-10249
Account Number: 00650

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Page: 2 / 2

3 APPLES - Nitrogen recommendations are basic guidelines only. Rates may vary with differences in variety, tree age, planting density, soil, etc.

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A&L Canada Laboratories Inc. is accredited by the Standards Council of Canada for specific tests as listed on www.scc.ca and by the Canadian Association for Laboratory Accreditation as listed on www.cala.ca

APPENDIX D: Site Photographs



Photo 1. View facing northeast of proposed fill placement area, with Robert Lake indicated by the red arrow.
(All photos taken August 3, 2022).



Photo 2. View facing north within proposed fill placement area, where fill had been previously placed.



Photo 3. View facing southwest within proposed fill placement area showing horse stables in the background.



Photo 4. View facing north of soil stockpile from which the soil sample was taken.



Photo 5. View facing southeast within proposed fill placement area.



Photo 6. View facing east of standing water with surrounding salt flats, and cattails within the proposed fill placement area.