City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	September 30, 2019
From:	Cecilia Achiam General Manager, Community Safety	**File:**	12-8080-12-01/Vol 01
Re:	**Non-Farm Use Fill Application for the Properties Located 11300 & 11340 Blundell Road (Athwal & Yau)**		

Staff Recommendation

That the Non-Farm Use Fill Application submitted by Mandeep Athwal for the properties located at 11300 and 11340 Blundell Road proposing to deposit soil for the purpose of improving drainage and transitioning to a machine harvest blueberry plantation be referred to the Agricultural Land Commission (ALC) for the ALC's review and decision.

Cecilia Achiam
General Manager, Community Safety
(604-276-4122)

Att. 6

REPORT CONCURRENCE	
ROUTED TO:	**CONCURRENCE**
Engineering	☑
Policy Planning	☑
Sustainability	☑
Transportation	☑
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	**INITIALS:** CJ
APPROVED BY CAO	

Staff Report

Origin

The City of Richmond is in receipt of a Non-Farm Use Fill application submitted by Mandeep Athwal (the "Applicant") for the properties located at 11300 and 11340 Blundell Road (the "Properties"). The intent of the application is to deposit soil for the purpose of improving the current poor drainage on the Properties and "site trafficability to transition from the existing hand-harvest blueberries to a new machine harvest blueberry plantation."

The Properties are situated within the Agricultural Land Reserve (the "ALR") and are subject to provisions of the *Agricultural Land Commission (ALC) Act, ALR Use, Subdivision, and Procedure Regulation* (the "Regulation"), and the City's *Soil Removal and Fill Deposit Regulation Bylaw No. 8094* (the "Bylaw"). The application to deposit soil is considered to be a Non-Farm Use (NFU) by the ALC.

Pursuant to applicable provincial regulations, a NFU soil deposit application requires Council authorization to be referred to the ALC for their review and approval. As such, a NFU soil deposit application must be submitted to the City for review and a decision from Council. Should the application be referred to the ALC and should it subsequently be approved by the ALC, the Applicant would be required to satisfy the City's requirements outlined in the Bylaw before a soil deposit permit would be issued by the City.

The proponent has satisfied all of the City's referral requirements for submission to the ALC.

There are currently no outstanding referrals with respect to soil deposition on or removal from ALR or non-ALR lands.

This report supports Council's Strategic Plan 2018-2022 Strategy #2 A Sustainable and Environmentally Conscious City:

> *Environmentally conscious decision-making that demonstrates leadership in implementing innovative, sustainable practices and supports the City's unique biodiversity and island ecology.*
>
> *2.3 Increase emphasis on local food systems, urban agriculture and organic farming.*

Analysis

The Properties are zoned AG1 (Agriculture). The current zoning permits a wide range of farming and compatible uses consistent with the provisions of the *ALC Act* and *Regulation* and the City's *Official Community Plan* and *Zoning Bylaw*.

The Applicant is proposing to deposit 17,500 cubic metres of soil over approximately 3.5 ha. The soil deposit area will consist of 1.7 ha at 11300 Blundell Road and 1.8 ha at 11340 Blundell Road.

Uses on Adjacent Lots

- To the North: ALR - Land is in agricultural production
- To the East: ALR – Land is in agricultural production
- To the South: ALR – Land is not in agricultural production
- To the West: ALR – Land is in agricultural production

Table 1: Existing Information and Proposed Changes for the Properties

Item	Existing	Proposed
Owner (11300 Blundell Rd)	Keerat Athwal	No change
Lot Size	2.0 ha (4.93 acres)	No change
Owner (11340 Blundell Rd)	Yamie Yau	No change
Lot Size	1.98 ha (4.89 acres)	No change
Applicant	Mandeep Athwal	No change
Authorized Consultant	Eyrne Croquet (Statlu Environmental Consulting)	No change
Land Uses	Properties are currently not in production	Blueberry production
Official Community Plan (OCP) Designation	Agriculture (both Properties)	No change
ALR Designation	Properties are within the ALR	No change
Zoning	AG1 (both Properties)	No change
Riparian Management Area (RMA)	NA	NA

Project Overview

A Fill Placement Plan (the "Fill Plan") has been provided by Eryne Croquet, M. Sc., P. Ag., P. Geo. (Statlu Environmental Consulting). The total project area within the Properties is approximately 3.5 hectares (8.65 acres). Contrary to the Fill Plan, the Properties are currently not in agricultural production as four (4) acres of blueberry plants were removed in 2018 due to disease and damage owing to excessive water. The clearing of the fields occurred after the Applicant had submitted the soil deposit application and the agrologist had provided the initial Fill Plan.

The proposed scope of the project involves placing 17,500 cubic metres of soil (approximately 2,500 truckloads) at an average depth of 50 cm (20 inches) to improve the drainage and machine trafficability. The Applicant has advised that the project will take 2-3 years to complete (not a few months as noted in the agrologist report) as the timeline for completion is heavily dependent on ensuring the appropriate soil is sourced to complete the project as proposed.

The Fill Plan summarizes the following:

- Site description (ie. current soil and agricultural conditions)
- Current and future climate conditions and impacts to the Properties
- Type of soil necessary for project completion
- Project completion recommendations (ie. erosion and sediment control, invasive species management, etc.)
- Post-fill agricultural capability

The Fill Plan underscores the importance of preserving existing topsoil on the site as it will "enhance agricultural capability" post-project completion. The Applicant intends to stockpile surface soil that is to be placed over imported soil. This is similar in practice for the Council endorsed project currently underway at 14791 Westminster Highway (Sixwest Holdings).

Soil sourcing has not commenced at this time due to the considerable period of time involved with respect to the application process and seeking approval from the City and ALC.

Staff Comments

Should the application to the be approved, staff will prepare a comprehensive soil deposit permit (the "Permit") that addresses a number of key areas, including, but not limited to, reporting requirements, invasive species, public safety, drainage, restricting impacts to neighbouring properties and City infrastructure, security deposits, and the permitted hours/days of operation.

Should the Permit be granted by the City, the applicant will be required to take all required measures to prevent sedimentation of any stream, creek, waterway, watercourse, ditch, drain, catch basin, culvert, or manhole either on or adjacent to the Properties. The City has the authority to require that erosion and sediment control measures (ESC) be installed and inspected by a qualified professional prior to soil deposit operations commencing. City staff will also inspect to ensure compliance prior to the importation of any soil. There will be a separate condition within the Permit that requires that such measures be sustained throughout the duration of the project.

The Permit holder will be required to maintain an accurate daily log of trucks depositing soil on the site. At the sole discretion of the City, alternate measures may be required (i.e. survey, etc) in order to determine the volume of soil deposited on the Properties.

As a condition of the Permit, staff will require that the project be monitored by a professional agrologist and that the agrologist provide the City inspection reports every 3,000 cubic metres unless determined otherwise by the ALC or upon request by City staff. Regular reporting will include that the agrologist inspect the soil at the source site(s) and provide a written assessment report prior to delivery to ensure that only the appropriate soil is delivered to the site.

Should an agrologist not be retained or cease providing regular oversight and reporting, the City would reserve the right, as per the Permit conditions, to suspend and/or void the Permit until such time as a new qualified agrologist, agreeable to the City and ALC, is retained to monitor the project and provide regular reporting.

Permit conditions will provide staff the latitude to request a geotechnical report at any time should the Manager of Community Bylaws or designate consider it necessary. Staff will require a closure report from the geotechnical engineer following completion of the project.

In addition to the expected reporting requirements of the agrologist-of-record or other qualified professionals as per the City and ALC, City staff will maintain proactive inspection and enforcement on the Properties that will include the following:

- multiple site inspections per week of the Properties at the onset of the project to ensure conditions of the SDP issued by the City are being maintained;
- weekly site assessments to continue to be undertaken when soil importation is underway to ensure the City's SDP conditions are respected;
- meet on-site with the site supervisor a minimum of two (2) times per month;
- maintain communications with the agrologist-of-record and the project coordinator on a monthly basis;
- review agrologist reports to ensure conditions of the SDP and ALC approval terms are being satisfied; and
- advise the ALC of concerns relative to the project and request that ALC staff undertake inspections to ensure compliance with the approval conditions when deemed necessary.

As per the Permit conditions, the City's security deposit will not be returned until all conditions as stated in the Permit and the ALC approval are satisfied in their entirety, to the satisfaction of the City. This will include confirmation of the project completion via final report from the owner's agrologist-of-record. City staff is to conduct a final inspection and receive confirmation from the ALC that the project has been completed as per ALC approval prior to closing the file.

The City's Flood Protection Management Strategy identifies raising land levels within all areas of the City as a key overall long-term objective, and that the City will strategically encourage land levels to be raised where such raising is proposed to meet other objectives, such as agricultural viability.

Richmond Food Security and Agricultural Advisory Committee (FSAAC) Consultation

The applicant presented the proposal to the FSAAC on September 12, 2019. The Committee unanimously supported the proposal and passed the following motion:

> That the Food Security and Agricultural Advisory Committee support the Soil Deposit Application at 11300 & 11340 Blundell Road as presented, subject to the following conditions:
>
> - Submission of an acceptable farm plan and execution of the farm plan;
> - Site monitoring and inspections as per Community Bylaws requirements;
> - Use of approved alluvial soil; and
> - Performance bond as per Agricultural Land Commission requirements.

Agricultural Considerations

As noted, the proponent provided a Fill Placement Plan (Attachment 1) prepared by a qualified agrologist as required by the City. Subsequent to the FSAAC meeting, the applicant provided a consolidated Farm Plan (Attachment 2) specifying additional detail in regards to the project and a Technical Memorandum (Attachment 3) regarding the FSAAC's condition with respect to alluvial soils.

The Fill Plan outlines the existing site and soil conditions (ie. current land capability). The Fill Plan also provides recommendations regarding how the project should be undertaken. This includes site preparation, monitoring, how to manage existing topsoil (ie. stockpiling plan) prior to importation, acceptable soil required to complete the project and reporting measures. Such recommendations have been reviewed by staff and in some cases will be strengthened within the City issued soil deposit permit should approval be granted.

The agrologist concludes:

> *"if fill placement proceeds, the agricultural capability of the fill area will improve from Class O4WLF, with excess water, degree of decomposition, permeability, and fertility limitations to Class O3."*

The Technical Memorandum provided by the agrologist-of-record outlines how source sites are evaluated and addresses the type of soil necessary to properly complete the project. The memorandum provides an overview of alluvial soils and potential limitations surrounding suitability for this proposed project. As noted by the agrologist-of-record with respect to the FSAAC's comment regarding using approved alluvial soil:

> *"It is possible to impose a condition for soil quality that will respect the desire to use good agricultural soil on a fill site without imposing unintended limitations to successfully completing the project in a timely manner. One method is to focus on physical and chemical properties of the soil to be imported. This method increases the number of potential source sites because it focuses on soil properties that are not dependent on soil parent material types."*

The Fill Plan and Technical Memorandum have been reviewed by an independent consultant, Bruce McTavish (MSc, MBA, PAg, RPBio) on behalf of the City. Mr. McTavish states that the reports have provided sufficient and accurate information regarding the current soil conditions for the Properties and that the proposal satisfies the requirements of *ALC Policy P-10 - Criteria for Agricultural Capability Assessments*.

Financial Costs and Considerations for the Applicant

Due to ongoing and approved development within the City of Richmond and the Lower Mainland, developers and contractors must find a location (the "End Site") that will accept soil that needs to be excavated and removed off-site to facilitate development. Due to such demand, a market has been created in which End Site owners can generate income via tipping fees. Such fees are variable depending on the location, type and volume of soil, and season. Contractors are

willing to pay a premium based on location (the "Source Site") of the soil to the End Site in order to reduce considerable trucking costs.

Although End Site owners derive income due to such tipping fees, soil deposit projects are not without significant costs to the Permit holder. It is anticipated that the applicant may receive tipping fees in excess of $300,000. However, the income derived through tipping fees shall be offset by costs estimated to be in excess of $300,000 due to upfront reporting expenditures, site preparation, project management (ie. soil monitoring), daily personal and machine expenditures, ongoing inspection and reporting, drainage upgrades, and final reporting expenses.

Please refer to Attachment 4 for the table outlining the upfront and estimated future project costs as provided by the Applicant.

Drainage & Geotechnical Considerations

The applicant provided a Geotechnical Report (the "Report") produced by Braun Geotechnical Ltd. and a drainage and grading plan produced by Core Concept Consulting. City Engineering staff have reviewed the drainage and grading plan and the Report (Attachment 5) and are satisfied with the conclusions of the Applicant's qualified professionals.

The Report focuses on current soil conditions and outlines site preparation requirements necessary to ensure the project does not impact neighbouring lands. The Report highlights that due to the proposed 4.5 m setback from property lines, "offsite settlement due to the proposed site filling is not anticipated."

Subsequent to the FSAAC meeting, the Applicant provided an additional Drainage Memorandum (Attachment 6) addressing the construction of berms and the pumping of excess water to improve current drainage conditions.

The memorandum contends that such a proposal is problematic and does not serve to improve the current conditions due to "the current topsoil [having] poor drainage" and the potential for mechanical failure. As per the memorandum, the Applicant proposes to create passive drainage system that:

> *"directs the water from the south end of the site to the storm sewer in Blundell Road to the north. As Blundell Road is higher than the property, the site needs to be raised so that the water that ponds at the south end of the property can drain to the storm system on Blundell Road."*

Environmental Considerations

The Applicant is exempt from an Environmentally Sensitive Area Development Permit (ESA DP) as a farm plan was provided to the City consistent with the exemptions permitted in the *Official Community Plan*. Despite the ESA DP exemption, the ESA designation remains on the Properties. Any future change to the proposed land use may require ESA restoration should the owner decides to stop farming.

Road and Traffic Considerations

Transportation staff have reviewed the proposal. A Traffic Management Plan will be required to be submitted and reviewed by City staff prior to the Permit being issued to ensure site traffic is properly managed and public safety is addressed. The applicant has been advised that Blundell Road has a nine tonne load limit; therefore all trucks entering and exiting site will be required to use No. 5 Road.

Security Bonds

Should the proposal receive approval and permit be granted, the City will require that the applicant provide the following security bonds prior to Permit issuance:

- $5,000 pursuant to s. 8(d) of the current *Boulevard and Roadway Protection Regulation Bylaw No. 6366* to ensure that roadways and drainage systems are kept free and clear of materials, debris, dirt, or mud resulting from the soil deposit activity; and
- $10,000 pursuant to s. 4.2.1 of the current *Soil Removal and Fill Deposit Regulation Bylaw No. 8094* to ensure full and proper compliance with the provisions of this Bylaw and all other terms and conditions of the Permit.

Staff will recommend to the ALC, as a condition of approval, that the applicant be required to post a substantial performance bond in a form and amount deemed acceptable by the ALC. The performance bond should be of a sufficient amount to ensure that all required mitigation and monitoring measures are completed as proposed and to ensure the rehabilitation of the Properties may be implemented in the event the project is not completed. The performance bond will be held by the ALC.

Alternatives to Council Approval

Should Council not authorize staff to refer the proposal to the ALC for their review and decision; the application will be considered to be rejected. Council may add additional recommendations for ALC consideration and/or conditions within a referral to the ALC, similar to conditions already provided within this report.

Financial Impact

None.

Conclusion

Staff is recommending that the Non-Farm Use Fill Application for the properties located at 11300 and 11340 Blundell Road be referred to the ALC to determine the merits of the proposal from an agricultural perspective as the proponent has satisfied all of the City's current reporting requirements.

Mike Morin
Soil Bylaw Officer, Community Bylaws
(8625)

Att. 1: Fill Placement Plan (23 Nov 2018)
2: Farm Plan (07 Oct 2019)
3: Technical Memorandum (28 Oct 2019)
4: Project Cost Table (21 May 2019)
5: Geotechnical Report (05 Dec 2018)
6: Drainage Memorandum (15 Oct 2019)

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FILL PLACEMENT PLAN - REVISED

11300 and 11340 Blundell Road, Richmond, BC

Project Number: 16-102
November 23, 2018

Client:

Jack Of All Trades Inc.
Mandeep Athwal
11300 Blundell Road
Richmond, BC V6Y 1L3

and

Sonic Development Ltd.
Andy Yau
11340 Blundell Road
Richmond, BC V6Y 1L3

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EARTH WATER LAND

CONTENTS

1.0 INTRODUCTION

Statlu Environmental Consulting Ltd. (Statlu) completed an agricultural capability assessment and fill placement plan for two properties located at 11300 and 11340 Blundell Road in Richmond, BC. This report provides an agricultural assessment for the site in the current condition and estimates the effect that the proposed fill placement will have on agricultural capability. It includes recommendations for land filling with the intent of preserving or enhancing agricultural capability. The report was revised in August 2018 to include a more detailed explanation of managing organic soils and to address concerns about fill source sites.

Eryne Croquet, M. Sc., P. Ag., P. Geo., conducted the field work and prepared the report. The soil survey was conducted at a detailed survey intensity level (1:5000 scale or larger) and used soil description terms and methods found in the Canadian System of Soil Classification (1998) and the Field Manual for Describing Terrestrial Ecosystems (2010). Soil survey and agricultural capability assessments are within Ms. Croquet's area of expertise and she has worked on similar assessments in the Fraser Valley since 2008.

The proposed fill project concerns two properties, 11300 and 11340 Blundell Road, in Richmond BC. The plan is to place a total of 17,500 m^3 of agricultural fill over a total of 3.5 ha that covers 1.7 ha at 11300 Blundell Road and 1.8 ha at 11340 Blundell Road. The purpose of fill placement is to improve poor soil drainage and site trafficability to transition from the existing hand-harvest blueberries to a new machine harvest blueberry plantation.

The project is expected to last for a few months although timelines depend upon the availability of good-quality fill. Surface soil from the site will be stockpiled before fill is brought to the site and will be placed over the fill surface to create soil profile that is well suited for soil-based agriculture.

2.0 SITE DESCRIPTION

The proposed fill area covers two properties. The western property is 11300 Blundell Road (PID 004-337-166). It is 1.99 ha (4.93 acres). The eastern property at 11340 Blundell Road (PID 004-337-174) is 1.98 ha (4.89 acres). Both properties are within the Agricultural Land Reserve (ALR), and are zoned AG1, according to the Richmond Zoning Bylaw 8500.

The properties lie on very flat land that was formed by sedimentation by Fraser River, followed by subsequent bog growth. The landscape is characterized by poor drainage that fosters the development of deep organic deposits over mineral sediments.

2.1 Land Uses

Both properties are used for blueberry production. Each property has a house and yard area on the north side, close to Blundell Road.

The properties are surrounded to the west, north, and east by agricultural properties. The property to the south is a City of Richmond Environmentally Sensitive Area. Most of the surrounding agricultural properties are used for blueberry production.

The blueberry plantations on the properties were planted nearly 30 years ago. The plantations were designed for hand-picking and are poorly suited to machine harvesting. Due to changes in the blueberry industry, the owners wish to replant with blueberries that will be suited to machine harvesting. Machine harvesting requires shorter blueberry plants, appropriate row spacing, and trafficable spaces between the rows for machines.

2.2 Landscape and Topography

The landscape is the flat floodplain on the delta formed by Fraser River. The topography is flat with fine-textured floodplain sediments and organic sediments in depressions and in places with poor drainage. The surficial material is up to 8 m of lowland peat overlying fine textured Fraser River floodplain sediment (Armstrong and Hicock, 1976).

2.3 Existing Soils and Land Capability for Agriculture Ratings Maps

Soils in the lower Fraser Valley were surveyed in the 1980s and Land Capability for Agriculture (LCA) ratings were determined for the surveyed area. The soil survey maps were developed from a reconnaissance level soil survey and air photo interpretation and represent a broad interpretation of soils and agricultural capability. Section 3.0 contains a site-specific assessment of the agricultural capability of the property.

The 1981 soil survey (Figure 1) indicates that the soils in the assessment area are Lumbum and Triggs series (Luttmerding, 1980). Both series belong to the Organic order and develop in deep, organic sediments (Luttmerding, 1981). They differ in the degree of decomposition of the organic parent material with Lumbum soils more decomposed than Triggs soils. Lumbum soil is classed as a Typic Mesisol, based on prevalence of partially decomposed organic material in the profile and Triggs are classed as Typic Fibrisol, with undecomposed (fibric) material in the profile.

Both soils are very poorly drained, moderately pervious, have very high water holding capacities, and slow surface runoff. They are limited for agricultural use by high watertables, extreme acidity (pH 3.6 to 4.2), and degree of decomposition. Over-drainage can lead to subsidence and accelerated decomposition of the organic soil. Specialized equipment might be required to cultivate these soils to compensate for their low bearing strength.

The Land Capability for Agriculture (LCA) ratings (Figure 1) describe the general suitability of the land for agriculture (Appendix 1). The classification is 70% Class O4 with excess water and 30% Class O5 with excess water and fertility limitations. The improved classification is 70% Class O3 with excess water and 30% Class O3 with excess water, degree of decomposition or permeability, and fertility limitations

Land in Classes O3 and O4 is considered suited to agricultural uses, with specific management practices to overcome the limitations. Land in Class O5 is not considered well-suited for agriculture because it is either suited to only a narrow range of crops or it requires intensive management to produce crops.

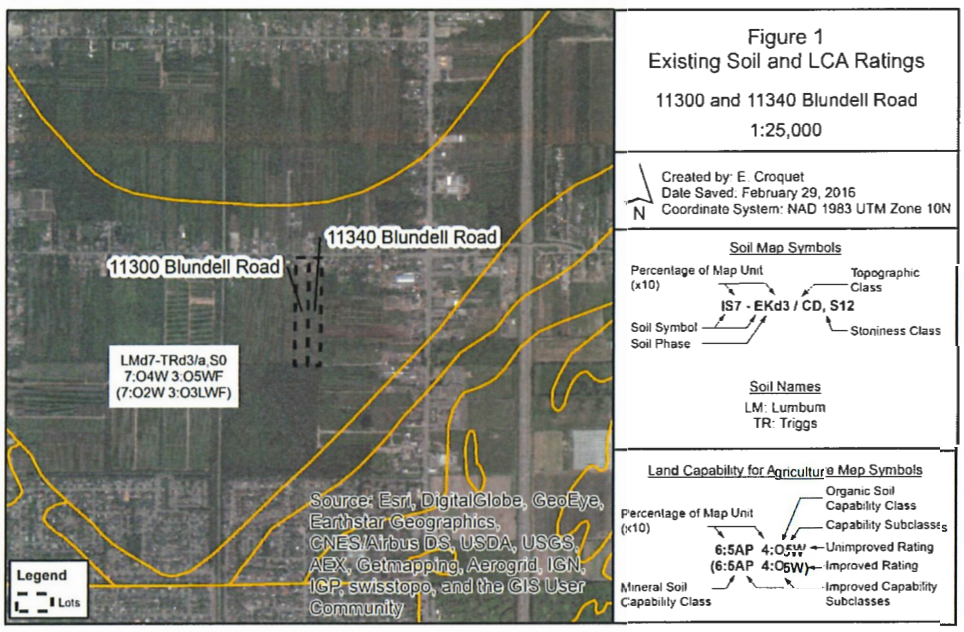

Figure 1: Historic Soil Survey and LCA Ratings Map

The BC Soil Information System[1] is a database that contains soil data used to develop the published soil surveys that includes chemical data that are useful for understanding the fertility limitation for Triggs and Lumbum soils (Tables 1 and 2).

Table 1: Chemical Properties of Triggs Soil

Horizon Designation	Horizon Thickness		CEC (meq/100 g)	Organic C (%)	pH CaCl2	pH H2O	Rubbed Fiber (%)
Of	0	20	158.5	58	2.8	4	80
Of	20	32	163.2	58	2.7	3.7	75
Of	32	62	172.6	58	2.6	3.6	50
Of	62	85	178.5	58	2.8	3.8	50
Of	85	117		58	2.9	4.1	80
Of	117	162		58	3	4.2	50

[1]http://sis.agr.gc.ca/cansis/soils/bc/soils.html

Table 2: Chemical Properties of Lumbum Soil

Horizon Designation	Horizon Thickness		CEC (meq/100 g)	Organic C (%)	pH CaCl2	pH H2O	Rubbed Fiber (%)
Of	0	22	178.5	58.00	2.8	3.3	
Om	22	40	173.9	58.00	2.8	3.4	
Om	40	73	164.7	58.00	2.9	3.3	30
Om	73	95		58.00	3.0	3.6	20
Om	95	125		58.00	3.7	4.2	15
Om	125	162		58.00	4.2	4.5	20

Rubbed fiber and organic matter content are used to classify these soils as Organic and to determine the degree of decomposition of the horizons that comprise the profile. Cation exchange capacity (CEC) is an approximation for nutrient-holding capacity because it describes the capacity of the soil to bind cations. Organic soils have high CEC because of the nature of the organic matter[2]. In addition, they typically have acidic pH. Triggs and Lumbum soils share these chemical characteristics. The fertility limitation is based on the acidic pH, rather than a lack of macronutrients.

[2] http://www.omafra.gov.on.ca/english/crops/facts/93-053.htm#Soil

3.0 LAND CAPABILITY FOR AGRICULTURE ASSESSMENT

I visited the property on April 1, 2016 to describe the soils in four soil pits. The pits were machine excavated and ranged in depth from 63 cm to 90 cm. At each pit, I described the soil profile and made observations about the topography, drainage, and condition of the nearby vegetation. Appendix 2 contains soil profile descriptions, soil photographs, and site photographs. Soil pit locations and Land Capability for Agriculture ratings are shown on Figure 2.

3.1 Soils

Soils in the assessment area have little variability. They developed on very poorly drained partially-decomposed organic deposits. The watertable at the time of assessment was within 35 cm of the surface. The soil classification is Typic Fibrisol because the middle tier of the soil has undecomposed (fibric) horizons. The soil correlates best to the Triggs series.

Organic soils change after long periods of cultivation because the shift from anaerobic to aerobic conditions promotes decomposition of organic matter in the soil, reducing the thickness of the soil and the degree of decomposition of organic matter (Kroetsch et al., 2011). These changes challenge correlating soils observed in the field to the published descriptions. The observed soils most closely match Triggs soil.

3.2 Climate and Climate Change

Climate is an important factor controlling agricultural capability. Climate variables for the property, predicted from the ClimateWNA model (Wang et al., 2012), indicate 10.6 °C mean annual temperature, 1162 mm of annual precipitation, 2258 effective growing degree days (a measure of heat accumulation), a 244 day frost-free period, and a climatic moisture deficit of 219 mm. The climate capability is Class 3A, with a drought or aridity limitation occurring between May 1 and September 30 resulting in a moisture deficit from 116 mm to 190 mm (Coligado, 1980).

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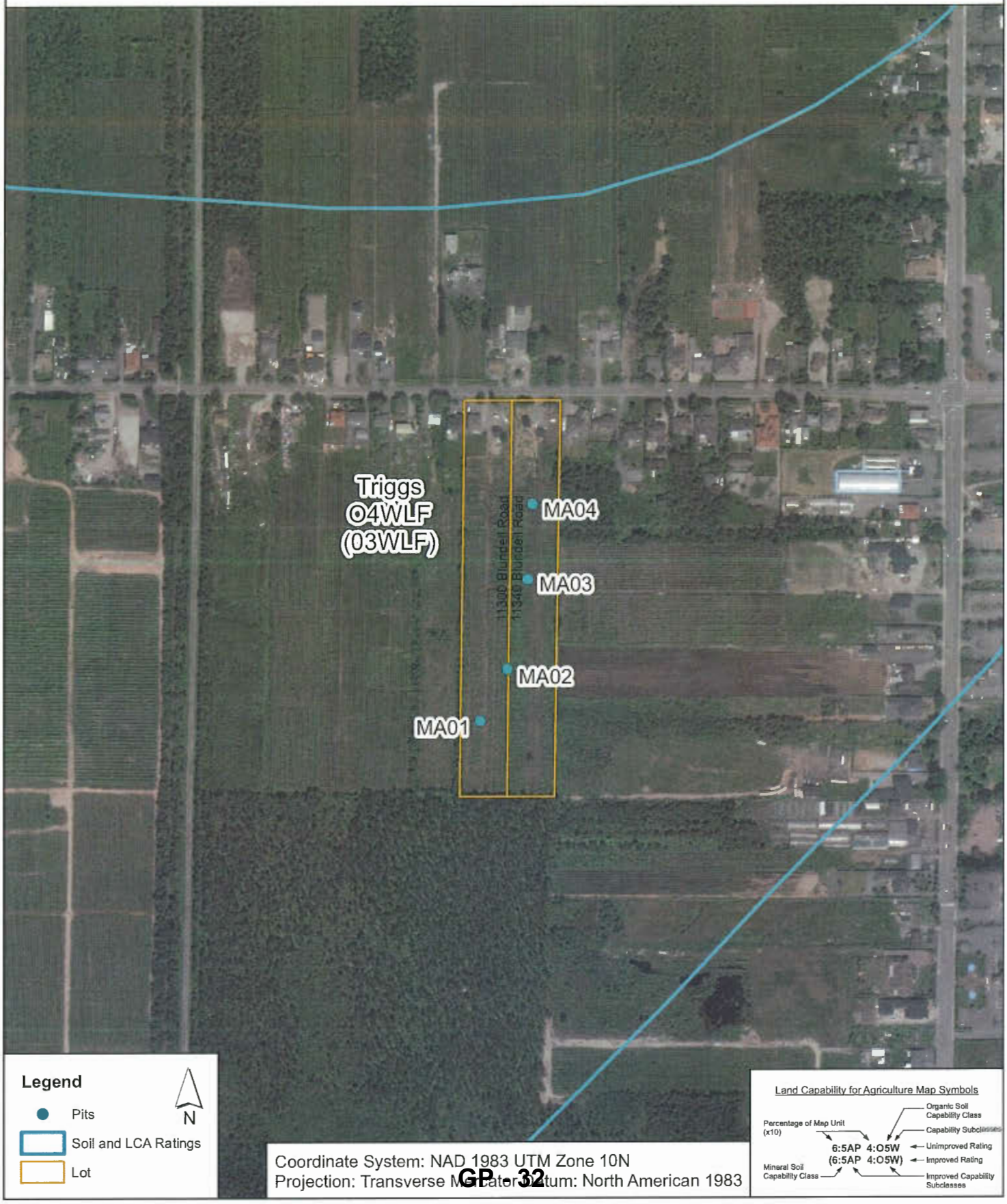
Figure 2: Soil Pits, Soil Types, and Agricultural Capability

11300 and 11340 Blundell Road, Richmond, BC

1:5,000

Project Number: 16-102
Created by: E. Croquet
Date Saved: Apr 29, 2016



Coordinate System: NAD 1983 UTM Zone 10N
Projection: Transverse Mercator Datum: North American 1983

Climate change will alter growing conditions in the future. The most significant changes will be changes to the seasonality of precipitation and increased mean annual temperature (Table 1). These changes will create longer periods of saturation during winter and longer, more intense summer drought. Some of these changes will benefit agriculture, but predicted changes in precipitation patterns will require altering management practices, especially during summer droughts.

Table 1: Summary of Climate Change for Greater Vancouver in the 2020s (PICS, 2012)

Climate Variable	Season	Projected Change from 1961-1990 Baseline	
		Ensemble Median	Range (10th to 90th percentile)
Mean Temperature (°C)	Annual	+1.0 °C	+0.5 °C to +1.4 °C
Precipitation (%)	Annual Summer Winter	+4% -7% +3%	-2% to +8% -16% to +8% -3% to +9%
Snowfall* (%)	Winter Spring	-22% -31%	-42% to -5% -62% to -4%
Growing Degree Days (degree days)	Annual	+225 degree days	+104 to +314 degree days
Heating Degree Days (degree days)	Annual	-334 degree days	-479 to -171 degree days
Frost-Free Days (days)	Annual	+13 days	+6 to +20 days

3.3 Land Capability for Agriculture Ratings

The land capability for agriculture ratings for the assessment area depends on soil and site conditions. I used the *Land Capability Classification for Agriculture in British Columbia* methods to determine LCA classes (Kenk and Cotic, 1983).

The agricultural capability is Class O4WLF, with excess water, degree of decomposition, permeability, and fertility limitations. This classification is based on moderate crop loss observed in the field, the fibric nature of the organic soil, and the acidity of the soil. The improved rating is Class O3WLF, based on draining the site and buffering the soil to raise the pH. There is no practical soil management practice that will improve the decomposition limitation.

4.0 FILL PLACEMENT PROPOSAL

The proposed fill project is to place approximately 17,500 m^3 of fill over the two properties (Figure 3). The fill footprint is 1.7 ha at 11300 Blundell Road and 1.8 ha at 11340 Blundell Road. The properties will receive 8,500 m^3 and 9,000 m^3, respectively. The fill will have an average thickness of 50 cm across the properties. The surface will be graded to create an even, slightly crowned surface that will direct surface runoff away from the growing area towards perimeter drains that connect to the main drainage parallel to Blundell Road at the north property line. The fill will then be capped with topsoil from the site to create a soil profile well-suited for blueberry production.

4.1 Acceptable Fill

Agricultural capability is influenced by soil properties, which increases the importance of using fill that has physical and chemical characteristics that make it suited for agricultural use. It is possible to introduce limitations to agriculture by importing poor quality fill to the site. For example, using stony fill can introduce a stoniness limitation to the site. It is important to consider the agricultural suitability of fill prior to importing it to the site in order to avoid a potential situation whereby adding fill degrades agricultural capability. Specific recommendations for selecting source sites with appropriate soil is described in Section 5.3.

Fill should be selected for properties that will enhance or improve agricultural capability. Therefore, fill should be medium-textured, preferably loam to silt loam, to improve nutrient and water-holding capacity. Fill should be stone-free and should be rich in organic matter. Soils that meet these criteria are generally surface soil (topsoil) from undeveloped or agricultural source sites.

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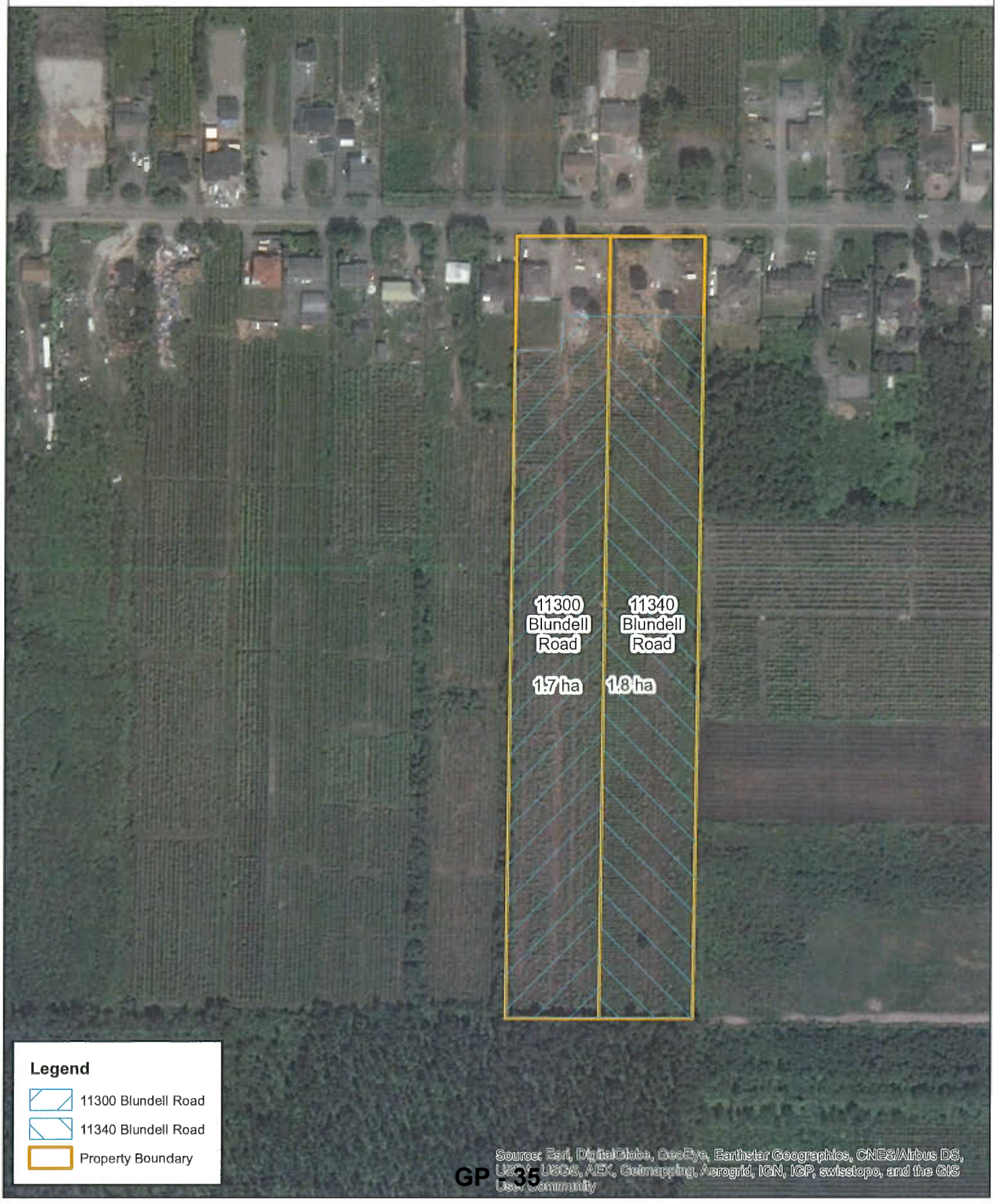
Figure 3: Property Boundaries and Fill Footprint

11300 and 11340 Blundell Road, Richmond, BC

1:2,500

N

Project Number: 16-102
Created by: E. Croquet
Date Saved: Dec 4, 2017



All soils imported to the site must meet the Soil Standards for Agricultural Land (Column 4 of Schedule 3.1 of Contaminated Sites Regulation[3] of the *Environmental Management Act*). Fill should be free of drywall, cement, asphalt, boards, or other construction debris and must not be contaminated.

Fill should not come from areas that have histories of industrial or commercial land use. If contaminated fill material is brought onto the site, the property owners will assume liability for remediating the site or removing the contaminated material. Statlu takes no responsibility if contaminated fill is found at the site.

4.2 Managing Organic Soil

Organic soil is derived from partially decomposed to undecomposed plant litter that forms when organic debris accumulates at a much higher rate than it decomposes, usually under anaerobic conditions. Organic soils are very poorly drained, acidic, and have low bulk density (Bertrand et al., 1991). These characteristics mean the soil is easily compacted and has very low bearing capacity. When organic soils are exposed to air, they begin to decompose. Cultivation leads to a loss of structure, which leads to subsidence.

Using organic soils for agriculture requires special management to control the rate of decomposition and subsidence. Decomposition and subsidence are managed by allowing the soils to be saturated during the winter. Managing the soil so that the watertable is at about 15 cm during the winter is recommended to minimize decomposition and subsidence while preserving soil structure closer the surface (Bertrand et al., 1991). In addition, no-till or reduced till practice will preserve soil structure, reduce soil exposure to air, and decrease compaction.

[3] http://www.bclaws.ca/civix/document/id/complete/statreg/375_96_07

4.3 Invasive Species Management

Invasive plants are non-native plants that can harm ecosystems[4]. They are fast-growing resilient plants that readily establish themselves on disturbed sites, such as a newly finished fill site. When they become established at a site, they can compete with desired crops for nutrients and water, displace desired vegetation, and increase erosion. They can be introduced in imported fill from an infested source site or from adjacent properties.

Some invasive species are on the noxious weeds list and may require control under the BC *Weed Control Act*[5]. If species on the noxious weeds list are introduced to the site, it will necessary to implement control methods, such as chemical or mechanical treatments. Most of these methods are labour-intensive and expensive. It is best to avoid importing invasive plant species, including noxious weeds, by selecting fill source sites that are free of invasive plants and by ensuring that trucks and other equipment operating on the site are kept clean.

4.4 Erosion and Sediment Control

It is not necessary to install structures to prevent sedimentation because there are no streams or creeks near the proposed fill site. Stockpiled topsoil should be covered to prevent soil loss through wind erosion.

4.5 Topsoil Management

The intended outcome of topsoil management is to preserve topsoil for constructing the final soil profile. Using topsoil from the site at the surface of the final soil profile will preserve or enhance agricultural capability because this soil is organic and is likely to be better in quality than mineral soil brought on site as fill. Stockpiling the existing organic soil to use at the surface of the reconstructed soil profile will allow for creating a constructed soil profile with similar characteristics to the existing soil but with a slightly higher elevation that should reduce the drainage limitation. At a minimum, 35,000 m^3, representing 1 m depth, of the existing

[4] http://bcinvasives.ca/documents/Field_Guide_to_Noxious_Weeds_Final_WEB_09-25-2014.pdf
[5] http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/10_66_85

organic soil, should be stockpiled.

It is important to ensure no topsoil resources are lost to erosion and that topsoil quality is not degraded. Therefore, stockpiled soil should be protected from drying and subsequent wind erosion by covering them with mulch or plastic, or by seeding with a mix of grass and legume seeds. To ensure topsoil does not become compacted, it should be handled only with a moisture content equivalent to field capacity – the moisture content of a soil 24 hours after soils have been saturated.

4.6 Constructed Soil Profile

The constructed soil profile will have 100 cm of the stockpiled organic soil at the surface, underlain by 50 cm of loam to silt loam textured imported mineral soil. This is the profile used to estimate the potential improvement to agricultural capability resulting from fill placement.

Since the existing soil is organic, it is essential to prepare the site before importing any fill. The pre-fill preparation must be removal of at least 1 m of the organic surface soil. The removed soil must be stockpiled to be spread over the graded mineral soil fill to construct an agriculturally-appropriate post-fill soil profile. Placing mineral soil directly over organic sediments can displace the underlying organic sediments. In addition, the organic material has low-bearing strength and will be compacted by overlying mineral soil. For these reasons, placing the mineral fill lower in the soil profile will preserve or enhance agricultural capability at the site.

The mineral soil layer in the constructed soil profile will be less permeable that the underlying in situ organic soil and the overlying placed topsoil, which will create a seasonal perched watertable in the overlying soil. The seasonal perched watertable will serve to reduce decomposition and subsidence in the overlying soil but will reduce agricultural capability when the soil is saturated.

The site is expected to have a similar rooting depth after fill placement because the perched water table will not reach the rooting depth, expected to be at about 30 cm depth after filling, during the dry season. The estimated height of the watertable is based on the observed height of the watertable which creates the root restriction.

Organic soils have limited trafficability because they have low bulk densities and are prone to compaction. It is likely that the soil will be more compacted, compared to pre-fill conditions, after fill placement because the physical manipulation of the soil will break the soil structure. In addition, heavy equipment operating on the fill site to spread soil will increase compaction. These factors mean that trafficability will be slightly better after fill placement, however, trafficability will be similar to current conditions when the soil is saturated during wet winter months.

4.7 Post-Fill Land Capability for Agriculture

The post-fill agricultural capability is estimated assuming that fill placement proceeds according to the plan and that the reconstructed soil profile is as described above. The estimated rating will be Class O3 with degree of decomposition - permeability, fertility, and excess water limitations.

Organic soils are challenging to manage for agricultural production because they need to be saturated to prevent soil loss through subsidence but saturation severely limits plant growth (Bertrand et al., 1991). Elevating the ground surface by 50 cm should reduce the drainage limitation. By placing the organic soil over the imported mineral fill, a perched watertable should be created that will keep the organic soil saturated to reduce subsidence. It is expected that there will be some soil loss through subsidence which will reduce the thickness of the Organic soil over time. The rate of subsidence may be as high as 2.5 cm per year under aerobic conditions (Bertrand et al., 1991). Under anaerobic or partially anaerobic conditions, the rate of organic material decomposition will be reduced and the oxidation of organic compounds is not as complete as under aerobic conditions. The rate of mineralization is 5 to 40 times less under anaerobic conditions. Allowing the soil to be saturated for part of the year will control the rate of soil loss while addressing poor drainage during the growing season.

By creating a landscape with slightly higher elevation, the soil will be raised above the height of the existing watertable. Adding the mineral soil at depth will create a situation where the seasonal water table is high enough to reduce soil loss through subsidence and decomposition while increasing agricultural capability by reducing the severity of the drainage limitation.

Degree of decomposition and fertility limitations are inherent properties of the parent material of the soil. These limitations will not be improved by adding fill although fertility limitations can be improved via other soil management practices.

5.0 RECOMMENDATIONS

5.1 Site Preparation

Before fill is imported to the site, topsoil should be stripped and stockpiled. The site should be inspected by a qualified professional after topsoil is stockpiled but before fill is imported to ensure that an appropriate amount of topsoil is stockpiled and to ensure that stockpiled soil is properly covered.

5.2 Monitoring

Fill placement should be periodically monitored to ensure that it proceeds according to the plan. The intent of monitoring is to ensure the project is adhering to professional recommendations and to document progress at the site.

Monitoring visits will be a mix of random spot checks and visits scheduled to coincide with the following milestones:

1. Prior to importing any fill to the site to ensure that topsoil resources are being adequately preserved;
2. At the approximate mid-point of the project, when approximately 8,500 m^3 of fill has been imported to the site;
3. After all the fill is imported to the site and the fill surface has been graded, prior to spreading topsoil; and,
4. When the stockpiled topsoil is spread at the surface.

5.3 Fill Source Sites

Since it is impractical to identify fill source sites before a potential fill site has all the necessary permits and approvals, source site verification is difficult. Source site suitability is verified using a combination of desktop investigation of maps, reports, and air photos. In some cases, a source site inspection is necessary.

Fill source sites *must* be approved by a qualified professional before fill is imported to the property. Appropriate source sites will have land uses such as agricultural, parkland, undeveloped, or residential. Soil from sites with prior commercial or industrial land uses are not acceptable for importing to an agricultural site.

Source site addresses should be provided to the responsible professional prior to accepting fill to verify the source site land use and to confirm that the soil will have suitable characteristics. If any Phase I or Stage 1 Contaminated Sites reports are available, they should be provided to the monitoring professional before any fill is imported from that location.

It is likely that the City of Richmond will have a permit condition that requires source site inspection arising out of concerns that soil movement is spreading invasive plants such as Japanese knotweed.

5.4 Record Keeping

Accurate and complete records of all fill brought to the site must be kept. The records should include truck counts and information about source sites, including addresses, land use, volume imported, and whether there is an environmental report available. Records will be kept by the fill contractor and will be provided to the professional monitoring the project each month that the site is in operation.

5.5 Reporting

A mid-point (when approximately half of the approved fill volume has been imported to the site) email report should be prepared to provide the Agricultural Land Commission (ALC) and the City of Richmond with an update about the site. The report will describe the progress of the fill operation, the condition of the site, the estimated volume of fill imported, and estimate the volume required to complete the project. It should also provide details about fill source site land uses, addresses, and observations of any field inspected source site.

5.6 Fill Placement

Fill placement can begin after site preparation has been completed and inspected. Imported fill must not be contaminated and it should be:

- Medium-textured (loam);
- Uncontaminated;
- Free of invasive plant species; and,
- Free of construction debris and other non-soil components.

When the required amount of fill has been imported, the fill surface should be covered with the stockpiled topsoil to create a layer, approximately 1 m thick, of soil well-suited for agricultural uses.

6.0 CONCLUSIONS

The proposal is to place approximately 17,500 m^3 of fill over 3.5 ha on two properties located at 11300 and 11340 Blundell Road, Richmond, BC. The intent of fill placement is to improve agricultural use by reducing drainage limitations and increasing trafficability that will aid in transitioning to machine-harvesting for the blueberries.

If fill placement proceeds according to my recommendation, the agricultural capability of the fill area will improve from Class O4WLF, with excess water, degree of decomposition, permeability, and fertility limitations to Class O3 with degree of decomposition-permeability, fertility, and excess water limitations.

7.0 LIMITATIONS

The recommendations provided in this report are based on observations made by Statlu and are supported by information Statlu gathered. Observations are inherently imprecise. Soil, agricultural, hydrological, and drainage conditions other than those indicated above may exist on the site. If such conditions are observed or if additional information becomes available, Statlu should be contacted so that this report may be reviewed and amended accordingly.

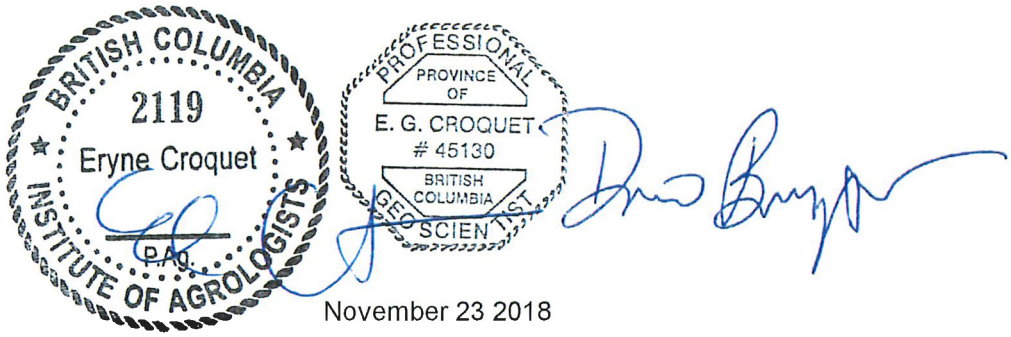
This report was prepared considering circumstances applying specifically to the client. It is intended only for internal use by the client for the purposes for which it was commissioned and for use by government agencies regulating the specific activities to which it pertains. It is not reasonable for other parties to rely on the observations or conclusions contained herein.

Statlu prepared the report in a manner consistent with current provincial standards and on par or better than the level of care normally exercised by Professional Agrologists currently practicing in the area under similar conditions and budgetary constraints. Statlu offers no other warranties, either expressed or implied.

8.0 CLOSURE

Please contact me should you have any questions or if you require further clarification.

Yours truly,
Statlu Environmental Consulting Ltd.



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APPENDIX 1: LAND CAPABILITY FOR AGRICULTURE

This information is summarized from Land Capability Classification for Agriculture in British Columbia (Kenk and Cotic, 1983). It is a classification system developed by the BC government to classify the agricultural land base in terms of suitability for agriculture based on soil properties. It provides pedologists with consistent guidelines for assessing agricultural capability. It is intended for site specific, detailed assessments rather than overview assessments of large areas.

The system classifies mineral and organic soils into one of seven capability classes using easily described soil and landscape factors. The range of suited crops decreases and the management inputs required increase from Class 1 to 7. There are situations where the unique combination of soil, climate, and agricultural practices make land with low capability valuable for agriculture, for example acidic peat soils in the Fraser Valley that are well-suited for growing cranberries or blueberries.

Mineral soils and organic soils are classified in different hierarchies because of the degree of difference in potentials and limitations for agriculture. In general, land in Classes 1 to 4 is suited for agriculture. Class 5 lands support perennial forage crops or specially adapted crops and Class 6 lands are suited for livestock grazing. Class 7 lands are unsuited for agriculture or grazing.

Lands are given two ratings – unimproved and improved. Unimproved ratings are based on actual ground conditions at the time of the assessment. Improved ratings reflect the capability after limitations to agriculture have been alleviated. Examples of common improvements are irrigation, fertilization, drainage, and subsoiling.

LCA ratings for agriculture describes the LCA class and the LCA subclass(es). LCA classes reflect the relative capability for agricultural use and subclasses indicate the type of limitation. When considered together, the class and subclass provide information about the degree and type of limitation to agricultural use.

Land Capability Classes for Mineral and Organic Soils

Class	Description	Management Requirements
Class 1 Class O1	no or very slight limitations that restrict agricultural use	• level or nearly level • deep soils are well to imperfectly drained and hold moisture well • managed and cropped easily • productive
Class 2 Class O2	minor limitations that require ongoing management or slightly restrict the range of crops, or both	• require minor continuous management • have lower crop yields or support a slightly smaller range of crops that Class 1 lands • deep soils that hold moisture well • managed and cropped easily
Class 3 Class O3	limitations that require moderately intensive management practices or moderately restrict the range of crops, or both	• more severe limitations than Class 2 land • management practices more difficult to apply and maintain • limitations may: o restrict choice of suitable crops o affect timing and ease of tilling, planting or harvesting o affect methods of soil conservation

Class	Description	Management Requirements
Class 4 Class O4	limitations that require special management practices or severely restrict the range of crops, or both	• may be suitable for only a few crops or may have low yield or a high risk of crop failure • soil conditions are such that special development and management conditions are required • limitations may: o affect timing and ease of tilling, planting or harvesting o affect methods of soil conservation
Class 5 Class O5	limitations the restrict capability to producing perennial forage crops or other specially adapted crops (e.g. cranberries)	• can be cultivated, provided intensive management is employed or crop is adapted to particular conditions of the land • cultivated crops may be grown where adverse climate is the main limitation, crop failure can be expected under average conditions
Class 6 Class O6	not arable, but capable of producing native and/or uncultivated perennial forage crops	• provides sustained natural grazing for domestic livestock • not arable in present condition • limitations include severe climate, unsuitable terrain or poor soil • difficult to improve, although draining, dyking and/or irrigation can remove some limitations
Class 7 Class O7	no capability for arable culture or sustained natural grazing	• all lands not in Class 1 to 6 • includes rockland, non-soil areas, small water-bodies

Land Capability for Agriculture Subclasses for Mineral Soils

LCA Classes, except Class 1 that has no limitations, can be divided into subclasses depending upon the type and degree of limitation to agricultural use. There are twelve LCA subclasses to describe mineral soils. Mineral soils contain less than 17% organic carbon; except for an organic surface layer (SCWG, 1998).

Subclass	Map Symbol	Description	Improvement
Soil moisture deficiency	A	used where crops are adversely affected by droughtiness, either through insufficient precipitation or low water holding capacity of the soil	irrigation
Adverse climate	C	used on a subregional or local basis, from climate maps, to indicate thermal limitations including freezing, insufficient heat units and/or extreme winter temperatures	n/a
Undesirable soil structure and/or low perviousness	D	used for soils that are difficult to till, requiring special management for seedbed preparation and soils with trafficability problems includes soils with insufficient aeration, slow perviousness or have a root restriction not caused by bedrock, permafrost or a high watertable	amelioration of soil texture, deep ploughing or blading to break up root restrictions cemented horizons cannot be improved
Erosion	E	includes soils on which past damage from erosion limits erosion (e.g. gullies, lost productivity)	n/a
Fertility	F	limited by lack of available nutrients, low cation exchange capacity or nutrient holding ability, high or low pH, high amount of carbonates, presence of toxic elements or high fixation of plant nutrients	constant and careful use of fertilizers and/or other soil amendments
Inundation	I	includes soils where flooding damages crops or restricts agricultural use	dyking

Subclass	Map Symbol	Description	Improvement
Salinity	N	includes soils adversely affected by soluble salts that restrict crop growth or the range of crops	specific to site and soil conditions
Stoniness	P	applies to soils with sufficient coarse fragments, 2.5 cm diameter or larger, to significantly hinder tillage, planting and/or harvesting	remove cobbles and stones
Depth to solid bedrock and/or rockiness	R	used for soils in which bedrock near the surface restricts rooting depth and tillage and/or the presence of rock outcrops restricts agricultural use	n/a
Topography	T	applies to soils where topography limits agricultural use, by slope steepness and/or complexity	n/a
Excess Water	W	applies to soils for which excess free water limits agricultural use	ditching, tilling, draining
Permafrost	Z	applies to soils that have a cryic (permanently frozen) layer	n/a

Land Capability for Agriculture Subclasses for Organic Soil

Organic soils are composed of organic materials such as peat and are generally saturated with water (SCWG, 1998). Subclasses for organic soils are based on the type and degree of limitation for agricultural use an organic soil exhibits. There are three subclasses specific to organic soils. Climate (C), fertility (F), inundation (I), salinity (N), excess water (W) and permafrost (Z) limitations for organic soil are the same as defined for mineral soil.

Subclass	Map Symbol	Description	Improvement
Wood in the profile	B	applies to organic soils that have wood within the profile	removal
Depth of organic soil over bedrock and/or rockiness	H	includes organic soils where the presence of bedrock near the surface restricts rooting depth or drainage and/or the presence of rock outcrops restricts agricultural use	n/a
degree of decomposition or permeability	L	applies to organic soils that are susceptible to organic matter decomposition through drainage	n/a

APPENDIX 2: SOIL PROFILE DESCRIPTIONS AND PHOTOGRAPHS

MA-01 Soil Profile Description

Horizon	Depth (cm)			Description
Op	0	-	16	Black (10YR2/1 m); very strongly decomposed sphagnum, strong, medium subangular blocky structure; friable when moist; plentiful coarse and few fine roots; abrupt, smooth boundary.
Om	16	-	33	Dark brown (10YR 3/3 m); moderately decomposed sedges and reeds; weak, fine platy structure; friable when moist; plentiful coarse and few fine roots; abrupt, smooth boundary.
Of	33	-	56	Dark yellowish brown (10YR 3/6 m); almost undecomposed sphagnum with 10% to 20% hard wood fragments; plentiful coarse and very few, fine roots, abrupt, smooth boundary.
Of	56	-	90+	Dark brown (10YR 3/3 m); almost undecomposed sedges and reeds; friable when moist.

Typic Fibrisol. The watertable is at 33 cm in the pit.

Comments

- The vegetation is a 30 year old blueberry plantation.

MA-02 Soil Profile Description

Horizon	Depth (cm)			Description
Op	0	-	12	Very dark brown (10YR 2/2 m); almost completely decomposed; few fine roots; abrupt smooth boundary.
Om	12	-	22	Very dark grayish brown (10YR 3/2 m); moderately decomposed sedges and reeds; few fine roots; abrupt, smooth boundary.
Om	22	-	46	Very dark grayish brown (10YR 3/2 m); strongly decomposed sphagnum; abrupt smooth boundary;
Of	46	-	75+	Dark yellowish brown (10YR ¾ m); almost undecomposed sedges and reeds.

Typic Fibrisol.

Comments

- Watertable at 32 cm.
- Rooting depth 27 cm.

MA-03 Soil Profile Description

Horizon	Depth (cm)			Description
Op	0	-	12	Black (10YR 2/1 m); few coarse roots; abrupt smooth boundary.
Of	12	-	34	Dark yellowish brown (10YR 3/6 m); slightly decomposed sphagnum; few coarse and plentiful fine roots; abrupt smooth boundary.
Of	34	-	63+	Dark brown (10YR 3/3 m); weakly decomposed sedges and reeds; few coarse roots.

Upper horizons of a Typic Fibrisol.

Comments

- Pit is located in the driving area between roads.
- Sawdust added at surface to build the road.

MA-04 Soil Profile Description

Horizon	Depth (cm)			Description
Op	0	-	21	Black (10YR 2/1 m); very strongly decomposed plentiful fine and few coarse roots; abrupt smooth boundary.
Om	21	-	47	Dark brown (10YR 3/3 m); moderately decomposed sedges and reeds; few fine roots; friable when moist; gradual smooth boundary.
Of	47	-	84+	Dark brown (10YR 3/3 m); very weakly decomposed sphagnum; few fine roots.

Typic Fibrisol, similar to the Triggs soil series.

Comments

- Rooting depth is 47 cm.
- Watertable at 56 cm.

Site photos. Photo 1 is the view north from the access road that approximately follows the boundary between the two properties. Photo 1 is the view south. Note water pooling on the road and the tracks left by the mini-excavator used to dig the soil pits. The height, age, and spacing of the blueberries leaves them unsuited to mechanical harvesting.

Farm Plan for 11300 and 11340 Blundell Road
Prepared by: Mandeep Athwal

1) A Site Plan

Please see Schedule "A" attached, which details the site plan.

2) A Site Description

The proposed fill area covers two properties. The western property is 11300 Blundell Road and is 1.99 ha (4.93 acres). The eastern property is 11340 Blundell Road and is 1.98 ha (4.89 acres).

The Properties lie on very flat land that was formed by sedimentation by Fraser River, followed by subsequent bog growth. The landscape is characterized by poor draining that fosters the development of deep organic deposits over mineral sediments.

3) Legal Description

11300 Blundell Road is legally described as L 7 SEC 24 BK 4 North R 6 W New Westminster District Pl 4179 – PID 004-337-166.

11340 Blundell Road is legal described as L 8 Sec 24 BK 4 North R 6 W New Westminster District Pl 4179 – PID 004-337-174

4) Zoning and Current Land Use

Both properties are within the Agricultural Land Reserve ("ALR"), and are zoned AG1, according to the Richmond Zoning Bylaw 8500.

Both properties were used for blueberry production, however, with the changes in the blueberry industry, the owners had to pull out all their blueberry bushes. The reason being, the blueberry bushes were planted nearly 30 years ago and were not suitable for machine harvesting, which requires shorter blueberry plants, appropriate row spacing, and trafficable spaces between the rows for machines. As such, the lands are not in use at this time.

5) Soils Description and Unimproved Agricultural Capability

Soils in the assessment area have little variability. They developed on very poorly drained partially-decomposed organic deposits. The waterable at the time of assessment was within 35 cm of the surface. The soil classification is Typic Fibrisol because the middle tier of the soil has undecomposed (fibric) horizons. The soil correlates best to the Triggs series. Both soils are poorly drained, moderately pervious, have very high water holding capacities, and slow

surface runoff. They are limited for agricultural use by high watertables, extreme acidity (pH 3.6 to 4.2), and degree of decomposition.

The Land Capability for Agriculture ("LCA") for the unimproved lands is classified 70% Class O4 with excess water and 30% 05 with excess water and fertility limitations. The agricultural capability is Class O4WLF, with excess water, degree of decomposition, permeability, and fertility limitations.

6) Soil Management Rationale/Improved Agricultural Capability

The improved LCA classification is 70% Class O3 with excess water and 30% Class O3 with excess water, degree of decomposition or permeability, and fertility limitations. The improved agricultural rating is Class O3WLF, based on draining the site and buffering the soil. There is an estimate that the Class may hit Class O2.

7) Recommended Agricultural Uses and Suitable Crops

The current status of the soil is Class 04 which comes with limitations that require special management practices or severely restrict the range of crops, or both. The soil, in it's current state, is only suitable for a few crops, has low yield and a high risk of crop failure. The soil is such that special development and management conditions are required.

After the proposed project, drainage fixes and soil development, the soil should improve to Class 03 which is a soil that requires moderately intensive management practices or moderately restricted crops.

8) Proposed Agricultural Plan Including:

a. Drainage Requirements/Rationale

The lands need upgraded drainage in order to allow the water to seep out of the soil. The soil will be graded to create an even, slightly crowned surface that will direct surface runoff away from the growing area towards perimeter drains that connect to the main drainage parallel to Blundell Road at the north property line.

b. Irrigation Requirements/Rationale and Water Sources

An irrigation system is not required, as the soil already contain excess water that needs to be drained.

c. Proposed Agricultural Operator

J & K Farms who have been in business for over 35 years. They are the owners and operator of 11300 Blundell Road.

d. Proposed Planting Plan with a site plan

We are going to plant blueberries in rows running north to south leaving 10 feet between rows for machine cultivation and 30 feet at the end of the rows for the machine to turnaround.

e. Agricultural Improvement Cost Estimate (including material costs, drainage costs, irrigation costs and installation costs)

So far in total the amount of $76,706.69 has been spent which includes monies spent on this application, drainage improvements, and professionals. We are expecting to spend another $100,000 in developing the soil tracker app and $250,000 on drainage improvements.

f. Projected Income Statement (5-10 years)

Once the fill project is complete, we will plant all new blueberry crops and they will be in production after 3 years. Once the blueberries are in full production the projected cultivation is 8,000 pounds per acre.

statlu
ENVIRONMENTAL CONSULTING

TECHNICAL MEMORANDUM - REVISED

To: Mandeep Athwal
JACK OF ALL TRADES INC.
11300 Blundell Road
Richmond, BC V6Y 1L3

From: Eryne Croquet, M. Sc., P. Ag., P. Geo.

Date: October 28, 2019

RE: Appropriate Soil Source Sites for 11300 and 11340 Blundell Road Richmond, BC

The Food Security and Agricultural Advisory Committee (FSAAC) of Richmond evaluated a proposal to import 17,500 m^3 of soil to the properties located at 11300 and 11340 Blundell Road in Richmond, BC. The FSAAC moved to support the application with several conditions. One of the conditions was to use approved alluvial soil.

This memo was prepared to discuss the condition to use approved alluvial soil and to expand on the process used for selecting a soil source site. The memo was revised to specify the organic matter content for desirable soils.

Background

The Fill Placement Plan[1] (the Plan) that accompanied the application described the physical characteristics of acceptable soil for importing to the receiving site based on desirable soil properties that would achieve the desired agricultural improvements to drainage and trafficability. Specifically, the desired soil would be medium-textured, preferably loam to silt loam, stone-free, and rich in organic matter. Soils with 10% or more organic matter in the A horizon are rich in organic matter[2]. In addition, the Plan described characteristic land uses for suitable source sites and outlined a process for evaluating soil source sites before any material moves to the receiving site.

[1] Fill Placement Plan – Revised, 11300 and 11340 Blundell Road, Richmond, BC. November 23, 2018. By Statlu Environmental Consulting Ltd.
[2] Acton, D. F., and Gregorich, L. J. 1995. The health of our soils: toward sustainable agriculture in Canada. Centre for Land and Biological Resources Research. Research Branch. Agriculture and Agri-Food Canada. Ottawa ON.

Statlu Environmental Consulting Ltd.
1-45950 Cheam Avenue
Chilliwack, BC V2P 1N6
info@statlu.ca | www.statlu.ca

Approved Alluvial Soil

The FSAAC set the condition to use of approved alluvial soil with their support of the project. No rationale for this condition was provided, but it could be interpreted as a condition imposed with the intent to preserve soil quality and agricultural capability at the receiving site. Using only alluvial soils may work against the intent of preserving the agricultural capability of the receiving site because it may lead to importing soils that lack the appropriate qualities to achieve the objective of improving drainage and trafficability. If the intent of the condition to use only alluvial soils was meant to preserve agricultural capability at the receiving site, it should be reconsidered.

Alluvial soils develop from alluvial parent material. The most recent soil survey for southwest BC[3] does not describe alluvial soils, but it describes several soil series that form on fluvial sediments, including alluvial and alluvial fan deposits. Fluvial sediments have a broad range of textures, including sandy gravelly stream deposits, silty clay deltaic deposits, and silty floodplain deposits.

Soils derived from alluvial parent materials do not necessarily have properties that would make them suitable for use at the Blundell Road site. For example, fine textured alluvial soils, such as silts and clays, can limit water movement through the soil profile. In addition, they are susceptible to compaction, especially when machines operate on them when they are saturated.

Several of the alluvial soil series common in Richmond, including the Blundell and Delta soils, may be limited for agricultural use by subsoil salinity. If these soils were imported to the Blundell Road site, they could introduce a salinity limitation that does not currently exist on the farm.

The soils on the receiving site have not developed from alluvial or fluvial parent material. They are organic with fine-textured underlying mineral sediments. Those are either clayey deltaic, silty floodplain, or clayey glaciomarine deposits.

The condition of using only alluvial soils reduces the number of possible soil source sites. When there are fewer acceptable soil sources, it will take longer to complete the project. Increasing the amount of time necessary to complete a fill project has its own negative consequences. For example, the soil quality of stockpiled topsoil can suffer when it is stored for a long time because there are no organic inputs.

[3] Luttmerding, H. 1981. Soils of the Langley-Vancouver Map Area, Report No. 15, Vol. 3: Description of the Soils, BC Ministry of Environment, Victoria, BC.

It is possible to impose a condition for soil quality that will respect the desire to use good agricultural soil on a fill site without imposing unintended limitations to successfully completing the project in a timely manner. One method is to focus on physical and chemical properties of the soil to be imported. This method increases the number of potential source sites because it focuses on soil properties that are not dependent on soil parent material types.

Source Site Selection

Appropriate source sites are difficult to identify before a fill placement permit is issued because of timing – source sites are ready to move soil faster than receiving sites work through the approval process. That means that source sites must be evaluated as they become available.

Soil source sites *must* be approved by a qualified professional before fill is imported to the receiving site. Appropriate soil source sites will have land uses such as agriculture, parkland, undeveloped, or residential. Soil from sites with prior commercial or industrial land uses are not acceptable because these land uses are more likely to result in contaminated soils.

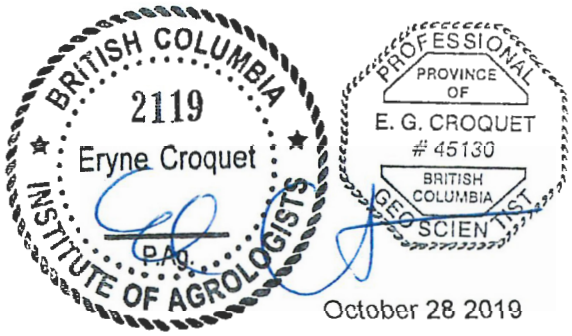
Source site land uses are evaluated by the qualified professional using a combination of desktop investigation of maps, reports, and historic air photos. Source sites may also require on-site inspection. If an unacceptable land use is identified, the source site is rejected. If the source site has a history of acceptable land use, then the mapped soils are evaluated to compare their qualities to the desired qualities at the receiving site. If the source site soils do not match the desired qualities, it is rejected.

Conclusion

The condition restricting to alluvial soils is not be the best method to preserve and/or improve agricultural capability at the receiving site. Using specific physical and chemical soil properties is a better method because it permits selecting soil based on factors related to agricultural capability and may include more potential source sites, which should shorten the amount of time necessary to complete the project.

In addition to soil properties, the source sites will be selected by considering land use to prevent importing contaminated soils or soils that are not well-suited to soil-based agriculture.

Yours truly,
Statlu Environmental Consulting Ltd.



Prepared by:
Eryne Croquet, M. Sc., P. Ag., P. Geo.
Agrologist and Geoscientist
EC/DB/tf

Reviewed by:
Drew Brayshaw, Ph. D, P. Geo.
Senior Hydrologist and Geoscientist

Non-Farm Use Fill Application for the Properties Located 11300 & 11340 Blundell Road (Athwal & Yau)

Project Cost Table	
Ongoing Project Reporting by Agrologist (per 3,000m^3)	**$21,000** (for four reports)
Erosion Sediment Control (ESC) installation	**$11,632**[i]
Source site investigation	**$500** (min) per inspection
Earthworks costs (Project management, on-site Load Inspector, machine/labour, fuel, ESC monitoring/ maintenance)	**$17,600** per week
Drainage upgrades	**$250,000**
Final Topographic survey	**$3,600**
Final P. Ag. closure report	**$5,000**
Final Geotechnical Report	**$6,500**
Project Cost Estimate (Note: does not include upfront costs)	**$297,732***
Upfront Cost to Date	**$44,906****
Potential Tipping Fee Income ($125-$160 per load)	**$312,500 - $400,000 (estimate)**

[i] Installation costs depends on the materials, supplier and the labour used (buying the silt fencing, having labourers install it, repairing it as needed, trucking costs, cost of grass seed, straw bales, etc.)

* Does not include projected costs for earthworks and source site investigations

**Upfront costs include Agrologist report, drainage plan, geotechnical report, topographic survey, soil tracker application and soil testing.

Foundations, Excavation & Shoring Specialists

December 5, 2018

Reference: 18-7918

Via email: duperathwal@gmail.com

Jack of All Trades Inc./Sonic Development Ltd.
11300 Blundell Road
Richmond, BC V6Y 1L3

Attn: Mandeep Athwal

Re: Geotechnical Report
Settlement Considerations – Proposed Farm Filling
11300-11340 Blundell Road, BC

Braun Geotechnical
102 – 19049 95A Ave.
Surrey, BC
V4N 4P3
Tel: 604-513-4190
Fax: 604-513-4195
info@braungeo.com

www.braungeo.com

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Natural Hazards

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Reinforced Soil Walls and Slopes

Rev. Sept 15, 2006

Professional Engineers and Geoscientists of BC MEMBER

1.0 INTRODUCTION

As requested, Braun Geotechnical Ltd. has carried out a geotechnical assessment for the above referenced project. The geotechnical work has been performed in general accordance with the terms and conditions of the Braun Geotechnical Fee Estimate dated November 26, 2018(our reference P18-6143).

The geotechnical work included completion of provision of this geotechnical report with comments and recommendations pertaining to settlement reloated to the proposed filling of the subject site for farming purposes. The subject site is located within an area typically underlain by natural compressible peat and silt soils.

The scope of services was limited to the evaluation of the geotechnical characteristics of the site and no consideration has been given to any environmental aspects. Should any changes be made to the proposed layout, elevations, or general nature of the project, Braun Geotechnical should be notified to review and modify the recommendations to reflect those changes, as appropriate.

2.0 SITE DESCRIPTION & PROPOSED ROAD WORKS

The subject site is comprised of 2 adjoining parcels, 11300 and 11340 Blundell Road, in the City of Richmond, BC. The site rectangular in shape with dimensions of approximately 100 x 405m. The site is relatively flay lying, with existing farmland on the bulk of the properties, and existing Single Family Dwellings (SFD's) and detached sheds/garages and associated driveway/parking and/or landscaped areas within the northern approximately 40 to 50m of the site.

The northern approximately 40 to 50m of the site is approximately 1.0 to 1.5m higher than the remainder of the site, consistent with historical fill placement in this area.

It is understood that general site filling (excluding the northern portion of the site) to raise grades of the farmland is proposed for improved agricultural use. Details for the proposed filling were provided on the Core Concept Consulting Ltd. (Core Concept) drawing "Lot Grading and Drainage Plan – 11300-11340 Blundell Rd.,"

dated October 2018, and Statlu Environmental Consulting (Statlu) report "Fill Placement Plan – 11300 and 11340 Blundell Road, Richmond, BC."

The following is understood based on the Core Concept drawings:

- Raising site grades by approximately 0.5m is proposed, with the crown of fill approximately at the common property line of 11300/11340, and the proposed toe of fill extending to approximately 4.5 of the east, west, and south property lines (excluding within an environmentally sensitive area).
- A drainage ditch would be provided along the east, west, and south limits of the fill, with the drainage ditch draining into existing drainage on Blundell road.
- Permanent slopes of 3H:1V or flatter are proposed.

The following is understood based on the Statlu report:

- Stripping of 1m of existing peat, placement of approximately 0.5m of import fill, and re-placement/regrading of the 1m of peat is proposed.
- Acceptable fill is noted as "medium-textured, preferably loam to silt loam… stone-free and… rich in organic matter."

3.0 EXPLORATION

Two test holes were previously drilled by Braun Geotechnical on 11300 Blundell Road, using a truck mounted solid stem auger drill under subcontract to Braun Geotechnical on December 24, 2012. The test holes were drilled to depths of approximately 6.1m at the locations shown on the attached plan (Dwg. 12-5833-01). The soil conditions were logged in the field by a representative of Braun Geotechnical and representative disturbed samples were collected from the augers for routine laboratory moisture content testing.

4.0 SOIL AND GROUNDWATER CONDITIONS

A review of available published and in-house geological information indicated that the study site area is underlain by natural soils comprised of near surface peat up to 8m thick, over Fraser River sediments comprised of silt & sand.

The findings of the test hole exploration are detailed on the attached test hole logs. A generalized subsoil profile based on the test holes has been summarized below.

FILL
Variable FILL, including grey, moist, loose SAND and GRAVEL with some silt to SAND and SILT with trace gravel, and brown moist, loose HOGFUEL was encountered immediately below existing grade within TH12-01 to a depth of 1.8m.

PEAT
Dark brown, moist to wet, soft to firm, amorphous PEAT with fibrous zones was encountered below existing fill at TH12-01 and below existing grade at TH12-02. The PEAT extended to depths of 3.8 and 2.7m at TH12-01 & -02 respectively.

SILT
Grey, moist, firm SILT with some clay and trace sand was encountered below the peat at TH12-01 and TH12-02 to depths of approximately 5.1 and 4.0m respectively.

SAND
Grey, wet, compact to dense SAND with trace silt, and occasional sandy silt interlayers was encountered below the silt to the depth of test hole exploration at 6.1m.

GROUNDWATER

Groundwater was encountered within TH12-01 and TH12-02 at depths of approximately 2.4 and 0.6m respectively. Note that groundwater levels measured during drilling and shortly thereafter are typically influenced by the disturbance caused during drilling. In general, groundwater levels are expected to fluctuate seasonally, and with drainage conditions.

The subsurface conditions described above were encountered at the test hole locations only. Subsurface conditions at other locations could vary.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

The geotechnical exploration encountered near surface organic/peat soils over firm silt, underlain by natural compact to dense sand. The natural underlying peat and silt would be expected to consolidate and compress when subjected to increased loading from placement of import mineral fill. In particular, the peat soils encountered are considered to be highly compressible, and subject to substantial long term settlement.

The following sections discuss geotechnical aspects of the proposed fill project.

5.2 Site Preparation

Site preparation below the proposed fill placement should include stripping of 1.0m of existing peat, per Statlu recommendations, and placement of fill. The fill should be placed in a uniform 0.5m thick lift. Temporary fill placement of up to 0.6 to 0.7m may be required for construction traffic, so as to not disturb the underlying peat subgrade. Stripping and/or placement of fill should be carried out during seasonally dry periods of the year. Significant pumping/dewatering is not recommended.

The toe of the placed fill should be kept a minimum distance of 3m from any onsite or offsite settlement sensitive areas.

Permanent slopes (3H:1V or flatter, per Statlu) should be temporarily covered with straw or equivalent to reduce potential for erosion, to allow for natural vegetation growth.

Stripped peat should be temporarily stockpiled maximum 3m high, with the stockpile sloped at 1.5H:1V or flatter. The toe of slope of the stockpiled peat should be minimum 3m from any onsite/offsite settlement sensitive areas/structures.

5.3 Settlement Considerations

A typical soil model has been developed for settlement calculation purposes based on available subsurface drill information obtained at the site. A settlement analysis was carried out using the commercially available software program SETTLE3D by Rocscience and was checked using empirical design charts.

Based on the settle analysis, settlements in the order of up to 250mm may occur below the proposed fill, with settlements less than 10mm expected a distance of 3m from the fill. As the site filling is proposed a minimum distance if 4.5m from the property lines, offsite settlement due to the proposed site filling is not anticipated.

Settlement is expected to occur in the years following fill placement at a decreasing settlement rate. If desirable, consideration may be given to placement of an additional 100mm of fill, to allow for some post fill settlement.

6.0 CONSTRUCTION FIELD REVIEWS

Geotechnical field reviews are required by the Geotechnical Engineer to confirm that the recommendations of the geotechnical report are understood and followed. Geotechnical field reviews and materials testing services should be arranged by the Contractor to address the following, as required:

- Review site stripping and confirm suitable subgrade;
- Review of fill placement;
- Review of peat placement.

7.0 CLOSURE

This report should be considered preliminary and is subject to review and revision as required. This report is prepared for the exclusive use of Jack of All Trades Inc., Sonic Development Ltd., and their designated representatives and may not be used by other parties without the written permission of Braun Geotechnical Ltd. The City of Richmond may also rely on the findings of this report.

If during construction soil conditions are noted to be different from those described in this report, Braun Geotechnical must be notified immediately in order that the geotechnical recommendations can be confirmed or modified, if required. Further, this report assumes that field reviews will be completed by Braun Geotechnical during construction.

The site contractor should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions. This report should not be included in the specifications without suitable qualifications approved by the geotechnical engineer.

The use of this report is subject to the Report Interpretation and Limitations, which is included with the report. The reader's attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

We hope the above meets with your requirements. Should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,
Braun Geotechnical Ltd.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
H. DHILLON
39484
Dec 6 2018

Harman Dhillon, P.Eng.
Geotechnical Engineer

Braun Geotechnical Ltd.

Stuart Hrysio, P.Eng.
Geotechnical Engineer

Encl: Report Interpretation and Limitations
Location Plan
Test Hole Logs

x:\2018 projects\18-7918 proposed site filling - 11300- 11340 blundell road, richmond, bc\report 18-7918 2018-12-05.docx

REPORT INTERPRETATION AND LIMITATIONS

1. STANDARD OF CARE

Braun Geotechnical Ltd. (Braun) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

2. COMPLETENESS OF THIS REPORT

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Braun by the Client, communications between Braun and the Client, and/or to any other reports, writings, proposals or documents prepared by Braun for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Braun cannot be responsible for use by any party of portions of this report without reference to the entire report.

3. BASIS OF THIS REPORT

This report has been prepared for the specific site, development, design objective, and purpose described to Braun by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project at described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Braun. Braun cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Braun cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

4. USE OF THIS REPORT

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Braun Geotechnical Ltd. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users." With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Braun. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. BRAUN GEOTECHNICAL LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Braun.

5. INTERPRETATION OF THIS REPORT

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1. These tasks are judgemental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection. As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary

significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.
The Client and "Approved Users" accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.
The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review, or addressed in any other way.
The exploration and Report is based on information provided by the Client or the Client's Consultants, and conditions observed at the time of our site reconnaissance or exploration. Braun has relied in good faith upon all information provided. Accordingly, Braun cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

6. DESIGN AND CONSTRUCTION REVIEW

This report assumes that Braun will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Braun will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Braun's recommendations and generally accepted engineering standards. It is the Client's or the Client's Contractor's responsibility to provide timely notice to Braun to carry out site reviews. The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Braun. Accordingly, it is the Client's or Client's Contractor's responsibility to inform Braun of any such conditions.
Work that is covered prior to review by Braun may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

7. SAMPLE DISPOSAL

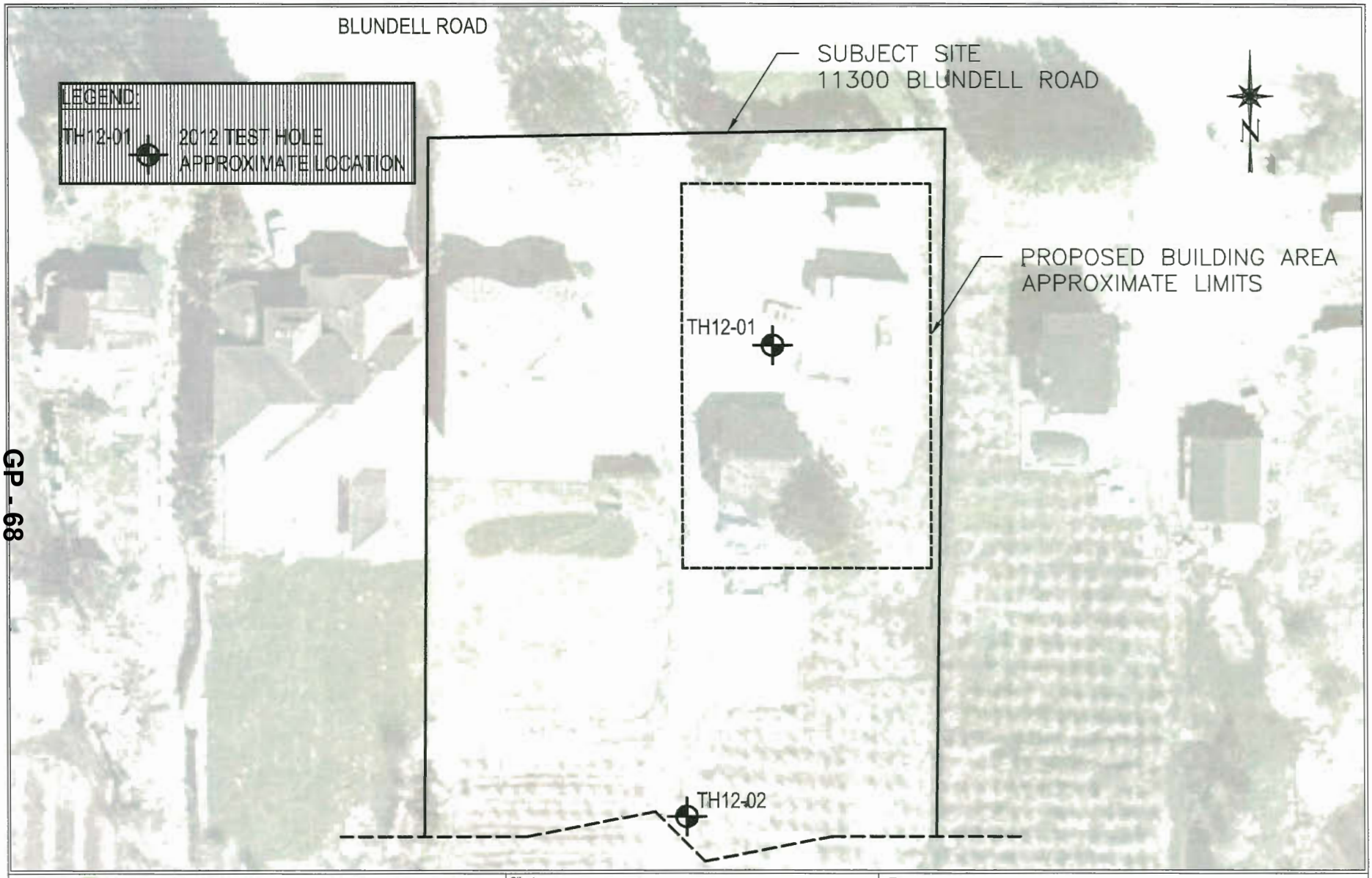
Braun will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client's expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client's responsibility to dispose of them properly.

8. SUBCONSULTANTS AND CONTRACTORS

Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Braun Geotechnical Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client's benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Braun Geotechnical Ltd. from and against all claims arising through such Subconsultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized subconsultants and the use of drilling, excavation and laboratory testing services, and any other Subconsultant or Contractor.

9. SITE SAFETY

Braun Geotechnical Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client's or the Client's Contractors responsibility to inform Braun of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.
Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Braun for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Braun Geotechnical Ltd. will not be a cause for either action or dispute.



GP - 68

BRAUN GEOTECHNICAL LTD.

Client: Mandeep Athwal				Title: LOCATION PLAN			
Project: Proposed Blueberry Processing Facility 11300 Blundell Road, Richmond, BC							
Project no.	Drawn	Design	Checked	Date	Scale	Drawing no.	
12-5833	HD	HD	SH	January 3, 2012	~ 1:500	12-5833-01	

Test Hole Log: TH12-01

File: 12–5833
Project: Proposed Blueberry Processing Facility
Client: Mandeep Athwal
Location: 11300 Blundell Road, Richmond, BC

BRAUN GEOTECHNICAL LTD.

Depth	Sample	Soil Description	Sample #	Water Cont.	Remarks
0 ft / 0 m		grey, moist, loose SAND and GRAVEL, some silt (FILL)			
		brown, moist, loose HOGFUEL (FILL)			
1	○	grey, moist, variable, loose SAND and SILT, trace gravel (FILL)	S1	27%	
5 / 2		dark brown, moist, firm, amorphous PEAT with fibrous zones			Water Level (at time of drilling)
	○	- wet below 2.4m	S2	431%	
10 / 3					
4	○	grey, moist, firm SILT, some clay, trace sand	S3	78%	
15 / 5					
	○	grey, wet, compact to dense SAND, trace silt	S4		
20 / 6		End of Test Hole @ 6.1m			
7					
25 / 8					
9					
30 / 10					
35 / 11					

Equipment: Truck Mounted Auger Rig
Sampling Method: Lump Sample
Hammer Type: N/A

Datum: Ground Surface
Water Depth: 2.4m
Location: See Location Plan

Logged By: HD
Drilling Date: December 24, 2012
Dwg No.: 12-5833-TH12-01
Page: 1 of 1

Test Hole Log: TH12-02

File: 12–5833
Project: Proposed Blueberry Processing Facility
Client: Mandeep Athwal
Location: 11300 Blundell Road, Richmond, BC

BRAUN GEOTECHNICAL LTD.

Depth		Sample	Soil Description	Sample #	Water Cont.		Remarks
0 ft / 0 m			dark brown, moist, soft, amorphous PEAT with fibrous zones - wet below 0.6m				Water Level (at time of drilling)
1		○		S1	554%		
2		○		S2	384%		
3			grey, moist, firm SILT, some clay, trace sand				
		○		S3	61%		
4			grey, wet, compact to dense SAND, trace silt, with occasional sandy silt interlayers				
5		○		S4			
6			End of Test Hole @ 6.1m				
7							
8							
9							
10							
11							

Equipment: Truck Mounted Auger Rig
Sampling Method: Lump Sample
Hammer Type: N/A

Datum: Ground Surface
Water Depth: 0.6m
Location: See Location Plan

Logged By: HD
Drilling Date: December 24, 2012
Dwg No.: 12-5833-TH12-02
Page: 1 of 1

Core Concept
CONSULTING LTD.

220 – 2639 Viking Way
Richmond, BC, V6V 3B7

Tel: 604.249.5040
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www.coreconceptconsulting.com

DRAINAGE MEMORANDUM

CCC Project #18114
15 October 2019

City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Attention: Mike Morin

Regarding: 11300 & 11340 Blundell Road, Richmond, BC

We have reviewed the minutes provided from the Food Security Agricultural Advisory Committee (FSAAC) meeting on September 12, 2019 and one of the primary questions was can the drainage issues be addressed without filling the site with the primary alternative suggested by the council being to berm the blueberry plants and pump the water away. From an engineering drainage stand point, this arrangement is not preferable and problematic as it relies following two conditions to be functional:

1. The site drainage would need to be able to convey through the soils to collect at the pumps

2. Pumping down the water level requires active drainage and monitoring to prevent flooding

As per the environmental report for the fill placement plan, the current topsoil has poor drainage. As topsoil does not have a high percentage of aggregates, there will be little voids for the water to move through the topsoil on the site. Without easy movement of water in the soils, the water will not be able to effectively collect at the pumps to bring the water level down.

The alternative proposed by the FSAAC would require a system of pumps through the property to keep the water level down to a level appropriate for farming. For this system to function, it requires active pumping of site particularly during high storm rainfall events. Any failures in the active drainage system would result in flooding of the low-lying areas. By introducing a mechanical component into a drainage system, you introduce an opportunity for a mechanical failure causing flooding.

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DRAINAGE MEMORANDUM

CCC Project #18114
15 October 2019

To avoid potential problems resulting from a system that requires active monitoring, we have proposed a system to provides passive drainage. The grading design for fill placement directs the water from the south end of the site to the storm sewer in Blundell Road to the north. As Blundell Road is higher than the property, the site needs to be raised so that the water that ponds at the south end of the property can drain to the storm system on Blundell Road.

To create a consistent drainage pattern, we crowned the shared lot line between 11300 & 11340 Blundell Road so that the water runs off towards ditches on the west side of 11300 Blundell and the east side of 11340 Blundell. The ditches run at an average grade of 0.17%. With the minimal ditch grade, we balance out the intermediate high and low grades of the neighbouring property and allow the water to drain towards Blundell without unnecessarily raising the grade of the property.

By raising the site, we are allowing the site to drain passively and creating a permanent solution to the site's drainage issues.

Yours Truly,
Core Concept Consulting Ltd.

Brendan Regier, P.Eng.
Project Manager