City of Richmond

Report to Committee

To:	General Purposes Committee	**Date:**	November 28, 2019
From:	Cecilia Achiam General Manager, Community Safety	**File:**	12-8080-12-01/Vol 01
Re:	**Non-Farm Use Fill Application for the Property Located at 21700 River Road (Gosal)**		

Staff Recommendation

That the Non-Farm Use Fill Application submitted by Inderjit Gosal for the property located at 21700 River Road proposing to deposit soil for the purpose of improving the land for crop production be endorsed and referred to the Agricultural Land Commission (ALC) for their review and approval.

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:** GJ
APPROVED BY CAO	

Staff Report

Origin

The City of Richmond is in receipt of a Non-Farm Use Fill application submitted by Inderjit Gosal (the "Applicant") for the property located at 21700 River Road (the "Property"). The Applicant is proposing to deposit soil for the purpose of improving the agricultural capability of the Property and to develop an organic blueberry farm. The current owners have attempted to grow blueberries on the Property in the past; however, such attempts have failed as agricultural production has been negatively impacted by poor drainage and a high water table.

The Property is situated within the Agricultural Land Reserve (the "ALR") and is subject to the 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 requirements of 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.

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 Property is 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 Property is currently not in agricultural production.

The Applicant is applying to deposit 23,673 cubic metres of soil over approximately 2.3 ha of the 3.32 ha property at an average depth of 1.0 m to improve the Property's agricultural capability.

Uses on Adjacent Lots

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

Table 1: Existing Information and Proposed Changes for the Property

Item	Existing	Proposed
Owner	Inderjit and Ranjit Gosal	No change
Lot Size (western lot)	3.32 hectares (8.2 acres)	No change
Applicant	Inderjit Gosal	No change
Authorized Consultant	John Paul (Transform Land & Soil Investigation)	No change
Land Uses	Property is currently not in agricultural production	Crop production
Official Community Plan (OCP) Designation	Agriculture	No change
ALR Designation	Property is within the ALR	No change
Zoning	AG1	No change
Riparian Management Area (RMA)	Yes	No change

Project Overview

An agrologist's report has been provided by John Paul, Ph. D, P. Ag (Transform Land & Soil Investigation). The agrologist report provides a summary of the Property's history, current site conditions, farm establishment plan and costs, project costs and project completion recommendations. The area of the Property proposed to be developed/filled is currently not in agricultural production and will be cleared prior to importation of the soil. Existing topsoil shall be stockpiled on-site and utilized following importation of soil.

The proposed scope of the project involves placing 23,673 cubic metres of soil (approximately 3,380 truckloads) to establish a farm capable of growing crops. The total project area is approximately 2.3 ha (5.7 acres). The estimated duration of the project is two years.

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. However, if this application is referred to the ALC and approved, the City will include reporting requirements from the agrologist-of-record to ensure the quality of the soil meets the standards as outlined within the project proposal.

Staff Comments

City 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, eliminating 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 necessary precautions to prevent sedimentation of the Riparian Management Area (RMA) located along the north property line, any stream, creek, waterway, watercourse, ditch, drain, catch basin, culvert, or manhole either on or adjacent to the Property. The City will require that erosion and sediment control measures 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. The City will review the logs regularly to ensure that the conditions are adhered to. At the sole discretion of the City, alternate measures may be required (i.e. survey) in order to determine the volume of soil deposited on the Property.

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.

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 Property that will include the following:

- multiple site inspections per week of the Property at the onset of the project to ensure conditions of the Permit 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 Permit conditions are respected;
- meet on-site with the site supervisor a minimum of two 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 Permit 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 21700 River 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;*
> - *Performance bond as per Agricultural Land Commission requirements; and*
> - *Testing, removal and remediation if contaminated soils are found on the site."*

Agricultural Considerations

The proponent has retained a qualified agrologist and submitted an agrologist report (the "Report") (Attachment 1) outlining the historical and current land conditions and an overview of the proposal including proposed site monitoring and reporting.

The Report indicates that the current owners have attempted to grow blueberries on the Property; however, such attempts have failed. The owners indicate that the agricultural production is negatively impacted by poor drainage and a high water table which is supported as per the Land Capability Mapping, which indicates the Property is Class 4W. Class 4W is defined as follows:

> *"Frequent or continuous occurrence of excess water during the growing period causing moderate crop damage and occasional crop loss. Water level is near the soil surface during most of the winter and/or until late spring preventing seeding in some years, or the soil is very poorly drained."* (BCMOE 1983)

The Report indicates that the agricultural capability of the Property is limited to cranberries or a "very short season" for growing vegetable crops. As per the agrologist-of-record: "Cranberries normally require larger fields than the [Property's size]. Although short season vegetable crops are one option, it is risky and does not represent the best use of this valuable agricultural land."

The Applicant intends to stockpile the existing peat layer that is to be placed over the imported soil. This is similar in practice for the Council endorsed project currently underway at 14791 Westminster Highway (Sixwest Holdings).

Subsequent to the FSAAC meeting, the applicant provided a consolidated Farm Plan (Attachment 2) specifying additional detail in regards to the proposal and a Technical Memorandum (Attachment 3) regarding the type of soil(s) suitable to complete the project, soil placement and productivity limitations due to current and future conditions as result of flooding and a high water table.

The Report and Technical Memorandum have been reviewed from an agricultural perspective on behalf of the City by an independent consultant Bruce McTavish (MSc, MBA, P. Ag, RP Bio). Mr. McTavish has no concerns regarding the information provided as it relates to the current conditions of the Property.

Should the proposal be approved, the City will require that a qualified agrologist be retained to monitor the project and provide regular reporting. 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.

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 locations (the "End Site") that will accept soil and other material 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 and other material 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 estimated at approximately $290,000. However, the income derived through tipping fees shall be offset by costs estimated to be in excess of $200,000 due to upfront reporting expenditures, site preparation, project management (ie. soil monitoring), daily personnel 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

City Engineering staff have reviewed the proposal and associated documents and are satisfied with the conclusions of the Applicant's qualified professionals.

A site Grading and Drainage Plan (the "Plan") has been provided. The Plan (Attachment 5) provides an assessment of the Property's current drainage configuration and conditions and the proposed finished grades.

The applicant has provided a Geotechnical Investigation Report (the "Investigation"). The Investigation (Attachment 6) provides a review of the Property's current soil conditions, water table depth and assessment of future settlement post-soil deposition. In addition, the Investigation outlines the soil placement process to be undertaken by the Applicant including setback requirements in order to mitigate risk to neighbouring properties.

Environmental Considerations

The proposed soil deposition area is outside of the Riparian Management Area (RMA) located near the north property line; however, protective measures will be required to be undertaken to ensure the RMA is protected.

As per City permit conditions, all work undertaken in or around a watercourse, must be completed in compliance with the *Water Sustainability Act*, under the guidance of a Qualified Environmental Professional (QEP). The City will require that erosion and sediment control measures be installed and inspected by a QEP.

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 Property. Any future change to the proposed land use may require ESA restoration should the owner decides to stop farming.

The owner will be exempt from obtaining a Tree Removal Permit under *Tree Bylaw No. 8057* as per the "Farm Practices Protection Act". A breeding bird survey will be required by a QEP for any land cleared between March and August pursuant to the federal *Migratory Bird Act* and the provincial *Wildlife Act*. No tree removal may take place between March and August due to bird nesting season.

Road and Traffic Considerations

The City will institute the following requirements with respect to trucks accessing the Property:

- All trucks importing soil will enter and exit River Road from the east end at Westminster Highway;
- All trucks are to obey the 30 km/h speed limit on River Road. The speed limit will be enforced;
- Traffic control measures must be in accordance with the *"Traffic Control Manual for Work on Roadways"* as published by the Highways Engineering Branch, BC Ministry of Transportation and Highways and per the City's *Traffic Bylaw No. 5870*, Part V. s. 18.4;
- A traffic control person may be required at the driveway to control trucks entering and exiting the site and to ensure safe passage for pedestrians and cyclists; and

- A Traffic Management Plan will be required by the City's Transportation Department prior to commencement of the project.

Security Bonds

Should the proposal receive approval, 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 Property 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 property located at 21700 River 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: Agrologist Report (23 May 2019)
2: Farm Plan (07 Oct 2019)
3: Technical Memorandum (12 Nov 2019)
4: Project Cost Table (13 Nov 2019)
5: Grading and Drainage Plan (08 Nov 2019)
6: Geotechnical Investigation Report (20 Aug 2018)

Soil Deposit Application

21700 River Rd, Richmond, BC

Prepared for:

Inderjit and Ranjit Gosal
21700 River Road
Richmond, BC V6V 1M4

and

The City of Richmond

and

The BC Agricultural Land Commission

TRANSFORM LAND and SOIL INVESTIGATION

Soil Deposit Application

Report to: Inderjit and Ranjit Gosal
21700 River Rd
Richmond, BC V6V 1M4

City of Richmond

Agricultural Land Commission

Updated May 23, 2019

Transform Land and Soil Investigation
3911 Mt Lehman Rd
Abbotsford, BC, Canada
Phone 604-302-4367
Email: transform@telus.net

Executive Summary

The owners of the property located at 21700 River Rd is requesting to import soil to allow them to overcome the drainage issues and allow them to grow an agricultural crop.

Transform Land and Soil Investigation has been hired to provide an assessment of the existing conditions, the soil type and the agricultural capability.

The owners have stated that they have attempted to grow blueberries on this property twice, but both times the crop failed because of the poor drainage.

It appears that there may have been very little to no agricultural crop production on this property historically because of the poor drainage.

The estimated volume of soil required is 23,673 m^3 to be distributed over a 2.31 ha area on the farm.

In the areas of the property where soil has already been imported, all of the organic soil above the clay layer has been removed and set aside. This material will be returned and used as the topsoil.

Potential sources of soil would be from the general surrounding area, and must be demonstrated to be clean and free of contamination.

Potential impacts of the project are related to the fill activity and include dust on the property or on the roadways, spills of soil onto the roadway, or accidents. These impacts are considered minimal with the proposed mitigation measures, including managing the soil on the wheels of the trucks, dust control, and erosion and sediment control measures.

The soil fill will occur in several stages to allow the existing organic soil to be removed, set aside, and then placed on the fill. The blueberries will be planted when the project is complete.

The timeline is estimated at two years, and depends primarily on the availability of the soil at a time when it can be appropriately received and managed.

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1. Introduction

The owners of the property located at 21700 River Rd, Richmond, BC have requested permission to import soil to improve their land for crop production.

Currently there is no crop grown on this property. Some soil has already been imported onto the northwest corner of the property. The owners had removed all of the organic soil to the clay layer and set it aside until it can be placed onto the imported soil.

Figure 1. Photo of the southern portion of the property (Jan 8, 2019)

After failed attempts to establish a berry crop, the soil is populated with grasses, shrubs and some deciduous trees common to poorly drained soils.

The owners would like to import soil so that they can raise the elevation of the property by to 0.5 m above the high water table (1 m increase in height), which would allow them to farm the property.

Transform Land and Soil Investigation (Transform) has been retained to complete a comprehensive assessment of the soil currently on the property and its agricultural capability, identify potential sources of soil, and prepare the property improvement plan to allow the property to be used for crop production.

1.1. Property Owners and Contact

The current property owners are Inderjit and Ranjit Gosal. They purchased this property in 2004, and are living in the home on the property. The contact for the property owners is:

Harinder Gosal
21700 River Road
Richmond, BC V6V 1M4

Email: harindergosal@hotmail.com
Phone:

1.2 Author Credentials

John Paul, PhD PAg is a soil scientist based in Abbotsford, British Columbia. He has extensive training and experience in all aspects of soil science, including soil chemistry, physics and classification, soil fertility and biochemistry. Dr. Paul has been working with soil deposit permits and other soils related work since 1998.

2. Methodology

2.1. Scope of the Project

The scope of the project includes the 3.32 ha property located at 21700 River Rd, within the context of the surrounding properties, land uses and features.

This report includes:

- Desktop review of the property including soil types and soil capability
- Site visits to confirm conditions
- Review of previous applicable reports
- Soil Import Plan
- Long term farming Plan

3. Property Information

3.1. Zoning

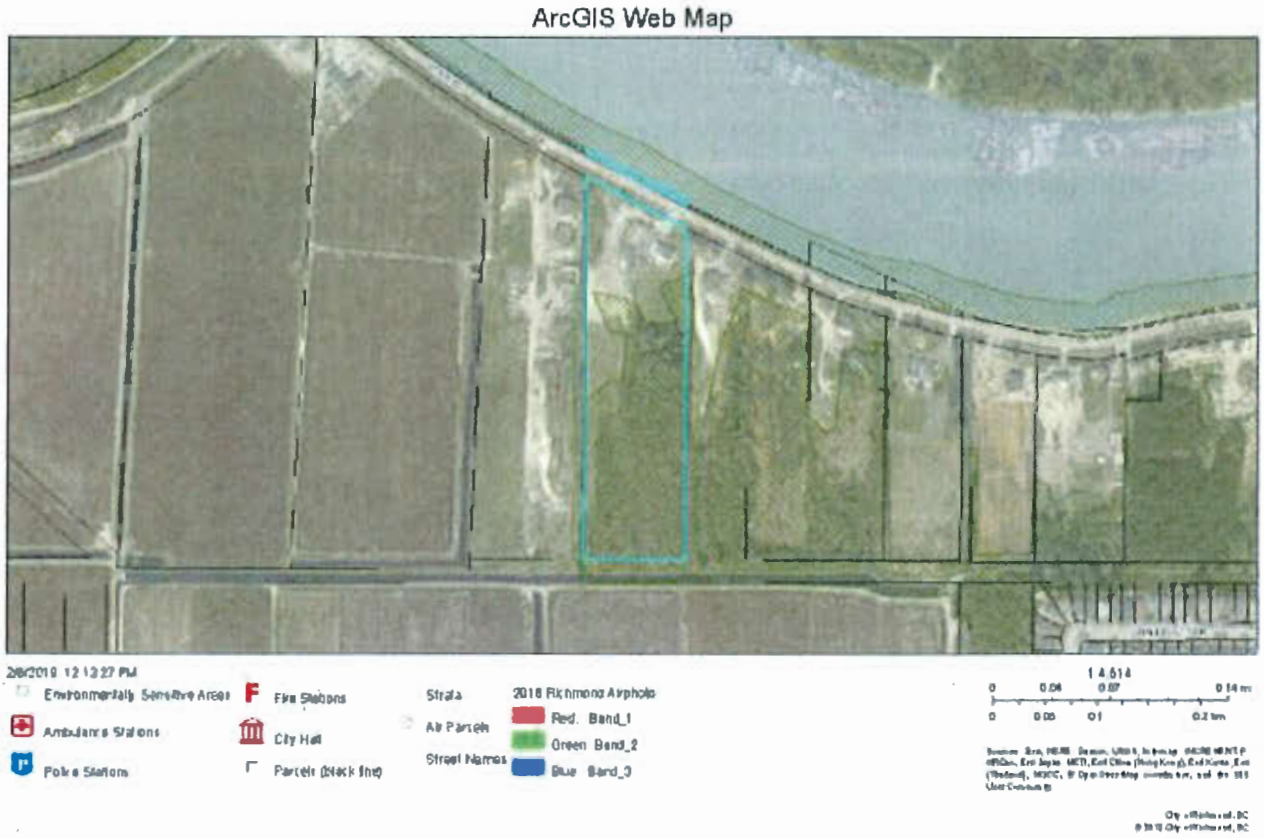


Figure 2. Property located at 21700 River Rd, Richmond, BC

According to information from the City of Richmond, the property has a civic address at 21700 River Rd, Richmond, V6V 1M4. It consists of a 3.32 ha parcel zoned AG1 in the ALR. The legal description is PID 011-994-240, LT 1C Sec 34 Blk 5N RGE 4W, NWP1108 Except Plan Bylaw 50800.

The property is located in the Agricultural Land Reserve, and is therefore governed also by the ALC Act and Regulations.

A large section of the property is designated as an Environmentally Sensitive Area (ESA). Development in an ESA is limited; however, agricultural production may occur on these areas.

3.2. History of Agricultural Use

The owners of the property located at 21700 River Rd, have owned the property since 2004. They describe two attempts to establish some blueberries on the property. These attempts have not been successful. The letter from the owners including photos of flooding is provided in Appendix B.

There is no additional information available on whether this property was farmed previously to 2002.

3.3. Surrounding Land Use

The property to the east is currently not in agricultural production. The land is being leased to the vegetable farmer who farms the property further to the east, and is currently waiting for permission to add some soil to reduce the drainage limitations on this site.

The property to the west also does not appear to have had any agricultural production on it, however the property was cleared of trees and shrubs already in 2002, suggesting that some agricultural crop production may have been attempted (Google Earth). It appears from images on Google Earth that soil was being imported onto this property as early as 2007. Agricultural activity on this property appears to be limited at this time, based on Google Maps.

The properties along the southern border are cropped to cranberries, and appear to have been for almost 20 years (Google Earth).

North of the property located at 21700 River Rd is one of the arms of the Fraser River.

Figure 3. Photo of property to the south of 21700 River Rd, showing the berm and cranberry fields (January 8, 2019 photo)

4. Soil Type

The soils on this property is classified as a combination of EM-RU b in the north part of the property, and a LU-RC a in the southern half of the property (Luttmerding 1980).

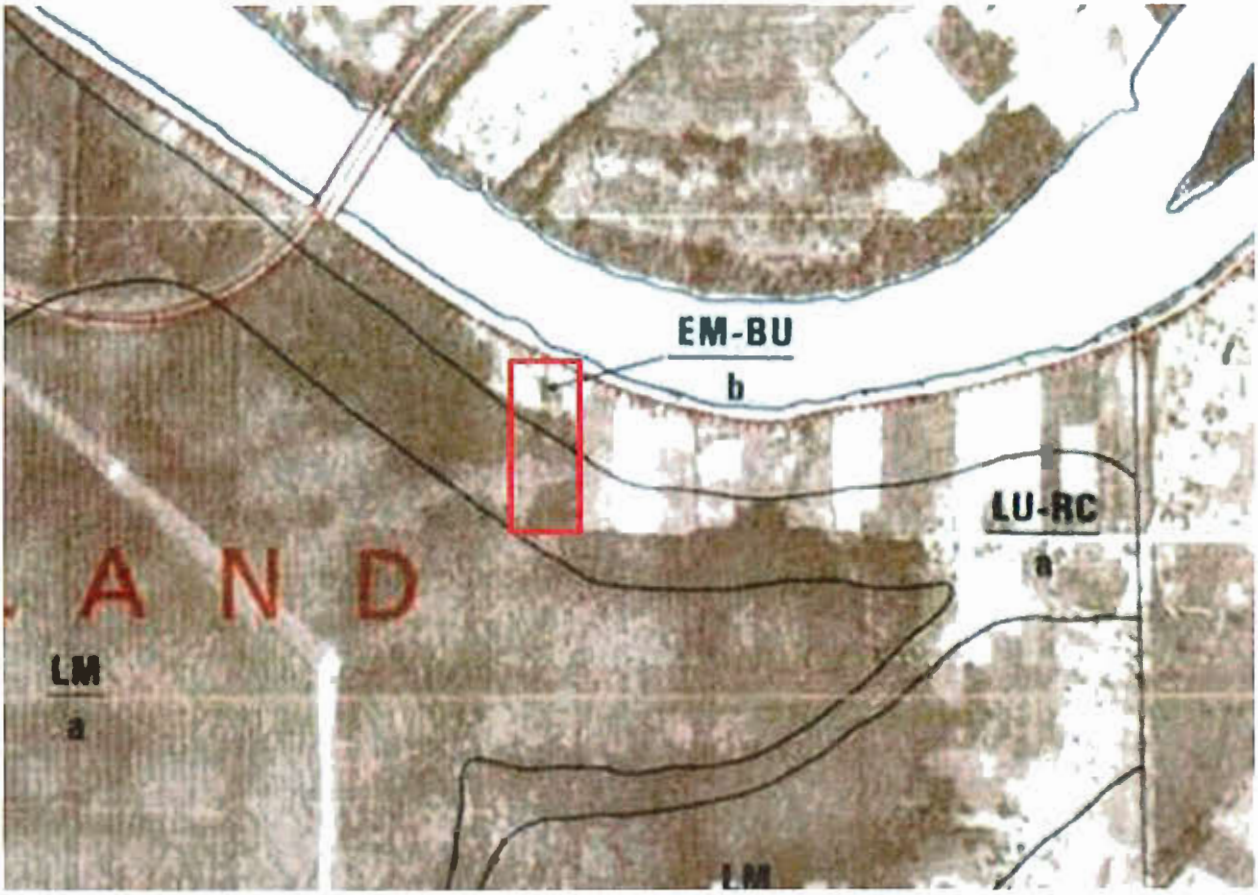


Figure 4. Soil type on and near 21700 River Rd., Richmond

EM refers to Embree soil, which is a medium textured deltaic deposit containing organic strata. BU refers to Blundell soil, which consists of 15-40 cm of organic material over medium textured deltaic sediments. The topography may be gently undulating.

Towards the south of the property, there is a combination of LU-RC. Lulu (LU) soil consists of 40-160 cm of partially decomposed organic material over moderately fine textured deltaic deposits. Richmond soil (RC) consists of 40-160 cm of well decomposed organic material over moderately fine deltaic deposits. The topography on the southern half of the property is level.

Soil Code	Soils Name	Description	Drainage
BU	Blundell	15-40 cm of organic material over medium textured deltaic deposits	Poor to very poor High groundwater table
EM	Embree	Medium textured deltaic deposits containing organic strata	Poor to very poor High groundwater table
LU	Lulu	40-160 cm of partially decomposed organic material over moderately fine textured deltaic deposits	Very poor High groundwater table
RC	Richmond	40-160 cm of well decomposed organic material over moderately fine textured deltaic deposits	Very poor High groundwater table

Figure 5. Soil types on the property at 21700 River Rd

5. Agricultural Capability

The agricultural capability of the soils on this property is depicted as being Class 4 W in the north of the property, and Class O4W in the southern half. The 04WL Class represents an organic soil, as confirmed by the soil type.

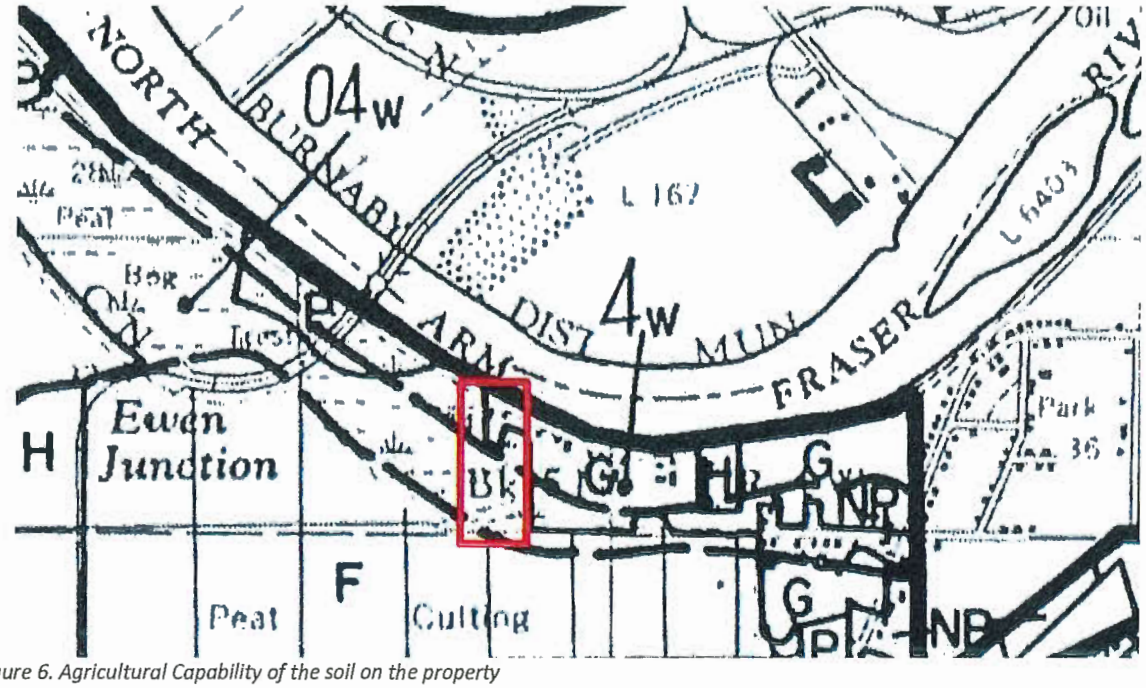


Figure 6. Agricultural Capability of the soil on the property

Class 4 land, whether it is is mineral or organic is *"land in this class has limitations that require special management practices or severely restrict the range of crops, or both"* (BCMOE 1983).

The capability subclasses according to the Land Capability Mapping includes W, which depicts excess water.

"This subclass applies to soils for which excess free water, other than from flooding, limits their use for agricultura. The excess water occurs because of imperfect to very poor drainage due to high water tables, seepage, or runoff from surrounding areas." (BCMOE 1983)

Class 4W is defined as follows:

"Frequent or continuous occurance of excess water during the growing period causing moderate crop damage and occasional crop loss. Water level is near the soil surface during most of the winter and/or until late spring preventing seeding in some years, or the soil is very poorly drained." (BCMOE 1983)

In the case of the property located at 21700 River Rd, the Agricultural Capability is limited by excess water due to a high water table extending into the growing season, and thus causing the potential for crop damage or loss.

The potential for crops on this property include cranberries, similar to what is grown on the lands to the south, or very short season vegetable crops.

Cranberries normally require larger fields than the area available at 21700 River Rd. Although short season vegetable crops are one option, it is risky and does not represent the best use of this valuable agricultural land.

The improved capability of the northern portion of the property with the Agricultural Capability of 4W is 6:2WN~4:3WN. The improved capability of the southern portion of the property with the Agricultural Capability of 04WL is O3WL.

We anticipate that the addition of fill to the property as per the plan outlined in this report will increase the Agricultural Capability to Class 2, where "land in this class has minor limitations that require good ongoing management practices or slightly restrict the range of crops, or both" (BCMOE 1983).

6. Site Investigations

A site investigation was conducted on January 8, 2019. A second investigation to dig soil pits was conducted on May 15, 2019.

6.1. January 8, 2019 Site Visit

The site investigation on January 8, 2019 confirmed the drainage issues contributing to the poor agricultural capability of the property. The water table was almost at the surface of the soil. As a result, it was not possible to dig test holes on the property.

The site investigation also confirmed the import of significant amount of soil onto the property already. We were also able to confirm that the organic layer was removed before the soil was imported.

Figure 7. View of front of property (northeast corner) from the road. Owners indicated regular flooding of the front yard (see photos in Appendix B).

Figure 8. View of the home towards the north, with the backyard. The owners described regular flooding of the backyard (see also Appendix B)

Figure 9. View of property looking south along the west boundary. Land surface on property to the west is 2-3 m higher than surface of the property at 21700 River Rd.

Figure 10. View of the vegetation and the water ponding in the southwest corner of the property.

Figure 11. View of property along the southern property boundary.

Figure 12. View of the vegetation in the south west portion of the property.

Figure 13. View of some taller trees in the northeast quadrant of the property.

Figure 14. Location of the soil pit used for the previous site analysis.

Figure 15. Area in the northwest quadrant where some soil had already been deposited.

6.2. May 15, 2019 Site Visit

A second site visit was conducted on May 15, 2019. This was made possible by less than average precipitation and relatively low river levels.

Figure 10. Approximate location of each of the three soil pits excavated on the property on May 15, 2019

A total of three soil pits were excavated. The primary purpose of pits # 1 and # 2 were to verify the depth of the peat, and to visually assess its quality.

The primary purpose of pit # 3 was to determine the potential for garbage or other contamination that may have to be removed from this fill.

The estimated depth to the clay layer underneath the peat as observed in Pits 1 and 2 was 8 ft (240 cm).

The fill that had already been imported as observed in Pit # 3 was clean and free of debris.

We recommend ongoing inspection of the fill that was already imported to ensure that it is all clean and free of debris.

Figure 17. Excavating soil pit # 1 at 21700

Figure 11. The clay layer was approximately 240 cm below the surface of the peat.

Figure 19. Excavating soil pit # 2. Depth to clay was

Figure 20. Inspection of the imported soil in Hole # 3 did not reveal any contamination.

7. Review of Previous Reports

The following documents were reviewed:

- Geotechnical Report dated August 20, 2018 – Horizon Engineering Inc.
- 21700 River Rd Grading/Drainage Plan October 31, 2018 – McElhanny
- Plan for Outdoor Blueberry Production, Container Blueberry Nursery Plants and Possible Alternative Orchard in the Future at 21700 River Road, Richmond, BC – Aman Agri Consult Co Nov 7 2018
- Supplementary Report on Soil Survey and Land Capability at 21700 River Road Richmond – Jiang Nov 2 2018
- P.Ag Report Review December 14, 2018

7.1. Geotechnical Report dated August 20, 2018 – Horizon Engineering Inc.

This report confirms the information in the site survey which provides the elevation of the property which ranges from 1 to 1.9 m on the eastern half, and 1.2 to 4 m on the west side of the property.

During the subsurface investigation on June 13, 2013, the ground water was reported to be at the soil surface and at one meter below grade at the two sites. The report that I received did not contain the locations of the test holes on the property, so it was not possible to make conclusions regarding the depth to groundwater.

This report also identifies the existing ditching along the east, west and south sides of the property, the depth of which ranges from minor depressions to 2 m.

Based on the two test holes, the thickness of the peat was approximately 1.5.

The flood construction level at this this site is 3.5 m Geodetic.

The report provided the construction procedure consisting of the following:

- *"Step 1: Reinstate perimeter ditches to ensure that collected surface runoff would be directed to a local discharge location. It is envisaged that the local discharge location is located at the northern end of the subject property; therefore, the bottom of the ditch shall be sloped adequately towards the north to ensure that the ditch drains suitably directed towards the outlet.*
- *Step 2: Strip superficial organic material and stockpiled it for the future use. As previously noted, stripping peat materials had been carried out prior to our recent site visit at some areas.*
- *Step 3. Place imported fill material to raise the grade to the elevation near Flood-Construction-Level. Fill shall be placed in lifts. Each lift shall be compacted adequately for the agricultural use. It is recommended that the maximum slope shall be no steeper than 1V:2.5H.*
- *Step 4. Stripped surficial organic materials to be spread over the top of the raised grade as required to achieve the design grade of El. 3.5 meters."*

7.2. 21700 River Road Grading /Drainage Plan – October 31, 2018 – McElhanney

The proposed fill thickness is approximately 2.5 meters, depending on the location within the property.

"The ditch running along the south property line drains east to the ditch running along the east property line. The east and west ditch then drain north to the River Road roadside ditch. The River Road ditch is eventually drained via a pump station to the Fraser River. The east, west, and south ditches are lined by thick vegetation, reducing the capacity of the ditch."

This report is included in Appendix C.

7.3 Plan for Outdoor Blueberry Production, Container Blueberry Nursery Plants and Possible Alternative Orchard in the Future at 21700 River Road, Richmond, BC – Aman Agri Consult Co Nov 7 2018

Estimated volume of fill required is 41,300 cubic meters, based on adding soil to 7.5 acres to raise an elevation of 3.5 m.

The report provides some cost estimates and recommendations for the establishment of a blueberry farm as well as a blueberry nursery.

The report identifies that Ministry of Environment approval is required for a well for irrigation.

7.4 Supplementary Report on Soil Survey and Land Capability at 21700 River Road Richmond – Jiang Nov 2 2018

The soil on the property is fen peat (fibric mesisol). A pit was excavated in the center of the property, where it was identified that the depth of the peat was 5 ft from the surface. It was identified that the peat was rather uniform from the top to bottom, therefore there was no need to strip the peat in layers.

"The fen peatland was previously covered mainly by Douglas fir (Pseudotsuga menziesii va. Menziesii) with fen underneath. Most of the trees were cleared couple of years ago by the current owners. Newly generated plant species are mainly blackberries, aspen (Populus tremuloides), bog willow, birch (Betula neoalaskana), alder (Alnus spp.), fen, blueberries. There are cattail plants in small pond at south west corner of the property. Alfalfa, clover, grasses were also noticed on the mineral filling area."

7.5 P.Ag Report Review December 14, 2018

The agricultural capability for the site is O4WL, improvable to O3LW for the southern ½ of the property and 4W improvable to 6:2WN 4:3 WN on the northern ½ of the property.

The report suggests that the Agricultural Capability of the property will be improved after the filling, but does not indicate to what Class it will be improved to.

8. Soil Import Recommendations and Details

8.1. Depth of Soil Required

Although the previous reports indicated that the proposed elevations were to be a minimum of 3.5 m along the east and west boundaries, and almost 4 m along the centerline, we determined that raising the entire elevation is not necessary. The average natural elevation of the site ranges from 1.1 to 1.5 m.

It is our opinion that the property can be adequately improved to allow agricultural production, including blueberries, by the following:

- Increasing the elevation by 1 meter on average,
- Crowning the land along the center in the north-south direction
- Establishing good site drainage by designing and maintaining the ditches along the south, east and west property boundaries.

We will utilize the topographic survey provided with the October 31, 2018 McElhanney Report – and reduce the elevations by 1 m (Appendix A). This results in an elevation of 2.5 m at the property boundary, and 2.96 m along the centerline (north-south).

8.2 Volume of Soil Required

An estimate of the soil volume required is normally provided from the topographic survey by calculating the volume between the existing elevation and the proposed elevation. Given that this was not provided, we will provide an estimate based on average elevations of the site.

The site must be separated into the two areas, one being the area where no fill had been applied, and the other area where fill had already been applied.

Based on the area measurements in Figure 15, and the elevations found in Appendix A, we obtain a volume requirement of 23, 673 cubic meters over a total fill area of 2.31 ha.

Figure 21. Area measurements at 21700 Riverside Rd delineating the area already filled, and the area requiring fill (from Google Pro)

Area	Size	Elevation	Target Elevation	Volume Soil Required
	(m2)	(ave meters)	(m)	(m^3)
Undisturbed	18300	1.3	2.73	26,169
Filled	4800	3.25	2.73	-2,496
Total Fill Area	23100			**23,673**

8.3. Potential Sources of Soil

Potential sources of soil includes suitable soil from the general surrounding area. It must be a mineral soil that has been demonstrated to be free of contamination by chemicals or any other visible contamination including concrete, asphalt, brick, plastic, rubber. Coarse organic material such as logs, large roots, stumps or other significant volumes of organic matter is also not allowed.

Potential sources of fill will not include topsoil or peat, as there is sufficient peat that can be used for topsoil already on this property. The soil that will be sourced may range from a heavy textured soil similar to the soil below the peat, to a medium textured soil that includes some sand.

8.3.1. Contingency

To ensure that all of the soil imported to the property at 21700 River Rd is appropriate for the purpose and free of contaminants, a contingency plan provides the minimum standards for a fill assessment.

When a potential source of soil has been identified, the following assessment process must be initiated:

a. Review historical and present land use of the source and adjacent properties from available information including the B.C. Ministry of Environment's Contaminated Sites Registry, as well as any additional information available from property owners, neighbours or other potentially reliable sources.

b. A visual inspection of the site where the material originates, including using an excavator on site to further inspect the potential soil.

c. A Phase I Environmental report where applicable

d. Certification from the owner, project manager or other party responsible for the soil at the source that they confirm that the soil is free of contamination and accept any liability resulting from contamination.

Each incoming load will be visibly inspected during delivery. Any loads of concern will be immediately identified and separated, and the driver or source location notified.

A qualified professional will be permitted to randomly access the property at any time to monitor the fill process, take photographs, as well as samples of the fill.

8.3.2. Reporting

Records of the assessment process including photographs for the approved fill sources will be kept on file. All soil being imported will be logged in a logbook containing the source location, quantity, truck license plate and the driver's signature. The driver's signature also verifies their responsibility to remove unacceptable material.

The qualified professional will provide an update report following each site visit, including photographs and sampling results if applicable.

8.3.3. Existing Fill on Property

The fill that has already been delivered to the property will be inspected by randomly excavating holes throughout the fill area along with visible assessment of the material. Any contamination found must be removed, and will trigger further investigation and review of the material that had already been imported. The investigation may also require sampling for hydrocarbons or other contaminants if suspected.

The qualified professional retains the right to order the removal of any contaminated material, or require further and additional investigation of the fill already delivered to the site.

Surplus fill already imported will be preferentially used for the farm access roadway along the western property boundary as required.

8.4. Required Construction Works

8.4.1. Access and Staging Areas

The following is required to minimize impacts to the property.

a. All access will be limited to the driveway entrance at River Rd. Trucks will deliver soil between 7:30 AM and 6:00 PM, Monday through Saturday.

b. Access to 21700 River Rd will be along River Rd. Cones and flags will be required along the roadway to alert traffic along River Rd. If there is more than 2 trucks per hour expected, a dedicated flag person must attend the site to assist with traffic.

c. The staging area on the site including access and truck turn around area has already been prepared on the site.

d. Staging areas for the excavators and other equipment, including fuels and refueling should be located as far as possible from sensitive habitats, such as the ditches or undisturbed areas.

e. The access road to the south of the property shall be along the western boundary, where some filling has already occurred. The maximum width of this access road is 4 m.

f. Any additional temporary staging areas nearer to the south property boundary will be a maximum radius of 15 m to allow trucks to turn around.

g. Runoff from access roads and staging areas should be contained using interceptor ditches and silt fencing to reduce the risk of entering watercourses.

8.4.2. Site Preparation

Although some of the site preparation has already occurred in that some fill has already been imported, the following is required before additional fill is imported.

a. all fill activity must take place during the summer and fall season when the groundwater table is most likely to be at its lowest.

b. The drainage ditches along the south, east and west property boundaries must be cleaned and shaped according to the drainage plan

c. the farm access road will be completed along the west property boundary, using excess fill that has already been delivered to the site.

d. construction of the access road requires clearing and grubbing, and excavation of all of the peat to the underlying mineral soil.

e. The fill project will be conducted in at least four Phases to minimize exposure of the soil to erosion.

f. In each of the Phases, the works shall include: 1) clearing and grubbing to remove all existing vegetation, including trees and roots, 2) excavating the peat and setting it aside to be replaced following the fill.

g. Erosion control measures as required to minimize the impact of silt or soil movement to watercourses.

8.4.3. Soil Placement

Following the site preparation, the soil can be imported as required for each phase. The imported fill layer will be placed on top of the existing deltaic mineral deposit, and graded to include a crown along the north/south centerline. The elevation of the imported fill will be approximately 50 cm higher along the centerline than along the edges to allow natural drainage to the watercourses on the east and west property boundaries.

During fill placement, elevations will be measured and recorded to confirm consistency with the fill plan.

Following the addition of the fill, the peat layer will returned onto the top of the fill layer and sloped as per fill drawings and plan.

8.5. Potential Impacts and Proposed Mitigation

8.5.1. Accidents or Spills

Accidents or spills may result in a number of effects on the environment including site contamination, toxins, damage to water courses or damage to wildlife. Mitigation measures to prevent accidents or spills and appropriate responses are required.

8.5.2 Dust

Airborne dust may be a concern because the fill will be occurring during the driest months of the year when the groundwater elevation is likely to be at its lowest point.

Most areas around the fill area are agricultural and are likely to have minimal impact. The health of agricultural workers or residents of neighbouring homes must be considered.

The following mitigation measures will be implemented:

a. keep the paved surfaces clean and free of soil by ensuring that vehicles are not tracking mud onto the roadways.

b. having trucks or other vehicles keep to a maximum 20 km/h speed limit when travelling on access roads or anywhere in the project area.

c. Using dust suppression methods such as applying water on unpaved roadways

d. Temporarily covering piles of peat or soil to prevent dust.

8.5.3 Drainage and Watercourses

Because the activity will occur primarily during the summer, impacts to the water are expected to be minimal. Water drainage concerns increase during the winter months. If the project is not completed during one season, it is imperative that appropriate measures are taken for erosion control.

The ditches will be cleaned and shaped at the beginning of the project in order to allow adequate drainage but also to allow revegetation beside the ditches. Erosion control measures will be implemented as required which include:

a. Allow and encourage revegetation along the ditches as soon as possible

b. Use silt fencing and other control measures to minimize the risk of silt entering the ditches

c. Ensure that equipment remains away from the edges of the ditches

d. Construct temporary water settling areas as required in case of rainstorms during construction to reduce the risk of silt entering watercourses

The qualified professional is also responsible for erosion and sediment control. The qualified professional has the authority to stop work on the project and require a remediation plan if there are any concerns.

8.5.4. Wildlife

Clearing and grubbing will take place after the amphibian breeding season, which is normally from late February to June. Clearing and grubbing is also better completed after July 31 to minimize impacts on bird breeding locations.

8.5.5. Construction Impacts

Potential negative impacts during the fill process will be minimized by adhering to the following:

a. Following Best Management Practices and municipal bylaws

b. Ensuring that staging areas for machinery, maintenance and refueling remains at the northwest corner of the property and is located as far as possible from the ditch along the west property boundary.

c. Keep an Emergency Spill Kit readily available

d. Ensuring proper storage of fuels, oils and other chemical products

e. Ensuring that the machinery is maintained regularly and any leaks repaired immediately

f. Ensuring that the import of noxious weeds is avoided as much as possible

g. Stage the fill in separate phases to minimize the amount of exposed material at any time.

h. Use silt fencing and other erosion control measures to contain the work area and minimize the risk of silt entering the ditches

i. Cover piles of peat to reduce the risk of wind erosion

j. A qualified professional will conduct regular inspections

9. Site Monitoring and Reporting

The following reporting is required:

a. Reports including observations, environmental reports, photographs, and sample results of all source sites

b. Log sheets from each truck signed by the drivers after each load and submitted daily

c. Weekly inspections of the project by the qualified professional

d. Monthly reporting of fill volumes and any concerns or comments to the City of Richmond

e. Topographic survey of the site following the addition of imported fill, as well as a final topographic survey of the site.

f. Final report by the Qualified Professional indicating that the work has been completed satisfactorily.

10. Preliminary Schedule

The desired schedule is to have the work begin on July 1, 2019, with the construction of the farm access road along the western boundary.

The clearing and grubbing, as well as the excavation of peat may begin on August 1, 2019 and the import of soil may begin immediately following that until the end of September, 2019.

If the project has not been completed by the end of September 2019, the soil will be leveled, surveyed, and covered with peat as soon as possible thereafter in order to stabilize the site.

If the work is not complete by the end of September 2019, it will be completed during the months of July through September 2020.

11. Long Term Farm Planning

The plan for the site is for the owners to plant and grow blueberries, as well as some nursery stock. Their letter of intent and farm plan is found in Appendix B.

12. Closure

The professional agrologist will provide a final closure report that includes the volumes of soil imported, the type of soil imported, the final topographic survey of the fill material and of the site.

13. References

British Columbia Ministry of the Environment. 1983. Land Capability Classification for Agriculture in British Columbia. MOE Manual 1. Surveys and Resource Mapping Branch and Ministry of Agriculture and Food – Soils Branch.

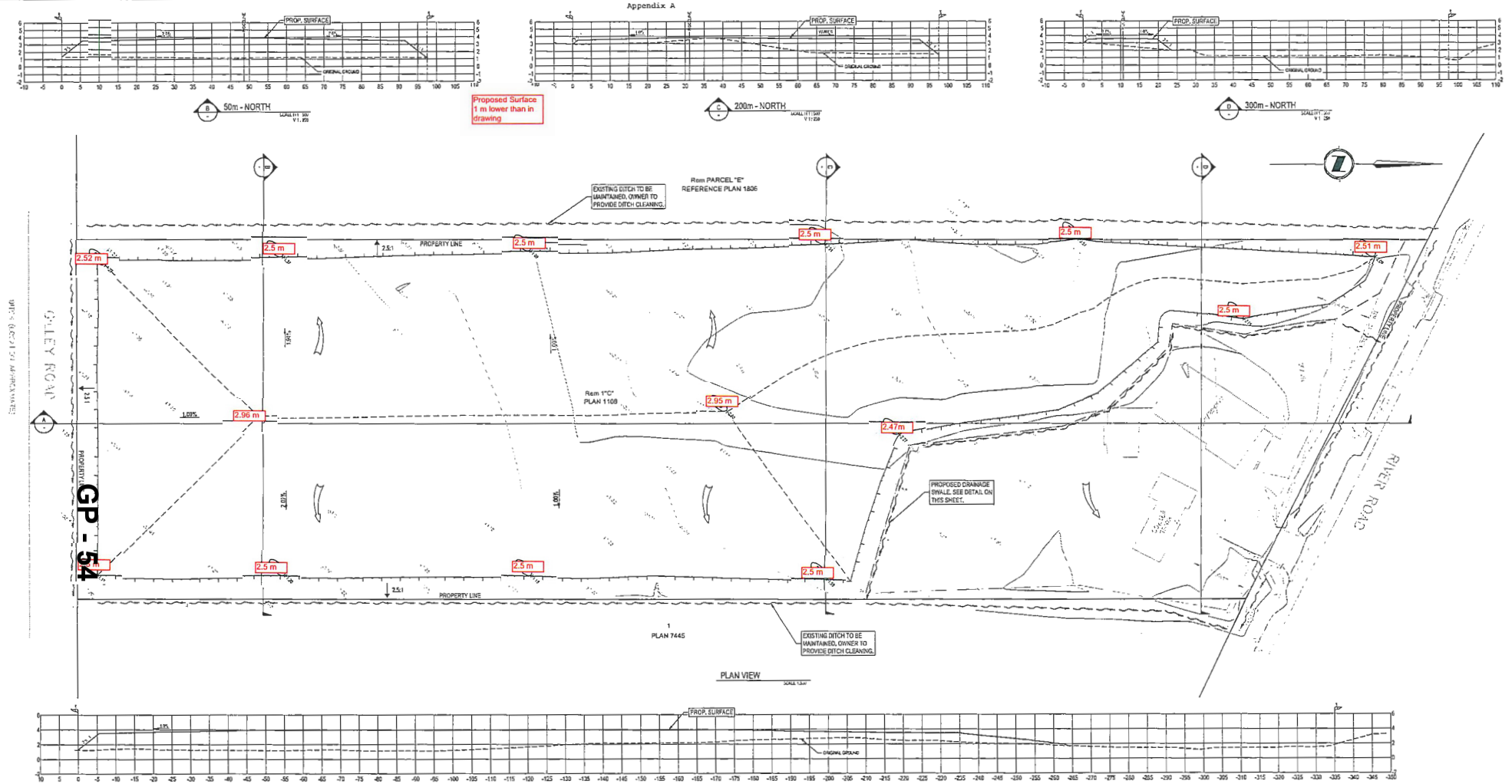
Luttmerding, H.A. 1980. Soils of the Langley-Vancouver Map Area. Volume 1. British Columbia Soil Survey Report No. 15

Luttmerding, H.A. 1981. Soils of the Langley-Vancouver Map Area. Volume 3. British Columbia Soil Survey Report No. 18

This report has been prepared by John Paul, Ph.D, P.Ag

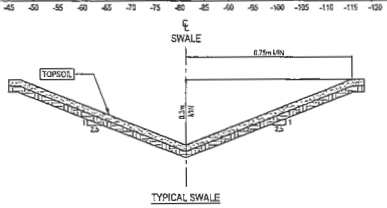
I certify that I have conducted the field observations and confirmed the information provided.

This fill plan represents the best option for improving this soil for crop production, given the information available to the author. The professional agrologists accepts no liability for any present or future losses, including crop losses resulting from deviations from the fill plan without written authorization.



GENERAL NOTES:

- EXISTING PERIMETER DITCHES TO BE MAINTAINED
- FOR EXISTING SOIL CONDITIONS AND PROPOSED FILL CONDITION REFER TO GEOTECHNICAL REPORT AS PREPARED BY: CONSULTANT: HORIZON ENGINEERING LTD. FILE: 113-2053 DATE: JUNE 11, 2018
- FOR BACKGROUND INFORMATION REFER TO 21700 RIVER ROAD GRADING AND DRAINAGE PLAN (MCELHANNEY, 2018)
- MINIMUM SURFACE SLOPE 1.0%



MID-PROPERTY

LEGEND

- OVERLAND FLOW DIRECTION
- PROPOSED ELEVATION 0.00
- EXISTING ELEVATION 0.00
- EXISTING DITCH
- PROPOSED SWALE
- TOP OF BANK
- BOTTOM OF BANK
- RIDGELINE

NOT FOR CONSTRUCTION

BC 1 CALL 1-800-474-6886

H1:500 25
V1:250 12.5

McElhanney
McElhanney Consulting Services Ltd.
Suite 2300 - 13450 - 102 Ave., Surrey, BC Canada V3T 5X3 Tel. 604-596 0391

City of Richmond
6911 No. 3 ROAD RICHMOND B.C. V6Y 2C1

MUNICIPAL ADDRESS: 21700 RIVER ROAD
LEGAL: LOT 1C SEC 34 BLK 5N RG 4W
PL. NWP1108

B.C. GAS SERVICES

THE DEVELOPER OR CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING EXISTING LOCATION OF GAS SERVICE LINES, AND WHERE NECESSARY ARRANGE FOR THEIR RELOCATION IN ORDER TO FACILITATE INSTALLATION OF THE WORKS SHOWN ON THESE PLANS. A LIST OF SERVICE LINE LOCATIONS MAY BE OBTAINED FROM:

B.C. GAS SERVICE RECORDS DEPARTMENT
TELEPHONE 293-4653

NOTE:- B.C. GAS REQUIRES 10 DAYS NOTICE PRIOR TO THE COMMENCEMENT OF ANY WORK.

BENCHMARK

ALL ELEVATIONS ARE TO GEODETIC DATUM AND REFER TO MONUMENT BENCHMARK NUMBER: 02H2423

ELEVATION _____ FIELD BOOK № _____

CITY WORK ORDER № _____ TENDER / PROJECT № _____

CONTRACTOR WORK ORDER № _____ ACCOUNT № _____

REFERENCE DRAWINGS

PROPERTY ACQUISITION	Aq.		
SURVEY PLAN & PROFILE	PP		
ROAD CONSTRUCTION	Dc		
STORM SEWER INSTALLATION	Ls		
WATERMAIN INSTALLATION	Ws		
ORNAMENTAL STREET LIGHTING	Ts		
TRAFFIC SIGNALS	Ss		
SANITARY SEWER INSTALLATION			
OTHER			

NOTE:- PROVE LOCATION OF ALL UTILITIES / SERVICES BEFORE STARTING CONSTRUCTION.

№	DATE	BY	CH.	DESCRIPTION
1	2018-10-31	SR	NS	ON-SITE GRADING AND DRAINAGE PLAN

REVISIONS

Approved Sealed

TITLE: 21700 RIVER ROAD
ON-SITE GRADING AND DRAINAGE PLAN AND SECTION VIEW

DESIGN: SR			
DRAWN: MS	DWG. №:		
CHECKED: NS	SCALE: AS SHOWN	DATE: 2018-08-14	
ENGINEER: JM	SEC. №:	SHT. №: 1 OF 1	

Appendix B

Inderjit Gosal & Ranjit Gosal
21700 River road
Richmond, V6V 1M4

January 28, 2019

City of Richmond
6911 No 3 Rd
Richmond, BC

To Whom It May Concern:

We are applying to City of Richmond for fill deposition on our agricultural land to raise the needed soil surface elevation. Raising the soil surface elevation will address our ongoing water ponding and drainage issues, and it will take our property out of the flood zone which it is currently under. Unstable weather patterns mean that our agricultural land is in constant risk of major flooding. Because the water table is very high, we are unable to utilize our agricultural land to its potential under current conditions.

Before we fully invest our resources of time, money and labour efforts, we need to ensure that our land is not only able to carry out initial agricultural operations, but also that our crops and agricultural practices are sustainable in the future. In order for us to make sure that our investment is sustainable, we need to address the water table issue, and the uneven elevation surface of our field throughout. There is also a huge discrepancy of elevation between our property and our neighbor's property. Unevenness of the soil surface has a significant impact on the germination, stand, and yield of crops. To enhance the agricultural potential of our farm land, field levelling is necessary to create uniformly sloped field surfaces to eliminate the existence of any rapidly draining high or low-lying areas that are prone to ponding.

Without these necessary changes, we are confident that the resources spent on cultivating our land be in vain. Under current flood zone conditions and with changing weather patterns, we expect that year after year, cultivation will not be sustainable because of current levels of flood risks.

We are aware that part of our situation can be helped by improving the drainage on our property. We have spent time working on drainage and will continue do so, but we know that for our land to yield sustainable crops, more needs to be done than simply improving the drainage. Our drainage system will only work if we have the appropriate leveled land. Currently, maintaining effective drainage is difficult due to the difference in elevation with our neighbors' land, River Road, and the city ditch. Once we are able to raise the surface of our land to an appropriate level, we will be able to further improve and maintain our drainage system.

History and Current Conditions:

Having come from a family of farmers from other part of the world, we purchased this farm in hopes of farming one day. When we purchased the farm in 2004, it had blueberry bushes that have died. In attempt to getting started with the farming, we planted some new blueberry plants soon after. Due to poor land conditions and long months of surface water issues, the cultivated plants did not stand a chance of survival and unfortunately, our hard work went to waste.

Due to holding our respective jobs and raising a family, we had limited time and resources to fix the land and get the farming project going again. However, it has been our ongoing effort to improve the land and deal with the drainage issues. We have tried to improve drainage by installing additional pipes through one part of the property. We have dug and re-dug the ditches a few times. Our surface ditches also need constant cleaning and maintenance due to the condition and elevation of our surface. Additionally, the ditch on our west side was almost gone due to our neighbor's fill operation, which caused us to spend our time, money, and efforts to re-dig the ditch. All these attempts have been disappointing up until this point due to circumstances beyond our control.

The surface and weather conditions have gotten worse over the years. We are concerned about the changes in precipitation patterns and constant flooding again would result in further loss of crops. Because our property is lower than our neighbors', River Road and the city ditch, the higher water level is unavoidable. The property is either flooded during high precipitation times or the surface is very damp. Flooding and excess soil moisture are significant obstacles for production on our field, and we have been unsuccessful in remediating the drainage problems.

Future Plan or Purpose of Doing the Above Operation:

We would like to start with the blueberry farming and may have a small orchard on the side later on. The initial plan as shown in the attached drawing is to start with a nursery of potted blueberry plants in preparation for planting in the fields. We are hoping that this process at the beginning is cost effective and less risky since we have faced failure in the past. Our goal is to have the farming operation underway as we approach our retirement years and leave it in a solid condition for cultivation for the younger generation in our family who is eager to maintain it in the future.

We request for the City of Richmond to grant their permission for us to fix our property in hopes to start on our father's dream of farming with the intent to pass it on to our future generation in good condition. We have consulted the necessary professionals and have the necessary reports done (which are provided to the city) to make sure the required work is carried on properly to avoid any damage to our land or the neighboring, private, and city land.

We are committed to work within city's regulations after we are granted the permit to ensure that there is no negative impact on our environment. Thank you for your consideration.

Sincerely,

Inderjit Gosal & Ranjit Gosal

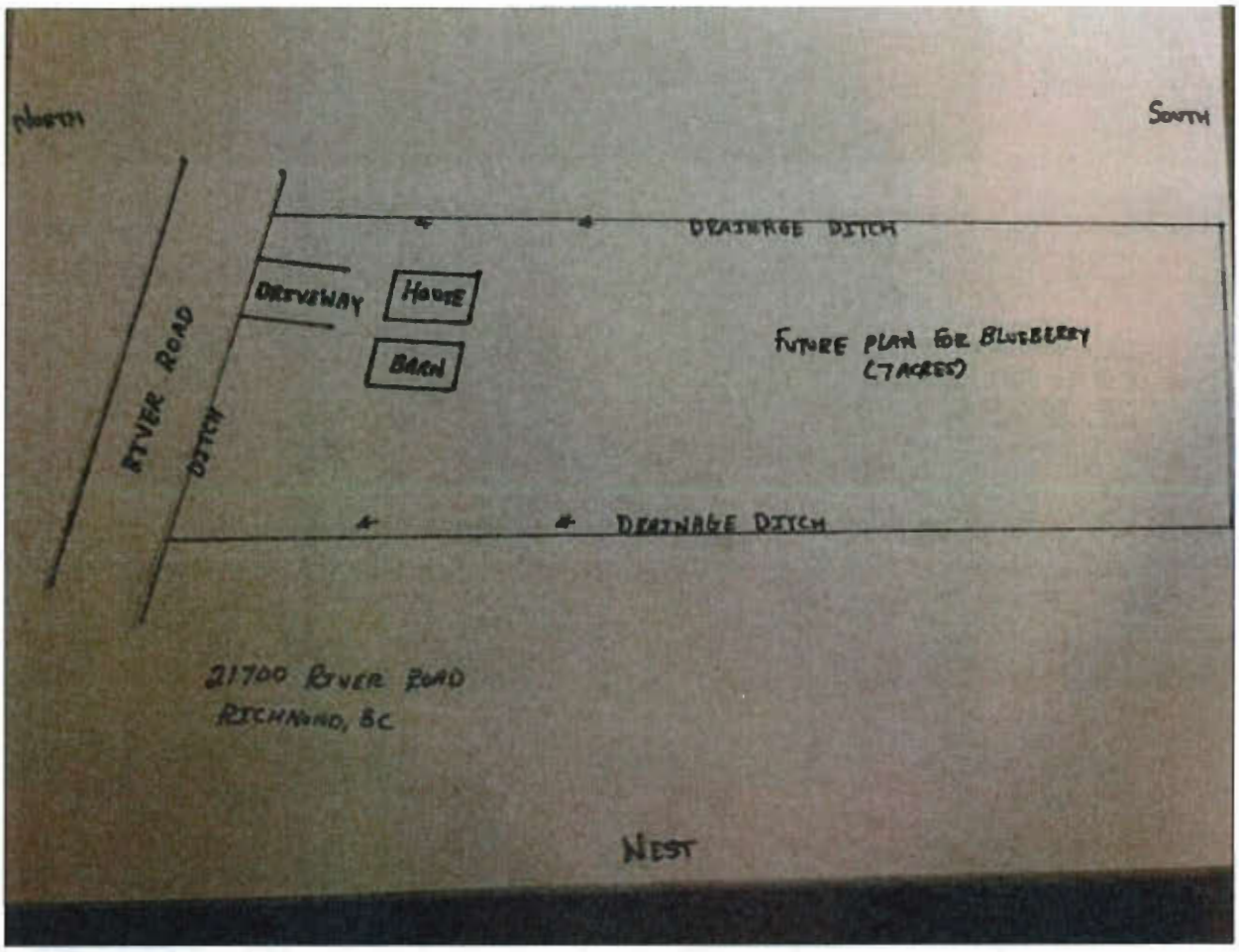


Figure 1. Sketch showing planned use of property for agriculture

Figure 2. View of backyard showing high water table

Figure 3. View of front yard and river showing flooding

21700 River Rd
Richmond, British Columbia
V6V1M4

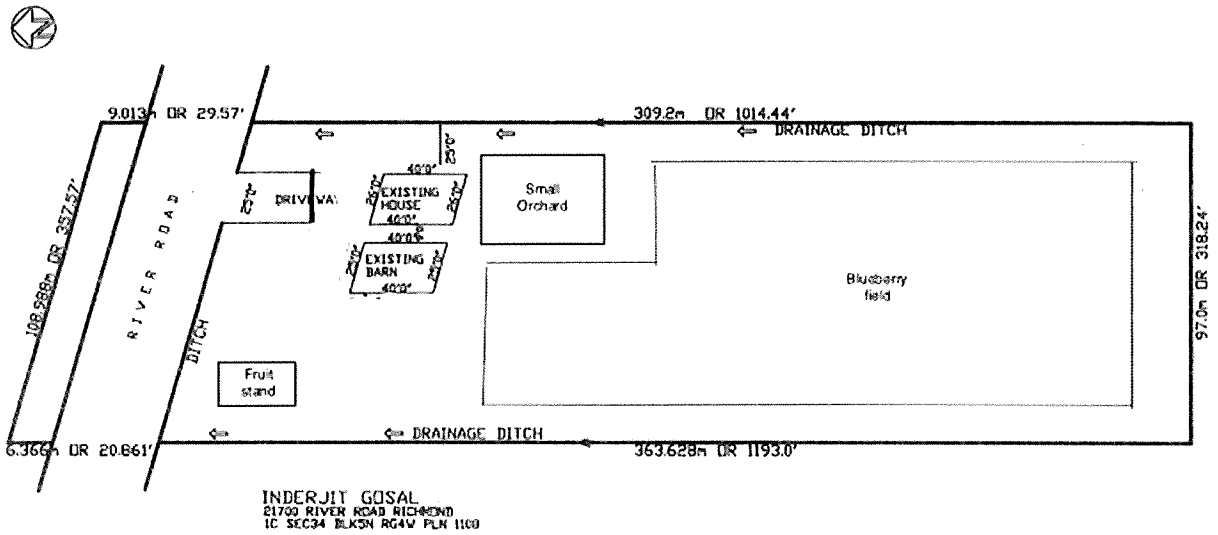
Farm Plan

Our plan is to establish a fresh picked organic blueberry farm on seven acres and a small orchard of apple and pear trees on half an acre on our 8.3-acre property. We will purchase organically grown plants to speed up the process of establishment and help us have a return on investment as soon as possible.

Agricultural Operations will be managed by both the owner and a hired manager in consultation with the appropriate professionals. They will be responsible for the management decisions of the agricultural operation pertinent to aspects of the farm.

Below is the proposed site plan.

Site Plan



Below is a list of previously incurred costs for equipment obtained.

Table 1.1-Current Investment into Farm Equipment:

Equipment Item:	**Cost Incurred:**
John Deer Tractor	$5,000
Rototiller	$2,000
Vibrating Roller	$7,000
Rotary Cutter	$1,000
Hitachi EX200 Excavator	$45,000
Kamatsu PC270 Excavator	$70,000
Toyota Tundra Pickup Truck	$35,000
GMC 1500 Pickup Truck with Tidy Tank	$5,000
Caterpillar Dozer D6R	$65,000
Landscape Rake	$1,200
Digging & Clean up Buckets	$7000
Snow Blower	$4,000
Water Pump & Hoses	$1,500
Machine Rake Attachment	$1,500
Used Oil Recycling Tanks	$300
Diesel Fuel Tanks	$2,500
Landscape Trailer	$1,000
Rakes, Axes, Hoes, Chippers, Loppers, Shears, Picks, Shovels, Wheel Barrows, Manure Forks, etc.	$1,200
Barn Equipment:	
Metal Saw, Hydraulic Jacks, Acetylene Tanks & Torches, Generator, Air Compressor, Workbenches with Vices, Engine Hoist, Lube Oil, Hydraulic Oil, Grease Guns, Fuel, Hydraulic & Water filters, Cables, Shackles, Tool Chests with Tools, Air Filters & Chains etc.	$7,000
Barn Roof Repair and shed cost:	$25,000

Below are Initial Capital Costs for planting blueberry fields and orchard.

Table 1.2-Expected Blueberry Plant Costs:

Row Spacing	Plant Spacing	Plants Per Acre	# Of Acres	Price Per Blueberry Plant	Total Cost of Blueberry Plants
2.35m/8'	1.20m/4'	1350	7	~ $7	$66,150

Table 1.3-Expected Apple and Pear Tree Costs:

Row Spacing	Tree Spacing	# of Acres and trees	Price per Tree	Total Cost of Apple and Pear Trees
6 ft.	6ft	½ Acre = 500 trees	~$20	$10,000

Next is a tentative list of projected equipment costs to be incurred.

Table 1.4-Expected Equipment Costs:

Machine	Size or Description	Market Value	Expected life (years)	Salvage Value
Tractor	New 4- wheel drive Unit	$40,000	20	$5000
Air-blast sprayer	400 Liter Unit	$6500	15	$600
Mower	Flail, 5'unit	$4000	15	$600
Weed Sprayer	200 Liter Unit	$2000	15	$400
Cultivator	Disk/Ripper	$3000	15	$200
Fertilizer spreader	Tote Fertilizer Spreader	$3000	15	$200
Pickup	½ ton 4x4, gas, new	$30,000	10	$10000
ATV	4- wheeler new	$5000	5	$2000
Portable Toilets	Rental units and Servicing	$1,000	N/A	0
Irrigation system	Pump, filter, injector etc.	$176,749.00	15	0
Trellis system, per acre	1500/acre	$10,500	20	0
Tripod ladder	1-2	$200	10	0
Fruit bins	20	$1000	10	0
Saw dust	$1500/acre	$10,500	7-10	
Fruit Stand	12ft x 20ft	$10,000	20	

Below are average operating costs expected to be incurred yearly.
Costs will fluctuate as the agricultural operation requirements will vary year to year.

Table 1.5-Expected Operation Costs:

Variable costs	Per unit	Estimated total cost
Land preparation/Soil testing costs		$3000
Fuel (10 Litres per hour	Gasoline: $1.40/Liter - Diesel: $1.30/Liter (10L/hr)	$5000
Fertilizers	$100/acre	$700
Fruit Tree Spray	$200	$200
Utilities (water/electricity)	400/acre	$2800
Machinery related-repair, lube etc.	$2000	$2000
Farm Labor	$15/hr	$4000
Misc.	$2000	$2000

Table 1.6-Expected Income

Year	**Projected Blueberry Crop Production (Per Acre)**	**Bulk Price (6 Acres)**	**Income from Bulk (6 Acres)**	**U-Pick Price (1 Acre)**	**Income from U-Pick (1 Acres)**	**Apple and Pear Crop**
1	0	n/a	$0	n/a	$0	$0
2	0	n/a	$0	n/a	$0	$0
3	2000 lbs.	$2.50	$30,000	$1.50	$3,000	$1,500
4	4000 lbs.	$2.50	$60,000	$1.50	$6,000	$1,500
5	6000 lbs.	$2.50	$90,000	$1.50	$9,000	$2,000
6	8000 lbs.	$2.50	$120,000	$1.50	$12,000	$2,000
7	8000 lbs.	$2.50	$120,000	$1.50	$12,000	$2,500
8	8000 lbs.	$2.50	$120,000	$1.50	$12,000	$2,500
9	8000 lbs.	$2.50	$120,000	$1.50	$12,000	$3,000
10	8000 lbs.	$2.50	$120,000	$1.50	$12,000	$3,000

Summary of farm Plan.

Table 1.7-Summary of estimated cost vs. expected Income:

Years	Income	Previously invested in farming and farming related operation	Additional required Investment	Farm Operation Maintenance
0	0	$287,200.00	$379,599.00	19,700.00
1	0			cost will vary from year 1 to year 10
2	0			
3	$34,500			
4	$67,500			
5	$101,000			
6	$134,000			
7	$134,500			
8	$134,500			
9	$135,000			
10	$135,000			

TRANSFORM LAND and SOIL INVESTIGATION

TECHNICAL MEMORANDUM **November 12, 2019**

Soil Deposits on Agricultural Land in Richmond

Prepared by: John Paul, Professional Agrologist, PhD in Soil Science

Summary

Addition of soil to raise the elevation of some of the low lying agricultural land in Richmond is a prudent approach to increase its viability and an adaption strategy to reduce the impacts of climate change. For the organic soils, wherever possible, the imported soil should be placed under the organic layer and directly on top of the underlying silt layer. The soil must be clean and may range in texture from silt to sand. The fertile organic layer is then replaced on top of the imported soil.

Background

Raising the elevation of some of the agricultural land in Richmond is important for a number of reasons:

1. The soil in Richmond is a provincially significant agricultural area and includes some of the most productive soils in the province[1,2].
2. Some of the low lying land has a history of flooding due to high rainfall events, and the Fraser River freshet, which limits the agricultural potential of the land[1,2].
3. Flooding in these productive soils may result in a number of subsequent years of lost production, particularly with crops such as blueberries[1].
4. Climate change is likely to increase the risk of flooding due to rising sea levels, increasing frequency and intensity of extreme precipitation events and changing timing and intensity of the Fraser River freshet[1, 3, 4].
5. Repeated flooding may affect blueberries or other high value perennial crops to such a degree that their production is no longer viable[1].
6. The City of Richmond's Official Community Plan established policies to enhance the viability of farmland and farming, including removing constraints to farming and increasing the amount of farmed land[1].
7. The City of Richmond's Flood Protection Management Strategy includes raising land levels strategically and economically, including raising the land to meet agricultural viability objectives[4].
8. Adaptation to the increased potential for flooding is not only an investment in the future economic viability of agriculture, but also in the future food security of the province[1,5].

The soil in Richmond originated from sand and silts deposited by the Fraser River, otherwise known as fluvial deposits. They are also sometimes called alluvial soils. In many areas of Richmond, deposits of

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organic soil developed in peat bogs resulting from the high water table and the low permeability of the soil[2].

Much of the organic soils are highly productive for a wide variety of crops as indicated by the wide variety of vegetable crops that have been grown in Richmond[2], as well as other similar soils in Canada such as the Holland Marsh in Ontario[6].

Some of the organic soil within the City of Richmond has either never been farmed or had limited success with farming because of the high water table and flooding risk. Adding soil to increase the elevation of the land is a prudent approach to enhancing agriculture in these situations.

Important questions include what type of soil should be added, and where should it be placed.

Where Should the Imported Soil Be Placed?

The depth of the organic soils in Richmond varies with location, with some areas having a very shallow organic layer (15-30 cm), and other areas having a much deeper organic layer (> 2 m). The organic soil is highly productive, but is also prone to subsidence.

Subsidence occurs when organic soils are converted to agricultural production, which includes increasing the depth to groundwater to allow crops to grow. Increasing the depth to groundwater allows enhanced oxidation of the organic soil, resulting in decreased elevation of the land[6].

It has been noted that subsidence in organic soils can be reduced through good management practices that include maintaining groundwater as a level that will minimize subsidence while at the same time allow for optimum crop yields, and reduced tillage to minimize susceptibility to wind and water erosion[6].

While it can be stated that increasing the elevation of the land may potentially increase the loss of the organic material through subsidence, adding soil on top of the organic soil results in a loss of the agricultural value of the organic soil.

> ***Placing the soil underneath the peat and directly over the underlying mineral soil allows the agricultural value of the organic soil to be realized, as well as increasing the elevation to reduce the risk of flooding.***

The concern regarding subsidence can be addressed by managing the groundwater level as much as possible[6].

What Types of Soil Can Be Placed Under the Organic Soils?

A wide variety of mineral soils can be placed under the organic soil layer. The mineral layer preexisting underneath the organic layer consists of fine textured silts resulting from fluvial deposits at the mouth of the Fraser River. This soil often has drainage limitations because of its fine texture.

> ***The imported soil may range from fine textured silts to sands, and may be sourced from alluvial deposits throughout the Fraser Valley.***

Imported soil should not include soils containing gravel, as this is not native to this area. The imported soil is not required to be top soil, as this soil will be placed below the rooting depth.

Some imported soils originating from areas near salt water may contain significant concentration of

salts. These soils should be avoided.

As with any soil imported onto agricultural land, the soil must be free of non-soil material including concrete, asphalt, plastic or wood.

It is advisable, particularly with the import of fine textured soils, to place the soil in such a way to enhance the drainage capability. This can be done by creating a slight slope that allows water to move laterally towards drainage ditches.

Replacing the Organic Soil

The organic layer must be replaced on top of the imported soil. When removing the organic layer to allow placement of the fill, it is important to remove the top 30-50 cm layer separately, set this soil aside, and place it on the surface again following replacement of the organic soil.

Conclusions

Some of the low lying organic soils have never been farmed successfully because of flooding risk. This flooding risk is predicted to increase as a result of climate change. Considering the City of Richmond's goal to improve the viability of agriculture, and the Agricultural Land Commission's goal to encourage farming, raising the elevation of some of the low lying organic soils in Richmond is a prudent approach to increase its value for agriculture.

To protect the high value of the existing organic soils, the imported soil must be placed below the organic layer as much as possible. The imported soil must consist of clean soil ranging from sands to fine textured silt which may originate from fluvial deposits throughout the Fraser Valley. The organic layer must be placed on top of the imported soil to allow a wide range of crops to be grown on this valuable organic soil.

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Non-Farm Use Fill Application for the Property Located at 21700 River Road (Gosal)

Cost Estimates	
Erosion Sediment Control Installation	**$3,500**[i]
Drainage improvement (ie. ditches, irrigation, etc)	**$10,000**
Ongoing Project Reporting by Agrologist (per 3,000m^3)	**$350** per report **($2,800)**
Earthworks costs (Project management, load inspector, machine/labour, fuel, etc.)	**$125,000**
Source site investigation (ie. per source site)	**$300** per investigation **($2,400 estimated)**
Interim survey work	**$3,000**
Final topographic survey	**$3,000**
Final Agrologist Report	**$1,000**
Final Geotechnical Report	**$5,000**
Project Cost Estimate (Note: does not include upfront costs)	**$155,700**
Upfront Cost to Date	**$50,580.48***
Potential Tipping Fee Income ($85-$95 per load)	**$287,000 – $321,000 (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.)
*Upfront costs include Agrologist reports, grading and drainage plan, geotechnical report, topographic survey, supplementary reports, and application fee.

McElhanney | BEST MANAGED COMPANIES

November 8, 2019
Our File: 2111-05267-00

Inderjit Gosal,
21700 River Road
Richmond, BC V3M 0A6

Attention: Inderjit Gosal

RE: 21700 RIVER ROAD GRADING / DRAINAGE PLAN

McElhanney Ltd. (McElhanney) was retained by Inderjit Gosal (the client) to complete a high-level grading and drainage plan in order to obtain a permit for the placement of fill material at 21700 River Road, Richmond BC. This document provides a summary of the methodology employed to develop the grading plan and to complete the drainage assessment.

Scope of Work

Based on the information provided and our understanding the project involved the following services:

1) Preparation of a grading plan for the subject property for submission to the City of Richmond. The grading plan will display the increase in grade to 2.5 m. The grading plan will be based on the topographic survey provided.

2) Develop a drainage plan for the subject property. The drainage plan will be displayed in the grading plan drawing.

3) Prepare a summary letter for submission to the City.

Background

The proposed agriculture plan is blueberries, potted nursery of blueberry plants and possibility of orchards in the future. The northeast corner of the property is occupied by a two-story at grade residential single-family house and a detached garage and shed. For geotechnical information regarding the effect of the placement of fill on neighbouring properties refer to the Proposed Fill Placement 21700 River Road, Richmond, BC Geotechnical Investigation Report (Horizon Engineering Inc, 2018).

McElhanney completed a preliminary investigation of two options for improving drainage conditions on the site:

1. Import fill into the site to raise the existing grade of the site and reduce the frequency of flooding; and

2. Provide a berm surrounding the property and introduce a pumping system to convey water over the proposed berm.

Option 1 involves raising the existing elevation of the subject property to 2.5 m to reduce the frequency of flooding. Based on a target elevation of 2.5 m, the proposed fill thickness is approximately 1.5 metres (depending on location within the property, please see the grading plan drawing).

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Option 2 involved the construction of a berm surrounding the property. The berm would be built up to the Flood Construction Level of 3.5 metres. A pumping system would be introduced to convey water from the proposed site to the surrounding municipal ditches.

Option Selection

The subject property is in close proximity to the Fraser River and groundwater levels are influenced by the water levels in the Fraser River. The subject property also currently sits on a thick layer of peat, which allows water to freely permeate to the surface. Based on a discussion with the property owners, the property floods on a yearly basis and is subject to frequent surface flooding from groundwater during high water levels in the Fraser River (all winter season). As a result, if a berm is constructed around the property, continual pumping would be required to dewater the property from a constant flow of groundwater entering the property. The pumping system would also be continuously discharging the groundwater into the surrounding municipal ditches. Therefore, this approach is not considered feasible and as a result, Option 1 was selected and carried forward through design.

Existing Drainage

The subject property is 3.32 ha and is currently zoned for agricultural use. Under the Official Community Plan (OCP) the property will remain zoned for agricultural use. The current land cover consists of blackberry bushes, grasses and thick brush. The property is bounded by agricultural properties on the east, west and south and by River Road to the North, which runs parallel to the Fraser River. Based on discussion with the client, under current conditions the property experiences substantial surface ponding and flooding each winter as a result of high ground water levels which fluctuate with the Fraser River water surface elevation. Elevations on the property currently vary from 1.0 m to 1.9 m.

The property is bounded by ditches on all four sides. Runoff currently sheetflows off of the land to one of the bounding ditches. The ditch running along the south property line drains east to the ditch running along the east property line. The east and west ditch then drain north to the River Road roadside ditch. The River Road ditch is eventually drained via a pump station to the Fraser River. The east, west and south ditches are lined by thick vegetation, reducing the capacity of the ditch.

Proposed Grading and Drainage

To bring the property to an elevation of approximately 2.5 m fill will be brought in and placed. The existing peat layer will be removed and stockpiled prior to the placement of the permanent fill material. The peat will be placed on top of the fill and will be used for agricultural purposes. As per the Proposed Fill Placement 21700 River Road, Richmond, BC Geotechnical Investigation Report (Horizon Engineering Inc, 2018) the property will be backfilled with permanent fill material at slopes of 2.5H:1V from the current ditch bottom to an elevation of approximately 2.5 m. The surrounding east, west and south ditches will be cleared to re-establish storage volumes and capacity. The grading will only be completed for a portion of the property. The northeast corner of the property is occupied by a two-story at grade residential single-family house and a detached garage and shed, this area will not be graded as part of the project.

Under proposed conditions the land use will be orchard with fruit trees and blueberry bushes. Therefore, the land cover under proposed conditions will be unchanged from existing conditions. Under current conditions, the soil is approximately 1.5 – 2.9 m of peat underlain by silty clay (Horizon, 2018), under the proposed conditions the topsoil will be the same peat material underlain by granular fill. As a result, the only anticipated change in runoff volumes or rates as a result of the placement of fil will be due to a potential change in depression storage as a result of grading. Therefore, the additional runoff volume from the property will be negligible.

During the grading works, appropriate erosion and sediment control measure are recommended to mitigate against risk of erosion of temporally exposed soils and wash off of sediment laden water into the receiving downstream systems.

CLOSING

This report is prepared for the sole use of Inderjit Gosal. No representation of any kind, are made by McElhanney Ltd. or its employees to any party not affiliated with Inderjit Gosal. The information provided in this report represents McElhanney's best professional judgement in light of the knowledge available to McElhanney during the time of preparation.

We trust the above provides the necessary information for your review. Please contact the undersigned should you have any questions.

Yours truly,

McELHANNEY LTD.

Prepared by:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA J. L. McKEE # 48602

NOV 8, 2019

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August 20, 2018

Our File: 113-3353

GOLDEN EAGLE ENT.
21700 River Road,
Richmond, BC, V3M 0A6

Re: Proposed Fill Placement
21700 River Road, Richmond, BC
Geotechnical Investigation Report

1.0 INTRODUCTION

This document is prepared to update the original geotechnical investigation report for 21700 River Road Richmond, BC, dated July 31, 2013, in order to reflect the proposed land use and current site conditions. Prior to preparing this document, we have received the additional documents as follows;

- Email including a list of outstanding requirements from the City of Richmond, dated April 19, 2018 and,
- Topographic survey drawing, dated May 15, 2018, prepared by Matson, Peck and Topliss Surveyors & Engineers.

We also attended the subject site on 20th of June, 2018 to review the current site condition of the subject site.

The recommendations presented herein are based on the geotechnical investigation carried out on June 13, 2013 and information available to us with regards to the proposed development at the time of preparing this report.

2.0 SITE DESCRIPTION

The subject property is located on the south side of River Road in Richmond with a civic address of 21700 River Road. Currently, the subject property is bounded by agricultural properties on the east, west and south sides, and by River Road, in turn bounded by Fraser River to the north. The northern part of the subject site is currently occupied by a two-storey, at-grade, residential single family house and a one-storey, detached garage/shed to the west of the aforementioned house. As indicated on the aforementioned topographic survey drawing, the topography within the eastern half is relatively flat with elevations varying from El.1.0 metre to 1.9 metres, whereas there is a mound (fill) at the middle section of the western half property with elevation varying from El. 1.2 metres to 4.0 metres. The topography in the general vicinity of the site is essentially flat.

Based on our observations during our recent site visit, vegetation along the east, west and south property lines was cleared. We confirmed that there are ditched along the west, south and the

southern half of the east property lines. The depths of the ditches vary from approximately minor depression to 2 metres. It should be noted that some ditches do not have clear indentation and are required to be reinstated.

The approximate location of the subject site is shown in Figure 1, attached to this document.

3.0 BACKGROUND INFORMATION

3.1 Surficial Geology

Based on published information from the Geological Survey of Canada, the expected subgrade material at the subject site is Bog, swamp and shallow lake deposits which can be described as a lowland peat up to 1 metres thick underlying Fraser River Sediments.

3.2 Land Use and Flood Construction Level (FCL)

Based on Geographic Information System provided by the City of Richmond (Richmond Interactive Map: RIM), the land use of the subject site is categorized as an agricultural and FCL is 3.5 metres Geodetic at the subject property.

3.3 Past Geotechnical Investigation in Neighbouring Property

Geotechnical investigation was carried out at 21660 River Road, Richmond which is the immediate neighbouring property to the west, by Horizon Engineering Inc on April 25, 2008. This investigation consisted of five auger holes with depths ranging from 12 to 15 metres. The subsurface materials encountered during this investigation was imported granular fill material, underlain by organic silt and peat, which was followed by a grey, plastic, wet silt. Organic silt, peat and silt were considered to be soft and blow counts measured within these materials ranged from 2 to 10 blows per 30 centimetres. The local groundwater table was measured to be ranging from 1.2 to 2.7 metres below the grade at the time of the investigation.

4.0 PROPOSED DEVELOPMENT

Based on the information forwarded to us, the existing grade will be raised to Flood Construction Level at the area and property will be allocated to outdoor nursery, orchard (fruit trees) with a consideration of the future plans for a nursery and blueberry plants. Based on the Flood Construction Level of El. 3.5 metres, we estimate that the fill thickness would be in a range of null to 2.5 metres to achieve the FCL.

5.0 FIELD INVESTIGATION

The subsurface investigation was carried out on June 13, 2013. The investigation program consisted of two, continuous flight, solid stem, auger test holes, (AH13-1 and -2) advanced to depths of 12 metres. Two dynamic cone penetration tests (DCPT, hereafter) were advanced to depths of 13.7 metres at AH13-1 location and 6.1 metres at AH13-2 location. In addition, two piezometric cone penetration test (CPT, hereafter) soundings were advanced at both test hole

locations. At AH13-2 location, the top 3 metres of the subsurface material was drilled out prior to advance CPT soundings in order to minimize a risk of damaging the CPT equipment due to potential presence of large size aggregates such as cobbles and boulders. CPT soundings were advanced to a depth of 32 metres at AH13-1 location and 26 metres at AH13-2 locations.

Select soil samples were retrieved from the auger flights for further soil characterization. This subsurface investigation was directed by an engineer from our office who also documented the soil data and stratigraphy encountered at the test holes. The investigation was carried out using a truck mounted drill rig supplied and operated by Uniwide Drilling Co. Ltd, of Burnaby.

As per the British Columbia Groundwater Protection regulations, test holes were backfilled with drill cuttings and sealed with bentonite chips where the hole was greater than 4.5 metres deep. Where test holes were advanced through a paved surface, cold asphalt patch was used to restore the pavement.

6.0 SOIL and GROUNDWATER CONDITIONS

A summary of the soil and groundwater conditions encountered at the test hole locations is provided in the following sections. Detailed descriptions of the subsurface materials encountered at the test hole locations are provided in the test hole logs attached to this report.

6.1 Subsurface Soil Conditions

The soil stratigraphy encountered at both test holes is briefly described as follows (from top to bottom);

Auger Holes to a depth of 12.2 metres

- FILL (AH13-2 only) - grey, fine to medium grained silty sand to non-plastic silt, dry to moist, 1.6 metres thick;
- PEAT - dark brown, fibrous to mixture of fibrous and amorphous, 1.5 to 2.9 metres thick, and
- SILT - grey, highly plastic, trace to some clay to the bottom of the auger holes.

CPT to a depth of 32 and 26 metres

- Silty Clay to Clay - to a depth of 15 metres, estimated average undrained shear strength of 37kPa, blow count average to be 3 per 0.3 metre;
- SAND - to a depth of 18 metres, estimated average blow counts to be 15 per 0.3 metre;
- Clay to Silty Sand and Sandy Silt - interbedded thin layers of various soil types to 26 metres, DCPT varied from 5 to 8 blows per 0.3 metre;
- SAND to Sandy SILT - to a depth of 29 metres, estimated blow counts to be 15 per 0.3 metre; and
- SAND - to a bottom of the CPT soundings, estimated blow counts to be 20 per 0.3 metre.

Both auger test holes were terminated at a depth of 12.2 metres within grey silt material. CPT1 and CPT2 soundings were terminated at depths of 32 metres and 24 metres, respectively.

6.2 Groundwater Condition

A local groundwater table was encountered at ground surface at AH13-1 location and approximately 1 metre below grade at AH13-2 location. CPT soundings indicated that the depths of local groundwater tables are consistent with the depths encountered within both auger hole locations. We envisage that the groundwater level will be affected by the water table in Fraser River and fluctuates seasonally.

7.0 CPT/DCPT INTERPRETATIONS AND ANALYSES

Two piezometric cone penetration tests (CPT) were carried out adjacent to both auger test hole locations during the investigation. The CPT soundings were advanced to a depth of approximately 32 metres and 24 metres at CPT13-1 and CPT13-2 locations, respectively.

7.1 General

7.1.1 CPT

A "standard" piezometric cone system was used to carry out the cone penetration testing. The electronic cone system used employs a 35.7 mm diameter cone which records tip resistance, sleeve friction, dynamic pore pressure and inclination at 0.05 metre intervals. Each reading is automatically recorded by a computer acquisition system wired to the cone. The results are plotted on the CPT series of figures attached to this document.

7.1.2 DCPT

Dynamic Cone Penetration Test (DCPT) provides subgrade soils' characteristic by measuring the resistence in an in-situ state, similar to the Standard Penetration Test (SPT). Resistance is measured by the number of blows required to advance a metal cone tip 0.3 metre into the ground. The metal cone tip is driven by striking it with a 63.4kgf weight hammer dropped from a distance of 762 millimetres. Unlike the SPT, the DCPT provides continuous data throughout the investigation depth of interest. The DCPT blow count results can be correlated to various soil properties using available methods.

7.2 Water Levels

CPT soundings provide a hydrostatic pressure reading while the piezometric cone probe is passing through layers of relatively coarse grained materials such as sand or sandy silt, allowing an estimation of the local water table elevation (or depth). As the CPT equipment passes through granular soils, its temperature increases and the readings used to estimate groundwater level can become distorted. The deviation in pore pressure baseline between when the probe is inserted and when it is withdrawn gives an indication of the potential error in estimated water table depth. The DCPT is not considered capable of providing information with regards to a local groundwater table.

For the purpose of this report, the depth of water at the subject site has been taken to be at-grade and 1.0 metre at the CPT13-1 and CPT13-2 locations, respectively.

7.3 Soil Behaviour Type

The Soil Behaviour Type has been interpreted and plotted on the CPT series figures . The method of determining Soil Behaviour Type is in accordance with the recommendations by Robertson et al, 1985 and involves inferring Soil Behaviour Type, depending upon the ratio of tip resistance to sleeve friction. For example, the resistance at the tip of the cone is very large when compared to the friction on the side of the cone in coarse-grained (sand) materials, and the tip resistance is low when compared to the sleeve friction in fine-grained (clay) materials.

A chart plotting the sleeve friction ratio versus tip resistance has been derived and assigns Soil Behaviour Types to particular zones within the chart. The zone numbers are plotted versus depth on the CPT series of figures attached to this report and the Soil Behaviour Type associated with each zone number is indicated on the right side of the figures.

It should be noted that "Soil Behaviour Type" may not exactly correspond to the descriptions by the Unified Soil Classification system. Soil Behaviour Type implies that the subsurface soils encountered by a piezometric cone may have similar inherent sounding values, and may behave similarly to the corresponding soil types.

Based on the CPT soundings, the subsurface stratigraphy generally consists of compressive organic material such as peat and fine grained material to a depth of 10 metres underlain by 2 to 4 metres thick sand layer. Beneath the sand layer, series of thin interbedded silty clay, clayey silt, silt, sandy silt and silty sand layers were encountered. This interbedded zone is underlain by a sand layer to a bottom of the CPT sounding. The Soil Behaviour Types encountered at test hole locations are plotted on Figure CPT-01 attached to this document.

7.4 Undrained Shear Strength

This parameter indicates the material's inherent strength for a fine-grained material in the short term, which represents the condition of "undrained". This parameter is usually applied for an estimation of bearing capacity, provided that the material is not likely to be weathered. The undrained shear strengths of the fine-grained materials have also been estimated using the CPT data.

A zone of compressible material was encountered at the CPT locations to a depth of 26 metres. As described in Section 6.0, the compressible zone consisted of three different layers (organic material, clay and sensitive fine-grained material based on Soil Behaviour Type). The CPT sounding indicates that the undrained shear strength of these materials ranged from 10 to 100 kPa with an average of 30 kPa and Over Consolidation Ratio ranging from 1.0 to 15.0.

The undrained shear strength (Su) values have been plotted versus depth on Figure 3353-SU1 and 3353-SU2 following the text of this report. For presentation purposes, any shear strengths over 100 kPa have not been shown.

The ratio of undrained shear strength, Su, to effective vertical pressure can be used to estimate the compressibility of soil. We have also presented the ratio of undrained shear strength to existing vertical pressure on the aforementioned figures.

7.5 Settlement Estimate

Due to the presence of compressible subgrade material encountered at all test hole locations, we carried out settlement analyses. To estimate the magnitude of the settlement, Schmertmann's equations were applied. In addition, we considered Over Consolidation ratio by applying the re-compression index (C_r). The re-compression index used for the analysis was set as 7.5% of its compression index (C_c). Based on "Correlations of Soil Property" by Michael Carter and Stephen P. Bentley, typical values of C_r range from 0.015 to 0.35 (Roscoe et al, 1958) and are often assumed to be 5% to 10%.

As described in the Section 3, the existing grade will be raised in order to provide proposed nursery or blueberry planting area. At the time of preparing this document, the thickness of the proposed fill is unknown. Thus, we carried out settlement estimates with some conditions for both CPT1 and 2 locations. For preliminary design, we have applied "area pressure" placed at the current grade, which may represent a thickness of fill be placed in the future.

Settlement Estimate at each CPT location

Thickness of Fill Placement (m)	CPT 1 Location (centimetres)	CPT 2 Location (centimetres)
1	3.0 - 5.5	2.0 - 8.0
2	6.0 - 16.0	4.5 - 17.0
3	10.5 - 28.0	7.5 - 25.5
4	15.5 - 38.0	11.5 - 33.5

It should be noted that this settlement was estimated based on only the primary consolidation and does not include an amount which may be caused by the secondary consolidation nor decomposition of peat.

8.0 DISCUSSIONS and RECOMMENDATIONS

Based on a discussion with the owner and available information provided to us, we understand that this report is to provide our geotechnical comments and recommendations for the proposed development with includes future agricultural operations; therefore, no geotechnical comments and recommendations would be provided for the settlement sensitive structures such as, dwellings, garages, sheds, indoor nurseries or inner road in this report. In the event that geotechnical comments and recommendations are required for the settlement sensitive structures, they will be provided under a separate cover.

8.1 General

Our geotechnical investigation results indicate that a layer of fibrous and amorphous peat underlain by compressible fine grained material was encountered at all test hole locations. The thickness of the peat was approximately 1.5 metres with underlying soft compressible material to a depth of 15 metres. We envisage that the thickness of the peat used to be greater at the northern part of the subject site. We understand that imported fill material had been placed to provide an access road

to the centre and southern parts of the property and the thickness of peat appeared to be consolidated due to this fill placement. We were also informed by the owner during our recent site visit that the peat material had been subexcavated from some areas in the western half of the subject site prior to placing fill materials.

In addition to above, the settlement due to decomposition within the peat layer would be expected to continue throughout the design life of the proposed development. The magnitude of the settlement by decomposition is dependent on the thickness and type of peat and the location of the local groundwater table. To accurately estimate the magnitude of settlement and the risk of differential settlement are considered difficult.

If required, in order to minimize the risk of settlement due to decomposition of the underlying peat, any organic materials within the footprint of the proposed fill placement could be removed and grade could be restored using suitable selected mineral granular fill to the design grade. This removed topsoil could be placed over the fill materials for agricultural growing medium.

The sections below present geotechnical recommendations for the proposed development. All recommendations presented herein are provided based on the survey drawing and information gathered during the geotechnical investigation.

8.2 Proposed Construction Procedure

Based on our site observations and subsurface materials encountered at the subject site, it is recommended that the following procedures (steps) be implemented on the proposed fill placement.

- *Step 1*: Reinstate perimeter ditches to ensure that collected surface runoff would be directed to a local discharge location. It is envisaged that the local discharge location is located at the northern end of the subject property; therefore, the bottom of the ditch shall be sloped adequately towards the north to ensure that the ditch drains suitably directed towards the outlet.

- *Step 2*: Strip surficial organic materials and stockpiled it for the future use. As previously noted, stripping peat materials had been carried out prior to our recent site visit at some areas.

- *Step 3*: Place imported fill material to raise the grade to the elevation near Flood-Construction-Level. Fill shall be placed in lifts. Each lift shall be compacted adequately for the agricultural use. It is recommended that the maximum slope shall be no steeper than 1V:2.5H.

- *Step 4*: Stripped surficial organic materials to be spread over the top of the raised grade as required to achieve the design grade of El.3.5 metres

It is envisaged that this procedure will be performed in sections. However, it is recommended that Step 1 shall be carried out the entire site such that potential surficial run-off from the fill slope could be contained within the subject property.

8.3 Site Preparation

8.3.1 Stripping

Based on our geotechnical investigation, a peat material was encountered at a shallow depth at the CPT 1 location and approximately 1.5 metres below grade at the location of CPT-2. As previously stated, this underlying peat material may be removed prior to placing a permanent fill material. The benefit of this peat removal operation would include;

- minimizing a risk of post construction settlement due to a decomposition of organic materials, and
- utilizing excavated peat material for the proposed nursery and agricultural planting area.

However, for developing the agricultural land, the stripping operation may not be required from the geotechnical viewpoint.

8.3.2 Grade Increase

Based on the information provided to us, FCL at the subject property is 3.5 metres Geodetic. In order to achieve the FCL, it is required that the existing grade be increased. It is recommended that the grade increase should be carried out by placing select, inorganic granular fill at the area of interest.

Side slopes for grade increase must be kept no steeper than 2.5 horizontal : 1 vertical slope (21.8 degrees). This requirement is based on use of the aforementioned granular materials. This corresponds to the slope length (in plan view) of ranging up to 6.25 metres.

8.3.3 Impact on Neighbouring Properties.

The proposed ground level increase may generate settlement in the neighbouring properties along the east and west property lines. Based on the site condition at the time of our site investigation, and our recent site visit on 20th of June, 2018, it is confirmed that there is no settlement sensitive structures located along the east and west property lines, except at the northern portions of both properties where single family residential houses are located. The proposed grade increase will be carried out at central and southern parts of the subject property; therefore, we envisage that there would be no adverse impact to the structures in the neighbouring properties due to the potential settlement. However, in the event that the footprint of the fill placement is considered to be close to the settlement sensitive structures such as dwellings, garage and shed, the following setback distance to the implemented to the fill placement.

- When settlement sensitive structures are nearby, it is recommended that the minimum setback would be 5 metres from the existing perimeters to the toe of the grade increase.
- When neighbouring grade is the same as the proposed fill elevation, no setback distance is required, provided no settlement sensitive structure is present nearby the fill placement.
- When the grade elevation at the neighbouring property is less than the proposed grade, the minimum setback distance of 3 metres between the property line and toe of the grade increase should be implemented.

We envisage that the settlement monitoring program is not considered necessary for the subject site except for the areas where the fill placement is closed to the existing settlement sensitive structures. Results of the settlement monitoring program should be forwarded to the Horizon

Engineering Inc for further review. It is recommended that no settlement sensitive structures be constructed along the property lines in the neighbouring properties unless the ground settlement due to this fill plaement is considered to be complete.

8.3.4 Surficial Run-off Management

We expect that surficial run-off will be altered subsequent to the proposed fill placement at the subject site. In order to address this consideration, we understand that a surficial run-off management design and grading plan were prepared by McElhanney Consulting Services Ltd..

The documents prepared by McElhanney Consulting Services Ltd were forwarded to us on August 5th, 2018 and included:

- On-Site Grading and Drainage Plan drawing dated August 14th, 2018, and
- 2170 River Road Grading / Drainage Plan, dated August 7, 2018.

The drawing indicated that the elevation at the majority of the proposed fill area was increased to El. 3.5 metres. All sides of the fill area was sloped down to the existing grade with a 1V:2.5H slope with a perimeter drainage ditch at the toe of the slope. We understand that all surficial water captured by the newly placed fill area will be captured by the perimeter slope-toe ditches and directed to the ditch along River Road which is eventually discharged to Fraser River through a pump station.

8.3.5 Groundwater Condition

As previously stated, the local groundwater was located approximately 1 metre below the current grade at the time of our geotechnical investigation. Based on our experience with various projects, seasonal fluctuation of groundwater table is generally in the order of 1 metre and the highest groundwater level are often take place during November through March. Our geotechnical investigation was carried out in the month of June thus, it is envisaged that the groundwater table depth measured during the investigation was considered to be a seasonal low elevation; thus the local groundwater table may raise at the current grade during the fall-winter months. When the fill material is placed over the current site, the local groundwater may potentially be raised due to change in in-situ soil stress condition and capillary effect. Potential groundwater table raise due to the change in soil stress condition will likely to dissipate in time and may not take place when the rate of material placement is slow. However, the groundwater table raise due to capillary effect will likely to be there and fluctuates with the level of the local groundwater elevation. Based on available literatures, the height of capillary effect is function of the particle size and material hydraulic conductivity and height would be greater when the material has a finer particle and low hydraulic conductivity. It is also indicated that the height of capillary effect would be 0.5 to 1 metre for fine to medium grained sand. We envisage that the minor increase in groundwater table would be expected (1 metre or less) after fill is placed. Therefor, it is recommended that the proposed ditches for surficial run-off management should be located approximately 1 metre above the local groundwater table after the completion of the proposed fill placement in order to minimize a risk of groundwater migration into the surficial drainage system to address environmental concerns.

8.3.6 Fill Material

Provided not settlement sensitive structures be constructed within the area of the grade increase, the suitable fill material would consist of select, clean, well-graded granular material. Fill material shall be placed in suitable lifts and compacted with heavy machinery traffic to reduce inconsistency

in material density. We envisage that field density tests are not considered to be required for the fill material placement for agricultural use. However, we should be given an opportunity to observe a procedure of fill placement and perform proof-roll during its placement to confirm that the fill materials are adequately compacted.

8.4 Special Design Considerations

It is envisaged that a continuous long term settlement (Secondary Compression) will take place after the primary consolidation is complete. The magnitude of this 'long term' settlement would be expected to be less than the settlement experienced during the initial fill placement and primary consolidation. However, some future settlement of the site grades should be expected and this may require continuous maintenance on the proposed surficial drainage plan so that no deficiency in drainage is anticipated in the future. Site preparation, such as increasing grade above the FCL to mitigate this settlement can be considered; however, it must be recognized that ongoing settlement of the site cannot be avoided.

9.0 CLOSURE

This report has been prepared for the sole use of our client and other consultants for this project, as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to call.

For:
HORIZON ENGINEERING INC

Karim Karimzadegan M.A.Sc., P.Eng.
President

For:
HORIZON ENGINEERING INC

Hiro Shozen, M.A.Sc, P.Eng
Geotechnical Engineer

Attachments

Site Location Plan	Figure 1
Test Hole Location Plan	Figure 2
Soil Log	AH13-1 and 2
CPT Plots	3353CPT-1, 3353CPT-2, 3353-SU1, 3353-SU2

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GOLDEN EAGLE ENT. 21700 River Road, Richmond, BC	SITE LOCATION PLAN	HORIZON ENGINEERING INC
PROPOSED DEVELOPMENT 21700 River Road, Richmond, BC	**GP - 81**	Scale: NTS · Job No: 113-3353 · Date: JUL/2013 · FIGURE: 1 Des: HS · Dwn: BB · Chk: KK · Rev:

3-Jul-13, 4:23:12 PM, Bronson, N:\2013 Projects\113-3353 RMD 21700 River Road\Drawings\113-3353 Site & Test Hole Location Plans.dwg

LEGEND:

- Approximate location of Auger Hole & Dynamic Cone Penetration Test
- Approximate location of Cone Penetration Test

Reference: City of Richmond Aerial Photography

GOLDEN EAGLE ENT.
21700 River Road, Richmond, BC

PROPOSED DEVELOPMENT
21700 River Road, Richmond, BC

TEST HOLE LOCATION PLAN
GP - 82

HORIZON ENGINEERING INC

Scale:	Job No:	Date:	FIGURE:
NTS	113-3353	JUL/2013	2

Des:	Dwn:	Chk:	Rev:
HS	BB	KK	

3-Jul-13, 4:23:12 PM, Bronson, N:\2013 Projects\113-3353 RMD 21700 River Road\Drawings\113-3353 Site & Test Hole Location Plans.dwg

Auger Hole LOG

Auger Hole No.: AH13-1

LOGGED BY: AM ON: 14 / 06 / 2013 REVIEWED BY: HS COLLAR ELEVATION: _____ METHOD: _____

Type of Test
- O Dynamic Cone Penetrometer Test (DCPT)
- ● Becker Denseness Test (BDT)
- ▲ Number of blows - Standard Penetration (SPT)
- ■ Moisture Content (% of dry weight)
- > Plastic limit
- < Liquid limit

TYPE -- Type of sample
- SPT -- Split spoon
- S -- Shelby tube
- G -- Grab
- O -- Other (specify)

▽ Ground water level

Notes: _____

Depth m	Depth ft	DESCRIPTION	Symbol	Depth	SAMPLE DCPT	SAMPLE TYPE	20	40	60	80	Piezometer / Comments / Additional Testing
0	0	**PEAT** (brown) 50% amorphous, 50% fibrous, wet			1		O				
					1		O				
					1		O				
					1		O				
1					1		O				
	5	**SILT** (grey) highly plastic, CLAYEY to some clay, wet		5	1		O				
					1		O				
2		- at 25.8' - light grey silt nodule			1		O				
					1		O				
					1		O				
					1		O				
3	10				1		O				
					1		O				
					1		O				
4					1		O				
	15				1		O				
					1		O				
5					1		O				
					1		O				
					1		O				
6	20				4		O				
					3		O				
					4		O				
7					4		O				
					4		O				
	25				5		O				
8					5		O				
					5		O				
					6		O				
9					7		O				
	30				7		O				
					6		O				
10					7		O				
					6		O				
	35				8		O				
11					8		O				
					7		O				
					9		O				
					9		O				
12					9		O				
	40	Auger hole terminated at a depth of 40 feet		40	12			O			
					13			O			
					14			O			
13					13			O			
					15			O			

TESTHOLE LOG 21700 RIVER ROAD.GPJ HORIZON.GDT 3/7/13

HORIZON ENGINEERING INC

PROJECT: 21700 River Road, Richmond BC

JOB NO.: 113-3353

SHEET 1 of 1

Auger Hole LOG

Auger Hole No.: AH13-2

LOGGED BY: AM ON: 14 / 06 / 2013 REVIEWED BY: HS COLLAR ELEVATION: _____ METHOD: _____

Type of Test
- O Dynamic Cone Penetrometer Test (DCPT)
- ● Becker Denseness Test (BDT)
- ▲ Number of blows - Standard Penetration (SPT)
- ■ Moisture Content (% of dry weight)
- > Plastic limit
- < Liquid limit

TYPE -- Type of sample
- SPT -- Split spoon
- S -- Shelby tube
- G -- Grab
- O -- Other (specify)

▽ Ground water level

Notes: _____

Depth m	Depth ft	DESCRIPTION	Symbol	Depth	SAMPLE DCPT	SAMPLE TYPE	20 40 60 80	Piezometer / Comments / Additional Testing
0	0	**FILL - SILTY SAND** (grey) fine to medium grained, moist			9		O	▽
					7		O	
1		**FILL - SILT** (brown) non plastic, trace sand, trace gravel, dry to moist		2.9	5		O	
	5				9		O	
		PEAT (dark brown) fibrous, dry to moist		5.4	3		O	
2					8		O	
		PEAT (dark brown) 70% fibrous, 30% amorphous, wet to moist		7	6		O	
					2		O	
					1		O	
3	10				2		O	
					2		O	
		CLAYEY SILT (grey) highly plastic, trace organics (wood pieces), wet to moist		11.6	2		O	
					3		O	
4		**PEAT** (dark brown) 70% fibrous, 30% amorphous, wet to moist		13	3		O	
	15				5		O	
		SILT (grey) highly plastic, trace clay, trace organics, moist		15	4		O	
5					4		O	
					4		O	
					5		O	
6	20	**SILT** (grey) highly plastic, some clay to CLAYEY, moist		20				
		- at 25.8' light grey nodule						
7								
	25							
8								
9	30							
10								
	35							
11								
12	40	Auger hole teminated at a depth of 40 feet		40				
13								

TESTHOLE LOG 21700 RIVER ROAD.GPJ HORIZON.GDT 3/7/13

HORIZON ENGINEERING INC

PROJECT: 21700 River Road, Richmond BC

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JOB NO.: 113-3353

SHEET 1 of 1

HE TESTING

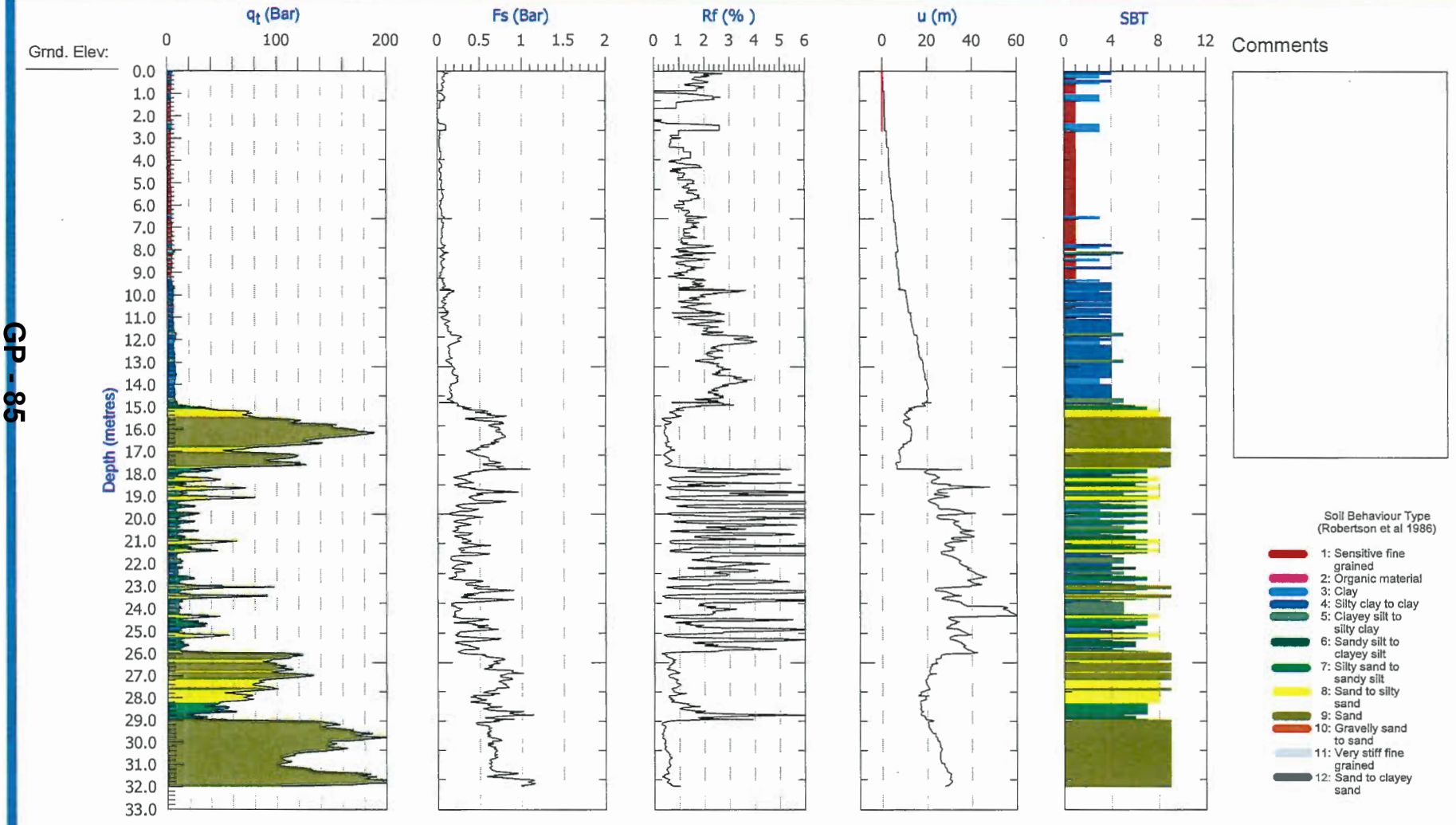
Cone Penetration Test

Job No: 113-3353
Date: 13-June-2013
Site: 21700 River Road, Richmond
File: 113-3353 - 21700 River Rd - CPT 1

Soundings: 1
Test Hole: 001
Coords: N49°10.705',W122°59.057'
Cone: I-CFXYP20-10 120317

Max Depth: 31.94 m
Depth Inc: .020 m
Ave Int:

Data & Results



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HE Testing & Monitoring
102-173 Forester St, North Vancouver, BC

HE TESTING

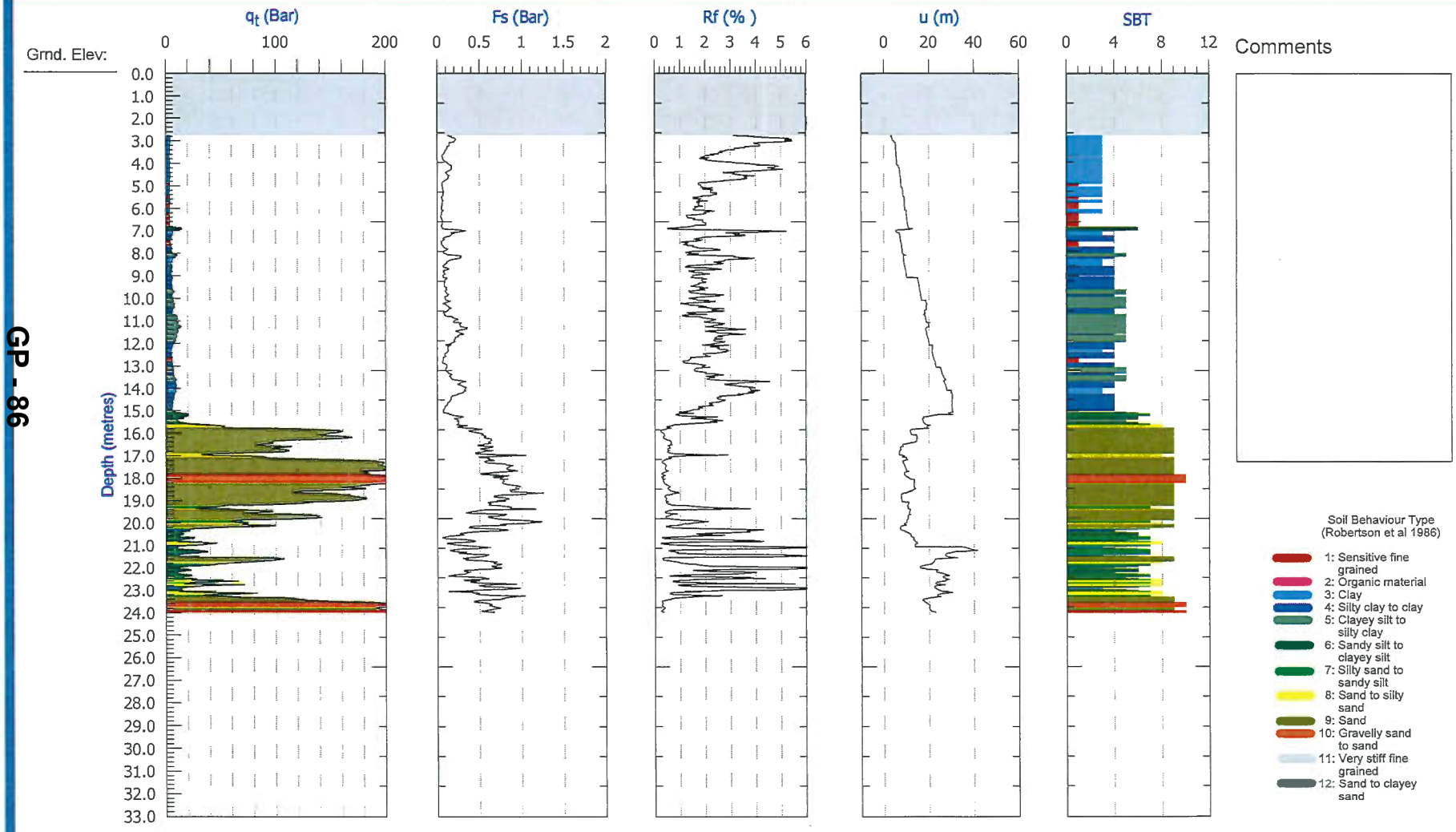
Cone Penetration Test

Job No: 113-3353
Date: 13-June-2013
Site: 21700 River Road, Richmond
File: 113-3353 - 21700 River Rd - CPT2

Soundings: 2
Test Hole: 002
Coords: N49°10.809',W122°59.043'
Cone: I-CFXYP20-10 120317

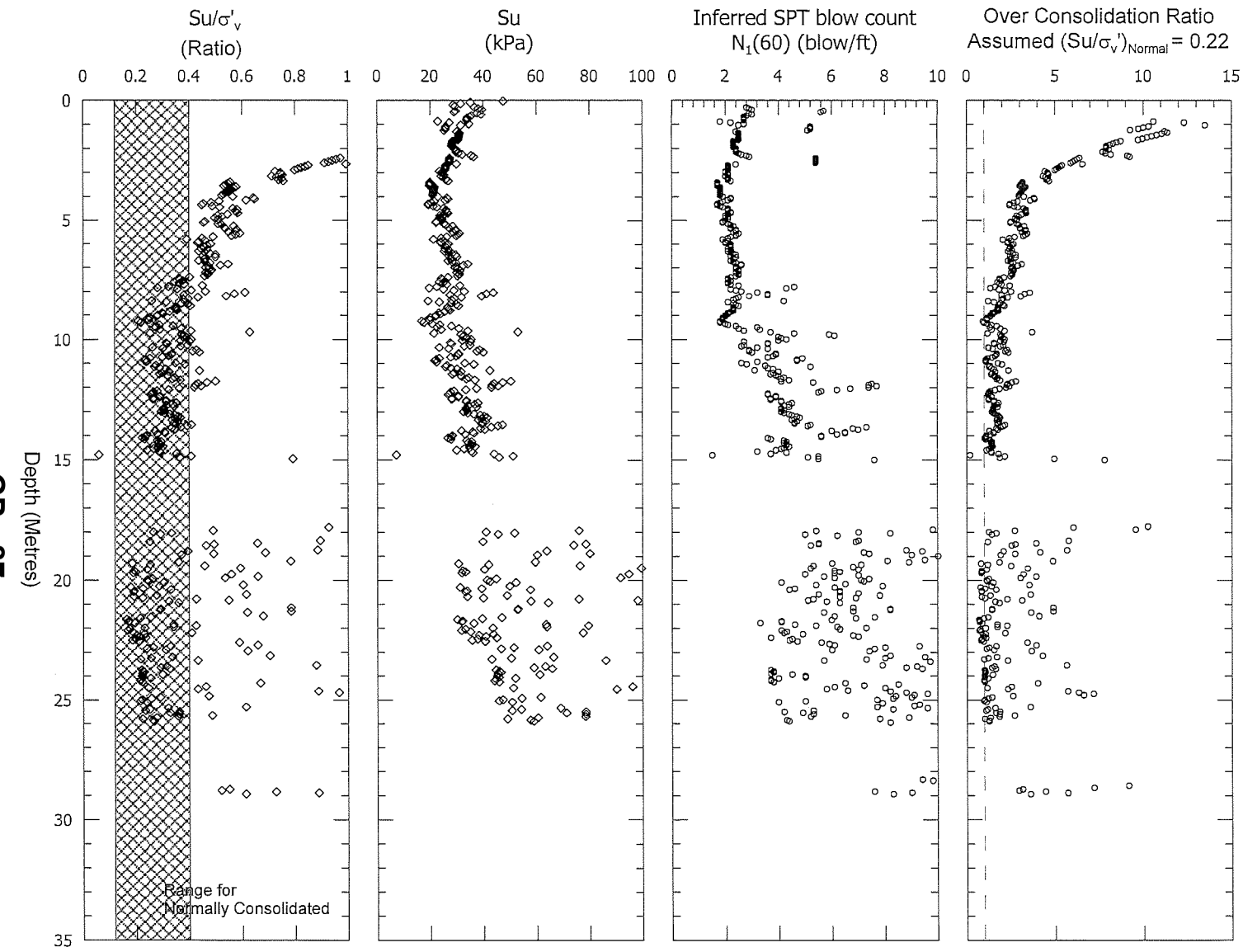
Max Depth: 31.8 m
Depth Inc: .020 m
Ave Int:

Data & Results



GP - 86

HE Testing & Monitoring
102-173 Forester St, North Vancouver, BC



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HORIZON ENGINEERING INC

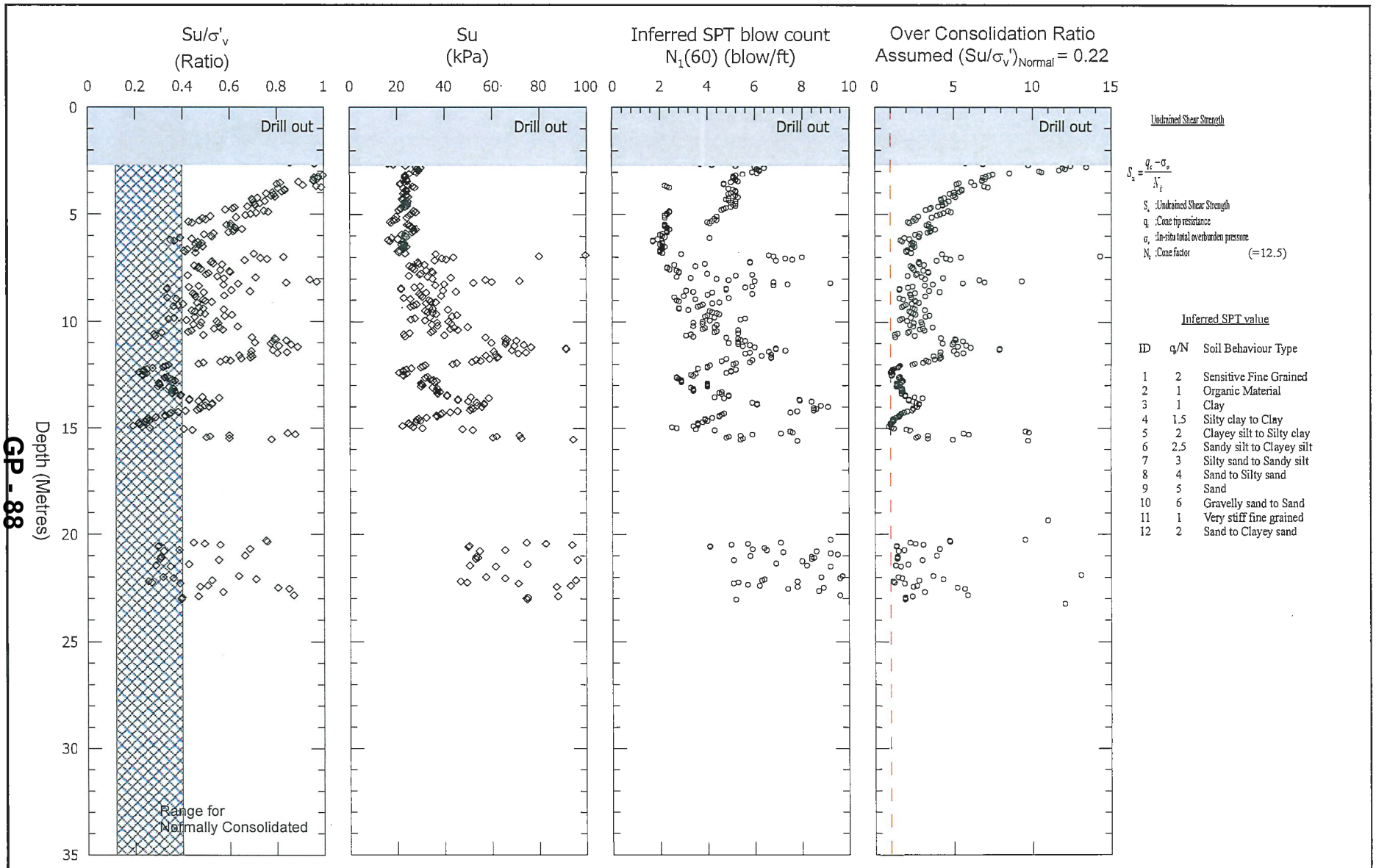
Sounding: CPT13-1
Cone Used: DDG1175 5Ton
CPT Date: 13-Jun-13
Location: Richmond

Strength Analysis Using CPT-1 Data

Mr. Ingrijit Gosal (Golden Eagle Ent.)
21700 River Road, Richmond, BC

PROPOSED DEVELOPMENT
21700 River Road, Richmond, BC

DWN: HS | CHK: KK | DATE: July 2013 | FIGURE: 3353-SU1



GP - 88

HORIZON ENGINEERING INC

Sounding: CPT13-2
Cone Used: DDG1175 5Ton
CPT Date: 13-Jun-13
Location: Richmond

Strength Analysis Using CPT-2 Data

Mr. Ingrijit Gosal (Golden Eagle Ent.)
21700 River Road, Richmond, BC

PROPOSED DEVELOPMENT
21700 River Road, Richmond, BC

DWN: HS | CHK: KK | DATE: July 2013 | FIGURE: 3353-SU2