



City of Richmond

Report to Committee


To:	General Purposes Committee	Date:	April 26, 2013
From:	Phyllis L. Carlyle General Manager	File:	12-8080-12-01/Vol 01
Re:	Non-Farm Use Fill Application by Sunshine Cranberry Farm Ltd No. BC 735293 for Property Located at 12871 Steveston Highway		

Staff Recommendation

That Council endorse the non-farm use application submitted by Sunshine Cranberry Farm Ltd to fill the property located at 12871 Steveston Highway to an agricultural standard suitable for the purpose of blueberry farming; and



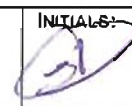
That the endorsed application be forwarded to the Agricultural Land Commission (ALC) for consideration with the recommendation that the ALC incorporate as a condition of permit:

1. The requirement for a performance bond, in a form and amount deemed acceptable to the ALC as a mitigation measure until the satisfactory completion of the proposed project;
2. The requirement for quarterly inspections and monitoring and reporting by a professional agrologist as well as the submission of quarterly reports to the ALC with a copy to the City; and
3. That the multi-purpose soils placed on the property must be capable of supporting a wide range of agricultural crops.



Phyllis L. Carlyle
General Manager
(604-276-4104)

Att. Staff Report dated February 26, 2013

REPORT CONCURRENCE			
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER	
	Engineering	<input checked="" type="checkbox"/>	
	Law	<input checked="" type="checkbox"/>	
	Policy Planning	<input checked="" type="checkbox"/>	
REVIEWED BY DIRECTORS	INITIALS: 	REVIEWED BY CAO	INITIALS: 

Staff Report

Origin

On May 23, 2012 *Sunshine Cranberry Farm Ltd* submitted to the City a non-farm use application for 12871 Steveston Highway. The application seeks approval to place fill on the property to an agricultural standard suitable for the purpose of blueberry farming. On March 18, 2013 a staff report dated February 26, 2013 on the non-farm use application was presented to the General Purposes Committee for consideration. The Committee referred the application to the City's Agricultural Advisory Committee (AAC) for further review and comment.

The staff report dated February 26, 2013 from the General Manager, Law & Community Safety is attached to this report for further background information (**Attachment 1**).

Analysis

At the AAC meeting of April 10, 2013 the AAC reviewed the non-farm use application submitted by *Sunshine Cranberry Farm Ltd*. Staff from the City's Engineering Division provided an overview of the update to the 2006 East Richmond Agricultural Water Supply Study (the "Study"). The purpose of the Study update is to identify improvements that can be made to reduce the frequency of flooding and improve irrigation in the area. Staff advised that part of this work will be a focus on the Sidaway area (location of the subject application).

Staff further advised that the City's ability to lower the water table in East Richmond is fairly limited and that the City would not be changing overall water grades. There was consensus about how important well designed drainage is for marketable crops and that chronically flooded fields limit the range and yield of crops that can be produced.

The following motion was subsequently passed by the AAC:

That the "non-farm use" application for the purposes of soil fill activities on 12871 Steveston Highway, as per the terms and conditions of phasing, implementation and monitoring of the proposed soil fill activities as presented to the Agricultural Advisory Committee, and contained in the February 26, 2013 staff report by Magda Laljee and Ed Warzel, be advanced to Council for their consideration through the required process;

and that the multi-purpose soils placed on the property must be capable of supporting a wide range of agricultural crops.

Options

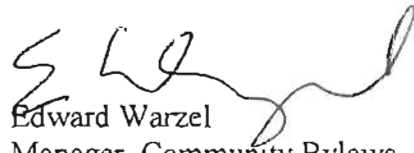
- Option 1 – Deny the non-farm use fill proposal involving the subject site.
- Option 2 – (Recommended) Endorse the non-farm use fill application and forward the application to the Agricultural Land Commission ("ALC") with the recommendations that the ALC incorporate at the expense of the applicant, requirements for a performance bond, quarterly inspections, reports and monitoring by a professional argologist, and that the soils placed on the property be capable of supporting a wide range of agricultural crops.

Financial Impact

An application fee of \$600 under the City's Soil Removal and Fill Deposit Regulation Bylaw No. 8094 and \$600 under the ALC Act have been paid to the City; \$300 of this amount will be forwarded to the ALC with the application.

Conclusion

The AAC is supportive of the non-farm use application for 12871 Steveston Highway conditional to bonding, monitoring and soil fill that supports a wide range of crops. Staff recommend that the application be endorsed on this basis.



Edward Warzel
Manager, Community Bylaws
(604-247-4601)



Magda Laljee
Supervisor, Community Bylaws
(604-247-4642)

ML:ml



City of Richmond

Report to Committee

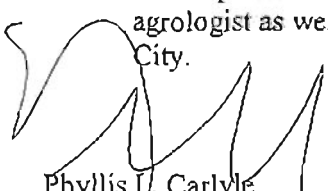
To: General Purposes Committee **Date:** February 26, 2013
From: Phyllis L. Carlyle **File:** 12-8080-12-01/Vol 01
 General Manager, Law & Community Safety
Re: Non-Farm Use Fill Application by Sunshine Cranberry Farm Ltd No. BC735293
 for Property Located at 12871 Steveston Highway.

Staff Recommendation

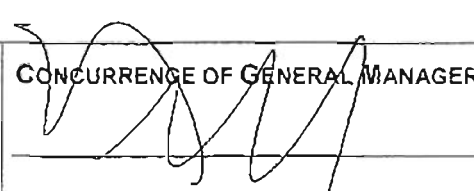

That Council endorse the non-farm use application submitted by Sunshine Cranberry Farm Ltd to fill the property located at 12871 Steveston Highway to an agricultural standard suitable for the purpose of blueberry farming; and

That the endorsed application be forwarded to the Agricultural Land Commission (ALC) for consideration with the recommendation that the ALC incorporate as a condition of permit:

1. The requirement for a performance bond, in a form and amount deemed acceptable to the ALC as a mitigation measure until the satisfactory completion of the proposed project and;
2. The requirement for quarterly inspections and monitoring and reporting by a professional agrologist as well as the submission of quarterly reports to the ALC with a copy to the City.


 Phyllis L. Carlyle
 General Manager, Law & Community Safety
 (604-276-4104)

Att.10

REPORT CONCURRENCE			
ROUTED TO:	Engineering	CONCURRENCE	 CONCURRENCE OF GENERAL MANAGER
	Roads & Construction	<input checked="" type="checkbox"/>	
	Sewerage & Drainage	<input checked="" type="checkbox"/>	
	Sustainability	<input checked="" type="checkbox"/>	
	Policy Planning	<input checked="" type="checkbox"/>	
	Transportation	<input checked="" type="checkbox"/>	
	Law	<input checked="" type="checkbox"/>	
REVIEWED BY DIRECTORS	INITIALS:	REVIEWED BY CAO	INITIALS:
	DW		

Staff Report

Origin

The City of Richmond is in receipt of a non-farm use application by Sunshine Cranberry Farm Ltd, to fill the property located at 12871 Steveston Highway to an agricultural standard suitable for the purpose of blueberry farming (**Attachment 1**).

The subject property is situated in the Agricultural Land Reserve (ALR) and is thus subject to provisions of the Agricultural Land Commission Act and associated regulations. The proponent is making an application to place fill on agricultural land and is therefore subject to sections 20 (1) and (2) of the ALC Act which states:

- 20 (1) A person must not use agricultural land for a non-farm use unless permitted by this Act, the regulations or an order of the commission.
- (2) For the purposes of subsection (1), except as provided in the regulations, the removal of soil and the placement of fill are non-farm uses.

Non-farm use applications must be submitted to the City of Richmond first for the appropriate review. When the review of the non-farm use application is complete, it is forwarded to Richmond City Council for consideration. Pursuant to section 25 (3) of the ALC Act, a resolution from Council is required in order to authorize the subject non-farm use application to proceed to the Agricultural Land Commission (ALC) for a final decision.

Analysis

The property located at 12871 Steveston Highway is zoned AG1 (Agriculture), which permits a wide range of farming and compatible uses consistent with the provisions of the ALC Act and regulations, and the City's Official Community Plan and Zoning Bylaw.

The applicant has been involved in the farming industry in British Columbia since 1986; the applicant's farming contribution includes 30 acres of active cranberry farming in Richmond, over 150 acres of active cranberry farming in Abbotsford, and 40 acres of blueberry farming in Surrey.

Uses on Adjacent Lots

To the North: Active blueberry farm.

To the East: Residential/agricultural

To the South: Active agricultural

To the West: Highway 99

The following table outlines key information related to the current use of lands under application:

Item	Existing	Proposed
Owner	Sunshine Cranberry Farms Ltd. Inc. No. BC0735293	No Change
Applicant	Sunshine Cranberry Farms Ltd. Inc. No. BC0735293	No Change
Authorized Agent	Keystone Environmental Ltd.	No Change
Site Size	14 hectares (34 acres)	No change
Land Uses at 12871 Steveston Highway	<ul style="list-style-type: none"> • Vacant Land • Single cell phone tower with an associated maintenance building is located in south eastern quadrant 	<ul style="list-style-type: none"> • Blueberry farming • Single cell phone tower with an associated maintenance building is located in south eastern quadrant
OCP Designation	Agriculture	<ul style="list-style-type: none"> • Agriculture • No OCP amendment required.
ALR Designation	Subject site is contained in the ALR	<ul style="list-style-type: none"> • Subject site to remain in the ALR. • Non-farm use proposal for property within the ALR.
Zoning	AG1	AG1
Riparian Management Area	5 m RMA	5 m RMA

Project Overview

The total project parcel area of the subject property located at 12871 Steveston Highway is approximately 14 hectares. The applicant maintains that standing water on the land in winter is not beneficial to perennial crops such as blueberries. The project scope involves placing approximately 120,000 cubic metres of fill, to raise the soil elevation, in order to address issues of drainage and bring the property to an agricultural standard suitable for the production of blueberries.

The proposed fill would generally consist of deeper Fraser Sands and structural fill from approved local excavation sites. Otherwise, any other fill that is sourced will be a loamy sands or SP-SM grade that meets the Contaminated Sites Regulation (CSR) schedule 7 standards. The proposed depth is 0.88m above existing grade of fill with an organic soil top dress to achieve a proper growth medium for blueberries of approximately 0.5m. This is a change from the previous proposed depth of 1.0m.

A revised plan for drainage improvements includes an increase in density, from the original spacing of 18.2m (60 feet) down to 12.2m (40 feet) and a change from a single direction flow design from west to east to one where the drainage moves to both the east and west from a topographic high that is created by the fill placement running north to south on the centre of the site.

The applicant has advised that the proposed duration of the project, which includes the filling of the site, and topsoil preparation will be two years. The blueberry production will be phased in with fill activities in approximately 4-hectare sections. The applicant has confirmed that the monitoring, inspection and reporting of the fill activities will be overseen and conducted by a geotechnical engineer and a professional agrologist.

The applicant has submitted a comprehensive agrologist report and addendums prepared by Keystone Environmental Ltd in support of their application (**Attachments 2 - 7**). The agrologist report concludes that: *"...the application of fill material is anticipated to improve soil structure and drainage, mitigate current flooding issues and increase the utility of the land for agricultural use, specifically for the growth of blueberries and annual planting practices"*.

Consultation – Richmond Agricultural Advisory Committee

The Richmond Agricultural Advisory Committee (AAC) reviewed the project on July 19, 2012. While there was no quorum at this meeting, the members in attendance provided comment that the applicant considers submitting a detailed phasing plan on how farming will be implemented as well as a monitoring and inspection plan in support of the soil fill proposal for further review. On August 29, 2012 the applicant submitted the recommended supplementary information for review.

On September 13, 2012 the AAC reviewed the subject fill proposal and referred it back to the applicant to provide further justification for the necessity to raise the grade of the site. Specifically, the applicant was requested to prepare and submit a detailed topographic survey undertaken over the entire subject site by a Professional BC land surveyor. The AAC recommended that the applicant forward the topographic survey to a drainage consultant to determine whether a plan could be developed to adequately drain the lands for farm production without having to raise the property with non-native fill. The AAC also recommended that the City review the topographic data in relation to the elevations/grades of the existing drainage canals within the area to determine if the City could facilitate improved drainage for the site to potentially reduce the requirement to place fill on the property.

The applicant submitted a detailed topographic survey of the subject site and surrounding ditches to the City in November 2012. On December 19, 2012 the applicant forwarded a revised drainage plan based on the topographic survey.

The subject fill proposal was brought forward for final review at the February 13, 2013 AAC meeting. The AAC supported the use of the land for blueberry farming providing that sufficient fill management and monitoring mechanisms were put in place. A motion was passed as follows:

That the "non-farm use" application for the purposes of soil fill activities on 12871 Steveston Highway, as per the terms and conditions of phasing, implementation and monitoring of the proposed soil fill activities as presented to the Agricultural Advisory Committee, be advanced to Council for their consideration through the required process.

Excerpts of the AAC meeting minutes of September 13, 2012 and February 13, 2013 are attached to this report (**Attachment 9**).

Staff Comments

The watercourse bordering the property on the west, south and east sides have a 5 meter wide Riparian Management Area (RMA). As the proposed fill activity is for a farm use, it is exempt from the City's Riparian Area Regulations. However the applicant is subject to the provisions under the City's Watercourse Protection and Crossing Bylaw No. 8441 that prohibits the introduction of pollution (such as sediment laden water) to the watercourse. Infill of the watercourse is not permitted and any additional crossings (including temporary ones) established to the property require a permit from the City's Engineering Department. The agrologist's report indicates that fill placement will be set back 5 metres from the property line on all sides, to provide a buffer to the watercourses. The applicant has provided a firm commitment to the City in writing that appropriate sediment and flow control measures such as installing silt fencing during fill placement, sloping the zone between the top of the fill area and watercourses and planting ground cover on slopes to minimize soil erosion will be adopted to ensure sediment laden water does not enter the watercourse (**Attachment 8 pages 4-5**).

Given the presence of shrubs and undergrowth on the site, there is a possibility of bird nesting activity on the property. Staff recommend that any anticipated vegetation clearing to be done on site be postponed until the end of the bird nesting season (August 31). Disturbing active nests is a contravention of the Wildlife Act. The applicant has agreed to comply with this request (**Attachment 4 page 3**).

The applicant has submitted a traffic control plan and the proposed route(s) is acceptable to staff. However the scope of the operation requires strict adherence to operating between the hours of 09:00 am to 3:00 pm. In addition trucks are to enter and exit the site using the Steveston Highway/Highway 99 interchange due to concerns of potential damage to Sidaway Road and No. 6 Road. Traffic control personnel will also be required to guide trucks in and out of the site in order to help mitigate traffic congestion. The applicant has agreed to comply with these requirements (**Attachment 5 pages 2-3**).

The applicant has submitted a geotechnical report from Geopacific Consultants Ltd., addressing the concerns regarding the impact of fill to neighboring properties as well as issues related to drainage (**Attachment 6**). The proponent's consultant for the project indicated that the depth of the proposed fill would be approximately 0.88 m on average across the entire subject site and the spacing of the drainage lines would be decreased to 40 ft. spacing. The overall finished grading approach to the project increases the elevation along the centre of the site (running north-south) and gradually decreases in elevation to the east and west of this centre "ridge" to facilitate drainage into adjacent canals (**Attachment 7**).

The staff review of the topographic survey provided by the applicant in relation to the elevations/grades of the existing drainage canals concludes as follows:

- *Permitting the farmer to raise the land to an approximate ground elevation of 1.2m appears reasonable, to facilitate farming.*
- *The City uses the Ministry of Agricultural Drainage Criteria Factsheet (Attachment 10) as a guide for land drainage needs in agricultural areas. This Factsheet states that between 0.9m and 1.2m of drainage freeboard (the height from a ditch water surface to an adjacent field ground surface) will typically create drainage conditions for low land crops to survive and thrive. Freeboard should be achieved within 2 days following a summer storm event and 5 days following a winter storm event.*
- *Water levels in the Sidaway Road west ditch and Steveston Highway north ditch vary with rainfall and season. During the summer farmers have requested that ditch water levels are artificially maintained at an elevated level to allow water storage for irrigation. This is done by installing a weir on the Steveston Highway ditch, downstream of property 12871 Steveston Highway. In the winter, when drainage is a priority, the weir is removed. The weir height is approx. 0.26m geodetic. Summer water levels are therefore maintained at around this level. Typical winter water levels in the forenamed ditches are lower (except during large rain events) at between -0.3m to -0.1m depending how close to Steveston Highway the measurement is taken (closer measurements result in lower water levels). Considering these water elevations and the Ministry of Agriculture's Agricultural Drainage Criteria it seems appropriate to permit ground raising to approximately 1.2m geodetic. On a typical summer day this elevation will provide a clear drainage freeboard of slightly over 0.9m, and on a typical winter day the freeboard will be over 1.2m.*

If the ALC approves the fill application for the subject site, the City will issue a soil deposit permit to the applicant and require the applicant to provide the following security to the City:

- \$5,000 pursuant to section 8 (d) of the Boulevard and Roadway Protection Regulation Bylaw 6366 to ensure that roadways and drainage systems are kept clear of materials, debris, dirt or mud during or resulting from the fill activity.
- \$10,000 pursuant to section 4.2 of the Soil Removal and Fill Deposit Regulation Bylaw 8094 to ensure the full and proper compliance with the provisions of this bylaw and all terms and conditions of the soil deposit permit.

Staff are recommending to the ALC that as a condition of approval, the applicant be required to post a performance bond in a form and amount deemed acceptable by the ALC. This performance bond should be of a sufficient amount to ensure that all required mitigation and monitoring measures are completed as proposed, as well as ensure the rehabilitation of the land in the event the project is not completed. The performance bond will be held by the ALC. To assist the ALC in determining an acceptable bond, the applicant has provided a cost estimate of \$488,750 for implementing a blueberry field.

Staff also recommend the requirement for quarterly inspections and monitoring by a professional agrologist as well as the submission of quarterly reports to the ALC with a copy to the City.

Options

- Option 1 - Deny the non-farm use fill proposal involving the subject site.
- Option 2 – (Recommended) Endorse the non-farm use fill application and forward to the ALC with the recommendation that the ALC incorporate the requirement for a performance bond as well as quarterly inspections, monitoring and reports by a professional agrologist.

Financial Impact

An application fee of \$600 under the City's Soil Removal and Fill Deposit Regulation Bylaw No. 8094 and \$600 under the ALC Act have paid to the City; \$300 of this amount will be forwarded to the ALC with the application.

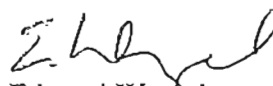
Conclusion

The General and Specific Land Use Maps contained in the City of Richmond's Official Community Plan (OCP) identify the subject site for agriculture, which means those areas of the City where the principal use is agriculture. The OCP also states objectives and supporting policies to protect farmlands in the ALR and enhance agricultural viability and productivity in Richmond.

The proposed non-farm use fill application, for the purpose of improving the agricultural land use of the subject site for blueberry farming, complies with City land use designations and policies for land contained in the ALR. As such, Staff recommends that Council endorse the application and forward the non-farm use fill application submitted by Sunshine Cranberry Farm Ltd., to the ALC for consideration.



Magda Laljee
Supervisor, Community Bylaws
(604-247-4642)



Edward Warzel
Manager, Community Bylaws
(604-247-4601)

ML:ml

- Att.
1. Copy of non-farm use application by Sunshine Cranberry Farm Ltd.
 2. Copy of Agrologist Report (Keystone) dated April 2012
 3. Copy of Agrologist Report (Keystone) dated May 18, 2012
 4. Copy of Agrologist Report (Keystone) dated June 18, 2012
 5. Copy of Agrologist Report (Keystone) dated August 29, 2012 (Phasing/Monitoring Plan)
 6. Copy of Geotechnical Report dated June 14, 2012 from Geopacific
 7. Copy of Agrologist Report (Keystone) dated December 19, 2012
 8. Copy of Drainage Plan (Hunter) dated December 2012
 9. Copy of excerpts of the AAC meeting minutes (Sep 13, 2012 /Feb 13, 2013)
 10. Copy of Agriculture Factsheet – Agricultural Drainage Criteria

SCHEDULE C to BYLAW NO. 8094

Application for Soil Removal / Fill Deposit
Proposed Farm or Non-Farm Operations - Agricultural Land Reserve

☐ Application to remove soil☒ Application to deposit fillOwner: Sunshine Crawley FarmsAgent: Keystone Environmental LtdAddress: 40 Arta BhullarAddress: 10 Lois Larsen6660 Seabury Rd, Richmond BCSuit 320 - 4400 Dominion St. Burnaby BC
V5G 4G3Telephone (B) ✓Telephone (B) 604 430 0611(C) 604 626 9050(C) ✓(F) ✓(F) 604 430 - 0672Email: abhullar1@gmail.comEmail: llarsen@keystoneenviro.comAddress of Property or Legal Description: 12871 Steweston Highway, RichmondSize of Property/Parcel 1.4 hectaresCurrent Use of Property: VacantAdjacent Uses: North: blueberry farm

Total Project Area: _____ hectares

East: residential/agriculturalVolume of Soil or Fill: Approx. 120,000 cubic metresSouth: Road Side Stand & agriculturalDepth of Soil or Fill: one metresWest: Highway 99Duration of Project: 12 months weeks/monthsType of Soil / Fill Material (reference *Guidelines for Farm Practices Involving Fill* (BC Ministry of Agriculture and Lands))The soil to be placed will be a locally sourced coarse grained soil with some fines.Purpose of Project (reference *Guidelines for Farm Practices Involving Fill* (BC Ministry of Agriculture and Lands))To raise the soil surface elevation to address on-farm soil drainage issues - Plans are to strip the top 20-25 cm of organic material, place a locally sourced coarse grained soil with some fines as fill, then to top dress the area using the previously stripped soils mixed with peat, sand and other organic material to achieve a good growth medium.

Proposed Reclamation Measures: (for soil removal projects)

All soil that is stripped from the land will be stockpiled. Once filling is completed, the stripped top soil will be mixed with peate, sand and other organic material to achieve a good growth medium.

**Application for Soil Removal / Fill Deposit
Proposed Farm or Non-Farm Operations - Agricultural Land Reserve**

Has a Professional Agrologist reviewed the project and provided a written report? ☒ Yes ☐ No

(If yes, please attach a copy of the report)

(If no, please explain why) _____

Has a Professional Engineer reviewed the project and provided a written report? ☐ Yes ☒ No

(If yes, please attach a copy of the report)

(If no, please explain why) _____

Are you hereby undertaking to provide a security deposit as outlined in
Section 4.2.1 of the City's Soil Removal and Fill Deposit Regulation Bylaw No 8094 (deposit is required to be in place before any permit is issued) ☒ Yes ☐ No

Have all requirements been met under the following City Bylaws:

Boulevard and Roadway Protection and Regulation Bylaw No. 6366

☒ Yes ☐ No

Tree Protection Bylaw No. 8057

☒ Yes ☐ No

Public Health Protection Bylaw No. 6989

☒ Yes ☐ No

(If yes for any, please attach confirmation)

(If no for any, please explain why) _____

Please attach the following documents:

- ☒ Copy of Submission to Agricultural Land Commission (Not done at this point of the application as per discussion with Magda Laljee)
- ☒ Certificate of Title or Title Search Print (See the attached Agrologist's Report)
- ☒ Map or sketch of parcel showing the proposed project (See the attached Agrologist's Report)
- ☒ Map of Routing and Schedule for Vehicular Traffic
- ☒ Any photographs (See the attached Agrologist's Report)
- ☒ Other Documents as Required under Section 4.1

Declaration: I/We declare that:

- the information provided in this document is true and correct, to the best of my/our knowledge, and
- that any fictitious or misleading information that I/we provide may be a violation of the City of Richmond Soil Removal and Fill Deposit Regulation Bylaw No 8094 and punishable by a fine of up to \$10,000.

2 May 12
Date


Signature of Owner

ANWAR BHULLAR
Print name

INVOICE

Receipt: 18554/20
Dated: Mar 15, 2013
Station: PERMITS/SANDRA

Mar 15, 2013
09:28:51 AM

City of Richmond

6911 No. 3 Road
Richmond, BC V6Y 2C1

TCPMT3710 0000728187
PAID BY: CHEQUE

600.00

INVOICE TO: Sunshine Cranberry Farm Ltd
Mailbox 184
185-9040 BLUNDELL RD
RICHMOND BC V6Y 1K3

INVOICE NO.: 728187
INVOICE DATE: Mar 15, 2013
FOLDER #: 12 611415 NF
SUBSCRIBER ID:



PROJECT LOCATION: 12871 Steveston Hwy

PROJECT DESCRIPTION: 12871 Steveston Hwy

<u>FEE DESCRIPTION</u>	<u>AMOUNT</u>
Non-Farm Use Application Fee	\$600.00
TOTAL:	\$600.00
PAYMENT RECEIVED:	\$0.00
BALANCE:	\$600.00

ALC Act Fee

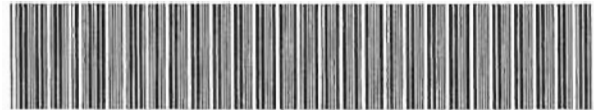
INVOICE

City of Richmond

6911 No. 3 Road
Richmond, BC V6Y 2G1

INVOICE TO: Sunshine Cranberry Farm Ltd
Mailbox 184
185-9040 BLUNDELL RD
RICHMOND BC V6Y 1K3

INVOICE NO.: 699659
INVOICE DATE: May 23, 2012
FOLDER #: 12 611415 NF
SUBSCRIBER ID:



PROJECT LOCATION: 12871 Steveston Hwy

PROJECT DESCRIPTION: 12871 Steveston Hwy

<u>FEE DESCRIPTION</u>	<u>AMOUNT</u>
Non-Farm Use Application Fee	\$600.00
TOTAL:	\$600.00
PAYMENT RECEIVED:	\$0.00
BALANCE:	\$600.00

City Bylaw Fee

City of Richmond
6911 No. 3 Rd
Richmond BC V6Y 2G1

Receipt: 13029/16 May 23, 2012
Dated: May 23, 2012 2:14:02 PM
Station: FOH/ALBERT

TCPMT3710 0000699659 600.00

Total 600.00
CHEQUE SUNSHINE CRANBERRY -600.00

**AGROLOGIST REPORT
FILL PLACEMENT APPLICATION
FOR
12871 STEVESTON HIGHWAY
RICHMOND, BC**

Prepared for:

**Mr. Avtar Bhullar
SUNSHINE CRANBERRY FARMS
12871 Steveston Highway
Richmond, BC**

Prepared by:

**KEYSTONE ENVIRONMENTAL LTD.
Suite 320 - 4400 Dominion Street
Burnaby, BC
V5G 4G3**

**Telephone: 604-430-0671
Facsimile: 604-430-0672
www.keystoneenviro.com**

Project No. 11311

April 2012

EXECUTIVE SUMMARY

This KEYSTONE ENVIRONMENTAL™ Agrologist Report was prepared for a property located at 12871 Steveston Highway, City of Richmond, BC (the Site). The site assessment was conducted to review the need for fill material to improve the agricultural utility of the property to grow blueberry plants. It is understood that this report will be used to support the application to place fill under section 20(3) of the *Agricultural Land Commission Act*.

The property is bounded by Highway 99 to the west, Sidaway Road to the east, Steveston Highway to the south, and 10051 Sidaway Road to the north. The Site is zoned AG1 by the City of Richmond for traditional agricultural use. The site was not currently in use for agriculture and was overgrown with vegetation. A single cell phone tower was located in the southeastern quadrant and two maintenance buildings were also located in this general area. Several towers which had previously occupied a portion of the site and been torn down. The property is 116,615 m² and, in general, was relatively level.

The land use surrounding the Site is zoned AG1 (agriculture), CR (roadside stand), ZA3 (agriculture and botanical show garden), ASY (assembly), ZMU18 (commercial mixed use). Highway 99 is located adjacent to and parallel to the west property boundary.

The soils on the Site were confirmed as two separate units, Richmond-Annis and Delta soils as classified according to the "Soils of the Langley-Vancouver Map Area, Volume 3" (Province of British Columbia, Ministry of Environment, 1981). The Land Classification Map for Agriculture has the Site classified as O4 6/W – 4 4/W on the southern two thirds and 3 6/W - 4 4/W. Standing water was observed on the soils in March and is known to have been present throughout the winter period.

The proposed use for the Site is to grow blueberries on the land. Standing water on the land in winter is not beneficial to perennial crops such as blueberries. Annual plantings could be achieved but would suffer late planting due to accessibility issues. Application of standard drainage practices such as drainage tile would not be possible due to the high water levels on the land and the surrounding drainage ditches to where they would drain. To optimize the best growth opportunities for blueberries and improved use for annual plantings infilling of the Site is required. The proposed fill plan is to:

- Strip all good quality, arable soils from the field to be stockpiled until such time as enough fill is placed to achieve the required elevation
- Place a locally-sourced coarse-grained soil with some fines as fill
- Elevate the existing grade by approximately one metre throughout
- Place fill such that fill embankments meet 2H:1V slope criteria
- In the area of watercourses, place fill at 3H:1V to prevent potential erosion and sediment intrusion
- Place fill to elevate the contours of the Site to meet the City of Richmond Soil and Fill Deposit Regulation Bylaw 8094 in order to facilitate the potential placement of farm support structures, if any should need to be constructed



- Follow setbacks of 5 m from all watercourses adjacent to the Site and on-Site for start of fill placement
- Top dress the filled area using the previously stripped soils mixed with peat, sand, and other organic matter to achieve a proper growth medium for blueberries

The following measures should be implemented to minimize the potential impacts of the fill placement on the Site and associated watercourses:

- Use erosion and sediment control Best Management Practices (BMPs), such as silt fence installation during fill placement;
- Slope the zone between the top of fill area and watercourses, such that there is a gradual transition (3H:1V) in order to minimize accelerated overland water flow to the riparian areas and watercourses, and other potential erosion and sediment control issues; and
- Plant grasses or other ground cover on the slopes to minimize soil erosion from disturbed and new filled areas.

The following agricultural improvements are anticipated for the Site following the placement of fill material:

- Increased water holding capacity during drier summer months, due to the larger volume of soil that will be present on the Site, as well as improved water retention characteristics in the winter months
- Improved soil structure, which will allow for an increase in the number of days that farm machinery can traverse the soils on the Site
- Improved soil structure that will allow for a wider variety of agricultural crops to be grown
- Compliance with the City of Richmond bylaws for the base of buildings in a flood plain which will then allow for the construction of agricultural support buildings, if so required in the future

Overall, the potential impact of fill placement on the aesthetic issue of view is negligible. Other operational aesthetic impacts, from increasing active operation of the land for agricultural purposes, such as odour and dust, can be readily mitigated and managed through BMPs. The potential impact to the Site from the placement of the fill will be an improvement to the agricultural utility, due to improved soil drainage and ability to grow a wider variety of crops. With the preservation of the standard setbacks for on-site and adjacent watercourses, there should be no impact on sensitive natural communities associated with these areas. There is expected to be a potential displacement of birds and mammals that currently inhabit the Site but the adjacent similar habitat types can accommodate this displacement until fill placement is completed.

The overall use of a granular, well-drained material for fill will reduce the current flooding of the area. The soil will allow for more infiltration of water during storm events and the increased volume of soil will increase water retention capacity. This increase in water holding capacity should, in turn, moderate/regulate water discharge to the receiving watercourses. With use of

mitigation measures and BMPs during fill placement, the potential impacts on water quality from erosion and sedimentation should be minimized.

It is concluded that the Site located at 12871 Steveston Highway, City of Richmond, BC, is a suitable location to receive the fill material required to improve the agricultural land use of the Site for both annual and perennial crops. With the appropriate use of measures to prevent soil erosion, and later operational measures such as best management practices, the application of fill material is anticipated to improve soil structure and drainage, mitigate current flooding issues and increase the utility of the land for agricultural use, specifically for the growth of blueberries and annual planting practices.



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1. INTRODUCTION

This report presents the findings of the KEYSTONE ENVIRONMENTAL™ Agrologist Report, prepared for Mr. Avtar Bhullar for 12871 Steveston Highway, City of Richmond, BC (the Site). Keystone Environmental Ltd. (Keystone Environmental) understands that Mr. Avtar Bhullar would like to infill and develop the Site for use as a blueberry farm.

The assessment was conducted to evaluate whether the placement of fill material would improve the agricultural ability of the property. It is understood that this report will be used to support the application to place fill under Section 20(3) of the *Agricultural Land Commission Act*, respecting regulated Department of Fisheries and Oceans (DFO) recommended watercourse setbacks and to assist in compliance with the City of Richmond Bylaw No. 8094, Section 4.1 requirements.

1.1 Scope of Work

The scope of work for this study was in general accordance with the suggested guidelines of the Provincial Agricultural Land Commission and included the following tasks:

- A pre-site assessment of the agricultural capability and agricultural suitability of the land
- A detailed description of the land, including, but not limited to, topographic features, watercourses, drainage patterns, current land use, presence of buildings and structures, etc.
- A detailed description of the overall agricultural objective of placing fill on land in the Agricultural Land Reserve (ALR)
- A description of the volume and type of fill, and the location of the fill source
- An assessment of the potential impacts of placing fill as they related to watercourses, drainage patterns and adjacent properties
- A professional opinion as to whether or not improvement to the land for agricultural purposes can be achieved using conventional farm management practices



1.2 Study Limitations

Findings presented in this report are based upon (i) a review of accessible areas on-site and on surrounding grounds, (ii) a review of available site and historic archive records, and (iii) the results of field investigations. Site conditions (soil, geologic, hydrogeologic, and chemical characterization) may vary from that extrapolated from the data collected during this investigation. Site characteristics and soil sampling results reflect conditions encountered at specific test locations. Consequently, while findings and conclusions documented in this report have been prepared in a manner consistent with the level of care and skill normally exercised by other members of the agricultural profession practising under similar circumstances in the area at the time of the performance of the work, this report is not intended nor is it able to provide a totally comprehensive review of past or present site conditions.

This report has been prepared solely for the internal use of Mr. Avtar Bhullar and for review purposes by the Agricultural Land Commission, the City of Richmond and the Department of Fisheries and Oceans, pursuant to the agreement between Keystone Environmental Ltd. and Mr. Avtar Bhullar. A copy of the general terms and conditions associated with this agreement is attached in Appendix C. By using the report, Mr. Avtar Bhullar, the Agricultural Land Commission, the City of Richmond and the Department of Fisheries and Oceans agree that they will review and use the report in its entirety. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

2. SITE DESCRIPTION

The Site is identified as follows:

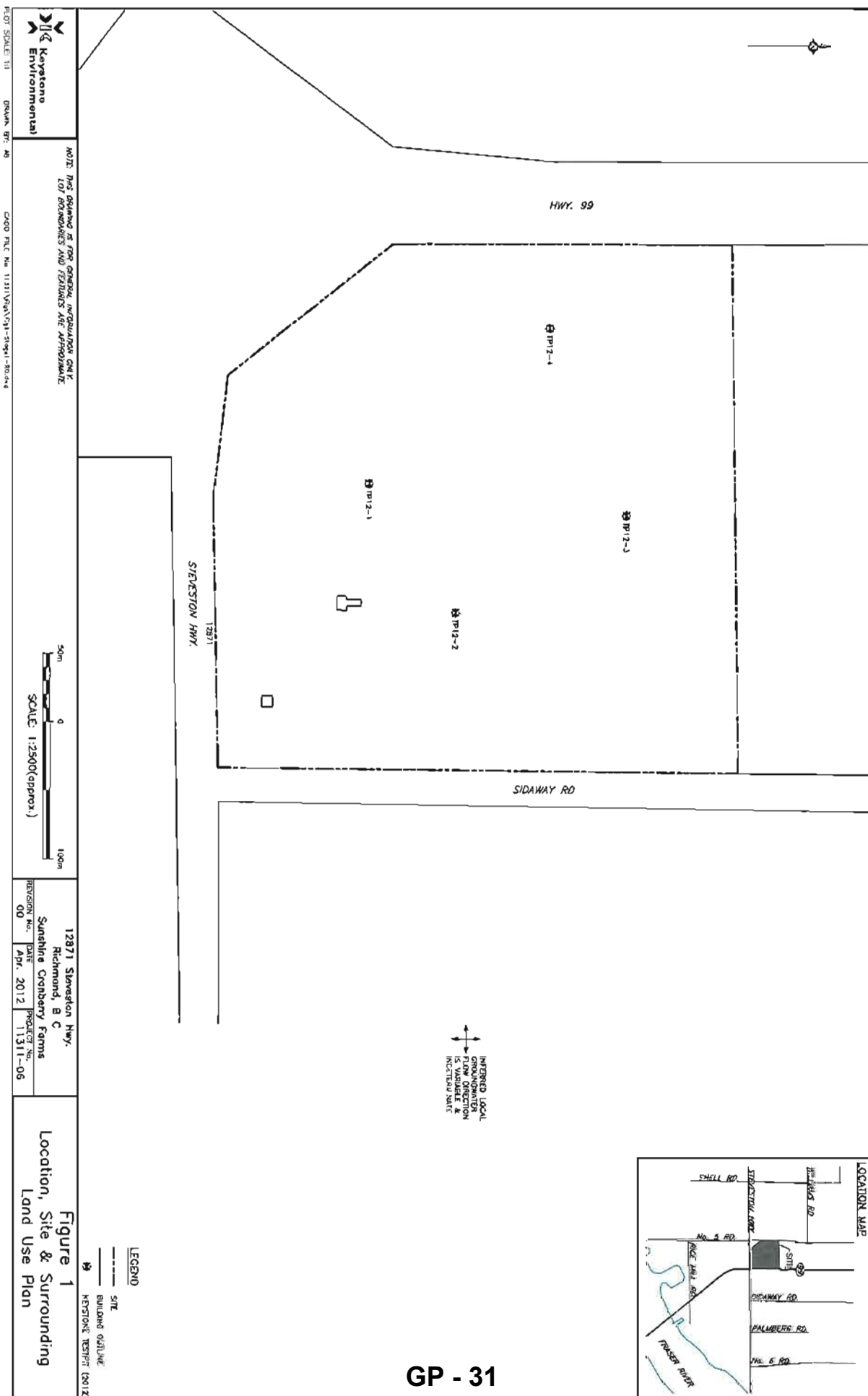
Legal Description:	South East Quarter Section 31 Block 4 North Range 5 West New Westminster District Except: Firstly: Part on Plan with Bylaw Filed 66269; Secondly: Part on Statutory Right of Way Plan 21305; Thirdly: Part on Highway Statutory Right of Way Plan 60799
Parcel Identifier:	013-069-241
Site Owner on Title:	Sunshine Cranberry Farm Ltd.
General Civic Address:	12871 Steveston Highway
Current Zoning:	AG1 (traditional sites zoned for agriculture purposes)
Site Latitude:	49° 08' 06.72" N
Site Longitude:	123° 05' 01.24" W

A copy of the land title is appended.

2.1 General Site Description

The Site was located in the southern part of the City of Richmond, BC. Highway 99 borders the site to the west, Steveston Highway borders the site to the south, Sidaway Road borders the site to the east, and 10051 Sidaway Road borders the site to the north (see Figure 2-1). The Site is approximately 116,615 m² and zoned AG1 (agricultural use) by the City of Richmond. The land use zoning surrounding the Site was varied. The land north of the site at 10051 Sidaway Road (currently a blueberry farm) and east of the site at 10900, 10620, 10520, and 10440 were zoned as AG1. The south neighbour at 12900 Steveston Highway was zoned as CR (roadside stand) and AG1. To the west across Highway 99, the land was zoned ZA3 (agriculture and botanical show garden) and ASY (assembly) at 10640 No. 5 Road, and ZA3 and ZMU18 (commercial mixed use) at 12733 Steveston Highway. The Fraser River is located approximately 1.1 km south and 1.3 km east of the property.





The main site entrance was located midway along the southern property boundary off of Steveston Highway. A paved driveway led to an old maintenance building. This area of the site had previously been used to house cell phone towers, and the remnants of these were stacked beside the access road (Photograph 1). Some of the concrete anchors for the towers had been excavated, and Mr. Bhullar indicated that all of them would be removed prior to fill placement. A single cell phone tower with an associated maintenance building remained in the southeast corner of the site which could be accessed from a gravel driveway off of Sidaway Road (Photograph 2). Agricultural drainage ditches were present along each of the property boundaries.

The remainder of the site was comprised of open fields with unmanaged vegetation. Generally, the site had mildly undulating terrain of low relief and, as a result, pools of standing water were observed throughout. In these wetter sections, hardhack (*Spiraea douglasii*) dominated the shrub layer, with reed canary grass (*Phalaris arundinacea*) and sedges (*Carex* spp.) representing the forbs (Photograph 3). In areas of higher relief, patches of reed canary grass, western butter cup (*Ranunculus occidentalis*) and various grasses were present (Photograph 4). Small patches of the invasive species, Himalayan blackberry (*Rubus discolor*), were distributed sporadically throughout the Site.

Observations of the Site were made in February, March and April 2012. During all three months, standing water was observed on the southwest section of the land and during February also in other areas of the Site. During February and March, the drainage ditches surrounding the Site were at capacity, not allowing drainage of the adjacent lands into the ditches. It was reported by the Mr. Bhullar, that the ditches around the Site have been at capacity during December and January as well. Ground truthing of soils and agricultural capability maps was carried out in March 2012 and the pictures contained within this report are representative of conditions at the Site on March 9, 2012.





Photograph 1 Site entrance with cell phone tower steel stacked on the left.



Photograph 2 Existing cell phone tower with concrete anchor blocks.



Photograph 3 A patch of hardhack around an anchor block and stay cable.



Photograph 4 Sedges and reed canarygrass.



Photograph 5 Standing water noted on the southwest portion of the Site.



Photograph 6 Standing water on the southwest portion of the Site.

2.2 Topography

The Site was relatively level with elevation varying from five to six metres above sea level. The lowest part of land appeared to be in the southwest corner where standing water was prevalent; however, slope changes were visibly imperceptible. Throughout the Site, depressions were filled with ponded water.

2.3 Surficial Geology and Hydrogeology

Local surficial geology was assessed using the Geological Survey of Canada Map 1486A, New Westminster, Scale 1:50,000, Map number: 1486A (1979). The Site, and the general vicinity around it, was classified by the Geological Survey of Canada Surficial Geology map as Fraser River Sediments which consisted of deltaic and distributary channel fill sediments overlying and cutting estuarine sediments and overlain in much of the area by overbank sediments. Specifically, the northwest quarter was classified as having over bank sandy to silt loam, normally less than two metres overlying the deltaic deposits. The remainder of the Site was classified as having lowland peat to eight metres thick overlying the Fraser River sediments. Current soil stratigraphy may or may not be as described by the surficial geology map due to past and present human activities.

Site groundwater was expected to follow regional topography. Local groundwater flow direction may vary as a result of local conditions, such as topography, geology and the presence of drainage channels and buried utilities, and is subject to confirmation with field measurements. Because the Site is relatively flat, local groundwater flow was indeterminate, although aquifer connectivity to the Fraser River is expected. It is possible that the groundwater flow direction and gradient is tidally influenced, due to the Site's proximity to the Fraser River. Drainage is provided by infiltration which partly feeds the ditches along the Site boundaries and the central watercourse. Groundwater on and around the Site is a part of the Fraser River groundwater basin.

2.4 Soil

According to the "Soils of the Langley-Vancouver Map Area, Volume 3" soil survey (1981), as shown in Figure 2, below, the Site has previously been mapped with two soils types: a complex of Richmond-Annis soil over the south and southeastern two-thirds of the Site and Delta Soils on the northwestern third of the Site. The area is described as gently undulating.



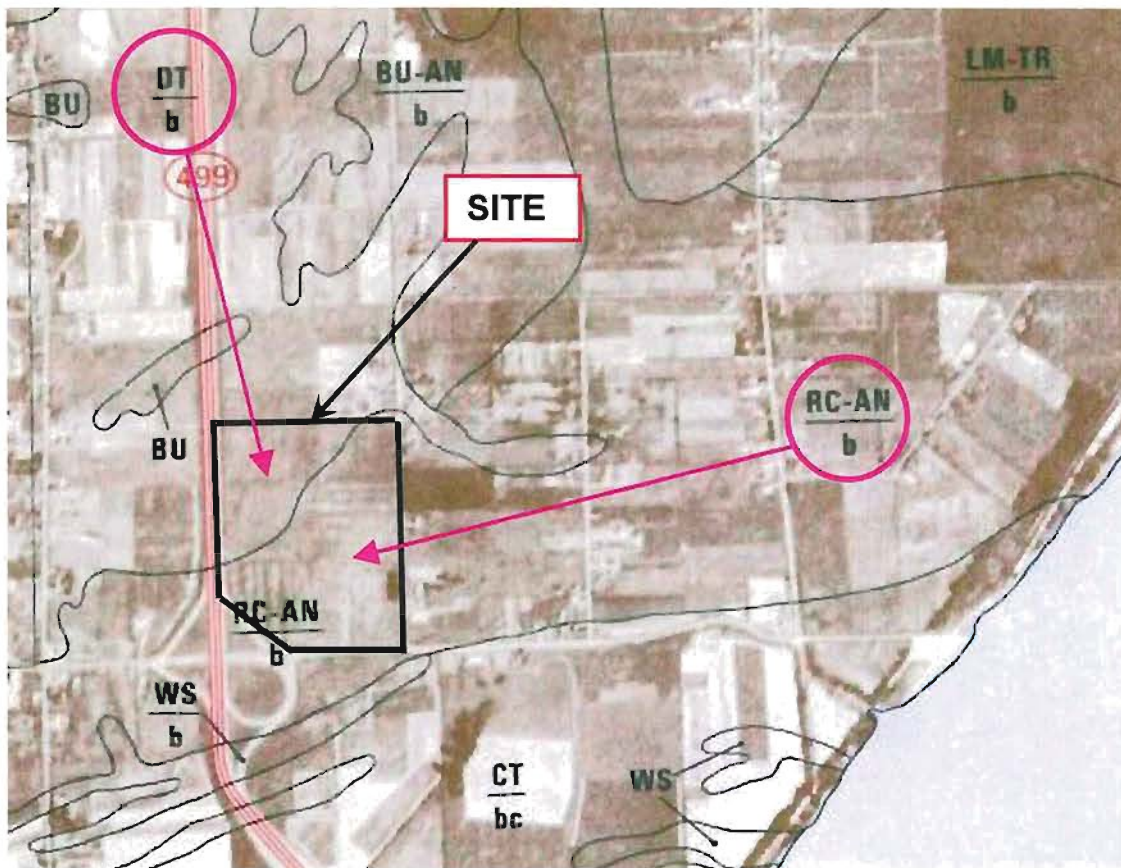


Figure 2 Two Soil Units Identified On-Site

Site Assessment and Soil Observations

A Site assessment was conducted on March 9 2012, to determine conditions and verify soil type classifications with test pits on the Site.

Keystone Environmental confirmed the presence of the two soil units identified in the "Soils of the Langley Map Area": Richmond-Annis and Delta soils units. They were defined by soil classification, site location, topography and drainage moisture regime

Soil Unit #1 – Richmond-Annis Soil Complex

Soil unit #1, Richmond-Annis soil complex is present on the Site over the southwest, northeast, and southeast portion of the Site.

General Soil Description

Richmond-Annis soils have a layer of black to brownish well decomposed organic material averaging 15 cm to 40 cm, which are underlain by a greyish, massive silty clay layer. The soils are very poorly drained. The soil is classified as *Terric Humisol* grading to a *Rego Gleysol* which is typically found in the lowlands of Richmond and Delta.

A black, organic silty loam deposit horizon was identified near the surface to a depth of 20-24 cm (see Photograph 7). From 22 cm to 56 cm, a brown layer of silty clay was present. Low to no coarse fragments were located in the Richmond soil pits and rooting depth was restricted to the upper 50 cm. Groundwater flowed between the middle brown layer and lower confining silty clay located at the 56 cm mark and downward. See picture below where water is exiting root holes.



Photograph 7 Typical Richmond-Annis Soils profile identified on three-quarters of the Site (NE, SE and SW).

Drainage and Soil Moisture

Richmond-Annis soils are very poorly drained. The soil is moderately pervious and has a very high water holding capacity and slow surface runoff. The groundwater tables are near, or sometimes at the soil surface during most of the winter and early spring but usually recede during the growing season. Surface ponding during heavy prolonged rains is common, due in part to accumulation of runoff from adjacent soils at higher locations, and thus have high water tables with poor surface drainage. Groundwater tables are often at or near the surface during the winter months with frequent ponding of surface water.

Soil Textures

Surface textures were observed to be composed of mostly a silty loam and subsoils were dominantly silty clay loam overlying a massive silty clay layer. These fine textures act as confining layers which limit the downward movement of groundwater.

Soil Unit #2 – Delta Soils

Soil unit #2 was identified as a Delta soil transecting the property over the northwest quadrant of the Site. Delta soils are typically found in western Delta and central Richmond at low elevations.

General Soil Description

These soils are organically rich but poorly drained. This soil had a shallow layer (up to 5 cm) of organic litter on the surface. Much of the upper organic decomposed layer was absent. The Delta soils were stratified with a dark grey, silt loam, friable, prior cultivated surface approximately 25 cm thick underlain by a firm, greyish blocky layer of silty clay loam approximately 16 cm in thickness, followed by a light grey massive silty clay layer with some orange brown mottles. The soil is classified as *Ortho Humic Gleysol: saline phase*, found in central Richmond and western Delta.



Photograph 8 Typical Delta Soil Profile identified on the NW portion of the Site.

Drainage and Soil Moisture

Delta soils are poorly drained. These soils are moderately pervious; have a high water holding capacity and low surface runoff. Water often accumulates at the surface during significant rainfall events during the winter months.

Soil Textures

The texture of the surface layer was observed to be a silty clay loam, with a clear transition to a thin underlying layer of clay loam (Photograph 6). The lowest layer was a confining layer of light grey silty clay. These soils have developed from Fraser River deltaic deposits and are generally stone free (no coarse fragments were found in the pits dug on-site).

2.5 Agricultural Land Classification

According to the Standing Committee on Agriculture's "Agricultural Land Reserve Agricultural Land Classification" Map, the north west corner of the Site is rated Class 2 6/W to Class 3 4/W. and the remainder of the Site is rated Class O4 6/W to 4 4/W. An excerpt from the map showing the Site is below. The Site is outlined in blue and agricultural land capability rating is circled with an arrow pointing to the shaded portion of the Site for which it applies.

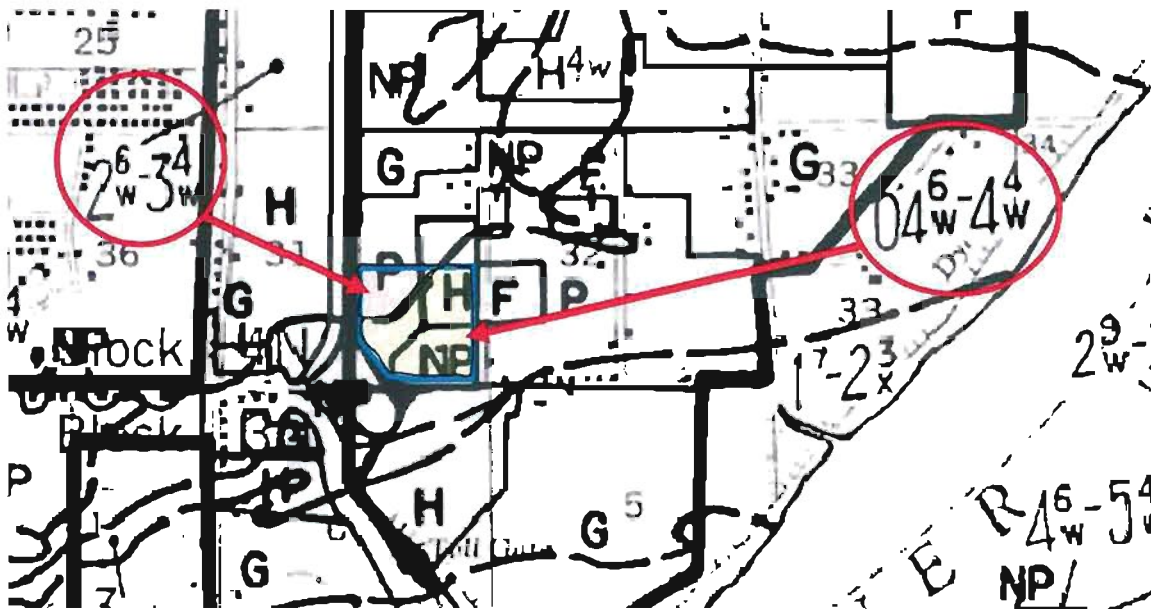


Figure 3 Agricultural Land Classification for Agriculture

The P stands for pastureland, the H stands for horticulture and the NP stands for non-productive. In the agricultural land capability rating the "O" stands for organic matter. The numerator number following the class rating is the percentage of the unit that has that rating [i.e. 4 = 40%] and the denominator indicates the limitation. For these classes the limitation in the denominator is "W" meaning excess water.

The definitions listed below are from the Land Capability Classification of Agriculture in British Columbia describing the limiting condition of excess water.

Class 2W: Occasional occurrence of excess water during the growing period causing slight crop damage, or the occurrence of excess water during the winter

months adversely affecting deep rooted perennial crops. Water level is rarely, if ever, at the surface and excess water is within the upper 50 cm for only short periods (less than 2 weeks) during the year.

Class 3W: Occasional occurrence of excess water during the growing period causing minor crop damage, but no crop loss, or the occurrence of excess water during the winter months adversely affecting perennial crops. Water level is near the soil surface until mid-spring forcing late seeding, or the soil poorly and in some cases imperfectly drained, or the water level is less than 20 cm below the soil surface for a continuous maximum period of 7 days during the growing period.

Class 4W: 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.

Standing water was noted in April 2012 on portions of the Site and water has been noted at the surface on areas of the Site throughout the winter. The majority of the Site (the southern two thirds) meets the Class O4W – 4W rating and the northwest corner meets the 3W rating.

2.6 Drainage

Areas of standing water were observed throughout the Site, which was generally wet throughout. Moisture-tolerant vegetation was present in proximity to site drainages and included sedges, reeds, birch, blackberry, hardhack and hydrophilic grasses. Site drainage features were present on the property boundaries:

- The drainage ditch running parallel to the east property boundary had a steady southern flow and was approximately 2.5 m wide and 0.5 m deep (Photograph 9). This ditch separated the property from Sidaway Road.





Photograph 9 Eastern Drainage Ditch parallel to Sidaway Road.

- The drainage ditch running parallel to the west property boundary, adjacent to Highway 99, was approximately 2 m wide and 0.5 m deep. Water was present in this ditch and appeared stagnant in places. The general flow direction was southward.
- The drainage ditch running parallel to the south property boundary was connected to the western ditch. This ditch was approximately 1.5 m wide and 0.5 m deep, with an easterly flow direction (Photograph 10).



Photograph 10 Southern Drainage Ditch Parallel to Steveston Highway.

- Drainage on the north property boundary consisted of an ill-defined, heavily vegetated, shallow swale approximately 1 m wide (Photograph 11). Water in the ditch was stagnant with no observable flow direction. This drainage ditch is not shown on the City of Richmond map site and is considered a private ditch that has been established by either the previous owner or the adjacent property owner.



Photograph 11 Heavily Vegetated Northern Drainage Swale.

The City of Richmond has adopted the Riparian Areas Regulation and has identified watercourses within the municipality where the RAR applies. These watercourses have either 5 m or 15 m Riparian Management Areas (RMA) as defined under the regulation in which development activities are not permitted. For the property at 12871 Steveston Highway, the 5 m RMA is required for the ditches on the south, west and east property boundaries. The north ditch was not identified with an RMA as per the City of Richmond GIS mapping service accessed on March 14, 2012, neither was the site identified in any Environmentally Sensitive Areas as per this same source.

3. HISTORIC LAND USE

Aerial photographs were reviewed for information concerning past uses of and activities at the Site.

3.1 Aerial Photographs

Aerial photographs, dated 1938, 1949, 1954, 1963, 1974, 1979, 1982, 1991, 1997, 2002 and 2009, were reviewed for information concerning historical physical features of land use on-site and on properties in the vicinity of the Site. The following discussion is a summary of observations made during the aerial photograph review. Copies of the aerial photographs are presented in Appendix A.

1938 and 1949 Aerial Photographs

On-Site

- In 1938, the eastern half of the site appeared to be agricultural fields, whereas the western portion appeared uncultivated, but vegetated. This area appeared to have been cultivated by 1949. A small structure, presumably a farm house was present in both photographs.

Off-Site

- Photographs showed that the entire surrounding area was a mix of agricultural use.
- Directly south and east of the site were access roads.

1954 Aerial Photograph

On-Site

- The site appeared to still be in use for agricultural purposes, with evidence of ploughed fields (parallel lines across the property).
- The small farm house was still present.

Off-Site

- The surrounding area was still agricultural, with no significant changes in visible characteristics.



1963 Aerial Photograph

On-Site

- The Site had not changed significantly since 1954. Tilling lines were still evident indicating continued use for agriculture, and the on-site farm house was present. No changes to drainage were observed.

Off-Site

- By 1963, Highway 99 had been constructed west of the site and an interchange had been built as part of this transportation corridor southwest of the site.
- Surrounding agricultural properties were similar in condition as observed in the 1954 photograph.

1974 and 1979 Aerial Photographs

On-Site

- In 1974, cultivation was evident in the southwest and northeast quadrants of the property. Both the northwest and southeast quadrants appeared to be fallow and several poles or towers appeared to have been erected in these areas. An additional farm house was present in the northeast portion of the site, off of Sidaway Road.
- By 1979, the entire site appeared to be used for cultivation. Pairs of towers were erected in the northwest and southwest quadrants. An additional pair of towers may be present in the southeast quadrant.

Off-Site

- Surrounding agricultural properties were similar in condition as was observed in the 1963 photograph.

1982 and 1991 Aerial Photographs

On-Site

- The 1982 aerial photograph showed the two farm houses and evidence of continued cultivation; however, the photograph was of poor quality, so additional features were not discernible.
- By 1991, an additional building had been constructed in the lower southeast quadrant of the site and towers surrounding this structure were evident. Cultivation was evident in the southwest and northeast quadrants of the property, and the towers previously surmised were visible.
- Till marks were visible in the northeast and southwest quadrants.

Off-Site

- The 1982 aerial photograph showed the beginning of development west of Highway 99. By 1991, the development had been completed.
- Additional structures had been constructed on property south of the site.
- The remaining neighbouring agricultural properties were similar in condition as was observed in the 1979 photograph.

1997 Aerial Photograph

On-Site

- In 1997, the Site had not changed visibly since 1991.

Off-Site

- The surrounding landscape was similar to 1991.



2002-2009 Aerial Photographs

On-Site

- The 2002 aerial photograph showed an apparent abandonment of cultivation and an increase in vegetation growth. The towers in the northwest and southwest quadrants appeared to have been removed; a tower in the southeast corner remained. In 2009, no significant changes were observed from 2002.

Off-Site

- The surrounding landscape was similar from 1997.

3.2 Current Title Search

A title search was reviewed via the BC Online website. No title transfers, covenants or easements related to Site contamination issues were listed. A copy of the current land title search result is provided in Appendix B.

4. FILL PLACEMENT

Keystone Environmental personnel visited the Site to:

- Observe current conditions, as well as neighbouring properties
- Determine the need and appropriateness for fill placement on Site
- Prepare photographic documentation of Site history

4.1 Proposed Agricultural Crop

The Site owner proposes to reintroduce agriculture usage of the Site by planting blueberries. This is a perennial plant for which the climate of the Richmond area is very suitable for the growth of this crop. The northern neighbour also cultivates this species but has reported substantially reduced yields due to the lack of drainage during the winter months as compared with nearby neighbouring properties which have had fill placement and are also growing blueberries.

4.2 Fill Placement Plan

The proposed plan for the Site is to:

- Strip all of the top 20 to 25 cm of organic material from the fields and stockpile until such time as enough fill is placed to achieve the required elevation
- Place a locally-sourced coarse-grained soil with some fines as fill to elevate the existing grade by approximately one metre throughout which will allow for year round drainage of the soils
- Top dress the filled area using the previously stripped soils mixed with peat, sand, and other organic matter to achieve a proper growth medium for blueberries of approximately 0.5 m
- Place fill such that fill embankments meet 2H:1V slope criteria
- In the area of watercourses, place fill at 3H:1V to prevent potential erosion and sediment intrusion



- Place fill to elevate the contours of the Site to meet the City of Richmond Soil and Fill Deposit Regulation Bylaw 8094 in order to facilitate the potential placement of farm support structures, if any should need to be constructed
- Follow setbacks of 5 m from all watercourses adjacent to the Site and on-Site for start of fill placement

The following measures should be implemented to minimize the potential impacts of the fill placement on the property and associated watercourses:

- Use erosion and sediment control Best Management Practices (BMPs), such as silt fence installation during fill placement
- Slope the zone between the top of fill area and watercourses, such that there is a gradual transition (3H:1V) in order to minimize accelerated overland water flow to the riparian areas and watercourses, and other potential erosion and sediment control issues
- Plant grasses or other ground cover on the slopes to minimize soil erosion from disturbed and new filled areas

4.3 Anticipated Agricultural Improvements to the Site

A review of relevant historical information and aerial photographs indicated that the Site was historically utilized for agricultural pasture with some annual cropping prior to the placement of telecommunication towers. At the current time, the site is not being cultivated and all but one communications tower has been removed.

The site is zoned for agricultural use and can be revived into productive cultivation through the use of improved drainage. Native soils on Site had high water tables and poor infiltration capacity contributing to poor drainage. These soil characteristics are not conducive to perennial crops such as the cultivation of blueberries.

The site is considered usable without fill placement for annual cropping with a reduced growing season due to lack of access in spring months and for pasture. Perennial plantings, such as blueberries, would currently suffer with the prolonged elevated water table during the winter months which would promote root rot and lack of drainage would inhibit early seasonal growth

due to the persistence of ponded water. Drainage tile would not substantially improve the drainage of the Site in the winter or early spring to improve accessibility, which is required for annual plantings, as the drainage would be to ditches which are at capacity well into the early spring months and would not be able to effectively drain.

Increased drainage from the placement of granular fill would benefit both annual and perennial cropping practices. The following agricultural improvements are anticipated for the Site following the placement of appropriate fill material:

- Increased water holding capacity for dry summer months due to the larger volume of soil that will be present on the Site, as well as improved water retention characteristics which modify discharges to surrounding ditches
- Increased drainage in winter months in the rooting zone which would protect perennial crops from water ponding effects
- Improved soil structure, which will allow for an increase in the number of days that farm machinery can traverse the soils on the Site
- Improved soil structure that will allow for a wider variety of agricultural crops to be grown
- Compliance with the City of Richmond bylaws for the base of buildings in a flood plain which will then allow for the construction of agricultural support buildings, if so required in the future.
- Overall, the potential impact of fill placement on the aesthetic issue of view is negligible. Other operational aesthetic impacts, from increasing active operation of the land for agricultural purposes, such as odour and dust, can be readily mitigated and managed through BMPs.

The potential impact to the Site from the placement of the fill will be an improvement to the agricultural utility, due to improved soil drainage and ability to grow a wider variety of crops. With the preservation of the standard setbacks for on-site and adjacent watercourses, there should be no impact on sensitive natural communities associated with these areas. There is expected to be a potential displacement of birds and mammals that currently inhabit the Site but



the adjacent similar habitat types can accommodate this displacement until fill placement is completed.

The overall use of a granular, well-drained material for fill will reduce the current flooding of the area. The soil will allow for more infiltration of water during storm events and the increased volume of soil will increase water retention capacity. This increase in water holding capacity should, in turn, moderate/regulate water discharge to the receiving watercourses. With use of mitigation measures and BMPs during fill placement, the potential impacts on water quality from erosion and sedimentation should be minimized.

5. SUMMARY AND CONCLUSIONS

It is concluded that the Site located at 12871 Steveston Highway, City of Richmond, BC, is a suitable location to receive the fill material required to improve the agricultural land use of the Site for both annual and perennial crops. With the appropriate use of measures to prevent soil erosion, and later operational measures such as best management practices, the application of fill material is anticipated to improve soil structure and drainage, mitigate current flooding issues and increase the utility of the land for agricultural use, specifically for the growth of blueberries and annual planting practices.



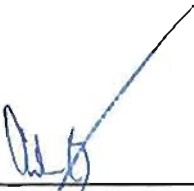
6. PROFESSIONAL STATEMENT

This report has been prepared and reviewed by Keystone Environmental Ltd.¹ approved personnel who have the credentials and knowledge of the applicable public laws, regulations and/or policies which apply to this report.

This report was prepared by Mr. Andrew Booth, P. Biol., and reviewed by Ms. Shawna Reed, Ph.D., R.P. Bio., and Ms. Lori C. Larsen, P.Ag. It is subject to the General Terms and Conditions appended at the end of the report.

April 25, 2012

Date



Andrew Booth, P. Biol.,
Project Biologist

Signed for Shawna by



Shawna E. Reed, Ph.D., R.P. Bio.
Director of Biological Assessment Services



Lori C. Larsen, P.Ag.
Senior Project Manager

¹ Keystone Environmental Ltd.'s corporate address is:
Suite 320 - 4400 Dominion Street, Burnaby, BC V5G 4G3
Telephone: 604-430-0671 / Facsimile: 604-430-0672 / Internet: www.keystoneenviro.com

7. REFERENCES

Aerial photographs dated 1938, 1949, 1954, 1963, 1974, 1979, 1984, September 1991, September 1997, and April 2004

BC Ministry of Agriculture and Food and BC Ministry of Environment, *Land Capability Classification for Agriculture in British Columbia MOE Manual 1*, ISSN 0821-0640, April 1993

City of Richmond Geographic and Land Information GIS Interactive Map Inquiry Tool:
<http://map.city.richmond.bc.ca/website/gis/viewer.htm>

Current Title Search obtained from BC Online

Geological Survey of Canada Surficial Geology Map, 1486A dated 1981

Luttmerding, H.A., *Soils of the Langley-Vancouver Map Area Report No. 15 British Columbia Soil Survey Volume 1 Soil Map Mosaics and Legend Lower Fraser Valley*
(Scale 1:25000), 1980

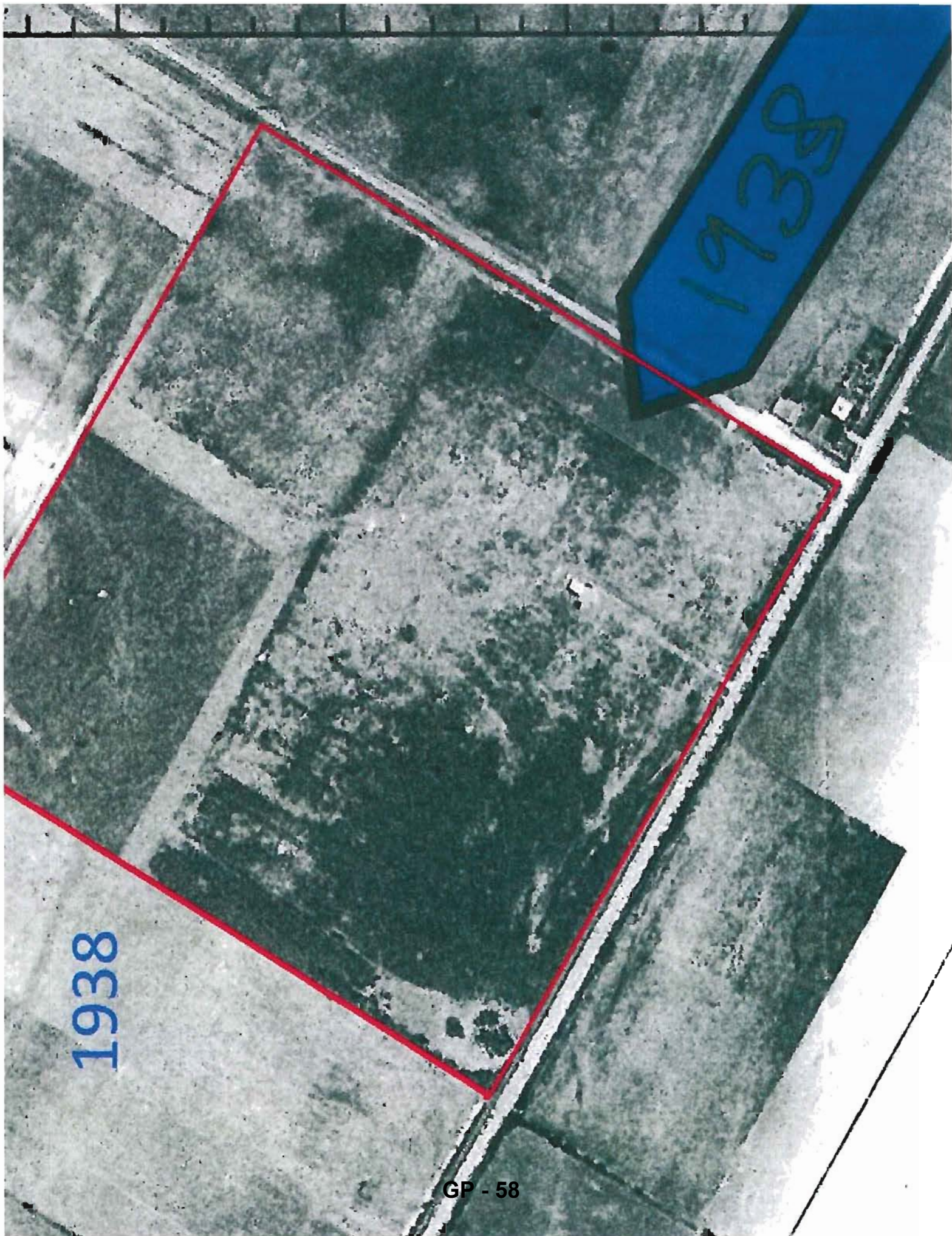
Talisman Projects Inc. for Select Standing Committee on Agriculture, *Agricultural Land Reserves Agricultural Capability and Land Use – Vancouver South 92G3*
(Scale 1:50,000), February 1979



APPENDIX A

HISTORICAL AERIAL PHOTOGRAPHS





1938

GP - 58

1949

GP - 59

1949



1954

1956



1963

1963

GP - 61

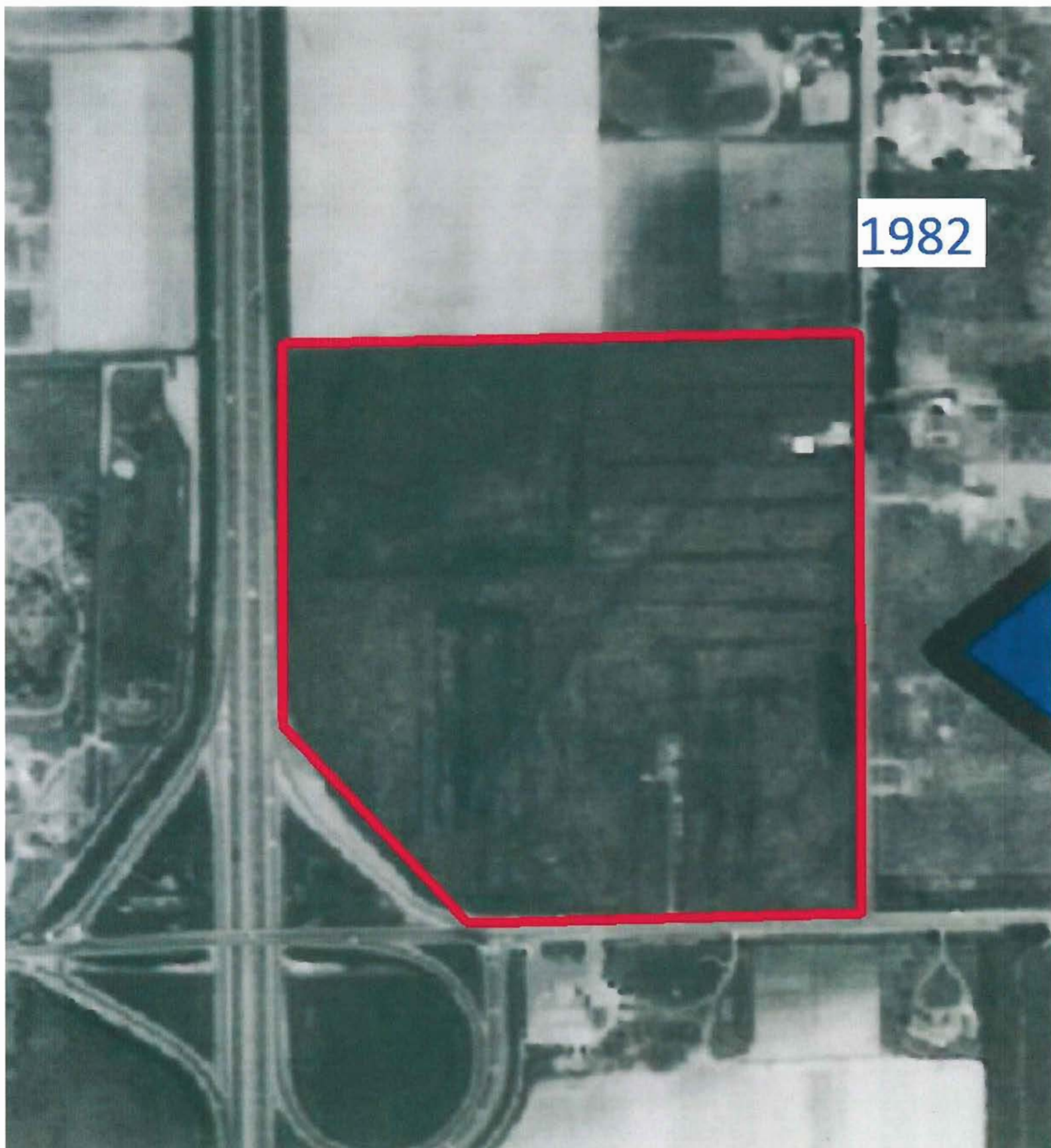


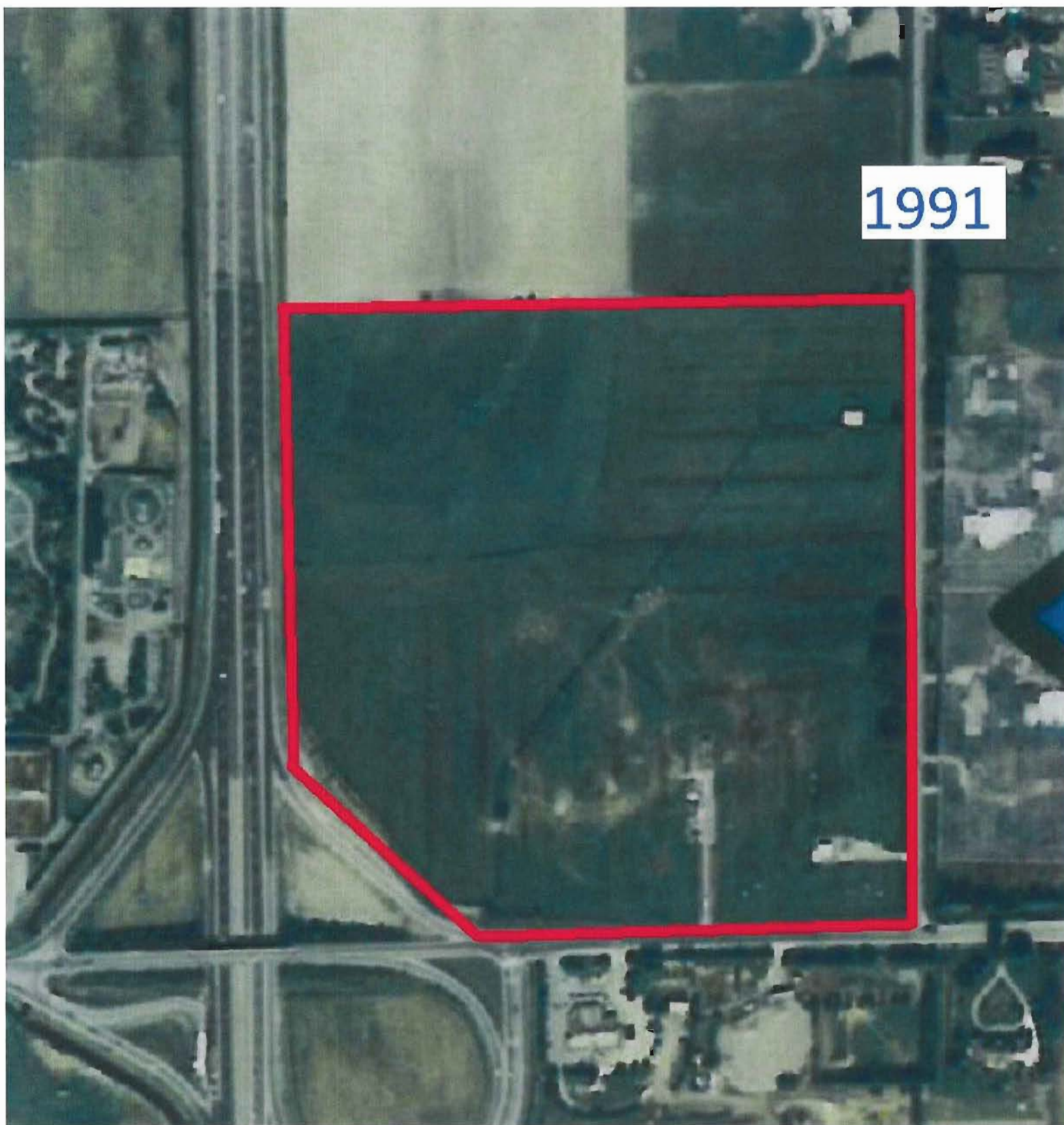




1979







1991



1997



GP - 67

2009



APPENDIX B
CURRENT TITLE SEARCH



title-CA2331555.txt
Date: 20-Apr-2012 TITLE SEARCH PRINT Time: 10:05:15
Requestor: (PV43481) KEYSTONE ENVIRONMENTAL LTD. Page 001 of 002
Folio: 11311 TITLE - CA2331555

NEW WESTMINSTER LAND TITLE OFFICE TITLE NO: CA2331555
FROM TITLE NO: BV204168

APPLICATION FOR REGISTRATION RECEIVED ON: 29 DECEMBER, 2011
ENTERED: 10 JANUARY, 2012

REGISTERED OWNER IN FEE SIMPLE:
SUNSHINE CRANBERRY FARM LTD., INC.NO. BC0735293
6660 SIDAWAY ROAD
RICHMOND, BC
V6W 1H1

TAXATION AUTHORITY:
CITY OF RICHMOND

DESCRIPTION OF LAND:
PARCEL IDENTIFIER: 013-069-241
SOUTH EAST QUARTER SECTION 31 BLOCK 4 NORTH RANGE 5 WEST NEW WESTMINSTER
DISTRICT EXCEPT: FIRSTLY: PART ON PLAN WITH BYLAW FILED 66269; SECONDLY:
PART ON STATUTORY RIGHT OF WAY PLAN 21305; THIRDLY: PART ON HIGHWAY
STATUTORY RIGHT OF WAY PLAN 60799;

LEGAL NOTATIONS:

THIS TITLE MAY BE AFFECTED BY THE AGRICULTURAL LAND COMMISSION ACT,
SEE AGRICULTURAL LAND RESERVE PLAN NO. 1 DEPOSITED JULY 30TH, 1974

CHARGES, LIENS AND INTERESTS:

NATURE OF CHARGE
CHARGE NUMBER DATE TIME

STATUTORY RIGHT OF WAY
BV303323 2003-08-05 11:02
REGISTERED OWNER OF CHARGE:
TM MOBILE INC.
INCORPORATION NO. A56593
BV303323
REMARKS: PART IN PLAN BCP6598
MODIFIED BY CA2312593
MODIFIED BY CA2328389
MODIFIED BY CA2331501

MODIFICATION
CA2312593 2011-12-13 15:28
REMARKS: MODIFICATION OF BV303323

MODIFICATION
CA2328389 2011-12-23 13:15
REMARKS: MODIFICATION OF BV303323
SEE CA2312593

MODIFICATION
CA2331501 2011-12-29 16:19
REMARKS: MODIFICATION OF BV303323,
SEE CA2312593 AND CA2328389

Date: 20-Apr-2012 TITLE SEARCH PRINT Time: 10:05:15
Requestor: (PV43481) KEYSTONE ENVIRONMENTAL LTD. Page 002 of 002
Folio: 11311 TITLE - CA2331555

title-CA2331555.txt

MORTGAGE
CA2331556 2011-12-29 16:51 CANCELLED BY: CA2418396 2012-03-01
REGISTERED OWNER OF CHARGE:
TELUS COMMUNICATIONS INC.
INCORPORATION NO. 55547A
CA2331556

ASSIGNMENT OF RENTS
CA2331557 2011-12-29 16:51 CANCELLED BY: CA2418397 2012-03-01
REGISTERED OWNER OF CHARGE:
TELUS COMMUNICATIONS INC.
INCORPORATION NO. 55547A
CA2331557

MORTGAGE
CA2410153 2012-02-27 13:10
REGISTERED OWNER OF CHARGE:
FARM CREDIT CANADA
CA2410153 .

"CAUTION - CHARGES MAY NOT APPEAR IN ORDER OF PRIORITY. SEE SECTION 28, L.T.A."

DUPLICATE INDEFEASIBLE TITLE: NONE OUTSTANDING

TRANSFERS: NONE

PENDING APPLICATIONS: NONE

CORRECTIONS: NONE

APPENDIX C

GENERAL TERMS AND CONDITIONS FOR SERVICES



KEYSTONE ENVIRONMENTAL LTD.
GENERAL TERMS AND CONDITIONS FOR SERVICES

The terms and conditions set forth below govern all work or services requested by CLIENT as described and set forth in the Proposal of Keystone Environmental Ltd. ("Keystone") attached hereto, any Purchase Order issued by CLIENT or Agreement between Keystone and CLIENT. The provisions of said Proposal or Agreement govern the scope of services to be performed, including the time schedule, compensation, and any other special terms. The terms and conditions contained herein shall otherwise apply expressly stated to the contract or inconsistent with said Proposal or Agreement.

1. COMPENSATION

Unless otherwise stated in Keystone's Proposal, CLIENT agrees to compensate Keystone in accordance with Keystone's published rate schedules in effect on the date when the services are performed. Copies of the schedules currently in effect are attached hereto. Keystone's rate schedules are revised periodically; and Keystone will notify CLIENT of any such revisions and the effective date thereof which shall not be less than thirty (30) days after receipt of such notice. As to those services for which no schedule exists, Keystone shall be compensated on a time and materials basis as set forth in any change order executed pursuant to this Agreement.

2. PAYMENT

Unless otherwise agreed to in writing, invoices will be submitted monthly. Payment of invoices is due within thirty (30) days of receipt of the invoice. Invoices not paid within (30) days after date of receipt shall be deemed delinquent.

3. INDEPENDENT CONTRACTOR

Keystone shall be an independent contractor and shall be fully independent in performing the services of work and shall not act or hold themselves out as an agent, servant or employee of CLIENT.

4. KEYSTONE'S LIMITED WARRANTY

The sole and exclusive warranty which Keystone makes with respect to the services to be provided in the performance of the work is that they shall be performed in accordance with generally accepted professional practices and CLIENT's standards and specifications to the extent accepted by Keystone and shall be performed in a skillful manner.

In the event Keystone's performance of work, or any portion thereof, fails to conform with the above stated limited warranty, Keystone shall, at its discretion and its expense, proceed expeditiously to reperform the nonconforming, or upon the mutual agreement of the parties, refund the amount of compensation paid to Keystone for such nonconforming work. In no event shall Keystone be required to bear the cost of gaining access in order to perform its warranty obligations.

5. CLIENT WARRANTY

CLIENT warrants that: it will provide to Keystone all available information regarding the site, structures, facilities, buildings, and land involved with the work and that such information shall be true and correct; it will provide all licences and permits required for the work; that all work which it performs shall be in accordance with generally accepted professional practices; and it has title to or will provide right of entry or access to all property necessary to perform the work.

6. INDEMNITY

- a. Subject to the limitations of Section 7 below, Keystone agrees to indemnify, defend and hold harmless CLIENT (including its officers, directors, employees and agents) from and against any and all losses, damages, liabilities, claims, suits, and the costs and expenses incident thereto (including legal fees and reasonable costs of investigation) which any or all of them may hereafter incur, become responsible for or pay out as a result of death or bodily injuries to any person, destruction or damage to any property, private or public, contamination or adverse effects on the environment or any violation or alleged violation of governmental laws, regulations, or orders, to the extent caused by or arising out of: (i) Keystone's errors or omissions or (ii) negligence on the part of Keystone in performing services hereunder.
- b. CLIENT agrees to indemnify and hold harmless Keystone (including its officers, directors, employees and agents) from and against any and all losses, damages, liabilities, claims, suits and the costs and expenses incident thereto (including legal fees and reasonable costs of investigation) which any or all of them may hereafter incur, become responsible for or pay out as a result of death or bodily injuries to any person, destruction or damage to any property, private or public, contamination or adverse effects on the environment or any violation or alleged violation of governmental laws, regulations, or



orders, caused by, or arising out of in whole or in part: (i) any negligence or willful misconduct of CLIENT, (ii) any breach of CLIENT of any warranties or other provisions hereunder, (iii) any condition including, but not limited to, contamination existing at the site, or (iv) contamination of other property arising or alleged to arise from or be related to the site provided, however, that such Indemnification shall not apply to the extent any losses, damages, liabilities or expenses result from or arise out of: (i) any negligence or willful misconduct of Keystone; or (ii) any breach of Keystone of any warranties hereunder.

7. **LIMITATION OF LIABILITY**

Keystone's total liability, whether arising from or based upon breach of warranty, breach of contract, tort, including Keystone's negligence, strict liability, indemnity or any other cause of basis whatsoever, is expressly limited to the limits of Keystone's insurance coverage. This provision limiting Keystone's liability shall survive the termination, cancellation or expiration of any contract resulting from this Proposal and the completion of services thereunder. After three (3) years of completion of Keystone's services, any legal costs arising to defend third party claims made against Keystone in connection with the project defined in the Proposal or Agreement will be paid in full by the CLIENT.

8. **INSURANCE**

Keystone, during performance of this Agreement, will at its own expense carry Worker's Compensation Insurance within limits required by law; Comprehensive General Liability Insurance for bodily injury and for property damage; Professional Liability Insurance for errors omissions and negligence; and Comprehensive Automobile Liability Insurance for bodily injury and property damage. At CLIENT'S request, Keystone shall provide a Certificate of Insurance demonstrating Keystone's compliance with this section. Such Certificate of Insurance shall provide that said insurance shall not be cancelled or materially altered until at least ten (10) days after written notice to CLIENT.

9. **CONFIDENTIALITY**

Each party shall retain as confidential all information and data furnished to it by the other party which relate to the other party's technologies, formulae, procedures, processes, methods, trade secrets, ideas, improvements, inventions and/or computer programs, which are designated in writing by such other party as confidential at the time of transmission and are obtained or acquired by the receiving party in connection with work or services performed subject to this Proposal or Agreement, and shall not disclose such information to any third party.

However, nothing herein is meant to prevent nor shall it be interpreted as preventing either Keystone or CLIENT from disclosing and/or using said information or data; (i) when the information or data is actually known to the receiving party before being obtained or derived from the transmitting party; or (ii) when the information or data is generally available to the public without the receiving party's fault; or (iii) where the information or data is obtained or acquired in good faith at any time by the receiving party from a third party who has the right to disclose such information or data; or (iv) where a written release is obtained by the receiving party from the transmitting party; or (v) as required by law.

10. **PROTECTION OF INFORMATION**

Keystone specifically disclaims any warranties expressed or implied and does not make any representations regarding whether any information associated with conducting the work, including the report, can be protected from disclosure in responses to a request by a federal, provincial or local government agency, or in response to discovery or other legal process during the course of any litigation involving Keystone or CLIENT. Should Keystone receive such request from a third party, it will immediately advise CLIENT.

11. **FORCE MAJEURE**

Neither party shall be responsible or liable to the other for default or delay in the performance of any of its obligations hereunder (other than the payment of money for services already rendered) caused in whole or in part by strikes or other labour difficulties or disputes; governmental orders or regulations; war, riot, fire, explosion; acts of God; acts of omissions of the other party; any other like causes; or any other unlike causes which are beyond the reasonable control of the respective party.

In the event of delay in performance due to any such cause, the time for completion will be extended by a period of time reasonably necessary to overcome the effect of the delay. The party so prevented from complying shall within a reasonable time of its knowledge of the disability advise the other party of the effective cause, the performance suspended or affected and the anticipated length of time during which performance will be prevented or delayed and shall make all reasonable efforts to remove such disability as soon as possible, except for labour disputes, which shall be solely within said party's discretion. The party prevented from complying shall advise the other party when the cause of the delay or default has ended, the number of days which will be reasonably required to compensate for the period of suspension and the

date when performance will be resumed. Any additional costs or expense accruing or arising from the delaying event shall be solely for the account of the CLIENT.

12. **NOTICE**

Any notice, communication, or statement required or permitted to be given hereunder shall be in writing and deemed to have been sufficiently given when delivered in person or sent by facsimile, wire, or certified mail, return receipt requested, postage prepaid, to the address of the party set forth below, or to such address for either party as the party may by written notice designate.

13. **ASSIGNMENT/SUBCONTRACT**

Neither party hereto shall assign this Agreement or any part thereof or any interest therein without the prior written approval of the other party hereto except as herein otherwise provided. Keystone shall not subcontract the performance of any work hereunder without the written approval of CLIENT. Subject to the foregoing limitation, the Agreement shall inure to the benefit of and be binding upon the successors and permitted assigns of the parties hereto.

14. **ESTIMATES**

To the extent the work requires Keystone to prepare opinions of probable cost, for example, opinions of probable cost for the cost of construction, such opinions shall be prepared in accordance with generally accepted engineering practice and procedure. However, Keystone has no control over construction costs, competitive bidding and market conditions, costs of financing, acquisition of land or rights-of-way and Keystone does not guarantee the accuracy of such opinion of probable cost as compared to actual costs or contractor's bid.

15. **DELAYED AGREEMENTS AND OBLIGATIONS**

The performance by Keystone of its obligations under this Agreement depends upon the CLIENT performing its obligations in a timely manner and cooperating with Keystone to the extent reasonably required for completion of the Work. Delays by CLIENT in providing information or approvals or performing its obligations set forth in this Agreement may result in an appropriate adjustment of contract price and schedule.

16. **CONSTRUCTION PHASE**

To the extent the work is related to or shall be followed by construction work not performed by Keystone, Keystone shall not be responsible during the construction phase for the construction means, methods, techniques, sequences or procedures of construction contractors, or the safety precautions and programs incident thereto, and shall not be responsible for the construction contractor's failure to perform the work in accordance with the contract documents. Keystone will not direct, supervise or control the work of the CLIENT'S contractors or the CLIENT'S subcontractors.

17. **DOCUMENTATION, RECORDS, AUDIT**

Keystone when requested by CLIENT, shall provide CLIENT with copies of all documents relating to the service(s) of work performed. Keystone shall retain true and correct records in connection with each service and/or work performed and all transactions related thereto and shall retain all such records for twelve (12) months after the end of the calendar year in which the last service pursuant to this Agreement was performed. CLIENT, at its expense and upon reasonable notice, may from time to time during the term of this Agreement, and at any time after the date the service(s) were performed up to twelve (12) months after the end of the calendar year in which the last service(s) were performed, audit all records of Keystone in connection with all costs and expenses which it was invoiced.

18. **REPORTS, DOCUMENTS AND INFORMATION**

All field data, field notes, laboratory test data, calculations, estimates and other documents prepared by Keystone in performance of the work shall remain the property of Keystone. If required as part of the work, Keystone shall prepare a written report addressing the items in the work plan including the test results. Such report shall be the property of CLIENT, Keystone shall be entitled to retain three (3) copies of such report for its internal use and reference.

All drawings and documents produced under the terms of this Agreement are the property of Keystone, and cannot be used for any reason other than to bid and construct the project as described in the Proposal or Agreement.

19. **LIMITED USE OF REPORT**

Any report prepared as part of the work will be prepared solely for the internal use of CLIENT. Unless otherwise agreed by Keystone and CLIENT, parties agree that third parties are not to rely upon the report.



20. **SAMPLE MANAGEMENT**
Ownership of all samples obtained by Keystone from the project site is maintained by the CLIENT. Keystone will store such samples in a professional manner in a secure area for the period of time necessary to complete the project. Upon completion of the project, Keystone will return any unused samples or portions thereof to the CLIENT or at Keystone's option dispose of the samples in a lawful manner and bill the CLIENT for all costs related thereto. Keystone will normally store samples for thirty (30) days. Written notice will be given to the CLIENT before finally disposing of samples.
21. **RECOGNITION OF RISK**
CLIENT recognized and accepts the work to be undertaken by Keystone may involve unknown conditions and hazards. CLIENT further recognizes that environmental, geologic, hydrological, and geotechnical conditions can and may vary from those encountered by Keystone at the times and locations where it obtained data and information, and that limitations on available data results in some uncertainty with respect to the interpretation of these conditions, despite the use of due professional care by Keystone. CLIENT recognizes that the performance of services hereunder or the implementation of recommendations made by Keystone may unavoidably alter the existing site conditions and affect the environment in the area being studied.
22. **DISPOSAL OF CONTAMINATED MATERIAL**
It is understood and agreed that Keystone is not, and has no responsibility as, a generator, operator or storer of pre-existing hazardous substances or wastes found or identified at work sites. Keystone shall not directly or indirectly assume title to such hazardous or toxic substances and shall not be liable to third parties.

CLIENT will indemnify and hold harmless Keystone from and against all incurred losses, damages, costs and expenses, including but not limited to attorneys' fees, arising or resulting from actions brought by third parties alleging or identifying Keystone as a generator, operator, storer or owner of pre-existing hazardous substances or wastes found or identified at work sites.
23. **SUSPENSION OR TERMINATION**
In the event the work is terminated or suspended by CLIENT prior to the completion of the services contemplated hereunder, Keystone shall be paid for: (i) the services rendered to the date of termination or suspension, (ii) the demobilization costs, and (iii) the costs incurred with respect to noncancelable commitments.
24. **GOVERNING LAW**
This Agreement shall be governed by and interpreted pursuant to the laws of the Province of British Columbia.
25. **HEADINGS AND SEVERABILITY**
Any heading preceding the text of sections hereof is inserted solely for convenience or reference and shall not constitute a part of the Agreement and shall not effect the meanings, context, effect or construction of the Agreement. Every part, term or provision of this Agreement is severable from others. Notwithstanding any possible future finding by duly constituted authority that a particular part, term or provision is invalid, void or unenforceable, this Agreement has been made with the clear intention that the validity and enforceability of the remaining parts, terms and provision shall not be affected thereby.
26. **ENTIRE AGREEMENT**
The terms and conditions set forth herein constitute the entire Agreement and understanding of the parties relating to the provision of work or services by Keystone to CLIENT, and merges and supersedes all prior agreements, commitments, representation, writings, and discussions between them and shall be incorporated in all work orders, purchase orders and authorization unless otherwise so stated therein. The terms and conditions may be amended only by written instrument signed by both parties.



**Keystone
Environmental**
Knowledge-Driven Results

May 18, 2012

Ms. Magda Laljee, BA
Supervisor, Community Bylaws
City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Dear Ms. Laljee:

**Re: Additional Information Pertaining to the
Sunshine Cranberry Farm ALC Fill Application
12871 Steveston Highway, Richmond, BC
Our File No. 11311**

Keystone Environmental Ltd. (Keystone Environmental) was retained by Mr. Avtar Bhullar of Sunshine Cranberry Farm Ltd. to present the following information of his intentions with respect to future fill placement on the property at 12871 Steveston Highway, Richmond, BC. This following information is in response to subsections under Section 4.1 of the Soil Removal and Fill Deposit Regulation Bylaw No. 8094.

1. As discussed with you, the fill application has not been submitted to the Agricultural Land Commission as per your recommendation and it is our client's understanding that you will be forwarding the application to the Agricultural Commission if the City of Richmond approves this fill application.
2. The previously submitted Agrologist's report for the Site in Section 4.2 indicates the fill shall be a locally sourced coarse-grained soil with some fines. The anticipated volume of soil to be deposited is 120,000 cubic metres
3. The location of the fill Site is shown in the Agrologist's report along with the legal description and a copy of the current title for the parcel.
4. The owner of the land is Mr. Bhullar (Sunshine Cranberry Ltd.) who is making the application so there is consent from the owner of the parcel.
5. Attached is Figure A, which clearly shows the area of the proposed fill deposit. There are no watercourses on the Site and the nearest ditches are located at the property lines to the east, west and south. There are no trees on the Site.
6. As discussed in the Agrologist's report under Section 4.2 – the proposed depth is 1 m and the slopes on all sides will be 3 Horizontal to 1 Vertical as the fill will be near ditches. The fill slope near the existing building on the Site will be at a slope of 2 Horizontal to 1 Vertical.

7. Again erosion prevention was discussed in the Agrologist's report under Section 4.2. The proposed methods include the use of erosion and sediment control Best Management Practices (BMPs), such as :
 - Installing silt fence during fill placement
 - Sloping the zone between the top of fill area and watercourses, such that there is a gradual transition (3H:1V) in order to minimize accelerated overland water flow to the riparian areas and watercourses, and other potential erosion and sediment control issues
 - Planting grasses or other ground cover on the slopes to minimize soil erosion from disturbed and new filled areas the methods proposed to control the erosion of the banks of a removal or deposit;
8. It is proposed that drainage tile will be placed below the proposed fill layer to facilitate water control on the Site.
9. The receipt of fill would occur during standard working hours and a flag person would be present at the entrance of the property to ensure that the trucks have access and egress from the Site. No trucks will be lined up on Steveston Highway. Attached Figure B shows the proposed routing of truck and vehicular traffic.
10. The roadway will be swept if there is any tracking of soils from the Site to Steveston Highway. Sunshine Cranberry Ltd. Is willing to place the required security deposit as described in the Boulevard and Roadway Protection and Regulation Bylaw No. 6366 if the fill application is approved.
11. There are no trees present on the Site which would be removed during the proposed fill placement. Thus there are no requirements opposite the City's Tree Protection Bylaw No. 8057 as amended.
12. The location of the Site is removed from surrounding residential and commercial enterprises. There will be a 5 m set back from the property line on all sides to accommodate the riparian area setback of the ditches that are present. This will also provide a buffer to the roadways located to the south, east and west. Highway 99 is located to the west and there is already a buffer of land present between the Site and the Highway. The fill operation is only to increase the grade by one meter and would not create a sight nuisance and the fill operation will be conducted such that there no unacceptable noise or nuisance dust.
13. The proposed fill operation will comply with the prescriptions outlined in the City's Public Health Protection Bylaw No. 6989, as amended.
14. Once the permit for fill has been approved, it is the applicant's intention to place fill during the dry summer months when the Site is trafficable. The applicant would like to have the fill placed within the summer season of 2012 if possible. Thus it is proposed that filling can be completed within one year if the permit is granted such that an entire dry season is within the year after issuance. Otherwise the fill will be completed at the end of two years after the fill permit is issued.
15. Keystone Environmental has prepared a cross section of the Site showing the proposed fill areas. Please see Figure A.
16. By the way of this letter, Sunshine Cranberry Farm Ltd. issues an indemnity in favour of the City, in the form prescribed, indemnifying and saving harmless the City, its agents, employees, officers and servants, from and against all claims, demands, losses, costs, damages, actions, suits or proceedings whatsoever by whomsoever brought by reason of,

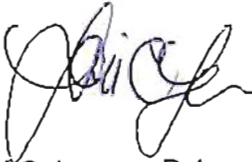


or arising from, the issue by the City of a permit under this bylaw to conduct the proposed deposit or removal operation.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Keystone Environmental Ltd.



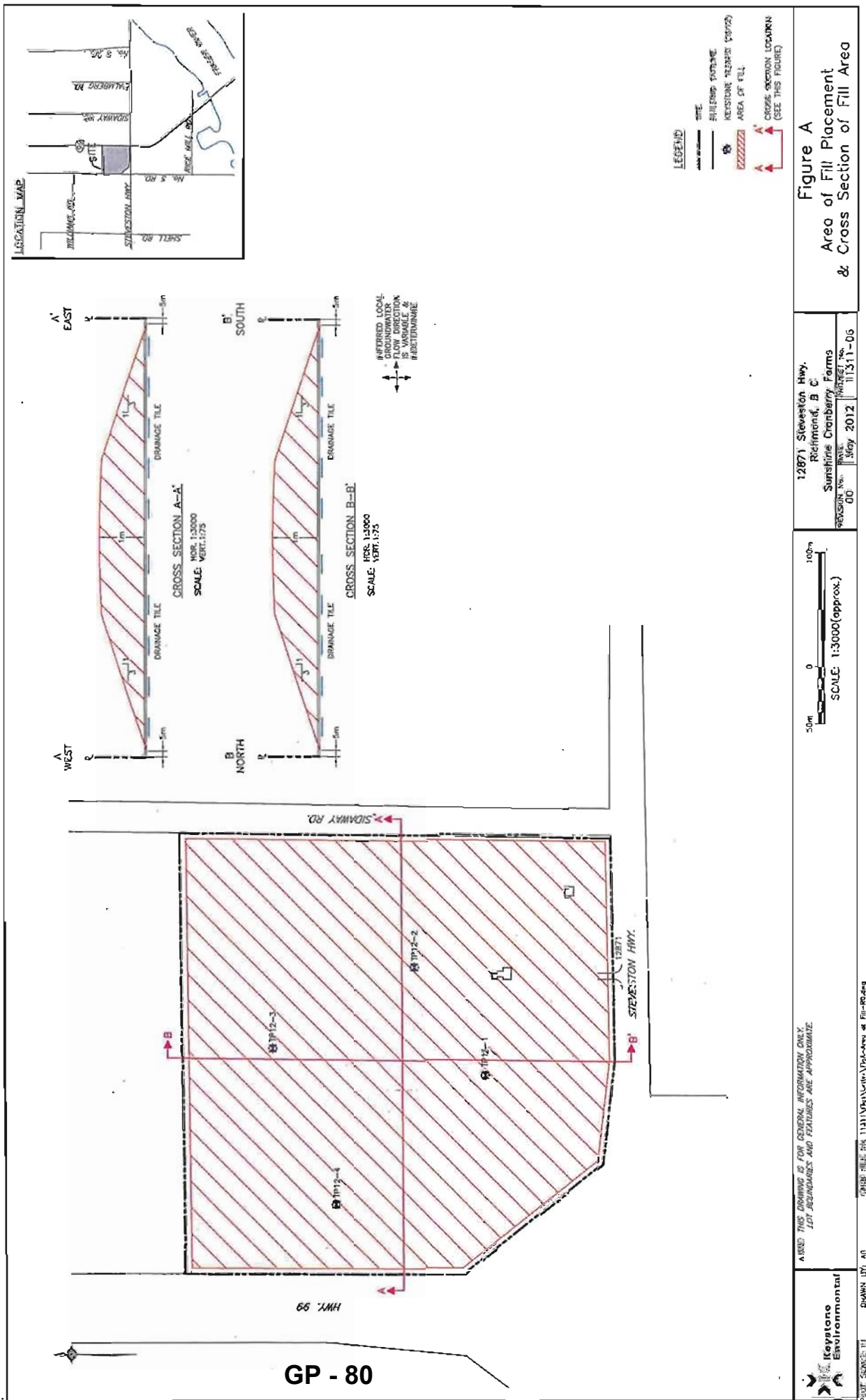
Lori C. Larsen, P.Ag.
Agrologist and Senior Project Manager

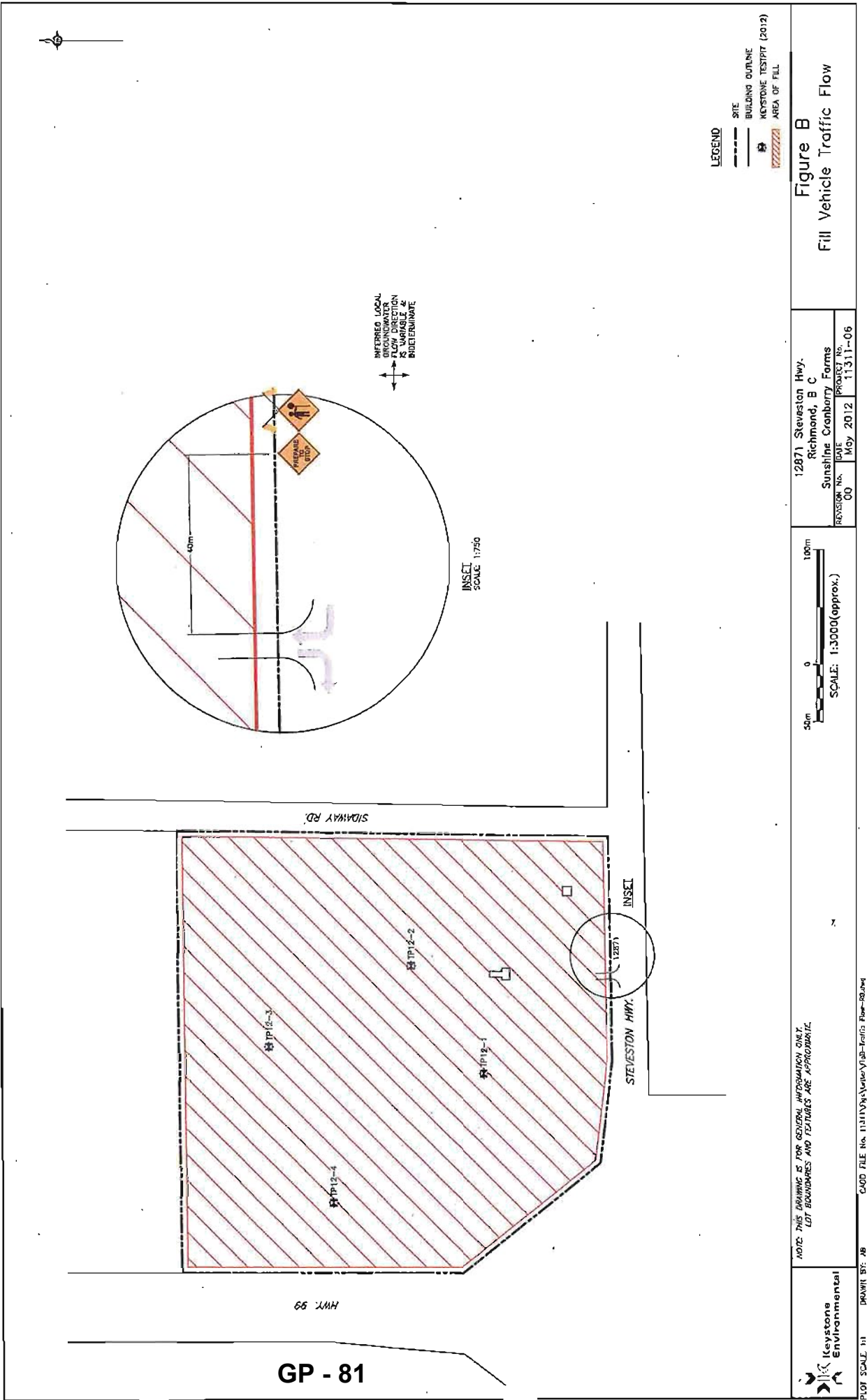
11311 120518 Additional Info to COR.docx

ATTACHMENTS:

- Figure A – Area of Fill Placement and Cross Sections of Proposed Fill Area
- Figure B – Fill Vehicle Traffic Flow









Keystone Environmental

Knowledge-Driven Results

June 18, 2012

Ms. Magda Laljee, BA
Supervisor, Community Bylaws
City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Dear Ms. Laljee:

**Re: Requested Information Pertaining to the
Sunshine Cranberry Farm ALC Fill Application
12871 Steveston Highway, Richmond, BC
City of Richmond File: 12-611415
KeystoneEnvironmental File No. 11311**

This letter contains information to address the concerns you have outlined to Mr. Bhullar in your letter dated May 30, 2012 and referenced "Non-Farm Use Fill Application for Property Located at 12871 Steveston Highway Richmond, BC". We attach the following items with this letter:

- Figure B – Road Location, Fill Placement and Planting Plan
- Drainage and Irrigation Figure – Prepared by Russ Tichauer C.I.D. – with WaterTec Inc.
- A letter from Geopacific Consultants Ltd., a geotechnical engineering firm commenting on the impacts of the proposed fill placement.

Keystone Environmental Ltd. has been retained to address the concerns and requests for information from your letter by Mr. Avtar Bhullar of Sunshine Cranberry Farms. Your original requests/comments are bulleted with our responses following.

- **Confirm the source of the fill other than locally sourced please be specific where will the coarse-grained soils with some fine soils come from?**

The fill will be obtained from a number of larger development projects that will be proceeding within the next year in Richmond. We wish to obtain the deeper Fraser Sands that will be excavated from these projects. Geopacific Consultants Ltd. have indicated that fill obtained from the Fraser Sands would be suitable for the fill placement and the compaction required. Otherwise, any fill that is sourced would have to be a loamy sand or SP-SM grade from a site that can produce an environmental report showing that both the grain size is suitable and that it meets the CSR Schedule 7 standards.

- **Please provide a farm plan which should include a planting scheme showing how the entire portion of the property will be brought into agricultural production.**

Please refer to Figure B. The fill placement will start with the preparation of road ways around the perimeter of the Site as shown. Fill will begin in area A which is furthest to the west on the Site. As each section is filled, then drainage and topsoil placement will occur. The idea is to bring the property into production in stages depending on the availability of the fill.

- **Please confirm how farm vehicles and machinery will access the property and how access roads will be arranged on site given the grade elevation.**

Please refer to Figure B. There are two access points to the property. The established access point off of Steveston Highway which is shown on the figure and a second access point which has just recently been developed off of Sidaway Road. The machinery will be accessing the property from these points. Access roads are shown on Figure B

- **Please submit a comfort letter from a certified geotechnical engineer confirming that the proposed fill process will have no impact to surrounding properties and ground water table including but not limited to impacts on the neighbouring properties, land uses and infrastructure (particularly drainage and roads), and provide assurance as to how any potential impacts will be managed.**

Please see the attached letter from the geotechnical engineer

- **A comprehensive drainage and irrigation plan is required. The plan must include layouts, water table and ditch elevations, and any proposed additional ditches that may be required.**

Please see the attached figure from Russ Tichauer of Watertec. If further detail is required beyond what is provided in this drawing, please contact us.

- **How will the drainage tile under the fill be installed and monitored before and after the fill activities.**

This has been commented upon within the Geotechnical Engineer's Letter. Mr. Bhullar will be retaining them to monitor the placement of the drainage tile.

- **The watercourses within the RMA must be protected from impacts related to fill on other parts of the property such as excessive run-off of sediments, sand, silt or other substances from the filled area. If run-off from the filled area is projected to enter the watercourses on the property, or into any other City drainage, then appropriate sediment and flow control must be installed prior to fill. Please confirm your intentions for compliance with this request.**

It is Mr. Bhullar's intention to adopt the sediment and flow control measures that were outlined in the original Agrologist's report that was submitted to you initially. The proposed methods include the use of erosion and sediment control Best Management Practices (BMPs), such as :



- Installing silt fence during fill placement
- Sloping the zone between the top of fill area and watercourses, such that there is a gradual transition (3H:1V) in order to minimize accelerated overland water flow to the riparian areas and watercourses, and other potential erosion and sediment control issues
- Planting grasses or other ground cover on the slopes to minimize soil erosion from disturbed and new filled areas the methods proposed to control the erosion of the banks of a removal or deposit;

Mr. Bhullar intends to implement these practices prior to and during the fill application.

- **Given the presence of shrubs/undergrowth on the property there is a possibility of bird nesting activity onsite. Staff recommend that any anticipated vegetation clearing be postponed until the end of the bird nesting season (August 31). Disturbing active nests is a contravention of the Wildlife Act. Please confirm your intentions for compliance with this request.**

Mr. Bhullar intends to comply with your request to postpone fill placement until the end of the bird nesting season. We will retain a Professional Biologist to establish and declare when the bird nesting season is finished on Mr. Bhullar's property.

- **A wheel and chassis wash operation shall be established to reduce the amount of dirt and debris onto the roadway. Please confirm your intentions for compliance with this request.**

Mr. Bhullar intends to comply with your request to have a wheel and chassis wash operation.

- **Please provide a detailed route map and traffic management plan which details the number of anticipated trips per day and access point(s), shortest distance from the nearest arterial road to and from the destination (staff recommend the avoidance of Sidaway Road and the use of No 6 Road as it provides less of an impact to traffic).**

Anticipated number of trips per day cannot be established at this time as the fill volume and timing has not yet been arranged. This information can be provided to you at the time of the fill placement. We do anticipate during the peak times to be in operation between 9 AM and 3 PM with a total of twelve to twenty trucks making between three and five round trips per day. Mr. Bhullar will be making arrangements (directing the trucking firms) to access his property coming in along No. 6 Road and then west across on Steveston Highway. The entrance onto the Site will be alternating between the Steveston Highway access point onto the Site and the Sidaway Road access point, which is close to the intersection of Sidaway Road with Steveston Highway. Egress from the property will be south on Sidaway Road to Steveston Highway west bound or directly from the Site to Steveston Highway west bound and then to Highway 99 Northbound.

- **Due to traffic congestion at this location, a Traffic Control Person (TCP) will be required at all times during the project at the entrance point to the property. The area will be treated as an arterial road work zone and as such will be subject to restricted hours (09:00 am to 3:00 pm). Please confirm your intentions for compliance with this request.**



Mr. Bhullar intends to comply with your request to have a TCP person at the entrance point to the property and to keep the restricted hour schedule.

- **Sidaway Road and No 6 Road are weight limited roads; please note that truck operators will be required to have in their possession a current bill of lading or waybill which shows their destination to prove local delivery. Please confirm your intentions for compliance with this request.**

Mr. Bhullar intends to comply with your request.

- **Trucks exiting the site must proceed to the westbound/northbound entrance to Highway 99 and not over the overpass. Please confirm your intentions for compliance with this request.**

Mr. Bhullar intends to comply with your request to direct traffic to exit onto Highway 99 northbound and not over the overpass.

- **Staging of trucks on any portion of the road including the shoulder is not permitted at any time. Please confirm your intentions for compliance with this request.**

Mr. Bhullar intends to comply with your request not to have trucks staging on the shoulder of the road at any time.

- **Please confirm the anticipated duration of the project and the proposed time of year.**

Once approval is granted, fill placement will commence this year once the retained Professional Biologist declares that the bird nesting season on the property is over. Fill will be placed when available. With the establishment of perimeter roads on the property fill placement will be able to occur well into the winter months.

Fill placement is anticipated to take one year to complete but if restrictions to fill placement are in place (i.e. bird nesting season or trafficability problems on the Site) then it is anticipated that filling will take up to two years to complete.

- **An estimate is to be provided by the consulting agrologist, based on the total costs of materials and installation of works to fully implement the farm plan and land rehabilitation works related to bringing the site into agricultural production. The cost estimate if accepted will form the basis for a bond/security. (This cost estimate should encompass anticipated irrigation improvements, farm access road improvement as well as drainage improvements).**



The full estimate for the project is shown below

Item #	Item and Description	Cost Per Unit	Total Units	Total Cost
1	Stripping of insitu top soil - Excavator Operator per Hour	\$25	320	\$8,000
2	Trucking of Fill - -Estimated 120,000 cubic meters of fill -Truck Capacity 8 cubic meters = 15,000 trips -Truck Travel Time per round - 2 hr -Average truck cost /hr = \$65	\$65	30000	\$1,950,000
3	Fill Cost - Road ways only Estimate 22,000 cubic meters of crush fill for Site Road Prep	\$6	22000	\$132,000
4	Main Fill Cost	\$0	0	\$0
5	Grading and Site Prep per hour	\$25	320	\$8,000
6	Drainage System and Irrigation System Installation Cost estimate from Water Tech	\$80000	1	\$80,000
7	Organic Material for Topsoil per cubic meter	\$5	60000	\$300,000
8	Plant Costs - approx \$2 per plant Estimated 44,000 plants at rate of 3370 plants per ha - approx total ha = 12	\$2	44000	\$88,000
9	Geotechnical Services cost per hour	\$175	50	\$8,750
10	Agrology Services for Monitoring and Reporting	\$175	80	\$14,000
TOTAL ESTIMATED COST				\$2,588,750

- Please confirm what monitoring, inspection and reporting mechanisms will be in place while fill activities are underway (plan and inspection is to be undertaken by a professional agrologist).

In addition to retaining a geotechnical engineer to oversee grading and drainage tile placement, all fill being brought onto the site will be screened by accompanying documentation from its place of origin as previously described. A Professional Agrologist will be visit the Site on a regular basis to inspect the fill placement and ensure that materials being brought onto the Site are suitable for agricultural purposes. Final organic material and growth medium placement will be signed off by an Professional Agrologist and a report prepared for submission to needed authorities.

If you wish to contact someone here at Keystone Environmental Ltd. over the next month while I am away on vacation, please direct your calls to Ms. Keree Orso, R.P.Bio. Her contact number is 604 430-0671 and her email address is korso@keystoneenvironmental. I shall be returning

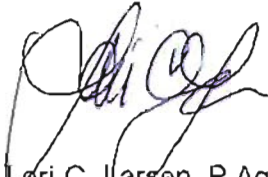


July 23, 2012. Please also respond directly to Mr. Avtar Bhullar with any responses or comments you may have.

If you have any questions, please do not hesitate to contact us.

Sincerely,

Keystone Environmental Ltd.



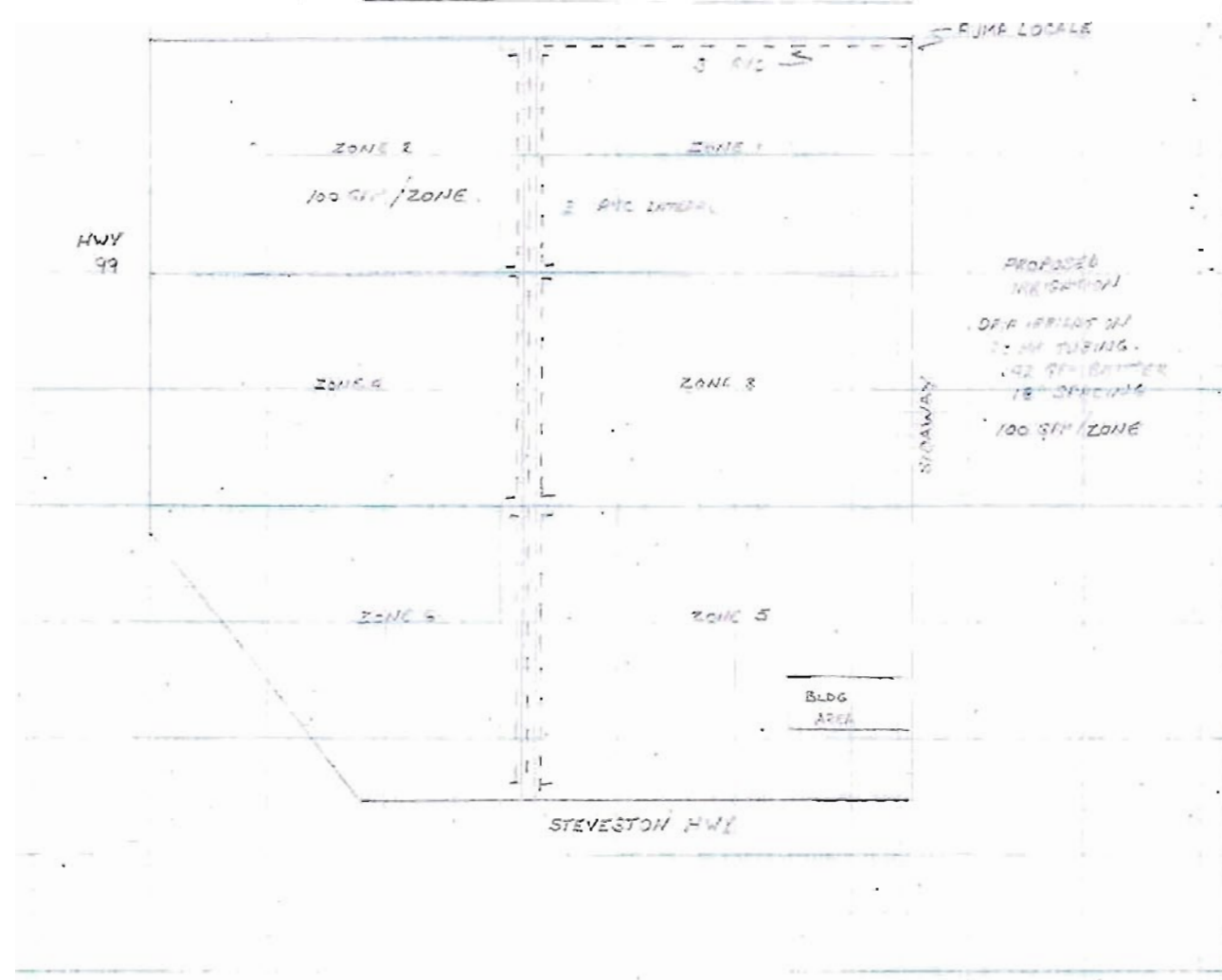
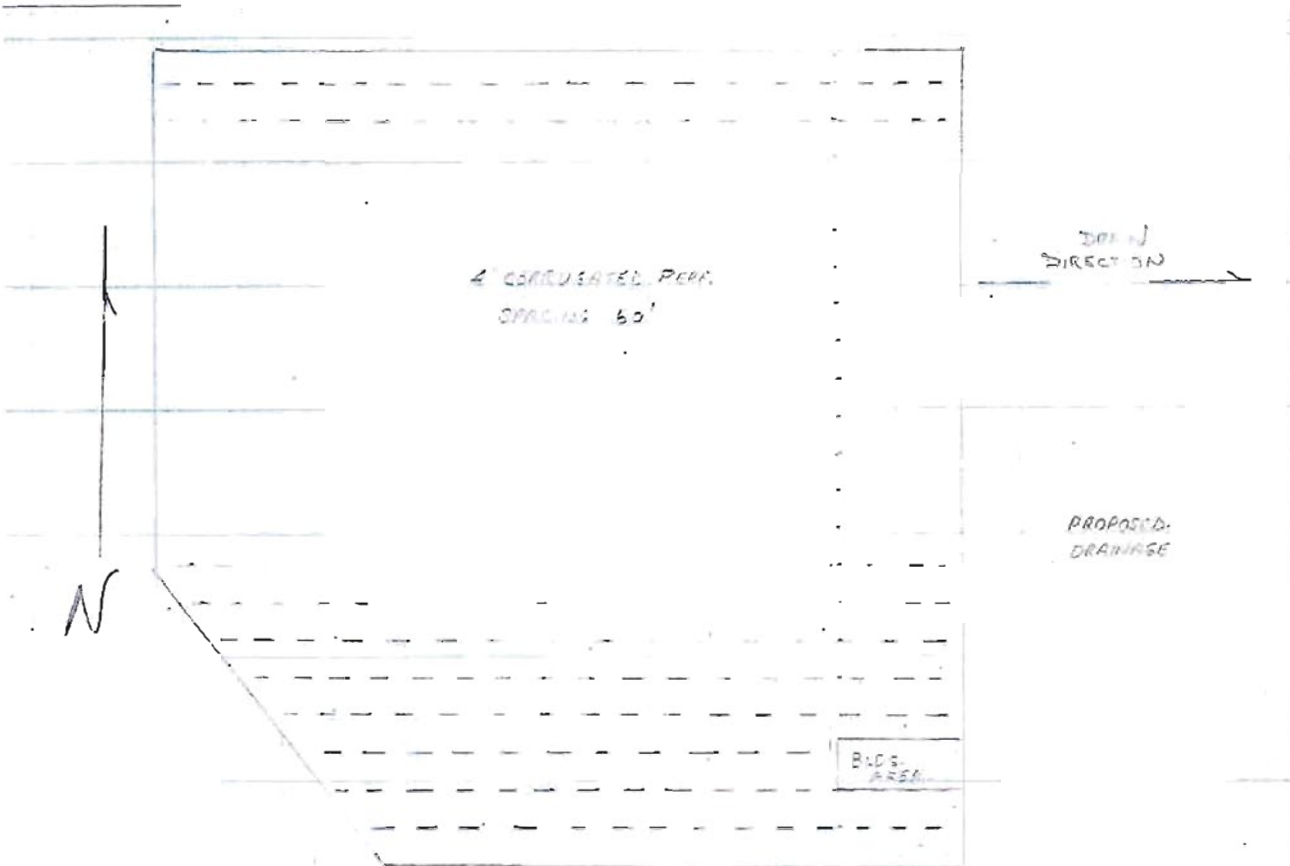
Lori C. Larsen, P.Ag.
Agrologist and Senior Project Manager

11311 120618 Requested Information for COR application.docx

cc: Avtar Bhullar – Sunshine Cranberry Farms







Hunter The Irrigation Innovators

Hunter Industries Incorporated • The Irrigation Innovators
1940 Diamond Street • San Marcos, California 92078 • TEL: (760) 744-5240 • FAX: (760) 744-7481
www.HunterIndustries.com

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PIN 700885 LIT-247 1/08

GP-89

Designed For: ANUR BHULLAR

Design: RUS T.

Date: JUNE 2012

Scale: 1:20



Keystone Environmental

Knowledge-Driven Results

August 29, 2012

Ms. Magda Laljee, BA
Supervisor, Community Bylaws
City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Dear Ms. Laljee:

**Re: Additional Requested Information for
Sunshine Cranberry Farm ALC Fill Application
12871 Steveston Highway, Richmond, BC
City of Richmond File: 12-611415
Keystone Environmental Ltd. File No. 11311**

This letter contains information to address the concerns you have outlined to Mr. Bhullar in your email letter dated July 3, 2012 and the information requested by Mr. Kevin Eng of the Policy Planning Department in his email dated July 26, 2012.

We attach the following items with this letter:

- Phasing Plan
- Monitoring and Inspection Plan

Update to Cost Estimate

Mr. Bhullar has requested that you receive an updated version of the Professional Agrologist's estimate of costs. Mr. Bhullar has indicated that since he is receiving fill from an excavation that he will not need to pay for trucking of the fill to his Site. Thus, line item #2 – trucking costs has been removed from the cost estimate. A revised cost estimate is provided below.

Item #	Item and Description	Cost Per Unit	Total Units	Total Cost
1	Stripping of insitu top soil - Excavator Operator per Hour	\$25	320	\$8,000
2	Trucking of Fill- no net cost	\$0	0	\$0
3	Fill Cost - Road ways only Estimate 22,000 cubic meters of crush fill for Site Road Prep	\$6	22000	\$132,000

Item #	Item and Description	Cost Per Unit	Total Units	Total Cost
4	Main Fill Cost	\$0	0	\$0
5	Grading and Site Prep per Hour	\$25	320	\$8,000
6	Drainage System and Irrigation System Installation Cost Estimate from Water Tech	\$80,000	1	\$80,000
7	Organic Material for Topsoil per cubic metre	\$5	30,000	\$150,000
8	Plant Costs – approx. \$2 per plant Estimated 44,000 plants at rate of 3370 plants per ha - approx. total ha = 12	\$2	44,000	\$88,000
9	Geotechnical Services cost per hour	\$175	50	\$8,750
10	Agrology Services for Monitoring and Reporting	\$175	80	\$14,000
TOTAL ESTIMATED COST				\$488,750

Commitment Declaration

Our previous letter, dated June 18, 2012, addressed most of the issues which your email has commented upon. We note that the City of Richmond staff wishes a firm commitment to the following bullets. The previous letter's wording used the word "intention" but we have been advised by Mr. Bhullar that he does commit to do the actions outlined in your email.

Specifically concerning the issues raised in your email, Mr. Bhullar commits to the following:

- The watercourses within the RMA will be protected from impacts related to fill on other parts of the property such as excessive run-off of sediments, sand, silt or other substances from the filled area. If run off from the filled area is projected to enter the watercourses on the property, or into any other City drainage, then appropriate sediment and flow control will be installed prior to fill. Mr. Bhullar will establish a 5 metre setback from the top of the bank of the watercourses on the west, south and east sides of the property and that existing vegetation in the setback will be retained.
- Mr. Bhullar will comply with the request to postpone fill placement until the end of the bird nesting season.
- Mr. Bhullar will have a Traffic Control Person at the entrance point to the property to help minimize congestion caused by trucks queuing to make left turns.
- Mr. Bhullar will comply with the request to ensure that truck operators have in their possession a current bill of lading or waybill which shows their destination to prove a local delivery.
- Mr. Bhullar will comply with preventing trucks staging on any portion of the road including the shoulder at any time.



- Mr. Bhullar notes and will direct trucks to enter and exit using the Steveston Hwy / Hwy 99 Interchange and commits to the trucking hours of 9:00 am to 3:00 pm and a Traffic Control Personnel to guide trucks in and out of the site in order to help minimize congestion caused by trucks queuing to make left turns.

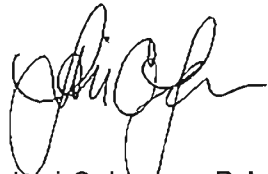
Flow Chart Request

The request for a flow chart with timelines of the project, from beginning to conclusion, can only be provided in a preliminary form as some key components, such as fill sourcing, have not yet been finalized. The attached Phasing Plan and Monitoring and Inspection Plan have been prepared and should suffice at this time for a flow chart of timelines.

If you have any questions, please do not hesitate to contact us. Please also respond directly to Mr. Avtar Bhullar with any responses or comments you may have.

Sincerely,

Keystone Environmental Ltd.



Lori C. Larsen, P.Ag.
Agrologist and Senior Project Manager

11311 120828 3rd Submission R1.docx

ATTACHMENTS:

- Phasing Plan
- Monitoring and Inspection Plan

cc: Mr. Avtar Bhullar – Sunshine Cranberry Farms



PHASING PLAN





Keystone Environmental

Knowledge-Driven Results

August 29, 2012

Ms. Magda Laljee, BA
Supervisor, Community Bylaws
City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Dear Ms. Laljee:

**Re: Phasing Plan for Fill Placement
Sunshine Cranberry Farm ALC Fill Application
12871 Steveston Highway, Richmond, BC
City of Richmond File: 12-611415
Keystone Environmental Ltd. File No. 11311**

The following table presents the phasing plan for the proposed fill placement at 12871 Steveston Highway, Richmond, BC (Site). It is projected that it will take one to two years to complete as we will have ceased filling activities at least once per year to accommodate the request from the City of Richmond not to place fill during the bird nesting season. Please also refer to the previously submitted Figure B, Road Location Fill Placement and Planting Plan (attached).

Item #	Activity	Description	Estimated Timeframe
Perimeter Road Construction and Section A Site Fill			
1	Road Alignment and stream setback Survey	A survey to stake out where the major perimeter road will need to be established will occur. This important step will ensure that the 5 metre setback from the top of bank is established and then allow room for the proposed 3 metre wide fill slope to top of proposed grade.	September 2012
2	Establish Erosion Control Measures	Around each area of the perimeter road, silt fencing will be placed prior to any Site soil removal.	September 2012
3	Site Perimeter Road Preparation	Strip surface organic material for the areas of proposed fill slope and perimeter roadways around Site.	September 2012
4	Strip and stockpile Section A	Strip area of first 10 acre parcel (A) on fill placement plan and stock pile.	September 2012
5	Geotechnical Review of stripped area	Have a geotechnical engineer review the stripped areas and provide comment and instruction.	End of September 2012

Item #	Activity	Description	Estimated Timeframe
6	Perimeter Road Construction	Place compactable crush for road construction to proposed finished perimeter roadways and compact.	October 2012
7	Fill Slope Preparation	Concurrently with the road construction fill will be placed to meet the three horizontal to one vertical proposed slope leading up to the roadway. This sloped area will be planted with vegetation to prevent future erosion issues for the ditches at the perimeters of the Site.	October 2012
8	Geotechnical Inspections of Road Construction	Have a geotechnical review compaction for placed perimeter road system and approve.	October 2012
9	Source Fill and Vet	Vet proposed fill sources – must receive geotechnical and agrologist approval.	September-October 2012
10	Section A fill placement and minor road construction	Place fill with the first section of the Site and allow for compaction to 90% Proctor.	Mid to late October 2012 to November 2012
11	Fill Inspection	During the placement of the fill both Geotechnical Engineer and Agrologist inspections will occur. Monitoring of the sediment and erosion control measures around the ditch areas will be done during these inspections.	Through time of fill placement
12	Fill Contouring	Complete final subsurface fill contouring to meet drainage requirements and allow for compaction.	November 2012
13	Geotechnical Inspection	Confirmation that proposed slopes and compaction requirement have been met for fill placement, drainage slopes and confirm traffic-ability of the minor road installations.	End of November 2012
14	Tile Drainage Installation	Install drainage system on Section A.	December 2012
15	Soil Organic Fill and Vet	Procure additional organic materials to mix with stripped topsoil. Additional organic soil is to be assessed by the Agrologist and must have his/her approval.	October to December 2012
16	Irrigation System Installation	Installation of the irrigation system for the 10 acre parcel will occur at this time. It will be designed for the crop that will be planted. For the majority of the Site this will be blueberries.	December 2012
17	Planting	Procure and plant blueberry bushes on the prescribed spacing.	Spring 2013



Item #	Activity	Description	Estimated Timeframe
Repeat following steps 18-28 for each of Section B and C			
18	Strip and stockpile Section X	Strip area of 10 acre parcel (Section X) on fill placement plan and stock pile.	Section B: January 2013 Section C: Late August 2013
19	Geotechnical Review of stripped area	Have a geotechnical engineer review the stripped area and provide comment and instruction.	Section B: February 2013 Section C: September 2013
20	Source Fill and Vet	Vet proposed fill sources – must receive geotechnical and Agrologist approval.	Section B: September to February 2013 Section C: Jan-Sept 2013
21	Section X fill placement and minor road construction	Place fill in the section of the Site and allow for compaction to 90% Proctor.	Section B: February-March 2013 Section C: September – October 2013
22	Fill Inspection	During the placement of the fill both Geotechnical Engineer and Agrologist Inspections will occur.	Section B: February – March 2013 Section C: September – October 2013
23	Fill Contouring	Complete final subsurface fill contouring to meet drainage requirements and allow for compaction.	Section B: April 2013 Section C: November 2013
24	Geotechnical Inspection	Confirmation that proposed slopes and compaction requirement have been met for fill placement, drainage slopes and confirm traffic-ability of the minor road installations.	Section B: April 2013 Section C: November 2013

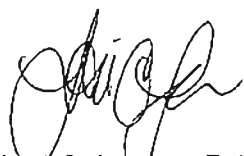


Item #	Activity	Description	Estimated Timeframe
25	Tile Drainage Installation	Install drainage system on Section X.	Section B: April 2013 Section C: November – December 2013
26	Soil Organic Fill and Vet	Procure additional organic materials to mix with stripped topsoil. Additional organic soil is to be assessed by the Agrologist and must have his/her approval.	Section B: Dec - April 2013 Section C: Nov 2013 – Jan 2014
27	Irrigation System Installation	Installation of the irrigation system for the 10 acre parcel will occur at this time. It will be designed for the crop that will be planted. For the majority of the Site this will be blueberries.	Section B: April 2013 Section C: Jan-Feb 2014
28	Planting	Procure and plant blueberry bushes on the prescribed spacing.	Section B: Spring 2013 Section C: Spring 2014

If you have any questions, please do not hesitate to contact us. Please also respond directly to Mr. Avtar Bhullar with any responses or comments you may have.

Sincerely,

Keystone Environmental Ltd.



Lori C. Larsen, P.Ag.
Agrologist and Senior Project Manager

11311 120829 Phasing Plan R1.docx

ATTACHMENT:

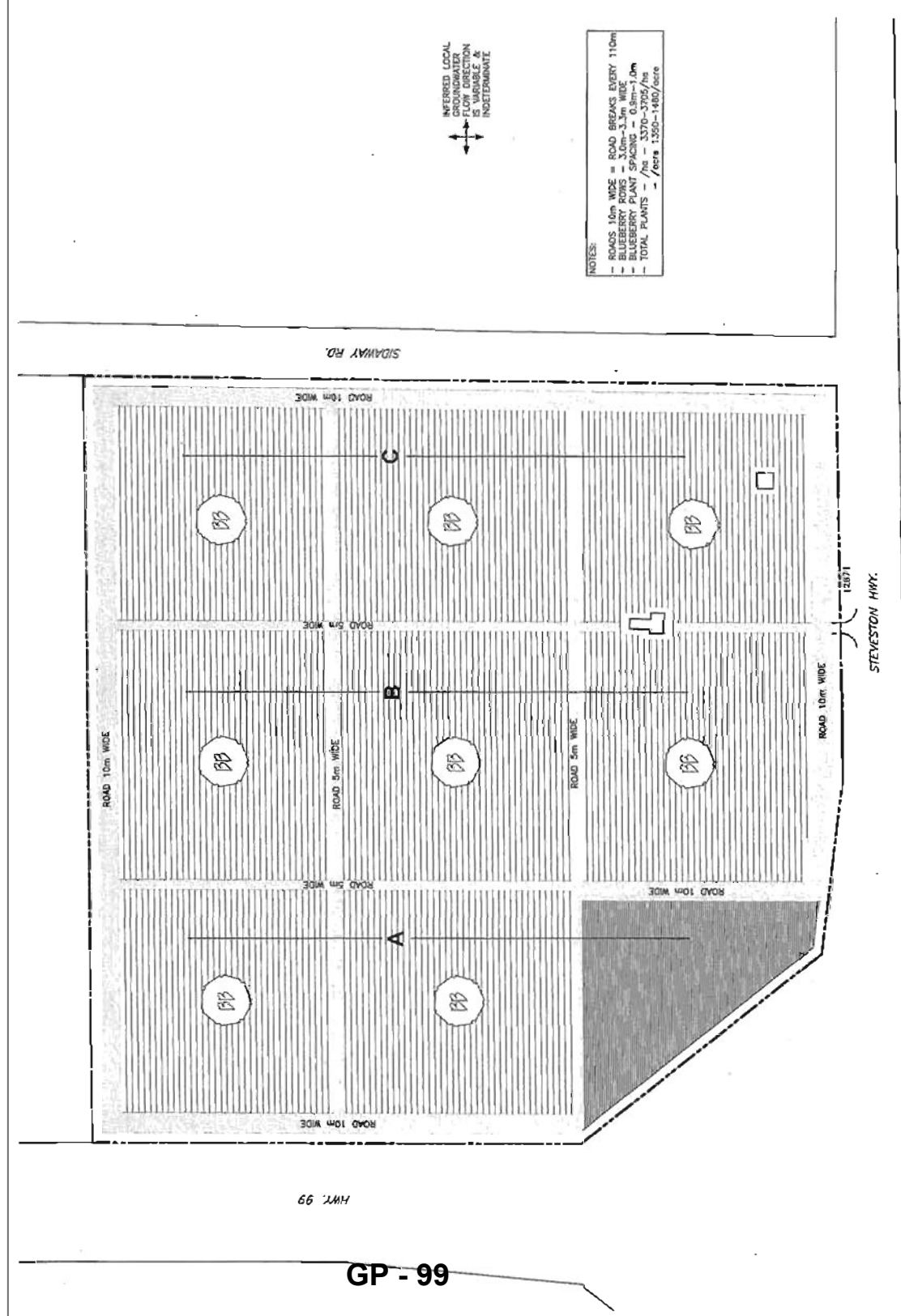
- Figure B – Fill Placement

cc: Mr. Avtar Bhullar – Sunshine Cranberry Farms



FIGURE B





**GeoPacific****Consultants Ltd.**#215 – 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5

Phone (604) 439-0922 / Fax (604) 439-9189

Mr. Avtar Bhullar
Sunshine Cranberry Farms
12871 Steveston Highway
Richmond, BC

June 14, 2012

c/o

Keystone Environmental
Suite 320 – 4400 Dominion Street
Burnaby, BC V5G 4G3

Attention: Lori Larsen, P.Ag.

**Re: Geotechnical Comments on Proposed Fill Placement,
12871 Steveston Highway, Richmond, BC**

1.0 Introduction

We understand that it is intended to place soil fill materials on the property at 12871 Steveston Highway to improve the agricultural utility of the site for the purpose of growing blueberries. In their review process the City of Richmond has requested that the proposal be reviewed by a geotechnical engineer and that it be confirmed that the proposal will not impact surrounding properties and improvements and how potential impacts will be managed.

GeoPacific has reviewed the proposal and are in general agreement with that proposed. However, this area of Richmond is underlain by compressible soils and a shallow water table. Thus, GeoPacific has provided recommendations herein which should be considered with this proposal to ensure the successful implementation of the improvements proposed.

In preparation of this letter we have reviewed the following documents;

1. *"Agrologist Report, Fill placement Application for 12871 Steveston Highway, Richmond, BC, Project No. 11311"* prepared by Keystone Environmental dated April 2012.
2. *"Non-Farm Use Fill Application for Property Located at 12871 Steveston Highway, Richmond, BC"* prepared by the City of Richmond dated May 30, 2012.

2.0 Discussion and Recommendations

2.1 Fill Placement

We understand that it is intended to strip and stockpile the arable soils from the site to allow for fill placement on the underlying natural clayey silt. It is intended to place about 1 m of fill on the stripped subgrade to achieve the desired grade. Following the fill placement the stockpiled arable soils would be mixed with peat and placed over the site. It is currently proposed to use "coarse-grained soil with some

finer" as fill. It is intended to slope the sides of the fill at 3H to 1V to the adjacent ditches and water courses. These slopes are to be planted with grasses and ground cover to minimize erosion. From a geotechnical and slope stability standpoint we consider the proposed side slope to be suitable.

2.2 Drainage

It is intended to include drainage beneath the organic layer, overlying the proposed fill, to ensure that there is adequate drainage for the proposed crops. The drainage is to consist of 4 inch perforated corrugated pipe. The current proposal contemplates pipes which run east to west spaced at 6 feet apart and which drain to the east.

We understand from the owner that it is intended to wrap the perforated pipes in filter fabric. The filter fabric has potential to be plugged by silty or organic soils reducing its effectiveness. Therefore, we recommend that the filter fabric wrapped drains be surrounded by at least 150 mm of sand or sand and gravel fill. This will help maintain and prolong the performance of the drainage system.

2.3 Settlement

The underlying natural clayey silt is normally consolidated and therefore prone to consolidation settlement when exposed to an increase of stress such as that which would result from the proposed fill placement. We estimate that settlements on the order of 25 to 100 mm could be realized beneath the filled area. In consideration of the current proposal, side slopes, and setbacks we expect that the settlement will be limited to within the boundaries of the property. Thus, adjacent properties and off-site improvement should not be impacted.

We consider the long term functionality of the drainage system critical to the project. As such, the proposed fill should be placed and allowed to settle prior to installing the drains. This would help ensure that the intended grade on the pipes is maintained following construction. We expect that the primary consolidation settlement would be complete within 6 to 8 weeks of completion of fill placement and that following this time period the drainage could be installed.

In order to limit long term differential settlements due to variations in density and placement, we recommend that the fill be compacted to a minimum standard of 90% Standard Proctor maximum dry density (ASTM D698) while at a moisture content that is within 2% of optimum. The underlying clayey silt is sensitive to disturbance and compaction induced vibrations; therefore we recommend that a minimum base lift thickness of 0.9 m be maintained prior to compaction. The fill should be sloped to encourage drainage such that there is no ponding of water on the site.

3.0 Geotechnical Field Reviews

GeoPacific should be engaged to confirm that the recommendations contained within this letter are considered throughout the filling process and to identify any potential concerns. As a minimum we recommend that GeoPacific be asked to review the following aspects of construction.

1. Subgrade – review of stripped site prior to any fill placement
2. Fill Materials – review of materials, placement and compaction
3. Drainage – review of layout, materials and bedding

4.0 Closure

We trust that the forgoing is sufficient for your current purposes. If you require any further information or clarification please contact the undersigned.

For:

GeoPacific Consultants Ltd.



JUN 14 2012

Steven Fofonoff, P.Eng.
Senior Geotechnical Engineer



Keystone Environmental

Knowledge-Driven Results

December 19, 2012

Ms. Magda Laljee, BA
Supervisor, Community Bylaws
City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

Dear Ms. Laljee:

**Re: Revised Drainage Plan and Original Fill Placement Monitoring Plan
Sunshine Cranberry Farm ALC Fill Application
12871 Steveston Highway, Richmond, BC
City of Richmond File: 12-611415
Keystone Environmental Ltd. File No. 11311**

This letter is to comment on the provided revised drainage plan has been prepared for the proposed fill placement activities planned for 12871 Steveston Highway, Richmond, BC (Site) and to outline again the proposed monitoring plan that will be in place for the fill placement activities.

REVISED DRAINAGE PLAN

A copy of the revised drainage plan is attached and replaces the drainage plan originally submitted to the City of Richmond in our June 18, 2012 letter referenced: "Requested Information Pertaining to the Sunshine Cranberry Farm ALC Fill Application - 12871 Steveston Highway, Richmond, BC"

The owner of the Site, Mr. Avatar Bhullar, had a topographic survey of the Site completed this past November. We understand that a copy of this topographic survey has been submitted to the City of Richmond. This survey indicates that the current land surface varies from below to just above sea level. It clearly demonstrates that if drainage system was to be installed on the Site as it is currently, the outlet of the drains would be below the elevation of most of the ditch system that is established around the Site.

To install effective drainage, fill is required and the revised drainage plan requires that a total of 0.88m of fill be placed to raise the grade of the Site. This is a change from the previous drainage plan that required a full 1.0m of fill to be placed. The two other changes are: (i) an increase in the density of the proposed drainage density from the original spacing of 18.2m (60 feet) down to 12.2 m (40 feet); and (ii) a change from a single direction flow design from west to east to one where the drainage moves to both the east and west from a topographic high that is created by the fill placement running north to south on the centre of the Site. The change in design appears to have a three-fold objective. First it will make for a more overall level placement of fill over the Site using less fill. Second it distributes

the potential drainage from the Site to more drainage areas, easing the loading that would have occurred on the east ditch system. Thirdly it increases the drainage capacity by decreasing the till drain spacing.

The change in the proposed amount of fill and drainage plan is acceptable for the planned use of blueberry farming and for general agricultural crop production and is necessary to make the land usable for those purposes. The revised drainage plan is acceptable and does not change any of the conclusions of the originally submitted agrology report for the Site.

FILL MONITORING PLAN

The fill monitoring plan consists of three components:

1. Screening of Fill Materials and Organic Soils
2. Fill Placement Monitoring
3. Document Controls

These three components are described below

1A - Subgrade Fill Screening

The subgrade fill used to raise the elevation of the land is to be compactable and is proposed to be obtained from large scale building projects that are up coming within the upcoming season in Richmond. Geotechnical advice from Pacific Geotechnical indicate that Fraser Sands would be suitable for the fill placement and the compaction required and this is the type of fill expected from the proposed building projects. Otherwise, any fill that is sourced would have to be a loamy sand or SP-SM grade from a property that can produce an environmental report showing that both the grain size is suitable and that it meets the Contaminated Sites Regulation (CSR) Schedule 7 standards. Specific testing requirements will be required.

Prior to placement on the Site, the fill origin and environmental quality must be documented. Fill will be received from a property that can provide the following:

- **Statement that Fill is not from a Potentially Contaminated Site.** This would consist of providing a copy of Stage 1 Preliminary Site Investigation report or equivalent that indicates that there are no potential areas of environmental concern from the source fill property. A copy of the report shall be made available to Keystone Environmental Ltd. (Keystone Environmental) for review prior to bringing the fill to the Site for review.
- **Analytical Laboratory Certificates:** In addition, a minimum of two samples, originating from insitu soils of the fill origin property that represent the bulk of the fill material to be brought to the Site, will need to be analyzed to show that it meets the objective grain size and that the following constituent concentrations meet the CSR Schedule 7 Standards for agricultural land (AL) use: Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH), Benzene, Toluene, Ethylbenzene & Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs) and metals. The review and approval of Agrologist or other Qualified Environmental Professional of these samples will be required prior to acceptance of the fill onto the Site.



- **Laboratory provided grain size evaluation:** The laboratory results must show that the fill is a loamy sand or SP-SM grade
- **Letter of confirmation** from a geotechnical engineer that the soil is suitable for fill placement at the Site based on the grain size and that it would be suitable to obtain a 90% Proctor compaction

1B - Organic Soil Screening

The proposed additional organic soils that will augment the native stripped organic topsoil will require an Agrologist's approval prior to use. Provision of the details of the soil origin and a statement that the soil does not originate from a contaminated site will need to be provided to the Site Agrologist.

2 - Site Preparation and Fill Monitoring

Geotechnical, agricultural and biological inspections form an integral part of the fill placement plan.

Geotechnical Engineering Input will be required during these main components of the fill placement plan:

1. Inspection of the Site after topsoil stripping and inspection to insure proposed roadways are suitably set back from top of bank ditches
2. Inspection of the constructed perimeter and minor roads constructed on the Site, including density testing
3. Review and approve proposed fill source, including inspection of source fill Site
4. Completion of a minimum of three Site inspections during fill placement of each section A, B and C
5. Inspection of final subgrade fill elevation to ensure that drainage slopes and compaction objectives have been met
6. Inspection of the placed drainage tile and confirmation of proper installation

Professional Agrologist Input will be required during these components of the fill placement plan:

1. Review of required fill documentation and analytical tests provided for potential fill sources including inspection of the source fill site
2. Inspection of sediment and erosion control measures during the construction of the perimeter roadways on the Site
3. Completion of a minimum of three Site inspections during fill placement of each section A, B & C
4. Inspection of document controls (manifest system) that ensures fill is being sourced from the approved site



5. Inspection of the drainage tile placement
6. Inspection of the irrigation installation
7. Review and approval of proposed organic topsoil to augment stripped soils

Professional Biologist Inspection will be required to inspect the Site during the summer months to confirm that the bird nesting season has finished prior to resumption of fill placement.

3 – Document Controls

The following document controls will be in place during the fill placement and will be retained by the designated Professional Agrologist unless otherwise indicated:

- Subgrade fill source properties will provide either: a copy of a Phase 1 Environmental Site Assessment or Stage 1 Preliminary Site Investigation report or an equivalent letter from a Qualified Environmental Professional documenting the potential for areas of environmental concern.
- All subgrade fill will have documented analytical testing and grain size analyses completed by a CAEL certified laboratory. The samples shall be procured while the fill material is still present within its native state on the property of origin, if possible. When in-situ sampling has not been conducted prior to the transported and placement of the fill materials to the Site, it will be implemented on the placed materials on a grid basis of 50 square metres. The owner agrees that if any sample fails to meet the standards of grain size and/or the Schedule 7 AL standards, that the grid section not in compliance will either be further tested to refine the non-confirming volume and those materials not in conformance with the standards are removed from the Site.
- Both a Geotechnical Engineer and Professional Agrologist will provide written approval of the fill source(s).
- Each trucker must have for each travel trip to the Site and must surrender each day to the Site Foreman the following waybill/manifest that stipulates the following:
 - The date
 - Fill Origin Address
 - Site Receiving Address
 - Number of loads delivered to the Site during that day
 - Approximate size/volume of loads (approximate cubic meters or truck description: truck, truck and pup, pony, etc.)
 - Description of the fill type
 - The delivery truck licence plate number
- The waybill/manifest must be collected by the Fill Site foreman and copies forwarded to the Professional Agrologist on a weekly basis for inspection and verification.
- Site inspection reports will be provided by the Geotechnical Engineer and the Professional Agrologist outlining the scope of the inspection, findings and recommendations. The reports will be delivered electronically to Mr. Avtar Bhullar and a second copy retained by the Professional Agrologist.



- A final geotechnical inspection report on fill contouring, slope, compaction and drainage tile inspection will be procured for the Site.
- Professional Agrologist's written approval of additional organic fill and irrigation installation will be procured.
- Preparation of a summary report of the above documents for the Site once fill placement is complete.

If you have any questions, please do not hesitate to contact us. Please also respond directly to Mr. Avtar Bhullar with any responses or comments you may have.

Sincerely,

Keystone Environmental Ltd.

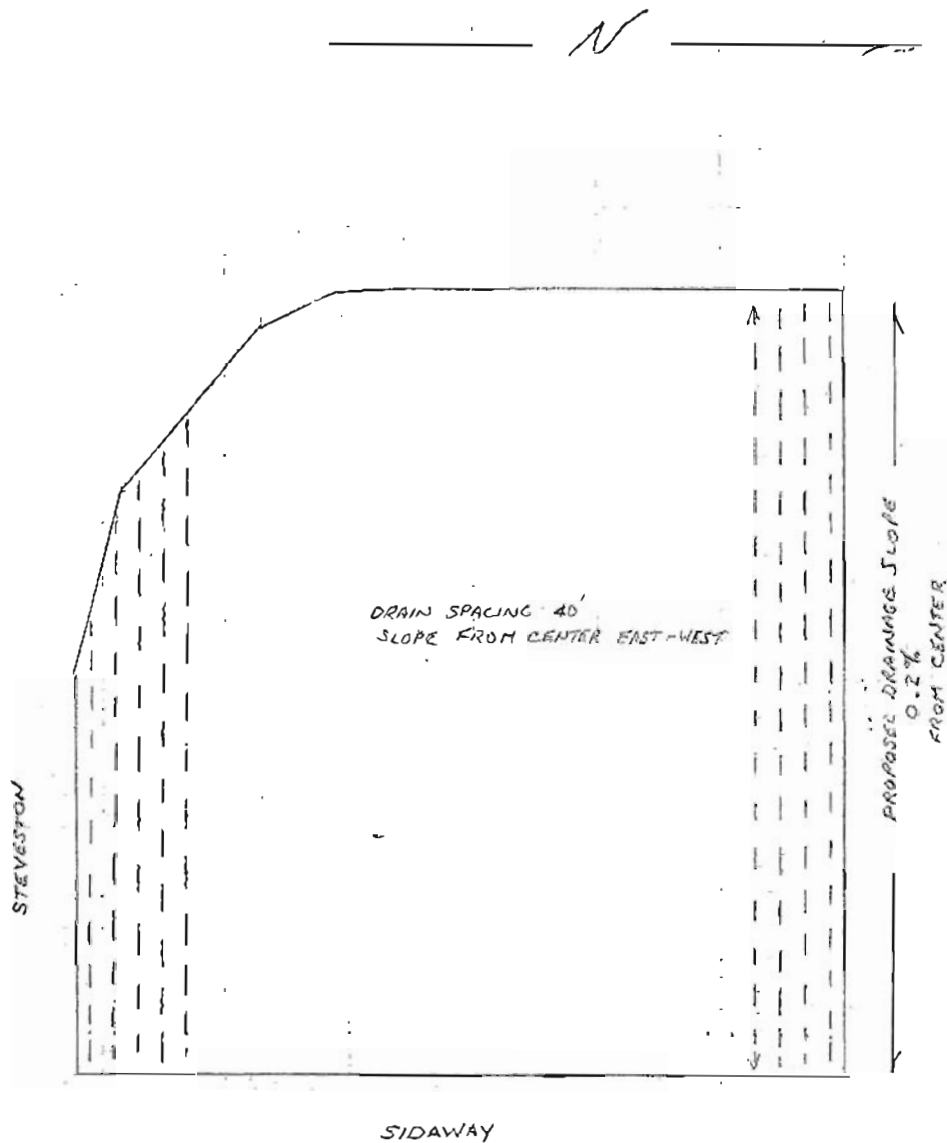


Lori C. Larsen, P.Ag.
Professional Agrologist and Senior Project Manager

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cc: Mr. Avtar Bhullar – Sunshine Cranberry Farm





REQUIRE 0.38 M. SLOPE FROM CENTER TO DITCH.
 AVG. ELEVATION DIFFERENCE LAND TO TOP OF DITCH - 0.5 M.
 MIN. REQUIRE FILL 0.88 FT

Attachment 9

Excerpt of AAC meeting minutes from September 13, 2012

Development Proposal – Non Farm Use Fill Proposal at 12871 Steveston Highway

City staff and the applicant provided background on the proposal to place fill on the subject property and associated works (top soil stripping; fill for a perimeter road; additional agricultural quality fill for growing medium) to put the property into blueberry production. Staff and the applicant also summarized the proposed phasing and monitoring plan prepared by the applicant's consultant. Questions and comments on the phasing and monitoring plan and overall fill operation were as follows:

- Questions were asked why the phasing plan referenced September 2012 as a starting period for fill activities, when no approvals had been granted by the City or ALC. In response, the applicant advised that activities would occur only when permission was granted. Staff also recommended that the phasing plan be adjusted if approvals are granted.
- A question was asked about what level of oversight and inspection would there be from the consulting agrologist. The applicant noted that the agrologist would be involved in inspecting sites where the fill is coming from and ensuring it is of suitable quality. Community Bylaw staff also noted that reports, inspections and follow-up from them and/or the consulting agrologist can be required and included in the reports to Council and the ALC on the fill application.
- Information was requested about when the site could not be filled due to poor weather. The proponent noted that no filling activity is permitted to occur during a specific nesting period for birds and that filling during wet and winter months would be dependent on the specific conditions at the time.
- Comments were made about the experience of being able to successfully implement a broad range of agricultural crops in allotment gardens on the west side of Highway 99 directly adjacent to the subject site and that no fill or major modification to this land was required.
- A concern was noted that by filling the agricultural land, there is a significant reduction in the range of agricultural crops a site would be able to yield in the future (i.e., site would be restricted to blueberry production only).
- General questions were asked about the experience of the consulting agrologist and if testing was going to be implemented as a monitoring measure prior to soil being brought onto the property. The applicant noted that the consulting agrologist would undertake this, which was supported in the agrologist report for the fill proposal.
- In response to a question about if testing had been done on materials already brought onto the subject site, the proponent indicated that no testing had been done as this materials was meant to be base materials for a farm access road. AAC members advised that even road based materials need to be tested as there is the potential for contaminants to leech from these materials to surrounding soils.

Attachment 9

- AAC members stressed the need for more detailed topographic information to be provided on the existing grade of the site, including all site specific variations (minus vegetation on site) to better inform the sites elevation in relation to the City drainage canals on Sidaway/Steveston and obtain a better understanding of how much fill is necessary. The applicant also indicated that the proposed elevation of the subject site was determined based on observations from neighbouring blueberry farms and assessments by the consulting agrologist.
- Information was provided on the excavation and fill works already conducted on the subject site. Community Bylaws staff noted that the ALC had granted previous permission to the proponent to install a farm access road (6 m wide) along a portion of the site's Sidaway Road frontage and along the north edge of the site. It was noted that the actual constructed width of the road was double the width of what was permitted by the ALC. ALC correspondence noted that it will be the applicant's responsibility to remediate and remove the fill associated with the portions of the road wider than 6 m to an acceptable agricultural standard.
- Committee members asked about the revised cost estimate provided in the proponents phasing plan associated with the project. The applicant noted that the revenue generated from the project would be reinvested into putting the property into agricultural production. A significant reduction of costs associated with the fill proposal in the agrologist report was noted. The applicant responded that some costs included by the consultant in the original report were removed based on further review of the proposal.
- Members stressed the importance of obtaining accurate topographic information for the entire site and that removal of existing vegetation on the site would be required to facilitate this so that the consultant has a complete elevation picture to determine the extent of necessary fill.
- Members noted that the overall fill plan, perimeter road and lack of topographic data on the site was not a cohesive approach to farming. It was noted that the establishment of a perimeter road would actually prohibit proper drainage by impeding water flows into City drainage canals. As a result, members commented that actual farming on filled land is questionable and has proven to be unsuccessful and difficult in the past. In response to questions about portions of the perimeter road, the applicant noted that the road could also be utilized as an access/maintenance road to a potentially relocated telecommunication tower on the site.
- There was discussion surrounding obtaining a water license for the future farm operation. Ministry staff noted that a water license will be required and recommended that the applicant make the necessary inquiries as soon as possible.
- Members suggested that the actual amount of works (i.e., filling or perimeter farm road development) should be minimized and that City engineering staff be requested to examine the drainage system in the area to see what options are available for improvement. It was also recommended that examination of drainage situation was required prior to consideration of any fill proposal on the site.

As a result of the discussion, the AAC moved and seconded the following motion:

Attachment 9

That the non-farm use application to place fill on 12871 Steveston Highway be referred back to City staff to work with the proponent in order to provide detailed existing topographic information conducted by a professional land surveyor over the entire site, a detailed on-site drainage plan (based on topographic information) and examination of City drainage in the surrounding area.

Carried Unanimously

Excerpt of AAC meeting minutes from February 13, 2013**Development Proposal at 12871 Steveston Highway (Non-Farm Use – Fill)**

Community Bylaws staff summarized the previous submissions and comments made by the AAC in 2012 and how the proponent has responded to the specific requests for information from the Committee and recent information submitted by the proponent and their Agrologist Consultant. Community Bylaws noted that a detailed topographic plan of current site elevations and a revised drainage and irrigation plan was completed.

The proponent's consultant for the project indicated that the depth of the proposed fill would be approximately 0.88 m on average across the entire subject site and the spacing of the drainage lines would be decreased to 40 ft. spacing. The overall finished grading approach to the project increases the elevation along the centre of the site (running north-south) and gradually decreases in elevation to the east and west of this centre "ridge" to facilitate drainage into adjacent canals.

AAC members had the following question and comments on the proposal:

- In response to questions, the proponent's agrologist consultant (Lori Larsen – Keystone Environmental) indicated that the topographic survey indicated an existing elevation of approximately 0.1m to 0.3m across the site.
- AAC members requested the feasibility of levelling the existing grade of the site, berming the perimeter and implementing a system of perimeter ditches to drain the water from the site. The agrologist noted that the challenge with that system is that the levelling of the site would not address the 5-10 days of standing water that would result if existing elevations on the site were maintained, especially during winter and high-rainfall events. This standing water would result in negative impacts to the proposed blueberry shrubs. Pumping water up and over an internal system of dykes into the City ditch system was challenging and would add significant infrastructure costs to the farm plan.
- A comment was made that the overall approach to the fill proposal made sense from a functional perspective, but that all other options should be explored prior to bringing in foreign materials onto the subject site.
- An AAC member commented that a berm and perimeter drainage system worked well for cranberry operations involving peaty soil, but that this approach might not be suitable to the subject site and proposed operation. It was also noted that this area of Richmond had different drainage infrastructure when compared to other areas in East Richmond.
- Improving the functioning of Sidaway Road as a drainage conveyance was noted as a concern to all farm operations in this area.

Attachment 9

- Background information was provided about the historical farm activities that occurred on the lands west of Highway 99, which was achieved through implementation of site specific drainage ditches feeding into perimeter drainage canals. This approach resulted in successful allotment gardens on the former Fantasy Gardens site. The general concern with bringing in fill onto the subject site was the impact it could have on the land and whether it would still be agriculturally productive land after fill activities were completed.
- Members referenced their experience with blueberry production and yields across Richmond on land with a variety of drainage conditions noting that where drainage is properly addressed, yields are typically higher.
- In response to questions from the Committee, the agrologist consultant indicated that the best type of fill material to be placed on the subject property is granular material that can facilitate drainage. The consultant also provided information on the provisions for monitoring of materials coming onto the subject site to ensure that they are not contaminated and consistent with the proper materials to facilitate farming. The consultant also noted that the proposed farm roads providing access throughout the property will consist of crushed granular gravel material.
- The agrologist provided clarity on the financial figures associated with the proposed fill operation and explained the rationale behind the revisions to the figures based on the proponent's business involvement in the trucking industry.
- Committee members indicated that, regardless of the outcome of the proposed fill operation, information was requested from Engineering staff on proposed future capital drainage and irrigation works in this area as it would be a benefit to this site as well as other agricultural operations in the surrounding area.
- Members commented that the applicant had responded to the AAC's requests for information as part of past review by the Committee.

Based on this, Agricultural Advisory Committee members forwarded the following motion:

That the "non-farm use" application for the purposes of soil fill activities on 12871 Steveston Highway, as per the terms and conditions of phasing, implementation and monitoring of the proposed soil fill activities as presented to the Agricultural Advisory Committee, be advanced to Council for their consideration through the required process.

Carried Unanimously

Drainage FACTSHEET



BRITISH
COLUMBIA

Ministry of Agriculture, Food and Fisheries

Order No. 535.100-2
November 2002

AGRICULTURAL DRAINAGE CRITERIA

Introduction

These criteria were developed to describe the level of drainage required to allow for good on-farm drainage. The criteria were used in projects under the Agricultural and Rural Development Subsidiary Agreement (ARDSA) that were intended to improve regional drainage and are commonly referred to as ARDSA criteria. They are also known as the "Agricultural Drainage Criteria".



Figure 1 Good Drainage on Productive Forage Land

The purpose of the Agricultural Drainage Criteria is to provide good drainage for low land crops to survive and thrive. The survival of crops depends upon the crop's roots not being saturated for long periods of time. The criteria were designed to limit the duration that the crop's roots are subjected to saturated soil conditions and provide a water table low enough to allow for good root growth.

Chronic flooding limits the range of crops that can be grown on farmland, reduces crop yields and in some cases leads to disease and pest management problems. Good drainage is required to ensure that farmers can produce marketable crops.

Regional Agricultural Drainage Criteria

The regional drainage criteria for agricultural areas are:

- To remove the runoff from the 10 year, 5 day storm, within 5 days in the dormant period (November 1 to February 28);
- To remove the runoff from the 10 year, 2 day storm, within 2 days in the growing period (March 1 to October 31);
- Between storm events and in periods when drainage is required, the base flow in channels must be maintained at 1.2 m below field elevation.
- The conveyance system must be sized appropriately for both base flow and design storm flow.

When conducting a drainage study using the above criteria, the flooding on the surface of the land is analyzed first, determining the length of time required to remove water from the surface of the land (field elevation). Generally surface flooding is limited to 4.5 days in the winter and 1.8 days in the summer.

The time for the water levels in the channel to return to base flow is then determined. To provide adequate drainage to the root zone, the water level should return to base flow levels within 6 hours during the summer and 12 hours in the winter after cessation of flooding.

The total time it takes to remove flooding and return the water level to base flow should not exceed 5 days in the winter and 2 days in the summer for the design storms stated in the first two criteria.

Explanation of Terms

Flooding

Flooding is considered to occur when the water levels exceed the designated field elevation.

Runoff

Runoff is considered all water above base flow that is not infiltrated.

Base Flow

Base flow is the amount of water flowing in the channel when there is no runoff from storm events.

In order to determine the effect that any changes in the watershed will have on water flows, an estimate of the base flow for summer and winter are required.

The summer base flow condition is to be based on available stream flow and precipitation data.

The winter base flow is calculated for an extremely wet period defined as 20 to 22 days of rainfall during a wet month.

On some systems the outlet is controlled by a pump station during freshet. The cycling of the pump determines water levels. Where the pump station operation governs the water levels, base flow water levels will be determined by the arithmetic mean of the maximum and minimum channel water elevations at the location that is near the lowest land in the flood cell.

Storm Flow

Storm water runoff should be calculated for summer and winter conditions using a one in 10 year return period for 5-day winter and 2-day summer storms.

The Rational and SCS method for calculating peak flows should not be used when designing regional

drainage systems. These methods over simplify a very complex process. Continuous simulation models are more realistic and take into account rainfall events that last for many days.

Freeboard

Freeboard is the elevation difference between base flow water levels in the channel and the field elevation.

For the purposed of determining freeboard the baseflow water level in the ditches is determined by analyzing base flow periods during the growing season.

Ideally the freeboard should be 1.2m, this provides a good outlet for tile drains. A freeboard of 0.9m may be acceptable in some areas.

Field Elevation

The field elevation can be designated where 95% of the land in the flood cell lies above the determined elevation. This is a general guideline.

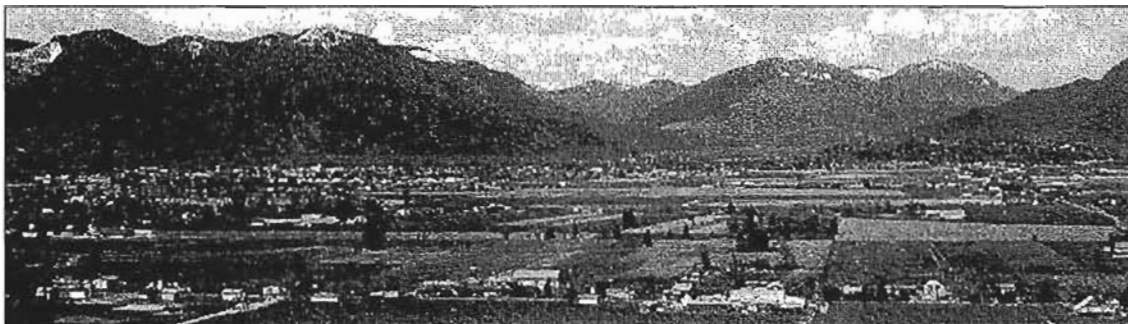
5% of the land would be below the designated field elevation. This 5% may receive less drainage benefits than the surrounding land.

Calculation of the Duration of Poor or Inadequate Drainage

Inadequate drainage is considered to occur when water levels rise above base flow conditions and crop roots are affected.

The duration of poor drainage should be calculated by summing the periods of inundation for the entire period of influence of the storm event.

During the dormant and growing seasons a certain amount of inadequate drainage may occur but the duration must be limited to the stated criteria to prevent damage to the crops



Explanation of Criteria

Remove the runoff from the 10 year, 5 day storm, within 5 days in the dormant period (winter).

What does a 5 day 10 year storm mean?

A 5-day storm, 10-year storm indicates the volume of water that is required to be removed by the drainage system. This volume of water is to be removed within 5 days from the time the root zone is saturated.

The amount of rain that can fall in a 5-day 10-year storm varies around the province.

To determine the local 5-day 10 year storm precipitation data from a near by climate station is statistically analyzed to determine what the average rainfall would be for a storm lasting 5 days that would occur once every 10 years. This would be more severe than a storm that occurs once a year, just as a 100-year storm would be even more severe than a 10-year storm.

Choosing this storm event to be used for the design or assessment a drainage system means that there is a level of acceptable risk that is assumed. The risk is that every 10 years a storm may occur that is larger than the drainage system is designed to convey.

There is a chance that a 5-day 10-year storm will occur more than once in a single year. The probability of this occurring is very small.

Remove the runoff within 5 days.

The on-farm drainage system is an integral part of removing the water from the root zone. Most subsurface drainage systems are installed with the pipe outlet at 1.0-1.1m below the field surface. To allow for the drains to flow freely the *base flow* in the channel should remain 1.2m below the field elevation between storm events.

Because regional drainage systems service on-farm drainage systems of farms with a variety of crops, a water level indicated by the 1.2m freeboard between storm events is the level used to determine if this criteria is met. By providing a 1.2m freeboard where it currently does not exist the agriculture community has the opportunity to convert to higher value crops.

However, in some situations where the crops grown are uniform and do not have deep roots determining when inadequate drainage begins can vary depending on the crop type.

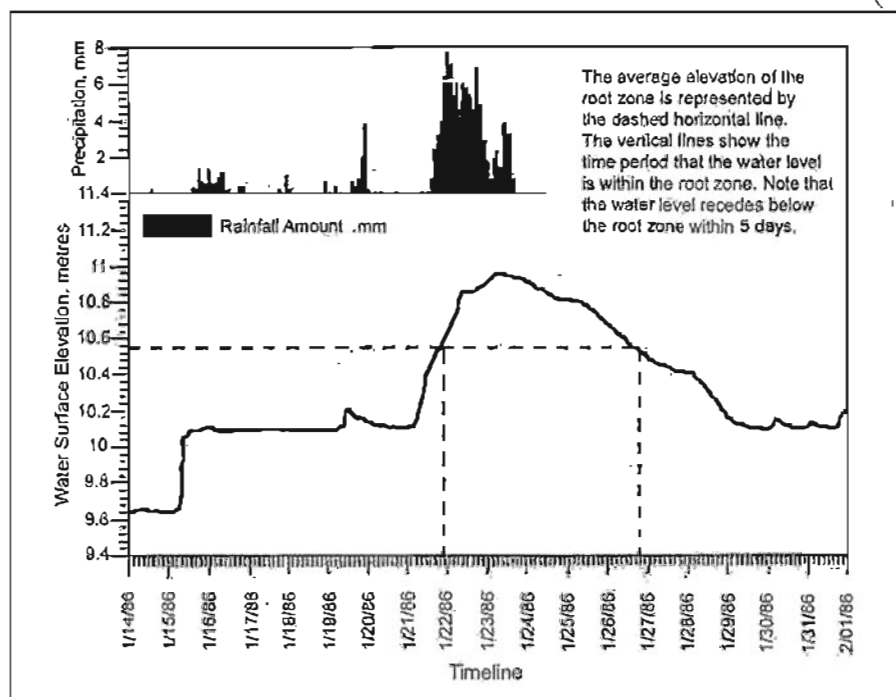


Figure 2 Sample Hydrograph

For perennial crops that have a deep established root system the roots of the crop should not be saturated for more than five days. The water level may rise higher but it must be below the root zone by the end of five days.

For shallow rooted crops and grasses the crop roots may not be affected until the water level has risen within 0.9m of the land surface. In these cases the inadequate drainage is considered to begin when it rises above this level and end when it falls below this level.

For some vegetable crops flooding during the winter is acceptable and even desirable. For drainage areas that only service areas where these crops exist inadequate drainage would be considered to begin the water reached the field elevation.

Figure 2 shows a hydrograph produced for a 5-day storm. Many factors affect the shape of the hydrograph including the land use in the area and the pattern of the storm. Notice the precipitation bars at the top of Fig. 2 indicates high rainfall the last day of the event and less the previous days. This may be a typical pattern for the area producing a certain volume of rain. This same amount of rainfall could fall in equal amounts each day and this would produce a different hydrograph.

The example hydrograph shows the rise and fall of the water table due to the storm. For this situation the water level recedes below the root zone within 5 days.

To remove the runoff from the 10 year, 2 day storm, within 2 days in the growing period (summer).

The analysis for this criterion is similar to the analysis described for the 5-day 10-year storm to be removed in 5 days in the dormant season.

For this criteria the 2-day 10-year storm in the growing season is analyzed to determine the amount of water to be removed by the drainage system.

During the growing season the water has to be removed quickly, within 2 days, to prevent damage to the crop's development. Since plants breathe through their roots it is important that there is air in the soils and the soil is not saturated for long periods of time.

Between storm events and in periods when drainage is required, the base flow in channels must be maintained at a 1.2 m below field elevation.

In many situations the banks of the watercourse may have been built up over the years. This creates a berm along the watercourse, see fig. 3. Although the bank may be at an elevation of 1.2 m above the water the actual low point in the field may be 0.5 m below the bank (berm) level. This would leave only a 0.7 m free board. It is important to have a topographical survey of the area showing all low spots, ditch bottoms and water levels in the channel.

The freeboard is critical in the spring and fall when equipment needs to access the fields. The water level may be maintained higher in the summer if field and crop conditions are conducive to subirrigation.

Subirrigation is an option that should be left up to the individual farmer.

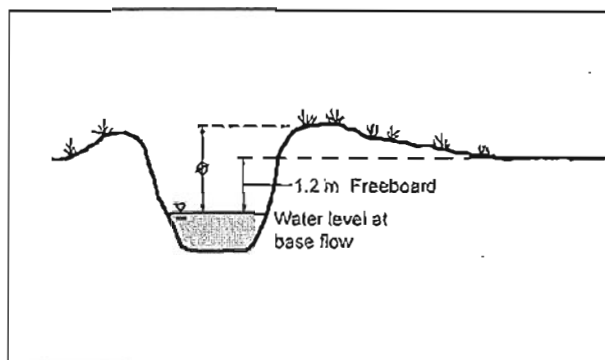


Figure 3 Determining Freeboard

The conveyance system must be sized appropriately for both base and design storm flows.

This criterion is to assure that all ditches and culverts are sized appropriately. In a number of regional drainage areas where the drainage is inadequate the problem is usually a culvert or channel that is too small to pass storm flows efficiently or a culvert installed too high.

Drainage Improvement Assessment for Agriculture

To conduct a proper drainage improvement assessment the following information should be provided for areas that do not meet the Agricultural Drainage Criteria.

- Delineate on a map the field areas that are capable of achieving 1.2m freeboard during non-storm situations.
- Delineate on a map the field areas that are capable of achieving only 0.9m freeboard during non-storm situations.
- If the 1.2m freeboard cannot be met within the time period stated after a storm, what water level in the ditches is achievable within the stated time period?
- If the 1.2m freeboard cannot be met within the time period stated after a storm, how long will it take to meet the 1.2m freeboard?
- If the 1.2 m freeboard cannot be met within a maximum of 12 hours in the summer or 24 hours in the winter after the cessation of flooding, create a map delineating the areas that meet 1.2m and 0.9 m of freeboard within the time period stated in the criteria. See fig. 4.

By providing this information in a report it is possible to assess the impact that the poorly drained areas will have on agriculture.

This information can help answer some of the most commonly asked questions and provides farmers with a clear picture of the drainage situation in their area.

The information indicates the severity of the impact.

Can the poorly drained areas support crops that are less sensitive to drainage conditions?

Is the land unfarmable?

The maps show the areas that are affected and how these areas relate to parcels of land that are farmed.

Does the poorly drained area negatively affect the entire parcel?

Does it make the parcel of land unproductive or too difficult to farm?

When planning drainage improvements this information gives an indication of which areas may benefit from drainage improvements and which areas may be too difficult to drain.

What is the cost / benefit ratio of improving drainage?

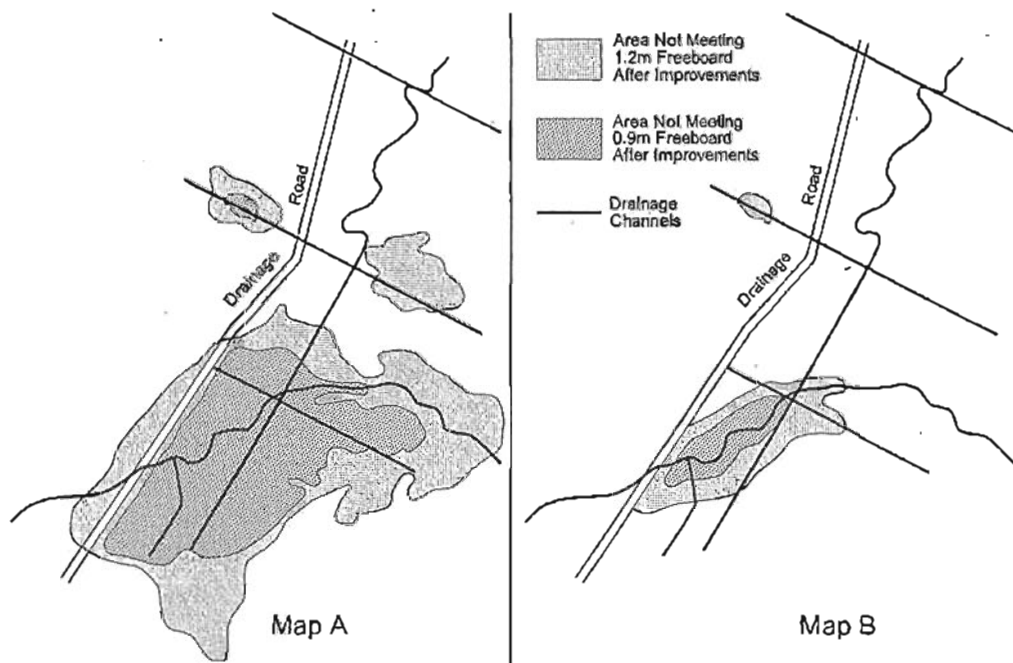


Figure 4 Regional Drainage Assessment Maps

Assessment Summary

Summarizing the affects of changes in the drainage system or drainage improvements in tabular and map form is a convenient method of displaying all the options. The table should include the changes that could be expected in flows, duration or saturation and the land area affected during the storm stage due to proposed changes in the watershed.

Regional overview of agricultural drainage

Figures 4 and 5 are examples of mapping the results of the drainage assessment. Figure 4, Map A and Map B, give an overall regional view of the areas that will still be affected after the proposed drainage improvements have been implemented. A map like this may also include lot boundaries. This map may then be used to show stakeholders which lands can reasonably be expected to be drained and which cannot.

Table 1 gives an example of summary information that may accompany these figures. The table may also contain other relevant information.

It is then possible to easily compare the options. The drainage improvements in Option B meet the agricultural drainage criteria in 95% of the drainage area. The areas not meeting the criteria only experience an extra day of flooding and have a 0.7m to 0.75m freeboard, which is acceptable for some crops. For Option A there will be some areas that do not meet the drainage criteria. However, the cost for Option A is quite a bit less than Option B.

The farmers and other stakeholders in the area can use this information to decide if the extra costs of the drainage improvements are justified.

Table 1 SUMMARY OF DRAINAGE IMPROVEMENTS AND COSTS		
	Option A	Option B
Description of work	Clean channels. Install small pump station	Clean and Improve channels. Install large pump stations.
For winter storm events		
Area not meeting 1.2 freeboard	92 ha	20ha
Area not meeting 0.9m freeboard	82 ha	11ha
% of area meeting drainage criteria	74%	95%
Freeboard achieved within criteria time period (within zone not meeting 0.9m freeboard)	0.4m	0.7m
Time required to meet the 1.2m freeboard*	9 days	6 days
For summer storm events (maps not shown)		
Area not meeting 1.2 freeboard*	85 ha	5 ha
Area not meeting 0.9m freeboard	75 ha	5 ha
% of area meeting drainage criteria	76%	98%
Freeboard achieved within criteria time period (within zone not meeting 0.9m freeboard)	0.7m	0.75
Time required to meet the 1.2m freeboard*	3 days	3 days
Economics		
Costs of Improvement	\$250,000	\$600,000
Benefits to Agriculture**	\$225,000	\$500,000

* This is assuming that the 1.2 m freeboard criteria is met when there are no storm events.

** Analysis by professional agriculture consultant. This includes improvements in crop yield, higher value crops, improved growing season, crop quality, management implications and any increases in production costs

How drainage affects individual properties

Figure 5 shows how poor drainage may affect a single property. It is important to consider not only the overall area within a region, but also how individual lots will be affected by drainage. Lot 1 in Figure 5 experiences poor drainage on over 75% of the property, half of the property does not meet the 0.9m freeboard and possibly a third would not meet a 0.6m freeboard.

This property owner of Lot 1 may not be able to productively farm a large portion of their land under this drainage scenario. Lot 2 also experiences poor drainage while Lot 3 is not affected.

This information would be used to determine the agricultural productivity of an area. Lot 1 may not be farmed because it is not worth the management effort to put a small portion of land into production. In that case the entire area of Lot 1 would not be included in the area receiving benefits in the summary information.

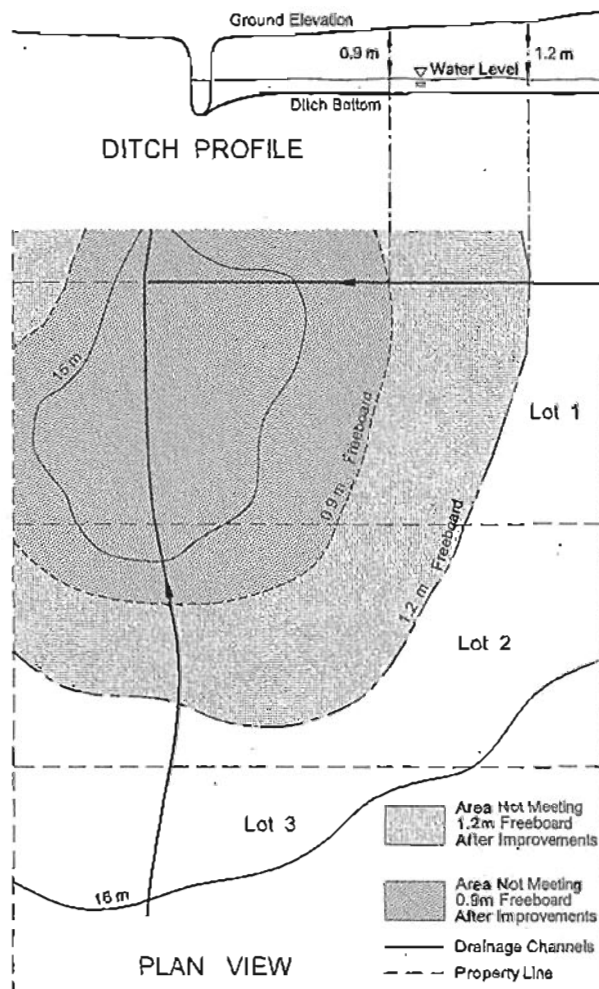


Figure 5 Regional Drainage Affecting Individual Property

References

- Lalonde, Vincent and Hughes-Games, Geoff. 1997. *B.C. Agricultural Drainage Manual*. B.C. Ministry of Agriculture, Food and Fisheries, Resource Management Branch, Victoria, B.C.
- Wilson, Ken. 1980. *Design Criteria for the Farm Drainage Outlet Assistance in the Lower Fraser Valley*. B.C. Ministry of Environment, Lands and Parks.

For further information on related topics, please visit our website

Resource Management Branch

www.agf.gov.bc.ca/resmgmt

Linking to our
Publications and Conceptual Plans



FOR FURTHER INFORMATION CONTACT
 Janine Nyvall, Water Management Engineer
 Phone: (604) 556-3113
 Email: Janine.Nyvall@gems5.gov.bc.ca

RESOURCE MANAGEMENT BRANCH
 Ministry of Agriculture, Food and Fisheries
 1767 Angus Campbell Road
 Abbotsford, BC CANADA V3G 2M3