

Section vi.

This portion of the application is detailed in Cascadia's report dated March 5, 2020.

*"A Site Remediation Plan Prepared by a Registered Professional"*

Section i. – ii

This portion of the application is detailed in our letter dated November 19, 2019.

Section iii.

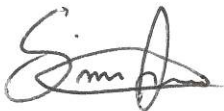
This portion of the application is detailed in Cascadia's report dated March 5, 2020.

*"For lands within 100 metres of a provincially-designated vulnerable aquifer, a Groundwater Impact Assessment, prepared by a Registered Professional, analyzing the potential impact of the proposed soil deposit activity on groundwater and recommended ground water protection measures."*



A Groundwater Impact Assessment was conducted by Active Earth. Active Earth findings are detailed in their report dated February 2020.

We trust that the preceding is suitable for your purposes at present. Please do not hesitate to contact our office if we can be of further assistance.

Yours very truly,  
Ryzuk Geotechnical



Simon Jones, EIT  
Junior Engineer



Bruce Dagg, M.Sc., P.Eng.  
Senior Geotechnical Engineer

6/3/20

Attachment

- Ryzuk Geotechnical letter dated November 19, 2019
- Cascadia Biological Services Environmental report dated March 5, 2020,
- Active Earth Engineering Ltd Groundwater Impact Assessment report dated February 2020),
- WSP Canada Inc drawing titled "Type 'C' Soil Deposit Permit Topographic Survey", dated January 8, 2020,
- WSP Canada Inc drawing titled "Type 'C' Soil Deposit Permit Volume Calculation Site Plan", dated February 25, 2020,
- Terms of Engagement
- Tile Search

Cc: Devin Warwick, Bylaw Enforcement Officer (By E-mail: [devin.warwick@cvrld.bc.ca](mailto:devin.warwick@cvrld.bc.ca))

## **RYZUK GEOTECHNICAL**

Engineering & Materials Testing

28 Crease Avenue, Victoria, BC, V8Z 1S3 Tel: 250-475-3131 Fax: 250-475-3611 www.ryzuk.com

November 19, 2019

File No: 9581-3

D & H Excavating  
1160 Stonecrest Way  
Shawnigan Lake, BC  
V0R 2W3

Dear Mr. Dolby,

Re: Soils Deposit Permit  
1160 Stonecrest Way – Shawnigan Lake, BC

As requested, we attended the above referenced site on October 9, 2019, to assess the property as such relates to the geotechnical aspects of the proposed deposition of soils and suitability of the earthworks completed to date. Subsequent to our site attendance we issued a confirmation of engagement letter to the Cowichan Valley Regional District (CVRD) on October 18, 2019 and this letter is in accordance with our letter of engagement. This letter summarizes our understanding of the purposed works and provides our observations, comments, and recommendations. As part of our work, we have reviewed the CVRD's Soil Deposit Bylaw No. 4236. Our work has been carried out in accordance with, and is subject to, the attached Terms of Engagement.

The site is located in the southeastern portion of Electoral B (Shawnigan Lake) within the Cowichan Valley Regional District, and is bounded by Stonecrest Way to the west, similar residential properties to the north and south, and Cowichan Valley Trail and two high voltage power lines to the east. The site slopes up from Stonecrest Way to the single family residence at a gentle inclination (< 15 degrees from horizontal) where it flattens to a near level area associated with the construction of the residence. To the east of the residence, the bedrock controlled terrain generally slopes down to the east and north at approximately 15 to 25 degrees below horizontal, with the southeast corner of the lot being the steepest portion. However, small local bedrock outcrops have steeper inclinations in the order of up to 3 – 4 vertical meters. The lot has previously been logged, with few mature trees left standing in the interior of the lot. This area contains immature trees, exposed stumps, slash piles, and grass and other minor vegetation. The north perimeter and southeast corner of the lot contain mature/immature trees with variable ground cover.

We observed native compact to dense sand and gravel with varying silt content (colluvium), atop dense to very dense silty sand with some gravel (glacial till), atop intact bedrock. The soils were observed in excavations associated with access to the interior of the property. Bedrock outcrops were observed throughout the site.

Prior to our site visit, deposition of soil had been taking place to the east of the single family residence. Soils appeared to generally range from poorly sorted fill, native silty clay to blast rock. From discussions on site, material had been sourced from multiple sites. We understand that material had been end-dumped to build the existing deposit area. When soil conditions were unfavorable for dump trucks to drive atop the soil, an excavator would track the material to the edge of the soil slopes and cast the material over the edge. The area of deposited soil is approximately 1500 m<sup>2</sup>. The surface of the soil deposit area currently consists of two different elevations, both of which are relatively level. The northern half of the fill area is approximately 15 to 20 m in height, relative to natural grade, and steps down approximately 4 m at the middle of the soil deposit. The lower portion of the soil deposit is approximately 10 to 12 m in height. Soil slopes are approximately 36 degrees below horizontal, which is likely close to the soils' angle of repose. The soil generally appears to daylight onto bedrock, and from discussions on site, the area below the soil also consists of bedrock.

It should be noted that some of the soil had been sourced from a site on North Dairy Road in Saanich, a site we had previously been involved with. The soil from this site consisted of native soft silty clay with minor sand lenses. At the time of excavation, late 2018 to early 2019, the weather was very poor due to heavy rainfall. Due the poor soil strength, soil type, and weather the material was heavily saturated and viscous when deposited. We understand that as a result of the saturated and viscous nature of the soil tree stumps and tree trunks were placed atop the surface of the soil. Placing of the stumps allowed for the excavator to traverse over the surface and continue to place addition soil atop. From our site attendance we observed the layer of stumps at the toe of the slope along the norther perimeter of the soil deposit atop the now dewatered silty clay. Additionally, due to the saturated and viscous nature of the silty clay when it was deposited, the soil flowed away from the soil deposit area towards the powerline right-of-way. The earthflow originates from the area where the stumps are visible at the toe of the soil slope, the northeast corner. The earthflow varied in widths of up to 20 m wide, at the source of the flow, to approximately 2 m at the narrowest point. The length of the earth flow is approximately 170 m. Based on excavations within the flow path the thickness of the flow was up to 2 m in depth. From the CVRD's Geographic Information System mapping and site features we consider the earthflow is entirely contained within the property.

We understand the purpose of the soils deposit is to create a relatively level area to plant a fruit orchard. No permanent structures are proposed within the soil deposit area. Based on discussions on site the long-term goal is to place soil over a total area of up to 10 000 m<sup>2</sup>, however this area will need to be confirmed with a survey. Currently, placement of soil directly to the east of the residence is desired. The proposed work will likely exceed 1000 m<sup>3</sup> of soil placed within the next year, therefore we consider a Type 'C' permit will be required.

Based on our site observations and discussion we consider the work to date to be acceptable, however soil placement methodology will be required to change. Currently erosion/sediment control is limited to an excavated trench to the northeast of the proposed soil deposit area. This is considered acceptable at present, though improvements to the trench will be required. Additionally, a sediment trap will be required downstream of the earthflow to limit any sediment



migration within the property and prevent sediment transport off the property to the extent possible.

After reviewing CVRD's Bylaw 4236, we recommend that the lot be surveyed. The survey should include the following items:

- Proposed extent of the soils deposit area,
- Topography of the existing grades within deposit area, to calculate soil volumes in the future, as defined in Bylaw 4236,
- Extent of the earth flow,
- Topographic survey of the existing soils deposit area to determine the volume of soil placed and area of deposit to date,
- All other defined items from Sections 21.1.c and d.

Access to the site and soil deposit area is currently achieved from the existing driveway. We consider this will be suitable for the purposes at present. In the future we recommend an access road be constructed to allow trucks to deposit soil at the base of the existing slopes, especially where the North Dairy Road soil and stumps are exposed. We suggest that this be done in conjunction with the proposed placement of soil to the east of the residence. We recommend that the road access follow our placement and compaction methodology provided below. As you stated that truck access can be an issue, we recommend capping the access road with a minimum of 450 mm of 300 mm minus blast rock.

We recommend that all organics within the proposed deposit area be stripped and stockpiled for later revegetation of the final soil slopes. Any soils placed should be done in lifts of up to 450 thickness and compacted with a 10 ton vibratory drum roller or thoroughly with the tracks of a large excavator. For overall soil heights exceeding 4 m, a vibratory roller must be used for compaction. Slope heights are not to exceed 30 m. We recommend that finished fill areas be constructed with 2H:1V (Horizontal:Vertical ) or flatter slopes. If the deposit area encroaches within 10 m of the property edge the slopes are required to be flattened to 4H:1V, as per Bylaw 4236. We recommend that all final slopes and disturbed areas be revegetated as soon as possible following completion of earthworks. Additionally, placement of stumps and tree trunk into the final slope surface will assist with surficial sloughing, erosion, and will assist in revegetation.

Where the North Dairy Road soil is daylighting from the soil slope additional measures will be required. Stripping of the earthflow material down to native subgrade will be required. Placement and compaction of materials should be done from the base of the existing soil slope. Building this area up with approved material will act as a resisting force to any potential movement that may occur due to the poor soil strength of the North Dairy Road soil. The stripped earthflow material can be mixed with soils from other sites to improve the consistency and strength of the soil. The mixed soil may then be placed and compacted within the proposed deposit area.

November 19, 2019

During construction of the deposit area we consider the completion of a sediment detention pond will be adequate to control sediment. The existing trench located to the north of the proposed deposit area can be utilized to direct any runoff water from the deposit area to the detention pond. On the south edge of the proposed deposit area an additional trench will need to be excavated and tied into the detention pond. The detention pond will allow sedimentation of suspended particles within the runoff water and control the discharge of water down slope. Details for the detention pond location and construction can be provided on site. Placement of filter fabric and a straw wattle at the southern most extent of the earthflow will be sufficient to minimize any sediment discharge.

We consider the 2H:1V slopes in conjunction with revegetation will be adequate to mitigate any erosion of the soil deposit area.

Based on our site attendance we do not consider the earthflow material at risk of remobilizing. The soil appears have dewatered sufficiently during the dry portion of the year. We consider that rainfall and surface water will not saturate the soils to the point of mobilization. We will monitor the existing earthflow to ensure that future movements do not occur. We do not consider the property to be at risk of flooding as no water courses were identified within the lot. Due to the lot being predominantly bedrock we do not consider the proposed soil deposit will cause any additional risk of landslide.

Once deposition of soil commences, we will set up a monitoring schedule to ensure that all our geotechnical recommendations are being carried out. Provided the above work proceeds based on our recommendations, we consider the proposed works to be in accordance with the submitted plans and that the land will be safe for the intended use from a geotechnical perspective.

We trust that the preceding is suitable for your purposes at present. Please don't hesitate to contact our office if we can be of further assistance.

Yours very truly,  
Ryzuk Geotechnical



Simon Jones, EIT  
Junior Engineer



Bruce Dagg, M.Sc., P.Eng.  
Senior Geotechnical Engineer



Attachment – Terms of Engagement

Cc: Devin Warwick, Bylaw Enforcement Officer (By E-mail: [devin.warwick@cverd.bc.ca](mailto:devin.warwick@cverd.bc.ca))