FLOODPLAIN CUT & FILL REPORT

Eight Residential Lots
Hemphill Street / Shea Road
Richmond (Ottawa), Ontario

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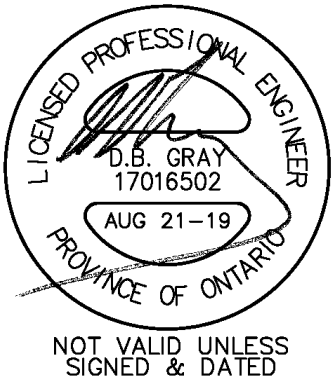

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Eight Residential Lots
Hemphill Street / Shea Road
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Eight residential lots are proposed on 1.18 hectares (ha) of land on Hemphill Street and Shea Road, in Richmond. Four of the lots (Lots 1 to 4) have frontage on Hemphill Street. A proposed extension of Hemphill Street will be constructed to provide frontage to three lots (Lots 6 to 8). One lot (Lot 5) will have frontage on Shea Road.

The proposed development is located within the 1:100 floodplain. The local 1:100 year flood elevation is 94.07 m (geodetic). To develop the proposed lots fill be required to raise the grade to a maximum of approximately 1.1 m (at the house foundations). To compensate for the placement of fill in the floodplain a proposed 2.34 hectare "Cut Area" will be excavated immediately west of the proposed development.

The Rideau Valley Conservation Authority (RVCA) has the authority to regulate "Fill, Construction and Alteration to Waterways" including placing fill in a regulated area such as a floodplain. The RVCA also has the authority to regulate the construction of buildings and structures in any area susceptible to flooding. A principal mandate of the RVCA is to prevent property damage due to flooding and erosion.

This report describes how the proposed development meets the policies of the RVCA for placing fill in a floodplain and preventing property damage. Also refer to drawings C-1 to C-4 prepared by D. B. Gray Engineering Inc.

RVCA Policy:
"New development must result in no significant impact on expected flood levels or velocities, taking into consideration the direct and cumulative effects of the development on flood plain conveyance capacity and storage capacity" and "*adequate overland flow routes in local drainage networks must be maintained."*

Including the "Cut Area", a total of 3.52 hectares area of the floodplain is affected. Within this area the storage capacity was calculated for each 0.15 m contour interval below the 94.07 m elevation (1:100 year flood elevation) for both the pre and post development conditions. The "Cut Area "is designed such the loss of storage volume is compensated by a gain in volume that is equal to or greater than the loss for each contour interval. (As requested by the RVCA, the gained storage volumes do not include drainage ditches. The RVCA has stated that the ditches cannot be used as part of the calculations since they are intended for conveyance and are expected to be filled prior to a storm event.) In summary: For the 93.62 m contour interval (the 0.15m contour interval having a top elevation of 93.62 m) 312 m^3 was gained and lost; for the 93.77 m contour interval the gain of 1,231 m^3 is about 42% greater than the 867 m^3 loss; and for the 93.92 m contour 1,777 m^3 gain is about 31% greater than the 1,356 m^3 loss. In addition to the above, for the 94.07 m contour

interval, the RVCA had additional requirements. As noted in an email from the RVCA, dated July 30, 2019 (attached to the end of this report), it was stated:

> *"The proposed cut and fill does not meet the RVCA policies 2.1(i) as portions of the area to be filled are lower than 0.3 m in depth, as well as the corresponding cut. (the 93.62masl to 93.77masl cross section). This represents approximately 343 m3 of volume based on the plan and calculations provided."*
>
> *"A significant proportion of the cut area is contingent upon utilizing the area within the floodplain for the offsetting cut, by regarding within the floodplain, which has generally been discouraged."*
>
> *"Staff level discretionary approval: If in addition to the plan as provided, that a 343m^3 surplus of volume is provided as part of the excavation above the 93.77masl cross section outside of the existing floodplain. Given the significant regrading work and deeper cut, the intent would be to provide for the cut at the matching elevation and an increased volume (equal to the cut below the 93.77 elevation) provided at a suitably graded depth outside of the floodplain. This additional volume would be to provide a safeguard from potential adverse impacts and through a conservative approach to floodplain management."*
>
> The following alternative option was also provided: *"Executive Committee decision: The current proposal be brought forward to the RVCA Executive Committee for a decision related to the required balanced cut/fill Section 28 permit for the work, and requesting an exception to the fill lower than 0.3 metre in depth. We cannot confirm the outcome of the Executive Committee's review, interpretation and ultimate decision on the matter."*

Originally a 1,551 m^3 gain in storage volume was proposed (slightly greater than the 1,548 m^3 loss). In response to July 30, 2019 email an additional 343 m^3 storage is proposed to be gained for a total of 1,894 m^3 (about 19% greater than the 1,548 m^3 loss). In all contours the total gain in storage is 5,213 m^3, 28% greater than the total loss of 4,083 m^3. Therefore the proposed development will have a positive effect on the floodplain storage capacity and flood levels. (Refer to drawing C-4 and the "Cut & Fill Calculation Methodology" at the end of this report.)

The subject lands are normally dry and very flat and they appear to drain overland to the Shea Road roadside ditch and, via a 900 mm culvert under Shea Road, to a ditch that conveys the drainage east to "Flowing Creek Drain" located approximately 150 m east of the subject lands. A proposed ditch around the rear perimeter of the seven lots will drain the "Cut Area" and the rear yard of these lots, and Lot 5, to the Shea Road culvert (and to Flowing Creek Drain). (The front yards of the seven lots fronting on Hemphill Street will drain to the existing municipal storm sewer.) Therefore adequate overland flow routes are maintained and a drainage system is proposed.

The portion of the floodplain that is affected by the proposed development is about 150m to 550m west of the main channel (Flowing Creek Drain); therefore during flood conditions flow velocities are expected to be negligible for both pre and post development.

RVCA Policy:

"New development involving capital investment in flood susceptible areas by the public and private sectors must be designed so that structures and their contents are protected against

flood damage." Specifically, "*the underside of main floor shall be at least 300 mm above the 1:100 year flood level*."

The proposed tops of foundation elevations (i.e. underside of main floor) of the houses vary from 95.00 m to 95.34 m; 930 mm to 1270 mm above the 1:100 year flood level. The proposed grade elevations at the foundation of the houses vary from 94.61 m to 95.01 m; 540 mm to 940 mm above the 1:100 year flood level. Therefore the houses are protected against flood damage.

RVCA Policy:
"New development must not increase the risks to public safety which are expected to be present during the regulatory flood (or more frequent floods); in this regard the viability of access to and egress from the structure and the potential depths of water over access routes will be the primary consideration." Specifically, *"for vehicular and pedestrian access routes (municipal roadways and private rights-of-way) safe access will be considered to be available if the depth of flooding at regulatory (1:100 year) flood level along the full length of the travelled surface of the access roadway or right-of-way is no greater than 0.3 metres."*

The lowest point in the municipal roads is a bottom of curb elevation on Hemphill Street (near where it starts to bend south to Gamble Drive) having a grade elevation of 93.77, 0.30 metres below the 1:100 year flood level. Therefore the depth of flooding at the 1:100 year flood level along the full length of the travelled surface of the access roadway or right-of-way is no greater than 0.3 metres.

CONCLUSIONS:

1. The proposed development will have a positive effect on the floodplain storage capacity and flood levels.

2. Adequate overland flow routes are maintained and a drainage system is proposed.

3. During flood conditions flow velocities are expected to be negligible for both pre and post development.

4. The proposed tops of foundation elevations and the proposed grade elevations at the foundation of the houses protected the houses against flood damage.

5. The depth of flooding at the 1:100 year flood level along the full length of the travelled surface of the access roadway is no greater than 0.3 metres.

Cut & Fill Calculation Methodology

Existing Conditions of Proposed Residential Development Boundaries

1. Draw existing contour lines at 0.15m intervals below the 100-year 94.07 m flood level.
2. Measure top area of each existing contour line.
3. Calculate existing volume of water being stored between each 0.15m interval using prizmoidal formula.
4. Cumulative volumes represent total volume of water being stored between 93.47 and the contour line elevation.

Proposed Conditions of Proposed Residential Development Boundaries

5. Draw proposed contour lines at 0.15m intervals below 94.07.
6. Measure top area of each proposed contour line, ignoring ditches as they are considered to be full under normal stormwater conveyance.
7. Calculate proposed volume of water being stored between each 0.15m interval using prizmoidal formula.
8. Cumulative volumes represent total volume of water being stored between 93.47 and the contour line elevation.
9. Subtract proposed volume stored from existing volume stored to yield loss of storage volume.
10. Cumulative volumes represent total loss of storage volume between 93.47 and the contour line elevation.

Existing Conditions of Proposed Cut Area

11. Draw existing contour lines at 0.15m intervals below 94.07.
12. Measure top area of each existing contour line.
13. Calculate existing volume of water being stored between each 0.15m interval using prizmoidal formula.
14. Cumulative volumes represent total volume of water being stored between 93.47 and the contour line elevation.

Proposed Conditions of Proposed Cut Area

15. Draw proposed contour lines at 0.15m intervals below 94.07.
16. Measure top area of each proposed contour line.
17. Calculate proposed volume of water being stored between each 0.15m interval using prizmoidal formula.
18. Cumulative volumes represent total volume of water being stored between 93.47 and the contour line elevation.
19. Subtract existing volume stored from proposed volume stored to yield gain of storage volume in cut area.
20. Cumulative volumes represent total gain of storage volume between 93.47 and the contour line elevation.
21. Repeat steps 15-19 a million times until the gain in storage volume is equal to or greater than the loss of storage volume.
22. Cumulative volumes represent total volume of material to be cut, and total gain of storage volume between 93.47 and the contour line elevation.

Gmail by Google

Douglas Gray <d.gray@dbgrayengineering.com>

Hemphill Subdivision - Updated Cut/Fill Analysis

1 message

Eric Lalande <eric.lalande@rvca.ca> Tue, Jul 30, 2019 at 11:49 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Terry Davidson <terry.davidson@rvca.ca>, Glen McDonald <glen.mcdonald@rvca.ca>, Evelyn Liu <evelyn.liu@rvca.ca>

Hi Doug,

The RVCA has reviewed the supporting updated cut/fill analysis, from a technical and policy perspective, and offer the following comments and options for next steps:

a. The cut fill analysis currently achieves an equilibrium in volume at each elevation interval (15 cm intervals) based on the volume calculations presented.
b. The proposed cut and fill does not meet the RVCA policies 2.1(i) as portions of the area to be filled are lower than 0.3 m in depth, as well as the corresponding cut. (the 93.62masl to 93.77masl cross section). This represents approximately 343 m^3 of volume based on the plan and calculations provided.
c. A significant proportion of the cut area is contingent upon utilizing the area within the floodplain for the offsetting cut, by regarding within the floodplain, which has generally been discouraged.

That being said, we have discussed internally and offer two options to proceed.

1. Staff level discretionary approval: If in addition to the plan as provided, that a 343m^3 surplus of volume is provided as part of the excavation above the 93.77masl cross section outside of the existing floodplain. Given the significant regrading work and deeper cut, the intent would be to provide for the cut at the matching elevation **and** an increased volume (equal to the cut below the 93.77 elevation) provided at a suitably graded depth outside of the floodplain. This additional volume would be to provide a safeguard from potential adverse impacts and through a conservative approach to floodplain management.

OR

2. Executive Committee decision: The current proposal be brought forward to the RVCA Executive Committee for a decision related to the required balanced cut/fill Section 28 permit for the work, and requesting an exception to the fill lower than 0.3 metre in depth. We cannot confirm the outcome of the Executive Committee's review, interpretation and ultimate decision on the matter.

Either option would include RVCA conditions that the land to be used for the cut/fill be protected from future land uses that may impact grading work, through the plan of subdivision process. (possibly through dedication of land/zoning ect. to be discussed further).

Please let me know which way you would like to proceed, (either updating the current plan through 1) or seeking a cut/fill exception 2)). We can then proceed with providing updated comments to the City regarding the subdivision application, following the path you and your client would prefer.

Please note that option 1) was discussed at length given the information provided, that is a reasonable effort to move forward to accommodate the proposed development in light of the unique considerations of the site in context of its location, scale, surrounding land uses, planning policy and recent planning approvals, and would not be considered in most other situations.

Thank you,

Eric Lalande, MCIP, RPP

Planner | x1137

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