January 27th, 2010

Susan Murphy
Project Manager, Mattamy Homes
123 Huntmar Drive
Ottawa, ON K2S 1B9

Dear Susan:

Re: Mattamy Homes Richmond – Channelization/ Berm Modifications Analysis, North of Perth Street

We are pleased to provide the following preliminary assessment of Van Gaal Drain channelization upstream of Perth Street and its impact on the effect of the berms on flood levels in the Van Gaal Drain upstream of Perth Street as discussed at the January 14, 2010 meeting with Rideau Valley Conservation Authority and City of Ottawa staff.

Should you have any questions, please contact me.

AECOM Canada Ltd.

Paul Frigon, P.Eng. Senior Engineer, Water
Paul.Frigon@aecom.com
613-820-7728 ext 246
Statement of Qualifications and Limitations

The attached Report (the “Report”) has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the “Agreement”).

The information, data, recommendations and conclusions contained in the Report:

- are subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the “Limitations”)
- represent Consultant’s professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- have not been updated since the date of issuance of the Report and their accuracy is limited to the time period and circumstances in which they were collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- were prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

Unless expressly stated to the contrary in the Report or the Agreement, Consultant:

- shall not be responsible for any events or circumstances that may have occurred since the date on which the Report was prepared or for any inaccuracies contained in information that was provided to Consultant
- agrees that the Report represents its professional judgement as described above for the specific purpose described in the Report and the Agreement, but Consultant makes no other representations with respect to the Report or any part thereof
- in the case of subsurface, environmental or geotechnical conditions, is not responsible for variability in such conditions geographically or over time

The Report is to be treated as confidential and may not be used or relied upon by third parties, except:

- as agreed by Consultant and Client
- as required by-law
- for use by governmental reviewing agencies

Any use of this Report is subject to this Statement of Qualifications and Limitations. Any damages arising from improper use of the Report or parts thereof shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report.
Introduction:

A berm has been constructed on the Arbuckle lands, as illustrated in Figures 1 and 2, with 30m offsets from the Van Gaal Drain north of Perth Street following consultation with the RVCA. The RVCA has developed floodline mapping, as illustrated in Figure 1, based on the recent report prepared by J.F. Sabourin & Associates: Floodplain Mapping Report for the Van Gaal and Arbuckle Municipal Drains in the Village of Richmond (November, 2009). The JFSA report and floodplain mapping does not acknowledge the berms north of Perth Street. AECOM had been retained by Mattamy Homes for water resources work associated with their Richmond development. AECOM was asked by Mattamy to assess the impact of the berm on flood levels (see letter report October 8th 2009) which was submitted to the RVCA. Our analysis concluded that the increase in flood level is confined to Mr. Arbuckle’s property and would not be a concern to adjacent landowners.

Following the deferral by the RVCA Board on the matter of the Van Gaal Drain Flood Plain Mapping – Final Report, a meeting took place on January 14, 2010 with Mattamy Homes, their consultants, RVCA and City staff. The purpose of the meeting was to continue discussion on the hydrologic analysis that produced the Van Gaal Flood Plain Mapping and to consider further revisions to the flood plain mapping that may be warranted in view of the grading changes (berms) in the study area. At this meeting, the RVCA staff suggested a potential solution that would involve widening the cross-sectional area of the watercourse (below bank full level) north of Perth Street. This solution would return the water surface profile to its original “pre-berm” position by increasing the conveyance capacity.

Mattamy Homes concurred in principle with the solution offered by the RVCA and agreed that AECOM would undertake further preliminary assessment of this solution which is contained in this report.
Assessment:
To this end, the HEC-RAS model used in the floodline analysis was modified by developing an overbank “terrace” at selected cross sections where measurable water level difference were computed by the berms. These terraces were started at the top of the drain bank in order to avoid impacting fish habitat and were run for approximately 10m towards the berms to the west of the drain. Since the Spring runoff event appears to be dominant upstream of Perth Street, the HEC-RAS Spring geometry (with an overbank mannings “n” of 0.05 rather than 0.08 for Summer) was used to assess the impact of the proposed channelization works. The location of the berm and “terraces” are illustrated in cross-section in Figure 3.

A comparison of the “RVCA floodline” and “the channelization/berm floodline” for 1:100 Year flood levels for Spring events is provided in Table 1 and the resulting floodline (ultimate) from the channelization/berm works is illustrated in Figure 2. It can be seen that there is no increase in 1:100 Year Spring flood level for the Van Gaal Drain upstream of Perth Street.

Conclusion:
It is apparent that the proposed terracing to the west overbank of the Van Gaal Drain would maintain flood levels in the Van Gaal Drain at or below those estimated in the recent Van Gaal Drain Floodline Mapping Report (JFSA – 2009). The channelization/berm modifications would result in a new floodline as illustrated in Figure 2.
Richmond - Nov 27 2009 (SPRING) Plan: 1) Plan 02 2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 2554

Legend
WS VG PEAK SPR-100 - Plan 02
WS VG PEAK SPR-100 - chanmods
Ground
Bank Sta.

Richmond - Nov 27 2009 (SPRING) Plan: 1) Plan 02 2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 2478

Legend
WS VG PEAK SPR-100 - Plan 02
WS VG PEAK SPR-100 - chanmods
Ground
Bank Sta.

Richmond - Nov 27 2009 (SPRING) Plan: 1) Plan 02 2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 2157

Legend
WS VG PEAK SPR-100 - chanmods
WS VG PEAK SPR-100 - Plan 02
Ground
Ineff
Bank Sta.

Richmond - Nov 27 2009 (SPRING) Plan: 1) Plan 02 2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 2076

Legend
WS VG PEAK SPR-100 - chanmods
WS VG PEAK SPR-100 - Plan 02
Ground
Ineff
Bank Sta.

Figure 3a - Proposed Cross Sections
Richmond - Nov 27 2009 (SPRING) Plan: 1) Plan 02 2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 1974

Legend
- WS VG PEAK SPR-100 - Plan 02
- WS VG PEAK SPR-100 - chanmods
- Ground
- Ineff
- Bank Sta.

Figure 3b - Proposed Cross Sections
Figure 3c - Proposed Cross Sections
Figure 3d- Proposed Cross Sections
Richmond - Nov 27 2009 (SPRING)  Plan:  1) Plan 02  2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms  Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 1416

Legend
WS VG PEAK SPR-100 - Plan 02
WS VG PEAK SPR-100 - chanmods
Ground
Ineff
Bank Sta.

Richmond - Nov 27 2009 (SPRING)  Plan:  1) Plan 02  2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms  Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 1400

Legend
WS VG PEAK SPR-100 - chanmods
WS VG PEAK SPR-100 - Plan 02
Ground
Bank Sta.

Richmond - Nov 27 2009 (SPRING)  Plan:  1) Plan 02  2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms  Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 1364

Legend
WS VG PEAK SPR-100 - Plan 02
WS VG PEAK SPR-100 - chanmods
Ground
Ineff
Bank Sta.

Richmond - Nov 27 2009 (SPRING)  Plan:  1) Plan 02  2) chanmods
Geom: P709 - 2009 (SPRING)-chan-berms  Flow: Dec 8 '09 (SPRING FLOWS W/ TIMING)
RS = 1340

Legend
WS VG PEAK SPR-100 - chanmods
WS VG PEAK SPR-100 - Plan 02
Ground
Ineff
Bank Sta.

Figure 3e - Proposed Cross Sections
<table>
<thead>
<tr>
<th>Reach</th>
<th>River Sta</th>
<th>Profile</th>
<th>Plan</th>
<th>Q Total (m^3/s)</th>
<th>W.S. Elev (m)</th>
<th>Vel Chnl (m/s)</th>
<th>Flow Area (m^2)</th>
<th>Top Width (m)</th>
<th>Volume (1000 m^3)</th>
<th>Hydr Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach 2</td>
<td>2554</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>8.3</td>
<td>96.28</td>
<td>0.8</td>
<td>20</td>
<td>125</td>
<td>68</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2554</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>8.3</td>
<td>96.28</td>
<td>0.8</td>
<td>19</td>
<td>124</td>
<td>70</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2478</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>8.3</td>
<td>96.15</td>
<td>1.1</td>
<td>13</td>
<td>92</td>
<td>67</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2478</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>8.3</td>
<td>96.15</td>
<td>1.1</td>
<td>13</td>
<td>88</td>
<td>68</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2157</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>8.3</td>
<td>95.48</td>
<td>1.0</td>
<td>22</td>
<td>180</td>
<td>61</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2157</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>8.3</td>
<td>95.48</td>
<td>1.1</td>
<td>14</td>
<td>178</td>
<td>63</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2076</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>95.27</td>
<td>1.2</td>
<td>17</td>
<td>113</td>
<td>60</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>2076</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>95.27</td>
<td>1.2</td>
<td>15</td>
<td>116</td>
<td>61</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1974</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>95.11</td>
<td>1.0</td>
<td>26</td>
<td>160</td>
<td>58</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1974</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>95.10</td>
<td>1.1</td>
<td>15</td>
<td>155</td>
<td>59</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1902</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.99</td>
<td>1.2</td>
<td>18</td>
<td>147</td>
<td>57</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1902</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.98</td>
<td>1.2</td>
<td>12</td>
<td>159</td>
<td>58</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1833</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.85</td>
<td>0.9</td>
<td>32</td>
<td>259</td>
<td>54</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1833</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.83</td>
<td>1.0</td>
<td>18</td>
<td>244</td>
<td>55</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1796</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.81</td>
<td>0.8</td>
<td>36</td>
<td>229</td>
<td>53</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1796</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.78</td>
<td>1.0</td>
<td>16</td>
<td>196</td>
<td>54</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1735</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.72</td>
<td>1.0</td>
<td>25</td>
<td>259</td>
<td>51</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1735</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.69</td>
<td>1.0</td>
<td>17</td>
<td>207</td>
<td>52</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1728</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.69</td>
<td>1.1</td>
<td>19</td>
<td>214</td>
<td>51</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1728</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.69</td>
<td>0.9</td>
<td>19</td>
<td>198</td>
<td>52</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1727</td>
<td>Culvert</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1717</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.69</td>
<td>1.1</td>
<td>18</td>
<td>200</td>
<td>51</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1717</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.65</td>
<td>0.8</td>
<td>20</td>
<td>119</td>
<td>52</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1615</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.61</td>
<td>0.6</td>
<td>48</td>
<td>280</td>
<td>47</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1615</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.57</td>
<td>0.7</td>
<td>25</td>
<td>271</td>
<td>48</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1555</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.55</td>
<td>0.9</td>
<td>23</td>
<td>102</td>
<td>45</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1555</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.51</td>
<td>0.9</td>
<td>18</td>
<td>82</td>
<td>46</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1488</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.45</td>
<td>1.0</td>
<td>14</td>
<td>69</td>
<td>44</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1488</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.45</td>
<td>0.8</td>
<td>20</td>
<td>78</td>
<td>45</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1416</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.41</td>
<td>0.7</td>
<td>46</td>
<td>329</td>
<td>42</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1416</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.40</td>
<td>0.8</td>
<td>28</td>
<td>324</td>
<td>42</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1400</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.36</td>
<td>1.0</td>
<td>12</td>
<td>18</td>
<td>42</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1400</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.36</td>
<td>1.0</td>
<td>12</td>
<td>18</td>
<td>42</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1364</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>10.8</td>
<td>94.29</td>
<td>1.1</td>
<td>11</td>
<td>27</td>
<td>41</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1364</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>10.8</td>
<td>94.29</td>
<td>1.1</td>
<td>10</td>
<td>27</td>
<td>41</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1340</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>11.6</td>
<td>94.19</td>
<td>1.5</td>
<td>8</td>
<td>26</td>
<td>41</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1340</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>11.6</td>
<td>94.19</td>
<td>1.5</td>
<td>8</td>
<td>26</td>
<td>41</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1339</td>
<td>Culvert</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1312</td>
<td>VG PEAK SPR-100 Plan 02</td>
<td>12.2</td>
<td>94.12</td>
<td>1.5</td>
<td>8</td>
<td>13</td>
<td>40</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Reach 2</td>
<td>1312</td>
<td>VG PEAK SPR-100 chanmods</td>
<td>12.2</td>
<td>94.12</td>
<td>1.5</td>
<td>8</td>
<td>13</td>
<td>40</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

**Plan 02 = JFSA 2009**

*chanmods = ultimate with berms and channelisation*

**Table 1:**

| Summary Floodlines |