

2010 Kanata West MSS and TMP & Carp River Restoration Plan Class EAs

Detailed Submission – Part II Order Request - Ted Cooper, M.A.Sc., P.Eng.

Please find below, and attached, supporting information from which I am filing this Part II Order Request for the 2010 Updates to the Master Servicing Study, Transportation Master Plan, and the Carp River, Poole Creek and Feedmill Creek Restoration Plan for the Kanata West Development in the City of Ottawa.

Part A - Background

I am currently employed by the City of Ottawa as an Infrastructure Planner, but file this request as a concerned professional engineer. I had been a member of the City's Kanata West technical advisory committee until September 2004 when I was removed from the file by non-technical senior management. Suffice it to say that I had concerns about flood risk in the Kanata West development area that I did not believe were being appropriately considered in the environmental assessment studies being undertaken to support development of the 700+ ha development area.

A.1 June 2006 Class EAs

In June 2006 the City of Ottawa (henceforth, the 'City') and Kanata West Owners Group (henceforth, 'KWOG') posted Notices of Completion for 22 Class Environmental Assessment projects (henceforth, 'Class EAs') planned under the Municipal Engineers Association 2000 Class EA process. Three key sets of documents were prepared in support of the 22 Class EAs:

1. 'Kanata West Master Servicing Study Report' (henceforth the 'MSS'), by Stantec Consulting Ltd. and CCL/IBI Group;
2. 'Kanata West Road Network Environmental Study Report' (henceforth the 'TMP'), by Delcan; and
3. 'Carp River, Poole Creek and Feedmill Creek Restoration Class Environmental Assessment Report (henceforth the 'CRRP'), by TSH (now AECOM) (and supporting hydro technical studies prepared by CH2M Hill Limited).

Part II Order Requests were filed with the Minister of Environment by several groups. I filed a Part II Order Request on the CRRP, after meeting with City managers to discuss my concerns and agreeing not to file Part II Order Requests on other Class EAs (that by their nature are inter-related with the CRRP).

I have also filed three appeals to the Ontario Municipal Board involving *Planning Act* approvals related to planned development of floodplain in the Carp River corridor through the reach of the Carp River where it crosses the Kanata West development area (basically Hazeldean Road to the south (upstream) and Richardson Sideroad to the north (downstream)) as shown in **Attachment 1**.

It was through one of the appeals to the Ontario Municipal Board that I was able to gain access to the hydro-technical computer model (HECRAS model) in January 2008 that was initially prepared by CH2M Hill Limited, and modified by TSH before the Notices of Completion of the Class EAs were posted in June 2006. By gaining access to the model I was able to discover an egregious error made by TSH - due to a coding error, the runoff hydrographs from the Kanata West development area were not accounted for in the CRRP. In general, the effect of the error was that rather than flood levels being lowered by 0.2 - 0.3m, they in fact would rise 0.2 - 0.3m. In fact the City had discovered the error just prior to releasing the model to me, but they did not disclose the egregious error to the public or the persons who had filed Part II Order Requests.

The flood elevations also have a bearing on the MSS because the design of the storm and sanitary sewer systems require consideration of the 100-year flood levels in the Carp River in the calculation of the 100-year hydraulic gradeline (HGL) required to set underside of footing elevations to minimize the risk of flooding. For the sanitary sewers, the boundary condition used in the calculation of the HGL is the elevation of the emergency overflow proposed at the Kanata West and Signature Ridge wastewater pump stations. The overflows are set above the 100-year flood elevation adjacent to the pump stations. For the sanitary sewers, the boundary condition used in the calculation of the HGL is the 100-year peak operating level in the stormwater ponds to which the storm sewers outlet. Appendix 4.2 of the 2006 MSS Class EA (**Attachment 2**) presents information about the calculation of the storm and sanitary sewer HGLs.

The flood elevations also have a bearing on certain projects in the TMP where the design of bridges required to cross the Carp River, Feedmill Creek and Poole Creek need to consider the hydraulic conditions in these watercourses.

A.2 City of Ottawa Auditor General Investigation

I had also filed a complaint to the City's Fraud and Waste Hotline in 2006 shortly after the Office of the Auditor General was established. The timing of the release of the audit more-or-less coincided with the discovery of the egregious computer modelling error. The Executive Summary of the audit is reproduced in **Attachment 3**.

A.3 MOE Minister July 21, 2008 Order

In response to the Part II Order Requests, and as a result of the egregious error and the findings of the City's Auditor General, then MOE Minister John Gerretsen issued an Order to the City and KWOG (**Attachment 4**) on July 21, 2008. The Order set three conditions which the City had to satisfy before moving forward with the construction of the projects. In general, conditions 1 and 2 relate to the completion of a Third Party Review (the 'TPR'), and through that review, report back on any revisions to the 22 Class EAs that need to be made as a result of the modelling errors. The third condition

requires Notices of Completion to be reposted, as a minimum for the seven projects for which Part II Order Requests were submitted for the Class EAs posted in June 2006.

The TPR, completed by Greenland International Consulting Ltd in March 2009, was approved by Ottawa City Council on May 27, 2009. To be brief, despite documenting increases in flood levels above existing conditions upstream, throughout, and downstream of the Kanata West reach of the Carp River (contrary to natural hazards policies of the Provincial Policy Statement) the TPR consultant concluded no significant changes were required to be made to any of the 22 Class EAs. The TPR's conclusions and recommendations were supported by the Mississippi Valley Conservation Authority (**Attachment 5**).

The hydrotechnical analysis completed in the TPR included the impact assessment of post-development changes in hydrologic conditions in the Carp River watershed on flood levels in the Carp River, including the additional 700+ ha of urbanization in the Kanata West development area - the area where not a single drop of runoff was factored into the analysis in the 2006 Class EAs. The analysis, however, did not factor the hydrologic change resulting from 200 ha in the Fernbank development area now designated as for development.

One issue that I raised after the TPR report was released in April 2009 was the selection of the 12-hour SCS Design Storm that was used in the hydrotechnical analysis. Section 5.4.3 of the City's Sewer Design Guidelines (**Attachment 6**) discusses the use of various design storms to be used in hydrotechnical studies. Section 5.4.3.4 states the SCS Design Storm is "generally applicable to undeveloped or rural basins." Section 5.4.3.2 of the guidelines states, however, that the "the Chicago storm is widely used in the Ottawa area with respect to urban drainage."

After the TPR report was released I discovered the January 15 2009 Superior Court Decision included in **Attachment 7**. Following the 2002 flood of the Glen Cairn community located just upstream of Kanata West, a number of impacted residents filed a class action lawsuit against the City of Ottawa that has yet to be settled. To reduce possible liability, the City filed a Third Party claim against Marshall Macklin Monahan (MMM) and Rob Bishop, P.Eng., who had advised the City of Kanata's insurers following the 1996 flood of the Glen Cairn community. Part of the Third Party claim is based on the City's position with respect to the appropriate design storm to use in calculating flood flows in an urban watershed. MMM and Bishop based their assessment in 1996 on flood flows from the 1983 floodplain mapping study that were derived using the 12-hour SCS Design Storm - whereas the position of the City is that for an urban watershed the 24-hour Chicago design storm should have been used.

The urban:rural land use ratio of the Carp River watershed at the channel crossing of particular interest in the court case (Castlefrank Road in Glen Cairn) is 53% urban : 47% rural (**Attachment 8**). The urban-rural land use ratios of the Carp River watershed in the Kanata West development area at Highway 417 and at Richardson Sideroad are 65:35 and 60:40, respectively (**Attachment 9**).

Section 5.4.3.1 of the Sewer Design Guidelines states that "When choosing a design storm, the designer should perform a sensitivity analysis using various storms and use the one that is most conservative.... As noted below, the Chicago distribution is one of the most used storms for urban runoff applications. When dealing with rural areas, the SCS Type II storm is preferred."

The key results of the TPR are the flood levels summarized in Table 3-6 (**Attachment 10**). The TPR consultant undertook analysis using the 24-hour Chicago design storm, and released the results in a June 5, 2009 letter (Table 2 of **Attachment 11**).

Despite documenting flood level increases at every cross-section when using the 24-hour Chicago design storm, the TPR consultant chose to disregard these findings and is proceeding with the hydrotechnical analysis based on the 12-hour SCS Design Storm. This decision is clearly inconsistent with Section 5.4.3.1 of the Sewer Design Guidelines which indicates the design storm that produces the most conservative results should be chosen.

A.4 July 22, 2009 Flood

On July 24, 2009 a serious flood struck the Carp River watershed resulting in the flooding of nearly 1500 homes - including several hundred homes in the Glen Cairn community that were flooded for the third time in 13 years. In the Glen Cairn community 600-700 homes were flooded this time, most with sewage when sanitary sewers were overwhelmed with extraneous flow, leading to the largest ever flows to the Hazeldean pumping station that serves the Glen Cairn community as well as all of Stittsville to the west. The peak flow at the Hazeldean PS was measured to be 1140 L/s - 140 L/s over the rated capacity in its Certificate of Approval under Section 53 of the *Ontario Water Resources Act*.

As a result the City has initiated investigations that are following the Municipal Class EA process (the West-end Flood Investigation (the 'WEFI'), and the Glen Cairn Flood Investigation, the 'GCFI') to try and resolve the persistent flooding problems impacting the area and affected residents. A copy of the summary report including the findings of Phases I and II of the five phase investigation is included in **Attachment 12**. The City had just completed a similar investigation in 2003, and spent \$7 Million on channelization works through the Glen Cairn community after the second flood in 2002. The City has now budgeted an additional \$20 Million to implement flood remediation measures.

Recommendations from the Class EA for the GCFI are scheduled to be presented to Council for approval in October 2010 - less than two months after the 30-day notice period of the KW Class EAs. The Glen Cairn community is located upstream of Kanata West on the Carp River. The CRRP and other Kanata West Class EAs, in particular the relaxed stormwater management criteria in five of the stormwater management (SWM)

ponds, will form additional boundary conditions that will constrain solutions for the existing flood prone community.

A.5 Holding Zone on Development in Hazeldean PS Catchment Area

On July 14, 2010 Ottawa City Council approved a Holding Zone for all new development areas tributary to the Hazeldean PS (**Attachment 13**), including a large area in the Kanata West development area (shown in Document 3 of **Attachment 13**) that the June 2006 MSS had recommended be serviced by the Hazeldean PS on an interim basis until the Kanata West PS is operational (**Attachment 14**).

Section A4.1.1 (Schedule B undertakings) and Section A4.2.2 (Schedule C undertakings) of the 2000 Municipal Class EA process (**Attachment 15**) discuss the circumstances in which addenda are to be prepared by proponents. While the City and KWOG have posted Notices of Completion for the Kanata West Class EAs pursuant to condition 3 of the MOE Minister's July 2008 Order, changes in the environmental setting may also warrant an addenda to be prepared by project proponents.

Section 9.2 of the 2006 MSS states "to effectively implement this [sanitary] servicing plan, it will be necessary to provide regular flow monitoring at the Stittsville Collector Sewer, the Hazeldean pumping station, and the Signature Ridge Pumping station." According to the West End Flood Investigation (**Attachment 12**):

"Under normal operating conditions, pumping stations have adequate capacity to handle sewage flows. The conditions experienced on July 24, 2009 resulted in higher than usual levels of extraneous flows in the sanitary sewers causing most of the pumping stations to operate at or above their design capacity.... The high operating levels at some of the stations caused water levels to rise in major trunk sewers further exacerbating sanitary sewer backups. This was particularly the case at the Hazeldean pumping station causing flows to backup in the Stittsville and Glamorgan collectors.... Phase 3 of the investigation will look into the inlet and overflow performances at the Hazeldean pumping station and opportunities for improvements as warranted."

It is apparent that the environmental setting of the sanitary servicing plan has changed significantly since the 2006 MSS, but this does not appear to have been considered in the timing of, or scope of the reposting of the Notices of Completion - despite the importance given to flow monitoring in the 2006 MSS.

A.6 July 30, 2010 Notices of Completion - Kanata West MSS, TMP and CRRP

On July 30, 2010 and August 7, 2010 the Notices of Completion were posted in the Ottawa Citizen for the seven Class EAs in the Kanata West MSS, TMP, and CRRP affected by the MOE Minister's July 2008 Order (**Attachment 17**).

According to the public documents released, the updates to the 2006 MSS, TMP, and CRRP have all been prepared by Delcan (**Attachment 18**).

Based on **Attachment 17** and **Attachment 18**,

- Neither the project manager for the City (Mr. Don Herweyer) or for KWOG (Mr. Michael Green, B.Sc.) are Professional Engineers;
- None of the 2010 Updates to the MSS, TMP or CRRP have been signed or sealed by Professional Engineers;

This is in contrast to the 2006 Class EAs for which at least one of the listed project managers included a Professional Engineer (**Attachment 19**):

- The project managers for the 2006 MSS included Mr. Guy Cormier, P.Eng. of JL Richards, representing KWOG.
- The project managers for the 2006 TMP included Mr. Guy Cormier, P.Eng. of JL Richards, representing KWOG, and Mr. Steven Stoddard P.Eng. representing the City.
- The project managers for the 2006 CRRP included Mr. Guy Cormier, P.Eng. of JL Richards, representing KWOG.

Based on the documentation provided to the public, the 2010 updates to the 2006 Class EAs appear to rely entirely on the 2006 MSS, TMP and CRRP documentation, in addition to the Third Party Review (March 2009) and Carp River Restoration Plan - Widening Alternatives (May 2010) reports prepared by Greenland International Consulting Ltd. The 2006 Class EA documentation appears to remain "as-is", despite any changes in the environmental setting or changes that may be warranted due to the modelling errors in the 2006 hydrotechnical analysis and other changes and decisions made related to infrastructure in the area since the 2006 MSS was completed.

The following points are noted:

- i) Mr. Steve Pichette, P.Eng. who co-authored the 2006 MSS is no longer employed by Stantec Consulting Ltd. [Mr. John Krug, P.Eng. was involved only in the water distribution component of the MSS];
- ii) One of the consulting firms who prepared the 2006 MSS (Cumming Cockburn Limited) now operates as IBI Consulting;
- iii) Mr. Cormier, P.Eng. and JL Richards no longer appear to be involved / responsible for any of the 2010 Class EA undertakings;
- iv) The 2006 TMP (prepared by Delcan) and the 2006 CRRP (prepared by TSH, Parish Geomorphic, Bruce Kilgour, and Ron Huizer) were not signed or sealed by any Professional Engineer.

There has been no documentation provided to the public that would indicate the Professional Engineers and their firms consent to the use of the 2006 Class EA documents as-is to support the 2010 update by Delcan.

Based on the foregoing, it is not clear what Professional Engineer(s) or Engineering firm(s) is/are responsible for any of the planned undertakings for which Notices of Completion have been posted for the 2010 MSS, TMP or CRRP.

Part B - 2010 Carp River Restoration Plan

Because of the egregious error in the 2006 hydrotechnical work; because of the subsequent modifications to the hydrotechnical models (in particular HECRAS used in modelling flood elevations along the Carp River) by the TPR consultant; and because of the changes to the environmental setting - including the GCFI Class EA that is evaluating possible solutions to the persistent flooding problems in the Glen Cairn community - which is immediately upstream of the CRRP, in my Professional Opinion, it is doubtful that no significant changes to the 2006 Restoration Class EA are required.

B.1 CRRP not a Schedule B undertaking per Municipal Class EA process

According to the Carp River Audit (page iv-v of **Attachment 3**), due to the potential environmental effects of the CRRP, it should have been prepared as a Schedule C undertaking.

According to Table 1.3.1 of Appendix B of the 2010 CRRP Class EA update (**Attachment 20**):

- Stantec/IBI used the post-development analysis of water levels and flows from the hydrotechnical work completed by CH2M Hill to confirm the SWMP locations;
- TSH also used the work by CH2M Hill to confirm the Carp River Restoration Plan;
- TSH used the SWM pond designs to establish flow conditions in the watercourses as part of the CRRP;
- CH2M Hill used the CRRP to determine future flood elevations;
- The structural general arrangements of future bridge and culvert crossings prepared by Delcan were considered in the CRRP, and used by CH2M Hill in their determination of flood elevations;
- etc., etc., etc.

Based on **Attachment 20**, it is evident that the CRRP is not a stand-alone type Schedule B Class EA undertaking which has no bearing on other works or other works have no bearing on it. Problems that could arise because of design deficiencies with the CRRP will impact the TMP and MSS undertakings - or design deficiencies in the TMP (bridges) or MSS (SWM pond design) could impact the CRRP.

Further, the solution to the persistent Glen Cairn flooding problems – which inevitably will increase discharges from the Glen Cairn SWM pond downstream to the CRRP - should not be constrained by the "CRRP Widening Alternative" specified to be 3.8m. Such a configuration implies that a higher level of analysis has been required to arrive at the solution - which is inconsistent with a Schedule B project.

If the City is to take an ecosystem / watershed approach, then the final determination of the widening requirements of a Schedule B CRRP needs to be coordinated with the

GCFI Class EA so existing and future residents of the watershed benefit equally, and the outcome of the coordinated Class EAs is a more sustainable solution.

An undertaking going forward with a width determined to one decimal point does not constitute a Schedule B undertaking. Other design alternatives (corridor widths) should be developed and evaluated, and another round of public consultation undertaken, before the preferred alternative is selected, to satisfy the requirements of the Municipal Class EA.

B.2 Update to 2006 CRRP inconsistent with Hydrotechnical Model of Record

According to the 2010 Class EA documentation, the modelling completed by Greenland in support of the May 2010 CRRP Widening Alternatives report forms the "model of record". This supersedes the CH2M Hill documentation of their hydrotechnical work in the 2006 Class EAs, that provided details of the flow conditions under the 2-year, 5-year 10-year and 100-year flood conditions.

Figure 5.2.1a of Appendix B of the 2010 CRRP (**Attachment 22**) shows cross-sections of the proposed restoration of the Carp River through the Kanata West development area. As shown, additional riparian plantings are proposed compared to the existing channel cross-section. Based on my more than 20 years of Professional experience plus graduate studies in water resources engineering, increases in riparian plantings will result in an increase in channel roughness, and a corresponding increase in the value of Mannings n, the parameter used in HECRAS to simulate channel roughness. Because of the increase in channel roughness, all other conditions remaining the same, I would expect to see a reduction in channel and over-bank velocity, and as a result an increase in flood levels, for a given flow.

According to Section 3.3 of Appendix B of the 2010 CRRP (**Attachment 23**), and the integration discussion in **Attachment 20**, the SWMP design, CRRP design and the flood level analyses have all been integrated. The CRRP has been based on the flow rates documented in Table 3.3.1 (included in **Attachment 23**) - which were based on the computer model with the egregious error.

Although the TPR corrected the egregious error, when the runoff from the 700+ ha Kanata West development was added to the floodplain analysis, flood levels rose (see Table 3.6 of TPR in **Attachment 10**). In an effort to keep flood levels no higher than those documented under the existing conditions (and maintaining the SWM criteria that requires quantity SWM controls only to the 10-year event), Greenland proceeded to make adjustments to the Mannings n values in the post-development model used in the 2010 Class EAs. **Attachment 24** compares the flows from the 2010 Greenland model of record against the flows documented in Table 3.3.1 (**Attachment 23**) in Appendix B of the 2010 CRRP. Two issues are apparent from reviewing Attachment 24:

1. The Class EA documentation released to the public does not provide flow information available to guide the design of the CRRP for the more frequent design flows (1:2 year and 1:5 year); and
2. The flow information available for the 1:100 year event shows flow rates have increased substantially (60-90%) downstream from Maple Grove Road.

B3. Impacts to Riparian Landowners

Although changes were made to Regulations under the *Lakes and Rivers Improvement Act* (LRIA) since the Notices of Completion were posted for the 2006 Class EAs such that channelization projects like the CRRP no longer require permit approvals under the LRIA, the design criteria still apply (and are supposed to be administered through the Fill Permit process under Regulations of the *Conservation Authorities Act*) - as they are intended to protect interests of riparian landowners upstream and downstream of the channelization projects. **Attachment 25** is Section 4 of the LRIA Technical Guidelines. Although the Guidelines are stamped 'Draft', they represent Guidelines that have been in use since the 1980's.

Section 4.5.1 of **Attachment 25** outlines the criteria that are to apply to projects like the CRRP. The post-development / post-CRRP flow conditions documented by Greenland in their 2010 CRRP Widening Alternatives report are clearly inadequate to assess the impact of the CRRP on downstream riparian landowners. The information documented in the Class EAs includes no information available to assess if there has been any change in travel time, and without the HECRAS model being made available in the documentation, it is not possible to assess whether the stage storage and stage discharge relationships are being maintained. Further, there is no information documented by Greenland that would enable an assessment to be conducted on the exception criteria that could be considered in-place of the standard criteria. Rather, the limited information that is made available is of concern - a greater than 60% increase in peak flows under 100-year conditions at the downstream limit of the CRRP.

The 2010 Greenland report failed to include updated / revised tabulation of riparian statistics that had been produced by CH2M Hill in their supporting documentation of the 2006 Class EAs (shown in **Attachment 26**). The documentation in **Attachment 26** included the effect of the egregious error.

On August 23, 2010, the City of Ottawa released computer listing files for the existing conditions 100-year model, as well as the listing files for the 1:2, 1:5, 1:10, 1:25, and 1:100-year Future models, as well as the summary of travel times that I have appended to Attachment 26. According to this recently released information, the travel time through the proposed channelization project is reduced by 1.88 hours, or nearly 25%. This is clearly contrary to the criteria of the Technical Guidelines of the LRIA.

Section 4.5.6 of **Attachment 25** states that "Applicants should make every effort to maintain the interests of riparian owners according to the above criteria. If this cannot

be achieved, consent or a release from the affected riparian owners must be obtained." Nowhere in the 2010 Class EA documentation has there been any documentation provided that the 60% increase in 100-year flows has been consented to by affected riparian owners.

B.4 2010 CRRP update did not evaluate Alternative Solutions

The standard Municipal Class EA process requires the development, evaluation, and selection of a preferred alternative, over other alternatives documented in the environmental study report. The only alternative documented by Delcan in the 2010 update to the CRRP is an alternative that will increase 100-year flood flows to downstream riparian landowners by 60% and reduce travel time by 1.88 hours. It is not clear how the 2010 CRRP update is consistent with the requirements of the Municipal Class EA, nor is in the public's interest.

B.5 CRRP deemed Sewage Works requiring approval under OWRA

A work colleague of mine, water resources engineer Ms. Darlene Conway, P.Eng., who also, as a private citizen, is contesting the planned floodplain development proposed in conjunction with the CRRP, gained access to the TPR HECRAS model through an OMB appeal process in which she and I were planning to testify on behalf of the appellant (Friends of the Greenspace Alliance). Based on her review of the HECRAS model in January 2010, Ms. Conway discovered that significant modifications (reductions) were made to the Mannings n parameters by Greenland in the future condition TPR model. Ms. Conway discovered that it was through significant reductions in the Mannings n parameters in the future model that the flood elevation increases (expected when the flow hydrographs from the 700+ ha Kanata West area were re-introduced in the hydrotechnical analysis) were minimized in the TPR (**Attachment 10**).

The modifications to the future Mannings n parameters appear to be inconsistent with the review comments by the MVC contained in the CH2M Hill predevelopment report (**Attachment 27**) that the Mannings n values used in the existing conditions model (that had been increased by 50% during model calibration) should be used in all subsequent model runs. After raising concerns about the Mannings n values (and the corresponding need for maintenance of the CRRP in perpetuity to avoid increases in flood levels of 0.3 to 0.4m) with Provincial agencies in a January 18, 2010 letter (**Attachment 28**), the MOE subsequently advised the City in a letter dated March 12, 2010 (**Attachment 29**) that the CRRP has been deemed by MOE to be a sewage works requiring approval under Section 53 of the *Ontario Water Resources Act*.

The CRRP Implementation Plan is outlined in Section 1.3.4 of Appendix B of the 2010 Update (**Attachment 30**), and includes the following statement:

Goals and Objectives

The Implementation Plan should fulfill the following key objectives.

- Ensure that the principles of Environmental Assessment in Ontario are actively upheld and embodied in all future stages of infrastructure planning and design.

According to the Municipal Class EA through which the CRRP is being planned, establishing sewage works ("1. Establish, extend or enlarge a sewage collection system and all works necessary to connect the system to an existing sewage outlet where such facilities are not in an existing road allowance or an existing utility corridor") is a distinct undertaking from "20. Works undertaken in a watercourse for the purposes of flood control or erosion control", which is the Class EA undertaking which the CRRP had been proceeding as. **Attachment 31** includes the Municipal Class EA Schedules for water and wastewater projects.

Based on the Notice of Completion for the 2010 CRRP update (**Attachment 17**) that fails to note the change in the status of the CRRP to be a sewage works, and the lack of documentation in the 2010 CRRP about possible consequences of the maintenance requirements of sewage works and their compatibility (or lack thereof) with the CRRP functioning as a natural river corridor, it is unclear how the 2010 update to the CRRP is consistent with the stated Goals and Objectives in Section 1.3.4 of Appendix B of the CRRP update.

B.6 Change in Environmental Setting - July 24, 2009 Flood

The July 24, 2009 flood in the Carp River watershed that impacted nearly 1500 homes, has resulted in the West End / Glen Cairn Flood Investigation, a Class EA being undertaken by the City of Ottawa, a co-proponent of the CRRP and related KW Class EAs (**Attachment 12**). The flood and subsequent Class EAs have changed the environmental setting of the CRRP.

Between 600-700 homes in the Glen Cairn Community (that is located just upstream of Kanata West in the Carp River watershed) were flooded. Moving forward with posting Notices of Completion for the KW Class EAs before a solution for the persistent flooding problems affecting 1,000's of existing residents is determined, could, and very likely will prejudice the feasibility of implementing certain alternatives for the benefit of upstream residents. Tailoring the corridor width of the CRRP - to one decimal point (3.8m) - while solutions to resolving the flooding problems of an upstream flood prone community are still being investigated, suggests an inappropriate setting of priorities is taking place to the detriment of existing residents.

Section 4.1.1 and Section 4.2.2 of the 2000 Municipal Class EA (**Attachment 15**) require an addendum to be prepared when a change in environmental setting occurs. The significant flood that took place after the TPR was approved in May 2009 constitutes a change in the environmental setting. Under the circumstances, alternatives

other than a 3.8m widening that (purportedly) meets only the needs of the Kanata West and Fernbank future development areas, warrant evaluation.

Part C - 2010 Kanata West MSS Update

Table 1-1 of Appendix B of the 2010 MSS Update (**Attachment 32**) documents the integration of the various Class EAs. Because of the egregious error in the 2006 hydrotechnical work; because of the subsequent modifications to the hydrotechnical models (in particular HECRAS) by the TPR consultant; because of the changes to the environmental setting - including the GCFI Class EA that is evaluating possible solutions to the persistent flooding problems in the Glen Cairn community - which is immediately upstream of the CRRP; and because of the Holding Zone implemented in the catchment area of the Hazeldean PS that affects the interim wastewater servicing strategy, in my Professional Opinion, it is doubtful that no changes to the undertakings in the 2006 MSS are required - as suggested in the 2010 Class EA documentation.

As noted in Section A.6, the 2006 MSS was authored by Stantec and CCL/IBI. I have outlined below changes in either the environmental setting, or planned changes to the servicing approach that have occurred since the Notices of Completion for the 2006 MSS were posted, that are not reflected in the 2010 MSS Update prepared by Delcan. Without any documentation made available to the public, it not possible to determine whether the professional engineers who signed the Stantec and CCL/IBI 2006 MSS Class EA support Delcan's proposed 2010 MSS update which relies on their conclusions and recommendations in the 2006 MSS. Further, there is no documentation of the evaluation of other servicing alternatives that have been proposed since the 2006 MSS. The 2000 Municipal Class EA requires such alternatives to be evaluated, and documented in an addendum to the 2006 MSS. The 2010 MSS update has failed to provide such documentation.

C.1 Trunk Sewer from Terry Fox Bus. Park to KW PS not feasible; 2010 Signature Ridge Class EA out-of-step with other City studies

The trunk sewer shown in **Attachment 14** that was proposed in the 2006 MSS to redirect existing sanitary drainage from the Signature Ridge PS catchment south of Highway 417 to the proposed KW PS cannot function without creating flood risks to the existing Home Depot and Vorlex developments on Frank Nighbor Place. As shown in **Attachment 2**, the HGL of the trunk sewer at Node 15, proposed as part of the 2006 MSS, is 95.61m. The as-built first floor elevation for the Home Depot (**Attachment 33**) is 95.5m. The as-built first floor elevation of the Vorlex development (**Attachment 34**) is 95.3m.

The proposed plan to establish an emergency overflow from the Kanata West PS to SWM Pond 5 to enable possible containment of the sanitary sewage from being released directly to the Carp River, in event of a catastrophic failure of the PS is rendered meaningless because of the existing sewer crossing of the Carp River in the Palladium / Frank Nighbor sewer (**Attachment 35**) that includes three manholes with

finished grades below elevation 94.5m - 1m lower than the HGL of the proposed trunk sewer at Node 16!

In my capacity as Infrastructure Planner for the City of Ottawa involved in a study related to the Signature Ridge PS, I had raised concerns in 2008 about the HGLs on Frank Nighbor Place and the risks posed to existing development if the trunk sewer proposed in the 2006 KW MSS was constructed. As a result, the catchment areas to be serviced by the Signature PS and Kanata West PS were changed – and these changes were adopted in the City's Infrastructure Master Plan in July 2009, or so I thought. This was also the plan as of March 3, 2010 as is evidenced by the CH2M Hill memo in **Attachment 36**, which states on page 1:

"In 2008, following discussions concerning the review of the updated analysis, the City advised that the ultimate tributary area to the Signature Ridge pumping station needed to be adjusted to avoid the possibility of existing building elevations being below the HGL derived from the expected overflow elevation at the future Kanata West Pumping Station. The Kanata West pumping station is planned to service Kanata West developments south of Highway 417. As a result, the City of Ottawa proposed the Terry Fox Business Park south of the Highway 417 and east of Carp River would continue to drain north to the Signature Ridge Pumping Station, and not be diverted to the future Kanata West Pumping Station as previously planned."

I find it very disconcerting to see that Delcan's 2010 MSS update - which includes the Signature Ridge PS, which was subject to the Ministers Order - has failed to implement the City's latest Council approved IMP, and other changes made in other studies completed since the 2006 MSS that are intended to resolve possible flooding risks such as those on Frank Nighbor Place. In my Professional Opinion, the failure of the 2010 MSS to incorporate the proposed modifications to the 2006 MSS intended to resolve the HGL issues on Frank Nighbor Place, is an excellent example of how projects in the MSS and CRRP which normally could be planned as Schedule B undertakings, need to be planned as Schedule C undertakings because of the complex inter-relationships, environmental risks, and need for additional detailed analysis, which is normally completed during Phases 3 and 4 of the Municipal Class EA process.

C.2 HGL analysis of Storm Sewers requires revision

The HGL analysis documented in Appendix B of the 2010 MSS update is based on starting 100-year flood elevations in the Carp River calculated in the 1983 floodplain mapping study. These flood elevations are no longer up-to-date, and like the other Kanata West Class EA undertakings, need to be based on integration of findings with the other updated Kanata West Class EAs.

Stantec Consulting Ltd., who undertook the HGL analysis of the Kanata West storm sewers, are also authors of the City's Storm Sewer Design Guidelines (see **Attachment 37**). Section 5.4.3 of the Sewer Design Guidelines (**Attachment 6**) states that the designer should undertake a sensitivity analysis on design storms and select the one

that is most conservative. Of all of the flood levels produced to date, the results presented in **Attachment 11** (24 Hour Chicago storm) are the most conservative.

There is no public documentation wherein it can be confirmed that Stantec has consented to Delcan using the HGL analysis that is based on the 1983 Carp River flood levels, rather than the most conservative numbers resulting from the 24-hour Chicago storm.

Examining the HGLs calculated in the storm sewer system tributary to SWM Pond 4 is a good example of the potential problem with proceeding with the 2010 MSS "as-is".

Stantec calculated the HGL for the storm sewer system using the computer model XPSWMM. The starting water level for Pond 4 was 94.2m (**Attachment 38**). The results of Stantec's HGL analysis are presented in a profile drawing of the storm sewers in Drawing P3 of Appendix B of the 2010 MSS update (**Attachment 39**).

Table 2 of **Attachment 11** documents the 100-year flood elevations in the Carp River using the 24-hour Chicago storm. Upstream of Palladium Drive, where SWM Pond 4 is located, the flood elevation is identified as 94.66m, or 0.46m higher than the boundary condition used in the HGL analysis documented in the 2010 MSS update prepared by Delcan. In my Professional Opinion, the use of the 1983 flood elevation to calculate HGLs in the 2010 MSS is insupportable, and could result in significant risks to public health and safety, and property damage if followed in subsequent planning and design. The documented HGLs provide no useful information from which evaluation of alternatives in the MSS can proceed.

As discussed in Section B.5 above, the TPR consultant has made significant modifications to the Mannings n values in the HECRAS modelling completed since the TPR was approved by Council in May 2009, and since **Attachment 11** was prepared. Table 4.1 of the 2010 CRRP Widening Alternatives Report (**Attachment 40**) documents the latest HECRAS results that use the 12-hour SCS design storm, and the reduced Mannings n values. As indicated in **Attachment 40**, the 100-year flood level upstream of Palladium Drive is 94.34m, which is still 0.14m higher than the boundary condition used in the HGL analysis by Stantec.

This is another example of why the undertakings in the MSS should be Schedule C undertakings, as opposed to Schedule B undertakings. Details such as the inconsistencies in the HGLs would require clearer documentation at Phases 3 and 4 of the Class EA process.

C.3 Signature Ridge PS Emergency Overflow(s)

Stantec Consulting completed a master servicing study for developers in North Kanata in December 2007 for an area that is to be in-part serviced by the Signature Ridge PS. At Section 3.3 of the report (**Attachment 41**) discussion reveals that two overflows are

proposed for the Signature Ridge PS - one at the Broughton SWM Pond, and the second at SWM Pond 2 on the west side of the Carp River in Kanata West (see **Attachment 42**). This contrasts with what is presented in the 2010 MSS update which proposes only one overflow to the channel outletting to the existing SWM pond near the Signature Ridge PS at the end of Didsbury Road. There is no documentation included in the 2010 MSS update that would enable the public to verify that the understanding Stantec had in December 2007 about the location of overflows in the Signature Ridge PS catchment area was no longer being pursued, and that they had consented to Delcan's proposal to revert to the one overflow at the end of Didsbury Road as proposed in the 2010 MSS update.

C.4 PS Overflow to SWM Ponds - CRRP Floodplain Model inconsistent with MSS

The 2010 MSS proposes to include an emergency overflow from Kanata West PS to SWM Pond #5, a SWM pond that is planned to be located in the existing Carp River floodplain. The intent of providing the emergency overflow is to minimize hydraulic gradeline conditions in the sanitary sewer system in the event of a catastrophic failure of the PS, such that overflows to the SWM pond would occur before basements would be subject to sewage back-ups, and the sewage overflowing to the SWM pond could largely be contained.

The design of the PS sewage overflow is to be set above the 100-year flood level of the Carp River, such that the overflow could function under extreme conditions, and that the risk of flood waters backing-up into the PS is low.

The intent of the overflow being directed to the SWM pond is to enable the containment of sewage overflows to minimize the amount of sewage discharging directly to the Carp River. To provide such containment, the embankments of the SWM pond need to be set at least as high as the 100-year flood level in the Carp River.

TSH (now AECOM) prepared the Final Design Hydraulics report (April 2007) in **Attachment 43**. This report presents the hydraulic conditions based on the final design of the CRRP, as it existed at the time. At page 1 of the report, the following statement is made about the storage and conveyance assumptions used in the modelling of flood flows along the SWM Ponds that are located in the Carp River floodplain (SWM Ponds 1, 2, 3, 4, and 5):

"For proposed SWMP's adjacent to the Carp River, it was assumed that the pond berm level, required to regulate the 10 year runoff event, was the same level as the 10 year flow level in the Carp River. Thus, for flows greater than the 10 year in the Carp River, the SWMP would be available for conveyance/storage in the hydraulic model."

Clearly, if Pond 5 is to provide containment of sewage overflows from the Kanata West PS under 100-year flow conditions, the assumption in the HECRAS modelling that the

SWMP would be available for conveyance/storage is incorrect. The same modelling assumption has been carried over into the models prepared by the TPR consultant.

Further, if Stantec's December 2007 position about the need for an emergency overflow for the Signature Ridge PS to SWM Pond #2 remains valid, but is not reflected in the 2010 MSS, then the inconsistencies between the MSS and the CRRP floodplain modelling outlined above also apply to SWM Pond #2.

The loss of conveyance capacity and storage from Ponds 2 and 5 will have an adverse effect on flood levels in the Carp River documented in Table 4.1 of the 2010 CRRP Widening Alternatives update (**Attachment 40**), which in-turn will impact the HGLs in the storm and sanitary sewers and overflow elevations of the pump stations in the MSS, and the design of the bridge crossings of the Carp River in the TMP.

In my opinion, the design of the embankments of the SWM ponds built in the floodplain of the Carp River should be set at elevations higher than the 10-year flood level of the Carp River. This would provide some allowance for settlement / subsidence that could be expected because of the sensitive soils that under-lie the embankment locations in the floodplain. Further, some allowance should be provided for protection against long-term erosion that could reduce the effective embankment elevation / maximum storage elevation of the SWM facilities. Such design allowances may not be as important if the SWM ponds were not being recommended to be constructed within the existing floodplain corridor of the Carp River.

Attachment 44 summarizes the 100-year flood elevations documented in Appendix 4 of Greenland's CRRP Widening Alternatives Report adjacent/through SWM Ponds 1, 2, 3, 4, and 5 and the conceptual design of the embankment/overflow configurations (**Attachment 45**) from Appendix 3.1 of the 2010 MSS update. Based on the conceptual design drawings of SWM Ponds 1-5, in every case, because the embankment elevation is higher than the 100-year flood elevation, the assumption in the HECRAS model that the SWM ponds can provide conveyance of flood flows in the Carp River floodplain is invalid.

The purpose of undertaking Class EAs is to enable a cumulative impact assessment of multiple projects / developments. If the cumulative impacts of all of these projects is not addressed at this key stage of the planning process of the Kanata West development area, I am unaware of how the subsequent piecemealed design and approval of individual SWM facilities at the Plan of Subdivision stage can possibly ensure the selected embankment overflow elevations have been properly integrated/coordinated.

Following receipt of the HECRAS files in January 2010 provided to her as part of an OMB Appeal, Ms. Conway, P.Eng., proceeded to undertake some sensitivity analysis of the HECRAS model. Ms. Conway documented the results of her analysis in Table 1 of a letter dated March 11, 2010 which has been included in the Public Consultation record for the 2010 Class EAs (**Attachment 46**). The model results in column E, which do not falsely assume the SWM ponds provide flood conveyance, and are based on more

defensible Manning's n values used in the CH2M Hill reports from the 2006 Class EAs, in my professional opinion, represent a more defensible modelling scenario of future flood levels in the Carp River - derived from hydrology based on the 12-hour SCS design storm. The sensitivity of the model using the 24-hour Chicago event was not possible because the City did not release the necessary hydrologic modelling information.

As noted by Ms. Conway near the top of page 9 of her letter in **Attachment 46**, the invalid assumption about the conveyance of flood flows across the SWM ponds alone results in underestimating flood elevations by 3-5 cm.

Should the modelling scenario with results as tabulated in column E of Table 1 in **Attachment 46** prove to be true - and I have many reasons to believe this to be a much more defensible modelling scenario compared to those documented by the City / KWOG in the 2010 Class EA documentation, then flood level increases of 0.5m or more could be expected. Failure to properly plan and design for such increases could have dire consequences on existing and future development in the area. For example, in Stantec's Master Planning report prepared for the Interstitial Lands in North Kanata, the Broughton SWM pond is to serve as an emergency overflow for the Signature Ridge PS at elevation 93.65m (**see Attachment 41**). According to scenario E of Ms. Conway's analysis, the future 100-year flood elevation in the Carp River would be 0.26m higher (93.91m at cross-section 40505) - and the level in the SWM Pond would be expected to be higher yet when accounting for the head required to convey inflows to the SWM pond through the SWM pond's outlets.

C.5 Change in Environmental Setting - July 24, 2009 Flood & Hazeldean PS Holding Zone

The July 24, 2009 flood in the Carp River watershed that impacted nearly 1500 homes and has resulted in the West End Flood Investigation, Glen Cairn Flood Investigation, and City Council's Approval of the Holding Zone (**Attachment 13**) affecting future development areas in the catchment area of the Hazeldean PS (which, based on the 2010 Class EA Implementation Plan, includes lands in Kanata West) have changed the environmental setting of the Kanata West Class EAs as follows:

Excerpt from Page 13 of West-End Flood Investigation (Attachment 12)

A key element of the study will be an evaluation of the Hazeldean pumping station, including but not limited to the inlet structure and the overflow performance to define improvements as warranted. This is being coordinated with operational improvements **and capacity needs to accommodate future growth.** [emphasis added]

Clearly there is a need for the Kanata West MSS to be coordinated with the GCFI if each are dealing with servicing for growth from the same development area.