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**Stittsville United
Pentecostal Church
2031 Stittsville Main Street
Development Servicing Study
And
Stormwater Management Report**

**STITTSVILLE UNITED PENTECOSTAL CHURCH
2031 STITTSVILLE MAIN STREET**

**DEVELOPMENT SERVICING STUDY
AND STORMWATER MANAGEMENT REPORT**

Prepared by:

NOVATECH ENGINEERING CONSULTANTS LTD.
Suite 200, 240 Michael Cowpland Drive
Kanata, Ontario
K2M 1P6

February 7, 2012

Ref: R-2012-012
Novatech File No. 111113



February 7, 2012

Stittsville United Pentecostal Church
c/o Mar Gard Builders Ltd.
92 Bentley Avenue, 2nd Floor
Ottawa, ON
K2E 6T9

Attention: Mr. Tony Mariani

Dear Sir.:

**Re: Development Servicing Study and Stormwater Management Report
Stittsville United Pentecostal Church
2031 Stittsville Main Street
Ottawa, ON
Our File No.: 111113**

Enclosed herein is a copy of the 'Development Servicing Study and Stormwater Management Report' for the proposed Stittsville United Pentecostal Church addition located at 2031 Stittsville Main Street in the City of Ottawa. This report addresses the approach to site servicing for the subject property and is submitted in support of the site plan amendment application.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.

A handwritten signature in cursive script that reads "François Thauvette".

François Thauvette, P. Eng.
Project Engineer

FT/sm

cc: Kevin Hall (City of Ottawa) – 6 copies
Pastor Dwayne McCarty (Stittsville United Pentecostal Church) – 1 copy
Sylvain Chartrand (Levac Robichaud Leclerc Associates Ltd.) – 1 copy

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1.0 INTRODUCTION

A building expansion is being proposed by the Stittsville United Pentecostal Church, and Novatech Engineering Consultants Ltd. has been retained to complete the servicing and grading design. This report addresses the approach to site servicing and stormwater management for the proposed development and is submitted in support of the site plan amendment application for the subject property.

1.1 Purpose

This document outlines the servicing aspects of the proposed development with respect to water, sanitary, storm drainage and stormwater management.

1.2 Location and Site Description

The Stittsville United Pentecostal Church is located at 2031 Stittsville Main Street, within the City of Ottawa. The 4.69 hectare property is bordered by Stittsville Main Street to the southwest, Flewellyn Road to the southeast and residential properties to the northeast and northwest as shown in Figure 1.1 – Key Plan. The existing church and paved parking lot are located within the western third of the property, while the remainder of the site consists of dense forest, which is to remain unchanged.

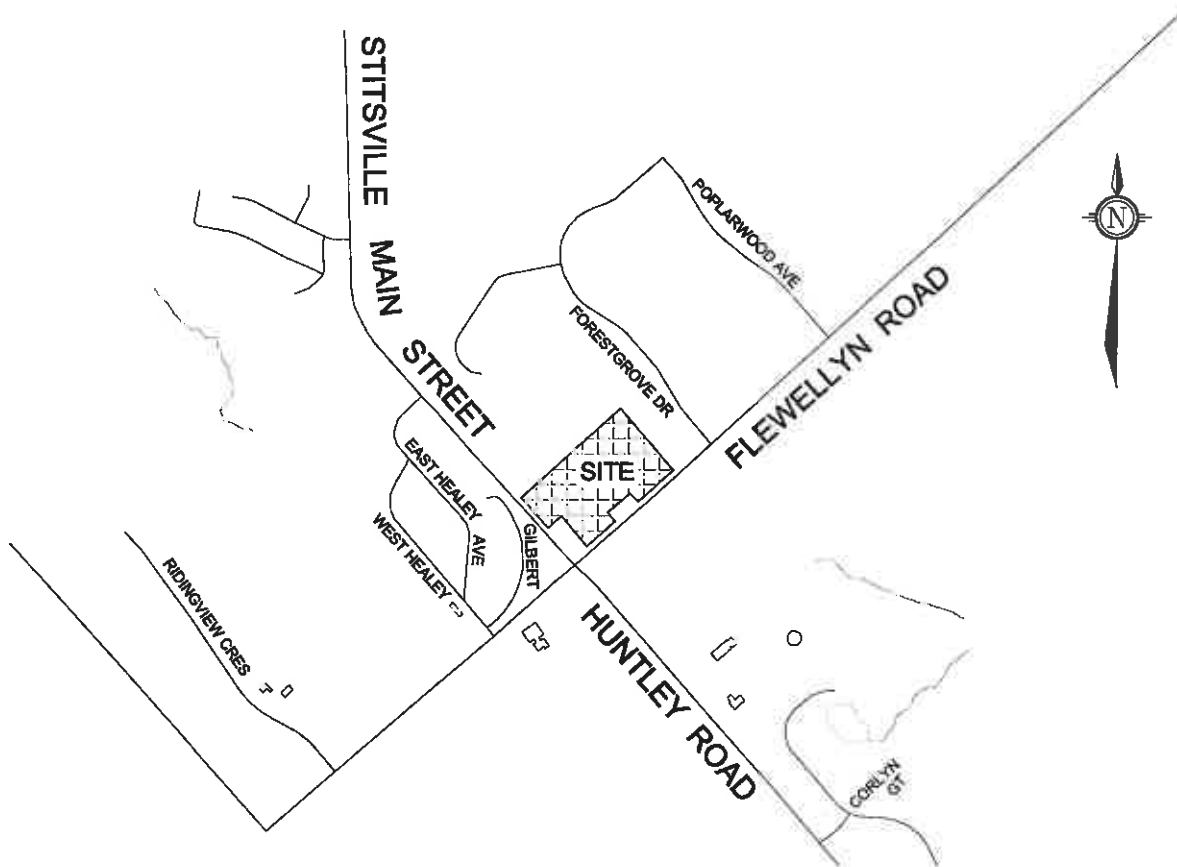


Figure 1.1 Key Plan

The legal description of the property is designated as Part of Lot 22, Concession 9, Geographic Township of Goulbourn, in the City of Ottawa. The property covers an approximate area of 4.69 hectares and is currently partially developed as shown in Figure 1.2 – Aerial view of the site.



Figure 1.2 – Aerial view of the site

1.3 Consultation and Reference Material

A pre-consultation meeting was held with the City of Ottawa on July 27, 2011, at which time Novatech was advised of the general submission requirements. Refer to **Appendix A** for e-mail correspondence with the City of Ottawa. The City of Ottawa Servicing Study Guidelines for Development Applications was used to prepare this report.

A pre-consultation meeting has not been held with the Ministry of the Environment (MOE) however several discussions were held with the Rideau Valley Conservation Authority (RVCA) regarding the proposed development. Refer to **Appendix A** for e-mail correspondence from the previous discussions with the RVCA.

1.3.1 Reference Items

- ¹ The "Geotechnical Investigation" reference # 11-401 prepared by Houle Chevrier Engineering Ltd. on October 6, 2011.
- ² The "Transportation Brief" (R-2012-013) prepared by Novatech Engineering Consultants Ltd. in January 2012.

2.0 PROPOSED CHURCH ADDITION

The proposed development will consist of a church expansion at the back (northeast side) of the existing United Pentecostal Church. A new access off Flewellyn Road as well as an additional gravel parking lot is being proposed as part of this project. The remainder of the site, approximately two thirds of the total area, which consists of dense forest, will remain unchanged. The proposed development is shown on Figure 2.1 – Conceptual Site Plan.

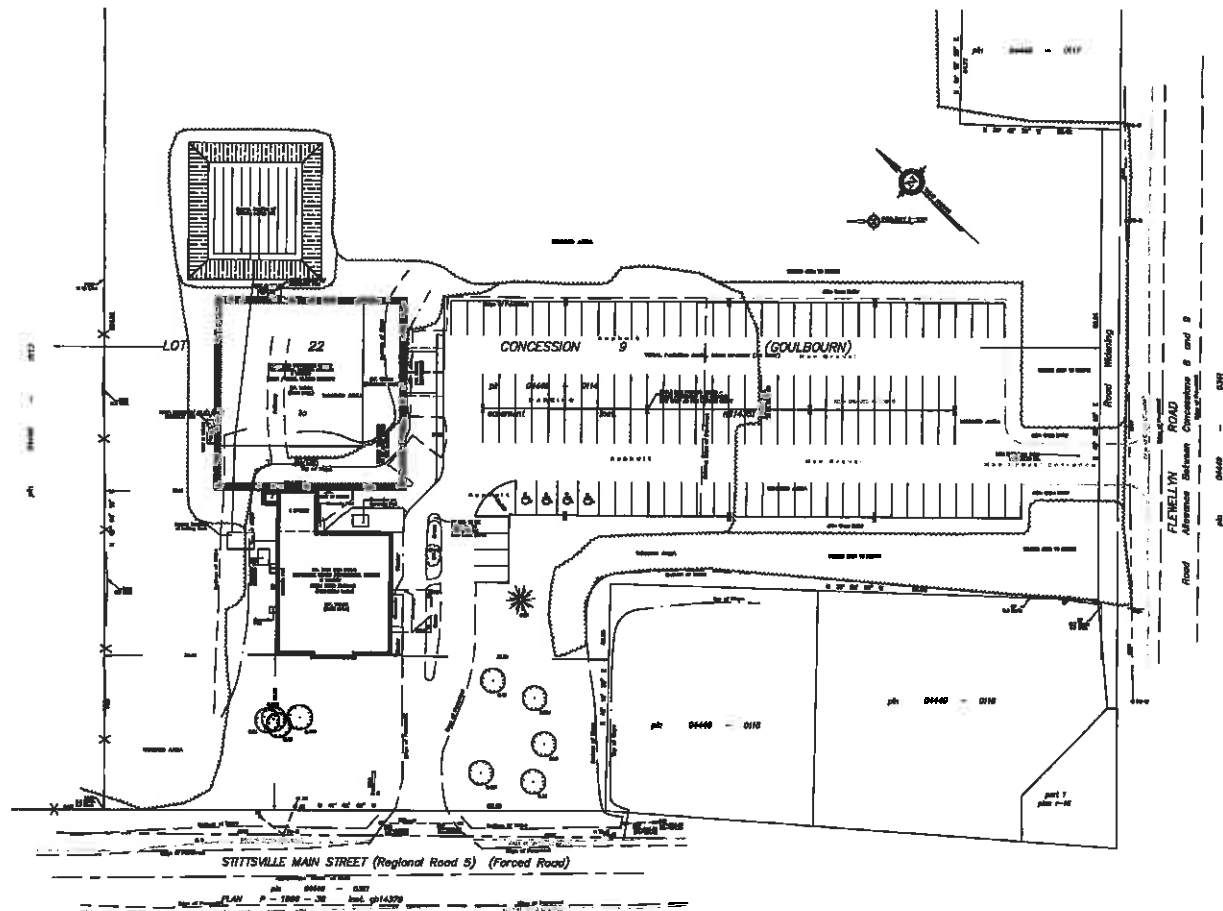


Figure 2.1 Conceptual Site Plan

2.1 Planning Context

The subject property is designated General Rural Area (3.7.2) in the City of Ottawa Official Plan. The intent of the General Rural Area designation is to accommodate a variety of land uses that are appropriate for a rural location, where such development does not preclude continued agricultural and non-residential uses, such as farms, rural housing, wood lots and forests, small industries, golf courses and small clusters of residential and commercial development. The proposed changes to the existing development conform to these policies of the Official Plan. The subject property is zoned RI5 – Rural Institutional, Subzone 5, in the City of Ottawa Zoning By-law 2008-250 (Sections 223-224). The purpose of the RI Zone is to accommodate a range of community-oriented uses which serve the needs of the rural population as well as a limited

range of religious-related institutional uses where they exist in areas designated General Rural Area in the Official Plan. In the RI Zone, it is intended that future development will have a minimal impact on adjacent land uses and will respect the character of the surrounding rural areas. The proposed expansion to the existing development at 2031 Stittsville Main Street complies with present zoning, both in terms of permitted uses and performance standards.

3.0 SITE SERVICING

The existing church is currently serviced by an on-site water well and septic system. Discussion with church officials about the expected use of the building and an analysis of the expected sewage flows, indicate that the existing tile field will have capacity for the proposed use with the addition of a balancing tank and the installation of a new septic tank. It is expected that the existing well will have sufficient capacity to service the proposed addition; however, the well will have to be tested to confirm its available capacity.

There are no storm sewers on site and stormwater runoff from the developed portion of the site currently sheet drains uncontrolled towards the dense forest to the north-east. In an attempt to minimize additional surface runoff to the forested area an infiltration trench will be installed along the edge of the parking lot. The existing drainage patterns will be maintained and runoff from the site will continue to sheet drain in a north-easterly direction towards the forest. Refer to the enclosed 'Grading and Servicing Plan' for details.

3.1 Water

As stated above, the existing building is currently serviced by an on-site well. It is expected that the existing well will have sufficient capacity to service the church, including the proposed addition, however testing will be required to confirm the well's capacity. The test results will be provided to the City once available. An upgrade of the existing pump may be required (TBD) due to the anticipated increase in water demand associated with the proposed development.

3.2 Sanitary

The existing building is currently serviced by a septic system located behind the church. The existing tile field will have capacity for both the existing building and the proposed addition, with the addition of a balancing tank and the installation of a new septic tank. Minor alterations to the tile field will be required to meet the setback requirements to the building. A balancing tank and pump system will be installed to store the peak flows on the weekends and release them during the lower flow weekdays. The existing septic tank will be removed, and a new, larger septic tank will be installed. Design details will be provided to support an application to the Ottawa Septic System Office for a septic permit as part of the building permit process.

3.3 Storm and Stormwater Management

As stated above, there are no storm sewers on site and stormwater runoff from the developed portion of the site currently sheet drains uncontrolled towards the dense forest located within the north-eastern portion of the property.

3.3.1 Stormwater Management Objectives

Given the existing site conditions and the fact that there is no defined storm outlet for this site, the objectives for the proposed stormwater management design are as follows:

- Maintain the existing drainage patterns;
- Minimize the impact on the existing forested area by directing stormwater runoff from the parking lot towards a clearstone infiltration trench, thus recharging the local groundwater table;
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

3.3.2 Pre-Development Conditions

Under current conditions, the theoretical runoff from the 4.69 hectare property, including the dense forest, was calculated to be approximately 339.6 L/s for the 1:5 year design event and 698.6 L/s for the 1:100 year design event. Refer to **Appendix B** for detailed Rational Method calculations. Based on the topography of the site and the relative size and density of the forested area, it is reasonable to assume that the site runoff is infiltrating directly into the ground and is being absorbed by the forest. No water quality control measures other than sheet drainage along grass swales and grass buffer strips of land are currently being provided on site.

3.3.3 Post-Development Conditions

Under post-development conditions, the theoretical runoff from the 4.69 hectare property, including the dense forest, was calculated to be approximately 380.4 L/s for the 1:5 year design event and 791.7 L/s for the 1:100 year design event. Refer to **Appendix B** for detailed Rational Method calculations. This represents a theoretical increase of approximately 12-13% in total site runoff.

In an attempt to minimize the impact on the forest, surface runoff from the parking area will be directed towards a 0.5m wide granular infiltration trench constructed along the edge of the parking lot. The purpose of this granular infiltration trench is to direct some of the additional runoff into the ground, thus recharging the local ground water table. The remainder of the runoff will continue to sheet drain uncontrolled towards the forest, thus maintaining the existing drainage patterns. Although there is an increase in total runoff, it is reasonable to assume that this increase in runoff will infiltrate directly into the ground and be absorbed by the forest.

4.0 SITE GRADING

The site generally slopes in a north-easterly direction, down from an approximate elevation of 124.10m near the site entrance off Stittsville Main Street to an elevation of 121.6m along the limit of the paved parking lot. The topography of the land continues to slope down towards the heavily forested area to the north-east.

The finished floor elevation of the existing church, located with the western portion of the site, is 123.50m. The finished floor elevation of the proposed addition will drop from 123.50m where it connects to the existing building down to 122.60m, in order to match into the existing parking lot

elevations and natural topography of the land. The proposed parking lot addition will also match into the existing site grades and new access off Flewellyn Road. The landscaped areas adjacent to the proposed addition will slope down, providing positive drainage away from the building, while matching into existing grades along the edge of the forest. Figure 4.1 illustrates the Conceptual Grading Plan for the site. Refer to the enclosed 'Grading and Servicing Plan' for additional details.

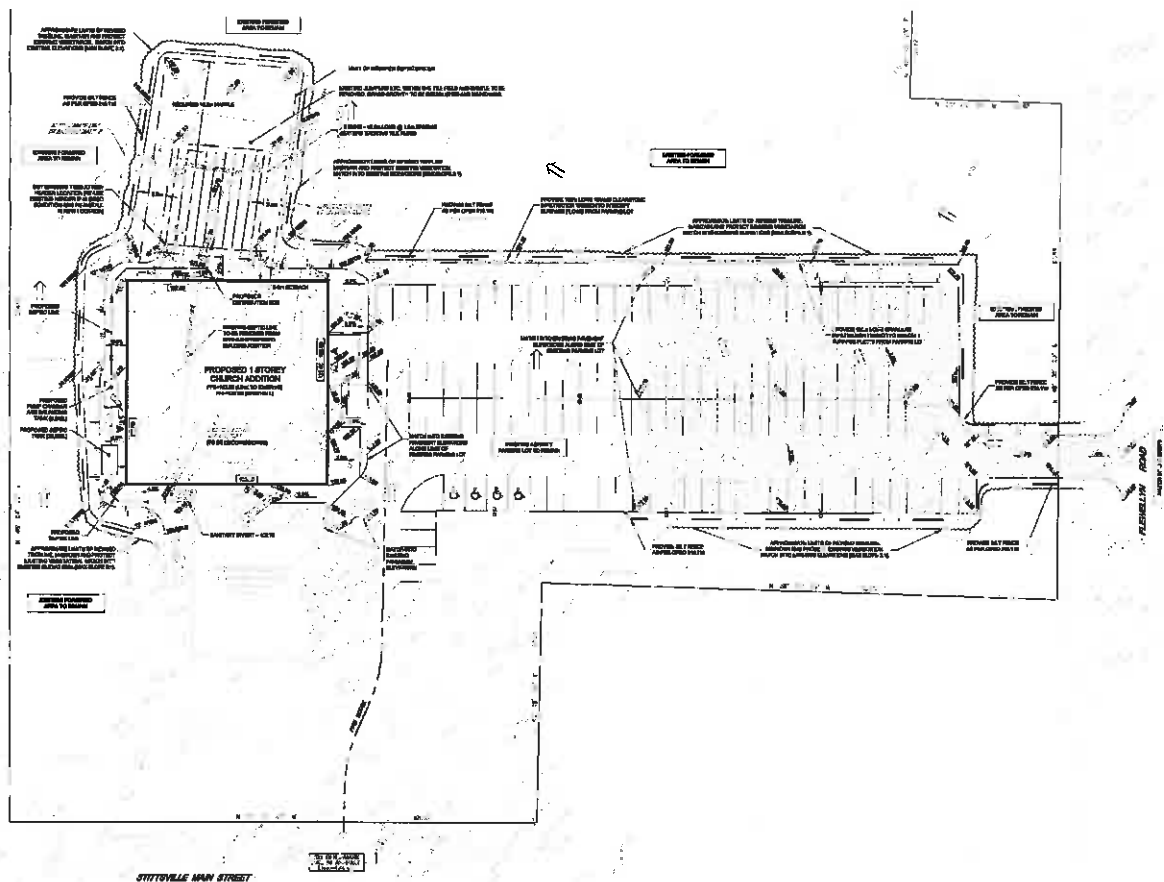


Figure 4.1 Conceptual Grading Plan

4.1 Erosion and Sediment Control

To mitigate erosion, temporary sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Silt fencing will be placed along the surrounding construction limits;
- Street sweeping and cleaning will be performed on all roads adjacent to active construction on a regular basis.

The proposed erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures is recommended to ensure they are operational.

In addition, the following will provide permanent erosion and sediment control measures:

- Grass swales and grass buffer strips along the sides of the church and edges of the parking lot;
- Clearstone infiltration trench between the limit of the parking lot and the forested area.

5.0 PHASING

All work shown on the enclosed 'Grading and Servicing Plan' will be completed as a single project.

6.0 GEOTECHNICAL INVESTIGATIONS

A Geotechnical Investigation Report has been prepared by Houle Chevrier Engineering Ltd. for the proposed United Pentecostal Church addition project. Refer to the Geotechnical Report¹ for subsurface conditions, construction recommendations and geotechnical inspection requirements.

7.0 SUMMARY AND CONCLUSIONS

This report has been prepared in support of the site plan amendment application for the Stittsville United Pentecostal Church project located at 2031 Stittsville Main Street, in the City of Ottawa. The proposed development will consist of a church expansion at the back of the existing church. A new access off Flewellyn Road, an additional gravel parking area and an upgraded septic system are also included as part of this project. The remainder of the site, approximately two thirds of the total area, will remain as natural dense forest.

The conclusions are as follows:

- It is expected that the existing well will have sufficient capacity to service the church, including the proposed addition, however testing will be required to confirm the well's capacity.
- With the addition of a balancing tank and the installation of a new septic tank, the existing tile field will have capacity for both the existing church and the proposed addition.
- Post-development flows will increase by approximately 12-13% due to an increase in the imperviousness of the site.
- Stormwater runoff from the parking lot will be directed towards a granular infiltration trench. The remainder of the runoff will continue to sheet drain uncontrolled towards the forest, thus maintaining the existing drainage patterns and minimizing the impact on the forest.

- Water quality control will continue to be provided by the grassed drainage swales and grass buffer strips located along the sides of the building and edges of the parking lot. Quality control will also be provided by the infiltration trench and runoff to the forested area;
- Regular inspection and maintenance of the septic system is recommended to ensure it is clean and operational;
- Temporary erosion and sediment control measures will be implemented during all phases of construction.

Servicing assessments discussed in the preceding sections show that there are no major obstacles to servicing the proposed church expansion. It is recommended that the proposed site servicing and stormwater management design be approved for implementation.

NOVATECH ENGINEERING CONSULTANTS LTD.

Prepared by:



François Thauvette, P. Eng.
Project Engineer

APPENDIX A
E-MAIL CORRESPONDENCE

Francois Thauvette

From: Steve [steve@margard.ca]
Sent: Friday, July 29, 2011 11:17 AM
To: 'Dwayne McCarty'; 'Kearney, Michel'; 'Pierre Yves'; r.cebryk@novatech-eng.com; l.bowley@novatech-eng.com; f.thauvette@novatech-eng.com
Cc: 'Tony'
Subject: FW: 2031 Stittsville Main (Pre-Consultation Follow-Up)
Attachments: Applicant's Study and Plan Identification List.doc

Good Morning,

We have received a response from the City Planner, Laurel Gibson, as per our pre-consultation meeting July 27th.

I have attached the "Applicant's Study and Plan Identification List" for the requirements for Site Plan application. 'S' indicates a drawing or report that is necessary for Site Plan submission. Please see the email below for more information.

If you have any questions, please feel free to ask.

Thank you,

Steve Dornan
Mar Gard Builders Ltd.
Tel: 613-723-1640
Fax: 613-723-8544
steve@margard.ca

----- Forwarded message -----

From: Gibson, Laurel <Laurel.Gibson@ottawa.ca>
Date: Thu, Jul 28, 2011 at 7:49 AM
Subject: 2031 Stittsville Main (Pre-Consultation Follow-Up)
To: tony@margard.ca

Hi Tony,

It was very nice to meet you at yesterday's pre-consultation meeting for 2031 Stittsville Main.

Please find attached the "Applicant's Study and Plan Identification List" that outlines which studies and plans required to be submitted with the application.

Regarding some answered questions, an Impact Assessment for the adjacent pit will **NOT** be required. We will only require paving for the new entrance off of Flewellyn up to the parking lot (not the entire lot). No loading space is required as per Table 113A- Minimum Number of Vehicle Loading Spaces Required, in Section 113 of the By-Law.

Please do not hesitate to contact me if you have any questions.

Regards,
Laurel

Laurel Gibson M.PL

2/3/2012

Planner
Development Review - Rural Services

Planning & Growth Management Department | City of Ottawa
110 Laurier Ave West | 4th Floor | Ottawa, ON | K1P 1J1
☎ 613.580.2424 ext. 16588
✉ laurel.gibson@ottawa.ca

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--

Tony Mariani
92 Bentley Avenue, 2nd Floor
Ottawa, ON K2E 6T9

Email: tony@margard.ca
Office: 613.723.1640
Cell: 613.913.2664

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend:

The letter **S** indicates that the study or plan is required with application submission.

The letter **A** indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information on preparing required studies and plans refer to: www.ottawa.ca/residents/planning/dev_review_procdss/guide/index_en.html.

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	55	1. Site Servicing Plan *Can be combined with #3	2. Assessment of Adequacy of Public Services / Site Servicing Study / Brief		6
S	55	3. Grade Control and Drainage Plan *Can be combined with #1	4. Geotechnical Study / Slope Stability Study		4
	2	5. Composite Utility Plan	6. Groundwater Impact Study		6
S	5	7. Servicing Options Report *Also include well testing *Can be combined with #11	8. Wellhead Protection Study		6
	9	9. Community Transportation Study and / or Transportation Impact Study / Brief	10. Erosion and Sediment Control Plan / Brief		6
S	6	11. Storm water Management Report / Brief *Can be combined with #7	12. Hydro geological and Terrain Analysis		8
	3	13. Hydraulic Water main Analysis	14. Noise / Vibration Study		3
	35/50/55	15. Roadway Modification Design Plan			

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
	50	16. Draft Plan of Subdivision	17. Plan Showing Layout of Parking Garage		2
	30	18. Draft Plan of Condominium	19. Planning Rationale (Design Statement and Integrated Environmental Review Statement)	S	3
S	55	20. Site Plan	21. Minimum Distance Separation (MDS)		3
	20	22. Concept Plan Showing Proposed Land Uses and Landscaping	23. Agrology and Soil Capability Study		5
	3	24. Concept Plan Showing Ultimate Use of Land	25. Cultural Heritage Impact Statement		3
S	55	26. Landscape Plan	27. Archaeological Resource Assessment		3
S	2	28. Survey Plan	29. Sun Shadow Study		3
	3	30. Architectural Building Elevation Drawings (dimensioned)	31. Downtown Urban Design Review Pilot Project - Submission Package (Central Area)		Available online

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
	5	32. Phase 1 Environmental Site Assessment	33. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		6
	5	34. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	35. Assessment of Landform Features		7
	4	36. Record of Site Condition	37. Mineral Resource Impact Assessment		4
	10	38. Tree Conservation Report	39. Environmental Impact Statement / Impact Assessment of Endangered Species		11
	4	40. Mine Hazard Study / Abandoned Pit or Quarry Study			

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
S	2	41. Transportation Brief	42.		

Meeting Date: July 27, 2011

Application Type: *Site Plan Control*

File Lead: Laurel Gibson

Engineer/Project Manager: Kevin Hall

Site Address: 2031 Stittsville Main Street

*Preliminary Assessment: 1 2 3 4 5

*One (1) indicates that considerable revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal, or in any way guarantee application approval.

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, City Planning will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in

Francois Thauvette

From: Jocelyn Chandler [jocelyn.chandler@rvca.ca]
Sent: Thursday, September 08, 2011 3:18 PM
To: f.thauvette@novatech-eng.com; kevin.hall@ottawa.ca
Subject: RE: Pentecostal Church Addition - SWM Criteria Request

Hello Francois, I concur with Kevin that we will need to know the increase in flows, and a statement from you regarding the capacity for infiltration in the wooded area as well as the likelihood of TSS reaching any natural watercourses (not including road side ditches...where does this wooded area drain out to anyways, if at all?) would likely be acceptable to the RCVA...barring any surprising revelations or new information. I hope this is helpful. Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP.
Planner, RVCA
613.692.3571 x1137
jocelyn.chandler@rvca.ca
www.rvca.ca

mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
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-----Original Message-----

From: Francois Thauvette [mailto:f.thauvette@novatech-eng.com]
Sent: August 25, 2011 3:48 PM
To: kevin.hall@ottawa.ca; Jocelyn Chandler
Subject: RE: Pentecostal Church Addition - SWM Criteria Request

Kevin & Jocelyn,

Attached is a copy of the topographical survey (PhotoKeyPlan) of the site along with photos I took during a site visit earlier this week. As you can see from the photos, the undeveloped area (forest) to the east is quite dense. I do not have a copy of the geotechnical investigation report yet, so I do not know what the soil conditions are in this area, however I suspect that the dense forest will have no problem soaking up additional runoff from the building roof and parking lot expansion.

Stormwater runoff from the site currently sheet drains uncontrolled towards the low lying forested area to the east. Since there are no storm sewers in the vicinity of the site, we are proposing to maintain the existing drainage patterns and allow the runoff from the site to continue to sheet drain uncontrolled towards the forest to the east. This will provide some TSS removal as the grass area adjacent to the parking lot will act as a vegetated filter strip. We will also investigate the opportunity to provide infiltration along the east side of the parking lot, once we receive the geotechnical investigation report. Given the site conditions and the fact that there does not seem to be a defined outlet for this site, what are the City of Ottawa and RVCA requirements regarding stormwater management (i.e. water quantity control and water quality control)? We want to ensure that our design meets the City of Ottawa and RVCA requirements.

Please review the attached documents and advise.

Regards,

François Thauvette, P. Eng.
Project Engineer

Novatech Engineering Consultants Ltd.
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Phone: (613) 254-9643 x 219
Fax: (613) 254-5867

The information contained in this email message is confidential and is for exclusive use of the addressee.

-----Original Message-----

From: Jocelyn Chandler [mailto:jocelyn.chandler@rvca.ca]
Sent: Tuesday, August 16, 2011 4:23 PM
To: f.thauvette@novatech-eng.com
Subject: RE: Pentecostal Church Addition - SWM Criteria Request

Hello Francois,

As per our conversation:

Please let me know what you find during your site visit, in so far as where the runoff from the parking area is currently going and what opportunities you see to get infiltration and some TSS removal.

Further, if it is not done before hand, our review of the SPC will include the need for review of a Part 10/11 request by the OSSO to determine the suitability of the private sewage system. If the current system is not considered suitable for the proposed expansion, a new design will have to be prepared and given approval by the OSSO.

Part 10/11 application link:

http://www.rvca.ca/osso/files/Part10-11_Renovation_Application.pdf

I'll speak with you again soon, Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP.

Planner, RVCA

613.692.3571 x1137

jocelyn.chandler@rvca.ca

www.rvca.ca

mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5

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-----Original Message-----

From: Francois Thauvette [mailto:f.thauvete@novatech-eng.com]
Sent: August 5, 2011 4:11 PM
To: Jocelyn Chandler
Subject: Pentecostal Church Addition - SWM Criteria Request

Jocelyn,

As discussed, we are working on a project in Stittsville (near the NE corner of Stittsville Main Street and Flewellyn Road). The project consists of a church addition and a parking lot expansion (as shown on the attached Site Plan).

I am sending you this e-mail requesting the RVCA's requirements regarding water quantity and water quality control for this site. I believe the site is located within the Jock

River sub-watershed. Please review and provide comments. Do not hesitate to call or e-mail should you have any questions.

Regards,

François Thauvette, P. Eng.
Project Engineer

Novatech Engineering Consultants Ltd.
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

Phone: (613) 254-9643 x 219
Fax: (613) 254-5867

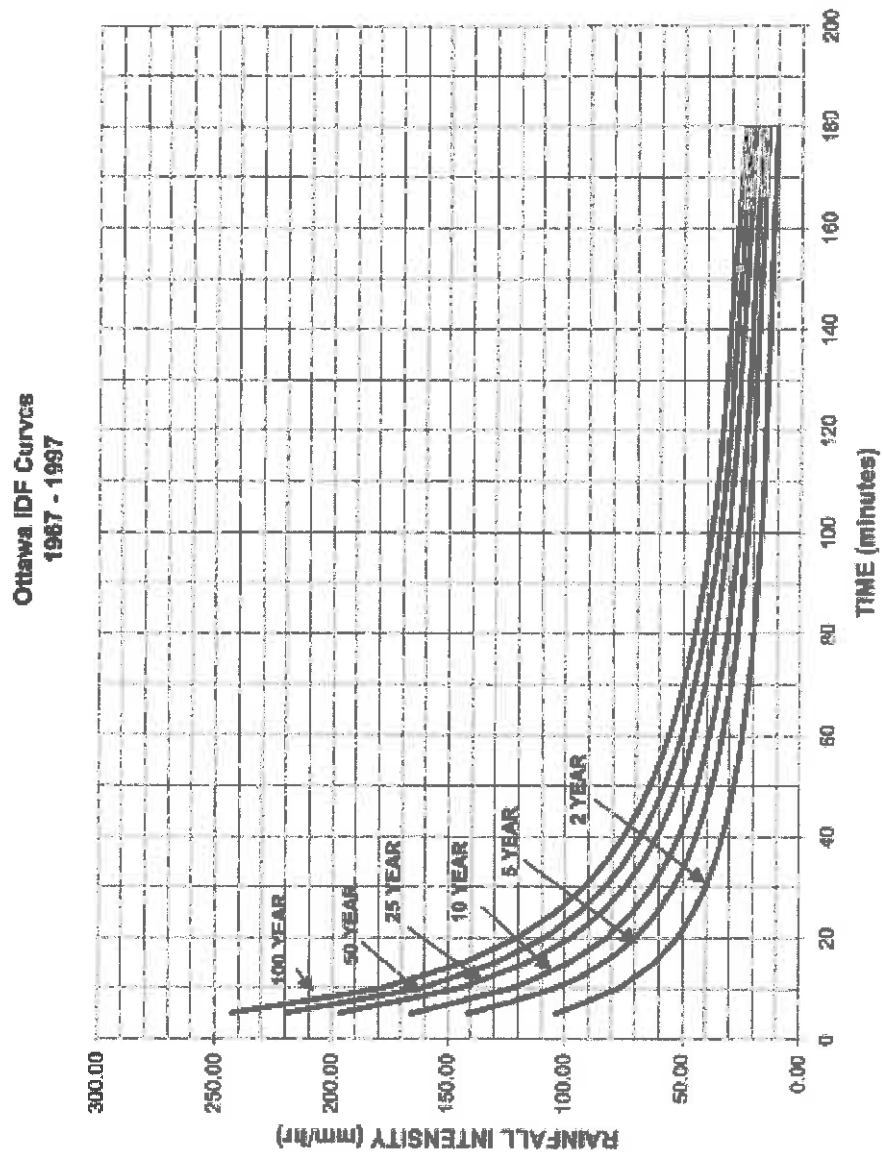
The information contained in this email message is confidential and is for exclusive use of the addressee.

APPENDIX B
RATIONAL METHOD CALCULATIONS, IDF CURVES

Ottawa Sewer Design Guidelines

APPENDIX 5-A

OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



RATIONAL METHOD

The Rational Method was used to determine both the theoretical pre-development runoff as well as the theoretical post-development runoff for the proposed site. The equation is as follows:

$$Q=2.78 \text{ CIA}$$

Where:

Q is the runoff in L/s

C is the weighted runoff coefficient*

I is the rainfall intensity in mm/hr**

A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{\text{perv}} \times C_{\text{perv}}) + (A_{\text{imp}} \times C_{\text{imp}}) + (A_{\text{grav}} \times C_{\text{grav}})}{A_{\text{tot}}}$$

Where:

A_{perv} is the pervious area in hectares

C_{perv} is the pervious area runoff coefficient ($C_{\text{perv}}=0.20$)

A_{imp} is the impervious area in hectares

C_{imp} is the impervious area runoff coefficient ($C_{\text{imp}}=0.90$)

A_{grav} is the gravel area in hectares

C_{grav} is the gravel area runoff coefficient ($C_{\text{grav}}=0.60$)

A_{tot} is the catchment area ($A_{\text{perv}} + A_{\text{imp}} + A_{\text{grav}}$) in hectares

Note: The C values above are to be increased by 25% for the 1:100 year event (max. $C_{\text{imp}}=1.0$).

**The rainfall intensities used in the calculations were taken from the new City of Ottawa IDF curves. A time of concentration (t_c) of 10 minutes was used, resulting in rainfall intensities of 104.2 mm/hr for the 1:5 year event and 178.6 mm/hr for the 1:100 year event.

PRE-DEVELOPMENT RUNOFF

Drainage Area (A) = 4.69 ha

Pervious Area = 4.38 ha

Impervious Area = 0.31 ha

Gravel Area = NA

Runoff Coefficient (C_{5yr}) = 0.25

Runoff Coefficient (C_{100yr}) = 0.30

$$C_{5yr} = \frac{(4.38 \times 0.2) + (0.31 \times 0.9)}{4.69} = 0.25$$

$Q_5 = 2.78 \text{ CIA}$

$Q_5 = 2.78 \times 0.25 \times 104.2 \times 4.69$

$Q_5 = 339.6 \text{ L/s}$

$$C_{W100yr} = \frac{(4.38 \times 0.25) + (0.31 \times 1.0)}{4.69} = 0.30$$

$$Q_{100} = 2.78 \text{ CIA}$$

$$Q_{100} = 2.78 \times 0.30 \times 178.6 \times 4.69$$

$$Q_{100} = 698.6 \text{ L/s}$$

POST-DEVELOPMENT RUNOFF

$$\text{Drainage Area (A)} = 4.69 \text{ ha}$$

$$\text{Pervious Area} = 4.05 \text{ ha}$$

$$\text{Impervious Area} = 0.43 \text{ ha}$$

$$\text{Gravel Area} = 0.21 \text{ ha}$$

$$\text{Runoff Coefficient (C}_{5yr}) = 0.28$$

$$\text{Runoff Coefficient (C}_{100yr}) = 0.34$$

$$C_{5yr} = \frac{(4.05 \times 0.2) + (0.43 \times 0.9) + (0.21 \times 0.6)}{4.69} = 0.28$$

$$Q_5 = 2.78 \text{ CIA}$$

$$Q_5 = 2.78 \times 0.28 \times 104.2 \times 4.69$$

$$Q_5 = 380.4 \text{ L/s}$$

$$C_{100yr} = \frac{(4.05 \times 0.25) + (0.43 \times 1.0) + (0.21 \times 0.75)}{4.69} = 0.34$$

$$Q_{100} = 2.78 \text{ CIA}$$

$$Q_{100} = 2.78 \times 0.34 \times 178.6 \times 4.69$$

$$Q_{100} = 791.7 \text{ L/s}$$

APPENDIX C
DEVELOPMENT SERVICING STUDY CHECKLIST

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

- N/A Executive Summary (for larger reports only).
- Date and revision number of the report.
- Location map and plan showing municipal address, boundary, and layout of proposed development.
- Plan showing the site and location of all existing services.
- Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.
- Summary of Pre-consultation Meetings with City and other approval agencies.
- N/A Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria.
- Statement of objectives and servicing criteria.
- Identification of existing and proposed infrastructure available in the immediate area.
- N/A Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).

- Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.
- N/A Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.
- Proposed phasing of the development, if applicable.
- Reference to geotechnical studies and recommendations concerning servicing.
- All preliminary and formal site plan submissions should have the following information:
 - Metric scale
 - North arrow (including construction North)
 - Key plan
 - Name and contact information of applicant and property owner
 - Property limits including bearings and dimensions
 - Existing and proposed structures and parking areas
 - Easements, road widening and rights-of-way
 - Adjacent street names

4.2 Development Servicing Report: Water * SECTION NOT APPLICABLE

EXISTING ON-SITE WATER WELL MAINTAINED

- Confirm consistency with Master Servicing Study, if available
- Availability of public infrastructure to service proposed development
- Identification of system constraints
- Identify boundary conditions
- Confirmation of adequate domestic supply and pressure
- Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.
- Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.
- Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design
- Address reliability requirements such as appropriate location of shut-off valves
- Check on the necessity of a pressure zone boundary modification.

EXISTING ON-SITE WATER WELL MAINTAINED

- Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range
- Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.
- Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.
- Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

4.3

Development Servicing Report: Wastewater * SECTION NOT APPLICABLE

DESIGN DETAILS WILL BE PROVIDED TO SUPPORT AN APPLICATION TO THE OTTAWA SEPTIC SYSTEM OFFICE FOR A SEPTIC PERMIT AS PART OF THE BUILDING PERMIT PROCESS.

- Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).
- Confirm consistency with Master Servicing Study and/or justifications for deviations.
- Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.
- Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)
- Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.
- Description of proposed sewer network including sewers, pumping stations, and forcemains.

DESIGN DETAILS WILL BE PROVIDED TO SUPPORT AN APPLICATION TO THE OTTAWA SEPTIC SYSTEM OFFICE FOR A SEPTIC PERMIT AS PART OF THE BUILDING PERMIT PROCESS.

DEVELOPMENT SERVICING STUDY CHECKLIST

- Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).
- Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- Special considerations such as contamination, corrosive environment etc.

4.4 Development Servicing Report: Stormwater Checklist

N/A

- Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)
- Analysis of available capacity in existing public infrastructure.
- A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.
- Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- Set-back from private sewage disposal systems.
- Watercourse and hazard lands setbacks.
- Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.

N/A

N/A

- N/A Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- N/A Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.
- N/A Any proposed diversion of drainage catchment areas from one outlet to another.
- Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- N/A If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.
- N/A Identification of potential impacts to receiving watercourses
- N/A Identification of municipal drains and related approval requirements.
- N/A Descriptions of how the conveyance and storage capacity will be achieved for the development.
- N/A 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.
- N/A Inclusion of hydraulic analysis including hydraulic grade line elevations.
- Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- N/A Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.
- N/A Identification of fill constraints related to floodplain and geotechnical investigation.

4.5 Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

- Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.
- N/A Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- N/A Changes to Municipal Drains.
- N/A Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- Clearly stated conclusions and recommendations
- Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.
- All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario