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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR THE

VILLAGE OF RICHMOND

CAIVAN COMMUNITIES

CITY OF OTTAWA

PROJECT NO.: 11-468

JULY 25, 2011
REVISION 1, 1ST SUBMISSION

EXECUTIVE SUMMARY

The Caivan Communities Village of Richmond Development consists of approximately 1,000 units comprised of approximately 60-70% single detached dwellings and 30-40% attached dwellings (townhomes) and a stormwater management pond. The development is proposed within the Village of Richmond, west of existing residential, north and south of Perth Street. The Caivan Richmond development is located within the Jock River drainage shed.

It is proposed that potable water will be provided to the proposed development by a communal well system, similar to the existing King's Grant communal well system in Richmond.

Sanitary servicing will be provided by connecting to the existing City of Ottawa wastewater network. The proposed outlet is via Martin Street to Cockburn Street to the Richmond Pump Station, then conveyed to the Glen Cairn trunk sewer via a 500mm diameter forcemain along Eagleson Road. Upgrades are required to the downstream sewers, pump station and forcemain, as well as Construction of a new forcemain.

Storm servicing will be provided per City guidelines, outletting to a proposed stormwater management pond for quality and quantity control treatment. The stormwater management pond is situated outside the summer 100-year flood line and inside the 100-year regulatory floodplain (rain on snow event). A small portion of development is tributary to a dry pond which provides quantity control, combined with a hydrodynamic separator to provide quality control.

Based on the volume of fill required, geotechnical grade raise restrictions, existing grades and the elevation of stormwater outlets, the site grading will be designed using sump pumps to drain the weeping tile surrounding the house in the proposed residential units.

Preliminary geotechnical investigation indicates that the site is subject to a grade raise restriction of 2.0m. The geotechnical engineer will provide recommendations based on the detailed grading plans and the geotechnical report.

Erosion and sediment control measures will be implemented and maintained throughout construction.

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CAIVAN COMMUNITIES

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1.0 INTRODUCTION

This functional servicing and stormwater management report is submitted in support of the Village of Richmond Draft Plan Application submitted by Caivan Communities.

The Caivan Richmond Development is proposed on approximately 54 ha (133 acres) of land within the Village of Richmond, in southwest Ottawa as depicted on ***Figure 1***. The proposed development is situated north and south of Perth Street, west of the existing Village of Richmond residential development. The Caivan Richmond Development is located within the Jock River drainage shed and is situated north and west of the Jock River.

It is proposed that the Richmond Development will have approximately 1,000 units through buildout, comprised of approximately 60-70% single detached dwellings and 30-40% attached dwellings (townhomes). The proposed subdivision layout is depicted on ***Figure 2***.

This functional servicing and stormwater management report is provided to demonstrate conformance with the design criteria of the City of Ottawa, the Background Studies, and general industry practice.

1.1 Existing Conditions

The subject site is currently being farmed. The terrain is relatively flat and the majority has been cleared of trees, with the exception of a number of hedgerows around the periphery of the site. Lands to the north and west are located outside of the Village boundary and are occupied by predominantly agricultural uses. The lands immediately to the south are Secondary Plan / CDP approved for future residential development. The lands to the east are predominantly built out at varying residential densities.

The Richmond development is located within the Jock River drainage shed and is connected to the Jock River via the Van Gaal Drain and Arbuckle Drains.

The proposed development is located within the jurisdiction of the Rideau Valley Conservation Authority (RVCA).

Existing ground elevations are between 94.50m to 96.00m. The soils in the area consist of sand over silts and marine clay, over glacial till.

The preliminary geotechnical investigation indicates that the maximum grade for the site is 2.0m. At the time of detailed design of the development, grading plans will be reviewed by a geotechnical engineer to confirm if the design is within the grade restriction and to make any necessary recommendations if the grade raise restriction is exceeded. The grading and servicing will be designed to keep grades as low as possible.

1.2 Summary of Pre-consultation

The following provides a summary of pre-consultation meetings to date.

1.2.1 City of Ottawa, May 17, 2011

A formal Pre-Application Consultation with Municipal Staff for the Village of Richmond Subdivision occurred on May 17, 2011. The intent of the meeting was to discuss the proposed development, review technical considerations and identify/confirm studies required to accompany the submission of a Plan of Subdivision application and Zoning By-Law Amendment. A copy of the Pre-Application Consultation meeting minutes in enclosed in ***Appendix A***.

1.3 Required Permits / Approvals

The Caivan Richmond Development is subject to the following permits and approvals:

1.3.1 City of Ottawa

The City of Ottawa is required to approve the engineering design drawings and reports for the Richmond Subdivision. The City of Ottawa must review and sign off on the design and forward to the Ministry of the Environment (MOE) for their transfer of review program.

1.3.2 Ministry of the Environment

The MOE is required to review the engineering design and issue Certificates of Approval for Sanitary and Storm Sewers and Stormwater Management (including the stormwater management pond). The Richmond Subdivision will not require a Certificate of Approval for Watermains. The City will review the watermains on behalf of the MOE.

The Stormwater Management Certificate of Approval (COA) application will be made for the use of Inlet Control Devices (ICDs). The MOE is presently reviewing these applications on a case-by-case basis. If it is determined that the ICDs are present to protect basements from flooding, the COA application may be cancelled by the MOE.

The MOE will also be required to issue a COA for a proposed temporary sedimentation system comprised of on-site ditches and temporary sediment ponds.

1.3.3 Rideau Valley Conservation Authority (RVCA)

The RVCA has agreed to revise the flood plain zoning overlay currently encumbering the northern half of the site, following the implementation of one of the following options:

1. Use fill to raise the site above the flood plain elevation;
2. Make alterations to the existing drainage channel in order to lower / narrow the flood plain elevations.

RVCA input and approval will be required to proceed with the proposed solution. Flood plain mapping will be revised once the construction work or flood plain mitigation measures have been completed.

1.3.4 Department of Fisheries and Oceans (DFO)

Based on a meeting at the Rideau Valley Conservation Authority May 19th, 2011, the proposed storm water solution for the site will not be create a HADD (Harmful Alteration, Disruption or Destruction of Fish Habitat) and, thus, no DFO approvals will be required. This decision that a HADD will not be created will be monitored through the design process.

1.4 Existing Permits / Approvals

The following permits and approvals in place are as follows:

1.4.1 Rideau Valley Conservation Authority

Flood Plain Mapping was completed and approved for the Jock River in 2005, which applied to the Jock River and Arbuckle Drain, south of Perth Street. The City of Ottawa and RVCA retained JF Sabourin & Associates in October 2008 to complete the flood plain mapping of the Van Gaal Municipal Drain, north of Perth Street. The report was prepared by JF Sabourin & Associates in November 2009, and was approved in January 2010.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report.

Sewer Design Guidelines,
City of Ottawa, November 2004
(City Standards)

Ottawa Design Guidelines – Water Distribution,
City of Ottawa, July 2010
(Water Supply Guidelines)

City of Ottawa Official Plan,
adopted by Council 2003.
(Official Plan)

Stormwater Management Planning and Design Manual,
Ministry of Environment, March 2003
(*SWMP Design Manual)*

Erosion & Sediment Control Guidelines for Urban Construction,
Greater Golden Horseshoe Area Conservation Authorities, December 2006
(E&S Guidelines)

Village of Richmond Water & Sanitary Master Servicing Study (EA Phases 1 & 2)
Stantec, July 2011
(MSS)

Stormwater Management and Drainage Plan
DSEL, JFSA, AECOM and Kilgour & Associates Ltd, March 2010
(SWM Report)

Preliminary Geotechnical Investigation
Jacques Whitford, June 22, 2007
(Geotechnical Study)

Supplementary Geotechnical Memo
Golder and Associates, June 2011
(Golder Memo)

2.2 Design Guideline Deviations

Section 7.2.1.6.8 of the ***City of Ottawa Sewer Design Guidelines*** outlines the Emergency Provision for Flood Protection for Pump Station Design. The guideline states that in the case of a catastrophic failure, provisions must be made to ensure that basements are at a minimum elevation above the sanitary hydraulic grade line

elevation. It should be noted that the existing pumping station does not provide the existing development in the Village of Richmond with this emergency provision for flood protection. Similarly to the existing development in the Village of Richmond, the proposed development will not be provided with emergency provision for flood protection with respect to the pump station operation.

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

As noted in the ***MSS***, the existing water distribution system available to future development in the Village of Richmond consists of private wells, a public communal well system or connection to the existing City of Ottawa water distribution network, currently terminating in Kanata and Barrhaven.

The majority of existing residences and businesses in the Village of Richmond are supplied with potable water by both shallow and deep private wells. Parts of the Village of Richmond are supplied with potable water by a public communal well system (King's Park Water Treatment Facility).

3.2 Proposed Water Supply

As noted in the ***MSS***, for development of the Caivan Village of Richmond lands, a communal well system and associated watermains are required with a centralized storage and pumping facility. The communal well will be located at the south end of the development as depicted on ***Figure 3***. As noted in the ***MSS***, it is anticipated that a new communal well system would be likely to provide yields equal to, or greater than, that of the existing King's Park Communal Well System.

The communal well system will be comprised of groundwater wells, along with an at-grade water storage reservoir. A high lift pumping station will be located adjacent to the reservoir with disinfection and treatment, as required.

As noted in the ***MSS***, the treatment of the groundwater will be minimal and similar to the existing King's Park Communal Well System. The treatment at the existing communal well includes only sodium hypochlorite injection followed by disinfection (chlorination).

The communal well system will pump treated water to a watermain distribution network to service the development internally. The watermain distribution network will be designed in accordance with the ***Water Supply Guidelines*** as summarized in ***Table 1***.

Table 1: Water Supply Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 persons/unit
Residential - Townhome	2.7 persons/unit
Fire Flow	Calculated as per the Fire Underwriter's Survey 1999.
Minimum Watermain Size	150mm diameter
Service Lateral Size	19mm dia Soft Copper Type 'K'
Minimum Depth of Cover	2.4m from top of watermain to finished grade
Peak hourly demand operating pressure	275kPa and 690kPa
Fire flow operating pressure minimum	140kPa
Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010)	

For communal systems, the "City of Ottawa Standard Flow Demand Design Parameters" considers blended unit demand rates as follows:

- Average Daily Demand = 360 L/p/day
- Maximum Daily Demand = 720 L/p/day
- Peak Hourly Demand = 1585 L/person/day

Fire flow requirements are to be determined in accordance with the Fire Underwriters Survey, City of Ottawa Guidelines and the Ontario Building Code. The City of Ottawa typically recommends a fire flow rate of 7500 L/min (125 L/s) for residential properties.

The water distribution network will be comprised primarily of 150, 200 and 300mm diameter watermains. The water supply will be looped in order to provide for system security. The proposed watermain layout is presented on ***Figure 3***.

A complete hydraulic analysis will be prepared for the proposed water distribution network at the time of detailed design to determine if water supply is available within the required pressure range under the anticipated demand during average day, peak hour and fire flow conditions.

3.3 Water Supply Conclusion

Potable water will be delivered to the proposed development area via a communal well to be located at the south end of the proposed development. The communal well will be designed similarly to the existing King's Park communal well system. The communal well will consist of groundwater wells, an at-grade water storage tank and a high lift pumping station with disinfection and treatment as required. The groundwater treatment will be minimal (sodium hypochlorite injection and chlorination).

The development will be serviced by a watermain network, which will be sized to meet maximum hour and maximum day plus fire flow demands. Preliminary analysis for the

network indicates that the 150mm, 200mm and 300mm diameter sizes will satisfy these demands. The water supply design will be designed to conform to all relevant City Standards and policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services and Ultimate Upgrades

The existing Village of Richmond is serviced primarily by City of Ottawa sanitary sewers that convey wastewater to the Richmond Pumping Station located south of the Jock River, on the northwest corner of Cockburn and York Street. The Richmond Pump Station (RPS) discharges to the Glen Cairn Trunk Sewer just south of Hazeldean and Robertson Road in Kanata through a 13.85km long, 500mm diameter forcemain along Eagleson Road as depicted on ***MSS Figure 5.3***, enclosed in ***Appendix B*** for reference.

A secondary trunk on Martin Street acts as a collector trunk for the proposed development, extending from Fortune to Cockburn, outlets to the Cockburn trunk sewer, which crosses the Jock River to the Richmond Pump Station. The Martin Street east-west primary trunk sewer is 300mm to 350mm in size with upgrades required to 450mm (Fortune to Fowler) and 525mm (Fowler to Cockburn). Furthermore the Martin Street trunk will need to be lowered by a minimum of 0.50m to service the proposed development. Further to the Martin Street upgrade, replacement and lowering of the sanitary sewers along Cockburn will also be required, including the replacement of the existing stream crossing to service the proposed development.

In addition to the existing gravity collection system upgrades, additional upgrades will be required at buildout: expansion of the existing Richmond Pump Station, repairs to the existing 500mm diameter forcemain, and construction of an additional 600mm diameter forcemain to provide redundancy for network reliability.

With respect to the sanitary hydraulic grade line (HGL), ***Section 7.2.1.6.8*** of the ***City of Ottawa Sewer Design Guidelines*** outlines the Emergency Provision for Flood Protection for Pump Station Design. The guidelines state that in the case of a catastrophic failure, provisions must be made to ensure that basements are at a minimum elevation above the sanitary hydraulic grade line elevation. It should be noted that the existing pumping station does not provide the existing development in the Village of Richmond with this emergency provision for flood protection.

The required upgrades of the existing collection system to service this development are outlined in the ***MSS.*** The upgrades will be more specifically linked to number of units and population, but to initiate development, a portion of the proposed upgrades are outlined in ***Section 4.2***.

4.2 Infrastructure Staging Plan

The Richmond infrastructure staging plan is included in the ***MSS***. A summary as it applies to the Caivan development is as follows:

Immediate Upgrades Required

For development to proceed, the following upgrades are required immediately:

- Upgrade to the local gravity sewers (Martin, Coburn and the stream crossing);
- Repairs to the existing 500mm diameter sanitary forcemain;
- Expansion of the existing sanitary pump station;
- Construction of 3km of new 600mm diameter sanitary forcemain.

Upgrades Required at Buildout

- Construction of remaining 10.5km of new 600mm diameter sanitary forcemain from Richmond to Kanata.

4.3 Wastewater Design

The Village of Richmond Subdivision will be serviced by a network of new gravity sewers designed in accordance with City of Ottawa criteria. It is proposed that the development outlets to the Martin Street sanitary trunk, tributary to the Richmond Pump Station, which outlets to the City of Ottawa's ROPEC treatment facility via a forcemain.

The proposed sanitary sewer layout is depicted on ***Figure 4***. ***Table 2*** summarizes the City Standards which will be employed in the design of the proposed wastewater sewer system.

Table 2: Wastewater Design Criteria

Design Parameter	Value
Low Density Residential	3.4p/unit
Medium Density Residential	2.7p/unit
Peak Wastewater Generation per Person	350L/p/d
Peaking Factor Applied	Harmon's Equation
Institutional Flows	50,000 L/ha/day
Institutional Peaking Factor	1.5
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Service Lateral Size	135mm dia PVC SDR 28 with a minimum slope of 1.0%
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Additional Considerations	Sewers servicing less than 10 residential connections to have a minimum gradient of 0.65%
	Where expected depth of flow is less than 1/3 pipe diameter, calculate actual flowing velocity and increase slope as required to achieve 0.60m/s.
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2004.	

Consistent with the current design of the existing pump station, the proposed homes will not conform to the City Guideline regarding emergency provision for flood protection, should there be a catastrophic failure.

The supporting preliminary sanitary sewer calculation sheets and sanitary drainage area plans are contained in ***Appendix B.***

The estimated peak sanitary flow from the proposed development is approximately 55 L/s at the outlet to the Martin Street sanitary trunk.

4.4 Wastewater Servicing Conclusion

The proposed wastewater system will outlet to the Martin Street trunk sewer and will be supported by downstream sanitary infrastructure, requiring upgrades. The following upgrades are required immediately to support this development: upgrades to local gravity sewers, expansion of the existing pump station, repair of the existing 500mm diameter forcemain and construction of 3km of the new 600mm diameter forcemain. In

the future (11 years plus) the remaining 10.5km of the new 600mm diameter forcemain will be required).

The wastewater system is designed in accordance with City of Ottawa guidelines, with the one exception being that the existing pump station does not provide emergency provision for flood protection. This deviation from guidelines is consistent with the existing pump station design, as well as existing residential development.

5.0 STORMWATER CONVEYANCE

5.1 Minor System

5.1.1 Existing Infrastructure

The development is located in an area where downstream stormwater is collected by natural drainage: the Jock River and the Van Gaal / Arbuckle Drain.

5.1.2 Proposed Infrastructure

The Village of Richmond Subdivision will be serviced by a conventional storm sewer system designed in accordance with the City of Ottawa guidelines. The storm sewers on local roads will be sized using a 5-year return frequency and City of Ottawa IDF curves. All storm flows will be directed to a stormwater management facility where the runoff will be treated for water quality and quantity control as noted in the SWMP Manual.

The stormwater management pond is situated in the 100-year regulatory floodplain, outside the 100-year erosion limit and 100-year summer flood elevation of the Van Gaal / Arbuckle Drain.

Refer to the ***Figure 4*** for a schematic of the storm sewer system. The preliminary storm sewer calculation sheets and storm drainage area plans are contained in ***Appendix C.***

The runoff that will be stored within some of the saw-toothed street segments will be conveyed to catchbasins at the low point of the road which will be equipped with inlet control devices. Flows greater than the controlled inlet rate will be stored within the road segment and then be released when capacity is available in the storm pipe or spill over to the next road segment as overland flow. Where roads cannot convey the flows, storm sewers will be designed to carry the 100-year flow.

The paved area and grassed area runoff coefficients of 0.9 and 0.2 will be used to calculate average runoff coefficients that were applied across the site. Using these values, an average runoff coefficient was derived. The anticipated peak flow rate from

the Caivan Village of Richmond Subdivision at the two pond outlets are: 1796 L/s and 1580 L/s.

5.1.3 Minor System Conclusions

The proposed stormwater design conforms to all relevant City guidelines and Policies. The proposed minor system will outlet to a proposed stormwater management pond, which outlets to the Jock River via the Van Gaal / Arbuckle Drain.

5.2 Major System

5.2.1 Existing Drainage Features

The Richmond development is located within the Jock River drainage shed and is connected to the Jock River via the Van Gaal Drain and the Arbuckle Drain.

5.2.2 Proposed Major System Design

Major system runoff in excess of the minor system (5-year event) and up to the 100-year event will be conveyed within the road allowances via a continuous overland flow route, ultimately directed to the stormwater management pond. The major system flow will not exceed the width of the road allowance, and in no case, will the depth of flow exceed 0.30 meters above the edge of pavement during a 100-year event, in accordance with the City Standards. Should the major system flow exceed the conveyance capacity of any given road, the storm sewer will be sized to accommodate the flows in excess of the road capacity. The major system will be directed to the proposed stormwater management pond.

5.2.3 External Drainage

External areas that currently drain through the subject property will be considered in the detailed design of the proposed development. As depicted on the ***Preliminary Storm Drainage Area Plan,*** enclosed in ***Appendix C,*** there is external drainage currently being conveyed from the west along the existing road side ditches on the north and south side of the Perth Street. The drainage pattern will be maintained while the road cross-section remains rural. Should the right-of-way become urbanized, storm sewers will be provided to convey the external areas to the Van Gaal Drain.

5.2.4 Major System Conclusions

All flows in excess of the 5-year flow for the proposed development will be conveyed via the subdivision roadways, outletting to a stormwater management pond for treatment prior to discharging to the Jock River. The proposed major system stormwater design will conform to all relevant City Guidelines and policies.

6.0 STORMWATER MANAGEMENT

A stormwater management scheme for a larger development area was selected in the ***SWM Report*** prepared by DSEL in March 2010. The following sections describe the selected stormwater management design as it relates to servicing of the Caivan Village of Richmond Lands.

6.1 Water Quality Criteria

The MOE ***SWMP Design Manual*** provides assistance to the consultant on the selection of the required level of quality treatment.

Fish habitat has been identified in the Jock River, the Van Gaal/Arbuckle Drain and a portion of the Moore Tributary (at the confluence of the Arbuckle Drain). Therefore, stormwater discharged to these receiving watercourses will require "Enhanced" total suspended solids removal (80% TSS removal) per the ***SWMP Design Manual.***

6.2 Water Quantity Criteria

The subject property is located in the Jock River Reach 2 sub-watershed. The sub-watershed is approximately 148km^2 and includes the area draining into the Jock River between Highway 416 to the outlet of the Richmond Fen. The Jock River Reach 2 sub-watershed study is not complete with the water quantity criteria for the Van Gaal and Jock River still outstanding.

The existing development currently drains to the Jock River and the Van Gaal Drain. Based on the ***SWM Report***, the following stormwater management criteria is recommended:

<u>Jock River</u>

- No quantity control storage required for flood control purposes as the hydrograph from the watershed will peak before the upstream peak in the Jock River.
- No erosion control storage is required to maintain the pre-development in-stream erosion condition.
- Quality control volume as per the MOE Enhanced Treatment (80% TSS removal).

<u>Van Gaal / Arbuckle Drain</u>

- Quantity controls required to demonstrate no impact on flood levels for storm events up to and including the 100-year event.

- Erosion control storage required to maintain the pre-development in-stream erosion condition.

- Quality control volume per the MOE Enhanced Treatment (80% TSS removal).

6.3 SWM Servicing

The stormwater management design for the subject property includes two stormwater management ponds as depicted on ***Figure 5***. To be consistent with the ***SWM Report***, the ponds are identified as Pond 1 and Pond 3. Pond 1 is a wet pond which will provide an MOE 'Enhanced' TSS removal and Pond 3 is a dry pond for quantity control, combined with a hydrodynamic separator to provide quality control. An example of a hydrodynamic separator is a Vortechs Stormwater Treatment System, a product of Contech Construction Products Inc.

External drainage west of the development currently being conveyed along the Perth Street roadside ditches will continue to outlet to the Van Gaal Drain. Once Perth Street is urbanized, the external drainage from west of Perth Street will be conveyed to the wet pond via storm sewers.

Pond 1 is the primary outlet for the Caivan Richmond lands. The total drainage area tributary to this pond is 73 ha, consisting of 45 ha between Perth and Ottawa Streets and 28 ha north of Perth Street and west of the Van Gaal Drain. The total drainage area includes both Caivan Richmond lands and external lands.
Pond 1 has two outlets:

- The first outlet will be designed to convey low flows up to and including the 2-year event, attenuated to 330 L/s to enhance cooling opportunities in accordance with the ***Geomorphic Study***.

- The second outlet will be designed to convey the treated stormwater runoff from the less frequent storm events generated during the 5 to 100 – year storms.

Pond 1 is situated in the 100-year regulatory floodplain, outside the 100-year erosion limit and 100-year summer flood elevation of the Van Gaal / Arbuckle Drain.

Pond 3 is designed to collect and retain runoff from approximately 3 ha north of Perth Street and east of the Van Gaal Drain. The pond will be designed to attenuate flows to 330 L/s in accordance with the ***Geomorphic Study***. The proposed facility will incorporate an oil / grit sedimentation chamber to provided 80% TSS removal per the ***SWMPDM***.

6.4 SWM Pond Operation Characteristics

Pond 1 has been designed in accordance with the requirements of the City of Ottawa and the ***SWMP Design Manual*** and includes the following features:

- **Sediment Forebay –** To improve sediment removal prior to entering the pond.
- **Permanent Pool –** To buffer storm flows and trap pollutants
- **Extended Detention Storage –** To provide water quality and erosion control
- **Quantity Control Storage –** Demonstrate no increase in flood levels for flow directed to the Van Gaal Drain.
- **Thermal Mitigation –** Ponds discharging to the Van Gaal Drain will incorporate a low flow drain that will draw stormwater from the bottom of the main cell. The low flow drain will consist of a "French Drain" to promote contact with the cooler ground temperature.

Operations and maintenance requirements will be addressed during the detailed design stage.

6.4.1 Sediment Forebay

All wet ponds include a sediment forebay, provided to improve the pollutant removal by trapping larger particles near the inlet of the pond. As noted in the ***SWMP Design Manual***, the forebay will be designed with a length to width ratio of approximately 2:1 and should not exceed one third of the permanent pool surface area for wet ponds. Furthermore, the forebay should have a minimum depth of 1.0m (1.5m preferred) to minimize the potential for re-suspension.

6.4.2 Permanent Pool

The permanent pool is approximately 1.5m deep, which is within the 1.0m to 2.0m deep range which is recommended in the ***SWMP Design Manual.***

The permanent pools have been sized to provide 'Enhanced' level of protection in accordance with the ***SWMP Design Manual***. The required storage volumes are illustrated in ***Table 3***.

Table 3: Criteria for Required Storage Volumes

Pond I.D.	Drainage Area (ha)	Imp. Coverage (%)	Permanent Pool Volume [1] (m^3/ha)
1	84.67	55	190
3	3.28	55	190
1) Protection level for wet pond: Enhanced 80% long-term S.S. removal. ***SWMDPM*** Table 3.2 (March 2003)			

The slopes in the permanent pool will be graded with side slopes of 5:1, with minor localized variations.

6.4.3 Active / Extended Detention Storage

The active detention storage has been sized based on 330L/s for erosion control for pond directing flow to the Van Gaal Drain, in accordance with the ***Geomorphology Study***. For flow directed to the Jock River active detention storage was based on the 24 hour release of runoff volume generated during the 2-year storm event. As stated in the ***SWMP Design Manual*** (pg 3-15) the two year storm is frequently adopted as the design event for determining active storage volume because it has been found to correspond to the bankfull flow stage. Meanwhile, extended detention is provided to attenuate peak flow generated during storm events up to and including the 100-year storm event to the free flowing capacity of the outlet sewer.

Table 4: Required Storage Volumes for SWM Facilities

Pond Component	Required Volume (m^3)	Volume Provided (m^3)	Volume Ratio	Provided Elevation (m)
Pond 1 Permanent Pool(1)	12,701	48,922	3.85	92.65
Pond 1 Quality Control(2)	3,387	3,758	1.11	92.74
1) Required PP volume based on Table 15. 2) Require quality control volume based on 40 m^3/ha.				

The extended detention storage should not exceed 2.0 metre depth in accordance with ***SWMPDM***.

The extended detention component has been provided with side slopes of 5:1 with minor localized variations. Side slopes of 5:1 have been applied to the pond area three metres on either side of the permanent pool water levels.

6.4.4 SWMP Post-Development Modeling Analysis

Table 5: Summary of Pond 1 Storage Characteristics

Pond Component	Target Outflow(1) (m^3/s)	Pond Inflow(2) (m^3/s)	Lower Elevation (m)	Upper Elevation (m)	Pond Outflow(2) (m^3/s)	Volume Used(2) (m^3)
Permanent Pool	N/A	N/A	91.15	91.65	N/A	48,922
Quality Control	0.029	N/A	92.65	92.74	0.029	3,758
2yr/24hr SCS	0.330	9.271	92.74	93.30	0.261	27,728
5yr/24hr SCS	2.133	14.811	93.30	93.36	0.644	30,738
10yr/24hr SCS	2.629	18.053	93.36	93.42	1.248	33,430
25hr/24hr SCS	3.253	21.335	93.42	93.50	2.267	36,896
50yr/24hr SCS	3.737	23.826	93.50	93.55	3.162	39,644
100yr/24hr SCS	4.258	26.599	93.55	93.61	4.174	42,448

1) Refer to Tables 15 and 16 for required permanent pool and quality control volumes. 24 hour detention time assumed for quality control volume. 2 to 100 year release rates based on pre-development flows.
2) Pond inflow taken as a direct summation of major and minor system inflows.
3) Assuming a $0.100m^2$ circular vertical quality control orifice at an invert of 92.65, a $0.074m^2$ circular vertical erosion control orifice at an invert of 92.74m and a 12.0m long quantity control weir at an invert of 93.296m.
4) Volumes used are active storage only for all pond components except the permanent pool.

The impervious coverage has been estimated based on the various land uses and their respective sizes in the current plan. The final impervious coverage will up-dated at the detailed design stage based on the characteristics of the actual plan, and the pond sizing adjusted accordingly.

6.4.5 Evaluation of Post-development Impact on Downstream Systems

As noted in the ***SWM Report***, a hydraulic and hydrological model was used to establish existing conditions for the proposed development, stormwater management facilities and the proposed routing of external areas.

Table 6 illustrates the post-development flow rates and estimated maximum elevations in the Van Gaal Drain at key locations.

The stormwater management pond outlet rate was established in accordance with the geomorphology recommendations. Therefore, the design should not cause undue erosion in the Van Gaal Drain downstream of the development area.

Table 6: Post-development Peak Flow Rates at Discharge locations along the Van Gaal Drain

Location	X-Sec ID	24 Hour SCS Storm[1]		10 Day Rain on Snow[2]		10 Day Rain on Snow[3]	
		Flow (m^3/s)	Elev. (m)	Flow (m^3/s)	Elev. (m)	Flow (m^3/s)	Elev. (m)
Upstream of Perth Street	1340	10.712	94.17	11.087	94.15	3.426	94.12
Downstream of Perth Street	1312	11.470	94.10	11.680	94.07	3.438	94.12
Upstream of Fortune Street	666	15.576	93.11	15.203	93.63	4.185	94.10

1. The Van Gaal Drain 100-year summer peak flow reaches the Jock River.
2. The Van Gaal Drain 100-year spring flow reaches the Jock River.
3. The Jock River 100-year spring peak flow reaches the outlet of the Van Gaal Drain.

Post-development water levels at all locations along the Van Gaal Drain are either equal to or lower than pre-development elevations.

7.0 SITE GRADING

7.1 Master Grading

The Village of Richmond development is subject to grade raise restrictions based on the information provided in the geotechnical report. Based on the ***Golder Memo***, the preliminary results indicate that the grade raise restriction for this site is 2.0m.

Due to the grade raise restrictions, and existing grades in the existing Richmond development, the site grading is designed using sump pumps to drain the weeping tile surrounding the proposed residential units, rather than a conventional gravity connection. Conventional storm servicing with a gravity connection will result in significant filling of the site.

Filling of the site is not feasible for the following reasons:

- May lead to grades in excess of the grade raise restriction;
- If maximum grade raises are exceeded, the site is at risk of settlement unless specific measures are taken, which often require significant lead time;
- Importing of fill can be complicated and cost prohibitive;
- Does not provide a natural transition to the existing Village of Richmond.

The use of a sump pump connection can help manage the grade raise constraint. A sump pump isolates the residential unit from the hydraulic fluctuation in the storm

sewer, and therefore allows the site grades to be lowered by up to one metre without risk of basement flooding.

The preliminary grading for the development is depicted on the ***Figure 6.*** The proposed grades range from 95.00 to 96.80, matching the existing ground elevations. This demonstrates that employing sump pumps will allow the proposed development to transition to the existing Village of Richmond and its village character. Minimizing fill requirements will allow for the integration of peripheral hedgerows and will help minimize the urban design impacts created from extreme grade raises.

At the time of detailed design, the grading plans will be forwarded to the geotechnical consultant for review and recommendations. Final signoff of the Caivan Village of Richmond detailed grading plans will be provided by the geotechnical engineer.

7.2 Sump Pump Design

Equipping homes with sump pumps to drain the weeping tile is a common strategy employed in the City of Ottawa's rural areas, including the existing Village of Richmond. Sump pumps are also commonly used for urban development in municipalities in the Southern Ontario, in the municipalities of Toronto, Barrie, Hamilton, Richmond Hill, London, Milton and Oakville.
The City of Ottawa Sewer Design Guidelines, Section 5.7.1, lists three types of storm sewer service connection systems that are available:

- Connection to the storm sewer;
- Sump pumps;
- And/or third-pipe system with a dedicated foundation drain sewer.

The design of sump pumps will provide a discharge connection to a storm sewer. The alternative to discharge to the surface is not recommended, as homeowners commonly connect their sump pump to the sanitary sewer, which has a significant impact on the capacity and operation of the sanitary system.

Refer to the sump pump configuration as depicted on ***Figure 7***. The sump pump will be equipped with a swan neck with an elevation above the 100-year HGL in the storm sewer. Furthermore, backwater valves are proposed at the storm service outlet and weeping tile. The elevation of the swan neck and the backwater valves will provide protection to the homes during significant storm events. Water and sanitary service laterals will be provided as per City of Ottawa guidelines.

At the time of detailed design, a hydrogeological report will be prepared to examine the relationship between the water table elevation and house foundation elevations.

7.3 Grading Criteria

The following grading criteria and guidelines will be applied at the time of detailed design as per City of Ottawa Guidelines:

- Maximum slope in grassed areas between 2% and 5%;
- Grades in excess of 7% require terracing to a maximum of a 3:1 slope;
- Driveway grades between 2% and 6%;
- Rear house grades must be at least 0.30m above the spillover point in the swale;
- Front terrace grade must be at least 0.30m above overland spillover point on road;
- Drainage ditches and swales should have a minimum slope of 1.5%;
- Perforated pipe is required for swales less than 1.5% in slope;
- Swales are to be 0.15m deep with 3:1 side slopes unless otherwise indicated on the drawings;

8.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosions losses is exaggerated during construction where the vegetation has been removed and the top layer of soil is disturbed.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

- Limit extent of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from entering existing ditches.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps and basins during dewatering.
- Install filter cloth between catch basins and frames.
- Installation of mud mats at construction accesses.
- Construction of temporary sedimentation ponds to treat water prior to outletting to existing wetlands and watercourses.

- Plan construction at proper time to avoid flooding.

A detailed erosion and sediment control plan will be prepared and submitted to the RVCA and the MOE as part of the permit applications which will be required for the construction of the Village of Richmond development. A technical memo will be submitted supporting a temporary drainage system, which will provide details of specific erosion and sediment control measures as well as a monitoring program.

9.0 CONCLUSION AND RECOMMENDATIONS

A summary of the Functional Servicing and Stormwater Management Report for the Caivan Village of Richmond development are as follows:

- The City of Ottawa has been pre-consulted regarding this submission. Approvals will be required from the City of Ottawa, Ministry of the Environment and Rideau Valley Conservation Authority.
- Water servicing is provided via a communal well system complete with groundwater wells, an at-grade storage reservoir and high-lift pump station with disinfection / treatment as required. The communal well system provides water to a distribution network of watermains, which will be designed as per City of Ottawa guidelines.
- Sanitary sewers are designed as per the City of Ottawa guidelines. Sanitary sewers will outlet to a trunk sewer on Martin Street then continue on Cockburn Street to the Richmond Pump Station which discharges to the Glen Cairn Trunk Sewer (just south of Hazeldean / Robertson Road) via a 500mm diameter forcemain along Eagleson Road. Upgrades to the existing pump station and local gravity sewers, repairs to the existing 500mm trunk, and construction of 3km of a new 600mm trunk will be required for development to proceed.
- There is a deviation from City of Ottawa guidelines, where sanitary HGL protection is not provided at the existing pump station for existing or proposed development.
- Storm sewers are designed as per the City of Ottawa guidelines and outlet to a proposed stormwater management pond for quality and quantity control treatment. The stormwater management pond is situated inside the 100-year regulatory floodplain. A small portion of development is tributary to a dry pond which provides quantity control, combined with a hydrodynamic separator to provide quality control.
- Based on the volume of fill required, geotechnical grade raise restrictions and existing Village of Richmond grades, the site grading will be designed using sump pumps to drain the weeping tile surrounding the house in the proposed residential units.

- Preliminary geotechnical analysis indicates that he site is subject to 2.0m grade raise restriction. The geotechnical engineer will provide recommendations at the detailed design stage of the development.
- Erosion and sediment control measures will be implemented and maintained throughout construction.

The functional servicing and stormwater management design of the Caivan Village of Richmond development has been completed in general conformance with the City of Ottawa Design Guidelines and criteria presented in other background study documents.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Jennifer Ailey, P.Eng.

LICENSED PROFESSIONAL ENGINEER
J. AILEY
100079299
2011.07.25
PROVINCE OF ONTARIO

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Stephen J. Pichette, P.Eng.

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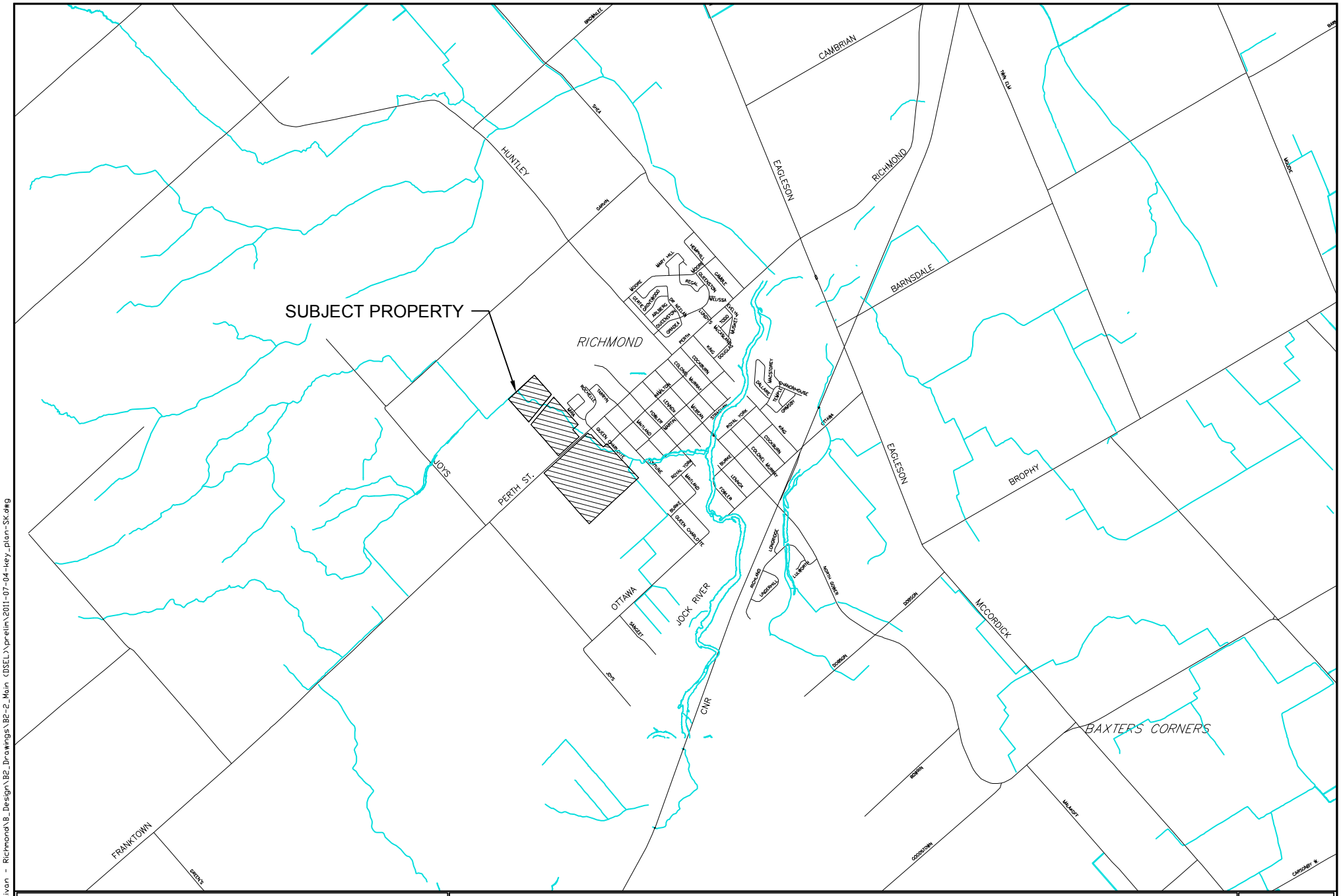

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CAIVAN - RICHMOND
KEY PLAN

CITY OF OTTAWA

DATE:	July 2011
SCALE:	N.T.S.
PROJECT No.:	11 - 468
FIGURE	1

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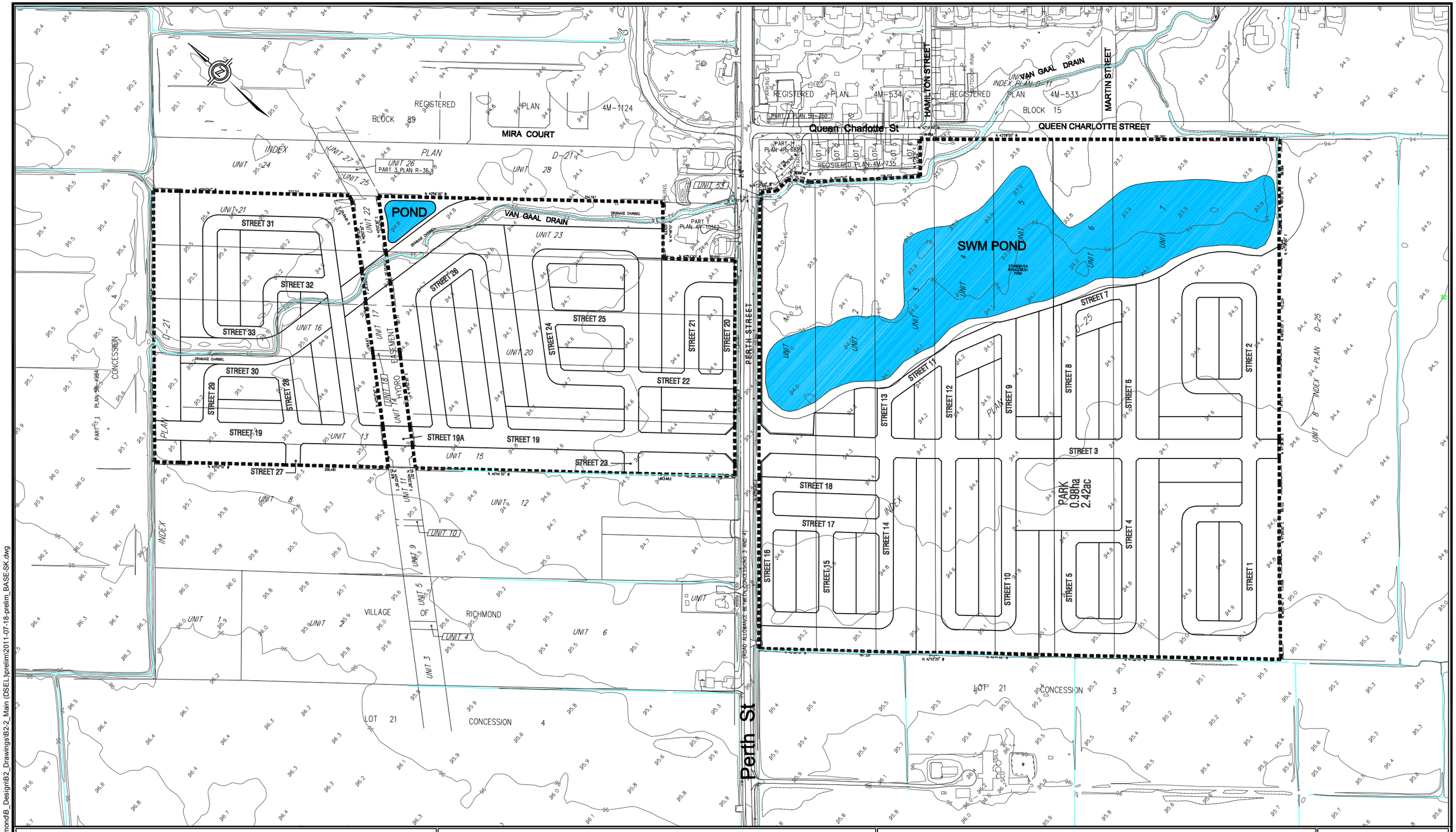

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Legend :

CAIVAN - RICHMOND SUBDIVISION PLAN

CITY OF OTTAWA

DATE:	July 2011
SCALE:	1:4000
PROJECT No.:	11-468
FIGURE	2

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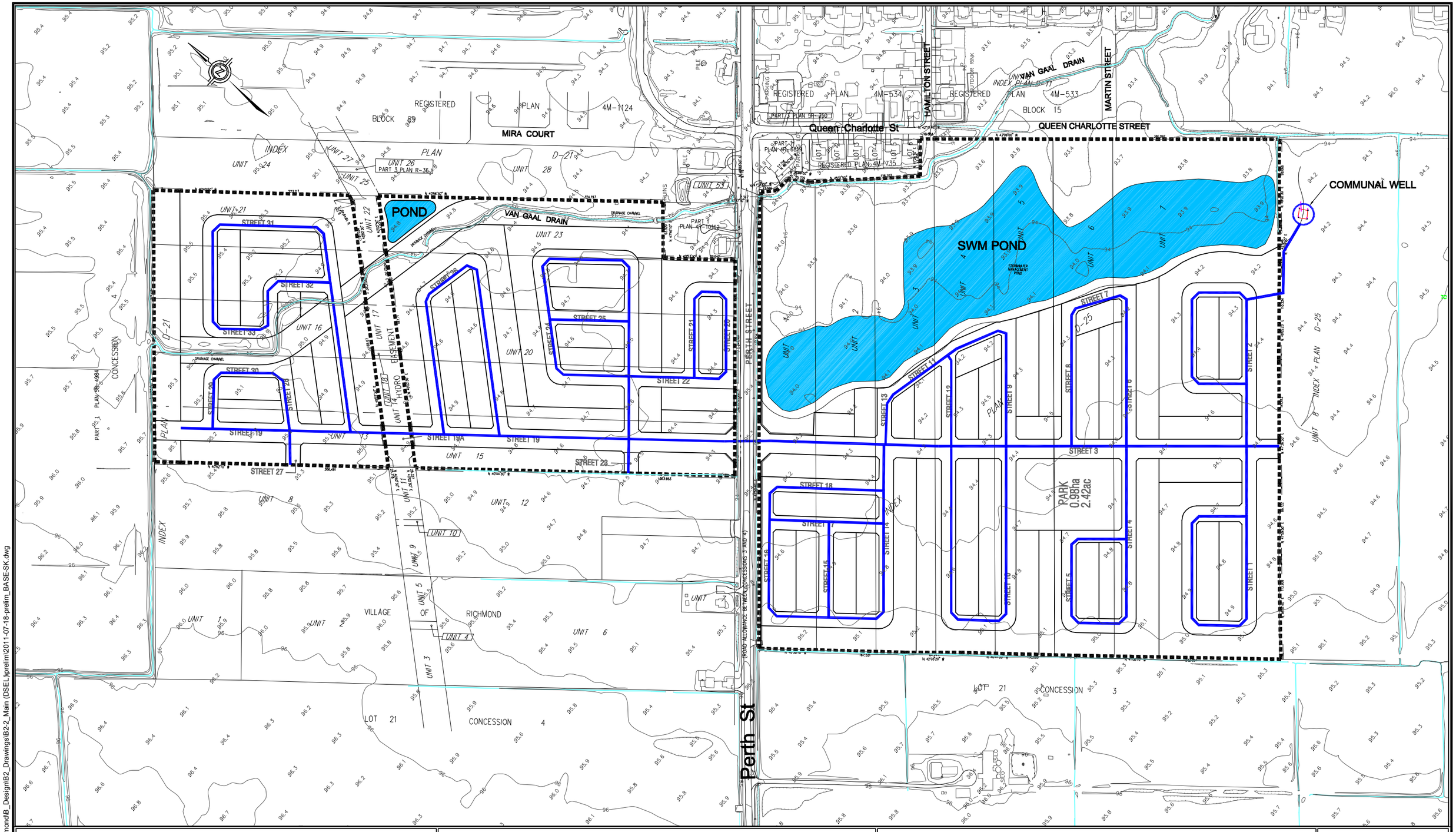

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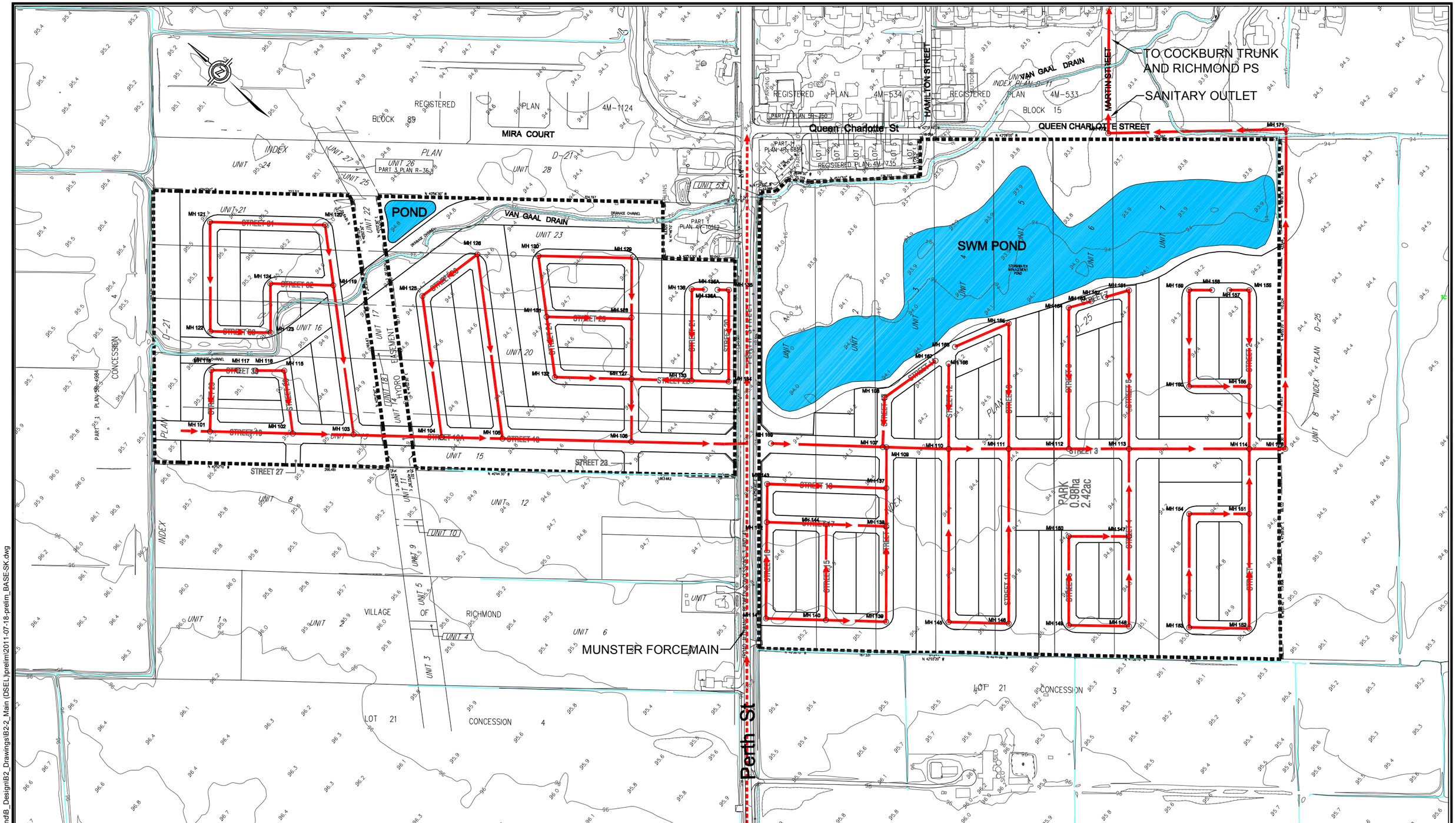
Legend :

PROPOSED WATERMAIN

CAIVAN - RICHMOND
PRELIMINARY WATER SERVICING
CITY OF OTTAWA

DATE:	July 2011
SCALE:	1:4000
PROJECT No.:	11-468
FIGURE	3

Z:\Projects\11-468 Caivan - Richmond\B_Design\B2_Drawings\B2-2_Main (DSEL)\prelim\2011-07-18-prelim_BASE-SK.dwg



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Legend :

EXISTING SANITARY FORCEMAIN

PROPOSED SANITARY

CAIVAN - RICHMOND
PRELIMINARY SANITARY SERVICING
CITY OF OTTAWA

DATE:	July 2011
SCALE:	1:4000
PROJECT No.:	11-468
FIGURE	4

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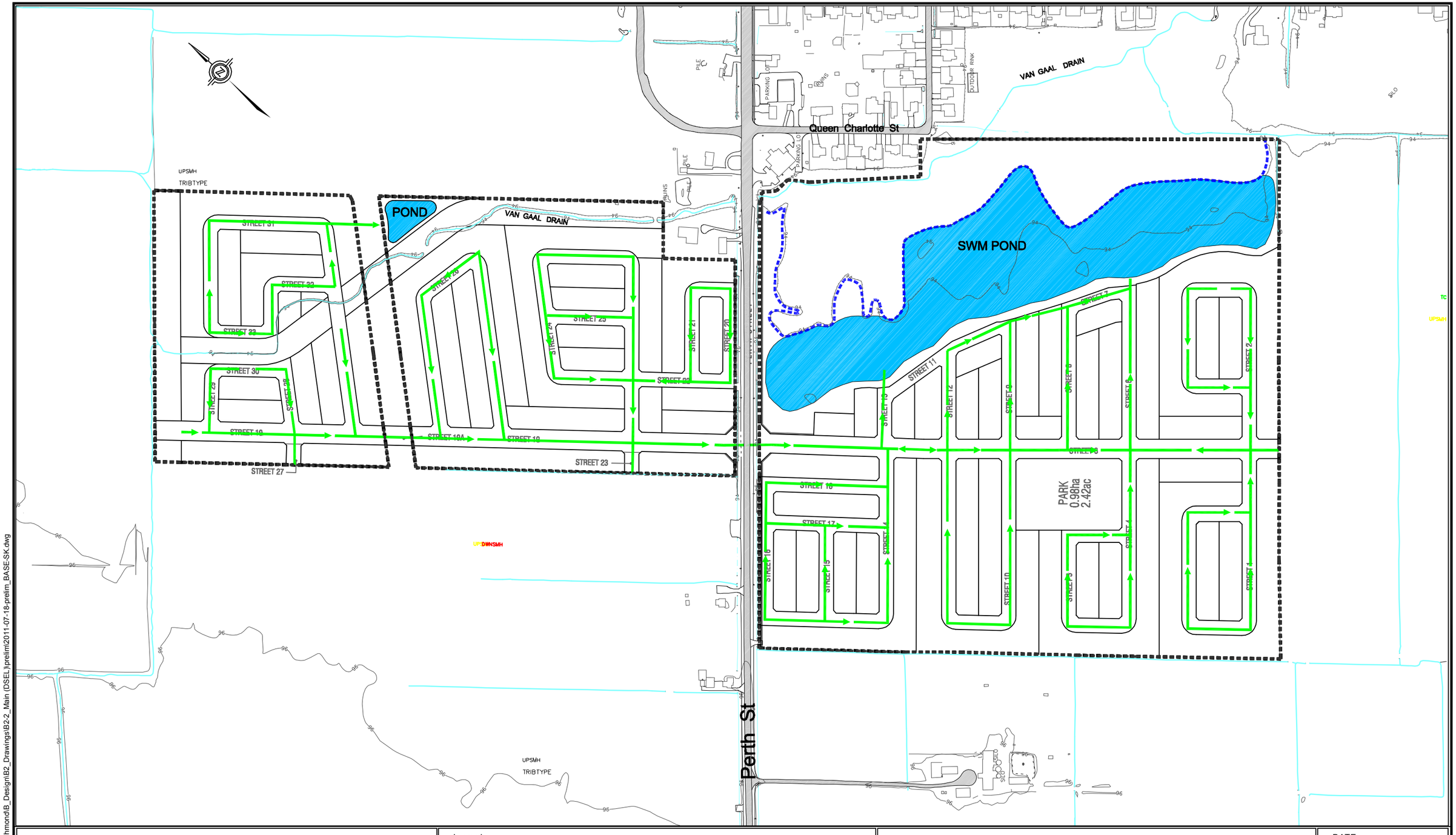

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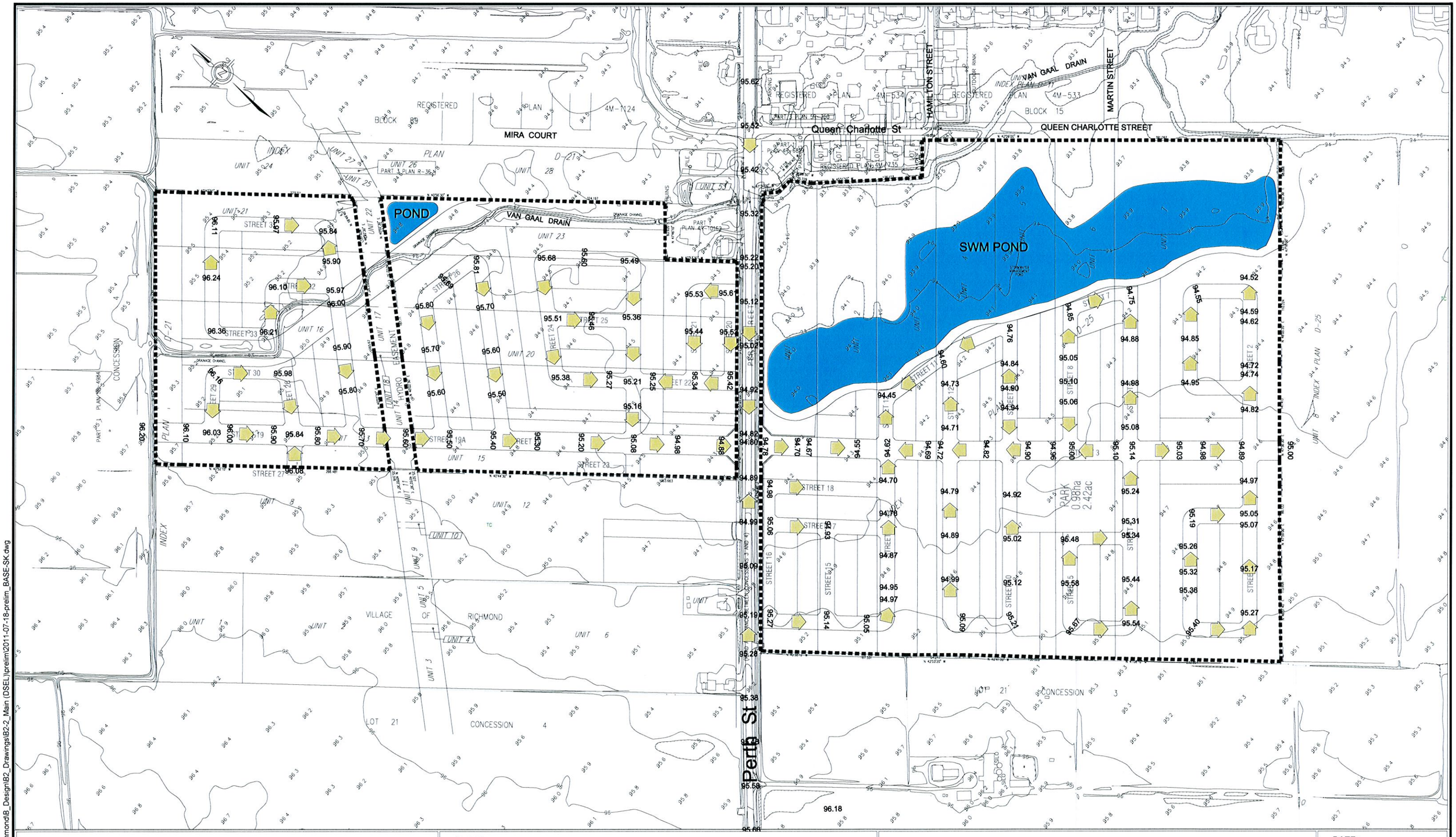
Legend :

PROPOSED STORM

CAIVAN - RICHMOND
PRELIMINARY STORM SERVICING
CITY OF OTTAWA

DATE:	July 2011
SCALE:	1:4000
PROJECT No.:	11-468
FIGURE	5

Z:\Projects\11-468 Caivan - Richmond\B_Design\B2_Drawings\B2-2_Main (DSEL)\prelim\2011-07-18-prelim_BASE-SK.dwg



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Legend :

95.14 PROPOSED CL OF ROAD GRADE

OVERLAND FLOW DIRECTION

CAIVAN - RICHMOND
PRELIMINARY GRADING PLAN
CITY OF OTTAWA

DATE: July 2011
SCALE: 1:4000
PROJECT No.: 11-468
FIGURE 6

Z:\Projects\11-468 Caivan - Richmond\B_Design\B2_Drawings\B2-2_Main (DSEL)\prelim\2011-07-18-prelim_BASE-SK.dwg

APPENDIX A

PRE-APPLICATION CONSULTATION MEETING MINUTES

Village of Richmond – Caivan Communities
Zoning Amendment and Plan of Subdivision

Meeting Minutes – Pre-Application Consultation
May 17, 2011 **2:00 - 3:15 p.m.**
City Hall, PGM 4103E

Attendees	Company	Initials
Frank Cairo	Caivan	FC
Natalie Hughes	FoTenn	NH
Sarah Millar Martin	FoTenn	SMM
Cheryl McWilliams	City of Ottawa	CM
Danny Page	City of Ottawa	DP
Don Morse	City of Ottawa	DM
Amira Shehata	City of Ottawa	AS
Kevin Hall	City of Ottawa	KH
Matthew Hailey	City of Ottawa	MH
Jocelyn Chandler	RVCA	JC

Apologies
Nil

Purpose of Meeting: Participate in a formal pre-consultation meeting with City staff in order to discuss the proposed development, review technical considerations and identify/confirm studies required to accompany the submission of both a Plan of Subdivision and Zoning Amendment application for residential development on Caivan's 130 acre land parcel, located on the western edge of the Village of Richmond.

ITEM	ACTION	For	Date
1.0	**Project Overview**		
1.1	FC provided Caivan Communities company overview.	Note	
1.2	FC introduced the property and Caivan's vision for a future residential community in Richmond: • 130 acres of land on western edge of village; • Western boundary of property is the existing village boundary; • Sanitary connections/most of the Storm Water Management Ponds and the Communal Well all outlet through this property. Should be considered the servicing hub of the western development lands; • A great deal of comprehensive work has been completed to date on this property in the context of the overall Richmond Community Design Plan (CDP) and Official Plan	Note	

	Amendment submitted by Mattamy Homes in 2009 - this work will help to inform the development of the community, along with the studies identified for submission; • Concept Plan still being finalized but will be very similar in land use to the Village of Richmond Community Design Plan (CDP) - Demonstration Plan; and • Densities fall within the densities permitted in the CDP.		
1.3	FC clarified that the southern property limit is shown incorrectly on the Demonstration Plan distributed. The boundary sits a block north of the east –west hedgerow, which bisects the property.	Note	
1.4	DM queried whether coordination with Mattamy would be occurring to achieve the overall density targets outlined in the CDP? *Response: FC confirmed the land ownership for the western development lands – Caivan 130 Acres; Mattamy 200 Acres (immediately south of Caivan lands); balance owned by smaller landholders). Mattamy have not confirmed a timeline for development. This will make it difficult to coordinate on densities. FC reaffirmed that Caivan product mix would be comparable to what is envisaged in the CDP.*	Note	
1.5	DM noted CDP outlines two (2) - seven (7) % of product type must be larger lot sizes – for the overall CDP area. Caivan will review and consider.	Note	
1.6	NH indicated that the zoning will be generally consistent with/reflective of the land uses shown on the demonstration plan and the density ranges established in the CDP. • Areas where Single Family dwellings are encouraged will be zoned to allow predominantly singles. • Areas where Townhouse and Back to Back product are shown will be zoned to allow predominantly multiple attached dwellings.	Note	
1.7	FC indicated that Caivan will be engaging the services of an architect to review streetscape and product design. NH added that the planning rationale prepared by FoTenn will speak directly to the application's ability to meet the intent of the CDP.	Note	
1.8	DP asked whether Caivan's involvement in the project would be as developer or also as builder. *Response: FC confirmed Caivan would act as both a builder and developer, but the plan will allow the opportunity for multiple builders to construct product on serviced lots.*	Note	

2.0	Technical Issues	For	Date
2.1.0	**1. Sump Pump Approval/Sanitary Hydraulic Grade Line**		
2.1.1	FC confirmed Caivan will be proposing sump pumps as a required servicing solution.	Note	
2.1.2	FC commented that the proposed development cannot meet certain Sanitary design requirement for Urban Areas (sanitary Hydraulic Grade Line), but can achieve consistency with the level of service provided for the existing Village. This is a factor of development in Richmond and the submission will speak to a proposed servicing alternative that addresses constraints created by existing infrastructure in the Village.	Note	
2.1.3	DP asked whether any current monitoring of the site's water table has been conducted. *Response: FC confirmed that there is active monitoring underway. The wet Spring will yield worst case results; these will be tempered with historical pattern of ground water levels throughout Richmond and included in the application submission information.*	FC	
2.2.0	**2. Floodplain Resolution North of Perth Street**		
2.2.1	In principle, there is approval from the RVCA to revise the floodplain zoning overlay via one of the following options: 1. Use fill to raise the site above the flood line elevation; or 2. Make alterations to the existing drainage channel in order to lower/narrow the floodplain elevations.	Note	
2.2.2	FC noted that a discussion is scheduled this week with the RVCA to work through the options available to complete the work. The ultimate solution will require input from the RVCA.	Note	
2.2.3	JC confirmed that although the RVCA has agreed to floodplain amendments, floodplain mapping in the Zoning By-law cannot revised until the construction work or floodplain mitigation measures have been completed.	Note	
2.2.4	DP asked what earthworks will be undertaken first. *Response: FC confirmed pre-loading is not required for servicing with the use of sump pumps. Caivan is considering the required alterations to modify the floodplain zoning via Option #2 identified (Refer 2.2.1) on the basis that it would satisfy the requirements for floodplain mapping amendment in the Zoning By-law and allow for the delay in other bulk site earthworks until a later point in time. RVCA support is required to proceed on this basis. Construction timing and method will ultimately depend on RVCA support.*	FC	

	JC added that alterations to the drainage channel could result in the creation of a HADD. JC noted that RVCA has agreed to conditioning HADD compensation (at Draft Plan Approval) in the past, but any constructed compensation works would need to be completed prior to registration.		
2.2.5	CM noted that before Plan Registration and Zoning Amendment could be approved, the City would require RVCA clearance in principle for the floodplain amendment. JC questioned whether RVCA could give clearance for Draft Plan Approval without construction work for the revised floodplain being complete. Consistency with the PPS is mandatory. Ultimately depends on the agreed-upon solution on how the required earthworks are undertaken. NH suggested if the timing necessitates, it would be possible to re-zone the underlying lands (under the floodplain overlay) in order to allow the Zoning By-law Amendment to proceed prior to the resolution of the floodplain mapping. In other words, the Zoning Amendment would not be delayed by the onsite works and mapping required to amend the flood plain. DP commented that the City generally prefers not to give Zoning or Draft Plan approval for residential uses that are located within an existing floodplain. He suggested that the preferred order of events would be to complete the necessary works (resulting in Floodplain mapping resolution), and then proceed to Draft Plan Approval; Zoning Amendment and ultimately Registration.	Note	
2.3.0	**3. Storm Water Pond (SWP) South of Perth Street**		
2.3.1	All agree that the storm water solution for this site will need to be unique. DP suggested that the water table levels in the Village of Richmond are atypical, and that a unique solution to stormwater management may be appropriate, but that further discussion is required.	Note	
2.3.2	FC explained that the proposed SWM pond will be located between the constant 100 year flood line and the 100 year spring melt line.	Note	

2.3.3	DM raised the councillor's concern about the storm water pond and if it would be advanced through an Environmental Assessment (EA) process. *Response – FC confirmed the EA process would integrated with the Plan of Subdivision application process. FC explained that a separate EA process independent from the Draft Plan would not be required.*	Note	
2.3.4	KH questioned why there needed to be an EA requirement for the SWP? *Response: FC noted that during the CDP process there was public concern that the CDP would be the last opportunity for the public to comment on the location and construction of the pond. An appeal of the Draft Plan of Subdivision is the next opportunity for the public to appeal the proposed SWM solution. –* *DP added that the PPS policy stipulates that an Environmental Assessment is required when infrastructure is proposed in a floodplain.*	Note	
2.3.5	DM suggested that both DP and KH speak with Roman Diduct's group on this matter. Both agreed.	DP/KH	
2.3.6	DP questioned whether an additional public meeting would be required as part of the combined EA DPA process. *Response: CM didn't think that would be necessary.*	Note	
2.3.7	FC noted the planning rationale submitted in support of the application will outline the proposed EA strategy for the SWM solution proposed.	Note	
2.4.0	**4. Infrastructure Finance Plan Approval/DC By-Law Amendment**		
2.4.1	DP provided an update on the status: • Advised that the DC By-Law needs to be amended, with consideration to whether or not to proceed with an Overall Rural DC charge or an Area Specific DC charge. • A lot of work has been undertaken by the City to work through these options and consider Benefit to Existing and associated calculations. • It may take up to six (6) months for the revised DC By-law to be in full force and effect.	DP	

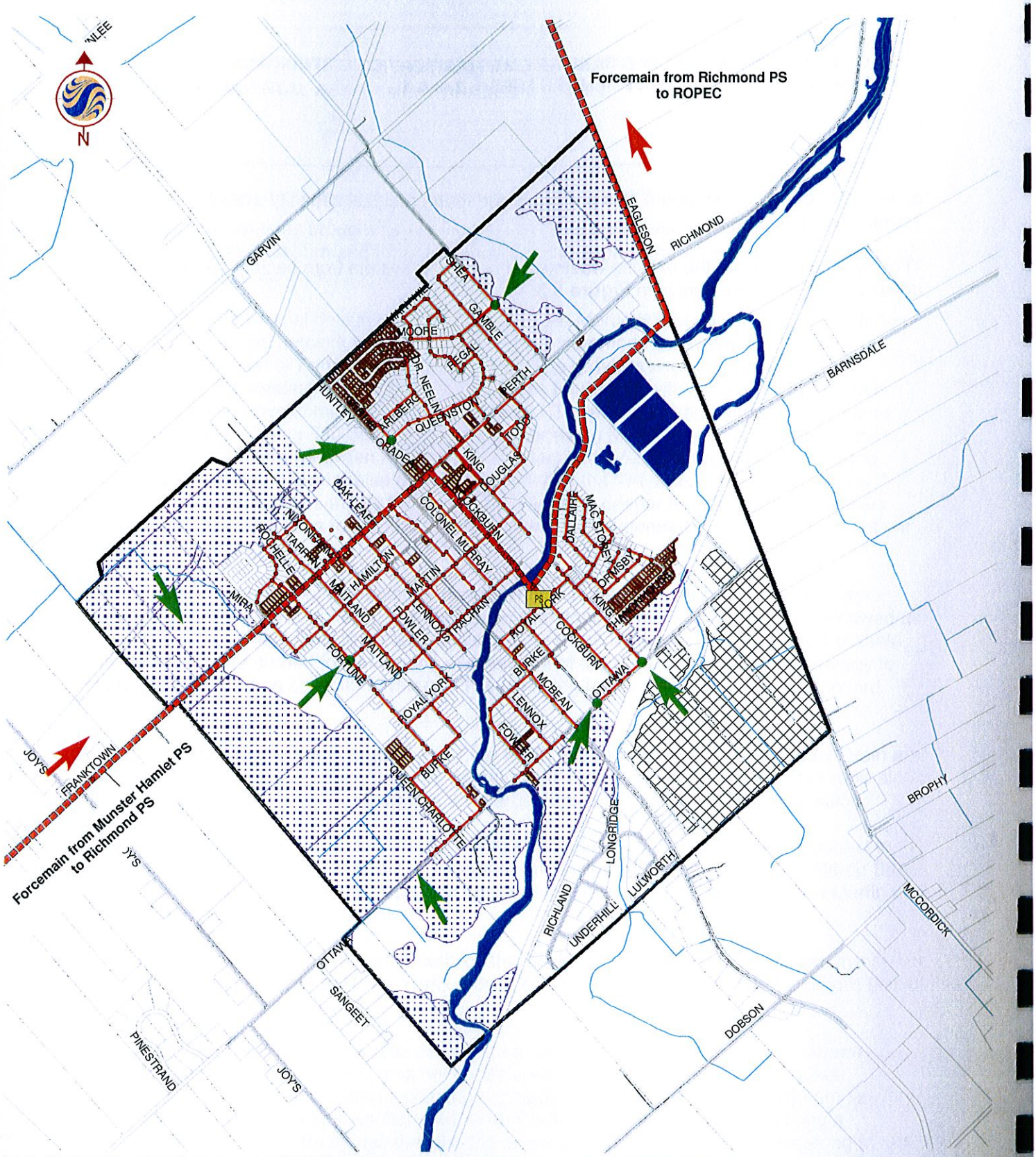
3.0	Project Timeline	For	Date
3.1	FC provided a desired timeline for achieving Draft Plan Approval: • City Pre-consultation • Councillor Pre-Consultation • Draft Plan Submission • Application Deemed complete • Statutory Public Meeting • **Delegated Authority Report (Draft Plan approval)**	City Caivan FoTenn City City **City**	May 17 May 18 Jun /11 July 15 Oct/11 **Dec/11**
3.2	FC confirmed construction schedule will be phased. • 75-100 units/year over. • Target Plan Registration of one (1) phase per year. • First Plan Registration target 1st July 2013.	Note	
3.3	CM asked for clarification on the land parcels making up the property. *Response: FC confirmed the property was divided into two (2) parcels with two ownerships, Richmond Village South Ltd. & Richmond Village North Ltd. (bisected by Perth Street). The draft plan submitted for approval will be for the whole property (both ownerships.)*	FC	
4.0	**Technical Studies**	**For**	**Date**
4.1	List of studies that will be submitted with both the Subdivision and Zoning Amendment applications was provided by Caivan to the City for review and comment.	Note	
4.2	FC reviewed list of studies provided and asked for comments from City staff. In summary the reports proposed for submission include: • Planning Rationale • Site Servicing Study • Storm Water Management Plan • Wellhead Protection Study • Transportation Impact Study – extension of TMP from CDP • Tree Conservation Report • Geotechnical Memo – informed by Jacques Whitford report for CDP CM noted that she would review the list next week and respond with any questions or additional information required.	CM	May 27
4.3	NH noted that in the list of studies provided by Caivan, it is proposed that some of the studies will rely on high level studies already completed during the CDP and OPA processes (e.g. TMP, MSS, etc), and will be in the form of a letter reports that document and build-on the earlier findings to provide site specific	Note	

	recommendations for the Caivan development.		
4.4	MH recommended the environmental consultant check the site for presence of Bobolink and/or Eastern Meadowlark habitat and species immediately given the Spring season. Bobolink was listed as an endangered species in Dec 2010, and the Eastern Meadowlark is anticipated to be listed in the near future. FC to advise Kilgour & Associates.	FC	
4.5	KH asked whether a Hydrology Report had been completed as part of the CDP process for the communal well being proposed. *Response: FC/NH confirmed it was completed as part of the CDP process.*	Note	
4.6	CM advised that the Wellhead Protection Plan should discuss both the existing well and the proposed well. FC to advise Golder. DP added that the Wellhead Protection Plan will also need to assess any residential setback requirements.	FC	
4.7	DM asked if there was a requirement to report to Planning Committee on the Stormwater Management Plan and pond location. He noted Darlene Conway felt the stormwater pond should be addressed prior to subdivision and zoning approval. *Response: FC noted that he is set to meet with the Councillor to review the development proposal, and would discuss this matter with him directly.* *DP noted that in a standard subdivision and zoning application process, the first visit to council would be through the zoning amendment as the subdivision can be approved by delegated authority. DP indicated that the Draft Plan of Subdivision approval is the trigger for the City to review and approve the sump pumps and SWM pond location.*	DP/FC	
4.8	KH commented that the City's Operations dept has concerns with rear lanes. If they are proposed, Caivan's architects should pay close attention to the city design guidelines for these road patterns. A meeting in advance of the submission would be a good idea. DM noted rear lanes can be considered, so long as design guidelines are met.	Note	
4.9	JC queried whether the Van Gaal drain had municipal status? *Response: FC confirmed that the Van Gaal Drain has no status north of Perth Street. There was a petition put forward to give the*	Note	

	northern section of the drain status at one point, but that petition is in the process of being removed.		
4.10	JC confirmed that RVCA approval will be required for all storm outlets.	Note	
4.11	FC clarified that the floodplain amendment is only required north of Perth St.	Note	
4.12	CM noted that there will need to be one report that deals with both the technical and policy aspects of the storm water pond as part of the submission. FC/NH/SMM to review.	FC/NH/ SMM	
4.13	CM commented that the Source Water Protection Policy is still not in place – Caivan should keep this in mind during the approvals process, Caivan's subdivision may act as a test case.	Note	
5.0	**Next Steps**		
5.1	NH discussed the idea of a regular meeting schedule following application to provide a forum to work through any concerns that arise during technical circulation to be resolved quickly and requested CM's support of the idea. CM confirmed that the City would always be open to meetings as required, but couldn't guarantee once a month. Certainly upon request when the need arises.	Note	

APPENDIX B

MSS FIGURE 5.3 – CONNECTION LOCATIONS
SANITARY DRAINAGE AREA PLANS
SANITARY DESIGN SHEETS



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Legend

- PS — WWPS
- Future Dev. Loadings
- Sanitary MH
- Sanitary Collector
- Sanitary Forcemain
- Village of Richmond Boundary
- Future Residential Development
- Future Infill Development
- Future Industrial Development

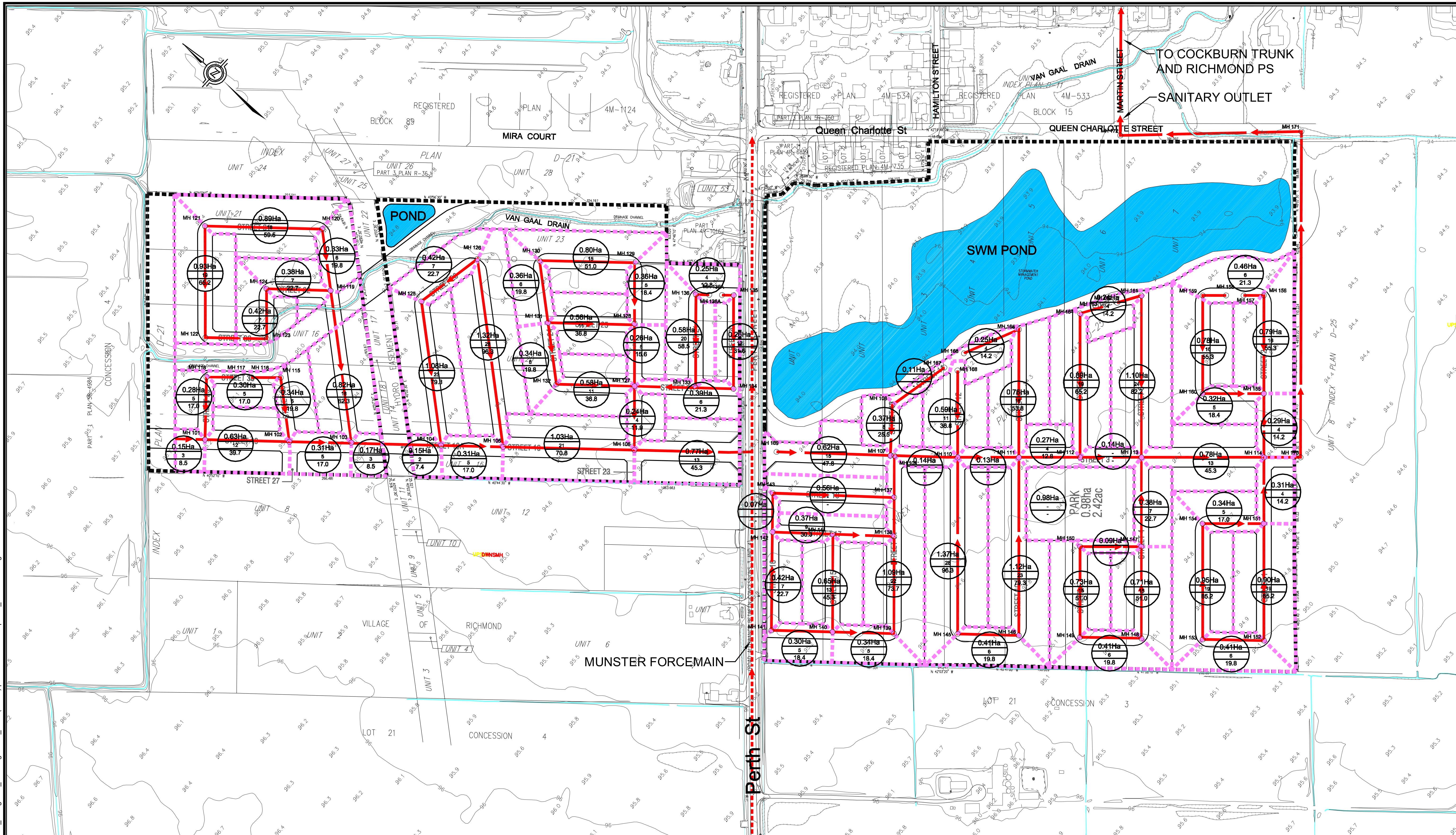
Stantec

Client/Project
CITY OF OTTAWA
VILLAGE OF RICHMOND
SANITARY MASTER SERVICING STUDY

Figure No.
5.3

Title **Connection Locations to the Central Collection System**

January 2009



Z:\Projects\11-468 Caivan - Richmond\B_Design\B2_Drawings\B2-2_Main (DSEL)\prelim\2011-07-18-prelim_BASE-SK.dwg

DSEL
david schaeffer engineering ltd

120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

Legend :

- EXISTING SANITARY FORCEMAIN
- PROPOSED SANITARY
- SANITARY DRAINAGE AREA

2.82Ha / 60 / 170 / MH 236A / Residential — DRANAGE AREA IN HECTARES, NUMBER OF UNITS, POPULATION

CAIVAN - RICHMOND
PRELIMINARY SANITARY DRAINAGE PLAN
CITY OF OTTAWA

DATE:	July 2011
SCALE:	1:4000
PROJECT No.:	11-468
FIGURE	SAN

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION				RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET		FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
		1	2	0.89	18	0	61	0.89	61	4.00	0.99	0.89	0.89	0.249	1.24	120.0	200	0.34	19.12	0.61	0.32
		2	6	0.33	6	0	20	1.22	81	4.00	1.31	0.33	1.22	0.342	1.65	65.0	200	0.34	19.12	0.61	0.35
								1.22	81												
		1	3	0.93	19	0	65	0.93	65	4.00	1.05	0.93	0.93	0.260	1.31	115.0	200	0.34	19.12	0.61	0.32
		3	4	0.00	0	0	0	0.93	65	4.00	1.05	0.00	0.93	0.260	1.31	60.0	200	0.34	19.12	0.61	0.32
		4	5	0.42	7	0	24	1.35	89	4.00	1.44	0.42	1.35	0.378	1.82	50.0	200	0.34	19.12	0.61	0.35
		5	6	0.38	7	0	24	2.99	185	2.00	1.50	0.38	2.99	0.837	2.34	65.0	200	0.34	19.12	0.61	0.40
								2.99	185												
		6	12	0.82	18	0	61	0.82	61	4.00	0.99	0.82	0.82	0.230	1.22	170.0	200	0.34	19.12	0.61	0.32
								0.82	61												
		9	10	0.15	3	0	10	0.15	10	4.00	0.16	0.15	0.15	0.042	0.20	35.0	200	0.34	19.12	0.61	0.00
								0.15	10												
		7	10	0.28	5	0	17	0.28	17	4.00	0.28	0.28	0.28	0.078	0.36	65.0	200	0.34	19.12	0.61	0.00
								0.28	17												
		10	11	0.63	12	0	41	1.06	68	4.00	1.10	0.63	1.06	0.297	1.40	95.0	200	0.34	19.12	0.61	0.32
								1.06	68												
		8	11	0.34	6	0	20	0.34	20	4.00	0.32	0.34	0.34	0.095	0.42	70.0	200	0.34	19.12	0.61	0.24
								0.34	20												
		11	12	0.31	5	0	17	1.71	105	4.00	1.70	0.31	1.71	0.479	2.18	70.0	200	0.34	19.12	0.61	0.38
								1.71	105												
		12	13	0.47	8	0	27	3.00	193	4.00	3.13	0.47	3.00	0.840	3.97	100.0	200	0.34	19.12	0.61	0.46
								3.00	193												

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	350	al Peak Factor =	as per MOE Graph
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed:	J.A.	Project:	CAIVAN - VILLAGE OF RICHMOND
Checked:	J.A.	Location:	City of Ottawa
Drawing Reference:	Sanitary Drainage Plan	File: 11-468	Date: 18-Jul-11 / Sheet No. 1 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	15	14	0.42	7	0	24	0.42	24	4.00	0.39	0.42	0.42	0.118	0.51	70.0	200	0.34	19.12	0.61	0.24
	14	13	1.08	23	0	78	1.50	102	4.00	1.65	1.08	1.50	0.420	2.07	160.0	200	0.34	19.12	0.61	0.38
							1.50	102												
	13	16	0.31	5	0	17	4.81	136	4.00	2.20	0.31	4.81	1.347	3.55	70.0	200	0.34	19.12	0.61	0.45
							4.81	136												
	15	16	1.32	28	0	95	1.32	95	4.00	1.54	1.32	1.32	0.370	1.91	200.0	200	0.34	19.12	0.61	0.35
							1.32	95												
	16	17	1.03	21	0	71	7.16	302	4.00	4.89	1.03	7.16	2.005	6.90	145.0	200	0.34	19.12	0.61	0.56
							7.16	302												
	18	27	0.36	6	0	20	0.36	20	4.00	0.32	0.36	0.36	0.101	0.42	65.0	200	0.34	19.12	0.61	0.24
	27	19	0.34	6	0	20	0.70	40	4.00	0.65	0.34	0.70	0.196	0.85	65.0	200	0.34	19.12	0.61	0.29
	19	21	0.58	11	0	37	1.28	77	4.00	1.25	0.58	1.28	0.358	1.61	85.0	200	0.34	19.12	0.61	0.35
							1.28	77												
	18	20	0.80	15	0	51	0.80	51	4.00	0.83	0.80	0.80	0.224	1.05	95.0	200	0.34	19.12	0.61	0.29
	20	28	0.36	5	0	17	1.16	68	4.00	1.10	0.36	1.16	0.325	1.43	65.0	200	0.34	19.12	0.61	0.32
							1.16	68												
	27	28	0.56	11	0	37	0.56	37	4.00	0.60	0.56	0.56	0.157	0.76	95.0	200	0.34	19.12	0.61	0.24
							0.56	37												
	28	21	0.26	5	0	17	1.98	122	4.00	1.98	0.26	1.98	0.554	2.53	65.0	200	0.34	19.12	0.61	0.40
							1.98	122												
	23	22	0.25	4	0	14	0.25	14	4.00	0.23	0.25	0.25	0.070	0.30	35.0	200	0.34	19.12	0.61	0.00
	22	25	0.58	20	0	68	0.83	82	4.00	1.33	0.58	0.83	0.232	1.56	100.0	200	0.34	19.12	0.61	0.35
							0.83	82												

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	350	al Peak Factor =	as per MOE Graph
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed: J.A.

Checked: J.A.

Drawing Reference: Sanitary Drainage Plan

Project: **CAIVAN - VILLAGE OF RICHMOND**

Location: **City of Ottawa**

File: 11-468

Date: 18-Jul-11

Sheet No. 2 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	23	24	0.26	12	0	41	0.26	41	4.00	0.66	0.26	0.26	0.073	0.73	100.0	200	0.34	19.12	0.61	0.24
	24	25	0.39	6	0	20	0.65	61	4.00	0.99	0.39	0.65	0.182	1.17	40.0	200	0.34	19.12	0.61	0.32
							0.65	61												
	25	21	0.00	0	0	0	1.48	144	4.00	2.33	0.00	1.48	0.414	2.74	70.0	200	0.34	19.12	0.61	0.42
							1.48	144												
	21	17	0.24	4	0	14	3.70	280	4.00	4.54	0.24	3.70	1.036	5.58	70.0	200	0.34	19.12	0.61	0.52
							3.70	280												
	17	26	0.77	13	0	44	11.63	626	3.92	9.94	0.77	11.63	3.256	13.20	130.0	200	0.34	19.12	0.61	0.66
	26	27	0.62	15	0	51	12.25	677	3.90	10.70	0.62	12.25	3.430	14.13	155.0	200	0.34	19.12	0.61	0.67
							12.25	677												
	28	33	0.42	7	0	24	0.42	24	4.00	0.39	0.42	0.42	0.118	0.51	105.0	200	0.34	19.12	0.61	0.24
	33	34	0.07	0	0	0	0.49	24	4.00	0.39	0.07	0.49	0.137	0.53	45.0	200	0.34	19.12	0.61	0.24
	34	35	0.56	20	0	68	1.05	92	4.00	1.49	0.56	1.05	0.294	1.78	130.0	200	0.34	19.12	0.61	0.35
							1.05	92												
	28	29	0.30	5	0	17	0.30	17	4.00	0.28	0.30	0.30	0.084	0.36	65.0	200	0.34	19.12	0.61	0.00
	29	30	0.34	5	0	17	0.64	34	4.00	0.55	0.34	0.64	0.179	0.73	65.0	200	0.34	19.12	0.61	0.24
	30	31	1.09	22	0	75	1.73	109	4.00	1.77	1.09	1.73	0.484	2.25	105.0	200	0.34	19.12	0.61	0.38
							1.73	109												
	29	32	0.65	13	0	44	0.65	44	4.00	0.71	0.65	0.65	0.182	0.89	105.0	200	0.34	19.12	0.61	0.29
							0.65	44												
	33	32	0.37	9	0	31	0.37	31	4.00	0.50	0.37	0.37	0.104	0.60	65.0	200	0.34	19.12	0.61	0.24
							0.37	31												

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	350	al Peak Factor = as per MOE Graph	
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed:	J.A.	Project: CAIVAN - VILLAGE OF RICHMOND	
Checked:	J.A.	Location: City of Ottawa	
Drawing Reference: Sanitary Drainage Plan		File: 11-468	Date: 18-Jul-11	Sheet No. 3 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	32	31	0.00	0	0	0	1.02	75	4.00	1.22	0.00	1.02	0.286	1.51	65.0	200	0.34	19.12	0.61	0.32
							1.02	75												
	31	35	0.00	0	0	0	2.75	184	4.00	2.98	0.00	2.75	0.770	3.75	45.0	200	0.34	19.12	0.61	0.45
							2.75	184												
	35	27	0.00	0	0	0	3.80	276	4.00	4.47	0.00	3.80	1.064	5.53	50.0	200	0.34	19.12	0.61	0.52
							3.80	276												
	37	36	0.11	0	0	0	0.11	0			0.11	0.11	0.031	0.03	130.0	200	0.34	19.12	0.61	0.00
	36	27	0.37	8	0	27	0.48	27	4.00	0.44	0.37	0.48	0.134	0.57	55.0	200	0.34	19.12	0.61	0.24
							0.48	27												
	27	38	0.14	0	0	0	16.67	997	3.80	15.35	0.14	16.67	4.668	20.02	50.0	250	0.26	30.32	0.62	0.67
							16.67	997												
	39	37	0.25	4	0	14	0.25	14	4.00	0.23	0.25	0.25	0.070	0.30	75.0	200	0.34	19.12	0.61	0.00
	37	38	0.59	11	0	37	0.84	51	4.00	0.83	0.59	0.84	0.235	1.07	105.0	200	0.34	19.12	0.61	0.29
							0.84	51												
	41	38	1.37	28	0	95	1.37	95	4.00	1.54	1.37	1.37	0.384	1.92	190.0	200	0.34	19.12	0.61	0.38
							1.37	95												
	38	40	0.13	28	0	95	19.01	1238	3.74	18.76	0.13	19.01	5.323	24.08	75.0	250	0.26	30.32	0.62	0.69
							19.01	1238												
	39	40	0.76	16	0	54	0.76	54	4.00	0.88	0.76	0.76	0.213	1.09	135.0	200	0.34	19.12	0.61	0.29
							0.76	54												
	41	42	0.41	6	0	20	0.41	20	4.00	0.32	0.41	0.41	0.115	0.44	60.0	200	0.34	19.12	0.61	0.24
	42	40	1.12	23	0	78	1.53	98	4.00	1.59	1.12	1.53	0.428	2.02	190.0	200	0.34	19.12	0.61	0.38
							1.53	98												
	40	49	0.27	4	0	14	21.57	1412	3.70	21.16	0.27	21.57	6.040	27.20	70.0	300	0.20	43.25	0.61	0.65
							21.57	1412												
	48	47	0.24	4	0	14	0.24	14	4.00	0.23	0.24	0.24	0.067	0.30	65.0	200	0.34	19.12	0.61	0.00
	47	49	0.89	19	0	65	1.13	79	4.00	1.28	0.89	1.13	0.316	1.60	160.0	200	0.34	19.12	0.61	0.35
							1.13	79												

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	350	al Peak Factor =	as per MOE Graph
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed: J.A.

Checked: J.A.

Drawing Reference: Sanitary Drainage Plan

Project: **CAIVAN - VILLAGE OF RICHMOND**

Location: **City of Ottawa**

File: 11-468

Date: 18-Jul-11

Sheet No. 4 of 6

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	40	49	0.27	4	0	14	24.50	1614	3.66	23.93	0.27	24.50	6.860	30.79	70.0	300	0.20	43.25	0.61	0.66
							24.50	1614												
	49	50	0.14	0	0	0	47.34	3105	3.43	43.14	0.14	46.45	13.006	56.15	70.0	300	0.20	43.25	0.61	0.70
							47.34	3105												
	48	50	1.10	24	0	82	1.10	82	4.00	1.33	1.10	1.10	0.308	1.64	170.0	200	0.34	19.12	0.61	0.35
							1.10	82												
	43	44	0.41	6	0	20	0.41	20	4.00	0.32	0.41	0.41	0.115	0.44	65.0	200	0.34	19.12	0.61	0.24
	44	46	0.71	15	0	51	1.12	71	4.00	1.15	0.71	1.12	0.314	1.46	90.0	200	0.34	19.12	0.61	0.32
							1.12	71												
	43	45	0.41	15	0	51	0.41	51	4.00	0.83	0.41	0.41	0.115	0.95	65.0	200	0.34	19.12	0.61	0.29
	45	46	0.71	0	0	0	1.12	51	4.00	0.83	0.71	1.12	0.314	1.14	90.0	200	0.34	19.12	0.61	0.29
							1.12	51												
	46	50	0.38	7	0	24	2.62	146	4.00	2.37	0.38	2.62	0.734	3.10	100.0	200	0.34	19.12	0.61	0.44
							2.62	146												
	50	55	0.78	13	0	44	51.84	3377	3.40	46.51	0.78	50.95	14.266	60.78	135.0	300	0.20	43.25	0.61	0.70
							51.84	3377												
	51	53	0.78	16	0	54	0.78	54	4.00	0.88	0.78	0.78	0.218	1.10	100.0	200	0.34	19.12	0.61	0.29
	53	54	0.32	5	0	17	1.10	71	4.00	1.15	0.32	1.10	0.308	1.46	60.0	200	0.34	19.12	0.61	0.32
							1.10	71												
	51	52	0.46	16	0	54	0.46	54	4.00	0.88	0.46	0.46	0.129	1.01	60.0	200	0.34	19.12	0.61	0.29
	52	54	0.79	16	0	54	1.25	108	4.00	1.75	0.79	1.25	0.350	2.10	100.0	200	0.34	19.12	0.61	0.38
							1.25	108												
	54	55	0.29	4	0	14	2.64	193	4.00	3.13	0.29	2.64	0.739	3.87	70.0	200	0.34	19.12	0.61	0.46
							2.64	193												
	58	57	0.95	19	0	65	0.95	65	4.00	1.05	0.95	0.95	0.266	1.32	125.0	200	0.34	19.12	0.61	0.32
	57	56	0.34	5	0	17	1.29	82	4.00	1.33	0.34	1.29	0.361	1.69	65.0	200	0.34	19.12	0.61	0.35
							1.29	82												

DESIGN PARAMETERS

Average Daily Flow =	350	l/p/day	350	al Peak Factor = as per MOE Graph	
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed: J.A.	Project: CAIVAN - VILLAGE OF RICHMOND		
Checked: J.A.	Location: City of Ottawa		
Drawing Reference: Sanitary Drainage Plan	File: 11-468	Date: 18-Jul-11	Sheet No. 5 of 2

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

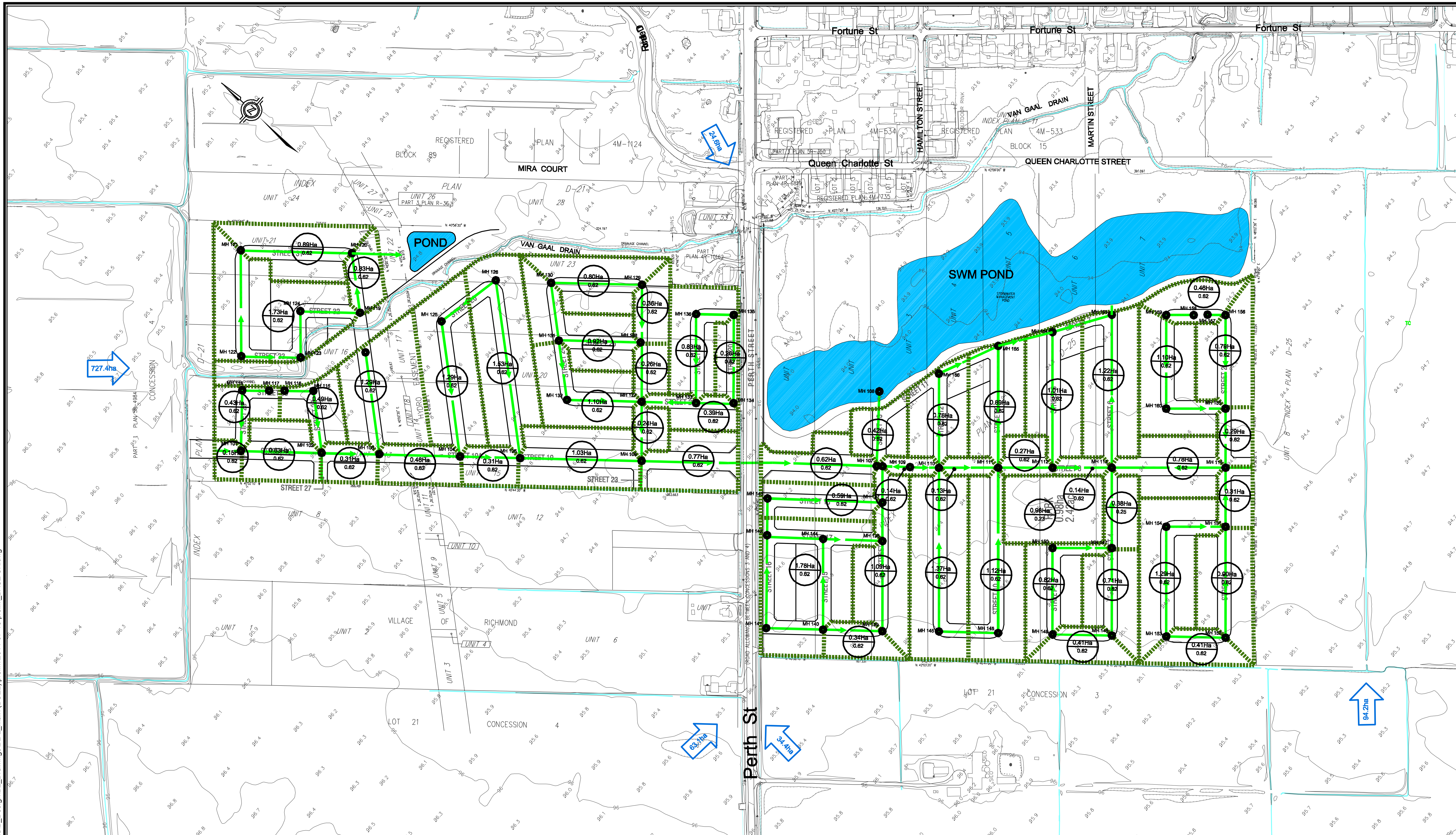
LOCATION				RESIDENTIAL AREA AND POPULATION								INFILTRATION				PIPE					
STREET		FROM M.H.	TO M.H.	AREA (ha)	UNITS Singles	UNITS Towns	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
		58	59	0.41	6	0	20	0.41	20	4.00	0.32	0.41	0.41	0.115	0.44	65.0	200	0.34	19.12	0.61	0.24
		59	56	0.90	19	0	65	1.31	85	4.00	1.38	0.90	1.31	0.367	1.75	125.0	200	0.34	19.12	0.61	0.35
								1.31	85												
		56	55	0.31	4	0	14	2.91	181	4.00	2.93	0.31	2.91	0.815	3.75	75.0	200	0.34	19.12	0.61	0.45
								2.91	181												
		55	60	0.00	0	0	0	57.39	3751	3.36	51.06	0.00	56.50	15.820	66.88	135.0	300	0.20	43.25	0.61	0.70
								57.39	3751												

DESIGN PARAMETERS					
Average Daily Flow =	350	l/p/day	350	al Peak Factor = as per MOE Graph	
Comm/Inst Flow =	50000	L/ha/da	50000	Infiltration Flow =	0.280
Industrial Flow =	35000	L/ha/da	35000	Minimum Velocity =	0.760
Max Res. Peak Factor =	4		4	Manning's n =	0.013
Commercial/Inst peak Fac	2		2	Townhouse coeff=	2.7
Institutional	1	l/s/Ha		Single house coeff=	3.4

Designed:	J.A.	Project:	CAIVAN - VILLAGE OF RICHMOND
Checked:	J.A.	Location:	City of Ottawa
Drawing Reference:	Sanitary Drainage Plan	File: 11-468	Date: 18-Jul-11 / Sheet No. 6 of 6

APPENDIX C

STORM DRAINAGE AREA PLANS
STORM DESIGN SHEETS



Z:\Projects\11-468 Caivan - Richmond\B_Design\B2_Drawings\B2-2_Main (DSEL)\prelim\2011-07-18-prelim_BASE-SK.dwg

120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
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Legend :

- PROPOSED STORM
- STORM DRAINAGE AREA
- 1.73Ha / 0.62 — DRAINAGE AREA IN HECTARES / RUN-OFF COEFFICIENT

CAIVAN - RICHMOND
PRELIMINARY STORM DRAINAGE PLAN
CITY OF OTTAWA

DATE: July 2011

SCALE: 1:4000

PROJECT No.: 11-468

FIGURE STM

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning 0.013 Return Frequency = 5 years

	LOCATION		AREA (Ha)				FLOW					SEWER DATA								
Location	From Node	To Node	R= 0.2	R= 0.5	R= 0.62	R= 0.9	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min.)	RATIO Q/Q full
	117	102			1.21		2.09	2.09	15.00	83.56	174	525	525	CONC	0.20	200.0	192	0.89	3.75	0.91
								2.09	18.75											
	116	102			0.49		0.84	0.84	15.00	83.56	71	375	375	PVC	0.26	110.0	89	0.81	2.26	0.79
								0.84	17.26											
	102	103			0.31		0.53	3.46	18.75	73.12	253	675	675	CONC	0.12	70.0	291	0.81	1.43	0.87
								3.46	20.19											
	119	103			1.29		2.22	2.22	15.00	83.56	186	600	600	CONC	0.14	130.0	230	0.81	2.67	0.81
								2.22	17.67											
	103	104			0.46		0.79	6.48	20.19	69.85	453	900	900	CONC	0.10	100.0	572	0.90	1.85	0.79
								6.48	22.04											
	119	104			1.29		2.22	2.22	15.00	83.56	186	600	600	CONC	0.14	30.0	205	0.73	0.69	0.91
								2.22	15.69											
	104	105			0.31		0.53	9.24	22.04	66.07	610	900	900	CONC	0.14	70.0	677	1.06	1.10	0.90
								9.24	23.13											
	126	105			1.53		2.64	2.64	15.00	83.56	220	675	675	CONC	0.12	215.0	291	0.81	4.40	0.76
								2.64	19.40											
	105	106			1.03		1.78	13.65	23.13	64.05	874	1200	1200	CONC	0.10	130.0	1233	1.09	1.99	0.71
								13.65	25.12											
		106			5.16		8.89	8.89												
								8.89												
	106	107			1.03		1.78	24.32	25.12	60.70	1476	1200	1200	CONC	0.10	130.0	1233	1.09	1.99	1.20
								24.32	27.11											
		107			3.80		6.55	6.55												
								6.55												

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.76 m/sec

Designed: J.A.
Checked: J.A.
Dwg. Reference: Storm Drainage Plan

PROJECT: **CAIVAN - VILLAGE OF RICHMOND**
LOCATION: **City of Ottawa**
File Ref: 11-468
Date: 25-Jul-11
Sheet No. 1 of 3

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning 0.013 Return Frequency = 5 years

	LOCATION		AREA (Ha)				FLOW					SEWER DATA								
Location	From Node	To Node	R= 0.2	R= 0.5	R= 0.62	R= 0.9	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min.)	RATIO Q/Q full
	110	107			0.14		0.24	0.24												
								0.24												
	107	Outlet			0.42		0.72	31.11	27.11	57.73	1796	1500	1500	CONC	0.10	90.0	2235	1.26	1.19	0.80
								31.11	28.29											
	145	110			1.50		2.59	2.59	15.00	83.56	216	675	675	CONC	0.12	200.0	291	0.81	4.10	0.74
								2.59	19.10											
	110	111			0.13		0.22	2.81	19.10	72.30	203	675	675	CONC	0.12	70.0	291	0.81	1.43	0.70
								2.81	20.53											
	146	111			1.12		1.93	1.93												
	111	113			1.39		2.40	7.14	20.53	69.11	493	900	900	CONC	0.10	140.0	572	0.90	2.59	0.86
								7.14	23.12											
		113			2.32		4.00	4.00												
	153	152			0.41		0.71	0.71	15.00	83.56	59	375	375	PVC	0.26	70.0	89	0.81	1.44	0.66
	152	151			0.90		1.55	2.26	16.44	79.17	179	600	600	CONC	0.14	135.0	230	0.81	2.77	0.78
								2.26	19.21											
	153	151			1.29		2.22													
	151	114			0.31		0.53	2.79	19.21	72.03	201	600	600	CONC	0.14	70.0	230	0.81	1.44	0.88
								2.79	20.65											
	north	114			2.64		4.55	4.55												
	114	113			0.78		1.34	8.69	20.65	68.86	598	900	900	CONC	0.10	140.0	572	0.90	2.59	1.04
								8.69	23.24											
	113	161			1.22		2.10	21.92	23.24	63.86	1400	900	900	CONC	0.10	140.0	572	0.90	2.59	2.45
								21.92	25.83											

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Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
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Checked: J.A.
Dwg. Reference: Storm Drainage Plan

PROJECT: **CAIVAN - VILLAGE OF RICHMOND**
LOCATION: **City of Ottawa**
File Ref: 11-468
Date: 25-Jul-11
Sheet No. 2 of 3

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Manning 0.013 Return Frequency = 5 years

	LOCATION		AREA (Ha)				FLOW					SEWER DATA								
Location	From Node	To Node	R= 0.2	R= 0.5	R= 0.62	R= 0.9	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc.	Rainfall Intensity	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min.)	RATIO Q/Q full
	110	166			0.76		1.31	1.31	15.00	83.56	109	450	450	PVC	0.20	115.0	128	0.80	2.39	0.86
	166	165			0.00		0.00	1.31	17.39	76.55	100	450	450	PVC	0.20	115.0	128	0.80	2.39	0.79
								1.31	19.78											
	111	165			0.89		1.53	1.53	15.00	83.56	128	525	525	CONC	0.17	150.0	177	0.82	3.05	0.72
								1.53	18.05											
	165	164			0.00		0.00	2.84	19.78	70.73	201	600	600	CONC	0.14	75.0	230	0.81	1.54	0.88
								2.84	21.32											
	112	164			1.01		1.74	1.74	15.00	83.56	145	525	525	CONC	0.17	185.0	177	0.82	3.76	0.82
								1.74	18.76											
	164	161			0.00		0.00	4.58	21.32	67.48	309	750	750	CONC	0.12	75.0	386	0.87	1.43	0.80
								4.58	22.75											
	161	Outlet			0.00		0.00	26.51	25.83	59.60	1580	1350	1350	CONC	0.10	75.0	1688	1.18	1.06	0.94
								26.51	26.89											
	122	121			1.00		1.72	1.72	15.00	83.56	144	525	525	CONC	0.17	135.0	177	0.82	2.75	0.81
	121	120			0.89		1.53	3.26	17.75	75.62	246	675	675	CONC	0.12	135.0	291	0.81	2.77	0.85
								3.26	20.51											
	123	119			0.73		1.26	1.26	15.00	83.56	105	450	450	PVC	0.20	120.0	128	0.80	2.49	0.82
	119	120			0.83		1.43	2.69	17.49	76.28	205	600	600	CONC	0.14	70.0	230	0.81	1.44	0.89
								2.69	18.93											
	120	Outlet			0.73		1.26	5.95	20.51	69.15	411	900	900	CONC	0.10	70.0	572	0.90	1.30	0.72

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PROJECT: **CAIVAN - VILLAGE OF RICHMOND**
LOCATION: **City of Ottawa**
File Ref: 11-468
Date: 25-Jul-11
Sheet No. 3 of 3