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September 30, 2025
File: 160401393

Attention: Ms. Rubina Rasool
City of Ottawa
Development Review – East Branch
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Dear Ms. Rasool,

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

This Servicing and Stormwater Management (SWM) letter report addendum has been prepared to reflect draft plan changes to the approved second registration phase of the Richcraft Kanata West Development. Specifically, a new public right-of-way has been added in the south-western corner of the site (north and east of Holstein Road) by reducing the size of the medium density residential block (Block 60). Additionally, lot configuration for a few townhouses along Winter Wheat Terrace and Tillage Street has been modified. Results from the revised water hydraulic analysis for ultimate development conditions, sanitary sewer design sheet and sanitary hydraulic grade line (HGL) analysis, as well as the revised storm sewer design sheet and stormwater management (SWM) dual drainage PCSWMM model are summarized in this letter report, and reflected on the revised engineering drawings included in **Appendix E**.

This letter report should be read in conjunction with the approved “*Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report*” prepared by Stantec on May 10, 2022, and a subsequent letter report addendum dated December 21, 2023.

POTABLE WATER

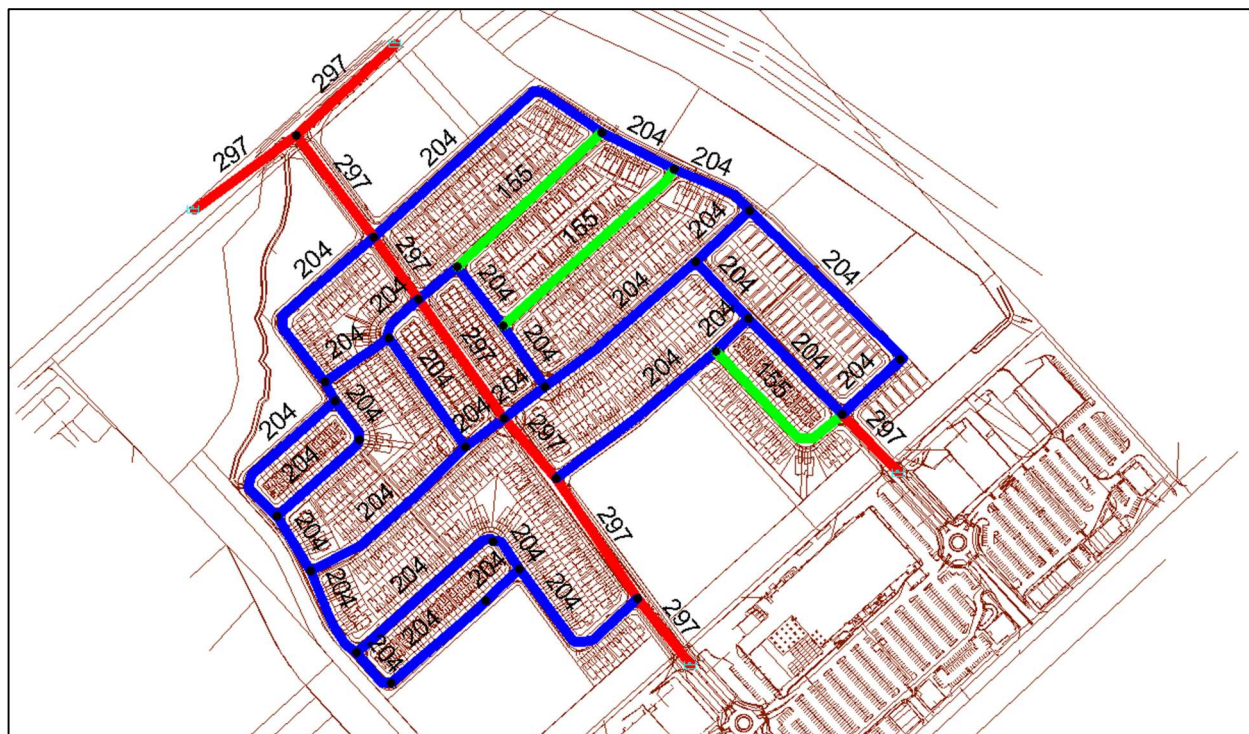
A detailed potable water servicing analysis has been completed and is included in **Appendix A**. The analysis was created to assess the proposed potable water distribution network in the ultimate development conditions of the Richcraft Kanata West Development, since it is the only scenario impacted by the proposed draft plan change. The models include both the approved First Registration Phase of the Richcraft KW Development as well as the proposed phase under ultimate development conditions.

Please refer to the “*Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report*” and “*Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum*” prepared by Stantec on May 10, 2022 and Dec 21, 2023 respectively, for background information and further details and results on the hydraulic analysis scenarios for all construction phases of the development.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

For the purpose of modelling the proposed watermain network, the specific connection points provided in the boundary conditions by the City were used in the analysis as shown in **Figure 1**.

Figure 1: Ultimate Development Potable Water Distribution Network



Proposed ground elevations of the site vary from approximately 100.8 m to 97.2 m. Boundary conditions for the ultimate condition scenario were obtained from the City of Ottawa as included in **Appendix A** and summarized in **Table 1**.

Table 1: Ultimate Condition Hydraulic Analysis Boundary Conditions

Connection	Maximum HGL (m)	Peak Hour HGL (m)	Max. Day plus Fire HGL (m) 167 L/s (10,000 L/min)	Max. Day plus Fire HGL (m) 250 L/s (15,000 L/min)	Max. Day plus Fire HGL (m) 267 L/s (16,000 L/min)	Max. Day plus Fire HGL (m) 283 L/s (17,000 L/min)	Ground Elevation (m)
Maple Grove Road East (Connection #1)	162.1	157.7	154.7	151.7	151.1	150.5	96.88

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Connection	Maximum HGL (m)	Peak Hour HGL (m)	Max. Day plus Fire HGL (m) 167 L/s (10,000 L/min)	Max. Day plus Fire HGL (m) 250 L/s (15,000 L/min)	Max. Day plus Fire HGL (m) 267 L/s (16,000 L/min)	Max. Day plus Fire HGL (m) 283 L/s (17,000 L/min)	Ground Elevation (m)
Maple Grove Road West (Connection #2)	161.0	157.4	153.9	143.2	141.1	138.9	100.90
Hazeldean and Kincardine Dr. (Connection#3)	161.5	157.9	158.8	158.2	158.0	157.9	97.49
Hazeldean Road (Connection #4)	161.4	158.0	158.7	158.1	157.9	157.8	99.90

1. Boundary conditions for Max. Day plus Fire flow of 267 L/s and 250 L/s were interpolated between the values obtained from the City for 167 L/s and 283 L/s

WATER DEMANDS

Water demands for the entire KW Development for each phase of construction were estimated using the City of Ottawa Water Distribution Design Guidelines. A daily rate of 28,000 L/ha/d was used for the proposed school and the commercial block. The population for the medium density residential block MD1 (Block 29) within the approved First Registration Phase was estimated based on a density of 38 units/ha and 2.7 persons per unit. The medium density residential block MD2 (Previous Block 75, now Block 60) within the Second Registration Phase was based on the concept site plan prepared by M. David Blakely Architect Inc. in February 2020 (see **Appendix C.3**), which results in a unit density of 93 unit/ha. The unit count for the medium density residential block MD3 (Block 117) located at the south-eastern corner of the site has been estimated based on a unit density of 93 units/ha and 2.7 persons per unit. See **Appendix A** for detailed domestic water demand estimates.

In the ultimate development condition, the average day demand (AVDY) was determined to be 13.2 L/s. The maximum day demand (MXDY) was determined to be 31.6 L/s, which was calculated as 1.5 times the AVDY for school and commercial blocks and 2.5 times the AVDY for all other residential areas. The peak hour demand (PKHR) totaled 68.7 L/s and was calculated as 1.8 times the MXDY for school and commercial blocks, and 2.2 times the MXDY for all other residential areas.

The calculated residential, institutional and commercial water consumption for the ultimate development scenario is shown in **Table 2** and **Table 3**.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Table 2: Ultimate Development Residential Water Demands

Unit Type	Units	Area (ha)	Person/Unit	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Singles	45	-	3.4	153	0.62	1.55	3.41
Townhomes (Including both B2B and Row townhouses)	646	-	2.7	1745	7.07	17.66	38.86
MD1 (Block 29)	28	0.74	2.7	76	0.31	0.77	1.68
MD2 (Block 60)	224	2.42	2.7	605	2.45	6.13	13.48
MD3 (Block 117)	122	1.32	2.7	330	1.33	3.34	7.34
Total	1,065	-	-	2909	11.8	29.5	64.8

Table 3: Ultimate Development Institutional and Commercial Water Demands

	Area (ha)	Demand (L/day)	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Commercial	1.47	28,000	0.48	0.71	1.29
School	2.95	28,000	0.98	1.47	2.65

Fire Flow Requirements

The fire flow requirement for residential properties is capped at 10,000 L/min (167 L/s) as per the City of Ottawa Technical Bulletin ISDTB-2014-02 (May 2014) provided that firewalls with a minimum two-hour fire-resistance rating that comply with OBC Div. B, Subsection 3.1.10, are constructed to separate townhouse blocks to the lesser of seven dwelling units and 600 m² of building area, and that a minimum 10 m separation exists between rear yards. For the purposes of this analysis, required fire flows for private residential development blocks, as well as for the majority of proposed townhome blocks and single-family dwellings were assumed at the cap of 10,000 L/min (167 L/s). As part of the approved Servicing and SWM Report for the Second Registration Phase (Stantec, May 2022), a maximum worst-case fire flow of 16,000 L/min (267 L/s) was estimated using FUS calculations (see detailed calculations in **Appendix A.3**) for back-to-back units, and 15,000 L/min (250 L/s) for townhome blocks that did not meet the 10 m separation between backs/sides of adjacent units. Please refer to the approved Second Registration Phase Servicing and SWM Report for hydrant spacing analysis and firewall configuration requirements.

Note that in previous submissions from the First Registration Phase, the worst-case fire flow for a 10-unit back-to-back townhome block was established to be 283 L/s (based on wood frame back-to-back townhome blocks designed without firewalls). Given that the 10-unit back-to-back townhome blocks were eventually designed with firewalls, the worst-case fire flow of 283 L/s no longer applies. The worst-case fire flow demand scenario has now been replaced with a fire flow of 267 L/s based on an 8-unit back-to-back townhome block and a 10-unit back-to-back townhome block with more exposure distance from the adjacent building which are designed without firewalls.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

HYDRAULIC MODEL

Level of Service

The City of Ottawa Water Distribution Design Guidelines state that the desired range of system pressures under normal demand conditions (i.e., basic day, maximum day and peak hour) should be in the range of 350 to 480 kPa (50 to 70 psi) and no less than 275 kPa (40 psi) at the ground elevation on the streets (i.e., at hydrant level). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way is 552 kPa (80 psi). As per the Ontario Building Code (OBC) & Guide for Plumbing, if pressures greater than 552 kPa (80 psi) are anticipated, pressure relief measures are required. The maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). Under emergency fire flow conditions, the minimum pressure objective in the distribution system is 138 kPa (20 psi).

Model Development

The hydraulic model used to simulate the approved First Registration Phase of the Richcraft KW Development which included the proposed Second Registration Phase distribution system has been modified to represent the ultimate development conditions based on the revised draft plan. Hazen-William's coefficients ("C-Factors") were applied to the new watermain in accordance with the City of Ottawa's Water Distribution Design Guidelines (Table 4).

Table 4: Proposed Watermain C-Factors

Pipe Diameter (mm)	C-Factor
150	100
200 to 250	110
300 to 600	120
> 600	130

HYDRAULIC MODEL RESULTS

A hydraulic model was created to simulate the ultimate development condition based on boundary conditions provided by the City of Ottawa. The hydraulic analysis was completed with H2OMAP Water Software and assessed the internal network and connections to the surrounding infrastructure. The model was tested under peak hour, average day, and maximum day plus fire flow conditions.

In the ultimate development condition, the maximum pressure modeled was approximately 92.8 psi (640 kPa) and the minimum pressure during the peak hour scenario was approximately 80.5 psi (596kPa) as shown in **Figure 2** and **Figure 3** respectively. These pressures are above the serviceable limit of 50 to 80 psi (345 to 552 kPa) and therefore all units will require pressure reducing valves.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Figure 2: AVDY Pressure Results for Ultimate Condition Scenario (psi)

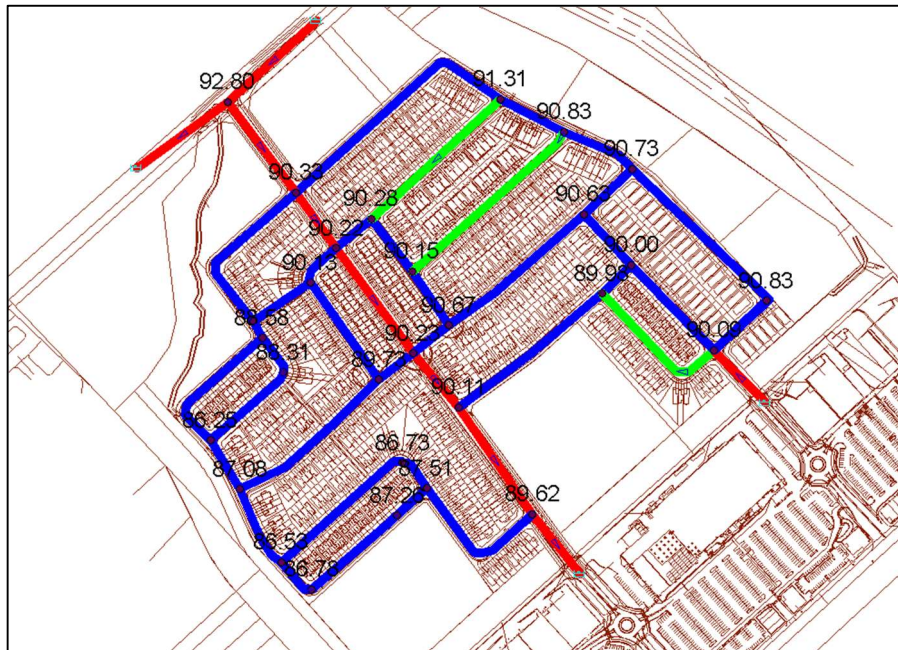
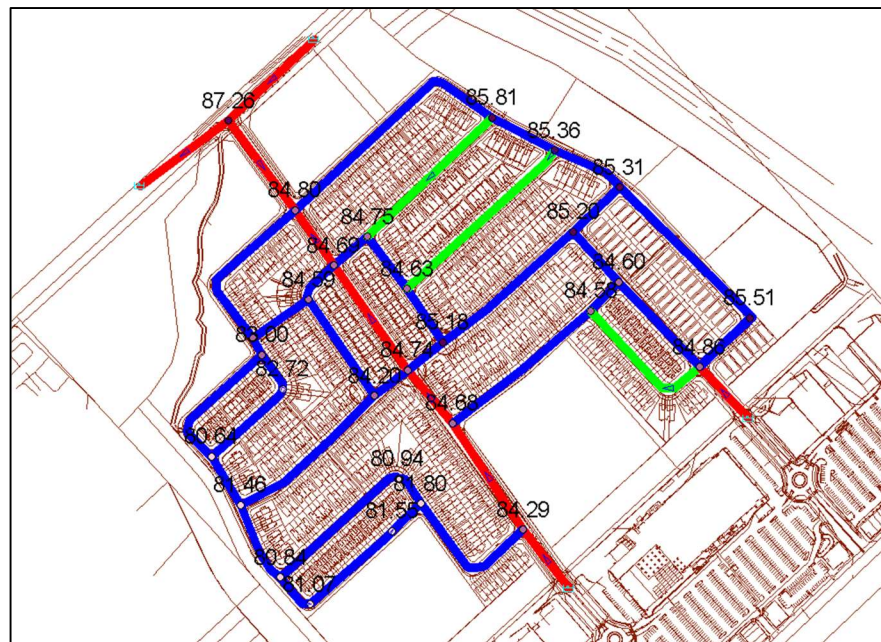


Figure 3: PKHR Pressure Results for Ultimate Condition Scenario (psi)

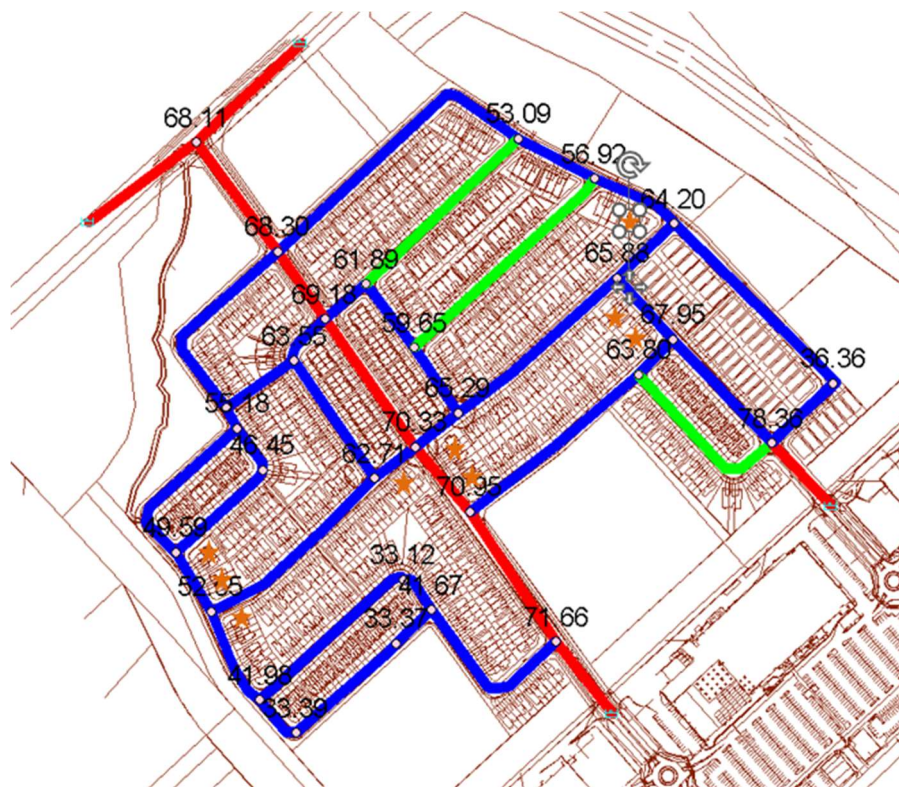


Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

A fire flow analysis was carried out in the hydraulic model to determine the anticipated amount of flow that could be provided for the proposed development under maximum day demands and a fire flow requirement of 267 L/s as per the worst-case for back to back units that do not meet the technical bulletin's 10,000 L/min fire flow cap conditions based on rear yard to side yard separation. Given that all nodes within the ultimate construction phase had residual pressures above 20 psi when modeling the fire flows of 267 L/s, an additional hydraulic model was not needed to represent lower fire flows.

Results of the ultimate condition modeling analysis indicate that flows in excess of 16,000 L/min (267 L/s) can be delivered for all proposed units while still maintaining a residual pressure of 140 kPa (20 psi). The residual pressures for the fire flow analysis are shown in Figure 4. Results of the hydraulic modeling are included for reference in **Appendix A**.

Figure 4: MXDY + 267 L/s Fire Flow Results for Ultimate Condition Scenario (Residual Pressure (psi))



★ Represent the Blocks that do not meet a rear yard to side yard separation of 10m.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STORM DRAINAGE

The following sections describe the stormwater management (SWM) design for the Richcraft Kanata West Development in the context of the approved background documents and governing criteria, revised to reflect the proposed draft plan changes.

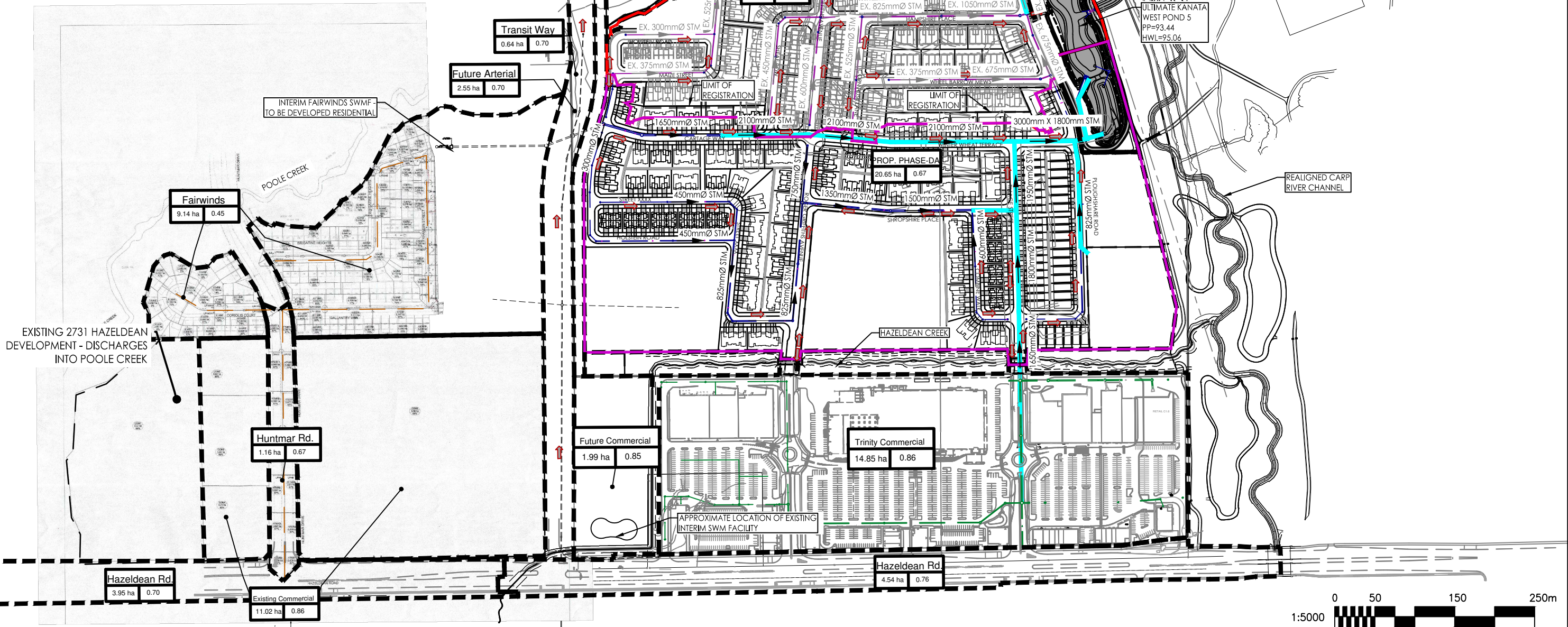
PROPOSED DRAINAGE CONDITIONS

The Second Registration Phase of the KW Development comprises approximately 20.7 ha of land and consists of a mixture of single homes, townhomes and back-to-back units, a park, a school block, and two medium density residential blocks. The school block and medium density residential private blocks will be developed as separate site plan applications.

The ultimate KW SWM Pond 5, as well as the storm trunk sewer along Cartage Way and Winter Wheat Terrace have been constructed to service the Mattamy Fairwinds Subdivision to the south. SWM Pond 5 was designed to provide quantity control and 'Normal' level of quality control of stormwater runoff which corresponds to 70% Total Suspended Solids (TSS) removal prior to discharging into the Carp River. Please refer to the *Ultimate Kanata West Pond 5 Design Brief* (Stantec, May 2022) for details on SWM Pond 5 design. The approved SWM model for the Kanata West Subdivision was subsequently revised to reflect changes to the draft plan within the south-eastern corner of the site which replaced part of the subdivision with a medium density residential private block (Block 117). **Figure 5** shows the overall drainage area to the ultimate SWM Pond 5.

The overall approach for storm servicing and stormwater management for the Richcraft Kanata West Development was initially outlined in the Kanata West Master Servicing Study (KWMSS) prepared by Stantec in 2006. In accordance with this document, the approved SWM plan for the Richcraft Kanata West Development consisted of inlet control devices designed at road low points to restrict inflow rates to the storm sewers and to provide attenuating surface storage. The major overland system comprising of swales, roadway sags, streets, etc. was designed to handle peak flows beyond the storm sewer capacity up to the 100-year storm and to be directed to the ultimate KW Pond 5.

The SWM approach in this letter report consists of sizing inlet control devices (ICDs) for the proposed catchbasins to meet City of Ottawa guidelines, and establishing minor and major system target peak flows for the proposed medium density residential blocks (Blocks 60 and 117), school block (Block 120), and park block (Block 116) in order to restrict peak flows to the previously approved minor and major system peak flows. Please refer to **Drawings SD-1** and **SD-2** for drainage areas, storm sewer information and ICD schedule.



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STORMWATER BACKGROUND AND DESIGN CRITERIA

The approved SWM criteria for the Richcraft Kanata West Development was established in the “*Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report*” prepared by Stantec on May 10, 2022, and is summarized below.

- Width parameter: Twice the street length to be used for arterial roadways, and 225 m/ha to be used for residential and mixed-use developments where no street layout is available.
- Major system storage: major system storage of 40 m³/ha and 50 m³/ha was assumed for arterial roads and residential/non-residential lands, respectively.
- The capture rates for arterial roadways to be equal to the 10-year storm design.
- All sewer hydraulic analysis is to use a static boundary condition equal to the MVC 1983 flood limit of 94.60 m.
- The Carp River Watershed/Subwatershed Study (Robinson Consultants, November 2004) proposed target infiltration rates of 104 mm/year and 73 mm/year for areas of moderate and low recharge respectively within the KW Community. Post development infiltration rates are to be increased by 25% above the pre-development rate. This rate of infiltration was established to compensate for those areas (i.e., roadway corridors) that can not provide infiltration. The Richcraft Kanata West subdivision is identified as having an estimated infiltration rate between 50-70 mm/yr.
- Use of the dual drainage principle.
- Size storm sewers to fully capture 2-year storm event under free-flow conditions (i.e., no ponding during 2-year storm event) using 2012 City of Ottawa Sewer Design Guidelines I-D-F parameters for local streets, the 5-year storm event for collector streets, and the 10-year storm event for arterial roads.
- Assess impact of 2-year storm, 5-year storm, the worst case 100-year storm event, and the climate change scenario (worst case 100-year storm event with a 20% increase of rainfall intensity) on the major & minor drainage systems.
- Separation of at least 0.3 m between the 100-year hydraulic grade line (HGL) and building under side of footing (USF) must be provided.
- Maximum ‘climate change’ HGL to be lower than proposed basement elevations.
- No rear-yard ponding volumes to be accounted for in SWM model preparation. However, the effect of flow routing can be accounted for by assuming a constant slope ditch/swale draining to the street with a minimum slope of 1.5% and a minimum depth of 150 mm. The maximum allowable depth of a swale /ditch shall be 600 mm. The maximum side slopes of swales/ditches shall be 3 horizontal to 1 vertical.
- Depth of flow may extend adjacent to the right-of-way provided that the water level does not touch any part of the building envelope and remains below the lowest building opening during the stress test event (100-year increased by 20%).
- Total maximum depth of flow under static and dynamic conditions shall be less than 0.35 m during the 100-year event.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

- There must be at least 15 cm of vertical clearance between the spill elevation on the street and the ground elevation at the building envelope that is in the proximity of the flow route or ponding area.
- There must be at least 30 cm of vertical clearance between the spill elevation on rear yard swales and the ground elevation at the building envelope that is in the proximity of the flow route or ponding area.
- Minimum swale grades at 1.5% (subgrade provided for grades < 1.5%).
- Minimum roadway profile grades at 0.5%.
- Minimum roadway slope of 0.1% from crest-to-crest for overland flow route.
- Provide adequate emergency overflow conveyance off-site.
- The SWM Model was revised in December 2023 to reflect draft plan changes to the south-easter corner of the site. Minor system target peak outflows for the medium density residential block (Block 117) were established in the 2023 SWM revision to restrict 100-year minor system peak flows in the storm sewer from MH233 to MH201 to 504 L/s as per the previously approved SWM model to minimize changes to the hydraulic grade line (HGL) across the site.
- Similarly, the December 2023 SWM Model was revised to establish on-site storage requirements for the medium density residential block (Block 117) to restrict the 100-year major system peak flow along Ploughshare Road east of the intersection with Winter Wheat Terrace to 145 L/s and thus minimize negative impacts to total flow depths downstream.

SWM DESIGN METHODOLOGY

A comprehensive hydrologic modeling exercise was completed with PCSWMM, accounting for the estimated major and minor systems to evaluate the storm sewer infrastructure and major system segments in the ultimate development condition. The approved PCSWMM model for the Richcraft Kanata West Development was revised to reflect the proposed draft plan changes within the site. The vast majority of the model and its parameters remained as per the approved PCSWMM model. The following assumptions were applied as per the approved PCSWMM model:

- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Horton infiltration, Manning's 'n', and depression storage values.
- 3-hour Chicago Storm distribution for the 2-year, 5-year, and 10-year to determine inlet capture rates for the different catchments.
- Minor and major system response assessed for the 100-year using the 3-hour Chicago Storm Distribution and the 12-hour SCS Type II distribution with a fixed water level in the Carp River of 94.60 m.
- To 'stress test' the system, a 'climate change' scenario was created by adding 20% of the individual intensity values of the 100-year storms at their specified time step.
- Assess the minor and major systems response during the July 1, 1979, historical storm with a fixed water level in the Carp River of 94.60 m.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

- Percent imperviousness calculated based on actual soft and hard surfaces for representative catchments and converted to equivalent runoff coefficient using the relationship $C = (\text{Imp.} \times 0.7) + 0.2$.
- Runoff coefficients for future medium density residential blocks (Block 60 and Block 117) of 0.80, 0.70 for the school block, and 0.85 for commercial blocks.
- Subcatchment areas are defined from high-point to high-point where sags occur, and detailed grading is available.
- Width parameter was taken as twice the length of the street/swale segment for two-sided catchments and as the length of the street/swale segment for one-sided catchments.
- Where detailed grading was not available, subcatchment areas were defined by the limits of the future development blocks with some assumed uncontrolled areas and the width of the subcatchment was defined as 225 m/ha as per the City of Ottawa Sewer Design Guidelines.
- Catchbasin inflow restricted with inlet-control devices (ICDs) as per City guidelines.
- Surface ponding in sag storage calculated based on grading plans (**Drawings PD-1 - PD-4**).
- Different segment cross-section types defined, accounting for varying right-of-way widths with 3% cross slope, swales, and spillways.
- Minor system discharge rate from the Fairwinds Subdivision up to the 100-year storm to be restricted to 4.794 m³/s.
- Minor system discharge rate from the Trinity Commercial Site up to the 100-year storm to be restricted to 2.118 m³/s.
- Future school block (area L218A) to restrict minor system peak flows up to the 100-year storm to 443 L/s and to restrict 100-year overflows to Shropshire Place to 376 L/s.
- Future medium density residential blocks, areas L123B, L225B, and L235B to limit minor system peak flows up to the 100-year storm to 111 L/s, 434 L/s and 130 L/s respectively and to restrict 100-year overflows to Maize Street, Grazier Row, and Ploughshare Road to 443 L/s, 437 L/s and 350 L/s respectively.
- Commercial block, area L121B, to restrict minor system peak flows up to the 100-year storm to 299 L/s and to provide on-site storage for 100-year overflows.
- Inlet control devices (ICDs) to have a minimum orifice diameter of 83 mm.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

- Inlet control devices, as represented by orifice links, use a user-specified diameter and discharge coefficient taken from manufacturer's specifications for the chosen ICD model (IPEX Tempest HF model with circular opening and floatable and odour control).

Boundary Conditions

The worst-case scenario for the second registration phase of the Richcraft Kanata West Development will occur under the ultimate development conditions once the full drainage area to the ultimate KW Pond 5 is built-out. The following table summarizes the approved ultimate KW Pond 5 water levels that drive the hydraulic grade line (HGL) elevations across the proposed development.

Table 5: Ultimate KW Pond 5 Water Levels

Boundary Condition	Storm Event	Ultimate Pond Water Level (m)
Carp Model Time Series	2yr, 12hrSCS	94.39
Carp Model Time Series	5yr, 12hrSCS	94.60
Carp Model Time Series	10yr, 12hrSCS	94.73
Carp Model Time Series	25yr, 12hrSCS	94.84
Carp Model Time Series	100yr, 12hrSCS	94.97
Fixed = 94.60 m	100yr, 3hrChicago	95.06

The detailed PCSWMM hydrology, the approved storm sewers and ICDs within the first and second registration phase, design assumptions and hydrology for external areas, and the proposed storm sewers and ICDs for the revised south-eastern corner within the second registration phase were used to assess the peak inflows and hydraulic grade line (HGL) in the overall development. The detailed design of the ultimate KW Pond 5 as depicted in the Ultimate Kanata West Pond 5 Design Brief (Stantec, June 2021) was included in the PCSWMM model. Static backwater elevations at the Carp River outlet corresponding to the 2-year (93.52 m), 5-year (93.73 m), and 25-year (94.02 m) water levels as obtained from the post restoration Ultimate Development Conditions Carp River model have been used as boundary conditions downstream of the ultimate condition SWM Pond for the 2-year, 5-year, and 25-year (25% sediment-filled pipe) models respectively, while a static backwater elevation of 94.60 m as per the MVC 1983 100-year flood elevation for the Carp River has been used for the 100 year, 100 year +20% and historical 1979 storm models.

SWM Modeling Parameters

Key parameters for the subject area are summarized below; an example input file is provided for the 100-year, 3hr Chicago storm which indicates all other parameters (see **Appendix B.3**). For all other input files and results of storm scenarios, please examine the electronic model files included in the digital submission. This analysis was performed using PCSWMM, which is a front-end GUI to the EPA-SWMM engine. Model files can be examined in any program which can read EPA-SWMM files version 5.1.015.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Table 6: General Subcatchment Parameters

Subcatchment Parameter	Value
Infiltration Method	Horton
Max. Infil. Rate (mm/hr)	76.2
Min. Infil. Rate (mm/hr)	13.2
Decay Constant (1/hr)	4.14
N Imperv	0.013
N Perv	0.25
Dstore Imperv (mm)	1.57
Dstore Perv (mm)	4.67

Table 7 presents the individual parameters that vary for each of the proposed subcatchments. Subcatchment parameters for external areas and approved development areas are summarized in **Appendix B.3**.

Table 7: Proposed Phase Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
C205A	0.26	70.9	2.5	67.1%	0.67
C206B	0.17	68.0	3.0	71.4%	0.70
C219A	0.09	79.8	2.0	68.6%	0.68
C220A	0.41	131.8	2.0	75.7%	0.73
C222A	0.52	257.0	4.0	70.0%	0.69
C223A	0.16	59.0	3.0	72.9%	0.71
EXT2	0.07	29.0	2.0	67.1%	0.67
EXT-4	0.13	79.6	0.5	48.6%	0.54
EXT5	0.11	77.0	4.0	24.3%	0.37
EXT6	0.12	78.8	4.0	40.0%	0.48
G234C	0.97	218.1	1.0	28.6%	0.40
L116A	0.22	84.0	1.0	70.0%	0.69
L202A	0.21	76.7	2.0	55.7%	0.59
L202B	0.25	152.0	3.0	50.0%	0.55
L204A	0.42	174.7	3.0	75.7%	0.73
L204B	0.39	146.7	3.0	70.0%	0.69
L202A	0.21	76.7	2.0	55.7%	0.59
L202B	0.25	152.0	3.0	50.0%	0.55
L204A	0.42	174.7	3.0	75.7%	0.73
L204B	0.35	146.7	3.0	70.0%	0.69
L204C	0.26	168.0	3.0	38.6%	0.47
L205B	0.49	238.1	3.0	35.7%	0.45
L206A	0.31	127.2	3.0	75.7%	0.73

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
L207A	0.58	202.3	3.0	64.3%	0.65
L209A	0.35	153.4	2.0	70.0%	0.69
L209B	0.15	159.0	2.0	67.1%	0.67
L209C	0.41	200.0	3.0	38.6%	0.47
L210A	0.34	97.7	4.0	71.4%	0.70
L211A	0.40	177.2	3.0	74.3%	0.72
L212A	0.10	44.0	3.0	57.1%	0.60
L213A	0.21	75.0	2.0	70.0%	0.69
L214A	0.55	221.0	4.0	72.9%	0.71
L217A	0.40	196.0	3.0	68.6%	0.68
L218A	2.68	664.0	1.0	71.4%	0.70
L218B	0.25	166.0	3.0	35.7%	0.45
L219B	0.36	111.7	2.0	68.6%	0.68
L220A	0.87	480.0	2.5	34.3%	0.44
L225A	0.27	134.6	2.5	71.4%	0.70
L225B	1.79	402.8	2.0	85.7%	0.80
L225C	0.35	170.0	2.5	71.4%	0.70
L228A	0.48	127.3	2.5	75.7%	0.73
L229A	0.32	102.3	3.0	75.7%	0.73
L234A	0.26	78.0	5.0	68.6%	0.68
L234B	0.23	81.1	4.0	70.0%	0.69
L234D	0.37	210.0	3.0	52.9%	0.57
L235A	0.59	232.0	4.0	70.0%	0.69
L235B	0.98	221.4	2.0	85.7%	0.80
L240A	0.16	100.0	5.0	78.6%	0.75
L241A	0.19	83.0	4.0	71.4%	0.70
L241B	0.24	136.0	5.0	78.6%	0.75
POND	2.56	576.0	1.0	60.0%	0.62
UNC-1	0.06	120.0	4.0	71.4%	0.70
UNC-10	0.10	102.8	33.0	85.7%	0.80
UNC-11	0.12	119.9	33.0	85.7%	0.80
UNC-2	0.07	120.0	4.0	71.4%	0.70
UNC-3	0.07	120.0	4.0	71.4%	0.70
UNC-4	0.07	120.0	4.0	71.4%	0.70
UNC-5	0.30	177.9	3.0	85.7%	0.80
UNC-6	0.11	105.6	3.0	85.7%	0.80
UNC-7	0.16	160.0	3.0	85.7%	0.80
UNC-8	0.07	144.3	3.0	85.7%	0.80
UNC-9	0.12	117.5	3.0	85.7%	0.80

Table 8 below presents the parameters for the outlet link objects in the model, which represent the minor system capture rate for the future private blocks within the Richcraft KW Development and the future external areas.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Table 8: SWM Criteria for Future Areas

Storm Drainage Area	Block ID/Location	Description	MH Outlet	Maximum Minor System Capture (L/s)	100-Year Major System Overflows (L/s)
Arterial	Block 79 & 80	Arterial	209	953	N/A - Overflow to Poole Creek as per KWMSS
B-1	North of Maple Grove	Residential	J2	116	100-year On-Site Storage as per KWMSS
B-2	Maple Grove ROW	Arterial	J4	199	N/A - Overflow to Poole Creek/Carp River as per KWMSS
Comm	North of Hazeldean	Commercial	209	399	100-year On-Site Storage
Hazeldean	Hazeldean ROW	Arterial	209	1,187	N/A - Overflow to Carp River/Poole Creek as per KWMSS
L121B	Block 1	Commercial	121	299	100-year On-Site Storage
L123B	Block 29	Residential	123	111	443 L/s to Maize Street
L218A	Block 70	School	218	443	376 L/s to Shropshire Place
L225B	Block 75	Residential	225	434	437 L/s to Grazier Row
G234A	Block 116	Park	234	34	185 L/s to Ploughshare Road
L235B	Block 117	Med-Density-New	235	130	350 L/s to Holstein Road

1. School block area L218A to provide 671 m³/year of infiltration.
2. Residential block area L225B to provide 490 m³/year of infiltration.
3. Residential block area L235B to provide 268 m³/year of infiltration.

The following section summarizes the key hydrologic and hydraulic model results for the second registration phase of the development area based on ultimate conditions. For detailed model results or inputs, please refer to the example input file in **Appendix B.3** and the electronic model files included in the digital submission.

Table 9 summarizes the revised ICD schedule.

Table 9: Second Registration Phase Inlet Control Device Results

Orifice Name	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
C205A-IC(1)	C205A	IPEX TEMPEST HF (127mm ORIFICE)	0.31	1.65	15.8	40.4
C205A-IC(2)	C205A	IPEX TEMPEST HF (152mm ORIFICE)	0.31	1.65	22.1	57.7
C219-IC	C219A	IPEX TEMPEST HF (102mm ORIFICE)	0.46	1.52	13.3	25.1
C220A-IC(1)	C220A	IPEX TEMPEST HF (191mm ORIFICE)	0.30	1.66	33.2	90.7
C220A-IC(2)	C220A	IPEX TEMPEST HF (191mm ORIFICE)	0.30	1.66	33.2	90.7
C222A-IC(1)	C222A	IPEX TEMPEST HF (203mm ORIFICE)	0.41	1.66	45.4	102.3

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Orifice Name	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
C222A-IC(2)	C222A	IPEX TEMPEST HF (203mm ORIFICE)	0.41	1.66	45.4	102.3
C223A-IC(1)	C223A	IPEX TEMPEST HF (152mm ORIFICE)	0.38	1.58	25.1	56.4
G234C-IC	G234C	IPEX TEMPEST HF (102mm ORIFICE)	1.58	4.35	18.3	34.3
L116A-IC(1)	L116A	IPEX TEMPEST HF (95mm ORIFICE)	0.91	1.66	16.7	22.8
L116A-IC(2)	L116A	IPEX TEMPEST HF (95mm ORIFICE)	0.91	1.66	16.7	22.8
L202A-IC(1)	L202A	IPEX TEMPEST HF (83mm ORIFICE)	0.86	1.67	12.4	17.5
L202A-IC(2)	L202A	IPEX TEMPEST HF (83mm ORIFICE)	0.86	1.67	12.4	17.5
L202B-IC	L202B	IPEX TEMPEST HF (108mm ORIFICE)	1.82	2.11	30.9	33.3
L204A-IC(1)	L204A	IPEX TEMPEST HF (127mm ORIFICE)	1.20	1.63	34.2	40.2
L204A-IC(2)	L204A	IPEX TEMPEST HF (127mm ORIFICE)	1.20	1.63	34.2	40.2
L204B-IC(1)	L204B	IPEX TEMPEST HF (127mm ORIFICE)	0.73	1.63	26.2	40.2
L204B-IC(2)	L204B	IPEX TEMPEST HF (127mm ORIFICE)	0.73	1.63	26.2	40.2
L204C-IC	L204C	IPEX TEMPEST HF (108mm ORIFICE)	1.15	2.40	24.3	35.5
L205B-IC	L205B	IPEX TEMPEST HF (127mm ORIFICE)	1.32	2.26	35.9	47.4
L206A-IC(1)	L206A	IPEX TEMPEST HF (108mm ORIFICE)	1.23	1.63	25.2	29.2
L206A-IC(2)	L206A	IPEX TEMPEST HF (108mm ORIFICE)	1.23	1.63	25.2	29.2
L206B-IC(1)	C206B	IPEX TEMPEST HF (140mm ORIFICE)	0.52	1.51	26.2	46.7
L207A-IC(1)	L207A	IPEX TEMPEST HF (152mm ORIFICE)	0.85	1.69	40.3	58.5
L207A-IC(2)	L207A	IPEX TEMPEST HF (152mm ORIFICE)	0.85	1.69	40.3	58.5
L209A-IC(1)	L209A	IPEX TEMPEST HF (127mm ORIFICE)	0.74	1.45	26.4	37.7
L209A-IC(2)	L209A	IPEX TEMPEST HF (127mm ORIFICE)	0.74	1.45	26.4	37.7
L209B-IC	L209B	IPEX TEMPEST HF (102mm ORIFICE)	1.12	1.42	21.4	24.2
L209C-IC	L209C	IPEX TEMPEST HF (108mm ORIFICE)	1.92	2.04	31.7	32.7
L210A-IC(1)	L210A	IPEX TEMPEST HF (108mm ORIFICE)	0.96	1.58	22.1	28.7
L210A-IC(2)	L210A	IPEX TEMPEST HF (127mm ORIFICE)	0.96	1.58	30.4	39.6
L211A-IC(1)	L211A	IPEX TEMPEST HF (127mm ORIFICE)	1.06	1.61	32.0	39.9
L211A-IC(2)	L211A	IPEX TEMPEST HF (127mm ORIFICE)	1.06	1.61	32.0	39.9
L212A-IC1	L212A	IPEX TEMPEST HF (83mm ORIFICE)	0.24	1.41	6.1	16.0
L212A-IC2	L212A	IPEX TEMPEST HF (83mm ORIFICE)	0.24	1.41	6.1	16.0
L213A-IC(1)	L213A	IPEX TEMPEST HF (95mm ORIFICE)	0.83	1.56	15.9	22.1
L213A-IC(2)	L213A	IPEX TEMPEST HF (95mm ORIFICE)	0.83	1.56	15.9	22.1
L214A-IC(1)	L214A	IPEX TEMPEST HF (152mm ORIFICE)	0.97	1.61	43.4	57.0
L214A-IC(2)	L214A	IPEX TEMPEST HF (152mm ORIFICE)	0.97	1.61	43.4	57.0
L217A-IC(1)	L217A	IPEX TEMPEST HF (127mm ORIFICE)	0.92	1.57	29.7	39.5
L217A-IC(2)	L217A	IPEX TEMPEST HF (127mm ORIFICE)	0.92	1.57	29.7	39.5
L218B-IC	L218B	IPEX TEMPEST HF (95mm ORIFICE)	2.04	2.15	25.4	26.1
L219B-IC(1)	L219B	IPEX TEMPEST HF (127mm ORIFICE)	0.72	1.69	26.1	40.9
L219B-IC(2)	L219B	IPEX TEMPEST HF (152mm ORIFICE)	0.72	1.69	37.0	58.4
L220A-S	L220A	IPEX TEMPEST HF (178mm ORIFICE)	1.14	2.09	64.7	89.2
L225A-IC(1)	L225A	IPEX TEMPEST HF (108mm ORIFICE)	1.38	1.66	26.8	29.5
L225A-IC (2)	L225A	IPEX TEMPEST HF (108mm ORIFICE)	1.38	1.66	26.8	29.5
L225C-IC(1)	L225C	IPEX TEMPEST HF (127mm ORIFICE)	1.32	1.59	36.0	39.6
L225C-IC(2)	L225C	IPEX TEMPEST HF (108mm ORIFICE)	1.32	1.59	26.1	28.7
L228A-IC(1)	L228A	IPEX TEMPEST HF (127mm ORIFICE)	1.08	1.60	32.4	39.8
L228A-IC(2)	L228A	IPEX TEMPEST HF (152mm ORIFICE)	1.08	1.60	46.1	56.8
L229A-IC(1)	L229A	IPEX TEMPEST HF (108mm ORIFICE)	1.29	1.59	25.8	28.8

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Orifice Name	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
L229A-IC(2)	L229A	IPEX TEMPEST HF (108mm ORIFICE)	1.29	1.59	25.8	28.8
L234A-IC1	L234A	IPEX TEMPEST HF (95mm ORIFICE)	1.20	1.63	19.3	22.6
L234A-IC2	L234A	IPEX TEMPEST HF (95mm ORIFICE)	1.20	1.63	19.3	22.6
L234B-IC1	L234B	IPEX TEMPEST HF (95mm ORIFICE)	0.96	1.65	17.1	22.7
L234B-IC2	L234B	IPEX TEMPEST HF (95mm ORIFICE)	0.96	1.65	17.1	22.7
L234D-IC	L234D	IPEX TEMPEST HF (152mm ORIFICE)	1.39	2.12	52.8	65.7
L235A-IC1	L235A	IPEX TEMPEST HF (178mm ORIFICE)	0.88	1.69	55.9	79.9
L235A-IC2	L235A	IPEX TEMPEST HF (178mm ORIFICE)	0.88	1.69	55.9	79.9
L240A-IC(1)	L240A	IPEX TEMPEST HF (83mm ORIFICE)	1.01	1.55	13.5	16.8
L240A-IC(2)	L240A	IPEX TEMPEST HF (83mm ORIFICE)	1.01	1.55	13.5	16.8
L241A-IC(1)	L241A	IPEX TEMPEST HF (108mm ORIFICE)	1.38	1.58	26.7	28.6
L241A-IC(2)	L241A	IPEX TEMPEST HF (108mm ORIFICE)	1.38	1.58	26.7	28.6
L241B-IC(1)	L241B	IPEX TEMPEST HF (127mm ORIFICE)	1.34	1.61	36.3	39.9
L241B-IC(2)	L241B	IPEX TEMPEST HF (127mm ORIFICE)	1.34	1.61	36.3	39.9

Proposed Development Storm Hydraulic Grade Line Analysis

As mentioned previously, the worst-case HGL across the site occurs in the ultimate development conditions once runoff from approved, proposed and external development areas is routed through the proposed site minor system to the ultimate KW SWM Pond 5.

As shown in

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Figure 5, a portion of the proposed storm sewer system will be partially submerged. Specifically, approximately 112 m of storm sewer tributary to the west forebay (approved first registration phase) and approximately 1,123 m of storm sewer tributary to the east forebay (proposed ultimate condition) will be partially submerged.

As per the above, the worst case 100-year hydraulic grade line (HGL) elevation across the proposed development was estimated using the proposed ultimate KW Pond 5 PCSWMM model for the 100-year, 3-hour Chicago and 12-hour SCS Type II storms with a static backwater elevation of 94.60 m as per the MVC 1983 100-year flood elevation for the Carp River. **Table 10** below presents the clearance between the trunk sewer worst case HGL and the proposed and approved under side of footings (USF) within the Richcraft Kanata West development. The storm sewer design sheet is included in **Appendix B.1**. The 'climate change' scenarios required by the City of Ottawa Sewer Design Guidelines (2012), where 100-year intensities are increased by 20% were also assessed. 100-Year HGL profiles from PCSWMM have been included in **Appendix B.4**.

Table 10: Ultimate Condition Hydraulic Grade Line Results

STM MH	Prop/App. USF Elevation (m)	100-Year HGL				100-year + 20%			
		12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR HGL (m)	USF – HGL Clearance (m)	12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR+ 20% HGL (m)	USF –HGL Clearance (m)
100A	N/A	95.08	95.08	95.08	-	95.11	95.13	95.13	-
100B	N/A	95.10	95.10	95.10	-	95.14	95.16	95.16	-
100C	N/A	95.07	95.07	95.07	-	95.10	95.12	95.12	-
100D	N/A	95.10	95.10	95.10	-	95.14	95.16	95.16	-
100E	N/A	95.07	95.07	95.07	-	95.10	95.12	95.12	-
101	95.74	95.19	95.19	95.19	0.55	95.24	95.26	95.26	0.48
102	95.63	95.21	95.21	95.21	0.42	95.26	95.28	95.28	0.35
103	95.69	95.24	95.24	95.24	0.45	95.30	95.32	95.32	0.37
104	95.75	95.26	95.26	95.26	0.49	95.31	95.35	95.35	0.40
105	96.00	95.35	95.34	95.35	0.65	95.41	95.44	95.44	0.56
106	96.00	95.37	95.36	95.37	0.63	95.44	95.48	95.48	0.52
107	96.10	95.58	95.61	95.61	0.49	95.69	95.75	95.75	0.35
108	96.10	95.62	95.67	95.67	0.43	95.77	95.86	95.86	0.24
+50	96.25	95.65	95.76	95.76	0.49	95.85	95.97	95.97	0.28
+86	96.33	95.68	95.83	95.83	0.50	95.91	96.05	96.05	0.28
109	96.23	95.70	95.89	95.89	0.34	95.96	96.12	96.12	0.11
110	96.54	95.71	95.75	95.75	0.79	95.84	95.90	95.90	0.64
111	96.30	95.77	95.81	95.81	0.49	95.90	95.96	95.96	0.34
112	96.30	95.94	96.00	96.00	0.30	96.08	96.14	96.14	0.16
+51	96.34	95.99	96.04	96.04	0.30	96.13	96.19	96.19	0.15
113	96.37	96.02	96.07	96.07	0.30	96.16	96.22	96.22	0.15
114	95.63	95.24	95.24	95.24	0.39	95.29	95.31	95.31	0.32
115	95.71	95.31	95.32	95.32	0.39	95.37	95.39	95.39	0.32
116	95.78	95.46	95.47	95.47	0.31	95.52	95.55	95.55	0.23

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STM MH	Prop/App. USF Elevation (m)	100-Year HGL				100-year + 20%			
		12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR HGL (m)	USF – HGL Clearance (m)	12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR+ 20% HGL (m)	USF –HGL Clearance (m)
117	95.77	95.42	95.43	95.43	0.34	95.48	95.51	95.51	0.26
118	95.90	95.58	95.60	95.60	0.30	95.68	95.71	95.71	0.19
119	95.70	95.34	95.35	95.35	0.35	95.41	95.44	95.44	0.26
+51	95.79	95.40	95.41	95.41	0.38	95.48	95.51	95.51	0.28
121	96.20	95.48	95.49	95.49	0.71	95.56	95.60	95.60	0.60
121A	N/A	95.49	95.50	95.50	-	95.56	95.60	95.60	-
123	96.40	95.68	95.66	95.68	0.72	95.78	95.80	95.80	0.60
124	96.64	96.34	96.34	96.34	0.30	96.34	96.34	96.34	0.30
125	96.99	96.48	96.48	96.48	0.51	96.49	96.48	96.49	0.50
+69	97.15	96.84	96.83	96.84	0.31	96.86	96.84	96.86	0.29
126	97.44	96.96	96.95	96.96	0.48	96.98	96.96	96.98	0.46
+41	97.69	97.32	97.31	97.32	0.37	97.33	97.32	97.33	0.36
+71	98.00	97.58	97.58	97.58	0.42	97.59	97.58	97.59	0.41
127	98.35	97.92	97.93	97.93	0.42	97.93	97.93	97.93	0.42
128	97.44	97.05	97.04	97.05	0.39	97.07	97.06	97.07	0.37
129	97.49	97.13	97.12	97.13	0.36	97.14	97.13	97.14	0.35
+31	97.67	97.29	97.28	97.29	0.38	97.29	97.29	97.29	0.38
+65	98.17	97.46	97.45	97.46	0.71	97.46	97.46	97.46	0.71
130	98.35	97.70	97.70	97.70	0.65	97.70	97.70	97.70	0.65
131	98.50	97.70	97.70	97.70	0.80	97.70	97.70	97.70	0.80
132	98.46	97.56	97.56	97.56	0.90	97.56	97.56	97.56	0.90
201	N/A	95.21	95.22	95.22	-	95.27	95.29	95.29	-
210	95.87	95.54	95.57	95.57	0.30	95.63	95.69	95.69	0.18
+32	95.84	95.41	95.44	95.44	0.40	95.50	95.53	95.53	0.31
202	95.76	95.33	95.36	95.36	0.40	95.42	95.44	95.44	0.32
+46	95.77	95.40	95.45	95.45	0.32	95.51	95.53	95.53	0.24
204	95.94	95.56	95.64	95.64	0.30	95.71	95.74	95.74	0.20
+7	95.95	95.57	95.65	95.65	0.30	95.72	95.75	95.75	0.20
205	96.14	95.72	95.84	95.84	0.30	95.92	95.96	95.96	0.18
+82	96.74	95.85	95.99	95.99	0.75	96.07	96.15	96.15	0.59
206	97.12	95.89	96.04	96.04	1.08	96.12	96.21	96.21	0.91
207	97.12	96.39	96.72	96.72	0.40	96.76	97.00	97.00	0.12
209	97.79	96.70	97.13	97.13	0.66	97.14	97.47	97.47	0.32
211	95.92	95.58	95.62	95.62	0.30	95.68	95.74	95.74	0.18
212	96.11	95.64	95.67	95.67	0.44	95.75	95.81	95.81	0.30
213	96.32	95.67	95.71	95.71	0.61	95.78	95.84	95.84	0.48
214	96.14	95.76	95.81	95.81	0.33	95.88	95.94	95.94	0.20
+25	96.19	95.81	95.86	95.86	0.33	95.93	95.99	95.99	0.20
215	96.28	95.87	95.93	95.93	0.35	95.99	96.06	96.06	0.22
216	96.39	95.90	95.96	95.96	0.43	96.02	96.10	96.10	0.29
217	96.59	95.98	96.04	96.04	0.55	96.10	96.18	96.18	0.41

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STM MH	Prop/App. USF Elevation (m)	100-Year HGL				100-year + 20%			
		12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR HGL (m)	USF – HGL Clearance (m)	12-hr SCS HGL (m)	3-hr Chicago HGL (m)	Worst Case 100YR+ 20% HGL (m)	USF –HGL Clearance (m)
218	96.38	95.74	95.79	95.79	0.59	95.86	95.92	95.92	0.46
220	96.25	95.86	95.95	95.95	0.30	96.01	96.07	96.07	0.18
+43	96.22	95.84	95.92	95.92	0.30	95.98	96.04	96.04	0.18
219	96.26	95.80	95.88	95.88	0.38	95.94	96.00	96.00	0.26
+30	96.36	95.87	95.96	95.96	0.40	96.02	96.08	96.08	0.28
221	96.39	95.98	96.09	96.09	0.30	96.15	96.21	96.21	0.18
222	96.80	96.31	96.48	96.48	0.32	96.55	96.60	96.60	0.20
+54	97.19	96.62	96.78	96.78	0.41	96.86	96.90	96.90	0.29
223	97.48	96.74	96.90	96.90	0.58	96.98	97.02	97.02	0.46
224	97.48	96.86	97.01	97.01	0.47	97.09	97.13	97.13	0.35
225	97.66	97.23	97.36	97.36	0.30	97.45	97.48	97.48	0.18
226	98.34	97.33	97.47	97.47	0.87	97.56	97.59	97.59	0.75
227	98.29	97.39	97.54	97.54	0.75	97.63	97.66	97.66	0.63
228	98.14	97.61	97.78	97.78	0.36	97.87	97.91	97.91	0.23
229	98.35	97.70	97.87	97.87	0.48	97.96	98.00	98.00	0.35
230	N/A	97.73	97.87	97.87	-	97.98	98.00	98.00	-
231	98.55	97.73	97.88	97.88	0.67	97.98	98.00	98.00	0.55
232	98.48	97.58	97.58	97.58	0.90	97.98	98.00	98.00	0.48
233	95.60	95.25	95.25	95.25	0.35	95.31	95.33	95.33	0.27
234	95.70	95.37	95.37	95.37	0.33	95.43	95.45	95.45	0.25
235	95.85	95.46	95.47	95.47	0.38	95.53	95.55	95.55	0.30
236	95.80	95.46	95.47	95.47	0.33	95.53	95.55	95.55	0.25
237	95.80	95.46	95.47	95.47	0.33	95.53	95.55	95.55	0.25
240	98.14	97.52	97.66	97.66	0.48	97.76	97.78	97.78	0.36
241	98.35	97.72	97.87	97.87	0.48	97.97	97.99	97.99	0.36
242	N/A	97.72	97.87	97.87	-	97.97	98.00	98.00	-

1. HGL values have been interpolated between proposed manholes where the worst-case HGL did not meet the 0.3m clearance to the lowest USF between manholes.

The model results indicate that there is sufficient clearance between the worst case 100-year HGL and the proposed and approved under side of footings (USFs).

An additional sensitivity test has also been undertaken to assess the hydraulic grade line (HGL) elevation across the proposed storm sewer network under ultimate development conditions, during the 25-year, 3-hour Chicago storm with accumulation of sediment in the portions of the proposed storm sewer pipes submerged by the permanent pool of the SWM pond (93.44 m). Storm sewer pipes partially submerged by the permanent pool of the ultimate KW SWM Pond 5 were modelled as smaller diameter pipes, in order to replicate the impact of sediment accumulation (assumed to be 25% of submerged area) in the submerged portions of the pipes. The pipe parameters used in the sediment accumulation HGL analysis for the ultimate condition development are summarized in **Appendix B.5**

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Table 11 shows the results of the sediment accumulation HGL analysis for the Ultimate condition development during the 25-year, 3-hour Chicago storm.

Table 11: Ultimate Development Sediment Accumulation HGL Results

STM MH	Prop. USF (m)	25-Year, 3 HR Chicago HGL (m)	USF - HGL Clearance (m)
100A	N/A	94.77	N/A
100B	N/A	94.77	N/A
100C	N/A	94.77	N/A
100D	N/A	94.78	N/A
100E	N/A	94.75	N/A
101	95.74	94.85	0.89
102	95.63	94.87	0.76
103	95.69	94.89	0.80
104	95.75	94.90	0.85
105	96.00	95.18	0.82
106	96.00	95.26	0.74
107	96.10	95.18	0.92
108	96.10	95.27	0.83
+50	96.25	95.39	0.86
+86	96.33	95.48	0.85
109	96.23	95.56	0.67
110	96.54	95.34	1.20
111	96.30	95.41	0.89
112	96.30	95.61	0.69
+51	96.34	95.72	0.62
113	96.37	95.79	0.58
114	95.63	94.89	0.74
115	95.71	94.96	0.75
116	95.78	95.29	0.49
117	95.77	95.11	0.66
118	95.90	95.54	0.36
119	95.70	94.93	0.77

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STM MH	Prop. USF (m)	25-Year, 3 HR Chicago HGL (m)	USF - HGL Clearance (m)
+51	95.79	94.97	0.82
121	96.20	95.02	1.18
121A	N/A	95.49	N/A
123	96.40	95.61	0.79
124	96.64	96.34	0.30
125	96.99	96.48	0.51
+69	97.15	96.84	0.31
126	97.44	96.96	0.48
+41	97.69	97.32	0.37
+71	98.00	97.58	0.42
127	98.35	97.93	0.42
128	97.44	97.04	0.40
129	97.49	97.12	0.37
+31	97.67	97.28	0.39
+65	98.17	97.45	0.72
130	98.35	97.70	0.65
131	98.50	97.70	0.80
132	98.46	97.56	0.90
201	N/A	94.79	N/A
210	95.87	95.06	0.81
+32	95.84	94.91	0.93
202	95.76	94.82	0.94
+46	95.77	94.82	0.95
204	95.94	94.83	1.11
+7	95.95	94.83	1.12
205	96.14	94.83	1.31
+82	96.74	94.84	1.90
206	97.12	94.84	2.28
207	97.12	95.42	1.70
209	97.79	95.87	1.92

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STM MH	Prop. USF (m)	25-Year, 3 HR Chicago HGL (m)	USF - HGL Clearance (m)
211	95.92	95.10	0.82
212	96.11	95.15	0.96
213	96.32	95.18	1.14
214	96.14	95.27	0.87
+25	96.19	95.36	0.83
215	96.28	95.47	0.81
216	96.39	95.57	0.82
217	96.59	95.76	0.83
218	96.38	95.24	1.14
220	96.25	95.49	0.76
+43	96.22	95.36	0.86
219	96.26	95.28	0.98
+30	96.36	95.39	0.97
221	96.39	95.55	0.84
222	96.80	96.06	0.74
+54	97.19	96.40	0.79
223	97.48	96.53	0.95
224	97.48	96.65	0.83
225	97.66	97.06	0.60
226	98.34	97.17	1.17
227	98.29	97.23	1.06
228	98.14	97.46	0.68
229	98.35	97.54	0.81
230	N/A	97.59	N/A
231	98.55	97.35	1.20
232	98.48	97.58	0.90
233	95.60	94.84	0.76
234	95.70	94.97	0.73
235	95.85	95.07	0.78
236	95.80	95.07	0.73

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

STM MH	Prop. USF (m)	25-Year, 3 HR Chicago HGL (m)	USF - HGL Clearance (m)
237	95.80	95.07	0.73
240	98.14	97.38	0.76
241	98.35	97.59	0.76
242	N/A	97.59	N/A

The results show that sufficient clearance is provided between the proposed and approved USFs and the 25-year HGL assuming 25% of the submerged section of pipe is filled with sediment.

Overland Flow

Major system peak flows from the proposed development will be directed to the KW Pond 5. **Drawings SD-1** and **SD-2** show the proposed overland flow route.

The proposed ICDs have been sized to capture the 2-year runoff from local street catchments (areas named L-), and the 5-year runoff from collector road catchments (areas named C-), while still meeting the 0.3 m required 100-year HGL clearance to the USFs.

Table 12 presents the maximum total surface water depths (static ponding depth + dynamic flow) above the top-of-grate of the proposed street catchbasins for the 100-year, 3-hr Chicago storm and the 'climate change' storm. Based on the model results, the total ponding depth (static + dynamic) does not exceed the required 0.35 m maximum during the 100-year event. A summary table showing the total surface water depths for the 5-year design storms for the proposed phase areas of the Richcraft Kanata West Development has been included in **Appendix B.3**

Table 12: Proposed Phase – Ultimate Maximum Static and Dynamic Surface Water Depths

Storage node ID	Top of Grate Elevation (m)	Lowest Adjacent Building Opening (m)	2-year, 3-hour Chicago		100-year, 3-hour Chicago		100-year, 3-hour Chicago+20%	
			Max HGL (m)	Total Surface Ponding Depth (m)	Max HGL (m)	Total Surface Ponding Depth (m)	Max HGL (m)	Total Surface Ponding Depth (m)
205A-S(1)	97.45	98.25	96.38	0.00	97.72	0.27	97.78	0.33
206B-S(1)	97.77	98.49	96.91	0.00	97.90	0.13	97.93	0.16
219A-S(1)	97.82	N/A	96.90	0.00	97.96	0.14	98.00	0.18
220A-S	97.68	98.33	96.60	0.00	97.96	0.28	98.00	0.32
222A-S	97.82	98.50	96.85	0.00	98.10	0.28	98.19	0.37
223A-S	98.17	99.16	97.17	0.00	98.37	0.20	98.40	0.23
G234C-S	97.59	N/A	94.99	0.00	97.76	0.17	97.78	0.19
116A-S	97.20	97.88	96.73	0.00	97.48	0.28	97.54	0.34
202A-S(1)	97.27	97.87	96.75	0.00	97.56	0.29	97.62	0.35

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Storage node ID	Top of Grate Elevation (m)	Lowest Adjacent Building Opening (m)	2-year, 3-hour Chicago		100-year, 3-hour Chicago		100-year, 3-hour Chicago+20%	
			Max HGL (m)	Total Surface Ponding Depth (m)	Max HGL (m)	Total Surface Ponding Depth (m)	Max HGL (m)	Total Surface Ponding Depth (m)
204A-S(1)	97.39	98.05	97.21	0.00	97.64	0.25	97.71	0.32
204BS(1)	97.34	97.87	96.69	0.00	97.59	0.25	97.65	0.31
206A-S(1)	98.29	98.85	98.14	0.00	98.54	0.25	98.58	0.29
207A-S(1)	98.68	99.37	98.15	0.00	98.99	0.31	99.03	0.35
209A-S	99.59	100.25	98.95	0.00	99.66	0.07	99.66	0.07
209B-S	100.03	N/A	99.77	0.00	100.07	0.04	100.08	0.05
210A-S	97.37	97.94	96.95	0.00	97.57	0.20	97.64	0.27
211A-S(1)	97.75	98.27	97.43	0.00	97.98	0.23	98.02	0.27
L212A-S	96.94	N/A	95.80	0.00	96.97	0.03	96.97	0.03
213A-S	97.82	98.53	97.27	0.00	98.00	0.18	98.03	0.21
214A-S(1)	97.65	98.31	97.24	0.00	97.88	0.23	97.94	0.29
217A-S	97.81	98.56	97.35	0.00	98.00	0.19	98.05	0.24
219B-S	97.98	98.49	97.32	0.00	98.29	0.31	98.37	0.39
225A-S	99.03	99.59	99.03	0.00	99.31	0.28	99.35	0.32
225C-S	99.49	99.85	99.43	0.00	99.70	0.21	99.73	0.24
228A-S	99.99	100.40	99.69	0.00	100.21	0.22	100.24	0.25
229A-S	100.20	100.62	100.11	0.00	100.41	0.21	100.44	0.24
234A-S	97.35	97.95	97.17	0.00	97.60	0.25	97.66	0.31
234B-S	97.30	97.77	96.88	0.00	97.57	0.27	97.63	0.33
235A-S	97.36	97.90	96.86	0.00	97.67	0.31	97.71	0.35
240A-S	99.80	100.40	99.43	0.00	99.97	0.17	100.00	0.20
241B-S	99.90	100.47	99.86	0.00	100.13	0.23	100.16	0.26
241A-S	100.14	100.65	100.14	0.00	100.34	0.20	100.35	0.21

WATER BALANCE – INFILTRATION REQUIREMENTS

Based on a target infiltration rate of 50 mm/yr for the overall 36.53 ha Richcraft Kanata West site, on-site infiltration measures are required to infiltrate approximately 22,831 m³/year (Pre-development infiltration increased by 25%). Infiltration, evapotranspiration, and runoff values were established based on results of previous hydrogeologic and geotechnical investigations for areas in the City's west end that maintain similar subsurface soils conditions. Detailed water balance calculations are attached.

As the development will receive an extensive soils pre-loading and/or surcharge program to permit proposed grading at or near permissible grade raise recommendations, it is proposed that the upper 20 cm layer of soil within the proposed front and back landscaped areas (Second Registration Phase), and within landscaped areas in the proposed park (Second Registration Phase) be constructed with amended soils to promote infiltration and evapotranspiration. It is also recommended that the underlying soils below the proposed amended topsoil layer be scarified to a depth of 45 cm to promote additional infiltration.

Other practices for groundwater infiltration include:

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

- Direct roof leaders to rear yard areas
- Bioswales underlying drainage swales in proposed rear yard areas
- The use of amended planting topsoil in parks and residential backyards
- Infiltration of runoff captured by rear yard catch basins

Per the above, proposed roof eaves troughs will be directed to rear yard pervious areas, and rear yards will maintain perforated pipe subdrains and bioswales as per the approved cross-section for the First Registration Phase (see **Figure 6**).

Of the total site area, 21.88 ha will be converted to impervious area with no infiltration, which excludes the proposed ultimate SWM pond footprint of 2.56 ha that will not provide infiltration either. Approximately 12.09 ha will consist of parks, lawns and open space areas. The inclusion of amended planting topsoil in proposed residential landscaped areas and the proposed park area (total of 2.84 ha) is expected to provide additional infiltrative capacity to surficial soils in order to increase post development infiltration rate from pervious areas to 13,409 m³/year (9,423 m³/year to be infiltrated elsewhere). The practice of applying a deeper layer of organic topsoil has the potential to absorb runoff and increase infiltration, as well as to promote evapotranspiration, thus reducing runoff volumes overall. Due to the impervious nature of the native clay soils, it is expected that the addition of amended soils to the rear yard landscaped areas within the proposed phase as well as within the proposed park landscaped areas will promote shallow groundwater movement to the Carp River and Hazeldean Creek.

The recommended minimum topsoil depth and quality standards as per the Toronto and Region Conservation Authority is as follows.

Table 13: Amended Planting Soil Minimum Depth and Quality Standards

Planting Area Type	Subsoil Scarifying Depth (cm)	Topsoil Organic Matter (%dry wt.)	Topsoil PH	Planting Soil Depth (cm)	Total Uncompacted Soil Depth (cm)
Turf Area	45	5 to 10	6.0 to 8.0	20	65
Planting Bed of Tree Pit	45	10 to 15	6.0 to 8.0	20	65

Rear-yard bioswales within the approved and proposed phases of the development are required to provide the additional 9,423 m³/year.

Based on average precipitation data available (2000-2011), approximately 31 rainfall events/yr have a rainfall depth that ranges between 6 mm and 25 mm, for an average depth of 12.2 mm. Based on the roof area tributary to the rear yard bioswales in the approved and proposed phases (21,324 m² based on half roofs directed to rear yards), the annual volume of runoff from the roofs to the bioswales is approximately 7,992 m³ (1,431 m³/year to be infiltrated elsewhere).

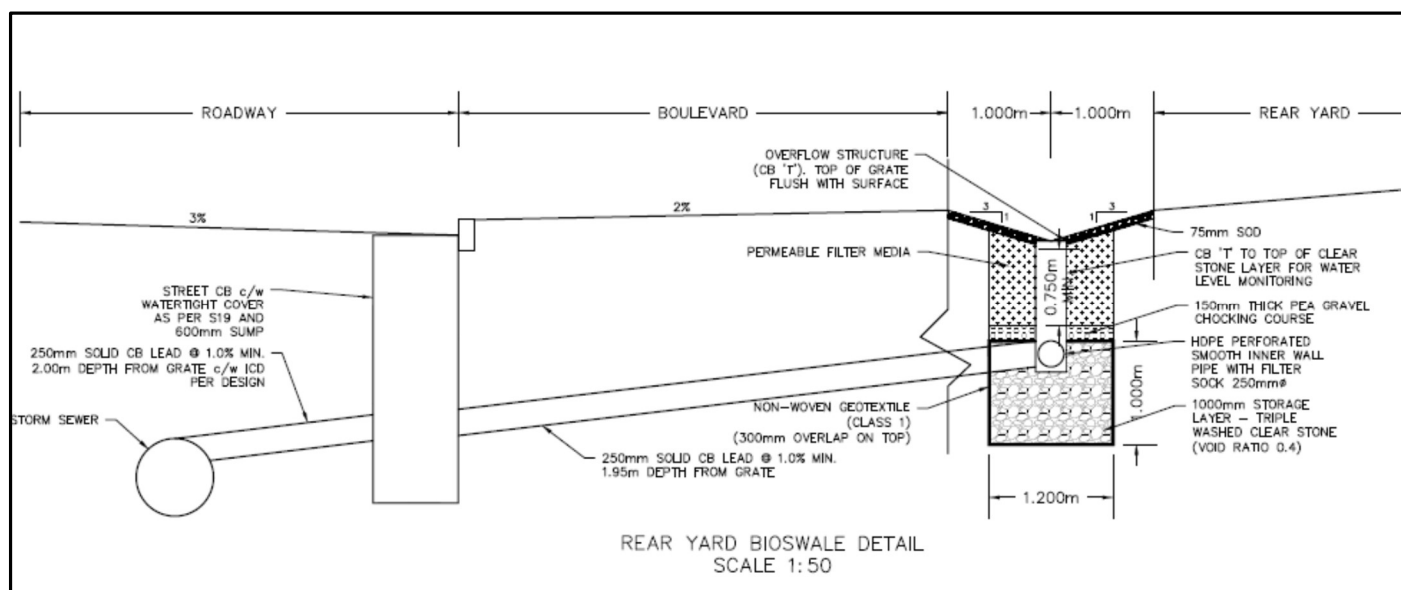
As per the approved SWM plan for the second registration phase of the development, the school block (Block 70) is required to infiltrate 671 m³/yr and as such, the remainder 759 m³/yr are required to be infiltrated within the two proposed medium density residential blocks (Block 60 and Block 117).

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Given that the total area for the two medium density residential blocks is 2.77 ha, an infiltration target of 274 m³/year has been established for each block (refer to **Table 8** for future block SWM criteria). Detailed water balance calculations are included in **Appendix B.6**.

The following figure shows the typical cross section of the bioswales as agreed upon with the City of Ottawa during the detailed design stage of the First Registration Phase of the KW Development.

Figure 6: Typical Bioswale Cross Section



The minimum required footprint area of the bioswales was estimated for each bioswale based on MECP guidelines (Equation 4.3) for a retention time of 24 hours and an average infiltration rate of the native soil equal to 19 mm/hr as recommended by Paterson in their technical memo PG4624-MEMO.07 dated June 28, 2019. However, for conservatism, the proposed infiltration measures have not been included in the PCSWMM models for the proposed development.

Table 14 summarizes the design characteristics of the proposed bioswales.

Table 14: Proposed Bioswale Characteristics

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Drainage Area ID	Drainage Area (ha)	Imperviousness (%)	Required Volume for 25mm Event (m ³)	Bioswale Length (m)	Bioswale Width (m)	Storage Layer Depth (m)	Maximum Storage Available (m)
L209C	0.41	39%	40	105	1.2	0.75	41
L205B	0.49	36%	44	130	1.2	0.75	51
L204C	0.26	39%	25	44	1.2	0.75	17
L202B	0.25	50%	31	75	1.2	0.75	29
L234D	0.37	53%	49	90	1.2	0.75	35
L218B	0.25	36%	22	131	1.2	0.75	51
L220A	0.87	34%	75	192	1.2	0.75	75

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

WASTEWATER

The second registration phase of the Richcraft Kanata West Development was previously approved in 2022 and an addendum letter was subsequently approved in 2023. However, the draft plan has been revised to replace single family homes in the south-eastern corner of the site by a medium density residential block (Block 117), a new public right-of-way has been added in the south-western corner of the site (north and east of Holstein Road) and lot configuration for a few townhouses along Winter Wheat Terrace and Tillage Street has been modified. As such, the sanitary sewer design sheet and HGL analysis across the entire site have been revised to reflect the revised draft plan changes.

The second registration phase of the Richcraft Kanata West Development will be serviced through the approved sanitary sewers within the first registration phase that ultimately discharge into the existing 1200 mm diameter sanitary sewer on Maple Grove Road and the Kanata West Pump Station (KWPS) as shown on **Drawing OSSP-2**. The proposed sanitary trunk sewers have been sized for the ultimate development condition which includes sewage peak flows from the existing Trinity Development to the south.

Modelling of the proposed sanitary sewer system is required as per the Kanata West Master Servicing Study (Stantec, 2006) to assess maximum HGLs during critical failure of the KWPS. In addition, as outlined in the City's "Technical Bulletin ISTB-2018-01", a sanitary HGL analysis is required to assess the maximum HGL in the sanitary sewer system under normal pumping station conditions. The HGL across the proposed site has been assessed under the worst-case scenario which occurs during full build-out of the Richcraft Kanata West Development, and once a sanitary connection has been provided for the existing Trinity Development through the proposed site.

DESIGN CRITERIA

The following design guidelines were obtained from the City's "Technical Bulletin ISTB-2018-01" and were used to estimate wastewater flow rates from the proposed development and to size the sanitary sewers.

- Minimum Full Flow Velocity – 0.6 m/s
- Maximum Full Flow Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Single Family Persons per unit – 3.4
- Townhouse unit – 2.7
- Per Capita Residential Average Daily Flow – 280 L/p/day
- Commercial and Institutional Average Daily Flow - 28,000 L/ha/day
- Peaking Factor for Commercial and Institutional Areas – 1.5 if ICI in contributing area is >20%; ICI Peak Factor =1.0 if ICI in contributing area <20%
- Extraneous Flow Allowance – 0.33 L/s/ha
- Manhole Spacing – 120m for pipes under 450mm dia., 150m for pipes over 450mm dia.
- Minimum Cover – 2.5 m

In the approved First Registration phase of the development, a unit density of 38 units/ha was used for the medium density residential block (Block 29). The unit density for the medium density residential block (previously Block 75) within the Second Registration Phase of the development is based on the concept

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

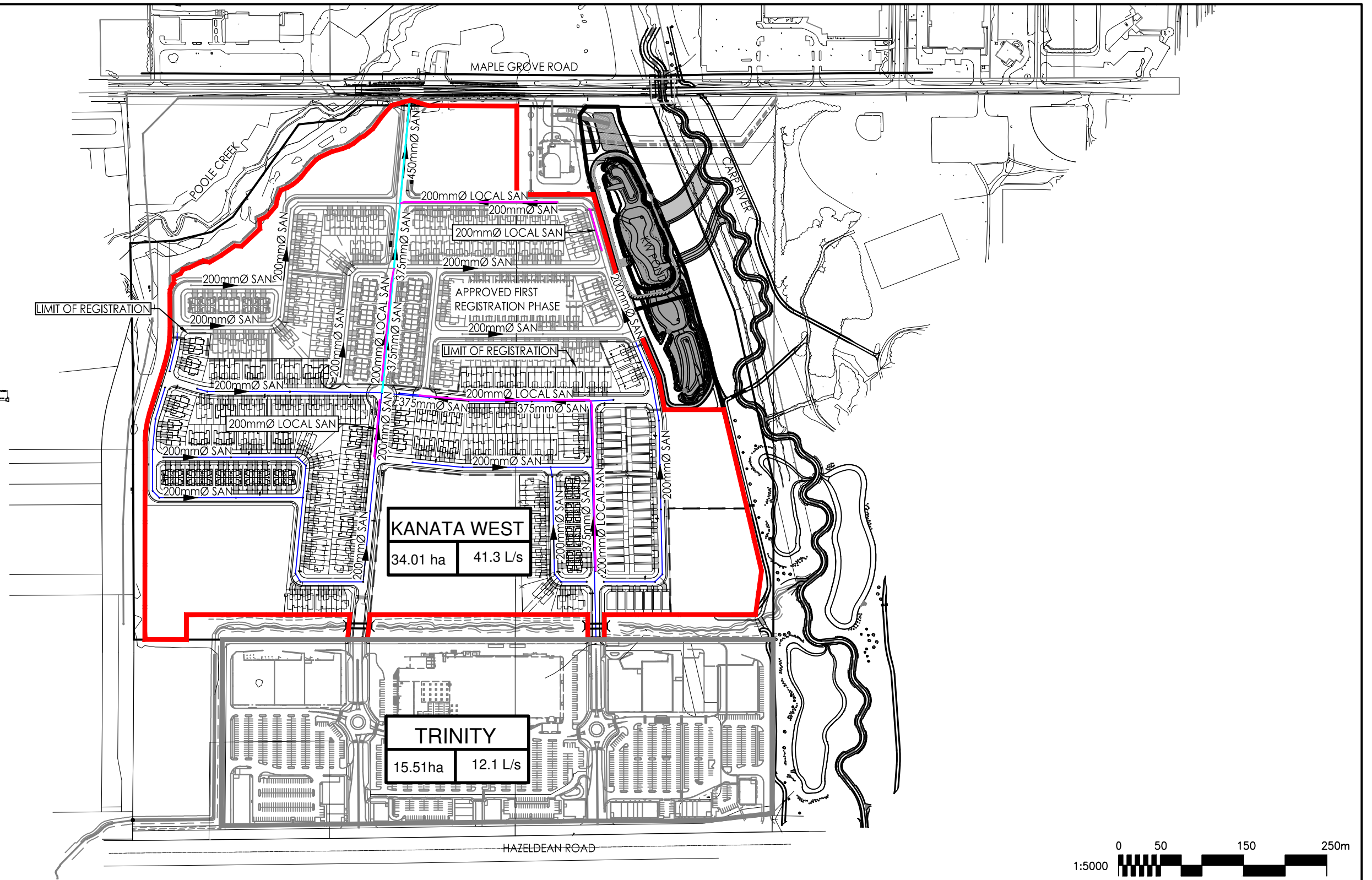
plan, included in **Appendix C.3**. Based on the concept plan, the unit density for medium density residential blocks within the Second Registration Phase has been revised to approximately 93 units/hectare. This unit density was used for both medium density residential blocks (Block 60 and Block 117) within the Second Registration Phase. A residential peak factor based on Harmon's Equation with a correction factor of 0.8 was used to determine the residential peak design flows.

PROPOSED SANITARY SEWERS

The proposed sanitary sewer system has been designed as a network of gravity sewers which will direct wastewater flows from the approved and proposed phases of the Richcraft Kanata West Subdivision and the existing Trinity Development (approximately **53.4 L/s** which includes **12.1 L/s** from the existing Trinity commercial site) to the Maple Grove trunk sewer and ultimately to the Kanata West Pump Station (KWPS). The overall external drainage extent is shown on **Figure 7**, while the overall drainage areas, wastewater peak flows and sanitary sewers within the approved and proposed development areas are shown on **Drawings SA-1** and **SA-2** and in the sanitary sewer design sheet included in **Appendix C.1**.

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160401393



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Ottawa ON

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Legend

Catchment 1
4.00 ha 50L/s

EXISTING SANITARY DRAINAGE BOUNDARY
PROPOSED OVERALL SANITARY DRAINAGE BOUNDARY

SITE ID

AREA (HA) / QPEAK (L/s)

PROPOSED SANITARY SEWER

APPROVED FIRST REGISTRATION PHASE SANITARY SEWER



PROPOSED DEEP TRUNK SANITARY SEWER (DEEPER THAN 6.0m)



PROPOSED HIGH LEVEL LOCAL SANITARY SEWER

Client/Project

RICHCRAFT HOMES

RICHCRAFT KANATA WEST

Figure No.

7

Title

PROPOSED SANITARY SEWER NETWORK
AND EXTERNAL DRAINAGE EXTENT

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

SANITARY HGL ANALYSIS

This section summarizes the results of the sanitary hydraulic grade line (HGL) analysis for the proposed second registration phase of the Richcraft Kanata West Development, which has been revised to replace the single family homes in the south-eastern corner of the site with a medium density residential block (Block 117), and to add a new public right-of-way in the south-western corner of the site, and adjust lotting configuration for a few townhouses. The worst-case HGL occurs at full build-out of the Richcraft KW Development and as such, the HGL analysis includes the approved and proposed sanitary sewers within the entire Richcraft KW Development, external wastewater flows from the existing Trinity Development, as well as the existing 1200 mm diameter sanitary trunk sewer on Maple Grove Road from the subdivision outlet to the Kanata West Pumping Station (KWPS) located at the southwest intersection of Maple Grove Road and Terry Fox Drive.

The sanitary HGL across the proposed Richcraft subdivision has been assessed assuming ultimate development conditions for the KWPS catchment area under both catastrophic failure and normal operating conditions of the KWPS. The sanitary HGL analysis was prepared based on the following background documents provided by the City of Ottawa (see **Appendix C.3**).

- *Alternative 2: Divert Stittsville Trunk Sewer Only Design Sheet Long Term Flows (2031)*, J.L. Richard and Associates, December 2014.
- *Fernbank Community – Kizell Lands, Sanitary Drainage Area Plan*, Novatech, February 2018.
- *Fernbank Community – Kizell Lands, Sanitary Sewer Design Sheet*, Novatech, February 2018.
- *Kanata West Master Servicing Study, Sanitary Sewer Design Sheet*, Stantec Consulting Ltd., CCL and IBI, April 2005.
- *Kanata West Concept Plan Master Servicing Study, Preferred Waste-Water Option*, Stantec Consulting Ltd., CCL and IBI, October 2005.
- *Reconstruction of Maple Grove Road, Sanitary Drainage Plan*, DSEL on behalf of the City of Ottawa, July 2011.
- *Reconstruction of Maple Grove Road, Sanitary Sewer Calculation Sheet*, DSEL on behalf of the City of Ottawa, May 2012.
- *Kanata West Serviceability Study, N-S Interceptor Sewer Sanitary Design Sheet*, IBI, June 2016.
- *Maple Grove Expansion Area Excel Sheet*, City of Ottawa.
- *Hazeldean Sanitary Sewer Analysis*, Atriel Engineering Ltd., November 29th, 2017.
- *Kanata West Pumping Station and Forcemains Preliminary Design Report*, Stantec Consulting Ltd., April 13, 2015
- *Kanata West Pumping station and Forcemains – Preliminary Design Report*, Stantec Consulting Ltd., April 2015.

Sanitary HGL Analysis Criteria

As per the City of Ottawa's Technical Bulletin from March 2018, a sanitary HGL analysis must be performed assuming both catastrophic failure and normal operating conditions of the KWPS.

Annual flow parameters are to be used to assess the HGL in the sanitary system assuming a catastrophic failure of the pump station with wet weather peak flows being discharged through the emergency overflow

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

into the ultimate condition Kanata West Pond 5 under 100-year water level. The HGL under this scenario cannot touch the proposed under side of footing (USF).

As per the KWPS overflow weir design calculations, a 20 cm head over the overflow weir crest is required to convey the design wet weather peak flow of 1,250 L/s to the KW Pond 5. The 20 cm head has been used to estimate the boundary conditions in the Catastrophic event scenarios for conservatism.

Additional scenarios have been run assuming catastrophic failure of the KWPS as described below.

- Scenario 1 assumes a conservative design peak flow of 583 L/s from the Stittsville trunk sewer diversion and a fixed backwater boundary condition of 95.20 m at the ultimate KW Pond 5 (100-year water level plus 20 cm head over the KWPS overflow weir).
- Scenario 2 assumes the ultimate condition IMP peak flow of 360 L/s from the Stittsville trunk sewer diversion and a fixed backwater boundary condition of 95.20 m at the ultimate KW Pond 5.
- Scenario 3 assumes the interim condition IMP peak flow of 465 L/s from the Stittsville trunk sewer diversion and a fixed backwater boundary condition of 95.20 m at the ultimate KW Pond 5.
- Scenario 4 assumes a conservative design peak flow of 583 L/s from the Stittsville trunk sewer diversion and a fixed backwater boundary condition of 95.06 m at the ultimate KW Pond 5 (25-year water level plus 20 cm head over the PS overflow weir).

Rare flow parameters are to be used to assess the maximum HGL in the sanitary system under normal pumping station conditions. Under this scenario, the HGL must be at least 0.3 m below the USF.

Design Parameters and Assumptions

The following table summarizes the design annual and rare flow parameters as obtained from the City's "Technical Bulletin ISTB-2018-01 Revision to Ottawa Design Guidelines - Sewer".

Table 15: Wastewater Annual and Rare Flow Parameters

Parameters	Annual	Rare
Res. Per Capita	200	200
Commercial	17,000	17,000
Institutional	17,000	17,000
Industrial	10,000	10,000
I/I Dry	0.02	0.02
I/I Wet	0.28	0.53
Total I/I	0.30	0.55
Harmon – Correction Factor	0.6	0.6
ICI Peak Factor	1	1

Sanitary inflows from the proposed and approved phases of the KW Development were obtained from the detailed sanitary drainage plans included in **Appendix E**, while sanitary inflows from all external areas under ultimate development conditions were obtained from background documents provided by the City of Ottawa as shown in **Appendix C.3**. **Appendix C.2** includes the rare and annual sewage inflow calculations

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

as well as a figure identifying each of the subareas used. **Table 16** summarizes the populations and areas obtained from the background documents as well as the assumptions made for any other areas.

Table 16: Wastewater Population and Area Assumptions

Segment	Population	Residential Area (ha)	Commercial/Industrial/Institutional Area (ha)	Annual Peak Inflows (L/s)	Rare Peak Inflows (L/s)	Additional Assumptions
Stittsville Trunk	28,031	526.60	76.0 ha Commercial and 40.5 ha Industrial	583.0 Scenario 1 360.0 Scenario 2 465.0 Scenario 3 583.0 Scenario 4	503.0	The peak design flow of 583 L/s was used in the catastrophic event Scenario 1 for conservatism, the ultimate condition IMP model peak flow of 360 L/s was used for the catastrophic event scenario 2, while the interim condition IMP model peak flow of 465 L/s was used for the catastrophic event scenario 3. A peak flow estimated using rare event parameters of 503 L/s was used for the normal operating condition analysis.
Kizell Lands	3,585	52.56	11.82	41.8	57.9	-
Huntmar and Hazeldean	6,357	111.52	65.44	103.9	151.6	Population and areas as obtained from Huntmar/Hazeldean Design Sheet based on KWMSS assumptions for areas 16, 20, 17, 21, 19A, 23, 24 and 19
Additional Hazeldean	296	13.62	5.39	8.7	13.5	-
Maple Grove Sewer	10,501	137.54	-	93.8	128.2	-
Maple Grove Expansion	3,549	84.43	-	42.9	61.9	Number of units and gross area based on spreadsheet provided by the City, with 90% of gross area contributing to I/I and 198 employees generating 83L/emp/day added to total flow

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Segment	Population	Residential Area (ha)	Commercial/Industrial/Institutional Area (ha)	Annual Peak Inflows (L/s)	Rare Peak Inflows (L/s)	Additional Assumptions
Future North-South Collector	4,936	28.44	165.28	147.5	195.9	Population and areas were obtained based on IBI Design Sheet areas A to F and 21.13 ha of area G. A 30L/s fixed flow was added to the total peak flow.
North of Richcraft Kanata Site	113	1.10	-	1.1	1.4	Assumed medium density residential area to have 38 units/ha and 2.7person/unit.
Richcraft Kanata West Development / Existing Trinity	2,911	28.14	18.65	38.2	50.6	-

Based on the above assumptions plus the peak flows estimated for the detailed sanitary catchments across the Richcraft KW Development as shown in **Appendix C.2**, the worst-case peak annual flow is 1,061 L/s (Scenario 1) and the peak rare flow is 1,164 L/s were obtained.

Boundary Conditions

The catastrophic HGL scenarios 1 through 3 which use annual flow parameters to calculate peak inflows into the sanitary system were assessed assuming a fixed backwater of 95.2 m based on a 100-year water level in the ultimate KW Pond 5 equal to 95.0 m plus an additional 0.2 m head over the KWPS emergency overflow weir (head required to convey the design wet weather peak flow of 1,250 L/s as obtained from the KWPS design brief). An additional catastrophic HGL scenario (Scenario 4) was assessed assuming a fixed backwater of 95.06 m based on a 25-year water level in the ultimate KW Pond 5 equal to 94.86 m plus an additional 0.2 m head over the KWPS emergency overflow weir.

The normal operating condition HGL analysis which uses rare flow parameters to calculate peak inflows into the sanitary system was done assuming startup and shutoff elevations in the KWPS of 84.25 m and 82.90 m respectively. The minimum and maximum wet well volumes assumed for the ultimate condition were 281 m³ and 810 m³ respectively, while the wet weather peak flow of 1,250 L/s was used as the pumping rate.

Sanitary HGL Analysis Results

The following tables summarize the HGL results from the catastrophic failure (annual parameters) scenarios and the normal operating conditions (rare parameters) scenario across the Richcraft KW Development.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Table 17: Catastrophic Pump Station Failure Sanitary HGL – Annual Parameters

MH ID	Road Grade (m)	USF (m)	Catastrophic HGL and USF – HGL Clearance							
			Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
10	99.43	97.51	96.32	1.19	96.32	1.19	96.32	1.19	96.32	1.19
11	100.75	97.69	96.90	0.79	96.9	0.79	96.9	0.79	96.9	0.79
12	100.60	98.50	97.04	1.46	97.04	1.46	97.04	1.46	97.04	1.46
13	100.23	98.46	97.30	1.16	97.3	1.16	97.3	1.16	97.3	1.16
14	97.61	N/A	95.42	-	95.36	-	95.39	-	95.28	-
16	97.35	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17	97.29	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17A	97.32	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17B	97.37	95.68	95.44	0.24	95.38	0.30	95.4	0.28	95.3	0.38
18	97.17	N/A	95.45	-	95.38	-	95.41	-	95.31	-
18A	97.65	95.69	95.44	0.25	95.38	0.31	95.41	0.28	95.3	0.39
18B	97.09	N/A	95.44	-	95.38	-	95.41	-	95.3	-
19	97.43	95.63	95.45	0.18	95.39	0.24	95.42	0.21	95.31	0.32
1A	96.22	N/A	95.35	-	95.29	-	95.32	-	95.21	-
1B	96.60	N/A	95.31	-	95.27	-	95.29	-	95.17	-
1C	95.30	N/A	95.24	-	95.22	-	95.23	-	95.1	-
2	97.46	N/A	95.37	-	95.31	-	95.33	-	95.23	-
20	97.50	95.63	95.47	0.16	95.41	0.22	95.44	0.19	95.33	0.30
20A	97.37	N/A	95.47	-	95.41	-	95.44	-	95.33	-
21	97.48	95.78	95.48	0.30	95.42	0.36	95.44	0.34	95.34	0.44
22	97.96	N/A	95.42	-	95.36	-	95.39	-	95.28	-
22A	97.83	96.10	95.42	0.68	95.36	0.74	95.39	0.71	95.28	0.82
22B	97.81	96.10	95.43	0.67	95.37	0.73	95.39	0.71	95.29	0.81
23	98.10	96.54	95.43	1.11	95.37	1.17	95.39	1.15	95.29	1.25
24	98.05	96.62	95.43	1.19	95.37	1.25	95.39	1.23	95.29	1.33
25	98.00	96.30	95.43	0.87	95.37	0.93	95.39	0.91	95.29	1.01

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

MH ID	Road Grade (m)	USF (m)	Catastrophic HGL and USF – HGL Clearance							
			Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
26	98.10	96.34	95.43	0.91	95.37	0.97	95.39	0.95	95.29	1.05
27	97.92	95.75	95.43	0.32	95.37	0.38	95.4	0.35	95.29	0.46
3	97.89	N/A	95.40	-	95.34	-	95.37	-	95.26	-
30	98.01	95.90	95.43	0.47	95.37	0.53	95.4	0.50	95.29	0.61
31	97.52	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
32	97.68	95.90	95.47	0.43	95.41	0.49	95.44	0.46	95.33	0.57
33	97.62	96.00	95.43	0.57	95.37	0.63	95.4	0.60	95.29	0.71
35	97.97	N/A	95.45	-	95.39	-	95.42	-	95.31	-
35A	97.94	96.10	95.44	0.66	95.38	0.72	95.41	0.69	95.3	0.80
36	98.67	96.52	95.73	0.79	95.73	0.79	95.73	0.79	95.73	0.79
37	99.34	97.12	96.39	0.73	96.39	0.73	96.39	0.73	96.39	0.73
38	99.55	97.79	96.57	1.22	96.57	1.22	96.57	1.22	96.57	1.22
39	98.03	N/A	95.51	-	95.45	-	95.48	-	95.37	-
39A	97.97	96.36	95.51	0.85	95.45	0.91	95.48	0.88	95.37	0.99
39B	98.01	96.22	95.51	0.71	95.45	0.77	95.48	0.74	95.37	0.85
3A	97.75	N/A	95.40	-	95.34	-	95.37	-	95.26	-
3B	97.66	95.79	95.40	0.39	95.34	0.45	95.37	0.42	95.26	0.53
3C	97.53	95.74	95.40	0.34	95.34	0.40	95.37	0.37	95.26	0.48
4	98.19	96.40	95.41	0.99	95.35	1.05	95.37	1.03	95.27	1.13
40	98.10	96.36	95.56	0.80	95.5	0.86	95.53	0.83	95.42	0.94
41	98.38	96.39	95.61	0.78	95.55	0.84	95.57	0.82	95.47	0.92
42	99.25	97.19	95.65	1.54	95.59	1.60	95.62	1.57	95.51	1.68
43	99.19	97.48	95.66	1.82	95.6	1.88	95.63	1.85	95.52	1.96
44	99.85	97.66	95.71	1.95	95.7	1.96	95.7	1.96	95.7	1.96
45	100.27	98.34	95.97	2.37	95.97	2.37	95.97	2.37	95.97	2.37
46	100.27	98.29	96.06	2.23	96.06	2.23	96.06	2.23	96.06	2.23
47	100.49	98.14	96.41	1.73	96.41	1.73	96.41	1.73	96.41	1.73

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

MH ID	Road Grade (m)	USF (m)	Catastrophic HGL and USF – HGL Clearance							
			Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
48	100.46	98.35	96.73	1.62	96.73	1.62	96.73	1.62	96.73	1.62
49	100.59	N/A	96.71	-	96.71	-	96.71	-	96.71	-
5	98.63	96.68	95.43	1.25	95.43	1.25	95.43	1.25	95.43	1.25
50	100.41	98.55	96.96	1.59	96.96	1.59	96.96	1.59	96.96	1.59
51	100.21	98.48	97.23	1.25	97.23	1.25	97.23	1.25	97.23	1.25
52	97.61	N/A	95.46	-	95.4	-	95.43	-	95.32	-
53	97.65	N/A	95.46	-	95.4	-	95.43	-	95.32	-
54	97.63	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54A	97.67	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54B	97.70	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54C	97.66	95.94	95.47	0.47	95.41	0.53	95.44	0.50	95.33	0.61
54D	97.69	95.95	95.47	0.48	95.41	0.54	95.44	0.51	95.33	0.62
54E	97.54	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54F	98.10	95.84	95.47	0.37	95.41	0.43	95.44	0.40	95.33	0.51
54G	98.17	95.95	95.50	0.45	95.5	0.45	95.5	0.45	95.5	0.45
55	98.09	N/A	95.47	-	95.41	-	95.44	-	95.33	-
56	98.16	96.32	95.48	0.84	95.42	0.90	95.44	0.88	95.34	0.98
57	98.13	96.38	95.48	0.90	95.42	0.96	95.45	0.93	95.34	1.04
58	98.24	96.26	95.55	0.71	95.55	0.71	95.55	0.71	95.55	0.71
59	97.99	N/A	95.48	-	95.42	-	95.44	-	95.34	-
6	98.67	N/A	95.52	-	95.52	-	95.52	-	95.52	-
60	98.23	96.14	95.48	0.66	95.42	0.72	95.45	0.69	95.34	0.80
61	98.13	96.39	95.48	0.91	95.42	0.97	95.45	0.94	95.34	1.05
62	97.95	96.59	95.48	1.11	95.42	1.17	95.45	1.14	95.34	1.25
63	98.15	N/A	95.48	-	95.42	-	95.45	-	95.34	-
64	97.29	N/A	95.49	-	95.43	-	95.45	-	95.35	-
65	97.56	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

MH ID	Road Grade (m)	USF (m)	Catastrophic HGL and USF – HGL Clearance							
			Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
66	97.47	95.60	95.49	0.11	95.43	0.17	95.45	0.15	95.35	0.25
67	97.58	95.60	95.50	0.10	95.44	0.16	95.47	0.13	95.36	0.24
68	97.49	95.85	95.51	0.34	95.45	0.40	95.47	0.38	95.37	0.48
69	97.56	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
7	99.11	96.99	96.01	0.98	96.01	0.98	96.01	0.98	96.01	0.98
70	97.95	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
8	100.21	97.69	97.18	0.51	97.18	0.51	97.18	0.51	97.18	0.51
80	100.15	98.14	96.08	2.06	96.08	2.06	96.08	2.06	96.08	2.06
81	100.28	98.35	96.45	1.90	96.45	1.90	96.45	1.90	96.45	1.90
82	100.35	N/A	96.47	-	96.47	-	96.47	-	96.47	-
9	99.23	97.44	96.21	1.23	96.21	1.23	96.21	1.23	96.21	1.23

As can be seen in the above table, the worst-case annual HGL (Scenario 1) remains below the proposed USF elevations across the proposed development.

Table 18: Normal Operating Conditions Sanitary HGL

Sanitary Manhole	Rim Elevation (m)	USF (m)	HGL (m)	USF - HGL Clearance
10	99.43	97.51	96.33	1.18
11	100.75	97.69	96.90	0.79
12	100.60	98.50	97.04	1.46
13	100.23	98.46	97.30	1.16
14	97.61	N/A	92.54	-
16	97.35	N/A	92.88	-
17	97.29	N/A	92.96	-
17A	97.32	N/A	94.32	-
17B	97.37	95.68	94.68	1.00

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Sanitary Manhole	Rim Elevation (m)	USF (m)	HGL (m)	USF - HGL Clearance
18	97.17	N/A	93.19	-
18A	97.65	95.69	93.57	2.12
18B	97.09	N/A	93.19	-
19	97.43	95.63	93.30	2.33
1A	96.22	N/A	88.79	-
1B	96.60	N/A	88.62	-
1C	95.30	N/A	87.66	-
2	97.46	N/A	89.01	-
20	97.50	95.63	93.52	2.11
20A	97.37	N/A	94.01	-
21	97.48	95.78	93.70	2.08
22	97.96	N/A	91.18	-
22A	97.83	96.10	94.33	1.77
22B	97.81	96.10	94.87	1.23
23	98.10	96.54	94.40	2.14
24	98.05	96.62	94.47	2.15
25	98.00	96.30	94.69	1.61
26	98.10	96.34	95.01	1.33
27	97.92	95.75	93.89	1.86
3	97.89	N/A	91.12	-
30	98.01	95.90	94.30	1.60
31	97.52	95.77	94.45	1.32
32	97.68	95.90	94.85	1.05
33	97.62	96.00	94.62	1.38
35	97.97	N/A	91.43	-
35A	97.94	96.10	91.29	4.81
36	98.67	96.52	95.73	0.79
37	99.34	97.12	96.39	0.73
38	99.55	97.79	96.57	1.22
39	98.03	N/A	93.67	-
39A	97.97	96.36	94.43	1.93
39B	98.01	96.22	94.69	1.53
3A	97.75	N/A	94.19	-

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Sanitary Manhole	Rim Elevation (m)	USF (m)	HGL (m)	USF - HGL Clearance
3B	97.66	95.79	94.57	1.22
3C	97.53	95.74	94.85	0.89
4	98.19	96.40	94.10	2.30
40	98.10	96.36	93.94	2.42
41	98.38	96.39	94.73	1.66
42	99.25	97.19	95.10	2.09
43	99.19	97.48	95.17	2.31
44	99.85	97.66	95.71	1.95
45	100.27	98.34	95.98	2.36
46	100.27	98.29	96.06	2.23
47	100.49	98.14	96.41	1.73
48	100.46	98.35	96.73	1.62
49	100.59	N/A	96.71	-
5	98.63	96.68	95.44	1.24
50	100.41	98.55	96.96	1.59
51	100.21	98.48	97.23	1.25
52	97.61	N/A	91.65	-
53	97.65	N/A	91.74	-
54	97.63	N/A	91.84	-
54A	97.67	95.77	94.00	1.77
54B	97.70	95.77	94.28	1.49
54C	97.66	95.94	94.55	1.39
54D	97.69	95.95	95.08	0.87
54E	97.54	N/A	94.79	-
54F	98.10	95.84	95.08	0.76
54G	98.17	95.95	95.50	0.45
55	98.09	N/A	92.02	-
56	98.16	96.32	92.71	3.61
57	98.13	96.38	95.18	1.20
58	98.24	96.26	95.56	0.70
59	97.99	N/A	92.78	-
6	98.67	N/A	95.53	-
60	98.23	96.14	94.58	1.56

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

Sanitary Manhole	Rim Elevation (m)	USF (m)	HGL (m)	USF - HGL Clearance
61	98.13	96.39	94.66	1.73
62	97.95	96.59	94.88	1.71
63	98.15	N/A	92.23	-
64	97.29	N/A	92.40	-
65	97.56	95.77	94.88	0.89
66	97.47	95.60	94.05	1.55
67	97.58	95.60	94.40	1.20
68	97.49	95.85	94.67	1.18
69	97.56	95.80	94.70	1.10
7	99.11	96.99	96.02	0.97
70	97.95	95.80	94.93	0.87
8	100.21	97.69	97.18	0.51
80	100.15	98.14	96.08	2.06
81	100.28	98.35	96.45	1.90
82	100.35	N/A	96.48	-
9	99.23	97.44	96.22	1.22

The above table shows that the 0.3 m required clearance to the normal operating condition HGL is achieved across the proposed development.

Reference: Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum

CONCLUSIONS

POTABLE WATER

Based on the findings of the report, the proposed change to the draft plan does not impact the overall potable water results. The proposed network can service the development area and with the use of pressure reducing valves will meet all servicing requirements as per City of Ottawa standards under typical demand conditions (peak hour and average day conditions), as well as under emergency fire demand conditions (maximum day + fire flow) during the ultimate development conditions.

STORMWATER MANAGEMENT

The proposed stormwater management plan is in compliance with the goals specified in the background reports and the 2012 City of Ottawa Sewer Guidelines. Inlet control devices are proposed to limit inflow from the site area into the minor system to the 2-year for local streets and to the 5-year storm for collector roads based on City of Ottawa IDF curves. The worst-case 100-year HGL remains 0.3 m below proposed USFs across the site. All dynamic surface water depths are less than 0.35 m during the 100-year storm event. Quality control and further quantity control of runoff from the proposed development will be provided in the ultimate KW Pond 5.

The proposed draft plan changes do not impact the previously approved SWM design.

SANITARY SERVICING

The proposed sanitary sewer network is sufficiently sized to provide gravity drainage for the site and external tributary areas. The proposed network connects to the approved sanitary sewer system within the first registration phase of the development that discharges into the existing Maple Grove Trunk sanitary sewer which will ultimately outlets to the Kanata West Pump Station (KWPS). The proposed drainage pattern is in accordance with the KWMSS.

The worst-case annual HGL remains below the proposed USF elevations across the proposed development.

Regards,

Stantec Consulting Ltd.

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September 30, 2025

Ms. Rubina Rasool

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Reference: **Richcraft Kanata West Development Second Registration Phase, 1620 Maple Grove Road – Servicing and Stormwater Management Report Addendum**

Attachment: Appendix A: Potable Water Calculations and Background, Appendix B: SWM Calculations and Background, Appendix C: Sanitary Calculations and Background, Appendix D: Draft 4M-Plan, Appendix E: Drawings

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APPENDIX A

Potable Water Calculations and Background

1620 Maple Grove Road

Information Provided:

Date provided August, 20, 2018

Scenario	Demand	
	L/min	L/s
Average Daily Demand	641	10.7
Maximum Daily Demand	1515	25.25
Peak Hour	3282	54.7
Fire Flow Demand # 1	17000	283

of connections

4

Connection Locations:



Figure 1 - Connection points

Results:

Connection 1 - Maple Grove Road and Silver Seven Road

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	162.1	92.7
Peak Hour	157.7	86.4
Max Day plus Fire (10,000 l/min)	154.7	82.7
Max Day plus Fire (17,000 l/min)	150.5	76.3

¹ Ground Elevation = 96.880 m

Connection 2 - Maple Grove Road and Rosehill Ave

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	161.0	88.8
Peak Hour	157.4	83.5
Max Day plus Fire (10,000 l/min)	153.9	75.3
Max Day plus Fire (17,000 l/min)	138.9	57.3

¹ Ground Elevation = 100.900 m

Connection 3 - Hazeldean Road and Kincardine Dr.

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	161.5	90.9
Peak Hour	157.9	85.8
Max Day plus Fire (10,000 l/min)	158.8	87.1
Max Day plus Fire (17,000 l/min)	157.9	85.8

¹ Ground Elevation = 97.490 m

Connection 4 - Hazeldean Road

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	161.4	90.9
Peak Hour	158.0	82.0
Max Day plus Fire (10,000 l/min)	158.7	83.5
Max Day plus Fire (17,000 l/min)	157.8	82.2

¹ Ground Elevation = 99.900 m

Notes:

- 1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
 - a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
 - b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.
- 2) Watermain along Maple Grove Road is expected to be constructed.
- 3) Ownership of existing private roads off of Hazeldean road are expected to be turned over to the City of Ottawa and therefore ownership of watermain along those roads are in turn to be given to the City of Ottawa prior to 1620 Maple Grove watermain connections.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermain deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Kanata West Richcraft - Domestic Water Demand Estimates
Ultimate

Densities as per City Guidelines:

LD 3.4 ppu
MD 2.7 ppu
HD 1.8 ppu

Medium Density Residential Blocks Unit Densities per Registration Phase

First Registration 38 Units/ha
Second Registration 93 Units/ha

Building ID	Area (m ²)	Population	Daily Rate of Demand ¹	Avg Day Demand ²		Max Day Demand ³		Peak Hour Demand ³	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
MD1 (Blk 29)	7,350	76	350	18.4	0.31	45.9	0.76	100.9	1.68
Commerical	14,700		28000	28.6	0.48	42.9	0.71	77.2	1.29
Residential 1		97	350	23.6	0.39	59.1	0.98	129.9	2.17
Total				70.6	1.2	147.8	2.5	308.0	5.1
Residential 2		59	350	14.4	0.24	36.1	0.60	79.4	1.32
Residential 3		127	350	30.8	0.51	77.1	1.29	169.6	2.83
Residential 4		127	350	30.8	0.51	77.1	1.29	169.6	2.83
Residential 5		41	350	9.8	0.16	24.6	0.41	54.1	0.90
Residential 6		167	350	40.7	0.68	101.7	1.70	223.8	3.73
Residential 7		38	350	9.2	0.15	23.0	0.38	50.5	0.84
Residential 8		124	350	30.2	0.50	75.5	1.26	166.0	2.77
Residential 9		103	350	24.9	0.42	62.3	1.04	137.2	2.29
Residential 10		130	350	31.6	0.53	79.1	1.32	173.9	2.90
Residential 11		76	350	18.4	0.31	45.9	0.77	101.1	1.68
Residential 12		85	350	20.7	0.34	51.6	0.86	113.6	1.89
MD3 (Blk 117)	13,200	330	350	80.2	1.34	200.6	3.34	441.3	7.35
Total				100.9	1.7	252.2	4.2	554.9	9.2
Residential 13		265	350	64.3	1.07	160.8	2.68	353.7	5.90
MD2 (Blk 60)	24,236	606	350	147.3	2.45	368.2	6.14	810.1	13.50
Total				211.6	3.5	529.0	8.8	1163.8	19.4
Residential 14		70	350	17.1	0.28	42.7	0.71	93.8	1.56
School	29,500		28000	57.4	0.96	86.0	1.43	154.9	2.58
Total				74.4	1.2	128.7	2.1	248.7	4.1
Residential 15		68	350	16.4	0.27	41.0	0.68	90.2	1.50
Residential 16		105	350	25.6	0.43	64.0	1.07	140.8	2.35
Residential 17		97	350	23.6	0.39	59.1	0.98	129.9	2.17
Residential 18		119	350	28.9	0.48	72.2	1.20	158.8	2.65
Total Site :		2909		792.9	13.2	1896.4	31.6	4120.6	68.7

Unit and Population Breakdown Excluding MD Blocks

Building	Node ID	Singles	Towns	Population
1	10		36	97
2	8		22	59
3	9		47	127
4	12		47	127
5	18		15	41
6	13		62	167
7	15		14	38
8	14		46	124
9	19		38	103
10	20	20	23	130
11	21		28	76
12	22	25		85
13	27		98	265
14	2		26	70
15	3		25	68
16	4		39	105
17	5		36	97
18	7		44	119
Sub Total		45	646	1897

MD Blocks within First Registration (38 Units/ha)

Block	Area (ha)	Towns	Population
29	0.74	28	75

MD Blocks within Second Registration (93 Units/ha)

	Area (ha)	Towns	Population
117	1.32	122	330
60	2.42	224	606

MD Sub Total	0	375	1011
Site Total	45	1021	2909

1 Average day water demand for residential areas equal to 350 L/cap/d and 28,000 L/ha/d for the school block

2 City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:

maximum day demand rate = 2.5 x average day demand rate for residential, 1.5 for institutional
maximum hour demand rate = 2.2 x maximum day demand rate for residential, 1.8 for institutional

3 Unit counts for unmarked Medium Density Residential area 1 (MD1) are equal to 38 Units/ha

4 Unit counts for unmarked Medium Density Residential area 2 (MD2) are based on the Concept Site Plan for Richcraft prepared by M. David Blakely Architch Inc. on February 2020

5 Unit counts for unmarked Medium Density Residential area 3 (MD3) derived from 250 persons/ha established for MD2.

6 Building IDs identified in attached Hydraulic Analysis Map in Appendices

Kanata West Richcraft - Domestic Water Demand Estimates
Ultimate

Densities as per City Guidelines:
LD 3.4 ppu
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Medium Density Residential Blocks Unit Densities per Registration Phase
First Registration 38 Units/ha
Second Registration 93 Units/ha

Building ID	Area (m ²)	Population	Daily Rate of Demand ¹	Avg Day Demand ²		Max Day Demand ³		Peak Hour Demand ³	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
MD1 (Blk 29)	7,350	76	350	18.4	0.31	45.9	0.76	100.9	1.68
Commerical	14,700		28000	28.6	0.48	42.9	0.71	77.2	1.29
Residential 1		97	350	23.6	0.39	59.1	0.98	129.9	2.17
Total				70.6	1.2	147.8	2.5	308.0	5.1
Residential 2		59	350	14.4	0.24	36.1	0.60	79.4	1.32
Residential 3		127	350	30.8	0.51	77.1	1.29	169.6	2.83
Residential 4		127	350	30.8	0.51	77.1	1.29	169.6	2.83
Residential 5		41	350	9.8	0.16	24.6	0.41	54.1	0.90
Residential 6		167	350	40.7	0.68	101.7	1.70	223.8	3.73
Residential 7		38	350	9.2	0.15	23.0	0.38	50.5	0.84
Residential 8		124	350	30.2	0.50	75.5	1.26	166.0	2.77
Residential 9		103	350	24.9	0.42	62.3	1.04	137.2	2.29
Residential 10		130	350	31.6	0.53	79.1	1.32	173.9	2.90
Residential 11		76	350	18.4	0.31	45.9	0.77	101.1	1.68
Residential 12		85	350	20.7	0.34	51.6	0.86	113.6	1.89
MD3 (Blk 117)	13,200	330	350	80.2	1.34	200.6	3.34	441.3	7.35
Total				100.9	1.7	252.2	4.2	554.9	9.2
Residential 13		265	350	64.3	1.07	160.8	2.68	353.7	5.90
MD2 (Blk 60)	24,236	606	350	147.3	2.45	368.2	6.14	810.1	13.50
Total				211.6	3.5	529.0	8.8	1163.8	19.4
Residential 14		70	350	17.1	0.28	42.7	0.71	93.8	1.56
School	30,250		28000	58.8	0.98	88.2	1.47	158.8	2.65
Total				75.9	1.3	130.9	2.2	252.7	4.2
Residential 15		68	350	16.4	0.27	41.0	0.68	90.2	1.50
Residential 16		105	350	25.6	0.43	64.0	1.07	140.8	2.35
Residential 17		97	350	23.6	0.39	59.1	0.98	129.9	2.17
Residential 18		119	350	28.9	0.48	72.2	1.20	158.8	2.65
Total Site :		2909		794.4	13.2	1898.6	31.6	4124.5	68.7

Unit and Population Breakdown Excluding MD Blocks

Building	Node ID	Singles	Towns	Population
1	10		36	97
2	8		22	59
3	9		47	127
4	12		47	127
5	18		15	41
6	13		62	167
7	15		14	38
8	14		46	124
9	19		38	103
10	20	20	23	130
11	21		28	76
12	22	25		85
13	27		98	265
14	2		26	70
15	3		25	68
16	4		39	105
17	5		36	97
18	7		44	119
Sub Total		45	646	1897

MD Blocks within First Registration (38 Units/ha)

Block	Area (ha)	Towns	Population
29	0.74	28	75

MD Blocks within Second Registration (93 Units/ha)

	Area (ha)	Towns	Population
117	1.32	122	330
60	2.42	224	606

MD Sub Total	0	375	1011
Site Total	45	1021	2909

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3 Unit counts for unmarked Medium Density Residential area 1 (MD1) are equal to 38 Units/ha

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5 Unit counts for unmarked Medium Density Residential area 3 (MD3) derived from 250 persons/ha established for MD2.

6 Building IDs identified in attached Hydraulic Analysis Map in Appendices

Ultimate Conditions
Hydraulic Model Results - Average Day Analysis

Junction Results

ID	Demand	Elevation	Head	Pressure	
	(L/s)	(m)	(m)	(psi)	(Kpa)
1	0	98.37	161.41	89.62	617.91198
2	1.3	98.03	161.42	90.11	621.29043
3	0.27	97.95	161.42	90.23	622.1178
4	0.43	98.3	161.42	89.73	618.6704
5	0.39	100.16	161.42	87.08	600.39918
7	0.48	100.75	161.42	86.25	594.6765
8	0.24	99.11	161.42	88.58	610.74138
9	0.51	97.96	161.42	90.22	622.04886
10	1.2	97.88	161.42	90.33	622.80728
12	0.51	97.92	161.42	90.28	622.46254
13	0.68	98.01	161.42	90.15	621.56622
14	0.5	97.64	161.42	90.67	625.15152
15	0.15	97.69	161.44	90.63	624.87572
16	0	97.62	161.44	90.73	625.5652
17	0	97.54	161.43	90.83	626.25468
18	0.16	97.2	161.43	91.31	629.56419
19	0.42	98.15	161.45	89.98	620.3941
20	0.53	98.14	161.45	90	620.532
21	0.31	98.11	161.48	90.09	621.15253
22	1.7	97.59	161.48	90.83	626.25468
1	0	96.15	161.43	92.8	639.83744
15	0	100.37	161.41	86.78	598.33074
17	0	100.03	161.41	87.26	601.64025
24	0	99.3	161.42	88.31	608.87979
27	0	100.4	161.41	86.73	597.986
28	0	99.18	161.42	88.48	610.0519
29	0	98.02	161.42	90.13	621.42832
3	3.5	99.85	161.41	87.51	603.36395
5	0	100.54	161.41	86.53	596.60704

Pipe Results

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	(mm)		(L/s)	(m/s)
101	302	1	290	297	120	-5.65	0.08
102	1	2	149.15	297	120	-6.8	0.1
103	2	3	81.27	297	120	-4.3	0.06
104	3	4	49.14	204	110	0.95	0.03
105	4	5	204.86	204	110	1.31	0.04
108	5	7	65.67	204	110	-1.43	0.04
111	8	28	21.85	204	110	-2.15	0.07
115	3	9	149.76	297	120	-3.16	0.05
116	3	14	52.56	204	110	-2.36	0.07
117	14	13	75.08	204	110	0.34	0.01
118	13	12	76.47	204	110	0.61	0.02
119	12	9	52.38	204	110	0.92	0.03
120	9	10	78.67	297	120	-4.35	0.06
121	10	18	304.89	204	110	-1.32	0.04
122	12	18	202.33	155	100	-0.82	0.04
123	18	17	82.35	204	110	-2.3	0.07
124	13	17	237.37	155	100	-0.95	0.05
125	17	16	89.96	204	110	-3.25	0.1
126	14	15	201.16	204	110	-3.21	0.1
127	15	16	75.48	204	110	-0.62	0.02
128	15	20	79.81	204	110	-2.73	0.08
129	2	19	209.67	204	110	-3.81	0.12
130	19	20	46.99	204	110	-2.1	0.06
131	19	21	176.52	155	100	-2.13	0.11
132	303	21	83.98	297	120	13.37	0.19
133	21	20	136.68	204	110	5.36	0.16
134	22	21	82.69	204	110	-1.7	0.05
135	16	21	289.34	204	110	-3.87	0.12
139	7	24	115.59	204	110	-0.96	0.03
140	24	8	48.04	204	110	-0.96	0.03
146	8	7	168.69	204	110	0.94	0.03
147	1	10	134.8	297	120	5.55	0.08
148	9	29	53.89	204	110	1.6	0.05
149	5	5	88.74	204	110	2.34	0.07
151	27	3	42.67	204	110	1.16	0.04
155	28	10	205.69	204	110	-1.33	0.04
157	29	4	136.3	204	110	0.79	0.02
159	28	29	79.48	204	110	-0.82	0.03
2	300	1	577.9	297	120	-28.06	0.4
5	3	1	179.14	204	110	-1.16	0.04
7	5	27	185.16	204	110	1.16	0.04
9	5	15	51.11	204	110	1.18	0.04
11	15	17	119.5	204	110	1.18	0.04
13	17	3	52.11	204	110	1.18	0.04

Hydraulic Model Results -Peak Hour Analysis

Junction Results

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure	
				(psi)	(Kpa)
1	0	98.37	157.67	84.29	581.16269
2	4.2	98.03	157.6	84.68	583.85166
3	1.5	97.95	157.56	84.74	584.26535
4	2.35	98.3	157.53	84.2	580.54216
5	2.17	100.16	157.46	81.46	561.65041
7	2.65	100.75	157.47	80.64	555.99667
8	1.32	99.11	157.49	83	572.2684
9	2.83	97.96	157.54	84.69	583.92061
10	5.1	97.88	157.54	84.8	584.67904
12	2.83	97.92	157.54	84.75	584.3343
13	3.73	98.01	157.54	84.63	583.50692
14	2.77	97.64	157.56	85.18	587.29906
15	0.84	97.69	157.63	85.2	587.43696
16	0	97.62	157.63	85.31	588.19539
17	0	97.54	157.58	85.36	588.54013
18	0.9	97.2	157.56	85.81	591.64279
19	2.29	98.15	157.65	84.58	583.16218
20	2.9	98.14	157.65	84.6	583.30008
21	1.68	98.11	157.8	84.86	585.09273
22	9.2	97.59	157.74	85.51	589.57435
1	0	96.15	157.54	87.26	601.64025
15	0	100.37	157.4	81.07	558.96144
17	0	100.03	157.39	81.55	562.27094
24	0	99.3	157.49	82.72	570.33786
27	19.4	100.4	157.34	80.94	558.06511
28	0	99.18	157.51	82.92	571.71682
29	0	98.02	157.53	84.59	583.23113
3	3.5	99.85	157.39	81.8	563.99464
5	0	100.54	157.4	80.84	557.37563

Pipe Results

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	(mm)		(L/s)	(m/s)
101	302	1	290	297	120	35.57	0.51
102	1	2	149.15	297	120	21.45	0.31
103	2	3	81.27	297	120	22.43	0.32
104	3	4	49.14	204	110	8.79	0.27
105	4	5	204.86	204	110	6.15	0.19
108	5	7	65.67	204	110	-4.8	0.15
111	8	28	21.85	204	110	-8.77	0.27
115	3	9	149.76	297	120	11.22	0.16
116	3	14	52.56	204	110	0.93	0.03
117	14	13	75.08	204	110	4.45	0.14
118	13	12	76.47	204	110	2.65	0.08
119	12	9	52.38	204	110	1.39	0.04
120	9	10	78.67	297	120	5.02	0.07
121	10	18	304.89	204	110	-3.07	0.09
122	12	18	202.33	155	100	-1.57	0.08
123	18	17	82.35	204	110	-5.54	0.17
124	13	17	237.37	155	100	-1.92	0.1
125	17	16	89.96	204	110	-7.47	0.23
126	14	15	201.16	204	110	-6.3	0.19
127	15	16	75.48	204	110	-1.08	0.03
128	15	20	79.81	204	110	-6.05	0.19
129	2	19	209.67	204	110	-5.18	0.16
130	19	20	46.99	204	110	-2.87	0.09
131	19	21	176.52	155	100	-4.6	0.24
132	303	21	83.98	297	120	35.86	0.52
133	21	20	136.68	204	110	11.82	0.36
134	22	21	82.69	204	110	-9.2	0.28
135	16	21	289.34	204	110	-8.55	0.26
139	7	24	115.59	204	110	-3.75	0.11
140	24	8	48.04	204	110	-3.75	0.11
146	8	7	168.69	204	110	3.69	0.11
147	1	10	134.8	297	120	0.73	0.01
148	9	29	53.89	204	110	4.75	0.15
149	5	5	88.74	204	110	8.78	0.27
151	27	3	42.67	204	110	-12.91	0.4
155	28	10	205.69	204	110	-3.72	0.11
157	29	4	136.3	204	110	-0.29	0.01
159	28	29	79.48	204	110	-5.05	0.15
2	300	1	577.9	297	120	-15.03	0.22
3	301	1	645	297	120	15.76	0.23
5	3	1	179.14	204	110	-14.12	0.43
7	5	27	185.16	204	110	6.49	0.2
9	5	15	51.11	204	110	2.29	0.07
11	15	17	119.5	204	110	2.29	0.07
13	17	3	52.11	204	110	2.29	0.07

Hydraulic Model Results -Fire Flow Analysis (200 L/s)

ID	Static Demand	Static Pressure		Static Head	Fire-Flow Demand	Residual Pressure		Available Flow at Hydrant	Available Flow Pressure	
	(L/s)	(psi)	(Kpa)	(m)	(L/s)	(psi)	(Kpa)	(L/s)	(psi)	(Kpa)
1	0	83.36	574.75053	157.01	200	77.52	534.4849	995.72	20	137.896
2	2.2	83.29	574.26789	156.62	200	77.34	533.24383	999.74	20	137.896
3	0.68	82.9	571.57892	156.27	200	77.07	531.38224	1,027.53	20	137.896
4	1.07	82.21	566.82151	156.13	200	72.38	499.04562	645.93	20	137.896
5	0.98	79.54	548.41239	156.11	200	65.2	449.54096	477.99	20	137.896
7	1.2	78.53	541.44864	155.99	200	63.17	435.54452	450.95	20	137.896
8	0.6	80.75	556.7551	155.92	200	67.46	465.12321	506.53	20	137.896
9	1.29	82.29	567.37309	155.85	200	76.47	527.24536	1,019.25	20	137.896
10	2.5	81.73	563.512	155.37	200	76.11	524.76323	1,040.14	20	137.896
12	1.29	82.56	569.23469	156	200	72.16	497.52877	616.26	20	137.896
13	1.7	82.68	570.06206	156.17	200	70.75	487.8071	559.28	20	137.896
14	1.26	83.36	574.75053	156.28	200	74.27	512.0768	684.74	20	137.896
15	0.38	84.16	580.26637	156.89	200	74.56	514.07629	643.06	20	137.896
16	0	84.25	580.8869	156.88	200	73.65	507.80202	591.27	20	137.896
17	0	83.69	577.02581	156.41	200	69.45	478.84386	486.87	20	137.896
18	0.41	83.76	577.50845	156.12	200	67.43	464.91636	446.39	20	137.896
19	1.04	83.91	578.54267	157.17	200	73.05	503.66514	581.34	20	137.896
20	1.32	83.96	578.88741	157.2	200	75.49	520.48845	685.13	20	137.896
21	0.77	85.36	588.54013	158.16	200	81.59	562.54673	1,312.45	20	137.896
22	4.2	86.08	593.50438	158.14	200	57.06	393.41729	324.44	20	137.896
1	0	82.05	565.71834	153.87	200	77.3	532.96804	1,100.17	20	137.896
15	0	79.47	547.92976	156.27	200	53.69	370.18181	325.75	20	137.896
17	0	80.04	551.85979	156.33	200	53.85	371.28498	324.84	20	137.896
24	0	80.51	555.10035	155.94	200	62.22	428.99446	407.94	20	137.896
27	8.8	79.46	547.86081	156.29	200	53.36	367.90653	333.76	20	137.896
28	0	80.61	555.78983	155.88	200	69.24	477.39595	563.49	20	137.896
29	0	82.28	567.30414	155.9	200	73.08	503.87198	671.31	20	137.896
3	0	80.34	553.92823	156.36	200	58.8	405.41424	369.01	20	137.896
5	0	79.18	545.93026	156.24	200	58.64	404.31107	374.59	20	137.896

Hydraulic Model Results -Fire Flow Analysis (267 L/s)

ID	Static Demand	Static Pressure		Static Head	Fire-Flow Demand	Residual Pressure		Available Flow at Hydrant	Available Flow Pressure	
	(L/s)	(psi)	(Kpa)	(m)	(L/s)	(psi)	(Kpa)	(L/s)	(psi)	(Kpa)
1	0	81.72	563.44306	155.85	267	71.66	494.08137	964.97	20	137.896
2	2.2	81.38	561.09882	155.28	267	70.95	489.18606	966.56	20	137.896
3	0.68	80.76	556.82405	154.76	267	70.33	484.91128	991.95	20	137.896
4	1.07	80	551.584	154.57	267	62.71	432.37291	614.72	20	137.896
5	0.98	77.33	533.17488	154.56	267	52.55	362.32174	449.8	20	137.896
7	1.2	76.22	525.52166	154.36	267	49.59	341.91313	423.56	20	137.896
8	0.6	78.38	540.41442	154.24	267	55.18	380.45506	475.37	20	137.896
9	1.29	79.85	550.54978	154.13	267	69.18	476.98226	981.16	20	137.896
10	2.5	78.92	544.13762	153.4	267	68.3	470.91484	998.34	20	137.896
12	1.29	80.23	553.1698	154.36	267	61.89	426.71917	584.66	20	137.896
13	1.7	80.47	554.82456	154.61	267	59.65	411.27482	527.74	20	137.896
14	1.26	81.23	560.0646	154.78	267	65.29	450.16149	654.22	20	137.896
15	0.38	82.41	568.20047	155.66	267	65.88	454.22942	614.3	20	137.896
16	0	82.5	568.821	155.65	267	64.2	442.64616	565.28	20	137.896
17	0	81.63	562.82252	154.96	267	56.92	392.45202	463.08	20	137.896
18	0.41	81.49	561.85725	154.52	267	53.09	366.04493	423.55	20	137.896
19	1.04	82.35	567.78678	156.08	267	63.8	439.88824	558.86	20	137.896
20	1.32	82.41	568.20047	156.11	267	67.95	468.50166	659.05	20	137.896
21	0.77	84.4	581.92112	157.48	267	78.36	540.27653	1,281.92	20	137.896
22	4.2	85.12	586.88538	157.47	267	36.36	250.69493	319.08	20	137.896
1	0	78.09	538.41493	151.08	267	68.11	469.60483	1,047.31	20	137.896
15	0	77.39	533.58857	154.81	267	33.39	230.21737	311.94	20	137.896
17	0	78.02	537.9323	154.91	267	33.37	230.07948	311.31	20	137.896
24	0	78.16	538.89757	154.28	267	46.45	320.26346	384.78	20	137.896
27	8.8	77.43	533.86436	154.87	267	33.12	228.35578	320	20	137.896
28	0	78.2	539.17336	154.19	267	58.23	401.4842	529.37	20	137.896
29	0	79.88	550.75662	154.21	267	63.55	438.16454	641.09	20	137.896
3	0	78.33	540.06968	154.95	267	41.67	287.30632	352.27	20	137.896
5	0	77.09	531.52013	154.77	267	41.98	289.4437	356.89	20	137.896

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						55.6	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						8	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						3	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	12000
5	Determine Occupancy Charge	Limited Combustible						-15%	10200
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	19	3	31-60	Wood Frame or Non-Combustible	18%	5508
		East	20.1 to 30	25	3	61-90	Wood Frame or Non-Combustible	9%	
		South	3.1 to 10	19	3	31-60	Wood Frame or Non-Combustible	18%	
		West	20.1 to 30	25	3	61-90	Wood Frame or Non-Combustible	9%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							16000
		Total Required Fire Flow in L/s							266.7
		Required Duration of Fire Flow (hrs)							3.50
		Required Volume of Fire Flow (m ³)							3360

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						492.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	10000
5	Determine Occupancy Charge	Limited Combustible						-15%	8500
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	30	2	31-60	Wood Frame or Non-Combustible	18%	4420
		East	20.1 to 30	16	2	31-60	Wood Frame or Non-Combustible	8%	
		South	20.1 to 30	30	2	31-60	Wood Frame or Non-Combustible	8%	
		West	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							13000
		Total Required Fire Flow in L/s							216.7
		Required Duration of Fire Flow (hrs)							2.50
		Required Volume of Fire Flow (m ³)							1950

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						563.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	11000
5	Determine Occupancy Charge	Limited Combustible						-15%	9350
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	37	2	61-90	Wood Frame or Non-Combustible	14%	5984
		East	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
		South	10.1 to 20	37	2	61-90	Wood Frame or Non-Combustible	14%	
		West	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							15000
		Total Required Fire Flow in L/s							250.0
		Required Duration of Fire Flow (hrs)							3.00
		Required Volume of Fire Flow (m ³)							2700

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						297.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	8000
5	Determine Occupancy Charge	Limited Combustible						-15%	6800
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	16	2	31-60	Wood Frame or Non-Combustible	8%	2992
		East	3.1 to 10	20	2	31-60	Wood Frame or Non-Combustible	18%	
		South	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
		West	> 45	20	2	31-60	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							10000
		Total Required Fire Flow in L/s							166.7
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1200

Step	Task	Notes					Value Used	Req'd Fire Flow (L/min)	
1	Determine Type of Construction	Wood Frame					1.5	-	
2	Determine Ground Floor Area of One Unit	-					297.0	-	
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less					1	-	
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space					2	-	
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min					-	8000	
5	Determine Occupancy Charge	Limited Combustible					-15%	6800	
6	Determine Sprinkler Reduction	None					0%	0	
		Non-Standard Water Supply or N/A					0%		
		Not Fully Supervised or N/A					0%		
		% Coverage of Sprinkler System					0%		
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	2992
		East	3.1 to 10	20	2	31-60	Wood Frame or Non-Combustible	18%	
		South	20.1 to 30	16	2	31-60	Wood Frame or Non-Combustible	8%	
		West	> 45	20	2	31-60	Wood Frame or Non-Combustible	0%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							10000
		Total Required Fire Flow in L/s							166.7
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1200

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						586.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	11000
5	Determine Occupancy Charge	Limited Combustible						-15%	9350
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	36	2	61-90	Wood Frame or Non-Combustible	9%	4769
		East	30.1 to 45	16	2	31-60	Wood Frame or Non-Combustible	5%	
		South	3.1 to 10	36	2	61-90	Wood Frame or Non-Combustible	19%	
		West	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							14000
		Total Required Fire Flow in L/s							233.3
		Required Duration of Fire Flow (hrs)							3.00
		Required Volume of Fire Flow (m ³)							2520

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						372.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	9000
5	Determine Occupancy Charge	Limited Combustible						-15%	7650
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	3749
		East	30.1 to 45	24	2	31-60	Wood Frame or Non-Combustible	5%	
		South	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
		West	20.1 to 30	24	2	31-60	Wood Frame or Non-Combustible	8%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							11000
		Total Required Fire Flow in L/s							183.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1320

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						372.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	9000
5	Determine Occupancy Charge	Limited Combustible						-15%	7650
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	3137
		East	3.1 to 10	26	2	31-60	Wood Frame or Non-Combustible	18%	
		South	> 45	16	2	31-60	Wood Frame or Non-Combustible	0%	
		West	30.1 to 45	26	2	31-60	Wood Frame or Non-Combustible	5%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							11000
		Total Required Fire Flow in L/s							183.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1320

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						372.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	9000
5	Determine Occupancy Charge	Limited Combustible						-15%	7650
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	16	2	31-60	Wood Frame or Non-Combustible	8%	3749
		East	3.1 to 10	26	2	31-60	Wood Frame or Non-Combustible	18%	
		South	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
		West	30.1 to 45	26	2	31-60	Wood Frame or Non-Combustible	5%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							11000
		Total Required Fire Flow in L/s							183.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1320

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						372.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	9000
5	Determine Occupancy Charge	Limited Combustible						-15%	7650
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	20.1 to 30	26	2	31-60	Wood frame or Non-Combustible	8%	4361
		East	3.1 to 10	16	2	31-60	Wood frame or Non-Combustible	18%	
		South	10.1 to 20	26	2	31-60	Wood frame or Non-Combustible	13%	
		West	3.1 to 10	16	2	31-60	Wood frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							12000
		Total Required Fire Flow in L/s							200.0
		Required Duration of Fire Flow (hrs)							2.50
		Required Volume of Fire Flow (m ³)							1800

Step	Task	Notes						Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame						1.5	-
2	Determine Ground Floor Area of One Unit	-						372.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less						1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space						2	-
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min						-	9000
5	Determine Occupancy Charge	Limited Combustible						-15%	7650
6	Determine Sprinkler Reduction	None						0%	0
		Non-Standard Water Supply or N/A						0%	
		Not Fully Supervised or N/A						0%	
		% Coverage of Sprinkler System						0%	
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	26	2	31-60	Wood Frame or Non-Combustible	13%	3749
		East	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
		South	> 45	26	2	31-60	Wood Frame or Non-Combustible	0%	
		West	3.1 to 10	16	2	31-60	Wood Frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							11000
		Total Required Fire Flow in L/s							183.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							1320

Step	Task		Value Used	Req'd Fire Flow (L/min)					
1	Determine Type of Construction	Wood Frame	1.5	-					
2	Determine Ground Floor Area of One Unit	-	156.0	-					
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	1	-					
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	2	-					
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min	-	6000					
5	Determine Occupancy Charge	Limited Combustible	-15%	5100					
6	Determine Sprinkler Reduction	None	0%	0					
		Non-Standard Water Supply or N/A	0%						
		Not Fully Supervised or N/A	0%						
		% Coverage of Sprinkler System	0%						
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	10.1 to 20	7	2	0-30	Wood Frame or Non-Combustible	12%	2856
		East	3.1 to 10	22	2	31-60	Wood Frame or Non-Combustible	18%	
		South	20.1 to 30	7	2	0-30	Wood Frame or Non-Combustible	8%	
		West	3.1 to 10	22	2	31-60	Wood Frame or Non-Combustible	18%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							8000
		Total Required Fire Flow in L/s							133.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							960

Step	Task		Value Used	Req'd Fire Flow (L/min)					
1	Determine Type of Construction	Wood Frame	1.5	-					
2	Determine Ground Floor Area of One Unit	-	174.0	-					
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	1	-					
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	2	-					
4	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min	-	6000					
5	Determine Occupancy Charge	Limited Combustible	-15%	5100					
6	Determine Sprinkler Reduction	None	0%	0					
		Non-Standard Water Supply or N/A	0%						
		Not Fully Supervised or N/A	0%						
		% Coverage of Sprinkler System	0%						
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	3.1 to 10	22	2	31-60	Wood Frame or Non-Combustible	18%	2601
		East	3.1 to 10	7	2	0-30	Wood Frame or Non-Combustible	17%	
		South	20.1 to 30	22	2	31-60	Wood Frame or Non-Combustible	8%	
		West	20.1 to 30	7	2	0-30	Wood Frame or Non-Combustible	8%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							8000
		Total Required Fire Flow in L/s							133.3
		Required Duration of Fire Flow (hrs)							2.00
		Required Volume of Fire Flow (m ³)							960

Step	Task		Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Wood Frame	1.5	-
2	Determine Ground Floor Area of One Unit	-	156.0	-
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	1	-
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	2	-
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min	-	6000
5	Determine Occupancy Charge	Limited Combustible	-15%	5100
6	Determine Sprinkler Reduction	None	0%	0
		Non-Standard Water Supply or N/A	0%	
		Not Fully Supervised or N/A	0%	
		% Coverage of Sprinkler System	0%	
7	Determine Increase for Exposures (Max. 75%)	Direction Exposure Distance (m) Exposed Length (m) Exposed Height (Stories) Length-Height Factor (m x stories) Construction of Adjacent Wall	-	-
		North 3.1 to 10 22 2 31-60 Wood Frame or Non-Combustible	18%	3111
		East 3.1 to 10 7 2 0-30 Wood Frame or Non-Combustible	17%	
		South 3.1 to 10 22 2 31-60 Wood Frame or Non-Combustible	18%	
		West 20.1 to 30 7 2 0-30 Wood Frame or Non-Combustible	8%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min		8000
		Total Required Fire Flow in L/s		133.3
		Required Duration of Fire Flow (hrs)		2.00
		Required Volume of Fire Flow (m³)		960



Date: 7/10/2025

Fire Flow Calculation #: 15

Description: 10-Units Back-to-Back Townhouse - Block 18, 19 and 20

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		579	579	579						1737	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	14000
4	Determine Occupancy Charge	Limited Combustible								-15%	11900
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	> 30	31	3	81-100	Type V	NO	0%	4046	
		East	3.1 to 10	20	3	41-60	Type V	NO	17%		
		South	> 30	31	3	81-100	Type V	NO	0%		
		West	3.1 to 10	20	3	41-60	Type V	NO	17%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								16000	
		Total Required Fire Flow in L/s								266.7	
		Required Duration of Fire Flow (hrs)								3.50	
		Required Volume of Fire Flow (m³)								3360	



Date: 7/10/2025

Fire Flow Calculation #: 16

Description: 8-Units Back-toBack Townhouse - Block 21

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		477	477	477						1432	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	12000
4	Determine Occupancy Charge	Limited Combustible								-15%	10200
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	> 30	22	3	61-80	Type V	NO	0%	2040	
		East	> 30	40	3	> 100	Type V	NO	0%		
		South	> 30	22	3	61-80	Type V	NO	0%		
		West	3.1 to 10	40	3	> 100	Type V	NO	20%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									12000
		Total Required Fire Flow in L/s									200.0
		Required Duration of Fire Flow (hrs)									2.50
		Required Volume of Fire Flow (m³)									1800



Date: 7/10/2025

Fire Flow Calculation #: 17

Description: 8-Units Back-toBack Townhouse - Block 17

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes									Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction									1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas									-	-
		477	477	477							1432	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min									-	12000
4	Determine Occupancy Charge	Limited Combustible									-15%	10200
5	Determine Sprinkler Reduction	None									0%	0
		Non-Standard Water Supply or N/A									0%	
		Not Fully Supervised or N/A									0%	
		% Coverage of Sprinkler System									0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?		-	-	
		North	> 30	22	3	61-80	Type V	NO		0%	2040	
		East	3.1 to 10	40	3	> 100	Type V	NO		20%		
		South	> 30	22	3	61-80	Type V	NO		0%		
		West	> 30	40	0	0-20	Type V	NO		0%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									12000	
		Total Required Fire Flow in L/s									200.0	
		Required Duration of Fire Flow (hrs)									2.50	
		Required Volume of Fire Flow (m³)									1800	



Date: 7/10/2025

Fire Flow Calculation #: 18

Description: 4-Units Row Townhouse - Block 39, 40

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		362	362							724	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	9000
4	Determine Occupancy Charge	Limited Combustible								-15%	7650
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	10.1 to 20	25	2	41-60	Type V	NO	12%	3672	
		East	3.1 to 10	16	2	21-49	Type V	NO	16%		
		South	20.1 to 30	25	2	41-60	Type V	NO	4%		
		West	3.1 to 10	16	2	21-49	Type V	NO	16%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								11000	
		Total Required Fire Flow in L/s								183.3	
		Required Duration of Fire Flow (hrs)								2.00	
		Required Volume of Fire Flow (m³)								1320	



Date: 7/10/2025

Fire Flow Calculation #: 19

Description: 6-Units Row Townhouse - Block 41, 42

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		593	593							1186	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	11000
4	Determine Occupancy Charge	Limited Combustible								-15%	9350
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	10.1 to 20	37	2	61-80	Type V	NO	13%	4769	
		East	3.1 to 10	19	2	21-49	Type V	NO	16%		
		South	20.1 to 30	37	2	61-80	Type V	NO	6%		
		West	3.1 to 10	19	2	21-49	Type V	NO	16%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								14000	
		Total Required Fire Flow in L/s								233.3	
		Required Duration of Fire Flow (hrs)								3.00	
		Required Volume of Fire Flow (m³)								2520	



Date: 7/10/2025

Description: 4-Units Row Townhouse - Block 43

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		560	560							1120	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	11000
4	Determine Occupancy Charge	Limited Combustible								-15%	9350
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	10.1 to 20	30	2	41-60	Type V	NO	12%	4488	
		East	3.1 to 10	20	2	21-49	Type V	NO	16%		
		South	20.1 to 30	30	2	41-60	Type V	NO	4%		
		West	3.1 to 10	20	2	21-49	Type V	NO	16%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									14000
		Total Required Fire Flow in L/s									233.3
		Required Duration of Fire Flow (hrs)									3.00
		Required Volume of Fire Flow (m³)									2520



Date: 7/10/2025

Description: 4-Units Row Townhouse - Block 44

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes									Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction									1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas									-	-
		570	570								1140	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min									-	11000
4	Determine Occupancy Charge	Limited Combustible									-15%	9350
5	Determine Sprinkler Reduction	None									0%	0
		Non-Standard Water Supply or N/A									0%	
		Not Fully Supervised or N/A									0%	
		% Coverage of Sprinkler System									0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?		-	-	
		North	20.1 to 30	20	2	21-49	Type V	NO		2%	3740	
		East	20.1 to 30	30	2	41-60	Type V	NO		4%		
		South	0 to 3	20	3	41-60	Type V	NO		22%		
		West	10.1 to 20	30	2	41-60	Type V	NO		12%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min									13000	
		Total Required Fire Flow in L/s									216.7	
		Required Duration of Fire Flow (hrs)									2.50	
		Required Volume of Fire Flow (m³)									1950	



Date: 7/10/2025

Fire Flow Calculation #: 22

Description: 4-Units Row Townhouse - Block 44

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		570	570							1140	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	11000
4	Determine Occupancy Charge	Limited Combustible								-15%	9350
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	0 to 3	20	2	21-49	Type V	NO	21%	3834	
		East	20.1 to 30	30	2	41-60	Type V	NO	4%		
		South	20.1 to 30	20	3	41-60	Type V	NO	4%		
		West	10.1 to 20	30	2	41-60	Type V	NO	12%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								13000	
		Total Required Fire Flow in L/s								216.7	
		Required Duration of Fire Flow (hrs)								2.50	
		Required Volume of Fire Flow (m³)								1950	



Date: 7/10/2025

Fire Flow Calculation #: 23

Description: 4-Units Row Townhouse - Block 46

Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										-	-
		560	560									1120	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min										-	11000
4	Determine Occupancy Charge	Limited Combustible										-15%	9350
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-			
		North	20.1 to 30	30	2	41-60	Type V	NO	4%	4488			
		East	3.1 to 10	20	2	21-49	Type V	NO	16%				
		South	10.1 to 20	30	2	41-60	Type V	NO	12%				
		West	3.1 to 10	20	2	21-49	Type V	NO	16%				
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min										14000	
		Total Required Fire Flow in L/s										233.3	
		Required Duration of Fire Flow (hrs)										3.00	
		Required Volume of Fire Flow (m³)										2520	

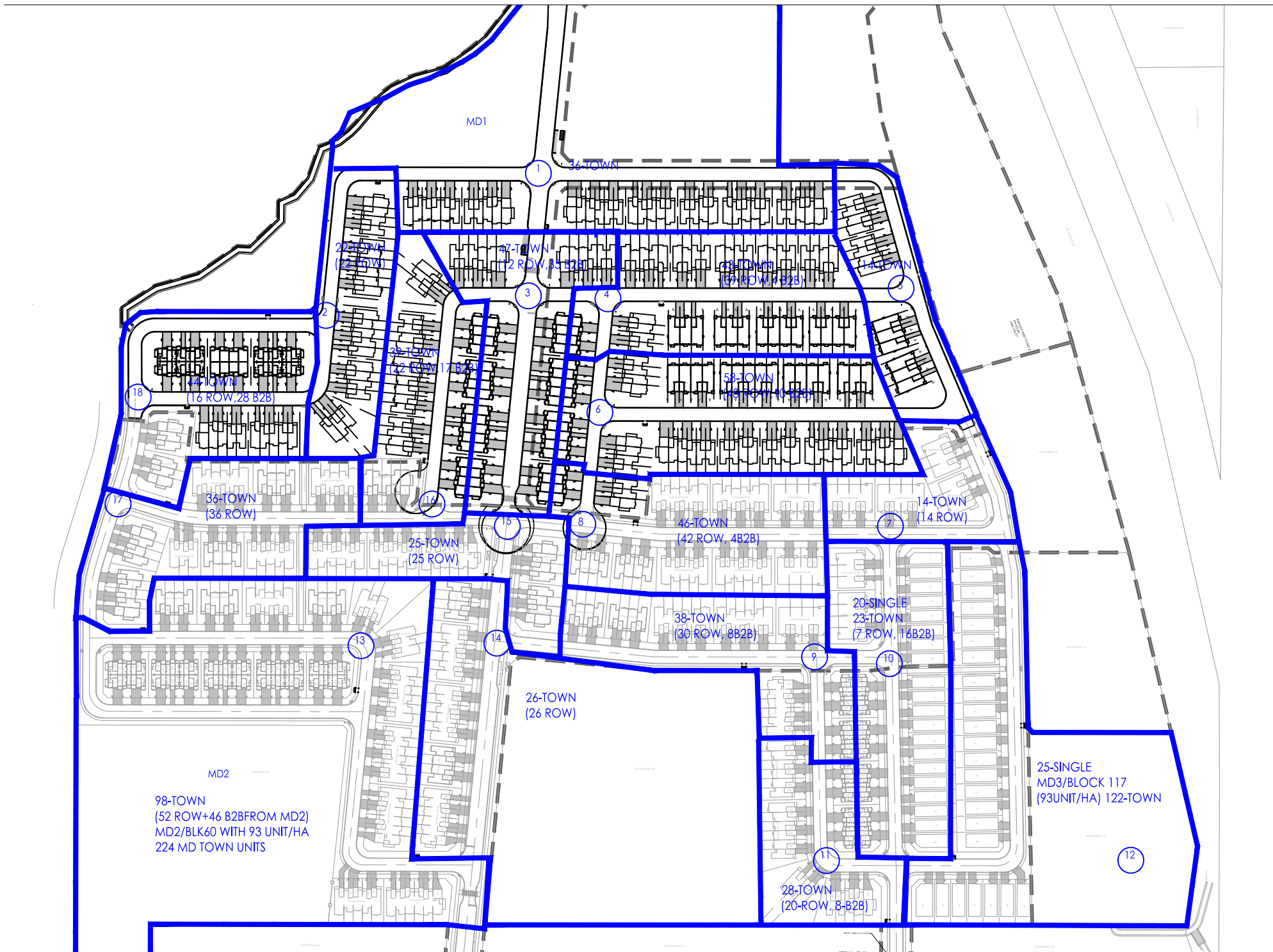


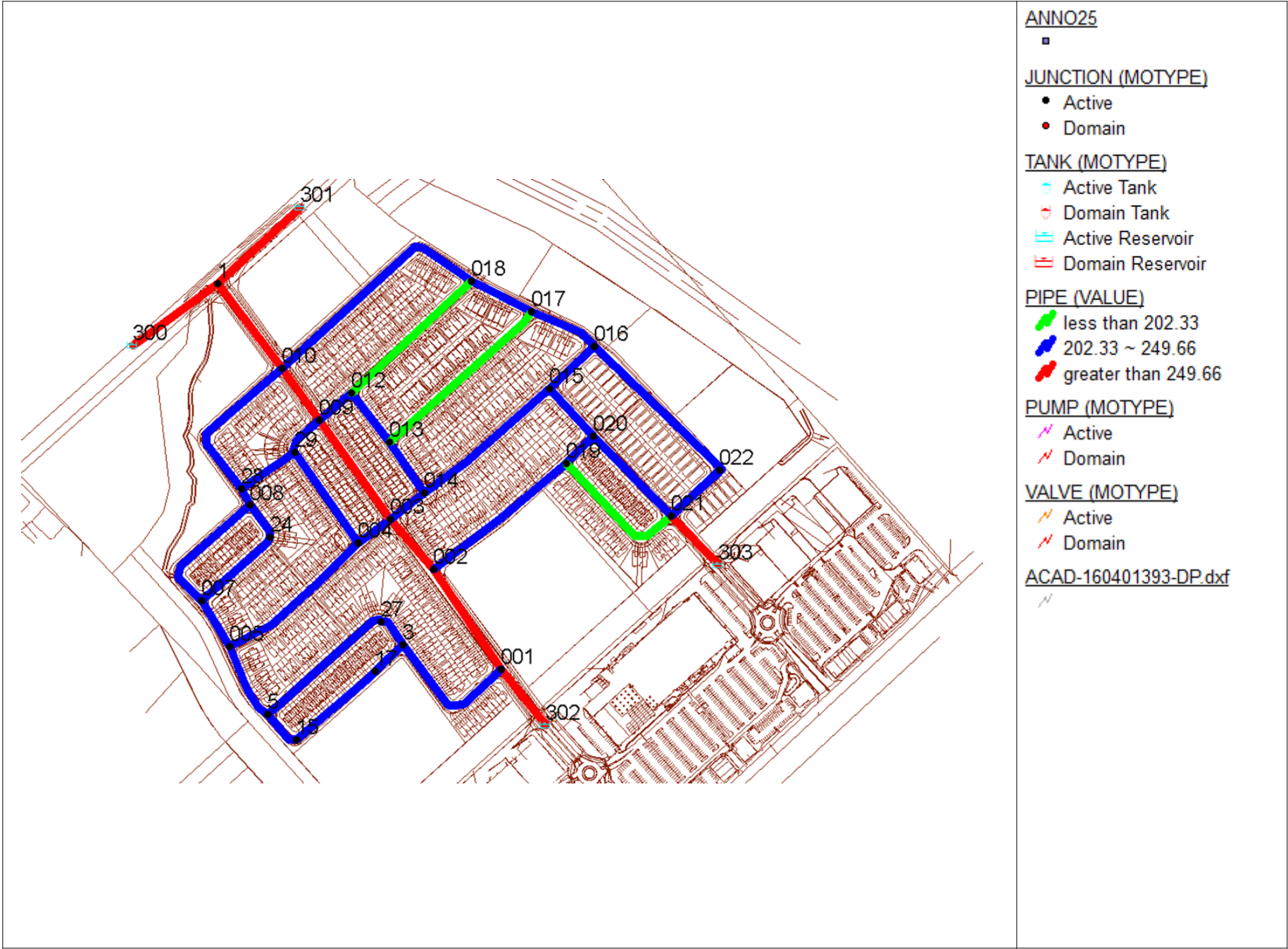
Date: 7/10/2025

Description: 6-Units Row Townhouse - Block 41, 42

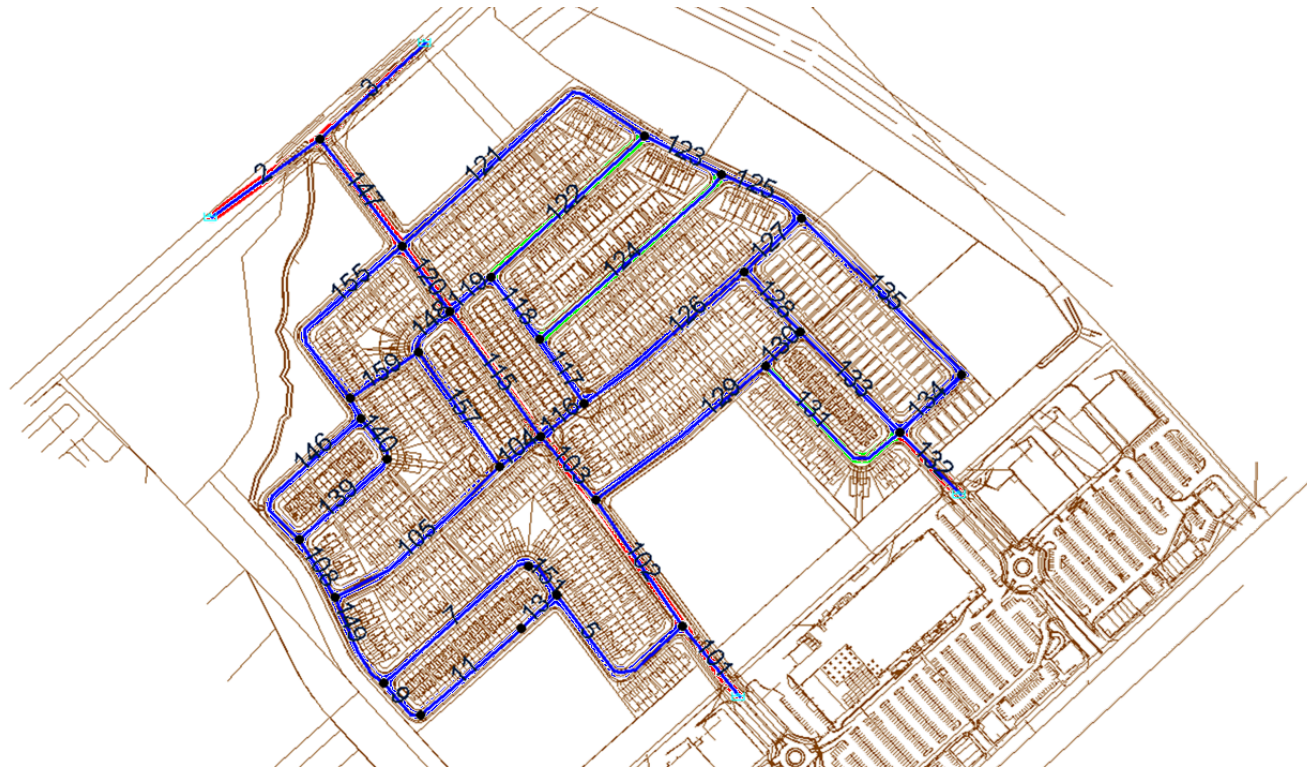
Notes: Wood frame structure without sprinkler system and firewall

Step	Task	Notes								Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction								1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas								-	-
		593	593							1186	-
3	Determine Required Fire Flow	(F = 220 x C x A ^{1/2}). Round to nearest 1000 L/min								-	11000
4	Determine Occupancy Charge	Limited Combustible								-15%	9350
5	Determine Sprinkler Reduction	None								0%	0
		Non-Standard Water Supply or N/A								0%	
		Not Fully Supervised or N/A								0%	
		% Coverage of Sprinkler System								0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?	-	-	
		North	20.1 to 30	37	2	61-80	Type V	NO	6%	4769	
		East	3.1 to 10	19	2	21-49	Type V	NO	16%		
		South	10.1 to 20	37	2	61-80	Type V	NO	13%		
		West	3.1 to 10	19	2	21-49	Type V	NO	16%		
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min								14000	
		Total Required Fire Flow in L/s								233.3	
		Required Duration of Fire Flow (hrs)								3.00	
		Required Volume of Fire Flow (m³)								2520	





Ultimate-2nd Registration-2025-07-10

JUNCTION (MOTYPE)

- Active
- Domain

ANNO25

TANK (MOTYPE)

-  Active Tank
-  Domain Tank
-  Active Reservoir
-  Domain Reservoir

PIPE (VALUE)

- less than 202.33
- 202.33 ~ 249.66
- greater than 249.66

PUMP (MOTYPE)

- Active
Domain

VALVE (MOTYPE)

- Active
Domain

ACAD-160401393-DP.dxf

APPENDIX B

Stormwater Management Calculations and Background

Appendix B1: Storm Sewer Design Sheet

Appendix B2: Stormwater Input Parameters

Project No. 160401393
Richcraft Kanata West Development
Runoff Coefficient Calculations

Runoff Coefficient for Hard Areas, C=0.90

Runoff Coefficient for Soft Areas, C=0.20

ID	Total Area (m ²)	Hard Area (m ²)	Soft Area (m ²)	C-Value
B-1	10983			0.60
B-2	6934			0.70
C107A	1854	1288	566	0.69
C109A	4301	3037	1264	0.69
C109B	3785	2758	1027	0.71
C110A	1281	851	430	0.67
C121A	3843	2645	1198	0.68
C121AA	908	589	319	0.65
C123A	2064	1386	678	0.67
C205A	2631	1758	873	0.67
C206B	1703	1216	487	0.70
C219A	895	617	278	0.68
C220A	4066	2944	1122	0.71
C222A	5208	3632	1576	0.69
C223A	1601	1168	433	0.71
EXT1	1249	768	481	0.63
EXT2	720	479	241	0.67
EXT4	5215	2862	2353	0.58
EXT5	1143	283	860	0.37
EXT6	1155	467	688	0.48
F101A	6923			0.55
G234A	9716			0.25
L102A	2275	1347	928	0.61
L103A	3885	2792	1093	0.70
L103B	2031	1229	802	0.62
L103C	6397	2539	3858	0.48
L103D	5523	2014	3509	0.46
L104A	3335	2273	1062	0.68
L105A	3236	2415	821	0.72
L106A	2440	1846	594	0.73
L106B	735	510	225	0.69
L112A	4137	2797	1340	0.67
L113A	3285	2311	974	0.69
L113B	4947	1552	3395	0.42
L115A	1651	1122	529	0.68
L116A	2227	1565	662	0.69
L117A	4246	3092	1154	0.71

Project No. 160401393
Richcraft Kanata West Development
Runoff Coefficient Calculations

Runoff Coefficient for Hard Areas, C=0.90

Runoff Coefficient for Soft Areas, C=0.20

ID	Total Area (m ²)	Hard Area (m ²)	Soft Area (m ²)	C-Value
L117B	1457	787	670	0.58
L117C	6623	2491	4132	0.46
L118A	4434	2921	1513	0.66
L119A	3110	2182	928	0.69
L121B	14671			0.85
L123B	7404			0.70
L124A	2320	1518	802	0.66
L124B	3815	1252	2563	0.43
L126A	317	239	78	0.73
L126B	2633	1879	754	0.70
L126C	4630			0.25
L127A	3820	2537	1283	0.66
L128A	3185	2115	1070	0.66
L130A	4541	3164	1377	0.69
L202A	2081	1154	927	0.59
L202B	2452	1227	1225	0.55
L204A	4213	2920	1293	0.69
L204B	3883	2919	964	0.73
L205B	4810	1726	3084	0.45
L206A	3093	2321	772	0.73
L207A	5812	3599	2213	0.63
L130B	2253	849	1404	0.46
L207C	4069	1577	2492	0.47
L209A	3501	2452	1049	0.69
L209B	1584	1058	526	0.67
L210A	2521	1680	841	0.67
L210B	2600	1014	1586	0.47
L211A	3995	2993	1002	0.72
L213A	2632	1849	783	0.69
L214A	5507	4027	1480	0.71
L217A	4012	2777	1235	0.68
L218A	29485			0.70
L218B	2503	890	1613	0.45
L219B	3617	2484	1133	0.68
L220A	8666	2958	5708	0.44
L225A	2733	1861	872	0.68
L226A	3031	2181	850	0.70
L228A	3458	2453	1005	0.70
L229A	2114	1504	610	0.70
L234A	2589	1831	758	0.70
L234B	2276	1593	683	0.69
L234D	3685	1970	1715	0.57
L235A	5889	4100	1789	0.69

Summary of Subcatchment Parameters

Individual Proposed Subcatchment Parameters (Site Servicing and SWM Report)

Area ID	Area (ha)	Width (m)	Slope (%)	%IMP	Runoff Coefficient	Subarea Routing	% Routed	Description
Arterial	3.19	1314.0	1.0	71.4%	0.70	OUTLET	100	Arterial
B-1	1.10	186.0	1.0	57.1%	0.60	PERVIOUS	30	Residential
B-2	0.69	186.0	1.0	71.4%	0.70	OUTLET	100	Arterial
C107A	0.19	52.0	1.0	70.0%	0.69	OUTLET	100	Road
C109A	0.43	160.0	1.0	70.0%	0.69	OUTLET	100	Road
C109B	0.38	138.0	1.0	72.9%	0.71	OUTLET	100	Road
C110A	0.12	39.0	1.0	67.1%	0.67	OUTLET	100	Road
C121A	0.38	95.0	1.0	68.6%	0.68	OUTLET	100	Road
C121AA	0.09	37.0	1.5	64.3%	0.65	OUTLET	100	Road
C123A	0.20	43.2	1.0	67.1%	0.67	OUTLET	100	Road
C205A	0.26	70.9	2.5	67.1%	0.67	OUTLET	100	Road_rev_2025
C206B	0.17	68.0	3.0	71.4%	0.70	OUTLET	100	Road
C219A	0.09	79.8	2.0	68.6%	0.68	OUTLET	100	Road
C220A	0.41	131.8	2.0	75.7%	0.73	OUTLET	100	Road_rev_2025
C222A	0.52	257.0	4.0	70.0%	0.69	OUTLET	100	Road
C223A	0.16	59.0	3.0	72.9%	0.71	OUTLET	100	Road
Comm	1.99	448.0	1.0	92.9%	0.85	OUTLET	100	Commercial
EXT1	0.12	59.0	1.5	61.4%	0.63	OUTLET	100	Road
EXT2	0.07	29.0	2.0	67.1%	0.67	OUTLET	100	Road
EXT-4	0.13	79.6	0.5	48.6%	0.54	OUTLET	100	2023_rev
EXT5	0.11	77.0	4.0	24.3%	0.37	PERVIOUS	100	RY
EXT6	0.12	78.8	4.0	40.0%	0.48	PERVIOUS	100	RY
F101A-1A	0.69	155.0	1.0	50.0%	0.55	PERVIOUS	100	KWPumpStation
G234C	0.97	218.1	1.0	28.6%	0.40	PERVIOUS	100	Park_2023_rev
Hazeldean	3.95	1764.0	1.0	71.4%	0.70	OUTLET	100	Arterial
L102A	0.23	82.4	1.0	58.6%	0.61	OUTLET	100	Road
L103A	0.39	161.8	1.0	71.4%	0.70	OUTLET	100	Road
L103B	0.20	63.2	1.0	60.0%	0.62	OUTLET	100	Road
L103C	0.64	300.0	1.0	40.0%	0.48	PERVIOUS	100	RY
L103D	0.55	278.0	1.0	37.1%	0.46	PERVIOUS	100	RY
L104A	0.33	122.7	1.0	68.6%	0.68	OUTLET	100	Road
L105A	0.32	153.2	1.0	74.3%	0.72	OUTLET	100	Road
L106A	0.24	97.3	1.0	75.7%	0.73	OUTLET	100	Road
L106B	0.07	26.6	1.0	70.0%	0.69	OUTLET	100	Road
L112A	0.41	167.7	1.0	67.1%	0.67	OUTLET	100	Road
L113A	0.33	127.0	1.0	70.0%	0.69	OUTLET	100	Road
L113B	0.49	280.0	1.0	31.4%	0.42	PERVIOUS	100	RY
L114A	0.06	63.2	1.0	68.6%	0.68	OUTLET	100	Road
L115A	0.17	58.0	1.0	68.6%	0.68	OUTLET	100	Road
L116A	0.22	84.0	1.0	70.0%	0.69	OUTLET	100	Road
L117A	0.42	173.7	1.0	72.9%	0.71	OUTLET	100	Road
L117B	0.15	49.3	1.0	54.3%	0.58	OUTLET	100	Road
L117C	0.66	360.0	1.0	37.1%	0.46	PERVIOUS	100	RY
L118A	0.44	167.3	1.0	65.7%	0.66	OUTLET	100	Road
L119A	0.31	89.8	1.0	70.0%	0.69	OUTLET	100	Road
L121B	1.47	331.0	1.0	92.9%	0.85	OUTLET	100	Commercial
L123B	0.74	167.0	1.0	71.4%	0.70	PERVIOUS	30	Residential
L124A	0.23	116.1	1.0	65.7%	0.66	OUTLET	100	Road
L124B	0.40	246.0	1.0	32.9%	0.43	PERVIOUS	100	RY
L126A	0.03	30.0	1.0	75.7%	0.73	OUTLET	100	Road
L126B	0.26	85.4	1.0	71.4%	0.70	OUTLET	100	Road
L126C	0.46	104.0	1.0	7.1%	0.25	PERVIOUS	100	Park

Rational Method Comparison

2yr/5yr Capture Rate (L/s)	Available Ponding (cu.m)	Static Ponding Depth (m)	Tc (min)	Intensity (mm/hr)	Q (L/s)	Qrat-Qswm	LOS
933.69	127.6	40 m3/ha	10	122.14	757.6	-176.1	10yr
106	157.0	100-YEAR DRY POND	10	76.81	140.6	34.6	2yr
195.28	27.7	40 m3/ha	10	122.14	164.7	-30.6	10yr
41.06	25.9	0.2	10	104.19	37.0	-4.0	5yr
97.27	27.1	0.17	10	104.19	85.9	-11.4	5yr
88.35	38.1	0.2	10	104.19	77.8	-10.6	5yr
25.61	0.6	0.04	10	104.19	23.0	-2.7	5yr
82.87	79.1	0.26	10	104.19	75.6	-7.2	5yr
19.67	0.0	-	10	104.19	17.1	-2.6	5yr
41.78	23	0.19	10	104.19	38.6	-3.1	5yr
57.97	56.9	0.21	10	104.19	50.9	-7.1	5yr
41.08	0.3	0.02	10	104.19	34.5	-6.6	5yr
22.06	0.0	0.12	10	104.19	17.6	-4.4	5yr
99.39	55.8	0.22	10	104.19	85.9	-13.5	5yr
127.47	64.4	0.24	10	104.19	104.0	-23.5	5yr
38.92	0.4	0.05	10	104.19	32.9	-6.0	5yr
392.69	N/A	100-year	15	83.56	392.8	0.1	5yr
-	0.0						
-	0.0						
-	0.0						
-	0.0						
233.81	0.0						
18.82	0.0	C= 0.33	24.5	45.76	40.8	22.0	2yr
1164.24	158.0	40 m3/ha	10	122.14	938.1	-226.1	10yr
28.74	32.5	0.21	10	76.81	29.6	0.9	2yr
59.81	25.3	0.19	10	76.81	58.0	-1.8	2yr
26.23	16.3	0.18	10	76.81	26.9	0.6	2yr
41.63	0	-	10	76.81	65.4	23.8	2yr
33.15	0.0	-	10	76.81	54.2	21.0	2yr
49.3	29.4	0.19	10	76.81	48.4	-0.9	2yr
51.86	23.3	0.18	10	76.81	49.7	-2.2	2yr
39.73	0.8	0.06	10	76.81	38.0	-1.8	2yr
11.08	0.8	0.12	10	76.81	10.8	-0.3	2yr
59.9	45.7	0.23	10	76.81	59.1	-0.8	2yr
49.54	29	0.19	10	76.81	48.4	-1.2	2yr
24.39	0	-	10	76.81	44.3	19.9	2yr
8.61	3.2	0.13	10	76.81	8.3	-0.3	2yr
24.37	16.2	0.16	10	76.81	24.0	-0.4	2yr
33.57	37.4	0.21	10	76.81	32.8	-0.8	2yr
66.64	61.8	0.26	10	76.81	64.3	-2.3	2yr
17.06	9.9	0.15	10	76.81	18.0	1.0	2yr
41.95	0.0		10	76.81	65.0	23.1	2yr
62.8	29.5	0.19	10	76.81	62.4	-0.4	2yr
46.84	28.1	0.2	10	76.81	45.9	-1.0	2yr
289.35	N/A	100-year	10	76.81	266.1	-23.3	2yr
101.76	37.0	50 m3/ha	10	76.81	110.6	8.8	2yr
32.98	17.2	0.17	10	76.81	32.7	-0.3	2yr
22.48	0.0		10	76.81	36.5	14.1	2yr
5.24	0.0	0.14	10	76.81	4.9	-0.3	2yr
40.43	23.9	0.2	10	76.81	39.3	-1.1	2yr
1.37	0.0		10	76.81	24.7	23.3	2yr

Individual Proposed Subcatchment Parameters (Site Servicing and SWM Report)

Area ID	Area (ha)	Width (m)	Slope (%)	%IMP	Runoff Coefficient	Subarea Routing	% Routed
L127A	0.38	144.2	1.0	65.7%	0.66	OUTLET	100
L128A	0.32	72.1	1.0	65.7%	0.66	OUTLET	100
L130A	0.45	170.7	1.0	70.0%	0.69	OUTLET	100
L130B	0.23	200.0	1.0	40.0%	0.48	PERVIOUS	100
L202A	0.21	76.7	2.0	55.7%	0.59	OUTLET	100
L202B	0.25	152.0	3.0	50.0%	0.55	PERVIOUS	100
L204A	0.42	174.7	3.0	75.7%	0.73	OUTLET	100
L204B	0.35	146.7	3.0	70.0%	0.69	OUTLET	100
L204C	0.26	168.0	3.0	38.6%	0.47	PERVIOUS	100
L205B	0.49	238.1	3.0	35.7%	0.45	PERVIOUS	100
L206A	0.31	127.2	3.0	75.7%	0.73	OUTLET	100
L207A	0.58	202.3	3.0	64.3%	0.65	OUTLET	100
L209A	0.35	153.4	2.0	70.0%	0.69	OUTLET	100
L209B	0.15	159.0	2.0	67.1%	0.67	OUTLET	100
L209C	0.41	200.0	3.0	38.6%	0.47	PERVIOUS	100
L210A	0.34	97.7	4.0	71.4%	0.70	OUTLET	100
L211A	0.40	177.2	3.0	74.3%	0.72	OUTLET	100
L212A	0.10	44.0	3.0	57.1%	0.60	OUTLET	100
L213A	0.21	75.0	2.0	70.0%	0.69	OUTLET	100
L214A	0.55	221.0	4.0	72.9%	0.71	OUTLET	100
L217A	0.40	196.0	3.0	68.6%	0.68	OUTLET	100
L218A	2.68	664.0	1.0	71.4%	0.70	PERVIOUS	30
L218B	0.25	166.0	3.0	35.7%	0.45	PERVIOUS	100
L219B	0.36	111.7	2.0	68.6%	0.68	OUTLET	100
L220A	0.87	480.0	2.5	34.3%	0.44	PERVIOUS	100
L225A	0.27	134.6	2.5	71.4%	0.70	OUTLET	100
L225B	1.79	402.8	2.0	85.7%	0.80	PERVIOUS	30
L225C	0.35	170.0	2.5	71.4%	0.70	OUTLET	100
L228A	0.48	127.3	2.5	75.7%	0.73	OUTLET	100
L229A	0.32	102.3	3.0	75.7%	0.73	OUTLET	100
L234A	0.26	78.0	5.0	68.6%	0.68	OUTLET	100
L234B	0.23	81.1	4.0	70.0%	0.69	OUTLET	100
L234D	0.37	210.0	3.0	52.9%	0.57	PERVIOUS	100
L235A	0.59	232.0	4.0	70.0%	0.69	OUTLET	100
L235B	0.98	221.4	2.0	85.7%	0.80	PERVIOUS	30
L240A	0.16	100.0	5.0	78.6%	0.75	OUTLET	100
L241A	0.19	83.0	4.0	71.4%	0.70	OUTLET	100
L241B	0.24	136.0	5.0	78.6%	0.75	OUTLET	100
POND	2.56	576.0	1.0	60.0%	0.62	PERVIOUS	60
UNC-1	0.06	120.0	4.0	71.4%	0.70	OUTLET	100
UNC-10	0.10	102.8	33.0	85.7%	0.80	OUTLET	100
UNC-11	0.12	119.9	33.0	85.7%	0.80	OUTLET	100
UNC-2	0.07	120.0	4.0	71.4%	0.70	OUTLET	100
UNC-3	0.07	120.0	4.0	71.4%	0.70	OUTLET	100
UNC-4	0.07	120.0	4.0	71.4%	0.70	OUTLET	100
UNC-5	0.30	177.9	3.0	85.7%	0.80	OUTLET	100
UNC-6	0.11	105.6	3.0	85.7%	0.80	OUTLET	100
UNC-7	0.16	160.0	3.0	85.7%	0.80	OUTLET	100
UNC-8	0.07	144.3	3.0	85.7%	0.80	OUTLET	100
UNC-9	0.12	117.5	3.0	85.7%	0.80	OUTLET	100

48.15 66.5% 0.67

25.07 ha - Proposed Subdivision Area (Not including private blocks)
36.53 ha - Proposed Development Area (Including SWM and private blocks)
2.56 ha - Ultimate Pond Block
13.32 ha - Approved First Registration Development Area (Including private blocks)
20.65 ha - Proposed Second Registration Development Area (Including private blocks)

2yr/5yr
Capture Rate
(L/s)

Available
Ponding (cu.m)
Static
Ponding
Depth (m)

National Method Comparison

Tc (min) Intensity
(mm/hr) Q (L/s) Grat-
Qswm LOS

54.1	0.0	0.00	10	76.81	53.8	-0.3	2yr
44.82	29.8	0.18	10	76.81	44.9	0.0	2yr
68.47	0.7	0.1	10	76.81	66.9	-1.6	2yr
22.04	0	-	10	76.81	23.1	1.0	2yr
25.15	15.7	0.16	10	76.81	26.2	1.0	2yr
35.39	-	-	10	76.81	28.8	-6.6	2yr
68.85	53.1	0.22	10	76.81	65.3	-3.6	2yr
52.82	27.1	0.19	10	76.81	51.1	-1.7	2yr
27.59	0	-	10	76.81	26.4	-1.2	2yr
38.99	0	-	10	76.81	46.6	7.6	2yr
50.79	9.2	0.13	10	76.81	48.2	-2.6	2yr
81.06	26.8	0.20	10	76.81	80.6	-0.5	2yr
53.11	3.7	0.13	10	76.81	51.5	-1.6	2yr
22.05	0	-	10	76.81	21.2	-0.9	2yr
36.76	-	-	10	76.81	40.8	4.0	2yr
52.87	7.8	0.14	10	76.81	51.1	-1.8	2yr
64.46	32.6	0.21	10	76.81	61.4	-3.1	2yr
12.24	0.0	0.00	10	76.81	12.5	0.3	2yr
32.01	8.9	0.13	10	76.81	31.2	-0.9	2yr
87.25	104.3	0.3	10	76.81	83.4	-3.8	2yr
59.97	69	0.3	10	76.81	58.2	-1.8	2yr
434	267.9	100	m3/ha	10	400.1	-33.9	2yr
24.17	0.0			10	24.0	-0.1	2yr
53.26	70.1	0.24		10	52.2	-1.0	2yr
66.79	0.0	-		10	81.4	14.6	2yr
42.46	9	0.14		10	40.8	-1.6	2yr
434	89.5	50	m3/ha	10	414.5	-19.5	2yr
55.09	8.2	0.14		10	53.0	-2.1	2yr
78.87	33.6	0.21		10	75.3	-3.5	2yr
51.92	53.5	0.22		10	49.4	-2.5	2yr
38.92	36.6	0.21		10	37.9	-1.0	2yr
34.6	14.3	0.15		10	33.5	-1.1	2yr
55.66	33	0.21		10	45.2	-10.4	2yr
90.29	55.6	0.24		10	87.3	-3.0	2yr
115	88.6	90	m3/ha	10	167.9	52.9	2yr
27.53	1.1	0.09		10	25.5	-2.0	2yr
30.17	7.6	0.12		10	29.0	-1.2	2yr
41.09	9.2	0.13		10	38.2	-2.9	2yr

7763.5 1522.40 61 m³/ha

does not include 2.56 ha pond block

3.19 ha - Future Arterial/Transitway	71.4%
1.10 ha - Future Med. Density Residential Area north of Maple Grove	57.1%
0.69 ha - Future Maple Grove	71.4%
1.99 ha - Future Commercial Block	92.9%
3.95 ha - Existing Hazeldean to Interim SWMF discharging to Hazeldean Creek	71.4%
0.69 ha - Kanata West Pump Station	50.0%

9.14 ha - Existing Fairwinds Development	35.7%
11.02 ha - Existing Commercial Development to Fairwinds Interim SWMF	94.3%
1.16 ha - Existing Huntmar Road to Fairwinds Interim SWMF	67.1%
14.85 ha - Existing Trinity Development	94.3%
4.54 ha - Existing Hazeldean Road to Trinity Interim SWMF	80.0%
88.86 Total Drainage Area to Ultimate Kanata West Pond 5	72.1%

Total Surface Flow Depth

Storage node ID	Structure ID	Top of Grate Elevation (m)	Lowest Adjacent Building Opening (m)	Rim Elevation (m)	100 year, 3 hour Chicago		100 year, 3 hour Chicago+20%		5 year, 3 hour Chicago		2 year, 3 hour Chicago	
					Max Surface HGL (m)	Total Surface Ponding Depth (m)	Max Surface HGL (m)	Total Surface Ponding Depth (m)	Max Surface HGL (m)	Total Surface Ponding Depth (m)	Max Surface HGL (m)	Total Surface Ponding Depth (m)
205A-S(I)	CB 205 A-1 & 2	97.45	98.25	97.80	97.72	0.27	97.78	0.33	97.45	0.00	96.38	0.00
206B-S(I)	CB 206 B-1	97.77	98.49	98.12	97.90	0.13	97.93	0.16	97.51	0.00	96.91	0.00
219A-S(I)	CB 219 A-1	97.82	N/A	98.17	97.96	0.14	98.00	0.18	97.50	0.00	96.90	0.00
220A-S	CB 220 A-1 & 2	97.68	98.33	98.03	97.96	0.28	98.00	0.32	97.53	0.00	96.60	0.00
222A-S	CB 222 A-1 & 2	97.82	98.50	98.25	98.10	0.28	98.19	0.37	97.32	0.00	96.85	0.00
223A-S	CB 223 A-1	98.17	99.16	98.52	98.37	0.20	98.40	0.23	97.56	0.00	97.17	0.00
G234C-S	CBMH 234A	97.59	N/A	98.19	97.76	0.17	97.78	0.19	97.67	0.08	94.99	0.00
116A-S	CB 116 A-1 & 2	97.20	97.88	97.55	97.48	0.28	97.54	0.34	97.24	0.04	96.73	0.00
202A-S(I)	CB 202 A-1 & 2	97.27	97.87	97.62	97.56	0.29	97.62	0.35	97.35	0.08	96.75	0.00
204A-S(I)	CB 204 A-1 & 2	97.39	98.05	97.74	97.64	0.25	97.71	0.32	97.49	0.10	97.21	0.00
204BS(I)	CB 204 B-1 & 2	97.34	97.87	97.69	97.59	0.25	97.65	0.31	97.39	0.05	96.69	0.00
206A-S(I)	CB 206 A-1 & 2	98.29	98.85	98.64	98.54	0.25	98.58	0.29	98.39	0.10	98.14	0.00
207A-S(I)	CB 207 A-1 & 2	98.68	99.37	99.03	98.99	0.31	99.03	0.35	98.78	0.10	98.15	0.00
209A-S	CB 209 A-1 & 2	99.59	100.25	99.94	99.66	0.07	99.66	0.07	99.62	0.03	98.95	0.00
209B-S	CB 209 B-2	100.03	N/A	100.38	100.07	0.04	100.08	0.05	100.05	0.02	99.77	0.00
210A-S	CB 210 A-1 & 2	97.37	97.94	97.72	97.57	0.20	97.64	0.27	97.43	0.06	96.95	0.00
211A-S(I)	CB 211 A-1 & 2	97.75	98.27	98.10	97.98	0.23	98.02	0.27	97.83	0.08	97.43	0.00
L212A-S	CB 212 A-1 & 2	96.94	N/A	97.29	96.97	0.03	96.97	0.03	96.12	0.00	95.80	0.00
213A-S	CB 213 A-1 & 2	97.82	98.53	98.17	98.00	0.18	98.03	0.21	97.86	0.04	97.27	0.00
214A-S(I)	CB 214 A-1 & 2	97.65	98.31	98.00	97.88	0.23	97.94	0.29	97.72	0.07	97.24	0.00
217A-S	CB 217 A-1 & 2	97.81	98.56	98.16	98.00	0.19	98.05	0.24	97.87	0.06	97.35	0.00
219B-S	CB 219 B-1 & 2	97.98	98.49	98.33	98.29	0.31	98.37	0.39	98.04	0.06	97.32	0.00
225A-S	CB 225 A-1 & 2	99.03	99.59	99.38	99.31	0.28	99.35	0.32	99.14	0.11	99.03	0.00
225C-S	CB 225 C-1 & 2	99.49	99.85	99.84	99.70	0.21	99.73	0.24	99.57	0.08	99.43	0.00
228A-S	CB 228 A-1 & 2	99.99	100.40	100.34	100.21	0.22	100.24	0.25	100.07	0.08	99.69	0.00
229A-S	CB 229 A-1 & 2	100.20	100.62	100.55	100.41	0.21	100.44	0.24	100.29	0.09	100.11	0.00
234A-S	CB 234 A-1 & 2	97.35	97.95	97.70	97.60	0.25	97.66	0.31	97.41	0.06	97.17	0.00
234B-S	CB 234 B-1 & 2	97.30	97.77	97.65	97.57	0.27	97.63	0.33	97.35	0.05	96.88	0.00
235A-S	CB 235 A-1 & 2	97.36	97.90	97.71	97.67	0.31	97.71	0.35	97.42	0.06	96.86	0.00
240A-S	CB 240 A-1 & 2	99.80	100.40	100.15	99.97	0.17	100.00	0.20	99.87	0.07	99.43	0.00
241B-S	CB 241 B-1 & 2	99.90	100.47	100.25	100.13	0.23	100.16	0.26	100.02	0.12	99.86	0.00
241A-S	CB 241 A-1 & 2	100.14	100.65	100.49	100.34	0.20	100.35	0.21	100.24	0.10	100.14	0.00

Future Development Blocks - SWM Criteria

Name	Storm Drainage Area	Block ID/Location	Description	MH Outlet	Maximum Minor System Capture (L/s)	100-Year Major System Overflows (L/s)
ART-IC	Arterial	Block 79 & 80	Arterial	209	953	N/A - Overflow to Poole Creek as per KWMSS
B1-IC	B-1	North of Maple Grove	Residential	J2	116	100-year On-Site Storage as per KWMSS
B2-IC	B-2	Maple Grove ROW	Arterial	J4	199	N/A - Overflow to Poole Creek/Carp River as per KWMSS
COMM-IC	Comm	North of Hazeldean	Commercial	209	399	100-year On-Site Storage
HZD-IC	Hazeldean	Hazeldean ROW	Arterial	209	1187	N/A - Overflow to Carp River/Poole Creek as per KWMSS
L121B-IC	L121B	Block 1	Commercial	121	299	100-year On-Site Storage
L123B-IC	L123B	Block 29	Residential	123	111	443 L/s to Maize Street
L218A-IC	L218A	Block 120	School	218	443	376 L/s to Shropshire Place
L225BIC	L225B	Block 60	Residential	225	434	437 L/s to Grazier Row
G234C-IC	G234C	Block 116	Park	234	34	185 L/s to Ploughshare Road
L235B-IC	L235B	Block 117	Residential	235	130	350 L/s to Ploughshare Road

Uncontrolled Areas from Future Blocks

Storm Drainage Area	Block ID/Location	Description	Outlet	100-year Peak Flow (L/s)
UNC-1	Block 120	School	Shropshire Place	29.5
UNC-2	Block 120	School	Rearyard East	31.3
UNC-3	Block 120	School	Hazeldean Creek	34.1
UNC-4	Block 120	School	Roger Griffiths Av.	33.4
UNC-5	Block 60	Residential	Holstein Road North	147.5
UNC-6	Block 60	Residential	Grazier Row East	51.3
UNC-7	Block 60	Residential	Hazeldean Creek	76.5
UNC-8	Block 60	Residential	Fut. N/S Arterial	35.1
UNC-9	Block 117	Residential	Ploughshare Road	57.1
UNC-10	Block 117	Residential	Hazeldean Creek	50.0
UNC-11	Block 117	Residential	Hazeldean Creek	58.3

Appendix B3: PCSWMM Input Example and Flow Depth Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

Ultimate Kanata West Pond 5

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units LPS

Process Models:

Rainfall/Runoff YES
RDII NO
Snowmelt NO
Groundwater NO
Flow Routing YES
Ponding Allowed YES
Water Quality NO
Infiltration Method HORTON
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/23/2009 00:00:00
Ending Date 07/25/2009 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 01:00:00
Routing Time Step 5.00 sec
Variable Time Step NO
Maximum Trials 8
Number of Threads 4
Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Initial LID Storage	0.050	1.044
Total Precipitation	3.450	71.665
Evaporation Loss	0.000	0.000
Infiltration Loss	0.694	14.423
Surface Runoff	2.760	57.322
Final Storage	0.050	1.044

Continuity Error (%) -0.110

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.760	27.599
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	2.326	23.256
External Outflow	5.080	50.800
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	3.171	31.710
Final Stored Volume	3.174	31.736
Continuity Error (%)	0.035	

Highest Continuity Errors

Node 231 (5.49%)
Node 219A-S(2) (4.33%)
Node 131 (-4.11%)
Node 220A-S(1) (4.08%)
Node 219B-S (-3.86%)

Highest Flow Instability Indexes

Link B2-IC (84)
Link G234C-IC (53)
Link W2 (15)
Link OR1 (15)
Link outlet (13)

Routing Time Step Summary

Minimum Time Step	:	5.00 sec
Average Time Step	:	5.00 sec
Maximum Time Step	:	5.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	6.35
Percent Not Converging	:	21.93

Subcatchment Runoff Summary

Perv	Total	Total	Total	Total	Total	Total	Imperv
Runoff	Runoff	Total	Peak	Runoff	Evap	Infil	Runoff
Subcatchment	Runoff	Precip	Runoff	Runoff	mm	mm	mm
mm	mm	Runoff	mm	Coeff	mm	mm	mm
		10^6 ltr	LPS				
Arterial			71.66	0.00	0.00	11.51	51.25
8.98	60.23	1.92	1478.28	0.840			
B-1			71.66	0.00	0.00	19.36	40.99
23.66	52.35	0.58	401.94	0.731			
B-2			71.66	0.00	0.00	11.65	51.24
8.84	60.08	0.42	311.40	0.838			
C107A			71.66	0.00	0.00	12.24	50.22
9.28	59.49	0.11	82.78	0.830			
C109A			71.66	0.00	0.00	12.13	50.22
9.38	59.61	0.26	196.58	0.832			
C109B			71.66	0.00	0.00	10.96	52.27
8.51	60.78	0.23	175.29	0.848			
C110A			71.66	0.00	0.00	13.37	48.17
10.19	58.36	0.07	52.67	0.814			
C121A			71.66	0.00	0.00	12.90	49.19
9.63	58.82	0.23	167.86	0.821			
C121AA			71.66	0.00	0.00	14.40	46.13
11.21	57.35	0.05	41.24	0.800			
C123A			71.66	0.00	0.00	13.59	48.16
9.97	58.13	0.12	84.84	0.811			
C205A			71.66	0.00	0.00	13.24	48.18
10.32	58.51	0.15	120.19	0.816			
C206B			71.66	0.00	0.00	11.40	51.27
9.10	60.36	0.10	80.79	0.842			
C219A			71.66	0.00	0.00	12.47	49.22
10.09	59.31	0.05	42.75	0.828			
C220A			71.66	0.00	0.00	9.73	54.33
7.69	62.02	0.25	192.68	0.865			
C222A			71.66	0.00	0.00	11.93	50.25
9.60	59.85	0.31	248.39	0.835			
C223A			71.66	0.00	0.00	10.84	52.29
8.64	60.92	0.10	76.08	0.850			
Comm			71.66	0.00	0.00	2.84	66.60

2.28	68.88	1.37	977.29	0.961			
EXT1			71.66	0.00	0.00	15.53	44.09
12.14	56.22	0.07	56.63	0.785			
EXT2			71.66	0.00	0.00	13.19	48.19
10.38	58.57	0.04	33.43	0.817			
EXT-4			71.66	0.00	0.00	21.05	34.86
15.83	50.69	0.07	51.94	0.707			
EXT5			71.66	0.00	0.00	33.01	17.42
38.75	38.75	0.04	50.20	0.541			
EXT6			71.66	0.00	0.00	27.95	28.71
43.82	43.82	0.05	53.57	0.611			
F101A-1A			71.66	0.00	0.00	24.46	35.87
47.27	47.27	0.33	247.42	0.660			
G234C			71.66	0.00	0.00	33.22	20.50
38.50	38.50	0.37	240.23	0.537			
Hazeldean			71.66	0.00	0.00	11.49	51.25
9.00	60.26	2.38	1839.13	0.841			
L102A			71.66	0.00	0.00	16.94	42.03
12.77	54.80	0.12	96.48	0.765			
L103A			71.66	0.00	0.00	11.51	51.25
8.98	60.23	0.23	180.16	0.841			
L103B			71.66	0.00	0.00	16.43	43.05
12.25	55.30	0.11	85.32	0.772			
L103C			71.66	0.00	0.00	28.21	28.71
43.54	43.54	0.28	258.29	0.608			
L103D			71.66	0.00	0.00	29.21	26.66
42.53	42.53	0.23	221.30	0.593			
L104A			71.66	0.00	0.00	12.73	49.20
9.81	59.01	0.20	151.26	0.823			
L105A			71.66	0.00	0.00	10.31	53.30
8.14	61.44	0.20	152.77	0.857			
L106A			71.66	0.00	0.00	9.76	54.32
7.66	61.99	0.15	114.87	0.865			
L106B			71.66	0.00	0.00	12.14	50.22
9.37	59.60	0.04	33.53	0.832			
L112A			71.66	0.00	0.00	13.29	48.18
10.27	58.45	0.24	187.46	0.816			
L113A			71.66	0.00	0.00	12.12	50.23
9.39	59.62	0.20	150.56	0.832			
L113B			71.66	0.00	0.00	31.12	22.56
40.62	40.62	0.20	193.75	0.567			
L114A			71.66	0.00	0.00	12.49	49.22
10.07	59.29	0.03	27.30	0.827			
L115A			71.66	0.00	0.00	12.75	49.20
9.79	58.99	0.10	74.52	0.823			
L116A			71.66	0.00	0.00	12.13	50.22
9.39	59.61	0.13	101.87	0.832			
L117A			71.66	0.00	0.00	10.93	52.28
8.54	60.82	0.26	197.94	0.849			
L117B			71.66	0.00	0.00	18.81	38.95

13.97	52.92	0.08	59.15	0.738			
L117C			71.66	0.00	0.00	29.18	26.66
42.57	42.57	0.28	270.78	0.594			
L118A			71.66	0.00	0.00	13.91	47.15
10.67	57.83	0.26	198.08	0.807			
L119A			71.66	0.00	0.00	12.23	50.22
9.29	59.50	0.19	139.54	0.830			
L121B			71.66	0.00	0.00	2.84	66.60
2.28	68.88	1.01	720.09	0.961			
L123B			71.66	0.00	0.00	13.26	51.24
22.60	58.47	0.43	334.10	0.816			
L124A			71.66	0.00	0.00	13.81	47.16
10.78	57.94	0.13	106.12	0.808			
L124B			71.66	0.00	0.00	30.58	23.59
41.16	41.16	0.16	161.80	0.574			
L126A			71.66	0.00	0.00	9.64	54.35
7.79	62.14	0.02	15.28	0.867			
L126B			71.66	0.00	0.00	11.58	51.25
8.91	60.15	0.16	120.06	0.839			
L126C			71.66	0.00	0.00	41.63	5.13
30.06	30.06	0.14	74.83	0.419			
L127A			71.66	0.00	0.00	13.91	47.15
10.67	57.83	0.22	170.64	0.807			
L128A			71.66	0.00	0.00	14.18	47.14
10.41	57.54	0.18	134.68	0.803			
L130A			71.66	0.00	0.00	12.13	50.22
9.39	59.61	0.27	207.75	0.832			
L130B			71.66	0.00	0.00	28.02	28.71
43.75	43.75	0.10	101.68	0.610			
L202A			71.66	0.00	0.00	17.94	39.99
13.82	53.81	0.11	90.68	0.751			
L202B			71.66	0.00	0.00	24.27	35.89
47.51	47.51	0.12	115.36	0.663			
L204A			71.66	0.00	0.00	9.67	54.34
7.76	62.10	0.26	201.12	0.867			
L204B			71.66	0.00	0.00	12.02	50.24
9.50	59.73	0.21	162.71	0.833			
L204C			71.66	0.00	0.00	24.64	27.74
19.43	47.16	0.12	115.15	0.658			
L205B			71.66	0.00	0.00	25.95	25.64
20.15	45.79	0.22	202.62	0.639			
L206A			71.66	0.00	0.00	9.67	54.34
7.76	62.10	0.19	148.37	0.867			
L207A			71.66	0.00	0.00	14.34	46.14
11.28	57.41	0.33	267.60	0.801			
L209A			71.66	0.00	0.00	12.00	50.24
9.52	59.76	0.21	164.75	0.834			
L209B			71.66	0.00	0.00	13.02	48.20
10.56	58.76	0.09	70.74	0.820			
L209C			71.66	0.00	0.00	24.78	27.69

19.28	46.97	0.19	172.34	0.655			
L210A			71.66	0.00	0.00	11.36	51.27
9.15	60.42	0.21	163.47	0.843			
L211A			71.66	0.00	0.00	10.24	53.32
8.22	61.53	0.25	191.31	0.859			
L212A			71.66	0.00	0.00	17.19	41.02
13.56	54.57	0.05	44.67	0.762			
L213A			71.66	0.00	0.00	12.00	50.24
9.52	59.76	0.13	99.63	0.834			
L214A			71.66	0.00	0.00	10.81	52.29
8.67	60.97	0.34	263.13	0.851			
L217A			71.66	0.00	0.00	12.53	49.22
10.03	59.24	0.24	190.09	0.827			
L218A			71.66	0.00	0.00	13.27	51.24
22.60	58.46	1.57	1222.30	0.816			
L218B			71.66	0.00	0.00	29.41	25.63
42.35	42.35	0.11	113.55	0.591			
L219B			71.66	0.00	0.00	12.67	49.20
9.87	59.07	0.21	165.28	0.824			
L220A			71.66	0.00	0.00	26.53	24.61
20.60	45.21	0.39	360.33	0.631			
L225A			71.66	0.00	0.00	11.39	51.27
9.12	60.38	0.17	130.10	0.843			
L225B			71.66	0.00	0.00	7.07	61.49
21.63	64.68	1.16	875.64	0.902			
L225C			71.66	0.00	0.00	11.37	51.27
9.14	60.41	0.21	169.42	0.843			
L228A			71.66	0.00	0.00	9.67	54.34
7.76	62.10	0.30	231.96	0.867			
L229A			71.66	0.00	0.00	9.65	54.34
7.78	62.12	0.20	152.51	0.867			
L234A			71.66	0.00	0.00	12.57	49.21
9.98	59.19	0.15	122.89	0.826			
L234B			71.66	0.00	0.00	11.98	50.24
9.55	59.79	0.14	107.64	0.834			
L234D			71.66	0.00	0.00	23.13	37.94
48.65	48.65	0.18	175.58	0.679			
L235A			71.66	0.00	0.00	11.96	50.24
9.56	59.81	0.35	281.27	0.835			
L235B			71.66	0.00	0.00	7.07	61.49
21.63	64.68	0.64	481.27	0.902			
L240A			71.66	0.00	0.00	8.47	56.40
6.92	63.32	0.10	77.31	0.884			
L241A			71.66	0.00	0.00	11.37	51.27
9.13	60.40	0.12	92.49	0.843			
L241B			71.66	0.00	0.00	8.48	56.40
6.91	63.31	0.15	115.60	0.883			
POND			71.66	0.00	0.00	19.15	43.04
35.37	52.58	1.35	1041.98	0.734			
UNC-1			71.66	0.00	0.00	11.26	51.24

9.28	60.52	0.04	29.78	0.844			
UNC-10			71.66	0.00	0.00	5.62	61.48
4.67	66.15	0.07	50.19	0.923			
UNC-11			71.66	0.00	0.00	5.62	61.48
4.67	66.15	0.08	58.57	0.923			
UNC-2			71.66	0.00	0.00	11.26	51.24
9.27	60.52	0.04	31.55	0.844			
UNC-3			71.66	0.00	0.00	11.27	51.25
9.27	60.51	0.04	34.39	0.844			
UNC-4			71.66	0.00	0.00	11.27	51.25
9.27	60.52	0.04	33.73	0.844			
UNC-5			71.66	0.00	0.00	5.65	61.52
4.61	66.14	0.20	148.19	0.923			
UNC-6			71.66	0.00	0.00	5.63	61.53
4.64	66.16	0.07	51.47	0.923			
UNC-7			71.66	0.00	0.00	5.63	61.53
4.64	66.16	0.10	76.80	0.923			
UNC-8			71.66	0.00	0.00	5.62	61.51
4.66	66.16	0.05	35.28	0.923			
UNC-9			71.66	0.00	0.00	5.63	61.53
4.64	66.16	0.08	57.39	0.923			

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J6	JUNCTION	0.04	0.19	94.75	0 01:13	0.19
J9	JUNCTION	1.85	1.87	94.62	1 01:07	1.87
CREEK	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
CREEK-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF10	OUTFALL	0.00	0.04	95.04	0 01:00	0.04
OF11	OUTFALL	0.00	0.14	100.14	0 01:00	0.14
OF13	OUTFALL	0.00	0.13	97.83	0 01:00	0.13
OF14	OUTFALL	0.00	0.13	97.83	0 01:00	0.13
OF2	OUTFALL	1.59	1.59	94.60	0 00:00	1.59
OF3	OUTFALL	0.00	0.06	95.96	0 01:00	0.06
OF4	OUTFALL	0.00	0.01	96.92	0 01:00	0.01
OF5	OUTFALL	0.00	0.04	98.39	0 01:00	0.04
OF6	OUTFALL	0.00	0.10	97.10	0 01:00	0.10
OF7	OUTFALL	0.00	0.00	99.00	0 00:00	0.00
OF8	OUTFALL	2.00	2.00	94.60	0 00:00	2.00
OF9	OUTFALL	0.00	0.01	95.01	0 01:15	0.01
100A	STORAGE	3.12	3.59	95.08	0 01:11	3.59
100B	STORAGE	3.11	3.61	95.11	0 01:11	3.61

100C	STORAGE	1.71	2.18	95.08	0	01:13	2.18
100D	STORAGE	1.77	2.27	95.11	0	01:12	2.27
100E	STORAGE	1.11	1.57	95.07	0	01:12	1.57
101	STORAGE	1.63	2.22	95.20	0	01:12	2.22
102	STORAGE	1.49	2.10	95.22	0	01:12	2.10
102A	STORAGE	1.03	1.66	95.24	0	01:12	1.65
102A-S	STORAGE	0.00	0.00	97.35	0	00:00	0.00
102A-S(1)	STORAGE	0.03	1.56	97.32	0	01:09	1.56
102A-S(2)	STORAGE	0.00	0.00	97.42	0	00:00	0.00
103	STORAGE	0.93	1.58	95.26	0	01:12	1.58
103A-S	STORAGE	0.02	1.59	97.47	0	01:03	1.59
103A-S(1)	STORAGE	0.00	0.02	97.47	0	01:01	0.02
103B-S	STORAGE	0.03	1.69	97.33	0	01:01	1.69
104	STORAGE	0.56	1.22	95.27	0	01:11	1.22
104A-S	STORAGE	0.03	1.59	97.67	0	01:04	1.59
104A-S(1)	STORAGE	0.00	0.02	97.67	0	01:02	0.02
105	STORAGE	0.32	0.84	95.36	0	01:11	0.84
105A-S	STORAGE	0.00	0.02	97.81	0	01:17	0.02
105A-S(1)	STORAGE	0.03	1.61	97.72	0	01:03	1.61
106	STORAGE	0.31	0.67	95.38	0	01:10	0.67
106A-S	STORAGE	0.00	0.00	97.88	0	00:00	0.00
106A-S(1)	STORAGE	0.02	1.51	97.78	0	01:00	1.51
106A-S(2)	STORAGE	0.00	0.05	97.76	0	01:00	0.05
106B-S	STORAGE	0.03	2.57	97.71	0	01:05	2.57
107	STORAGE	0.31	1.33	95.64	0	01:12	1.33
107A-S	STORAGE	0.00	0.05	97.85	0	01:11	0.05
107A-S(1)	STORAGE	0.03	1.60	97.81	0	01:16	1.60
108	STORAGE	0.31	1.23	95.70	0	01:03	1.23
109	STORAGE	0.24	0.97	95.92	0	01:03	0.96
109A-S	STORAGE	0.02	1.56	97.76	0	01:05	1.56
109A-S(1)	STORAGE	0.00	0.07	97.86	0	01:03	0.06
109B-S	STORAGE	0.01	1.47	97.68	0	01:00	1.47
109B-S(1)	STORAGE	0.00	0.00	97.87	0	00:00	0.00
109B-S(3)	STORAGE	0.00	0.07	98.08	0	01:10	0.07
110	STORAGE	0.24	1.10	95.79	0	01:13	1.10
110A-S	STORAGE	0.02	1.51	97.88	0	01:11	1.51
111	STORAGE	0.28	1.08	95.85	0	01:13	1.08
112	STORAGE	0.28	1.07	96.03	0	01:14	1.07
112A-S	STORAGE	0.00	0.08	98.17	0	01:05	0.08
112A-S(1)	STORAGE	0.03	1.68	98.08	0	01:10	1.68
113	STORAGE	0.28	0.81	96.11	0	01:14	0.81
113A-S	STORAGE	0.00	0.07	98.24	0	01:03	0.07
113A-S(1)	STORAGE	0.03	1.71	98.18	0	01:05	1.71
114	STORAGE	0.69	1.33	95.25	0	01:12	1.33
114A-S	STORAGE	0.03	1.59	97.28	0	01:03	1.59
115	STORAGE	0.50	1.21	95.33	0	01:13	1.21
115A	STORAGE	0.42	1.18	95.37	0	01:13	1.18
115A-S	STORAGE	0.03	1.62	97.41	0	01:14	1.62
115A-S(1)	STORAGE	0.00	0.07	97.40	0	01:14	0.07
116	STORAGE	0.33	0.68	95.48	0	01:13	0.68

116A-S	STORAGE	0.04	1.67	97.49	0	01:12	1.67
116A-S(1)	STORAGE	0.00	0.07	97.48	0	01:12	0.07
117	STORAGE	0.32	1.04	95.45	0	01:13	1.03
117A-S	STORAGE	0.03	1.62	97.50	0	01:03	1.62
117A-S(1)	STORAGE	0.00	0.00	97.52	0	00:00	0.00
117B-S	STORAGE	0.04	1.68	97.49	0	01:01	1.68
118	STORAGE	0.31	0.69	95.64	0	01:15	0.69
118A-S	STORAGE	0.02	1.59	97.59	0	01:04	1.59
118A-S(1)	STORAGE	0.00	0.02	97.59	0	01:02	0.02
119	STORAGE	1.12	1.87	95.37	0	01:12	1.87
119A-S	STORAGE	0.03	1.57	97.41	0	01:03	1.57
120A-S(1)	STORAGE	0.00	0.04	97.66	0	01:12	0.04
121	STORAGE	0.62	1.52	95.52	0	01:12	1.52
121A	STORAGE	0.30	0.50	95.52	0	01:12	0.50
121AA-S	STORAGE	0.01	1.40	97.33	0	01:00	1.40
121A-S	STORAGE	0.00	0.09	97.81	0	01:03	0.09
121A-S(1)	STORAGE	0.00	0.00	98.05	0	00:00	0.00
121A-S(2)	STORAGE	0.03	1.68	97.66	0	01:13	1.68
121B-S	STORAGE	0.04	2.12	97.97	0	01:03	2.12
123	STORAGE	0.32	1.00	95.71	0	01:11	1.00
123A-S	STORAGE	0.02	1.53	97.84	0	01:02	1.53
123B-S	STORAGE	0.03	2.23	98.23	0	01:00	2.23
124	STORAGE	0.32	0.77	96.34	0	01:06	0.77
124A-S	STORAGE	0.04	1.66	98.21	0	01:01	1.66
124A-S(1)	STORAGE	0.00	0.09	98.19	0	01:02	0.09
125	STORAGE	0.32	0.79	96.49	0	01:06	0.79
126	STORAGE	0.32	0.88	96.98	0	01:06	0.88
126A-S	STORAGE	0.03	1.60	99.13	0	01:02	1.60
126B-S	STORAGE	0.00	0.07	99.12	0	01:03	0.07
126B-S(1)	STORAGE	0.03	1.64	98.63	0	01:10	1.64
126B-S(2)	STORAGE	0.00	0.05	98.62	0	01:10	0.05
126C-S	STORAGE	0.05	2.65	99.14	0	01:00	2.65
127	STORAGE	0.31	0.50	97.93	0	00:53	0.50
127A-S	STORAGE	0.00	0.00	100.62	0	00:00	0.00
127A-S(1)	STORAGE	0.02	1.44	99.21	0	01:00	1.44
128	STORAGE	0.24	0.62	97.07	0	01:06	0.62
128A-S(1)	STORAGE	0.03	1.64	99.13	0	01:03	1.64
129	STORAGE	0.31	0.60	97.14	0	01:05	0.60
130	STORAGE	0.31	0.57	97.70	0	00:58	0.57
130A-S	STORAGE	0.02	1.53	99.47	0	01:00	1.53
130A-S(1)	STORAGE	0.00	0.06	99.45	0	01:00	0.06
131	STORAGE	0.30	0.40	97.70	0	00:58	0.40
132	STORAGE	0.00	0.00	97.56	0	00:00	0.00
201	STORAGE	3.15	3.76	95.22	0	01:07	3.76
202	STORAGE	3.04	3.79	95.37	0	01:07	3.79
202A-S	STORAGE	0.00	0.03	97.59	0	01:02	0.03
202A-S(1)	STORAGE	0.05	1.68	97.57	0	01:10	1.68
203A-S	STORAGE	0.00	0.03	97.64	0	01:10	0.03
204	STORAGE	2.16	3.19	95.65	0	01:06	3.18
204A-S	STORAGE	0.00	0.05	97.71	0	01:06	0.05

204A-S(1)	STORAGE	0.03	1.63	97.64	0	01:09	1.63
204BS(1)	STORAGE	0.02	1.63	97.59	0	01:01	1.63
205	STORAGE	1.84	3.08	95.85	0	01:06	3.08
205A-S	STORAGE	0.00	0.20	97.71	0	01:06	0.20
205A-S(1)	STORAGE	0.02	1.64	97.71	0	01:06	1.64
206	STORAGE	1.68	3.11	96.05	0	01:04	3.11
206A-S	STORAGE	0.00	0.09	98.97	0	01:01	0.09
206A-S(1)	STORAGE	0.02	1.63	98.54	0	01:02	1.63
206B-S	STORAGE	0.00	0.09	98.51	0	01:02	0.09
206B-S(1)	STORAGE	0.02	1.50	97.89	0	01:03	1.50
206B-S1	STORAGE	0.00	0.06	97.96	0	01:01	0.06
207	STORAGE	0.39	2.49	96.73	0	01:03	2.48
207A-S(1)	STORAGE	0.03	1.69	98.99	0	01:00	1.69
209	STORAGE	0.34	2.44	97.14	0	01:01	2.44
209A-S	STORAGE	0.01	1.44	99.65	0	01:00	1.44
209B-S	STORAGE	0.01	0.21	98.86	0	01:20	0.21
209B-S(1)	STORAGE	0.00	0.00	100.44	0	00:00	0.00
210	STORAGE	2.71	3.68	95.59	0	01:07	3.67
210A-S	STORAGE	0.02	1.59	97.58	0	01:03	1.59
211	STORAGE	2.38	3.39	95.63	0	01:07	3.39
211A-S	STORAGE	0.00	0.00	98.01	0	01:02	0.00
211A-S(1)	STORAGE	0.02	1.61	97.98	0	01:01	1.61
211A-S(2)	STORAGE	0.00	0.00	98.21	0	00:00	0.00
212	STORAGE	2.23	3.30	95.69	0	01:08	3.30
213	STORAGE	1.62	2.74	95.74	0	01:08	2.74
213A-S	STORAGE	0.02	1.57	98.01	0	01:01	1.57
214	STORAGE	0.32	1.40	95.84	0	01:08	1.40
214A-S	STORAGE	0.00	0.00	98.02	0	00:00	0.00
214A-S(1)	STORAGE	0.02	1.62	97.89	0	01:01	1.62
214A-S(2)	STORAGE	0.00	0.00	98.26	0	00:00	0.00
215	STORAGE	0.24	0.93	95.95	0	01:09	0.93
216	STORAGE	0.24	0.88	95.99	0	01:09	0.88
217	STORAGE	0.23	0.77	96.07	0	01:09	0.77
217A-S	STORAGE	0.02	1.58	98.01	0	01:02	1.58
217A-S(1)	STORAGE	0.00	0.00	98.11	0	00:00	0.00
217A-S(2)	STORAGE	0.00	0.00	98.11	0	00:00	0.00
218	STORAGE	0.95	2.15	95.83	0	01:08	2.15
219	STORAGE	0.72	2.02	95.92	0	01:08	2.02
219A-S	STORAGE	0.00	0.00	98.07	0	01:09	0.00
219A-S(1)	STORAGE	0.02	1.53	97.97	0	01:01	1.52
219A-S(2)	STORAGE	0.00	0.09	98.31	0	01:05	0.09
219B-S	STORAGE	0.03	1.70	98.30	0	01:05	1.70
219B-S(1)	STORAGE	0.00	0.00	98.32	0	00:00	0.00
220	STORAGE	0.09	0.91	95.99	0	01:08	0.91
220A-S	STORAGE	0.02	1.66	97.96	0	01:00	1.66
220A-S(1)	STORAGE	0.00	0.09	97.96	0	01:01	0.09
221	STORAGE	0.31	1.67	96.15	0	01:09	1.67
222	STORAGE	0.32	1.63	96.59	0	01:09	1.63
222A-S	STORAGE	0.02	1.63	98.07	0	01:08	1.63
222A-S(1)	STORAGE	0.00	0.11	98.33	0	01:03	0.11

222A-S(2)	STORAGE	0.00	0.00	98.82	0	00:00	0.00
223	STORAGE	0.32	1.80	97.08	0	01:10	1.80
223A-S	STORAGE	0.02	1.57	98.36	0	01:02	1.57
224	STORAGE	0.33	1.87	97.21	0	01:10	1.86
225	STORAGE	0.33	1.97	97.62	0	01:10	1.97
225A-S	STORAGE	0.02	1.65	99.30	0	01:00	1.65
225A-S(1)	STORAGE	0.00	0.10	99.26	0	01:01	0.10
225C-S	STORAGE	0.02	1.58	99.69	0	01:02	1.58
225C-S(1)	STORAGE	0.00	0.05	99.68	0	01:03	0.05
226	STORAGE	0.32	1.61	97.74	0	01:11	1.61
227	STORAGE	0.32	1.61	97.82	0	01:11	1.61
228	STORAGE	0.32	1.62	98.10	0	01:12	1.62
228A-S	STORAGE	0.02	1.62	100.23	0	01:00	1.62
228A-S(1)	STORAGE	0.00	0.03	100.23	0	01:01	0.03
229	STORAGE	0.31	1.34	98.22	0	01:12	1.34
229A-S	STORAGE	0.02	1.59	100.41	0	01:01	1.59
229A-S(1)	STORAGE	0.00	0.00	100.42	0	00:00	0.00
230	STORAGE	0.31	1.15	98.32	0	01:13	1.15
231	STORAGE	0.30	0.97	98.32	0	01:13	0.97
232	STORAGE	0.30	0.74	98.32	0	01:13	0.74
233	STORAGE	2.22	2.87	95.26	0	01:07	2.87
234	STORAGE	1.69	2.46	95.38	0	01:08	2.46
234A-S	STORAGE	0.04	1.64	97.61	0	01:09	1.64
234A-S(1)	STORAGE	0.00	0.05	97.61	0	01:08	0.05
234B-S	STORAGE	0.04	1.66	97.58	0	01:10	1.66
234B-S(1)	STORAGE	0.00	0.08	97.57	0	01:11	0.08
235	STORAGE	1.25	2.12	95.48	0	01:08	2.12
235A-S	STORAGE	0.03	1.70	97.68	0	01:02	1.70
235A-S(1)	STORAGE	0.00	0.08	97.68	0	01:02	0.08
236	STORAGE	0.84	1.70	95.48	0	01:08	1.70
237	STORAGE	0.60	1.46	95.48	0	01:08	1.46
240	STORAGE	0.32	1.69	98.02	0	01:12	1.69
240A-S	STORAGE	0.02	1.54	99.96	0	01:01	1.54
240A-S(1)	STORAGE	0.00	0.06	99.95	0	01:02	0.06
241	STORAGE	0.31	1.58	98.31	0	01:12	1.58
241A-S	STORAGE	0.02	1.57	100.33	0	01:00	1.57
241A-S(1)	STORAGE	0.00	0.07	100.33	0	01:00	0.07
241B-S	STORAGE	0.02	1.60	100.12	0	01:01	1.60
241B-S(1)	STORAGE	0.00	0.06	100.11	0	01:01	0.06
242	STORAGE	0.31	1.39	98.31	0	01:12	1.39
B1-S	STORAGE	0.22	2.15	96.58	0	01:15	2.15
B2-S	STORAGE	0.22	2.19	96.59	0	01:00	2.19
Comm-S	STORAGE	0.04	2.13	99.53	0	01:03	2.13
EXT-1A-S	STORAGE	0.00	0.00	97.92	0	00:00	0.00
EXT-1A-S(1)	STORAGE	0.00	0.07	96.00	0	01:00	0.07
EXT2-S	STORAGE	0.00	0.06	98.45	0	01:00	0.06
EXT-4-S	STORAGE	0.01	0.13	98.13	0	01:00	0.13
EXT5-S	STORAGE	0.00	0.13	98.13	0	01:00	0.13
EXT6-S	STORAGE	0.00	0.10	99.70	0	01:00	0.10
F101A(1)	STORAGE	0.41	0.89	95.09	0	01:13	0.89

F101A(2)	STORAGE	0.61	1.09	95.09	0	01:13	1.09
F101A-S	STORAGE	1.18	1.67	95.10	0	01:13	1.67
G234C-S	STORAGE	1.26	4.35	97.76	0	01:00	4.35
HW7	STORAGE	0.96	1.44	95.09	0	01:13	1.44
HZD-S	STORAGE	0.02	2.29	100.29	0	01:00	2.29
J2	STORAGE	0.51	1.10	95.20	0	01:13	1.10
J3	STORAGE	0.91	1.40	95.10	0	01:11	1.40
J4	STORAGE	0.51	1.23	95.33	0	01:07	1.23
L212A-S	STORAGE	0.01	1.41	96.97	0	01:00	1.41
L218A-S	STORAGE	0.04	2.31	98.31	0	01:01	2.31
L225B-S	STORAGE	0.03	2.28	99.48	0	01:00	2.28
L235B-S	STORAGE	1.22	2.25	97.80	0	01:00	2.25
POND-S1	STORAGE	3.91	4.37	95.07	0	01:13	4.37
RY103C-S	STORAGE	0.02	1.39	97.63	0	01:00	1.39
RY103D-S	STORAGE	0.02	1.39	97.59	0	01:00	1.39
RY113B-S	STORAGE	0.03	1.52	98.18	0	01:04	1.52
RY117C-S	STORAGE	0.02	1.42	97.59	0	01:00	1.42
RY124B-S	STORAGE	0.02	1.36	98.27	0	01:00	1.36
RY130B-S	STORAGE	0.01	1.03	99.41	0	01:00	1.03
RY202B-S	STORAGE	0.02	2.11	97.61	0	01:00	2.11
RY205B-S	STORAGE	0.03	2.26	97.72	0	01:00	2.26
RY209C-S	STORAGE	0.03	2.04	99.45	0	00:51	2.04
RY210B-S	STORAGE	0.02	2.40	97.76	0	01:00	2.40
RY218B-S	STORAGE	0.03	2.15	98.44	0	01:00	2.15
RY220A-S	STORAGE	0.03	2.10	97.98	0	01:00	2.09
RY234D-S	STORAGE	0.03	2.12	97.61	0	01:08	2.12
SU	STORAGE	0.00	0.12	97.32	0	01:01	0.12
Transitway-S	STORAGE	0.02	2.26	99.26	0	01:00	2.25

Node Inflow Summary

Total		Flow		Maximum	Maximum		Lateral	
Inflow		Balance		Lateral	Total	Time of Max	Inflow	
Volume		Error		Inflow	Inflow	Occurrence	Volume	
Node			Type	LPS	LPS	days hr:min	10^6 ltr	10^6
ltr	Percent							

J6			JUNCTION	0.00	10560.98	0 01:13	0	
30.2	0.001							

J9		JUNCTION	0.00	2978.03	0	01:13	0
20.7	0.602						
CREEK		OUTFALL	34.39	34.39	0	01:00	0.0433
0.0433	0.000						
CREEK-1		OUTFALL	76.80	76.80	0	01:00	0.104
0.104	0.000						
OF10		OUTFALL	0.00	109.43	0	01:00	0
0.0164	0.000						
OF11		OUTFALL	0.00	587.70	0	01:00	0
0.108	0.000						
OF13		OUTFALL	0.00	50.04	0	01:00	0
0.0443	0.000						
OF14		OUTFALL	108.76	160.45	0	01:00	0.147
0.212	0.000						
OF2		OUTFALL	0.00	2978.06	0	01:13	0
20	0.000						
OF3		OUTFALL	0.00	60.86	0	01:00	0
0.0715	0.000						
OF4		OUTFALL	0.00	12.16	0	01:00	0
0.00303	0.000						
OF5		OUTFALL	0.00	86.59	0	01:00	0
0.0928	0.000						
OF6		OUTFALL	0.00	339.54	0	01:00	0
0.071	0.000						
OF7		OUTFALL	0.00	0.00	0	00:00	0
0	0.000 ltr						
OF8		OUTFALL	0.00	10560.78	0	01:13	0
30.2	0.000						
OF9		OUTFALL	0.00	0.02	0	01:15	0
5.85e-06	0.000 ltr						
100A		STORAGE	0.00	6151.55	0	01:07	0
22.1	-0.004						
100B		STORAGE	0.00	12195.83	0	01:07	0
41.3	-0.003						
100C		STORAGE	0.00	526.53	0	01:12	0
2.53	-0.020						
100D		STORAGE	0.00	1957.93	0	00:58	0
8.01	-0.004						
100E		STORAGE	0.00	1447.55	0	00:59	0
6.09	0.001						
101		STORAGE	0.00	2195.39	0	01:12	0
7.93	-0.007						
102		STORAGE	0.00	755.24	0	01:20	0
2.81	-0.000						
102A		STORAGE	0.00	373.54	0	01:12	0
1.34	-0.007						
102A-S		STORAGE	0.00	0.00	0	00:00	0
0	0.000 ltr						
102A-S(1)		STORAGE	96.48	96.48	0	01:00	0.125
0.125	-0.521						

102A-S(2)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
103	STORAGE	0.00	374.73	0	01:11	0
1.29 -0.004						
103A-S	STORAGE	180.16	180.17	0	01:00	0.234
0.237 -0.029						
103A-S(1)	STORAGE	0.00	38.92	0	01:00	0
0.00485 17.680						
103B-S	STORAGE	85.32	478.96	0	01:00	0.112
0.396 -0.274						
104	STORAGE	0.00	182.94	0	01:11	0
0.605 -0.550						
104A-S	STORAGE	151.26	151.26	0	01:00	0.197
0.199 -0.159						
104A-S(1)	STORAGE	0.00	33.98	0	01:00	0
0.0041 28.290						
105	STORAGE	0.00	128.48	0	00:59	0
0.384 0.772						
105A-S	STORAGE	0.00	25.16	0	01:13	0
0.00467 44.842						
105A-S(1)	STORAGE	152.77	152.77	0	01:00	0.199
0.2 -0.588						
106	STORAGE	0.00	71.32	0	01:00	0
0.183 0.159						
106A-S	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
106A-S(1)	STORAGE	114.87	114.87	0	01:00	0.151
0.151 0.157						
106A-S(2)	STORAGE	0.00	62.18	0	01:00	0
0.0255 -2.762						
106B-S	STORAGE	33.53	94.63	0	01:00	0.0438
0.0731 1.370						
107	STORAGE	0.00	482.79	0	01:03	0
1.44 0.021						
107A-S	STORAGE	0.00	102.00	0	01:11	0
0.0664 -0.399						
107A-S(1)	STORAGE	82.78	94.77	0	01:00	0.11
0.155 0.071						
108	STORAGE	0.00	271.60	0	01:02	0
0.546 -0.810						
109	STORAGE	0.00	279.45	0	01:00	0
0.546 0.120						
109A-S	STORAGE	196.58	220.90	0	01:00	0.256
0.295 0.086						
109A-S(1)	STORAGE	0.00	185.45	0	01:03	0
0.0968 -0.102						
109B-S	STORAGE	175.29	181.47	0	01:00	0.23
0.252 0.122						
109B-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						

109B-S(3)	STORAGE	0.00	118.23	0	01:09	0
0.0795 0.979						
110	STORAGE	0.00	210.29	0	01:20	0
0.712 -0.156						
110A-S	STORAGE	52.67	132.90	0	01:10	0.0691
0.147 0.028						
111	STORAGE	0.00	191.40	0	01:29	0
0.632 0.090						
112	STORAGE	0.00	173.66	0	01:20	0
0.633 0.058						
112A-S	STORAGE	0.00	194.97	0	01:04	0
0.141 -0.070						
112A-S(1)	STORAGE	187.46	258.93	0	01:05	0.242
0.382 0.290						
113	STORAGE	0.00	87.86	0	01:05	0
0.331 -0.009						
113A-S	STORAGE	0.00	287.83	0	01:02	0
0.156 0.000						
113A-S(1)	STORAGE	150.56	372.39	0	01:00	0.196
0.386 -0.046						
114	STORAGE	0.00	356.58	0	01:29	0
1.29 -0.003						
114A-S	STORAGE	27.30	413.98	0	01:02	0.034
0.403 -0.385						
115	STORAGE	0.00	324.58	0	01:20	0
1.18 0.016						
115A	STORAGE	0.00	241.28	0	01:21	0
0.808 0.012						
115A-S	STORAGE	74.52	153.41	0	01:10	0.0974
0.256 0.016						
115A-S(1)	STORAGE	0.00	112.27	0	01:13	0
0.118 1.071						
116	STORAGE	0.00	45.72	0	01:12	0
0.211 -0.041						
116A-S	STORAGE	101.87	209.67	0	01:04	0.133
0.32 1.028						
116A-S(1)	STORAGE	0.00	190.60	0	01:01	0
0.198 -0.668						
117	STORAGE	0.00	240.70	0	01:01	0
0.793 -0.321						
117A-S	STORAGE	197.94	197.94	0	01:00	0.258
0.26 -1.078						
117A-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
117B-S	STORAGE	59.15	282.61	0	01:00	0.0771
0.24 -0.997						
118	STORAGE	0.00	79.29	0	01:04	0
0.254 1.184						
118A-S	STORAGE	198.08	198.08	0	01:00	0.256
0.258 -0.169						

118A-S(1)	STORAGE	0.00	36.76	0	01:01	0
0.00437 31.884						
119	STORAGE	0.00	1491.42	0	01:04	0
5 -0.006						
119A-S	STORAGE	139.54	139.54	0	01:00	0.185
0.198 -1.147						
120A-S(1)	STORAGE	0.00	55.28	0	01:07	0
0.0169 13.663						
121	STORAGE	0.00	1448.04	0	01:03	0
4.68 -0.023						
121A	STORAGE	0.00	31.97	0	01:00	0
0.0511 1.954						
121AA-S	STORAGE	41.24	41.24	0	01:00	0.0521
0.0521 0.035						
121A-S	STORAGE	0.00	244.88	0	01:02	0
0.174 -1.412						
121A-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
121A-S(2)	STORAGE	167.86	310.80	0	01:03	0.226
0.404 0.629						
121B-S	STORAGE	720.09	720.09	0	01:00	1.01
1.01 0.231						
123	STORAGE	0.00	539.65	0	01:06	0
1.72 0.132						
123A-S	STORAGE	84.84	301.03	0	01:02	0.116
0.321 -0.025						
123B-S	STORAGE	334.10	334.10	0	01:00	0.433
0.434 0.508						
124	STORAGE	0.00	378.47	0	01:06	0
1.25 -0.008						
124A-S	STORAGE	106.12	508.11	0	01:18	0.134
0.393 -0.537						
124A-S(1)	STORAGE	0.00	259.75	0	01:01	0
0.205 0.366						
125	STORAGE	0.00	312.98	0	01:06	0
0.999 -0.049						
126	STORAGE	0.00	313.17	0	01:04	0
1 0.066						
126A-S	STORAGE	15.28	254.69	0	01:00	0.0197
0.176 0.898						
126B-S	STORAGE	0.00	149.12	0	01:02	0
0.0989 -0.716						
126B-S(1)	STORAGE	120.06	194.14	0	01:03	0.158
0.259 -0.239						
126B-S(2)	STORAGE	0.00	70.21	0	01:08	0
0.0514 3.065						
126C-S	STORAGE	74.83	74.83	0	01:00	0.139
0.139 0.007						
127	STORAGE	0.00	73.30	0	00:51	0
0.18 1.218						

127A-S	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
127A-S(1)	STORAGE	170.64	170.64	0	01:00	0.221
0.221 -2.455						
128	STORAGE	0.00	153.21	0	01:10	0
0.48 0.158						
128A-S(1)	STORAGE	134.68	238.58	0	01:00	0.183
0.254 0.808						
129	STORAGE	0.00	101.49	0	01:00	0
0.275 -0.175						
130	STORAGE	0.00	101.10	0	01:00	0
0.277 0.572						
130A-S	STORAGE	207.75	207.75	0	01:00	0.271
0.272 -0.886						
130A-S(1)	STORAGE	0.00	112.15	0	01:00	0
0.0518 -2.860						
131	STORAGE	0.00	3.64	0	00:53	0
0.000869 -3.945						
132	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
201	STORAGE	0.00	12220.37	0	01:07	0
40.4 0.000						
202	STORAGE	0.00	11787.62	0	01:06	0
38.8 -0.000						
202A-S	STORAGE	0.00	75.49	0	01:00	0
0.0139 3.959						
202A-S(1)	STORAGE	90.68	201.18	0	01:00	0.112
0.193 -1.149						
203A-S	STORAGE	0.00	44.63	0	01:00	0
0.00976 14.675						
204	STORAGE	0.00	7912.39	0	01:01	0
18.1 -0.002						
204A-S	STORAGE	0.00	57.96	0	01:01	0
0.0267 5.869						
204A-S(1)	STORAGE	201.12	201.18	0	01:00	0.26
0.285 -2.076						
204BS(1)	STORAGE	162.71	243.27	0	01:00	0.207
0.251 -0.245						
205	STORAGE	0.00	7761.96	0	00:59	0
17.4 -0.009						
205A-S	STORAGE	0.00	124.97	0	01:00	0
0.0667 -0.286						
205A-S(1)	STORAGE	120.19	312.36	0	01:00	0.153
0.33 0.036						
206	STORAGE	0.00	7639.47	0	00:59	0
16.7 -0.372						
206A-S	STORAGE	0.00	313.45	0	01:00	0
0.147 0.818						
206A-S(1)	STORAGE	148.37	390.11	0	01:00	0.192
0.337 -0.066						

206B-S		STORAGE	0.00	287.69	0	01:02	0
0.157	0.005						
206B-S(1)		STORAGE	80.79	180.57	0	01:02	0.103
0.186	-0.019						
206B-S1		STORAGE	0.00	77.84	0	01:00	0
0.0228	1.836						
207		STORAGE	0.00	7556.81	0	00:59	0
16.3	0.461						
207A-S(1)		STORAGE	267.60	569.34	0	01:00	0.334
0.509	1.361						
209		STORAGE	4794.00	7447.70	0	01:00	9.97
15.9	0.036						
209A-S		STORAGE	164.75	164.75	0	01:00	0.209
0.209	-2.637						
209B-S		STORAGE	70.74	70.74	0	01:00	0.0871
0.0871	0.087						
209B-S(1)		STORAGE	0.00	0.00	0	00:00	0
0	0.000 ltr						
210		STORAGE	0.00	4543.46	0	01:10	0
20.7	-0.000						
210A-S		STORAGE	163.47	166.06	0	01:00	0.207
0.215	0.414						
211		STORAGE	0.00	2215.05	0	01:10	0
13.5	0.000						
211A-S		STORAGE	0.00	7.61	0	01:01	0
0.000502	346.176						
211A-S(1)		STORAGE	191.31	191.31	0	01:00	0.246
0.246	-1.331						
211A-S(2)		STORAGE	0.00	0.00	0	00:00	0
0	0.000 ltr						
212		STORAGE	2118.00	2129.08	0	01:11	13.2
13.2	-0.000						
213		STORAGE	0.00	2249.76	0	01:10	0
6.98	-0.006						
213A-S		STORAGE	99.63	99.63	0	01:00	0.126
0.127	0.368						
214		STORAGE	0.00	196.87	0	01:18	0
0.573	-0.258						
214A-S		STORAGE	0.00	0.00	0	00:00	0
0	0.000 ltr						
214A-S(1)		STORAGE	263.13	263.13	0	01:00	0.336
0.336	-0.340						
214A-S(2)		STORAGE	0.00	0.00	0	00:00	0
0	0.000 ltr						
215		STORAGE	0.00	91.30	0	01:25	0
0.237	0.442						
216		STORAGE	0.00	79.37	0	01:18	0
0.236	-0.116						
217		STORAGE	0.00	79.06	0	01:02	0
0.237	0.319						

217A-S	STORAGE	190.09	190.09	0	01:00	0.238
0.238 0.347						
217A-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
217A-S(2)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
218	STORAGE	0.00	1996.31	0	01:10	0
6.13 -0.014						
219	STORAGE	0.00	1515.28	0	01:11	0
4.31 -0.301						
219A-S	STORAGE	0.00	3.87	0	01:08	0
0.000247 334.090						
219A-S(1)	STORAGE	42.75	54.84	0	00:58	0.0531
0.0601 0.075						
219A-S(2)	STORAGE	0.00	92.88	0	01:01	0
0.0225 4.528						
219B-S	STORAGE	195.07	671.76	0	01:00	0.25
0.49 -3.716						
219B-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
220	STORAGE	0.00	270.58	0	01:00	0
0.62 0.828						
220A-S	STORAGE	192.68	460.03	0	01:00	0.252
0.404 -0.806						
220A-S(1)	STORAGE	0.00	100.34	0	00:59	0
0.0207 4.258						
221	STORAGE	0.00	1117.07	0	01:11	0
3.13 0.160						
222	STORAGE	0.00	1117.47	0	00:59	0
3.14 0.225						
222A-S	STORAGE	282.13	413.54	0	01:03	0.354
0.493 1.029						
222A-S(1)	STORAGE	0.00	343.03	0	01:01	0
0.139 -2.136						
222A-S(2)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
223	STORAGE	0.00	934.02	0	01:00	0
2.65 -0.073						
223A-S	STORAGE	76.08	457.28	0	01:01	0.0976
0.264 0.413						
224	STORAGE	0.00	893.83	0	01:00	0
2.52 -0.110						
225	STORAGE	0.00	915.69	0	01:00	0
2.52 0.179						
225A-S	STORAGE	130.10	572.54	0	01:00	0.165
0.362 0.024						
225A-S(1)	STORAGE	0.00	426.93	0	01:00	0
0.163 -0.352						
225C-S	STORAGE	169.42	223.75	0	00:59	0.214
0.277 -1.092						

225C-S(1)	STORAGE	51.47	93.95	0	01:00	0.0697
0.101 -0.344						
226	STORAGE	0.00	203.33	0	01:22	0
0.502 -0.406						
227	STORAGE	0.00	191.37	0	01:23	0
0.501 -0.175						
228	STORAGE	0.00	171.51	0	01:23	0
0.501 0.106						
228A-S	STORAGE	231.96	231.96	0	01:00	0.3
0.302 -2.479						
228A-S(1)	STORAGE	0.00	51.27	0	01:00	0
0.00787 17.490						
229	STORAGE	0.00	68.42	0	01:01	0
0.2 0.095						
229A-S	STORAGE	152.51	152.51	0	01:00	0.197
0.197 -1.289						
229A-S(1)	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
230	STORAGE	0.00	29.76	0	01:20	0
0.0206 -0.287						
231	STORAGE	0.00	16.21	0	01:18	0
0.00984 5.809						
232	STORAGE	0.00	10.50	0	01:04	0
0.00237 -12.131						
233	STORAGE	0.00	490.01	0	01:08	0
1.86 0.000						
234	STORAGE	0.00	484.16	0	01:09	0
1.82 -0.015						
234A-S	STORAGE	122.89	248.24	0	01:00	0.155
0.264 -0.431						
234A-S(1)	STORAGE	0.00	57.65	0	01:01	0
0.031 3.015						
234B-S	STORAGE	107.64	309.95	0	01:00	0.136
0.397 -0.336						
234B-S(1)	STORAGE	0.00	178.24	0	01:04	0
0.189 -0.393						
235	STORAGE	0.00	292.45	0	01:09	0
1.07 0.002						
235A-S	STORAGE	338.66	689.49	0	01:00	0.432
0.597 -1.568						
235A-S(1)	STORAGE	0.00	156.21	0	01:00	0
0.0699 1.034						
236	STORAGE	0.00	24.74	0	00:51	0
0.0419 -0.002						
237	STORAGE	0.00	15.50	0	00:51	0
0.0154 -0.188						
240	STORAGE	0.00	210.90	0	01:16	0
0.531 -0.512						
240A-S	STORAGE	77.31	127.62	0	01:00	0.101
0.13 0.068						

240A-S(1)	STORAGE	0.00	73.69	0	01:00	0
0.0367 -0.291						
241	STORAGE	0.00	171.06	0	01:15	0
0.458 0.209						
241A-S	STORAGE	92.49	155.34	0	00:58	0.117
0.19 0.355						
241A-S(1)	STORAGE	148.19	166.59	0	01:00	0.201
0.204 -0.077						
241B-S	STORAGE	115.60	248.60	0	01:00	0.151
0.283 -0.052						
241B-S(1)	STORAGE	0.00	89.61	0	01:00	0
0.0302 2.315						
242	STORAGE	0.00	49.33	0	01:20	0
0.033 1.902						
B1-S	STORAGE	401.94	401.94	0	01:00	0.575
0.607 0.498						
B2-S	STORAGE	311.40	311.40	0	01:00	0.417
1.3 1.446						
Comm-S	STORAGE	977.29	977.29	0	01:00	1.37
1.37 -0.627						
EXT-1A-S	STORAGE	0.00	0.00	0	00:00	0
0 0.000 ltr						
EXT-1A-S(1)	STORAGE	56.63	63.64	0	01:00	0.0702
0.0715 0.006						
EXT2-S	STORAGE	33.43	86.93	0	01:00	0.0422
0.0928 0.013						
EXT-4-S	STORAGE	51.94	51.94	0	01:00	0.065
0.065 0.029						
EXT5-S	STORAGE	50.20	50.20	0	01:00	0.0443
0.0443 0.045						
EXT6-S	STORAGE	53.57	53.57	0	01:00	0.0506
0.0506 0.046						
F101A(1)	STORAGE	0.00	53.06	0	00:55	0
0.0793 0.085						
F101A(2)	STORAGE	0.00	712.23	0	01:05	0
2.09 0.030						
F101A-S	STORAGE	247.42	429.13	0	01:05	0.327
0.871 -0.063						
G234C-S	STORAGE	240.23	240.23	0	01:00	0.374
0.376 0.448						
HW7	STORAGE	0.00	613.18	0	01:08	0
2.12 -0.001						
HZD-S	STORAGE	1839.13	1839.13	0	01:00	2.38
2.38 0.164						
J2	STORAGE	0.00	116.00	0	01:11	0
0.645 -0.203						
J3	STORAGE	0.00	300.70	0	01:07	0
1.13 -0.136						
J4	STORAGE	0.00	199.00	0	00:57	0
1.31 -1.353						

L212A-S		STORAGE	44.67	44.67	0	01:00	0.0535
0.0535	0.074						
L218A-S		STORAGE	1222.30	1222.30	0	01:00	1.57
1.66	0.214						
L225B-S		STORAGE	875.64	875.64	0	01:00	1.16
1.16	0.176						
L235B-S		STORAGE	481.27	481.27	0	01:00	0.636
0.636	-0.117						
POND-S1		STORAGE	1041.98	15375.93	0	01:06	1.35
80.2	-0.055						
RY103C-S		STORAGE	258.29	258.29	0	01:00	0.278
0.278	0.156						
RY103D-S		STORAGE	221.30	221.30	0	01:00	0.235
0.235	0.187						
RY113B-S		STORAGE	193.75	193.75	0	01:00	0.201
0.209	0.310						
RY117C-S		STORAGE	270.78	270.78	0	01:00	0.282
0.288	0.392						
RY124B-S		STORAGE	161.80	161.80	0	01:00	0.164
0.164	0.130						
RY130B-S		STORAGE	101.68	101.68	0	01:00	0.0985
0.0985	0.066						
RY202B-S		STORAGE	115.36	115.36	0	01:00	0.116
0.126	0.206						
RY205B-S		STORAGE	202.62	202.62	0	01:00	0.222
0.229	0.569						
RY209C-S		STORAGE	172.34	172.34	0	01:00	0.191
0.191	-3.735						
RY210B-S		STORAGE	115.15	115.15	0	01:00	0.124
0.124	0.257						
RY218B-S		STORAGE	145.10	145.10	0	01:00	0.146
0.146	0.160						
RY220A-S		STORAGE	360.33	360.33	0	01:00	0.392
0.393	0.548						
RY234D-S		STORAGE	175.58	175.58	0	01:00	0.181
0.221	0.475						
SU		STORAGE	0.00	387.44	0	01:00	0
0.26	0.173						
Transitway-S		STORAGE	1513.56	1513.56	0	01:00	1.97
1.97	0.188						

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

 Storage Volume Summary

of Max		Average	Avg	Evap	Exfil	Maximum	Max	Time
Maximum		Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt	
Occurrence	Outflow	1000 m3	Full	Loss	Loss	1000 m3	Full	days
Storage Unit	LPS							
hr:min								
100A		0.004	65	0	0	0.004	75	0
01:11	6144.21							
100B		0.004	59	0	0	0.004	69	0
01:11	12181.45							
100C		0.002	46	0	0	0.002	58	0
01:13	526.51							
100D		0.002	40	0	0	0.003	51	0
01:12	1945.29							
100E		0.001	31	0	0	0.002	43	0
01:12	1426.93							
101		0.002	37	0	0	0.003	50	0
01:12	2195.47							
102		0.002	37	0	0	0.002	52	0
01:12	761.93							
102A		0.000	0	0	0	0.000	0	0
00:00	372.88							
102A-S		0.000	0	0	0	0.000	0	0
00:00	0.00							
102A-S(1)		0.000	0	0	0	0.000	0	0
00:00	33.77							
102A-S(2)		0.000	0	0	0	0.000	0	0
00:00	0.00							
103		0.001	24	0	0	0.002	40	0
01:12	373.54							
103A-S		0.000	0	0	0	0.000	0	0
00:00	118.22							
103A-S(1)		0.000	0	0	0	0.000	0	0
00:00	11.51							

103B-S	0.000	0	0	0	0.000	0	0
00:00 422.70							
104	0.001	15	0	0	0.001	32	0
01:11 182.08							
104A-S	0.000	0	0	0	0.000	0	0
00:00 91.44							
104A-S(1)	0.000	0	0	0	0.000	0	0
00:00 7.50							
105	0.000	9	0	0	0.001	24	0
01:11 125.95							
105A-S	0.000	0	0	0	0.000	0	0
00:00 5.80							
105A-S(1)	0.000	0	0	0	0.000	0	0
00:00 57.92							
106	0.000	11	0	0	0.001	23	0
01:10 71.04							
106A-S	0.000	0	0	0	0.000	0	0
00:00 0.00							
106A-S(1)	0.000	0	0	0	0.000	0	0
00:00 112.15							
106A-S(2)	0.000	0	0	0	0.000	0	0
00:00 61.66							
106B-S	0.000	0	0	0	0.000	0	0
00:00 68.45							
107	0.000	9	0	0	0.002	37	0
01:12 475.56							
107A-S	0.000	0	0	0	0.000	0	0
00:00 99.77							
107A-S(1)	0.000	0	0	0	0.000	0	0
00:00 69.77							
108	0.000	9	0	0	0.001	37	0
01:03 265.11							
109	0.000	9	0	0	0.001	34	0
01:03 271.60							
109A-S	0.000	0	0	0	0.000	0	0
00:00 131.71							
109A-S(1)	0.000	0	0	0	0.000	0	0
00:00 180.08							
109B-S	0.000	0	0	0	0.000	0	0
00:00 148.40							
109B-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
109B-S(3)	0.000	0	0	0	0.000	0	0
00:00 116.18							
110	0.000	7	0	0	0.001	33	0
01:13 214.88							
110A-S	0.000	0	0	0	0.000	0	0
00:00 130.06							
111	0.000	9	0	0	0.001	34	0
01:13 194.21							

112	0.000	9	0	0	0.001	36	0
01:14 191.40							
112A-S	0.000	0	0	0	0.000	0	0
00:00 191.60							
112A-S(1)	0.000	0	0	0	0.000	0	0
00:00 199.92							
113	0.000	10	0	0	0.001	29	0
01:14 93.25							
113A-S	0.000	0	0	0	0.000	0	0
00:00 284.75							
113A-S(1)	0.000	0	0	0	0.000	0	0
00:00 254.71							
114	0.001	20	0	0	0.002	38	0
01:12 363.35							
114A-S	0.000	0	0	0	0.000	0	0
00:00 407.84							
115	0.001	15	0	0	0.001	36	0
01:13 328.37							
115A	0.000	0	0	0	0.000	0	0
00:00 243.94							
115A-S	0.000	0	0	0	0.000	0	0
00:00 146.68							
115A-S(1)	0.000	0	0	0	0.000	0	0
00:00 111.65							
116	0.000	12	0	0	0.001	26	0
01:13 50.02							
116A-S	0.000	0	0	0	0.000	0	0
00:00 162.08							
116A-S(1)	0.000	0	0	0	0.000	0	0
00:00 187.01							
117	0.000	10	0	0	0.001	34	0
01:13 241.28							
117A-S	0.000	0	0	0	0.000	0	0
00:00 80.06							
117A-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
117B-S	0.000	0	0	0	0.000	0	0
00:00 225.66							
118	0.000	12	0	0	0.001	26	0
01:15 80.72							
118A-S	0.000	0	0	0	0.000	0	0
00:00 116.00							
118A-S(1)	0.000	0	0	0	0.000	0	0
00:00 7.55							
119	0.001	27	0	0	0.002	46	0
01:12 1479.04							
119A-S	0.000	0	0	0	0.000	0	0
00:00 57.23							
120A-S(1)	0.000	0	0	0	0.000	0	0
00:00 21.11							

121	0.001	16	0	0	0.002	40	0
01:12 1434.19							
121A	0.000	11	0	0	0.001	19	0
01:12 33.54							
121AA-S	0.000	0	0	0	0.000	0	0
00:00 39.11							
121A-S	0.000	0	0	0	0.000	0	0
00:00 235.98							
121A-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
121A-S(2)	0.000	0	0	0	0.000	0	0
00:00 170.97							
121B-S	0.002	0	0	0	0.216	27	0
01:03 299.00							
123	0.000	9	0	0	0.001	29	0
01:11 540.14							
123A-S	0.000	0	0	0	0.000	0	0
00:00 295.29							
123B-S	0.000	0	0	0	0.038	48	0
01:00 565.69							
124	0.000	10	0	0	0.001	26	0
01:06 378.46							
124A-S	0.000	0	0	0	0.000	0	0
00:00 305.32							
124A-S(1)	0.000	0	0	0	0.000	0	0
00:00 255.18							
125	0.000	11	0	0	0.001	27	0
01:06 312.98							
126	0.000	11	0	0	0.001	30	0
01:06 312.98							
126A-S	0.000	0	0	0	0.000	0	0
00:00 166.24							
126B-S	0.000	0	0	0	0.000	0	0
00:00 143.76							
126B-S(1)	0.000	0	0	0	0.000	0	0
00:00 122.33							
126B-S(2)	0.000	0	0	0	0.000	0	0
00:00 67.78							
126C-S	0.000	0	0	0	0.000	0	0
00:00 74.56							
127	0.000	11	0	0	0.001	18	0
00:53 74.21							
127A-S	0.000	0	0	0	0.000	0	0
00:00 0.00							
127A-S(1)	0.000	0	0	0	0.000	0	0
00:00 165.79							
128	0.000	9	0	0	0.001	23	0
01:06 155.56							
128A-S(1)	0.000	0	0	0	0.000	0	0
00:00 159.27							

129		0.000	11	0	0	0.001	21	0
01:05	101.33							
130		0.000	9	0	0	0.001	16	0
00:58	101.49							
130A-S		0.000	0	0	0	0.000	0	0
00:00	190.01							
130A-S(1)		0.000	0	0	0	0.000	0	0
00:00	108.96							
131		0.000	9	0	0	0.000	12	0
00:58	6.11							
132		0.000	0	0	0	0.000	0	0
00:00	0.00							
201		0.004	52	0	0	0.004	62	0
01:07	12195.83							
202		0.003	50	0	0	0.004	63	0
01:07	11755.96							
202A-S		0.000	0	0	0	0.000	0	0
00:00	32.94							
202A-S(1)		0.000	0	0	0	0.000	0	0
00:00	53.13							
203A-S		0.000	0	0	0	0.000	0	0
00:00	12.09							
204		0.002	42	0	0	0.004	62	0
01:06	7865.77							
204A-S		0.000	0	0	0	0.000	0	0
00:00	40.26							
204A-S(1)		0.000	0	0	0	0.000	0	0
00:00	124.68							
204BS(1)		0.000	0	0	0	0.000	0	0
00:00	155.81							
205		0.002	36	0	0	0.003	60	0
01:06	7717.72							
205A-S		0.000	0	0	0	0.000	0	0
00:00	65.86							
205A-S(1)		0.000	0	0	0	0.000	0	0
00:00	215.22							
206		0.002	29	0	0	0.004	55	0
01:04	7603.12							
206A-S		0.000	0	0	0	0.000	0	0
00:00	301.98							
206A-S(1)		0.000	0	0	0	0.000	0	0
00:00	345.97							
206B-S		0.000	0	0	0	0.000	0	0
00:00	287.83							
206B-S(1)		0.000	0	0	0	0.000	0	0
00:00	177.67							
206B-S1		0.000	0	0	0	0.000	0	0
00:00	64.06							
207		0.000	8	0	0	0.003	49	0
01:03	7535.39							

207A-S(1)	0.000	0	0	0	0.000	0	0
00:00 430.30							
209	0.000	6	0	0	0.003	45	0
01:01 7440.22							
209A-S	0.000	0	0	0	0.000	0	0
00:00 162.65							
209B-S	0.000	0	0	0	0.000	0	0
00:00 8.37							
209B-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
210	0.003	44	0	0	0.004	60	0
01:07 4549.28							
210A-S	0.000	0	0	0	0.000	0	0
00:00 68.51							
211	0.003	40	0	0	0.004	58	0
01:07 2235.12							
211A-S	0.000	0	0	0	0.000	0	0
00:00 0.03							
211A-S(1)	0.000	0	0	0	0.000	0	0
00:00 79.94							
211A-S(2)	0.000	0	0	0	0.000	0	0
00:00 0.00							
212	0.003	48	0	0	0.004	72	0
01:08 2135.58							
213	0.002	32	0	0	0.003	54	0
01:08 2256.46							
213A-S	0.000	0	0	0	0.000	0	0
00:00 51.96							
214	0.000	9	0	0	0.002	39	0
01:08 206.77							
214A-S	0.000	0	0	0	0.000	0	0
00:00 0.00							
214A-S(1)	0.000	0	0	0	0.000	0	0
00:00 114.29							
214A-S(2)	0.000	0	0	0	0.000	0	0
00:00 0.00							
215	0.000	8	0	0	0.001	30	0
01:09 102.20							
216	0.000	8	0	0	0.001	30	0
01:09 91.30							
217	0.000	9	0	0	0.001	30	0
01:09 79.37							
217A-S	0.000	0	0	0	0.000	0	0
00:00 79.06							
217A-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
217A-S(2)	0.000	0	0	0	0.000	0	0
00:00 0.00							
218	0.001	21	0	0	0.002	49	0
01:08 2008.33							

219	0.001	18	0	0	0.002	50	0
01:08 1527.76							
219A-S	0.000	0	0	0	0.000	0	0
00:00 0.01							
219A-S(1)	0.000	0	0	0	0.000	0	0
00:00 42.35							
219A-S(2)	0.000	0	0	0	0.000	0	0
00:00 75.19							
219B-S	0.000	0	0	0	0.000	0	0
00:00 270.18							
219B-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
220	0.000	3	0	0	0.001	32	0
01:08 281.92							
220A-S	0.000	0	0	0	0.000	0	0
00:00 321.01							
220A-S(1)	0.000	0	0	0	0.000	0	0
00:00 57.64							
221	0.000	9	0	0	0.002	48	0
01:09 1121.36							
222	0.000	9	0	0	0.002	48	0
01:09 1117.07							
222A-S	0.000	0	0	0	0.000	0	0
00:00 204.40							
222A-S(1)	0.000	0	0	0	0.000	0	0
00:00 317.55							
222A-S(2)	0.000	0	0	0	0.000	0	0
00:00 0.00							
223	0.000	8	0	0	0.002	46	0
01:10 921.25							
223A-S	0.000	0	0	0	0.000	0	0
00:00 399.01							
224	0.000	0	0	0	0.000	0	0
00:00 878.40							
225	0.000	0	0	0	0.000	0	0
00:00 893.83							
225A-S	0.000	0	0	0	0.000	0	0
00:00 496.76							
225A-S(1)	0.000	0	0	0	0.000	0	0
00:00 417.31							
225C-S	0.000	0	0	0	0.000	0	0
00:00 143.29							
225C-S(1)	0.000	0	0	0	0.000	0	0
00:00 79.25							
226	0.000	0	0	0	0.000	0	0
00:00 211.08							
227	0.000	0	0	0	0.000	0	0
00:00 203.33							
228	0.000	0	0	0	0.000	0	0
00:00 191.37							

228A-S	0.000	0	0	0	0.000	0	0
00:00 148.26							
228A-S(1)	0.000	0	0	0	0.000	0	0
00:00 19.60							
229	0.000	0	0	0	0.000	0	0
00:00 78.90							
229A-S	0.000	0	0	0	0.000	0	0
00:00 68.42							
229A-S(1)	0.000	0	0	0	0.000	0	0
00:00 0.00							
230	0.000	0	0	0	0.000	0	0
00:00 49.33							
231	0.000	0	0	0	0.000	0	0
00:00 29.76							
232	0.000	11	0	0	0.001	29	0
01:13 16.21							
233	0.003	44	0	0	0.003	57	0
01:07 494.72							
234	0.000	0	0	0	0.000	0	0
00:00 490.01							
234A-S	0.000	0	0	0	0.000	0	0
00:00 106.84							
234A-S(1)	0.000	0	0	0	0.000	0	0
00:00 40.65							
234B-S	0.000	0	0	0	0.000	0	0
00:00 217.00							
234B-S(1)	0.000	0	0	0	0.000	0	0
00:00 165.98							
235	0.000	0	0	0	0.000	0	0
00:00 295.56							
235A-S	0.000	0	0	0	0.000	0	0
00:00 315.96							
235A-S(1)	0.000	0	0	0	0.000	0	0
00:00 115.96							
236	0.000	0	0	0	0.000	0	0
00:00 35.77							
237	0.000	0	0	0	0.000	0	0
00:00 21.64							
240	0.000	0	0	0	0.000	0	0
00:00 225.41							
240A-S	0.000	0	0	0	0.000	0	0
00:00 107.23							
240A-S(1)	0.000	0	0	0	0.000	0	0
00:00 70.33							
241	0.000	0	0	0	0.000	0	0
00:00 178.54							
241A-S	0.000	0	0	0	0.000	0	0
00:00 95.72							
241A-S(1)	0.000	0	0	0	0.000	0	0
00:00 147.96							

241B-S	0.000	0	0	0	0.000	0	0
00:00 186.08							
241B-S(1)	0.000	0	0	0	0.000	0	0
00:00 77.38							
242	0.000	0	0	0	0.000	0	0
00:00 62.84							
B1-S	0.003	1	0	0	0.176	34	0
01:15 116.02							
B2-S	0.000	0	0	0	0.026	41	0
01:00 308.43							
Comm-S	0.002	0	0	0	0.310	30	0
01:03 398.88							
EXT-1A-S	0.000	0	0	0	0.000	0	0
00:00 0.00							
EXT-1A-S(1)	0.000	0	0	0	0.000	0	0
00:00 60.86							
EXT2-S	0.000	0	0	0	0.000	0	0
00:00 86.59							
EXT-4-S	0.000	0	0	0	0.000	0	0
00:00 51.69							
EXT5-S	0.000	0	0	0	0.000	0	0
00:00 50.04							
EXT6-S	0.000	0	0	0	0.000	0	0
00:00 53.51							
F101A(1)	0.000	0	0	0	0.000	0	0
00:00 36.18							
F101A(2)	0.000	0	0	0	0.000	0	0
00:00 633.47							
F101A-S	0.000	0	0	0	0.000	0	0
00:00 428.38							
G234C-S	0.000	0	0	0	0.000	0	0
00:00 242.98							
HW7	0.001	41	0	0	0.002	61	0
01:13 584.20							
HZD-S	0.000	0	0	0	0.157	61	0
01:00 1774.70							
J2	0.001	18	0	0	0.001	38	0
01:13 127.34							
J3	0.001	35	0	0	0.002	54	0
01:11 289.92							
J4	0.001	18	0	0	0.001	42	0
01:07 191.17							
L212A-S	0.000	0	0	0	0.000	0	0
00:00 44.20							
L218A-S	0.003	1	0	0	0.263	63	0
01:01 891.81							
L225B-S	0.000	0	0	0	0.090	57	0
01:00 872.40							
L235B-S	0.001	1	0	0	0.089	73	0
01:00 480.83							

POND-S1	27.427	73	0	0	33.998	91	0
01:13 13538.99							
RY103C-S	0.000	0	0	0	0.000	0	0
00:00 257.39							
RY103D-S	0.000	0	0	0	0.000	0	0
00:00 220.43							
RY113B-S	0.000	0	0	0	0.000	0	0
00:00 191.58							
RY117C-S	0.000	0	0	0	0.000	0	0
00:00 270.10							
RY124B-S	0.000	0	0	0	0.000	0	0
00:00 160.76							
RY130B-S	0.000	0	0	0	0.000	0	0
00:00 100.84							
RY202B-S	0.000	0	0	0	0.000	0	0
00:00 115.26							
RY205B-S	0.000	0	0	0	0.000	0	0
00:00 200.38							
RY209C-S	0.000	0	0	0	0.000	0	0
00:00 169.61							
RY210B-S	0.000	0	0	0	0.000	0	0
00:00 114.75							
RY218B-S	0.000	0	0	0	0.000	0	0
00:00 144.89							
RY220A-S	0.000	0	0	0	0.000	0	0
00:00 357.13							
RY234D-S	0.000	0	0	0	0.000	0	0
00:00 171.58							
SU	0.000	0	0	0	0.000	0	0
00:00 386.73							
Transitway-S	0.000	0	0	0	0.129	53	0
01:00 1291.41							

 Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
CREEK	6.48	3.87	34.39	0.043
CREEK-1	6.88	8.75	76.80	0.104
OF10	0.17	54.52	109.43	0.016
OF11	0.25	245.77	587.70	0.108
OF13	2.82	9.09	50.04	0.044
OF14	7.09	17.33	160.45	0.212
OF2	99.95	115.66	2978.06	19.976

OF3	7.65	5.40	60.86	0.072
OF4	0.24	7.39	12.16	0.003
OF5	7.00	7.67	86.59	0.093
OF6	0.29	141.92	339.54	0.071
OF7	0.00	0.00	0.00	0.000
OF8	96.68	180.54	10560.78	30.160
OF9	0.00	0.00	0.00	0.000

System	16.82	797.92	13621.19	50.903

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CHANNEL	60.86	0 01:00	0.41	0.01	0.19
C10	CHANNEL	64.06	0 01:01	0.59	0.01	0.17
C100	CHANNEL	36.76	0 01:01	0.11	0.01	0.33
C101	CHANNEL	4.08	0 01:02	0.12	0.00	0.37
C102	CHANNEL	0.00	0 00:00	0.00	0.00	0.34
C103	CHANNEL	0.00	0 00:00	0.00	0.00	0.42
C104	CHANNEL	190.60	0 01:01	0.19	0.02	0.52
C105	CHANNEL	108.41	0 01:03	0.19	0.01	0.47
C106	CHANNEL	100.99	0 01:00	0.49	0.02	0.67
C107	CHANNEL	57.96	0 01:01	0.16	0.01	0.36
C108	CHANNEL	40.26	0 01:06	0.11	0.01	0.43
C109	CHANNEL	44.63	0 01:00	0.11	0.01	0.39
C11	CHANNEL	77.84	0 01:00	0.13	0.01	0.48
C110	CHANNEL	9.42	0 01:10	0.15	0.00	0.39
C111	CHANNEL	75.49	0 01:00	0.13	0.01	0.40
C112	CHANNEL	10.92	0 01:02	0.02	0.00	0.46
C113	CHANNEL	97.99	0 01:03	0.11	0.01	0.55
C114	CHANNEL	22.02	0 01:02	0.24	0.00	0.35
C115	CHANNEL	0.01	0 01:02	0.00	0.00	0.31
C116	CHANNEL	0.01	0 01:02	0.02	0.00	0.34
C117	CHANNEL	0.00	0 00:00	0.00	0.00	0.33
C118	CHANNEL	0.00	0 00:00	0.00	0.00	0.00
C119	CHANNEL	0.00	0 00:00	0.00	0.00	0.29
C12	CHANNEL	84.17	0 00:59	0.16	0.01	0.53
C120	CHANNEL	0.00	0 00:00	0.00	0.00	0.04
C121	CHANNEL	23.35	0 01:04	0.27	0.00	0.34
C122	CHANNEL	0.00	0 00:00	0.00	0.00	0.13
C123	CHANNEL	92.88	0 01:01	0.12	0.01	0.59
C124	CHANNEL	0.00	0 00:00	0.00	0.00	0.46
C125	CHANNEL	0.00	0 00:00	0.00	0.00	0.00

C126	CHANNEL	0.00	0	00:00	0.00	0.00	0.27
C127	CHANNEL	7.61	0	01:01	0.03	0.00	0.28
C128	CONDUIT	212.50	0	01:00	1.90	0.05	0.32
C129	CONDUIT	183.46	0	01:00	1.72	0.05	0.31
C13	CHANNEL	0.01	0	01:09	0.01	0.00	0.13
C130	CONDUIT	224.75	0	01:00	1.45	0.06	0.43
C131	CONDUIT	80.10	0	01:00	1.29	0.02	0.29
C132	CONDUIT	155.37	0	01:00	0.89	0.19	0.43
C133	CHANNEL	448.81	0	01:01	0.45	0.11	0.67
C134	CONDUIT	118.82	0	01:00	1.65	0.03	0.35
C135	CONDUIT	50.04	0	01:00	1.06	0.02	0.21
C136	CONDUIT	12.16	0	01:00	0.21	0.02	0.14
C137	CHANNEL	89.61	0	01:00	0.14	0.01	0.40
C138	CONDUIT	210.06	0	01:00	2.35	0.04	0.29
C139	CONDUIT	81.97	0	01:00	2.09	0.01	0.32
C14	CHANNEL	3.87	0	01:08	0.01	0.00	0.36
C140	CHANNEL	77.38	0	01:01	0.20	0.01	0.31
C141	CHANNEL	456.15	0	01:18	0.97	0.04	0.40
C142	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C143	CONDUIT	54.33	0	01:00	0.74	0.01	0.28
C144	CONDUIT	140.17	0	01:00	1.73	0.02	0.36
C145	CONDUIT	163.67	0	01:00	0.81	0.20	0.54
C146	CONDUIT	77.88	0	01:00	0.78	0.01	0.05
C147	CHANNEL	136.93	0	01:00	0.61	0.08	0.24
C148	CONDUIT	267.81	0	01:00	1.36	0.10	0.45
C149	CHANNEL	70.33	0	01:02	0.13	0.01	0.37
C15	CHANNEL	317.55	0	01:03	0.39	0.04	0.48
C150	CHANNEL	73.69	0	01:00	0.20	0.01	0.31
C151	CONDUIT	428.38	0	01:05	0.79	0.26	0.82
C152	CONDUIT	53.51	0	01:00	2.75	0.01	0.13
C153	CONDUIT	86.59	0	01:00	0.42	0.11	0.34
C154	CONDUIT	12195.83	0	01:07	2.26	1.18	1.00
C155	CONDUIT	6032.08	0	01:07	2.37	1.29	1.00
C156	CONDUIT	6151.55	0	01:07	1.43	0.78	0.91
C157	CONDUIT	6144.21	0	01:07	1.36	0.76	1.00
C158	CONDUIT	1957.93	0	00:58	1.11	0.78	1.00
C159	CONDUIT	1447.55	0	00:59	1.40	0.27	0.84
C16	CHANNEL	0.00	0	00:00	0.00	0.00	0.16
C160	CONDUIT	1426.93	0	01:00	1.07	0.17	0.95
C161	CONDUIT	526.53	0	01:12	0.61	0.50	1.00
C162	CONDUIT	526.51	0	01:13	0.61	0.41	1.00
C163	CONDUIT	0.02	0	01:15	0.26	0.00	0.01
C164	CHANNEL	109.43	0	01:00	2.03	0.00	0.11
C165	CONDUIT	10560.78	0	01:13	1.47	0.13	0.69
C166	CONDUIT	379.10	0	01:03	0.31	0.02	0.57
C167	CONDUIT	53.06	0	00:55	0.02	0.00	0.45
C168	CHANNEL	386.73	0	01:01	1.28	0.11	0.65
C169	CONDUIT	241.28	0	01:21	1.00	0.64	1.00
C17	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
C170	CONDUIT	243.94	0	01:20	0.72	0.68	1.00

C171	CONDUIT	373.54	0	01:12	0.43	0.45	1.00
C172	CONDUIT	191.17	0	01:07	0.68	0.80	1.00
C173	CONDUIT	584.20	0	01:09	0.92	0.30	1.00
C174	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C175	CHANNEL	339.54	0	01:00	0.93	0.03	0.30
C176	CONDUIT	613.18	0	01:08	0.08	0.01	0.57
C177	CONDUIT	127.34	0	01:46	0.47	0.54	1.00
C178	CONDUIT	289.92	0	01:07	0.66	0.71	1.00
C179	CONDUIT	33.54	0	01:00	0.76	0.38	0.72
C18	CHANNEL	0.00	0	00:00	0.00	0.00	0.22
C180	CHANNEL	7.14	0	01:00	0.09	0.00	0.14
C181	CHANNEL	587.70	0	01:00	0.85	0.08	0.41
C182	CONDUIT	372.88	0	01:12	0.43	0.40	1.00
C183	CONDUIT	475.25	0	01:03	0.89	1.05	1.00
C184	CHANNEL	395.40	0	01:00	1.18	0.06	0.36
C19	CHANNEL	112.15	0	01:00	0.29	0.01	0.31
C2	CHANNEL	0.00	0	00:00	0.00	0.00	0.03
C20	CHANNEL	108.96	0	01:00	0.15	0.01	0.45
C21	CHANNEL	107.07	0	01:02	0.15	0.02	0.69
C22	CHANNEL	149.12	0	01:02	0.22	0.02	0.41
C23	CHANNEL	143.76	0	01:03	0.21	0.01	0.45
C24	CHANNEL	70.21	0	01:08	0.12	0.01	0.44
C25	CHANNEL	67.78	0	01:10	0.16	0.01	0.43
C26	CHANNEL	259.75	0	01:01	0.25	0.04	0.52
C27	CHANNEL	255.18	0	01:02	0.56	0.02	0.34
C28	CHANNEL	244.88	0	01:02	0.54	0.04	0.34
C29	CHANNEL	133.75	0	01:03	0.12	0.01	0.57
C3	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
C30	CHANNEL	194.97	0	01:04	0.15	0.02	0.59
C31	CHANNEL	191.60	0	01:05	0.19	0.02	0.54
C32	CHANNEL	118.23	0	01:09	0.11	0.02	0.53
C33	CHANNEL	116.18	0	01:10	0.35	0.01	0.29
C34	CHANNEL	102.00	0	01:11	0.37	0.01	0.26
C35	CHANNEL	92.95	0	01:00	0.59	0.01	0.39
C36	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
C37	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C38	CHANNEL	0.00	0	00:00	0.00	0.00	0.31
C39	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
C4	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
C40	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
C41	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
C42	CHANNEL	51.27	0	01:00	0.11	0.01	0.38
C43	CHANNEL	14.45	0	01:01	0.17	0.00	0.33
C44	CHANNEL	64.21	0	01:02	0.34	0.01	0.36
C45	CHANNEL	79.25	0	01:03	0.54	0.01	0.47
C46	CHANNEL	426.93	0	01:00	0.40	0.06	0.53
C47	CHANNEL	417.31	0	01:01	0.67	0.03	0.40
C48	CHANNEL	343.03	0	01:01	0.63	0.04	0.42
C49	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
C5	CHANNEL	0.00	0	00:00	0.00	0.00	0.07

C50	CHANNEL	87.42	0	01:00	0.26	0.01	0.52
C51	CHANNEL	313.45	0	01:00	0.25	0.04	0.57
C52	CHANNEL	301.98	0	01:01	0.34	0.03	0.48
C53	CHANNEL	287.69	0	01:02	0.32	0.04	0.49
C54	CHANNEL	287.83	0	01:02	1.34	0.02	0.23
C55	CHANNEL	151.00	0	01:03	0.48	0.01	0.28
C56	CHANNEL	130.95	0	01:03	0.45	0.03	0.27
C57	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
C58	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
C59	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
C6	CHANNEL	32.98	0	01:12	0.44	0.00	0.17
C60	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
C61	CHANNEL	2.89	0	01:17	0.15	0.00	0.33
C62	CHANNEL	0.00	0	00:00	0.00	0.00	0.33
C63	CHANNEL	0.00	0	00:00	0.00	0.00	0.18
C64	CHANNEL	62.18	0	01:00	0.47	0.01	0.25
C65	CHANNEL	61.66	0	01:00	0.59	0.00	0.32
C66	CHANNEL	47.08	0	01:01	0.15	0.02	0.57
C67	CHANNEL	235.98	0	01:03	0.33	0.02	0.52
C68	CHANNEL	55.28	0	01:07	0.12	0.01	0.48
C69	CHANNEL	21.11	0	01:12	0.18	0.00	0.32
C7	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
C70	CHANNEL	0.00	0	00:00	0.00	0.00	0.28
C71	CHANNEL	0.00	0	00:00	0.00	0.00	0.25
C72	CHANNEL	0.00	0	00:00	0.00	0.00	0.25
C73	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
C74	CHANNEL	111.65	0	01:14	0.22	0.01	0.36
C75	CHANNEL	112.27	0	01:13	0.15	0.02	0.43
C76	CHANNEL	137.07	0	01:12	0.19	0.01	0.44
C77	CHANNEL	116.36	0	01:12	0.16	0.01	0.51
C78	CHANNEL	145.61	0	01:11	0.14	0.02	0.53
C79	CHANNEL	171.57	0	01:03	0.20	0.02	0.52
C8	CHANNEL	0.00	0	00:00	0.00	0.00	0.26
C80	CHANNEL	40.65	0	01:08	0.09	0.01	0.47
C81	CHANNEL	57.65	0	01:01	0.13	0.01	0.45
C82	CHANNEL	115.96	0	01:02	0.15	0.02	0.47
C83	CHANNEL	156.21	0	01:00	0.16	0.02	0.57
C84	CHANNEL	0.00	0	00:00	0.00	0.00	0.46
C85	CONDUIT	51.69	0	01:00	1.07	0.02	0.21
C86	CHANNEL	0.00	0	00:00	0.00	0.00	0.28
C87	CHANNEL	63.75	0	00:58	0.50	0.01	0.38
C88	CHANNEL	350.83	0	01:00	0.74	0.03	0.58
C89	CHANNEL	107.14	0	00:58	0.23	0.10	0.91
C9	CHANNEL	71.67	0	01:03	0.22	0.01	0.35
C90	CHANNEL	141.64	0	01:00	0.57	0.02	0.41
C91	CHANNEL	66.79	0	01:11	0.18	0.01	0.37
C92	CHANNEL	25.16	0	01:13	0.11	0.00	0.33
C93	CHANNEL	2.81	0	01:17	0.15	0.00	0.30
C94	CHANNEL	33.98	0	01:00	0.10	0.01	0.32
C95	CHANNEL	4.48	0	01:02	0.16	0.00	0.33

C96	CHANNEL	38.92	0	01:00	0.12	0.01	0.34
C97	CHANNEL	9.06	0	01:01	0.01	0.00	0.48
C98	CHANNEL	387.44	0	01:00	0.26	0.02	0.62
C99	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
F101A-IC	CONDUIT	287.09	0	01:12	1.02	0.67	1.00
outlet	CONDUIT	2978.06	0	01:13	1.10	0.36	1.00
Pipe_-(131)	CONDUIT	225.41	0	01:17	1.42	1.25	1.00
Pipe_-(132)	CONDUIT	178.54	0	01:16	1.22	0.99	1.00
Pipe_-(133)	CONDUIT	62.84	0	01:21	0.99	1.03	1.00
Pipe_-(134)	CONDUIT	49.33	0	01:20	0.79	0.81	1.00
Pipe_-(234)	CONDUIT	265.11	0	01:03	1.08	0.64	1.00
Pipe_-(234)_(1)	CONDUIT	271.60	0	01:02	1.31	0.75	1.00
Pipe_-(235)	CONDUIT	3.49	0	01:12	0.50	0.06	0.16
Pipe_-(238)	CONDUIT	7603.12	0	00:59	2.20	1.12	1.00
Pipe_-(240)	CONDUIT	7535.39	0	00:59	3.52	1.50	1.00
Pipe_-(241)_(1)	CONDUIT	7440.22	0	00:59	3.48	1.54	1.00
Pipe_-(245)	CONDUIT	74.21	0	00:55	1.43	0.77	0.82
Pipe_-(253)	CONDUIT	93.25	0	01:29	0.97	0.52	1.00
Pipe_-(263)	CONDUIT	11755.96	0	01:07	2.18	1.07	1.00
Pipe_-(264)	CONDUIT	7865.77	0	01:00	2.27	1.17	1.00
Pipe_-(267)	CONDUIT	7717.72	0	01:01	2.23	1.15	1.00
Pipe_-(329)	CONDUIT	312.98	0	01:06	1.61	1.15	0.84
Pipe_-(330)	CONDUIT	312.98	0	01:06	1.48	1.15	0.94
Pipe_-(331)	CONDUIT	155.56	0	01:11	1.22	0.77	0.94
Pipe_-(332)	CONDUIT	101.33	0	01:10	1.27	0.82	0.79
Pipe_-(333)	CONDUIT	101.49	0	01:00	1.27	0.82	0.70
Pipe_-(334)	CONDUIT	6.11	0	01:17	0.30	0.09	0.47
Pipe_-(335)	CONDUIT	0.00	0	00:00	0.00	0.00	0.13
Pipe_-(337)	CONDUIT	125.95	0	00:56	0.94	0.66	1.00
Pipe_-(338)	CONDUIT	71.04	0	00:59	0.79	0.56	0.90
Pipe_-(344)	CONDUIT	50.02	0	01:30	1.07	0.73	1.00
Pipe_-(345)	CONDUIT	328.37	0	01:29	0.92	0.87	1.00
Pipe_-(346)	CONDUIT	363.35	0	01:29	0.82	0.73	1.00
Pipe_-(347)	CONDUIT	761.93	0	01:20	0.43	0.34	1.00
Pipe_-(349)	CONDUIT	1479.04	0	01:04	1.31	0.98	1.00
Pipe_-(350)	CONDUIT	1434.19	0	01:04	1.27	0.95	1.00
Pipe_-(351)	CONDUIT	540.14	0	01:05	1.76	1.29	0.97
Pipe_-(352)	CONDUIT	378.46	0	01:06	1.72	0.98	0.73
Pipe_-(354)	CONDUIT	182.08	0	01:11	0.34	0.33	1.00
Pipe_-(360)	CONDUIT	80.72	0	01:20	1.02	0.92	1.00
Pipe_-(366)	CONDUIT	4549.28	0	01:09	1.52	0.85	1.00
Pipe_-(367)	CONDUIT	2235.12	0	01:12	0.88	0.49	1.00
Pipe_-(368)	CONDUIT	2135.58	0	01:10	1.00	0.62	1.00
Pipe_-(4)	CONDUIT	214.88	0	01:19	1.19	0.85	1.00
Pipe_-(43)	CONDUIT	2256.46	0	01:10	1.28	0.72	1.00
Pipe_-(44)	CONDUIT	2008.33	0	01:10	1.14	0.64	1.00
Pipe_-(45)	CONDUIT	1527.76	0	01:10	1.07	0.64	1.00
Pipe_-(47)	CONDUIT	1121.36	0	01:11	1.47	0.68	1.00
Pipe_-(48)	CONDUIT	1117.07	0	01:11	2.16	1.32	1.00
Pipe_-(49)	CONDUIT	281.92	0	00:54	1.42	0.36	1.00

Pipe_-(5)	CONDUIT	194.21	0	01:29	1.32	1.08	1.00
Pipe_-(50)	CONDUIT	921.25	0	00:59	1.72	1.09	1.00
Pipe_-(51)	CONDUIT	878.40	0	00:59	1.64	1.03	1.00
Pipe_-(52)	CONDUIT	893.83	0	01:00	1.67	1.14	1.00
Pipe_-(52)_(1)	CONDUIT	211.08	0	01:22	1.44	1.35	1.00
Pipe_-(53)	CONDUIT	203.33	0	01:22	1.29	1.31	1.00
Pipe_-(54)	CONDUIT	191.37	0	01:23	1.21	1.23	1.00
Pipe_-(54)_(1)	CONDUIT	78.90	0	01:23	0.89	0.71	1.00
Pipe_-(56)	CONDUIT	29.76	0	01:20	0.57	0.44	1.00
Pipe_-(57)	CONDUIT	16.21	0	01:18	0.30	0.24	1.00
Pipe_-(58)	CONDUIT	206.77	0	01:18	0.91	0.59	1.00
Pipe_-(58)_(1)	CONDUIT	102.20	0	01:25	1.21	0.82	1.00
Pipe_-(59)	CONDUIT	91.30	0	01:25	1.18	0.73	1.00
Pipe_-(6)	CONDUIT	191.40	0	01:29	1.23	1.07	1.00
Pipe_-(60)	CONDUIT	79.37	0	01:18	1.15	0.65	1.00
Pipe_-(73)	CONDUIT	494.72	0	01:09	0.66	0.35	1.00
Pipe_-(77)	CONDUIT	490.01	0	01:08	0.92	0.58	1.00
Pipe_-(84)	CONDUIT	295.56	0	01:09	0.83	0.59	1.00
Pipe_-(85)	CONDUIT	35.77	0	01:35	0.51	0.63	1.00
Pipe_-(87)	CONDUIT	21.64	0	01:35	0.31	0.38	1.00
C107A-IC(1)	ORIFICE	22.36	0	01:16			1.00
C107A-IC(2)	ORIFICE	22.36	0	01:16			1.00
C109A-IC(1)	ORIFICE	65.85	0	01:05			1.00
C109A-IC(2)	ORIFICE	65.85	0	01:05			1.00
C109B-IC(1)	ORIFICE	74.20	0	01:00			1.00
C109B-IC(2)	ORIFICE	74.20	0	01:00			1.00
C110A-IC(1)	ORIFICE	28.06	0	01:11			1.00
C121AA-IC(1)	ORIFICE	15.98	0	01:00			1.00
C121AA-IC(2)	ORIFICE	15.98	0	01:00			1.00
C121A-IC(1)	ORIFICE	58.19	0	01:13			1.00
C121A-IC(2)	ORIFICE	58.19	0	01:13			1.00
C123A-IC(1)	ORIFICE	25.20	0	01:02			1.00
C123A-IC(2)	ORIFICE	25.20	0	01:02			1.00
C205A-IC(1)	ORIFICE	57.57	0	01:06			1.00
C205A-IC(2)	ORIFICE	57.57	0	01:06			1.00
C219-IC	ORIFICE	25.15	0	01:01			1.00
C220A-IC(1)	ORIFICE	90.78	0	01:00			1.00
C220A-IC(2)	ORIFICE	90.78	0	01:00			1.00
C222A-IC(1)	ORIFICE	101.37	0	01:07			1.00
C222A-IC(2)	ORIFICE	101.37	0	01:07			1.00
C223A-IC(1)	ORIFICE	56.17	0	01:02			1.00
G234C-IC	ORIFICE	34.29	0	01:36			1.00
L102A-IC(1)	ORIFICE	16.89	0	01:09			1.00
L102A-IC(2)	ORIFICE	16.89	0	01:09			1.00
L103A-IC(1)	ORIFICE	39.69	0	01:03			1.00
L103A-IC(2)	ORIFICE	39.69	0	01:03			1.00
L103B-IC(1)	ORIFICE	17.63	0	01:01			1.00
L103B-IC(2)	ORIFICE	17.63	0	01:01			1.00
L103C-IC	ORIFICE	44.89	0	01:00			1.00
L103D-IC	ORIFICE	36.96	0	01:00			1.00

L104A-IC(1)	ORIFICE	28.76	0	01:04	1.00
L104A-IC(2)	ORIFICE	28.76	0	01:04	1.00
L105A-IC(1)	ORIFICE	28.96	0	01:03	1.00
L105A-IC(2)	ORIFICE	28.96	0	01:03	1.00
L106A-IC(1)	ORIFICE	24.99	0	01:00	1.00
L106A-IC(2)	ORIFICE	24.99	0	01:00	1.00
L106B-IC(1)	ORIFICE	21.38	0	01:01	1.00
L112A-IC(1)	ORIFICE	40.84	0	01:10	1.00
L112A-IC(2)	ORIFICE	40.84	0	01:10	1.00
L113A-IC(1)	ORIFICE	29.87	0	01:05	1.00
L113A-IC(2)	ORIFICE	29.87	0	01:05	1.00
L113B-IC	ORIFICE	28.12	0	01:04	1.00
L114A-IC	ORIFICE	28.74	0	01:03	1.00
L115A-IC(1)	ORIFICE	17.20	0	01:14	1.00
L115A-IC(2)	ORIFICE	17.20	0	01:14	1.00
L116A-IC(1)	ORIFICE	22.86	0	01:12	1.00
L116A-IC(2)	ORIFICE	22.86	0	01:12	1.00
L117A-IC(1)	ORIFICE	40.03	0	01:03	1.00
L117A-IC(2)	ORIFICE	40.03	0	01:03	1.00
L117B-IC(1)	ORIFICE	17.53	0	01:01	1.00
L117B-IC(2)	ORIFICE	17.53	0	01:01	1.00
L117C-IC	ORIFICE	45.36	0	01:00	1.00
L118A-IC(1)	ORIFICE	39.64	0	01:04	1.00
L118A-IC(2)	ORIFICE	39.64	0	01:04	1.00
L119A-IC(1)	ORIFICE	28.62	0	01:03	1.00
L119A-IC(2)	ORIFICE	28.62	0	01:03	1.00
L124A-IC(1)	ORIFICE	22.79	0	01:01	1.00
L124A-IC(2)	ORIFICE	22.79	0	01:01	1.00
L124B-IC	ORIFICE	20.58	0	01:00	1.00
L126A-IC(1)	ORIFICE	17.12	0	01:02	1.00
L126B-IC(1)	ORIFICE	26.07	0	01:10	1.00
L126B-IC(2)	ORIFICE	26.07	0	01:10	1.00
L126C-IC	ORIFICE	20.98	0	01:27	1.00
L127A-IC(1)	ORIFICE	36.65	0	00:51	1.00
L127A-IC(2)	ORIFICE	36.65	0	00:51	1.00
L128A-IC(1)	ORIFICE	26.11	0	01:03	1.00
L128A-IC(2)	ORIFICE	26.11	0	01:03	1.00
L130A-IC(1)	ORIFICE	38.93	0	01:00	1.00
L130A-IC(2)	ORIFICE	38.93	0	01:00	1.00
L130B-IC	ORIFICE	22.96	0	01:00	1.00
L202A-IC(1)	ORIFICE	17.56	0	01:10	1.00
L202A-IC(2)	ORIFICE	17.56	0	01:10	1.00
L202B-IC	ORIFICE	33.28	0	01:00	1.00
L204A-IC(1)	ORIFICE	40.16	0	01:09	1.00
L204A-IC(2)	ORIFICE	40.16	0	01:09	1.00
L204B-IC(1)	ORIFICE	40.18	0	01:01	1.00
L204B-IC(2)	ORIFICE	40.18	0	01:01	1.00
L205B-IC	ORIFICE	47.23	0	00:55	1.00
L206A-IC(1)	ORIFICE	29.14	0	01:02	1.00
L206A-IC(2)	ORIFICE	29.14	0	01:02	1.00

L206B-IC(1)	ORIFICE	46.72	0	01:03	1.00
L207A-IC(1)	ORIFICE	58.43	0	01:01	1.00
L207A-IC(2)	ORIFICE	58.43	0	01:01	1.00
L209A-IC(1)	ORIFICE	37.62	0	01:00	1.00
L209A-IC(2)	ORIFICE	37.62	0	01:00	1.00
L209B-IC	ORIFICE	8.37	0	01:20	1.00
L209C-IC	ORIFICE	32.71	0	00:51	1.00
L210A-IC(1)	ORIFICE	28.80	0	01:03	1.00
L210A-IC(2)	ORIFICE	39.71	0	01:03	1.00
L210B-IC	ORIFICE	35.46	0	00:57	1.00
L211A-IC(1)	ORIFICE	39.97	0	01:02	1.00
L211A-IC(2)	ORIFICE	39.97	0	01:02	1.00
L212A-IC1	ORIFICE	16.02	0	01:00	1.00
L212A-IC2	ORIFICE	16.02	0	01:00	1.00
L213A-IC(1)	ORIFICE	22.18	0	01:01	1.00
L213A-IC(2)	ORIFICE	22.18	0	01:01	1.00
L214A-IC(1)	ORIFICE	57.15	0	01:01	1.00
L214A-IC(2)	ORIFICE	57.15	0	01:01	1.00
L217A-IC(1)	ORIFICE	39.53	0	01:02	1.00
L217A-IC(2)	ORIFICE	39.53	0	01:02	1.00
L218B-IC	ORIFICE	26.07	0	01:00	1.00
L219B-IC(1)	ORIFICE	41.13	0	01:05	1.00
L219B-IC(2)	ORIFICE	58.69	0	01:05	1.00
L220A-S	ORIFICE	89.32	0	01:00	1.00
L225A-IC(1)	ORIFICE	40.47	0	01:00	1.00
L225A-IC_(2)	ORIFICE	29.36	0	01:00	1.00
L225C-IC(1)	ORIFICE	39.54	0	01:02	1.00
L225C-IC(2)	ORIFICE	39.54	0	01:02	1.00
L228A-IC(1)	ORIFICE	57.08	0	01:01	1.00
L228A-IC(2)	ORIFICE	40.01	0	01:01	1.00
L229A-IC(1)	ORIFICE	39.65	0	01:01	1.00
L229A-IC(2)	ORIFICE	28.77	0	01:01	1.00
L234A-IC1	ORIFICE	22.68	0	01:09	1.00
L234A-IC2	ORIFICE	22.68	0	01:09	1.00
L234B-IC1	ORIFICE	22.81	0	01:10	1.00
L234B-IC2	ORIFICE	22.81	0	01:10	1.00
L234D-IC	ORIFICE	65.79	0	01:08	1.00
L235A-IC1	ORIFICE	80.02	0	01:02	1.00
L235A-IC2	ORIFICE	80.02	0	01:02	1.00
L240A-IC(1)	ORIFICE	16.77	0	01:01	1.00
L240A-IC(2)	ORIFICE	16.77	0	01:01	1.00
L241A-IC(1)	ORIFICE	39.44	0	01:00	1.00
L241A-IC(2)	ORIFICE	28.61	0	01:00	1.00
L241B-IC(1)	ORIFICE	56.72	0	01:01	1.00
L241B-IC(2)	ORIFICE	39.76	0	01:01	1.00
OR1	ORIFICE	293.12	0	01:13	1.00
Spillway	WEIR	10560.98	0	01:13	0.78
W2	WEIR	2684.91	0	01:13	1.00
ART-IC	DUMMY	953.00	0	00:56	
B1-IC	DUMMY	116.00	0	01:11	

B2-IC	DUMMY	199.00	0	00:57
COMM-IC	DUMMY	398.88	0	01:03
HZD-IC	DUMMY	1187.00	0	00:56
L121B-IC	DUMMY	299.00	0	01:00
L123B-IC	DUMMY	111.00	0	00:55
L218A-IC	DUMMY	443.00	0	00:56
L225BIC	DUMMY	477.00	0	00:55
L235B-IC	DUMMY	130.00	0	00:54

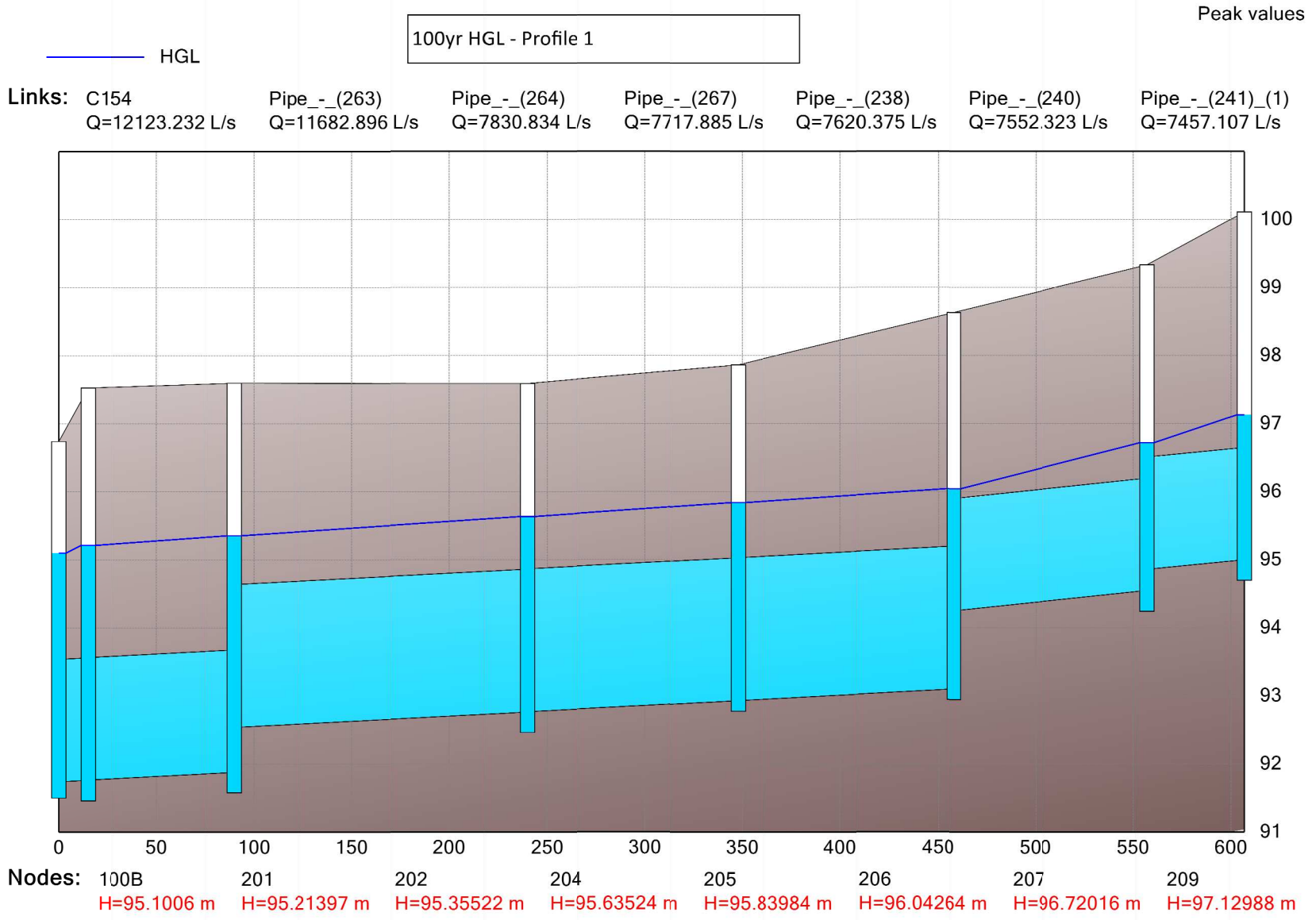
Conduit Surcharge Summary

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C154	48.00	48.00	48.00	0.28	0.69
C155	48.00	48.00	48.00	0.42	0.43
C157	48.00	48.00	48.00	0.01	0.01
C158	0.99	0.99	1.03	0.01	0.78
C160	0.01	0.01	0.86	0.01	0.01
C161	48.00	48.00	48.00	0.01	0.01
C162	48.00	48.00	48.00	0.01	0.01
C165	0.01	0.01	48.00	0.01	0.01
C166	0.01	0.01	47.02	0.01	0.01
C169	0.30	0.30	0.50	0.01	0.01
C170	0.52	0.53	0.52	0.01	0.52
C171	0.59	0.59	0.69	0.01	0.01
C172	0.63	0.63	1.61	0.01	0.01
C173	48.00	48.00	48.00	0.01	0.01
C177	0.61	0.61	1.61	0.01	0.01
C178	0.95	0.95	1.05	0.01	0.01
C182	0.71	0.71	0.72	0.01	0.47
C183	0.55	0.55	0.55	0.08	0.40
C89	0.01	0.01	0.56	0.01	0.01
F101A-IC	48.00	48.00	48.00	0.01	0.01
outlet	48.00	48.00	48.00	0.01	0.01
Pipe_-_ (131)	0.47	0.48	0.48	0.17	0.27
Pipe_-_ (132)	0.42	0.42	0.47	0.01	0.01
Pipe_-_ (133)	0.41	0.41	0.42	0.01	0.03
Pipe_-_ (134)	0.33	0.33	0.40	0.01	0.01
Pipe_-_ (234)	0.51	0.51	0.55	0.01	0.07
Pipe_-_ (234)_ (1)	0.17	0.17	0.50	0.01	0.01
Pipe_-_ (238)	0.62	0.62	0.67	0.21	0.25
Pipe_-_ (240)	0.16	0.25	0.16	0.34	0.16
Pipe_-_ (241)_ (1)	0.16	0.23	0.16	0.35	0.16

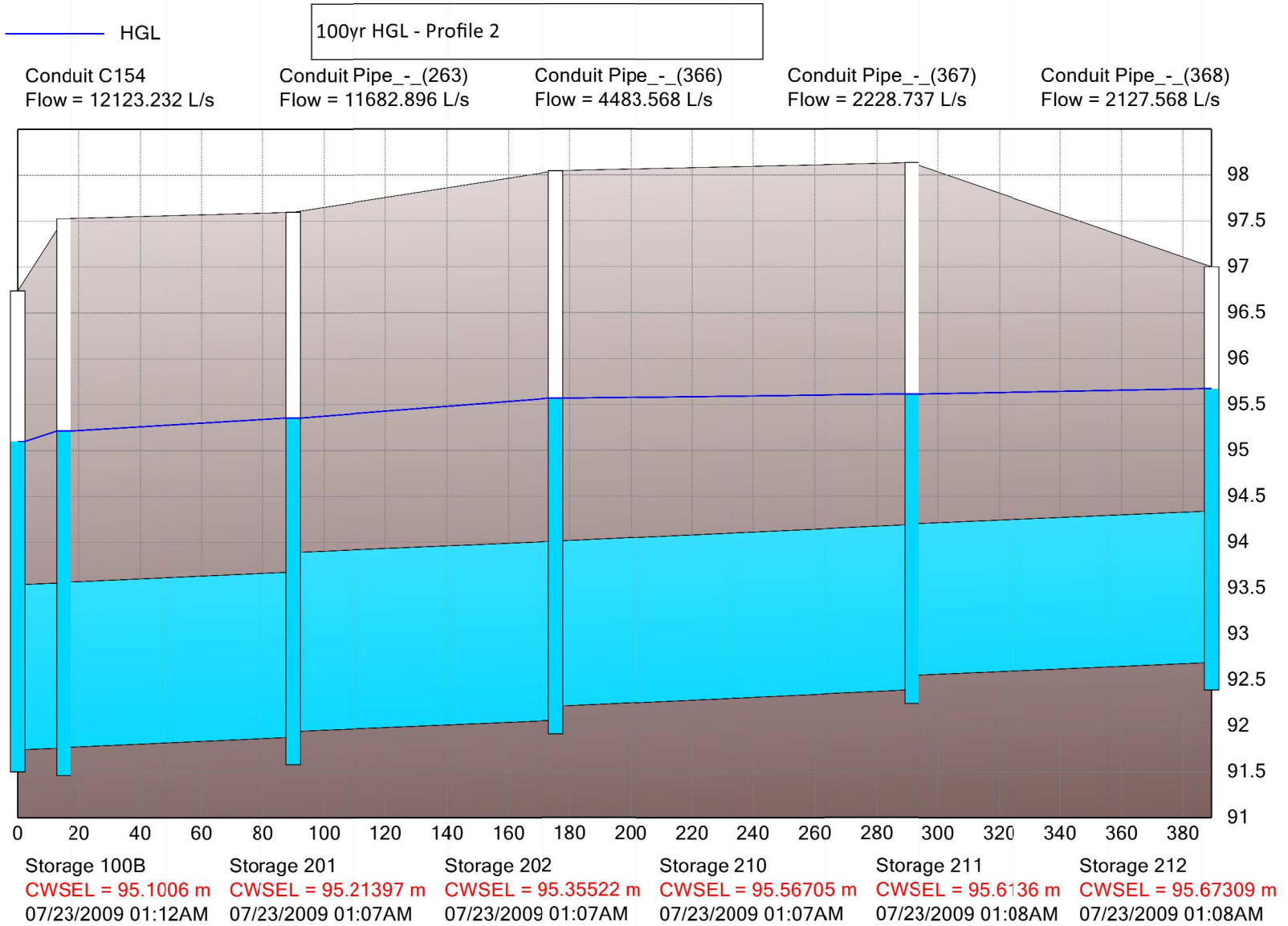
Pipe_-(245)	0.01	0.01	0.25	0.01	0.01
Pipe_-(253)	0.26	0.26	0.53	0.01	0.01
Pipe_-(263)	48.00	48.00	48.00	0.13	0.21
Pipe_-(264)	0.85	0.85	2.27	0.26	0.26
Pipe_-(267)	0.67	0.67	0.85	0.23	0.26
Pipe_-(329)	0.01	0.01	0.01	0.37	0.01
Pipe_-(330)	0.01	0.25	0.01	0.37	0.01
Pipe_-(331)	0.01	0.01	0.25	0.01	0.01
Pipe_-(337)	0.04	0.04	0.35	0.01	0.01
Pipe_-(338)	0.01	0.01	0.04	0.01	0.01
Pipe_-(344)	0.28	0.28	0.57	0.01	0.01
Pipe_-(345)	0.57	0.57	0.65	0.01	0.01
Pipe_-(346)	0.65	0.65	0.71	0.01	0.01
Pipe_-(347)	0.71	0.71	0.86	0.01	0.01
Pipe_-(349)	0.66	0.66	0.84	0.01	0.06
Pipe_-(350)	0.55	0.55	0.66	0.01	0.01
Pipe_-(351)	0.01	0.12	0.01	0.43	0.01
Pipe_-(354)	0.35	0.35	0.58	0.01	0.01
Pipe_-(360)	0.08	0.08	0.29	0.01	0.01
Pipe_-(366)	48.00	48.00	48.00	0.01	0.47
Pipe_-(367)	48.00	48.00	48.00	0.01	0.01
Pipe_-(368)	48.00	48.00	48.00	0.01	0.01
Pipe_-(4)	0.54	0.54	0.55	0.01	0.16
Pipe_-(43)	1.11	1.11	1.83	0.01	0.47
Pipe_-(44)	0.55	0.55	0.64	0.01	0.01
Pipe_-(45)	0.42	0.42	0.55	0.01	0.01
Pipe_-(47)	0.35	0.35	0.42	0.01	0.01
Pipe_-(48)	0.35	0.43	0.35	0.49	0.35
Pipe_-(49)	0.16	0.16	0.42	0.01	0.01
Pipe_-(5)	0.54	0.55	0.54	0.18	0.51
Pipe_-(50)	0.38	0.48	0.38	0.33	0.38
Pipe_-(51)	0.47	0.49	0.47	0.26	0.47
Pipe_-(52)	0.47	0.48	0.48	0.33	0.45
Pipe_-(52)_(1)	0.47	0.49	0.48	0.26	0.21
Pipe_-(53)	0.48	0.50	0.48	0.26	0.46
Pipe_-(54)	0.47	0.49	0.48	0.27	0.31
Pipe_-(54)_(1)	0.41	0.41	0.49	0.01	0.01
Pipe_-(56)	0.26	0.26	0.32	0.01	0.01
Pipe_-(57)	0.15	0.15	0.25	0.01	0.01
Pipe_-(58)	0.52	0.52	0.64	0.01	0.01
Pipe_-(58)_(1)	0.41	0.41	0.53	0.01	0.01
Pipe_-(59)	0.38	0.38	0.39	0.01	0.01
Pipe_-(6)	0.52	0.53	0.54	0.02	0.40
Pipe_-(60)	0.27	0.27	0.36	0.01	0.01
Pipe_-(73)	48.00	48.00	48.00	0.01	0.01
Pipe_-(77)	48.00	48.00	48.00	0.01	0.01
Pipe_-(84)	48.00	48.00	48.00	0.01	0.01
Pipe_-(85)	48.00	48.00	48.00	0.01	0.01
Pipe_-(87)	2.73	2.73	48.00	0.01	0.01

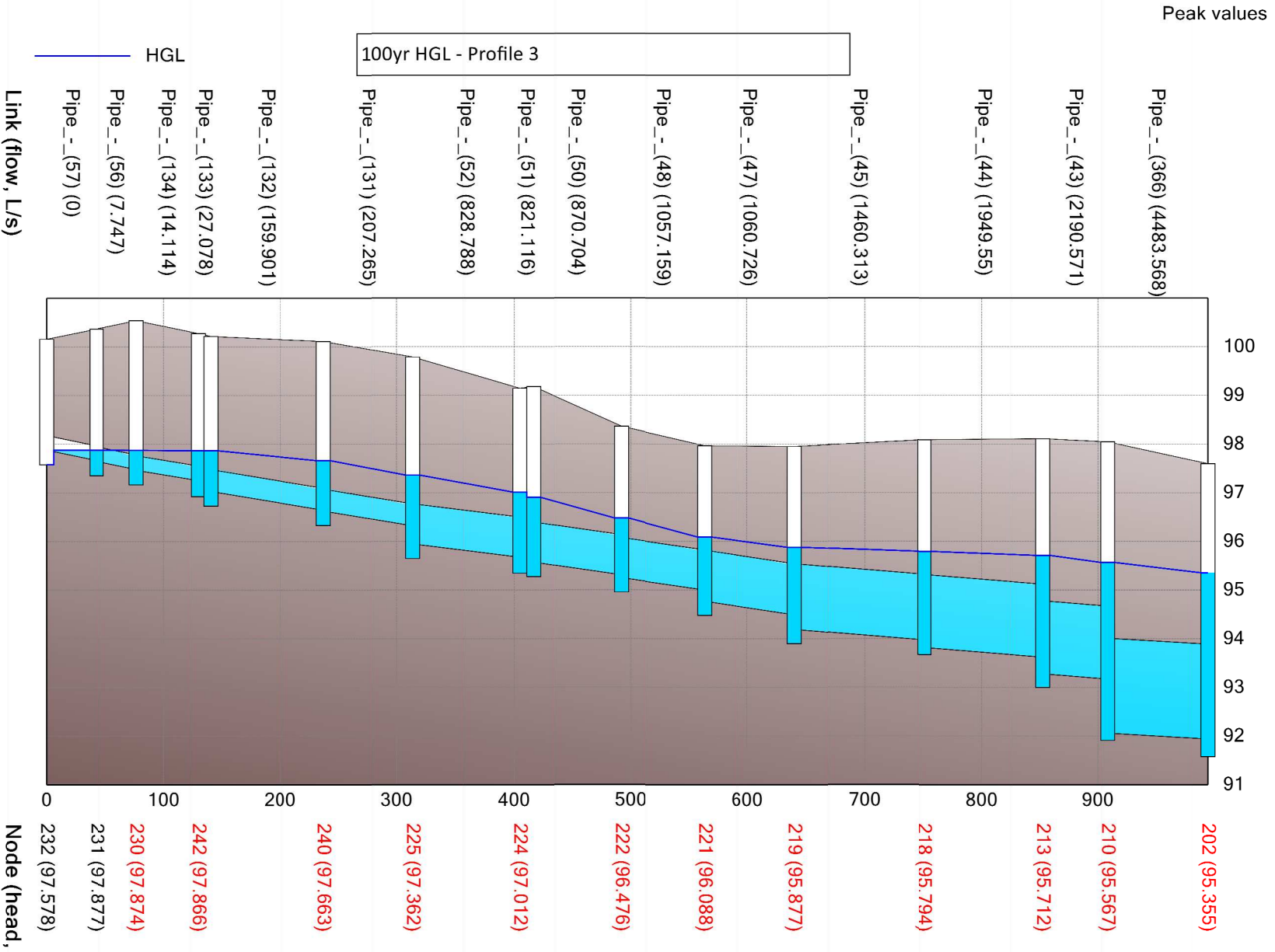
Analysis begun on: Thu Jun 12 11:25:28 2025
Analysis ended on: Thu Jun 12 11:25:46 2025
Total elapsed time: 00:00:18

Appendix B4: PCSWMM HGL Profiles



Peak values



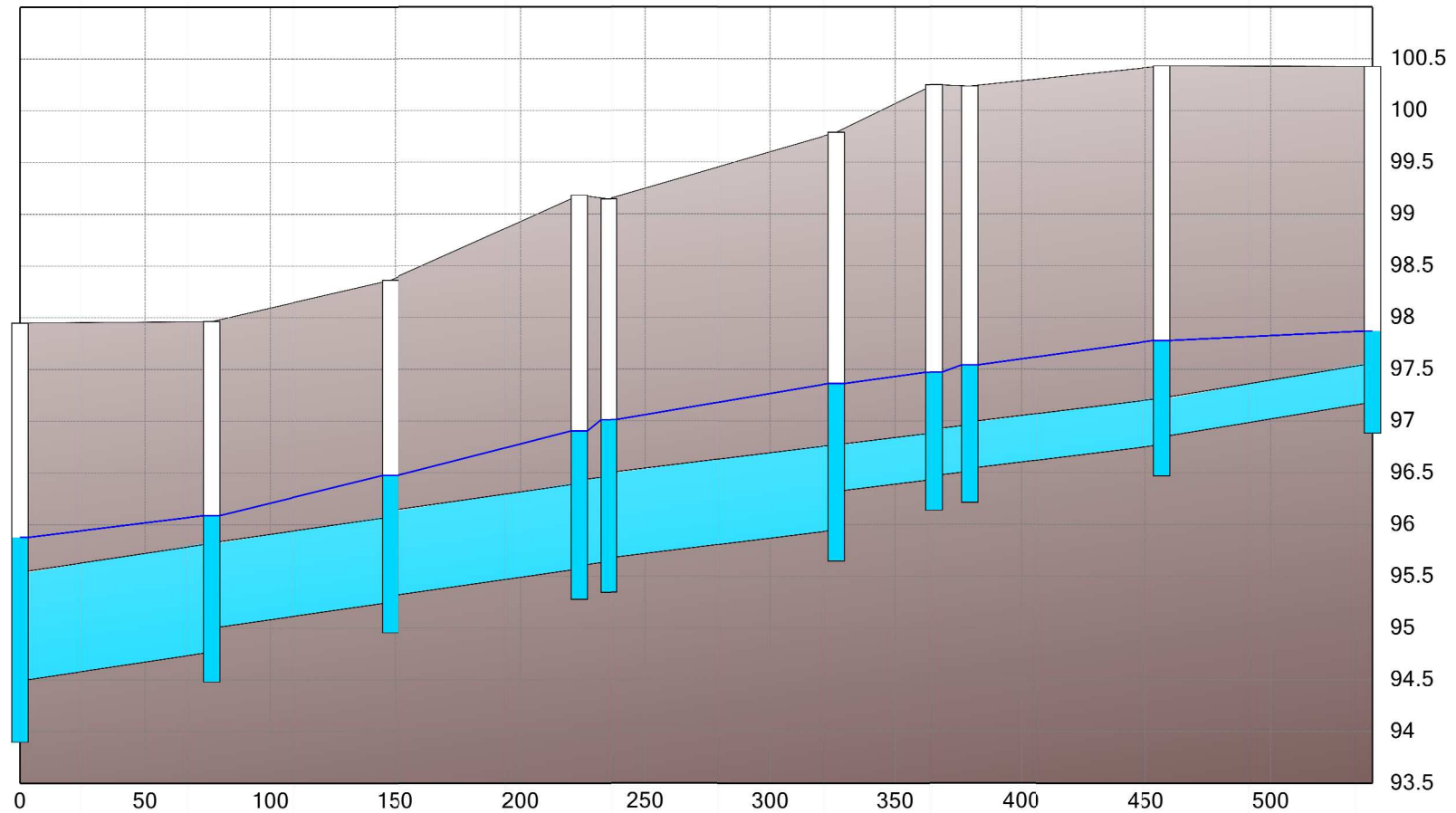


Peak values

— HGL

100yr HGL - Profile 4

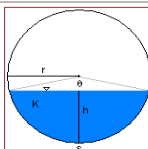
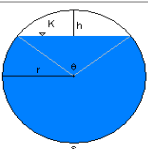
Links:	Pipe_-_ (47)	Pipe_-_ (48)	Pipe_-_ (50)	Pipe_-_ (51)	Pipe_-_ (52)	Pipe_-_ (52)_ (1)	Pipe_-_ (53)	Pipe_-_ (54)	Pipe_-_ (54)_ (1)
Q:	1060.726 L/s	1057.159 L/s	870.704 L/s	821.116 L/s	828.788 L/s	190.145 L/s	186.26 L/s	177.335 L/s	66.038 L/s



Nodes:	Storage 219	Storage 221	Storage 222	Storage 223	Storage 224	Storage 225	Storage 226	Storage 227	Storage 228	Storage 229
H:	95.87749 m	96.08795 m	96.47599 m	96.90429 m	97.01191 m	97.36188 m	97.47054 m	97.53961 m	97.77779 m	97.86893 m

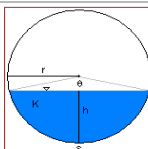
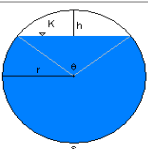
Appendix B5: Sediment HGL Analysis Parameters and Profiles

Ultimate Kanata West SWM Pond 5 - Sediment Accumulation in Storm Sewer Pipes Submerged by Permanent Pool
Permanent Pool Elevation = 93.44 m

step	solve for	if flow depth < radius	if flow depth ≥ radius
			
1	circular segment height	$h = d$	$h = 2r - d$
2	central angle	$\theta = 2\arccos\left(\frac{r-h}{r}\right)$	$\theta = 2\arccos\left(\frac{r-h}{r}\right)$
3	circular segment area	$K = \frac{r^2(\theta - \sin \theta)}{2}$	$K = \frac{r^2(\theta - \sin \theta)}{2}$

Name	Upstream Node Name	Downstream Node Name	Diameter (Height) (m)	Upstream Invert Elevation	Downstream Invert Elevation	Pipe Area (m ²)	Submerged Depth (m) ¹	Central Angle ²	Submerged Area (m ²) ³	Pipe Area - 25% Submerged Area (m ²)	Reduced Diameter (m)	PipeLength (m)	Length of Submerged Pipe (m)
Pipe_-(87)	237	236	0.300	94.32	94.11	0.071	0.00	0.000	0.000	N/A	N/A	61.3	0.00
Pipe_-(85)	236	235	0.300	94.08	94.03	0.071	0.00	0.000	0.000	N/A	N/A	12.7	0.00
Pipe_-(84)	235	234	0.675	93.66	93.38	0.358	0.06	1.211	0.016	0.354	0.671	80.8	80.82
Pipe_-(77)	234	233	0.825	93.23	92.85	0.535	0.40	3.081	0.257	0.470	0.774	106.9	106.86
Pipe_-(73)	233	201	0.975	92.69	92.59	0.747	0.80	1.745	0.656	0.583	0.861	26.6	26.63
Pipe_-(60)	217	216	0.375	95.52	95.37	0.110	0.00	0.000	0.000	N/A	N/A	31.2	0.00
Pipe_-(6)	112	111	0.450	95.23	95.06	0.159	0.00	0.000	0.000	N/A	N/A	41.9	0.00
Pipe_-(59)	216	215	0.375	95.34	95.28	0.110	0.00	0.000	0.000	N/A	N/A	11.9	0.00
Pipe_-(58)_(1)	215	214	0.375	95.25	94.96	0.110	0.00	0.000	0.000	N/A	N/A	57.5	0.00
Pipe_-(58)	214	213	0.600	94.74	94.51	0.283	0.00	0.000	0.000	N/A	N/A	70.6	0.00
Pipe_-(57)	232	231	0.300	97.88	97.66	0.071	0.00	0.000	0.000	N/A	N/A	42.8	0.00
Pipe_-(56)	231	230	0.300	97.65	97.48	0.071	0.00	0.000	0.000	N/A	N/A	33.9	0.00
Pipe_-(54)_(1)	229	228	0.375	97.18	96.85	0.110	0.00	0.000	0.000	N/A	N/A	83.9	0.00
Pipe_-(54)	228	227	0.450	96.77	96.54	0.159	0.00	0.000	0.000	N/A	N/A	77.2	0.00
Pipe_-(53)	227	226	0.450	96.51	96.47	0.159	0.00	0.000	0.000	N/A	N/A	14.1	0.00
Pipe_-(52)_(1)	226	225	0.450	96.44	96.32	0.159	0.00	0.000	0.000	N/A	N/A	38.7	0.00
Pipe_-(52)	225	224	0.825	95.95	95.67	0.535	0.00	0.000	0.000	N/A	N/A	91.2	0.00
Pipe_-(51)	224	223	0.825	95.64	95.60	0.535	0.00	0.000	0.000	N/A	N/A	11.9	0.00
Pipe_-(50)	223	222	0.825	95.57	95.31	0.535	0.00	0.000	0.000	N/A	N/A	75.3	0.00
Pipe_-(5)	111	110	0.450	95.03	94.99	0.159	0.00	0.000	0.000	N/A	N/A	11.2	0.00
Pipe_-(49)	220	219	0.750	95.15	94.79	0.442	0.00	0.000	0.000	N/A	N/A	71.8	0.00
Pipe_-(48)	222	221	0.825	95.25	95.00	0.535	0.00	0.000	0.000	N/A	N/A	71.4	0.00
Pipe_-(47)	221	219	1.050	94.77	94.49	0.866	0.00	0.000	0.000	N/A	N/A	76.8	0.00
Pipe_-(45)	219	218	1.350	94.19	93.97	1.431	0.00	0.000	0.000	N/A	N/A	110.7	0.00
Pipe_-(44)	218	213	1.500	93.82	93.62	1.767	0.00	0.000	0.000	N/A	N/A	102.1	0.00
Pipe_-(43)	213	210	1.500	93.28	93.17	1.767	0.22	1.553	0.156	1.728	1.483	55.3	55.35
Pipe_-(4)	110	107	0.525	94.91	94.76	0.216	0.00	0.000	0.000	N/A	N/A	44.4	0.00
Pipe_-(368)	212	211	1.650	92.69	92.55	2.138	0.82	3.129	1.061	1.873	1.544	97.8	97.80
Pipe_-(367)	211	210	1.800	92.39	92.21	2.545	1.14	2.602	1.699	2.120	1.643	115.9	115.94
Pipe_-(366)	210	202	1.950	92.06	91.94	2.986	1.44	2.147	2.364	2.395	1.746	85.5	85.51
Pipe_-(360)	118	117	0.375	95.25	95.01	0.110	0.00	0.000	0.000	N/A	N/A	96.8	0.00
Pipe_-(354)	104	103	0.825	94.36	94.21	0.535	0.00	0.000	0.000	N/A	N/A	99.8	0.00
Pipe_-(352)	124	123	0.600	95.87	95.59	0.283	0.00	0.000	0.000	N/A	N/A	71.4	0.00
Pipe_-(351)	123	121	0.675	95.01	94.89	0.358	0.00	0.000	0.000	N/A	N/A	51.3	0.00
Pipe_-(350)	121	119	1.200	94.00	93.83	1.131	0.00	0.000	0.000	N/A	N/A	113.2	0.00
Pipe_-(349)	119	101	1.200	93.83	93.65	1.131	0.00	0.000	0.000	N/A	N/A	115.1	0.00
Pipe_-(347)	102	101	1.500	93.42	93.34	1.767	0.06	0.781	0.022	1.762	1.498	79.8	79.78
Pipe_-(346)	114	102	0.750	94.23	94.17	0.442	0.00	0.000	0.000	N/A	N/A	28.2	0.00

Ultimate Kanata West SWM Pond 5 - Sediment Accumulation in Storm Sewer Pipes Submerged by Permanent Pool
Permanent Pool Elevation = 93.44 m

step	solve for	if flow depth < radius	if flow depth ≥ radius
			
1	circular segment height	$h = d$	$h = 2r - d$
2	central angle	$\theta = 2\arccos\left(\frac{r-h}{r}\right)$	$\theta = 2\arccos\left(\frac{r-h}{r}\right)$
3	circular segment area	$K = \frac{r^2(\theta - \sin \theta)}{2}$	$K = \frac{r^2(\theta - \sin \theta)}{2}$

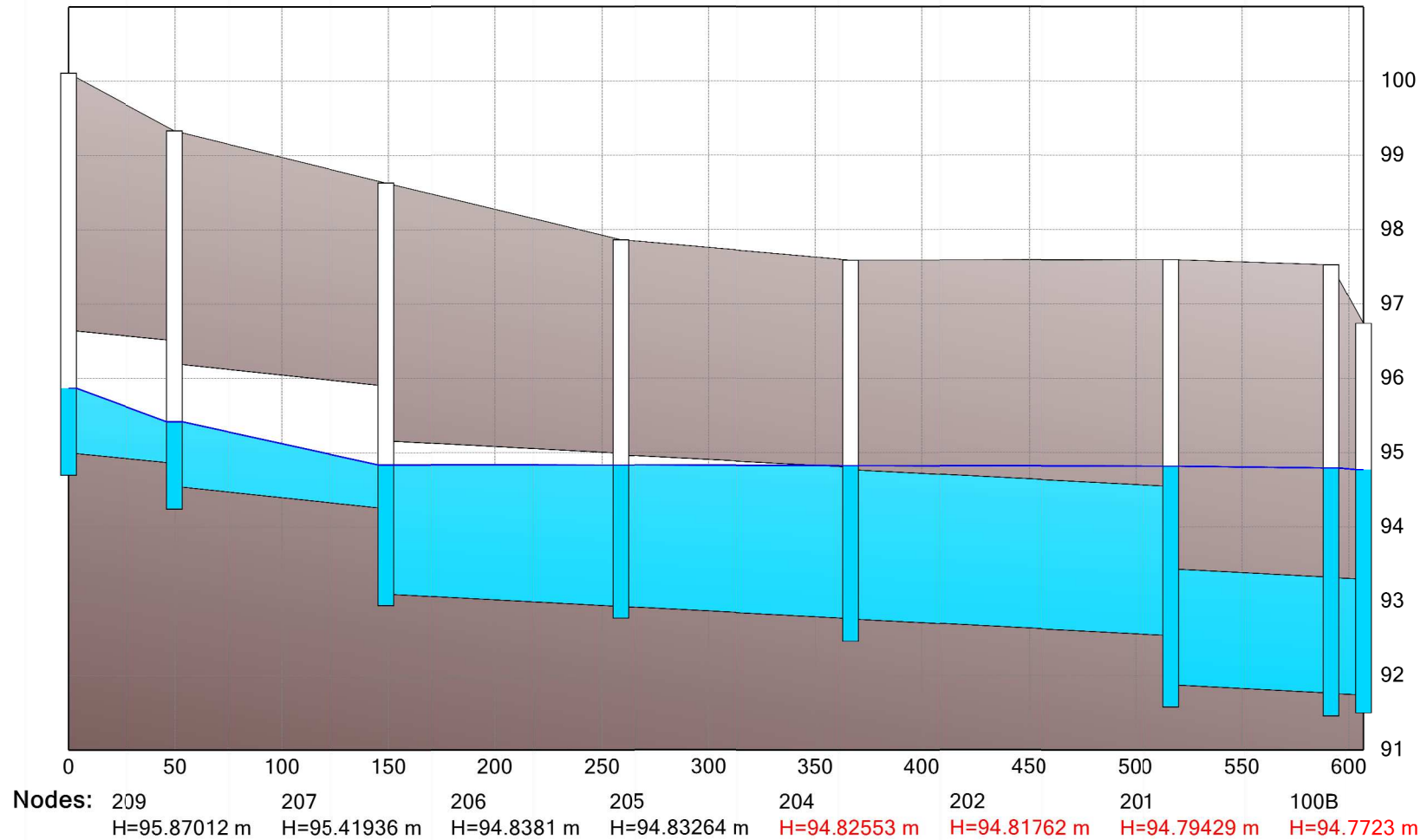
Name	Upstream Node Name	Downstream Node Name	Diameter (Height) (m)	Upstream Invert Elevation	Downstream Invert Elevation	Pipe Area (m ²)	Submerged Depth (m) ¹	Central Angle ²	Submerged Area (m ²) ³	Pipe Area - 25% Submerged Area (m ²)	Reduced Diameter (m)	PipeLength (m)	Length of Submerged Pipe (m)
Pipe_-(345)	115	114	0.675	94.41	94.31	0.358	0.00	0.000	0.000	N/A	N/A	54.7	0.00
Pipe_-(344)	116	115	0.300	95.12	94.79	0.071	0.00	0.000	0.000	N/A	N/A	65.7	0.00
Pipe_-(338)	106	105	0.450	95.02	94.89	0.159	0.00	0.000	0.000	N/A	N/A	63.5	0.00
Pipe_-(337)	105	104	0.525	94.82	94.66	0.216	0.00	0.000	0.000	N/A	N/A	79.4	0.00
Pipe_-(335)	132	131	0.300	97.86	97.63	0.071	0.00	0.000	0.000	N/A	N/A	35.9	0.00
Pipe_-(334)	131	130	0.300	97.61	97.51	0.071	0.00	0.000	0.000	N/A	N/A	19.5	0.00
Pipe_-(333)	130	129	0.375	97.44	96.87	0.110	0.00	0.000	0.000	N/A	N/A	113.9	0.00
Pipe_-(332)	129	128	0.375	96.84	96.78	0.110	0.00	0.000	0.000	N/A	N/A	12.3	0.00
Pipe_-(331)	128	126	0.450	96.67	96.47	0.159	0.00	0.000	0.000	N/A	N/A	39.5	0.00
Pipe_-(330)	126	125	0.525	96.40	96.03	0.216	0.00	0.000	0.000	N/A	N/A	92.5	0.00
Pipe_-(329)	125	124	0.525	96.00	95.95	0.216	0.00	0.000	0.000	N/A	N/A	12.2	0.00
Pipe_-(267)	205	204	2.100	92.93	92.77	3.464	0.59	2.239	0.801	3.263	2.038	108.1	108.14
Pipe_-(264)	204	202	2.100	92.76	92.54	3.464	0.79	2.641	1.191	3.166	2.008	149.9	149.90
Pipe_-(263)	202	201	1.800	91.88	91.77	2.545	1.62	0.000	2.545	1.909	1.559	75.0	74.95
Pipe_-(253)	113	112	0.450	95.57	95.24	0.159	0.00	0.000	0.000	N/A	N/A	84.2	0.00
Pipe_-(245)	127	126	0.300	97.73	96.62	0.071	0.00	0.000	0.000	N/A	N/A	110.8	0.00
Pipe_-(241) (1)	209	207	1.650	95.00	94.86	2.138	0.00	0.000	0.000	N/A	N/A	49.7	0.00
Pipe_-(240)	207	206	1.650	94.55	94.25	2.138	0.00	0.000	0.000	N/A	N/A	99.2	0.00
Pipe_-(238)	206	205	2.100	93.10	92.93	3.464	0.43	1.868	0.502	3.338	2.062	110.0	109.96
Pipe_-(235)	107	104	0.300	95.59	95.38	0.071	0.00	0.000	0.000	N/A	N/A	51.7	0.00
Pipe_-(234) (1)	109	108	0.600	95.19	94.78	0.283	0.00	0.000	0.000	N/A	N/A	116.8	0.00
Pipe_-(234)	108	107	0.600	94.77	94.68	0.283	0.00	0.000	0.000	N/A	N/A	18.9	0.00
Pipe_-(134)	230	242	0.300	97.46	97.25	0.071	0.00	0.000	0.000	N/A	N/A	53.6	0.00
Pipe_-(133)	242	241	0.300	97.22	97.18	0.071	0.00	0.000	0.000	N/A	N/A	10.6	0.00
Pipe_-(132)	241	240	0.450	97.03	96.64	0.159	0.00	0.000	0.000	N/A	N/A	96.1	0.00
Pipe_-(131)	240	225	0.450	96.63	96.32	0.159	0.00	0.000	0.000	N/A	N/A	76.7	0.00
F101A-IC	F101A-S	101	0.600	93.43	93.35	0.283	0.05	1.171	0.011	0.280	0.597	16.3	16.30
C173	HW7	POND-S1	0.900	93.66	93.45	0.636	0.00	0.000	0.000	N/A	N/A	18.1	0.00
C159	100D	100E	1.350	94.04	93.89	1.431	0.00	0.000	0.000	N/A	N/A	15.3	0.00
C158	101	100D	1.500	93.28	93.26	1.767	0.17	1.373	0.110	1.740	1.488	15.7	15.70
C157	100A	POND-S1	2.400	91.79	91.76	4.524	1.66	2.346	3.349	3.687	2.167	28.1	28.1
C156	100B	100A	2.400	92.93	92.88	4.524	0.53	1.967	0.752	4.336	2.350	49.8	49.8
C155	100B	POND-S1	1.800	91.73	91.70	2.545	1.72	0.000	2.545	1.909	1.559	18.0	18
C154	201	100B	1.800	91.76	91.74	2.545	1.69	0.000	2.545	1.909	1.559	15.0	15

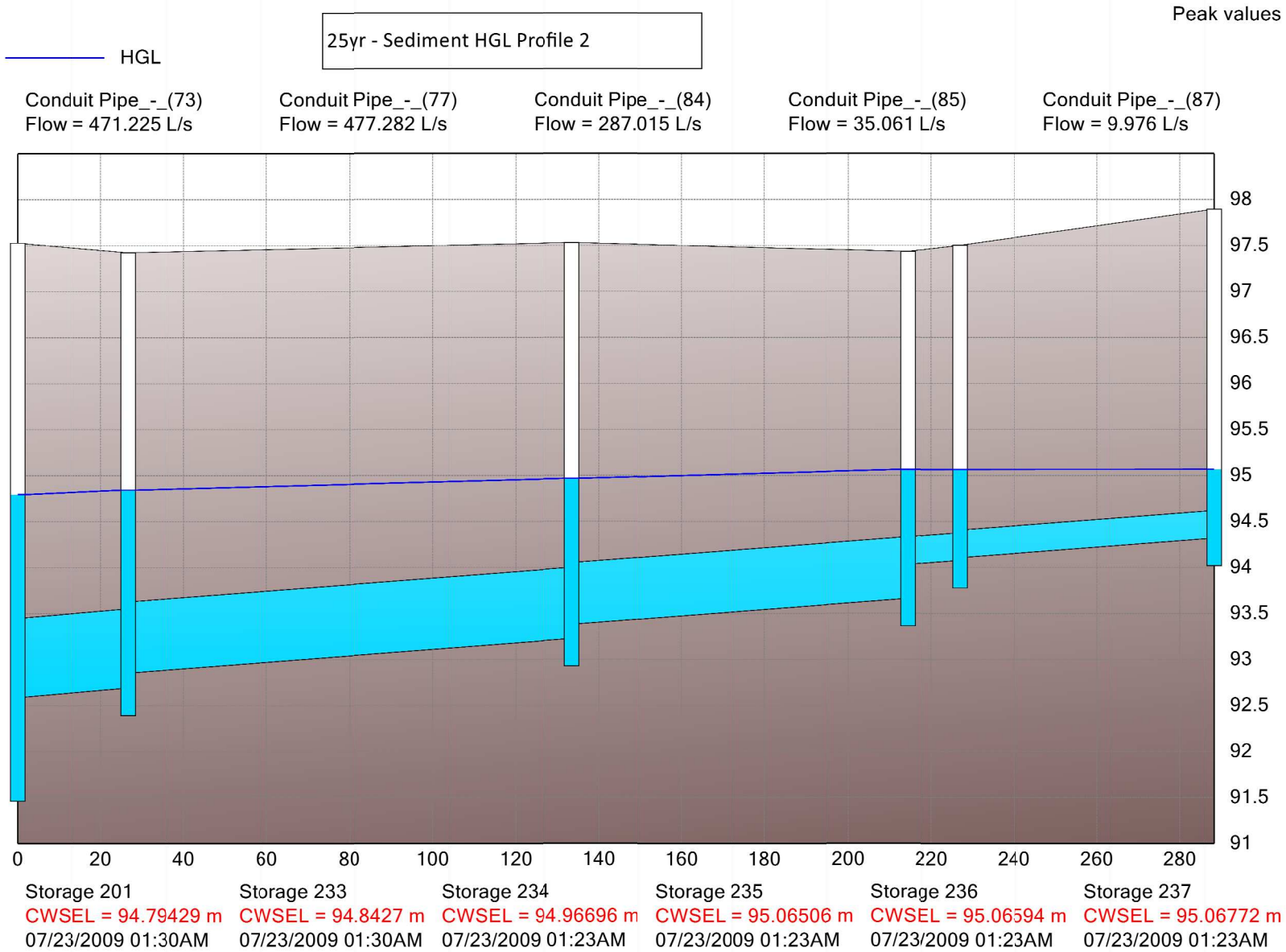
Peak values

— HGL

25yr - Sediment HGL Profile 1

Links:	Pipe_-_ (241)_ (1)	Pipe_-_ (240)	Pipe_-_ (238)	Pipe_-_ (267)	Pipe_-_ (264)	Pipe_-_ (263)	C154
	Q=2645.598 L/s	Q=2759.371 L/s	Q=2963.994 L/s	Q=3250.531 L/s	Q=3549.71 L/s	Q=6653.761 L/s	Q=7019.053 L/s



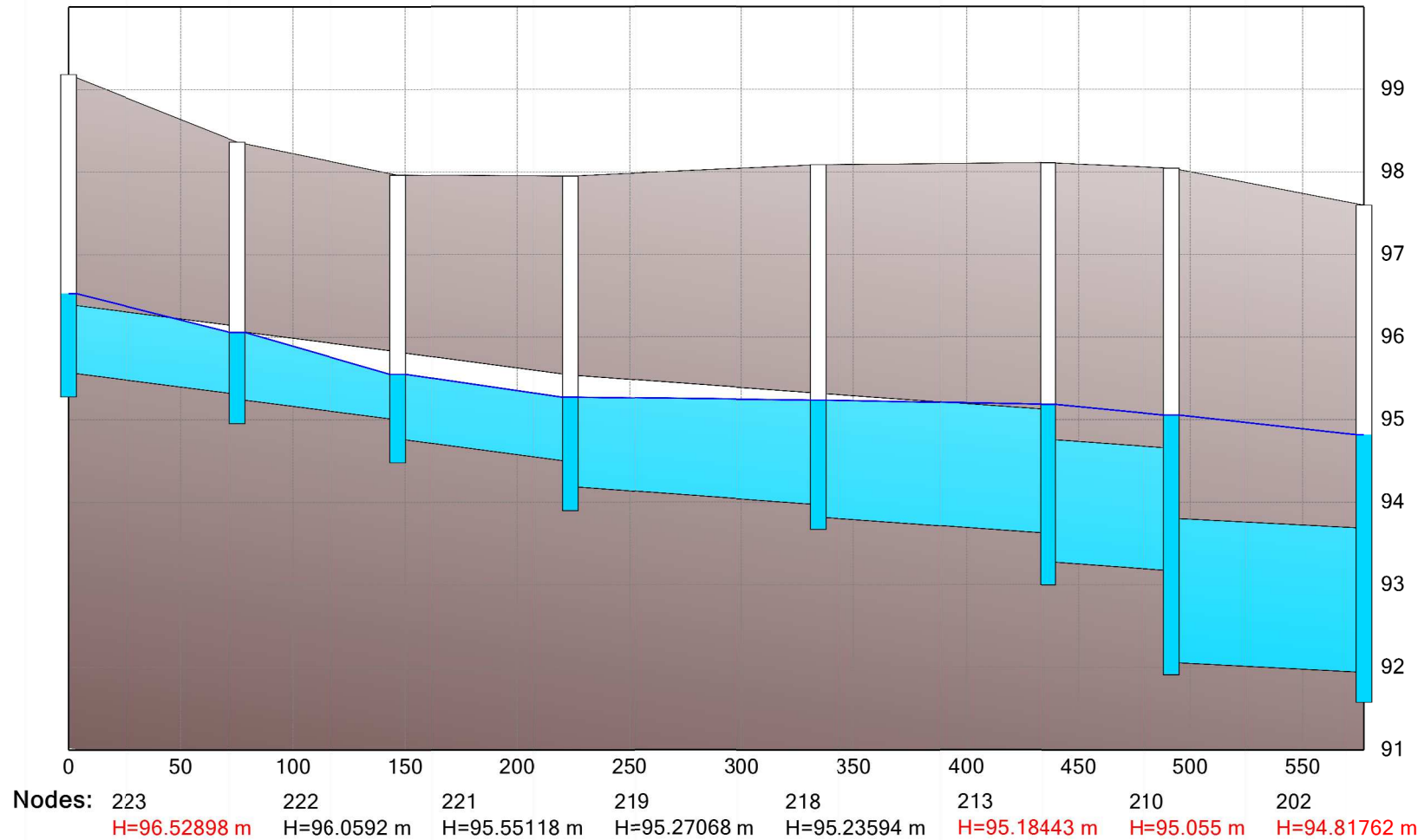


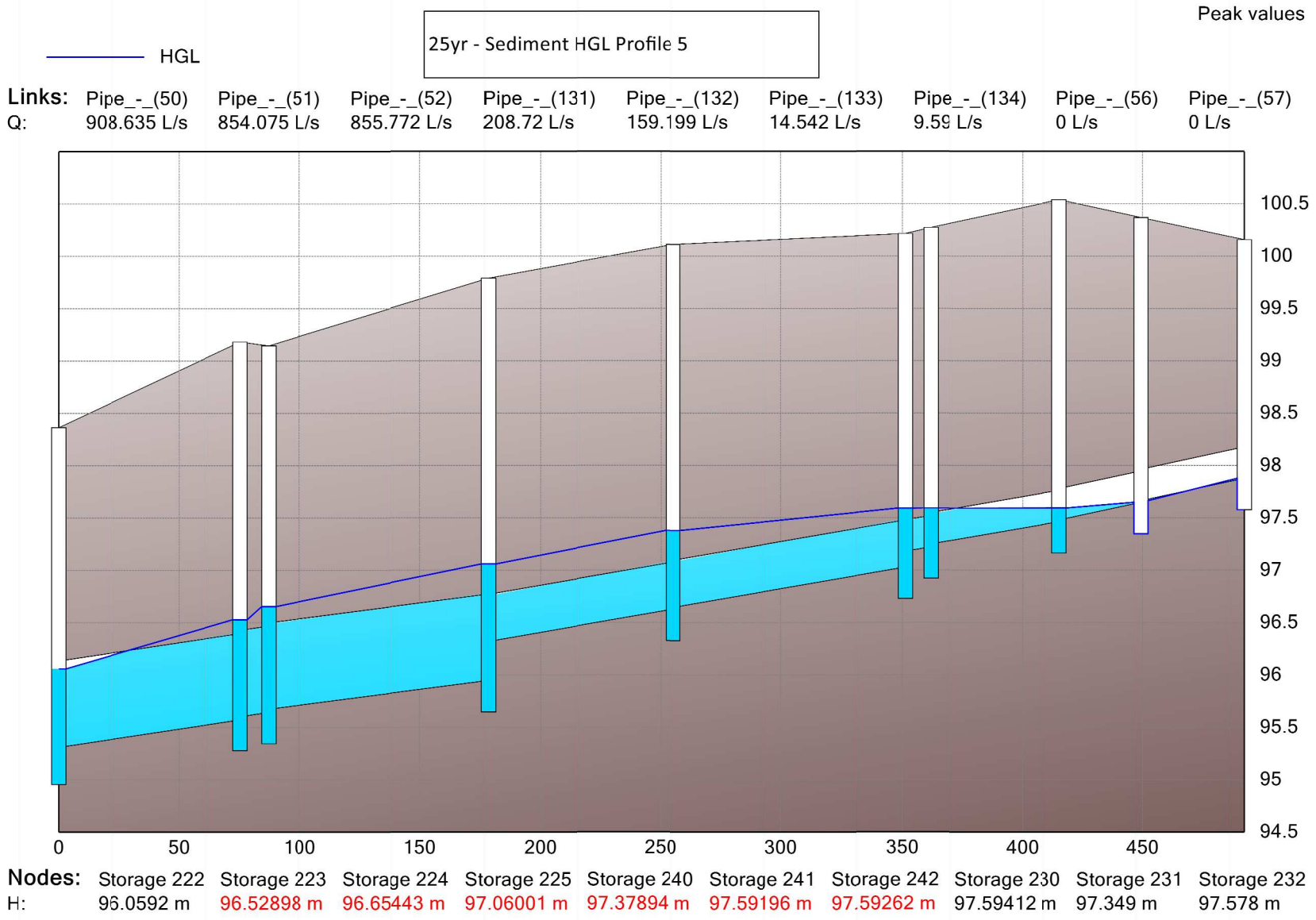
Peak values

25yr - Sediment HGL Profile 3

— HGL

Links: Pipe_-_ (50) Q=908.635 L/s Pipe_-_ (48) Q=1066.061 L/s Pipe_-_ (47) Q=1067.474 L/s Pipe_-_ (45) Q=1423.091 L/s Pipe_-_ (44) Q=1869.243 L/s Pipe_-_ (43) Q=2068.91 L/s Pipe_-_ (366) Q=3974.703 L/s





Appendix B6: Infiltration Calculations

Project No. 160401393
Richcraft Kanata West Subdivision Infiltration Calculations

Required Infiltration Rate	50 mm/yr	
Proposed Site Area	36.53 ha	64.5% Imperviousness
Pre-Development Infiltration	18265 m ³ /yr	
25% Infiltration Augmentation (KWMSS)	22831 m ³ /yr	Target Infiltration for Overall Site

Proposed Condition Infiltration Calculation Breakdown

Proposed Land Use	Total Area	%IMP	%BMP (Amended Soil)	Imp. Area (ha)	Lawns (w/BMP) (ha)	Lawns (w/o BMP) (ha)	SWMF	
School Blocks	2.95	71.4	0	2.11	0.00	0.84	0.00	
App. Commercial Blocks	1.47	92.9	0	1.36	0.00	0.11	0.00	
First Registration Private Residential	0.74	71.4	0	0.53	0.00	0.21	0.00	
Second Registration Private Residential	3.75	85.7	0	3.21	0.00	0.54	0.00	
First Reg. Rear Yard	2.97	36.4	0	1.08	0.00	1.89	0.00	
Second Reg. Rear Yard	3.25	33.9	100	1.10	2.15	0.00	0.00	
Approved Phase 1 ROW / Front Yard Areas	7.68	68.5	0	5.26	0.00	2.42	0.00	
Proposed Phase 2 ROW / Front Yard Areas	9.73	71.0	100	6.91	2.82	0.00	0.00	
SWMF (Pond 5)	2.56	-	-	-	-	-	2.56	
Approved Phase Parks	0.46	7.1	0	0.03	0.00	0.43	0.00	
Proposed Phase Park	0.97	28.6	100	0.28	0.69	0.00	0.00	
Total	36.53			21.88	5.66	6.43	2.56	Overall Richcraft Kanata West Development

Land Use	Soil Type	Area ha	%	Precip. (mm)	ET (mm)	Infil. (mm)	Runoff (mm)
Meadows	Clay	0.00	0.0%	943	577	50	316
SWMF	Clay (SWMF)	2.56	7.0%	943	640	0	303
Lawns (w/ BMP)	Topsoil / Sandy Loam	5.66	15.5%	943	480	180	283
Lawns (w/o BMP)	Topsoil / Clay	6.43	17.6%	943	525	50	368
Impervious	Impervious	21.88	59.9%	943	150	0	793
Total		36.53	100.0%				

*Infiltration for native soil assumed as 50mm/year as per KWMSS and detailed geotech recommendations

** Evapotranspiration by Land Classes obtained from Carp River Watershed Water Balance Table 3.5.2 (Robinsons, 2004)

Post Development Infiltration in Pervious Areas	13409 m ³ /yr	(Based on the pervious areas with the infiltration values shown above)
Post Development Infiltration Needed in Infiltration Trenches	9423 m ³ /yr	

Number of Rainfall Events/yr 6mm< x <25mm	31	*based on average precip 2000-2011
Average days between events	9	
Average depth 6mm<x<25mm	12.19 mm	Assume this is the average depth of rainfall that will recharge the infiltration galleries.

Rearyard Bioswale Storage

Roof area feeding rearyard bioswales	21324 m ²	Calculated based on rearyard area C value (i.e., half roofs)
Total Annual depth of rainfall 6mm<x<25mm	374.8 mm	number of events * 12mm
Annual volume of runoff from roofs to Bioswales	7992 m ³ /yr	for events with rainfall 6mm< x <25mm
Store up to 25mm event from roof in bioswales		
Total Storage Required (25mm) =	533 m ³ water storage	
Total Bioswale Storage Provided (25mm) =	596 m ³	(see detailed calculations for each rearyard bioswale)
Post Development Infiltration for School Block - As per Previously Approved	671 m ³ /yr	for events with rainfall 6mm< x <25mm
Below are preliminary infiltration calculations for the school block based on assumptions.		
School Block Area	2.95 ha	
Assumed Roof Area	2950 m ²	(10% of total school block)
Total Annual depth of rainfall 6mm<x<25mm	374.8 mm	number of events * 12mm
Annual volume of runoff from school roof to infiltration UID	1106 m ³ /yr	for events with rainfall 6mm< x <25mm
Post Development Infiltration for Medium Residential Blocks (Block 60 and Block 117)	759 m ³ /yr	Total Residential Block Area (Second Phase) = 2.77 ha (274 m ³ /yr/ha)

Richcraft Kanata West Subdivision Infiltration Calculations

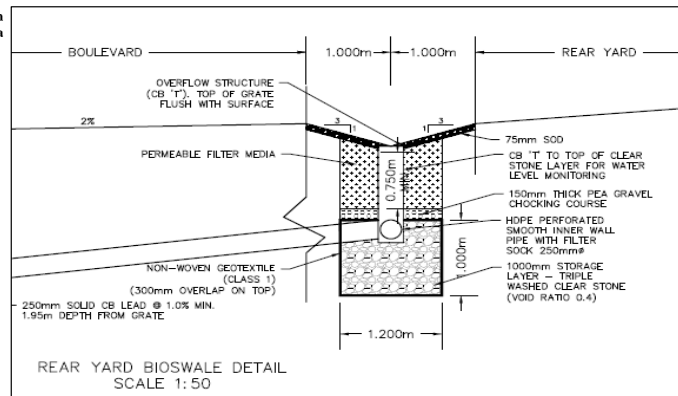
Bioswales with Storage Volume Calculations Based on Infiltration Trench Design Calculations (Based on section 4.5.8 of MOE 2003 SWM Guidelines)

$$A = \frac{1,000V}{P_{nat}\Delta t}$$

Equation 4.3: Infiltration Trench Bottom Area

where A = bottom area of the trench (m²)
V = runoff volume to be infiltrated (Table 3.2)
P = percolation rate of surrounding native soil (mm/h)
n = porosity of the storage media (0.4 for clear stone)
Δt = retention time (24 to 48 hours)

Storage Volume (cu.m/ha) for Impervious Level				
	35%	55%	70%	85%
Enhanced (80% TSS removal)	25	30	35	40
Normal (70% TSS removal)	20	20	25	30
Basic (60% TSS removal)	20	20	20	20



Subsurface Trench Width = 1.2 m

Soil Infiltration Rate (Paterson PG3062-MEMO.07) = 19 mm/hr

REARYARD AREA L103C

Input	
Drainage Area	= 0.64 ha
Runoff Co-efficient	= 0.48
Roof Area	= 0.26 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 159 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 40%
Required Quality Treatment Volume	= 19.2 m ³ (MECP)
Required 25mm Infiltration Volume	= 64 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 105.3 m ²
Provided Bottom Area of trench	= 190.3 m ²
Infiltration Rate	= 1.0 L/s
Drawdown Time of Quality Treatment Volume	= 5.3 hr
Maximum Subsurface Volume Available, Vss	= 61.8 m ³ rectangular trench

REARYARD AREA L124B

Input	
Drainage Area	= 0.40 ha
Runoff Co-efficient	= 0.43
Roof Area	= 0.13 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 130 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 33%
Required Quality Treatment Volume	= 10 m ³ (MECP)
Required 25mm Infiltration Volume	= 33 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 54.8 m ²
Provided Bottom Area of trench	= 155.4 m ²
Infiltration Rate	= 0.8 L/s
Drawdown Time of Quality Treatment Volume	= 3.4 hr
Maximum Subsurface Volume Available, Vss	= 50.4 m ³ rectangular trench

Richcraft Kanata West Subdivision Infiltration Calculations

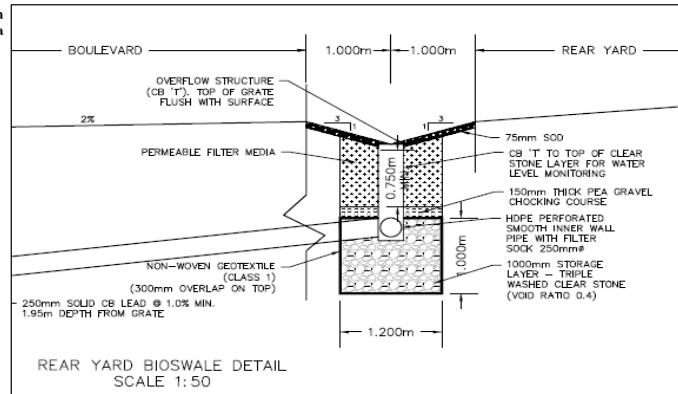
Bioswales with Storage Volume Calculations Based on Infiltration Trench Design Calculations (Based on section 4.5.8 of MOE 2003 SWM Guidelines)

$$A = \frac{1,000V}{P_{nat}\Delta t}$$

Equation 4.3: Infiltration Trench Bottom Area

where A = bottom area of the trench (m²)
V = runoff volume to be infiltrated (Table 3.2)
P = percolation rate of surrounding native soil (mm/h)
n = porosity of the storage media (0.4 for clear stone)
Δt = retention time (24 to 48 hours)

Storage Volume (cu.m/ha) for Impervious Level				
	35%	55%	70%	85%
Enhanced (80% TSS removal)	25	30	35	40
Normal (70% TSS removal)	20	20	25	30
Basic (60% TSS removal)	20	20	20	20



Subsurface Trench Width = 1.2 m

Soil Infiltration Rate (Paterson PG3062-MEMO.07) = 19 mm/hr

REARYARD AREA L113B

Input	
Drainage Area	= 0.49 ha
Runoff Co-efficient	= 0.42
Roof Area	= 0.15 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 98 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 31%
Required Quality Treatment Volume	= 12.25 m ³ (MECP)
Required 25mm Infiltration Volume	= 39 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 67.2 m ²
Provided Bottom Area of trench	= 117.5 m ²
Infiltration Rate	= 0.6 L/s
Drawdown Time of Quality Treatment Volume	= 5.5 hr
Maximum Subsurface Volume Available, Vss	= 38.1 m ³ rectangular trench

REARYARD AREA L103D

Input	
Drainage Area	= 0.55 ha
Runoff Co-efficient	= 0.46
Roof Area	= 0.20 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 167 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 37%
Required Quality Treatment Volume	= 16.5 m ³ (MECP)
Required 25mm Infiltration Volume	= 51 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 90.5 m ²
Provided Bottom Area of trench	= 200.4 m ²
Infiltration Rate	= 1.1 L/s
Drawdown Time of Quality Treatment Volume	= 4.3 hr
Maximum Subsurface Volume Available, Vss	= 65.0 m ³ rectangular trench

REARYARD AREA L117C

Input	
Drainage Area	= 0.66 ha
Runoff Co-efficient	= 0.46
Roof Area	= 0.25 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 210 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 37%
Required Quality Treatment Volume	= 19.8 m ³ (MECP)
Required 25mm Infiltration Volume	= 61 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 108.6 m ²
Provided Bottom Area of trench	= 252.0 m ²
Infiltration Rate	= 1.3 L/s
Drawdown Time of Quality Treatment Volume	= 4.1 hr
Maximum Subsurface Volume Available, Vss	= 81.8 m ³ rectangular trench

Richcraft Kanata West Subdivision Infiltration Calculations

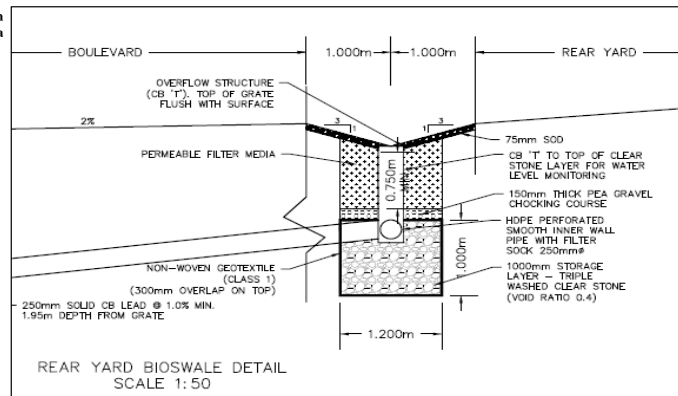
Bioswales with Storage Volume Calculations Based on Infiltration Trench Design Calculations (Based on section 4.5.8 of MOE 2003 SWM Guidelines)

$$A = \frac{1,000V}{P_{nat}\Delta t}$$

Equation 4.3: Infiltration Trench Bottom Area

where A = bottom area of the trench (m²)
V = runoff volume to be infiltrated (Table 3.2)
P = percolation rate of surrounding native soil (mm/h)
n = porosity of the storage media (0.4 for clear stone)
Δt = retention time (24 to 48 hours)

Storage Volume (cu.m/ha) for Impervious Level				
	35%	55%	70%	85%
Enhanced (80% TSS removal)	25	30	35	40
Normal (70% TSS removal)	20	20	25	30
Basic (60% TSS removal)	20	20	20	20



Subsurface Trench Width = 1.2 m

Soil Infiltration Rate (Paterson PG3062-MEMO.07) = 19 mm/hr

REARYARD AREA L209C

Input

Drainage Area = 0.41 ha
Runoff Co-efficient = 0.47
Roof Area = 0.16 ha
Level of Treatment = Enhanced (80% TSS removal)
Storage Media = 50mm diameter clear stone
Media Porosity, n = 0.4 typical (range 0.25-0.40)
Percolation Rate = 19 mm/h
Retention Time = 24 h
Subdrain size = 250 mm
Length = 105 m
Subsurface Trench Width = 1.2 m
Maximum Depth of Subsurface Trench, dt = 0.75 m

Calculations

Imperviousness = 39%
Required Quality Treatment Volume = 12.3 m³ (MECP)
Required 25mm Infiltration Volume = 40 m³

Bioswale Configuration

Required Bottom Area of trench, A = 67.4 m²
Provided Bottom Area of trench = 126.0 m²
Infiltration Rate = 0.7 L/s
Drawdown Time of Quality Treatment Volume = 5.1 hr
Maximum Subsurface Volume Available, Vss = 40.9 m³ rectangular trench

REARYARD AREA L205B

Input

Drainage Area = 0.49 ha
Runoff Co-efficient = 0.45
Roof Area = 0.18 ha
Level of Treatment = Enhanced (80% TSS removal)
Storage Media = 50mm diameter clear stone
Media Porosity, n = 0.4 typical (range 0.25-0.40)
Percolation Rate = 19 mm/h
Retention Time = 24 h
Subdrain size = 250 mm
Length = 130 m
Subsurface Trench Width = 1.2 m
Maximum Depth of Subsurface Trench, dt = 0.75 m

Calculations

Imperviousness = 36%
Required Quality Treatment Volume = 14.7 m³ (MECP)
Required 25mm Infiltration Volume = 44 m³

Bioswale Configuration

Required Bottom Area of trench, A = 80.6 m²
Provided Bottom Area of trench = 155.6 m²
Infiltration Rate = 0.8 L/s
Drawdown Time of Quality Treatment Volume = 5.0 hr
Maximum Subsurface Volume Available, Vss = 50.5 m³ rectangular trench

REARYARD AREA L204C

Input

Drainage Area = 0.26 ha
Runoff Co-efficient = 0.47
Roof Area = 0.10 ha
Level of Treatment = Enhanced (80% TSS removal)
Storage Media = 50mm diameter clear stone
Media Porosity, n = 0.4 typical (range 0.25-0.40)
Percolation Rate = 19 mm/h
Retention Time = 24 h
Subdrain size = 250 mm
Length = 44 m
Subsurface Trench Width = 1.2 m
Maximum Depth of Subsurface Trench, dt = 0.75 m

Calculations

Imperviousness = 39%
Required Quality Treatment Volume = 7.8 m³ (MECP)
Required 25mm Infiltration Volume = 25 m³

Bioswale Configuration

Required Bottom Area of trench, A = 42.8 m²
Provided Bottom Area of trench = 52.3 m²
Infiltration Rate = 0.3 L/s
Drawdown Time of Quality Treatment Volume = 7.8 hr
Maximum Subsurface Volume Available, Vss = 17.0 m³ rectangular trench

Richcraft Kanata West Subdivision Infiltration Calculations

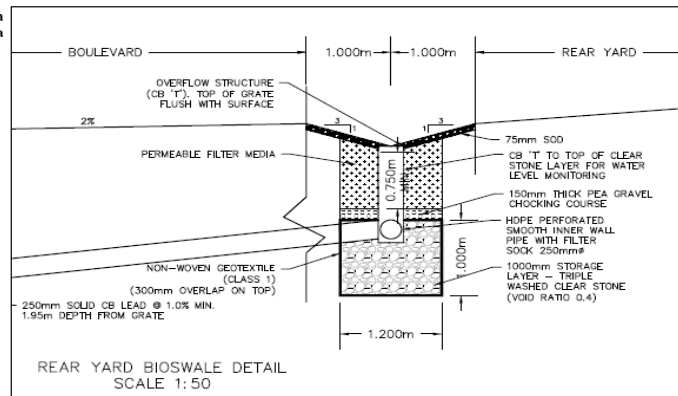
Bioswales with Storage Volume Calculations Based on Infiltration Trench Design Calculations (Based on section 4.5.8 of MOE 2003 SWM Guidelines)

$$A = \frac{1,000V}{P_{nat}\Delta t}$$

Equation 4.3: Infiltration Trench Bottom Area

where A = bottom area of the trench (m²)
 V = runoff volume to be infiltrated (Table 3.2)
 P = percolation rate of surrounding native soil (mm/h)
 n = porosity of the storage media (0.4 for clear stone)
 Δt = retention time (24 to 48 hours)

Storage Volume (cu.m/ha) for Impervious Level				
	35%	55%	70%	85%
Enhanced (80% TSS removal)	25	30	35	40
Normal (70% TSS removal)	20	20	25	30
Basic (60% TSS removal)	20	20	20	20



Subsurface Trench Width = 1.2 m

Soil Infiltration Rate (Paterson PG3062-MEMO.07) = 19 mm/hr

REARYARD AREA L202B

Input	
Drainage Area	= 0.25 ha
Runoff Co-efficient	= 0.55
Roof Area	= 0.13 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 75 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 50%
Required Quality Treatment Volume	= 7.5 m ³ (MECP)
Required 25mm Infiltration Volume	= 31 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 41.1 m ²
Provided Bottom Area of trench	= 90.5 m ²
Infiltration Rate	= 0.5 L/s
Drawdown Time of Quality Treatment Volume	= 4.4 hr
Maximum Subsurface Volume Available, Vss	= 29.4 m ³ rectangular trench

REARYARD AREA L234D

Input	
Drainage Area	= 0.37 ha
Runoff Co-efficient	= 0.57
Roof Area	= 0.20 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 90 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 53%
Required Quality Treatment Volume	= 11.1 m ³ (MECP)
Required 25mm Infiltration Volume	= 49 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 60.9 m ²
Provided Bottom Area of trench	= 108.0 m ²
Infiltration Rate	= 0.6 L/s
Drawdown Time of Quality Treatment Volume	= 5.4 hr
Maximum Subsurface Volume Available, Vss	= 35.1 m ³ rectangular trench

REARYARD AREA L218B

Input	
Drainage Area	= 0.25 ha
Runoff Co-efficient	= 0.45
Roof Area	= 0.09 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 131 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 36%
Required Quality Treatment Volume	= 7.5 m ³ (MECP)
Required 25mm Infiltration Volume	= 22 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 41.1 m ²
Provided Bottom Area of trench	= 157.2 m ²
Infiltration Rate	= 0.8 L/s
Drawdown Time of Quality Treatment Volume	= 2.5 hr
Maximum Subsurface Volume Available, Vss	= 51.0 m ³ rectangular trench

REARYARD AREA L220A

Input	
Drainage Area	= 0.87 ha
Runoff Co-efficient	= 0.44
Roof Area	= 0.30 ha
Level of Treatment	= Enhanced (80% TSS removal)
Storage Media	= 50mm diameter clear stone
Media Porosity, n	= 0.4 typical (range 0.25-0.40)
Percolation Rate	= 19 mm/h
Retention Time	= 24 h
Subdrain size	= 250 mm
Length	= 192 m
Subsurface Trench Width	= 1.2 m
Maximum Depth of Subsurface Trench, dt	= 0.75 m

Calculations

Imperviousness	= 34%
Required Quality Treatment Volume	= 21.75 m ³ (MECP)
Required 25mm Infiltration Volume	= 75 m ³

Bioswale Configuration

Required Bottom Area of trench, A	= 119.2 m ²
Provided Bottom Area of trench	= 230.4 m ²
Infiltration Rate	= 1.2 L/s
Drawdown Time of Quality Treatment Volume	= 5.0 hr
Maximum Subsurface Volume Available, Vss	= 74.8 m ³ rectangular trench

Required 25mm Infiltration Volume = 533 m³
 Maximum Subsurface Volume Available, Vss = 596 m³

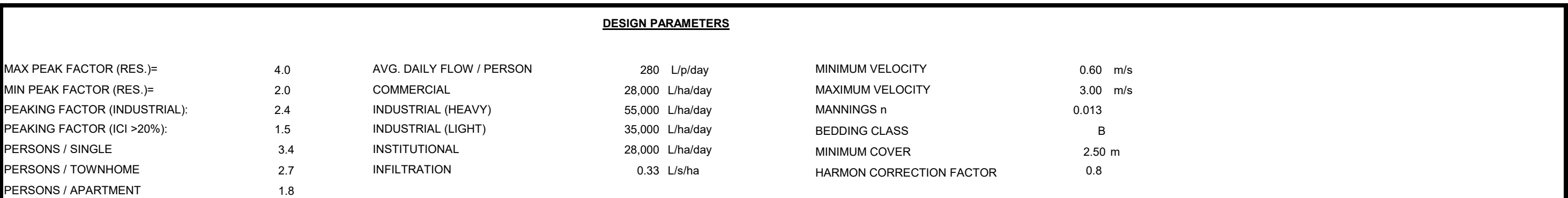
Drainage Area ID	Drainage Area (ha)	Imperviousness (%)	Required Volume for 25mm Event (m ³) ¹	Trench Length (m)	Trench Width (m)	Trench Depth (m)	Maximum Storage Available (m ³)
REARYARD AREA L103C	0.64	40%	64	159	1.2	0.75	62
REARYARD AREA L124B	0.40	33%	33	130	1.2	0.75	50
REARYARD AREA L113B	0.49	31%	39	98	1.2	0.75	38
REARYARD AREA L103D	0.55	37%	51	167	1.2	0.75	65
REARYARD AREA L117C	0.66	37%	61	210	1.2	0.75	82
REARYARD AREA L209C	0.41	39%	40	105	1.2	0.75	41
REARYARD AREA L205B	0.49	36%	44	130	1.2	0.75	51
REARYARD AREA L204C	0.26	39%	25	44	1.2	0.75	17
REARYARD AREA L202B	0.25	50%	31	75	1.2	0.75	29
REARYARD AREA L234D	0.37	53%	49	90	1.2	0.75	35
REARYARD AREA L218B	0.25	36%	22	131	1.2	0.75	51
REARYARD AREA L220A	0.87	34%	75	192	1.2	0.75	75

Total: 533 m³

596 m³

APPENDIX C

Sanitary Calculations and Background



LOCATION			RESIDENTIAL AREA AND POPULATION								COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL	PIPE									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (L/s)	FLOW (L/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)		
			(ha)					(ha)				(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)		
PROPOSED SECOND REGISTRATION PHASE																																			
R64A, EXT-1	64	63	0.17	0	0	0	0	0.17	0	3.80	0.0	13.19	13.19	0.00	0.00	0.00	0.00	1.04	1.04	1.28	1.28	6.9	15.68	15.68	5.2	12.1	87.0	400	PVC	SDR 26	0.19	67.8	17.8%	0.6	0.4
	63	55	0.00	0	0	0	0	0.17	0	3.80	0.0	0.00	13.19	0.00	0.00	0.00	0.00	0.00	1.04	1.28	6.9	0.00	15.68	5.2	12.1	120.0	400	PVC	SDR 26	0.19	67.6	17.9%	0.6	0.4	
R58A I57B, R57A	58	57	0.36	0	8	0	22	0.36	22	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.36	0.36	0.1	0.4	60.6	200	PVC	SDR 35	0.65	27.0	1.4%	0.8	0.3	
	57	56	0.52	0	15	0	41	0.88	62	3.64	0.7	0.00	0.00	0.00	0.00	0.00	0.00	2.95	2.95	0.00	0.00	1.4	3.47	3.83	1.3	3.4	105.5	200	PVC	SDR 35	0.40	21.1	16.2%	0.7	0.4
R62A R61A R60A	62	61	0.17	0	5	0	14	0.17	14	3.72	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.17	0.1	0.2	30.8	200	PVC	SDR 35	0.65	27.0	0.8%	0.8	0.2	
	61	60	0.17	0	3	0	8	0.35	22	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.35	0.1	0.4	11.9	200	PVC	SDR 35	0.50	23.6	1.6%	0.7	0.2		
	60	59	0.80	0	34	0	92	1.15	113	3.58	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.80	1.15	0.4	1.7	117.1	200	PVC	SDR 35	0.50	23.6	7.2%	0.7	0.4		
	59	56	0.00	0	0	0	0	1.15	113	3.58	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.15	0.4	1.7	11.6	200	PVC	SDR 35	0.40	21.1	8.0%	0.7	0.3		
R56A	56	55	0.10	0	1	0	3	2.13	178	3.53	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.95	0.00	0.00	1.4	0.10	5.08	1.7	5.1	49.8	200	PVC	SDR 35	0.40	21.1	24.3%	0.7	0.5
	55	54	0.00	0	0	0	0	2.30	178	3.53	2.0	0.00	13.19	0.00	0.00	0.00	0.00	0.00	3.99	0.00	1.28	8.4	0.00	20.76	6.9	17.2	79.5	400	PVC	SDR 26	0.14	58.7	29.4%	0.6	0.4
R65A	65	54	0.21	0	3	0	8	0.21	8	3.74	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.21	0.21	0.1	0.2	27.3	200	PVC	SDR 35	1.00	33.4	0.5%	1.1	0.2		
R54GA R54FA	54G	54F	0.80	12	16	0	84	0.80	84	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.80	0.3	1.2	119.4	200	PVC	SDR 35	0.35	19.8	6.3%	0.6	0.3		
	54F	54E	0.60	8	7	0	46	1.40	130	3.57	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.60	1.40	0.5	2.0	79.3	200	PVC	SDR 35	0.35	19.8	9.9%	0.6	0.3		
	54E	54	0.00	0	0	0	0	1.40	130	3.57	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.40	0.5	2.0	5.8	200	PVC	SDR 35	0.35	19.8	9.9%	0.6	0.3		
R54DA R54CA R54BA	54D	54C	0.40	0	9	0	24	0.40	24	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.40	0.1	0.4	81.8	200	PVC	SDR 35	0.65	27.0	1.6%	0.8	0.3		
	54C	54B	0.60	0	22	0	59	1.00	84	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.60	1.00	0.3	1.3	76.0	200	PVC	SDR 35	0.35	19.8	6.6%	0.6	0.3		
	54B	54A	0.44	0	13	0	35	1.44	119	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.44	1.44	0.5	1.9	70.2	200	PVC	SDR 35	0.35	19.8	9.4%	0.6	0.3		
	54A	54	0.00	0	0	0	0	1.44	119	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	1.44	0.5	1.9	2.5	200	PVC	SDR 35	0.35	19.8	9.4%	0.6	0.3		
	54	53	0.00	0	0	0	0	5.35	435	3.40	4.8	0.00	13.19	0.00	0.00	0.00	0.00	0.00	3.99	0.00	1.28	8.4	0.00	23.81	7.9	21.0	70.7	400	PVC	SDR 26	0.14	58.2	36.1%	0.6	0.4
	53	52	0.00	0	0	0	0	5.35	435	3.40	4.8	0.00	13.19	0.00	0.00	0.00	0.00	0.00	3.99	0.00	1.28	8.4	0.00	23.81	7.9	21.0	76.0	400	PVC	SDR 26	0.14	58.2	36.1%	0.6	0.4
	52	35	0.00	0	0	0	0	5.35	435	3.40	4.8	0.00	13.19	0.00	0.00	0.00	0.00	0.00	3.99	0.00	1.28	8.4	0.00	23.81	7.9	21.0	104.6	400	PVC	SDR 26	0.14	58.2	36.1%	0.6	0.4
R51A R50A R49A R82A R81A, R81B¹ R80A	51	50	0.18	0	4	0	11	0.18	11	3.73	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.18	0.1	0.2	39.8	200	PVC	SDR 35	0.65	27.0	0.7%	0.8	0.2		
	50	49	0.19	0	5	0	14	0.37	24	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.37	0.1	0.4	36.5	200	PVC	SDR 35	0.65	27.0	1.5%	0.8	0.3		
	49	82	0.09	0	0	0	0	0.46	24	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.46	0.2	0.4	49.9	200	PVC	SDR 35	0.40	21.1	2.1%	0.7	0.2		
	82	81	0.03	0	0	0	0	0.49	24	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.49	0.2	0.5	11.5	200	PVC	SDR 35	0.40	21.1	2.1%	0.7	0.2		
	81	80	2.73	0	237	0	641	3.22	665	3.33	7.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	2.73	3.22	1.1	8.2	91.9	200	PVC	SDR 35	0.40	21.1	38.9%	0.7	0.5		
R48A R47A R46A R45A	80	44	0.24	0	10	0	27	3.46	692	3.32	7.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.24	3.46	1.1	8.6	80.4	200	PVC	SDR 35	0.40	21.1	40.6%	0.7	0.5		
	48	47	0.45	0	19	0	51	0.45	51	3.65	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.45	0.1	0.8	80.9	200	PVC	SDR 35	0.40	21.1	3.6%	0.7	0.3		
	47	46	0.54	0	22	0	59	0.99	111	3.58	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.54	0.99	0.3	1.6	80.2	200	PVC	SDR 35	0.40	21.1	7.6%	0.7	0.3		
	46	45	0.22	0	4	0	11	1.21	122	3.58	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.22	1.21	0.4	1.8	14.3	200	PVC	SDR 35	0.40	21.1	8.5%	0.7	0.3		
	45	44	0.20	0	6	0	16	1.41	138	3.56	1.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	1.41	0.5	2.1	38.6	200	PVC	SDR 35	0.40	21.1	9.7%	0.7	0.3		
R44A R43A R42A R41A, R41B R40A	44	43	0.44	0	13	0	35	5.31	865	3.27	9.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.44	5.31	1.8	10.9	91.4	200	PVC	SDR 35	0.40	21.1	51.7%	0.7	0.6		
	43	42	0.09	0	2	0	5	5.39	870	3.27	9.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	5.39	1.8	11.0	11.7	200	PVC	SDR 35	0.40	21.1	52.0%	0.7	0.6		
	42	41	0.31	0	9	0	24	5.70	895	3.26	9.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.31	5.70	1.9	11.3	75.4	200	PVC	SDR 35	0.40	21.1	53.7%	0.7	0.6		
	41	40	0.62	0	11	0	30	6.32	924	3.26	9.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.62	6.32	2.1	11.8	85.4	200	PVC	SDR 35	0.40	21.1	56.0%	0.7	0.6		
	40	39	0.35	0	10	0	27	6.67	951	3.25	10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.35	6.67	2.2	12.2	63.2	200	PVC	SDR 35	0.40	21.1	57.8%	0.7	0.6		



SUBDIVISION:
Richcraft Kanata West Subdivision
Second Registration Phase
DATE: 6/24/2025
REVISION: 6
DESIGNED BY: WAJ
CHECKED BY: MN

SANITARY SEWER
DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401393

DESIGN PARAMETERS			
MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 L/p/day
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 L/ha/day
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 L/ha/day
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 L/ha/day
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 L/ha/day
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 L/s/ha
PERSONS / APARTMENT	1.8		
		MINIMUM VELOCITY	0.60 m/s
		MAXIMUM VELOCITY	3.00 m/s
		MANNINGS n	0.013
		BEDDING CLASS	B
		MINIMUM COVER	2.50 m
		HARMON CORRECTION FACTOR	0.8

LOCATION			RESIDENTIAL AREA AND POPULATION								COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL	PIPE									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (L/s)	(L/s)	(m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)		
R39BA	39B	39A	0.49	0	13	0	35	0.49	35	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.49	0.2	0.6	65.2	200	PVC	SDR 35	0.35	19.8	2.9%	0.6	0.2		
	39A	39	0.00	0	0	0	0	0.49	35	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.49	0.2	0.6	3.4	200	PVC	SDR 35	0.35	19.8	2.9%	0.6	0.2		
	39	35	0.00	0	0	0	0	7.16	987	3.24	10.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	7.16	2.4	12.7	79.5	200	PVC	SDR 35	0.40	21.1	60.2%	0.7	0.6		
R38A	38	37	0.08	0	2	0	5	0.08	5	3.75	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.1	12.6	200	PVC	SDR 35	0.65	27.0	0.3%	0.8	0.2		
R37A	37	36	0.78	0	26	0	70	0.86	76	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.78	0.86	0.3	1.2	99.3	200	PVC	SDR 35	0.40	21.1	5.5%	0.7	0.3		
R36A	36	35	0.63	0	21	0	57	1.49	132	3.57	1.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.63	1.49	0.5	2.0	110.3	200	PVC	SDR 35	0.40	21.2	9.6%	0.7	0.3		
R70A	70	69	0.28	5	0	0	17	0.28	17	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.28	0.1	0.3	61.5	200	PVC	SDR 35	0.32	18.9	1.6%	0.6	0.2		
R69A	69	68	0.10	2	0	0	7	0.38	24	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.38	0.1	0.4	12.5	200	PVC	SDR 35	0.32	18.9	2.2%	0.6	0.2		
R68A, R68B¹	68	67	1.69	7	122	0	353	2.07	377	3.43	4.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.69	2.07	0.7	4.9	77.8	200	PVC	SDR 35	0.32	18.9	25.7%	0.6	0.4		
R67A, G67A	67	66	0.53	10	0	0	34	2.60	411	3.41	4.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.50	3.57	1.2	5.7	106.9	200	PVC	SDR 35	0.32	18.9	30.3%	0.6	0.4		
R66A	66	21	0.13	1	0	0	3	2.73	414	3.41	4.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.13	3.70	1.2	5.8	50.9	200	PVC	SDR 35	0.32	18.9	30.7%	0.6	0.4		
R21A	21	20	0.31	0	6	0	16	3.04	431	3.41	4.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.31	4.01	1.3	6.1	62.2	200	PVC	SDR 35	0.32	18.9	32.1%	0.6	0.4		
APPROVED FIRST REGISTRATION PHASE																																			
R8A	8	7	0.42	0	14	0	38	0.42	38	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.42	0.1	0.6	110.7	200	PVC	SDR 35	1.00	33.4	1.8%	1.1	0.3		
R13A	13	12	0.28	0	5	0	14	0.28	14	3.72	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.28	0.1	0.3	38.9	200	PVC	SDR 35	0.65	27.0	0.9%	0.8	0.2		
R12A	12	11	0.10	0	1	0	3	0.38	16	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.38	0.1	0.3	16.8	200	PVC	SDR 35	0.62	26.3	1.2%	0.83	0.24		
R11A	11	10	0.58	0	24	0	65	0.96	81	3.61	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.96	0.3	1.3	112.4	200	PVC	SDR 35	0.50	23.6	5.4%	0.74	0.33		
R10A	10	9	0.22	0	4	0	11	1.18	92	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.22	1.18	0.4	1.5	15.3	200	PVC	SDR 35	0.50	23.6	6.2%	0.74	0.34		
R9A	9	7	0.19	0	6	0	16	1.37	108	3.59	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	1.37	0.5	1.7	37.9	200	PVC	SDR 35	0.50	23.6	7.2%	0.74	0.36		
G7A, R7A	7	6	0.45	0	12	0	32	2.24	178	3.53	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.49	0.0	0.93	2.73	0.9	2.9	92.3	200	PVC	SDR 35	0.50	23.6	12.4%	0.74	0.42		
R6A	6	5	0.03	0	0	0	0	2.27	178	3.53	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.0	0.03	2.76	0.9	3.0	12.1	200	PVC	SDR 35	0.50	23.6	12.5%	0.74	0.42		
R5A	5	4	0.25	0	6	0	16	2.53	194	3.52	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.0	0.25	3.01	1.0	3.2	71.2	200	PVC	SDR 35	0.50	23.6	13.6%	0.74	0.43		
R4A, R4B¹	4	3	0.94	0	33	0	89	3.47	284	3.47	3.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.0	0.94	3.95	1.3	4.5	51.6	200	PVC	SDR 35	0.50	23.7	19.0%	0.74	0.48		
R33A	33	30	0.41	0	17	0	46	0.41	46	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.41	0.1	0.7	63.6	200	PVC	SDR 35	0.40	21.1	3.2%	0.67	0.25		
R30A	30	27	0.42	0	17	0	46	0.83	92	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.83	0.3	1.3	79.4	200	PVC	SDR 35	0.40	21.1	6.4%	0.67	0.31		
R27A	27	22	0.20	0	5	0	14	1.02	105	3.59	1.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.20	1.02	0.3	1.6	51.7	200	PVC	SDR 35	0.40	21.1	7.4%	0.67	0.32		
	35	35A	0.00	0	0	0	0	14.00	1554	3.13	15.8	0.00	13.19	0.00	0.00	0.00	0.00	3.99	1.28	8.4	0.00	32.46	10.7	34.8	68.7	400	PVC	SDR 35	0.34	90.7	38.4%	0.86	0.68		
	35A	22	0.00	0	0	0	0	14.00	1554	3.13	15.8	0.00	13.19	0.00	0.00	0.00	0.00	3.99	1.28	8.4	0.00	32.46	10.7	34.8	81.6	375	PVC	SDR 35	0.14	60.7	57.4%	0.58	0.51		
R26A	26	25	0.50	0	21	0	57	0.50	57	3.64	0.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.50	0.2	0.8	81.2	200	PVC	SDR 35	0.40	21.1	3.9%	0.67	0.27		
R25A	25	24	0.32	0	11	0	30	0.82	86	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.32	0.82	0.3	1.3	41.9	200	PVC	SDR 35	0.40	21.2	6.0%	0.67	0.30		
R24A	24	23	0.15	0	3	0	8	0.97	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.97	0.3	1.4	11.4	200	PVC	SDR 35	0.40	21.1	6.7%	0.67	0.31		
R23A	23	22	0.19	0	5	0	14	1.16	108	3.59	1.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	1.16	0.4	1.6	44.3	200	PVC	SDR 35	0.40	21.1	7.7%	0.67	0.33		
R22BA	22B	22A	0.71	0	35	0	95	0.71	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.71	0.71	0.2	1.3	120.0	200	PVC								

Appendix C1: Sanitary Sewer Design Sheet

			SUBDIVISION:				SANITARY INFLOWS FOR CATASTROPHIC HGL ANALYSIS				Annual Parameters as per Technical Bulletin ISTB-2018-01								
			Richcraft Kanata West Subdivision Second Registration Phase								*Harmon Correction Factor of 0.8 MAX PEAK FACTOR (RES.)= 4.0 MIN PEAK FACTOR (RES.)= 2.0 PEAKING FACTOR (INDUSTRIAL): 1.0 PEAKING FACTOR (COMM., INST.): 1.0 PERSONS / SINGLE 3.4 PERSONS / TOWNHOME 2.7 PERSONS / APARTMENT 1.8 AVG. DAILY FLOW / PERSON 200 L/p/day COMMERCIAL 17,000 L/ha/day INDUSTRIAL (HEAVY) 55,000 L/ha/day INDUSTRIAL (LIGHT) 10,000 L/ha/day INSTITUTIONAL 17,000 L/ha/day INFILTRATION 0.30 L/s/ha 1st REGISTRATION MED. DENSITY RESIDENTIAL POP. ⁷ 38 units/ha 2nd REGISTRATIONMED. DENSITY RESIDENTIAL POP. ⁷ 93 units/ha								
			DATE: 9/24/2025 REVISION: 6 DESIGNED BY: WAJ CHECKED BY: MN																
				FILE NUMBER: 160401393															
LOCATION			RESIDENTIAL AREA AND POPULATION							COMMERCIAL	INDUSTRIAL (L)	INDUSTRIAL (H)	INSTITUTIONAL	GREEN / UNUSED	C+H		INFILTRATION		TOTAL
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA SINGLE	UNITS TOWN	APT	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	INFILT. FLOW (L/s)	FLOW		
R64A, EXT-1	64	63	0.17	0	0	0	3.10	0.0	13.19	0.00	0.00	1.04	1.28	2.8	15.68	4.7	7.5		
R58A	58	57	0.36	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.0	0.36	0.1	0.3		
I57B, R57A	57	56	0.52	0	15	0	41	3.00	0.3	0.00	0.00	0.00	2.95	0.00	0.6	3.47	1.0	1.9	
R62A	62	61	0.17	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.1	
R61A	61	60	0.17	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.1	
R60A	60	59	0.80	0	34	0	92	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.2	0.9	
R56A	56	55	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.05	
R65A	65	54	0.21	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.21	0.1	0.1	
R54GA	54G	54F	0.80	12	16	0	84	2.96	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.2	0.8	
R54FA	54F	54E	0.60	8	7	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.2	0.5	
R54DA	54D	54C	0.40	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.1	0.3	
R54CA	54C	54B	0.60	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.2	0.6	
R54BA	54B	54A	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.1	0.4	
R51A	51	50	0.18	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.1	0.1	
R50A	50	49	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2	
R49A	49	82	0.09	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.03	
R82A	82	81	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.01	
R81A, R81B	81	80	2.73	0	237	0	641	2.75	4.1	0.00	0.00	0.00	0.00	0.00	0.0	2.73	0.8	4.9	
R80A	80	44	0.24	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.24	0.1	0.3	
R48A	48	47	0.45	0	19	0	51	2.99	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.1	0.5	
R47A	47	46	0.54	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.54	0.2	0.6	
R46A	46	45	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.1	
R45A	45	44	0.20	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.2	
R44A	44	43	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.1	0.4	
R43A	43	42	0.09	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.1	
R42A	42	41	0.31	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.1	0.3	
R41A, R41B	41	40	0.62	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.62	0.2	0.4	
R40A	40	39	0.35	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.35	0.1	0.3	
R39BA	39B	39A	0.49	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.1	0.4	
R38A	38	37	0.08	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.0	0.1	
R37A	37	36	0.78	0	26	0	70	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.78	0.2	0.7	
R36A	36	35	0.63	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.63	0.2	0.6	
R70A	70	69	0.28	5	0	0	17	3.03	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.1	0.2	
R69A	69	68	0.10	2	0	0	7	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.1	
R68A, R68B1	68	67	1.69	7	122	0	353	2.83	2.3	0.00	0.00	0.00	0.00	0.00	0.0	1.69	0.5	2.8	
R67A, G67A	67	66	0.53	10	0	0	34	3.01	0.2	0.00	0.00	0.00	0.00	0.97	0.0	1.50	0.5	0.7	
R66A	66	21	0.13	1	0	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.0	0.1	
R21A	21	20	0.31	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.1	0.2	
APPROVED FIRST REGISTRATION PHASE																			
R8A	8	7	0.42	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.1	0.4	
R13A	13	12	0.28	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.1	0.2	
R12A	12	11	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.0	
R11A	11	10	0.58	0	24	0	65	2.97	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.2	0.6	
R10A	10	9	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.1	
R9A	9	7	0.19	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2	
G7A, R7A	7	6	0.45	0	12	0	32	3.01	0.2	0.00	0.00	0.00	0.00	0.49	0.0	0.93	0.3	0.5	
R6A	6	5	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.0	
R5A	5	4	0.25	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.1	0.2	
R4A, R4B1	4	3	0.94	0	33	0	89	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.94	0.3	0.9	
R33A	33	30	0.41	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.1	0.4	
R30A	30	27	0.42	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.1	0.4	
R27A	27	22	0.20	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.2	
R26A	26	25	0.50	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.1	0.5	
R25A	25	24	0.32	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.32	0.1	0.3	
R24A	24	23	0.15	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.0	0.1	
R23A	23	22	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2	
R22BA	22B	22A	0.71	0	35	0	95	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.71	0.2	0.9	
R22AA	22A	22	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.0	

R22A	22	3	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.0	0.0
R32A	32	31	0.82	0	27	0	73	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.82	0.2	0.7
R31A	31	20A	0.57	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.57	0.2	0.5
R20A	20	19	0.23	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.23	0.1	0.2
R19A	19	18	0.11	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.11	0.0	0.1
R27B	27	18A	0.65	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.65	0.2	0.6
R18AA	18A	18B	0.58	0	18	0	49	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.2	0.5
R17BA	17B	17A	0.33	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.33	0.1	0.3
R17A	17	16	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.0
C14B	14	3	0.00	0	0	0	0	3.10	0.0	1.47	0.00	0.00	0.00	0.00	0.3	1.47	0.4	0.7
R3CA	3C	3B	0.45	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.1	0.3
R3BA	3B	3A	0.50	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.1	0.4
R3A	3	2	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.0	0.0
R2A	2	1A	0.14	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.0	0.0
Stittsville Trunk ¹	1A	1B	526.60	0	0	0	28031	2.00	129.8	76.00	40.50	0.00	0.00	0.00	19.6	643.10	192.9	583.0
Stittsville Interceptor (Kizell Lands)	1A	1B	52.56	0	0	0	3585	2.43	20.1	11.82	0.00	0.00	0.00	0.00	2.3	64.38	19.3	41.8
Huntmar and Hazeldean ²	1A	1B	111.52	0	0	0	6357	2.29	33.7	65.44	0.00	0.00	0.00	0.00	12.9	191.09	57.3	103.9
Additional Hazeldean ⁶	1A	1B	13.62	0	0	0	296	2.85	2.0	5.39	0.00	0.00	0.00	0.00	1.1	19.01	5.7	8.7
Mattamy Maple Grove Sewer	1A	1B	137.54	0	0	0	10501	2.16	52.5	0.00	0.00	0.00	0.00	0.00	0.0	137.54	41.3	93.8
Maple Grove Expansion ³	1A	1B	84.43	657	409	117	3549	2.43	19.9	0.00	0.00	0.00	0.00	0.00	0.0	75.99	22.8	42.9
Future Noth south collector ⁴	1B	1C	28.44	0	0	0	4936	2.35	26.9	165.28	0.00	0.00	0.00	0.00	32.5	193.72	58.1	147.5
North of Richcraft Kanata Site ⁵	1B	1C	1.10	0	42	0	113	2.94	0.8	0.00	0.00	0.00	0.00	0.00	0.0	1.10	0.3	1.1
4510210291172.091060.83																		

1. Stittsville trunk sewer annual peak flows equal approximately 342 L/s. However, peak flows equal to 583L/s, 360 L/s and 465 L/s have been assumed for Scenarios 1, 2 and 3 respectively as per the design peak flows obtained by JL Richards and the IMP assumptions made for ultimate and interim conditions respectively.

2. Population and areas as obtained from Huntmar/Hazeldean Design Sheet based on KWMSS assumptions for areas 16, 20, 17, 21, 19A, 23, 24 and 19

3. Maple Grove expansion number of units and gross area based on spreadsheet provided by the City, with 90% of gross area contributing to I/I and 198 employees generating 83L/emp/day added to total flow

4. Future north-south collector population and are estimates based on IBI spreadsheet provided by the City. It includes a 30L/s fixed flow

5. Future medium density residential area, assumed to have 38 units/ha and 2.7person/unit

6. Additional area from existing residential and commercial developments along Hazeldean between Hartin Street and Savage Drive were included in Novemnr 2017 (see Atrcl correspondence)



SUBDIVISION:
**Richcraft Kanata West Subdivision
Second Registration Phase**

DATE: 9/24/2025
REVISION: 6
DESIGNED BY: WAJ
CHECKED BY: MN

**SANITARY INFLOWS FOR
NORMAL HGL ANALYSIS**

FILE NUMBER: 160401393

Annual Parameters as per Technical Bulletin ISTB-2018-01

*Harmon Correction Factor of 0.8

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	200 L/p/day
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	17,000 L/ha/day
PEAKING FACTOR (INDUSTRIAL):	1.0	INDUSTRIAL (HEAVY)	55,000 L/ha/day
PEAKING FACTOR (COMM., INST.):	1.0	INDUSTRIAL (LIGHT)	10,000 L/ha/day
PERSONS / SINGLE	3.4	INSTITUTIONAL	17,000 L/ha/day
PERSONS / TOWNHOME	2.7	INFILTRATION	0.55 L/s/ha
PERSONS / APARTMENT	1.8	1st REGISTRATION MED. DENSITY RESIDENTIAL POP. ⁷	38 units/ha
		2nd REGISTRATIONMED. DENSITY RESIDENTIAL POP. ⁷	93 units/ha

LOCATION			RESIDENTIAL AREA AND POPULATION							COMMERCIAL	INDUSTRIAL (L)	INDUSTRIAL (H)	INSTITUTIONAL	GREEN / UNUSED	C+H	INFILTRATION		TOTAL
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	INFILT. FLOW (L/s)	FLOW (L/s)
R64A, EXT-1	64	63	0.17	0	0	0	0	3.10	0.0	13.19	0.00	0.00	1.04	1.28	2.8	15.68	8.6	11.426521
R58A	58	57	0.36	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.36	0.2	0.349446
I57B, R57A	57	56	0.52	0	15	0	41	3.00	0.3	0.00	0.00	0.00	2.95	0.00	0.6	3.47	1.9	2.769042
R62A	62	61	0.17	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.191165
R61A	61	60	0.17	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.151945
R60A	60	59	0.80	0	34	0	92	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.4	1.067328
R56A	56	55	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.074207
R65A	65	54	0.21	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.21	0.1	0.173489
R54GA	54G	54F	0.80	12	16	0	84	2.96	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.4	1.012792
R54FA	54F	54E	0.60	8	7	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.3	0.649394
R54DA	54D	54C	0.40	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.2	0.389529
R54CA	54C	54B	0.60	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.3	0.740076
R54BA	54B	54A	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.2	0.486241
R51A	51	50	0.18	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.1	0.175438
R50A	50	49	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.197640
R49A	49	82	0.09	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.049500
R82A	82	81	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.016500
R81A, R81B	81	80	2.73	0	237	0	641	2.75	4.1	0.00	0.00	0.00	0.00	0.00	0.0	2.73	1.5	5.581579
R80A	80	44	0.24	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.24	0.1	0.320571
R48A	48	47	0.45	0	19	0	51	2.99	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.2	0.602261
R47A	47	46	0.54	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.54	0.3	0.706667
R46A	46	45	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.196502
R45A	45	44	0.20	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.223821
R44A	44	43	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.2	0.486241
R43A	43	42	0.09	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.086167
R42A	42	41	0.31	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.2	0.340092
R41A, R41B	41	40	0.62	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.62	0.3	0.545762
R40A	40	39	0.35	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.35	0.2	0.381071
R39BA	39B	39A	0.49	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.3	0.512749
R38A	38	37	0.08	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.0	0.081004
R37A	37	36	0.78	0	26	0	70	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.78	0.4	0.913751
R36A	36	35	0.63	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.63	0.3	0.737732
R70A	70	69	0.28	5	0	0	17	3.03	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.2	0.273382
R69A	69	68	0.10	2	0	0	7	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.103129
R68A, R68B	68	67	1.69	7	122	0	353	2.83	2.3	0.00	0.00	0.00	0.00	0.00	0.0	1.69	0.9	3.241938
R67A, G67A	67	66	0.53	10	0	0	34	3.01	0.2	0.00	0.00	0.00	0.00	0.97	0.0	1.50	0.8	1.062579
R66A	66	21	0.13	1	0	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.1	0.094206
R21A	21	20	0.31	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.2	0.286349
APPROVED FIRST REGISTRATION PHASE																		
R8A	8	7	0.42	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.2	0.494986
R13A	13	12	0.28	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.2	0.247742
R12A	12	11	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.075320
R11A	11	10	0.58	0	24	0	65	2.97	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.3	0.767444
R10A	10	9	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.197121
R9A	9	7	0.19	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.218257
G7A, R7A	7	6	0.45	0	12	0	32	3.01	0.2	0.00	0.00	0.00	0.00	0.49	0.0	0.93	0.5	0.738674
R6A	6	5	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.016282
R5A	5	4	0.25	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.1	0.253670
R4A, R4B	4	3	0.94	0	33	0	89	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.94	0.5	1.126653
R33A	33	30	0.41	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.2	0.543710
R30A	30	27	0.42	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.2	0.546444
R27A	27	22	0.20	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.204332
R26A	26	25	0.50	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.3	0.665901
R25A	25	24	0.32	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.32	0.2	0.381004
R24A	24	23	0.15	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.1	0.142454
R23A	23	22	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.197411
R22BA	22B	22A	0.71	0	35	0	95	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.71	0.4	1.038333
R22AA	22A	22	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.010368

R22A	22	3	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.1	0.086909
R32A	32	31	0.82	0	27	0	73	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.82	0.5	0.951290
R31A	31	20A	0.57	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.57	0.3	0.629252
R20A	20	19	0.23	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.23	0.1	0.223028
R19A	19	18	0.11	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.11	0.1	0.097522
R27B	27	18A	0.65	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.65	0.4	0.769465
R18AA	18A	18B	0.58	0	18	0	49	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.3	0.657757
R17BA	17B	17A	0.33	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.33	0.2	0.332977
R17A	17	16	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.008633
C14B	14	3	0.00	0	0	0	0	3.10	0.0	1.47	0.00	0.00	0.00	0.00	0.3	1.47	0.8	1.095582
R3CA	3C	3B	0.45	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.2	0.456848
R3BA	3B	3A	0.50	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.3	0.536400
R3A	3	2	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.1	0.089911
R2A	2	1A	0.14	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.1	0.075153
Stittsville Trunk ¹	1A	1B	526.60	0	0	0	28031	2.00	129.8	76.00	40.50	0.00	0.00	0.00	19.6	643.10	353.7	503.1
Stittsville Interceptor (Kizell Lands)	1A	1B	52.56	0	0	0	3585	2.43	20.1	11.82	0.00	0.00	0.00	0.00	2.3	64.38	35.4	57.9
Huntmar and Hazeldean ²	1A	1B	111.52	0	0	0	6357	2.29	33.7	65.44	0.00	0.00	0.00	0.00	12.9	191.09	105.1	151.6
Additional Hazeldean ⁶	1A	1B	13.62	0	0	0	296	2.85	2.0	5.39	0.00	0.00	0.00	0.00	1.1	19.01	10.5	13.5
Mattamy Maple Grove Sewer	1A	1B	137.54	0	0	0	10501	2.16	52.5	0.00	0.00	0.00	0.00	0.00	0.0	137.54	75.6	128.2
Maple Grove Expansion ³	1A	1B	84.43	657	409	117	3549	2.43	19.9	0.00	0.00	0.00	0.00	0.00	0.0	75.99	41.8	61.9
Future Noth south collector ⁴	1B	1C	28.44	0	0	0	4936	2.35	26.9	165.28	0.00	0.00	0.00	0.00	32.5	193.72	106.5	195.9
North of Richcraft Kanata Site ⁵	1B	1C	1.10	0	42	0	113	2.94	0.8	0.00	0.00	0.00	0.00	0.00	0.0	1.10	0.6	1.4
															72.09			1164.0

1. Stittsville trunk sewer rare peak flows equal approximately 503 L/s, while design peak flows of 583L/s were obtained by JL Richards.
2. Population and areas as obtained from Huntmar/Hazeldean Design Sheet based on KWMSS assumptions for areas 16, 20, 17, 21, 19A, 23, 24 and 19
3. Maple Grove expansion number of units and gross area based on spreadsheet provided by the City, with 90% of gross area contributing to I/I and 198 employees generating 83L/emp/day added to total flow
4. Future north-south collector population and are estimates based on IBI spreadsheet provided by the City. It includes a 30L/s fixed flow
5. Future medium density residential area, assumed to have 38 units/ha and 2.7person/unit
6. Additional area from existing residential and commercial developments along Hazeldean between Hartin Street and Savage Drive were included in Novemenr 2017 (see Atrcl correspondence)
7. In the 1st registration a unit density of 38 units/ha was used for the medium density residential block (R4B). Based on a revised concept plan for R44B the unit density for the 2nd registration was revised to approximately 93 units/hectare. This unit density was used for both medium density residential blocks (R44B and R68B).

CATASTROPHOC FAILURE OF KWPS ASSUMING										
BC= 95.20 Stittsville= 583 L/s Scenario 1					BC= 95.20 Stittsville= 360 L/s Scenario 2		BC= 95.20 Stittsville= 465 L/s Scenario 3		BC= 95.06 Stittsville= 583 L/s Scenario 4	
San MH	Rim Elev.	Prop. USF (m)	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE
10	99.43	97.51	96.32	1.19	96.32	1.19	96.32	1.19	96.32	1.19
11	100.75	97.69	96.90	0.79	96.9	0.79	96.9	0.79	96.9	0.79
12	100.60	98.50	97.04	1.46	97.04	1.46	97.04	1.46	97.04	1.46
13	100.23	98.46	97.30	1.16	97.3	1.16	97.3	1.16	97.3	1.16
14	97.61	N/A	95.42	-	95.36	-	95.39	-	95.28	-
16	97.35	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17	97.29	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17A	97.32	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17B	97.37	95.68	95.44	0.24	95.38	0.30	95.4	0.28	95.3	0.38
18	97.17	N/A	95.45	-	95.38	-	95.41	-	95.31	-
18A	97.65	95.69	95.44	0.25	95.38	0.31	95.41	0.28	95.3	0.39
18B	97.09	N/A	95.44	-	95.38	-	95.41	-	95.3	-
19	97.43	95.63	95.45	0.18	95.39	0.24	95.42	0.21	95.31	0.32
1A	96.22	N/A	95.35	-	95.29	-	95.32	-	95.21	-
1B	96.60	N/A	95.31	-	95.27	-	95.29	-	95.17	-
1C	95.30	N/A	95.24	-	95.22	-	95.23	-	95.1	-
2	97.46	N/A	95.37	-	95.31	-	95.33	-	95.23	-
20	97.50	95.63	95.47	0.16	95.41	0.22	95.44	0.19	95.33	0.30
20A	97.37	N/A	95.47	-	95.41	-	95.44	-	95.33	-
21	97.48	95.78	95.48	0.30	95.42	0.36	95.44	0.34	95.34	0.44
22	97.96	N/A	95.42	-	95.36	-	95.39	-	95.28	-
22A	97.83	96.10	95.42	0.68	95.36	0.74	95.39	0.71	95.28	0.82
22B	97.81	96.10	95.43	0.67	95.37	0.73	95.39	0.71	95.29	0.81
23	98.10	96.54	95.43	1.11	95.37	1.17	95.39	1.15	95.29	1.25
24	98.05	96.62	95.43	1.19	95.37	1.25	95.39	1.23	95.29	1.33
25	98.00	96.30	95.43	0.87	95.37	0.93	95.39	0.91	95.29	1.01
26	98.10	96.34	95.43	0.91	95.37	0.97	95.39	0.95	95.29	1.05
27	97.92	95.75	95.43	0.32	95.37	0.38	95.4	0.35	95.29	0.46
3	97.89	N/A	95.40	-	95.34	-	95.37	-	95.26	-
30	98.01	95.90	95.43	0.47	95.37	0.53	95.4	0.50	95.29	0.61
31	97.52	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
32	97.68	95.90	95.47	0.43	95.41	0.49	95.44	0.46	95.33	0.57
33	97.62	96.00	95.43	0.57	95.37	0.63	95.4	0.60	95.29	0.71
35	97.97	N/A	95.45	-	95.39	-	95.42	-	95.31	-
35A	97.94	96.10	95.44	0.66	95.38	0.72	95.41	0.69	95.3	0.80
36	98.67	96.52	95.73	0.79	95.73	0.79	95.73	0.79	95.73	0.79
37	99.34	97.12	96.39	0.73	96.39	0.73	96.39	0.73	96.39	0.73
38	99.55	97.79	96.57	1.22	96.57	1.22	96.57	1.22	96.57	1.22
39	98.03	N/A	95.51	-	95.45	-	95.48	-	95.37	-
39A	97.97	96.36	95.51	0.85	95.45	0.91	95.48	0.88	95.37	0.99
39B	98.01	96.22	95.51	0.71	95.45	0.77	95.48	0.74	95.37	0.85
3A	97.75	N/A	95.40	-	95.34	-	95.37	-	95.26	-
3B	97.66	95.79	95.40	0.39	95.34	0.45	95.37	0.42	95.26	0.53
3C	97.53	95.74	95.40	0.34	95.34	0.40	95.37	0.37	95.26	0.48
4	98.19	96.40	95.41	0.99	95.35	1.05	95.37	1.03	95.27	1.13
40	98.10	96.36	95.56	0.80	95.5	0.86	95.53	0.83	95.42	0.94
41	98.38	96.39	95.61	0.78	95.55	0.84	95.57	0.82	95.47	0.92
42	99.25	97.19	95.65	1.54	95.59	1.60	95.62	1.57	95.51	1.68
43	99.19	97.48	95.66	1.82	95.6	1.88	95.63	1.85	95.52	1.96
44	99.85	97.66	95.71	1.95	95.7	1.96	95.7	1.96	95.7	1.96
45	100.27	98.34	95.97	2.37	95.97	2.37	95.97	2.37	95.97	2.37
46	100.27	98.29	96.06	2.23	96.06	2.23	96.06	2.23	96.06	2.23

47	100.49	98.14	96.41	1.73	96.41	1.73	96.41	1.73	96.41	1.73
48	100.46	98.35	96.73	1.62	96.73	1.62	96.73	1.62	96.73	1.62
49	100.59	N/A	96.71	-	96.71	-	96.71	-	96.71	-
5	98.63	96.68	95.43	1.25	95.43	1.25	95.43	1.25	95.43	1.25
50	100.41	98.55	96.96	1.59	96.96	1.59	96.96	1.59	96.96	1.59
51	100.21	98.48	97.23	1.25	97.23	1.25	97.23	1.25	97.23	1.25
52	97.61	N/A	95.46	-	95.4	-	95.43	-	95.32	-
53	97.65	N/A	95.46	-	95.4	-	95.43	-	95.32	-
54	97.63	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54A	97.67	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54B	97.70	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54C	97.66	95.94	95.47	0.47	95.41	0.53	95.44	0.50	95.33	0.61
54D	97.69	95.95	95.47	0.48	95.41	0.54	95.44	0.51	95.33	0.62
54E	97.54	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54F	98.10	95.84	95.47	0.37	95.41	0.43	95.44	0.40	95.33	0.51
54G	98.17	95.95	95.50	0.45	95.5	0.45	95.5	0.45	95.5	0.45
55	98.09	N/A	95.47	-	95.41	-	95.44	-	95.33	-
56	98.16	96.32	95.48	0.84	95.42	0.90	95.44	0.88	95.34	0.98
57	98.13	96.38	95.48	0.90	95.42	0.96	95.45	0.93	95.34	1.04
58	98.24	96.26	95.55	0.71	95.55	0.71	95.55	0.71	95.55	0.71
59	97.99	N/A	95.48	-	95.42	-	95.44	-	95.34	-
6	98.67	N/A	95.52	-	95.52	-	95.52	-	95.52	-
60	98.23	96.14	95.48	0.66	95.42	0.72	95.45	0.69	95.34	0.80
61	98.13	96.39	95.48	0.91	95.42	0.97	95.45	0.94	95.34	1.05
62	97.95	96.59	95.48	1.11	95.42	1.17	95.45	1.14	95.34	1.25
63	98.15	N/A	95.48	-	95.42	-	95.45	-	95.34	-
64	97.29	N/A	95.49	-	95.43	-	95.45	-	95.35	-
65	97.56	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
66	97.47	95.60	95.49	0.11	95.43	0.17	95.45	0.15	95.35	0.25
67	97.58	95.60	95.50	0.10	95.44	0.16	95.47	0.13	95.36	0.24
68	97.49	95.85	95.51	0.34	95.45	0.40	95.47	0.38	95.37	0.48
69	97.56	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
7	99.11	96.99	96.01	0.98	96.01	0.98	96.01	0.98	96.01	0.98
70	97.95	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
8	100.21	97.69	97.18	0.51	97.18	0.51	97.18	0.51	97.18	0.51
80	100.15	98.14	96.08	2.06	96.08	2.06	96.08	2.06	96.08	2.06
81	100.28	98.35	96.45	1.90	96.45	1.90	96.45	1.90	96.45	1.90
82	100.35	N/A	96.47	-	96.47	-	96.47	-	96.47	-
9	99.23	97.44	96.21	1.23	96.21	1.23	96.21	1.23	96.21	1.23

KWPS UNDER NORMAL OPERATING CONDITIONS - RARE EVENT FLOW PARAMETERS				
San MH	Rim Elev.	Prop. USF (m)	HGL (m)	USF-HGL CLEARANCE
10	99.43	97.51	96.33	1.18
11	100.75	97.69	96.90	0.79
12	100.60	98.50	97.04	1.46
13	100.23	98.46	97.30	1.16
14	97.61	N/A	92.54	-
16	97.35	N/A	92.88	-
17	97.29	N/A	92.96	-
17A	97.32	N/A	94.32	-
17B	97.37	95.68	94.68	1.00
18	97.17	N/A	93.19	-
18A	97.65	95.69	93.57	2.12
18B	97.09	N/A	93.19	-
19	97.43	95.63	93.30	2.33
1A	96.22	N/A	88.79	-
1B	96.60	N/A	88.62	-
1C	95.30	N/A	87.66	-
2	97.46	N/A	89.01	-
20	97.50	95.63	93.52	2.11
20A	97.37	N/A	94.01	-
21	97.48	95.78	93.70	2.08
22	97.96	N/A	91.18	-
22A	97.83	96.10	94.33	1.77
22B	97.81	96.10	94.87	1.23
23	98.10	96.54	94.40	2.14
24	98.05	96.62	94.47	2.15
25	98.00	96.30	94.69	1.61
26	98.10	96.34	95.01	1.33
27	97.92	95.75	93.89	1.86
3	97.89	N/A	91.12	-
30	98.01	95.90	94.30	1.60
31	97.52	95.77	94.45	1.32
32	97.68	95.90	94.85	1.05
33	97.62	96.00	94.62	1.38
35	97.97	N/A	91.43	-
35A	97.94	96.10	91.29	4.81
36	98.67	96.52	95.73	0.79
37	99.34	97.12	96.39	0.73
38	99.55	97.79	96.57	1.22
39	98.03	N/A	93.67	-
39A	97.97	96.36	94.43	1.93
39B	98.01	96.22	94.69	1.53

3A	97.75	N/A	94.19	-
3B	97.66	95.79	94.57	1.22
3C	97.53	95.74	94.85	0.89
4	98.19	96.40	94.10	2.30
40	98.10	96.36	93.94	2.42
41	98.38	96.39	94.73	1.66
42	99.25	97.19	95.10	2.09
43	99.19	97.48	95.17	2.31
44	99.85	97.66	95.71	1.95
45	100.27	98.34	95.98	2.36
46	100.27	98.29	96.06	2.23
47	100.49	98.14	96.41	1.73
48	100.46	98.35	96.73	1.62
49	100.59	N/A	96.71	-
5	98.63	96.68	95.44	1.24
50	100.41	98.55	96.96	1.59
51	100.21	98.48	97.23	1.25
52	97.61	N/A	91.65	-
53	97.65	N/A	91.74	-
54	97.63	N/A	91.84	-
54A	97.67	95.77	94.00	1.77
54B	97.70	95.77	94.28	1.49
54C	97.66	95.94	94.55	1.39
54D	97.69	95.95	95.08	0.87
54E	97.54	N/A	94.79	-
54F	98.10	95.84	95.08	0.76
54G	98.17	95.95	95.50	0.45
55	98.09	N/A	92.02	-
56	98.16	96.32	92.71	3.61
57	98.13	96.38	95.18	1.20
58	98.24	96.26	95.56	0.70
59	97.99	N/A	92.78	-
6	98.67	N/A	95.53	-
60	98.23	96.14	94.58	1.56
61	98.13	96.39	94.66	1.73
62	97.95	96.59	94.88	1.71
63	98.15	N/A	92.23	-
64	97.29	N/A	92.40	-
65	97.56	95.77	94.88	0.89
66	97.47	95.60	94.05	1.55
67	97.58	95.60	94.40	1.20
68	97.49	95.85	94.67	1.18
69	97.56	95.80	94.70	1.10
7	99.11	96.99	96.02	0.97
70	97.95	95.80	94.93	0.87
8	100.21	97.69	97.18	0.51
80	100.15	98.14	96.08	2.06
81	100.28	98.35	96.45	1.90
82	100.35	N/A	96.48	-
9	99.23	97.44	96.22	1.22

Appendix C2: Sanitary HGL Parameters

			SUBDIVISION: Richcraft Kanata West Subdivision Second Registration Phase		SANITARY INFLOWS FOR CATASTROPHIC HGL ANALYSIS					Annual Parameters as per Technical Bulletin ISTB-2018-01																													
										*Harmon Correction Factor of 0.8																													
			DATE: 9/24/2025							REVISION: 6		DESIGNED BY: WAJ		CHECKED BY: MN		FILE NUMBER: 160401393		MAX PEAK FACTOR (RES.)= 4.0		MIN PEAK FACTOR (RES.)= 2.0		PEAKING FACTOR (INDUSTRIAL): 1.0		PEAKING FACTOR (COMM., INST.): 1.0		PERSONS / SINGLE 3.4		PERSONS / TOWNHOME 2.7		PERSONS / APARTMENT 1.8		AVG. DAILY FLOW / PERSON 200 L/p/day		COMMERCIAL 17,000 L/ha/day		INDUSTRIAL (HEAVY) 55,000 L/ha/day		INDUSTRIAL (LIGHT) 10,000 L/ha/day	
LOCATION			RESIDENTIAL AREA AND POPULATION							COMMERCIAL	INDUSTRIAL (L)	INDUSTRIAL (H)	INSTITUTIONAL	GREEN / UNUSED	C+H		INFILTRATION		TOTAL																				
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	INFILT. FLOW (L/s)	FLOW																					
R64A, EXT-1	64	63	0.17	0	0	0	0	3.10	0.0	13.19	0.00	0.00	1.04	1.28	2.8	15.68	4.7	7.5																					
R58A	58	57	0.36	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.36	0.1	0.3																					
I57B, R57A	57	56	0.52	0	15	0	41	3.00	0.3	0.00	0.00	0.00	2.95	0.00	0.6	3.47	1.0	1.9																					
R62A	62	61	0.17	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.1																					
R61A	61	60	0.17	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.1																					
R60A	60	59	0.80	0	34	0	92	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.2	0.9																					
R56A	56	55	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.05																					
R65A	65	54	0.21	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.21	0.1	0.1																					
R54GA	54G	54F	0.80	12	16	0	84	2.96	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.2	0.8																					
R54FA	54F	54E	0.60	8	7	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.2	0.5																					
R54DA	54D	54C	0.40	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.1	0.3																					
R54CA	54C	54B	0.60	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.2	0.6																					
R54BA	54B	54A	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.1	0.4																					
R51A	51	50	0.18	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.1	0.1																					
R50A	50	49	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2																					
R49A	49	82	0.09	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.03																					
R82A	82	81	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.01																					
R81A, R81B	81	80	2.73	0	237	0	641	2.75	4.1	0.00	0.00	0.00	0.00	0.00	0.0	2.73	0.8	4.9																					
R80A	80	44	0.24	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.24	0.1	0.3																					
R48A	48	47	0.45	0	19	0	51	2.99	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.1	0.5																					
R47A	47	46	0.54	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.54	0.2	0.6																					
R46A	46	45	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.1																					
R45A	45	44	0.20	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.2																					
R44A	44	43	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.1	0.4																					
R43A	43	42	0.09	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.1																					
R42A	42	41	0.31	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.1	0.3																					
R41A, R41B	41	40	0.62	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.62	0.2	0.4																					
R40A	40	39	0.35	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.35	0.1	0.3																					
R39BA	39B	39A	0.49	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.1	0.4																					
R38A	38	37	0.08	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.0	0.1																					
R37A	37	36	0.78	0	26	0	70	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.78	0.2	0.7																					
R36A	36	35	0.63	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.63	0.2	0.6																					
R70A	70	69	0.28	5	0	0	17	3.03	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.1	0.2																					
R69A	69	68	0.10	2	0	0	7	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.1																					
R68A, R68B1	68	67	1.69	7	122	0	353	2.83	2.3	0.00	0.00	0.00	0.00	0.00	0.0	1.69	0.5	2.8																					
R67A, G67A	67	66	0.53	10	0	0	34	3.01	0.2	0.00	0.00	0.00	0.00	0.97	0.0	1.50	0.5	0.7																					
R66A	66	21	0.13	1	0	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.0	0.1																					
R21A	21	20	0.31	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.1	0.2																					
APPROVED FIRST REGISTRATION PHASE																																							
R8A	8	7	0.42	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.1	0.4																					
R13A	13	12	0.28	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.1	0.2																					
R12A	12	11	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.0	0.0																					
R11A	11	10	0.58	0	24	0	65	2.97	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.2	0.6																					
R10A	10	9	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.1																					
R9A	9	7	0.19	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2																					
G7A, R7A	7	6	0.45	0	12	0	32	3.01	0.2	0.00	0.00	0.00	0.00	0.49	0.0	0.93	0.3	0.5																					
R6A	6	5	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.0																					
R5A	5	4	0.25	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.1	0.2																					
R4A, R4B1	4	3	0.94	0	33	0	89	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.94	0.3	0.9																					
R33A	33	30	0.41	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.1	0.4																					
R30A	30	27	0.42	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.1	0.4																					
R27A	27	22	0.20	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.2																					
R26A	26	25	0.50	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.1	0.5																					
R25A	25	24	0.32	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.32	0.1	0.3																					
R24A	24	23	0.15	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.0	0.1																					
R23A	23	22	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.2																					
R22BA	22B	22A	0.71	0	35	0	95	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.71	0.2	0.9																					
R22AA	22A	22	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.0																					

R22A	22	3	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.0	0.0
R32A	32	31	0.82	0	27	0	73	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.82	0.2	0.7
R31A	31	20A	0.57	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.57	0.2	0.5
R20A	20	19	0.23	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.23	0.1	0.2
R19A	19	18	0.11	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.11	0.0	0.1
R27B	27	18A	0.65	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.65	0.2	0.6
R18AA	18A	18B	0.58	0	18	0	49	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.2	0.5
R17BA	17B	17A	0.33	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.33	0.1	0.3
R17A	17	16	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.0
C14B	14	3	0.00	0	0	0	0	3.10	0.0	1.47	0.00	0.00	0.00	0.00	0.3	1.47	0.4	0.7
R3CA	3C	3B	0.45	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.1	0.3
R3BA	3B	3A	0.50	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.1	0.4
R3A	3	2	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.0	0.0
R2A	2	1A	0.14	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.0	0.0
Stittsville Trunk ¹	1A	1B	526.60	0	0	0	28031	2.00	129.8	76.00	40.50	0.00	0.00	0.00	19.6	643.10	192.9	583.0
Stittsville Interceptor (Kizell Lands)	1A	1B	52.56	0	0	0	3585	2.43	20.1	11.82	0.00	0.00	0.00	0.00	2.3	64.38	19.3	41.8
Huntmar and Hazeldean ²	1A	1B	111.52	0	0	0	6357	2.29	33.7	65.44	0.00	0.00	0.00	0.00	12.9	191.09	57.3	103.9
Additional Hazeldean ⁶	1A	1B	13.62	0	0	0	296	2.85	2.0	5.39	0.00	0.00	0.00	0.00	1.1	19.01	5.7	8.7
Mattamy Maple Grove Sewer	1A	1B	137.54	0	0	0	10501	2.16	52.5	0.00	0.00	0.00	0.00	0.00	0.0	137.54	41.3	93.8
Maple Grove Expansion ³	1A	1B	84.43	657	409	117	3549	2.43	19.9	0.00	0.00	0.00	0.00	0.00	0.0	75.99	22.8	42.9
Future Noth south collector ⁴	1B	1C	28.44	0	0	0	4936	2.35	26.9	165.28	0.00	0.00	0.00	0.00	32.5	193.72	58.1	147.5
North of Richcraft Kanata Site ⁵	1B	1C	1.10	0	42	0	113	2.94	0.8	0.00	0.00	0.00	0.00	0.00	0.0	1.10	0.3	1.1
4510210291172.091060.83																		

1. Stittsville trunk sewer annual peak flows equal approximately 342 L/s. However, peak flows equal to 583L/s, 360 L/s and 465 L/s have been assumed for Scenarios 1, 2 and 3 respectively as per the design peak flows obtained by JL Richards and the IMP assumptions made for ultimate and interim conditions respectively.

2. Population and areas as obtained from Huntmar/Hazeldean Design Sheet based on KWMSS assumptions for areas 16, 20, 17, 21, 19A, 23, 24 and 19

3. Maple Grove expansion number of units and gross area based on spreadsheet provided by the City, with 90% of gross area contributing to I/I and 198 employees generating 83L/emp/day added to total flow

4. Future north-south collector population and are estimates based on IBI spreadsheet provided by the City. It includes a 30L/s fixed flow

5. Future medium density residential area, assumed to have 38 units/ha and 2.7person/unit

6. Additional area from existing residential and commercial developments along Hazeldean between Hartin Street and Savage Drive were included in Novemnr 2017 (see Atrcl correspondence)

			SUBDIVISION: Richcraft Kanata West Subdivision Second Registration Phase			SANITARY INFLOWS FOR NORMAL HGL ANALYSIS FILE NUMBER: 160401393					Annual Parameters as per Technical Bulletin ISTB-2018-01 *Harmon Correction Factor of 0.8 MAX PEAK FACTOR (RES.)= 4.0 MIN PEAK FACTOR (RES.)= 2.0 PEAKING FACTOR (INDUSTRIAL): 1.0 PEAKING FACTOR (COMM., INST.): 1.0 PERSONS / SINGLE 3.4 PERSONS / TOWNHOME 2.7 PERSONS / APARTMENT 1.8 AVG. DAILY FLOW / PERSON 200 L/p/day COMMERCIAL 17,000 L/ha/day INDUSTRIAL (HEAVY) 55,000 L/ha/day INDUSTRIAL (LIGHT) 10,000 L/ha/day INSTITUTIONAL 17,000 L/ha/day INFILTRATION 0.55 L/s/ha 1st REGISTRATION MED. DENSITY RESIDENTIAL POP. ⁷ 38 units/ha 2nd REGISTRATIONMED. DENSITY RESIDENTIAL POP. ⁷ 93 units/ha									
			DATE: 9/24/2025 REVISION: 6 DESIGNED BY: WAJ CHECKED BY: MN																	
LOCATION			RESIDENTIAL AREA AND POPULATION							COMMERCIAL	INDUSTRIAL (L)	INDUSTRIAL (H)	INSTITUTIONAL	GREEN / UNUSED	C+I+I	INFILTRATION		TOTAL		
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	INFILT. FLOW (L/s)	FLOW (L/s)		
R64A, EXT-1	64	63	0.17	0	0	0	0	3.10	0.0	13.19	0.00	0.00	1.04	1.28	2.8	15.68	8.6	11.426521		
R58A	58	57	0.36	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.36	0.2	0.349446		
I57B, R57A	57	56	0.52	0	15	0	41	3.00	0.3	0.00	0.00	0.00	2.95	0.00	0.6	3.47	1.9	2.769042		
R62A	62	61	0.17	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.191165		
R61A	61	60	0.17	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.17	0.1	0.151945		
R60A	60	59	0.80	0	34	0	92	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.4	1.067328		
R56A	56	55	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.074207		
R65A	65	54	0.21	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.21	0.1	0.173489		
R54GA	54G	54F	0.80	12	16	0	84	2.96	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.80	0.4	1.012792		
R54FA	54F	54E	0.60	8	7	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.3	0.649394		
R54DA	54D	54C	0.40	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.40	0.2	0.389529		
R54CA	54C	54B	0.60	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.60	0.3	0.740076		
R54BA	54B	54A	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.2	0.486241		
R51A	51	50	0.18	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.18	0.1	0.175438		
R50A	50	49	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.197640		
R49A	49	82	0.09	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.049500		
R82A	82	81	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.016500		
R81A, R81B	81	80	2.73	0	237	0	641	2.75	4.1	0.00	0.00	0.00	0.00	0.00	0.0	2.73	1.5	5.581579		
R80A	80	44	0.24	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.24	0.1	0.320571		
R48A	48	47	0.45	0	19	0	51	2.99	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.2	0.602261		
R47A	47	46	0.54	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.54	0.3	0.706667		
R46A	46	45	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.196502		
R45A	45	44	0.20	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.223821		
R44A	44	43	0.44	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.2	0.486241		
R43A	43	42	0.09	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.0	0.086167		
R42A	42	41	0.31	0	9	0	24	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.2	0.340092		
R41A, R41B	41	40	0.62	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.62	0.3	0.545762		
R40A	40	39	0.35	0	10	0	27	3.02	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.35	0.2	0.381071		
R39BA	39B	39A	0.49	0	13	0	35	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.49	0.3	0.512749		
R38A	38	37	0.08	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.0	0.081004		
R37A	37	36	0.78	0	26	0	70	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.78	0.4	0.913751		
R36A	36	35	0.63	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.63	0.3	0.737732		
R70A	70	69	0.28	5	0	0	17	3.03	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.2	0.273382		
R69A	69	68	0.10	2	0	0	7	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.103129		
R68A, R68B	68	67	1.69	7	122	0	353	2.83	2.3	0.00	0.00	0.00	0.00	0.00	0.0	1.69	0.9	3.241938		
R67A, G67A	67	66	0.53	10	0	0	34	3.01	0.2	0.00	0.00	0.00	0.00	0.97	0.0	1.50	0.8	1.062579		
R66A	66	21	0.13	1	0	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.13	0.1	0.094206		
R21A	21	20	0.31	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.2	0.286349		
APPROVED FIRST REGISTRATION PHASE																				
R8A	8	7	0.42	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.2	0.494986		
R13A	13	12	0.28	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.28	0.2	0.247742		
R12A	12	11	0.10	0	1	0	3	3.07	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.1	0.075320		
R11A	11	10	0.58	0	24	0	65	2.97	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.3	0.767444		
R10A	10	9	0.22	0	4	0	11	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.1	0.197121		
R9A	9	7	0.19	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.218257		
G7A, R7A	7	6	0.45	0	12	0	32	3.01	0.2	0.00	0.00	0.00	0.00	0.49	0.0	0.93	0.5	0.738674		
R6A	6	5	0.03	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.0	0.016282		
R5A	5	4	0.25	0	6	0	16	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.25	0.1	0.253670		
R4A, R4B	4	3	0.94	0	33	0	89	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.94	0.5	1.126653		
R33A	33	30	0.41	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.2	0.543710		
R30A	30	27	0.42	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.42	0.2	0.546444		
R27A	27	22	0.20	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.20	0.1	0.204332		
R26A	26	25	0.50	0	21	0	57	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.3	0.665901		
R25A	25	24	0.32	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.32	0.2	0.381004		
R24A	24	23	0.15	0	3	0	8	3.05	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.1	0.142454		
R23A	23	22	0.19	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.1	0.197411		
R22BA	22B	22A	0.71	0	35	0	95	2.95	0.6	0.00	0.00	0.00	0.00	0.00	0.0	0.71	0.4	1.038333		
R22AA	22A	22	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.010368		

R22A	22	3	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.1	0.086909
R32A	32	31	0.82	0	27	0	73	2.97	0.5	0.00	0.00	0.00	0.00	0.00	0.0	0.82	0.5	0.951290
R31A	31	20A	0.57	0	17	0	46	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.57	0.3	0.629252
R20A	20	19	0.23	0	5	0	14	3.04	0.1	0.00	0.00	0.00	0.00	0.00	0.0	0.23	0.1	0.223028
R19A	19	18	0.11	0	2	0	5	3.06	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.11	0.1	0.097522
R27B	27	18A	0.65	0	22	0	59	2.98	0.4	0.00	0.00	0.00	0.00	0.00	0.0	0.65	0.4	0.769465
R18AA	18A	18B	0.58	0	18	0	49	2.99	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.58	0.3	0.657757
R17BA	17B	17A	0.33	0	8	0	22	3.03	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.33	0.2	0.332977
R17A	17	16	0.02	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.02	0.0	0.008633
C14B	14	3	0.00	0	0	0	0	3.10	0.0	1.47	0.00	0.00	0.00	0.00	0.3	1.47	0.8	1.095582
R3CA	3C	3B	0.45	0	11	0	30	3.01	0.2	0.00	0.00	0.00	0.00	0.00	0.0	0.45	0.2	0.456848
R3BA	3B	3A	0.50	0	14	0	38	3.00	0.3	0.00	0.00	0.00	0.00	0.00	0.0	0.50	0.3	0.536400
R3A	3	2	0.16	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.16	0.1	0.089911
R2A	2	1A	0.14	0	0	0	0	3.10	0.0	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.1	0.075153
Stittsville Trunk ¹	1A	1B	526.60	0	0	0	28031	2.00	129.8	76.00	40.50	0.00	0.00	0.00	19.6	643.10	353.7	503.1
Stittsville Interceptor (Kizell Lands)	1A	1B	52.56	0	0	0	3585	2.43	20.1	11.82	0.00	0.00	0.00	0.00	2.3	64.38	35.4	57.9
Huntmar and Hazeldean ²	1A	1B	111.52	0	0	0	6357	2.29	33.7	65.44	0.00	0.00	0.00	0.00	12.9	191.09	105.1	151.6
Additional Hazeldean ⁶	1A	1B	13.62	0	0	0	296	2.85	2.0	5.39	0.00	0.00	0.00	0.00	1.1	19.01	10.5	13.5
Mattamy Maple Grove Sewer	1A	1B	137.54	0	0	0	10501	2.16	52.5	0.00	0.00	0.00	0.00	0.00	0.0	137.54	75.6	128.2
Maple Grove Expansion ³	1A	1B	84.43	657	409	117	3549	2.43	19.9	0.00	0.00	0.00	0.00	0.00	0.0	75.99	41.8	61.9
Future Noth south collector ⁴	1B	1C	28.44	0	0	0	4936	2.35	26.9	165.28	0.00	0.00	0.00	0.00	32.5	193.72	106.5	195.9
North of Richcraft Kanata Site ⁵	1B	1C	1.10	0	42	0	113	2.94	0.8	0.00	0.00	0.00	0.00	0.00	0.0	1.10	0.6	1.4
															72.09			1164.0

1. Stittsville trunk sewer rare peak flows equal approximately 503 L/s, while design peak flows of 583L/s were obtained by JL Richards.

2. Population and areas as obtained from Huntmar/Hazeldean Design Sheet based on KWMSS assumptions for areas 16, 20, 17, 21, 19A, 23, 24 and 19

3. Maple Grove expansion number of units and gross area based on spreadsheet provided by the City, with 90% of gross area contributing to I/I and 198 employees generating 83L/emp/day added to total flow

4. Future north-south collector population and are estimates based on IBI spreadsheet provided by the City. It includes a 30L/s fixed flow

5. Future medium density residential area, assumed to have 38 units/ha and 2.7person/unit

6. Additional area from existing residential and commercial developments along Hazeldean between Hartin Street and Savage Drive were included in Novemenr 2017 (see Atrcl correspondence)

7. In the 1st registration a unit density of 38 units/ha was used for the medium density residential block (R4B). Based on a revised concept plan for R44B the unit density for the 2nd registration was revised to approximately 93 units/hectare. This unit density was used for both medium density residential blocks (R44B and R68B).

CATASTROPHOC FAILURE OF KWPS ASSUMING

BC= 95.20										
Stittsville= 583 L/s					Stittsville= 360 L/s			Stittsville= 465 L/s		Stittsville= 583 L/s
Scenario 1					Scenario 2		Scenario 3		Scenario 4	
San MH	Rim Elev.	Prop. USF (m)	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE	HGL (m)	USF-HGL CLEARANCE
10	99.43	97.51	96.32	1.19	96.32	1.19	96.32	1.19	96.32	1.19
11	100.75	97.69	96.90	0.79	96.9	0.79	96.9	0.79	96.9	0.79
12	100.60	98.50	97.04	1.46	97.04	1.46	97.04	1.46	97.04	1.46
13	100.23	98.46	97.30	1.16	97.3	1.16	97.3	1.16	97.3	1.16
14	97.61	N/A	95.42	-	95.36	-	95.39	-	95.28	-
16	97.35	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17	97.29	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17A	97.32	N/A	95.44	-	95.38	-	95.4	-	95.3	-
17B	97.37	95.68	95.44	0.24	95.38	0.30	95.4	0.28	95.3	0.38
18	97.17	N/A	95.45	-	95.38	-	95.41	-	95.31	-
18A	97.65	95.69	95.44	0.25	95.38	0.31	95.41	0.28	95.3	0.39
18B	97.09	N/A	95.44	-	95.38	-	95.41	-	95.3	-
19	97.43	95.63	95.45	0.18	95.39	0.24	95.42	0.21	95.31	0.32
1A	96.22	N/A	95.35	-	95.29	-	95.32	-	95.21	-
1B	96.60	N/A	95.31	-	95.27	-	95.29	-	95.17	-
1C	95.30	N/A	95.24	-	95.22	-	95.23	-	95.1	-
2	97.46	N/A	95.37	-	95.31	-	95.33	-	95.23	-
20	97.50	95.63	95.47	0.16	95.41	0.22	95.44	0.19	95.33	0.30
20A	97.37	N/A	95.47	-	95.41	-	95.44	-	95.33	-
21	97.48	95.78	95.48	0.30	95.42	0.36	95.44	0.34	95.34	0.44
22	97.96	N/A	95.42	-	95.36	-	95.39	-	95.28	-
22A	97.83	96.10	95.42	0.68	95.36	0.74	95.39	0.71	95.28	0.82
22B	97.81	96.10	95.43	0.67	95.37	0.73	95.39	0.71	95.29	0.81
23	98.10	96.54	95.43	1.11	95.37	1.17	95.39	1.15	95.29	1.25
24	98.05	96.62	95.43	1.19	95.37	1.25	95.39	1.23	95.29	1.33
25	98.00	96.30	95.43	0.87	95.37	0.93	95.39	0.91	95.29	1.01
26	98.10	96.34	95.43	0.91	95.37	0.97	95.39	0.95	95.29	1.05
27	97.92	95.75	95.43	0.32	95.37	0.38	95.4	0.35	95.29	0.46
3	97.89	N/A	95.40	-	95.34	-	95.37	-	95.26	-
30	98.01	95.90	95.43	0.47	95.37	0.53	95.4	0.50	95.29	0.61
31	97.52	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
32	97.68	95.90	95.47	0.43	95.41	0.49	95.44	0.46	95.33	0.57
33	97.62	96.00	95.43	0.57	95.37	0.63	95.4	0.60	95.29	0.71
35	97.97	N/A	95.45	-	95.39	-	95.42	-	95.31	-
35A	97.94	96.10	95.44	0.66	95.38	0.72	95.41	0.69	95.3	0.80
36	98.67	96.52	95.73	0.79	95.73	0.79	95.73	0.79	95.73	0.79
37	99.34	97.12	96.39	0.73	96.39	0.73	96.39	0.73	96.39	0.73
38	99.55	97.79	96.57	1.22	96.57	1.22	96.57	1.22	96.57	1.22
39	98.03	N/A	95.51	-	95.45	-	95.48	-	95.37	-
39A	97.97	96.36	95.51	0.85	95.45	0.91	95.48	0.88	95.37	0.99
39B	98.01	96.22	95.51	0.71	95.45	0.77	95.48	0.74	95.37	0.85
3A	97.75	N/A	95.40	-	95.34	-	95.37	-	95.26	-
3B	97.66	95.79	95.40	0.39	95.34	0.45	95.37	0.42	95.26	0.53
3C	97.53	95.74	95.40	0.34	95.34	0.40	95.37	0.37	95.26	0.48
4	98.19	96.40	95.41	0.99	95.35	1.05	95.37	1.03	95.27	1.13
40	98.10	96.36	95.56	0.80	95.5	0.86	95.53	0.83	95.42	0.94
41	98.38	96.39	95.61	0.78	95.55	0.84	95.57	0.82	95.47	0.92
42	99.25	97.19	95.65	1.54	95.59	1.60	95.62	1.57	95.51	1.68
43	99.19	97.48	95.66	1.82	95.6	1.88	95.63	1.85	95.52	1.96
44	99.85	97.66	95.71	1.95	95.7	1.96	95.7	1.96	95.7	1.96
45	100.27	98.34	95.97	2.37	95.97	2.37	95.97	2.37	95.97	2.37
46	100.27	98.29	96.06	2.23	96.06	2.23	96.06	2.23	96.06	2.23

47	100.49	98.14	96.41	1.73	96.41	1.73	96.41	1.73	96.41	1.73
48	100.46	98.35	96.73	1.62	96.73	1.62	96.73	1.62	96.73	1.62
49	100.59	N/A	96.71	-	96.71	-	96.71	-	96.71	-
5	98.63	96.68	95.43	1.25	95.43	1.25	95.43	1.25	95.43	1.25
50	100.41	98.55	96.96	1.59	96.96	1.59	96.96	1.59	96.96	1.59
51	100.21	98.48	97.23	1.25	97.23	1.25	97.23	1.25	97.23	1.25
52	97.61	N/A	95.46	-	95.4	-	95.43	-	95.32	-
53	97.65	N/A	95.46	-	95.4	-	95.43	-	95.32	-
54	97.63	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54A	97.67	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54B	97.70	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
54C	97.66	95.94	95.47	0.47	95.41	0.53	95.44	0.50	95.33	0.61
54D	97.69	95.95	95.47	0.48	95.41	0.54	95.44	0.51	95.33	0.62
54E	97.54	N/A	95.47	-	95.41	-	95.44	-	95.33	-
54F	98.10	95.84	95.47	0.37	95.41	0.43	95.44	0.40	95.33	0.51
54G	98.17	95.95	95.50	0.45	95.5	0.45	95.5	0.45	95.5	0.45
55	98.09	N/A	95.47	-	95.41	-	95.44	-	95.33	-
56	98.16	96.32	95.48	0.84	95.42	0.90	95.44	0.88	95.34	0.98
57	98.13	96.38	95.48	0.90	95.42	0.96	95.45	0.93	95.34	1.04
58	98.24	96.26	95.55	0.71	95.55	0.71	95.55	0.71	95.55	0.71
59	97.99	N/A	95.48	-	95.42	-	95.44	-	95.34	-
6	98.67	N/A	95.52	-	95.52	-	95.52	-	95.52	-
60	98.23	96.14	95.48	0.66	95.42	0.72	95.45	0.69	95.34	0.80
61	98.13	96.39	95.48	0.91	95.42	0.97	95.45	0.94	95.34	1.05
62	97.95	96.59	95.48	1.11	95.42	1.17	95.45	1.14	95.34	1.25
63	98.15	N/A	95.48	-	95.42	-	95.45	-	95.34	-
64	97.29	N/A	95.49	-	95.43	-	95.45	-	95.35	-
65	97.56	95.77	95.47	0.30	95.41	0.36	95.44	0.33	95.33	0.44
66	97.47	95.60	95.49	0.11	95.43	0.17	95.45	0.15	95.35	0.25
67	97.58	95.60	95.50	0.10	95.44	0.16	95.47	0.13	95.36	0.24
68	97.49	95.85	95.51	0.34	95.45	0.40	95.47	0.38	95.37	0.48
69	97.56	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
7	99.11	96.99	96.01	0.98	96.01	0.98	96.01	0.98	96.01	0.98
70	97.95	95.80	95.51	0.29	95.45	0.35	95.47	0.33	95.37	0.43
8	100.21	97.69	97.18	0.51	97.18	0.51	97.18	0.51	97.18	0.51
80	100.15	98.14	96.08	2.06	96.08	2.06	96.08	2.06	96.08	2.06
81	100.28	98.35	96.45	1.90	96.45	1.90	96.45	1.90	96.45	1.90
82	100.35	N/A	96.47	-	96.47	-	96.47	-	96.47	-
9	99.23	97.44	96.21	1.23	96.21	1.23	96.21	1.23	96.21	1.23

KWPS UNDER NORMAL OPERATING CONDITIONS - RARE EVENT FLOW PARAMETERS				
San MH	Rim Elev.	Prop. USF (m)	HGL (m)	USF-HGL CLEARANCE
10	99.43	97.51	96.33	1.18
11	100.75	97.69	96.90	0.79
12	100.60	98.50	97.04	1.46
13	100.23	98.46	97.30	1.16
14	97.61	N/A	92.54	-
16	97.35	N/A	92.88	-
17	97.29	N/A	92.96	-
17A	97.32	N/A	94.32	-
17B	97.37	95.68	94.68	1.00
18	97.17	N/A	93.19	-
18A	97.65	95.69	93.57	2.12
18B	97.09	N/A	93.19	-
19	97.43	95.63	93.30	2.33
1A	96.22	N/A	88.79	-
1B	96.60	N/A	88.62	-
1C	95.30	N/A	87.66	-
2	97.46	N/A	89.01	-
20	97.50	95.63	93.52	2.11
20A	97.37	N/A	94.01	-
21	97.48	95.78	93.70	2.08
22	97.96	N/A	91.18	-
22A	97.83	96.10	94.33	1.77
22B	97.81	96.10	94.87	1.23
23	98.10	96.54	94.40	2.14
24	98.05	96.62	94.47	2.15
25	98.00	96.30	94.69	1.61
26	98.10	96.34	95.01	1.33
27	97.92	95.75	93.89	1.86
3	97.89	N/A	91.12	-
30	98.01	95.90	94.30	1.60
31	97.52	95.77	94.45	1.32
32	97.68	95.90	94.85	1.05
33	97.62	96.00	94.62	1.38
35	97.97	N/A	91.43	-
35A	97.94	96.10	91.29	4.81
36	98.67	96.52	95.73	0.79
37	99.34	97.12	96.39	0.73
38	99.55	97.79	96.57	1.22
39	98.03	N/A	93.67	-
39A	97.97	96.36	94.43	1.93
39B	98.01	96.22	94.69	1.53

3A	97.75	N/A	94.19	-
3B	97.66	95.79	94.57	1.22
3C	97.53	95.74	94.85	0.89
4	98.19	96.40	94.10	2.30
40	98.10	96.36	93.94	2.42
41	98.38	96.39	94.73	1.66
42	99.25	97.19	95.10	2.09
43	99.19	97.48	95.17	2.31
44	99.85	97.66	95.71	1.95
45	100.27	98.34	95.98	2.36
46	100.27	98.29	96.06	2.23
47	100.49	98.14	96.41	1.73
48	100.46	98.35	96.73	1.62
49	100.59	N/A	96.71	-
5	98.63	96.68	95.44	1.24
50	100.41	98.55	96.96	1.59
51	100.21	98.48	97.23	1.25
52	97.61	N/A	91.65	-
53	97.65	N/A	91.74	-
54	97.63	N/A	91.84	-
54A	97.67	95.77	94.00	1.77
54B	97.70	95.77	94.28	1.49
54C	97.66	95.94	94.55	1.39
54D	97.69	95.95	95.08	0.87
54E	97.54	N/A	94.79	-
54F	98.10	95.84	95.08	0.76
54G	98.17	95.95	95.50	0.45
55	98.09	N/A	92.02	-
56	98.16	96.32	92.71	3.61
57	98.13	96.38	95.18	1.20
58	98.24	96.26	95.56	0.70
59	97.99	N/A	92.78	-
6	98.67	N/A	95.53	-
60	98.23	96.14	94.58	1.56
61	98.13	96.39	94.66	1.73
62	97.95	96.59	94.88	1.71
63	98.15	N/A	92.23	-
64	97.29	N/A	92.40	-
65	97.56	95.77	94.88	0.89
66	97.47	95.60	94.05	1.55
67	97.58	95.60	94.40	1.20
68	97.49	95.85	94.67	1.18
69	97.56	95.80	94.70	1.10
7	99.11	96.99	96.02	0.97
70	97.95	95.80	94.93	0.87
8	100.21	97.69	97.18	0.51
80	100.15	98.14	96.08	2.06
81	100.28	98.35	96.45	1.90
82	100.35	N/A	96.48	-
9	99.23	97.44	96.22	1.22

Appendix C3: Sanitary HGL Background



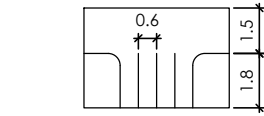
STREET BACK TO BACK TOWNHOMES :			
BLOCK No. :	BUILDING AREA:	GROSS FLOOR AREA:	No. UNITS:
BLOCK 11 = BACK TO BACK TOWNHOMES	523.0 m ²	1,281.1 m ²	10 UNITS
BLOCK 12 = BACK TO BACK TOWNHOMES	425.0 m ²	1,026.6 m ²	8 UNITS
BLOCK 13 = BACK TO BACK TOWNHOMES	523.0 m ²	1,281.1 m ²	10 UNITS
BLOCK 14 = BACK TO BACK TOWNHOMES	523.0 m ²	1,281.1 m ²	10 UNITS
BLOCK 15 = BACK TO BACK TOWNHOMES	523.0 m ²	1,281.1 m ²	10 UNITS
BLOCK 16 = BACK TO BACK TOWNHOMES	523.0 m ²	1,281.1 m ²	10 UNITS
BLOCK 17 = BACK TO BACK TOWNHOMES	425.0 m ²	1,026.6 m ²	8 UNITS
BLOCK 18 = BACK TO BACK TOWNHOMES	425.0 m ²	1,026.6 m ²	8 UNITS
TOTAL =	3,890.0 m ²	9,485.3 m ²	74 UNITS

TERRACE FLATS & BACK TO BACK TERRACE HOMES			
BLOCK No. :	BUILDING AREA:	GROSS FLOOR AREA:	No. UNITS:
BLOCK 21 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 22 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 23 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 24 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 25 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 26 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 27 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 28 = TERRACE FLATS	412.0 m ²	1,219.0 m ²	12 UNITS
BLOCK 31 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 32 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 33 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 34 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 35 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 36 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BLOCK 37 = BACK TO BACK TERRACE HOMES	342.3 m ²	1,375.0 m ²	12 UNITS
BICYCLE / GARBAGE =	xxx.0 m ²	xxx.0 m ²	
TOTAL =	5,692.1 m ²	19,377.0 m ²	180 UNITS
TOTAL UNITS =			254 UNITS

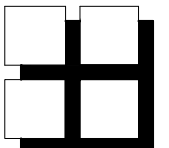
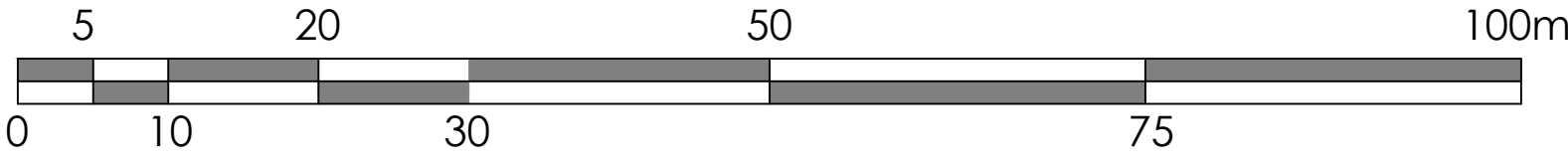
TERRACE FLATS & BACK TO BACK TERRACE HOME PARKING :
PARKING REQUIRED : 1.2 Spaces / (180) d.u. + 0.2 / (180) d.u. (Visitor) = 216.0 + 36.0 = 252.0 Spaces
PARKING PROVIDED : 216 Spaces + 36 Visitor Spaces = 252 Spaces

BICYCLE PARKING REQUIRED : 180 [0.5 / (180) d.u.] = 90 Spaces
BICYCLE PARKING PROVIDED : xx Interior Spaces + xx Exterior Spaces = xx Spaces

SNOW STORAGE : SNOW STORAGE WILL BE OFF SITE.



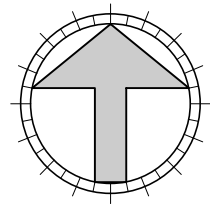
EXTERIOR BICYCLE STORAGE
4 SPACES



M. David Blakely
Architect Inc.
2200 Prince of Wales Dr. - Suite 101
Ottawa, Ontario K2E 6Z9
Phone (613) 224-8811 Fax (613) 224-7942

GENERAL NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS. ANY DISCREPANCY MUST BE REPORTED TO M. DAVID BLAKELY ARCHITECT INC.
2. ALL WORK AND MATERIALS TO BE IN COMPLIANCE WITH ALL CODES, REGULATIONS, AND BY-LAWS.
3. ADDITIONAL DRAWINGS MAY BE ISSUED FOR CLARIFICATION TO ASSIST THE PROPER EXECUTION OF WORK. SUCH DRAWINGS WILL HAVE THE SAME MEANING AND INTENT AS IF THEY WERE INCLUDED WITH THE PLANS IN CONTRACT DOCUMENTS.
4. DO NOT SCALE DRAWINGS.
5. THIS DRAWING SHALL NOT BE USED FOR PERMIT OR CONSTRUCTION UNLESS THE DRAWING BEARS THE ARCHITECT'S SEAL AND SIGNATURE.
6. THIS REPRODUCTION SHALL NOT BE ALTERED



CONSTRUCTION NORTH

SEAL

No.	DATE	DESCRIPTION	INIT.
10.			
9.			
8.			
7.			
6.			
5.			
4.	16/04/20	REV. ACCESSORY BUILDING SIZE	SM
3.	18/03/20	REV. ACCESSORY BUILDING	SM
2.	10/03/20	FOR REVIEW	SM
1.	27/02/20	FOR REVIEW	SM

No.	DATE	DESCRIPTION	INIT.
20.			
19.			
18.			
17.			
16.			
15.			
14.			
13.			
12.			
11.			

PROJECT: **BLOCK 89, KANATA WEST
PLANNED UNIT DEVELOPMENT
OTTAWA, ONT.**

CLIENT: **RICH CRAFT
Group Of Companies**

DRAWING TITLE: **CONCEPT SITE PLAN**

DATE: **FEB., 2020.**

SCALE: **1:500**

SHEET No.: **SP-1**

DRAWN BY: **SBM**

CHECKED: **MDB**



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CCL/IBI
Cumming Cockburn Limited
1770 WOODWARD DR., OTTAWA (613)225-1311

1770 WOODWARD DR., OTTAWA (613)225-131

ULTIMATE MAJOR
DRAINAGE LIMIT

— — — — SUBCATCHMENT AREAS

 PROPOSED TRUNK SEWER

PROPOSED FORCEMAIN

TEMPORARY FORCE MAIN

 PROPOSED STITTSVILLE PUMPING
STATION AND FORCEMAIN

— — — — — EXISTING TRUNK SEWER

MAJOR DRAINAGE SPLIT

①


 EXISTING PUMPING STATION
 AND FORCEMAIN (TO BE
 DECOMMISSIONED)

44
25.54 ha.

EXISTING PUMPING STATION
GRAVITY OUTLET

File Name:	Own.	Child.	Donn.	Date
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Seals

Client/Project

Kanata West Concept Plan
Master Servicing Study

Ottawa, Ontario

Preferred Waste-Water Option

Project No.
60400378

S-I

1 of 1

4

J:\35001-KantaSanInterceptor\5.9 Drawings\blocks\ACAD-3568-LD-West Kanata Dwg S-1-layout.dwg
Layout Name: Model
Last Saved By: SD.Taylor Jul 27, 2018 - 11:49am

IBI GROUP 400-333 Preston Street Ottawa, Ontario K1S 5N4 Canada tel 613 225 1311 fax 613 225 9868 ibigroup.com				SANITARY SEWER DESIGN SHEET N-S INTERCEPTOR SEWER Kanata West Serviceability Study CITY OF OTTAWA																													
LOCATION				Area - Denisty (units/Ha)				AREA w/o Units (Ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	ICI AREAS COMMERCIAL AREA (Ha)								PEAK FLOW (L/s)	INFILTRATION ALLOWANCE AREA (Ha)		FLOW (L/s)	FIXED FLOW (L/s)	TOTAL FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	19	30	50	75		IND	CUM			14,400 l/Ha/d		30,000 l/Ha/d		35,000 l/Ha/d		50,000 l/Ha/d			IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(m/s)	L/s	(%)	
													IND	CUM	IND	CUM	IND	CUM	IND	CUM													
Cyclone Taylor	A (35, 36A, 38)	MH100	MH101					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.80	89.95	375	0.20	0.717	81.80	100.00%
Cyclone Taylor		MH101	MH102					0.00	0.0	0.0	4.00	0.00	20.15	20.15	6.05	6.05		0.00		0.00	8.19	26.20	26.20	7.34	15.00	30.52	81.80	64.98	375	0.20	0.717	51.28	62.68%
Cyclone Taylor		MH102	MH103					0.00	0.0	0.0	4.00	0.00	20.15	20.15	6.05	6.05		0.00		0.00	8.19	0.00	26.20	7.34	15.00	30.52	81.80	68.32	375	0.20	0.717	51.28	62.68%
Cyclone Taylor		MH103	MH104					0.00	0.0	0.0	4.00	0.00	20.15	20.15	6.05	6.05		0.00		0.00	8.19	0.00	26.20	7.34	15.00	30.52	81.80	109.53	375	0.20	0.717	51.28	62.68%
future road	B (36B)	MH104	MH105					0.00	0.0	0.0	4.00	0.00	20.15	20.15	6.05	6.05		0.00		0.00	8.19	0.00	26.20	7.34	30.00	45.52	81.80	90.64	375	0.20	0.717	36.28	44.35%
future road		MH105	MH106					0.00	0.0	0.0	4.00	0.00	20.15	20.15	6.05	6.05		0.00		0.00	8.19	0.00	26.20	7.34	30.00	45.52	81.80	58.31	375	0.20	0.717	36.28	44.35%
future road	C (37A)		MH106		9.36			9.36	954.7	954.7	3.81	14.75		0.00		0.00		0.00	12.60	12.60	10.94	21.96	21.96	6.15	0.00	31.83	39.07	25.00	300	0.15	0.535	7.24	18.53%
future road	D (37B)	MH106	MH107			6.24		6.24	1060.8	2015.5	3.58	29.26		20.15		6.05		0.00	8.50	21.10	26.50	14.74	62.90	17.61	30.00	103.37	339.63	94.22	675	0.15	0.919	236.26	69.56%
future road		MH107	MH108					0.00	0.0	2015.5	3.58	29.26		20.15		6.05		0.00		21.10	26.50	0.00	62.90	17.61	30.00	103.37	339.63	94.00	675	0.15	0.919	236.26	69.56%
future road		MH108	MH109					0.00	0.0	2015.5	3.58	29.26		20.15		6.05		0.00		21.10	26.50	0.00	62.90	17.61	30.00	103.37	339.63	94.00	675	0.15	0.919	236.26	69.56%
future road	E (39B)	MH109	MH110			4.50		4.50	765.0	2780.5	3.47	39.09		20.15	6.05	6.10	6.10		21.10	30.21	10.60	73.50	20.58	30.00	119.88	438.47	108.21	675	0.25	1.187	318.59	72.66%	
future road		MH110	MH111					0.00	0.0	2780.5	3.47	39.09		20.15	6.05	6.10	6.10		21.10	30.21	0.00	73.50	20.58	30.00	119.88	438.47	107.00	675	0.25	1.187	318.59	72.66%	
future road		MH111	MH112					0.00	0.0	2780.5	3.47	39.09		20.15	6.05	6.10	6.10		21.10	30.21	0.00	73.50	20.58	30.00	119.88	438.47	107.00	675	0.25	1.187	318.59	72.66%	
future road		MH112	MH (53)					0.00	0.0	2780.5	3.47	39.09		20.15	6.05	6.10	6.10		21.10	30.21	0.00	73.50	20.58	30.00	119.88	438.47	107.00	675	0.25	1.187	318.59	72.66%	
			MH200					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00	111.88	111.88	97.12	120.22	120.22	33.66	0.00	130.78	620.09	113.49	675	0.50	1.679	489.31	78.91%
Huntmar	F (32, 32A, 33, 34)	MH200	MH201					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	480.32	82.00	675	0.30	1.300	349.54	72.77%
Huntmar		MH201	MH202					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00			85.00	675	0.30	1.300	349.54	72.77%
Huntmar		MH202	MH203					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00			85.00	675	0.30	1.300	349.54	72.77%
North South Arterial		MH203	MH204					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	105.00	675	0.20	1.062	261.40	66.65%
North South Arterial		MH204	MH205					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	105.00	675	0.20	1.062	261.40	66.65%
North South Arterial		MH205	MH206					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	120.00	675	0.20	1.062	261.40	66.65%
North South Arterial		MH206	MH207					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	120.00	675	0.20	1.062	261.40	66.65%
North South Arterial		MH207	MH208					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	100.00	675	0.20	1.062	261.40	66.65%
North South Arterial		MH208	MH (55)					0.00	0.0	0.0	4.00	0.00		0.00		0.00		0.00		111.88	97.12	0.00	120.22	33.66	0.00	130.78	392.18	120.00	675	0.20	1.062	261.40	66.65%
Maple Grove	G (16-24, 26-30, 39A)	MH (54)	MH (55)	128.98	121.42	4.50	0.00	254.90	21481.9	21481.9	2.62	228.11		0.00		0.00	27.15	27.15	44.39	44.39	55.03	340.57	340.57	95.36	0.00	378.50	935.19	150.35	825	0.39	1.695	556.69	59.53%
Maple Grove		MH (55)	MH (56)					0.00	0.0	21481.9	2.62	228.11		0.00		0.00	27.15		156.27	152.15	0.00	460.79	129.02	0.00	509.28	923.12	49.59	825	0.38	1.673	413.84	44.83%	
Maple Grove		MH (56)	MH (57)					0.00	0.0	21481.9	2.62	228.11		0.00		0.00	27.15		156.27	152.15	0.00	460.79	129.02	0.00	509.28	947.10	179.66	825	0.40	1.716	437.82	46.23%	
Maple Grove		MH (52)	MH (53)					0.00	0.0	21481.9	2.62	228.11		0.00		0.00	27.15		156.27	152.15													

November 29th, 2017

City of Ottawa
110 Laurier Av. West
Ottawa, (Ontario)
K1P 1J1

Attention: **Ms. Hasnaa Zaknoun, P.Eng M.sc.**
 Senior Process Engineer-Wastewater Collection

Dear Madam,

Object: Hazeldean Sanitary Sewer Analysis
Our file No. 131003-4

This letter report provides clarifications with respect to the remaining capacity of the existing sanitary sewer system on Hazeldean Road, located between the Jackson Trails Pumping Station (JTPS) and Savage Drive. We have analyzed the sanitary sewer system using the current conditions with the JTPS pump flow at maximum capacity. We have also analyzed the sanitary system supposing that two pumping stations will be decommissioned in the near future. Sanitary sewer as-built information was obtained from drawings provided by the City which are included in Appendix C and were utilized to complete the study.

The criteria used in the analysis of the sanitary sewers are based on the Ministry of Environment and Climate Change (MOECC), the City of Ottawa design guidelines and current practices in Eastern Ontario.

- Residential average flow – 350 l/cd
- Commercial / institutional average flow – 50,000 l/ha/d
- Residential peaking factor – Harmon formula
- Commercial, Institutional peaking factor – 1.5
- Infiltration inflow – 0.28 l/s/ha

The sanitary drainage area is divided into several sub-basin areas in order to calculate the flow to the sewers. (See Drawing 131003-4-SAN1 in Appendix A)

The studied sanitary network presents a combination of both residential and commercial flows. Fixed flow inputs have been added to the system coming from three sanitary pumping stations. Once the Jackson Trails Pumping Station is upgraded, it will have a rated firm capacity of 120 L/s. The MOE Certificate of Approval for that sanitary pumping station is No.7921-6N7SEA. In addition, the pumping stations on Johnwood Street near Maple Grove Road and on Joseph Circle were shown to have a rated capacity of 21 L/s and 2 L/s, respectively (see E-mail correspondence with City of Ottawa in Appendix B).

The flow for the existing residential development was obtained using the Harmon Formula. The population density used was of 3.4 persons per unit for single dwellings as per the City of Ottawa Sewer Design Guidelines (OSDG) dated October 2012. The commercial flows were calculated using an average daily flow of 50,000 l/ha/day.

Table 1, in Appendix A, includes all three of the above mentioned pumped flows. It was determined that the existing 450 mm diameter sanitary sewer on Hazeldean Road between maintenance hole SA1 and maintenance hole SA2 is adequately sized to convey the peak design flow of 161.40 L/s. The sanitary sewer has a total capacity of 170.86 L/s and a remaining capacity of 5.5%, as per as-built conditions.

Secondly, we were informed by the City that in the future (likely 5 to 10 years from now), the sanitary pumping station on Johnwood St will be decommissioned and the flows will be redirected to Maple Grove; it is also intended to decommission the station on Joseph Circle to redirect the flows east towards the future Pool Creek Village sanitary sewer system (see E-mail correspondence with City of Ottawa in Appendix B). Table 2, in Appendix A, shows that the remaining capacity of the 450 mm pipe on Hazeldean Rd between maintenance hole SA1 and maintenance hole SA2 increases to 19.0% with a peak design flow of 138.40 L/s.

It was found that the capacity of the existing system on Hazeldean Road, between the Jackson Trails Pumping Station (JTPS) and Savage Drive has adequate capacity to convey the additional flow when the JTPS will be upgraded to 120 L/s. Furthermore, the sanitary sewer will have even more capacity once the Johnwood Street and the Joseph Circle pumping stations are decommissioned.

We trust the above letter is satisfactory.

Yours truly,

ATREL ENGINEERING LTD



André Sauvé, P.Eng.



c.c.: Mr. John Bougadis – City of Ottawa
Mr. Santhosh Kuruvilla – City of Ottawa
Mr. Domenic Idone – Minto Communities Inc.
Mr. Curtiss Scarlett – Minto Communities Inc.
Mr. Jean Décoeur – Atrél Engineering Ltd

APPENDIX A

(Prepared by Atrél Engineering Ltd)

Table 1 – Sanitary Sewer Computation Form (Current Conditions)

Table 2 – Sanitary Sewer Computation Form (Projecting Conditions)

131003-4-SAN1 – Hazeldean Road Sanitary Drainage Area Plan

SANITARY SEWER COMPUTATION FORM (Current Conditions)

DATE: **November, 2017**
DESIGNED BY: VLL
CHECKED BY: AGS

PROJECT: **Hazeldean Road**
CLIENT: Minto Communities Inc.
PROJECT #: 131003-4
BY: ATREL ENGINEERING LTD

q=	350	l/cap.day
l=	0.28	l/ha.s
PVC/CONC N=	0.013	
OTHER N=	0.024	

Single dwelling=	Table 1 3.4 person/unit
------------------	-----------------------------------

[illegible]

PROJECT: **Hazeldean Road**
CLIENT: Minto Communities Inc.
PROJECT #: 131003-4
BY: ATREL ENGINEERING LTD

q=	350	l/cap.day
I=	0.28	l/ha.s
PVC/CONC N=	0.013	
OTHER N=	0.024	

Single dwelling=

[illegible]



LEGEND

- 0.42ha.
Peq.= 20
- SANITARY DRAINAGE SUB AREA
- EQUIVALENT POPULATION BASED ON
A POPULATION OF 3.4 PERSON/UNIT
OR 50,000 l/s/ha FOR COMMERCIAL LOTS
- DRAINAGE AREA BOUNDARY
- EXISTING SANITARY SEWER
- PUMPED FLOW
EXISTING SANITARY
PUMPING STATION LOCATION

APPENDIX B

E-mail correspondence – City of Ottawa “Hazeldean Road Sanitary Sewer Analysis”

Vanessa Lalonde

From: Andre Sauve
Sent: February 6, 2017 9:28 AM
To: Vanessa Lalonde
Subject: FW: Hazeldean Road sanitary sewer analysis

André Sauvé, P.Eng.

Atrél Engineering Ltd
1-2884 Chamberland Street | Rockland, ON K4K 1M6
Tel: (613) 446-7423 ext. 30
Email andresauve@atrel.com

From: Bougadis, John [mailto:John.Bougadis@ottawa.ca]
Sent: Thursday, February 2, 2017 12:56 PM
To: Andre Sauve <andresauve@atrel.com>
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi Andre,

The rated capacity at each station is shown below:

- John St PS (near Maple Grove): 21 l/s
- Joseph Circle PS : Unknown but use 2 l/s. This value has been used in past studies and observed at the station during high inflow conditions The gravity sewer commences immediately west of 15 Joseph Circle.

To complicate matters, The City plans on decommissioning these two stations in the future (likely 5 to 10 years). Flows from the John St PS will be directed to the Maple Grove sanitary sewer while flows from the Joseph Circle PS will be directed east towards the future Pool Creek Village sanitary sewer system.

Thanks

John
x14990

From: Andre Sauve [<mailto:andresauve@atrel.com>]
Sent: Tuesday, January 31, 2017 1:45 PM
To: Bougadis, John
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi John,

We have setup the design sheet of the existing sanitary sewer on Hazeldean Road and we would need the pump flow from the Johnwoods Street and the Joseph Circle pump stations. Also, if you could provide to us the plan of profile of Johnwoods Street and Joseph Circle so we can delineate the dwelling that goes to the pump station vs the ones that are by gravity.

Thanks,

André Sauvé, P.Eng.

Atrél Engineering Ltd
1-2884 Chamberland Street | Rockland, ON K4K 1M6
Tel: (613) 446-7423 ext. 30
Email andresauve@atrel.com

From: Bougadis, John [<mailto:John.Bougadis@ottawa.ca>]

Sent: Monday, November 21, 2016 12:08 PM

To: Andre Sauve <andresauve@atrel.com>

Subject: RE: Hazeldean Road sanitary sewer analysis

No problem.

I am going to that meeting too.

John
x14990

From: Andre Sauve [<mailto:andresauve@atrel.com>]

Sent: 2016/11/21 9:17 AM

To: Bougadis, John

Subject: RE: Hazeldean Road sanitary sewer analysis

Hi John,

I'll be at the City tomorrow afternoon. I can pass by your office before 2:00 or after the meeting that should finish around 4:00 to transfer the 44 drawings on my memory stick? Let me know if it works for you.

Thanks,

André Sauvé, P.Eng.

Atrél Engineering Ltd
1-2884 Chamberland Street | Rockland, ON K4K 1M6
Tel: (613) 446-7423 ext. 30
Email andresauve@atrel.com

From: Bougadis, John [<mailto:John.Bougadis@ottawa.ca>]

Sent: Monday, November 7, 2016 2:10 PM

To: Andre Sauve <andresauve@atrel.com>

Subject: RE: Hazeldean Road sanitary sewer analysis

Hi Andre,

Doesn't work on my end (I have done this countless time with other firms FTP sites) .

The good news is that I have transferred you the following:

- Jackson Trails Pump Station (JTPS) drawings including the receiving 450 mm sewer on Hazeldean Road from the JTPS forcemains to Hartin Drive.
- JTPS design report and memo.
- GIS shapefiles of the sewers draining to Hazeldean as well as parcel and land use information.
- The majority of the 2010 Hazeldean Road Widening Drawings. The FTP site would not allow me to transfer 44 drawings. Perhaps we can pace the files on a memory stick the next time you are at the city.

Another important detail to add is that the City will be decommissioning the John St PS sometime after the KWPS is constructed. For the purpose of your assessment, assume flows from the station will still be pumped south to Hazeldean. The area that requires review is the 450 mm sewer from JTPS to Savage Drive.

Let me know if you have any questions.

Thanks

John
x14990

From: Andre Sauve [<mailto:andresauve@atrel.com>]
Sent: 2016/11/07 1:34 PM
To: Bougadis, John
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi John,

Yes, you just have to drag the folder and drop it in the ftp site.

Thanks,

André Sauvé, P.Eng.

Atrel Engineering Ltd
1-2884 Chamberland Street | Rockland, ON K4K 1M6
Tel: (613) 446-7423 ext. 30
Email andresauve@atrel.com

From: Bougadis, John [<mailto:John.Bougadis@ottawa.ca>]
Sent: Monday, November 7, 2016 1:23 PM
To: Andre Sauve <andresauve@atrel.com>
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi Andre,

Is there a way to upload folders on to your FTP site?

John
x14990

From: Andre Sauve [<mailto:andresauve@atrel.com>]
Sent: 2016/11/07 11:51 AM
To: Bougadis, John
Cc: Marcel Denomme; Jean Decoeur
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi John,

You can upload the information on the following link:

<https://files.atrel.com:8443/share.cgi?ssid=0ILppcE>

You may have to access the ftp site by accepting to proceed even though it says “unsafe”.

Thanks,

André Sauvé, P.Eng.

Atrel Engineering Ltd
1-2884 Chamberland Street | Rockland, ON K4K 1M6
Tel: (613) 446-7423 ext. 30
Email andresauve@atrel.com

From: Bougadis, John [<mailto:John.Bougadis@ottawa.ca>]
Sent: Monday, November 7, 2016 9:21 AM
To: Andre Sauve <andresauve@atrel.com>
Cc: Marcel Denomme <mdenomme@minto.com>; Jean Decoeur <jeandecoeur@atrel.com>
Subject: RE: Hazeldean Road sanitary sewer analysis

Hi Andre,

I have the information for you. Do you have an FTP site so I can upload the files?

Thanks

John
x14990

From: Andre Sauve [<mailto:andresauve@atrel.com>]
Sent: 2016/11/04 12:00 PM
To: Bougadis, John
Cc: Marcel Denomme; Jean Decoeur
Subject: Hazeldean Road sanitary sewer analysis

Hi John,

As discussed at Monday's meeting, can you please provide us with the plan and profile of Hazeldean Road showing the existing sanitary sewer from the pumping station up to where we need to analyze the sewer. Also, please provide us the drainage area and the sewer network connecting to the stretch of sewer to be analyzed.

Thanks,

André Sauvé, P.Eng.

Atrél Engineering Ltd

1-2884 Chamberland Street | Rockland, ON K4K 1M6

Tel: (613) 446-7423 ext. 30

Email andresauve@atrel.com

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APPENDIX C

Hazeldean Road Plans and Profiles

(Prepared by IBI Group)

DWG. NO. 13895-C4	STA 11+150 to STA 11+450	<i>(As built November 2008)</i>
DWG. NO. 13895-C5	STA 11+450 to STA 11+675	<i>(As built November 2008)</i>

(Prepared by McCormick Rankin Corporation)

DWG. NO. 068	STA 11+600 to STA 11+900	<i>(As built September 2012)</i>
---------------------	---------------------------------	----------------------------------



NO.	REVISIONS	BY	DATE
0	ISSUED FOR CITY REVIEW	J.I.M.	05/11/11
1	ISSUED FOR CITY APPROVAL	J.I.M.	05/12/20
2	ISSUED FOR TENDER	J.I.M.	06/02/08
3	ISSUED FOR CONSTRUCTION	J.I.M.	06/05/04
4	AS-BUILT BY TAGGART		08/11/17

NOTE: The location of the utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned.

The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

JACKSON TRAILS PUMP STATION

TWIN FORCEMAIN
HAZELDEAN ROAD
FROM STA. 11+150 TO STA. 11+450

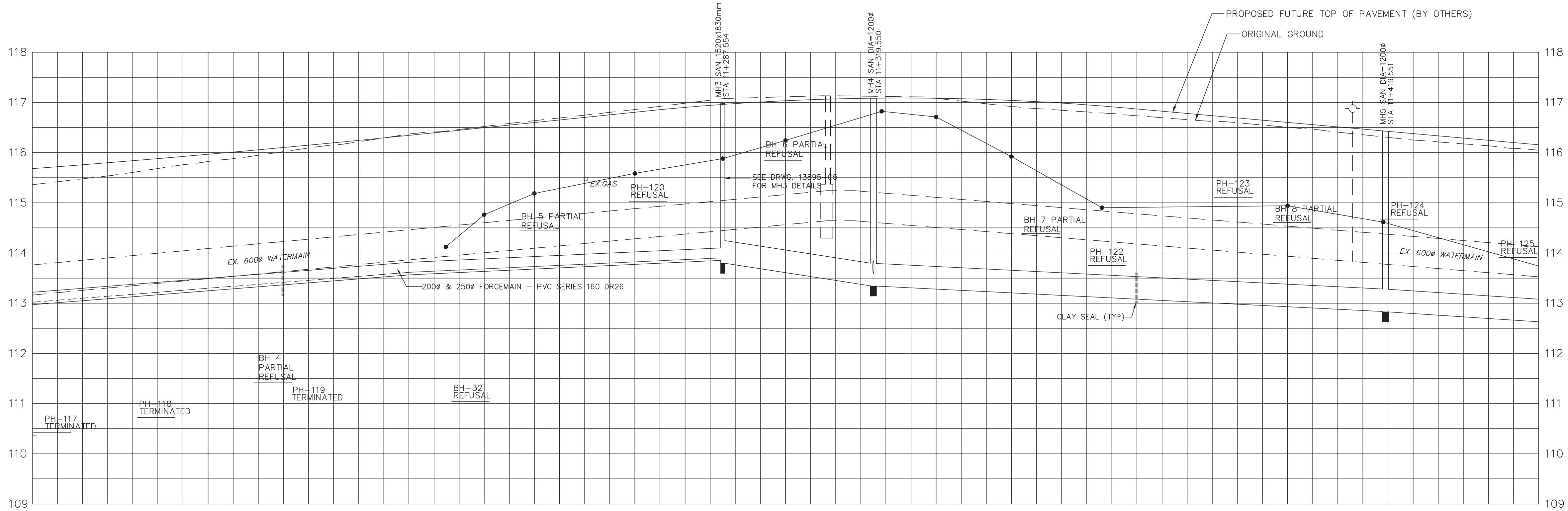
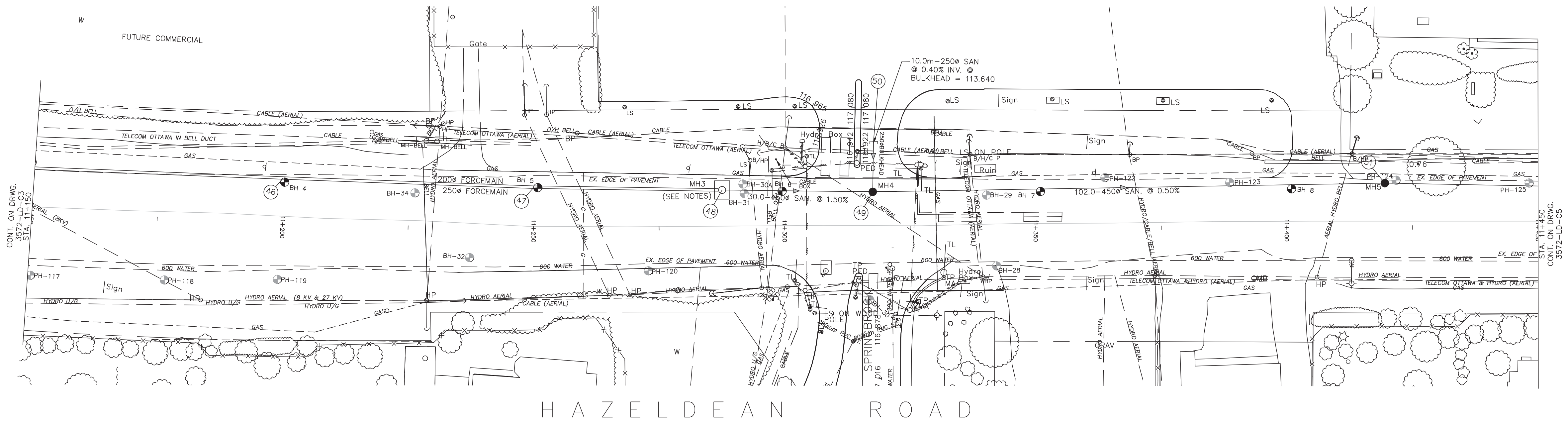
W.R. NEWELL, P.ENG. Acting Director Infrastructure Services		W. CLOUTHIER, P.ENG. Manager Construction Services - Development	
Dwn:	Chkd:	Des:	Chkd:

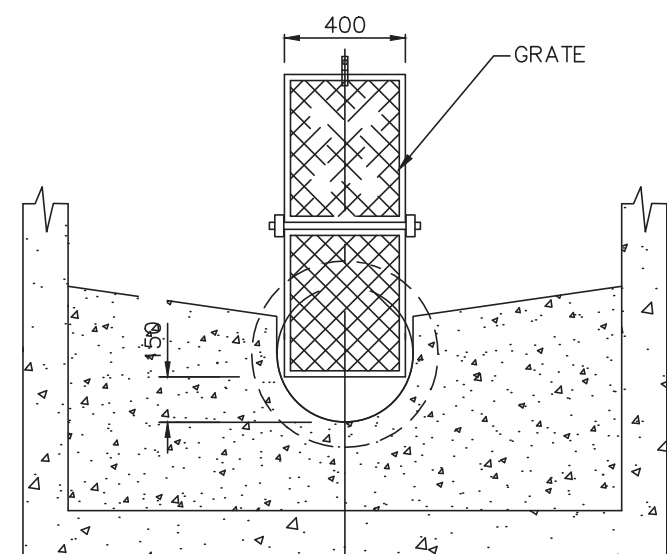
NOTE: 1. REFER TO DRWG. C5 FOR DETAILS OF MH3.

2. REFER TO DRWG. C5 FOR SURFACE RESTORATION
DETAILS ON HAZELDEAN ROAD.

3. FOR LAYOUT REFERENCE SEE DWG C7.

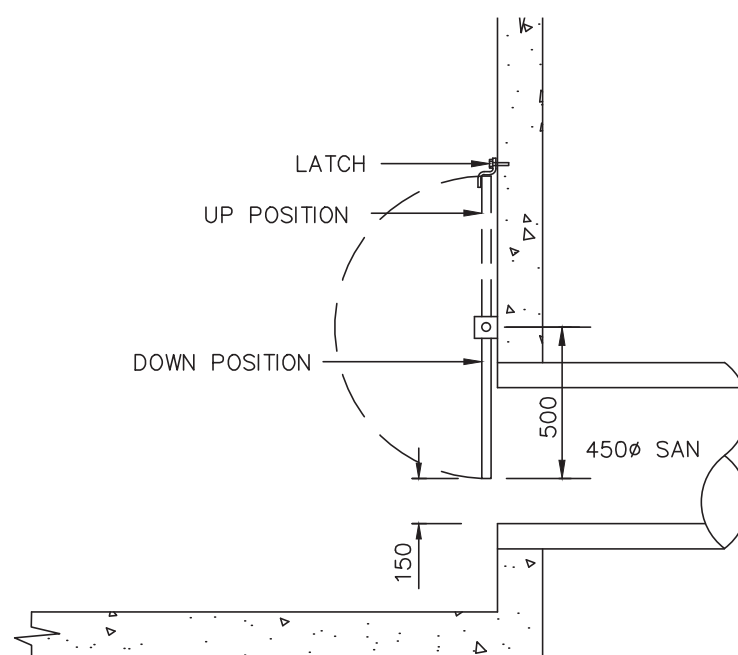
4. INSTALL A CLAY SEAL AS PER CITY OF OTTAWA
DRAWING S8 AT STATIONS 11+200 AND 11+370.

[illegible]



MH3 DETAILS

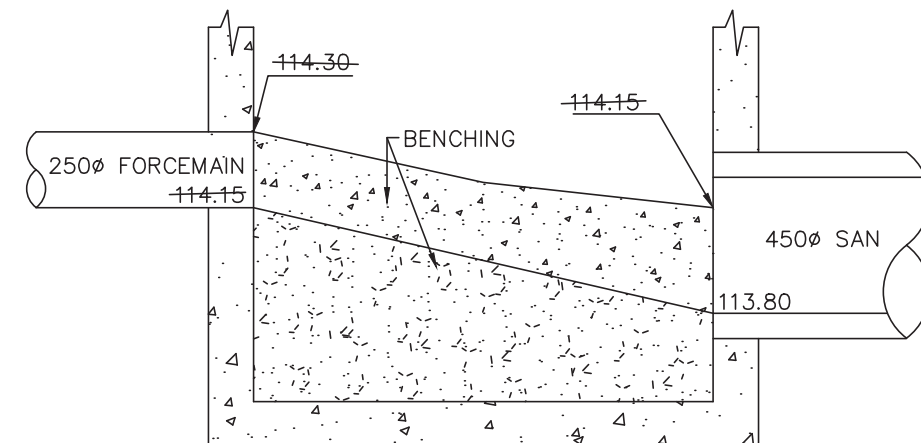
N.T.S.



GRATE DETAIL (MH3)

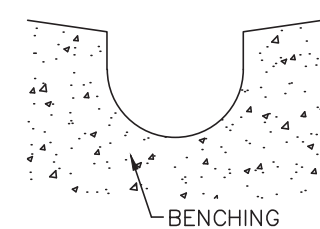
N.T.S

ALL GRATE MATERIAL TO BE FROM 19mmØ
ALUMINUM STOCK PATTERN TO BE MINIMUM
50mm OPENINGS ALL BOLTS, NUTS, TO BE
316 s/s.



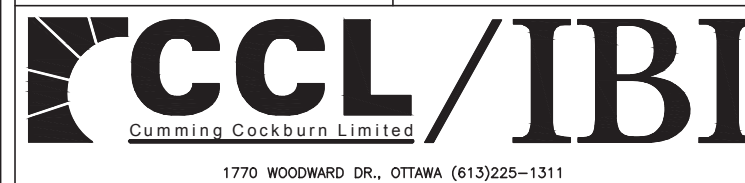
SECTION B:B
MANHOLE BENCHING

N.T.S.



SECTION A: A
MANHOLE BENCHING

N.T.S.



NOTE: 1. FOR LAYOUT REFERENCE SEE DWG C7.
2. INSTALL A CLAY SEAL AS PER CITY OF OTTAWA
DRAWING S8 AT STATIONS 11+455, 11+540
AND 11+610.

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CITY REVIEW	J.I.M.	05/11/11
1	ISSUED FOR CITY APPROVAL	J.I.M.	05/12/20
2	ISSUED FOR TENDER	J.I.M.	06/02/08
3	ISSUED FOR CONSTRUCTION		06/05/04
4	AS-BUILT BY TAGGART		08/11/17

NOTE:
The location of the utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned.
The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

JACKSON TRAILS PUMP STATION

TWIN FORCEMAIN
HAZELDEAN ROAD
FROM STA. 11+450 TO STA. 11+675

W.B. NEWELL, P. ENG	W. CLOUTHIER, P. ENG
---------------------	----------------------

W. S. SCHOENEN, P. ENG
Manager Construction Services - Develop

Dwn:	Chkd:	Des:	Chkd:
------	-------	------	-------



CONTRACT NO.

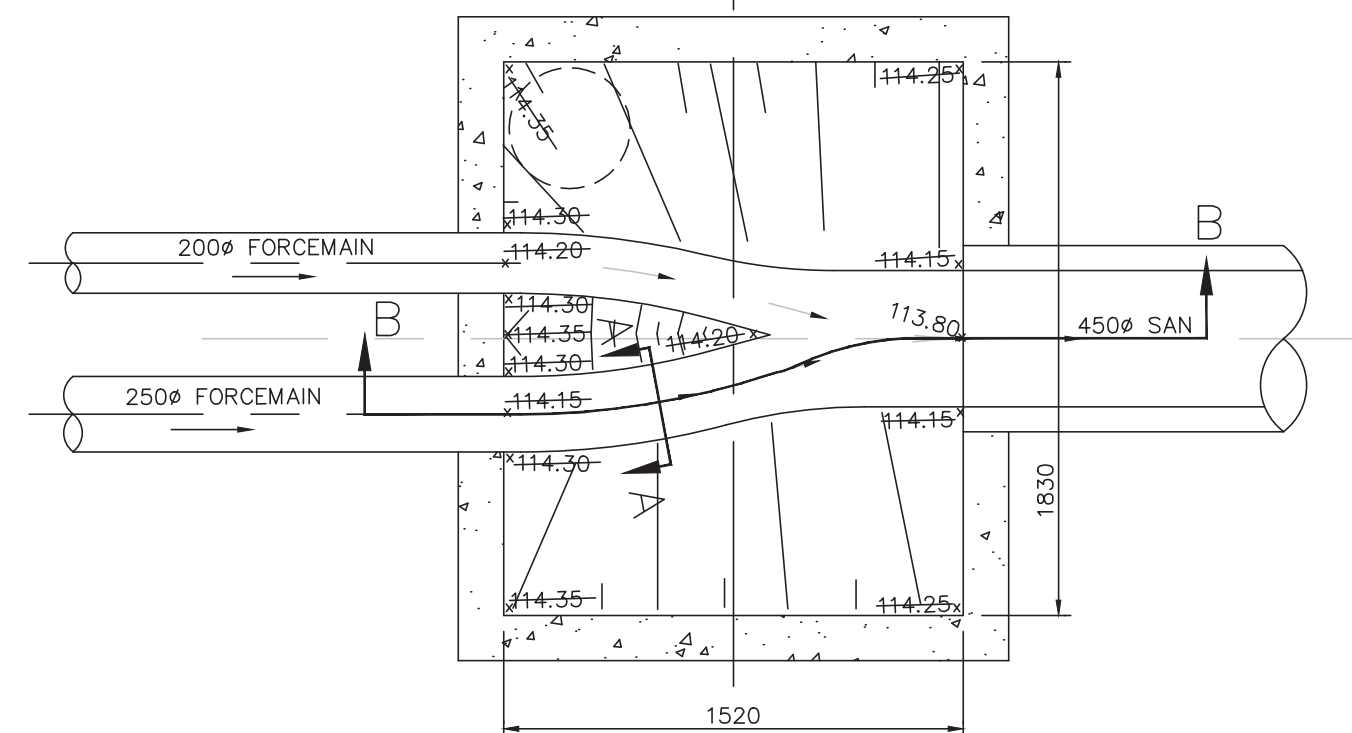
ISB05-2074

DWG. NO.
13895-C5

Date: NOVEMBER 2005

Scale: 0m 5

Horizontal 0m 5
Vertical 0m 0.5



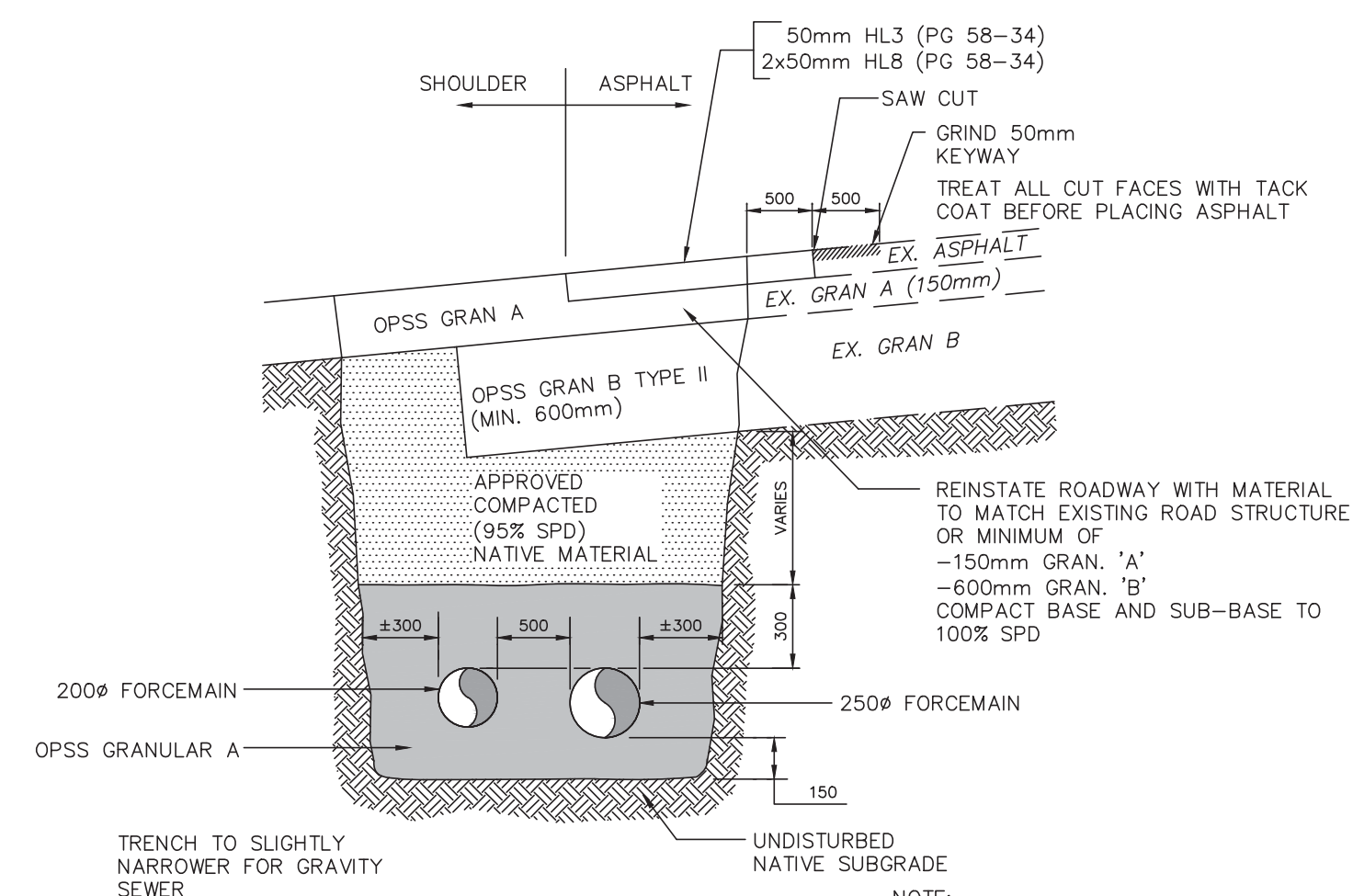
MH3 (1520x1830)

NTS

NOTE :

ASPHALT SHOULDER 2.0m WIDE

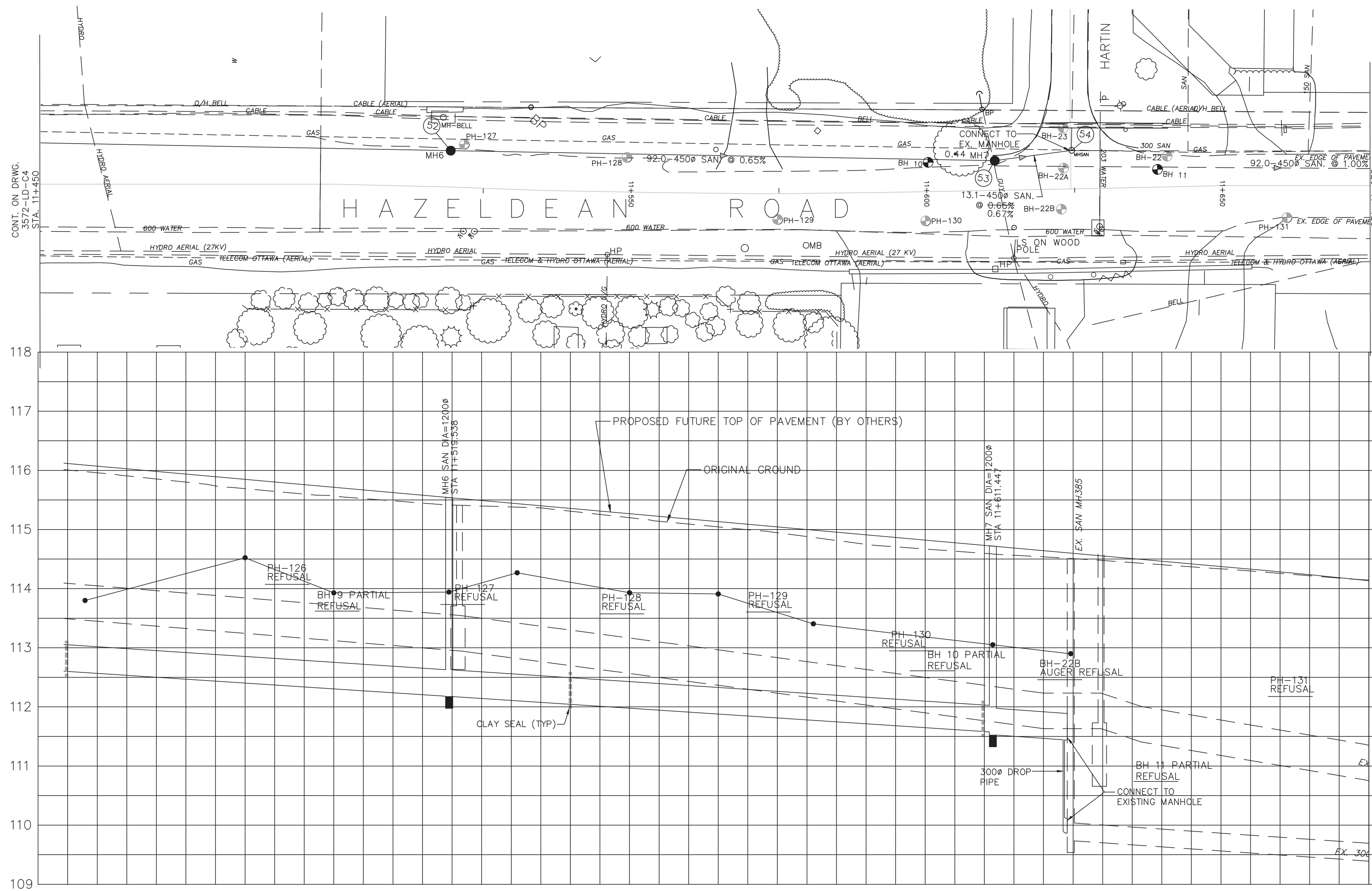
ASPHALT LANE 3.6m WIDE



TRENCH REINSTATEMENT HAZELDEAN ROAD

N.T.S

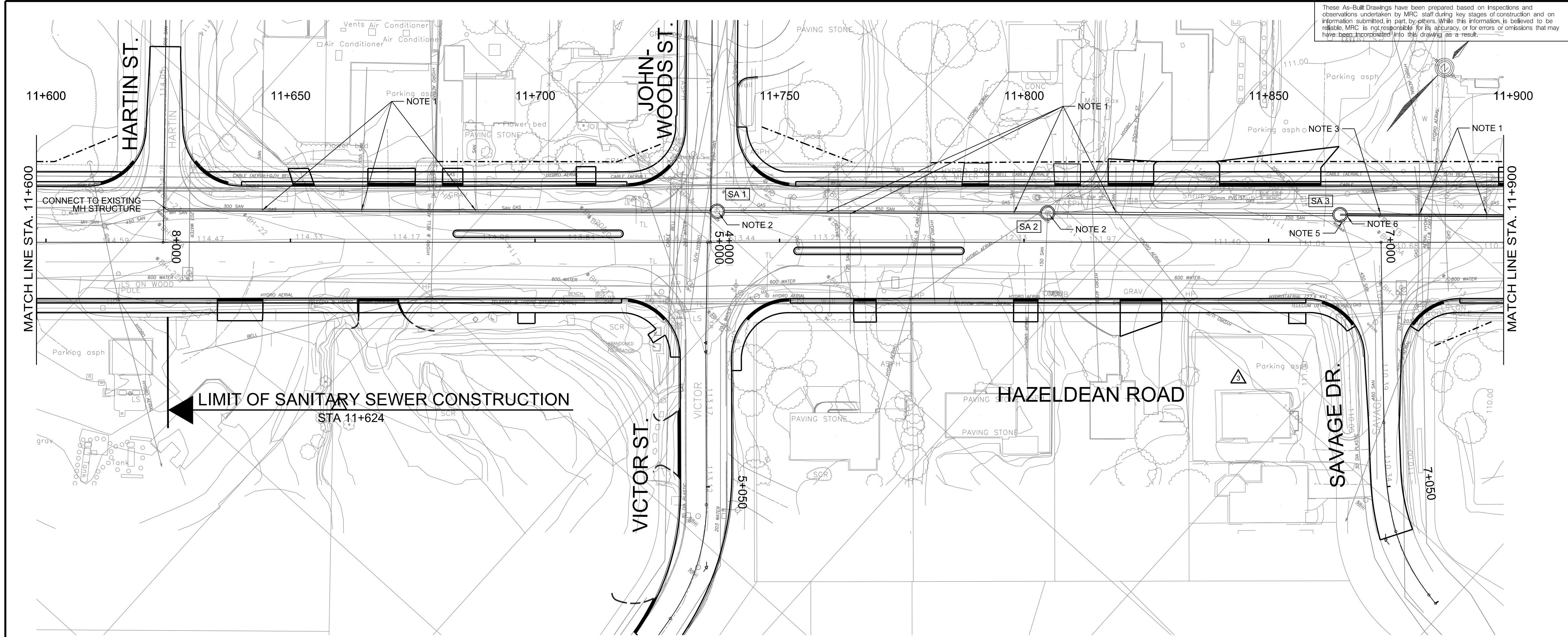
NOTE:
IF TRENCH CUT IS
TOTALLY IN ASPHALT
SAWCUT & GRIND BOTH
SIDES.



FORCEMAIN OBVERT ELEVATIONS																											
ROCK EX	113.77		114.51		113.95		113.97	114.28		113.96		113.93		113.43		113.06	112.92 3.3m-450Ø PVC SAN DR35 @ 0.66% 0.67% CLASS "B" BEDDING										
AS-BUILT SANITARY SEWER INVERT ELEVATION	100.0m-450Ø PVC SAN DR35 @ 0.65% CLASS "B" BEDDING																										
C.L. ROADWAY STATION	11+457		11+475		11+485		11+500		11+525		11+550		11+565		11+575		11+581		11+600		11+611		11+625		11+650		11+675

TITLE FRAME: 709mm x 534mm City of Ottawa 2008

Consultant Drawing Number



These As-Built Drawings have been prepared based on inspections and observations undertaken by MRC staff during key stages of construction and on information submitted in part by others. While this information is believed to be reliable, MRC is not responsible for its accuracy or for errors or omissions that may have been incorporated into this drawing as a result.

HAZELDEAN ROAD WIDENING

100m EAST OF CARP ROAD TO
100m WEST OF IBER ROAD

SANITARY SEWER

STA. 11+600 TO STA. 11+900

Contract No.
ISB09-5044

Dwg. No.
068

Sheet 68 of 148

Asset No.

Asset Group:
ISB

Des: JZ/DP Chk'd: PH/MB
Dwn: MS Chk'd: PH
Utility Circ. No.:
Const. Inspector:
Scale:
0m 10 20

NOTE:
The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

MCCORMICK RANKIN
CORPORATION
A member of **MWH GROUP**

No.	Description	By	Date
	ISSUED FOR REVIEW	P.H.	24/07/2009
	ISSUED FOR TENDER	P.H.	11/08/2009
	ISSUED FOR MOE SUBMISSION	P.H.	05/09/2009
	ISSUED FOR CONSTRUCTION	P.H.	26/11/2009
	RE-DESIGN FOR GAS CONFLICT	P.H.	26/02/2010

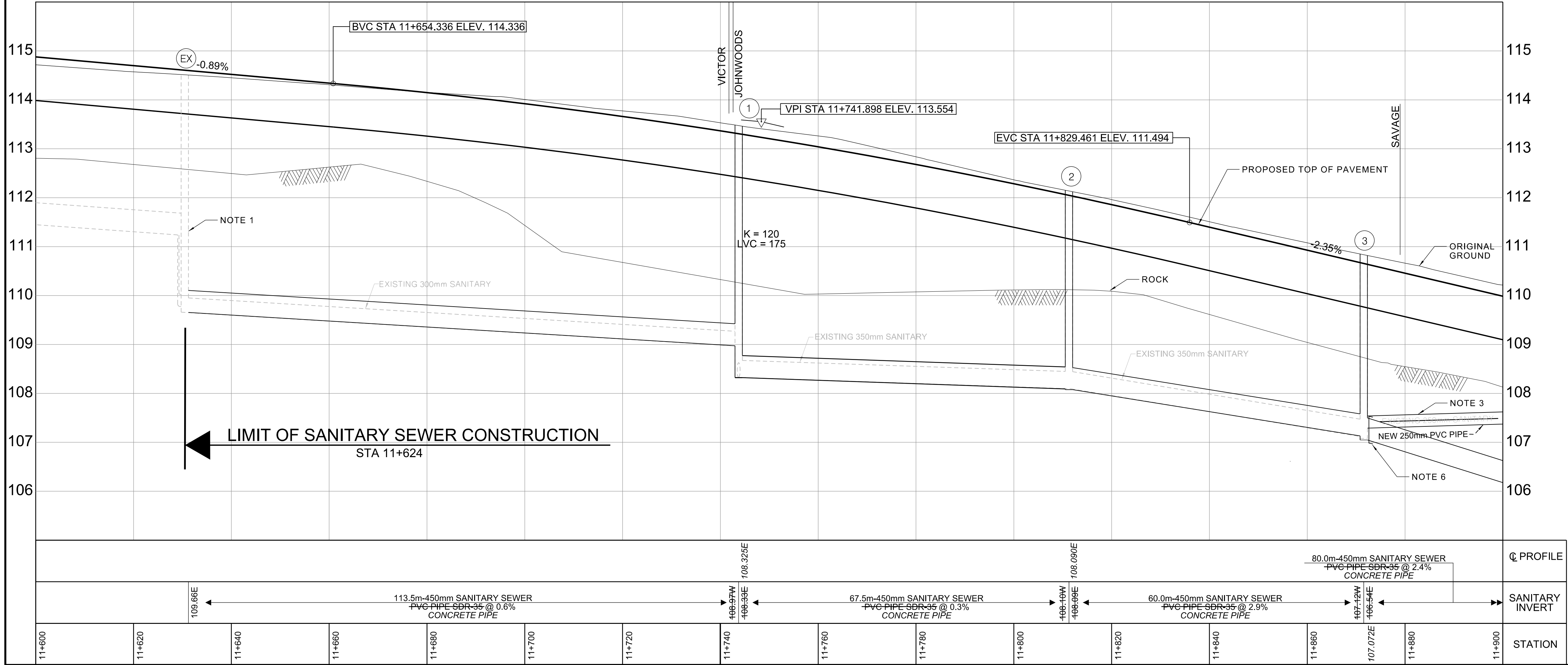
THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR THE USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT

No.	Description	By	Date
	REISSUED FOR CONSTRUCTION	M.B.	07/05/2010
	AS-BUILT	B.M.	SEPT 2012

AS-BUILT

SANITARY MAINTENANCE HOLE DATA						
NO.	STATION	OFFSET	COVER	STRUCTURE	ELEVATION	
					T/GRATE	LOW/INV.
SA1	11+737.2	6.3LT	S24	701.01	+113.25 113.225	+108.35 108.325
SA2	11+804.8	6.0LT	S24	701.01	111.99	109.09
SA3	11+864.6	5.6LT	S24	701.01	+110.55 110.602	+106.54 107.072

- NOTES:**
- CONNECT EXISTING SERVICE LATERAL TO NEW SEWER.
 - CONTRACTOR TO VERIFY CONDITION OF EXISTING MH STRUCTURE AND REPLACE AS REQUIRED (IN CONSULTATION WITH THE C.A.). CONNECT ALL EXISTING SERVICE LATERALS / SEWERS TO NEW MH (AS REQUIRED).
 - ~~RE-LAY EXISTING~~ **NEW** 250mm DIA. SANITARY SEWER IN COMMON TRENCH WITH NEW PROPOSED SEWER.
 - NOT USED
 - EXTEND EXISTING 450mm DIA. SANITARY SEWER TO NEW STRUCTURE.
 - PLUG PROPOSED 450mm DIA. SEWER (EAST OUTLET).



ALL NUMERICAL VALUES THAT ARE NOT STROKED OUT AND REPLACED IN ITALICS ON AS-BUILT DRAWINGS ARE CONSIDERED TO BE DESIGN VALUES ONLY AND NOT MEASURED IN THE FIELD.

Expansion Area = 3 Gross Area = 84.43 ha

Type	2011-2021	2021-2031 (Units)	2031-2060	Total
SFH	197	197	263.2	657.2
MTL	122	123	163.6	408.6
APT	35	35	47.2	117.2
Employees	99	99	0	198

SANITARY SEWER DESIGN SHEET
PROJECT : Kanata West Serviceability Study
LOCATION : CITY OF OTTAWA

PAGE 1 OF 1
PROJECT: 3598-LD-03
DATE: April 2005
DESIGN: JIM
FILE: 3598LD.sewers.XLS

MODEL 1 ULTIMATE (population based criteria..ICI simultaneous peaking)																									HARMON		ACTUAL		va/vf		ACTUAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
LOCATION			TOTAL AREA (Ha)	APPLIC AREA (Ha)	UNIT/Ha	RESIDENTIAL			EMPLOYMENT/RETAIL/BUSINESS PARK/OPEN SPACES						INFILTRATION			TOTAL FLOW (l/s)	PROPOSED SEWER			GRADE (%)	AVAIL. CAP. (%)	PF	Q/Q	va/vf	VELOCITY (m/s)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
STREET	FROM MH	TO MH				INDIV	ACCUM	PEAK FACTOR	PEAK FLOW (l/s)	APPLIC AREA (Ha)	ACCUM AREA (Ha)	TOTAL AREA (Ha)	FLOW RATE (l/s)	INDIV	ACCUM	PEAK FLOW (l/s)	INDIV		CUMUL	TOTAL CUMUL	VELOCITY (m/s)							LGTH. (m)	PIPE (mm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
Campeau Drive Trunk Sewer	1	2	Area 1 (PBP)	38.11																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

5.88ha of residential area from area 19

335.16 p based on 3p/unit and 19 unit/ha

Included in Maple Grove design by DSEL

Average Daily Per capita Flow Rate = 350 l/cap/d
Infiltration Allowance Flow Rate = 0.28 l/sec/ha
Residential Peaking Factor = 1+(14/(4+(P^0.5))), P=Pop. in 1000's, Max of 4
Population density per unit = 3.00
Flow for Employment/Retail/Business Park = 1.50
Mixed Uses Assumes: 15% Community Retail, 42.5% Business Park and 42.5% Residential

Revision No. 1: April 01, 2005
Revision No. 2: April 11, 2005
Revision No. 3: April 21, 2005
Revision No. 4: June 07, 2005
Revision No. 5: August 10, 2005
Revision No. 6: Oct. 14, 2005
Revision No. 7: Nov. 10, 2005
Revision No. 8: Nov. 11, 2005
Revision No. 9: Apr. 19, 2006

FIG. 4.2-1



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- | | |
|---|---|
|  | ULTIMATE MAJOR DRAINAGE LIMIT |
|  | SUBCATCHMENT AREAS |
|  | PROPOSED TRUNK SEWER |
|  | PROPOSED FORCEMAIN |
|  | TEMPORARY FORCEMAIN |
|  | PROPOSED STITTSVILLE PUMPING STATION AND FORCEMAIN |
|  | EXISTING TRUNK SEWER |
|  | MAJOR DRAINAGE SPLIT |
|  | NODES |
|  | EXISTING PUMPING STATION AND FORCEMAIN (TO BE DECOMMISSIONED) |
|  | INPUT POINT AND AREA IN HECTARES |
|  | EXISTING PUMPING STATION GRAVITY OUTLET |

5	REVISED FOR DEC.21/05 SUBMISSION	G.B.U.	S.J.P.	05:12:21
4	REVISED TRUNK SEWER FROM 16 TO KWPS	R.W.W.	R.W.W.	05:10:05
3	ARROWS FOR EXIST. PUMP STATIONS ADDED	R.W.W.	R.W.W.	05:08:09
2	REPORT JUNE 2005	R.W.W.	R.W.W.	05:06:07
1	REPORT APR. 2005	R.W.W.	R.W.W.	05:04:20

Revision	By	Appd.	Date
File Name:	Dwn.	Chkd.	Dsgn. Date

Seals

Client/Project

Kanata West Concept Plan
Master Servicing Study

Ottawa, Ontario

Preferred Waste-Water Option

Project No. 60400406

Drawing No.	Sheet	Revision
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S-I 7 of 7 5

V:\01-604\active\16040406\design\drawing\West Kanata Dwg S-1-Dec_05.dwg
Layout Name: S-1
Last Saved By: nlonita Feb 20, 2007 - 10:02am

ALTERNATIVE 2: DIVERT STITTVILLE TRUNK SEWER ONLY
DESIGN SHEET
LONG TERM FLOWS (2031)

SEWER ID	MANHOLE NUMBERS			RESIDENTIAL AREA AND POPULATION						MIXED USE	MIXED USE	COMMERCIAL	INSTITUTIONAL	Commercial + Institutional			INDUSTRIAL				INFILTRATION		PEAK FLOW	PIPE							
	From	To	@	TOTAL						Area (ha)	Accum. Area	Area (ha)	Area (ha)	TOTAL			Cumulative			TOTAL		TOTAL FLOW (l/s)	Pipe Dia. (mm)	Pipe Type	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/O _{ult} (%)	D/S Invert Elevation (m)	
				Area (ha)	Cumul. Area (ha)	Pop.	Cumul. Pop.	Peak Factor	Peak Flow (l/s)					Accum. Area	Peak Factor	Peak Flow (l/s)	Area (ha)	Cumul. Area (ha)	Peak Factor	Peak Flow (l/s)	Accum. Area										Infiltr. Flow (l/s)
Stittsville Trunk (2006 data)	N/A	N/A	MH-101	526.6	526.6	28031	28031	2.5	284.6	0	0	59.8	16.2	76	1.5	66.0	40.5	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	57.4	935	1.21	62.3%	98.45
	MH - 101	MH - 102		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	98.36
	MH - 102	MH - 103		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	98.17
	MH - 103	MH - 104		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.97
	MH - 104	MH - 105		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.79
	MH - 105	MH - 106		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.60
	MH - 106	MH - 107		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.41
	MH - 107	MH - 108		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.22
	MH - 108	MH - 109		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	97.02
	MH - 109	MH - 110		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	96.84
	MH - 110	MH - 111		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	96.65
	MH - 111	MH - 112		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	96.46
	MH - 112	MH - 113		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.0	935	1.21	62.3%	96.27
	MH - 113	MH - 114		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	90.5	935	1.21	62.3%	96.13
	MH - 114	MH - 115		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	84.7	935	1.21	62.3%	93.75
	MH - 115	MH - 116		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	91.3	935	1.21	62.3%	93.61
	MH - 116	MH - 117		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.16	120.5	935	1.21	62.3%	93.42
	MH - 117	MH - 118A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	95.0	1145	1.49	50.9%	93.19
	MH - 118A	MH - 119A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	120.0	1145	1.49	50.9%	92.90
	MH - 119A	MH - 120A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	67.3	1145	1.49	50.9%	92.74
	MH - 120A	MH - 121A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	60.2	1145	1.49	50.9%	92.60
	MH - 121A	MH - 122A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	70.5	1145	1.49	50.9%	92.43
	MH - 122A	MH - 123A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	103.1	1145	1.49	50.9%	90.33
	MH - 123A	MH - 124A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	120.9	1145	1.49	50.9%	90.04
	MH - 124A	MH - 125A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	91.6	1145	1.49	50.9%	89.72
	MH - 125A	MH - 126A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	86.2	1145	1.49	50.9%	89.51
	MH - 126A	MH - 127A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	103.6	1145	1.49	50.9%	89.21
	MH - 127A	MH - 128A		0	526.6	0	28031	2.5	284.6	0	0	0	0	76	1.5	66.0	0	40.5	3.17	52.0	643.1	180.1	582.6	975	C 100-D	0.24	24.5	1145	1.49	50.9%	89.15

Comments

Stittsville Trunk (2031 data) : Information is taken directly from the Fernbank Community Design Plan - Table D-8 Offsite - Sanitary Design Sheets - North Kanata Trunk

Peak Flow 800 L/s: The flow in the sewer would be limited by the diversion structure to 800 L/s

Mixed Use Peak Flow: 50% of the Mixed Use Area is Residential and 50% of Mixed Use Area is Commercial/Institutional Flow.

Del land: Additional flows from the Del land (approximately 102.7 L/s) are anticipated to be added following coordination during preliminary/detailed design.

From: Mark Bissett
To: [Bougadis, John](#)
Subject: Kizell Lands - Sanitary Drainage
Date: Monday, July 23, 2018 4:48:49 PM

I noticed that too...Lee actually provided the design flow to me this morning (i.e. 580L/s vs. 495L/s).

I was provided the 495L/s a while ago, and used that as our starting point...I can't speak to where the 580L/s comes from, but I intend to update our design sheets to match the JLR FDR when we make our next submission.

There's loads of conveyance capacity in the pipe, so I'm not too worried at this point. You have any concerns?

Mark Bissett, P.Eng., Senior Project Manager | Land Development & Municipal

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 237 | Cell: 613.261.4792

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From: Bougadis, John [mailto:John.Bougadis@ottawa.ca]

Sent: Monday, July 23, 2018 4:39 PM

To: Mark Bissett <m.bissett@novatech-eng.com>

Subject: RE: Kizell Lands - Sanitary Drainage

I do have one follow up question: the JLR FDR identified a flow rate of 580 l/s from the Stittsville Trunk while your updated sheet shows a flow of 495 l/s. I think this is due to areas redirected to Hazeldean PS.

Thanks again for your quick response.

John
X1490

From: Mark Bissett <m.bissett@novatech-eng.com>

Sent: Monday, July 23, 2018 4:30 PM

To: Bougadis, John <John.Bougadis@ottawa.ca>

Subject: Kizell Lands - Sanitary Drainage

Sanitary Design Sheet as requested.

Mark Bissett, P.Eng., Senior Project Manager | Land Development & Municipal

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 237 | Cell: 613.261.4792

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From: Mark Bissett

Sent: Monday, July 23, 2018 4:25 PM

To: 'Bougadis, John' <John.Bougadis@ottawa.ca>

Cc: Paerez, Ana <Ana.Paerez@stantec.com>; John Riddell (Novatech) <j.riddell@novatech-eng.com>

Subject: Kizell Lands - Sanitary Drainage

John- attached is the latest Sanitary Drainage Area Plan for the Kizell Lands (rev.3 Feb. 23/18).

Be advised the concept is not Draft Approved, and with a newly contemplated LRT Station at Hazeldean Road, my client is reviewing the plan.

Always in flux...call if you have any questions, or concerns with the above. Best,

Mark Bissett, P.Eng., Senior Project Manager | Land Development & Municipal

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 237 | Cell: 613.261.4792

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From: Bougadis, John [<mailto:John.Bougadis@ottawa.ca>]

Sent: Monday, July 23, 2018 3:40 PM

To: Mark Bissett <m.bissett@novatech-eng.com>

Cc: Paerez, Ana <Ana.Paerez@stantec.com>

Subject: FW: Kizell Lands - Sanitary Drainage

Importance: High

Hi Mark,

Could you provide the latest sanitary drainage plan and sewer design sheet for the Kizell lands and Stittsville Interceptor?

The information is required to advance developments (Richcraft) within the Kanata West Pump Station catchment area. Receiving the information sometime this week would be greatly appreciated.

Please feel to contact me if you have any questions or concerns.

Thanks

John Bougadis, M.A.Sc., P.Eng.

Senior Project Manager, Infrastructure Planning

Asset Management Branch

Planning, Infrastructure and Economic Development Department

City of Ottawa

☐ 613.580.2424 ext.14990

From: Mark Bissett <m.bissett@novatech-eng.com>

Sent: Friday, November 03, 2017 12:10 PM

To: Bougadis, John <John.Bougadis@ottawa.ca>

Cc: Gillis, Sheridan (Stantec) <Sheridan.Gillis@stantec.com>; Kevin Yemm (Richcraft) <keviny@richcraft.com>; Surprenant, Eric <Eric.Surprenant@ottawa.ca>

Subject: Kizell Lands - Sanitary Drainage

John- attached is the Sanitary Drainage Area Plan (SAN) for the Kizell Lands recently issued with our Draft Plan submission. Also, attached is a coordination figure (DSK-2) that highlights the approx. drainage boundaries.

In sum, the majority of sanitary flow will be routed to the Stittsville Diversion Trunk (SDT), but the precise boundaries are somewhat in flux until design parameters are finalized (such as the road configuration and the SDT elevation).

Regarding the local sanitary on Abbott Street, we have corrected the population in the High Density block to 680 people, so that it agrees with the Fernbank Master Servicing parameters. The affect is to resolve surcharge in the sewer under peak design flow conditions. I've attached the current design sheet for your consideration (excerpt from the Servicing Brief).

I believe this should address city concerns related to the wastewater system. Let me know if I've missed anything, or if there are other concerns.

Sincerely,

Mark Bissett, P.Eng., Senior Project Manager | Land Development & Municipal

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext: 237 | Cell: 613.261.4792

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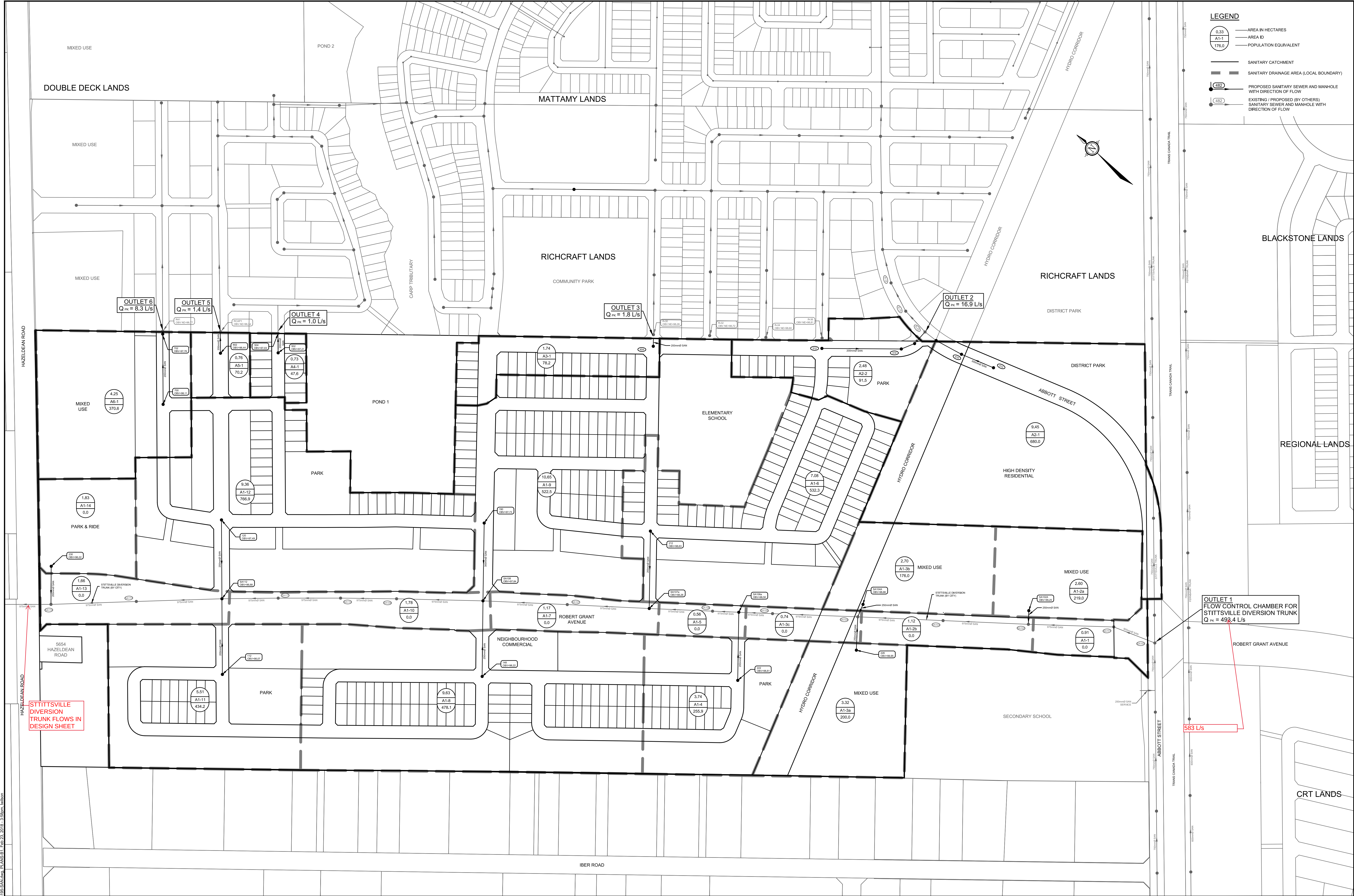
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,

FERNBANK COMMUNITY - KIZELL LANDS
SANITARY SEWER DESIGN SHEET

AREA			RESIDENTIAL																ICI				INFILTRATION			Total Flow (l/s)	PIPE								
ID	From	To	SINGLES		TOWNS		STACKED TOWNS		MEDIUM DENISTY		HIGH DENSITY		MIXED USE		TOTAL				Commercial Area (ha)	Institutional Area (ha)	Accum. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accum. Area (ha)	Infilt. Flow (l/s)		Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q _{full} (%)			
			Units	Pop.	Units	Pop.	Area	Pop.	Area	Pop.	Units	Pop.	Net Area (ha)	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)																	
Outlet 1																																			
Stittsville Diversion Trunk																																			
	SA100	SA101		0.0		0.0								0.0	0.0	0	4.0	0.0			0.00	0.0	0.00	0.00	0.00	0.00	0.0	493.4	900	0.38	62	1164.2	1.77	42.4%	
A1-1	SA101	SA102		0.0		0.0								0.0	0.0	0.0	4.0	0.0			0.00	0.0	0.94	0.94	0.3	493.7	975	0.16	120	935.2	1.21	52.8%			
A1-2	SA102	SA104		0.0		0.0							2.60	219.0	219.0	219.0	4.0	3.5	1.17		1.17	1.0	3.71	4.65	1.3	499.3	975	0.16	240	935.2	1.21	53.4%			
A1-3	SA104	SA106a		0.0		0.0							4.47	376.0	376.0	595.0	3.9	9.5	2.01		3.18	2.8	6.76	11.41	3.2	508.8	975	0.16	167	935.2	1.21	54.4%			
A1-4	222	SA106a	19	64.6		0.0	0.88	116.4	0.64	74.9				0.0	255.9	255.9	4.0	4.1		0.80	0.80	0.7	3.74	3.74	1.0	5.9	200	0.35	96	20.2	0.62	29.1%			
A1-5	SA106a	SA107a		0.0		0.0								0.0	0.0	850.9	3.8	13.3			3.98	3.5	0.56	15.71	4.4	514.5	975	0.16	126	935.2	1.21	55.0%			
A1-6	212	SA107a	76	258.4	36	97.2			1.51	176.7				0.0	532.3	532.3	4.0	8.5		0.81	0.81	0.7	7.08	7.08	2.0	11.2	200	0.35	109	20.2	0.62	55.4%			
A1-7	SA107a	SA108		0.0		0.0								0.0	0.0	1383.2	3.7	20.8			4.79	4.2	1.17	23.96	6.7	525.0	975	0.16	234	935.2	1.21	56.1%			
A1-8	148	SA108	68	231.2		0.0	2.26	299.0	2.11	246.9				0.0	478.1	478.1	4.0	7.7	0.55		0.55	0.5	9.63	9.63	2.7	10.9	250	0.35	106	36.7	0.72	29.7%			
A1-9	190	SA108	74	251.6	44	118.8			1.30	152.1				0.0	522.5	522.5	4.0	8.4		3.04	3.04	2.6	10.65	10.65	3.0	14.0	300	0.20	109	45.1	0.62	31.1%			
A1-10	SA108	SA112		0.0		0.0								0.0	0.0	2383.7	3.5	34.0			8.38	7.3	1.78	46.02	12.9	547.6	975	0.16	367	935.2	1.21	58.6%			
A1-11	112	SA112	16	54.4		0.0	1.50	198.5	1.55	181.4				0.0	434.2	434.2	4.0	7.0		0.80	0.80	0.7	5.51	5.51	1.5	9.3	200	0.80	106	30.6	0.94	30.3%			
A1-12	120	SA112	28	95.2	127	342.9			2.81	328.8				0.0	766.9	766.9	3.9	12.0		0.81	0.81	0.7	9.36	9.36	2.6	15.4	250	0.25	111	31.0	0.61	49.5%			
A1-13	SA112	SA114		0.0		0.0								0.0	0.0	3584.8	3.4	49.0			9.99	8.7	1.66	62.55	17.5	568.6	975	0.16	241	935.2	1.21	60.8%			
A1-14	SA114	SA115		0.0		0.0								0.0	0.0	3584.81	3.4	49.0		1.83	11.82	10.3	1.83	64.38	18.0	570.7	975	0.24	92	1145.4	1.49	49.8%			
Outlet 2																																			
A2-1, A2-2	R20	R19	15	51.0	15	40.5					680			0.0	772	772	3.9	12.1		1.64	1.64	1.4	11.93	11.93	3.3	16.9	300	0.50	43	71.3	0.98	23.6%			
Outlet 3																																			
A3-1	404	R30	23	78.2		0.0								0.0	78.2	78.2	4.0	1.3			0.00	0.0	1.74	1.74	0.5	1.8	200	0.35	11	20.2	0.62	8.7%			
Outlet 4																																			
A4-1	502	504	14	47.6		0.0								0.0	47.6	47.6	4.0	0.8			0.00	0.0	0.73	0.73	0.2	1.0	200	0.65	27	27.6	0.85	3.5%			
Outlet 5																																			
A5-1	602	RCAP1		0.0	26	70.2								0.0	70.2	70.2	4.0	1.1			0.00	0.0	0.76	0.76	0.2	1.4	200	0.75	29	29.6	0.91	4.6%			
Outlet 6																																			
A6-1	700	702		0.0	48	129.6								0.0	129.6	129.6	4.0	2.1			0.00	0.0	1.39	1.39	0.4	2.5	200	0.35	99	20.2	0.62	12.3%			
A6-1	702	R41		0.0		0.0							2.86	241.0	241.0	370.6	4.0	6.0	1.29		1.29	1.1	2.86	4.25	1.2	8.3	250	0.35	3	36.7	0.72	22.6%			
Design Parameters:																	Population Density:				Project: Kizell Lands (108195)														
Avg Flow/Person =				350		l/day												ppl/unit		units/net ha		Designed: LRW													
Comm./Inst. Flow =				50000		l/ha/day												Mixed Use/HDR		1.80		85		Checked: MAB											
Infiltration =				0.28		l/s/ha												Singles		3.40				Date: February 23, 2018											
Pipe Friction n =				0.013														Towns		2.70															
Residential Peaking Factor = Harmon Equation (max 4, min 2)																	Stacked Towns		2.70		49														
Peaking Factor Comm./Inst. =				1.5														Medium Density		1.80		65													

583L/s



NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS,
WATERMANS, SEWERS AND OTHER
UNDERGROUND AND OVERGROUND UTILITIES AND
STRUCTURES IS NOT NECESSARILY SHOWN ON
THE CONTRACT DRAWINGS, AND WHERE SHOWN,
THE ACCURACY OF THE POSITION OF SUCH
UTILITIES AND STRUCTURES IS NOT GUARANTEED.
BEFORE STARTING WORK, DETERMINE THE EXACT
LOCATION OF ALL SUCH UTILITIES AND
STRUCTURES AND ASSUME ALL LIABILITY FOR
DAMAGE TO THEM.

No.	REVISION	DATE	BY
3.	DRAFT PLAN RESUBMISSION	FEB 23/18	MAB
2.	REVISED PER CITY COMMENTS	JUL, 2017	MAB
1.	DRAFT PLAN APPLICATION	NOV, 9/16	MAB

SCALE

1:2000

0 20 40 60 80

DESIGN

LRW

CHECKED

MAB

DRAWN

DTD

CHECKED

MAB

APPROVED

JGR

FOR REVIEW ONLY

L.R. WILSON
100180065
PROVINCE OF ONTARIO

M.A. BISSETT
2018, 02, 23
PROVINCE OF ONTARIO

NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
FERNBANK COMMUNITY - KIZELL LANDS

SANITARY DRAINAGE AREA PLAN

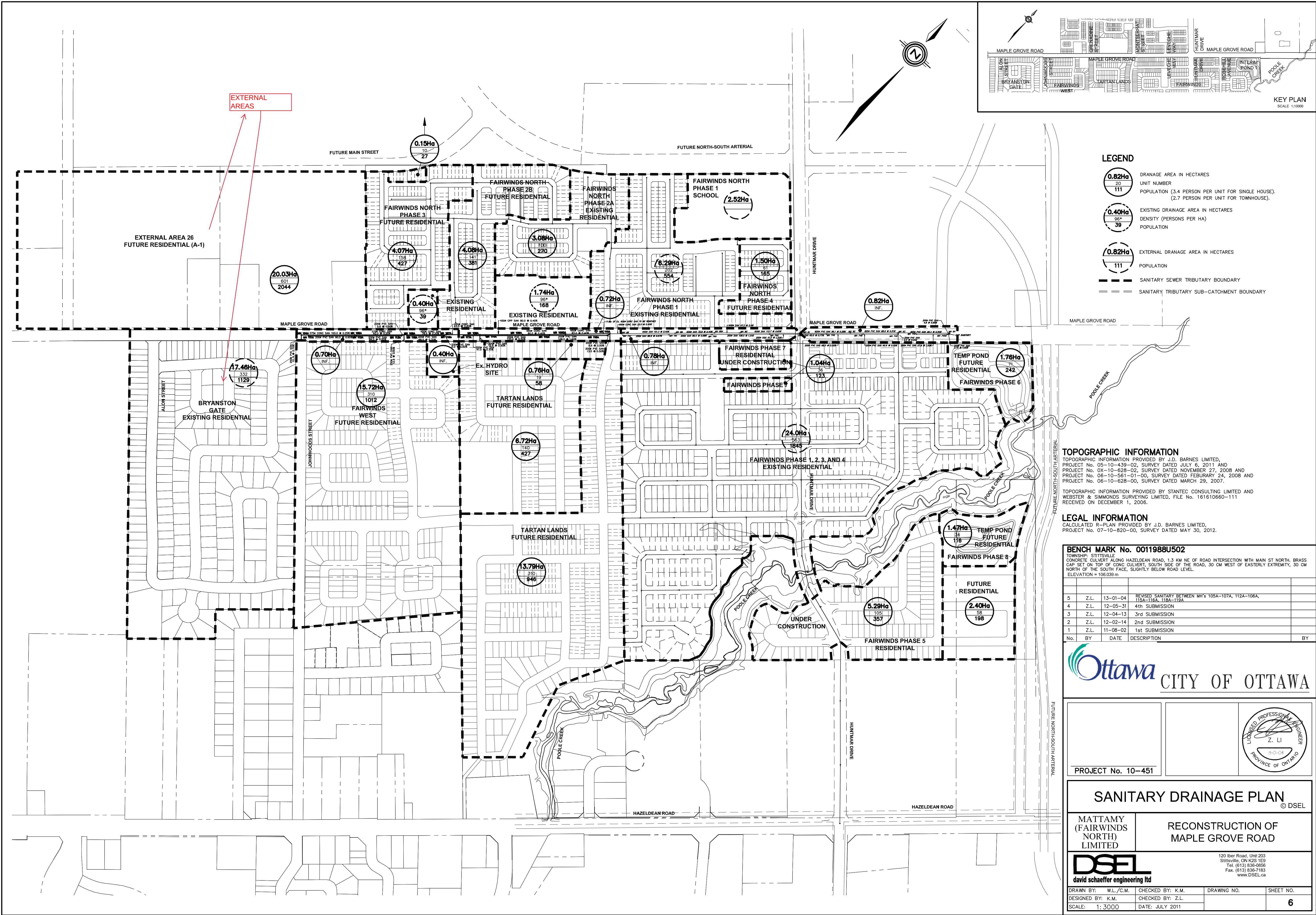
PROJECT NO.
108195

REV # 3

DRAWING NO.
108195-SAN

C:\Users\108195\Documents\CAD\Drawings\108195-SAN.dwg PLANS-B1 Feb 23, 2018 - 3:59pm, lalouin

PL-0407-2017-108195-01.dwg



LEGEND

- 0.82Ha**
20
111
DRAINAGE AREA IN HECTARES
UNIT NUMBER
POPULATION (3.4 PERSON PER UNIT FOR SINGLE HOUSE),
(2.7 PERSON PER UNIT FOR TOWNHOUSE).
- 0.40Ha**
96*
39
EXISTING DRAINAGE AREA IN HECTARES
DENSITY (PERSONS PER HA)
POPULATION
- 0.82Ha**
111
EXTERNAL DRAINAGE AREA IN HECTARES
POPULATION
- SANITARY SEWER TRIBUTARY BOUNDARY
-
- SANITARY TRIBUTARY SUB-CATCHMENT BOUNDARY

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY J.D. BARNES LIMITED,
PROJECT No. 05-10-459-02, SURVEY DATED JULY 6, 2011 AND
PROJECT No. 0X-10-628-02, SURVEY DATED NOVEMBER 27, 2008 AND
PROJECT No. 06-10-561-01-00, SURVEY DATED FEBRUARY 24, 2008 AND
PROJECT No. 06-10-628-00, SURVEY DATED MARCH 29, 2007.

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC CONSULTING LIMITED AND
WEBSTER & SIMMONDS SURVEYING LIMITED, FILE No. 161610660-111
RECEIVED ON DECEMBER 1, 2006.

LEGAL INFORMATION

CALCULATED R-PLAN PROVIDED BY J.D. BARNES LIMITED,
PROJECT No. 07-10-820-00, SURVEY DATED MAY 30, 2012.

BENCH MARK No. 0011988U502

TOWNSHIP: STITTVILLE
CONCRETE CULVERT ALONG HAZELDEAN ROAD, 1.3 KM NE OF ROAD INTERSECTION WITH MAIN ST NORTH, BRASS
CAP SET ON TOP OF CONC CULVERT, SOUTH SIDE OF THE ROAD, 30 CM WEST OF EASTERLY EXTREMITY, 30 CM
NORTH OF THE SOUTH FACE, SLIGHTLY BELOW ROAD LEVEL.
ELEVATION = 106.039 m

5	Z.L.	13-01-04	REVISED SANITARY BETWEEN MH'S 105A-107A, 112A-106A, 115A-116A, 118A-119A
4	Z.L.	12-05-31	4th SUBMISSION
3	Z.L.	12-04-13	3rd SUBMISSION
2	Z.L.	12-02-14	2nd SUBMISSION
1	Z.L.	11-08-02	1st SUBMISSION
No.	BY	DATE	DESCRIPTION

Ottawa CITY OF OTTAWA

PROJECT No. 10-451

SANITARY DRAINAGE PLAN

MATTAMY (FAIRWINDS NORTH) LIMITED
RECONSTRUCTION OF MAPLE GROVE ROAD

DSEL
david schaeffer engineering ltd
120 Berr Road, Unit 203
Stittville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7163
www.DSEL.ca

DRAWN BY: W.L./C.M.	CHECKED BY: K.M.	DRAWING NO.	SHEET NO.
DESIGNED BY: K.M.	CHECKED BY: Z.L.		6
SCALE: 1:3000	DATE: JULY 2011		

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

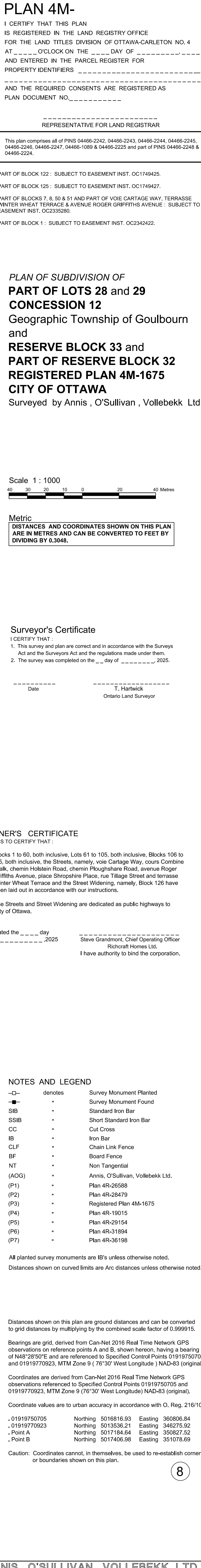
LOCATION	RESIDENTIAL AREA AND POPULATION		COMM	INDUST	INSTIT		C++I	INFILTRATION		PIPE
----------	---------------------------------	--	------	--------	--------	--	------	--------------	--	------

STREET		FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE		PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	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)	RATIO Q act/Q cap	VEL.		
							AREA (ha)	POP.																			(FULL) (m/s)	(ACT.) (m/s)	
MAPLE GROVE ROAD																													
				20.03	601	2044	20.03	2044										20.03	20.03										
		104A	105A	17.46	332	1129	37.49	3173	3.42	43.96								17.46	37.49	10.497	54.46	100.0	375	0.25	87.67	0.62	0.79	0.83	
		105A	106A	0.70	0	0	38.19	3173	3.42	43.96								0.70	38.19	10.693	54.65	92.0	375	0.25	87.67	0.62	0.79	0.83	
				0.40		39	38.59	3212										0.40	38.59										
				0.40	0	0	38.99	3212										0.40	38.99										
		106A	107A	15.72	310	1012	54.71	4224	3.31	56.64								15.72	54.71	15.319	71.96	78.5	450	0.20	127.50	0.56	0.80	0.82	
		107A	108A	0.72	0	0	55.43	4224	3.31	56.64								0.72	55.43	15.520	72.16	63.0	450	0.20	127.50	0.57	0.80	0.82	
		108A	109A	6.72	140	427	62.15	4651	3.27	61.61								6.72	62.15	17.402	79.01	80.0	450	0.40	180.32	0.44	1.13	1.09	
		109A	1090A	1.74		168	63.89	4819	3.26	63.64								1.74	63.89	17.889	81.53	80.0	450	0.40	180.32	0.45	1.13	1.10	
		1090A	110A				63.89	4819	3.26	63.64								0.00	63.89	17.889	81.53	83.0	450	0.40	180.32	0.45	1.13	1.10	
				0.76	19	58	64.65	4877										0.76	64.65										
		110A	Ex. 88	13.79	310	946	78.44	5823	3.18	75.01								13.79	77.68	21.750	96.76	22.0	600	0.40	388.33	0.25	1.37	1.14	
		Ex. 88	Ex. 89	0.78	0	0	79.22	5823	3.18	75.01								0.78	78.46	21.969	96.98	101.3	600	0.40	388.33	0.25	1.37	1.14	
				4.07	158	427	83.29	6250										4.07	82.53										
				4.08	141	381	87.37	6631										4.08	86.61										
				3.08	100	270	90.45	6901										3.08	89.69										
				2.52			92.97	6901																					
				6.29	202	554	99.26	7455										6.29	95.98										
		Ex. 89	Ex. 89A	1.50	61	165	100.76	7620	3.07	94.76								1.50	97.48	27.294	122.05	72.8	600	0.40	388.33	0.31	1.37	1.21	
		Ex. 89A	Ex. 90				100.76	7620	3.07	94.76								0.00	97.48	27.294	122.05	47.2	600	0.40	388.33	0.31	1.37	1.21	
		Ex. 90	Ex. 91				100.76	7620	3.07	94.76								0.00	97.48	27.294	122.05	112.7	600	0.62	483.47	0.25	1.71	1.42	
				0.82	0	0	101.58	7620										0.82	98.30										
				1.04	36	123	102.62	7743										1.04	98.52										
				1.76	71	242	104.38	7985										1.76	100.28										
				24.00	563	1845	128.38	9830										24.00	124.28										
				2.40	58	198	130.78	10028										2.40	126.68										
				5.29	105	357	136.07	10385										5.29	131.97										
		Ex. 91	Ex. 92	1.47	34	116	137.54	10501	2.93	124.64								1.47	133.44	37.363	162.00	96.1	825	0.28	759.56	0.21	1.42	1.12	
		Ex. 92	Ex. 93				137.54	10501	2.93	124.64								0.00	133.44	37.363	162.00	88.9	825	0.51	1025.11	0.16	1.92	1.39	
		Ex. 93	Ex. 94				137.54	10501	2.93	124.64								0.00	133.44	37.363	162.00	96.4	825	0.50	1015.01	0.16	1.90	1.39	

DESIGN PARAMETERS				Designed: K.M.		PROJECT: RECONSTRUCTION OF MAPLE GROVE ROAD			
Average Daily Flow =	350	l/p/day	Industrial Peak Factor = as per MOE Graph						
Commercial/Institution Flow =	50000	L/ha/da	Extraneous Flow =		0.280	L/s/ha			
Industrial Flow =	35000	L/ha/da	Minimum Velocity =		0.760	m/s			
Max Res. Peak Factor =	4.00		Manning's n =		0.013				
Commercial/Institution peak Factor =	1.50		Townhouse coeff=		2.7				
			Single house coeff=		3.4				
Dwg. Reference: Sanitary Drainage Plan, Dwg. No. 6				File Ref: 10-451		Date: May, 2012		Sheet No. 1 of 1	

APPENDIX D

Draft 4M Plan



APPENDIX E

Drawings