298 AXIS WAY

SITE SERVICING REPORT

PROJECT No: 240801

CITY OF OTTAWA

NOVEMBER 12, 2025

(Revision 2)

Table of Contents

APPENDIX

DESIGN BRIEF

1.0 BACKGROUND

1.1 General

Atrel Engineering has been retained by Minto Communities to complete a site servicing for a residential development of approximately 2.67 ha. located in Orleans, in the City of Ottawa. The proposed site plan, referred to as "298 Axis Way," is located within the Trails Edge Subdivision and is bounded by Brian Coburn Boulevard to the north, Axis Way to the south, Fern Casey Street to the east, and 640 Compass Street to the west, as illustrated in *Figure 1* below.

Figure 1-Location Map

The proposed development includes a mix of back-to-back townhouse (Avenue Towns) and apartment buildings (Metro Towns), totaling 200 residential units. Construction is expected to commence following the approval of the required reports and drawings by the relevant agencies.

1.2 Previously Approved Studies and Reports

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

- Paterson Group Geotechnical Investigation report titled "Proposed Residential Development, Trails Edge Stage 3, 298 Axis Way, Ottawa, Ontario", Revision 2 dated November 10, 2025

- DSEL report titled "Design Brief for the Trails Edge West Richcraft Group of Companies", dated January 26, 2015

- DSEL report titled "Master Servicing Study for East Urban Community Phase 3, Area Community Design Plan, Richcraft Homes", dated December 2020

- IBI Group report titled "Design Brief, Minto Trails Edge Phase II", dated January 2015

- DSEL report titled "Servicing report for Trails Edge and Orleans Business Park, Minto Developments Inc., Richcraft Group of Companies", dated March 2014

- JFSA report titled "East Urban Community / Preliminary Gradeline Analysis and Pond Design", dated June 2, 2019

- DSEL / JFSA report titled "Design Brief for Pond 1 East Urban Community North Main Cell and North Forebay Modifications", Revised February 2023.

1.3 Services

298 Axis Way can be physically serviced through the following existing municipal infrastructure:

i) An existing 200 mm diameter watermain stub off Axis Way through Block 139, as well as an existing 400 mm diameter watermain on Fern Casey Street.

ii) An existing 1050 mm diameter storm sewer off Axis Way through Block 139.

iii) An existing 200 mm diameter sanitary sewer off Axis Way through Block 139.

The proposed development will connect directly to the above-mentioned services which were designed to accommodate this site. The watermain, storm and sanitary sewers of the proposed site plan were designed in conjunction with the previously approved studies and reports listed in section 1.2.

1.4 Geotechnical Recommendation for Servicing

The proposed site plan is designed in conjunction with Paterson Group Geotechnical Investigation report titled "Proposed Residential Development, Trails Edge Stage 3, 298 Axis Way, Ottawa, Ottawa, Ontario", revision 2 dated November 10, 2025. The geotechnical report offers grade-raise recommendations and provides subsurface information that informs the detailed design of municipal infrastructure and grading within the specified development.

1.5 Permits and Approval Required for Servicing

To construct the proposed site plan, multiple permits and approvals are required as mentioned below:

- The City of Ottawa approval of various reports and plans related to this project.
- An Environment Compliance Approval (ECA) from the Ministry of Environment, Conservation and Parks (MOECP) is required to construct the sanitary sewers and storm sewers.
- A Form 1 "Record of Watermain Authorized as a Future Alteration" from the MOECP to construct the watermain.

2.0 STORM SEWERS

2.1 General

The proposed site plan is situated within the Trails Edge West Subdivision, located north of Mud Creek and the existing stormwater management (SWM) facility. This facility currently provides both quantity and quality control for the entire Trails Edge Subdivision, including the proposed development area. According to JFSA's Stormwater Management report, a runoff coefficient of 0.80 was assumed for the proposed site and the minor flow system capture rate is to be limited to the 5 year flow, with no on-site surface storage required. The design includes catch basins within the parking areas and roadways, with storm sewer connections proposed along Axis Way.

2.2 Design Constraints

The main design constraints were established in JFSA report titled "East Urban Community / Preliminary Gradeline Analysis and Pond Design, dated June 2, 2019" and are outlined below:

a) Minor System

i. Storm sewers sizing is to be designed based on the 5-year storm event using a time of concentration of 10 minutes.

ii. All residential inlets will be equipped with inlet control devices (ICD). The term "inlet" refers to "a single catch basin" or "a group of interconnected catch basins" connected by a single lead into the minor system. The inflow rate into the minor system shall be limited to ensure no surface ponding during the 2-year storm event. The release rate was established by JFSA to be 987 l/s during the 5-year DDSWMM flow event for the segment ID A041a which includes the proposed site plan (refer to excerpt pages 1 to 5 and Table 1 and A-1 from JFSA's 2019 report in Appendix A).

iii. The hydraulic grade line for a 100-year storm event shall be computed and the maximum permitted hydraulic grade line elevation is to be 0.30m below the underside of footing.

b) Major System and Emergency Overflow

i. Routing to emergency storage area shall be provided and illustrated on the grade control plan. This routing must incorporate a maximum of 0.35 m flow depth on the streets and parking's under either static or dynamic conditions. An overall positive slope of 0.10% will be required across consecutive ponding area spill points for routing purposes.

ii. On site detention storage volume are to be calculated and can be provided in the parking areas and road way..

c) Water Quality

i. The existing East Urban Community Stormwater Management Pond 1 (EUC Pond 1) was designed with water quality control targets specified in DSEL's report. It was planned to achieve a Normal level of fish habitat protection, corresponding to a 70% removal of total suspended solids (TSS).

2.3 Tributary Area

The proposed site plan will convey its storm water flow towards the existing 1050mm storm sewer stub on Axis Way which will ultimately reach Mud Creek and the existing SWM pond via existing storm sewers.

The overall drainage area has been divided into several sub-basins to evaluate stormwater flows within each segment of the storm sewer system. Drawing 240801-STM1 illustrates the delineation of these sub-basin areas. In addition, the Trails Edge West storm drainage plan and the corresponding storm sewer calculation sheet are provided in Appendix A, showing the tributary areas draining to the existing 1050 mm storm sewer at the project entrance (Block 136).

Runoff coefficients were assigned to each sub-basin based on surface type, with values of 0.20 for grassed areas and 0.90 for asphalt and roofed surfaces.

2.4 Theoretical Flows

The stormwater design flows for the proposed site plan were calculated using the Rational Method, assuming a 10-minute inlet time and the 5-year Intensity-Duration-Frequency (IDF) curve from the City of Ottawa. Inlet control devices (ICDs) will be used to regulate inflows and prevent system surcharging during major storm events, including the 100-year event.

A dual drainage analysis for the existing Trails Edge development was previously completed by DSEL / JFSA, establishing the hydraulic grade line (HGL) for the 100-year, 24-hour SCS Type II storm event at the downstream maintenance hole (STM MH 41). An excerpt from DSEL / JFSA's report titled "Design Brief for Pond 1 East Urban Community North Main Cell and North Forebay Modifications," revised February 2023, is provided in Appendix A.

The HGLs for all storm events were reviewed against the proposed underside of footings (USFs) to ensure a minimum freeboard of 0.30 m. Where the HGL is below the sewer obvert, the USF was confirmed to maintain at least 0.50 m clearance above the obvert.

Detailed calculations are provided in Appendix B as follows:

- Table 1: Rational Method stormwater computation forms.
- Table 2: Restricted flow computation form and HGL analysis.

2.5 Stormwater Management and Storm Sewers

The minor drainage system refers to the storm sewers, catch basins, swales and ditches and is usually designed to carry the so-called 1 in 5 year storm event. Storm sewer computation forms and the corresponding hydraulic grade line (HGL) for restricted flow conditions are provided in Tables 1 and 2 of Appendix A. The major drainage system includes the roadways and rear yard swales, which are designed to safely convey runoff from major storm events exceeding the 5-year level, such as the 1-in-100-year storm event.

According to JFSA's report titled "East Urban Community / Preliminary Gradeline Analysis and Pond Design" dated June 2, 2019, the inflow to the minor system must be limited to the 5-year release rate. Inlet Control Devices (ICDs) have been sized to ensure that the total site release rate does not exceed the allowable rate established in the previously approved studies. These ICDs will be installed within the catch basins to prevent uncontrolled surcharging of the minor system during storm events greater than the 5-year event.

The allowable release rate is derived from JFSA's simulation results for Segment A041a, representing a total tributary area of 3.70 ha and a release rate of 987 L/s, which includes the proposed development area. Based on this, the specific release rate is calculated as 266.76 L/s/ha (987 L/s ÷ 3.70 ha). Applying this value to the proposed site area of 2.67 ha yields an allowable release rate of 712.24 L/s (266.76 L/s/ha × 2.67 ha).

A portion of the site, totaling 0.42 ha, drains directly onto Brian Coburn Boulevard and Fern Casey Street. To account for this uncontrolled drainage, the 100-year flow from that area (143.90 L/s) was subtracted from the total allowable release rate, resulting in an adjusted allowable rate of 568.34 L/s for the minor system connection.

The hydraulic grade line of the restricted flow, which simulates the flow into the minor system during event larger than the 5 year event, such as the 100 year storm event, was calculated and shown everywhere to be at least 0.30m below the underside of footing (refer to table 2 in Appendix A). All rear yard and road catch basins will be equipped with an inlet control device (ICD) to achieve the desired restricted flow and prevent uncontrolled surcharging of the minor system.

The ICDs were sized using the orifice sizing equation presented below:

$$r = \sqrt{\frac{Q}{c\pi\sqrt{2gh}}}$$

Where:

$r = radius\ of\ pipe\ (m)$
$Q = discharge\ \left(\frac{m^3}{s}\right)$
$c = Coefficient\ of\ Discharge = 0.61$
$g = gravity = 9.81\ \left(\frac{m}{s^2}\right)$
$h = head\ (m)$

The majority of the permanent ICDs were sized according to the City of Ottawa MS-22.15, S18.4-3 & S18.4-5 dated March 2023 within the proposed development. Refer to Table 3 in Appendix "A" for the proposed ICD sizes and further details.

A single vortex flow regulator is proposed for an inlet with a low design flow rate of 10.0 l/s. Additional details are provided in Figure 1 of Appendix A.

In summary, the total restricted flow release rate for the proposed development is 560.60 L/s, which is within the allowable release rate of 568.34 L/s. This design is consistent with the release rate criteria established in the previously approved reports and studies.

2.6 Storage Analysis

Although on-site stormwater storage is not required, as indicated in JFSA's report, storage will be accommodated within roadway and parking area sags (refer to Drawing No. 240801-PA1). Minor stormwater flows will discharge into the storm sewer system, while major overland flows will generally follow the paved roads toward the existing stormwater management (SWM) pond.

The major drainage system, consisting of roads and rear yard swales, is designed to convey runoff from events exceeding the 5-year capacity, including the 100-year storm. An overflow route is provided to direct flows toward Axis Way during events greater than the 5-year storm.

For reference, storage volumes were calculated for each sub-catchment area of the proposed development (see ponding plan 240801-PA1). The total available storage within the road and parking areas is approximately 279 m^3.

3.0 SANITARY SEWERS

3.1 Criteria

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

The criteria used for the sizing of the sanitary sewer system are outlined below:
- Minimum velocity – 0.60 m/s
- Maximum velocity – 3.0 m/s
- Residential average flow – 280l/c/day
- Residential peaking factor – Harmon formula
- Infiltration inflow – 0.33 l/s/ha
- Minimum Diameter – 200 mm

Section 4.3 of the Ottawa sewer design guidelines provide standards for population densities in Ottawa. The following table illustrates the population densities used for the proposed site plan.

Unit Type	Person per Unit
Townhouses	2.7

In summary, for a total of 200 townhouse units, the total population for the proposed development is estimated to be 540.0

3.2 Tributary Area Characteristics

The sanitary drainage area is divided into several sub-basin areas, in order to assess the flow to the sewer (refer to plan No. 240801-SAN1). The design sanitary flow for each sub-basin is determined using the theoretical flow and adding infiltration as per the above-mentioned criteria.

3.3 Theoretical Flows

The flow was calculated using the Harmon equation to obtain the peaking factor, a population density and the infiltration rate per area.

The following equations were used to calculate the sanitary flow:

$$Peaking\ Factor = P.F = 1 + \left[\frac{14}{4 + \left({}^{pop}/_{1000}\right)^{0.5}}\right] \times K$$

Where:
$K = Correction\ Factor = 1$
$2 < P.F < 4$

$$Infiltration = Area \times Infiltration\ Rate$$

$$Flow = \frac{pop \times Residential\ Average\ Flow \times P.F}{86400}$$

$$Total\ Flow = Flow + Infiltration$$

A projected peak flow of 7.81 l/s was calculated at the connection of existing maintenance hole 2a. The sanitary sewer computation form can be found in Appendix "B – Table 5".

3.4 Analysis

The proposed site plan will discharge its sanitary flow to the existing sanitary sewer on Axis Way, which was designed to accommodate this development. During the design of the Trails Edge West subdivision, the total population for Block 135 was assumed to be 184. This block was later divided into two developments: 640 Compass Street on the west side with a projected population of 178, and 298 Axis Way on the east side with a projected population of 540.

Based on the sanitary sewer design sheets and sanitary drainage area plan for Trails Edge West, the most constrained segment is located between SAN MH 20A and SAN MH 204A on Compass Street (refer to Appendix B). The sewer segment was added to the sanitary sewer computation form (Table 5 in Appendix B) and updated to reflect the revised population, resulting in an additional 534 residents (540 + 178 − 184). Analysis confirmed that this segment has a remaining capacity of 27.30 L/s with the proposed development included.

As demonstrated in the sanitary sewer computation form (Appendix B, Table 5) and the engineering drawings (Appendix D), both the existing and proposed infrastructure provide sufficient depth and capacity to service the site.

4.0 WATERMAIN ANALYSIS

4.1 Background and Boundary Conditions

This analysis was carried out using the "H2ONET v.5.0" program as a design aid. The governing authorities design guidelines used during this analysis are the City of Ottawa's Design Guidelines for Water Distribution and the Technical Bulletin ISDTB-2014-02 - "Revision to Ottawa Design Guidelines - Water".

The following table summarizes the "Per Unit Populations" imposed by the City of Ottawa's Guidelines which were used for the purpose of this study.

Watermain Design Population Density

Unit Type	**Person per Unit**
Townhouses	2.7

The water demands for the entire site were calculated using an average daily consumption rate of 280 l/c·d for residential dwellings. The table below condenses the calculated results for demands under average day, maximum day and peak hour conditions for the proposed site.

Watermain Demands

Type of Development	Average Daily Demand	Maximum Daily Demand	Peak Hour Demand
Residential	280 l/c.d	2.50 x Average Day	5.50 x Average Day
298 Axis Way	1.7500 l/s	4.3750 l/s	9.6250 l/s

Watermain boundary conditions were provided by the City of Ottawa at two locations (please see boundary condition from the City received December 4, 2024 in Appendix "C"):

A complete model analysis of the site plan was carried out to carefully assess the different demand scenario. Refer to sketch 240801-WA1 in Appendix "C".

4.2 Assessment of the Watermain System

The analysis was executed under average day and peak hour conditions (Refer to sketch 240801-WA2 in Appendix "C" for average day demands and all other relevant information regarding the watermain analysis).

The system was designed and verified to meet the residual pressure requirements outlined in the City of Ottawa's Design Guidelines for Water Distribution which ranges from 276 kPa to 552 kPa during average day and peak hour demands. The following table summarizes maximum and minimum residual pressures throughout the network for each condition. Furthermore, tables 7 to 10 in Appendix "C" show all relevant calculations and results from these analyses.

Condition	Min. Head (m)	Min. Pressure (kPa)	Max. Head (m)	Max. Pressure (kPa)
Average Day	41.89	410.99	42.91	420.97
Peak Hour	37.69	369.72	38.92	381.77

A fire-flow of from 167 l/s to 233 l/s were also simulated throughout the system during maximum day demand. The system was designed and verified to withstand fire flow demands while satisfying minimum residual pressure requirements of 140 kPa.

4.3 Fire Underwriters Survey (FUS)

The Fire Underwriters Survey provides guidance which was followed for the calculation of required fire-flows. Fire-flows of 167 l/s to 233 l/s were simulated throughout the system during maximum day demands.

The proposed development will consist of two different types of dwelling units, and the required fire flows were calculated for each unit in the development. Fire flow areas have been delineated, refer to drawing 240801-WA3 in Appendix C. The required fire flow of each fire area was calculated, refer to table 11 to 14 in Appendix "E" for details.

The maximum day plus fire flow analysis was conducted to ensure that the water system is adequate to within the development and provide the appropriate fire flow for each fire flow areas.

All relevant fire flow calculations and results are found in Table 10 in Appendix "E".

5.0 BEST MANAGEMENT PRACTICES

To minimize the impact of the development to the watercourse, it is suggested to implement various mitigating measures mainly to reduce the suspended solids as follows:

i) Plan No 240801-ESC1 titled "erosion and sediment control plan" is included in the set of plans and shall be implemented during the construction.

ii) A sump of at least 600mm will be provided in all catch basins in order to minimize the amount of suspended solids from entering the sewer system.

iii) Each inlet catch basin will be controlled by an inlet control device, which will reduce the runoff rate.

iv) During construction, filter cloth will be placed under all catch basin and manhole frame and covers, siltation curtains and straw bales will be placed wherever water runoff can carry excessive sediments into the sewer system.

v) To prevent the event where water runoff would get into the storm sewer during construction, one temporary construction ICD will be installed at the outlet of the proposed development. Refer to Appendix "A" for Orifice sizing and location (Table 4).

vi) To prevent the event where water runoff would get into the sanitary sewer during construction, one temporary construction ICD would need to be installed ahead of any construction of the proposed development. Refer to Appendix "B" for Orifice sizing and location (Table 6).

6.0 CONCLUSION

In summary, the proposed storm and sanitary gravity sewer systems have been designed as outlined above to accommodate the proposed site plan. Stormwater management measures have been implemented to meet the established criteria of the Trails Edge Subdivision. Stormwater from the site will discharge to the existing storm sewer on Axis Way, which ultimately outlets to Mud Creek and the existing SWM pond. Finally, the proposed watermain system meets all requirements for water distribution and fire protection.

All of which is respectfully submitted:

Prepared by:
ATREL ENGINEERING LTD

André Sauvé, P.Eng.
Project Manager

APPENDIX "A"

Excerpt pages 1 to 5 and table A-1 from JFSA's report dated June 2, 2019
Excerpt Table G-1B from DSEL / JFSA's report dated February 2023
Table 1 - Storm Sewer Design Sheet (5-year Storm)
Table 2 - Storm Sewer Design Sheet (Restricted Flow)
Table 3 - Inlet Control Device Table
Figure 2 – Hydrovex Design
Table 4 - Temporary Construction ICD at storm MH 2

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June 2, 2019

David Schaeffer Engineering Limited
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Attention: **Ms. Laura Maxwell, P.Eng.**

Subject: **East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design**
our file: 883-10

As requested by your office, we have evaluated, based on the available information as described below, the preliminary hydraulic gradeline results for the trunk storm sewer of the proposed East Urban Community northwest and southwest quadrants. The impact of the proposed development on the operation of downstream Stormwater Management (SWM) Pond 1 has also been evaluated, under ultimate conditions with the proposed expansion of the north main cell and north forebay(s) in place. The interim conditions design of the pond, prior to the proposed expansion of the north main cell and north forebay(s), is as documented in the March 2014 *Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1 for the Trails Edge West Subdivision*. Note that this is an update of the October 16, 2018 version of this memo.

The layout of the East Urban Community lands and external drainage areas to SWM Pond 1 under ultimate conditions are as shown in the conceptual storm servicing drawing provided by DSEL in Attachment A. A preliminary model of this drainage area was prepared in SWMHYMO based on the information provided by DSEL, with the simulated minor system inflows input to an XPSWMM model of the proposed trunk sewer. Minor system capture rates and surface storage were estimated based on previous studies of similar developments, the October 2012 *City of Ottawa Sewer Design Guidelines*, the design tools presented in the May 2014 *Stormwater Management Guidelines for New Developments Draft Report* by JFSA, the February 2014 *City of Ottawa Technical Bulletin ISDTB-2014-01*, and the September 2016 *City of Ottawa Technical Bulletin PIEDTB-2016-01*. The proposed design may be summarized as follows:

- 2-year capture on local roads (including capture of runoff from adjacent residential lots), with no surface storage used during the 2-year storm, and on-site storage of all excess flows during the 100-year storm. Similarly, 5-year capture on local roads (including capture of runoff from adjacent residential lots), with no surface storage used during the 5-year storm, and on-site storage of all excess flows during the 100-year storm. The 100-year + 20% stress test storage has been set to 145% of 100-year storage, based on Abbottsville Crossing pilot project.

- 10-year capture with no on-site surface storage has been modelled for the 2.14 ha of Mer Bleue Road tributary to SWM Pond 1, with excess major system flows draining overland to an external system.

- 5-year capture on the mid-high density blocks and adjacent 4.66 ha park block in the northwest quadrant, with no surface storage used during the 5-year storm, and on-site storage of all excess flows during the 100-year storm. with excess major system flows for events greater than the 100-year design storm draining overland to an open ditch in the hydro corridor and subsequently to the north main cell of the pond.

- The existing 6.78 ha snow dump is not to be developed and is expected to continue to operate with a forcemain draining to the north main cell of the pond via an open ditch in the hydro corridor. Based on the March 2006 *Innes Snow Disposal Facility Meltwater Management Report*, the design flow rate of the pump station and forcemain is 22 L/s, and has been modelled in XPSWMM as a constant inflow to the north main cell.

- 100-year capture and no on-site surface storage on the external Innes Park Woods and surrounding internal buffer.

- 5-year capture and no on-site surface storage on the mid-high density blocks in the southwest quadrant, with excess major system flows draining overland to Belcourt Extension and Axis Way.

- 5-year capture and 100-year on-site storage on the hydro corridor block, and 10-year capture and 100-year on-site storage on the Transitway Corridor and Brian Colburn Boulevard. Note that, based on an existing high point on the land to be occupied by Brian Colburn Boulevard and the Transitway Corridor, it is understood that these areas may be smaller than currently modelled. The delineation of these drainage areas from previous studies has been maintained for the purposes of this exercise, on the understanding that they may be re-evaluated at the detailed design stage.

- 2-year or 5-year capture (as marked in Attachment A) and 100-year on-site storage on all remaining development blocks in the northwest and southwest quadrants, and on the external commercial blocks draining through the site from the north. The 100-year + 20% stress test storage has been set to 145% of 100-year storage, based on Abbottsville Crossing pilot project.

Refer to Table A-1 of Attachment A for a summary of the information and estimates used in preparing the SWMHYMO model of the East Urban Community (and external commercial blocks) under ultimate conditions. Digital SWMHYMO modelling files are attached.

The total drainage area to SWM Pond 1 under ultimate conditions is approximately 367.31 ha at 65% imperviousness, as shown in Figure A-1 of Attachment A, and summarized in Table C-6 of Attachment C. Ultimate conditions drainage areas to SWM Facility 1 outside of the East Urban Community development have been modelled as follows:

- DDSWMM / XPSWMM modelling of Trails Edge Phase 1, Trails Edge West, Edgewater and Orleans Village subdivisions by JFSA (last updated in the July 2018 *Stormwater Management Report for the Orleans Village Subdivision*);

- DDSWMM / XPSWMM modelling of the Minto TrailsEdge Phase II subdivision by IBI Group (May 2015 *Design Brief for Minto TrailsEdge Phase II*); and

- PCSWMM modelling of the Trails Edge East subdivision by Stantec (dated August 22, 2018, subsequent to the May 2018 *Trails Edge East Phase 1 Servicing and Stormwater Management Report*).

These models also include external existing areas also tributary to the pond that pre-date these subdivisions. The models above have been modified as needed in order to avoid overlap and convey major and minor system outflows from one subdivision to the next. Note in particular that the proposed storm trunk sewer servicing the southwest quadrant of the East Urban Community (MH 301 -> MH 302 / Stantec MH 1008) has been inserted into the Stantec PCSWMM model in order to best simulate the hydraulic gradeline elevations in this trunk sewer and the impact of the proposed East Urban Community design on the Trails Edge East Phase 1 development. Minor system outflows from the PCSWMM model at the limit of Trails Edge East were then input to the combined XPSWMM model of Trails Edge Phase 1, Trails Edge West, Edgewater, Orleans Village, Minto TrailsEdge Phase II, the East Urban

Community, and ultimate SWM Facility 1 (including south Mud Creek channel).

An XPSWMM model schematic and hydraulic simulation results are presented in Attachment B for the 100-year 3-hour Chicago storm, 100-year 24-hour SCS Type II storm, and July 1979, August 1988 and August 1996 historical events. A freeboard of 0.3 m between the hydraulic gradeline and the estimated underside of footings has been provided throughout the proposed East Urban Community and external areas included in the XPSWMM model for the 100-year storms, and a freeboard of 0 m has been provided for the historical events. Attachment B also presents the stress test results for the hydraulic gradeline analysis based on a 20% increase in the 100-year storm, as per the October 2012 *City of Ottawa Sewer Design Guidelines*. Under these conditions, a freeboard of 0 m between the hydraulic gradeline and the estimated underside of footings has been provided throughout the proposed East Urban Community and external areas included in the XPSWMM model.

Similarly, based on the PCSWMM modelling results, a freeboard of 0.3 m has been provided between the 100-year hydraulic gradeline and the estimated underside of footings (estimated 2.1 m below ground level) between MH 301 and MH 302 in the southwest quadrant of the East Urban Community. A freeboard of 0 m has been provided for the historical events and the 100-year + 20% stress test. Additionally, the 100-year, historical event and 100-year + 20% minor system peak outflows from the southwest quadrant to Trails Edge East are smaller than those estimated in the modelling provided by Stantec, with similar runoff volumes. As such, the proposed design of the East Urban Community does not have a negative impact on the hydraulic gradeline results in Trails Edge East.

Major system outflow from the East Urban Community southwest quadrant to Trails Edge East is 0 L/s for all modelled events except for the 100-year + 20% stress test, where the major system flow on the first downstream road segment in Trails Edge East (C1007W-M2) is 1.189 m^3/s; less than the 1.304 m^3/s estimated in the modelling provided by Stantec. As such, the proposed design of the East Urban Community does not have a negative impact on major system water depths in Trails Edge East.

Excess major system flows from the 2.28 ha mid-high density block in the southwest quadrant, which has 5-year capture and no on-site surface storage, are modelled as draining to Belcourt Boulevard, as designed by IBI Group as part of the Minto TrailsEdge Phase II modelling. The revised 100-year flows on Belcourt Boulevard are less than those estimated in the modelling provided by IBI Group, and are therefore not of concern. Conversely, the revised 100-year + 20% flows are generally less than those estimated in the modelling provided by IBI Group, except on areas S56E / S56W at the curb cuts through the road median and to the channel, where the 100-year + 20% flow has increased by up to 185 L/s. However, based on the curb cut calculations found in the May 2015 *Design Brief for Minto TrailsEdge Phase II* by IBI Group, the maximum 100-year + 20% water depth at this location based on the updated flows would be approximately 37 cm, which is within a reasonable range based on current City standards.

Excess major system flows from the 3.70 ha mid-high density block in the southwest quadrant, which has 5-year capture and no on-site surface storage, are modelled as draining to Axis Way and Compass Road in Trails Edge West as designed by DSEL and JFSA. The updated 100-year total water depths on Axis Way and Compass Road are still less than 30 cm, in accordance with the original design. Furthermore, the 100-year + 20% total water depths are 33.3 cm or less, and would not reach the building envelopes based on the standards to which the subdivision was designed.

As noted earlier in this memo, excess major system flows from the mid-high density blocks, snow dump and adjacent 4.66 ha park block in the northwest quadrant during events greater than the 100-year design storm are intended to drain overland to an open ditch in the hydro corridor and subsequently to the north main cell of the pond. Based on SWMHYMO modelling, the estimated 1.446 m^3/s 100-year + 20% stress text flow could be conveyed at a maximum depth of 22 cm in a trapezoidal ditch with 20 m bottom width, 3H:1V side slopes, 0.20% longitudinal slope, and an assumed Manning's roughness coefficient of 0.05 (refer to Calculation Sheet B-1 of Attachment B). This estimate and ditch sizing should be confirmed at a later design stage. Note that a culvert should be installed under the collector road crossing the hydro corridor in order to allow safe conveyance of flows in the ditch to the pond.

As noted earlier in this memo, Mer Bleue Road has been modelled with 10-year capture and no surface storage, and excess major system flows draining to a separate system. Based on SWMHYMO modelling and conservatively assuming an 8.5 m wide road, the estimated 100-year + 20% flow of 1.246 m^3/s could be conveyed at a flow depth of 16 cm and velocity x depth of 0.20 m^2/s (refer to Calculation Sheet B-2 of Attachment B).

As 100-year major system storage or capture is provided throughout the northwest quadrant, water depths on the road will be defined by static storage depths, of which a depth up to 35 cm is permitted by current City standards. The dynamic flow depths above static ponding areas during the 100-year + 20% stress test have been checked for feasibility in Calculation Sheet B-3 of Attachment B, based on the maximum overflow of 0.675 m^3/s from any 100-year storage area within the northwest quadrant. Assuming a maximum static ponding depth of 35 cm and an 8.5 m wide local road, this overflow would correspond to a total water depth of 53 cm on the road (35 cm static + 18 cm flow depth over the spill point). This is a high level check only, and is conservative in that it does not account for the attenuation provided by dynamic storage above static ponding areas, which would reduce the peak overflow. Final results will depend on the detailed design of the subdivision and ponding areas, but this test demonstrates that it is possible for excess 100-year + 20% flows to be conveyed safely along a typical road without reaching building envelopes.

The 100-year flows on the remainder of the proposed East Urban Community development tributary to SWM Pond 1 will be retained in surface storage or captured to the storm sewer system, and as such a safe overland flow route is required only under conditions such as the 100-year + 20% stress test. At the detailed design stage, the East Urban Community must be designed such that water on the surface during the 100-year + 20% stress test does not reach building envelopes.

As noted above, it is proposed that the north main cell and north forebay be expanded to provide additional storage in support of the East Urban Community development. Note that the existing north forebay is to be split into two forebays, northeast and northwest, as part of the proposed expansion. The permanent pool elevation in the north forebay will also be lowered from 81.50 m to 80.10 m as part of the proposed reconstruction. The operation of SWM Facility 1 under ultimate conditions, with existing outlet controls remaining in place, is summarized in Table 1. The SWM facility stage-storage-discharge relationship and outlet controls are presented in Attachment C.

Table 1: Summary of SWM Facility 1 Operating Characteristics Under Ultimate Conditions

Pond Component	Total Inflow (1) (m^3/s)	Water Level (m)				Volume Used (2) (m^3)	Allowable Outflow (3) (m^3/s)	Provided Outflow (m^3/s)
		North Forebay	North Main Cell	South Forebay	South Main Cell			
Permanent Pool (4)	N/A	80.100	80.100	81.500	80.100	43329	N/A	N/A
Quality Control	N/A	80.471	80.471	N/A	80.471	14692	N/A	0.137
Extended Detention	N/A	81.650	81.650	81.650	81.650	67410	N/A	0.383
2-Year, 24-Hour SCS	0.000	81.761	81.758	81.916	81.757	66193	1.000	0.461
5-Year, 24-Hour SCS	0.000	82.130	82.126	82.125	82.125	85838	2.300	0.981
10-Year, 24-Hour SCS	0.000	82.308	82.304	82.303	82.303	96162	3.800	1.294
25-Year, 24-Hour SCS	0.000	82.590	82.584	82.583	82.583	112944	5.600	2.603
50-Year, 24-Hour SCS	0.000	82.754	82.751	82.751	82.751	123225	6.700	4.057
100-Year, 24-Hour SCS (5)	0.000	82.916	82.910	82.917	82.917	133392	8.000	5.716
July 1st, 1979 Event	0.000	83.045	83.042	83.047	83.047	141725	N/A	7.242
August 4, 1988 Event	0.000	82.792	82.788	82.794	82.794	125648	N/A	4.425
August 8, 1996 Event	0.000	82.608	82.602	82.602	82.602	114050	N/A	2.737

(2) Volumes are active storage only for all SWM facility components except the permanent pool.
(3) Refer to the March 2014 *Design Brief* for target release rates and volumes.
(4) Bottom elevations are 79.00 m in the north main cell, 79.10 m in the south main cell, 79.50 m in the north forebay and 80.00 m in the south forebay.

(5) Maximum allowable 100-year pond level = 83.0 m in the main cell (per the April 2008 "East Urban Community Pond No. 1 Design Brief" by Stantec).

The above results show that the actual provided release rates do not exceed the allowable release rates for SWM Pond 1. Note that the maximum 100-year pond level is 82.92 m; below the maximum allowable 100-year water level of 83.0 m.

SWM Pond 1 has been equipped with three sediment forebays, The forebays have been designed with minimum length to width ratios of approximately 3:1. Note that they do not exceed one third of the permanent pool area, as per the requirements of the *SWMP Design Manual*. The forebays have been sized to meet the greater of the settling and dispersion criteria, as stated in the *SWMP Design Manual*. Calculations and verification for the minimum dispersion length, settling length and the average velocity have been included in Calculation Sheets C-2, C-3 and C-4 of Attachment C. Note that the northeast forebay exceeds the average velocity requirement of 0.15 m/s during the 10-year design storm. However, this target is most appropriate for a particle size of approximately 0.45 mm. Conversely, the bottoms of the proposed forebays are hard, and the sediment deposits will correspond roughly to a particle size of 0.01 mm based on the clay/silt soils. For a 0.01 mm particle size, a 0.45 m/s average velocity is a more appropriate limit based on the erosion velocity graph referenced by the *SWMP Design Manual* (Hjülstrom, 1939). The average velocity in the northeast forebay does not exceed the target of 0.45 m/s during the 10-year design storm. Note that this same approach is used in an example of Page H-9 of the *SWMP Design Manual*.

SWM Pond 1 has a permanent pool volume of 43,329 m^3, which is more than the minimum permanent pool volume the *SWMP Design Manual* requires for normal protection for a wet pond for the latest 367.308 ha drainage area at 65% imperviousness, as calculated below.

$$(123.33 - 40)\ m^3/ha \times 367.308\ ha = 30,609\ m^3$$

The required quality control volume of 14,692 m^3 (40 m^3/ha) for the latest 367.308 ha drainage area is contained within the extended detention volume at an elevation of 80.471 m. The provided extended detention volume of 67,410 m^3 exceeds the required volume of 43,405 m^3 calculated based on detention of the 25 mm storm runoff.

It may therefore be concluded that the operation of SWM Pond 1 under ultimate conditions is in conformance with the requirements presented in the March 2014 *Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1 for the Trails Edge West Subdivision*.

Yours truly,
J.F. Sabourin and Associates Inc.

L. Pipkins

Laura Pipkins, P.Eng.

cc: J.F. Sabourin, M.Eng, P.Eng.
Director of Water Resources Projects

Attachment A:	Conceptual Storm Servicing (June 2019, DSEL)
	Storm Sewer Calculation Sheet (June 2019, DSEL)
	Total Drainage Area to SWM Facility (Ultimate Conditions)
	Summary of East Urban Community Drainage Area Characteristics
Attachment B:	XPSWMM Model Schematic; Pipe Data and Hydraulic Simulation Results
	Major System Flow Depth Calculations
Attachment C:	Pond Outlet Controls; Sediment Forebay Calculations

Table A-1: Summary of East Urban Community Drainage Area Characteristics

MH	SWMHYMO	Area	C	TIMP	XIMP	Min. Capture [1]	Min. Capture [1]	100-Year Capture [2]	100-Year Storage [2]		100-Year + 20% Capture [3]	100-Year + 20% Storage [3]		Notes
ID	ID	(ha)					(m^3/s)	(m^3/s)	(m^3)	(m^3/ha)	(m^3/s)	(m^3)	(m^3/ha)	
41	A041a	3.70	0.80	86	86	5-Year	0.987	1.125	N/A	N/A	1.125	N/A	N/A	Modelled in DDSWMM; Negligible On-Site Storage Assumed
301	A301a	0.42	0.40	29	29	2-Year	0.026	0.030	N/A	N/A	0.032	N/A	N/A	Negligible On-Site Storage Assumed
301	A301b	0.56	0.90	99	99	5-Year	0.159	0.181	46	82	0.194	67	120	
301	A301c	2.28	0.80	86	86	5-Year	0.529	0.603	N/A	N/A	0.603	N/A	N/A	Also Modelled in DDSWMM; Negligible On-Site Storage Assumed
301	A301d	4.28	0.90	99	99	2-Year	0.817	0.931	573	134	0.996	831	194	
301	A301e	6.15	0.70	71	66	2-Year	0.771	0.879	857	139	0.941	1242	202	
301	A301f	7.35	0.85	93	93	2-Year	1.264	1.441	973	132	1.542	1411	192	
301	A301g	8.61	0.70	71	66	2-Year	1.049	1.196	1150	134	1.280	1668	194	
1i	A1ia	0.98	0.80	86	81	5-Year	0.233	0.266	77	79	0.285	112	114	
1i	A1ib	5.61	0.90	99	99	5-Year	1.465	1.670	417	74	1.787	605	108	
1i	A1ic	0.96	0.80	86	81	5-Year	0.229	0.261	75	78	0.279	109	114	
2000i	A2000ia	0.53	0.70	71	66	2-Year	0.075	0.086	70	132	0.092	102	192	
2001	A2001a	0.08	0.70	71	66	2-Year	0.011	0.013	12	145	0.014	17	213	
2002	A2002a	0.41	0.70	71	66	2-Year	0.058	0.066	55	134	0.071	80	195	
2002	A2002b	0.49	0.90	99	99	5-Year	0.139	0.158	41	84	0.169	59	120	
2002	A2002c	0.41	0.70	71	66	2-Year	0.058	0.066	55	134	0.071	80	195	
2003	A2003a	0.49	0.70	71	66	2-Year	0.069	0.079	66	134	0.085	95	194	
2004	A2004a	0.07	0.70	71	66	2-Year	0.010	0.011	10	147	0.012	15	214	
2005	A2005a	0.31	0.70	71	66	2-Year	0.044	0.050	42	135	0.054	61	197	
2006	A2006a	0.33	0.70	71	66	2-Year	0.047	0.054	44	133	0.058	64	194	
2007	A2007a	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2008	A2008a	0.78	0.70	71	66	2-Year	0.109	0.124	105	134	0.133	152	195	
2009	A2009a	0.27	0.70	71	66	2-Year	0.038	0.043	37	137	0.046	54	200	
2010	A2010a	0.28	0.70	71	66	2-Year	0.040	0.046	37	133	0.049	54	193	
2011	A2011a	0.28	0.70	71	66	2-Year	0.040	0.046	37	133	0.049	54	193	
2012	A2012a	0.19	0.70	71	66	2-Year	0.027	0.031	26	136	0.033	37	195	
2013	A2013a	0.78	0.70	71	66	2-Year	0.109	0.124	105	134	0.133	152	195	
2014	A2014a	0.78	0.70	71	66	2-Year	0.109	0.124	105	134	0.133	152	195	
2015	A2015a	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2016	A2016a	0.32	0.70	71	66	2-Year	0.045	0.051	44	137	0.055	63	197	
2017	A2017a	0.28	0.70	71	66	2-Year	0.040	0.046	37	133	0.049	54	193	
2018	A2018a	0.30	0.70	71	66	2-Year	0.043	0.049	40	133	0.052	58	193	
2019	A2019a	0.21	0.70	71	66	2-Year	0.030	0.034	29	136	0.036	41	195	
2020	A2020a	0.71	0.70	71	66	2-Year	0.099	0.113	96	135	0.121	138	194	
2021	A2021a	0.78	0.70	71	66	2-Year	0.109	0.124	105	134	0.133	152	195	
2022	A2022a	0.19	0.70	71	66	2-Year	0.027	0.031	26	136	0.033	37	195	
2023	A2023a	0.27	0.70	71	66	2-Year	0.038	0.043	37	137	0.046	54	200	
2024	A2024a	0.39	0.70	71	66	2-Year	0.055	0.063	52	134	0.067	76	195	
2025	A2025a	0.11	0.70	71	66	2-Year	0.016	0.018	15	138	0.019	22	200	
2026	A2026a	1.16	0.40	29	19	5-Year	0.083	0.095	177	153	0.102	257	222	
2026	A2026b	0.39	0.70	71	66	2-Year	0.055	0.063	52	134	0.067	76	195	
2027	A2027a	0.28	0.70	71	66	2-Year	0.040	0.046	37	133	0.049	54	193	
2028	A2028a	0.16	0.70	71	66	2-Year	0.023	0.026	22	137	0.028	32	200	
2029	A2029a	0.23	0.70	71	66	2-Year	0.033	0.038	31	133	0.041	44	191	
2030	A2030a	0.63	0.70	71	66	2-Year	0.088	0.100	85	135	0.107	123	195	
2031	A2031a	0.27	0.70	71	66	2-Year	0.038	0.043	37	137	0.046	54	200	
2033	A2033a	0.28	0.70	71	66	2-Year	0.040	0.046	37	133	0.049	54	193	
2033	A2033b	0.25	0.90	99	99	5-Year	0.071	0.081	22	88	0.087	32	128	
2033	A2033c	0.55	0.70	71	66	2-Year	0.077	0.088	74	134	0.094	107	195	
2034	A2034a	0.40	0.70	71	66	2-Year	0.057	0.065	53	133	0.070	77	193	
2034	A2034b	0.23	0.70	71	66	2-Year	0.033	0.038	31	133	0.041	44	191	
2034	A2034c	0.24	0.90	99	99	5-Year	0.069	0.079	21	86	0.085	30	125	
2035	A2035a	0.33	0.70	71	66	2-Year	0.047	0.054	44	133	0.058	64	194	
2035	A2035b	0.28	0.90	99	99	5-Year	0.080	0.091	24	86	0.097	35	125	
2036	A2036a	0.21	0.70	71	66	2-Year	0.030	0.034	29	136	0.036	41	195	

Table A-1: Summary of East Urban Community Drainage Area Characteristics

MH ID	SWMHYMO ID	Area (ha)	C	TIMP	XIMP	Min. Capture (1)	Min. Capture (1) (m^3/s)	100-Year Capture (2) (m^3/s)	100-Year Storage (2) (m^3)	100-Year Storage (2) (m^3/ha)	100-Year + 20% Capture (3) (m^3/s)	100-Year + 20% Storage (3) (m^3)	100-Year + 20% Storage (3) (m^3/ha)	Notes
2036	A2036b	0.28	0.90	99	99	5-Year	0.080	0.091	24	86	0.097	35	125	
2036	A2036c	1.27	0.40	29	19	5-Year	0.091	0.104	194	152	0.111	281	221	
2037	A2037a	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2037	A2037b	0.21	0.90	99	99	5-Year	0.060	0.068	19	89	0.073	27	129	
2037	A2037c	0.18	0.70	71	66	2-Year	0.026	0.030	24	133	0.032	35	194	
2038	A2038a	0.12	0.70	71	66	2-Year	0.017	0.019	17	142	0.020	25	208	
2038	A2038b	0.11	0.90	99	99	5-Year	0.032	0.036	10	91	0.039	14	127	
2039	A2039a	0.23	0.70	71	66	2-Year	0.033	0.038	31	133	0.041	44	191	
2039	A2039b	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2039	A2039c	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2040	A2040a	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2040	A2040b	0.15	0.90	99	99	5-Year	0.043	0.049	14	90	0.052	20	133	
2041	A2041a	1.39	0.80	86	81	2-Year	0.234	0.267	184	132	0.286	266	191	
2042	A2042a	1.20	0.80	86	81	2-Year	0.203	0.231	159	132	0.247	230	192	
2043	A2043a	1.29	0.80	86	81	2-Year	0.217	0.247	171	133	0.264	248	192	
2044	A2044a	2.14	0.90	99	99	10-Year	0.694	0.791	N/A	N/A	0.846	N/A	N/A	Negigible On-Site Storage Assumed; Major Flow to External System
2044	A2044b	0.22	0.90	99	99	5-Year	0.063	0.072	19	87	0.077	28	127	
2045	A2045a	1.63	0.80	86	81	2-Year	0.272	0.310	216	133	0.332	313	192	
2046	A2046a	0.76	0.80	86	81	2-Year	0.130	0.148	101	133	0.158	147	193	
2046	A2046b	0.23	0.90	99	99	5-Year	0.066	0.075	20	87	0.080	29	126	
2047	A2047a	1.15	0.80	86	81	2-Year	0.195	0.222	152	132	0.238	220	191	
2047	A2047b	0.26	0.90	99	99	5-Year	0.074	0.084	23	88	0.090	33	127	
2047	A2047c	0.47	0.80	86	81	2-Year	0.081	0.092	64	135	0.098	92	196	
2048	A2048a	0.80	0.80	86	81	2-Year	0.137	0.156	106	133	0.167	154	193	
2048	A2048b	1.14	0.80	86	81	2-Year	0.193	0.220	151	132	0.235	219	192	
2048	A2048c	0.26	0.90	99	99	5-Year	0.074	0.084	23	88	0.090	33	127	
2049	A2049a	0.25	0.90	99	99	5-Year	0.071	0.081	22	88	0.087	32	128	
2049	A2049b	0.49	0.80	86	81	2-Year	0.085	0.097	66	134	0.104	95	194	
2049	A2049c	0.76	0.80	86	81	2-Year	0.130	0.148	101	133	0.158	147	193	
2050	A2050a	2.13	0.80	86	81	2-Year	0.350	0.399	285	134	0.427	413	194	
2051	A2051a	1.34	0.80	86	81	2-Year	0.226	0.258	177	132	0.276	256	191	
2052	A2052a	0.25	0.80	86	81	2-Year	0.044	0.050	34	136	0.054	49	196	
2053	A2053a	1.00	0.80	86	81	2-Year	0.170	0.194	132	132	0.208	192	192	
2054	A2054a	0.66	0.80	86	81	2-Year	0.113	0.129	88	134	0.138	128	194	
2055	A2055a	0.36	0.80	86	81	2-Year	0.063	0.072	48	134	0.077	70	194	
2056	A2056a	0.62	0.80	86	81	2-Year	0.107	0.122	83	133	0.131	120	194	
2057	A2057a	0.44	0.80	86	81	2-Year	0.076	0.087	59	135	0.093	86	195	
2057	A2057b	0.24	0.90	99	99	5-Year	0.069	0.079	21	86	0.085	30	125	
2058	A2058a	1.78	0.40	29	19	100-Year	0.434	0.434	N/A	N/A	0.464	N/A	N/A	Negigible On-Site Storage Assumed
2058	A2058b	0.42	0.90	99	99	5-Year	0.120	0.137	35	83	0.147	51	121	
2058	A2058c	9.40	0.40	29	19	100-Year	1.713	1.713	N/A	N/A	1.833	N/A	N/A	Negigible On-Site Storage Assumed
2059	A2059a	0.28	0.90	99	99	5-Year	0.080	0.091	24	86	0.097	35	125	
2059	A2059b	0.17	0.70	71	66	2-Year	0.024	0.027	24	140	0.029	34	200	
2060	A2060a	0.20	0.90	99	99	5-Year	0.057	0.065	18	89	0.070	26	130	
2061	A2061a	0.20	0.90	99	99	5-Year	0.057	0.065	18	89	0.070	26	130	
2062	A2062a	0.13	0.90	99	99	5-Year	0.037	0.042	12	93	0.045	17	131	
2063	A2063a	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2065	A2065a	0.21	0.90	99	99	5-Year	0.060	0.068	19	89	0.073	27	129	
2065	A2065b	0.21	0.70	71	66	2-Year	0.030	0.034	29	136	0.036	41	195	
2066	A2066a	0.28	0.90	99	99	5-Year	0.080	0.091	24	86	0.097	35	125	
2066	A2066b	0.32	0.70	71	66	2-Year	0.045	0.051	44	137	0.055	63	197	
2067	A2067a	1.18	0.70	71	66	2-Year	0.163	0.186	159	134	0.199	230	195	
2068	A2068a	0.24	0.70	71	66	2-Year	0.034	0.039	33	136	0.042	47	196	
2069	A2069a	1.16	0.70	71	66	2-Year	0.160	0.182	157	135	0.195	227	196	
2070	A2070a	0.24	0.70	71	66	2-Year	0.034	0.039	33	136	0.042	47	196	

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MH ID	SWMHYMO ID	Area (ha)	C	TIMP	XIMP	Min. Capture [1]	Min. Capture [1] (m^3/s)	100-Year Capture [2] (m^3/s)	100-Year Storage [2] (m^3)	100-Year Storage [2] (m^3/ha)	100-Year + 20% Capture [3] (m^3/s)	100-Year + 20% Storage [3] (m^3)	100-Year + 20% Storage [3] (m^3/ha)	Notes
2071	A2071a	0.34	0.70	71	66	2-Year	0.048	0.055	46	135	0.059	66	194	
2072	A2072a	0.20	0.90	99	99	5-Year	0.057	0.065	18	89	0.070	26	130	
2073	A2073a	0.59	0.70	71	66	2-Year	0.083	0.095	79	133	0.102	114	193	
2074	A2074a	0.73	0.70	71	66	2-Year	0.102	0.116	98	134	0.124	142	195	
2075	A2075a	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2076	A2076a	1.42	0.70	71	66	2-Year	0.195	0.222	192	135	0.238	278	196	
2077	A2077a	0.63	0.70	71	66	2-Year	0.088	0.100	85	135	0.107	123	195	
2078	A2078a	0.54	0.70	71	66	2-Year	0.076	0.087	72	133	0.093	104	193	
2079	A2079a	0.21	0.70	71	66	2-Year	0.030	0.034	29	136	0.036	41	195	
2080	A2080a	0.16	0.70	71	66	2-Year	0.023	0.026	22	137	0.028	32	200	
2081	A2081a	0.76	0.70	71	66	2-Year	0.106	0.121	102	134	0.129	148	195	
2082	A2082a	0.55	0.70	71	66	2-Year	0.077	0.088	74	134	0.094	107	195	
2083	A2083a	0.18	0.90	99	99	5-Year	0.052	0.059	16	88	0.063	23	128	
2084	A2084a	0.92	0.70	71	66	2-Year	0.128	0.146	123	134	0.156	179	195	
2085	A2085a	0.71	0.70	71	66	2-Year	0.099	0.113	96	135	0.121	138	194	
2086	A2086a	0.59	0.70	71	66	2-Year	0.083	0.095	79	133	0.102	114	193	
2087	A2087a	0.30	0.90	99	99	5-Year	0.086	0.098	26	85	0.105	37	123	
2087	A2087b	0.53	0.70	71	66	2-Year	0.075	0.086	70	132	0.092	102	192	
2088	A2088a	0.57	0.70	71	66	2-Year	0.080	0.091	77	135	0.097	111	195	
2089	A2089a	0.41	0.70	71	66	2-Year	0.058	0.066	55	134	0.071	80	195	
2090	A2090a	2.18	0.40	29	19	100-Year	0.527	0.527	N/A	N/A	0.564	N/A	N/A	Negigible On-Site Storage Assumed
2090	A2090b	9.46	0.90	99	99	2-Year	1.693	1.930	1293	137	2.065	1875	198	
2090	A2090c	0.41	0.70	71	66	2-Year	0.058	0.066	55	134	0.071	80	195	
2091	A2091a	0.16	0.70	71	66	2-Year	0.023	0.026	22	137	0.028	32	200	
2091	A2091b	0.17	0.70	71	66	2-Year	0.024	0.027	24	140	0.029	34	200	
2091	A2091c	0.19	0.90	99	99	5-Year	0.054	0.062	17	89	0.066	24	126	
2092	A2092a	0.20	0.70	71	66	2-Year	0.029	0.033	27	133	0.035	39	195	
2092	A2092b	0.17	0.70	71	66	2-Year	0.024	0.027	24	140	0.029	34	200	
2092	A2092c	0.17	0.90	99	99	5-Year	0.049	0.056	15	88	0.060	22	129	
2093	A2093a	1.03	0.70	71	66	2-Year	0.143	0.163	138	134	0.174	200	194	
2094	A2094a	0.22	0.70	71	66	2-Year	0.031	0.035	31	139	0.037	44	200	
2095	A2095a	0.30	0.70	71	66	2-Year	0.043	0.049	40	133	0.052	58	193	
2096	A2096a	0.12	0.70	71	66	2-Year	0.017	0.019	17	142	0.020	25	208	
2096	A2096b	0.18	0.90	99	99	5-Year	0.052	0.059	16	88	0.063	23	128	
2097	A2097a	3.12	0.90	99	99	5-Year	0.842	0.960	237	76	1.027	343	110	
2097	A2097b	2.95	0.80	86	81	5-Year	0.676	0.771	222	75	0.825	322	109	
2097	A2097c	0.72	0.90	99	99	5-Year	0.204	0.233	58	81	0.249	84	117	
2097	A2097d	0.24	0.80	86	81	5-Year	0.058	0.066	20	85	0.071	29	121	
2097	A2097e	2.77	0.90	99	99	5-Year	0.752	0.857	211	76	0.917	306	110	
2097	A2097f	1.14	0.80	86	81	5-Year	0.270	0.308	89	78	0.330	129	113	
2098	A2098a	0.39	0.70	71	66	2-Year	0.055	0.063	52	134	0.067	76	195	
2099	A2099a	0.34	0.70	71	66	2-Year	0.048	0.055	46	135	0.059	66	194	
2099	A2099b	0.18	0.70	71	66	2-Year	0.026	0.030	24	133	0.032	35	194	
2099	A2099c	0.25	0.70	71	66	2-Year	0.036	0.041	33	133	0.044	48	192	
2100	A2100a	0.51	0.70	71	66	2-Year	0.072	0.082	68	134	0.088	99	194	
2101	A2101a	0.50	0.70	71	66	2-Year	0.071	0.081	66	133	0.087	96	192	
2102	A2102a	0.31	0.70	71	66	2-Year	0.044	0.050	42	135	0.054	61	197	
2103	A2103a	0.56	0.40	29	19	5-Year	0.046	0.052	77	137	0.056	112	200	
2103	A2103b	0.38	0.70	71	66	2-Year	0.054	0.062	50	133	0.066	73	192	
2104	A2104a	0.24	0.70	71	66	2-Year	0.034	0.039	33	136	0.042	47	196	
2105	A2105a	0.44	0.70	71	66	2-Year	0.062	0.071	59	134	0.076	85	193	
2106	A2106a	0.23	0.70	71	66	2-Year	0.033	0.038	31	133	0.041	44	191	
2107	A2107a	0.26	0.70	71	66	2-Year	0.037	0.042	35	135	0.045	51	196	
2108	A2108a	0.32	0.70	71	66	2-Year	0.045	0.051	44	137	0.055	63	197	
2109	A2109a	0.51	0.70	71	66	2-Year	0.072	0.082	68	134	0.088	99	194	

Table A-1: Summary of East Urban Community Drainage Area Characteristics

MH ID	SWMHYMO ID	Area (ha)	C	TIMP	XIMP	Min. Capture [(1)]	Min. Capture [(1)] (m^3/s)	100-Year Capture [(2)] (m^3/s)	100-Year Storage [(2)] (m^3)	100-Year Storage [(2)] (m^3/ha)	100-Year + 20% Capture [(3)] (m^3/s)	100-Year + 20% Storage [(3)] (m^3)	100-Year + 20% Storage [(3)] (m^3/ha)	Notes
2110	A2110a	0.24	0.70	71	66	2-Year	0.034	0.039	33	136	0.042	47	196	
2111	A2111a	0.17	0.70	71	66	2-Year	0.024	0.027	24	140	0.029	34	200	
2112	A2112a	0.07	0.70	71	66	2-Year	0.010	0.011	10	147	0.012	15	214	
2113	A2113a	0.13	0.70	71	66	2-Year	0.019	0.022	17	132	0.024	25	192	
2114	A2114a	0.57	0.70	71	66	2-Year	0.080	0.091	77	135	0.097	111	195	
2115	A2115a	0.48	0.70	71	66	2-Year	0.068	0.078	64	133	0.083	92	192	
2116	A2116a	0.42	0.70	71	66	2-Year	0.059	0.067	57	136	0.072	83	198	
2118	A2118a	0.61	0.70	71	66	2-Year	0.086	0.098	81	133	0.105	118	193	
2119	A2119a	0.38	0.70	71	66	2-Year	0.054	0.062	50	133	0.066	73	192	
2120	A2120a	0.43	0.70	71	66	2-Year	0.061	0.070	57	133	0.075	83	193	
2121	A2121a	0.52	0.70	71	66	2-Year	0.073	0.083	70	135	0.089	102	196	
2122	A2122a	1.17	0.70	71	66	2-Year	0.162	0.185	157	134	0.198	227	194	
2135	A2135a	0.18	0.70	71	66	2-Year	0.026	0.030	24	133	0.032	35	194	
2136	A2136a	0.37	0.70	71	66	2-Year	0.052	0.059	50	136	0.063	73	197	
2137	A2137a	0.69	0.70	71	66	2-Year	0.097	0.111	92	133	0.119	133	193	
2138	A2138a	0.38	0.70	71	66	2-Year	0.054	0.062	50	133	0.066	73	192	
2139	A2139a	0.38	0.70	71	66	2-Year	0.054	0.062	50	133	0.066	73	192	
2140	A2140a	0.11	0.70	71	66	2-Year	0.016	0.018	15	138	0.019	22	200	
2141	A2141a	0.37	0.70	71	66	2-Year	0.052	0.059	50	136	0.063	73	197	
2203	A2203a	0.40	0.80	86	81	5-Year	0.097	0.111	32	80	0.119	47	118	
2203	A2203b	4.66	0.40	29	19	5-Year	0.315	0.359	642	138	0.384	930	200	
2204	A2204a	0.90	0.80	86	81	5-Year	0.215	0.245	71	79	0.262	102	113	
2205	A2205a	0.84	0.80	86	81	5-Year	0.201	0.229	66	79	0.245	96	114	
2206	A2206a	1.04	0.80	86	81	5-Year	0.247	0.282	81	78	0.302	118	113	
2207	A2207a	1.49	0.80	86	81	5-Year	0.351	0.400	115	77	0.428	166	111	
2208	A2208a	0.39	0.90	99	99	5-Year	0.111	0.127	33	84	0.136	48	123	
2211	A2211a	4.00	0.80	86	81	5-Year	0.903	1.029	300	75	1.101	434	109	
2501	A2501a	0.50	0.70	71	66	2-Year	0.071	0.081	66	133	0.087	96	192	
ForeN	AForeN	4.90	0.55	50	50	100% Capture	N/A	N/A	N/A	N/A	N/A	N/A	N/A	North Forebay
MainS	AHE1	18.26	0.41	30	30	5-Year	0.688	0.688	635	35	0.688	635	35	Modelled in DDSWMM
MainS	ATW1	3.09	0.80	86	86	10-Year	3.295	3.295	1228	71	3.295	1228	397	Modelled in DDSWMM
MainS	ATW2	14.25	0.80	86	86									Modelled in DDSWMM

(1) 2-year capture on local roads, 5-year capture on collector roads, and 10-year capture on arterial roads, with no surface storage used during these events (exceptions and greater than 2-year capture highlighted).

(2) 100-year capture set to 114% of minimum capture, and 100-year surface storage set to minimum required to contain runoff within surface storage (exceptions as described under Notes).

(3) 100-year + 20% stress test capture set at 107% of 100-year capture, and 100-year + 20% stress test storage set to 145% of 100-year storage, based on Abbottsville Crossing pilot project (exceptions as described under Notes).

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JFSA Water Resources and Environmental Consultants

DESIGN BRIEF

FOR

POND 1
EAST URBAN COMMUNITY
NORTH MAIN CELL AND NORTH FOREBAY MODIFICATIONS

CITY OF OTTAWA

PROJECT NO.: 20-1191

OCTOBER 2022
REVISED FEBRUARY 2023

Excerpt from DSEL/JFSA's Design Brief for Pond 1 East Urban Community North Main Cell and North Forebay Modifications Revised February 8 2023.

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [1] (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL		
																					Length HGL (m)	Dist. From D/S MH (m)	HGL (m)
1	2	84.836	84.565	450	77.5	0.4	0.013	87.787	87.641	1.06	0.17	0.08	0.5	-0.214	11.93	85.072	84.769	B91W	85.99	0.918			
2	3	84.535	84.483	450	13.0	0.4	0.013	87.641	87.716	1.13	0.18	0.08	0.5	-0.216	11.95	84.769	84.683	N/A	N/A	N/A			
3	4	84.333	84.218	600	38.5	0.3	0.013	87.716	87.586	1.19	0.34	0.16	0.5	-0.287	11.95	84.646	84.543	B90N	85.76	1.114			
4	8	84.143	84.095	675	24.0	0.2	0.013	87.586	87.608	1.05	0.38	0.21	0.6	-0.275	11.96	84.543	84.511	N/A	N/A	N/A			
5	6	84.639	84.427	525	106.0	0.2	0.013	87.722	87.781	0.89	0.19	0.12	0.6	-0.211	11.93	84.953	84.799	B87S	85.67	0.717			
6	12	84.352	84.177	600	87.5	0.2	0.013	87.781	87.701	0.97	0.27	0.22	0.8	-0.153	11.94	84.799	84.525	B95SS	85.57	0.771			
7	8	84.550	84.300	450	83.5	0.3	0.013	87.620	87.608	0.98	0.16	0.15	1.0	-0.047	12.00	84.953	84.574	B84W	85.52	0.567			
8	14	84.075	83.640	675	87.0	0.5	0.013	87.608	87.229	1.66	0.59	0.43	0.7	-0.239	11.98	84.511	84.057	N/A	N/A	N/A			
9	10	84.648	84.447	525	100.5	0.2	0.013	87.795	87.658	0.89	0.19	0.14	0.7	-0.163	11.93	85.010	84.878	B94NN	85.78	0.770			
10	11	84.297	84.131	675	110.5	0.2	0.013	87.658	87.429	0.91	0.33	0.31	0.9	-0.094	11.95	84.878	84.672	B96SS	85.56	0.682			
11	12	84.611	84.417	300	48.5	0.4	0.013	87.429	87.701	0.87	0.06	0.01	0.1	-0.239	11.97	84.672	84.525	B79E	85.53	0.858			
11	18	84.071	83.995	675	50.5	0.2	0.013	87.429	87.453	0.91	0.33	0.38	1.2	-0.074	11.97	84.672	84.383	B80E	85.38	0.708			
12	13	84.117	83.933	600	61.5	0.3	0.013	87.701	87.583	1.19	0.34	0.28	0.8	-0.192	11.96	84.525	84.276	B77W	85.51	0.985			
13	14	83.783	83.565	750	72.5	0.3	0.013	87.583	87.229	1.38	0.61	0.38	0.6	-0.275	11.97	84.258	84.043	B75W	85.37	1.112			
14	140	83.415	83.393	900	5.5	0.4	0.013	87.229	87.196	1.80	1.14	0.82	0.7	-0.272	11.98	84.043	83.993	N/A	N/A	N/A			
15	17	84.180	83.645	1200	107.0	0.5	0.013	87.920	87.688	2.44	2.76	0.08	0.0	-1.057	11.93	84.323	84.324	B97NN	85.85	1.527			
17	170	83.015	82.954	1800	60.5	0.1	0.013	87.688	87.537	1.43	3.63	2.59	0.7	-0.491	12.01	84.324	84.260	B96NS	85.72	1.396			
18	19	82.720	82.645	1950	75.0	0.1	0.013	87.453	87.272	1.51	4.50	3.14	0.7	-0.447	12.03	84.223	84.188	N/A	N/A	N/A			
19	19S	82.495	82.494	2100	1.0	0.1	0.013	87.272	87.272	1.58	5.48	4.59	0.8	-0.407	12.02	84.188	84.185	N/A	N/A	N/A			
19	19W	83.723	83.721	750	1.0	0.2	0.013	87.272	87.272	1.13	0.50	0.24	0.5	-0.285	12.06	84.188	84.186	N/A	N/A	N/A			
20	20S	82.392	82.391	2100	1.0	0.1	0.013	87.148	87.148	1.58	5.48	4.66	0.9	-0.361	12.02	84.131	84.128	N/A	N/A	N/A			
20	20W	84.186	84.183	375	1.0	0.3	0.013	87.148	87.148	0.79	0.09	-0.04	-0.5	-0.223	11.92	84.338	84.396	N/A	N/A	N/A			
21	22	82.264	82.210	2100	54.5	0.1	0.013	87.025	86.460	1.58	5.48	4.70	0.9	-0.300	12.03	84.064	83.997	68	85.16	1.096			
22	Chan2	82.180	82.150	2100	29.5	0.1	0.013	86.460	86.700	1.58	10.97	4.67	0.4	-0.283	12.04	83.997	83.988	N/A	N/A	N/A			
23	230	83.463	83.245	750	109.0	0.2	0.013	87.057	86.944	1.13	0.50	0.41	0.8	-0.217	12.05	83.996	83.671	B74W	85.14	1.144			
24	25	82.565	82.523	1350	21.0	0.2	0.013	86.889	86.774	1.67	2.39	1.22	0.5	-0.501	12.04	83.414	83.391	N/A	N/A	N/A			
25	250	82.493	82.416	1350	38.5	0.2	0.013	86.774	86.730	1.67	2.39	1.26	0.5	-0.452	12.04	83.391	83.360	17	85.09	1.699			
26	27	82.338	82.020	1350	63.5	0.5	0.013	86.637	86.394	2.64	3.77	1.66	0.4	-0.350	12.04	83.338	83.323	N/A	N/A	N/A			
27	Chan3	81.990	81.800	1350	38.0	0.5	0.013	86.394	86.300	2.64	3.77	1.63	0.4	-0.017	12.05	83.323	83.313	N/A	N/A	N/A			
28	29	84.242	84.190	375	17.5	0.3	0.013	87.130	87.017	0.87	0.10	0.00	0.0	-0.256	11.82	84.361	84.360	52	85.18	0.819			
29	30	83.965	83.760	600	82.0	0.3	0.013	87.017	87.075	1.09	0.31	0.20	0.6	-0.205	11.95	84.360	84.069	53	85.16	0.800			
30	31	83.685	83.601	675	33.5	0.3	0.013	87.075	86.964	1.17	0.42	0.25	0.6	-0.291	11.95	84.069	83.984	42	85.14	1.071			
31	32	83.541	83.463	675	31.0	0.3	0.013	86.964	86.962	1.17	0.42	0.30	0.7	-0.232	11.95	83.984	83.917	41	85.08	1.096			
32	33	83.433	83.309	675	41.5	0.3	0.013	86.962	86.911	1.29	0.46	0.36	0.8	-0.191	11.96	83.917	83.748	39	85.01	1.093			
33	34	83.249	83.210	675	13.0	0.3	0.013	86.911	86.830	1.29	0.46	0.36	0.8	-0.176	11.96	83.748	83.674	37	85.13	1.382			
34	35	83.180	83.026	675	44.0	0.4	0.013	86.830	86.728	1.39	0.50	0.41	0.8	-0.181	11.95	83.674	83.437	22	84.97	1.296			
35	26	82.951	82.938	750	6.5	0.2	0.013	86.728	86.637	1.13	0.50	0.41	0.8	-0.264	11.96	83.437	83.338	20	85.01	1.573			
N3900	N54	83.086	83.063	2743	22.9	0.1	0.013	88.154	88.111	1.89	11.18	8.56	0.8	-0.543	12.00	85.286	85.225	IBI (FUT)	N/A	N/A			
N3900	39	N/A	N/A	N/A	N/A	N/A	N/A	88.154	88.154	N/A	N/A	0.71	N/A	N/A	12.02	85.286	84.767	N/A	N/A	N/A			
40	41	83.831	83.729	1200	102.0	0.1	0.013	87.901	87.791	1.09	1.23	0.88	0.7	-0.414	12.04	84.617	84.538	B133W	85.88	1.263			
41	17	83.429	83.315	1500	114.0	0.1	0.013	87.791	87.688	1.26	2.24	2.53	1.1	-0.391	12.01	84.538	84.324	B132E	85.88	1.342			
48	49	83.384	83.360	300	6.0	0.4	0.013	86.367	86.328	0.87	0.06	0.03	0.6	-0.141	12.00	83.543	83.501	N/A	N/A	N/A			
49	50	83.285	82.955	375	66.0	0.5	0.013	86.328	86.244	1.12	0.12	0.05	0.4	-0.203	12.00	83.457	83.120	B8L1	84.23	0.773			
50	ExPlug2	82.880	82.836	450	22.0	0.2	0.013	86.244	86.132	0.80	0.13	0.05	0.4	-0.217	12.00	83.113	83.091	N/A	N/A	N/A			

100 Year HGL at STM MH 41 was taken as the boundary condition for 298 Axis Way

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
N3901	N3900	85.529	85.396	457	53.6	0.2	0.013	88.166	88.154	0.90	0.15	0.15	1.0	-0.099	11.97	85.887	85.665	IBI (FUT)	N/A	N/A			
N54	N55	83.033	82.918	2743	114.7	0.1	0.013	88.111	88.003	1.89	11.18	8.61	0.8	-0.551	12.01	85.225	85.135	IBI (FUT)	N/A	N/A			
N55	N56	82.898	82.750	2743	148.3	0.1	0.013	88.003	87.980	1.89	11.18	8.70	0.8	-0.506	12.02	85.135	85.046	IBI (FUT)	N/A	N/A			
N56	N57	82.600	82.570	3048	30.2	0.1	0.013	87.980	87.347	2.02	14.73	15.35	1.0	-0.602	12.02	85.046	84.945	IBI (FUT)	N/A	N/A			
N56	N101	84.082	84.000	610	63.1	0.1	0.013	87.980	87.410	0.79	0.23	0.47	2.0	0.354	11.93	85.046	84.789	IBI (FUT)	N/A	N/A			
N57	Chan1	82.570	82.554	3048	15.9	0.1	0.013	87.347	87.800	2.04	14.88	16.48	1.1	-0.673	12.02	84.945	84.777	IBI (FUT)	N/A	N/A			
170	18	82.934	82.870	1800	64.5	0.1	0.013	87.537	87.453	1.43	3.63	2.63	0.7	-0.474	12.02	84.260	84.223	B96SS	85.56	1.300			
19S	20	82.494	82.412	2100	82.0	0.1	0.013	87.272	87.148	1.58	5.48	4.65	0.8	-0.409	12.02	84.185	84.131	N/A	N/A	N/A			
19W	23	83.721	83.483	750	119.0	0.2	0.013	87.272	87.057	1.13	0.50	0.32	0.7	-0.285	12.04	84.186	83.996	B71W	85.25	1.064			
20S	21	82.392	82.284	2100	106.5	0.1	0.013	87.148	87.025	1.58	5.48	4.67	0.9	-0.364	12.03	84.128	84.064	64	85.23	1.102			
20W	30	84.183	83.985	375	79.5	0.3	0.013	87.148	87.075	0.79	0.09	0.05	0.6	-0.162	11.92	84.396	84.149	56	85.28	0.884			
47	48	83.634	83.414	300	55.0	0.4	0.013	86.434	86.367	0.87	0.06	0.03	0.6	-0.134	12.00	83.800	83.555	B10L1	84.52	0.720			
Chan1	Chan1a	82.477	82.350	N/A	117.5	N/A	N/A	87.800	87.800	N/A	N/A	16.48	N/A	N/A	12.03	84.777	84.604	N/A	N/A	N/A			
Chan1a	Chan1b	82.350	82.300	N/A	54.4	N/A	N/A	87.800	87.800	N/A	N/A	16.35	N/A	N/A	12.04	84.604	84.490	N/A	N/A	N/A			
Chan1b	Chan1c	82.300	82.280	2100	18.0	0.1	0.013	87.800	87.800	1.76	22.23	16.27	0.7	0.090	12.05	84.490	84.463	N/A	N/A	N/A			
Chan1c	Chan1d	82.280	82.189	N/A	88.1	N/A	N/A	87.800	87.800	N/A	N/A	16.20	N/A	N/A	12.05	84.463	84.155	N/A	N/A	N/A			
Chan1d	Chan1e	82.189	82.160	N/A	37.0	N/A	N/A	87.800	85.900	N/A	N/A	16.04	N/A	N/A	12.07	84.155	84.102	N/A	N/A	N/A			
Chan2	Chan3a	81.654	81.320	N/A	340.7	N/A	N/A	86.700	86.300	N/A	N/A	22.00	N/A	N/A	12.09	83.988	83.455	N/A	N/A	N/A			
Chan3	Chan4	81.200	81.080	N/A	175.5	N/A	N/A	86.300	86.100	N/A	N/A	22.78	N/A	N/A	12.16	83.313	83.001	N/A	N/A	N/A			
Chan4	ForeS	81.080	81.072	N/A	7.6	N/A	N/A	86.100	83.500	N/A	N/A	23.10	N/A	N/A	12.16	83.001	83.001	N/A	N/A	N/A			
DICB	15	84.647	84.405	975	22.0	1.1	0.013	86.190	87.920	3.15	2.35	0.00	0.0	-0.975	0.00	84.647	84.323	N/A	N/A	N/A			
Ex100	Ex111	82.193	82.180	975	18.7	0.1	0.013	85.372	84.902	0.79	0.59	0.59	1.0	-0.167	11.94	83.001	83.001	N/A	N/A	N/A			
Ex107	Ex100	82.670	82.590	600	67.9	0.1	0.013	86.060	85.372	0.75	0.21	0.18	0.8	-0.185	11.94	83.085	83.001	IBI (3)	83.58	0.495			
																		B19LA	83.58	0.504	67.9	60.7	83.076
																		B19LB	83.58	0.520	67.9	47.8	83.060
																		B19LC	83.58	0.525	67.9	43.3	83.055
																		B18LA	83.53	0.482	67.9	38.3	83.048
																		B18LB	83.53	0.495	67.9	27.1	83.035
																		B18LC	83.53	0.497	67.9	25.6	83.033
																		B18LD	83.53	0.511	67.9	14.8	83.019
Ex111	Chan4	81.700	81.685	975	15.0	0.1	0.013	84.902	86.100	0.95	0.71	0.59	0.8	0.326	11.94	83.001	83.001	N/A	N/A	N/A			
ExPlug2	Ex107	82.836	82.821	450	7.3	0.2	0.013	86.132	86.060	0.80	0.13	0.05	0.4	-0.195	12.01	83.091	83.085	N/A	N/A	N/A			
ForeS	MainS	N/A	N/A	N/A	N/A	N/A	N/A	83.500	83.500	N/A	N/A	20.24	N/A	N/A	12.15	83.001	83.001	N/A	N/A	N/A			
PondN	Out	N/A	N/A	N/A	N/A	N/A	N/A	83.500	83.500	N/A	N/A	6.67	N/A	N/A	13.32	82.994	80.100	N/A	N/A	N/A			
MainS	PondN	N/A	N/A	N/A	N/A	N/A	N/A	83.500	83.500	N/A	N/A	13.47	N/A	N/A	12.20	83.001	82.994	N/A	N/A	N/A			
140	141	83.363	83.071	900	73.0	0.4	0.013	87.196	86.812	1.80	1.14	0.84	0.7	-0.270	11.99	83.993	83.653	N/A	N/A	N/A			
141	24	83.041	83.015	900	6.5	0.4	0.013	86.812	86.889	1.80	1.14	0.84	0.7	-0.288	11.99	83.653	83.556	N/A	N/A	N/A			
230	24	83.185	83.165	750	10.0	0.2	0.013	86.944	86.889	1.13	0.50	0.41	0.8	-0.264	12.06	83.671	83.559	N/A	N/A	N/A			
250	26	82.386	82.368	1350	9.0	0.2	0.013	86.730	86.637	1.67	2.39	1.30	0.5	-0.376	12.05	83.360	83.338	N/A	N/A	N/A			
39	40	84.086	83.981	1050	105.0	0.1	0.013	88.154	87.901	1.00	0.86	0.74	0.9	-0.369	12.05	84.767	84.617	B134W	86.14	1.373			
280	28	84.381	84.317	300	16.0	0.4	0.013	87.165	87.130	0.87	0.06	0.00	0.0	-0.300	0.00	84.381	84.361	47	85.21	0.829			
200	41	83.740	83.654	1050	43.0	0.2	0.013	87.754	87.791	1.41	1.22	0.05	0.0	-0.248	12.08	84.542	84.538	N/A	N/A	N/A			
Chan1e	Chan2	82.160	82.104	2400	55.0	0.1	0.013	85.900	86.700	1.73	15.66	15.97	1.0	-0.458	12.09	84.102	83.988	N/A	N/A	N/A			
N404	N406	82.649	82.574	1524	75.3	0.1	0.013	87.325	86.750	1.28	2.33	1.83	0.8	-0.086	12.03	84.087	84.039	IBI (4)	85.23	1.138			

HGL at STM MH 41 was taken as the boundary condition for 298 Axis Way

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL		
																					Length HGL (m)	Dist. From D/S MH (m)	HGL (m)
N406	N407	82.200	82.173	1829	27.2	0.1	0.013	86.750	86.800	1.44	3.77	2.62	0.7	0.010	12.02	84.039	84.024	IBI (4)	84.65	0.611			
N407	Chan2	82.143	82.136	1829	6.9	0.1	0.013	86.800	86.700	1.46	3.83	2.61	0.7	0.052	12.02	84.024	83.988	IBI (4)	84.70	0.676			
N101	N102	83.919	83.837	686	63.1	0.1	0.013	87.410	87.380	0.86	0.32	0.57	1.8	0.184	11.92	84.789	84.669	IBI (4)	85.31	0.521			
N104	N105	83.344	83.269	1067	68.2	0.1	0.013	87.400	87.620	1.06	0.95	0.65	0.7	0.072	12.10	84.483	84.429	IBI (4)	85.30	0.817			
N105	N106	83.118	83.108	1219	9.5	0.1	0.013	87.620	87.500	1.19	1.38	0.88	0.6	0.092	12.00	84.429	84.405	IBI (4)	85.52	1.091			
N106	19	83.088	82.957	1192	119.2	0.1	0.013	87.500	87.272	1.14	1.27	1.52	1.2	0.125	12.01	84.405	84.188	IBI (4)	85.40	0.995			
N310	N311	84.140	84.017	381	30.6	0.4	0.013	87.394	87.200	1.02	0.12	0.07	0.6	-0.127	11.95	84.394	84.346	IBI (4)	85.29	0.900			
N311	N312	83.792	83.672	610	80.1	0.2	0.013	87.200	87.000	0.85	0.25	0.18	0.7	-0.056	11.92	84.346	84.301	IBI (4)	85.10	0.754			
N312	N313	83.597	83.533	686	42.8	0.2	0.013	87.000	86.700	0.92	0.34	0.35	1.0	0.018	11.91	84.301	84.243	IBI (4)	84.90	0.599			
N313	N305	83.513	83.471	686	28.1	0.2	0.013	86.700	86.900	0.92	0.34	0.35	1.0	0.044	11.90	84.243	84.207	IBI (4)	84.50	0.257			
																		55	84.50	0.266	28.1	21.2	84.234
																		56	84.53	0.304	28.1	15.0	84.226
N305	N306	83.246	83.181	914	43.7	0.1	0.013	86.900	86.500	1.11	0.73	0.77	1.1	0.047	11.89	84.207	84.119	IBI (4)	84.80	0.593			
N306	N406	83.106	83.025	991	61.9	0.1	0.013	86.500	86.750	1.10	0.85	0.88	1.0	0.022	11.91	84.119	84.039	IBI (4)	84.42	0.301			
																		60	84.47	0.364	61.9	51.5	84.106
																		61	84.43	0.349	61.9	32.3	84.081
																		62	84.42	0.353	61.9	21.6	84.067
																		106	84.46	0.352	61.9	53.4	84.108
N401	N402	83.000	82.862	1524	115.0	0.1	0.013	87.390	87.260	1.40	2.55	1.27	0.5	-0.341	12.03	84.183	84.150	IBI (4)	85.29	1.107			
N402	N403	82.842	82.728	1524	94.6	0.1	0.013	87.260	87.218	1.41	2.57	1.49	0.6	-0.216	12.04	84.150	84.115	IBI (4)	85.16	1.010			
N403	N404	82.698	82.679	1524	15.8	0.1	0.013	87.218	87.325	1.40	2.55	1.48	0.6	-0.107	12.04	84.115	84.087	IBI (4)	85.12	1.003			
N501	N57	84.013	83.965	1067	40.0	0.1	0.013	88.000	87.347	1.10	0.99	1.69	1.7	-0.082	11.86	84.998	84.945	IBI (4)	85.90	0.902			
N500C	N501	84.706	84.538	533	67.4	0.2	0.013	87.740	88.000	1.00	0.22	0.18	0.8	-0.132	11.94	85.107	84.998	IBI (4)	85.64	0.533			
N500	N500C	85.025	84.856	381	67.4	0.3	0.013	87.760	87.740	0.80	0.09	0.08	0.9	-0.096	11.95	85.310	85.107	IBI (4)	85.66	0.350			
N400	N401	83.119	83.020	1524	83.0	0.1	0.013	87.800	87.390	1.39	2.54	1.18	0.5	-0.435	12.02	84.208	84.183	IBI (4)	85.70	1.492			
N399	N400	83.238	83.139	1524	82.0	0.1	0.013	89.000	87.800	1.41	2.57	1.20	0.5	-0.527	12.01	84.235	84.208	IBI (4)	86.90	2.665			
N412	N404	83.560	83.474	686	8.5	1.0	0.013	87.400	87.325	2.39	0.88	0.23	0.3	-0.152	11.93	84.094	84.087	IBI (4)	85.30	1.206			
N410	N412	84.048	83.740	533	30.9	1.0	0.013	87.540	87.400	2.00	0.45	0.24	0.5	-0.245	11.93	84.336	84.094	IBI (4)	85.44	1.104			
N410B	N410	84.550	84.091	533	57.4	0.8	0.013	87.570	87.540	1.79	0.40	0.23	0.6	-0.242	11.94	84.841	84.378	IBI (4)	85.47	0.629			
N309	N310	84.297	84.160	381	34.3	0.4	0.013	87.350	87.394	1.01	0.12	0.07	0.6	-0.168	12.00	84.510	84.394	IBI (4)	85.25	0.740			
N308	N309	84.363	84.317	381	11.5	0.4	0.013	87.220	87.350	1.01	0.12	0.07	0.6	-0.230	11.99	84.514	84.510	IBI (4)	85.12	0.606			
N307	N308	84.656	84.383	381	68.2	0.4	0.013	87.400	87.220	1.01	0.12	0.07	0.6	-0.162	12.00	84.875	84.572	IBI (4)	85.30	0.425			
N304	N305	83.509	83.396	762	75.6	0.2	0.013	86.800	86.900	0.99	0.45	0.41	0.9	-0.037	11.93	84.234	84.207	IBI (4)	84.70	0.466			
N303	N304	83.693	83.584	686	36.1	0.3	0.013	86.760	86.800	1.30	0.48	0.28	0.6	-0.159	11.89	84.220	84.234	IBI (4)	84.66	0.440			
																		87	84.66	0.439	36.1	34.2	84.221
N301	N303	84.292	83.843	533	112.4	0.4	0.013	87.230	86.760	1.27	0.28	0.20	0.7	-0.216	12.00	84.609	84.220	IBI (4)	85.13	0.521			
N314	N304	84.131	83.959	305	38.2	0.5	0.013	87.100	86.800	0.93	0.07	0.05	0.7	-0.108	11.92	84.328	84.234	IBI (4)	85.00	0.672			
N114	N105	84.424	84.254	533	68.0	0.2	0.013	87.680	87.620	1.00	0.22	0.25	1.1	-0.150	11.95	84.807	84.589	IBI (4)	85.58	0.773			
N113	N114	84.995	84.574	381	60.0	0.7	0.013	87.530	87.680	1.34	0.15	0.15	1.0	-0.117	11.95	85.259	84.855	IBI (4)	85.71	0.451			
N112B	N113	85.186	85.070	305	11.6	1.0	0.013	87.580	87.530	1.38	0.10	0.03	0.3	-0.191	11.99	85.300	85.259	IBI (4)	85.76	0.460			
N112_2	N101	84.426	84.219	381	68.9	0.3	0.013	87.580	87.410	0.88	0.10	0.07	0.7	0.070	11.87	84.877	84.789	IBI (4)	85.48	0.603			
N103	N104	83.658	83.644	762	13.1	0.1	0.013	87.370	87.400	0.83	0.38	0.59	1.5	0.110	11.93	84.530	84.483	IBI (4)	85.27	0.740			
N102	N103	83.817	83.733	686	64.7	0.1	0.013	87.380	87.370	0.86	0.32	0.60	1.9	0.166	11.93	84.669	84.530	IBI (4)	85.28	0.611			
Chan3a	Chan3	81.230	81.200	N/A	30.2	N/A	N/A	86.300	86.300	N/A	N/A	21.05	N/A	N/A	12.16	83.455	83.313	N/A	N/A	N/A			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
C13	C13b	84.650	82.840	N/A	250.0	0.7	0.05	85.750	85.150	N/A	N/A	0.29	N/A	N/A	12.07	85.076	83.268	N/A	N/A	N/A			
C13b	PondN	82.840	82.000	N/A	150.0	0.6	0.05	85.150	83.500	N/A	N/A	0.26	N/A	N/A	12.27	83.268	82.994	N/A	N/A	N/A			
B1	B2	81.101	80.943	1800	105.0	0.2	0.013	87.811	87.288	1.75	4.45	4.80	1.1	0.378	12.05	83.279	83.101	276	85.47	2.191			
B2	B3	80.943	80.923	1800	13.5	0.2	0.013	87.288	87.329	1.75	4.45	4.94	1.1	0.358	12.05	83.101	83.037	275	85.74	2.639			
B3	B60	80.923	80.861	1800	41.5	0.2	0.013	87.329	87.550	1.75	4.45	4.94	1.1	0.314	12.05	83.037	83.024	273	85.68	2.643			
B4	B58	83.882	83.311	375	81.5	0.7	0.013	87.834	87.788	1.33	0.15	0.11	0.8	-0.124	12.05	84.133	83.622	254	85.75	1.617			
																		254	85.75	1.785	81.3	54.5	83.965
																		253	85.79	1.758	81.3	65.3	84.032
																		252	85.98	1.861	81.3	79.1	84.119
																		258	85.68	2.033	81.3	3.9	83.647
																		257	85.79	2.079	81.3	14.2	83.711
																		256	85.74	1.957	81.3	25.6	83.783
																		255	85.78	1.920	81.3	37.8	83.860
B5	B6	84.597	84.452	300	14.5	1.0	0.013	87.803	87.913	1.37	0.10	0.00	0.0	-0.377	0.00	84.520	84.520	50	86.01	1.490			
B5	B56	83.691	82.380	675	138.0	1.0	0.013	87.803	87.712	2.29	0.82	0.30	0.4	-0.353	12.02	84.013	83.438	40	85.69	1.677			
B6	B7	84.388	84.082	300	47.0	0.7	0.013	87.913	87.917	1.10	0.08	0.01	0.1	-0.168	12.12	84.520	84.517	54	86.04	1.520			
B7	B8	84.022	83.956	300	12.0	0.6	0.013	87.917	87.801	1.01	0.07	0.02	0.3	0.195	12.15	84.517	84.516	55	85.97	1.453			
B8	B9	83.926	83.552	300	68.0	0.6	0.013	87.801	87.873	1.01	0.07	0.07	1.0	0.290	12.16	84.516	84.315	27	85.83	1.314			
B9	B57	83.477	82.547	375	71.5	1.3	0.013	87.873	87.813	1.81	0.20	0.19	1.0	0.463	11.87	84.315	83.298	21	85.69	1.375			
B10	B11	83.947	83.685	375	69.0	0.4	0.013	88.197	88.159	0.98	0.11	0.12	1.1	0.229	11.74	84.551	84.376	81	86.04	1.489			
B10	B49	84.417	83.682	300	106.5	0.7	0.013	88.197	88.057	1.14	0.08	0.03	0.4	-0.166	11.93	84.551	83.935	311	86.27	1.719			
B11	B34	83.665	83.053	375	80.5	0.8	0.013	88.159	87.886	1.38	0.15	0.17	1.1	0.336	11.91	84.376	83.725	74	85.92	1.544			
B12	B13	87.219	85.699	375	76.0	2.0	0.013	91.003	89.864	2.25	0.25	0.11	0.4	-0.201	11.93	87.393	85.872	N/A	N/A	N/A			
B13	B15	85.249	83.720	825	139.0	1.1	0.013	89.864	88.345	2.82	1.51	0.63	0.4	-0.451	11.94	85.623	84.143	N/A	N/A	N/A			
B15	B21	83.195	82.979	1350	58.5	0.4	0.013	88.345	88.484	2.27	3.25	1.95	0.6	-0.402	11.92	84.143	84.081	N/A	N/A	N/A			
B16	B40	84.536	84.061	375	108.0	0.4	0.013	88.626	88.320	1.05	0.12	0.12	1.0	-0.013	12.02	84.898	84.360	B370S	86.26	1.362			
																		B370S	86.26	1.805	108.2	19.1	84.455
																		B370N	86.63	2.109	108.2	32.3	84.521
																		B369S	86.63	2.048	108.2	44.6	84.582
																		B369N	86.41	1.690	108.2	72.4	84.720
																		B368S	86.53	1.743	108.2	85.9	84.787
																		B368N	86.63	1.774	108.2	99.7	84.856
																		B374S	86.87	1.979	108.2	106.7	84.891
																		B373N	86.67	1.812	108.2	100.1	84.858
																		B373S	86.55	1.802	108.2	78.1	84.748
																		B372N	86.55	1.866	108.2	65.2	84.684
																		B372S	86.62	2.043	108.2	43.6	84.577
																		B371N	86.62	2.104	108.2	31.4	84.516
																		B371S	86.77	2.321	108.2	17.8	84.449
B17	B16	84.801	84.611	300	9.5	2.0	0.013	88.702	88.626	1.93	0.14	0.01	0.1	-0.202	12.03	84.899	84.898	B374N	86.75	1.851			
B17	B18	84.894	84.371	300	48.0	1.1	0.013	88.702	88.502	1.43	0.10	0.00	0.0	-0.295	12.01	84.899	84.570	B376E	86.59	1.691			
B18	B21	84.296	83.934	375	67.0	0.5	0.013	88.502	88.484	1.17	0.13	0.09	0.7	-0.101	11.97	84.570	84.159	B377W	86.51	1.940			
B19	B21	84.917	83.859	450	141.0	0.8	0.013	88.600	88.484	1.55	0.25	0.09	0.4	-0.258	12.03	85.109	84.081	B356E	86.51	1.401			
B19	B26	84.843	84.810	300	9.5	0.4	0.013	88.600	88.678	0.81	0.06	0.05	0.9	-0.034	11.76	85.109	85.089	351	86.73	1.621			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [(1)] (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
B21	B24	82.959	82.707	1350	58.5	0.4	0.013	88.484	88.145	2.45	3.50	2.08	0.6	-0.228	11.92	84.081	84.023	B145N	86.60	2.519			
B22	B24	84.693	83.587	450	146.5	0.8	0.013	88.456	88.145	1.55	0.25	0.10	0.4	-0.245	11.96	84.898	84.023	B136E	86.15	1.252			
B22	B2200	84.552	84.434	300	29.0	0.4	0.013	88.456	87.660	0.88	0.06	0.09	1.4	0.046	11.93	84.898	84.665	B158	86.60	1.702			
B24	B25	82.687	82.479	1350	41.5	0.5	0.013	88.145	88.096	2.64	3.77	2.18	0.6	-0.014	11.90	84.023	83.960	B146S	86.09	2.067			
B25	B30	82.449	82.380	1350	14.0	0.5	0.013	88.096	88.193	2.61	3.74	2.18	0.6	0.161	12.09	83.960	83.934	N/A	N/A	N/A			
B26	B22	84.780	84.572	300	52.0	0.4	0.013	88.678	88.456	0.87	0.06	0.06	1.0	0.009	12.02	85.089	84.898	124	86.63	1.541			
B27	B28	83.872	83.767	675	10.5	1.0	0.013	88.285	88.194	2.35	0.84	0.34	0.4	-0.226	12.02	84.321	84.282	121	86.38	2.059			
B28	B30	83.692	82.980	750	142.5	0.5	0.013	88.194	88.193	1.78	0.79	0.48	0.6	-0.160	12.06	84.282	83.934	126	86.09	1.808			
B30	B33	82.230	82.103	1500	63.5	0.2	0.013	88.193	87.886	1.79	3.16	2.92	0.9	0.204	12.07	83.934	83.833	3	85.87	1.936			
B31	B33	84.349	83.133	450	143.0	0.9	0.013	88.117	87.886	1.65	0.26	0.13	0.5	-0.219	11.93	84.580	83.833	95	85.99	1.410			
B31	B35	84.334	84.234	300	9.5	1.1	0.013	88.117	88.196	1.40	0.10	0.05	0.5	-0.054	12.30	84.580	84.573	104	86.40	1.820			
B33	B34	82.083	81.948	1500	58.5	0.2	0.013	87.886	87.886	1.92	3.39	3.12	0.9	0.250	12.07	83.833	83.725	7	85.89	2.057			
B34	B38	81.928	81.788	1500	58.5	0.2	0.013	87.886	87.776	1.96	3.46	3.26	0.9	0.297	12.06	83.725	83.604	59	86.06	2.335			
B35	B10	84.204	84.022	300	52.0	0.4	0.013	88.196	88.197	0.81	0.06	0.06	1.0	0.069	12.28	84.573	84.551	105	86.31	1.737			
B36	B37	83.993	83.592	300	59.0	0.7	0.013	87.997	88.115	1.13	0.08	0.06	0.8	0.083	12.17	84.376	84.154	344	86.01	1.634			
B37	B38	83.517	82.913	375	80.5	0.8	0.013	88.115	87.776	1.37	0.15	0.13	0.9	0.262	12.18	84.154	83.604	338	86.00	1.846			
B38	B52	81.638	81.551	1650	54.5	0.2	0.013	87.776	87.772	1.71	3.65	3.42	0.9	0.316	12.06	83.604	83.531	18	85.82	2.216			
B39	B40	84.568	84.136	300	27.0	1.6	0.013	88.469	88.320	1.73	0.12	0.00	0.0	-0.300	0.00	84.568	84.360	160	86.56	1.992			
B40	B41	83.911	83.747	525	54.5	0.3	0.013	88.320	88.394	1.09	0.24	0.19	0.8	-0.076	11.94	84.360	84.289	164	86.37	2.010			
B41	B30	83.717	83.205	525	64.0	0.8	0.013	88.394	88.193	1.78	0.38	0.32	0.8	0.047	11.93	84.289	83.934	N/A	N/A	N/A			
B42	B43	84.621	84.321	375	45.5	0.7	0.013	88.269	87.998	1.29	0.14	0.09	0.6	-0.150	11.93	84.846	84.613	167	86.11	1.264			
																		167	86.11	1.446	45.7	10.0	84.664
																		166	86.14	1.417	45.7	21.6	84.723
																		165	86.39	1.604	45.7	34.0	84.786
B42	B45	84.501	84.141	375	103.0	0.4	0.013	88.269	88.178	0.94	0.10	0.11	1.0	-0.030	11.94	84.846	84.589	237	86.13	1.284			
																		237	86.13	1.344	102.8	78.7	84.786
																		236	86.13	1.315	102.8	90.6	84.816
																		231	86.36	1.536	102.8	94.0	84.824
																		230	86.18	1.386	102.8	82.0	84.794
																		229	86.19	1.424	102.8	70.7	84.766
																		228	86.29	1.561	102.8	56.2	84.730
																		227	86.36	1.665	102.8	42.2	84.695
																		226	86.47	1.811	102.8	28.1	84.659
																		225	86.47	1.844	102.8	14.8	84.626
																		224	86.36	1.769	102.8	0.9	84.591
																		243	86.43	1.827	102.8	5.7	84.603
																		242	86.47	1.836	102.8	18.2	84.635
																		241	86.47	1.802	102.8	31.8	84.669
																		240	86.31	1.612	102.8	43.8	84.699
																		239	86.30	1.574	102.8	54.9	84.726
																		238	86.16	1.403	102.8	67.3	84.757
B43	B44	84.291	84.182	375	10.5	1.0	0.013	87.998	88.123	1.62	0.18	0.09	0.5	-0.053	11.94	84.613	84.591	168	86.26	1.647			
																		168	86.26	1.650	10.7	9.2	84.610
																		169	86.38	1.778	10.7	5.4	84.602

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [(1)] (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
																		170	86.38	1.786	10.7	1.5	84.594
B44	B47	84.107	83.716	450	103.0	0.4	0.013	88.123	87.962	1.11	0.18	0.15	0.8	0.034	11.94	84.591	84.381	175	85.95	1.359			
																		175	85.95	1.507	103.2	30.3	84.443
																		174	86.09	1.613	103.2	47.0	84.477
																		173	86.31	1.804	103.2	61.2	84.506
																		172	86.32	1.782	103.2	77.2	84.538
																		171	86.34	1.772	103.2	91.7	84.568
																		251	86.33	1.752	103.2	96.9	84.578
																		250	86.33	1.777	103.2	84.5	84.553
																		249	86.26	1.730	103.2	73.3	84.530
																		248	86.15	1.645	103.2	61.1	84.505
																		247	86.07	1.587	103.2	50.0	84.483
																		246	86.03	1.577	103.2	35.2	84.453
																		245	86.03	1.600	103.2	24.3	84.430
																		244	85.96	1.555	103.2	11.8	84.405
																		177	86.23	1.841	103.2	4.0	84.389
																		176	86.08	1.665	103.2	16.9	84.415
B45	B46	84.081	84.005	375	10.5	0.7	0.013	88.178	87.992	1.35	0.15	0.11	0.7	0.133	11.94	84.589	84.558	222	86.26	1.671			
B46	B47	83.930	83.716	450	45.5	0.5	0.013	87.992	87.962	1.23	0.20	0.17	0.9	0.178	11.94	84.558	84.381	220	85.95	1.392			
																		220	85.95	1.467	45.6	26.2	84.483
																		221	86.07	1.534	45.6	39.9	84.536
																		219	86.07	1.642	45.6	12.0	84.428
B47	B54	83.566	83.131	600	111.5	0.4	0.013	87.962	87.818	1.36	0.38	0.39	1.0	0.215	11.93	84.381	83.937	185	85.85	1.469			
																		185	85.85	1.862	111.4	12.7	83.988
																		184	85.85	1.818	111.4	23.8	84.032
																		183	85.96	1.878	111.4	36.3	84.082
																		182	86.03	1.890	111.4	50.9	84.140
																		181	86.13	1.947	111.4	61.8	84.183
																		180	86.22	1.988	111.4	74.0	84.232
																		179	86.25	1.971	111.4	85.7	84.279
																		178	86.26	1.934	111.4	97.6	84.326
B48	B52	84.016	82.806	375	110.0	1.1	0.013	87.804	87.772	1.66	0.18	0.11	0.6	-0.130	12.09	84.261	83.531	211	85.83	1.569			
B49	B50	83.652	83.619	300	9.5	0.4	0.013	88.057	87.905	0.81	0.06	0.03	0.5	-0.017	11.93	83.935	83.930	309	86.14	2.205			
B50	B52	83.443	82.731	450	142.5	0.5	0.013	87.905	87.772	1.27	0.20	0.15	0.7	0.037	11.88	83.930	83.531	300	85.81	1.880			
B52	B56	81.531	81.426	1650	58.5	0.2	0.013	87.772	87.712	1.81	3.87	3.67	0.9	0.350	12.06	83.531	83.438	N/A	N/A	N/A			
B54	B55	83.071	83.036	600	10.0	0.4	0.013	87.818	87.903	1.28	0.36	0.40	1.1	0.266	12.16	83.937	83.879	188	86.02	2.083			
B55	B56	82.953	82.381	675	110.0	0.5	0.013	87.903	87.712	1.69	0.61	0.46	0.8	0.251	12.08	83.879	83.438	199	85.69	1.811			
B56	B57	81.405	81.267	1650	60.5	0.2	0.013	87.712	87.813	2.04	4.37	4.44	1.0	0.383	12.06	83.438	83.298	N/A	N/A	N/A			
B57	B1	81.117	81.117	1800	10.5	0.2	0.013	87.813	87.811	1.75	4.45	4.80	1.1	0.381	12.05	83.298	83.279	N/A	N/A	N/A			
B58	B57	83.237	82.468	450	61.5	1.3	0.013	87.788	87.813	2.00	0.32	0.21	0.7	-0.065	11.93	83.622	83.298	262	85.71	2.088			
																		262	85.71	2.315	61.6	18.4	83.395
																		261	85.71	2.251	61.6	30.6	83.459
																		260	85.73	2.212	61.6	41.9	83.518
																		259	85.88	2.296	61.6	54.3	83.584

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL		
																					Length HGL (m)	Dist. From D/S MH (m)	HGL (m)
B59	B63	83.060	83.022	375	8.5	0.5	0.013	87.585	87.606	1.06	0.12	0.10	0.8	-0.109	12.17	83.326	83.249	270	85.73	2.404			
B60	B61	80.801	80.755	1800	30.5	0.2	0.013	87.550	87.550	1.75	4.45	5.03	1.1	0.423	12.04	83.024	83.017	N/A	N/A	N/A			
B61	2144	80.755	80.645	1800	73.5	0.2	0.013	87.550	86.340	1.75	4.45	5.03	1.1	0.462	12.04	83.017	82.998	N/A	N/A	N/A			
B63	B60	82.259	82.226	375	5.5	0.6	0.013	87.606	87.550	1.23	0.14	0.10	0.7	0.391	12.11	83.025	83.024	N/A	N/A	N/A			
B120	B12	88.780	87.352	300	51.0	2.8	0.013	91.862	91.003	2.29	0.16	0.00	0.0	-0.300	0.00	88.780	87.393	N/A	N/A	N/A			
B180	B18	84.774	84.371	300	38.0	1.1	0.013	88.743	88.502	1.41	0.10	0.05	0.5	-0.143	11.93	84.931	84.570	B367N	86.55	1.619			
																		B367N	86.55	1.839	37.9	14.8	84.711
																		B367S	86.70	1.863	37.9	28.0	84.837
																		B362S	86.72	1.883	37.9	28.0	84.837
																		B362N	86.41	1.699	37.9	14.8	84.711
B180	B41	84.611	83.942	300	76.0	0.9	0.013	88.743	88.394	1.28	0.09	0.09	1.0	0.020	11.93	84.931	84.289	B364S	86.21	1.279			
																		B364S	86.21	1.770	77.2	18.1	84.440
																		B364N	86.22	1.672	77.2	31.1	84.548
																		B363S	86.22	1.565	77.2	44.0	84.655
																		B363N	86.72	1.829	77.2	72.4	84.891
																		B366N	86.72	1.829	77.2	72.4	84.891
																		B366S	86.28	1.625	77.2	44.0	84.655
																		B365N	86.28	1.732	77.2	31.1	84.548
																		B365S	86.26	1.820	77.2	18.1	84.440
B410	B42	84.928	84.576	300	51.0	0.7	0.013	88.272	88.269	1.14	0.08	0.06	0.7	-0.107	11.92	85.121	84.846	232	86.45	1.329			
B590	B59	83.957	83.090	375	102.0	0.9	0.013	87.720	87.585	1.46	0.16	0.10	0.6	-0.164	12.12	84.168	83.326	294	85.46	1.292			
B2200	B27	83.997	83.902	675	19.0	0.5	0.013	87.660	88.285	1.66	0.59	0.35	0.6	-0.247	12.02	84.425	84.321	122	86.48	2.055			
C12	C13	84.848	84.650	600	22.0	0.9	0.013	86.490	85.750	2.06	0.58	0.17	0.3	-0.344	12.08	85.104	85.076	N/A	N/A	N/A			
C4MH	B2200	85.207	84.463	450	31.0	2.4	0.013	88.250	87.660	2.78	0.44	0.26	0.6	-0.113	12.02	85.544	84.714	N/A	N/A	N/A			
C8MH	B5	85.210	84.950	300	26.0	1.0	0.013	88.060	87.803	1.37	0.10	0.10	1.1	0.153	12.02	85.663	85.200	N/A	N/A	N/A			
2144	PondN	80.645	80.605	1800	27.0	0.2	0.013	86.340	83.500	1.75	4.45	5.02	1.1	0.553	12.04	82.998	82.994	N/A	N/A	N/A			
CB1	CB2	86.457	86.410	250	19.5	0.2	0.013	88.880	88.750	0.59	0.03	0.07	2.3	1.398	11.88	88.105	87.960	N/A	N/A	N/A			
CB2	CB3	86.410	86.385	250	10.5	0.2	0.013	88.750	88.670	0.59	0.03	0.06	2.1	1.300	11.89	87.960	87.861	N/A	N/A	N/A			
CB3	CB4	86.385	86.360	250	10.5	0.2	0.013	88.670	88.600	0.59	0.03	0.08	2.8	1.226	11.88	87.861	87.792	N/A	N/A	N/A			
CB4	CB5	86.360	86.335	250	10.5	0.2	0.013	88.600	88.530	0.59	0.03	0.08	2.6	1.182	12.27	87.792	87.724	N/A	N/A	N/A			
CB5	CB6	86.335	86.310	250	10.5	0.2	0.013	88.530	88.460	0.59	0.03	0.08	2.8	1.139	12.25	87.724	87.660	N/A	N/A	N/A			
CB6	CB7	86.310	86.285	250	10.5	0.2	0.013	88.460	88.390	0.59	0.03	0.10	3.6	1.100	11.92	87.660	87.570	N/A	N/A	N/A			
CB7	CB8	86.285	86.260	250	10.5	0.2	0.013	88.390	88.320	0.59	0.03	0.12	4.0	1.035	11.94	87.570	87.402	N/A	N/A	N/A			
CB8	C100MH	86.260	86.230	250	12.5	0.2	0.013	88.320	88.250	0.59	0.03	0.16	5.3	0.892	12.02	87.402	86.480	N/A	N/A	N/A			
CB9	CB10	86.187	86.133	250	22.5	0.2	0.013	88.280	88.340	0.59	0.03	-0.04	-1.5	0.440	12.08	86.877	86.975	N/A	N/A	N/A			
CB10	CB10i	86.133	86.086	250	19.6	0.2	0.013	88.340	88.410	0.59	0.03	-0.04	-1.5	0.592	12.08	86.975	87.063	N/A	N/A	N/A			
CB10i	CB11	86.086	86.032	250	22.4	0.2	0.013	88.410	88.200	0.59	0.03	-0.04	-1.5	0.727	11.87	87.063	87.162	N/A	N/A	N/A			
CB11	CB12	86.032	85.976	250	23.5	0.2	0.013	88.200	88.120	0.59	0.03	0.02	0.8	0.880	11.77	87.162	87.162	N/A	N/A	N/A			
CB12	CB13	85.976	85.945	250	13.0	0.2	0.013	88.120	88.080	0.59	0.03	-0.02	-0.7	0.936	12.26	87.162	87.162	N/A	N/A	N/A			
CB13	CB14	85.945	85.914	250	13.0	0.2	0.013	88.080	88.040	0.59	0.03	-0.02	-0.7	0.967	12.26	87.162	87.162	N/A	N/A	N/A			
CB14	CB15	85.914	85.883	250	13.0	0.2	0.013	88.040	88.000	0.59	0.03	0.03	1.1	0.998	11.89	87.162	87.137	N/A	N/A	N/A			
CB15	CB16	85.883	85.852	250	13.0	0.2	0.013	88.000	87.960	0.59	0.03	0.03	0.9	1.004	11.93	87.137	87.118	N/A	N/A	N/A			
CB16	CB17	85.852	85.821	250	13.0	0.2	0.013	87.960	87.920	0.59	0.03	0.02	0.7	1.016	11.75	87.118	87.105	N/A	N/A	N/A			
CB17	CB18	85.821	85.790	250	13.0	0.2	0.013	87.920	87.880	0.59	0.03	0.04	1.4	1.034	11.88	87.105	87.069	N/A	N/A	N/A			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
CB18	CB19	85.790	85.759	250	13.0	0.2	0.013	87.880	87.840	0.59	0.03	0.04	1.2	1.029	11.88	87.069	87.036	N/A	N/A	N/A			
CB19	CB20	85.759	85.728	250	13.0	0.2	0.013	87.840	87.800	0.59	0.03	0.03	1.0	1.027	11.95	87.036	87.006	N/A	N/A	N/A			
CB20	CB21	85.728	85.697	250	13.0	0.2	0.013	87.800	87.760	0.59	0.03	0.03	1.1	1.028	12.41	87.006	86.985	N/A	N/A	N/A			
CB21	CB22	85.697	85.666	250	13.0	0.2	0.013	87.760	87.720	0.59	0.03	0.05	1.9	1.038	11.85	86.985	86.945	N/A	N/A	N/A			
CB22	CB23	85.666	85.635	250	13.0	0.2	0.013	87.720	87.680	0.59	0.03	0.06	2.0	1.029	12.38	86.945	86.906	N/A	N/A	N/A			
CB23	CB24	85.635	85.586	250	20.5	0.2	0.013	87.680	87.620	0.59	0.03	0.06	2.2	1.021	12.37	86.906	86.847	N/A	N/A	N/A			
CB24	CB25	85.586	85.518	250	28.5	0.2	0.013	87.620	87.540	0.59	0.03	0.07	2.4	1.011	12.35	86.847	86.753	N/A	N/A	N/A			
CB25	CB50	85.760	85.383	250	39.0	1.0	0.013	87.540	88.572	1.21	0.06	0.09	1.5	0.743	12.11	86.753	85.856	N/A	N/A	N/A			
CB25	CB25i	85.518	85.493	250	10.5	0.2	0.013	87.540	87.640	0.59	0.03	0.03	1.0	0.985	12.21	86.753	86.739	N/A	N/A	N/A			
CB25i	CB26	85.493	85.452	250	17.0	0.2	0.013	87.640	87.480	0.59	0.03	0.04	1.3	0.996	12.06	86.739	86.667	N/A	N/A	N/A			
CB26	CB27	85.452	85.409	250	18.0	0.2	0.013	87.480	87.420	0.59	0.03	0.03	1.1	0.965	12.03	86.667	86.619	N/A	N/A	N/A			
CB27	CB28	85.409	85.378	250	13.0	0.2	0.013	87.420	87.380	0.59	0.03	0.03	1.1	0.960	12.33	86.619	86.590	N/A	N/A	N/A			
CB28	CB29	85.378	85.342	250	15.0	0.2	0.013	87.380	87.330	0.59	0.03	0.05	1.8	0.962	11.87	86.590	86.537	N/A	N/A	N/A			
CB29	CB30	85.342	85.281	250	25.5	0.2	0.013	87.330	87.250	0.59	0.03	0.06	2.2	0.945	12.31	86.537	86.416	N/A	N/A	N/A			
CB30	C12	85.281	85.198	250	34.5	0.2	0.013	87.250	86.490	0.59	0.03	0.09	3.1	0.885	12.09	86.416	85.430	N/A	N/A	N/A			
CB50	C8MH	85.330	85.270	300	4.0	1.0	0.013	88.572	88.060	1.37	0.10	0.10	1.1	0.226	12.01	85.856	85.663	N/A	N/A	N/A			
CB100	CB1	86.503	86.457	250	19.0	0.2	0.013	89.000	88.880	0.59	0.03	-0.01	-0.4	1.353	11.88	88.106	88.105	N/A	N/A	N/A			
C100MH	C4MH	86.107	85.954	375	4.5	3.4	0.013	88.250	88.250	2.93	0.32	0.17	0.5	-0.083	12.02	86.399	86.148	N/A	N/A	N/A			
C101MH	CB9	86.221	86.187	250	14.3	0.2	0.013	88.240	88.280	0.59	0.03	-0.10	-3.3	-0.016	11.93	86.455	86.877	N/A	N/A	N/A			
C101MH	C4MH	86.165	86.075	300	4.5	2.0	0.013	88.240	88.250	1.93	0.14	0.10	0.7	-0.057	11.93	86.408	86.260	N/A	N/A	N/A			
1000	N3900	83.165	83.135	2700	17.9	0.0	0.013	87.742	88.154	0.26	1.52	9.13	6.0	-0.568	12.00	85.297	85.286	N/A	N/A	N/A			
2000	N56	82.960	82.930	2250	31.0	0.0	0.013	87.484	87.980	0.17	0.66	7.07	10.7	0.096	12.11	85.306	85.046	N/A	N/A	N/A			
1i	2003	85.670	85.390	1200	100.0	0.3	0.013	89.370	89.920	1.82	2.06	2.02	1.0	-0.102	12.02	86.768	86.172	Fut. Est. (4)	87.27	0.502			
2000i	2001	84.205	83.642	300	60.5	0.9	0.013	87.910	87.670	1.32	0.09	0.08	0.9	-0.071	12.10	84.434	83.863	Fut. Est. (4)	85.81	1.376			
2001	2121	83.567	83.520	375	13.5	0.4	0.013	87.670	87.560	0.94	0.10	0.10	0.9	-0.085	12.10	83.857	83.747	Fut. Est. (4)	85.57	1.713			
2002	2010	84.726	83.952	525	119.0	0.7	0.013	88.840	88.420	1.60	0.35	0.27	0.8	-0.129	12.03	85.122	84.301	Fut. Est. (4)	86.74	1.618			
2003	2004	83.279	83.198	1200	29.0	0.3	0.013	89.920	89.920	1.82	2.06	2.09	1.0	0.204	12.02	84.683	84.570	Fut. Est. (4)	87.82	3.137			
2004	2005	83.168	83.130	1200	13.5	0.3	0.013	89.920	89.910	1.82	2.06	2.10	1.0	0.202	12.02	84.570	84.494	Fut. Est. (4)	87.82	3.250			
2005	2009	83.100	82.898	1200	69.5	0.3	0.013	89.910	89.790	1.86	2.10	2.14	1.0	0.194	12.04	84.494	84.315	Fut. Est. (4)	87.81	3.316			
2006	2007	87.229	87.036	300	53.5	0.4	0.013	90.030	89.980	0.82	0.06	0.05	0.9	-0.069	12.09	87.460	87.237	Fut. Est. (4)	87.93	0.470			
2007	2008	86.961	86.926	375	13.5	0.3	0.013	89.980	89.960	0.81	0.09	0.08	0.9	-0.099	12.10	87.237	87.160	Fut. Est. (4)	87.88	0.643			
2008	2009	86.701	86.534	600	119.0	0.1	0.013	89.960	89.790	0.81	0.23	0.20	0.9	-0.141	12.12	87.160	86.826	Fut. Est. (4)	87.86	0.700			
2009	2010	82.878	82.637	1200	71.0	0.3	0.013	89.790	88.420	2.01	2.27	2.36	1.0	0.237	12.03	84.315	84.084	Fut. Est. (4)	87.69	3.375			
2010	2011	82.337	82.232	1500	80.5	0.1	0.013	88.420	88.340	1.44	2.55	2.64	1.0	0.247	12.07	84.084	83.989	Fut. Est. (4)	86.32	2.236			
2011	2012	82.212	82.136	1500	63.5	0.1	0.013	88.340	88.270	1.39	2.45	2.66	1.1	0.277	12.07	83.989	83.885	Fut. Est. (4)	86.24	2.251			
2012	2013	82.106	82.090	1500	13.5	0.1	0.013	88.270	88.260	1.39	2.45	2.67	1.1	0.279	12.07	83.885	83.839	Fut. Est. (4)	86.17	2.285			
2013	2017	82.060	81.910	1500	115.0	0.1	0.013	88.260	88.150	1.44	2.55	2.77	1.1	0.279	12.10	83.839	83.578	Fut. Est. (4)	86.16	2.321			
2014	2015	84.372	83.719	375	99.0	0.7	0.013	88.320	88.220	1.29	0.14	0.12	0.8	-0.100	12.10	84.647	83.974	Fut. Est. (4)	86.22	1.573			
2015	2016	83.623	83.513	375	9.5	1.2	0.013	88.220	88.210	1.71	0.19	0.15	0.8	-0.081	12.10	83.917	83.768	Fut. Est. (4)	86.12	2.203			
2016	2017	83.360	83.103	525	66.0	0.4	0.013	88.210	88.150	1.24	0.27	0.21	0.8	-0.145	12.15	83.740	83.578	Fut. Est. (4)	86.11	2.370			
2017	2018	81.850	81.757	1500	66.5	0.1	0.013	88.150	88.070	1.50	2.64	2.97	1.1	0.228	12.11	83.578	83.478	Fut. Est. (4)	86.05	2.472			
2018	2019	81.737	81.651	1500	66.0	0.1	0.013	88.070	88.010	1.44	2.55	3.00	1.2	0.241	12.11	83.478	83.344	Fut. Est. (4)	85.97	2.492			
2019	2020	81.621	81.609	1500	9.5	0.1	0.013	88.010	88.000	1.44	2.55	3.01	1.2	0.223	12.11	83.344	83.293	Fut. Est. (4)	85.91	2.566			
2020	2024	81.459	81.293	1650	118.5	0.1	0.013	88.000	87.880	1.59	3.41	3.09	0.9	0.184	12.12	83.293	83.090	Fut. Est. (4)	85.90	2.607			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S (1) (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
2021	2022	83.906	83.115	375	96.5	0.8	0.013	88.050	87.960	1.44	0.16	0.12	0.8	-0.126	12.09	84.155	83.382	Fut. Est. (4)	85.95	1.795			
2022	2023	83.085	82.942	375	13.5	1.1	0.013	87.960	87.950	1.63	0.18	0.15	0.8	-0.078	12.10	83.382	83.214	Fut. Est. (4)	85.86	2.478			
2023	2024	82.792	82.647	525	63.0	0.2	0.013	87.950	87.880	0.95	0.21	0.20	1.0	-0.103	12.18	83.214	83.090	Fut. Est. (4)	85.85	2.636			
2024	2025	81.233	81.126	1650	71.0	0.2	0.013	87.880	87.820	1.65	3.53	3.27	0.9	0.207	12.13	83.090	83.009	Fut. Est. (4)	85.78	2.690			
2025	2026	81.066	81.021	1650	32.0	0.1	0.013	87.820	87.790	1.59	3.41	3.26	1.0	0.293	12.13	83.009	83.008	Fut. Est. (4)	85.72	2.711			
2026	2119	80.991	80.843	1650	92.5	0.2	0.013	87.790	87.700	1.71	3.65	3.39	0.9	0.367	12.13	83.008	83.004	Fut. Est. (4)	85.69	2.682			
2027	2119	83.283	83.141	300	40.5	0.4	0.013	87.740	87.700	0.81	0.06	0.05	0.8	-0.072	12.09	83.511	83.304	Fut. Est. (4)	85.64	2.129			
2028	2029	84.108	83.916	300	31.0	0.6	0.013	87.960	87.930	1.08	0.08	0.03	0.3	-0.177	12.09	84.231	84.035	Fut. Est. (4)	85.86	1.629			
2029	2030	83.741	83.674	300	14.0	0.5	0.013	87.930	87.920	0.95	0.07	0.06	0.9	-0.064	12.09	83.977	83.868	Fut. Est. (4)	85.83	1.853			
2030	2031	83.341	83.225	525	68.5	0.2	0.013	87.920	87.850	0.82	0.18	0.16	0.9	-0.156	12.10	83.710	83.554	Fut. Est. (4)	85.82	2.110			
2031	2118	83.150	83.054	600	68.5	0.1	0.013	87.850	87.780	0.81	0.23	0.20	0.9	-0.196	12.11	83.554	83.416	Fut. Est. (4)	85.75	2.196			
2032	2084	85.584	84.062	300	99.5	1.5	0.013	88.380	88.280	1.69	0.12	0.00	0.0	-0.300	0.00	85.584	84.094	Fut. Est. (4)	86.28	0.696			
2033	2034	85.693	84.897	450	92.5	0.9	0.013	89.380	89.470	1.66	0.26	0.20	0.8	-0.155	12.02	85.988	85.205	Fut. Est. (4)	87.28	1.292			
2034	2035	84.597	84.469	750	98.5	0.1	0.013	89.470	89.440	0.91	0.40	0.37	0.9	-0.142	12.02	85.205	85.099	Fut. Est. (4)	87.37	2.165			
2035	2036	84.389	84.253	825	113.5	0.1	0.013	89.440	89.130	0.93	0.50	0.50	1.0	-0.115	12.04	85.099	84.979	Fut. Est. (4)	87.34	2.241			
2036	2037	84.178	84.001	900	118.0	0.2	0.013	89.130	88.810	1.10	0.70	0.70	1.0	-0.099	12.05	84.979	84.752	Fut. Est. (4)	87.03	2.051			
2037	2038	83.853	83.710	900	84.0	0.2	0.013	88.810	88.520	1.17	0.75	0.81	1.1	-0.001	12.04	84.752	84.594	Fut. Est. (4)	86.71	1.958			
2038	2039	83.690	83.603	900	48.5	0.2	0.013	88.520	88.440	1.21	0.77	0.85	1.1	0.004	12.05	84.594	84.493	Fut. Est. (4)	86.42	1.826			
2039	2040	83.528	83.410	975	84.5	0.1	0.013	88.440	88.360	1.12	0.84	0.96	1.1	-0.010	12.05	84.493	84.353	Fut. Est. (4)	86.34	1.847			
2040	2084	83.390	83.267	975	82.0	0.2	0.013	88.360	88.280	1.16	0.87	1.03	1.2	-0.012	12.06	84.353	84.094	Fut. Est. (4)	86.26	1.907			
2041	2042	87.020	86.828	525	29.5	0.7	0.013	91.140	91.030	1.60	0.35	0.26	0.7	-0.188	12.09	87.357	87.163	Fut. Est. (4)	89.34	1.983			
2042	2043	86.440	86.201	750	95.5	0.3	0.013	91.030	90.700	1.26	0.56	0.48	0.9	-0.164	12.10	87.026	86.848	Fut. Est. (4)	89.23	2.204			
2043	2044	86.121	85.769	825	110.0	0.3	0.013	90.700	90.320	1.52	0.81	0.72	0.9	-0.098	12.10	86.848	86.468	Fut. Est. (4)	88.90	2.052			
2044	2046	85.694	85.486	900	33.5	0.6	0.013	90.320	90.250	2.24	1.43	1.49	1.0	-0.126	12.00	86.468	86.317	Fut. Est. (4)	88.52	2.052			
2045	2046	86.727	86.126	525	92.5	0.7	0.013	90.830	90.250	1.60	0.35	0.30	0.9	-0.095	12.09	87.157	86.495	Fut. Est. (4)	89.03	1.873			
2046	2047	85.186	84.938	1200	103.5	0.2	0.013	90.250	90.090	1.69	1.91	1.96	1.0	-0.069	11.99	86.317	86.150	Fut. Est. (4)	88.45	2.133			
2047	2048	84.638	84.521	1500	117.0	0.1	0.013	90.090	89.920	1.26	2.24	2.27	1.0	0.012	12.00	86.150	86.060	Fut. Est. (4)	88.29	2.140			
2048	2049	84.491	84.356	1500	112.5	0.1	0.013	89.920	89.730	1.39	2.45	2.61	1.1	0.069	12.00	86.060	85.936	Fut. Est. (4)	88.12	2.060			
2049	2057	84.323	84.212	1500	85.5	0.1	0.013	89.730	89.570	1.44	2.55	2.84	1.1	0.113	12.00	85.936	85.818	Fut. Est. (4)	87.93	1.994			
2050	2051	86.849	86.095	675	116.0	0.7	0.013	90.890	90.770	1.89	0.68	0.38	0.6	-0.292	12.09	87.232	86.774	Fut. Est. (4)	89.09	1.858			
2051	2052	85.839	85.575	825	120.0	0.2	0.013	90.770	90.650	1.26	0.67	0.64	1.0	0.110	12.19	86.774	86.559	Fut. Est. (4)	88.97	2.196			
2052	2053	85.545	85.522	825	10.5	0.2	0.013	90.650	90.610	1.26	0.67	0.71	1.1	0.189	12.26	86.559	86.529	Fut. Est. (4)	88.85	2.291			
2053	2054	85.447	85.254	900	87.5	0.2	0.013	90.610	90.250	1.33	0.85	0.89	1.0	0.182	12.26	86.529	86.351	Fut. Est. (4)	88.81	2.281			
2054	2055	85.224	84.996	900	87.5	0.3	0.013	90.250	89.900	1.45	0.92	1.03	1.1	0.227	12.20	86.351	86.104	Fut. Est. (4)	88.45	2.099			
2055	2056	84.966	84.938	900	10.5	0.3	0.013	89.900	89.870	1.48	0.94	1.11	1.2	0.238	12.19	86.104	86.058	Fut. Est. (4)	88.10	1.996			
2056	2057	84.863	84.722	975	67.0	0.2	0.013	89.870	89.570	1.38	1.03	1.24	1.2	0.220	12.19	86.058	85.818	Fut. Est. (4)	88.07	2.012			
2057	2060	83.893	83.775	1800	90.5	0.1	0.013	89.570	89.370	1.63	4.14	4.01	1.0	0.125	12.19	85.818	85.608	Fut. Est. (4)	87.77	1.952			
2058	2059	88.954	88.188	1200	116.0	0.7	0.013	92.650	91.890	2.80	3.17	2.27	0.7	-0.444	12.02	89.710	88.939	Fut. Est. (4)	90.55	0.840			
2059	2060	85.142	84.567	1200	88.5	0.7	0.013	91.890	89.370	2.78	3.14	2.37	0.8	-0.368	12.02	85.974	85.608	Fut. Est. (4)	89.79	3.816			
2060	2061	83.620	83.433	1800	81.5	0.2	0.013	89.370	89.260	2.17	5.51	6.21	1.1	0.188	12.08	85.608	85.385	Fut. Est. (4)	87.27	1.662			
2061	2062	83.413	83.239	1800	79.0	0.2	0.013	89.260	89.150	2.12	5.39	6.25	1.2	0.172	12.09	85.385	85.162	Fut. Est. (4)	87.16	1.775			
2062	2063	83.219	83.112	1800	51.0	0.2	0.013	89.150	89.070	2.07	5.27	6.27	1.2	0.143	12.09	85.162	85.013	Fut. Est. (4)	87.05	1.888			
2063	2064	82.962	82.852	1950	78.5	0.1	0.013	89.070	88.950	1.78	5.32	6.30	1.2	0.101	12.09	85.013	84.851	Fut. Est. (4)	86.97	1.957			
2064	2203	82.702	82.652	2100	50.0	0.1	0.013	88.950	88.960	1.58	5.48	6.29	1.1	0.049	12.11	84.851	84.639	Fut. Est. (4)	86.85	1.999			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [(1)] (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
2065	2066	84.488	84.295	450	96.5	0.2	0.013	88.930	88.780	0.80	0.13	0.09	0.7	-0.134	12.01	84.804	84.714	Fut. Est. (4)	86.83	2.026			
2066	2072	84.145	84.011	600	96.0	0.1	0.013	88.780	88.620	0.81	0.23	0.22	1.0	-0.031	12.01	84.714	84.635	Fut. Est. (4)	86.68	1.966			
2067	2071	84.525	84.345	600	120.0	0.2	0.013	88.920	88.700	0.84	0.24	0.18	0.8	-0.127	12.21	84.998	84.857	Fut. Est. (4)	86.82	1.822			
2068	2070	85.106	84.911	300	30.0	0.7	0.013	88.880	88.760	1.10	0.08	0.04	0.5	-0.152	12.09	85.254	85.058	Fut. Est. (4)	86.78	1.526			
2069	2070	84.820	84.544	525	120.0	0.2	0.013	89.000	88.760	0.95	0.21	0.18	0.9	-0.113	12.10	85.232	84.935	Fut. Est. (4)	86.90	1.668			
2070	2071	84.422	84.325	600	51.0	0.2	0.013	88.760	88.700	0.95	0.27	0.26	1.0	-0.087	12.21	84.935	84.857	Fut. Est. (4)	86.66	1.725			
2071	2072	84.039	83.872	750	88.0	0.2	0.013	88.700	88.620	1.10	0.49	0.52	1.1	0.068	12.24	84.857	84.635	Fut. Est. (4)	86.60	1.743			
2072	2075	83.786	83.588	825	79.0	0.3	0.013	88.620	88.510	1.34	0.72	0.72	1.0	0.024	12.02	84.635	84.472	Fut. Est. (4)	86.52	1.885			
2073	2074	85.057	84.654	375	62.0	0.7	0.013	88.680	88.610	1.28	0.14	0.09	0.7	-0.154	12.10	85.278	84.874	Fut. Est. (4)	86.58	1.302			
2074	2075	84.097	83.944	600	109.0	0.1	0.013	88.610	88.510	0.81	0.23	0.21	0.9	-0.076	12.20	84.621	84.472	Fut. Est. (4)	86.51	1.889			
2075	2083	83.438	83.293	975	85.0	0.2	0.013	88.510	88.410	1.24	0.92	0.97	1.0	0.059	12.21	84.472	84.344	Fut. Est. (4)	86.41	1.938			
2076	2077	85.002	84.762	600	120.0	0.2	0.013	89.190	89.060	0.97	0.27	0.21	0.8	-0.157	12.09	85.445	85.284	Fut. Est. (4)	87.09	1.645			
2077	2078	84.742	84.513	600	79.0	0.3	0.013	89.060	88.680	1.17	0.33	0.32	1.0	-0.058	12.23	85.284	85.106	Fut. Est. (4)	86.96	1.676			
2078	2079	84.438	84.272	675	75.5	0.2	0.013	88.680	88.590	1.10	0.39	0.41	1.0	-0.007	12.23	85.106	84.937	Fut. Est. (4)	86.58	1.474			
2079	2080	84.242	84.210	675	13.5	0.2	0.013	88.590	88.580	1.15	0.41	0.44	1.1	0.020	12.23	84.937	84.878	Fut. Est. (4)	86.49	1.553			
2080	2081	84.180	84.079	675	39.0	0.3	0.013	88.580	88.540	1.20	0.43	0.47	1.1	0.023	12.25	84.878	84.777	Fut. Est. (4)	86.48	1.602			
2081	2082	83.928	83.732	750	85.0	0.2	0.013	88.540	88.490	1.21	0.53	0.59	1.1	0.099	12.25	84.777	84.588	Fut. Est. (4)	86.44	1.663			
2082	2083	83.657	83.512	825	85.0	0.2	0.013	88.490	88.410	1.11	0.59	0.68	1.1	0.106	12.25	84.588	84.344	Fut. Est. (4)	86.39	1.802			
2083	2084	83.218	82.990	1050	81.5	0.3	0.013	88.410	88.280	1.67	1.44	1.69	1.2	0.076	12.21	84.344	84.094	Fut. Est. (4)	86.31	1.966			
2084	2085	82.690	82.478	1350	118.0	0.2	0.013	88.280	88.110	1.58	2.26	2.80	1.2	0.054	12.18	84.094	83.801	Fut. Est. (4)	86.18	2.086			
2085	2116	82.178	82.058	1650	119.5	0.1	0.013	88.110	87.930	1.35	2.88	3.01	1.0	-0.027	12.20	83.801	83.605	Fut. Est. (4)	86.01	2.209			
2086	2087	85.028	84.428	375	75.0	0.8	0.013	89.140	88.700	1.42	0.16	0.09	0.6	-0.167	12.09	85.236	84.704	Fut. Est. (4)	87.04	1.804			
2087	2088	84.203	84.047	600	74.5	0.2	0.013	88.700	88.460	1.00	0.28	0.26	0.9	-0.099	12.09	84.704	84.578	Fut. Est. (4)	86.60	1.896			
2088	2089	83.970	83.828	675	74.5	0.2	0.013	88.460	88.220	1.02	0.37	0.35	1.0	-0.067	12.09	84.578	84.375	Fut. Est. (4)	86.36	1.782			
2089	2114	83.754	83.572	675	79.0	0.2	0.013	88.220	88.150	1.13	0.40	0.41	1.0	-0.054	12.10	84.375	83.979	Fut. Est. (4)	86.12	1.745			
2090	2091	84.276	83.844	1350	66.5	0.7	0.013	89.210	88.840	3.01	4.30	2.32	0.5	-0.422	12.01	85.204	84.611	Fut. Est. (4)	87.11	1.906			
2091	2092	83.740	83.404	1350	68.5	0.5	0.013	88.840	88.910	2.61	3.74	2.41	0.6	-0.479	12.02	84.611	84.422	Fut. Est. (4)	86.74	2.129			
2092	2096	83.254	83.055	1500	68.5	0.3	0.013	88.910	88.880	2.15	3.81	2.50	0.7	-0.332	12.13	84.422	84.348	Fut. Est. (4)	86.81	2.388			
2093	2094	85.433	84.664	450	116.5	0.7	0.013	89.290	89.070	1.46	0.23	0.16	0.7	-0.172	12.10	85.711	85.001	Fut. Est. (4)	87.19	1.479			
2094	2095	84.634	84.560	450	14.0	0.5	0.013	89.070	89.040	1.31	0.21	0.19	0.9	-0.083	12.11	85.001	84.868	Fut. Est. (4)	86.97	1.969			
2095	2096	84.410	84.238	600	71.5	0.2	0.013	89.040	88.880	1.06	0.30	0.24	0.8	-0.144	12.12	84.866	84.555	Fut. Est. (4)	86.94	2.074			
2096	2100	83.035	82.808	1500	75.5	0.3	0.013	88.880	88.800	2.19	3.87	2.86	0.7	-0.187	12.13	84.348	84.085	Fut. Est. (4)	86.78	2.432			
2097	2099	84.177	83.536	1050	60.5	1.1	0.013	89.430	89.060	3.25	2.81	2.94	1.0	-0.128	12.01	85.099	84.450	Fut. Est. (4)	87.33	2.231			
2098	2099	85.001	84.533	300	72.0	0.7	0.013	89.280	89.060	1.10	0.08	0.06	0.8	-0.076	12.10	85.225	84.725	Fut. Est. (4)	87.18	1.955			
2099	2100	83.236	83.003	1350	75.0	0.3	0.013	89.060	88.800	2.08	2.97	3.11	1.0	-0.242	12.02	84.344	84.085	Fut. Est. (4)	86.96	2.616			
2100	2101	82.403	82.227	1950	80.0	0.2	0.013	88.800	88.470	2.23	6.67	5.89	0.9	-0.268	12.04	84.085	83.968	Fut. Est. (4)	86.70	2.615			
2101	2114	82.207	82.044	1950	74.0	0.2	0.013	88.470	88.150	2.23	6.67	5.92	0.9	-0.189	12.09	83.968	83.863	Fut. Est. (4)	86.37	2.402			
2102	2103	85.073	84.693	300	58.5	0.7	0.013	88.700	88.400	1.10	0.08	0.05	0.6	-0.128	12.10	85.245	84.863	Fut. Est. (4)	86.60	1.355			
2103	2104	84.407	84.209	525	79.0	0.3	0.013	88.400	88.320	0.99	0.22	0.16	0.7	-0.174	12.11	84.758	84.562	Fut. Est. (4)	86.30	1.542			
2104	2105	84.178	84.095	525	9.5	0.9	0.013	88.320	88.300	1.85	0.40	0.20	0.5	-0.141	12.12	84.562	84.524	Fut. Est. (4)	86.22	1.658			
2105	2113	84.020	83.902	600	53.5	0.2	0.013	88.300	88.250	1.02	0.29	0.27	0.9	-0.096	12.12	84.524	84.297	Fut. Est. (4)	86.20	1.676			
2106	2107	84.967	84.580	300	59.5	0.7	0.013	88.460	88.400	1.10	0.08	0.04	0.5	-0.156	12.09	85.111	84.762	Fut. Est. (4)	86.36	1.249			
2107	2112	84.444	84.229	375	82.5	0.3	0.013	88.400	88.310	0.81	0.09	0.08	0.9	-0.057	12.12	84.762	84.579	Fut. Est. (4)	86.30	1.538			
2108	2109	85.129	84.745	300	59.0	0.7	0.013	88.980	88.780	1.10	0.08	0.05	0.6	-0.126	12.10	85.303	84.917	Fut. Est. (4)	86.88	1.577			

Table G-1B: Pipe Data and Hydraulic Simulation Results for the 100-Year, 24-Hour SCS Type II Storm (Ultimate Conditions)

U/S MH	D/S MH	U/S Invert (m)	D/S Invert (m)	Pipe Dia. / Height (mm)	Pipe Length (m)	Pipe Slope (%)	n	U/S MH Cover Elev. (m)	D/S MH Cover Elev. (m)	Design Vel. (m/s)	Design Flow (m^3/s)	Peak Pipe Flow (m^3/s)	Peak / Design Flow	Surcharge U/S [(1)] (m)	Time to Peak (h)	Max. U/S HGL (m)	Max. D/S HGL (m)	Lot Number	USF (m)	Freeboard (m)	Interpolated HGL: Length HGL (m)	Interpolated HGL: Dist. From D/S MH (m)	Interpolated HGL: HGL (m)
2109	2110	84.534	84.336	450	79.0	0.3	0.013	88.780	88.490	0.90	0.14	0.13	0.9	-0.098	12.10	84.886	84.693	Fut. Est. (4)	86.68	1.794			
2110	2111	84.306	84.243	450	9.5	0.7	0.013	88.490	88.450	1.46	0.23	0.17	0.7	-0.063	12.11	84.693	84.640	Fut. Est. (4)	86.39	1.697			
2111	2112	84.167	84.078	525	35.5	0.3	0.013	88.450	88.310	0.99	0.22	0.19	0.9	-0.052	12.12	84.640	84.579	Fut. Est. (4)	86.35	1.710			
2112	2113	84.033	83.933	525	24.5	0.4	0.013	88.310	88.250	1.27	0.28	0.28	1.0	0.021	12.13	84.579	84.297	Fut. Est. (4)	86.21	1.631			
2113	2114	83.613	83.487	825	79.0	0.2	0.013	88.250	88.150	1.07	0.57	0.57	1.0	-0.141	12.14	84.297	83.938	Fut. Est. (4)	86.15	1.853			
2114	2115	82.024	81.820	1950	73.0	0.3	0.013	88.150	88.010	2.52	7.53	6.96	0.9	-0.111	12.09	83.863	83.714	Fut. Est. (4)	86.05	2.187			
2115	2116	81.670	81.533	2100	72.0	0.2	0.013	88.010	87.930	2.18	7.56	7.01	0.9	-0.056	12.09	83.714	83.605	Fut. Est. (4)	85.91	2.196			
2116	2117	81.383	81.270	2250	75.0	0.2	0.013	87.930	87.860	2.03	8.07	9.79	1.2	-0.028	12.11	83.605	83.439	Fut. Est. (4)	85.83	2.225			
2117	2122	81.120	81.028	2400	84.0	0.1	0.013	87.860	87.730	1.81	8.21	9.79	1.2	-0.081	12.11	83.439	83.317	Fut. Est. (4)	85.76	2.321			
2118	2137	82.797	82.689	750	98.0	0.1	0.013	87.780	88.700	0.84	0.37	0.37	1.0	-0.131	12.12	83.416	83.307	Fut. Est. (4)	85.68	2.264			
2119	2120	80.783	80.736	1650	47.0	0.1	0.013	87.700	87.650	1.35	2.88	3.46	1.2	0.571	12.14	83.004	83.002	Fut. Est. (4)	85.60	2.596			
2120	2121	80.716	80.631	1650	84.5	0.1	0.013	87.650	87.560	1.35	2.88	3.50	1.2	0.636	12.14	83.002	82.998	Fut. Est. (4)	85.55	2.548			
2121	2142	80.571	80.495	1650	76.0	0.1	0.013	87.560	87.330	1.35	2.88	3.64	1.3	0.777	12.15	82.998	82.995	Fut. Est. (4)	85.46	2.462			
2122	2136	80.878	80.794	2550	84.0	0.1	0.013	87.730	87.610	1.80	9.20	9.96	1.1	-0.111	12.12	83.317	83.086	Fut. Est. (4)	85.63	2.313			
2135	2136	81.066	81.031	2700	35.0	0.1	0.013	87.560	87.610	1.87	10.72	8.60	0.8	-0.476	12.11	83.290	83.086	Fut. Est. (4)	85.46	2.170			
2136	2138	80.644	80.508	2700	90.5	0.2	0.013	87.610	88.100	2.29	13.13	18.62	1.4	-0.258	12.12	83.086	83.000	Fut. Est. (4)	85.51	2.424			
2137	2138	82.669	82.522	750	98.0	0.2	0.013	88.700	88.100	0.98	0.43	0.48	1.1	-0.112	12.15	83.307	83.000	Fut. Est. (4)	86.60	3.293			
2138	2139	80.488	80.365	2700	77.0	0.2	0.013	88.100	88.000	2.37	13.56	19.16	1.4	-0.188	12.13	83.000	82.996	Fut. Est. (4)	86.00	3.000			
2139	2140	80.269	80.193	2700	50.5	0.2	0.013	88.000	88.250	2.29	13.13	19.23	1.5	0.027	12.13	82.996	82.994	Fut. Est. (4)	85.90	2.904			
2140	PondN	80.163	80.134	2700	19.5	0.2	0.013	88.250	83.500	2.29	13.13	19.25	1.5	0.131	12.13	82.994	82.994	Fut. Est. (4)	86.15	3.156			
2141	2142	84.466	83.839	300	95.0	0.7	0.013	88.370	87.330	1.11	0.08	0.06	0.7	-0.094	12.11	84.672	84.025	Fut. Est. (4)	86.27	1.598			
2142	2143	80.227	80.200	1800	26.7	0.1	0.013	87.330	86.880	1.43	3.63	3.67	1.0	0.968	12.15	82.995	82.994	Fut. Est. (4)	85.23	2.235			
2143	PondN	80.150	80.137	1800	10.6	0.1	0.013	86.880	83.500	1.43	3.63	3.66	1.0	1.044	12.15	82.994	82.994	Fut. Est. (4)	84.78	1.786			
2203	2204	82.592	82.502	2100	81.5	0.1	0.013	88.960	88.970	1.66	5.75	6.73	1.2	-0.053	12.12	84.639	84.521	Fut. Est. (4)	86.86	2.221			
2204	2205	82.482	82.360	2100	111.0	0.1	0.013	88.970	88.590	1.66	5.75	6.92	1.2	-0.061	12.12	84.521	84.354	Fut. Est. (4)	86.87	2.349			
2205	2206	82.340	82.259	2100	74.0	0.1	0.013	88.590	88.340	1.66	5.75	7.10	1.2	-0.086	12.12	84.354	84.239	Fut. Est. (4)	86.49	2.136			
2206	2207	82.239	82.157	2100	74.5	0.1	0.013	88.340	88.090	1.66	5.75	7.30	1.3	-0.100	12.12	84.239	84.115	Fut. Est. (4)	86.24	2.001			
2207	2208	82.137	82.023	2100	103.5	0.1	0.013	88.090	87.740	1.66	5.75	7.63	1.3	-0.122	12.10	84.115	83.928	Fut. Est. (4)	85.99	1.875			
2208	2209	82.003	81.994	2100	8.0	0.1	0.013	87.740	87.710	1.66	5.75	7.71	1.3	-0.175	12.10	83.928	83.907	Fut. Est. (4)	85.64	1.712			
2209	2210	81.974	81.842	2100	120.0	0.1	0.013	87.710	87.640	1.66	5.75	7.71	1.3	-0.167	12.11	83.907	83.680	Fut. Est. (4)	85.61	1.703			
2210	2211	81.692	81.573	2250	119.0	0.1	0.013	87.640	87.570	1.66	6.59	7.72	1.2	-0.262	12.12	83.680	83.521	Fut. Est. (4)	85.54	1.860			
2211	2135	81.273	81.236	2550	36.5	0.1	0.013	87.570	87.560	1.80	9.20	8.57	0.9	-0.302	12.11	83.521	83.290	Fut. Est. (4)	85.47	1.949			
2501	2118	83.368	83.172	375	75.5	0.3	0.013	87.890	87.780	0.81	0.09	0.08	0.9	-0.074	12.10	83.669	83.416	Fut. Est. (4)	85.79	2.121			

Note: (1) A negative surcharge implies that the pipe is not flowing full

(2) Conservative estimate of freeboard based on U/S HGL and lowest USF connected to pipe. Actual HGL / freeboard at all connecting lots interpolated where conservative estimate does not meet freeboard requirements.

(3) Minimum USF elevation as per June 2010 "Trails Edge Phase 1 SWM Report" by IBI Group.

(4) Future USF elevation estimated as 2.1 m below upstream top of manhole elevation or 1.8 m in employment lands (MH 2041 to MH 2057 and MH 2057 to MH 2060).

83.965 Interpolated HGL elevation

STORM SEWER COMPUTATION FORM

DESIGNED BY: AGS
CHECKED BY: AGS

PROJECT: **298 Axis Way**
CLIENT: MINTO COMMUNITIES INC.
PROJECT #: 240801
BY: ATREL ENGINEERING LTD
DATE: NOVEMBER 12 2025

STORM FREQUENCY : 5 YEAR
RATIONAL METHOD Q= 2.78 AIR
PVC/CONC N= 0.013
CSP N= 0.024
CORR N= 0.021

Table 1

LOCATION					AREA (ha.) RUNOFF COEFFICIENT						RATIONAL METHOD		5 YEAR		ACTUAL			SEWER DATA						UpStream		DwStream	
STREET NAMES		FROM (Up)		TO (Down)	0.50	0.60	0.65	0.70	0.75	0.80	INDIV. 2.78AR	ACCUM. 2.78AR	TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)	PIPE FLOW (L/S)	DIA. (N0M) (mm)	(ACT)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)
Street No. 3	MH	601	MH	611	0.04		0.11			0.22	0.74	0.74	10.00	104.19	77.48	375	366.4	0.45	77.5	110.58	30%	1.05	1.23	85.77	85.40	85.42	85.05
Street No. 3	MH	611	MH	613					0.21		0.44	1.18	11.23	98.11	115.92	450	457.2	0.30	37.5	162.91	29%	0.99	0.63	85.42	84.97	85.31	84.86
Street No. 1	MH	612	MH	613				0.12			0.23	0.23	10.00	104.19	24.33	300	299.2	0.34	28.5	55.99	57%	0.80	0.60	85.71	85.41	85.61	85.31
Street No. 1	MH	613	MH	623						0.22	0.49	1.90	11.86	95.29	181.46	525	533.4	0.30	55.0	245.74	26%	1.10	0.83	85.31	84.79	85.14	84.62
Street No. 2	MH	616	MH	618			0.06			0.10	0.33	0.33	10.00	104.19	34.47	300	299.2	0.36	25.0	57.61	40%	0.82	0.51	85.73	85.43	85.64	85.34
Street No. 4	MH	617	MH	618						0.17	0.38	0.38	10.00	104.19	39.39	300	299.2	0.34	46.5	55.99	30%	0.80	0.97	85.80	85.50	85.64	85.34
Street No. 2	MH	618	MH	619				0.17			0.33	1.04	10.97	99.32	103.26	450	457.2	0.25	51.0	148.72	31%	0.91	0.94	85.64	85.19	85.51	85.06
Street No. 2	MH	619	MH	623								1.04	11.91	95.07	98.85	450	457.2	0.25	17.0	148.72	34%	0.91	0.31	85.48	85.03	85.44	84.99
Street No. 1	MH	623	MH	627				0.12		0.06	0.37	3.31	12.70	91.83	304.05	675	685.8	0.25	43.5	438.47	31%	1.19	0.61	85.14	84.47	85.03	84.36
Street No. 2	MH	625	MH	626					0.30		0.63	0.63	10.00	104.19	65.17	375	366.4	0.26	73.0	84.05	22%	0.80	1.53	85.49	85.12	85.30	84.93
Street No. 2	MH	626	MH	627								0.63	11.53	96.77	60.53	375	366.4	0.26	17.0	84.05	28%	0.80	0.36	85.27	84.90	85.23	84.86
Street No. 1	MH	627	MH	628				0.13			0.25	4.19	13.31	89.46	374.79	750	762.0	0.25	35.0	580.71	35%	1.27	0.46	85.03	84.28	84.94	84.19
Street No. 1	MH	628	MH	2				0.22			0.43	4.62	13.76	87.78	405.33	825	838.2	0.20	80.5	669.70	39%	1.21	1.11	84.94	84.12	84.78	83.96
Street No. 1	MH	2	MH	41	0.08	0.15					0.36	4.98	14.87	83.98	418.13	1050	1066.8	0.25	43.0	1424.40	71%	1.59	0.45	84.78	83.73	84.67	83.62

Proposed Storm Sewers
Existing Storm Sewers

STORM SEWER COMPUTATION FORM

DESIGNED BY: AGS
CHECKED BY: AGS

PROJECT: **298 Axis Way**
CLIENT: MINTO COMMUNITIES INC.
PROJECT #: 240801
BY: ATREL ENGINEERING LTD
DATE: NOVEMBER 12 2025

RESTRICTED FLOW

PVC/CONC N= 0.013
CSP N= 0.024
CORR N= 0.021

Table 2

LOCATION					AREA (ha.) RUNOFF COEFFICIENT									**ACTUAL**	PIPE			SEWER DATA						UpStream		DwStream		**UpStream**		Down	UpStream	
STREET NAMES	FROM (Up)		TO (Down)		0.50	0.60	0.65	0.70	0.75	0.80	0.70	0.76	Restricted Flow (L/S)	**PIPE FLOW (L/S)**	TYPE	DIA. (N0M) (mm)	(ACT)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)	**Hgl at UP-MH (M)**	Hgl Out UP-MH (M)	MH Hgl (M)	USF ELEV (M)	HGL FREEBOARD (M)
Street No. 3	MH	601	MH	611	0.04		0.11			0.22			105.00	105.00	PVC	375	366.4	0.45	77.5	110.58	5%	1.05	1.23	85.77	85.40	85.42	85.05	85.82	85.82	85.51	86.71	0.89
Street No. 3	MH	611	MH	613					0.21				38.00	143.00	CONC	450	457.2	0.30	37.5	162.91	12%	0.99	0.63	85.42	84.97	85.31	84.86	85.51	85.49	85.40	86.71	1.22
Street No. 1	MH	612	MH	613				0.12					38.00	38.00	PVC	300	299.2	0.34	28.5	55.99	32%	0.80	0.60	85.71	85.41	85.61	85.31	85.71	85.71	85.61	86.34	0.63
Street No. 1	MH	613	MH	623						0.22			38.00	219.00	CONC	525	533.4	0.30	55.0	245.74	11%	1.10	0.83	85.31	84.79	85.14	84.62	85.40	85.34	85.21	86.24	0.90
Street No. 2	MH	616	MH	618			0.06			0.10			57.00	57.00	PVC	300	299.2	0.36	25.0	57.61	1%	0.82	0.51	85.73	85.43	85.64	85.34	85.77	85.77	85.68	86.27	0.50
Street No. 4	MH	617	MH	618						0.17			38.00	38.00	PVC	300	299.2	0.34	46.5	55.99	32%	0.80	0.97	85.80	85.50	85.64	85.34	85.80	85.80	85.68	86.41	0.61
Street No. 2	MH	618	MH	619				0.17					38.00	133.00	CONC	450	457.2	0.25	51.0	148.72	11%	0.91	0.94	85.64	85.19	85.51	85.06	85.68	85.64	85.51	86.27	0.63
Street No. 2	MH	619	MH	623										133.00	CONC	450	457.2	0.25	17.0	148.72	11%	0.91	0.31	85.48	85.03	85.44	84.99	85.49	85.48	85.44	86.32	0.84
Street No. 1	MH	623	MH	627				0.12		0.06			57.00	409.00	CONC	675	685.8	0.25	43.5	438.47	7%	1.19	0.61	85.14	84.47	85.03	84.36	85.21	85.14	85.03	86.24	1.10
Street No. 2	MH	625	MH	626					0.30				56.80	56.80	PVC	375	366.4	0.26	73.0	84.05	32%	0.80	1.53	85.49	85.12	85.30	84.93	85.49	85.49	85.30	86.10	0.61
Street No. 2	MH	626	MH	627										56.80	PVC	375	366.4	0.26	17.0	84.05	32%	0.80	0.36	85.27	84.90	85.23	84.86	85.28	85.27	85.23	86.14	0.87
Street No. 1	MH	627	MH	628				0.13					38.00	503.80	CONC	750	762.0	0.25	35.0	580.71	13%	1.27	0.46	85.03	84.28	84.94	84.19	85.03	85.03	84.96	86.14	1.11
Street No. 1	MH	628	MH	2				0.22					56.80	560.60	CONC	825	838.2	0.20	80.5	669.70	16%	1.21	1.11	84.94	84.12	84.78	83.96	84.96	84.94	84.78	86.10	1.16
Street No. 1	MH	2	MH	41	0.08	0.15							59.70	620.30	CONC	1050	1066.8	0.25	43.0	1424.40	56%	1.59	0.45	84.78	83.73	84.67	83.62	84.78	84.78	84.538	86.10	1.32

Proposed Storm Sewers
Existing Storm Sewers
HGL TAKEN FROM JFSA'S REPORT AT MH 41 (84.538m)

LICENSED PROFESSIONAL ENGINEER
A. G. Y. SAUVE
100142393
Nov 12, 2025
PROVINCE OF ONTARIO

Table 3

INLET CONTROL DEVICE TABLE

Project Name : 298 Axis Way
Project number : 240801

Orifice Sizing formula: $r = \sqrt{\frac{Q}{c\pi\sqrt{2gh}}}$

Coefficient of Discharge	0.61
Gravity (9.81 m/s^2)	9.81 m/s^2

RR	Flow, Q (L/s)	Orifice Type	Head (m)	Orifice Size (m)	Orifice Area (m^2)
10	10.00	Vortex	1.65	Hydrovex - 100SVHV-2 wall mount type	
19	19.00	Round	1.65	Diameter of 0.083	0.0056
28.4	28.40	Round	1.65	Diameter of 0.102	0.0082

Figure 2

SVHV Vertical Vortex Flow Regulator

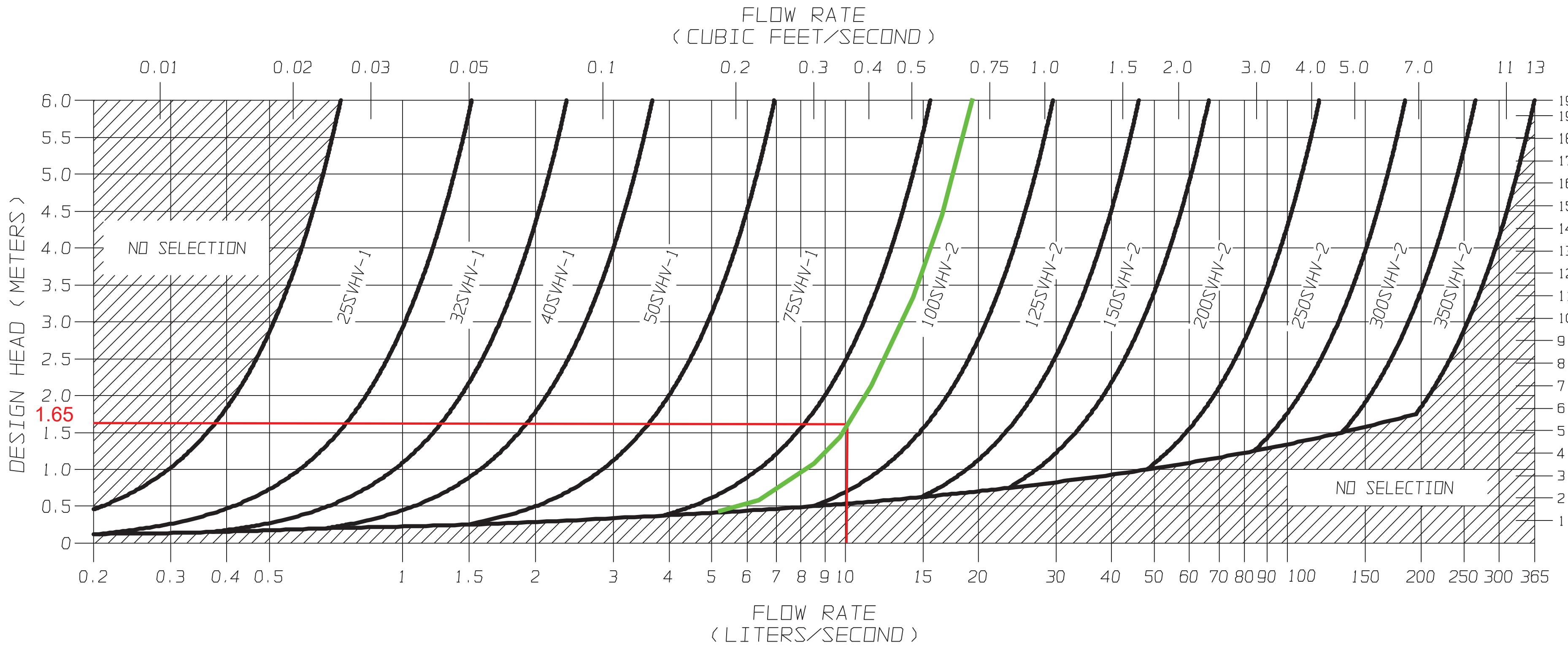


FIGURE 2 - SVHV

Table 4

TEMPORARY CONSTRUCTION ICD FOR STORM MH 2 SOUTH PIPE

ORIFICE SIZING FORMULA

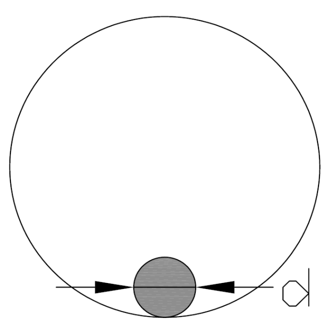
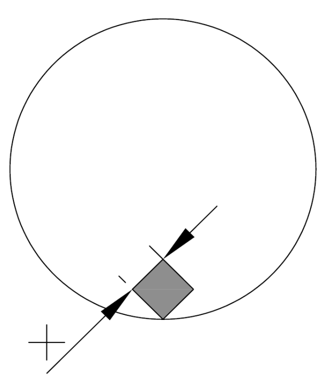
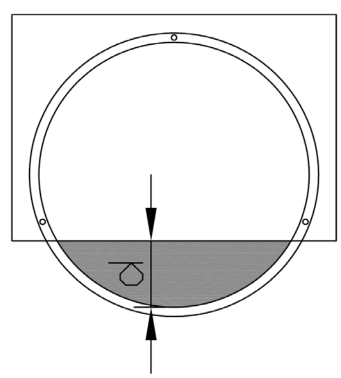
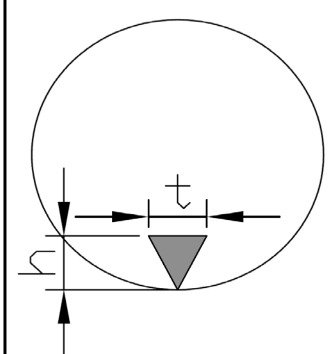
$$Q = CA\sqrt{2gh}$$

WHERE:

Q=	Discharge (m^3/s)	0.661	m^3/s
C=	Coefficient of Discharge	0.61	
A=	Area of Flow (m^2)	unknown	m^2
g=	Gravity (9.81 m/s^2)	9.81	m/s^2
h=	Head (m)	2.000	m
d=	pipe diameter	1.050	m

SOLVE FOR **r** (radius of pipe)

$$r = \sqrt{\frac{Q}{c\pi\sqrt{2gh}}}$$

Circle Orifice	**Diamond Orifice**	**Circle Segment**	**Triangular Orifice**
Radius = 0.235 m	One side = 0.4158 m	Radius = 0.525 m	Height= 264 mm
Diameter= 0.469 m	= 416 mm	θ-sinθ = 1.2544566	Top= 1310 mm
Diameter= 469 mm	Area= 0.17288 m^2		Area= 0.17288 m^2
Inches= 18.5		θ= 2.1114045 rad	
Area= 0.17288 m^2		depth = 266 mm	
		Area= 0.17282 m^2	
			

USE A CIRCLE SEGMENT WITH A BOTTOM OPENING OF 266mm

APPENDIX “B”

Table 5 - Sanitary Sewer Computation Form
Trails Edge West Sanitary Sewer Calculation Sheet (DSEL) dated January 2015
Trail Edge West Sanitary Drainage Area Plan (DSEL) dated January 26, 2015
Table 6 - Temporary Construction ICD at sanitary MH 2a

SANITARY SEWER COMPUTATION FORM (DESIGN)

DATE: **NOVEMBER 12, 2025**
DESIGNED BY: AGS
CHECKED BY: AGS

PROJECT: **298 AXIS WAY**
CLIENT: MINTO COMMUNITIES INC.
PROJECT #: 240801
BY: ATREL ENGINEERING LTD

Comm./Inst. Flow = 28000 l/s/ha
q= 280 l/cap.day
I= 0.33 l/ha.s
PVC/CONC N= 0.013

TABLE 5

	LOCATION				RESIDENTIAL						COMMERCIAL , INSTITUTIONAL						SPLASH PAD FLOW		PEAK	**PEAK**	SEWER DATA								Up Stream		Down Stream	
					INDIVIDUAL		CUMULATIVE		PEAKING	FLOW	INDIVIDUAL		CUMULATIVE		PEAKING	FLOW			EXT.FLOW	**DES.**	TYPE	Roug	DIA.	SLOPE	LENGTH	CAP.	Remaining	VEL.				
Area	FROM (Up)		TO (Down)		AREA (ha.)	POP.	AREA (ha.)	POP.	FACTOR M	Q(p) (L/S)	AREA (ha.)	POP.	AREA (ha.)	POP.	FACTOR M	Q(p) (L/S)	Ind. (L/S)	Cum. (L/S)	Q(i) (L/S)	**Q(d) (L/S)**	PIPE	Coef "n"	(N0M) (mm)	(%)	(M)	(L/S)	Capacity (%)	(M/S)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)
Street No. 3	MH	701	MH	709	0.21	32.4	0.21	32	4.00	0.42									0.07	0.49	PVC	0.013	200	0.65	54.0	26.86	98%	0.84	85.43	85.23	85.08	84.88
Block 5	MH	705	MH	706	0.05	21.6	0.05	22	4.00	0.28									0.02	0.30	PVC	0.013	200	0.65	29.5	26.86	99%	0.84	85.98	85.78	85.79	85.59
Block 5	MH	706	MH	708			0.05	22	4.00	0.28									0.02	0.30	PVC	0.013	200	0.32	27.0	18.93	98%	0.60	85.76	85.56	85.67	85.47
Block 2	MH	707	MH	708	0.09	32.4	0.09	32	4.00	0.42									0.03	0.45	PVC	0.013	200	0.65	55.5	26.86	98%	0.84	86.03	85.83	85.67	85.47
Street No. 5	MH	708	MH	709	0.09	10.8	0.23	65	4.00	0.84									0.08	0.92	PVC	0.013	200	0.32	36.0	18.93	95%	0.60	85.61	85.41	85.49	85.29
Street No. 3	MH	709	MH	711	0.05	5.4	0.49	103	4.00	1.33									0.16	1.49	PVC	0.013	200	0.32	24.0	18.93	92%	0.60	85.08	84.88	85.00	84.80
Block 3 & 4	MH	710	MH	711	0.13	43.2	0.13	43	4.00	0.56									0.04	0.60	PVC	0.013	200	0.65	44.5	26.86	98%	0.84	84.87	84.67	84.58	84.38
Street No. 3	MH	711	MH	713	0.10	16.2	0.72	162	4.00	2.10									0.24	2.34	PVC	0.013	200	0.32	37.5	18.93	88%	0.60	84.52	84.32	84.40	84.20
Street No. 1	MH	712	MH	713	0.13	21.6	0.13	22	4.00	0.28									0.04	0.32	PVC	0.013	200	0.65	28.5	26.86	99%	0.84	85.13	84.93	84.94	84.74
Street No. 1	MH	713	MH	723	0.21	48.6	1.06	232	4.00	3.01									0.35	3.36	PVC	0.013	200	0.32	58.5	18.93	82%	0.60	84.34	84.14	84.15	83.95
																							200									
Block 1	MH	715	MH	716	0.06	21.6	0.06	22	4.00	0.28									0.02	0.30	PVC	0.013	200	0.65	47.5	26.86	99%	0.84	85.69	85.49	85.38	85.18
Street No. 2	MH	716	MH	718	0.12	18.9	0.18	41	4.00	0.53									0.06	0.58	PVC	0.013	200	0.32	36.0	18.93	97%	0.60	85.32	85.12	85.20	85.00
Street No. 4	MH	717	MH	718	0.18	43.2	0.18	43	4.00	0.56									0.06	0.62	PVC	0.013	200	0.65	49.5	26.86	98%	0.84	85.28	85.08	84.96	84.76
Street No. 2	MH	718	MH	719	0.16	29.7	0.52	113	4.00	1.47									0.17	1.64	PVC	0.013	200	0.32	51.5	18.93	91%	0.60	84.90	84.70	84.73	84.53
Street No. 2	MH	719	MH	723	0.03		0.55	113	4.00	1.47									0.18	1.65	PVC	0.013	200	0.32	16.0	18.93	91%	0.60	84.54	84.34	84.49	84.29
Block 6 & 7	MH	720	MH	722	0.15	48.6	0.15	49	4.00	0.63									0.05	0.68	PVC	0.013	200	0.65	87.0	26.86	97%	0.84	85.58	85.38	85.01	84.81
Block 8	MH	721	MH	722	0.10	32.4	0.10	32	4.00	0.42									0.03	0.45	PVC	0.013	200	0.65	63.0	26.86	98%	0.84	85.42	85.22	85.01	84.81
Block 7 & 8	MH	722	MH	723	0.06		0.31	81	4.00	1.05									0.10	1.15	PVC	0.013	200	1.00	35.5	33.31	97%	1.05	84.41	84.21	84.05	83.85
Street No. 1	MH	723	MH	727	0.09	16.2	2.01	443	4.00	5.74									0.66	6.40	PVC	0.013	200	0.32	39.5	18.93	66%	0.60	83.89	83.69	83.76	83.56
Street No. 2	MH	725	MH	726	0.30	51.3	0.30	51	4.00	0.67									0.10	0.76	PVC	0.013	200	0.65	73.0	26.86	97%	0.84	85.45	85.25	84.98	84.78
Street No. 2	MH	726	MH	727	0.04	2.7	0.34	54	4.00	0.70									0.11	0.81	PVC	0.013	200	0.32	14.5	18.93	96%	0.60	84.41	84.21	84.36	84.16
Street No.1	MH	727	MH	728	0.10	16.2	2.45	513	3.97	6.60									0.81	7.41	PVC	0.013	200	0.35	34.5	19.71	62%	0.62	83.76	83.56	83.64	83.44
Street No.1	MH	728	MH	2	0.22	27.0	2.67	540	3.96	6.92									0.88	7.81	PVC	0.013	200	0.35	78.0	19.71	60%	0.62	83.58	83.38	83.31	83.11
Street No.1	MH	2	MH	37			2.67	540	3.96	6.92									0.88	7.81	PVC	0.013	200	0.32	42.5	18.93	59%	0.60	83.28	83.08	83.14	82.94
Compass Street	MH	20A	MH	204A	97.91	6225.0	97.91	6225	3.16	63.66	10.55		10.55		1.50	5.13	10.00	10.00	35.79	114.58	CONC	0.013	525	0.10	39.9	141.88	19%	0.63	80.51	79.99	80.47	79.95

BLOCK 140
EXISTING
Population, areas and splash pad flow are taken from DSEL's Trails Edge West Sanitary Sewer Calculation Sheet. The population was revised from 5691 to 6225 for the additonal 534 from Minto's and Richcraft's site plans.

LICENSED PROFESSIONAL ENGINEER
A. G. Y. SAUVE
100142393
Nov. 12, 2025
PROVINCE OF ONTARIO

SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION: STREET	LOCATION: FROM M.H.	LOCATION: TO M.H.	RESIDENTIAL: AREA (ha)	RESIDENTIAL: UNITS	RESIDENTIAL: POP.	CUMULATIVE: AREA (ha)	CUMULATIVE: POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM: AREA (ha)	COMM: ACCU. AREA (ha)	INDUST: AREA (ha)	INDUST: ACCU. AREA (ha)	INSTIT: AREA (ha)	INSTIT: ACCU. AREA (ha)	C+I+I: PEAK FLOW (l/s)	INFILTRATION: TOTAL AREA (ha)	INFILTRATION: ACCU. AREA (ha)	INFILTRATION: INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	PIPE: DIST (m)	PIPE: DIA (mm)	PIPE: SLOPE (%)	PIPE: CAP. (FULL) (l/s)	PIPE: RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Block 136 (Access)																											
Contribution From Block 135 (Fut. Mixed Use Centre)			3.84	102	184	3.84	184										3.84	3.84									
	Cont 2A	37A	0.06			3.90	184	4.00	2.98								0.06	3.90	1.092	4.07	42.5	200	0.40	20.74	0.20	0.66	0.51
To voie Axis Way , Pipe 37A - 38A						3.90	184																				
voie Axis Way																											
	360A	36A	0.34	10	27	0.34	27	4.00	0.44								0.34	0.34	0.095	0.54	62.5	200	0.70	27.44	0.02	0.87	0.34
Contribution From BLOCK 137 (SCHOOL), Pipe Cont. MH 4A - 36A														2.88	2.88	2.50	2.88	3.22	0.902	3.40	13.0	200	1.00	32.80	0.10	1.04	0.67
	36A	37A	0.50	14	38	0.84	65	4.00	1.05								0.50	3.72	1.042	2.09	106.0	200	0.40	20.74	0.10	0.66	0.42
Contribution From BLOCK 135 (ACCESS), Pipe 102A - 37A						3.90	184										3.90	7.62									
	37A	16A	0.50	13	36	5.24	285	4.00	4.62								0.50	8.12	2.274	6.89	112.5	200	0.40	20.74	0.33	0.66	0.59
To rue Compass Street , Pipe 16A - 160A						5.24	285							2.88				8.12									
cours Dragonfly Walk																											
	13A	14A	0.56	23	63	0.56	63	4.00	1.02								0.56	0.56	0.157	1.18	99.0	200	0.70	27.44	0.04	0.87	0.43
	14A	10A	0.51	30	81	1.07	144	4.00	2.33								0.51	1.07	0.300	2.63	110.0	200	0.40	20.74	0.13	0.66	0.45
To croissant Rainrock Crescent , Pipe 10A - 17A						1.07	144																				
croissant Rainrock Crescent																											
	15A	16A	0.43	12	33	0.43	33	4.00	0.53								0.43	0.43	0.120	0.65	85.0	200	0.70	27.44	0.02	0.87	0.36
To rue Compass Street , Pipe 16A - 160A						0.43	33																				
	1A	2A	0.35	6	17	0.35	17	4.00	0.28								0.35	0.35	0.098	0.38	77.5	200	0.70	27.44	0.01	0.87	0.30
	2A	3A	0.04			0.39	17	4.00	0.28								0.04	0.39	0.109	0.39	11.5	200	0.50	23.19	0.02	0.74	0.28
	3A	4A	0.17	4	11	0.56	28	4.00	0.45								0.17	0.56	0.157	0.61	37.5	200	0.60	25.41	0.02	0.81	0.34
	4A	5A	0.05			0.61	28	4.00	0.45								0.05	0.61	0.171	0.62	20.5	200	0.60	25.41	0.02	0.81	0.34
To voie Featherfoil Way , Pipe 5A - 6A						0.61	28																				
	7A	8A	0.59	19	52	0.59	52	4.00	0.84								0.59	0.59	0.165	1.01	69.5	200	0.80	29.34	0.03	0.93	0.43
	8A	9A	0.35	12	33	0.94	85	4.00	1.38								0.35	0.94	0.263	1.64	61.5	200	0.80	29.34	0.06	0.93	0.50
Contribution From voie Wild Calla Way, Pipe 12A - 9A						2.56	194										2.56	3.50									
	9A	10A	0.22	7	19	3.72	298	4.00	4.83								0.22	3.72	1.042	5.87	48.5	200	0.40	20.74	0.28	0.66	0.56
Contribution From cours Dragonfly Walk, Pipe 14A - 10A						1.07	144										1.07	4.79									
	10A	17A	0.21	6	17	5.00	459										0.21	5.00	1.400	1.40	52.0	200	0.90	31.12	0.04	0.99	0.49
To rue Compass Street , Pipe 17A - 18A						5.00	459																				
voie Featherfoil Way																											
Contribution From croissant Rainrock Crescent, Pipe 4A - 5A						0.61	28										0.61	0.61									
	5A	6A	0.20			0.81	28	4.00	0.45								0.20	0.81	0.227	0.68	9.0	200	0.40	20.74	0.03	0.66	0.30
	6A	12A	0.56	15	41	1.37	69	4.00	1.12								0.56	1.37	0.384	1.50	113.0	200	0.40	20.74	0.07	0.66	0.38
To voie Wild Calla Way , Pipe 12A - 9A						1.37	69																				
voie Wild Calla Way																											
	11A	12A	0.73	27	73	0.73	73	4.00	1.18								0.73	0.73	0.204	1.38	107.5	200	1.00	32.80	0.04	1.04	0.50

LICENSED PROFESSIONAL ENGINEER
Z. LI
PROVINCE OF ONTARIO

DESIGN PARAMETERS

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 =	0.60	m/s
Max Res. Peak Factor =	4.00		Manning's n =	0.013	
Commercial/Institution peak Factor =	1.50		Townhouse coeff=	2.7	
Park Average Flow =	9300	L/ha/da	Single house coeff=	3.4	

Designed: K.M.	PROJECT: TRAILS EDGE WEST		
Checked: Z.L.	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwg. No. 14, 15, & 16	File Ref: 12-612	Date: January, 2015	Sheet No. 1 of 2

SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	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. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From voie Featherfoil Way, Pipe 6A - 12A						1.37	69										1.37	2.10									
	12A	9A	0.46	19	52	2.56	194	4.00	3.14								0.46	2.56	0.717	3.86	83.5	200	0.40	20.74	0.19	0.66	0.50
To croissant Rainrock Crescent , Pipe 9A - 10A						2.56	194																				
cour des Tournesols Court																											
	320A	32A	0.29	3	11	0.29	11	4.00	0.18								0.29	0.29	0.081	0.26	19.0	200	0.70	27.44	0.01	0.87	0.26
	32A	33A	0.60	5	17	0.89	28	4.00	0.45								0.60	0.89	0.249	0.70	18.5	200	0.70	27.44	0.03	0.87	0.37
	33A	34A	0.35	4	14	1.24	42	4.00	0.68								0.35	1.24	0.347	1.03	85.5	200	0.70	27.44	0.04	0.87	0.41
To croissant Shinleaf Crescent , Pipe 34A - 19A						1.24	42																				
croissant Shinleaf Crescent																											
			0.37	7	24	0.37	24	2.00	0.19								0.37	0.37									
	25A	26A	0.57	18	49	0.94	73	4.00	1.18								0.57	0.94	0.263	1.44	115.5	200	0.65	26.44	0.05	0.84	0.44
			0.41	15	41	1.35	114	2.00	0.92								0.41	1.35									
	26A	18A	0.39	9	31	1.74	145	4.00	2.35								0.39	1.74	0.487	2.84	115.0	200	0.40	20.74	0.14	0.66	0.46
To rue Compass Street , Pipe 18A - 19A						1.74	145																				
	27A	28A	0.53	6	21	0.53	21	4.00	0.34								0.53	0.53	0.148	0.49	89.5	200	0.70	27.44	0.02	0.87	0.33
	28A	29A	0.17	2	7	0.70	28	4.00	0.45								0.17	0.70	0.196	0.65	12.0	200	0.40	20.74	0.03	0.66	0.30
	29A	30A	0.20	3	11	0.90	39	4.00	0.63								0.20	0.90	0.252	0.88	41.5	200	0.40	20.74	0.04	0.66	0.33
	30A	31A	0.23	4	14	1.13	53	4.00	0.86								0.23	1.13	0.316	1.18	29.5	200	0.40	20.74	0.06	0.66	0.35
	31A	34A	0.31	6	21	1.44	74	4.00	1.20								0.31	1.44	0.403	1.60	36.5	200	0.40	20.74	0.08	0.66	0.39
Contribution From cour des Tournesols Court, Pipe 33A - 34A						1.24	42										1.24	2.68									
	34A	19A	0.52	10	34	3.20	150	4.00	2.43								0.52	3.20	0.896	3.33	82.5	200	0.80	29.34	0.11	0.93	0.61
To rue Compass Street , Pipe 19A - 20A						3.20	150																				
rue Compass Street																											
Contribution From voie Axis Way, Pipe 37A - 16A						5.24	285							2.88			8.12										
Contribution From croissant Rainrock Crescent, Pipe 15A - 16A						0.43	33										0.43										
	16A	160A	0.25	9	25	5.92	343	4.00	5.56						2.88	2.50	8.80	8.80	2.464	10.52	65.5	200	0.40	20.74	0.51	0.66	0.66
	160A	17A	0.22	7	19	6.14	362	4.00	5.87						2.88	2.50	0.22	9.02	2.526	10.90	60.0	200	0.40	20.74	0.53	0.66	0.67
Contribution From croissant Rainrock Crescent, Pipe 10A - 17A						5.00	459										5.00	14.02									
Contribution From Block 137 and 138 (Multiple), Pipe Cont 1A - 17A			1.87	112	202	1.87	202	4.00	3.27								1.87	1.87	0.524	3.79	15.5	200	0.50	23.19	0.16	0.74	0.54
	17A	18A	0.17			13.18	1023	3.79	15.71						2.88	2.50	0.17	16.06	4.497	22.71	79.0	250	0.40	37.61	0.60	0.77	0.81
Contribution From croissant Shinleaf Crescent, Pipe 26A - 18A						1.74	145										1.74										
														3.43			3.43			5.00	Future Park Splash Pad 5.0 L/s Flow Allowance						
Contribution From rue Yellow Birch Street, Pipe106A - 18A						78.86	4342			1.52	1.52			0.80			81.18										
																				5.00	Block 140 (Park) Splash Pad 5.0 L/s Flow Allowance						
Contribution From Block 140 (Park)														1.92		0.31	1.92		0.538	5.85							
	18A	19A	0.17			93.95	5510	3.21	71.65		1.52				9.03	5.38	0.17	104.50	29.260	116.29	79.0	525	0.10	136.00	0.86	0.63	0.71
Contribution From croissant Shinleaf Crescent, Pipe 34A - 19A						3.20	150										3.20	107.70									
	19A	20A	0.48	7	24	97.63	5684	3.19	73.45		1.52				9.03	5.38	0.48	108.18	30.290	119.12	107.3	525	0.10	136.00	0.88	0.63	0.71
			0.06			97.69	5684										0.06	108.24									
	20A	204A (B.O.)	0.22	2	7	97.91	5691	3.19	73.54		1.52				9.03	5.38	0.22	108.46	30.369	119.29	39.9	525	0.10	136.00	0.88	0.63	0.71
			0.06			97.97	5691										0.06	108.52									
	204A (B.O.)	205A (B.O.)	0.08			98.05	5691	3.19	73.54		1.52				9.03	5.38	0.08	108.60	30.408	119.33	75.68	600	0.10	194.17	0.61	0.69	0.72

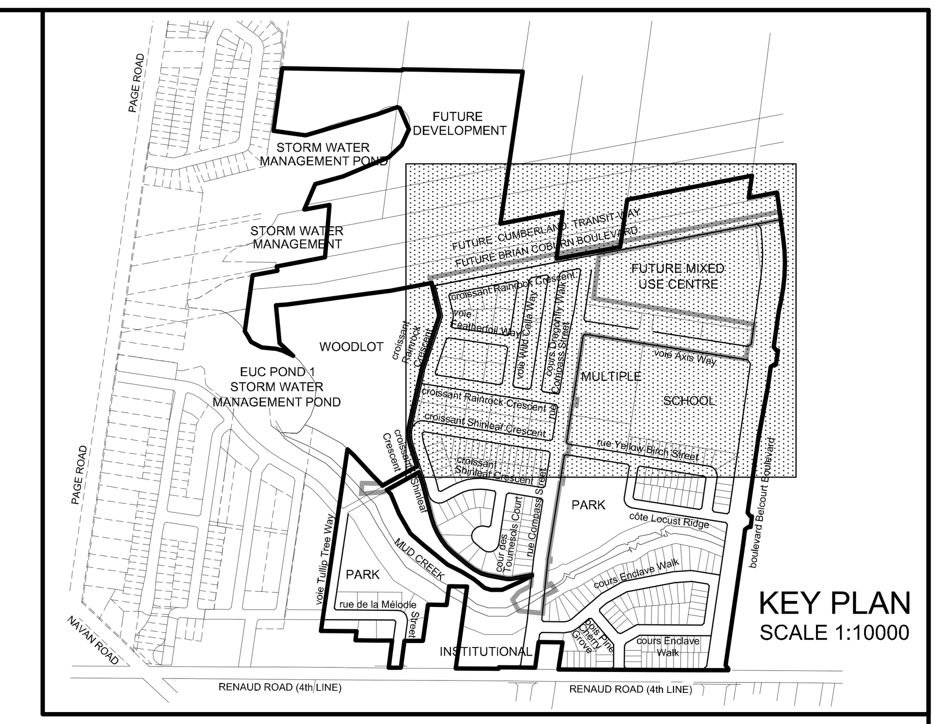
LICENSED PROFESSIONAL ENGINEER
Z. LI
PROVINCE OF ONTARIO

DESIGN PARAMETERS

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 =	0.60	m/s
Max Res. Peak Factor =	4.00		Manning's n =	0.013	
Commercial/Institution peak Factor =	1.50		Townhouse coeff=	2.7	
Park Average Flow =	9300	L/ha/da	Single house coeff=	3.4	

Designed: K.M.	PROJECT: TRAILS EDGE WEST		
Checked: Z.L.	LOCATION: City of Ottawa		
Dwg. Reference: Sanitary Drainage Plan, Dwg. No. 14, 15, & 16	File Ref: 12-612	Date: January, 2015	Sheet No. 2 of 2

612_san3_Submission.xls



LEGEND

- 0.82Ha / 23 / 62 — DRAINAGE AREA IN HECTARES; NUMBER OF UNITS; POPULATION (3.4 PERSON PER UNIT FOR SINGLE HOUSE) (2.7 PERSON PER UNIT FOR TOWNHOUSE)
- 10.37Ha / 260 / 884 — DRAINAGE AREA IN OTHER PHASES IN HECTARES; NUMBER OF UNITS; POPULATION (3.4 PERSON PER UNIT) (2.7 PERSON PER UNIT FOR TOWNHOUSE)
- SANITARY MANHOLE
- SANITARY MANHOLE IN OTHER PHASES
- SANITARY SINGLE HOUSE CONNECTION
- SANITARY SEWER TRIBUTARY BOUNDARY
- SANITARY SEWER TRIBUTARY SUB-CATCHMENT BOUNDARY
- PHASE LINE
- WORKS TO BE COMPLETED BY OTHERS AND OTHER PHASES

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LIMITED, FILE No. 161611903-111, SURVEY DATED AUGUST 2, 2012.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LIMITED, JOB No. 161613137-132, RECEIVED ON OCTOBER 30, 2014.

PRE-SERVICING RE-SUBMISSION 15-01-26

ELEVATION NOTE

ELEVATION = 86.708 m

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM NATIONAL CAPITAL COMMISSION No. 019680227, HAVING AN ELEVATION OF 86.708 m.

No.	BY	DATE	DESCRIPTION	BY
6	Z.L.	15-01-26	PRE-SERVICING RE-SUBMISSION	
5	Z.L.	15-01-15	PRE-SERVICING SUBMISSION	
4	Z.L.	14-10-16	3rd SUBMISSION	
3	Z.L.	14-09-11	2nd SUBMISSION	
2	Z.L.	14-05-16	1st RE-SUBMISSION	
1	Z.L.	12-09-14	1st SUBMISSION	

Ottawa CITY OF OTTAWA

LICENSED PROFESSIONAL ENGINEER Z. LI 15-01-26 PROVINCE OF ONTARIO

PROJECT No. 12-612

SANITARY DRAINAGE PLAN

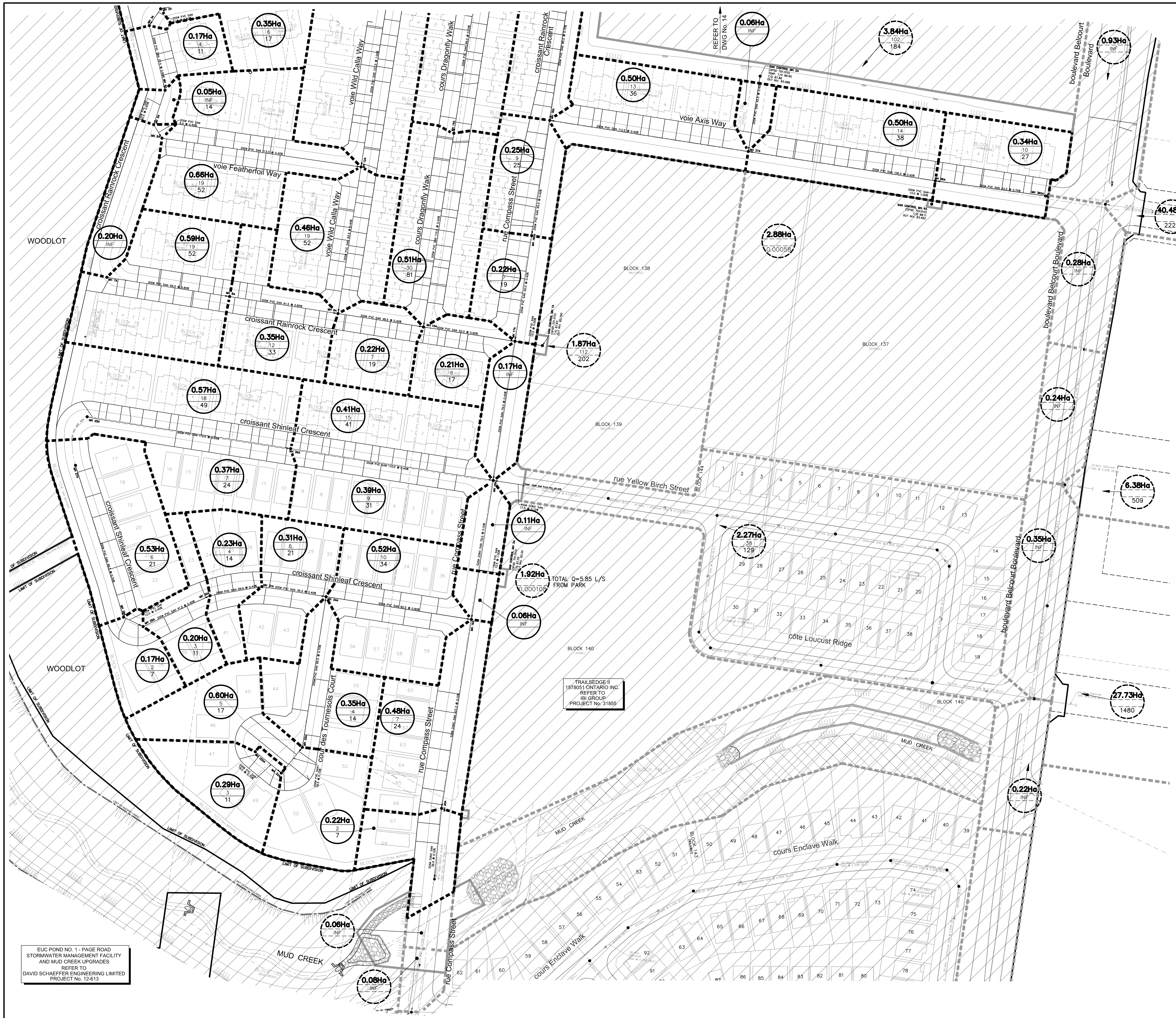
© DSEL

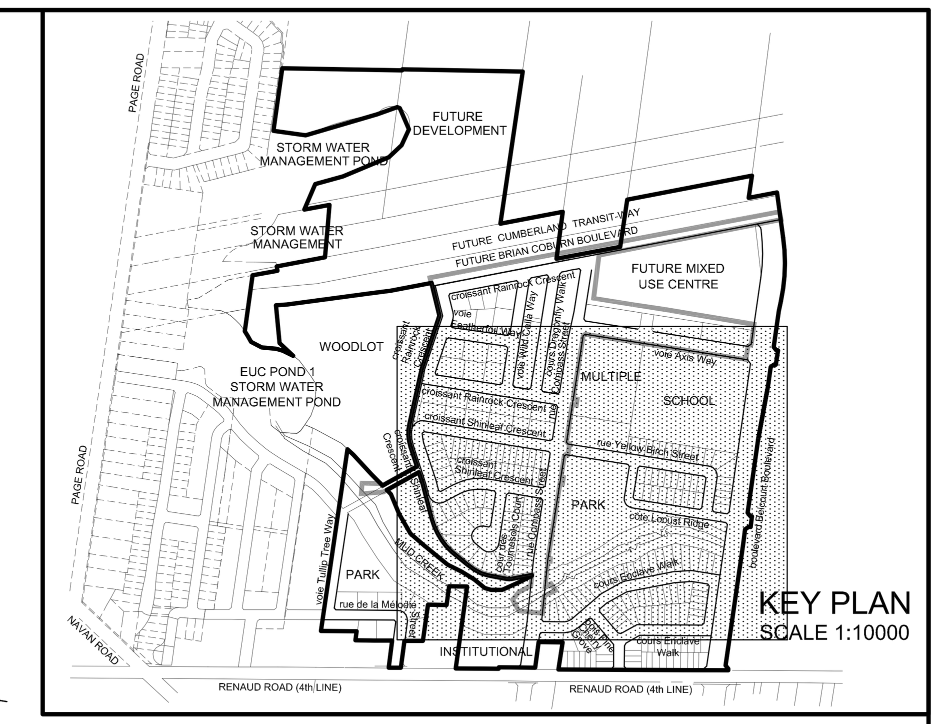
RICHCRAFT GROUP OF COMPANIES

TRAILS EDGE WEST

DSEL david schaeffer engineering ltd
120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

DRAWN BY: M.Z./J.Y.	CHECKED BY: K.M.	DRAWING NO.	SHEET NO.
DESIGNED BY: K.M.	CHECKED BY: Z.L.		14
SCALE: 1:1000	DATE: SEPTEMBER 2012		





KEY PLAN
SCALE 1:10000

LEGEND

- 0.82Ha / 23 / 62 — DRAINAGE AREA IN HECTARES; NUMBER OF UNITS; POPULATION (3.4 PERSON PER UNIT FOR SINGLE HOUSE) (2.7 PERSON PER UNIT FOR TOWNHOUSE)
- 10.37Ha / 260 / 884 — DRAINAGE AREA IN OTHER PHASES IN HECTARES; NUMBER OF UNITS; POPULATION (3.4 PERSON PER UNIT) (2.7 PERSON PER UNIT FOR TOWNHOUSE)
- SANITARY MANHOLE
- SANITARY MANHOLE IN OTHER PHASES
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- SANITARY SEWER TRIBUTARY SUB-CATCHMENT BOUNDARY
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TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY STANTEC GEOMATICS LIMITED, FILE No. 161611903-111, SURVEY DATED AUGUST 2, 2012.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY STANTEC GEOMATICS LIMITED, JOB No. 161613137-132, RECEIVED ON OCTOBER 30, 2014.

PRE-SERVICING RE-SUBMISSION 15-01-26

ELEVATION NOTE

ELEVATION = 86.708 m

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM NATIONAL CAPITAL COMMISSION No. 019680227, HAVING AN ELEVATION OF 86.708 m.

No.	BY	DATE	DESCRIPTION	BY
6	Z.L.	15-01-26	PRE-SERVICING RE-SUBMISSION	
5	Z.L.	15-01-15	PRE-SERVICING SUBMISSION	
4	Z.L.	14-10-16	3rd SUBMISSION	
3	Z.L.	14-09-11	2nd SUBMISSION	
2	Z.L.	14-05-16	1st RE-SUBMISSION	
1	Z.L.	12-09-14	1st SUBMISSION	

Ottawa CITY OF OTTAWA

LICENSED PROFESSIONAL ENGINEER Z. LI 15-01-26 PROVINCE OF ONTARIO

PROJECT No. 12-612

SANITARY DRAINAGE PLAN

© DSEL

RICHCRAFT GROUP OF COMPANIES

TRAILS EDGE WEST

DSEL david schaeffer engineering ltd
120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

DRAWN BY: M.Z./J.Y.	CHECKED BY: K.M.	DRAWING NO.	SHEET NO.
DESIGNED BY: K.M.	CHECKED BY: Z.L.		15
SCALE: 1:1000	DATE: SEPTEMBER 2012		

TEMPORARY CONSTRUCTION ICD FOR SANITARY MH2a

ORIFICE SIZING FORMULA

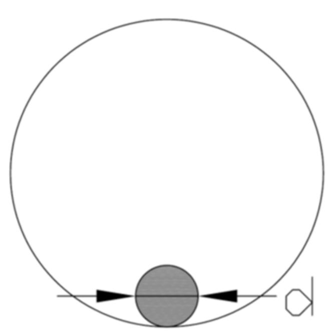
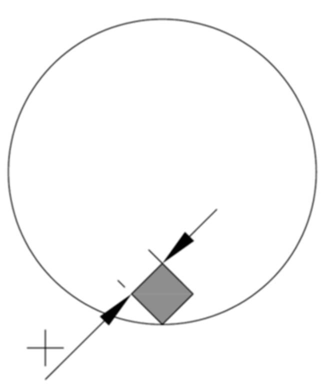
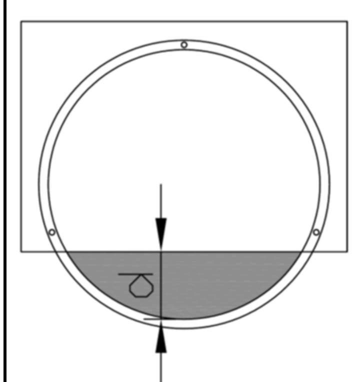
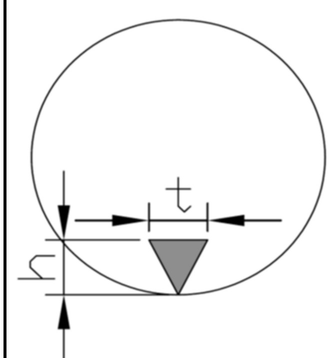
$$Q = CA\sqrt{2gh}$$

WHERE:

Q=	Discharge (m^3/s)	0.0094	m^3/s
C=	Coefficient of Discharge	0.61	
A=	Area of Flow (m^2)	unknown	m^2
g=	Gravity (9.81 m/s^2)	9.81	m/s^2
h=	Head (m)	2.000	m
d=	pipe diameter	0.200	m

SOLVE FOR **r** (radius of pipe)

$$r = \sqrt{\frac{Q}{c\pi\sqrt{2gh}}}$$

Circle Orifice		Diamond Orifice		Circle Segment		Triangular Orifice	
Radius =	0.028 m	One side =	0.0496 m	Radius =	0.1 m	Height=	70 mm
Diameter=	0.056 m	=	50 mm	θ-sinθ =	0.4919982	Top=	70 mm
Diameter=	56 mm	Area=	0.00246 m2			Area=	0.00246 m2
Inches=	2.2			θ=	1.4882346 rad		
Area=	0.00246 m2			depth =	26 mm		
				Area=	0.00246 m2		
							

USE AN INVERTED TRIANGULAR RESTRICTOR HAVING A TOP OPENING OF 70mm AND A HEIGHT OF 70mm

APPENDIX "C"

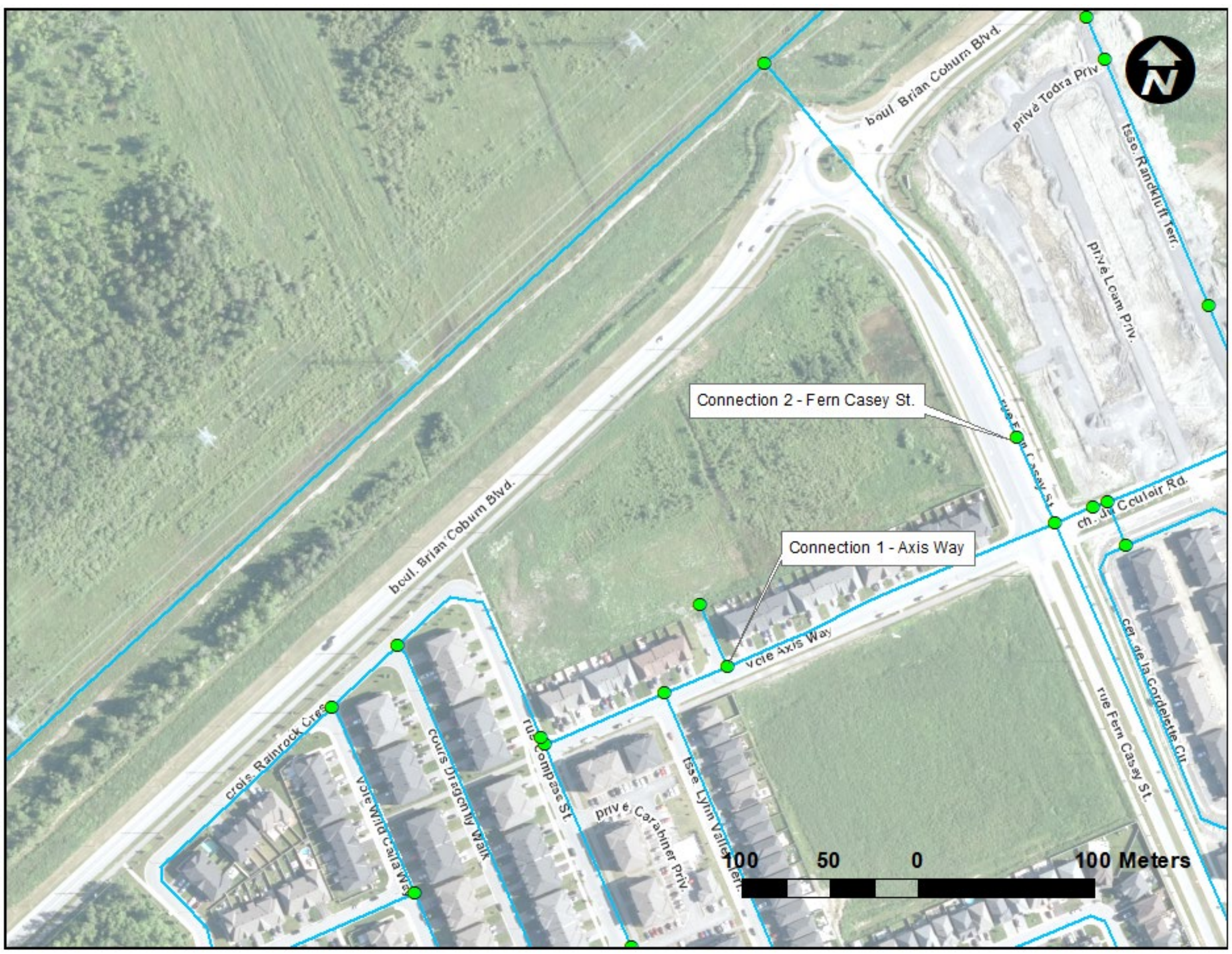
Boundary Condition 298 Axis Way
240801-WA1 - Watermain Size and Alignment
240801-WA2 – Watermain Layout and Demand
240801-WA3 – Fire Flow Areas
Table 7 - Node Data
Table 8 - Pipe Data
Table 9 - Average Day and Peak Hour Demands Results
Table 10 - Maximum Day plus Fire-Flow Results
Table 11 and 14 - Fire-Flow Calculations

Boundary Conditions
298 Axis Way

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	89	1.49
Maximum Daily Demand	224	3.73
Peak Hour	492	8.20
Fire Flow Demand #1	10,000	166.67
Fire Flow Demand #2	12,000	200.00
Fire Flow Demand #3	14,000	233.33
Fire Flow Demand #4	15,000	250.00
Fire Flow Demand #5	16,000	266.67
Fire Flow Demand #6	17,000	283.33
Fire Flow Demand #7	18,000	300.00

Location



Results

Connection 1 - Axis Way

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	61.7
Peak Hour	126.6	56.0
Max Day plus Fire Flow #1	126.4	55.8
Max Day plus Fire Flow #2	125.2	54.0
Max Day plus Fire Flow #3	124.2	52.6
Max Day plus Fire Flow #4	123.6	51.7
Max Day plus Fire Flow #5	123.4	51.4
Max Day plus Fire Flow #6	122.9	50.8
Max Day plus Fire Flow #7	122.4	50.0
[1] Ground Elevation =	87.2	m

Connection 2 - Fern Casey

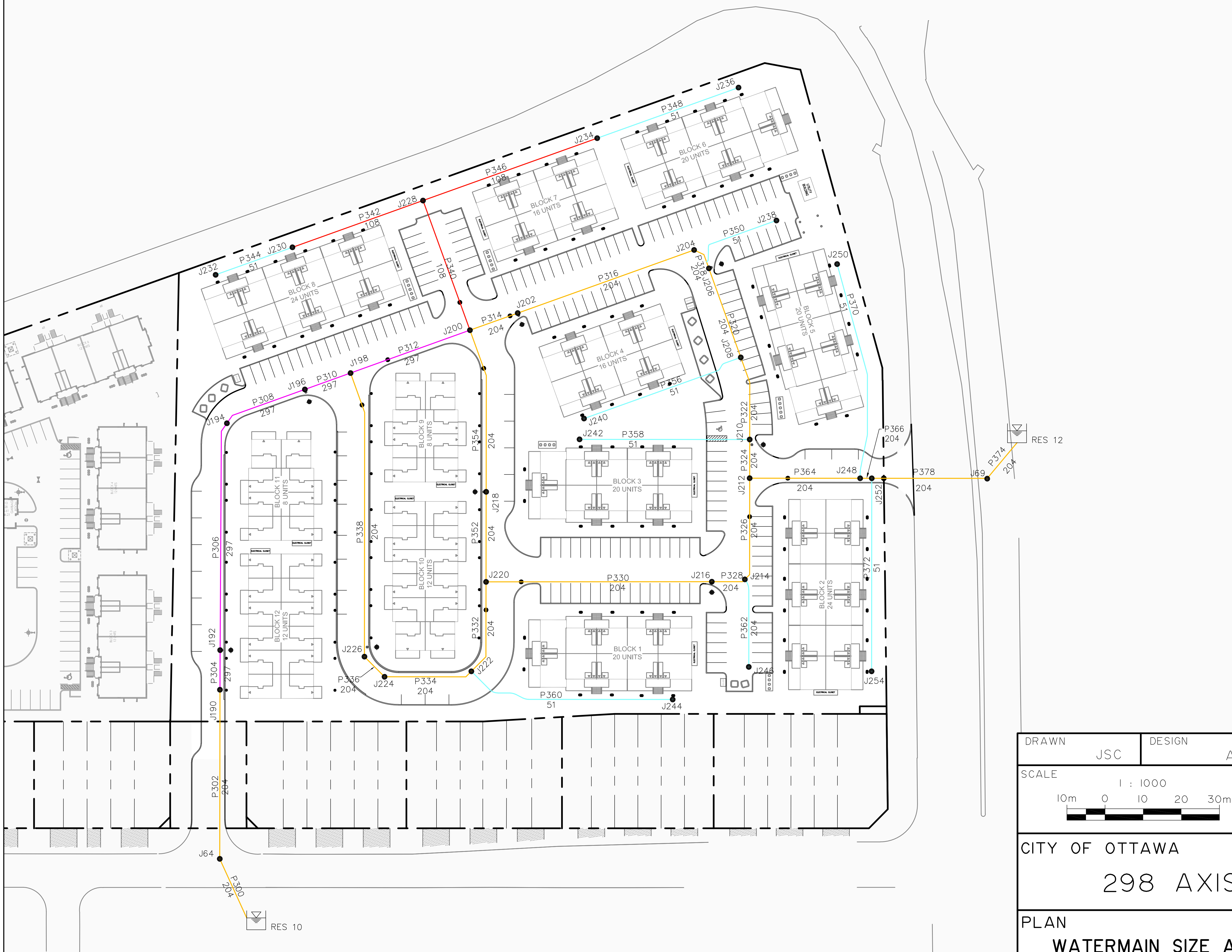
Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.6	61.9
Peak Hour	126.6	56.2
Max Day plus Fire Flow #1	127.7	57.8
Max Day plus Fire Flow #2	127.0	56.8
Max Day plus Fire Flow #3	126.6	56.2
Max Day plus Fire Flow #4	126.3	55.7
Max Day plus Fire Flow #5	126.5	56.0
Max Day plus Fire Flow #6	126.3	55.8
Max Day plus Fire Flow #7	126.2	55.6
[1] Ground Elevation =	87.1	m

Notes

1. *Demands for proposed Connection 1 at existing water main stub off Axis Way were assigned to upstream junction at Axis Way off the public looped watermains. The engineer must calculate headloss off the dead-end main.*
2. *Any connection to a watermain 400 mm or larger should be approved by Drinking Water Service as per the Water Design Guidelines.*

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 watermains 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.*



LEGEND

51.0	PROPOSED 50mmø WATERMAIN
108.0	PROPOSED 100mmø WATERMAIN
204.0	PROPOSED 200mmø WATERMAIN
297.0	PROPOSED 300mmø WATERMAIN
J30	NODE NUMBER
●	NODE LOCATION
P302	PIPE NUMBER

DRAWN JSC	DESIGN AGS
SCALE 1 : 1000 (10m 0 10 20 30m)	ATREL Engineering Ltd Ltée — Engineers - Ingénieurs

CITY OF OTTAWA

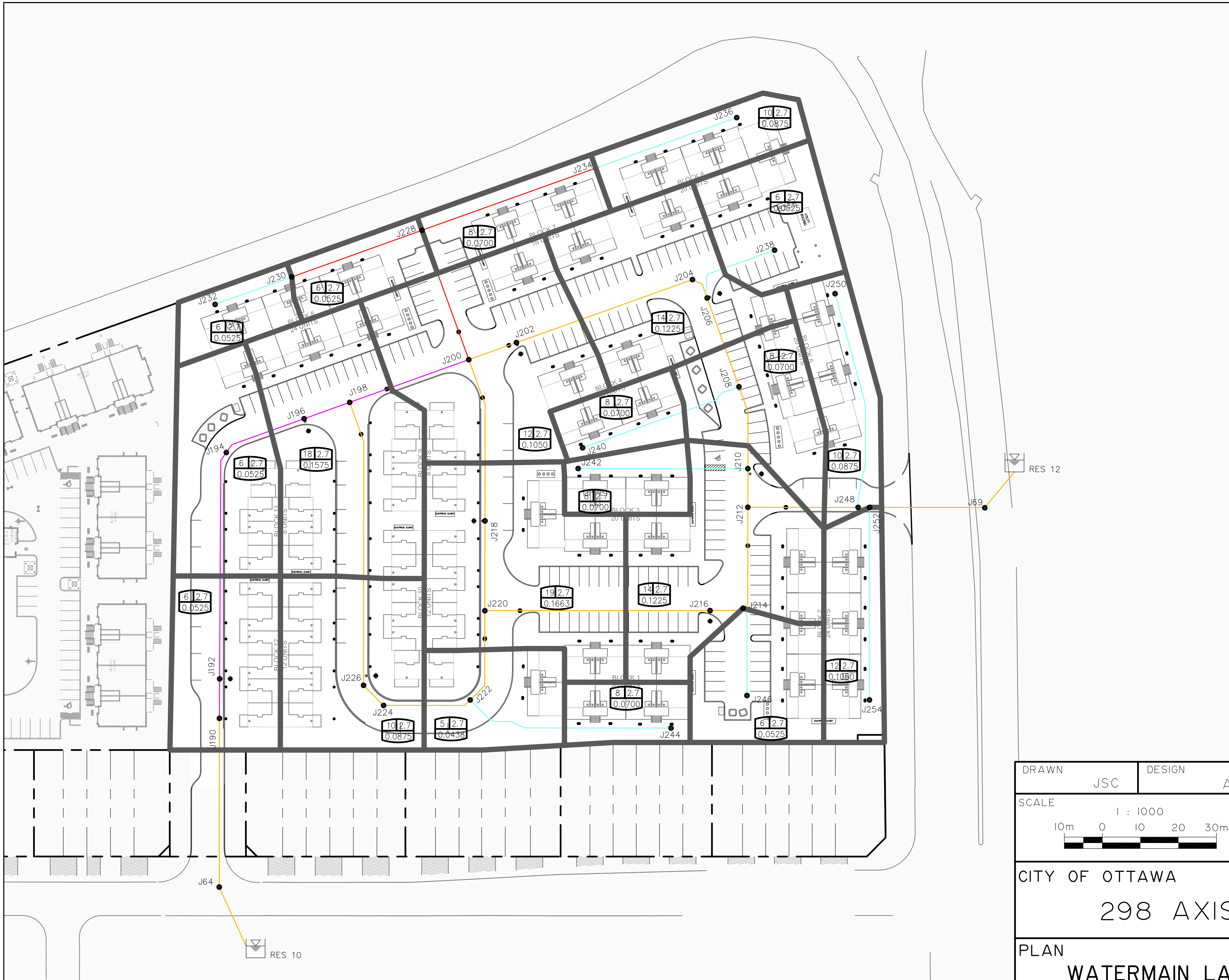
298 AXIS WAY

PROJECT No. 240801

PLAN

WATERMAIN SIZE AND ALIGNMENT

DRAWING No. 240801-WA1



LEGEND

51.0	PROPOSED 50mmø WATERMAIN
108.0	PROPOSED 100mmø WATERMAIN
204.0	PROPOSED 200mmø WATERMAIN
297.0	PROPOSED 300mmø WATERMAIN
J30	NODE NUMBER
●	NODE LOCATION
	DESIGN AREA BOUNDARY
R1	RESERVOIR LOCATION
4	NUMBER OF UNITS IN SUB AREA
2.7	CAPITA PER UNITS
0.0438	AVERAGE DAY DEMAND (L/S)

DRAWN JSC	DESIGN AGS
SCALE 1 : 1000	10m 0 10 20 30m

ATREL Engineering Ltd Ltée
Engineers - Ingénieurs

CITY OF OTTAWA

298 AXIS WAY

PROJECT No. 240801

PLAN

WATERMAIN LAYOUT AND DEMAND

DRAWING No. 240801-WA2

LEGEND

51.0	PROPOSED 50mmø WATERMAIN
108.0	PROPOSED 100mmø WATERMAIN
204.0	PROPOSED 200mmø WATERMAIN
297.0	PROPOSED 300mmø WATERMAIN
J30	NODE NUMBER
●	NODE LOCATION
	FIRE FLOW AREA
356	GROUND FLOOR AREA (m^2)
	PROPOSED 2hr FIREWALL

DRAWN JSC
DESIGN AGS
SCALE 1 : 1000
10m 0 10 20 30m

ATREL Engineering Ltd Ltée
Engineers - Ingénieurs

CITY OF OTTAWA
298 AXIS WAY

PROJECT No. 240801

PLAN
FIRE FLOW AREAS

DRAWING No. 240801-WA3

TABLE 7: NODE DATA

PROJECT: **298 Axis Way**
DATE: **November 2025**
CLIENT: Minto Communities
DESIGNED BY: AGS
PROJECT #: 240801
CHECKED BY: AGS
BY: Atrel Engineering Ltd

NODE. NO.	AVERAGE DAY DEMAND (l/s)	Street C.L. Elevation (m)	X COORDINATE (m)	Y COORDINATE (m)
J190	0.0000	87.77	382212.48	5033697.12
J192	0.0525	87.70	382208.48	5033706.70
J194	0.0525	87.91	382186.88	5033762.17
J196	0.0000	87.86	382202.24	5033778.32
J198	0.1575	87.93	382211.59	5033786.94
J200	0.1050	87.95	382236.02	5033809.52
J202	0.0000	87.93	382245.80	5033818.53
J204	0.1225	88.03	382281.92	5033851.82
J206	0.0000	88.03	382287.37	5033848.89
J208	0.0700	87.94	382304.18	5033830.66
J210	0.0000	88.05	382314.74	5033811.75
J212	0.1225	88.08	382318.69	5033802.41
J214	0.0000	88.10	382327.89	5033777.48
J216	0.0000	88.09	382320.15	5033773.54
J218	0.0000	87.97	382256.49	5033772.15
J220	0.1663	88.08	382265.67	5033750.39
J222	0.0438	88.03	382271.28	5033727.30
J224	0.0875	88.03	382250.88	5033717.09
J226	0.0000	87.96	382243.97	5033719.90
J228	0.0000	88.02	382211.42	5033836.01
J230	0.0525	88.10	382184.69	5033811.36
J232	0.0525	88.10	382168.96	5033796.86
J234	0.0700	88.09	382247.08	5033868.89
J236	0.0875	88.19	382276.02	5033895.57
J238	0.0525	87.94	382298.77	5033867.36
J240	0.0700	88.30	382272.60	5033799.86
J242	0.0700	88.30	382273.65	5033794.37
J244	0.0700	88.27	382322.76	5033741.10
J246	0.0525	87.93	382337.80	5033756.76
J248	0.0000	88.38	382345.37	5033813.69
J250	0.0875	88.55	382317.89	5033863.05
J252	0.0000	88.43	382348.17	5033814.88
J254	0.1050	88.65	382367.89	5033768.26
J64	0.0000	87.64	382229.75	5033656.27
J69	0.0000	88.46	382376.08	5033826.61

PROPOSED NODES
EXISTING NODES

TABLE 8: PIPE DATA

PROJECT: **298 Axis Way**
CLIENT: Minto Communities
PROJECT #: 240801
BY: Atrel Engineering Ltd

DATE: **November 2025**
DESIGNED BY: AGS
CHECKED BY: AGS

PIPE NO.	FROM	TO	LENGTH (m)	INSIDE DIAMETER (mm)	ROUGHNESS	AVERAGE DAY DEMAND				PEAK HOUR DEMAND			
						FLOW (L/S)	VELOCITY (m/s)	HEADLOSS (m)	HL/1000 (m/km)	FLOW (L/S)	VELOCITY (m/s)	HEADLOSS (m)	HL/1000 (m/km)
P302	J64	J190	44.35	204	110	0.8988	0.0275	0.0004	0.0094	4.9436	0.1512	0.0097	0.2186
P304	J190	J192	10.39	297	120	0.8988	0.0130	0.0000	0.0009	4.9436	0.0714	0.0003	0.0295
P306	J192	J194	59.96	297	120	0.8463	0.0122	0.0001	0.0011	4.6548	0.0672	0.0016	0.0267
P308	J194	J196	22.71	297	120	0.7938	0.0115	0.0000	0.0012	4.3660	0.0630	0.0005	0.0238
P310	J196	J198	12.72	297	120	0.7938	0.0115	0.0000	0.0007	4.3660	0.0630	0.0003	0.0241
P312	J198	J200	33.26	297	120	0.5040	0.0073	0.0000	0.0006	2.7721	0.0400	0.0003	0.0101
P314	J200	J202	13.30	204	110	0.0604	0.0018	0.0000	0.0000	0.3320	0.0102	0.0000	0.0014
P316	J202	J204	49.13	204	110	0.0604	0.0018	0.0000	0.0000	0.3320	0.0102	0.0001	0.0015
P318	J204	J206	6.18	204	110	-0.1146	0.0035	0.0000	0.0000	-0.6306	0.0193	0.0000	0.0045
P320	J206	J208	24.80	204	110	-0.1146	0.0035	0.0000	0.0000	-0.6306	0.0193	0.0001	0.0049
P322	J208	J210	21.94	204	110	-0.2546	0.0078	0.0000	0.0013	-1.4006	0.0429	0.0005	0.0212
P324	J210	J212	10.14	204	110	-0.3246	0.0099	0.0000	0.0009	-1.7855	0.0546	0.0003	0.0330
P326	J212	J214	27.05	204	110	0.2116	0.0065	0.0000	0.0007	1.1638	0.0356	0.0004	0.0151
P328	J216	J214	8.91	204	110	-0.1591	0.0049	0.0000	0.0000	-0.8750	0.0268	0.0001	0.0084
P330	J216	J220	59.19	204	110	0.1591	0.0049	0.0000	0.0005	0.8750	0.0268	0.0005	0.0088
P332	J222	J220	25.03	204	110	-0.0690	0.0021	0.0000	0.0000	-0.3793	0.0116	0.0000	0.0019
P334	J224	J222	23.37	204	110	0.0448	0.0014	0.0000	0.0000	0.2463	0.0075	0.0000	0.0008
P336	J226	J224	7.46	204	110	0.1323	0.0040	0.0000	0.0012	0.7275	0.0223	0.0000	0.0062
P338	J198	J226	75.01	204	110	0.1323	0.0040	0.0000	0.0002	0.7275	0.0223	0.0005	0.0062
P340	J200	J228	36.15	108	100	0.2625	0.0287	0.0009	0.0252	1.4439	0.1576	0.0214	0.5913
P342	J228	J230	36.36	108	100	0.1050	0.0115	0.0002	0.0046	0.5776	0.0631	0.0039	0.1082
P344	J230	J232	21.40	51	100	0.0525	0.0257	0.0011	0.0491	0.2888	0.1414	0.0248	1.1599
P346	J228	J234	48.50	108	100	0.1575	0.0172	0.0005	0.0096	0.8663	0.0946	0.0111	0.2294
P348	J234	J236	39.36	51	100	0.0875	0.0428	0.0050	0.1271	0.4813	0.2356	0.1176	2.9874
P350	J204	J238	22.92	51	100	0.0525	0.0257	0.0011	0.0495	0.2888	0.1414	0.0266	1.1602
P352	J220	J218	23.62	204	110	-0.0762	0.0023	0.0000	0.0004	-0.4187	0.0128	0.0000	0.0020
P354	J218	J200	43.14	204	110	-0.0762	0.0023	0.0000	0.0000	-0.4187	0.0128	0.0001	0.0024
P356	J208	J240	44.48	51	100	0.0700	0.0343	0.0037	0.0841	0.3850	0.1885	0.0879	1.9757
P358	J210	J242	44.61	51	100	0.0700	0.0343	0.0038	0.0842	0.3850	0.1885	0.0881	1.9757
P360	J222	J244	55.34	51	100	0.0700	0.0343	0.0047	0.0840	0.3850	0.1885	0.1093	1.9758
P362	J214	J246	23.19	51	100	0.0525	0.0257	0.0011	0.0493	0.2888	0.1414	0.0269	1.1598
P364	J212	J248	28.97	204	110	-0.6588	0.0202	0.0001	0.0051	-3.6232	0.1109	0.0036	0.1230
P366	J248	J252	3.04	204	110	-0.7463	0.0228	0.0000	0.0092	-4.1045	0.1256	0.0005	0.1559
P370	J248	J250	57.42	51	100	0.0875	0.0428	0.0073	0.1270	0.4813	0.2356	0.1716	2.9875
P372	J252	J254	50.62	51	100	0.1050	0.0514	0.0090	0.1783	0.5775	0.2827	0.2119	4.1865
P378	J252	J69	30.27	204	110	-0.8513	0.0260	0.0003	0.0083	-4.6820	0.1432	0.0060	0.1976

PROPOSED PIPES
EXISTING PIPES

TABLE 9: AVERAGE DAY AND PEAK HOUR DEMAND RESULTS

PROJECT: **298 Axis Way**
DATE: **November 2025**
CLIENT: Minto Communities
DESIGNED BY: AGS
PROJECT #: 240801
CHECKED BY: AGS
BY: Atrel Engineering Ltd

NODE NO.	Street C.L. Elevation (m)	AVERAGE DAY DEMAND			PEAK HOUR DEMAND		
		Demand (l/s)	HGL (m)	Pressure (kPa)	Demand (l/s)	HGL (m)	Pressure (kPa)
J190	87.77	0.0000	130.60	419.70	0.0000	126.59	380.40
J192	87.70	0.0525	130.60	420.38	0.2888	126.59	381.09
J194	87.91	0.0525	130.60	418.32	0.2888	126.59	379.01
J196	87.86	0.0000	130.60	418.81	0.0000	126.59	379.50
J198	87.93	0.1575	130.60	418.13	0.8663	126.59	378.81
J200	87.95	0.1050	130.60	417.93	0.5775	126.59	378.61
J202	87.93	0.0000	130.60	418.13	0.0000	126.59	378.81
J204	88.03	0.1225	130.60	417.15	0.6738	126.59	377.82
J206	88.03	0.0000	130.60	417.15	0.0000	126.59	377.82
J208	87.94	0.0700	130.60	418.03	0.3850	126.59	378.71
J210	88.05	0.0000	130.60	416.95	0.0000	126.59	377.63
J212	88.08	0.1225	130.60	416.66	0.6738	126.59	377.34
J214	88.10	0.0000	130.60	416.46	0.0000	126.59	377.14
J216	88.09	0.0000	130.60	416.56	0.0000	126.59	377.24
J218	87.97	0.0000	130.60	417.73	0.0000	126.59	378.41
J220	88.08	0.1663	130.60	416.66	0.9144	126.59	377.33
J222	88.03	0.0438	130.60	417.15	0.2406	126.59	377.82
J224	88.03	0.0875	130.60	417.15	0.4813	126.59	377.82
J226	87.96	0.0000	130.60	417.83	0.0000	126.59	378.51
J228	88.02	0.0000	130.60	417.24	0.0000	126.57	377.71
J230	88.10	0.0525	130.60	416.45	0.2888	126.56	376.89
J232	88.10	0.0525	130.60	416.44	0.2888	126.54	376.65
J234	88.09	0.0700	130.60	416.55	0.3850	126.55	376.92
J236	88.19	0.0875	130.59	415.52	0.4813	126.44	374.79
J238	87.94	0.0525	130.60	418.02	0.2888	126.56	378.45
J240	88.30	0.0700	130.60	414.46	0.3850	126.50	374.32
J242	88.30	0.0700	130.60	414.46	0.3850	126.50	374.32
J244	88.27	0.0700	130.59	414.75	0.3850	126.48	374.40
J246	87.93	0.0525	130.60	418.12	0.2888	126.56	378.55
J248	88.38	0.0000	130.60	413.72	0.0000	126.59	374.44
J250	88.55	0.0875	130.59	411.98	0.4813	126.42	371.09
J252	88.43	0.0000	130.60	413.23	0.0000	126.59	373.95
J254	88.65	0.1050	130.59	410.99	0.5775	126.38	369.72
J64	87.64	0.0000	130.60	420.97	0.0000	126.60	381.77
J69	88.46	0.0000	130.60	412.94	0.0000	126.60	373.72

PROPOSED NODES
EXISTING NODES

TABLE 10: MAXIMUM DAY PLUS FIRE FLOW RESULTS

PROJECT: **298 Axis Way**
CLIENT: Minto Communities
PROJECT #: 240801
BY: Atrel Engineering Ltd

DATE: **November 2025**
DESIGNED BY: AGS
CHECKED BY: AGS

NODE NO.	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Available Flow @ Hydrant (L/s)	Available Flow Pressure (kPa)	Total Demand (L/s)	Available Flow @ Hydrant (L/s)	Critical NODE ID	Critical Node Pressure (kPa)	Critical Node Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
J190	0.0000	381.56	126.71	167.00	353.12	525.24	140.0	166.9988	525.24	J190	140.0	102.05	525.24	525.24
J192	0.1313	371.87	125.65	200.00	331.64	510.39	140.0	200.1299	510.39	J192	140.0	101.98	510.39	510.39
J194	0.1313	380.81	126.77	167.00	349.50	500.67	140.0	167.1301	500.67	J194	140.0	102.19	500.67	500.67
J196	0.0000	363.48	124.95	233.00	304.42	476.20	140.0	232.9983	476.20	J196	140.0	102.14	476.20	476.20
J198	0.3938	380.93	126.80	167.00	348.45	492.50	140.0	167.3926	492.50	J198	140.0	102.21	492.50	492.50
J200	0.2625	380.92	126.82	167.00	346.78	479.78	140.0	167.2613	479.78	J236	137.3	102.20	476.88	476.88
J202	0.0000	363.85	125.06	233.00	286.49	412.99	140.0	232.9983	412.99	J202	140.0	102.21	412.99	412.99
J204	0.3063	381.35	126.95	167.00	327.26	376.70	140.0	167.3051	376.70	J204	140.0	102.31	376.70	376.70
J206	0.0000	371.96	125.99	200.00	296.70	368.99	140.0	199.9986	368.99	J206	140.0	102.31	368.99	368.99
J208	0.1750	382.86	127.01	167.00	332.71	395.11	140.0	167.1738	395.11	J240	136.2	102.20	391.81	391.81
J210	0.0000	373.09	126.12	200.00	315.29	429.01	140.0	199.9986	429.01	J242	137.3	102.31	426.35	426.35
J212	0.3063	382.17	127.08	167.00	346.76	478.67	140.0	167.3051	478.67	J212	140.0	102.36	478.67	478.67
J214	0.0000	381.37	127.02	167.00	333.49	403.71	140.0	166.9988	403.71	J214	140.0	102.38	403.71	403.70
J216	0.0000	371.90	126.04	200.00	302.06	384.82	140.0	199.9986	384.82	J216	140.0	102.37	384.82	384.82
J218	0.0000	363.50	125.06	233.00	274.03	381.72	140.0	232.9983	381.72	J218	140.0	102.25	381.72	381.72
J220	0.4156	380.08	126.87	167.00	334.47	410.19	140.0	167.4144	410.19	J220	140.0	102.36	410.19	410.19
J222	0.1094	380.44	126.85	167.00	324.72	368.13	140.0	167.1082	368.13	J244	137.4	102.29	365.97	365.97
J224	0.2188	380.33	126.84	167.00	320.65	354.66	140.0	167.2176	354.66	J224	140.0	102.31	354.67	354.67
J226	0.0000	371.01	125.82	200.00	287.42	346.18	140.0	199.9986	346.18	J226	140.0	102.24	346.18	346.18
J228	0.0000	380.18	126.82	167.00	-1050.83	63.24	140.0	166.9988	63.24	J236	138.0	102.27	62.96	62.96
J230	0.1313	379.39	126.82	167.00	-2450.44	43.67	140.0	167.1301	43.67	J232	139.9	102.38	43.66	43.66
J232	0.1313	379.34	126.81	167.00	-34225.59	11.33	140.0	167.1301	11.33	J232	140.0	102.38	11.34	11.33
J234	0.1750	379.47	126.81	167.00	-2920.33	40.16	140.0	167.1738	40.16	J236	138.7	102.35	40.04	40.04
J236	0.2188	378.23	126.79	167.00	-61435.71	8.28	140.0	167.2176	8.28	J236	140.0	102.47	8.28	8.28
J238	0.1313	382.17	126.94	167.00	-33711.41	11.51	140.0	167.1301	11.51	J238	140.0	102.22	11.51	11.51
J240	0.1750	379.13	126.99	167.00	-65756.00	8.01	140.0	167.1738	8.01	J240	140.0	102.58	8.01	8.01
J242	0.1750	379.59	127.04	167.00	-65947.73	8.01	140.0	167.1738	8.01	J242	140.0	102.58	8.01	8.00
J244	0.1750	377.84	126.83	167.00	-81902.96	7.10	140.0	167.1738	7.10	J244	140.0	102.55	7.10	7.10
J246	0.1313	382.98	127.01	167.00	-34099.55	11.46	140.0	167.1301	11.46	J246	140.0	102.21	11.46	11.46
J248	0.0000	381.56	127.32	167.00	351.00	526.12	140.0	166.9988	526.12	J250	137.9	102.62	523.67	523.67
J250	0.2188	379.50	127.28	167.00	-85013.11	6.99	140.0	167.2176	6.99	J250	140.0	102.83	6.99	6.99
J252	0.0000	381.31	127.34	167.00	351.69	536.04	140.0	166.9988	536.04	J254	137.3	102.66	532.83	532.83
J254	0.2625	378.68	127.29	167.00	-74931.29	7.48	140.0	167.2613	7.48	J254	140.0	102.93	7.48	7.48
J64	0.0000	379.97	126.42	167.00	377.62	1836.89	140.0	166.9988	1836.89	J64	140.0	101.92	1836.94	1836.63
J69	0.0000	383.51	127.60	167.00	369.15	852.76	140.0	166.9988	852.76	J69	140.0	102.74	852.76	852.76

FIRE HYDRANT NODE
PROPOSED NODES
EXISTING NODES

FIRE FLOW CALCULATIONS

Table 11

CONSULTANT: Atrel Engineering Ltd
BY: AGS
DATE: NOVEMBER, 2025

CLIENT: Minto Communities Inc.
240801
PROJECT NAME: 298 AXIS WAY

(A) C = Coefficient related to type of construction

Type V wood frame construction	1.5	X
Type IV-A Mass Timber Construction	0.8	
Type IV-B Mass Timber Construction	0.9	
Type IV-C Mass Timber Construction	1	
Type IV-D Mass Timber Construction	1.5	
Type III Ordinary Construction	1	
Type II Noncombustible Construction	0.8	
Type I Fire Restrictive Construction	0.6	

A = Area of structure considered (m²)

(B)

Building No.	BLOCK 1A	BLOCK 1B	BLOCK 2A	BLOCK 2B	BLOCK 3A	BLOCK 3B
Location No.						
Ground Floor Area	339	231	231	447	339	231
Number of Storeys	3	3	3	3	3	3
Total Effective Floor Area	1017	693	693	1341	1017	693

(C) F = The required flow in litres per minutes (L/min)

= 220·C·(A)^½	11000	9000	9000	12000	11000	9000

(D) Occupancy hazard reduction or surcharge (contents, L/min)

- non-combustible - 25%
- limited combustible - 15%
- combustible - 0%
- free burning + 15%
- rapid burning + 25%

	-15	-15	-15	-15	-15	-15
Required Flow (L/min)	9350	7650	7650	10200	9350	7650

(E) Sprinkler protection reduction (entire building, % of (2), L/min)

- non-comb. - fire resistive construction with very low fire hazard (- 75%)
- other

non-comb. - fire resistive (- 75%)						
other	0	0	0	0	0	0
Reduction (L/min)	0	0	0	0	0	0

(F) Exposure surcharge (% of 2, L/min)

		BLOCK 1A			BLOCK 1B			BLOCK 2A			BLOCK 2B			BLOCK 3A			BLOCK 3B		
North	Separation Distance	26.5	4	374	>30	0	0	FW	-	0	22.5	2	204	12.0	12	1122	19.0	12	918
	Length-Height Factor	41-60			41-60			-			21-40			41-60			41-60		
East	Separation Distance	FW	-	0	28.5	2	153	>30	0	0	>30	0	0	FW	-	0	28.5	2	153
	Length-Height Factor	-			21-40			41-60			>100			-			21-40		
South	Separation Distance	13.0	12	1122	15.0	12	918	12.5	11	842	FW	-	0	26.5	4	374	>30	0	0
	Length-Height Factor	41-60			41-60			21-40			-			41-60			41-60		
West	Separation Distance	21.5	4	374	FW	-	0	28.5	4	306	28.5	10	1020	21.5	4	374	FW	-	0
	Length-Height Factor	41-60			-			41-60			>100			41-60			-		
Exposure surcharge total		1870			1071			1148			1224			1870			1071		

Fire Flow

=(D) +(E) + (F)	11220	8721	8798	11424	11220	8721

(G) Round off fire flow (L/min) Fc

- to nearest 1,000 L/min

	11000	9000	9000	11000	11000	9000
	(183 l/s)	(150 l/s)	(150 l/s)	(183 l/s)	(183 l/s)	(150 l/s)
Fire Flow Required	(183 l/s)	(150 l/s)	(150 l/s)	(183 l/s)	(183 l/s)	(150 l/s)

As per the "Technical Bulletin ISDTB-2014-02 - Revisions to Ottawa Design Guidelines - Water", single dwellings or traditional side-by-side town comply with the provision of the Bulletin; therefore the required fire flow is 10,000 l/min

FIRE FLOW CALCULATIONS

CONSULTANT: Atrel Engineering Ltd
BY: AGS
DATE: NOVEMBER, 2025

CLIENT: Minto Communities Inc.
240801
PROJECT NAME: 298 AXIS WAY

(A) C = Coefficient related to type of construction

· **Type V** wood frame construction	1.5	X
· **Type IV-A** Mass Timber Construction	0.8	
· **Type IV-B** Mass Timber Construction	0.9	
· **Type IV-C** Mass Timber Construction	1	
· **Type IV-D** Mass Timber Construction	1.5	
Type III Ordinary Construction	1	
Type II Noncombustible Construction	0.8	
· **Type I** Fire Restrictive Construction	0.6	

A = Area of structure considered (m²)

(B)

Building No.	BLOCK 4		BLOCK 5A	BLOCK 5B	BLOCK 6A	BLOCK 6B
Location No.						
Ground Floor Area	462		231	339	231	339
Number of Storeys	3		3	3	3	3
Total Effective Floor Area	1386		693	1017	693	1017

(C) F = The required flow in litres per minutes (L/min)

= 220·C·(A)^½	12000		9000	11000	9000	11000

(D) Occupancy hazard reduction or surcharge (contents, L/min)

- non-combustible - 25%
- limited combustible - 15%
- combustible - 0%
- free burning + 15%
- rapid burning + 25%

	-15		-15	-15	-15	-15
Required Flow (L/min)	10200		7650	9350	7650	9350

(E) Sprinkler protection reduction (entire building, % of (2), L/min)

- non-comb. - fire resistive construction with very low fire hazard (- 75%)
- other

non-comb. - fire resistive construction with very low fire hazard (- 75%)						
other	0		0	0	0	0
Reduction (L/min)	0		0	0	0	0

(F) Exposure surcharge (% of 2, L/min)

North	Separation Distance	>30	0	0				26.0	2	153	FW	-	0	>30	0	0	>30	0	0
	Length-Height Factor	>100						21-40			-			41-60			61-80		
East	Separation Distance	27.5	2	204				>30	0	0	>30	0	0	FW	-	0	>30	0	0
	Length-Height Factor	21-40						41-60			61-80			-			41-60		
South	Separation Distance	12.0	10	1020				FW	-	0	22.5	4	374	28.0	4	306	26.0	6	561
	Length-Height Factor	>100						-			41-60			41-60			61-80		
West	Separation Distance	24.0	2	204				27.5	4	306	27.5	6	561	7.5	16	1224	FW	-	0
	Length-Height Factor	21-40						41-60			61-80			21-40			-		
Exposure surcharge total		1428						459			935			1530			561		

Fire Flow

=(D) +(E) + (F)	11628		8109	10285	9180	9911

(G) Round off fire flow (L/min) Fc

· to nearest 1,000 L/min

	12000		8000	10000	9000	10000
	(200 l/s)	(0 l/s)	(133 l/s)	(167 l/s)	(150 l/s)	(167 l/s)
Fire Flow Required	(200 l/s)	(0 l/s)	(133 l/s)	(167 l/s)	(150 l/s)	(167 l/s)

As per the "Technical Bulletin ISDTB-2014-02 - Revisions to Ottawa Design Guidelines - Water", single dwellings or traditional side-by-side town comply with the provision of the Bulletin; therefore the required fire flow is 10,000 l/min

FIRE FLOW CALCULATIONS

CONSULTANT: Atrel Engineering Ltd
BY: AGS
DATE: NOVEMBER, 2025

CLIENT: Minto Communities Inc.
240801
PROJECT NAME: 298 AXIS WAY

(A) **C = Coefficient related to type of construction**

·	**Type V** wood frame construction	1.5	X
·	**Type IV-A** Mass Timber Construction	0.8	
·	**Type IV-B** Mass Timber Construction	0.9	
·	**Type IV-C** Mass Timber Construction	1	
·	**Type IV-D** Mass Timber Construction	1.5	
	Type III Ordinary Construction	1	
	Type II Noncombustible Construction	0.8	
·	**Type I** Fire Restrictive Construction	0.6	

A = Area of structure considered (m²)

(B)

Building No.	BLOCK 7		BLOCK 8A	BLOCK 8B		
Location No.						
Ground Floor Area	462		447	231		
Number of Storeys	3		3	3		
Total Effective Floor Area	1386		1341	693		

(C) **F = The required flow in litres per minutes (L/min)**

= 220·C·(A)^½	12000		12000	9000		

(D) **Occupancy hazard reduction or surcharge (contents, L/min)**

- non-combustible - 25%
- limited combustible - 15%
- combustible - 0%
- free burning + 15%
- rapid burning + 25%

(combustible)	-15		-15	-15		
Required Flow (L/min)	10200		10200	7650		

(E) **Sprinkler protection reduction (entire building, % of (2), L/min)**

- non-comb. - fire resistive construction with very low fire hazard (- 75%)
- other

non-comb. - fire resistive construction with very low fire hazard (- 75%)						
other	0		0	0		
Reduction (L/min)	0		0	0		

(F) **Exposure surcharge (% of 2, L/min)**

North	Separation Distance	>30	0	0				>30	0	0	>30	0	0						
	Length-Height Factor		>100						>100			41-60							
East	Separation Distance	7.5	16	1632				FW	-	0	25.5	2	153						
	Length-Height Factor		21-40						-			21-40							
South	Separation Distance	>30	0	0				25.0	10	1020	25.5	4	306						
	Length-Height Factor		>100						>100			41-60							
West	Separation Distance	25.5	2	204				17.5	11	1122	FW	-	0						
	Length-Height Factor		21-40						21-40			-							
Exposure surcharge total			1836						2142			459							

Fire Flow

=(D) +(E) + (F)	12036		12342	8109		

(G) **Round off fire flow (L/min) Fc**

- to nearest 1,000 L/min

	12000		12000	8000		
	(200 l/s)	(0 l/s)	(200 l/s)	(133 l/s)	(0 l/s)	(0 l/s)
Fire Flow Required	(200 l/s)	(0 l/s)	(200 l/s)	(133 l/s)	(0 l/s)	(0 l/s)

As per the "Technical Bulletin ISDTB-2014-02 - Revisions to Ottawa Design Guidelines - Water", single dwellings or traditional side-by-side town comply with the provision of the Bulletin; therefore the required fire flow is 10,000 l/min

FIRE FLOW CALCULATIONS Table 14

CONSULTANT: Atrel Engineering Ltd
BY: AGS
DATE: NOVEMBER, 2025

CLIENT: Minto Communities Inc.
240801
PROJECT NAME: 298 AXIS WAY

(A) C = Coefficient related to type of construction

· **Type V** wood frame construction	1.5	X
· **Type IV-A** Mass Timber Construction	0.8	
· **Type IV-B** Mass Timber Construction	0.9	
· **Type IV-C** Mass Timber Construction	1	
· **Type IV-D** Mass Timber Construction	1.5	
Type III Ordinary Construction	1	
Type II Noncombustible Construction	0.8	
· **Type I** Fire Restrictive Construction	0.6	

A = Area of structure considered (m²)

(B)

Building No.	BLOCK 9	BLOCK 10 A	BLOCK 10B	BLOCK 11	BLOCK 12A	BLOCK 12B
Location No.						
Ground Floor Area	440	331	324	440	324	324
Number of Storeys	3	3	3	3	3	3
Total Effective Floor Area	1320	993	972	1320	972	972

(C) F = The required flow in litres per minutes (L/min)

= 220·C·(A)^½	12000	10000	10000	12000	10000	10000

(D) Occupancy hazard reduction or surcharge (contents, L/min)

- non-combustible - 25%
- limited combustible - 15%
- combustible - 0%
- free burning + 15%
- rapid burning + 25%

Occupancy	-15	-15	-15	-15	-15	-15
Required Flow (L/min)	10200	8500	8500	10200	8500	8500

(E) Sprinkler protection reduction (entire building, % of (2), L/min)

- non-comb. - fire resistive construction with very low fire hazard (- 75%)
- other

non-comb. - fire resistive (- 75%)						
other	0	0	0	0	0	0
Reduction (L/min)	0	0	0	0	0	0

(F) Exposure surcharge (% of 2, L/min)

North	Separation Distance	23.5	4	408	FW	-	0	5.0	17	1445	25.0	4	408	FW	-	0	3.5	17	1445
	Length-Height Factor	41-60			-			41-60			41-60			-			41-60		
East	Separation Distance	21.0	6	612	21.5	6	510	21.5	4	340	20.5	6	612	21.0	4	340	21.0	4	340
	Length-Height Factor	61-80			61-80			41-60			61-80			41-60			41-60		
South	Separation Distance	5.0	17	1734	25.0	4	340	FW	-	0	3.5	17	1734	12.5	12	1020	FW	-	0
	Length-Height Factor	41-60			41-60			-			41-60			41-60			-		
West	Separation Distance	20.5	6	612	20.5	6	510	20.5	4	340	27.0	6	612	27.0	4	340	27.0	4	340
	Length-Height Factor	61-80			61-80			41-60			61-80			41-60			41-60		
Exposure surcharge total		3366			1360			2125			3366			1700			2125		

Fire Flow

=(D) +(E) + (F)	13566	9860	10625	13566	10200	10625

(G) Round off fire flow (L/min) Fc

· to nearest 1,000 L/min

	14000	10000	11000	14000	10000	11000
	(233 l/s)	(167 l/s)	(183 l/s)	(233 l/s)	(167 l/s)	(183 l/s)
Fire Flow Required	(233 l/s)	(167 l/s)	(183 l/s)	(233 l/s)	(167 l/s)	(183 l/s)

As per the "Technical Bulletin ISDTB-2014-02 - Revisions to Ottawa Design Guidelines - Water", single dwellings or traditional side-by-side town comply with the provision of the Bulletin; therefore the required fire flow is 10,000 l/min

APPENDIX "D"

Roll of Plans

Separate from report (Supplied as a roll of plans)

240801 – ESC1	Erosion Sediment Control Plan
240801 – R1	Removal Plan
240801 – S1	General Plan of Service
240801 – GR1	Grading Plan
240801 – SAN1	Sanitary Drainage Area Plan
240801 – STM1	Storm Drainage Area Plan
240801 – PA1	Ponding Area Plan