



**Trailsedge East Phase 4
Functional Servicing Report**

Stantec Project No. 160401250

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Sign-off Sheet

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) has been commissioned by Richcraft Group of Companies Inc. (Richcraft) to prepare the following Functional Servicing Report for Phase 4 of the Trailsedge East Subdivision in support of a Draft Plan of Subdivision application. The subject property is located northwest of the intersection of Mer Bleue Road and Renaud Road within the southwest quadrant of the Gloucester East Urban Community (EUC) Phase 3 CDP study area in the City of Ottawa. The property is currently zoned Development Reserve (DR) and is bordered by Mer Bleue Road to the east, Phases 1-3 of the Trailsedge East Subdivision to the south, Fern Casey Street to the west, and a proposed BRT and hydro corridor along Brian Coburn Boulevard to the north. The property is indicated in **Figure 1** below. Phase 4 comprises approximately 26.3 ha of land, with proposed development consisting of 136 single family units, 144 townhomes, 116 Back-to-Back townhomes, and 292 mixed-use residential units. In addition, commercial development and light industrial development within the mixed-use area has been proposed for Block 198 and Block 195, respectively. A 0.43Ha community park will be established within Phase 4 of the development. The Trailsedge East Block 193-194 preliminary servicing analysis has been conducted independently of Phase 4, the results of which have been considered and integrated into the overall servicing analysis.

The intent of this report is to build on the servicing principles outlined in the Master Servicing Study (MSS) for East Urban Community Phase 3 Area Community Design Plan (DSEL June 2020) to create a servicing strategy specific to the subject property. The report will establish criteria for future detailed design of the subdivision, in accordance with the associated background studies, City of Ottawa Guidelines, and all other relevant regulations.

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Introduction

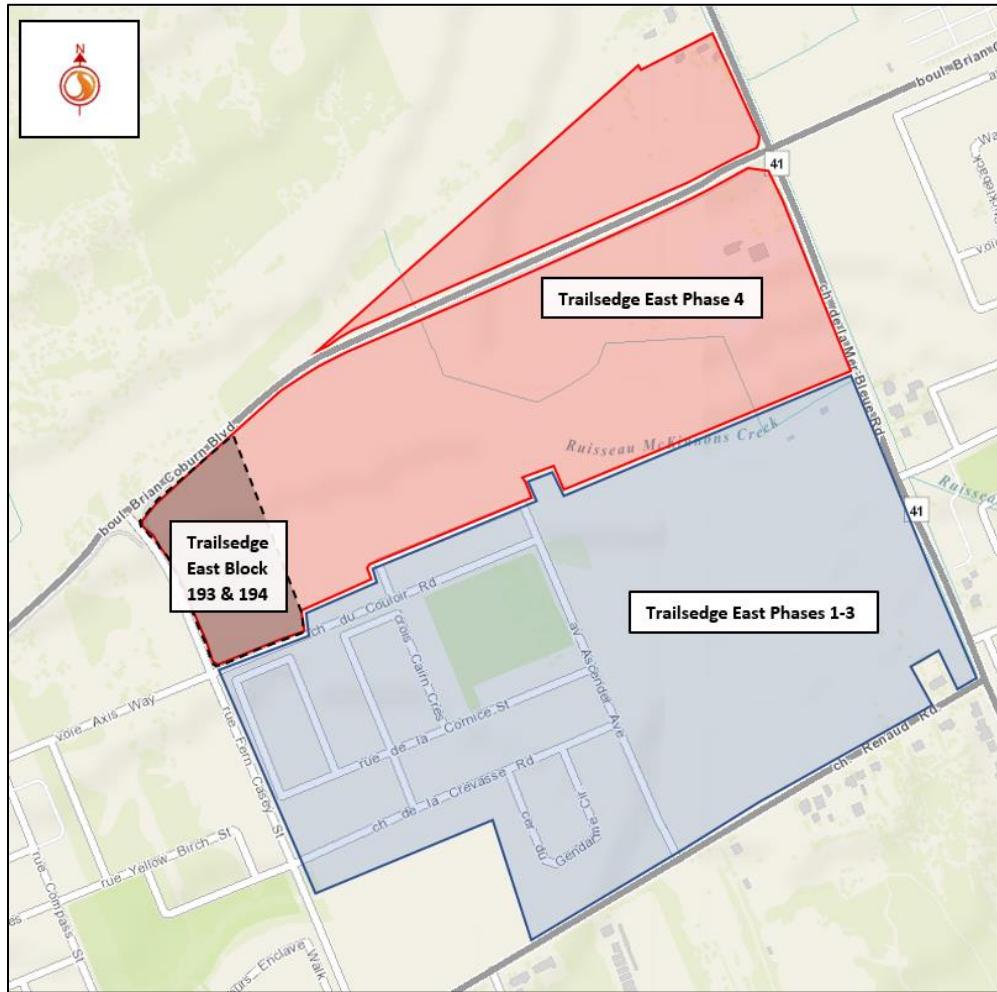


Figure 1: Key Map of Trailsedge East Subdivision

References

2.0 REFERENCES

The following documents were referenced in the preparation of this report:

- Gloucester East Urban Community (EUC) Infrastructure Servicing Study Update (In Support of the EUC Community Design Plan), Stantec Consulting Ltd., March, 2005.
- Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing, Stantec Consulting Ltd., July, 2006.
- East Urban Community Pond No.1 Design Brief, Stantec Consulting Ltd., April 2008.
- Geotechnical Investigation – Proposed Residential Development Eden Park – East Portion – Renaud Road, Paterson Group Inc., November 15, 2016.
- Proposed Trailsedge East Development Community Transportation, Castleglenn Consultants, October 2016.
- Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1 for the Trailsedge Subdivision, David Schaeffer Engineering Ltd., December 2012.
- Stormwater Management Report for the Trailsedge West Subdivision, J.F. Sabourin and Associates Inc., January 2015.
- Trailsedge Subdivision / Proposed Modification of Mud Creek Channel Between Belcourt Extension and Compass Street, J.F. Sabourin and Associates, January 2015.
- Design Brief for the Trailsedge West, David Schaeffer Engineering Ltd., January 26, 2015.
- Design Brief – Minto Trailsedge Phase II, IBI Group, February 2015.
- City of Ottawa Sewer Design Guidelines, City of Ottawa, 2014 (and all subsequent technical bulletins).
- City of Ottawa Design Guidelines – Water Distribution, Infrastructure Services Department, City of Ottawa, First Edition, July 2010 (and all subsequent technical bulletins).
- East Urban Community (EUC) Phase 3 Master Servicing Study, David Schaeffer Engineering Ltd. (DSEL), June 2020.
- Trailsedge East – Functional Servicing Report, Stantec Consulting Ltd., August 2017.
- Trailsedge East Phase 1 – Detailed Servicing and Stormwater Management Report, Stantec Consulting Ltd., August 2019.
- Trailsedge East Phase 2-3 – Detailed Servicing and Stormwater Management Report, Stantec Consulting Ltd., December 2020.
- Trailsedge East Block 193-194 – Servicing and Stormwater Management Report, Stantec Consulting Ltd., December 2020.

3.0 POTABLE WATER SERVICING

3.1 EXISTING CONDITIONS

The proposed development is located within Zone 2E of the City of Ottawa’s water distribution system. This zone is fed by the Forest Ridge Pump Station, with the Innes Road elevated storage tank providing balancing storage for peak flows and demands. A 300mm diameter watermain exists along Ascender Avenue and Couloir Road immediately south of the Trailsedge East Phase 4 development area, and a 400mm diameter main exists along Mer Bleue Road between Renaud Road and Brian Coburn Boulevard, and north of the Hydro One Corridor (HEPC). 400mm and 600mm watermains exist further north along Innes Road. A 600mm watermain also exists north of the site along the HEPC.

3.2 PROPOSED WATERMAIN SIZING AND LAYOUT

The proposed watermain alignment and sizing for the development is shown on **Drawing WTR-1** with 203mm diameter and 305mm diameter watermain following the alignment of the road network within the subject property. Similarly to the assumptions made in the East Urban Community Phase 3 Area Master Servicing Study (DSEL, 2020), the proposed network considers existing connections to the watermains within Fern Casey Street and Mer Bleue Boulevard from Phases 1-3 of the Trailsedge East development continuing to a 300mm watermain loop from Alpenstock Avenue and Ascender Avenue extending to the mixed-use area north of Brian Coburn. The watermain network plan from the master servicing study is included in **Appendix A**. The pipe layout and sizing for the development is preliminary and is to be verified upon detailed hydraulic analysis for the development.

3.2.1 Connection to Existing Infrastructure

Potable water supply for Phase 4 of the Trailsedge East Subdivision is to be provided via existing mains located on Couloir Road, d’Arête Way, Ascender Avenue. Additionally, connections to future mains located on the north end of Crux Road, and the north end of Alpenstock Avenue have been proposed to service the development. **Drawing WTR-1** shows the location of the connection points to the existing and proposed infrastructure.

3.2.2 Ground Elevations

The proposed ground elevations of the development range from approximately 88.3m and 89.8m. Preliminary grading and elevations have been determined for the site and included on **Drawing GP-1**.

3.2.3 Domestic Water Demand

Phase 4 of the Trailsedge East Development contains a total of 136 single family units, 144 townhome units, 116 Back-to-Back townhome units, and 292 apartment style units providing an estimated population of 1,620 persons. Phase 4 will include parcels for commercial development and mixed-use development. The future Mixed-Use development is expected to contribute both commercial and residential flows to

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overall demands. Commercial demand flowrates will be applied to half the Mixed-Use area, and residential demand flowrates will be applied to the remaining half of the parcel area as per assumptions made in the MSS.

Domestic water demands for the development were estimated using the City of Ottawa's Water Distribution Design Guidelines. For residential developments, the average day (AVDY) per capita water demand is 350 L/cap/d. For maximum day (MXDY) demand, AVDY was multiplied by a factor of 2.5 and for peak hour (PKHR) demand, MXDY was multiplied by a factor of 2.2. For commercial and institutional use, the AVDY is based on the area of land use and is shown in the following tables. For MXDY demand, AVDY was multiplied by a factor of 1.5 and for PKHR demand, MXDY was multiplied by a factor of 1.8. The calculated residential water consumption, and commercial and future mixed-use water consumption is represented in **Table 1** and **Table 2**, respectively:

Table 1: Residential Water Demands

Unit Type	Units	Person/Unit	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Singles	136	3.4	462	1.9	4.7	10.3
Townhomes	144	2.7	389	1.6	3.9	8.7
Back-to-Back Townhomes	116	2.7	313	1.3	3.2	7.0
Mid-High Density (B 193/194)	186	2.4	445	1.8	4.5	9.9
Apartments (MU Residential)	292	1.8	526	2.1	5.3	11.7
TOTAL:	874		2135	8.7	21.6	47.6

Table 2: Commercial & Mixed-Use Area (MUC) Water Demands

Land Use Type	Daily Rate of Demand (L/ha/day)	Area	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Commercial (Block 198)	35,000	4.25	1.7	2.6	4.6
Commercial (Block 195)	28,000	3.52	1.1	1.7	3.1
TOTAL:			2.9	4.3	7.7

3.3 LEVEL OF SERVICE

3.3.1 Allowable Pressures

The City of Ottawa Water Distribution Design Guidelines state that the desired range of system pressures under normal demand conditions (i.e. basic day, maximum day and peak hour) should be in the range of 350 to 552 kPa (50 to 80 psi) and no less than 275 kPa (40 psi) at the ground elevation in the streets (i.e. at hydrant level). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way is 552 kPa (80 psi). As per the Ontario Building Code (OBC) & Guide for Plumbing, if pressures greater than 552 kPa (80 psi) are anticipated, pressure relief measures are required. The

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maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). Under emergency fire flow conditions, the minimum pressure objective in the distribution system is 138 kPa (20 psi).

3.3.2 Fire Flow

The Master Servicing Study model applied a uniform fire flow requirement of 15,000L/min (250L/s) for the EUC Phase 3 Area CDP to size trunk infrastructure. The estimate provided is considered both conservative and representative of the different land uses in Phase 4 of the development and ensures that local distribution mains are limited to 200mm in diameter. As per the report: *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018), included in Appendix B of the MSS, the modelling results indicate that the development can be adequately serviced by the proposed watermain network. As outlined in the MSS, the distribution system will meet the minimum and maximum service pressure criteria under normal domestic flow delivery, and emergency fire flow conditions.

A site-specific analysis using the Fire Underwriters Survey (FUS) methodology found a maximum fire flow of 13,000 L/min (217 L/s) for Phase 4 of the Trailsedge East Subdivision using 5-unit clusters of back-to-back townhomes. Back-to-back townhome blocks containing 10 or more units will be required to maintain a minimum 2-hour fire separation between unit clusters. Refer to **Appendix A** for FUS fire flow calculations for typical connected back-to-back townhouse requirements.

As per the City's technical bulletin ISDTB-2014-02 (City of Ottawa, 2014), fire flow shall be capped at 10,000 L/min for traditional side-by-side townhomes constructed in accordance with the OBC and with a minimum separation of 10 meters between the back of adjacent units. According to the assumptions and analysis outlined within the MSS, the proposed watermain network is expected to adequately service Phase 4 of the development.

3.4 POTABLE WATER SUMMARY

The proposed piping alignment and sizing can achieve the required level of service within Phase 4 of Richcraft's Trails Edge East subdivision. Based on the hydraulic analysis created at the Master Servicing level, the following conclusions were made:

- The proposed water distribution system is recommended to include a combination of 305mm and 203mm diameter pipes;
- During peak hour conditions, the proposed system is capable of operating above the minimum pressure objective of 275kPa (40psi);
- During fire conditions, the proposed system can provide sufficient fire flows (15,000L/min and above) while maintaining a residual pressure of 138kPa (20 psi) in Phase 4 of the Trailsedge East development. Sizing of internal mains on local streets will be coordinated to ensure a minimum fire flow of 10,000 L/min may be achieved.

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

As indicated in the Master Servicing Study (MSS) for EUC Phase 3 Area CDP, wastewater servicing for the Trailsedge East Development is conveyed to the Forest Valley Trunk Sewer (FVT) via a free flow gravity trunk running along Renaud Road to the Forest Valley Pumping Station. The MSS outlines the sanitary servicing requirements for the subject property, which identify an integrated network within Minto and further Richcraft lands to the west, eventually connecting to the newly constructed 600 mm trunk sewer extension along Renaud Road recommended by the MSS. The Trailsedge East Phase 1 – Servicing and Stormwater Management Report further detailed assumed contributing flows from Phase 4 through sewers on Ascender and Arete Way. The Sanitary Drainage Plan and sanitary sewer design sheet for the existing Trailsedge East Phase 1 development is included in **Appendix B**.

The Design Brief – Minto Trailsedge Phase II report (IBI Group, 2015) identifies an external contribution to their subdivision based on a future population of 4,212, which includes drainage from the entirety of the Trailsedge East development phases 1-4, as well as future lands forming a mixed-used community (MUC) identified within the EUC MSS.

4.2 DESIGN CRITERIA

As outlined in the City's Sewer Design Guidelines, the following design parameters were used to calculate estimated wastewater flow rates and to preliminarily size on-site sanitary sewers:

- Minimum Full Flow Velocity – 0.6 m/s
- Maximum Full Flow Velocity – 3.0 m/s
- Manning's roughness coefficient for all smooth walled pipes – 0.013
- Single Family Persons per unit – 3.4
- Townhouse Persons per unit – 2.7
- Extraneous Flow Allowance – 0.33 L/s/ha
- Residential Average Flows – 280 L/cap/day
- Commercial/Mixed Use Flows – 35,000 L/ha/day
- Harmon Correction Factor – 0.8
- Maintenance hole Spacing – 120 m
- Minimum Cover – 2.5 m

In addition, a residential peak factor based on Harmon's Equation was used to determine the peak design flows. Institutional and commercial areas were assigned a peaking factor of 1.5 where commercial areas contribute greater than 20% of the total tributary area to each sanitary sewer per Ottawa's Sewer Design Guidelines.

4.3 PROPOSED SERVICING

Phase 1 of the Trailsedge East Subdivision is currently serviced by a network of gravity sewers which direct wastewater flows westerly to the trunk sewer within Fern Casey Street within the adjacent Minto development. Sanitary sewers within Phase 4 of the Trails Edge East Subdivision are to flow westerly and connect to the sanitary sewer network established in Phase 1. Flows from mixed use lands to the north will be conveyed through Phase 4 sewers crossing Brian Coburn Boulevard under direction of the MSS. The proposed sanitary sewer design sheet and associated Sanitary Drainage Area Plan can be found in **Appendix B & Appendix E**. The proposed sanitary sewer design indicates two (2) connection points to the recently constructed sanitary sewers within Phase 1.

The connection points and associated flows are summarized in **Table 3** below. Allocated flows for the available connection points based on the EUC Phase 3 MSS are noted in **Table 4**.

Table 3: Wastewater Connections to Existing Network

MH ID	Residential Area (ha)	Commercial Area (ha)	Residential Population	Total Flow (L/s)	Sewer Dia. (mm)
101	3.30	0.00	513	6.7	200
104	17.82	7.78	1623	29.6	375
Total	21.12	7.78	2136	36.3	

Table 4: Wastewater Connections per EUC Phase 3 MSS

MH ID	Total Area (ha)	Commercial Area (ha)	Residential Population	Total Flow (L/s)	Sewer Dia. (mm)
302A	2.28	0.00	27	-	375
302A	19.28	7.98	798	-	375
Total	21.56	7.98	2392	38.1	

Based on sanitary sewer design sheets for downstream areas as provided in the Trailsedge East Phase 1 Servicing Report (Stantec, 2019), peak flows from the proposed development and upstream contributing areas can be accommodated within the downstream sewer network.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The objective of this stormwater management plan is to determine the measures necessary to control the quantity/quality of stormwater released from the proposed development to criteria established in the *Master Servicing Study (MSS) for East Urban Community Phase 3 Area Community Design Plan* and the earlier *Trailsedge East Functional Servicing Report* (Stantec, August 2017)

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), through the various background documents and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff. (City of Ottawa).
- Assess impact of 100-year event and climate change event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa).

Storm Sewer & Inlet Controls

- Proposed site to discharge the existing storm sewer stubs at Ascender Avenue (Stantec).
- Minor system inflow to be restricted for all contributing areas to capture at minimum the 2-year event for local streets, or to the 5-year event along proposed collector roads (City of Ottawa).
- Boundary conditions for the site outlets per PCSWMM model prepared for Trailsedge East Phase 1 Subdivision (Stantec).
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).
- Climate Change event HGL to be below building foundation footing (City of Ottawa)

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.15 m above the 100-year water level within adjacent ROWs (City of Ottawa).
- No overland flow was originally accounted for to Ascender Avenue from Phases 2-3 up to the 100-year event. Overland flow allowances made to Ascender Avenue for climate change (100yr+20%) event (Stantec).
- Subdivision to provide sufficient storage to contain at minimum 30 m³/ha (IBI/JFSA).
- No surface ponding is to be permitted on local roads during the 2-year storm event, and no surface ponding is to be permitted on collector roads during the 5-year storm event (City of Ottawa).
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.35m for design storm events (i.e. up to 100-year storm) (City of Ottawa).

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- Minimum clearance depth of 0.30m to be provided from rear yard spill elevation to the ground elevation at the adjacent building envelope (City of Ottawa).
- Minimum clearance depth of 0.15m to be provided from spill elevations within the proposed rights-of-way to building envelopes in proximity of overland flow routes or ponding areas.
- Water must not encroach upon proposed building envelopes and must remain below all proposed building openings during the climate change event (City of Ottawa).
- Provide adequate emergency overflow conveyance off-site (City of Ottawa).
- No rear-yard ponding volumes to be accounted for in SWM model preparation (City of Ottawa).
- The product of depth times velocity on streets not to be greater than 0.6 during the 100-year storm (City of Ottawa).
- Major and minor flow to be conveyed to SWM pond 1 for quality (70% TSS Removal) and quantity control (EUC MSS).

5.3 STORMWATER MANAGEMENT DESIGN

The site is to be designed using the “dual drainage” principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 2-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely off site without impacting proposed or existing downstream properties.

In keeping with the 2-year inlet restriction criterion (5-year for collector streets, 10-year for arterial roads), inlet control devices (ICDs) or orifice plates will be specified during the detailed design stage for all street and rear yard catchbasins to limit the inflow to the minor system. Restricted inlet rates to the sewer are necessary to prevent the hydraulic grade line from surcharging storm sewers into basements during major storms.

Drawing STM-1 outlines the proposed storm sewer alignment and drainage divides. The major system flows generated from larger events will be safely conveyed to Belcourt Boulevard via Couloir Road and ultimately SWM Pond 1 by engineered (overland) channels such as roadways and walkways. Details of overland flow routes to SWM pond 1 through further Richcraft and Minto owned lands can be found in the Master Servicing Study (MSS) for EUC Phase 3 Area CDP. Per the requirements noted in the PCSWMM model prepared as part of the Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, 2019), it is intended to convey major system flows to the boundary of Phase 1 lands and provide additional minor system inlets to limit major system spillage to Couloir Road, and to ensure a maximum depth of flow of 0.35m (including static storage depths) as necessary to meet current City of Ottawa SWM criteria.

The minor system from the proposed subdivision will be conveyed and modeled up to the point of discharge to existing stubs on Arete Way and Ascender Avenue (see **Drawing STM-1** for locations). Pond 1 has been designed and sized to permit servicing of the proposed development area per DSEL’s Design Brief for the Reconstruction of the East Urban Community Stormwater Management Pond 1, and verified within the EUC Phase 3 MSS (see **Appendix C**). Per the report, Pond 1 infrastructure is sufficient to service the development in the interim prior to construction of Brian Colburn Boulevard and the future Transitway. Mixed Use developments to the north including portions of the future Brian Colburn Boulevard are expected to be serviced through the Trails Edge East development, along with an anticipated stub drop-off location at the boundary of Street 28 and Brian Coburn. Per the Phase 1 Servicing and Stormwater Management

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Stormwater Management

Report, external lands serviced through Trails Edge East are expected to provide sufficient surface storage to contain the 100-year storm event within their respective areas.

As demonstrated within the storm design sheet included within **Appendix C**, anticipated AxC values for the development (22.294) do not exceed that previously assumed for capture via Phase 1 storm sewers within the PCSWMM model for the region (24.868). As such, downstream infrastructure is assumed to be sufficiently sized for Phase 4 development areas and will be further assessed during detailed design of the subdivision.

The potential effectiveness of at-source (low impact development 'LID') measures in reducing volume of runoff from the proposed development area is limited. The EUC Phase 3 MSS notes that the Mud Creek Cumulative impact study has determined requirement for LIDs in the EUC MUC CDP study area including the following:

- A tree planting program in parkland;
- Using infiltration trenches in backyards of singles and townhomes where feasible;
- Setting right-of-way widths for the majority of local roadways at 18m (not 16.5m) to ensure healthy street trees that will be effective in providing evapotranspiration in post-development conditions.

5.4 DEVIATIONS FROM PREVIOUS STUDIES

The EUC Phase 3 MSS notes that the mid-high density block located adjacent to Fern Casey Boulevard (identified as Blocks 193 and 194 on the current draft plan) were assumed to have a minor system capture rate associated with the 5-year event, and capture area of 2.28ha. The current draft plan indicates the block to have an increased size of approximately 2.60ha, and minor system capture rates have been reduced to that previously assumed in the Trails Edge East Phase 1 Servicing and Stormwater Management Report of the 2-year event at an identical runoff C of 0.80.

Additionally, location of the trunk storm sewer connection to the mixed-use block to the north of the development has been realigned to suit larger proposed rights-of-way on Street 28 to ease conflicts with local sewers and easement requirements at pathway connections adjacent to proposed unit side yards.

Major overland flow paths have also been realigned to suit the proposed road configuration, and optimize grading with respect to anticipated grade raises across the development. As noted in prior studies, the 100-year major system flow from the development is expected to be minimized to suit assumptions made in development of the detailed PCSWMM model for the downstream Phase 1 areas. Major system spillage from events beyond the 100-year event (climate change event) will be modeled to discharge freely to downstream areas. Resultant depths of flow will be assessed at the detailed design stage to ensure no deleterious effects to downstream systems are noted as a result of such flows.

6.0 GRADING AND DRAINAGE

Phase 4 of the Trailsedge East Subdivision measures approximately 26.3 ha in area and has been cleared of topsoil and deleterious material. Phase 4 of the site is expected to be subjected to a soil preloading program as per previous phases of development. As of the writing of this report, Phase 3 is still undergoing a soil preloading program with surcharge material placed throughout the lot footprints, with excess from the preloading program anticipated to be placed within Phase 4.

Historically, the topography across the site has been relatively flat, generally sloping from northeast to southwest, with a cutoff swale at the southern property boundary providing relief to the existing Trailsedge development phases from external flows progressing overland from the east. As part of the earthworks program for Phase 2-3, a drainage ditch just north of Phase 3 was created to carry flows from east to west. The ditch ultimately outlets into a catch basin just northeast of the Fern Casey Street and Couloir Road intersection.

The objective of the grading design strategy is to satisfy the stormwater management requirements, adhere to permissible grade raise restrictions where possible (**see Section 9**) for the site, and provide for minimum cover requirements for storm and sanitary sewers. The grading design also follows the recommendations outlined in the EUC Phase 3 MSS where possible, and endeavors to provide an overland route at the southern phase boundary to the existing Trailsedge East Phase 1 rights-of-way.

As mixed use lands to the north of Brian Coburn will not be able to discharge overland to the remainder of the Trails Edge development, major system runoff from the 100-year storm event will be required to be retained on site and released slowly to the minor system. An emergency overland flow route will be provided to Brian Coburn / Mer Bleue per requirements outlined in the MSS.

Refer to grading plan **Drawing GP-1** for conceptual grading plans of the development.

Approvals

7.0 APPROVALS

An Environmental Compliance Approval (ECA) from the Ontario Ministry of Environment, Conservation, and Parks (MECP) will be required for the proposed Phase 4 servicing works related to inlet control devices, storm sewers and sanitary sewers (Transfer of Review). The Rideau Valley Conservation Authority (RVCA) and South Nation Conservation Authority (SNCA) will be circulated on detailed design submissions prior to MECP ECA submission and municipal approval of the subdivision. DFO/RVCA approval has already been given with regards to fish habitat compensation for the Mud Creek headwaters during design of Trailsedge West.

An MECP Permit to Take Water (PTTW) may be required for the development if more than 400,000 L/day of ground or surface water is to be pumped during the construction works. If between 50,000 L/day and 400,000 L/day are expected to be pumped during the construction works, registration on the Environmental Activity and Sector Registry (EASR) are required. The geotechnical consultant shall confirm prior to construction whether a PTTW or EASR registry are required for construction dewatering purposes.

8.0 EROSION CONTROL DURING CONSTRUCTION

In order to protect downstream water quality and prevent sediment build up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Provide sediment traps and basins during dewatering works.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing EC-1** for the proposed location of silt fences, straw bales and other erosion control structures.

9.0 GEOTECHNICAL CONSIDERATIONS AND GRADING

9.1 GEOTECHNICAL INVESTIGATION

A geotechnical existing conditions report for the development was completed by Paterson Group on July 7, 2019, which expanded on the previously prepared geotechnical investigation reports for Eden Park – East Portion – Renaud Road and Trailsedge East – Renaud Road, which were prepared on December 29, 2008 and July 26, 2018 (Paterson Group), respectively. Field testing throughout the subject site of the Trailsedge development was completed in October 2008. Excerpts from the geotechnical existing conditions report are included in **Appendix D**.

The subsurface profile within the Trailsedge East Phase 4 lands consists of a shallow bedrock and deep silty clay deposits. More specifically, the shallow bedrock was found beneath a cultivated organic zone/topsoil overlain by a silty sand, and/or a clayey silt layer within the north portion of the site. The remainder of the subject site was underlain by a sensitive silty clay deposit.

Groundwater levels, determined via piezometers, varied in depths ranging from 0.2 to 6.3m below original ground surface (elevations of 86.8 to 87.62 m) based on monitoring in October 2008. These groundwater levels can be influenced by surface water perched within the borehole backfill material and are subject to seasonal fluctuations.

A 0.5 to 1.5m permissible grade raise restriction (above original ground surface) is recommended within the Trailsedge East Phase 4 development, per the Paterson Group's permissible Grade Raise Plan (Drawing PG3130-7) in Appendix 2 of the Geotechnical – Existing Conditions Report (Paterson Group).

9.1.1 Recommendations for Settlement/Grade Raise

As outlined in the Geotechnical – Existing Conditions Report (Paterson Group, 2019) the development will be subjected to grade restrictions and residential buildings should be design in accordance with Part 4 of the current Ontario Building Code (OBC). Given permissible grade raise restrictions are expected to be exceeded, the geotechnical recommendations are that preloading with or without surcharge, lightweight fill and/or other measures be considered to reduce the risks of total and differential settlement. Additionally, municipal services within the subject site will be completed mostly through OHSA Type 2 and 3 soils.

In instances where the proposed grade exceeds the permitted grade raise recommendations, the following options have been provided by Paterson Group to adequately support proposed building foundations:

- More reinforcement should be considered in the design of the footings and walls of the concrete foundation to mitigate the risk of cracking, and control joints should be considered within the brick work between the garage and basement.
- Lightweight fill can be used to allow grade raises without substantially impacting the load on the underlying soils.
- Preloading and surcharging the proposed site in localized areas to accelerate the consolidation and settlement process.

9.1.2 Recommendations for Groundwater Control

Groundwater infiltration into excavated areas is expected to be low, given site soil properties, and can typically be controlled via open sumps. In instances where perched groundwater conditions produce high temporary groundwater infiltration levels, pumping from open sumps are expected to sufficiently control groundwater inflows into the excavated area. Under circumstances where the pumping flowrate exceeds 50,000 L/day during construction of the development, a temporary MOE permit to take water will be required.

The surficial geology across the site is primarily glaciomarine clay. The infiltration potential on the subject area is considered to be low to moderate due to the low permeability silty clay and shallow bedrock of relatively high competence. As such, the subject area can be considered as non-conductive to stormwater infiltration and recharge per the *Existing Conditions Report: Hydrogeology: East Urban Community MUC CDP* (Paterson Group, October 2, 2014).

9.2 FUNCTIONAL GRADING PLAN

A Conceptual Grading Plan has been prepared for Phase 4 and is detailed on **Drawing GP-1**. As shown on the grading plan, road grades for Phase 4 exceed the permissible grade raise identified in the Geotechnical - Existing Conditions Report, dated July 7, 2019 (Report No. PG3130-2). As specified above, the geotechnical report allows for grade raises between 0.5m and 1.5m depending on the subsurface soil conditions. Since the proposed grading indicates portions of the site above the permissible grade raise, a surcharge program or lightweight fill program will be required, which will be completed under the direction of a Geotechnical Engineer licensed in Ontario.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 POTABLE WATER SERVICING

The proposed piping alignment and sizing is anticipated to be capable of achieving the level of service in the proposed development:

- During peak hour (PKHR) conditions, the Phase 4 proposed watermain network is expected to operate above the minimum pressure objective of 276 kPa (40 psi);
- The proposed system is capable of providing sufficient fire flow while maintaining a residual pressure of 138kPa (20 psi) in all areas based on hydraulic analysis done at the Master Servicing level. A final hydraulic analysis is to be completed at time of detailed design;
- As the Richcraft development proceeds eastwards, additional water transmission and available fire flows may necessitate connection to the 600mm diameter trunk watermain within the HEPC, as determined by detailed hydraulic analysis for the current phase of development.

10.2 WASTEWATER SERVICING

The Trailsedge East subdivision will be serviced by a network of gravity sewers which will direct wastewater flows westerly through the Fern Casey Street sewer, and ultimately to Renaud Road and the Forest Valley Pumping Station. Mixed use lands to the north of Brian Coburn Boulevard will also be conveyed through the subject property as directed in the MSS. The proposed sanitary sewer design for Phase 4 indicates two (2) connection points to the existing sewer network within Trailsedge East Phase 1. The connection points generate a total estimated peak outflow of **36.3L/s**. The preferred cover requirement of 2.5 m for the sanitary sewer system has been satisfied in all locations, and requirements for slope and velocities have been met within the local internal sewers. Downstream sewers have been adequately sized to receive peak sanitary discharge from the proposed subdivision.

10.3 STORMWATER MANAGEMENT

The proposed stormwater management plan is in compliance with the goals specified in the background reports and the 2012 City of Ottawa Sewer Guidelines:

- Inlet control devices are proposed to limit inflow from the site area into the minor system to the 2-year storm event (5-year event for collector roads) based on City of Ottawa IDF curves;
- The storm sewer hydraulic grade line will be maintained at least 0.30 m below the underside of footing in the subdivision and downstream properties during design storm events;
- All dynamic surface water depths are to be less than or equal to 0.35 m during all design storm events up to the 100-year event;
- The downstream SWM Pond 1 has sufficient volume capacity to receive runoff volumes from the proposed site and provide the required water quantity and quality control as outlined in the SWM facility design report submitted by others.
- Mixed use properties north of Brian Coburn Boulevard will be required to provide on-site storage to contain the 100-year event within their respective areas while restricting minor system inflows to the 2-year/5-year design event as appropriate. Major system flow from the climate change event can be accommodated through rights-of-way within Phase 1.

TRAILSEGE EAST PHASE 4 – FUNCTIONAL SERVICING REPORT

Conclusions And recommendations

10.4 GRADING

The grading for this site has been designed to allow for an emergency overland flow outlet to downstream rights-of-way as per City standards and to minimize the grade raise per restrictions as recommended by the Geotechnical Investigation by Paterson Group (July 2019).

10.5 APPROVALS/PERMITS

An MECP Environmental Compliance Approval (ECA) is required for the installation of the proposed storm and sanitary sewers within the site under the MECP's transfer of review program. A Permit to Take Water or registration on the EASR may be required for dewatering works during sewer/watermain installation pending confirmation by the geotechnical consultant. The Rideau Valley Conservation Authority and South Nation Conservation Authority will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.

APPENDICES

Appendix A : POTABLE WATER SERVICING

A.1 DOMESTIC WATER DEMAND CALCULATIONS

Trailsedge East Phases 4 - Domestic Water Demand Estimates

Densities as per City Guidelines:		
Singles	3.4	ppu
Townhomes	2.7	ppu
Back-to Back Townhomes	2.7	ppu
Apartments	1.8	ppu

Phase 4

Building ID	Area (m ²)	Population	Daily Rate of Demand (L/cap/day)	Daily Rate of Demand (L/ha/day)	Avg Day Demand ²		Maximum Day Demand ²		Peak Hour Demand ²	
					(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Singles	-	462	350		112.4	1.9	281.0	4.7	618.1	10.3
Towns	-	389	350		94.5	1.6	236.3	3.9	519.8	8.7
Back-to-Back Townhomes		313	350		76.1	1.3	190.3	3.2	418.7	7.0
Mid-High Density B193/194		445	350		108.3	1.8	270.6	4.5	595.4	9.9
Commercial	4.25			35,000	103.3	1.7	154.9	2.6	278.9	4.6
Mixed-Use										
• MU Residential Portion	3.52	526	350		127.8	2.1	319.6	5.3	703.2	11.7
• MU Commercial Portion	3.52			28,000	68.4	1.1	102.7	1.7	184.8	3.1
TOTAL:		2136			691	11.5	517	25.9	1138	55.3

TRAILSEDGE EAST PHASE 4		
Scenario	Demand	
	L/min	L/s
Average Daily Demand	691	11.5
Maximum Daily Demand	517	25.9
Peak Hour Demand	1138	55.3
Fire Flow Demand (refer to FUS sheet)	13000	217

1 Average day water demand for residential areas equal to 350 L/cap/d

2 The City water demand criteria used to estimate peak demand rates for residential areas are as follows:
 maximum day demand rate = 2.5 x average day demand rate for residential
 peak hour demand rate = 2.2 x maximum day demand rate for residential

3

Unit Type	Units	Person/Unit	Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Singles	136	3.4	462	1.9	4.7	10.3
Townhomes	144	2.7	389	1.6	3.9	8.7
Back-to-Back Townhomes	116	2.7	313	1.3	3.2	7.0
B 193/194	186	2.4	445	1.8	4.5	9.9
Apartments (MU Portion)	292	1.8	526	2.1	5.3	11.7
TOTAL:	874		2135	8.7	21.6	47.6

Land Use Type	Daily Rate of Demand	Area	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Commercial ¹	35,000	4.25	1.7	2.6	4.6
Commercial (MU Portion)	28,000	3.52	1.1	1.7	3.1
TOTAL:			2.9	4.3	7.7

¹ Commercial calculations based on L/cap/day criteria

A.2 FUS CALCULATION SHEETS



FUS Fire Flow Calculation Sheet

Stantec Project #: 160401250
 Project Name: Trailledge East Phase 4
 Date: 2/2/2021

Fire Flow Calculation #: 1
 Description: Back-to-Back 10-Unit Townhouse Block (Block 151)

Notes: Case 1: 3-storey building with basement. Back-to-back townhouse units (on Street No. 23 and Street No.25). Building Classification C. 2-hour firewall provided vertically down the middle of the building, separating building into 5-unit sections.

Step	Task	Notes	Value Used	Req'd Fire Flow (L/min)					
1	Determine Type of Construction	Wood Frame	1.5	-					
2	Determine Ground Floor Area of One Unit	Approx. area of a single storey of a single unit	54	-					
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	5	-					
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	3	-					
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min	-	9000					
5	Determine Occupancy Charge	Limited Combustible	-15%	7650					
6	Determine Sprinkler Reduction	None	0%	0					
		Non-Standard Water Supply or N/A	0%						
		Not Fully Supervised or N/A	0%						
		% Coverage of Sprinkler System	0%						
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	0 to 3	8.5	3	0-30	Wood Frame or Non-Combustible	22%	4973
		East	0 to 3	31	3	91-120	Wood Frame or Non-Combustible	25%	
		South	20.1 to 30	8.5	3	0-30	Wood Frame or Non-Combustible	8%	
		West	20.1 to 30	31	3	91-120	Wood Frame or Non-Combustible	10%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min						13000	
		Total Required Fire Flow in L/s						216.7	
		Required Duration of Fire Flow (hrs)						2.50	
		Required Volume of Fire Flow (m ³)						1950	



FUS Fire Flow Calculation Sheet

Stantec Project #: 160401250
 Project Name: Trailsedge East Phase 4
 Date: 2/2/2021

Fire Flow Calculation #: 2

Description: Back-to-Back 10-Unit Townhouse Block (Block 171)

Notes: Case 2: 3-storey building with basement. Back-to-back townhouse units (on Street No. 27). Building Classification C. 2-hour firewall provided vertically down the middle of the building, separating building into 5-unit sections.

Step	Task	Notes	Value Used	Req'd Fire Flow (L/min)					
1	Determine Type of Construction	Wood Frame	1.5	-					
2	Determine Ground Floor Area of One Unit	Approx. area of a single storey of a single unit	54	-					
	Determine Number of Adjoining Units	Includes adjacent wood frame structures separated by 3m or less	5	-					
3	Determine Height in Storeys	Does not include floors >50% below grade or open attic space	3	-					
4	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min	-	9000					
5	Determine Occupancy Charge	Limited Combustible	-15%	7650					
6	Determine Sprinkler Reduction	None	0%	0					
		Non-Standard Water Supply or N/A	0%						
		Not Fully Supervised or N/A	0%						
		% Coverage of Sprinkler System	0%						
7	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	-	-
		North	0 to 3	8.5	3	0-30	Wood Frame or Non-Combustible	22%	5738
		East	0 to 3	30.2	3	91-120	Wood Frame or Non-Combustible	25%	
		South	0 to 3	8.5	3	0-30	Wood Frame or Non-Combustible	22%	
		West	20.1 to 30	30.2	3	91-120	Wood Frame or Non-Combustible	10%	
8	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min							13000
		Total Required Fire Flow in L/s							216.7
		Required Duration of Fire Flow (hrs)							2.50
		Required Volume of Fire Flow (m ³)							1950

A.3 EXCERPTS FROM BACKGROUND REPORTS

	Innes Road and 300 mm diameter watermain on Vanguard Drive.	diameter watermain on Vanguard Drive.	Innes Road and 300 mm diameter watermain on Vanguard Drive.
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The water supply servicing strategy for the North East quadrant is included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results can be found in **Appendix B** and are summarized in **Section 9.6**.

9.3.3 Consideration of Alternative Implementation Details for Servicing Designs

Watermain sizing was reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area, the modelled watermain performance, and the efficient looped network that is proposed, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

9.4 South West Quadrant Preferred Water Servicing Plan

9.4.1 South West Existing Water Supply Servicing

An existing 400 mm diameter watermain exists within the South West quadrant on the future extension of Fern Casey Street. The 400 mm diameter watermain is connected to a 600 mm diameter watermain along the Hydro Corridor north of the quadrant, and a 300 mm diameter watermain on Renaud Road to the south of the quadrant. A network of watermains servicing existing developments exists to the south west of the quadrant and a 400 mm diameter watermain exists on Mer Bleue Road. The surrounding existing watermain network is shown in **Drawing 7**.

9.4.2 South West Water Supply Servicing Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the South West quadrant of the EUC Phase 3 Area study area, which, at the time of the MSU (Stantec, July 2006), was considered a mixed use centre. Per the MSU (Stantec, July 2006), the South West quadrant was to be serviced off of the trunk infrastructure surrounding the quadrant that was identified in the hydraulic model included within the MSU (Stantec, July 2006). See **Appendix C** for details of the hydraulic model included in the MSU (Stantec, July 2006). The model indicates 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road and a 300 mm diameter east-west watermain to the south of the quadrant. Local watermains varying in size from 150 mm to 200 mm diameter are shown to service the South West quadrant off the mains identified above. Fire flows of 108 L/s (6,500 L/min) for residential areas and 217 L/s (13,000 L/min) for non-residential areas were assigned as part of the hydraulic analysis. Per the MSU (Stantec, July 2006), it was recommended that any future work on the water network in the area consider higher fire flows. The South West quadrant was deemed serviceable in the MSU (Stantec, July 2006).

More recently the water supply servicing for the South West quadrant has been considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). The watermain network was updated to reflect an updated road network and projected land uses. Consistent with the MSU (Stantec, July 2006), a network of 150 mm-300 mm diameter watermains was proposed to service the South West

RICHCRAFT HOMES

JUNE 2020
DSEL 14-733

quadrant off the 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road. Per the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), commercial fire flow requirements were consistent with the MSU (Stantec, July 2006) and residential fire flow requirements were refined and taken as 100 L/s (6,000 L/min) for detached single homes and 125 L/s (7,500 L/min) for townhomes. Excerpts from the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) are provided in **Appendix C**.

As part of the approved development application bordering the South West quadrant, the overall water supply servicing strategy for the quadrant has been recently reconsidered. The *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) proposed the South West quadrant be serviced by existing watermains on Mer Bleue Road, Renaud Road and Fern Casey Street (formerly named Belcourt Boulevard), and a proposed 300 mm watermain running through the South West quadrant (consistent with the MSU (Stantec, July 2006)). The Trailsedge East lands are undergoing detailed design & construction per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018) and subsequent reports associated with the development application. Based on the construction of certain lands within the MSU (Stantec, July 2006) hydraulic model, minor deviations from the MSU (Stantec, July 2006) have been proposed within the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) and the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018).

The *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) proposes a network of 300 mm and 200 mm diameter watermains, deviating from the MSU (Stantec, July 2006) use of 150 mm diameter watermains. A minimum watermain diameter of 200 mm is expected to provide the entirety of the South West quadrant with a fire flow of 217 L/s (13,000 L/min), per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). See **Appendix C** for the proposed watermain system and excerpts from the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). Note that while the watermain network is not shown extended into the South West quadrant, the quadrant was taken into consideration using the City of Ottawa's Water Supply Guidelines to estimate the quadrant's water demands.

Per the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015), servicing of the portion of the South West quadrant west of Fern Casey Street was considered in the design of the existing watermains in the area. It was considered to be serviced off the existing watermain network to the south, via a 200 mm diameter watermain stub bordering the block (Axis Way).

Respecting the development applications within the South West quadrant, the proposed water supply servicing strategy is to have 200 mm to 300 mm diameter watermain trunks run through the South West quadrant connecting to existing surrounding watermains. Connections are proposed to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the future watermain network to the south. Note that certain watermains detailed within the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) have been upsized to 300 mm diameter. The landowner to the south has been notified and the larger watermain is to be included in the future phases of Trailsedge East design. The portion of the South West quadrant west of Fern Casey Street is proposed to be serviced by the existing 200 mm diameter watermain stub bordering the block on Axis Way. A required fire flow of 250 L/s (15,000

L/min) was assumed throughout the quadrant, which is considered appropriate for the land uses being proposed.

The proposed watermain network is provided in **Drawing 6**. Note that at this stage of analysis, only the trunk watermain within the quadrant is shown. A network of local watermains is assumed to service the South West quadrant. The details of the local watermain network are subject to change and will be addressed as design of the parcels comprising the South West quadrant advance.

A summary of the Water Supply servicing for the South West quadrant is provided in **Table 10**.

Table 10: Summary of Water Supply Servicing – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Trails Edge East – Functional Servicing Report (Stantec, August 11, 2017) and Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015)	EUC Phase 3 Area CDP MSS (June 2020)
Servicing Strategy	150 mm to 200 mm diameter watermains connecting to the 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road and a 300 mm diameter east-west watermain south of quadrant.	200 mm and 300 mm diameter watermains connecting to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the proposed watermain network to the south. Portion of quadrant west of Fern Casey street to be serviced by 200 mm diameter stub bordering block.	200 mm and 300 mm diameter watermains connecting to the existing 400 mm diameter watermains on Fern Casey Street and Mer Bleue Road via the proposed watermain network to the south. Portion of quadrant west of Fern Casey street to be serviced by existing 200 mm diameter stub off of Axis Way.

The water supply servicing strategy for the South West quadrant was included in the *Hydraulic Capacity and Modelling Analysis East Urban Community Mixed-Use Centre Development* (GeoAdvice, July 2018). Results are summarized in **Section 9.6** of this MSS and in **Appendix B**.

9.4.3 Consideration of Alternative Implementation Details for Servicing Designs

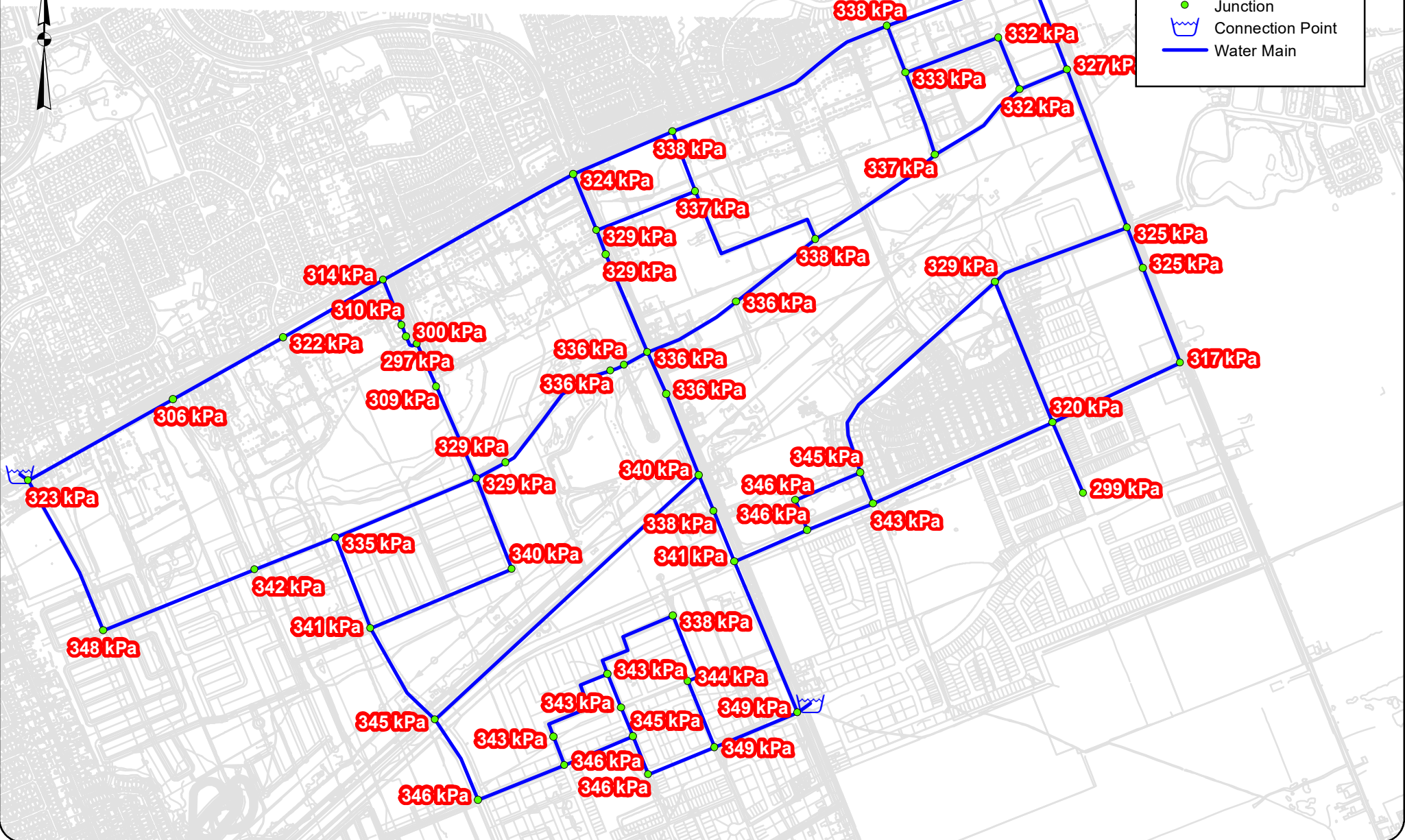
Watermain sizing was reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area, the modelled watermain performance, and the efficient looped network that is proposed, no other logical or efficient alternative designs were advanced for additional analysis and evaluation. Additional connections to the existing 600mm dia watermain within the Hydro Corridor may be pursued as part of detailed design, depending on phasing – see **Section 9.2.3**.

N



Legend

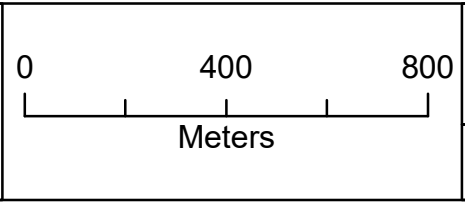
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- Connection Point
- Water Main




GeoAdvice
Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
 Client: **David Schaeffer Engineering Ltd.**
 Date: **July 2018**
 Created by: **AM**
 Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.



PHD Pressure Results

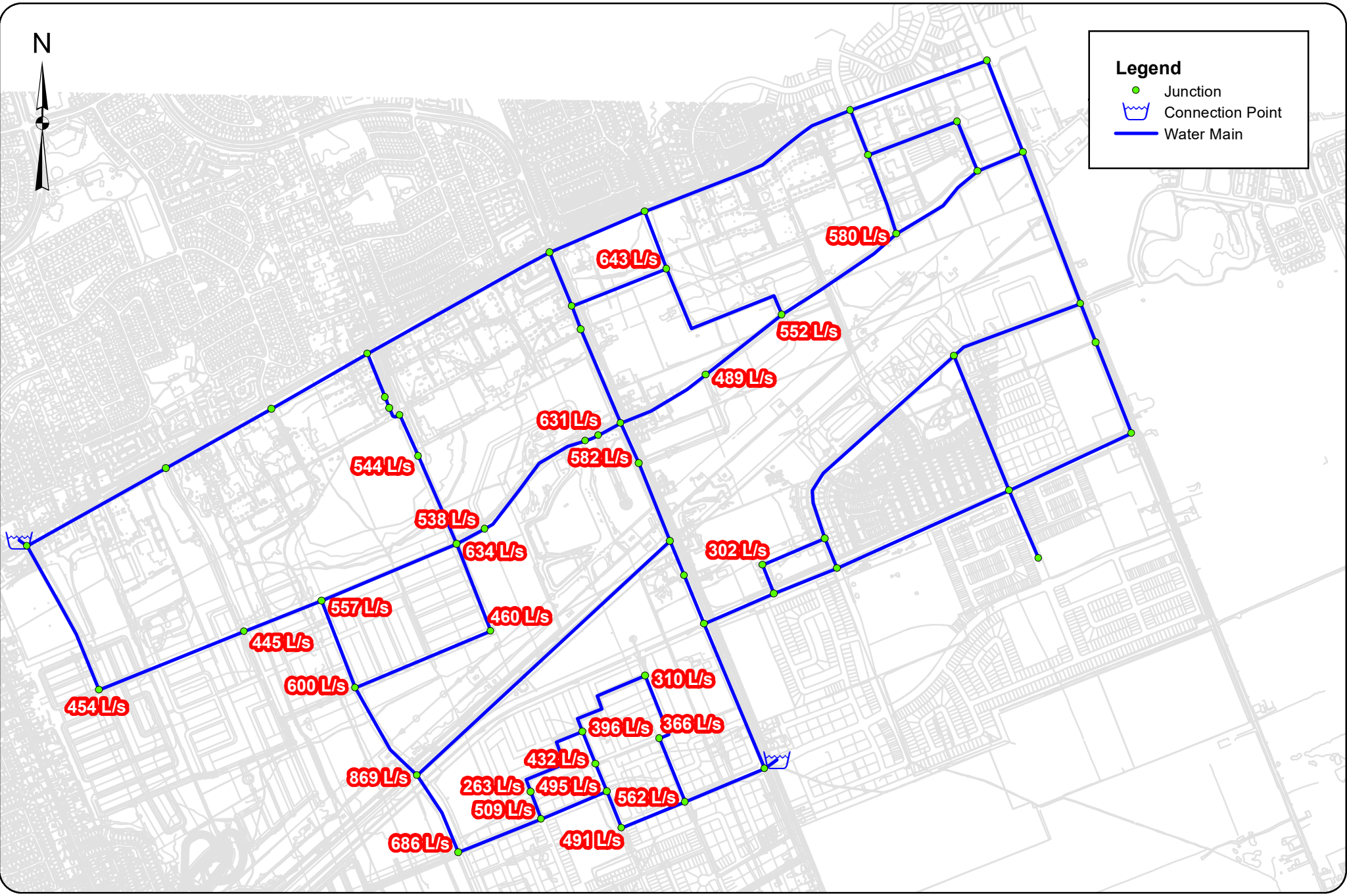
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B35

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Legend

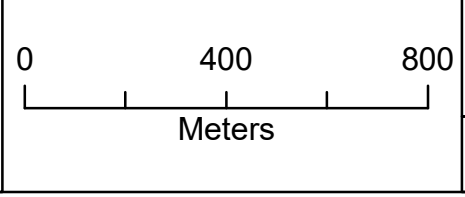
- Junction
- Connection Point
- Water Main



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Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
 Client: **David Schaeffer Engineering Ltd.**
 Date: **July 2018**
 Created by: **AM**
 Reviewed by: **WdS**

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Available Fire Flow @ 20 psi

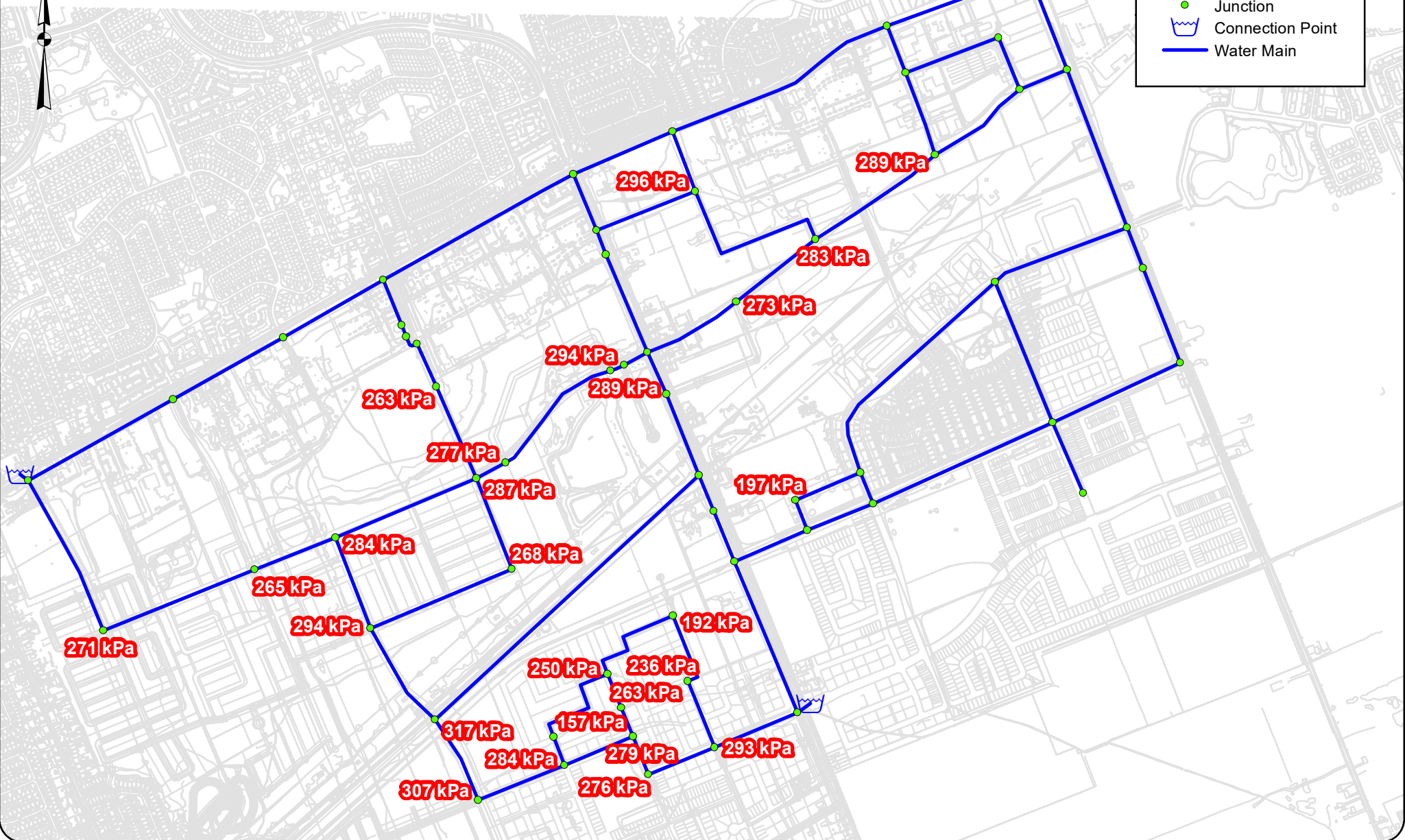
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B38

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Legend

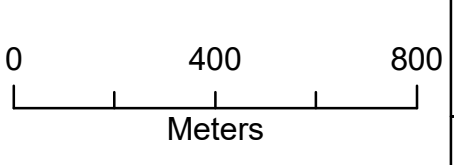
- Junction
- Connection Point
- Water Main



GeoAdvice
Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
 Client: **David Schaeffer Engineering Ltd.**
 Date: **July 2018**
 Created by: **AM**
 Reviewed by: **WdS**

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Residual Pressure @ Required Fire Flow

Figure E.2
B39

Appendix B : WASTEWATER SERVICING

B.1 SANITARY SEWER DESIGN SHEET



SUBDIVISION:
Trailsedge East Phase 4
 DATE: 2/2/2021
 REVISION: 1
 DESIGNED BY: -
 CHECKED BY: -

**SANITARY SEWER
 DESIGN SHEET
 (City of Ottawa)**

FILE NUMBER: 160401250

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

LOCATION AREA ID NUMBER	FROM M.H.	TO M.H.	RESIDENTIAL AREA AND POPULATION								COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H PEAK FLOW (l/s)	INFILTRATION			TOTAL FLOW (l/s)	PIPE									
			AREA (ha)	SINGLE	UNITS TOWN	APT	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)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)		ACCU. AREA (ha)	TOTAL AREA (ha)	ACCU. AREA (ha)		INFILT. FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
R416A	416	415	3.52	0	0	0	526	3.52	526	3.37	5.7	3.52	3.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	7.04	7.04	2.3	10.2	43.4	375	PVC	SDR 35	0.15	62.9	16.24%	0.60	0.36
R415A	415	409	1.01	21	0	0	71	4.53	597	3.35	6.5	0.00	3.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.1	1.01	8.05	2.7	11.3	120.9	375	PVC	SDR 35	0.15	62.9	17.93%	0.60	0.37	
R413A	413	412	1.69	5	57	0	171	1.69	171	3.54	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.69	1.69	0.6	2.5	113.7	200	PVC	SDR 35	0.50	23.6	10.65%	0.74	0.40	
C414A	414	412	0.00	0	0	0	0	0.00	0	3.80	0.0	4.26	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	4.26	4.26	1.4	4.0	41.5	250	PVC	SDR 35	0.30	33.2	12.02%	0.67	0.37	
R412A	412	411	1.58	10	13	0	69	3.27	240	3.49	2.7	0.00	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	1.58	7.53	2.5	7.8	79.5	250	PVC	SDR 35	0.30	33.2	23.45%	0.67	0.45	
R411A	411	410	2.57	34	23	0	178	5.84	418	3.41	4.6	0.00	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	2.57	10.10	3.3	10.5	243.0	250	PVC	SDR 35	0.30	33.2	31.73%	0.67	0.49	
R410A	410	409	0.72	13	0	0	44	6.57	462	3.39	5.1	0.00	4.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.6	0.72	10.82	3.6	11.2	73.8	250	PVC	SDR 35	0.30	33.2	33.83%	0.67	0.51	
	409	405	0.00	0	0	0	0	11.10	1059	3.23	11.1	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	18.87	6.2	22.0	84.0	375	PVC	SDR 35	0.15	62.9	35.04%	0.60	0.46	
R407A	407	406	1.05	6	22	0	80	1.05	80	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.05	1.05	0.3	1.3	97.7	200	PVC	SDR 35	0.50	23.6	5.43%	0.74	0.33	
R406A	406	405	1.37	12	28	0	116	2.42	196	3.52	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.37	2.42	0.8	3.0	128.6	200	PVC	SDR 35	0.50	23.6	12.85%	0.74	0.42		
R408A	408	405	0.73	0	29	0	78	0.73	78	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.73	0.73	0.2	1.2	108.8	200	PVC	SDR 35	0.50	23.6	4.90%	0.74	0.32		
	405	404	0.00	0	0	0	0	14.24	1334	3.17	13.7	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	22.02	7.3	25.7	79.0	375	PVC	SDR 35	0.15	62.9	40.89%	0.60	0.48	
R404A	404	403	1.80	35	0	0	119	16.05	1453	3.15	14.8	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	1.80	23.82	7.9	27.4	128.2	375	PVC	SDR 35	0.15	62.9	43.62%	0.60	0.49	
	403	401	0.00	0	0	0	0	16.05	1453	3.15	14.8	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	23.82	7.9	27.4	48.5	375	PVC	SDR 35	0.15	62.9	43.62%	0.60	0.49	
R402A	402	401	1.78	0	63	0	170	1.78	170	3.54	2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.78	1.78	0.6	2.5	113.3	200	PVC	SDR 35	0.50	23.6	10.73%	0.74	0.41		
	401	104A	0.00	0	0	0	0	17.83	1623	3.12	16.4	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	25.60	8.4	29.6	14.9	375	PVC	SDR 35	0.30	88.9	33.30%	0.84	0.64	
	104A	104	0.00	0	0	0	0	17.83	1623	3.12	16.4	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	25.60	8.4	29.6	23.0	375	PVC	SDR 35	0.30	88.9	33.30%	0.84	0.64	
R106B	106	105	0.55	0	25	0	68	0.55	68	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.55	0.55	0.2	1.0	85.6	200	PVC	SDR 35	0.10	10.6	9.21%	0.33	0.17		
R105A	105	104	0.03	0	0	0	0	0.58	68	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.03	0.58	0.2	1.0	10.5	200	PVC	SDR 35	0.10	10.6	9.31%	0.33	0.17		
	104	103	0.00	0	0	0	0	18.40	1690	3.11	17.1	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.00	26.18	8.6	30.4	41.8	375	PVC	SDR 35	0.14	60.7	50.09%	0.58	0.49	
R107B	107	103	0.41	0	12	0	32	0.41	32	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.41	0.41	0.1	0.5	93.6	200	PVC	SDR 35	0.10	10.6	4.95%	0.33	0.14		
R103A	103	102	0.51	0	10	0	27	19.33	1750	3.10	17.6	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.51	27.10	8.9	31.3	80.5	375	PVC	SDR 35	0.16	64.9	48.16%	0.62	0.52	
R102A	102	101	0.23	0	5	0	14	19.55	1763	3.10	17.7	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.23	27.33	9.0	31.5	47.0	375	PVC	SDR 35	0.15	62.7	50.22%	0.59	0.51	
R400B, R400A	400	101A	3.30	0	25	0	513	3.30	513	3.37	5.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	3.30	3.30	1.1	6.7	218.1	200	PVC	SDR 35	0.50	23.6	28.31%	0.74	0.54		
	101A	101	0.00	0	0	0	0	3.30	513	3.37	5.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	3.30	1.1	6.7	48.0	200	PVC	SDR 35	0.50	23.7	28.30%	0.74	0.54		
R101A	101	100	0.46	0	0	0	0	23.31	2276	3.03	22.4	0.00	7.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.7	0.46	31.08	10.3	37.4	105.0	375	PVC	SDR 35	0.22	76.1	49.06%	0.72	0.61	

B.2 EXCERPTS FROM BACKGROUND REPORTS

sewer on Renaud Road. The Renaud Road sanitary sewer ultimately outlets to the Forest Valley Pump Station to the west. The existing sanitary sewer network is shown in **Drawing 7**.

10.4.2 South West Wastewater Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the wastewater of the South West quadrant. The South West quadrant is tributary to the Forest Valley Pump Station. The MSU (Stantec, July 2006) considered the South West quadrant to be serviced by a 375 mm diameter trunk sanitary sewer to the south of the quadrant, running westward before ultimately draining into a 600 mm diameter sewer on Renaud Road (formerly named Fourth Line Road). The sanitary collector sewers considered in the MSU (Stantec, July 2006) can be seen in **Appendix D**. A peak sanitary flow of 29.40 L/s was considered within the MSU (Stantec, July 2006). Note that no commercial flows were applied to the quadrant within the MSU (Stantec, July 2006), although the area was contemplated as mixed-use.

More recently the wastewater servicing of the South West quadrant and its surrounding area has been considered within the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). See **Appendix D** for excerpts from the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017).

Since the completion of the MSU (Stantec, July 2006), the wastewater servicing of the South West quadrant has been considered during the construction of downstream infrastructure. The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) includes the wastewater drainage for the portion of the South West quadrant that is east of Fern Casey Street. Per the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015), the downstream wastewater infrastructure anticipated a total peak flow allowance of 45.97 L/s at the South West quadrant's outlet, MH35A. See **Appendix D**, for sanitary drainage information and flow allowance calculations. It can be concluded that the capacity in the constructed downstream infrastructure exceeds the capacity that was considered within the MSU (Stantec, July 2006).

The wastewater servicing for the South West quadrant has also been considered as part of an approved development application neighbouring the South West quadrant. Per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), an additional 2.96 ha area drains to the existing MH35A along with the portion of the South West quadrant east of Fern Casey Street. The Trailsedge East lands are undergoing detailed design and construction. Per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018) and subsequent reports associated with the development application, the additional area has been refined to a 1.92 ha area with a population of 105 persons draining to the existing MH35A along with the portion of the South West quadrant that is east of Fern Casey Street. Note that the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018) proposes to accommodate the wastewater flows from the South West quadrant through 2 inlet locations. All wastewater flows from the South West quadrant east of Fern Casey Street are still proposed to be directed towards existing manhole MH35A, despite the multiple inlet locations. See **Appendix D** for details.

The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) includes the wastewater drainage for the portion of the South West quadrant west of Fern Casey Street. A

peak flow allowance of 4.07 L/s at existing MH37A was considered in the constructed wastewater infrastructure for the portion of the South West quadrant that is west of Fern Casey Street. See **Appendix D** for sanitary drainage information and flow allowance calculations.

Respecting the MSU (Stantec, July 2006), existing wastewater infrastructure and development applications within the South East quadrant, the proposed sanitary servicing strategy is to have all flows from the quadrant drain to the Forest Valley Pump Station via the existing 600 mm diameter sanitary sewer on Renaud Road. The proposed sanitary sewer network is shown in **Drawing 5**. A sewer is proposed to cross Brian Coburn Boulevard at an existing gap in underground services – coordination will be required for work in the ROW, including utility coordination.

At this stage of analysis, only the trunk sanitary sewer within the quadrant is shown. To demonstrate servicing feasibility, the trunk sewer is carried back at minimum possible slopes while accounting for drops at manholes, existing infrastructure sizing, and possible conflicts with crossing other sewers. As the design of the South West quadrant advances, the sanitary sewer network details are subject to change; for example, to be raised where appropriate to offer construction cost savings, provided that the conditions in **Section 14** related to minor changes are met. Additional springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in **Section 14** related to minor changes are met. These are currently considered deviations from City Standards, and will require review on a case-by-case basis.

As shown in the design sheet included in **Appendix D**, the anticipated peak sanitary flow from the portion of the quadrant east of Fern Casey Street is 38.08 L/s. Including the additional 1.92 ha and population of 105 as per *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August 2018), the total peak sanitary flow to existing MH35A is 39.66 L/s. This represents roughly 86% of the 45.97 L/s allowance reported within the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015). Therefore, the existing downstream wastewater infrastructure is demonstrated to adequately service the portion of the South West quadrant east of Fern Casey Street.

Please note that consistent with the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), the wastewater flows from the South West quadrant east of Fern Casey Street are shown directed towards one outlet in this MSS for the purpose of high-level serviceability review. Outlets and routing alternatives may be refined as the design process advances, based on the constructed downstream infrastructure (e.g. to direct flows to the constructed two outlets).

The anticipated peak sanitary flow from the portion of the South West quadrant that is west of Fern Casey Street is 7.03 L/s, which is larger than the 4.07 L/s allowance considered in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015). The primary reason for the increase in wastewater flows is a proposed increase of the population from 184 to 532 based on the high-level demand estimate assumptions adopted in this MSS. A check of the downstream sanitary sewers considered in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) shows that the constraining segment (MH160A – MH17A) still has 22% residual capacity with the addition of the proposed population increase of 348 persons. See **Appendix D** for detailed calculations. Therefore it is concluded that the existing downstream wastewater infrastructure can adequately service

the portion of the South West quadrant that is west of Fern Casey Street. It is expected that capacity will be confirmed as part of detailed design and operational requirements for the downstream Forest Valley Pump Station and Forest Valley Trunk will be assessed by the City of Ottawa for the contributing flows described in this MSS, as part of their City-wide growth assessments, infrastructure management, etc.

A summary of the wastewater servicing for the South West quadrant is provided in **Table 17**.

Table 17: Summary of Wastewater Servicing – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015) and Design Brief – Minto Trailsedge Phase II (IBI Group, May 2015)	EUC Phase 3 Area CDP MSS (June 2020)
Servicing Strategy	Quadrant to be serviced by the Forest Valley Pump Station and the 600 mm diameter sewer on Renaud Road via the sanitary sewer network to the south west.	Quadrant to be serviced by the Forest Valley Pump Station and the existing 600 mm diameter sewer on Renaud Road via the existing sanitary sewer network to the south west.	Quadrant to be serviced by the Forest Valley Pump Station and the existing 600 mm diameter sewer on Renaud Road via the existing sanitary sewer network to the south west.
Total Drainage Area to Ex MH37A	N/A	3.84 ha.	3.69 ha.
Residential Peak Flow to Ex MH37A	N/A	2.98 L/s	5.81 L/s.
ICI Peak Flow to Ex MH37A	N/A	0 L/s.	0 L/s.
Peak Total Flow to Ex MH37A	N/A	4.07 L/s.	7.03 L/s.
Total Drainage Area to Ex MH35A	N/A	42.80 ha.	29.54 ha. (31.46 ha including future area to the south).
Residential Peak Flow to Ex MH35A	N/A	31.97 L/s	23.41 L/s. (24.36 L/s including future area to the south).
ICI Peak Flow to Ex MH35A	N/A	2.01 L/s.	4.92 L/s.
Peak Total Flow to Ex MH35A	N/A	45.97 L/s.	38.08 L/s. (39.66 L/s including future area to the south).



SUBDIVISION:
TrailsEdge East

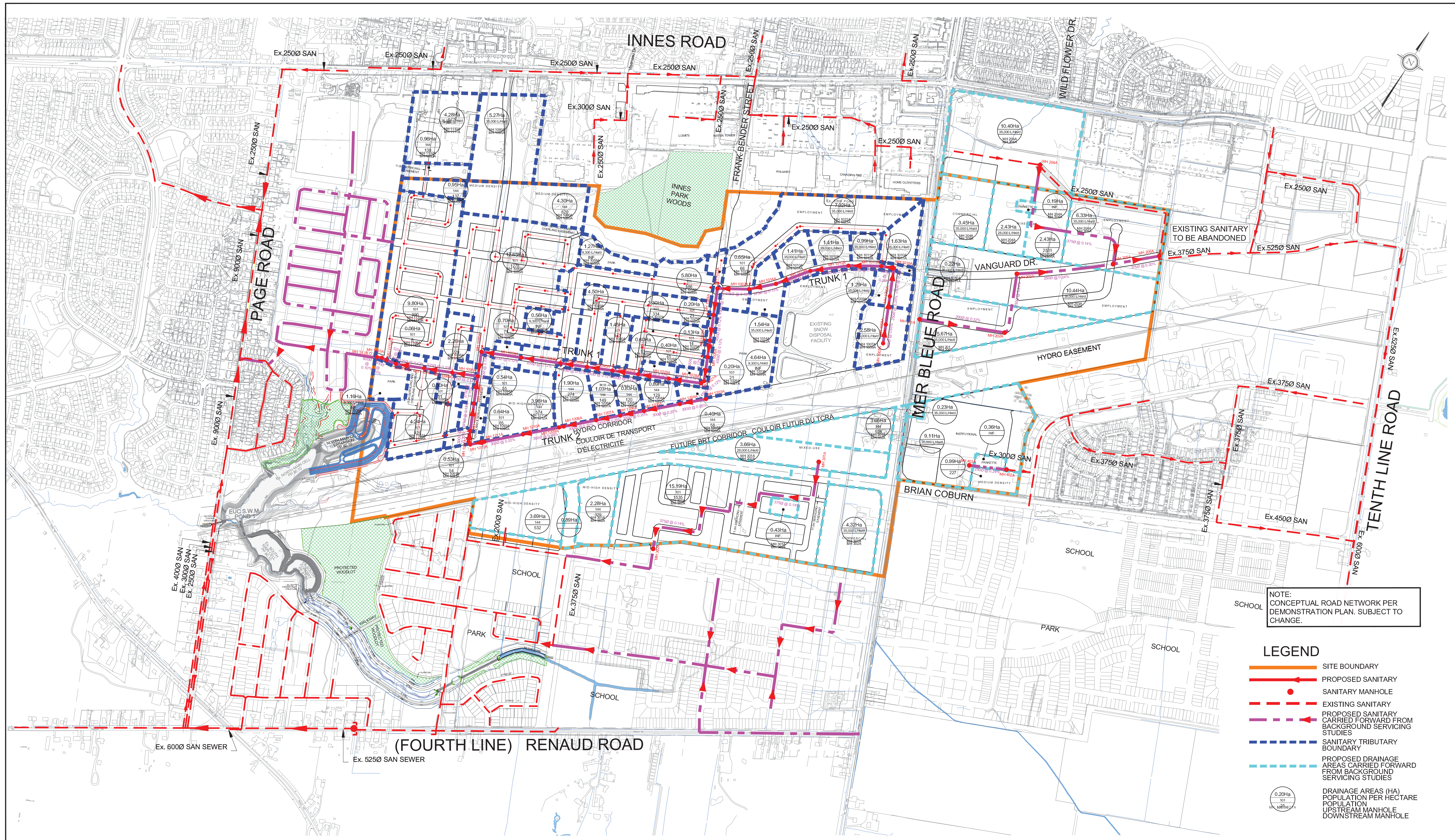
DATE: 24/7/2019
REVISION: 2
DESIGNED BY: MJS/SG
CHECKED BY: DT

**SANITARY SEWER
DESIGN SHEET
(City of Ottawa)**

FILE NUMBER: 160401250

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

LOCATION	FROM		RESIDENTIAL AREA AND POPULATION						COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+H	INFILTRATION			TOTAL FLOW (l/s)	PIPE										
	AREA ID NUMBER	M.H.	M.H.	AREA (ha)	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA (ha)	POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)		AREA (ha)	ACCU. AREA (ha)	TOTAL AREA (ha)		ACCU. AREA (ha)	INFILT. FLOW (l/s)	LENGTH (m)	DIA (mm)	MATERIAL	CLASS	SLOPE (%)	CAP. (FULL) (l/s)	CAP. V. PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
RENAUD, L237A	237	236		5.19	4	0	0	245	5.19	245	3.49	2.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.19	5.19	1.7	4.5	54.7	200	PVC	SDR 35	0.35	19.8	22.65%	0.62	0.42
R236A	236	235		0.24	5	0	0	17	5.43	262	3.48	3.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	5.43	1.8	4.7	26.9	200	PVC	SDR 35	0.35	19.8	23.98%	0.62	0.42
R235A	235	206		0.86	17	0	0	58	6.29	319	3.45	3.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	6.29	2.1	5.6	120.0	200	PVC	SDR 35	0.35	19.8	28.56%	0.62	0.45
Phase 2	Stub	218		3.84	38	47	0	256	3.84	256	3.49	2.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.84	3.84	1.3	4.2	43.4	200	PVC	SDR 35	0.40	21.1	19.67%	0.67	0.43
R107A	107	225		0.43	0	14	0	38	0.43	38	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.43	0.1	0.6	120.0	200	PVC	SDR 35	0.50	23.6	2.50%	0.74	0.27
R227A	227	226		0.14	0	5	0	14	0.14	14	3.72	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.0	0.2	18.5	200	PVC	SDR 35	1.00	33.4	0.62%	1.05	0.26
R106A	106	226		0.36	0	14	0	38	0.36	38	3.67	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.36	0.1	0.6	120.0	200	PVC	SDR 35	0.50	23.6	2.41%	0.74	0.26
R226A	226	225		0.18	0	6	0	16	0.68	68	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.68	0.2	1.0	49.3	200	PVC	SDR 35	0.50	23.6	4.31%	0.74	0.31
R225A	225	224		0.42	0	14	0	38	1.53	143	3.56	1.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	1.53	0.5	2.2	110.5	200	PVC	SDR 35	0.75	29.0	7.44%	0.91	0.44
Phases 2, 3	Stub	224		10.13	13	279	0	798	10.13	798	3.29	8.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.13	10.13	3.3	11.8	17.8	200	PVC	SDR 35	0.50	23.6	50.09%	0.74	0.64
G224A	Stub	224		0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	2.22	0.0	0.7	18.1	200	PVC	SDR 35	0.50	23.6	3.10%	0.74	0.28	
R224A	224	218		0.35	5	0	0	17	12.01	958	3.25	10.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	14.23	4.7	14.8	64.8	200	PVC	SDR 35	0.50	23.6	62.52%	0.74	0.68
R218A	218	206		0.16	0	0	0	0	16.01	1214	3.20	12.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	18.23	6.0	18.6	79.0	250	PVC	SDR 35	0.50	42.9	43.35%	0.86	0.71
Phase 2	207	206		7.16	0	0	0	429	7.16	429	3.41	4.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.16	7.16	2.4	7.1	43.6	200	PVC	SDR 35	0.40	21.1	33.57%	0.67	0.51
R206A	206	205		0.53	11	0	0	37	29.99	2000	3.07	19.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	32.21	10.6	30.5	81.0	300	PVC	SDR 35	0.30	52.6	58.02%	0.75	0.67
R232B	232	233		0.17	1	0	0	3	0.17	3	3.76	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.1	0.1	9.5	200	PVC	SDR 35	0.65	27.0	0.37%	0.85	0.16
R233A	233	234		0.49	9	0	0	31	0.67	34	3.68	0.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.67	0.2	0.6	68.0	200	PVC	SDR 35	0.50	23.6	2.65%	0.74	0.27
R234A	234	205		0.25	4	0	0	14	0.92	48	3.66	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.92	0.3	0.9	58.0	200	PVC	SDR 35	1.05	34.3	2.53%	1.08	0.39
R205A	205	204		0.55	11	0	0	37	31.46	2085	3.06	20.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	33.68	11.1	31.8	79.0	300	PVC	SDR 35	0.30	52.6	60.41%	0.75	0.68
R232A	232	231		0.33	5	0	0	17	0.33	17	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.1	0.3	64.4	200	PVC	SDR 35	0.65	27.0	1.17%	0.85	0.24
R231A	231	230		0.23	1	0	0	3	0.56	20	3.70	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.56	0.2	0.4	11.8	200	PVC	SDR 35	0.65	27.0	1.60%	0.85	0.26
R230A	230	229		0.55	10	0	0	34	1.11	54	3.65	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.11	0.4	1.0	67.3	200	PVC	SDR 35	0.50	23.6	4.27%	0.74	0.31
R229A	229	204		0.37	6	0	0	20	1.49	75	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	1.49	0.5	1.4	67.3	200	PVC	SDR 35	1.90	46.1	2.97%	1.45	0.55
R204A	204	203		0.43	4	8	0	35	33.37	2195	3.04	21.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	35.59	11.7	33.4	68.9	300	PVC	SDR 35	0.30	52.6	63.49%	0.75	0.69
R203A	203	202		0.40	6	4	0	31	33.77	2226	3.04	21.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	35.99	11.9	33.8	65.8	300	PVC	SDR 35	0.30	52.6	64.27%	0.75	0.69
R213A	213	212		0.52	0	17	0	46	0.52	46	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.52	0.2	0.7	114.3	200	PVC	SDR 35	0.50	23.6	3.03%	0.74	0.28
R212A	212	211		0.18	0	5	0	14	0.70	59	3.64	0.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.70	0.2	0.9	34.1	200	PVC	SDR 35	0.50	23.6	3.94%	0.74	0.31
R211A	211	210		0.09	0	2	0	5	0.79	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.79	0.3	1.0	12.6	200	PVC	SDR 35	0.40	21.1	4.84%	0.67	0.28
R210A	210	209		0.35	0	10	0	27	1.14	92	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.14	0.4	1.4	71.5	200	PVC	SDR 35	0.40	21.1	6.85%	0.67	0.31
R215A	215A	215		0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	5.8	200	PVC	SDR 35	1.00	33.4	0.00%	1.05	0.00
R214A	215	214		0.69	0	24	0	65	0.69	65	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.69	0.2	1.0	79.6	200	PVC	SDR 35	0.50	23.6	4.18%	0.74	0.31
R214A	214	209		0.59	0	22	0	59	1.28	124	3.57	1.4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	1.28	0.4	1.9	82.5	200	PVC	SDR 35	0.50	23.6	7.87%	0.74	0.37
R209A	209	208		0.27	0	6	0	16	2.69	232	3.50	2.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	2.69	0.9	3.5	79.0	200	PVC	SDR 3					



NOTE:
CONCEPTUAL ROAD NETWORK PER
DEMONSTRATION PLAN. SUBJECT TO
CHANGE.

- LEGEND**
- SITE BOUNDARY
 - PROPOSED SANITARY
 - SANITARY MANHOLE
 - - - EXISTING SANITARY
 - - - PROPOSED SANITARY CARRIED FORWARD FROM BACKGROUND SERVICING STUDIES
 - - - SANITARY TRIBUTARY BOUNDARY
 - - - PROPOSED DRAINAGE AREAS CARRIED FORWARD FROM BACKGROUND SERVICING STUDIES
 - 0.20Ha
POPULATION PER HECTARE
UPSTREAM MANHOLE
DOWNSTREAM MANHOLE DRAINAGE AREAS (HA)
POPULATION PER HECTARE
UPSTREAM MANHOLE
DOWNSTREAM MANHOLE



120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

**EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
CONCEPTUAL SANITARY SERVICING**

PROJECT No. :	14-733
SCALE	1:5000
DATE:	OCTOBER 2019
DRAWING No.	5

Appendix C : STORMWATER MANAGEMENT

C.1 STORM SEWER DESIGN SHEET



Trailsedge East Phase 4

**STORM SEWER
DESIGN SHEET**
(City of Ottawa)

DESIGN PARAMETERS

$I = a / (t+b)^5$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
 MINIMUM COVER: 2.00 m
 TIME OF ENTRY 10 min
 BEDDING CLASS = B

DATE: 2021-02-02
 REVISION: 1
 DESIGNED BY: -
 CHECKED BY: -
 FILE NUMBER: 160401250

LOCATION AREA ID NUMBER	FROM M.H.	TO M.H.	DRAINAGE AREA														PIPE SELECTION																							
			AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM AxC (100YR) (ha)	T of C (min)	I _{2-YEAR} (mm/h)	I _{5-YEAR} (mm/h)	I _{10-YEAR} (mm/h)	I _{100-YEAR} (mm/h)	Q _{CONTROL} (L/s)	ACCUM. Q _{CONTROL} (L/s)	Q _{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETER (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE (%)	Q _{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)	
L4007A	4007	4006	1.16	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.810	0.810	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	172.8	92.1	600	600	CIRCULAR	CONCRETE	-	0.20	286.5	60.33%	0.98	0.89	1.72
L4006A	4006	4005	1.04	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.730	1.541	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.72	70.77	95.90	112.38	164.22	0.0	0.0	302.9	128.6	750	750	CIRCULAR	CONCRETE	-	0.15	449.8	67.33%	0.99	0.92	2.32
L4013A	4013	4012	1.62	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	1.133	1.133	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	241.7	113.7	675	675	CIRCULAR	CONCRETE	-	0.20	392.2	61.64%	1.06	0.96	1.96
L4014A	4014	4012	4.26	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	3.831	3.831	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	817.3	41.5	1050	1050	CIRCULAR	CONCRETE	-	0.15	1103.3	74.07%	1.23	1.19	0.58
L4012A	4012	4011	1.72	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	1.120	6.084	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.96	70.00	94.85	111.14	162.39	0.0	0.0	1183.1	79.5	1200	1200	CIRCULAR	CONCRETE	-	0.15	1575.3	75.10%	1.35	1.31	1.01
L4011A	4011	4010	1.80	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	1.257	7.342	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.98	66.99	90.71	106.27	155.25	0.0	0.0	1366.1	242.5	1350	1350	CIRCULAR	CONCRETE	-	0.15	2156.5	63.35%	1.46	1.34	3.02
C4009A, L4015A	4010	4009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	7.342	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.00	59.50	80.45	94.20	137.53	0.0	0.0	1213.3	73.8	1350	1350	CIRCULAR	CONCRETE	-	0.15	2156.5	56.26%	1.46	1.29	0.95
	4009	4005	7.04	1.74	0.00	0.00	0.00	0.85	0.70	0.00	0.00	5.984	13.326	1.218	1.218	0.000	0.000	0.000	0.000	0.000	16.95	57.51	77.73	91.00	132.84	0.0	0.0	2391.7	84.5	1650	1650	CIRCULAR	CONCRETE	-	0.15	3682.6	64.95%	1.67	1.54	0.92
L4008A	4008	4005	0.90	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.630	0.630	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	134.4	104.1	600	600	CIRCULAR	CONCRETE	-	0.20	286.5	46.92%	0.98	0.82	2.11
	4005	4004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	15.496	0.000	1.218	0.000	0.000	0.000	0.000	0.000	17.87	55.73	75.30	88.15	128.66	0.0	0.0	2653.7	79.0	1650	1650	CIRCULAR	CONCRETE	-	0.15	3682.6	72.06%	1.67	1.59	0.83
L4003A	4004	4003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	15.496	0.000	1.218	0.000	0.000	0.000	0.000	0.000	18.70	54.23	73.25	85.74	125.12	0.0	0.0	2582.1	127.8	1650	1650	CIRCULAR	CONCRETE	-	0.15	3682.6	70.12%	1.67	1.58	1.35
	4003	4001	2.68	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	1.876	17.372	0.000	1.218	0.000	0.000	0.000	0.000	0.000	20.04	51.97	70.16	82.11	119.80	0.0	0.0	2745.0	48.5	1650	1650	CIRCULAR	CONCRETE	-	0.15	3682.6	74.54%	1.67	1.60	0.50
L4002A	4002	4001	1.56	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	1.089	1.089	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	232.3	86.5	600	600	CIRCULAR	CONCRETE	-	0.20	286.5	81.09%	0.98	0.97	1.48
	4001	1005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	18.461	0.000	1.218	0.000	0.000	0.000	0.000	0.000	20.54	51.17	69.08	80.83	117.93	0.0	0.0	2857.7	17.5	2100	2100	CIRCULAR	CONCRETE	-	0.15	7005.7	40.79%	1.96	1.58	0.19
L4000A, L4000C, L4000B	4000	1002A	3.36	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	2.615	2.615	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	557.9	216.7	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	93.42%	0.91	0.94	3.86

C.2 EXCERPTS FROM BACKGROUND REPORTS

Capture Rate – Development Lands	50 L/s/ha	50 L/s/ha	51.25 L/s/ha to account for future roads in development areas as road network is subject to change.*
Capture Rate – Roads	100 L/s/ha	100 L/s/ha	100 L/s/ha. Only Vanguard Drive (collector road) considered as road network is subject to change.*
Peak rational method total flow to Ex. 1350mm diameter stub	1666 L/s	1552.9 L/s	1666 L/s*
Major System Stormwater Management Strategy	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.	On site storage and road sags proposed to meet the required release rates. Storage within quadrant up to 100 year storm event.*
*Reported values are based on background studies that contemplate the North East quadrant draining to Bilberry Creek. These values are subject to change based on a watershed analysis to be completed separate from this MSS, and is planned to be implemented through City of Ottawa review of development applications under the Planning Act.			

11.3.4 Consideration of Alternative Implementation Details for Servicing Designs

Stormwater sewer sizing, minor and major flow routing, and preliminary grading were reviewed as part of MSS-level design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation, except for consideration of future diversion from the Bilberry Creek watershed to the McKinnon’s Creek watershed. This diversion is to be studied further in accordance with the recommendations of the Vanguard Drive Environmental Assessment (IBI, Jan 2020) and the Mer Bleue Urban Expansion Area McKinnons Creek Enhancement (IBI, Sept 30, 2019), to inform future development applications within the area, and is planned to be implemented via *Planning Act* approvals.

11.4 South West Quadrant Preferred Stormwater Management Plan

11.4.1 South West Existing Stormwater Drainage Infrastructure

The quadrant was at one time tributary to the Mud Creek and McKinnon’s Creek watersheds, which drain into Green’s Creek (Ottawa River) and Bear Brook (South Nation River), respectively. Current earthworks programs associated with development have redirected drainage from existing conditions.

Existing developments to the southwest of the quadrant have brought a storm sewer network to the southern boundary of the South West quadrant. A 1050 mm diameter storm sewer stub borders the portion of the South West quadrant west of Fern Casey Street, and a 2700 mm diameter stub borders the portion of the quadrant east of Fern Casey Street. A 900 mm-1050 mm diameter storm sewer within Brian Coburn Boulevard is located within the South West quadrant. To the east, there is a 525 mm-900 mm diameter storm sewer on Mer Bleue Road. The existing storm sewer network is shown in **Drawing 7**.

11.4.2 South West Minor System Design

The MSU (Stantec, July 2006) reviewed the required infrastructure to service the South West quadrant of the EUC Phase 3 Area. The intended storm outlet for the quadrant is the existing South Forebay of EUC Pond 1.

The MSU (Stantec, July 2006) considered the South West quadrant to be serviced by trunk storm sewers ranging in diameter from 1250 mm to 2400 mm. The minor system generally drains east to west, through adjacent lands towards the EUC Pond 1 South Forebay. Five-year capture was used for all development lands and local roads, while 10-year capture was applied for arterial roads. The minor system did not consider flows from Brian Coburn Boulevard (then known as the Blackburn Hamlet By-Pass) as it was assumed that the drainage would be addressed through a separate sewer. The portion of the South West quadrant north of Brian Coburn was also assumed to drain separately from the rest of the quadrant. Details of the MSU (Stantec, July 2006) minor system can be found in **Appendix E**.

More recently, the South West quadrant was considered as part of the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017). Consistent with the MSU (Stantec, July 2006), the quadrant was to be serviced by a trunk sewer network draining towards the EUC Pond 1 South Forebay. A stormwater conveyance channel was detailed to direct outflows from the trunk storm sewers to the EUC Pond 1 South Forebay. The storm drainage plan can be seen in **Drawing 4**. Five-year capture was used for all development lands and local roads, while 10-year capture was applied for arterial roads. Deviating from the MSU (Stantec, July 2006), the portion of the South West quadrant north of Brian Coburn Boulevard and the segment of Brian Coburn Boulevard within the quadrant were assumed to drain through the quadrant's storm sewer network. The majority of the South West quadrant was considered as Mixed-Use and was assigned a runoff coefficient of 0.8. There were also Medium Density and Commercial land uses which were assigned runoff coefficients of 0.7 and 0.65, respectively.

Since the completion of the MSU (Stantec, July 2006), the stormwater management of the South West quadrant has been considered during the construction of downstream infrastructure. The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) considers the stormwater drainage for the portion of the South West quadrant that is east of Fern Casey Street. Per the storm design information included in **Appendix E**, a 2700 mm diameter storm sewer stub exists south of the quadrant. Per the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015), this stretch of sewer anticipated a Rational Method peak flow of 5,424.84 L/s from undeveloped land to the east, which includes the portion of the South West quadrant that is east of Fern Casey Street. Five-year capture was assumed and an available Rational Method additional capacity of 5,040.86 L/s was reported available downstream in the constraining segment (MH55 - MH55B).

The *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015) also considered the stormwater drainage for the portion of Fern Casey Street (formerly Belcourt Boulevard) within the South West quadrant. A portion of the street is to drain to Brian Coburn while a portion is being serviced by the storm sewers constructed as part of Trailsedge Phase II.

The stormwater servicing of the South West quadrant has also been considered as part of the approved *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017). As shown in **Appendix E**, an additional 3.18 ha residential area drains to the existing 2700 mm diameter stub along with the stormwater flows from the portion of the South West quadrant east of Fern Casey Street. Per the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), a rational method peak flow of 4,824.3 L/s was anticipated from the portion of the South West quadrant that is east of Fern Casey Street. 2-year capture was assumed for the portion of the South West quadrant that is east of Fern Casey Street, deviating from past studies, but consistent with current City of Ottawa and MECP standards. Brian Coburn Boulevard was expected to drain separately consistent with the MSU (Stantec, July 2006) and design information for Brian Coburn Boulevard.

The Trailsedge East lands are currently undergoing detailed design and construction. Per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018), 5-year capture was assumed for the portion of the South West quadrant east of Fern Casey Street. Note that the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018) proposes to accommodate the stormwater flows from the portion of the South West quadrant east of Fern Casey Street through 2 inlet locations (MH1004 & MH1002). The anticipated Rational Method peak flow attributed to the portion of the South West quadrant east of Fern Casey Street to MH1004 and MH1002 are 4686.2 L/s and 741.52 L/s respectively. All stormwater flows from the South West quadrant east of Fern Casey Street are still proposed to ultimately be directed towards the existing 2700mm diameter stub. Brian Coburn Boulevard is reported to drain separately, which is consistent with the MSU (Stantec, July 2006) and with as-built information for Brian Coburn Boulevard. Details are provided in **Appendix E**. The total Rational Method peak flow anticipated to the existing 2700 mm diameter storm sewer stub is reported to be 6,154.9 L/s, which is above the 5,424.84 L/s allowance detailed in the *Design Brief – Minto Trailsedge Phase II* (IBI Group, May 2015). The anticipated increase in flows of 730.06 L/s is below the 5,040.86 L/s available Rational Method capacity downstream in the constraining segment (MH55 – MH55B).

The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) includes the stormwater drainage for the portion of the South West quadrant west of Fern Casey Street. 5-year capture was assumed and a rational method peak flow of 845.8 L/s was determined to drain into existing Control MH2. See **Appendix E** for details.

Respecting the MSU (Stantec, July 2006), existing stormwater infrastructure, and ongoing development applications within the South West quadrant, the proposed stormwater servicing strategy is to have all flows from the quadrant drain to the EUC Pond 1 South Forebay via the existing stormwater conveyance channel and an extension of the existing trunk storm sewer network. The proposed storm sewer network is shown in **Drawing 4**. A trunk 2100 mm trunk storm sewer is shown servicing the majority of the quadrant by routing minor system stormwater flows to the proposed Trailsedge East storm sewer south of the quadrant. The remaining portions of the South West quadrant drain directly into existing infrastructure. A storm sewer

crosses Brian Coburn Boulevard at an existing gap in underground infrastructure – coordination will be required for work in the ROW, including utility coordination.

Note that at this stage of analysis, only the trunk storm sewer within the quadrant is shown. To demonstrate serviceability, the trunk sewer is carried back at minimum possible slopes accounting for drops at manholes, existing infrastructure sizing and possible conflicts with the sanitary sewer. As design of the South West quadrant advances, the storm sewer network details are subject to change for construction efficiencies, etc., provided that the conditions in Section 14 related to minor changes are met. Additional springline connections and/or reduced drops across maintenance holes may be proposed as part of detailed design, to assist in minimizing grade raise requirements, provided that the conditions in **Section 14** related to minor changes are met. These are currently considered deviations from City Standards, and will require review on a case-by-case basis.

2-year capture was assumed for all local roads and development lands in the South West quadrant. 5-year capture was used for collector roads in order to adhere to City Standards regarding allowable depth of flow on streets.

The rational method, with design criteria described in **Section 11.1**, was employed to size the storm sewer to accommodate all minor flows. Per the design sheet included in **Appendix E**, the anticipated rational method peak flow from the portion of the South West quadrant east of Fern Casey Street is 4,964 L/s. Please note that consistent with the *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017), the stormwater flows from the North West quadrant east of Fern Casey Street are directed towards one outlet in this MSS for the purpose of high-level servicing review. Outlets and routing alternatives may be refined as the design and construction processes advance, based on constructed downstream infrastructure (e.g. direct flows to multiple constructed outlets, rather than a single outlet).

The proposed 4,964 L/s rational method peak flow to MH 302 is roughly 106% of the 4,686.2 L/s flow anticipated at this location within the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). A flow of 741.5 L/s was also anticipated from the portion of the South West quadrant east of Fern Casey Street, to be collected further downstream per the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019)(see **Appendix E**), the peak modelled flow to the existing stub is 5,800 L/s under the 100-year plus 20% storm event. The proposed design of the South West quadrant east of Fern Casey does not have a negative impact of the downstream stormwater management infrastructure. Therefore, it is concluded that the downstream infrastructure has adequate capacity to service the minor system stormwater flows from the portion of the South West quadrant, east of Fern Casey Street.

The portions of Brian Coburn Drive and Fern Casey Street within the South West quadrant are proposed to continue draining as they are at the time of this MSS, per asbuilt conditions.

The anticipated rational method peak flow from the portion of the South West quadrant west of Fern Casey Street is 853 L/s, roughly 101% of the 845.8 L/s flow anticipated in the in the *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015). Seeing as the land is to provide 5-year capture consistent with the *Design Brief for the Trails Edge West Richcraft Group of Companies*

(DSEL, January 26, 2015), any discrepancy in anticipated rational method peak flow can be attributed to rounding. Per the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), see **Appendix E**, the proposed design of the South West quadrant west of Fern Casey is consistent with the design of the downstream stormwater management infrastructure. Therefore, it is concluded that the downstream infrastructure has adequate capacity to service the minor system stormwater flows from the portion of the South West quadrant, west of Fern Casey Street.

11.4.3 South West Hydraulic Grade Line Analysis

Given the preferred minor system design and land uses differ from background studies, a Hydraulic Grade Line analysis was completed for the South West quadrant, using downstream modelling information provided by Stantec from the *Trails Edge East Phase 1 Servicing and Stormwater Management Report* (Stantec, August, 2018). The suitability of the proposed trunk sewer network was analyzed in the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019), provided in **Appendix E**. The simulated 100-year HGL results through the proposed trunk storm sewer network have been analyzed for suitability with the proposed road grades and anticipated underside of footing elevations, estimated to be 2.1 m below ground level.

The analysis was simulated with 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. The results indicated that the quadrant is serviceable per the preferred design as a freeboard of 0.3 m between the hydraulic gradeline and the estimated underside of footing is provided for the 100-year storms and a freeboard of 0 m has been provided for the historical events and the 100-year storm + 20% climate change stress test. As noted earlier, the storm sewer design is expected to change at detailed design (e.g. to include local sewers, to minimize earthworks costs, etc.), and an updated analysis will be required in conformance with all City of Ottawa and MECP guidelines.

11.4.4 South West Major System & Grading Design

The MSU (Stantec, July 2006) did not seem to include a detailed design of the major system for the South West quadrant. Based on the MSU (Stantec, July 2006) Macro Grading Plan, included in **Appendix E**, the major system flow is generally directed towards the EUC Pond 1 South Forebay. Grade raise restrictions for the South West quadrant are reported as 0-0.6 m and are respected in the grading plan.

Per the *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017), the major flow servicing strategy was updated based on the proposed road network. Consistent with the MSU (Stantec, July 2006), the major flow was to be routed westward towards the EUC Pond 1 South Forebay. See **Appendix E** for details. The majority of the South West quadrant was reported to provide onsite storage up to the 100-year storm event as they were contemplated for Mixed-Use, High Density Residential and Commercial land uses. The *Servicing Report for Trails Edge and Orléans Business Park* (DSEL, July 2017) grading plan reports grade raises up to 3 m within the South West quadrant. This exceeds the grade raise restriction for the quadrant of 0.5 m to 1.5 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018). As such, a surcharge program or lightweight fill was recommended to be considered as the design process continued.

Per the approved *Trails Edge East – Functional Servicing Report* (Stantec, August 11, 2017) and the *Trails Edge East Phase 1 Servicing Design Brief* (Stantec, August 2018), onsite storage up to the 100-year storm event was to be provided for the portion of the South West quadrant, east of Fern Casey Street. The *Design Brief for the Trails Edge West Richcraft Group of Companies* (DSEL, January 26, 2015) similarly states that onsite storage up to the 100-year storm event was to be provided for the portion of the South West quadrant, west of Fern Casey Street.

The proposed major system design is for commercial and mixed-use blocks within the South West quadrant to provide onsite storage up to the 100-year storm event, which is consistent with background servicing reports for the quadrant. The remaining areas are to have overland flow stored within the road network, then directed towards the EUC Pond 1 via the neighbouring lands to the south. The routing is to follow the proposed road network, as shown in **Drawing 2**. Note that the medium-high density block west of Fern Casey Street is to have major system flows directed towards Axis Way, while the other medium-high density block is to have major system flows directed towards Fern Casey Street.

Given that the updated preferred stormwater concept has not been detailed in background documents, a stormwater model has been prepared for the South West quadrant within the *East Urban Community / Preliminary Hydraulic Gradeline Analysis and Pond Design* (JFSA, June 2019) – see **Appendix E**. The modelling indicates that the main road network is expected to adequately convey major system flow per City of Ottawa and MECP standards.

As shown in the proposed grading plan, road grade elevations for the conceptual road network are anticipated to be greater than 1.5 m in some areas. The maximum permissible grade raise for the South West quadrant is 0.5 m - 1.5 m per the *Geotechnical – Existing Conditions Report East Urban Community Mixed Use CDP* (Paterson Group, June 28, 2018). Note that the conceptual road network is subject to change. The grading plan has been designed as low as possible to best respect the grade raise restrictions and was determined by providing minimum cover to the infrastructure (assuming basements for all land uses with gravity foundation drainage), facilitating major system flow to the EUC Pond 1, and respecting existing/proposed road grades surrounding the quadrant.

Since the proposed grading plan indicates portions of the South West quadrant to be above proposed grade raise restrictions, a surcharge program or lightweight fill program may be required to the satisfaction of a licensed Geotechnical Engineer in Ontario. As the design process advances for the quadrant, grading plans, grade raises, surcharge programs and fill specifications will be required from a Geotechnical Engineer.

A summary of the stormwater management strategy for the South West quadrant is provided in **Table 25**.

Table 25: Summary of Stormwater Management Strategy – South West Quadrant

	Governing Servicing Study	Additional Background Servicing Study	Proposed MSS
Study Name	Gloucester and Cumberland East Urban Community Expansion Area and Bilberry Creek Industrial Park Master Servicing Update (Stantec, July 2006)	Design Brief for the Trails Edge West Richcraft Group of Companies (DSEL, January 26, 2015) and the Trails Edge East Phase 1 Servicing and Stormwater Management Report (Stantec, August, 2018)	EUC Phase 3 Area CDP MSS (June 2020)
Minor System Stormwater Management Strategy	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands to the South Forebay of the EUC Pond 1.	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands and a stormwater conveyance channel to the South Forebay of the EUC Pond 1.	Quadrant to be serviced by trunk storm sewers running through southern adjacent lands and a stormwater conveyance channel to the South Forebay of the EUC Pond 1.
Total Area to Existing Control MH 2	N/A	3.65 ha.	3.68 ha.
Avg. C	N/A	0.8	0.8
Total Rational Method Peak Flow to Existing Control MH 2	N/A	845.8 L/s.	853 L/s.
100-year, 3-Hour Chicago Storm + 20% modelled Peak Flow to proposed Existing Control MH 2	N/A	N/A	1,189 L/s.
Total Area to Proposed MH STM 1004	N/A	27.89 ha to MH 1004 & 3.20 ha to MH 1002 downstream	29.28 ha.
Avg. C	N/A	0.8	0.78
Total Rational Method Peak Flow to Proposed STM MH 1004	N/A	4,686.2 L/s to MH 1004 & 757.8 L/s to MH 1002 downstream	4,964 L/s
100-year, 3-Hour Chicago Storm + 20% modelled Peak Flow to existing	N/A	N/A	5,800 L/s.

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stub on Fern Casey Street			
Major System Stormwater Management Strategy	Overland flow to be directed towards the EUC Pond 1.	Overland flow to be directed towards the EUC Pond 1. Onsite storage up to the 100-year storm event was to be provided.	Overland flow to be directed towards the EUC Pond 1. Onsite storage up to the 100-year storm event is to be provided for mixed use and commercial land uses.

11.4.5 Consideration of Alternative Implementation Details for Servicing Designs

Stormwater sewer sizing, minor and major flow routing, and preliminary grading were reviewed as part of MSS-level servicing design, to address all City of Ottawa and MECP requirements. Given the background infrastructure planning in this area and the predicted performance, no other logical or efficient alternative designs were advanced for additional analysis and evaluation.

The use of sump pumps for foundation drainage is recommended to be advanced for consideration in detailed design as an alternative design for residential areas in the South West quadrant. Per City of Ottawa standards, sump pumps are only to be considered as drainage solutions under certain conditions per ISTB-2018-04 and subsequent Technical Bulletins. The area must be on full services, be underlain by clay soils subject to grade raise restrictions and have finished grades required to allow gravity drainage exceed the grade raise restriction. Finally, the HGL of the area cannot be able to be reasonably lowered any further due to outlet restrictions. Given the South West quadrant meets all of these requirements, sump pumps may be considered as an alternative for the South West as the design process advances. See Paterson Group (July 7, 2019) for additional details.

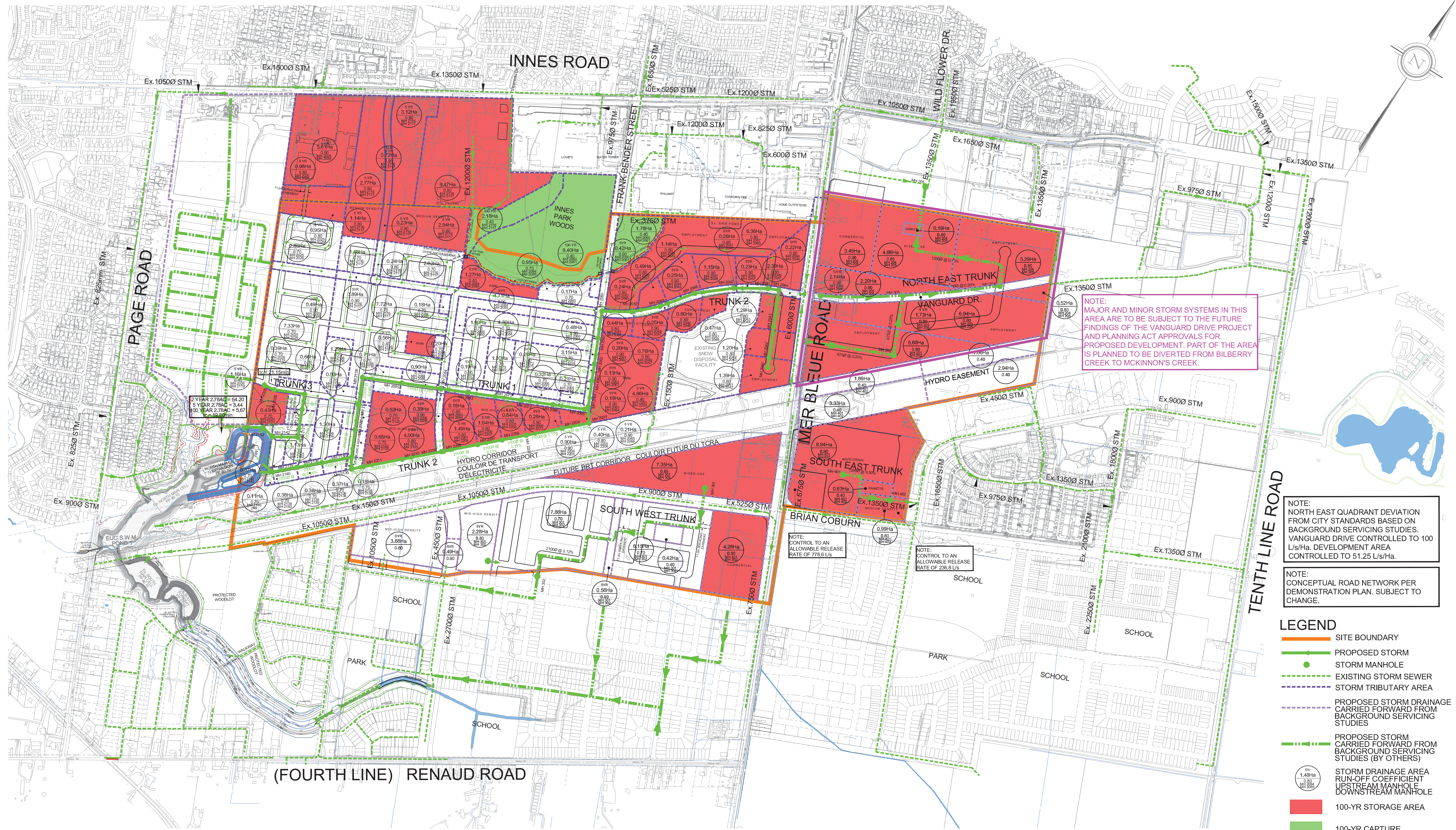
11.5 South East Quadrant Preferred Stormwater Management Plan

11.5.1 South East Existing Stormwater Drainage Infrastructure

Existing residential developments to the east of the South East quadrant have brought a 1350 mm diameter storm sewer stub to the eastern property boundary. This stub connects to the 1650 mm diameter storm sewer within Gerry Lalonde Drive, ultimately running to the existing Avalon West (Neighborhood 5) Stormwater Management Facility via an existing storm sewer network shown in **Drawing 7**.

A portion of the Hydro Corridor to the north of the quadrant is serviced by the existing 450 mm diameter storm sewer on Trigorina Crescent. The sewer then follows the existing storm sewer network to the existing Avalon West (Neighborhood 5) Stormwater Management Facility and ultimately McKinnon's Creek.

The portion of the South East quadrant designated as Medium Density has already been constructed and is being serviced by the 1350 mm diameter storm sewer stub mentioned above.



NOTE: MAJOR AND MINOR STORM SYSTEMS IN THIS AREA ARE TO BE SUBJECT TO THE FUTURE FINDINGS OF THE VANGUARD DRIVE PROJECT AND PLANNING ACT APPROVALS FOR PROPOSED DEVELOPMENT. PART OF THE AREA IS PLANNED TO BE DIVERTED FROM BILBERRY CREEK TO MCKINNON'S CREEK.

NOTE: NORTH EAST QUADRANT DEVIATION FROM CITY STANDARDS BASED ON BACKGROUND SERVICING STUDIES. VANGUARD DRIVE CONTROLLED TO 100 L/s/ha. DEVELOPMENT AREA CONTROLLED TO 51.25 L/s/ha.

NOTE: CONCEPTUAL ROAD NETWORK PER DEMONSTRATION PLAN. SUBJECT TO CHANGE.

- LEGEND**
- SITE BOUNDARY
 - PROPOSED STORM
 - STORM MANHOLE
 - EXISTING STORM SEWER
 - STORM TRIBUTARY AREA
 - PROPOSED STORM DRAINAGE CARRIED FORWARD FROM BACKGROUND SERVICING STUDIES
 - PROPOSED STORM CARRIED FORWARD FROM BACKGROUND SERVICING STUDIES (BY OTHERS)
 - 5YR
1.48ha
0.80
MH 2115 STORM DRAINAGE AREA RUN-OFF COEFFICIENT UPSTREAM MANHOLE DOWNSTREAM MANHOLE
 - 100-YR STORAGE AREA
 - 100-YR CAPTURE



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**EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
CONCEPTUAL STORM SERVICING**

PROJECT No. :	14-733
SCALE	1:5000
DATE:	OCTOBER 2019
DRAWING No.	4



Trails Edge East Phase 1

STORM SEWER DESIGN SHEET (City of Ottawa)

DESIGN PARAMETERS

I = a / (t+b)^c (As per City of Ottawa Guidelines, 2012)

Table with design parameters: a=, b=, c=, 1:2 yr, 1:5 yr, 1:10 yr, 1:100 yr, MANNING'S n=, BEDDING CLASS=, MINIMUM COVER, TIME OF ENTRY

DATE: 2019-07-24, REVISION: 3, DESIGNED BY: DT, CHECKED BY: MJS

FILE NUMBER: 160401250

Main data table with columns: LOCATION, DRAINAGE AREA, PIPE SELECTION. Includes rows for L1006W, L1008A, C1007W, C1003A, C1003B, L1002A, C1002AA, C1002AB, C1002A, C1001A.



Trails Edge East Phase 1
 DATE: 2019-07-24
 REVISION: 3
 DESIGNED BY: DT
 CHECKED BY: MJS

**STORM SEWER
 DESIGN SHEET
 (City of Ottawa)**

FILE NUMBER: 160401250

DESIGN PARAMETERS
 I = a / (t+b)^c (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr	
a =	732.951	998.071	1174.184	1735.688	MANNING'S n = 0.013
b =	6.199	6.053	6.014	6.014	MINIMUM COVER: 2.00 m
c =	0.810	0.814	0.816	0.820	TIME OF ENTRY 10 min

BEDDING CLASS = B

LOCATION AREA ID NUMBER	FROM M.H.	TO M.H.	DRAINAGE AREA										PIPE SELECTION																											
			AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM Ax C (2YR)	A x C (5-YEAR) (ha)	ACCUM Ax C (5YR)	A x C (10-YEAR) (ha)	ACCUM Ax C (10YR)	A x C (100-YEAR) (ha)	ACCUM Ax C (100YR)	T of C (min)	I ₂ -YEAR (mm/h)	I ₅ -YEAR (mm/h)	I ₁₀ -YEAR (mm/h)	I ₁₀₀ -YEAR (mm/h)	Q _{CONTROL} (L/s)	ACCUM. Q _{CONTROL} (L/s)	Q _{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETER (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE (%)	Q _{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)	
L2007A, L2007B	2007	2006	9.20	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	5.972	5.972	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.08	64.02	86.64	101.48	148.22	0.0	0.0	1061.9	45.6	1200	1200	CIRCULAR	CONCRETE	-	0.10	1286.2	82.56%	1.10	1.10	0.69
	2028	2027	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	16.9	300	300	CIRCULAR	PVC	-	0.35	56.9	0.00%	0.81	0.00	0.00
L1006B, L1006A	1006	2027	0.51	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.355	0.355	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	75.7	120.0	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	56.95%	0.81	0.72	2.79
L2027A	2027	2026	0.31	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.210	0.565	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.79	67.54	91.47	107.16	156.56	0.0	0.0	106.1	53.3	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	52.88%	0.90	0.78	1.13
C1007A, C1007B	1007	2026	0.00	0.48	0.00	0.00	0.00	0.69	0.00	0.00	0.000	0.000	0.331	0.331	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	95.8	120.0	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	72.01%	0.81	0.77	2.58
C2026B, C2026A	2026	2025	0.00	0.42	0.00	0.00	0.00	0.69	0.00	0.00	0.000	0.565	0.291	0.622	0.000	0.000	0.000	0.000	0.000	0.000	13.92	64.44	87.22	102.16	149.21	0.0	0.0	252.0	105.5	825	825	CIRCULAR	CONCRETE	-	0.10	473.6	53.21%	0.86	0.75	2.35
C2029A, L2029A	2029	2025	8.32	1.13	0.00	0.00	0.65	0.65	0.00	0.00	5.411	5.411	0.736	0.736	0.000	0.000	0.000	0.000	0.000	0.000	14.92	61.96	83.83	98.17	143.36	0.0	0.0	1102.8	19.8	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.6	62.64%	1.19	1.09	0.30
L2025B, L2025A	2025	2022	0.46	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.304	6.281	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	16.27	58.92	79.66	93.27	136.17	0.0	0.0	1328.6	80.3	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.8	75.45%	1.19	1.15	1.16
L2030B, L2030A	2030	2022	3.33	0.00	0.00	0.00	0.65	0.00	0.00	0.00	2.156	2.156	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.08	64.02	86.64	101.48	148.22	0.0	0.0	383.4	45.4	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	64.19%	0.91	0.84	0.90
L2022S	2022	2006	0.16	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.111	8.548	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	17.43	56.56	76.44	89.49	130.62	0.0	0.0	1631.5	83.5	1650	1650	CIRCULAR	CONCRETE	-	0.10	3006.9	54.26%	1.36	1.20	1.16
L2039A	2039	2038	0.24	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.172	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	36.7	39.8	375	375	CIRCULAR	PVC	-	0.25	84.4	43.51%	0.80	0.66	1.01
	2038	2037	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.73	73.14	99.15	116.21	169.84	0.0	0.0	35.0	26.3	525	525	CIRCULAR	CONCRETE	-	0.25	224.3	15.58%	1.00	0.61	0.72
L2040A	2040	2037	0.10	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.060	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	12.8	44.3	450	450	CIRCULAR	CONCRETE	-	0.25	148.7	8.58%	0.91	0.46	1.60
L2037A	2037	2006	0.52	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.380	0.612	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.73	70.75	95.87	112.34	164.16	0.0	0.0	120.3	119.2	675	675	CIRCULAR	CONCRETE	-	0.15	339.6	35.41%	0.92	0.71	2.81
L2006A	2006	2005	0.29	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.208	15.339	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	18.60	54.41	73.49	86.02	125.54	0.0	0.0	2595.6	77.1	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.4	55.29%	1.52	1.34	0.96
L2035A	2034	2035	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	9.5	300	300	CIRCULAR	PVC	-	0.35	56.9	0.00%	0.81	0.00	0.00
L2036B, L2036A	2035	2036	0.33	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.239	0.239	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	50.9	68.2	450	450	CIRCULAR	CONCRETE	-	0.25	148.7	34.23%	0.91	0.69	1.65
	2036	2005	0.86	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.525	0.763	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.65	71.00	96.21	112.74	164.75	0.0	0.0	150.6	56.7	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	75.03%	0.90	0.87	1.09
L2005A	2005	2004	0.31	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.227	16.329	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	19.56	52.76	71.24	83.38	121.66	0.0	0.0	2661.9	83.0	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.5	56.70%	1.52	1.35	1.02
L2034A, L2034B	2034	2033	0.86	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.540	0.540	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	115.3	67.1	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	57.45%	0.90	0.80	1.39
L2032A	2033	2032	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.540	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.39	71.84	97.37	114.10	166.75	0.0	0.0	107.8	12.3	525	525	CIRCULAR	CONCRETE	-	0.20	200.6	53.74%	0.90	0.78	0.26
L2031A, L2031B	2032	2031	0.23	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.168	0.709	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11.66	70.98	96.19	112.72	164.72	0.0	0.0	139.7	66.7	600	600	CIRCULAR	CONCRETE	-	0.20	286.5	48.78%	0.98	0.83	1.34
	2031	2004	0.66	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.419	1.128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.99	66.95	90.66	106.21	155.16	0.0	0.0	209.7	66.7	750	750	CIRCULAR	CONCRETE	-	0.15	449.8	46.62%	0.99	0.83	1.34
L2004A, L2004B, L2004C	2004	2003	1.08	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.656	18.113	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	20.58	51.12	69.00	80.75	117.80	0.0	0.0	2832.2	69.0	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.4	60.33%	1.52	1.38	0.83
L2003A, L2003B	2003	2002	0.70	0.00	0.00	0.00	0.64	0.00	0.00	0.00	0.447	18.559	0.000	1.359	0.000	0.000	0.000	0.000	0.000	0.000	22.22	21.41	49.87	67.30	78.74	0.0	0.0	2824.7	66.2	1950	1950	CIRCULAR	CONCRETE	-	0.10	4694.4	60.17%	1.52	1.37	0.80
L2013B, L2013A	2013	2012	0.32	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.223	0.223	0.000	0.000	0.000																									



Trails Edge East Phase 1

**STORM SEWER
DESIGN SHEET**
(City of Ottawa)

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr		
a =	732.951	998.071	1174.184	1735.688	MANNING'S n =	0.013
b =	6.199	6.053	6.014	6.014	MINIMUM COVER:	2.00 m
c =	0.810	0.814	0.816	0.820	TIME OF ENTRY	10 min

BEDDING CLASS = B

DATE: 2019-07-24
REVISION: 3
DESIGNED BY: DT
CHECKED BY: MJS

FILE NUMBER: 160401250

LOCATION AREA ID NUMBER	FROM M.H.	TO M.H.	DRAINAGE AREA											PIPE SELECTION																									
			AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	I ₂ -YEAR (mm/h)	I ₅ -YEAR (mm/h)	I ₁₀ -YEAR (mm/h)	I ₁₀₀ -YEAR (mm/h)	Q _{CONTROL} (L/s)	ACCUM. Q _{CONTROL} (L/s)	Q _{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETER (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE (%)	Q _{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
L2020A, L2020B	2020	2008	0.77	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.399	2.153	0.000	0.000	0.000	0.000	0.000	0.000	14.41	63.20	85.52	100.16	146.28	0.0	0.0	378.1	83.1	975	975	CIRCULAR	CONCRETE	-	0.10	739.4	51.13%	0.96	0.83	1.67
L2008A	2008	2002	0.32	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.234	4.658	0.000	0.000	0.000	0.000	0.000	0.000	16.85	57.73	78.03	91.35	133.36	0.0	0.0	746.9	87.8	1350	1350	CIRCULAR	CONCRETE	-	0.10	1760.8	42.42%	1.19	0.97	1.51
L2002A, L2002B, L2002C L2001A	2002 2001	2001 2000	1.52 0.26	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.56 0.73	0.00 0.00	0.00 0.00	0.00 0.00	0.858 0.190	24.075 24.265	0.000 0.000	1.359 1.359	0.000 0.000	0.000 0.000	0.000 0.000	0.000 0.000	22.22 23.59	48.72 46.89	65.74 63.24	76.91 73.98	112.17 107.88	0.0 0.0	0.0 0.0	3506.3 3399.1	120.0 28.1	2100 2100	2100 2100	CIRCULAR CIRCULAR	CONCRETE CONCRETE	- -	0.10 0.10	5720.1 5720.1	61.30% 59.42%	1.60 1.60	1.45 1.44	1.38 0.32

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Legend

- AREA ID
- RUNOFF COEFFICIENT
- STORM DRAINAGE AREA ha.
- STORM DRAINAGE BOUNDARY
- EXISTING/FUTURE STORM DRAINAGE BOUNDARY
- EXISTING/FUTURE STORM DRAINAGE AREA
- TYPICAL SERVICE LATERAL LOCATION
- MAXIMUM PONDING LIMITS
- DIRECTION OF OVERLAND FLOW
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED DOUBLE CATCH BASIN
- PROPOSED SUB DRAIN CATCH BASIN AS PER CITY OF OTTAWA STANDARD DETAIL DRAWINGS L10 AND L11.
- PROPOSED PERFORATED SUBDRAIN
- EXISTING STORM SEWER
- EXISTING CATCHBASIN MANHOLE
- EXISTING CATCHBASIN
- EXISTING SUBDRAIN CATCHBASIN
- FUTURE STORM SEWER
- FUTURE CATCHBASIN MANHOLE
- FUTURE CATCHBASIN
- FUTURE SUBDRAIN CATCHBASIN
- CIRCULAR ORIFICE (SEE SEE ICD TABLE)
- MAJOR SYSTEM DIVIDE

Notes

8	ISSUED FOR APPROVAL	AJ	DT	19.09.18
7	REVISED ASCENDER OFFSITE SERVING	AJ	DT/SG	19.05.17
6	ISSUED FOR GRADING APPROVAL	AJ	DT	19.03.11
5	ISSUED FOR CONSTRUCTION	MJS	GR	18.10.25
4	REVISED FIRE HYDRANT LOCATIONS	MJS	DT	18.10.24
3	REVISED AS PER CITY COMMENTS	MJS	DT	18.09.28
2	REVISED AS PER CITY COMMENTS AND DRAFT PLAN	MJS	DT	18.08.23
1	REVISED AS PER CITY COMMENTS	MJS	DT	18.05.30
0	ISSUED TO CITY FOR REVIEW	MJS	DT	18.03.06

Revision	By	Appd.	YY.MM.DD
8	AJ	DT	19.09.18
7	AJ	DT/SG	19.05.17
6	AJ	DT	19.03.11
5	MJS	GR	18.10.25
4	MJS	DT	18.10.24
3	MJS	DT	18.09.28
2	MJS	DT	18.08.23
1	MJS	DT	18.05.30
0	MJS	DT	18.03.06

File Name:	16401250.DWG	JP	MJS	JP	18.02.14
Drawn:		Chkd:	Dgn:	YY.MM.DD	

Permit/Seal

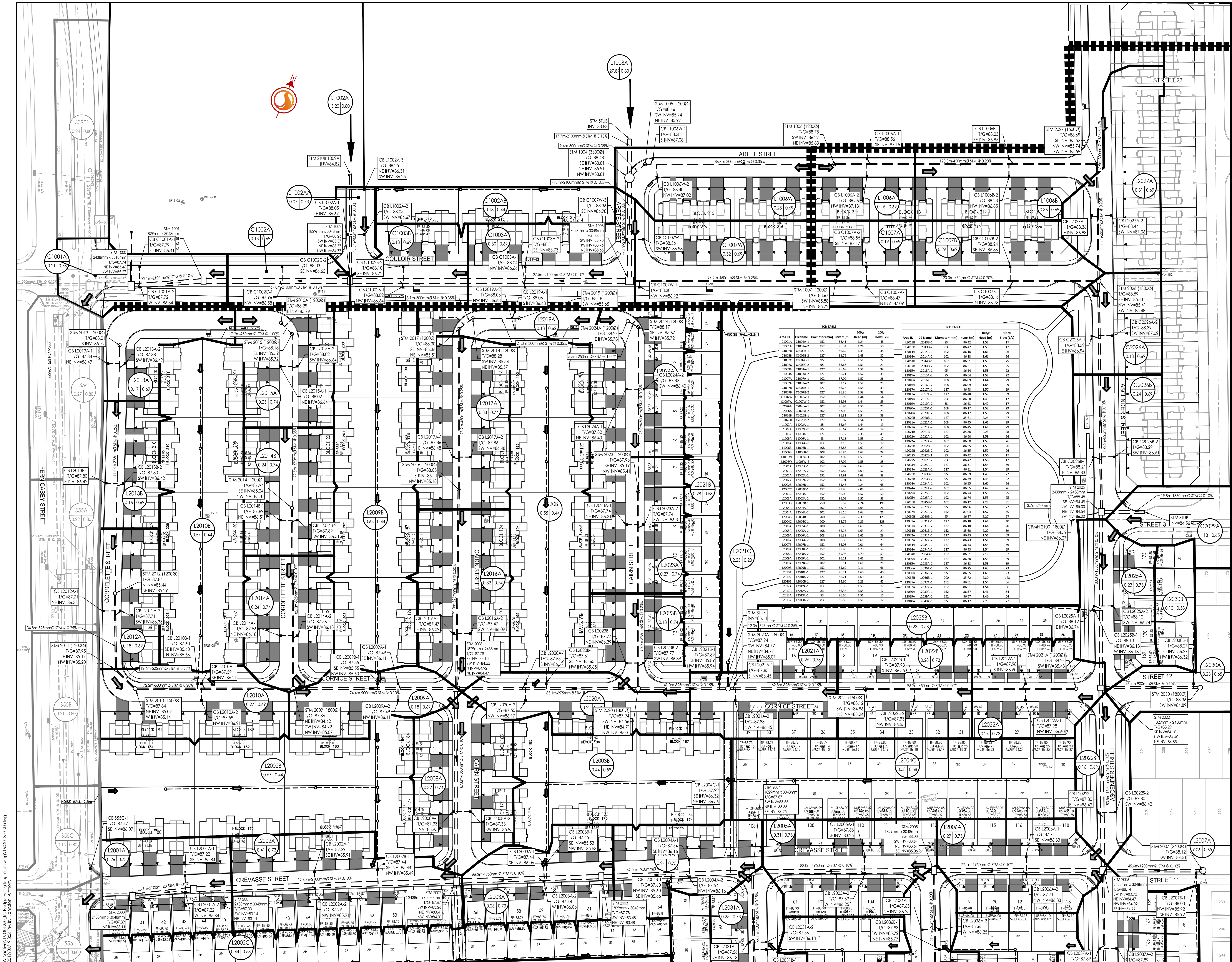
Client/Project
RICH CRAFT GROUP OF COMPANIES
2280 ST. LAURENT BLVD
OTTAWA, ON, K1G 4K1

TRAILS EDGE EAST SUBDIVISION
OTTAWA, ON, CANADA

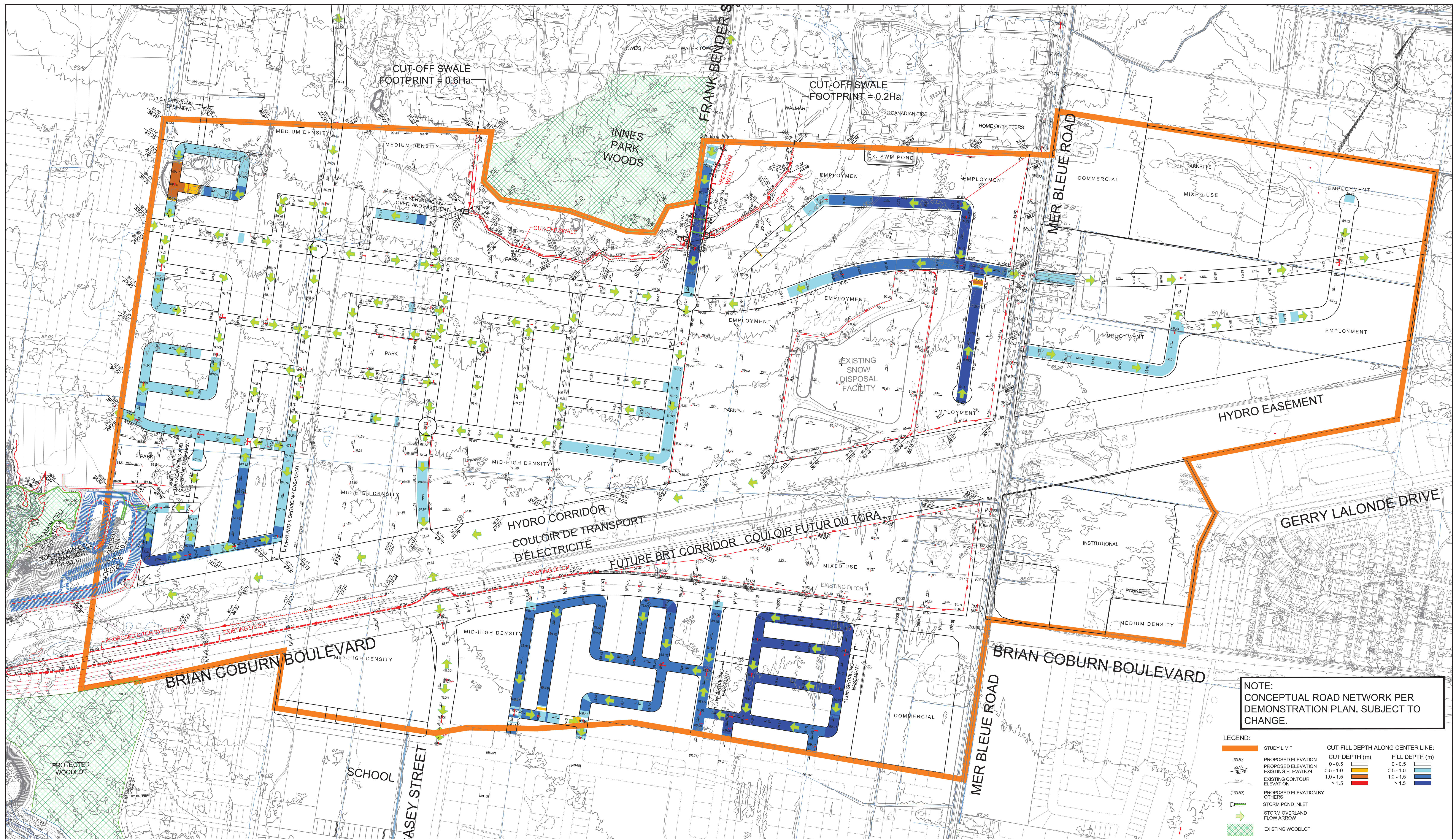
Title
STORM DRAINAGE PLAN

Project No. 16401250 Scale 0 7.5 22.5 37.5m
Drawing No. Sheet Revision

SD-1 40 of 46 8
DOT-16-0002 DWG# 17807



Area ID	CB Name	Diameter (mm)	Invert (m)	500yr Head (m)	500yr Flow (L/s)
L2001A	L2001A-1	150	86.41	1.34	48
L2001A	L2001A-2	150	86.41	1.34	48
L2001A	L2001A-3	150	86.41	1.34	48
L2001A	L2001A-4	150	86.41	1.34	48
L2001A	L2001A-5	150	86.41	1.34	48
L2001A	L2001A-6	150	86.41	1.34	48
L2001A	L2001A-7	150	86.41	1.34	48
L2001A	L2001A-8	150	86.41	1.34	48
L2001A	L2001A-9	150	86.41	1.34	48
L2001A	L2001A-10	150	86.41	1.34	48
L2001A	L2001A-11	150	86.41	1.34	48
L2001A	L2001A-12	150	86.41	1.34	48
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L2001A	L2001A-14	150	86.41	1.34	48
L2001A	L2001A-15	150	86.41	1.34	48
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L2001A	L2001A-65	150	86.41	1.34	48
L2001A	L2001A-66	150	86.41	1.34	48
L2001A	L2001A-67	150	86.41	1.34	48
L2001A	L2001A-68	150	86.41	1.34	48
L2001A	L2001A-69	150	86.41	1.34	48
L2001A	L2001A-70	150	86.41	1.34	48
L2001A	L2001A-71	150	86.41	1.34	48
L2001A	L2001A-72	150	86.41	1.34	48
L2001A	L2001A-73	150	86.41	1.34	48
L2001A	L2001A-74	150	86.41	1.34	48
L2001A	L2001A-75	150	86.41	1.34	48
L2001A	L2001A-76	150	86.41	1.34	48
L2001A	L2001A-77	150	86.41	1.34	48
L2001A	L2001A-78	150	86.41	1.34	48
L2001A	L2001A-79	150	86.41	1.34	48
L2001A	L2001A-80	150	86.41	1.34	48
L2001A	L2001A-81	150	86.41	1.34	48
L2001A	L2001A-82	150	86.41	1.34	48
L2001A	L2001A-83	150	86.41	1.34	48
L2001A	L2001A-84	150	86.41	1.34	48
L2001A	L2001A-85	150	86.41	1.34	48
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L2001A	L2001A-96	150	86.41	1.34	48
L2001A	L2001A-97	150	86.41	1.34	48
L2001A	L2001A-98	150	86.41	1.34	48
L2001A	L2001A-99	150	86.41	1.34	48
L2001A	L2001A-100	150	86.41	1.34	48



CUT-OFF SWALE
FOOTPRINT = 0.6Ha

CUT-OFF SWALE
FOOTPRINT = 0.2Ha

NOTE:
CONCEPTUAL ROAD NETWORK PER
DEMONSTRATION PLAN. SUBJECT TO
CHANGE.

LEGEND:

[Orange line]	STUDY LIMIT	CUT-FILL DEPTH ALONG CENTER LINE:	
[Blue line]	PROPOSED ELEVATION	CUT DEPTH (m)	FILL DEPTH (m)
[Red line]	EXISTING ELEVATION	0 - 0.5	0 - 0.5
[Green line]	EXISTING CONTOUR ELEVATION	0.5 - 1.0	0.5 - 1.0
[Green line]	PROPOSED ELEVATION BY OTHERS	1.0 - 1.5	1.0 - 1.5
[Green arrow]	STORM POND INLET	> 1.5	> 1.5
[Green arrow]	STORM OVERLAND FLOW ARROW		
[Green hatched area]	EXISTING WOODLOT		



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www.DSEL.ca

EAST URBAN COMMUNITY PHASE 3 AREA COMMUNITY DESIGN PLAN
GRADING PLAN

PROJECT No. :	14-733
SCALE	1:4000
DATE:	OCTOBER 2019
DRAWING No.	2

Appendix D : GEOTECHNICAL INVESTIGATION

Geotechnical
Engineering

Environmental
Engineering

Hydrogeology

Geological
Engineering

Materials Testing

Building Science

Archaeological Services

Geotechnical - Existing Conditions Report

East Urban Community Mixed Use CDP
Mer Bleue Road
Ottawa - Ontario

Prepared For

Richcraft Group of Companies

Paterson Group Inc.

Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

July 7, 2019

Report: PG3130-2 Revision 2

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	3.1 Surface Conditions	4
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Appendices

Appendix 1	Soil Profile and Test Data Sheets Boreholes by Others Symbols and Terms Consolidation Testing Results Atterberg Limits Testing Results
Appendix 2	Figure 1 - Key Plan Drawing PG3130-6 - Test Hole Location Plan Drawing PG3130-7 - Permissible Grade Raise Plan
Appendix 3	Slope Stability Analysis Report - By Others

1.0 Introduction

Paterson Group (Paterson) was commissioned by Richcraft Group of Companies (Richcraft) to complete an existing conditions report from a geotechnical perspective for the proposed East Urban Community (EUC) development to be located along Mer Bleue Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the study is:

- ❑ to determine the subsurface soil and groundwater conditions based on available subsoil information and supplemental borehole investigation.
- ❑ to provide preliminary geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work. Therefore, the present report does not address environmental issues.

2.0 Background Information

Field Investigation

The subject site is located to the north of Renaud Road and to the south of Innes Road. Mer Bleue Road runs in a north-south direction through the east portion of the site and the existing Hydro corridor runs in roughly an east-west direction through the south portion of the site.

The current field program was completed on September 12 and 15, 2014. The historical geotechnical field investigations were completed by Paterson between March 2002 and February 2012. During that time, a total of fifty-four (54) test holes, consisting of boreholes, test pits and hand auger holes, were extended to a maximum depth of 22 m. Previous geotechnical investigations were also completed by others within the area of the subject site. The results of the previous investigations by others are discussed in the present report.

The locations of the test holes are shown on Drawing PG3130-6 - Test Hole Location Plan included in Appendix 2.

The boreholes were completed using a track-mounted auger drill rig operated by a two person crew. The test pits were completed using a rubber tire backhoe. All fieldwork was conducted under the full-time supervision of personnel from our geotechnical division under the direction of a senior engineer. The testing procedure consisted of augering to the required depths and at the selected locations sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler, using 73 mm diameter thin walled (TW) Shelby tubes in conjunction with a piston sampler, or from the auger flights.

Soil samples were recovered along the sidewalls of the test pits by hand during excavation.

All soil samples were visually inspected and initially classified on site. The split-spoon samples were placed in sealed plastic bags and the Shelby tubes were sealed at both ends on site. All samples were transported to the our laboratory for examination and classification. The depths at which the split-spoon, Shelby tube, auger and grab samples were recovered from the test holes are shown as SS, TW, AU and G, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was carried out at regular depth intervals in cohesive soils. Undrained shear strength testing in test pits was completed using a handheld, portable vane apparatus (field inspection vane tester Roctest Model H-60).

All soil samples were classified on site, placed in sealed plastic bags and were transported to our laboratory for visual inspection.

Overburden thickness was evaluated during the course of the site investigations by dynamic cone penetration testing (DCPT) at several of the borehole locations. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed at the borehole and test pits were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets and Borehole Logs by Others in Appendix 1.

Groundwater

Flexible standpipes were installed in all boreholes to monitor the groundwater levels subsequent to the completion of the sampling program. Groundwater infiltration levels were noted at the time of excavation at the test pit locations.

Laboratory Testing

The soil samples recovered from the subject site were visually examined in our laboratory to review the results of the field logging.

Ten (10) Shelby tube samples were submitted for unidimensional consolidation during the previous geotechnical investigations. The results of the consolidation and Atterberg testing are presented on the Consolidation Test sheets presented in Appendix 1 and are further discussed in Sections 4.

3.0 Existing Conditions

3.1 Surface Conditions

Currently, the subject site, consists of agricultural lands and lands formerly used for agricultural purposes. The site and regional topography is relatively flat and approximately at grade with neighboring properties and adjacent roadways.

3.2 Subsurface Profile

Overburden Profile

Generally, the subsurface profile encountered at the test hole locations varies between shallow bedrock and a deep silty clay deposit across the subject site. Shallow bedrock was encountered below a cultivated organic zone/topsoil followed by a silty sand, and/or clayey silt layer within the north portion of the site. The remainder of the subject site was underlain by a sensitive silty clay deposit. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and dolomite of the Gull River formation with an overburden drift thickness of 0 to 30 m depth.

Groundwater

Generally, the groundwater levels recovered from the piezometers installed at the borehole locations varied between 0.2 and 6.3 m below existing ground surface. It is important to note that groundwater readings at piezometers can be influenced by surface water perched within the borehole backfill material. Groundwater conditions can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, it is estimated that groundwater can be expected between 1.5 to 2.5 m depth. Groundwater levels are subject to seasonal fluctuations and therefore could vary during time of construction.

The groundwater conditions observed at the borehole and test pits were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1.

4.0 Geotechnical Assessment

An existing slope stability analysis report was completed by others for Reaches 7 and 12 of the Stormwater Management Pond Block. The report also defines the limit of hazard lands limits along the west portion of the SWMP. Reference should be made to the attached report in Appendix 3.

4.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is adequate for the proposed development. Bedrock removal may require line drilling and blasting or hoe ramming depending on the depth of bedrock removal required. Due to the presence of the sensitive silty clay layer, residential buildings should be design in accordance with Part 4 of the current Ontario Building Code (OBC). Also, due to the sensitive silty clay deposit, the proposed development will be subjected to grade raise restrictions.

Preliminary permissible grade raise recommendations have been designed based on the existing soils information. The recommended permissible grade raise areas are presented in Drawing PG3130-7 - Permissible Grade Raise Plan in Appendix 2. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

Municipal services are anticipated within the subject site and will be completed mostly through OHSA Type 2 and 3 soils.

The above and other considerations are further discussed in the following sections.

4.2 Foundation Design

Bearing Resistance Values

For preliminary design purposes, a conventional style shallow footing for commercial or residential buildings can be designed using the bearing resistance values presented in Table 1. A geotechnical resistance factor of 0.5 was applied to the bearing resistance values at ULS.

Table 1 - Bearing Resistance Values		
Bearing Surface	Bearing Resistance Value at SLS (kPa)	Factored Bearing Resistance Value at ULS (kPa)
Compact Sandy Silt	60	125
Firm Clayey Silt/Silty Clay	60	125
Stiff Silty Clay/Clayey Silt	100	150
Glacial Till	150	225
Bedrock	500	1000
Note: Footings, up to 3 m wide, can be designed using the above noted bearing resistance values placed over a silty clay bearing surface.		

The bearing resistance values are provided on the assumption that the footings will be placed on undisturbed soil bearing surfaces. An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

The bearing resistance values at SLS for shallow footing bearing on compact sandy silt, firm to stiff clayey silt/silty and/or glacial till will be subjected to potential post-construction total and differential settlements of 25 and 15 mm, respectively.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings bearing on an acceptable bedrock bearing surface and designed using the bearing resistance values provided herein will be subjected to negligible potential post-construction total and differential settlements.

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the subexcavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Settlement/Grade Raise

Ten (10) consolidation tests were conducted within the immediate area of the subject site. The results of the consolidation tests from the previous investigations are presented in Tables 2, 3 and 4 and in Appendix 1.

The value for p'_c is the preconsolidation pressure and p'_o is the effective overburden pressure of the test sample. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided.

The values for C_{cr} and C_c are the recompression and compression indices, respectively. These soil parameters are a measure of the compressibility due to stress increases below and above the preconsolidation pressures. The higher values for the C_c , as compared to the C_{cr} , illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 2 - Summary of Consolidation Test Results (Paterson Investigation PG2392)							
Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 7	TW 2	4.36	90	53	0.016	1.643	A
BH 9	TW 3	4.33	106	53	0.021	4.008	A
BH 11	TW 4	4.32	85	53	0.027	2.735	P
* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed							

Table 3 - Summary of Consolidation Test Results (Paterson Investigation PG0861)							
Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 9-08	TW 2	4.8	126	55	0.026	3.260	A
BH 12-08	TW 4	9.4	109	68	0.031	3.080	A
BH 13-08	TW 2	3.42	142	43	0.025	1.334	A
BH 15-08	TW 2	4.91	87	50	0.029	1.890	A
BH 19-08	TW 3	4.9	99	43	0.025	3.100	A
* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed							

Table 4 - Summary of Consolidation Test Results (Paterson Investigation G8533)							
Borehole	Sample	Depth	p'_c	p'_o	C_{cr}	C_c	Q
BH 3	TW 5	6.53	103	64	0.043	2.967	A
BH 3	TW 7	9.6	175	82	0.028	3.046	A
* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed							

The values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering testing procedures and are estimates only. Natural variations within the soil deposit will affect the results. The p'_o parameter is directly influenced by the groundwater level. Groundwater levels were measured during the site investigation. Groundwater levels vary seasonally which has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The p'_o values for the consolidation tests during the investigation are based on the long term groundwater level being at 0.5 m below the existing groundwater table. The groundwater level is based on the colour and undrained shear strength profile of the silty clay.

The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when building are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

To reduce potential long term liabilities, consideration should be given to accounting for a larger groundwater lowering and to provide means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the dwellings, etc). Buildings on silty clay deposits increases the likelihood of movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking compared to unreinforced foundations.

The recommended permissible grade raise areas for buildings are defined in Drawing PG3130-7 - Permissible Grade Raise Plan in Appendix 2.

Where proposed grade raises exceed our permissible grade raise recommendations, several options could be considered for the foundation support of the proposed buildings:

Scenario A

Where the grade raise is close to, but below, the maximum permissible grade raise, consideration should be given to using more reinforcement in the design of the foundation (footings and walls) to reduce the risks of cracking in the concrete foundation. The use of control joints within the brick work between the garage and basement area should also be considered.

Scenario B

Where the grade raise cannot be accommodated with soil fill, the following options could be used alone or in combination.

Option 1 - Use of Lightweight Fill

Lightweight fill (LWF) can be used, consisting of EPS (expanded polystyrene) Type 19 or 22 blocks or other light weight materials which allow for raising the grade without adding a significant load to the underlying soils. However, these materials are expensive and, in the case of the EPS, are more difficult to use under the groundwater level, as they are buoyant, and must be protected against potential hydrocarbon spills. Use lightweight fill within the interior of the garage and porch areas to reduce the fill-related loads.

Option 2 - Preloading or Surcharging

It is possible to preload or surcharge the proposed site in localized areas provided sufficient time is available to achieve the desired settlements based on theoretical values from the settlement analysis. If this option is considered, a monitoring program using settlement plates will have to be implemented. This program will determine the amount of settlement in the preloaded or surcharged areas. Obviously, preloading to proposed finished grades will allow for consolidation of the underlying clays over a longer time period. Surcharging the site with additional fill above the proposed finished grade will add additional load to the underlying clays accelerating the consolidation process and allowing for accelerated settlements. Once the desired settlements are achieved, the site can be unloaded and the fill can be used elsewhere on site.

Once the required grade raises are established, the above options could be further discussed along with further recommendations on specific requirements.

4.3 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the foundations bearing on a compact to dense glacial till and/or bedrock within the north portion of the subject site. A higher site class, such as Class A or B, is applicable for footings bearing on the bedrock surface. However, a site specific seismic shear wave test will be required to confirm the Class A or B seismic site classification.

Based on existing subsoils information, a seismic site response **Class D or E** is applicable for design of the proposed buildings bearing over a stiff to firm silty clay deposit throughout the remainder of the site. The specific site classification is dependent on the bedrock depth, which should be more accurately delineated as part of a future geotechnical investigation program for the subject site.

Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

4.4 Groundwater Control

Due to the relatively impervious nature of the silty clay/clayey silt materials, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. A perched groundwater condition may be encountered within the sandy silt deposit, where encountered, which may produce significant temporary groundwater infiltration levels. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

A temporary MOE permit to take water (PTTW) will be required for this project if more than 50,000 L/day are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MOE.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

4.5 Stormwater Management Facility

It is understood that a stormwater management facility is planned for the subject site. However, details of the SWMF have not been designed yet. From a geotechnical perspective, the construction of the proposed SWMF is possible. The main areas of concern will be:

- The groundwater infiltration rate within the excavation side slopes and along the bottom of the pond
- The permeability of the subsoil materials
- The stability of the excavation side slopes

From a geotechnical perspective, the construction of the proposed SWMF is possible and its long term performance will depend on the stability of its excavation side slopes. From a geotechnical perspective, sidewalls shaped to a 3H:1V slope are considered to be stable in the long term and are adequate for SWMF construction at the subject site.

5.0 Recommendations

This existing conditions report provides preliminary design information. A detailed geotechnical investigation will be required once the proposed design is finalized. It is recommended that the following be carried out once the design plans and site development are determined:

- Carry out a detailed geotechnical investigation for the final detailed design which will include boreholes at strategic locations to recover undisturbed soil samples of the sensitive underlying silty clay deposit for consolidation testing.
- Review detailed grading plan(s) from a geotechnical perspective.
- Review detailed foundation plan(s) from a geotechnical perspective.
- A MOE Permit to Take Water (PTTW) will be required for the subject site and should be applied for well in advance of building construction (4 to 5 months).

6.0 Statement Of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests to be notified immediately in order to permit reassessment of the recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Richcraft Group of Companies or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.



Faisal I. Abou-Seido, P.Eng.



David J. Gilbert, P.Eng.

Report Distribution:

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PERMISSIBLE GRADE RAISE:

SHALLOW OVERBURDEN WITH BEDROCK RANGING FROM 1m TO 5m BELOW GRADE (<2m GRADE RAISE RESTRICTION)

SILTY CLAY DEPOSIT WITH BEDROCK RANGING FROM 5m TO 25m BELOW GRADE (0.5 TO 1.5m GRADE RAISE RESTRICTION)

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG2392
- HAND AUGER HOLE LOCATION, PATERSON GROUP REPORT PG1605
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0861
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
- BOREHOLE LOCATION, PATERSON GROUP REPORT G8533
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG0811
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0811
- TEST PIT LOCATION, PATERSON GROUP REPORT PG0861
- BOREHOLE LOCATION BY OTHERS
- 86.93 GROUND SURFACE ELEVATION (m)
- (62.93) PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)

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NO.	REVISIONS	DATE	INITIAL

RICHCRAFT GROUP OF COMPANIES
EXISTING CONDITIONS REPORT
EAST URBAN COMMUNITY MIXED-USE DEVELOPMENT
OTTAWA, ONTARIO

PERMISSIBLE GRADE RAISE PLAN

Drawn by:	MPG	Report No.:	PG3130-2
Checked by:	CDS	Drawing No.:	PG3130-7
Scale:	1:4000		
Date:	10/2014		

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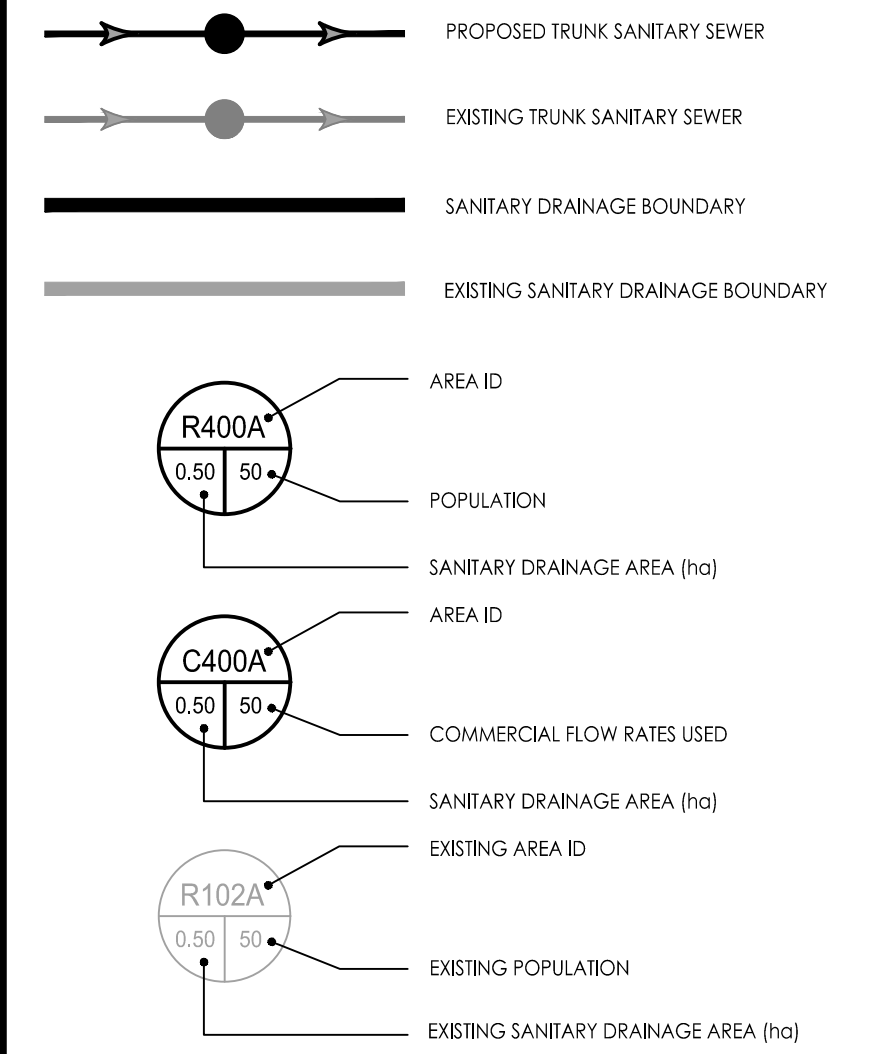
Appendix E : DRAWINGS



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Legend



Notes

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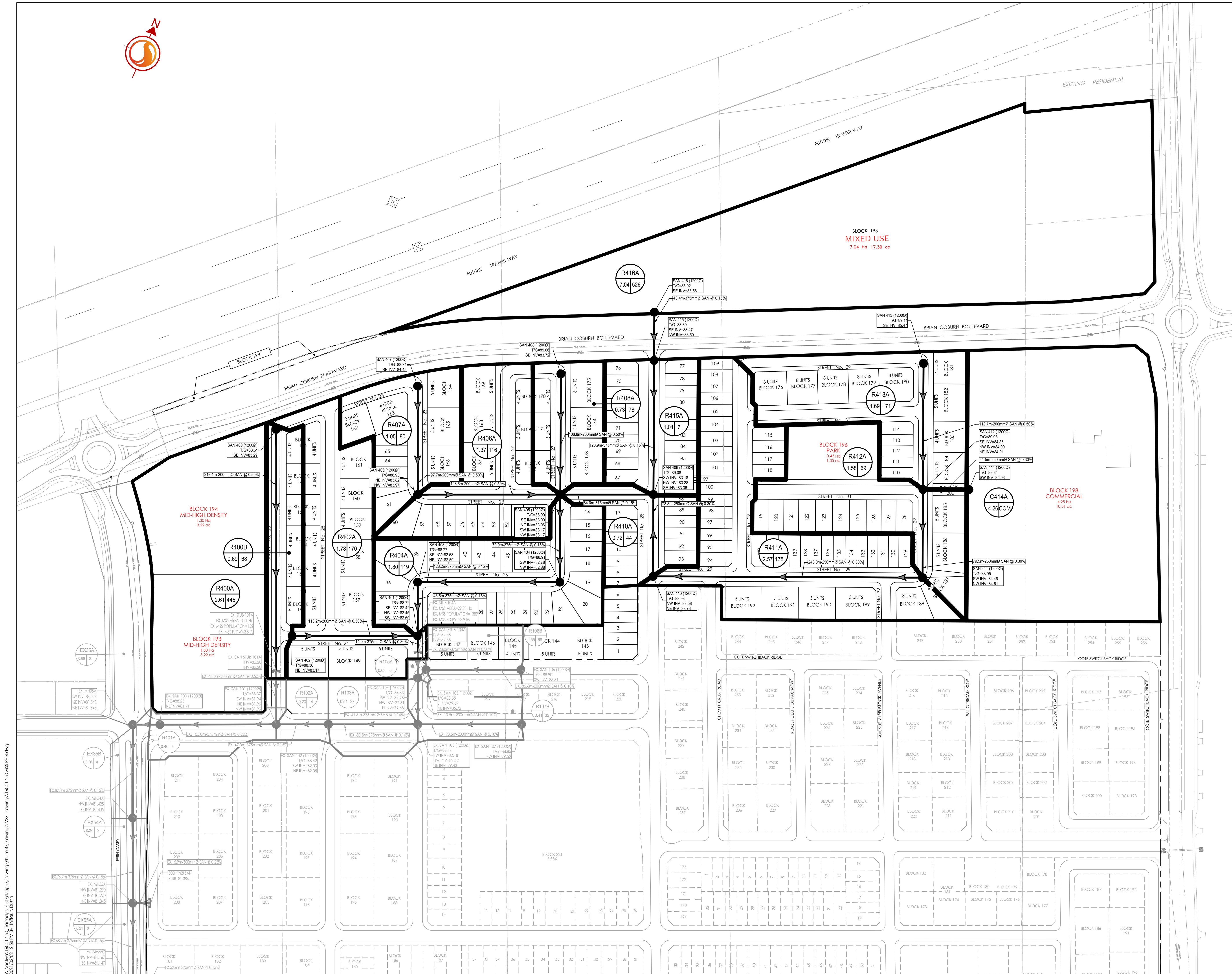
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160401250 M55 PH 4	Dwn.	Chkd.	Dgn.	YY.MM.DD

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Client/Project
RICHCRAFT GROUP OF COMPANIES
2280 ST. LAURENT BLVD
OTTAWA, ON, K1G 4K1
TRAILSEDGE EAST SUBDIVISION

Title
OVERALL SANITARY SEWER SYSTEM

Project No. 160401250	Scale 1:1500	0 15 45 75m
Drawing No.	Sheet	Revision



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Legend

- 610mmØ WATERMAIN
- 406mmØ WATERMAIN
- 305mmØ WATERMAIN
- 203mmØ WATERMAIN
- 152mmØ WATERMAIN
- EX. 610mmØ WATERMAIN
- EX. 406mmØ WATERMAIN
- EX. 305mmØ WATERMAIN
- EX. 203mmØ WATERMAIN
- EX. 152mmØ WATERMAIN

Notes

Revision	By	Appd.	Date
1	MJS	SG	11.11.11

File Name:	MJS	SG	MJS	20.11.11
160401250 WSS PH 4	Dwn.	Chkd.	Dgn.	YY.MM.DD

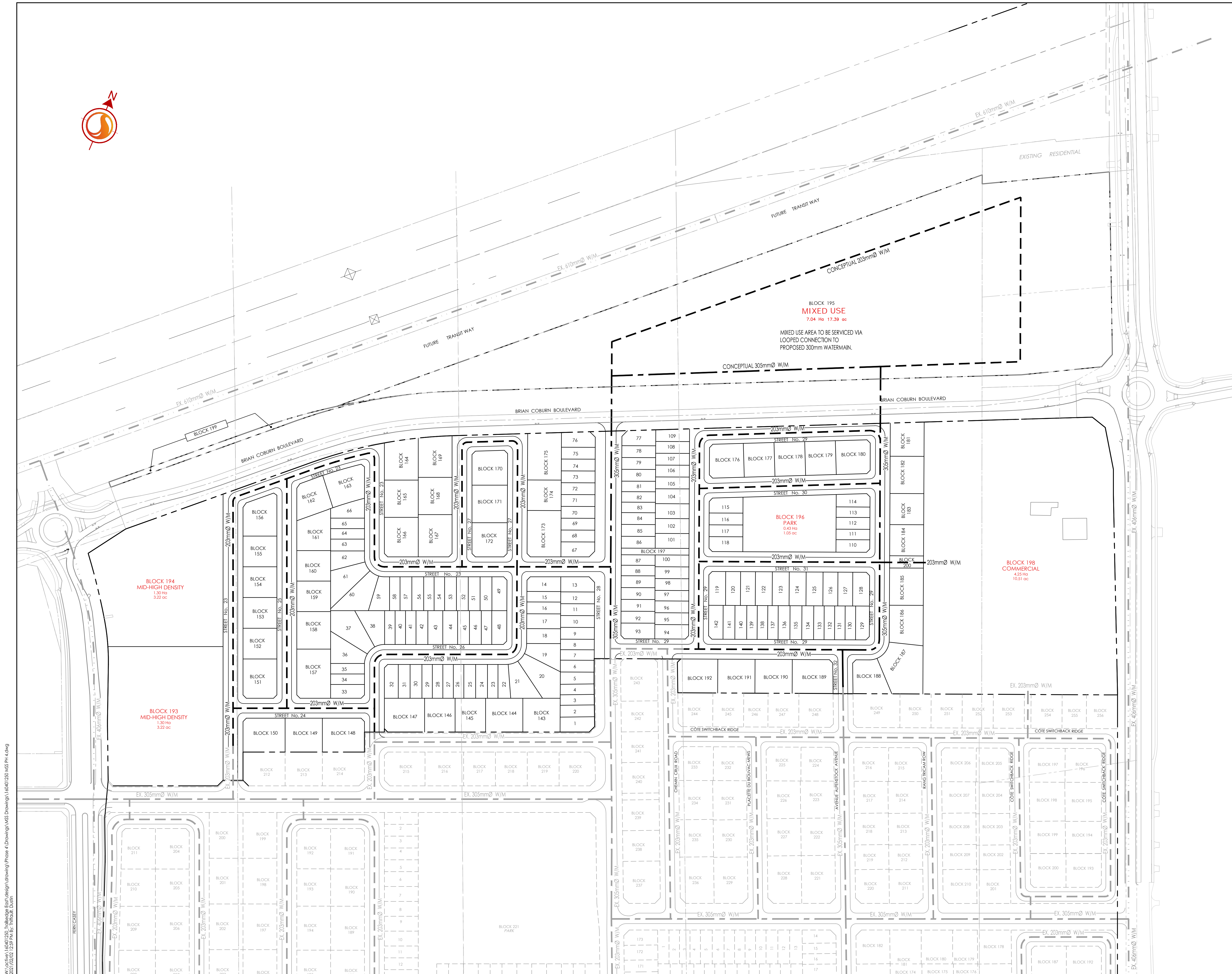
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Client/Project
RICHCRAFT GROUP OF COMPANIES
2280 ST. LAURENT BLVD
OTTAWA, ON, K1G 4K1
TRAILSEDGE EAST SUBDIVISION

Title
OVERALL WATERMAIN SYSTEM

Project No. 160401250	Scale 1:1500	Sheet 3 of 5	Revision 1
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WTR-1 3 of 5 1


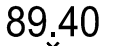






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Legend

-  EXISTING ELEVATION
 -  89.40 PROPOSED ELEVATION
 -  MAJOR OVERLAND FLOW ROUTE
 -  EXISTING MAJOR OVERLAND FLOW ROUTE
- PROPOSED GRADE RAISE PROVIDED BY PATERSON GROUP BASED ON THE FOLLOWING REPORTS: REPORT TITLED - GEOTECHNICAL INVESTIGATION - PROPOSED RESIDENTIAL DEVELOPMENT - EDEN PARK - EAST PORTION - RENAULT ROAD, REPORT DATED DECEMBER 29, 2008, REPORT NO. PG0841-3
REPORT TITLED - GEOTECHNICAL INVESTIGATION - PROPOSED RESIDENTIAL DEVELOPMENT - TRAILSEDGE BLOCK 193 AND 194, REPORT DATED JULY 24, 2020, REPORT NO. PG5397-1.
REPORT TITLED - GEOTECHNICAL - EXISTING CONDITIONS REPORT - EAST URBAN COMMUNITY MIXED USE COP - MER BLEUE ROAD - OTTAWA, ON, REPORT DATED JULY 7, 2019, REPORT NO. PG3130-2 REVISION 2.
-  GRADE RAISES FROM 0.5m UP TO 1.2m ARE PERMITTED.
 -  GRADE RAISES FROM 0.5m UP TO 1.5m ARE PERMITTED.

Notes

1	DRAFT PLAN APPROVAL 1ST SUBMISSION	MJS	SG	22.02.22
Revision		By	Appd.	YY.MM.DD

File Name:	160401250 M55 PH 4	MJS	SG	MJS	20.11.11
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OTTAWA, ON, K1G 4K1
TRAILSEDGE EAST SUBDIVISION

Title
OVERALL GRADE CONTROL PLAN

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		Revision	1



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