PARSONS

Site Servicing and Stormwater Management Report
Residential Development
530 Tremblay Road
Ottawa, Ontario
October 28, 2019

Prepared for :

CLV Group Inc.

Submitted to :

City of Ottawa

Parsons Project # 477074

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1.0 INTRODUCTION

1.1 Site Description and Proposed Development

CLV Group (CLV) has retained Parsons Inc. to prepare a *Site Servicing and Stormwater Management Report* in support of the design of a residential development located at 530 Tremblay Road. **Figure 1** shows the site location.

The proposed development consists of two (2) phases. The scope of the current project, Phase 1, will consist of two buildings with a total of 125 units. Phase 2 is proposed for the future, outside the scope of the current project, and will consist of a third building with 150 units.

Access will be provided by an extension of Avenue U. The private road will be two-way and extend along the east, south and west side of the property with emergency only access at Avenue P. A single vehicle lane will be provided along the north side of the buildings for drop offs and visitor parking. A ramp to the underground parking will be provided from the south side of the building. Pedestrian links will be provided to Avenue S and Avenue T. A pedestrian pathway will be provided along the north side of the property.

Phase 1 of the development will include 10,737 m^2 in gross floor area (4,409 m^2 in Building A and 6,328 m^2 in Building B). Surface parking will provide 62 parking spots with an additional 60 parking spots in the shared underground parking lot.

The proposed building breakdown is listed in the table below.

Table 1: Proposed Building Breakdown

	PROPOSED BUILDING A (5 STOREY)	PROPOSED BUILDING B (6 STOREY)	TOTAL
Gross Floor Area	4,409 m^2	6,328 m^2	10,737 m^2
Total Number of Units	55	70	125
Persons per Unit	1.8	1.8	
Population	99	126	225

The existing parcel currently consists of roughly 1.274 ha of undeveloped vegetated woodlands, with a zoning of TD1 Transit Oriented Development Zone in the Ottawa Zoning Bylaw. The site ground elevation varies between approximately 67.02 m and 68.35 m and generally slopes to the northwest.

The 530 Tremblay Road property is surrounded by the features described below.

- North: Single family one-storey residential dwellings and Avenues S, T, and U
- East: Undeveloped land owned by Canada Lands Company (current concept plan shows park area bordering the subject property as well as a proposed road)
- South: Canadian Pacific Railway corridor
- West: Townhouses and Avenue P

Figure 1: 530 Tremblay Road, Ottawa Key Plan

1.2 Guidelines and Background Documents

The 530 Tremblay Road design is in accordance with the documents below.

- *Ottawa Design Guidelines – Water Distribution,* 1st Edition, July 2010 (OWG and technical bulletins)
  - *Technical Bulletin ISD-2010-2*, December 15, 2010
  - *Technical Bulletin ISDTB-2014-02*, May 27, 2014
  - *Technical Bulletin ISTB-2018-02*, March 21, 2018

- *Sewer Design Guidelines*, City of Ottawa, 2nd Edition, October 2012 (OSG and technical bulletins)
  - *Technical Bulletin ISDTB-2012-6,* October 31, 2012
  - *Technical Bulletin ISDTB-2014-01,* February 5, 2014
  - *Technical Bulletin PIEDTB-2016-01,* September 6, 2016
  - *Technical Bulletin ISTB-2018-01,* March 21, 2018

- *Water Supply for Public Fire Protection*, Fire Underwrites Survey, 1999 (FUS)
- *Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)*

- *City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)*
- *City of Ottawa Environmental Noise Control Guidelines (January 2016)*
- *City of Ottawa Park and Pathway Development Manual (2012)*
- *City of Ottawa Accessibility Design Standards (2012)*
- *Ottawa Standard Tender Documents (2019)*
- *Ontario Provincial Standards for Roads & Public Works (2013)*

1.3 Existing Infrastructure

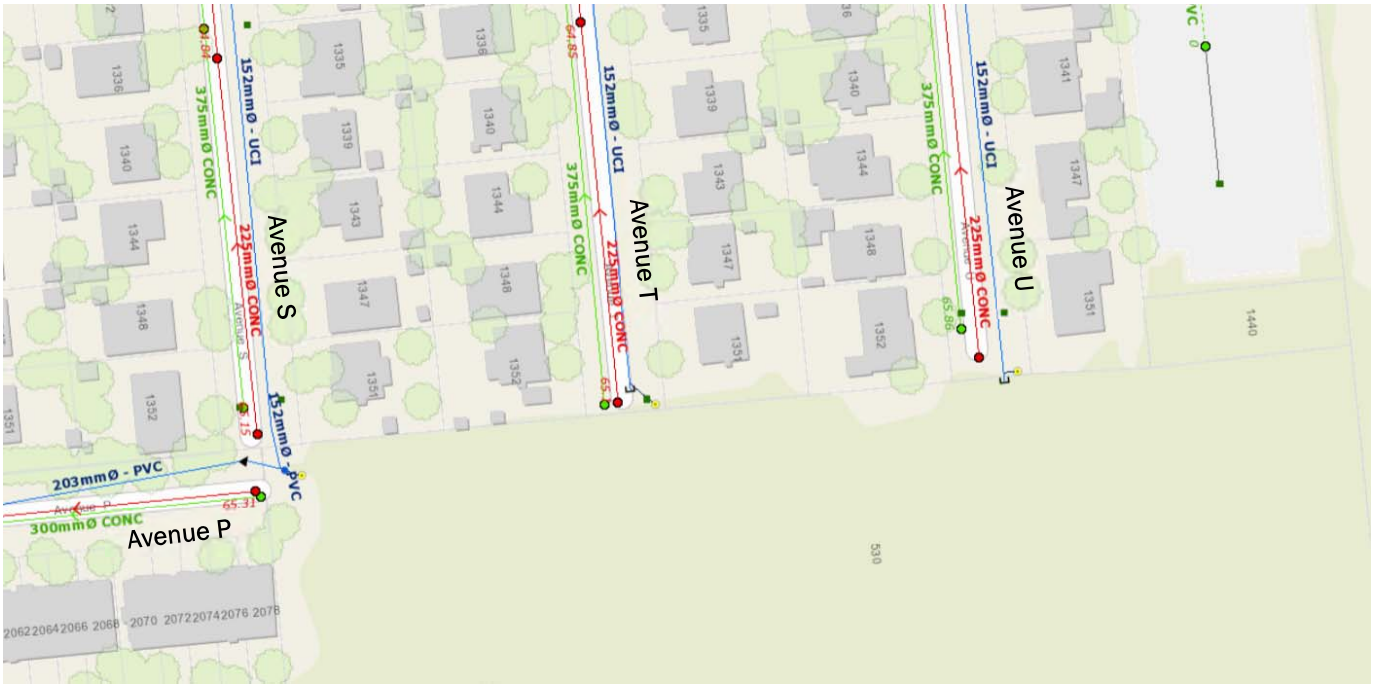
The site is currently undeveloped and is not serviced by municipal infrastructure with the exception of one catchbasin near the northwest corner of the property. The exiting municipal infrastructure surrounding the property is shown on **Figure 2**.

The existing infrastructure, and possible connection points are listed below.

Avenue P:	200mm PVC watermain (1997) 250mm PVC sanitary sewer (1997) 300mm CONC storm sewer (1997)
Avenue S:	150mm UCI watermain (1956) 225mm CONC sanitary sewer (1958) 375mm CONC storm sewer (1962)
Avenue T:	150mm UCI watermain (1956) 225mm CONC sanitary sewer (1958) 375mm CONC storm sewer (1963)
Avenue U:	150mm UCI watermain (1956) 225mm CONC sanitary sewer (1958) 375mm CONC storm sewer (1962)

There is planned road, water and sewer works for Avenues S, T and U forecasted for 2 – 3 years. As it is not confirmed that this work will be completed before the 530 Tremblay Road development begins, the proposed servicing is based on the existing municipal infrastructure.

Figure 2: Existing Municipal Infrastructure Surrounding the Site



1.4 Consultation and Permits

The City of Ottawa and agencies were consulted for this proposed redevelopment. A summary of the consultations is provided below; copies of the correspondences and/or minutes are provided in **Appendix A.**

CONSULTATIONS

City of Ottawa

The City of Ottawa provided the following criteria for the proposed development:

- Stormwater management for the site shall be based on the 5-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
- The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (8.3.7.3);
- A calculated time of concentration (Cannot be less than 10 minutes);
- Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site;
- As per the City's Sewer Design guideline a monitoring manhole shall be required just inside the property line located in an accessible location (ie: not in a parking area) for all non-residential and multi residential buildings connections from a private sewer to a public sewer;
- As per the City's Sewer Design guideline it is expected that the alternative of a high-level sewer in a public right-of-way and connected to the collector sewer is the preferred method of servicing properties; and
- New connections to sewer or watermain services within the City right-of-way is subject to City approval and are to be made above the springline of the sewermain as per:
    - Std Dwg S11.1 for flexible main sewers – connections made using approved tee or wye fittings.
    - Std Dwg S11 (For rigid main sewers) – lateral must be less than 50% the diameter of the sewermain.
    - Std Dwg S11.2 (for rigid main sewers using bell end insert method) – for larger diameter laterals where manufactured inserts are not available; lateral must be less than 50% the diameter of the sewermain.

- Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert with the outlet pipe unless pipes are similar size.
- No submerged outlet connections.

Rideau Valley Conservation Authority (RVCA)

The City contacted Jamie Bachelor, RVCA, who indicated that stormwater for the site is assumed to be directed to the existing storm sewer network on Avenue P. There is no end of pipe stormwater management facility providing water quality treatment. The stormwater management plan for the site needs to incorporate onsite water quality treatment for all surface parking areas and drive isles. The appropriate water quality target is 80% TSS removal.

Ministry of the Environment, Conservation and Parks (MECP)

An Environmental Compliance Approval is not required for this site as the work is all located within one parcel of land, there are no industrial land uses and the municipal infrastructure in the area is fully separated storm and sanitary sewers.

PERMITS AND APPROVALS

The City of Ottawa and the various agencies consulted require the approvals and permits listed below. The City of Ottawa Development Servicing Study Checklist in **Appendix B**.

City of Ottawa

- Municipal Consent
- Commence Work Order
- Water permit
- Water Data Card
- Flow Control Roof Drainage Declaration

RVCA

- Letter of Approval

Ontario Ministry of the Environment, Conservation and Parks

- Permit to Take Water or Environmental Activity and Sector Registry

2.0 GEOTECHNICAL CONSIDERATIONS

Paterson Group completed a geotechnical report, *Preliminary Geotechnical Investigation, Proposed Residential Development, 530 Tremblay Road – Ottawa* dated July 25, 2016. The report is submitted separately.

The report's recommendations regarding grading, site servicing, and drainage are described below. These recommendations are integrated in the design.

Site Preparations

- Topsoil and deleterious fill, such as those containing organic materials should be stripped from under any buildings and other settlement sensitive structures.
- Bedrock removal can be accomplished by hoe ramming where only a small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting and/or hoe ramming. Should blasting be required, a pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be carried out prior to commencing site activities.
  - Generally, peak particle velocities measured at the site should not exceed 25 mm per second during the blasting.

- Blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant
- Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. A minimum 1m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing.

Groundwater Control

- It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps.
- A temporary Permit to Take Water or EASR from the Ontario Ministry of the Environment, Parks and Conservation may be required if more than 50,000 L/day is to be pumped during the construction phase.

Fill Placement

- Fill used for grading beneath the proposed buildings footprint, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. Lifts should be no thicker than 300mm. Fill placed beneath the proposed building should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).
- Non-specified existing fill along with site-excavated soil can be used as general landscaping fill. If these fills are used to build up the subgrade level for areas to be paved, they should be compacted to 95% of their SPMDD. These soils are not suitable to be used as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

Building Drainage and Frost Considerations

- A perimeter foundation drainage system is recommended for both buildings and should be a gravity connection to a storm sewer.
- Backfill against foundation walls should be free-draining and non-frost susceptible granular materials.

Pavement Structure

- Minimum Performance Graded (PG)58-34 asphalt cement should be used for this project.
- Consideration should be given to installing subdrains during the pavement construction
  - Subdrain inverts should be approximately 300 mm below subgrade level, and should extend orthogonally in four directions, or longitudinally when placed along a curb.
- Note that the pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD.

Table 2: Recommended Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	WEAR COURSE – HL-3 or Superpave 12.5 Asphaltic Concrete
150	BASE – OPSS Granular A Crushed Stone
300	SUBBASE – OPSS Granular B Type II
SUBGRDAE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 3: Recommended Pavement Structure - Access Lanes and Heavy Truck Parking Areas

Thickness (mm)	Material Description
40	WEAR COURSE – HL-3 or Superpave 12.5 Asphaltic Concrete
50	BINDER COURSE – HL-8 or Superpave 19 Asphaltic Concrete
150	BASE – OPSS Granular A Crushed Stone
450	SUBBASE – OPSS Granular B Type II
SUBGRDAE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or fill	

3.0 WATER SERVICING

3.1 Proposed Water Servicing

The proposed drinking water servicing approach for the site includes a new private 250 mm diameter watermain that will be linked to the existing watermains at Avenue P/S, Avenue T and Avenue U to provide looping and reliability. Individual services to each building will be provided from the new private watermain.

Drawing C101, in **Appendix C,** shows the existing and proposed water distribution network.

3.2 Design Criteria

The proposed water servicing network has been designed in general conformance with OWG and FUS as amended by the City of Ottawa by its technical bulletins.

The system pressure criteria under normal and various operating conditions are listed in the table below.

Table 4: Water System Pressure – Criteria

OPERATING CONDITIONS	PRESSURE CRITERIA	
	KPa	psi
Average Daily Demand		
minimum to maximum	276-552	40-80
Desirable range	350-480	50-70
Peak Hourly Demand		
minimum to maximum	276-552	40-80
Desirable range	350-480	50-70
Maximum Daily Demand + Fire Flow		
minimum	140	20

The *OWG* section 4.2.12. lists the design friction factors for design per the table below. The proposed watermain is 250mm in diameter. Therefore, the water network was modeled with a friction factor of 110.

Table 5: Pipe Diameter and Friction Factor

PIPE DIAMETER	C-FACTOR
150 mm	100
200 mm to 250 mm	110
300mm to 600 mm	120
Over 600 mm	130

The City of Ottawa provided the watermain boundary conditions shown in the table below. A copy of the correspondence is in **Appendix D**.

Table 6: Avenue S Watermain Boundary Conditions

MINIMUM HGL	MAXIMUM HGL	MAXIMUM DAY + FIRE FLOW
110.2 m	118.5 m	92.0m
61 psi	73 psi	35 psi
421 KPa	503 KPa	241 KPa

Table 7: Avenue T Watermain Boundary Conditions

MINIMUM HGL	MAXIMUM HGL	MAXIMUM DAY + FIRE FLOW
110.2 m	118.5 m	*
61 psi	73 psi	
421 KPa	503 KPa	

* Available flow at 20 psi = 175 L/s assuming a ground elevation of 67.4m.

Table 8: Avenue U Watermain Boundary Conditions

MINIMUM HGL	MAXIMUM HGL	MAXIMUM DAY + FIRE FLOW
110.2 m	118.5 m	*
60 psi	71 psi	
421 KPa	503 KPa	

* Available flow at 20 psi = 155 L/s assuming a ground elevation of 68.2m.

The boundary conditions provided demonstrate that the available pressure ranges from approximately 61 psi to 73 psi during normal operating conditions but is limited during fire flow conditions.

The fire flow was calculated with the following parameters:

Type of construction: non-combustible construction

Occupancy Type: limited combustible

Sprinkler Protection: fully monitored, automatic sprinkler system from standard water supply

In order to provide adequate fire protection, the fire demand in Building B was reduced by the addition of a firewall with a fire-resistance rating of 2 hours to subdivide the building into two separate fire areas, as recommended in OWG Technical Bulletin 2018. The architect has proposed to install the fire separation along the corridor running through the middle of the building longitudinally. The associated floor areas of the two sections of Building B are shown in the fire demand calculations in **Appendix E**.

The OWG requires that "Service areas with a basic day demand greater than 50 m^3/day (about 50 homes) shall be connected with a minimum of two watermains, separated by an isolation valve, to avoid the creation of a vulnerable service area. Individual residential facilities with a basic day demand greater than 50 m^3/day shall be connected with a minimum of two water services, separated by an isolation valve, to avoid the creation of a vulnerable service area." Looking at the site as a whole, there are three connections to the City water system from different streets; therefore, the failure of one service connection from the City water system will not eliminate the supply to the site. As Building B is considered an individual residential facility with a basic day demand greater than 0.58 L/s, two services from the private watermain, with an isolation valve between the two have been proposed.

The OWG recommends two valves be provided at tees and three valves at cross intersections to minimize the impact of watermain isolations. The proposed valving meets these requirements.

The proposed pipes will be installed with a minimum cover of 2.4 m where possible. Should there be less than 2.4 m cover or separation from an open structure, the pipes will be insulated as per City Standard Drawings W22 and W23.

3.3 Calculations and Simulation Results

The table below summarizes the anticipated maximum water demand for the proposed residential development. Detailed calculations for the water demand and fire flow are in **Appendix E**.

Table 9: Residential Consumption Rates

BUILDING	UNITS	POPULATION	AVERAGE DAY DEMAND (ADD) L/s	MAX DAILY DEMAND (MDD) 3.6 X ADD L/s	PEAK HOURLY DEMAND (PHD) 5.4 X MDD L/s	FIRE FLOW DEMAND (FF) L/s	MDD+FF L/s
Building A	55	99	0.40	1.44	2.17	150	151.4
Building B	70	126	0.51	1.84	2.76	183	184.8
Building C (Future)	*150*	*270*	*1.09*	*3.94*	*5.91*	*167*	*170.9*

EPA-NET is the hydraulic modeling software used to determine the required pipe sizes and the system pressures for the proposed design.

The pressures were determined for the average day demand (ADD), maximum daily demand plus fire flow (MDD+FF), and peak hourly demand (PHD) based on the boundary conditions provided by the City of Ottawa.

The simulation with EPA-NET shows that residual pressures criteria are satisfied. These resulting pressures are shown in the table below. Outputs and details of the EPA- NET model are provided in **Appendix F**.

Table 10: Residual Pressures Under Each Demand

	AVERAGE DAY			PEAK HOUR			MAX DAY + FIRE FLOW*		
	(m)	(psi)	(kPa)	(m)	(psi)	(kPa)	(m)	(psi)	(kPa)
Building A	50.5	72	496	42.2	60	414	21.1	30	207
Building B	50.5	72	496	42.2	60	414	15.4	22	152
Building C	50.3	72	496	42.0	60	414	15.7	22	152

* Assuming worst case fire scenario (Building B Fire Demand = 183 L/s)

High pressure is not an issue on this site as the boundary conditions are below 80 psi. Therefore, pressure reducing valves will not be required.

3.4 Summary and Conclusions

The proposed water network is to be connected to the existing water network on Avenue P/S, Avenue T, and Avenue U.

The water pressures, under average day demand, peak hour demand and max day plus fire flow conditions, are within the allowable pressure range specified by the City of Ottawa.

The proposed watermains are shown on **Drawing C101** in **Appendix C.**

4.0 SANITARY SERVICING

4.1 Proposed Sanitary Servicing

The proposed sanitary sewer system will be composed of 150 mm diameter laterals from each building, which will connect to a 150 mm diameter private sanitary sewer. The private sanitary sewer will drain towards Avenue U where it will connect to the existing City owned 225 mm diameter sanitary sewer. A monitoring manhole will be provided near the property line.

Drawing C101, in **Appendix C**, shows the proposed sanitary sewer system.

4.2 Design Criteria

The proposed sanitary sewer system has been designed in general conformance with the *OSG* and its technical bulletins.

The sanitary design flow rate is the peak flow plus the peak extraneous flow. The table below presents the values for the average flow, peak factor and peak extraneous flows used in the sanitary servicing calculations for the residential development.

Table 11: Sanitary Design Flows Criteria

DEVELOPMENT TYPE	AVERAGE SANITARY FLOW	UNIT	PEAK FACTOR	PEAK EXTRANEOUS FLOW*
Residential	280	L/c/d	Harmon Equation	0.33 L/s/gross ha

The sanitary sewer system is designed with a pipe roughness coefficient of 0.013.

The proposed pipes will be installed with a minimum cover of 2.0 m where possible. Where there is less than 2.0 m cover, the pipes will be insulated as per the details provided on **Drawing C103**.

4.3 Calculations and Results

The sanitary design flows and sewer pipe design spreadsheets, included in **Appendix G**, shows the flows from the proposed sewers as well as the existing City sewers. The existing City owned sanitary sewer on Avenue U is 225 mm in diameter and ranges in slope from 0.32% to 1.07% at the connection point to the Tremblay Road sewer. The existing City infrastructure has sufficient capacity to accommodate the additional flows with the existing sewers operating between 11% and 25% full with the addition of the proposed flows. There will be additional sanitary flows from the parking garage sump which will collect the stormwater from the ramp entrance into the parking garage and any other drainage collected within the garage from snow melt off cars, etc. The discharge rate from the sump pump is not known at this time but is expected to be almost negligible compared to the sanitary flows from the domestic use.

Details regarding pipes length, material, and elevation are shown on **Drawing C101**, in **Appendix C**.

4.4 Summary and Conclusions

The proposed sanitary sewer system will connect both of the buildings with laterals to a proposed private sanitary sewer system, including monitoring maintenance hole, which will connect into the existing 225mm diameter sanitary sewer on Avenue U.

The sanitary flow increase will not significantly alter the flow to the municipal sewer on Avenue U.

The proposed sanitary sewer system is shown on **Drawing C101**, in **Appendix C**.

5.0 STORM SERVICING AND STORMWATER MANAGEMENT

5.1 Existing Storm Servicing

The existing site is not serviced with the exception of a catchbasin at the northwest corner of the site between Avenue P and Avenue S. The site generally sheet drains to the northwest towards the City right-of-way. The topography of the wooded lands is fairly flat with slopes less than 2%.

The City infrastructure consists of 375 mm diameter storm sewers on Avenue's S, T and U as well as a 300 mm diameter storm sewer on Avenue P. Each of the storm sewers ends in the City right-of-way adjacent to the subject property and then drains towards Tremblay Road. The Tremblay Road sewer continues west and ultimately outlets to the Rideau River just south of Highway 417.

5.2 Proposed Storm Servicing

The green space along the north border of the site will have a ditch, as will the area to the east of the site where the proposed developed portion of the site ties in with the future Phase 2 portion of the site. A subdrain connected to the private piped storm system will be provided for the ditches and retaining walls. Stormwater within the site will be captured by a series of concrete catch basins, catch basin maintenance holes, and subdrains. The stormwater will be detained on site using underground storage. Stormwater quality will be provided through use of oil-grit separators. The stormwater from the site will discharge to two outlets, the 375 mm diameter storm sewer on Avenue S and the 375 mm diameter storm sewer on Avenue T. Two outlets are being provided due to capacity restraints in the City's existing storm sewers.

The roofs of the two buildings will have controlled roof drains to provide detention. The roof drains will exit the building in a private storm service at the northwest corner of Building A and connect directly to the City's 375 mm diameter storm sewer in Avenue U.

A small portion of the grass and pathway at the northwest corner of the site will continue to drain to Avenue S uncontrolled.

A portion of the ramp to the parking garage is uncovered. Therefore, the stormwater that falls on the ramp will be collected within the parking garage and will be directed to the sanitary sewer system. The surface drainage near the entrance to the ramp is directed away from the ramp to a catch basin on the south side of the driving isle. The spillover point for the catch basin drains to the neighbouring catch basin to prevent additional stormwater flows from entering the parking garage.

The site existing drainage area is shown on **Figure A: Pre-development Drainage Plan** in **Appendix H.**

2013 IMP indicates that the site is in an area publicly serviced by fully separated water collection systems. Future works near the site include the replacement of water and sewer on the adjacent Avenue's S, T and U. It is expected that the proposed works will increase the capacity of the existing municipal infrastructure. There is also planned work to the east by the Canada Lands Company including the re-alignment of Tremblay Road and the associated municipal infrastructure.

There is no known history of flooding. The design approach for the stormwater management is to ensure that the post-development peak flows do not exceed the existing 5-year pre-development release rate flow.

Figure B: Post-development Drainage Plan in **Appendix H** depicts the boundaries of the post-development drainage areas.

5.3 Design Criteria

The proposed storm sewer system has been designed in general conformance with the *OSG* and its technical bulletins, plus more specific requirements from the City of Ottawa and RVCA.

The criteria below were provided in part by the City of Ottawa and RVCA. These agencies correspondence are located in **Appendix A**.

The design criteria for the site includes the following:

i. Stormwater management for the site shall be based on the 5-year storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997;
ii. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (8.3.7.3);
iii. A calculated time of concentration (Cannot be less than 10 minutes);
iv. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site;
v. The Rational Method is used to calculate the allowable peak flow to discharge into the receiving storm sewer systems and the runoff volume to be retained on site;
vi. IDF curve equations used with the Rational formula:
    a. 5-year $=998.071/(Tc+6.053)^{0.814}$
    b. 100-year $= 1735.688/(Tc+6.014)^{0.820}$
vii. the runoff quality is to provide 80% TSS removal.

The Rational Method uses runoff coefficients for various surfaces. The table below shows the runoff coefficients chosen in this study. The runoff coefficient for a 100-year storm event is increased by 25% per the OSG.

Table 12: Rational Method Runoff Coefficients

SURFACE	5-YEAR COEFFICIENT	100-YEAR COEFFICIENT
Grass/Trees/Shrub	0.20	0.25
Woodlands	0.30	0.38
Asphalt/Building/Concrete	0.90	1.00

5.4 Allowable Release Rate

The allowable release rate for the 0.99 ha of the site to be developed was calculated using the rational method formula based on the 5-year flow and the existing runoff coefficient of 0.3.

$$Q = 2.78\ CiA$$

where

Q = Flow rate (L/s)

C = Runoff coefficient

i = Rainfall intensity (mm/hr)

A = Area (ha)

The resultant allowable release rate is **53.2 L/s**.

5.5 Storm Sewer Design

Calculations showing the storm sewer design are included in **Appendix I**. The storm sewer design spreadsheet is based on the Rational Method and Manning formula and was used to calculate the design flow and required pipe sizes. Ottawa IDF information for the 5-year design storm was used to calculate the peak flows.

Figure B: Post-development Drainage Plan in **Appendix H** shows the drainage areas and the sewer layout with catch basin and maintenance hole locations indicated. Details including pipe lengths, sizes, materials, inverts elevations and structure types are shown on **Drawing C101** in **Appendix C**.

5.6 Stormwater Management

The on-site storm sewers and related storm structures have been sized to attenuate the 5-year and 100-year post-development flow rates to the allowable post-development flow rates as shown in **Appendix J**.

AREA 1 (DRAINAGE AREA WS-02)

The uncontrolled post-development flow from this sub-catchment area was calculated using the Rational Method to be **0.8 L/s** for the 5-year event and **1.8 L/s** for the 100-year event.

AREA 2 (DRAINAGE AREAS WS-07 AND WS-08)

The post-development flow from the two building roofs will be controlled using Watts Adjustable Accutrol roof drains. The drainage area per roof drain controlled roof drains.

Table 13: Roof Drain Controlled Development Flows and Storage

	Number of Roof Drains	Controlled Flow (L/s)		Max Ponding Depth (mm)		Storage Volume (m^3)	
		1:5 Year	1:100 Year	1:5 Year	1:100 Year	1:5 Year	1:100 Year
Building A	4	0.71	1.35	57.5	108.7	4.5	8.4
Building B	5	0.70	1.33	56.6	107.0	4.1	7.8
Total		6.4	12.0			38.5	72.6

The controlled flow from these sub-catchment areas will be **6.4 L/s** for the 5-year event and **12.0 L/s** for the 100-year event. A dedicated storm service for the roof drain flows will be provided with a direct connection to the City infrastructure, at Avenue U, separate from the other controlled stormwater from the site.

AREA 3 (DRAINAGE AREA WS-10)

The stormwater that falls on the parking garage ramp will be collected within the parking garage and will be directed to the sanitary sewer system. Therefore, this area will not contribute any flows to the stormwater system.

AREA 4 (DRAINAGE AREAS WS-01, WS-09, WS-11, WS-12 and WS-14)

The post-development flow for these sub-catchment areas, consisting of parking lot, driving isle and landscaped areas, will be collected using catch basins and catch basin manholes. The controlled flows will be discharged to the 375 mm diameter City storm sewer on Avenue S. The flows from the pipe system will be controlled using an ICD in the outlet pipe of ST-CBMH-03S, to a flow rate of **22.5 L/s (100-year)**. The stormwater flows will be stored in an underground storage tank located in the southeast corner of the parking lot. See **Appendix J** for detailed calculations and **Drawing C103** for ICD detail.

Table 14: ICD Schedule Avenue S

ICD ID	LOCATION	OUTLET DIAMETER (mm)	FLOW (L/s)	HEAD (m)	EQUIVALENT DIAMETER (mm)	MODEL	STORAGE VOLUME REQUIRED (m^3)
1	ST-CBMH-03S	375	22.2 (100-year)	0.97	102	TEMPEST MHF	158.0
			20.7 (5-year)	0.84			54.4

The required underground storage is provided in the underground storage tank (133.7 m^3) and the pipes (31 m^3). The proposed underground storage system is presented in **Appendix K**.

AREA 5 (DRAINAGE AREAS WS-04, WS-05, WS-03, WS-06 and WS-13)

The post-development flow for these sub-catchment areas, consisting of driving isle and landscaped areas, will be collected using catch basins and catch basin manholes. The controlled flows will be discharged to the 375 mm diameter City storm sewer on Avenue T. The flows from the pipe system will be controlled using an ICD in the outlet pipe of ST-MH-25, to a flow rate of **17.0 L/s (100-year)**. The stormwater flows will be stored in an underground storage tank located in the driving aisle at the east side of the site. See **Appendix J** for detailed calculations and **Drawing C103** for ICD detail.

Table 15: ICD Schedule Avenue T

ICD ID	LOCATION	OUTLET DIAMETER (mm)	FLOW (L/s)	HEAD (m)	EQUIVALENT DIAMETER (mm)	MODEL	STORAGE VOLUME REQUIRED (m^3)
2	ST-MH-04T	300	17.2 (100-year)	1.34	83	TEMPEST MHF	79.7
			14.3 (5-year)	0.93			27.9

The required underground storage is provided in the underground storage tank (78.9 m^3) and the pipes (9 m^3). The proposed underground storage system is presented in **Appendix K**.

The proposed stormwater management methods described above will be implemented to control the post-development flows to the 5-year pre-development flows as outlined in the table below.

Table 16: Summary of Pre-Development and Post Development Flows

DESIGN EVENT	PRE-DEVELOPMENT SITE FLOW (L/S)	POST-DEVELOPMENT CONTROLLED FLOW (L/S)					
		AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	TOTAL
5-year	53.2	0.8	6.4	0	20.7	14.3	42.4
100-year	113.5	1.8	12.0	0	22.2	17.2	53.2

5.7 Stormwater Quality

The RVCA has indicated that onsite water quality treatment will be required for all surface parking areas and driving isles. The water quality target is 80% TSS remove. Quality controls are to be provided which meets 80% TSS removal. An oil grit separator was sized to provide the required 80% TSS removal. Two oil-grit separators will be provided, one at the Avenue S outlet and one at the Avenue T outlet. Refer to **Appendix L** for the oil-grit separator sizing and proposed models.

5.8 Major Overland Flow

The major overland flow route generally flows to the north with most of the site exiting to the City right-of-way at Avenue P with outlets at Avenue's T and U as well.

5.9 Summary and Conclusions

The proposed stormwater system will consist of three separate controlled outlets and one uncontrolled outlet. The small uncontrolled outlet will flow overland to Avenue S. The roof drain controlled flows will outlet to Avenue U. Underground storage will be provided to control the flows from the remainder of the site in two separate systems, one which will outlet to the existing City Avenue S storm sewer and the second will outlet to the existing City Avenue T storm sewer.

The 100 year hydraulic grade line for the Avenue S controlled system is 66.87 m and for Avenue T is 67.11 m. The finished floor elevations for Buildings A and B are 68.31 m and 68.37 m respectively.

6.0 SEDIMENT AND EROSION CONTROL

To mitigate the impacts due to erosion and sedimentation during construction, erosion and sediment control measures shall be installed and maintained throughout the duration of construction. Measures shall only be removed once the construction activities are complete, and the site has stabilized.

The measures will include:

- Siltsack® shall be installed between the frame and cover of existing and new catchbasins and maintenance holes, to minimize sediments entering the storm drainage system. These shall remain in place until vegetation has been established and construction is complete.
- A mud mat shall be provided at Avenue U where equipment will be leaving the site.
- Light Duty Silt Fence Barriers shall be placed around the perimeter of the site. The barriers shall be installed and maintained according to OPSS 577 and OPSD 219.110.
- All catch basins and maintenance holes will have sumps to maximize the removal of sediments prior to discharging into the existing and new sewer system. These sumps must be cleaned of debris following construction and on a yearly basis.
- The underground storage tanks and the oil and grit separators should be inspected and cleaned out as per the manufacturers instructions.

7.0 CONCLUSIONS

This report outlines the proposed servicing and stormwater management design for the residential development proposed at 530 Tremblay Road, Ottawa, ON.

The proposed drinking water system will include three connections to the City owned drinking water system at Avenue's P/S, T and U to provide domestic and fire demands to the proposed buildings at pressures within the City's allowable pressure ranges.

The proposed sanitary sewer system will consist of 150 mm diameter sanitary sewers collecting flows from Buildings A and B with an outlet to the existing City owned sanitary sewer on Avenue U.

Stormwater runoff from the site will include a small uncontrolled area as well as multiple controlled outlets. The flows will be controlled using roof drains and inlet control devices. Onsite storage will be provided through underground storage chambers as well as on the roofs of the two buildings. The total release rate from the site will be 53.2 L/s which is equal to the pre-development 5-year storm.

Prepared by:

Meghan MacSween, M.Eng., P.Eng.

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APPENDIX A | CORRESPONDENCE

530 Tremblay Road

Meeting Summary Notes
January 31, 2019, Ottawa City Hall

Attendees:

- Emilie Coyle, Fotenn
- Brian Casagrande, Fotenn
- Chris Gordon, CGH Transportation
- Meghan MacSween, Parsons
- Mike Kelly, CLV Group
- Evan Johnson, CLV Group
- Oz Drewniak, CLV Group
- Wally Dubyk (Transportation Project Manager, City of Ottawa)
- Sharif Sharif (Project Manager, City of Ottawa)
- Christopher Moise (Urban Designer, Architect, City of Ottawa)
- Mark Richardson (Forester, City of Ottawa)
- Tracey Scaramozzino (File Lead, Planner, City of Ottawa)

Unable to Attend:

- Matthew Hayley (Environmental Planner, City of Ottawa)
- Jamie Bachelor (RVCA)
- Jeanette Krabicka (Parks Planner, City of Ottawa)

Issue of Discussion:

- CLV owns the property
- Proposed development of 530 Tremblay Road for three mid-rise apartment buildings
- Development would be phased, starting with two buildings
- Access would be off an extension of Avenue P. The extension would be a private road and would end at the property line at the eastern edge of the property – to allow eventual connection to the larger parcel of land, also known as 530 Tremblay Rd.
- Parking would mostly be underground, with some surface parking at the rear.
- Proposing to submit application in March or April, to start construction ASAP


Avenue T
Avenue U
N
29.0
20.0
PROPERTY LINE
SETBACK
Egress
Egress
Entrance
Egress
3 Storeys
4 Storeys
Proposed 5
Storey Building
48 units
5 Storeys
Proposed 6
Storey Building
70 units
DN
Proposed 6
Storey Building
104 units
DN
48.0
PROPERTY LINE
49.0
70 Regular Spots (2.6 x 5.2)
2 Accessible Spot (Type A)
2 Accessible Spot (Type B)

1. **Official Plan**
    a. Designated “Mixed Use” – ensure policies in 2.5.1 and 4.11 are implemented
    b. Part of the St. Laurent TOD Plan Area

2. **Zoning Information**
    a. Transit Oriented Development Zone, Subzone 1
    b. This is considered a Planned Unit Development (PUD)

3. **Infrastructure/Servicing (Golam Sharif):**

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/development-application-review-process-2/guide-preparing-studies-and-plans

2. Servicing and site works shall be in accordance with the following documents:

    ⇨ Ottawa Sewer Design Guidelines (October 2012), Technical Bulletin, ISDTB-2014-01, PIEDTB-2016-01 and ISTB-2018-01.

    ⇨ Ottawa Design Guidelines – Water Distribution (2010) and Technical Bulletins ISD-2010-2, ISDTB-2014-02 and ISTB-2018-02.

    ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)

    ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)

    ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)

    ⇨ City of Ottawa Park and Pathway Development Manual (2012)

    ⇨ City of Ottawa Accessibility Design Standards (2012)

    ⇨ Ottawa Standard Tender Documents (latest version)

    ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

4. The Stormwater Management Criteria, for the subject site, is to be based on the following:

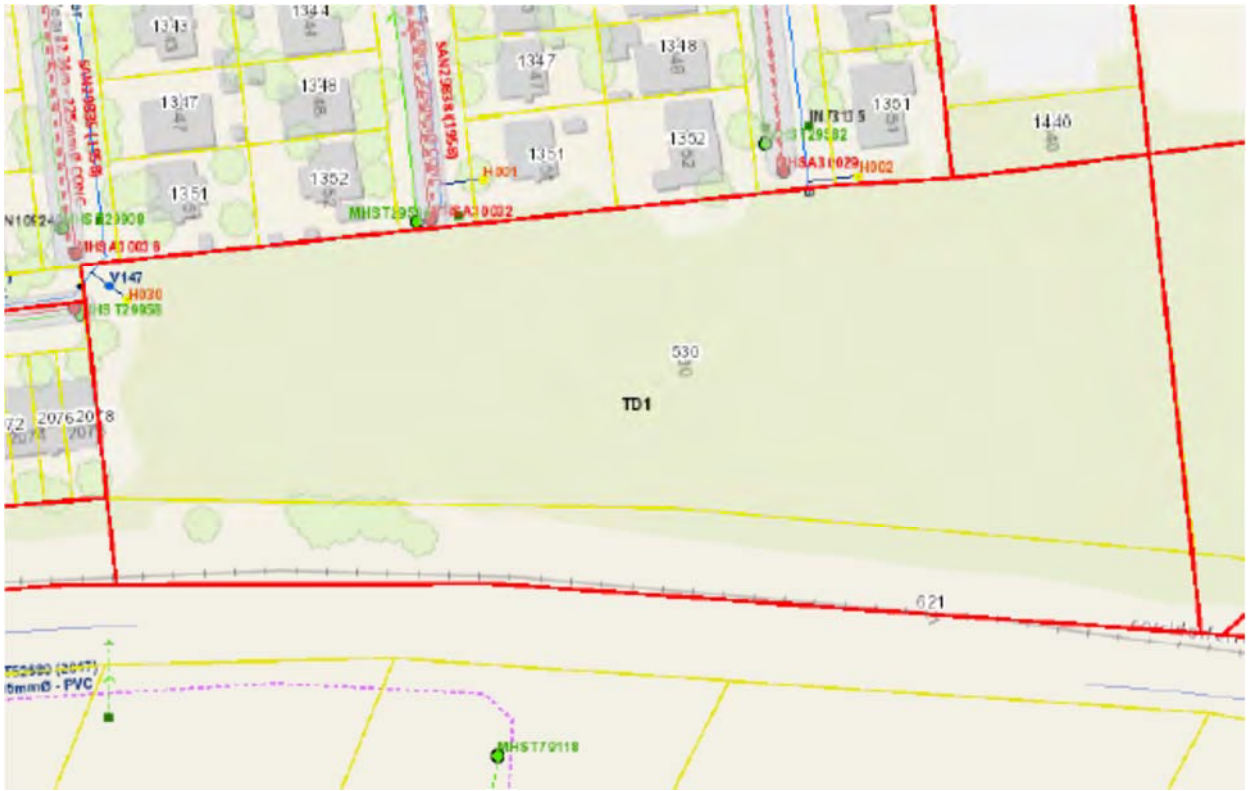
   i. The 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.

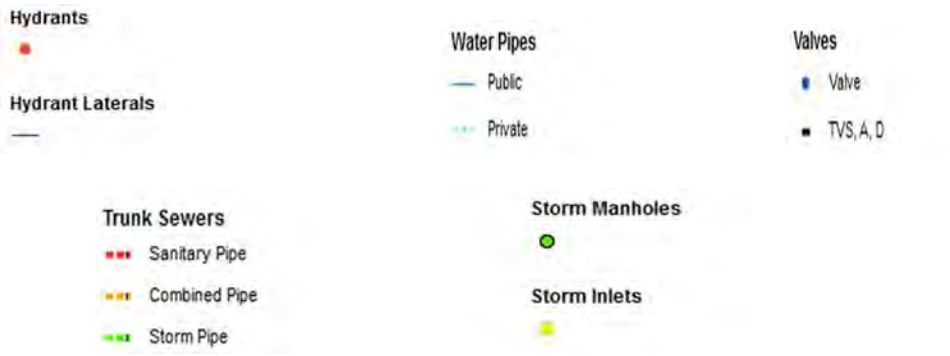
   ii. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).

   iii. A calculated time of concentration (Cannot be less than 10 minutes).

   iv. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site.

5. Deep Services (Storm, Sanitary & Water Supply)





i. A plan view of the existing services may be seen above. Services should ideally be grouped in a common trench to minimize the number of road cuts. The sizing of existing services is:

   a. Avenue U:

      i. Water – 150 mm STUB (Iron – 1956).

      ii. Sanitary – 225 mm (Concrete - 1958).

      iii. Storm – 375 mm (Concrete – 1962).

   b. Avenue T:

      i. Water – 150 mm STUB (Iron – 1956).

      ii. Sanitary – 225 mm (Concrete - 1958).

      iii. Storm – 375 mm (Concrete – 1963).

   c. Avenue S:

      i. Water – 150 mm STUB (Iron – 1956).

      ii. Sanitary – 225 mm (Concrete - 1958).

      iii. Storm – 375 mm (Concrete – 1962).

   d. Avenue P:

      i. Water – 200 mm (PVC – 1997).

      ii. Sanitary – 250 mm (PVC - 1997).

iii. Storm – 300 mm (Concrete – 1997).

ii. As per City's Sewer Design guideline a monitoring manhole shall be required just inside the property line located in an accessible location (ie. Not in a parking area) for all non-residential and multi residential buildings connections from a private sewer to a public sewer.

iii. As per City's Sewer Design guideline it is expected that the alternative of a high level sewer in a public right-of-way and connected to the collector sewer is the preferred method of servicing properties.

iv. New connections to sewer or watermain services within the City right of way is subject to City approval and are to be made above the springline of the sewermain as per:

a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*

b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*

c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*

d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

e. *No submerged outlet connections*

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

i. Location of service

ii. Type of development and the amount of fire flow required (as per FUS, 1999).

iii. Average daily demand: ___ l/s.

iv. Maximum daily demand: ___l/s.

v. Maximum hourly daily demand: ___ l/s.

vi. Hydrant location and spacing to meet City's Water Design guidelines.

7. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

8. Additional comments –

i. City construction forecast: Ave S, T and U road, water and sewer target within 2-3 years.

ii. Consult with RVCA for quality control measures for stormwater discharge (discharge to Rideau River via St. Laurent Station storm).

iii. Provide reference including excerpt to the Master Servicing Study in the Site Servicing report if any.

4. Initial Planning/Design Comments (Tracey Scaramozzino, Christopher Moise)

- This file will be Site Plan, Manager Approval, Public Consultation
- Speak to the Councillor (Jean Cloutier) to obtain early comments as well as to obtain contacts for any community associations in that area. The Councillor may chose to host a public meeting in the community, although it is not a requirement of the City for this application.
- Cash-in-lieu of parkland will be required (see additional comments below from the Parks Planner).
- Ensure 2% of total lot area is outdoor communal space for amenity – as per the Zoning By-law.
- Bring the community character into the design (use of brick) and ensure a residential look and feel (it now presents itself as more of a commercial building).
- Ensure a mix of unit types.
- Are you reaching the required density?
- Show all setbacks – including that from the Queensway.
- Use permeable pavers when possible, as opposed to standard pavers, to promote sustainability.

- Provide more bicycle parking spaces than are required in the zoning by-law. One/unit would be preferred.
- Allow the prospective architect to be free with ideas and not constrained by previous plans.
- There is too much road for a TOD designated area.
- Perhaps access could be off of the stub ends of Avenues T and U – instead of extending Avenue P.
- Transition and compatibility with low-rise residential to the west and north are very important
- This file is subject to the Urban Design Review Panel (UDRP)
- Show the pathway that was discussed that exists under the Queensway that connects the area to the transit station
- Ensure excellent pedestrian connectivity to north (transit) and future development to the east.
- Alexandria Rail Corridor is a heavy rail line – owned by CN and CP. Via Rail operates on it. Contact is Suzanne.Glenn-Rigny@cn.ca; tel: 514-399-7844
- City to discuss internally the road connection at the proposed end of Avenue P to the proposed roads on the abutting property to the east.

5. **Transportation (Wally Dubyk):**
    a. City will determine if an RMA is required for the connection to Avenue U and Avenue T.
    b. Screening form has been received. Applicant must now start the TIA.

6. **RVCA (Jamie Bachelor)**
    It is assumed that stormwater for this site will be directed to the existing storm sewer network on Ave P which is a little less than 2km upstream of the direct outlet to the Ottawa River. There is no end of pipe stormwater management facility providing water quality treatment. Therefore, the stormwater management plan for this site needs to incorporate onsite water quality treatment for all surface parking areas and drive isles. The appropriate water quality target is 80% TSS removal.

7. **Environmental Issues (Matthew Hayley):**
    The site appears to have a forest community on it that may be a significant woodland, accordingly this will need to be addressed through an EIS.

    Significant Woodlands
    The significant woodland assessment in the EIS will need to address the OPA 179 policies. The EIS significant woodland evaluation and assessment will need to address:
    - A woodlot inventory, including an assessment under the uncommon characteristics criteria, as per the NHRM. This will include an assessment of the size of the woodlot to determine if it meets the minimum size criteria presented in the OPA 179 policies.
    - A species at risk survey, with an emphasis on birds and bats.
    - An iTree Eco evaluation of the existing woodlot (assuming the woodlot meets the size threshold).
    - A detailed landscaping plan and urban canopy analysis, with demonstration of adequate soil volumes for retained and planted trees.
    - An assessment of the change in accessible greenspace for residential units within a 250 m straight-line distance of the woodlot, broken down by housing type.
    - An assessment of the benefits of retained and planted trees at 40 years of maturity, using iTree Design.
    - An assessment of the change in tree canopy cover within the neighbourhood, as defined in GeoOttawa, at 40 years of maturity.

8. **Tree Conservation Report (Mark Richardson):**
    a) A Tree Conservation Report (TCR) must be supplied for review along with the various other plans/reports required by the City; an approved TCR is a requirement for Site Plan approval

b) any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR
c) the removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR
d) in this case, the TCR may be combined with the EIS
e) the TCR must list all trees on site by species, diameter and health condition; similar groupings (stands) of trees can combined using averages by species, diameter class
f) the TCR must address all trees with a critical root zone that extends into the developable area – all trees that could be impacted by the construction that are outside the developable area need to be addressed.
g) Trees with a trunk that crosses/touches a property line are considered co-owned by both property owners; permission from the adjoining property owner must be obtained prior to the removal of co-owned trees
h) If trees are to be removed, the TCR must clearly show where they are, and document the reason they can not be retained – please provide a plan showing retained and removed treed areas
i) All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines listed on Ottawa.ca
j) Please ensure newly planted trees have an adequate soil volume for their size at maturity. The following is a table of recommended minimum soil volumes:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

k) The City requests that all efforts are made to retain trees – trees should be healthy, and of a size and species that can grow into the site and contribute to Ottawa's urban forest canopy
l) For more information on the TCR process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca

9. Parks and Facilities (Jeanette Krabicka):

a) Parkland Dedication:

As part of the Planning Rationale to be submitted for circulation, please include a separate section titled "Parkland Dedication" in the document. This section is to provide

an explanation of how the proposed development will address the Parkland Dedication requirements, as per the City of Ottawa Parkland Dedication By-law No 2009-95.

To be included (if applicable):

- the number and type of residential units proposed;
- the gross land area of all apartment blocks proposed;
- the gross land area of all commercial/industrial blocks proposed;
- the gross land area and type of all other development blocks proposed;
- the total area of Parkland Dedication (in hectares, to 3 decimal places) that is to be transferred to the City; and
- Please also indicate whether land conveyance or Cash-in-lieu-of-Parkland is being proposed.

To be noted: Parks & Facilities Planning is recommending Cash-in-lieu-of-Parkland be considered instead of land dedication.

b) If the Parkland Dedication for this development has been satisfied previously:

Please indicate (if applicable):

- under what application number it has occurred;
- the number and type of units included in the calculation;
- the gross land area of apartment blocks included in the calculation;
- the gross land area of commercial/industrial blocks included in the calculation;
- the gross land area and type of other development blocks included in the calculation;
- the total area of Parkland Dedication (in hectares) that had been transferred to the City; and
- whether the dedication was satisfied through land conveyance or Cash-in-Lieu-of-Parkland.

c) Proposed road:

Please consider removing the portion of road, as shown below in the orange bubble.

- The road is proposed to lead into an O1 zoning
- The proposed phase 2 building does not seem to be affected by the removal of this road – the proposed road can elbow into Avenue U.
- The land can potentially be used as outdoor amenity space – with a future pathway connection to the O1 lands.

10. Waste Collection (Andre Laplante):

a. Please see City's Waste Management Guidelines for multi-unit residential: http://ottawa.ca/calendar/ottawa/citycouncil/pec/2012/11-13/Solid%20Waste%20Collection%20Guidelines%20-%20Doc%201.pdf

11. Process/Required Applications

a. Please name electronic files as follows:
   1. June XX, 1248 Dorchester, Landscape
   2. June XX, 1248 Dorchester, SWM

   Etc

12. General Information

a. Please ensure the zoning table on the site plan is in the following format. Ensure that all zoning provisions and rates are shown and differentiate those that require a re-zoning or variance.

ZONING INFORMATION: MC16		
PROPOSED 8 STOREY BUILDING (MID-RISE APARTMENT)		
	REQUIRED	PROPOSED
MINIMUM LOT WIDTH	NO MINIMUM	27.824m
MINIMUM LOT AREA	NO MINIMUM	881.37m²
MINIMUM BUILDING HEIGHT	6.7	27m
MAXIMUM BUILDING HEIGHT	27m	27m
MINIMUM FRONT YARD SETBACK	NO MINIMUM	2m
MINIMUM CORNER SIDE YARD SETBACK	N/A	N/A
MINIMUM REAR YARD SETBACK	3m & 7.5 ABOVE 3RD FLOOR	3m & 7.5 ABOVE 3RD FLOOR
MINIMUM INTERIOR SIDE YARD SETBACK	NO MINIMUM	0.6m & 2.44m
Parking Rate		
Motor Vehicle	NO	14 spaces
Bicycle Parking (0.5/unit)	26 spaces	27 spaces

APPENDIX B | SERVICING CHECKLIST

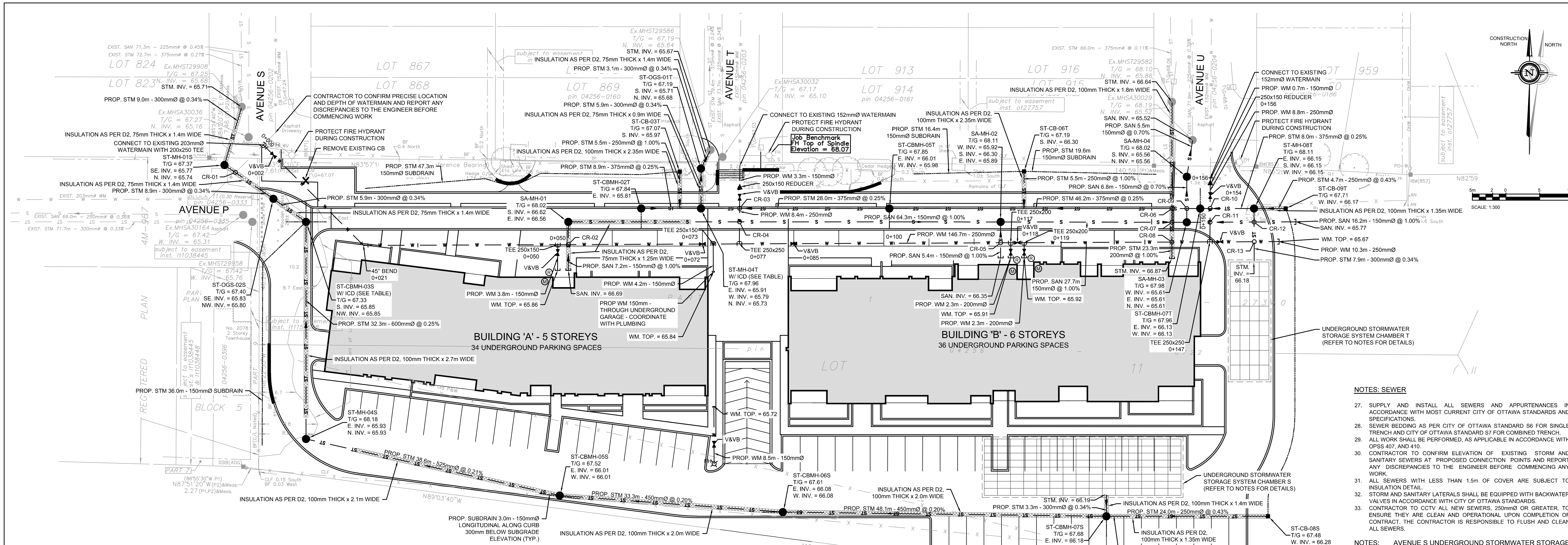
Development Servicing Study Checklist		
1 General Content		**Comments**
NA	Executive Summary (for larger reports only).	
Y	Date and revision number of the report.	Title page
Y	Location map and plan showing municipal address, boundary, and layout of proposed development.	Figure 1 and Drawing C101
Y	Plan showing the site and location of all existing services.	Drawing C101
NA	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	
Y	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.4
NA	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	
Y	Statement of objectives and servicing criteria.	Section 3.2/4.2/5.3
Y	Identification of existing and proposed infrastructure available in the immediate area.	Section 1.3
NA	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	
Y	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed storm water management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Drawing C102
NA	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	
Y	Proposed phasing of the development, if applicable	Section 1.1
Y	Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0
	All preliminary and formal site plans submissions should have the following information:	
Y	● Metric Scale	Drawings
Y	● North arrow (including construction North)	Drawings
Y	● Key Plan	Drawings
Y	● Name and contact information of applicant and property owner	Drawings/Title page
Y	● Property limits including bearing and dimensions	Drawings
Y	● Existing and proposed structures and parking areas	Drawings
Y	● Easement, road widening and right-of-way	Drawings
Y	● Adjacent street names	Drawings
2 Development Servicing Report : Water		**Comments**
NA	Confirm consistency with Master Servicing Study, if available.	
Y	Availability of public infrastructure to services proposed development.	Section 3.0
Y	Identification of system constraints.	Section 3.2
Y	Identification of boundary conditions.	Section 3.2
Y	Confirmation of adequate domestic supply and pressure	Section 3.3
Y	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.3

Development Servicing Study Checklist		
NA	Provided a check of high pressure. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Section 3.3
Y	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	Section 3.3
Y	Address reliability requirements such as appropriate location of shut-off valves.	Section 3.2
NA	Check on the necessity of a pressure zone boundary modification.	
Y	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	Section 3.3
Y	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.1
NA	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	
Y	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2 and 3.3
Y	Provision of model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Appendix F
3 Development Servicing Report: Wastewater		**Comments**
Y	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitoring Flow data from relatively new infrastructure cannot be used to justify capacity requirements	Section 4.2
NA	Confirm consistency with Master Servicing Study and/or justification for deviations.	
NA	Consideration of local conditions that may contribute to extraneous flow that are higher than the recommended flow in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	
Y	Description of existing sanitary sewer available for discharge of wastewater from proposed development	Section 4.1
Y	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable).	Section 4.3
Y	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Appendix G
Y	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.1
NA	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitation imposed on the development in order to preserve the physical condition of watercourse, vegetation,	
NA	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to services development.	
NA	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	
NA	Identification and implementation of the emergency overflow from sanitary pumping station in relation to the hydraulic grade line to protect against basement	
NA	Special considerations such as contamination, corrosive environment etc.	
4 Development Servicing Report: Stormwater Checklist		**Comments**

Development Servicing Study Checklist		
Y	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
	Analysis of available capacity in existing public infrastructure.	Section 5.5
Y	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage patterns.	Figure A and Figure B in Appendix H
Y	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm event ranging from the 2 or 5 years event (dependent on the receiving sewer design) to 100 years return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatershed, taking into account long-term cumulative effects.	Section 5.3
Y	Water Quality control objectives (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.8
Y	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 5.6
NA	Set-back from private sewage disposal systems.	
NA	Watercourse and hazard lands setbacks.	
Y	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
NA	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	
Y	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 years return period) and major events (1:100 years return period).	Section 5.6
NA	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	
Y	Calculate pre and post development peak flow rates including a descriptions of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.6, Appendix J
NA	Any proposed diversion of drainage catchment areas from one outlet to another.	
Y	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Drawing C101, C104, Section 5.1, 5.8
NA	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	
NA	Identification of potential impacts to receiving watercourses.	
NA	Identification of municipal drains and related approvals requirements.	
Y	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Sections 5.2, 5.6
Y	100 years flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Section 5.6, Drawing C104
Y	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.6
Y	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 6.0

Development Servicing Study Checklist		
NA	Identification of floodplains - proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	
NA	Identification of fill constraints related to floodplain and geotechnical investigation.	
5 Approval and Permit Requirements: Checklist		**Comments**
NA	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approvals under Lakes and Rivers Improvements Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvements Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvements Act is not required, except in cases of dams as defined in the Act.	
NA	Application for Certificate of Approvals (CofA) under the Ontario Water Resources Act.	
NA	Change to Municipal Drains	
NA	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	
6 Conclusion Checklist		**Comments**
Y	Clearly stated conclusion and recommendations.	Section 7.0
Y	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Appendix A
Y	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Report

APPENDIX C | DRAWINGS C101, C102, C103 AND C104



OIL GRIT SEPARATOR DATA					
STRUCTURE	COVER	SIZE	MODEL	ELEVATION T/G	ELEVATION INVERT
ST-OGS-02S	OPSD 401.030	1829mm	STORMCEPTOR EFO6	67.40	SE 65.83 (300mm) NW 65.80 (300mm)
ST-OGS-01T	OPSD 401.030	1219mm	STORMCEPTOR EFO4	67.19	S 65.71 (300mm) N 65.68 (300mm)

WATERMAIN TABLE					
STATION	SURFACE ELEVATION	W/M DEPTH	TOP OF W/M ELEV.	INV. OF W/M ELEV.	NOTES
0+000.0	67.24	EXIST	EXIST	EXIST	TEE, 200 x 250, CONNECT TO EXISTING W/M
0+002.2	67.27	2.40m	64.87	64.62	VALVE AND VALVE BOX
0+021.1	67.27	2.40m	65.34	65.09	HORZ. 45° BEND
0+050.0	68.13	2.40m	65.73	65.48	TEE, 250 x 150
0+050.0	68.17	2.40m	65.77	65.62	OFFSET 1.18m, VALVE AND VALVE BOX
0+050.0	68.26	2.40m	65.86	65.71	OFFSET 3.83m, WATER CAP 1.0m FROM BUILDING
0+051.6	68.14	2.40m	65.74	65.49	CR-02, REFER TO CROSSING TABLE
0+071.5	68.13	2.40m	65.73	65.48	VALVE AND VALVE BOX
0+073.1	68.13	2.40m	65.73	65.58	TEE, 250 X 150
0+073.1	68.24	2.40m	65.84	65.69	OFFSET 4.18m, WATER CAP
0+073.1	68.12	2.40m	65.72	65.57	OFFSET 24.15m, WATER CAP
0+073.1	67.99	2.40m	65.59	65.44	OFFSET 29.78m, VALVE AND VALVE BOX
0+073.1	67.91	2.40m	65.51	65.36	OFFSET 32.69m, FIRE HYDRANT
0+077.0	68.15	2.40m	65.75	65.50	TEE, 250 x 250
0+077.0	68.08	2.40m	65.68	65.43	OFFSET 3.27m, CR-04, REFER TO CROSSING TABLE
0+077.0	68.06	2.40m	65.66	65.41	OFFSET 4.34m, VERT. 45° BEND
0+077.0	68.06	2.64m	65.42	65.17	OFFSET 4.58m, VERT. 45° BEND
0+077.0	68.04	2.62m	65.42	65.17	OFFSET 5.27m, CR-03, REFER TO CROSSING TABLE
0+077.0	68.04	2.69m	65.35	65.10	OFFSET 6.93m, VALVE AND VALVE BOX
0+077.0	68.06	2.77m	65.29	65.04	OFFSET 8.43m, REDUCER, 250 x 150
0+077.0	67.16	EXIST	EXIST	EXIST	OFFSET 11.65m, CONNECT TO EXISTING W/M
0+085.1	68.15	2.40m	65.75	65.50	VALVE AND VALVE BOX
0+115.8	68.23	2.40m	65.83	65.58	CR-05, REFER TO CROSSING TABLE
0+117.3	68.23	2.40m	65.83	65.58	TEE, 250 x 150
0+117.3	68.28	2.40m	65.88	65.73	OFFSET 1.41m, VALVE AND VALVE BOX
0+117.3	68.31	2.40m	65.91	65.76	OFFSET 2.26m, WATER CAP 1.0m FROM BUILDING
0+118.3	68.23	2.40m	65.83	65.58	VALVE AND VALVE BOX
0+119.3	68.23	2.40m	65.83	65.58	TEE, 250 x 150
0+119.3	68.29	2.40m	65.89	65.74	OFFSET 1.18m, VALVE AND VALVE BOX
0+119.3	68.32	2.40m	65.92	65.77	OFFSET 3.83m, WATER CAP 1.0m FROM BUILDING
0+141.3	68.25	2.40m	65.85	65.60	CR-08, REFER TO CROSSING TABLE
0+146.9	68.20	2.55m	65.65	65.40	TEE, 250 x 250
0+146.9	68.05	2.40m	65.65	65.40	OFFSET 1.50m, VALVE AND VALVE BOX
0+146.9	68.14	2.47m	65.67	65.42	OFFSET 6.57m, CR-13, REFER TO CROSSING TABLE
0+146.9	68.13	2.46m	65.67	65.42	OFFSET 10.29m, WATER CAP
0+148.8	68.00	2.40m	65.60	65.35	VERT. 45° BEND
0+149.3	68.00	2.86m	65.14	64.89	VERT. 45° BEND
0+149.9	67.99	2.85m	65.14	64.89	CR-11, REFER TO CROSSING TABLE
0+150.4	67.99	2.85m	65.14	64.89	VERT. 45° BEND
0+150.9	67.98	2.40m	65.58	65.33	VERT. 45° BEND
0+151.9	67.98	2.40m	65.58	65.33	CR-10, REFER TO CROSSING TABLE
0+153.8	67.98	2.40m	65.58	65.33	VALVE AND VALVE BOX
0+154.5	67.99	2.40m	65.59	65.34	VERT. 45° BEND
0+154.8	67.99	2.00m	65.99	65.74	VERT. 45° BEND
0+155.7	68.01	2.00m	66.01	65.76	REDUCER, 250 x 150
0+156.5	68.02	EXIST	EXIST	EXIST	CONNECT TO EXISTING W/M

NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
19. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.

NOTES: WATERMAIN

20. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
21. ALL WATER MAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23.
22. WATER MAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
23. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER DETAILS ON DRAWING C103.
24. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER DETAILS ON DRAWING C103.
25. IF WATER MAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
26. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.

SANITARY MAINTENANCE HOLE DATA					
STRUCTURE	COVER	SIZE	STANDARD	ELEVATION T/G	ELEVATION INVERT
SA-MH-01	OPSD 401.030	1200mm	OPSD 701.010	68.02	S 66.62 (150mm) E 66.56 (150mm)
SA-MH-02	OPSD 401.030	1200mm	OPSD 701.010	68.11	W 65.92 (150mm) S 66.30 (150mm) E 65.89 (150mm)
SA-MH-03	OPSD 401.030	1200mm	OPSD 701.010	67.98	W 65.61 (150mm) E 65.61 (150mm) N 65.61 (150mm)
SA-MH-04	OPSD 401.030	1200mm	OPSD 701.010	68.02	N 65.56 (150mm) S 65.56 (150mm)
Ex. MHSA30029	EXIST	EXIST	EXIST	68.19	N 65.52 (150mm) S 65.56 (150mm)

STORM MAINTENANCE HOLE DATA					
STRUCTURE	COVER	SIZE	STANDARD	ELEVATION T/G	ELEVATION INVERT
Ex. MHST29908	EXIST	EXIST	EXIST	67.25	N 65.68 (375mm) S 65.71 (300mm)
ST-MH-01S	OPSD 401.010 TYPE A	1200mm	OPSD 701.010	67.37	SE 65.77 (300mm) N 65.74 (300mm)
ST-CBMH-03S	OPSD 401.010 TYPE B	1500mm	OPSD 701.011	67.33	S 65.85 (600mm) NW 65.85 (300mm)
ST-MH-04S	OPSD 401.010 TYPE A	1500mm	OPSD 701.011	68.18	E 65.93 (525mm) N 65.93 (600mm)
ST-CBMH-05S	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.52	E 66.01 (450mm) W 66.01 (525mm)
ST-CBMH-06S	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.61	E 66.08 (450mm) W 66.08 (450mm)
ST-CBMH-07S	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.98	E 66.18 (250mm) N 66.18 (300mm) W 66.18 (450mm)
ST-CB-08S	OPSD 400.020	600x600mm	OPSD 705.010	67.48	W 66.28 (250mm)
Ex. MHST29586	EXIST	EXIST	EXIST	67.19	N 65.64 (375mm) S 65.67 (300mm)
ST-CBMH-02T	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.84	E 65.81 (375mm)
ST-CB-03T	OPSD 400.020	600x600mm	OPSD 705.010	67.07	S 65.97 (250mm)
ST-MH-04T	OPSD 401.010 TYPE A	1200mm	OPSD 701.010	67.96	E 65.91 (375mm) W 65.79 (375mm) N 65.73 (300mm)
ST-CBMH-05T	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.85	E 66.01 (375mm) W 65.98 (375mm)
ST-CB-06T	OPSD 400.020	600x600mm	OPSD 705.010	67.19	S 66.30 (250mm)
ST-CBMH-07T	OPSD 401.010 TYPE B	1200mm	OPSD 701.010	67.96	E 66.13 (375mm) W 66.13 (375mm)
ST-MH-08T	OPSD 401.010 TYPE A	1200mm	OPSD 701.010	68.11	E 66.15 (250mm) S 66.15 (300mm) W 66.15 (375mm)
ST-CB-09T	OPSD 400.020	600x600mm	OPSD 705.010	67.71	W 66.17 (250mm)

CROSSING TABLE			
CROSSING No.	SEWER ELEV. AT CROSSING	SEWER ELEV. AT CROSSING	CLEARANCE
CR-01	STM, INV. 65.77	WM, TOP. ±64.97	0.80m
CR-02	SAN, INV. 66.65	WM, TOP. 65.74	0.91m
CR-03	STM, INV. 65.92	WM, TOP. 65.42	0.50m
CR-04	SAN, INV. 66.31	WM, TOP. 65.68	0.63m
CR-05	SAN, INV. 66.33	WM, TOP. 65.83	0.50m
CR-06	STM, INV. 66.80	STM, OBV. 66.50	0.30m
CR-07	STM, INV. 66.82	SAN, OBV. 65.78	1.04m
CR-08	STM, INV. 66.84	WM, TOP. 65.85	0.99m
CR-09	STM, INV. 66.12	SAN, OBV. 65.74	0.38m
CR-10	STM, INV. 66.13	WM, TOP. 65.58	0.55m
CR-11	SAN, INV. 65.64	WM, TOP. 65.14	0.50m
CR-12	STM, INV. 66.16	SAN, OBV. 65.86	0.30m
CR-13	STM, INV. 66.17	WM, TOP. 65.67	0.50m

LEGEND:

- EXISTING PROPERTY LINE
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CURB
- PROPOSED BUILDING OR STRUCTURE
- EXISTING WATERMAIN
- EXISTING V&VB
- EXISTING CURBSTOP
- EXISTING FIRE HYDRANT
- PROPOSED WATERMAIN
- PROPOSED V&VB
- PROPOSED REDUCER
- PROPOSED FIRE HYDRANT
- EXISTING TREE AND HEDGE
- TREE PROTECTION FENCE
- PROPOSED BOLLARD
- EXISTING SANITARY SEWER AND MANHOLE
- PROPOSED SANITARY SEWER AND MANHOLE
- EXISTING STORM SEWER AND MANHOLE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED RETAINING WALL
- PROPOSED TERRANCING (MAX 3:1 SLOPE)
- PROPOSED SUBDRAIN
- PROPOSED PIPE INSULATION
- PROPOSED REMOTE METER
- PROPOSED WATER METER

ICD DATA							
ICD ID	LOCATION	OUTLET DIAMETER	FLOW (L/s)	HEAD	EQUIVALENT DIAMETER	MODEL	STORAGE VOLUME REQUIRED
1	ST-CBMH-03S	300mm	22.2 (100-YEAR) 20.7 (5-YEAR)	0.97m 0.84m	102mm	TEMPEST MHF	158.0 cu.m (100-YEAR) 54.4 cu.m (5-YEAR)
2	ST-MH-04T	300mm	17.2 (100-YEAR) 14.3 (5-YEAR)	1.34m 0.93m	83mm	TEMPEST MHF	79.7 cu.m (100-YEAR) 27.9 cu.m (5-YEAR)

ROOF DRAIN DATA								
LOCATION	No. OF DRAINS	CONTROLLED FLOW (L/s)		MAX PONDING DEPTH (mm)		STORAGE VOLUME (cu.m)		
		5 YEAR	100 YEAR	5 YEAR	100 YEAR	5 YEAR	100 YEAR	
BUILDING A	4	0.71	1.35	57.5	108.7	4.5	8.4	
BUILDING B	5	0.70	1.33	56.6	107.0	4.1	7.8	

SANITARY SEWER DATA							
LOCATION FROM	LOCATION TO	DIAMETER	MATERIAL	CLASS	LENGTH	INVERT ELEVATIONS UPSTREAM	INVERT ELEVATIONS DOWNSTREAM
CAP	SA-MH-01	150mm	PVC	SDR-35	7.2m	66.69	66.62
SA-MH-01	SA-MH-02	150mm	PVC	SDR-35	64.3m	66.56	65.92
CAP	SA-MH-02	150mm	PVC	SDR-35	5.4m	66.35	66.30
SA-MH-02	SA-MH-03	150mm	PVC	SDR-35	27.7m	65.89	65.61
CAP	SA-MH-03	150mm	PVC	SDR-35	16.2m	65.77	65.61
SA-MH-03	SA-MH-04	150mm	PVC	SDR-35	6.8m	65.61	65.56
SA-MH-04	Ex. MHSA30029	150mm	PVC	SDR-35	5.5m	65.56	65.52

STORM SEWER DATA							
LOCATION FROM	LOCATION TO	DIAMETER	MATERIAL	CLASS	LENGTH	INVERT ELEVATIONS UPSTREAM	INVERT ELEVATIONS DOWNSTREAM
ST-MH-01S	Ex. MHST29908	300mm	PVC	SDR-35	9.0m	65.74	65.71
ST-OGS-02S	ST-MH-01S	300mm	PVC	SDR-35	8.9m	65.80	65.77
ST-CBMH-03S	ST-OGS-02S	300mm	PVC	SDR-35	5.9m	65.85	65.83
ST-MH-04S	ST-CBMH-03S	600mm	CONC	50-D	32.3m	65.93	65.85
ST-CBMH-05S	ST-MH-04S	525mm	CONC	50-D	38.6m	66.01	65.93
ST-CBMH-06S	ST-CBMH-05S	450mm	CONC	50-D	33.3m	66.08	66.01
ST-CBMH-07S	ST-CBMH-06S	450mm	CONC	50-D	48.1m	66.18	66.08
CAP	ST-CBMH-07S	300mm	PVC	SDR-35	3.3m	66.19	66.18
ST-CB-08S	ST-CBMH-07S	250mm	PVC	SDR-35	24.0m	66.28	66.18
ST-OGS-01T	Ex. MHST29586	300mm	PVC	SDR-35	3.1m	65.68	65.67
ST-MH-04T	ST-OGS-01T	300mm	PVC	SDR-35	5.9m	65.73	65.71
ST-CB-03T	TEE	250mm	PVC	SDR-35	5.5m	65.97	65.92
ST-CBMH-02T	ST-MH-04T	375mm	PVC	SDR-35	8.9m	65.81	65.79
ST-CBMH-05T	ST-MH-04T	375mm	PVC	SDR-35	28.0m	65.98	65.91
ST-CBMH-07T	ST-CBMH-05T	375mm	PVC	SDR-35	46.2m	66.13	66.01
ST-CB-06T	TEE	250mm	PVC	SDR-35	5.5m	66.30	66.24
ST-MH-08T	ST-CBMH-07T	375mm	PVC	SDR-35	8.0m	66.15	66.13
CAP	ST-MH-08T	300mm	PVC	SDR-35	7.9m	66.18	66.15
ST-CB-09T	ST-MH-08T	250mm	PVC	SDR-35	4.7m	66.17	66.15

NOTES: SEWER

27. SUPPLY AND INSTALL ALL SEWERS AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
28. SEWER BEDDING AS PER CITY OF OTTAWA STANDARD S6 FOR SINGLE TRENCH AND CITY OF OTTAWA STANDARD S7 FOR COMBINED TRENCH.
29. ALL WORK SHALL BE PERFORMED, AS APPLICABLE IN ACCORDANCE WITH OPSS 407, AND 410.
30. CONTRACTOR TO CONFIRM ELEVATION OF EXISTING STORM AND SANITARY SEWERS AT PROPOSED CONNECTION POINTS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE COMMENCING ANY WORK.
31. ALL SEWERS WITH LESS THAN 1.5m OF COVER ARE SUBJECT TO INSULATION DETAIL.
32. STORM AND SANITARY LATERALS SHALL BE EQUIPPED WITH BACKWATER VALVES IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
33. CONTRACTOR TO CCTV ALL NEW SEWERS, 250mmØ OR GREATER, TO ENSURE THEY ARE CLEAN AND OPERATIONAL UPON COMPLETION OF CONTRACT. THE CONTRACTOR IS RESPONSIBLE TO FLUSH AND CLEAN ALL SEWERS.

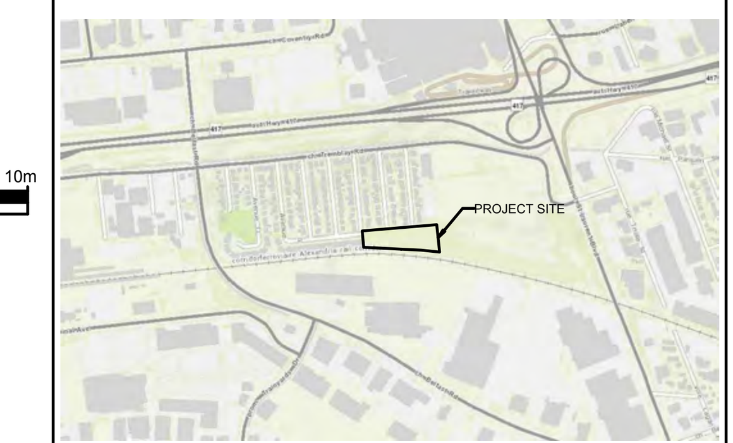
NOTES: AVENUE S UNDERGROUND STORMWATER STORAGE

25. UNDERGROUND STORMWATER STORAGE SYSTEM STORAGE REQUIREMENT: $127m^3$.
26. CHAMBER TYPE: CULTEC RECHARGER 180HD OR EQUIVALENT.
27. BOTTOM OF CHAMBER ELEVATION: 66.19m.
28. TOP OF SYSTEM TO BE A MINIMUM OF 690mm BELOW FINISHED ROAD SURFACE.
29. ENTIRE SYSTEM TO BE LINED WITH 3 PART IMPERMEABLE LINER SYSTEM (8OZ NON-WOVEN GEOTEXTILE, 30MIL PVC THERMOPLASTIC LINER, 8OZ NON-WOVEN GEOTEXTILE).

NOTES: AVENUE T UNDERGROUND STORMWATER STORAGE

29. UNDERGROUND STORMWATER STORAGE SYSTEM STORAGE REQUIREMENT: $74m^3$.
30. CHAMBER TYPE: CULTEC RECHARGER 330XLHD OR EQUIVALENT.
31. BOTTOM OF CHAMBER ELEVATION: 66.18m.
32. TOP OF SYSTEM TO BE A MINIMUM OF 690mm BELOW FINISHED ROAD SURFACE.
33. ENTIRE SYSTEM TO BE LINED WITH 3 PART IMPERMEABLE LINER SYSTEM (8OZ NON-WOVEN GEOTEXTILE, 30MIL PVC THERMOPLASTIC LINER, 8OZ NON-WOVEN GEOTEXTILE).

GENERAL ARCHITECTURAL NOTES:
1. This drawing is the property of the Architect and may not be reproduced or used without the expressed consent of the Architect.
2. Drawings are not to be scaled. The Contractor is responsible for checking and verifying all levels and dimensions and shall report all discrepancies to the Architect and obtain clarification prior to commencing work.
3. Upon notice in writing, the Architect will provide written/graphic clarification or supplementary information regarding the intent of the Contract Documents.
4. The Architectural drawings are to be read in conjuction with all other Contract Documents including Project Manuals and the Structural, Mechanical and Electrical Drawings.
5. Positions of exposed or finished Mechanical or Electrical devices, fittings and fixtures are indicated on the Architectural Drawings. Locations shown on the Architectural Drawings shall govern over Mechanical and Electrical Drawings. Mechanical and Electrical items not clearly located will be located as directed by the Architect.
6. These documents are not to be used for construction unless specifically noted for such purpose.



KEY PLAN

CLV GROUP

CLV GROUP
485 Bank Street, Suite 200
Ottawa, Ontario
K2P 1Z2

REVISION RECORD

REGISTERED PROFESSIONAL ENGINEER
M.E. MACSWEEN
100104372
October 28, 2019
PROVINCE OF ONTARIO

ISSUED FOR SITE PLAN APPROVAL	2019-10-28
ISSUED FOR REVIEW	2019-10-01
ISSUED FOR COORDINATION	2019-04-30

ISSUE RECORD

PARSONS
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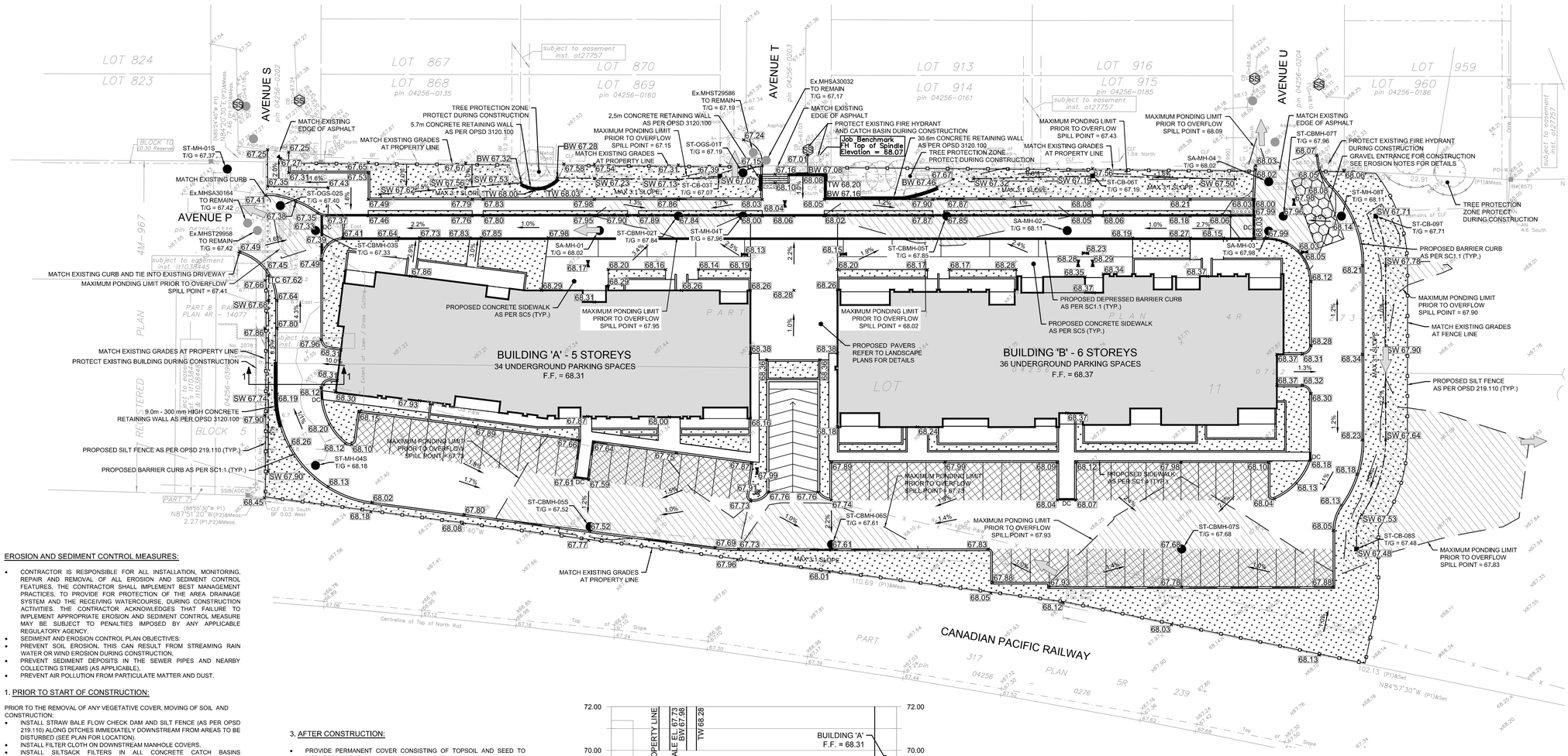
530 TREMBLAY

530 TREMBLAY RD
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
477074	1:300	SS	MM

SITE SERVICING PLAN

C101



EROSION AND SEDIMENT CONTROL MEASURES:

- CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURE MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
- SEDIMENT AND EROSION CONTROL PLAN OBJECTIVES:
- PREVENT SOIL EROSION, THIS CAN RESULT FROM STREAMING RAIN WATER OR WIND EROSION DURING CONSTRUCTION,
- PREVENT SEDIMENT DEPOSITS IN THE SEWER PIPES AND NEARBY COLLECTING STREAMS (AS APPLICABLE),
- PREVENT AIR POLLUTION FROM PARTICULATE MATTER AND DUST.

1. PRIOR TO START OF CONSTRUCTION:

PRIOR TO THE REMOVAL OF ANY VEGETATIVE COVER, MOVING OF SOIL AND CONSTRUCTION:

- INSTALL STRAW BALE FLOW CHECK DAM AND SILT FENCE (AS PER OPSD 219.110) ALONG DITCHES IMMEDIATELY DOWNSTREAM FROM AREAS TO BE DISTURBED (SEE PLAN FOR LOCATION).
- INSTALL FILTER CLOTH ON DOWNSTREAM MANHOLE COVERS,
- INSTALL SILTSACK FILTERS IN ALL CONCRETE CATCH BASINS STRUCTURES,
- INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.
- THE CONTRACTOR MUST SET UP THE MEASURES INDICATED ON THE PLAN, INSPECT THEM FREQUENTLY AND CLEAN AND REPAIR OR REPLACE THE DETERIORATED STRUCTURES. AT THE END OF THE CONSTRUCTION PERIOD, THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF THE TEMPORARY STRUCTURES AND RECONDITIONING THE AFFECTED AREAS

2. DURING CONSTRUCTION:

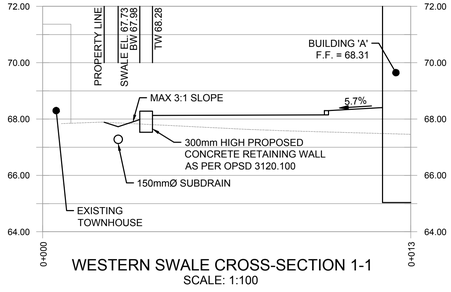
- SEDIMENT AND EROSION CONTROL MEASURES TO BE CONSTRUCTED AS PER OPSS 805.
- WHEN SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED TO COMPLETE A PORTION OF THE WORK, THE SAME MEASURES MUST BE REINSTATED UPON THE WORK'S COMPLETION.
- WORK TO BE DONE IN THE VICINITY OF MAJOR WATERWAYS TO BE CARRIED OUT FROM JULY AND SEPTEMBER ONLY.
- MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE.
- PROTECT DISTURBED AREAS FROM RUNOFF.
- PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED SHORTLY.
- INSPECT STRAW BALE FLOW CHECK DAMS, SILT FENCES, SILT SACKS, AND CATCH BASIN SUMPS REGULARLY AND AFTER EVERY MAJOR STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
- PLAN TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
- EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES.
- DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS). WHEN STORING SOIL ON SITE IN PILES THE CONTRACTOR MUST COVER EACH PILE WITH TARPS, STRAW OR A GEOTEXTILE FABRIC TO AVOID FINE PARTICLE TRANSPORT BY WIND AND/OR STREAMING RAIN WATER.
- CONTROL WIND-BLOWN DUST OFF SITE TO ACCEPTABLE LEVELS BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED). FOR DUST CONTROL, CONTRACTOR TO APPLY CALCIUM CHLORIDE (TYPE I – OPSS 2501 AND CAN/CGSB-15-1) AND WATER WITH EQUIPMENT APPROVED BY THE OWNER'S REPRESENTATIVE AT RATE IN ACCORDANCE TO OPSS 506 WHEN DIRECTED BY OWNER'S REPRESENTATIVE.
- ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN DESTABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER. SEDIMENT CAPTURE SILT SACKS MUST BE MAINTAINED AND CANNOT BE REMOVED UNTIL ALL LANDSCAPING AREAS ARE COMPLETED.
- NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVES BY THIS CONSULTING ENGINEER AND THE TOWN DEPARTMENT OF PUBLIC WORKS.
- CONTRACTOR RESPONSIBLE FOR MUNICIPAL ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING ETC. AT THE END OF EACH WORK DAY.
- DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
- ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
- TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ABUTTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
- PROVIDE GRAVEL ENTRANCE WHEREVER EQUIPMENT LEAVES THE SITE TO PROVIDE MUD TRACKING ONTO PAVED SURFACES, GRAVEL BED SHALL BE A MINIMUM OF 10m LONG, 4m WIDE, AND 0.15m DEEP AND SHALL CONSIST OF COARSE MATERIAL. MAINTAIN GRAVEL ENTRANCE IN CLEAN CONDITION.

3. AFTER CONSTRUCTION:

- PROVIDE PERMANENT COVER CONSISTING OF TOPSOIL AND SEED TO DISTURBED AREAS.
- ALL SEDIMENT AND EROSION CONTROL MEASURES TO BE REMOVED BY THE CONTRACTOR FOLLOWING THE COMPLETION OF WORK AND AFTER DISTURBED AREAS HAVE BEEN REHABILITATED AND STABILIZED, THIS INCLUDES REMOVE STRAW BALE FLOW CHECK DAMS, SILT FENCES AND FILTER CLOTHS ON CATCH BASINS AND MANHOLE COVERS.
- INSPECT AND CLEAN CATCH BASIN SUMPS AND STORM SEWERS.

NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1. ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314, MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
19. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.



WESTERN SWALE CROSS-SECTION 1-1
SCALE: 1:100

LEGEND:

- EXISTING PROPERTY LINE
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CURB
- PROPOSED BUILDING OR STRUCTURE
- EXISTING WATERMAIN
- EXISTING V&VB
- EXISTING CURBSTOP
- EXISTING FIRE HYDRANT
- PROPOSED V&VB
- PROPOSED FIRE HYDRANT
- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED LIGHT DUTY PAVEMENT
- PROPOSED TWSI AS PER SC7.3
- EXISTING TREE AND HEDGE
- PROPOSED LANDSCAPE AREA
- TREE PROTECTION FENCE
- PROPOSED BOLLARD
- PROPOSED RETAINING WALL
- PROPOSED TERRANCING (MAX 3:1 SLOPE)
- PROPOSED DITCH
- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED BOTTOM OF WALL GRADE
- PROPOSED TOP OF WALL GRADE
- PROPOSED SWALE GRADE
- PROPOSED SILT FENCE AS PER OPSD 219.110
- SILT SACKS IN CATCH BASIN GRATE PER DETAIL D1
- GRAVEL ENTRANCE FOR CONSTRUCTION
- PROPOSED MAXIMUM PONDING LIMIT PRIOR TO OVERFLOW
- PROPOSED MAJOR OVERLAND FLOW

PAVEMENT STRUCTURES		
MATERIAL	LIGHT DUTY	HEAVY DUTY
Asphaltic Concrete Surface Course: SP12.5 CAT B (PG58-34)	50 mm	40 mm
Asphaltic Concrete Binder Course: SP19 CAT B (PG 58-34)	n/a	50 mm
Granular Base: OPSS Granular A Crushed Stone	150 mm	150 mm
Granular Sub-base: OPSS Granular B, Type II	300 mm	450 mm

FROM: PRELIMINARY GEOTECHNICAL INVESTIGATION, PROPOSED RESIDENTIAL DEVELOPMENT, 530 TREMBLAY ROAD, OTTAWA, ONTARIO, BY PATERSON GROUP INC. DATED JULY 25, 2016

5m 2 0 5 10m
SCALE: 1:300

GENERAL ARCHITECTURAL NOTES:

1. This drawing is the property of the Architect and may not be reproduced or used without the expressed consent of the Architect.
2. Drawings are not to be scaled. The Contractor is responsible for checking and verifying all levels and dimensions and shall report all discrepancies to the Architect and obtain clarification prior to commencing work.
3. Upon notice in writing, the Architect will provide written/graphic clarification or supplementary information regarding the intent of the Contract Documents.
4. The Architectural drawings are to be read in conjuction with all other Contract Documents including Project Manuals and the Structural, Mechanical and Electrical Drawings.
5. Positions of exposed or finished Mechanical or Electrical devices, fittings and fixtures are indicated on the Architectural Drawings. Locations shown on the Architectural Drawings shall govern over Mechanical and Electrical Drawings. Mechanical and Electrical items not clearly located will be located as directed by the Architect.
6. These documents are not to be used for construction unless specifically noted for such purpose.

KEY PLAN

CLV GROUP
485 Bank Street, Suite 200
Ottawa, Ontario
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REVISION RECORD

ISSUED FOR SITE PLAN APPROVAL	2019-10-28
ISSUED FOR REVIEW	2019-10-01
ISSUED FOR COORDINATION	2019-04-30

ISSUE RECORD

REGISTERED PROFESSIONAL ENGINEER
M.E. MACSWEEN
100104372
October 28, 2019
PROVINCE OF ONTARIO

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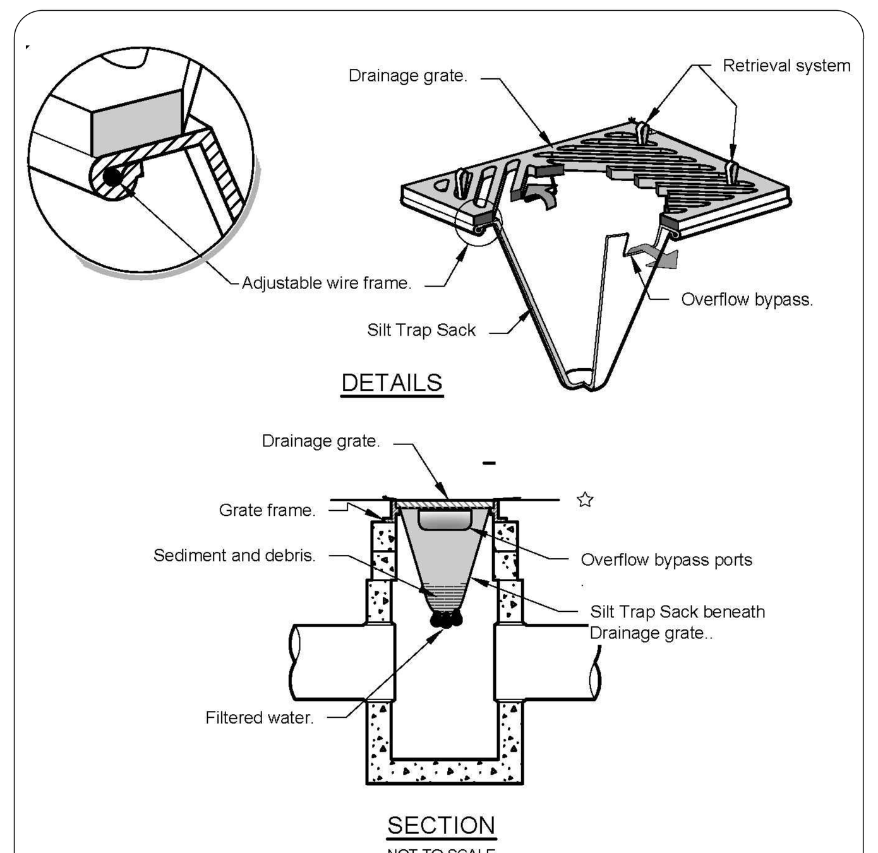
530 TREMBLAY

530 TREMBLAY RD
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
477074	1:300	SS	MM

GRADING AND EROSION AND SEDIMENT CONTROL PLAN

C102

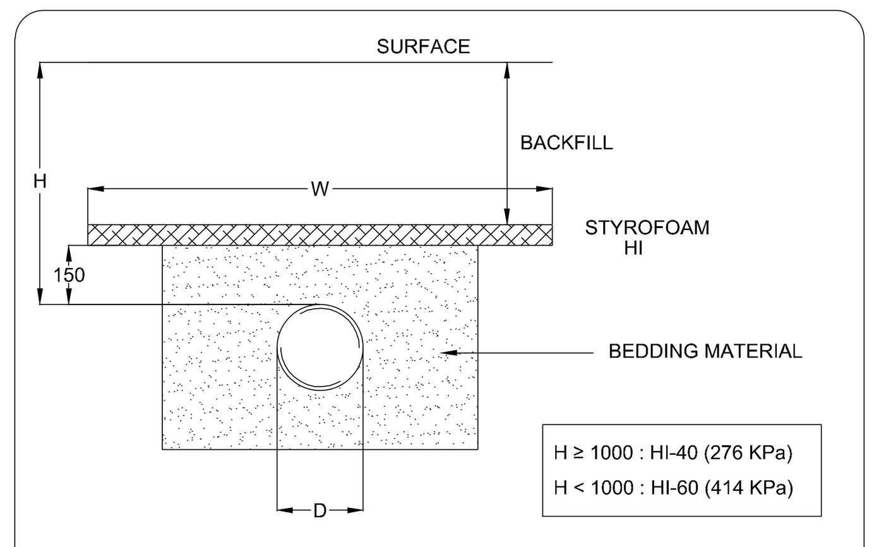


NOTES

1. Size and shape of the silt trap sack to fit the storm structure it will service. (rectangular or round).
2. The silt trap sack shall have a built-in high-flow relief system (overflow bypass).
3. The silt trap sack assembly must allow removal without spilling the collected material.
4. Empty silt trap sack and dispose of sediment and debris before the sack is half-full.
5. Ensure the silt trap sack assembly does not spill or fall into the storm structure. If sediment is spilled into the storm structure, remove the spilled material by suction hose or other approved method.
6. Provide protection for catch basin hoods (Wattles, 2x4 lumber, and so forth)

SILT SACK DETAIL

PARSONS — D1



H= DEPTH OF COVER
W= INSULATION WIDTH
D= PIPE DIAMETER

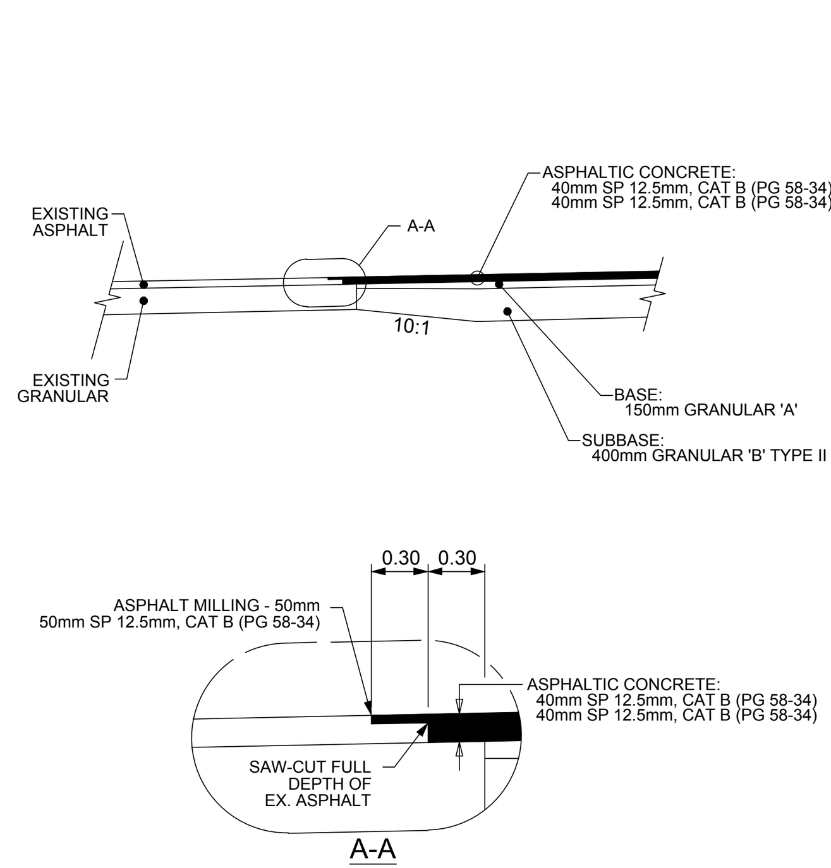
INSULATION MINIMUM WIDTH (W)

H \ D	≤150	200	250	300	400	500	600	INSULATION THICKNESS
750	2250	2300	2350	2400	2500	2600	2700	100
1000	1750	1800	1850	1900	2000	2100	2200	90
1250	1250	1300	1350	1400	1500	1600	1700	80
1500	750	800	850	900	1000	1100	1200	70
1750	600	600	600	600	600	600	700	60

ALL DIMENSIONS IN MILLIMETERS

THERMAL INSULATION FOR SEWER IN SHALLOW TRENCHES

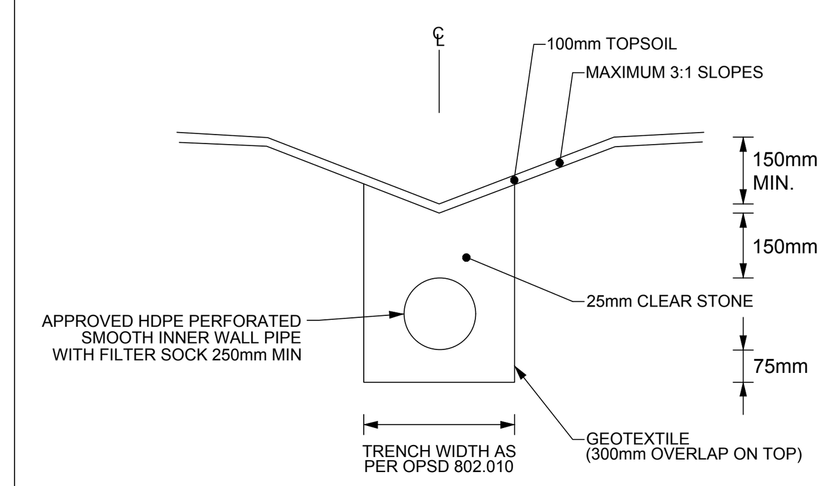
PARSONS — D2



NEW TO EXISTING PAVEMENT PERPENDICULAR TRANSITION TREATMENT

N.T.S.

PARSONS — D3



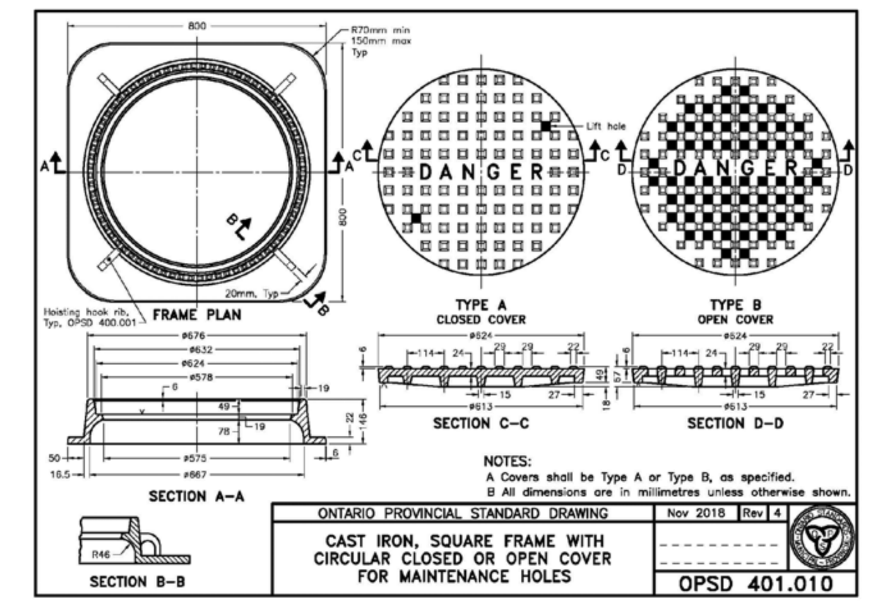
NOTES:

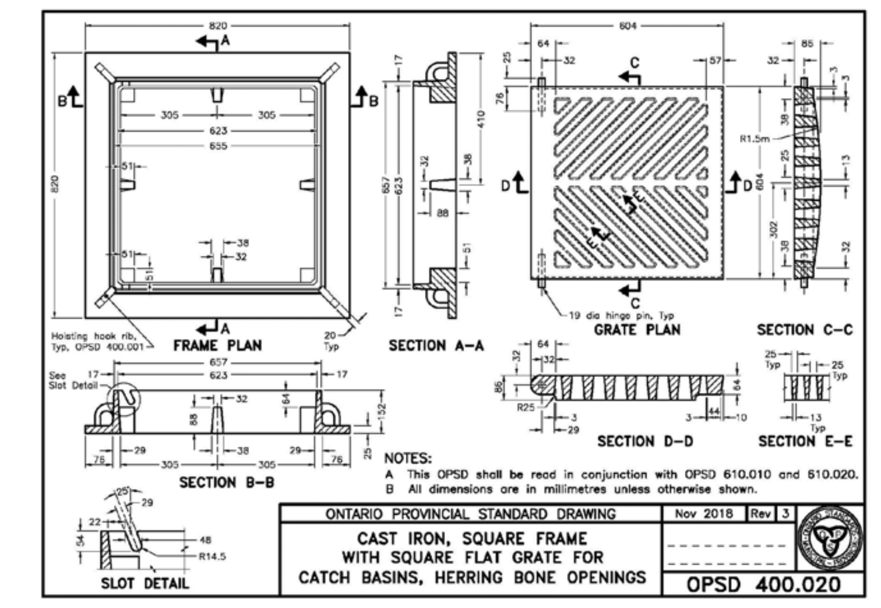
1. SIDE SLOPE OF SWALE - MIN. 1.5%, MAX 3:1.
2. UNDER PAVEMENT STRUCTURE NON PERFORATED PIPE TO BE USED WITH 75mm BEDDING AND BACKFILLED WITH APPROVED NATIVE MATERIAL.
3. GEOTEXTILE SHALL BE APPROVED NON-WOVEN CLASS 1 OR AS SPECIFIED.

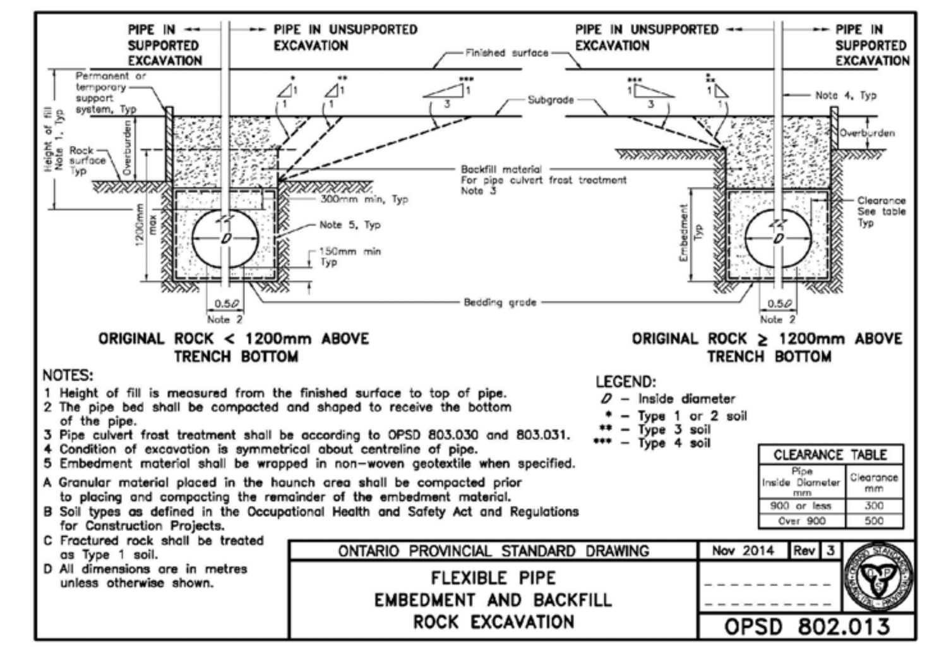
PERFORATED PIPE INSTALLATION UNDERNEATH SWALE

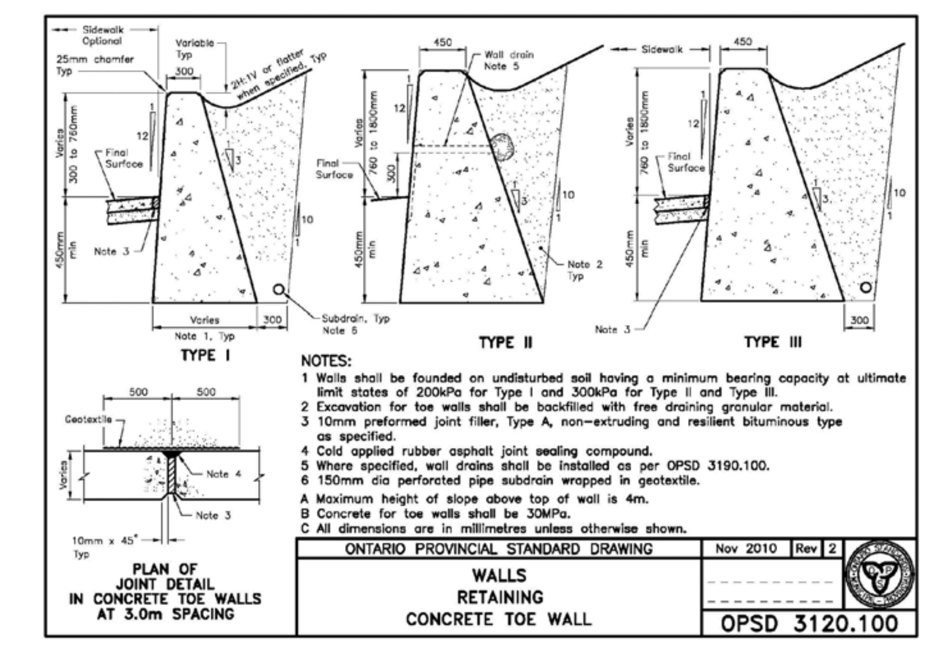
N.T.S.

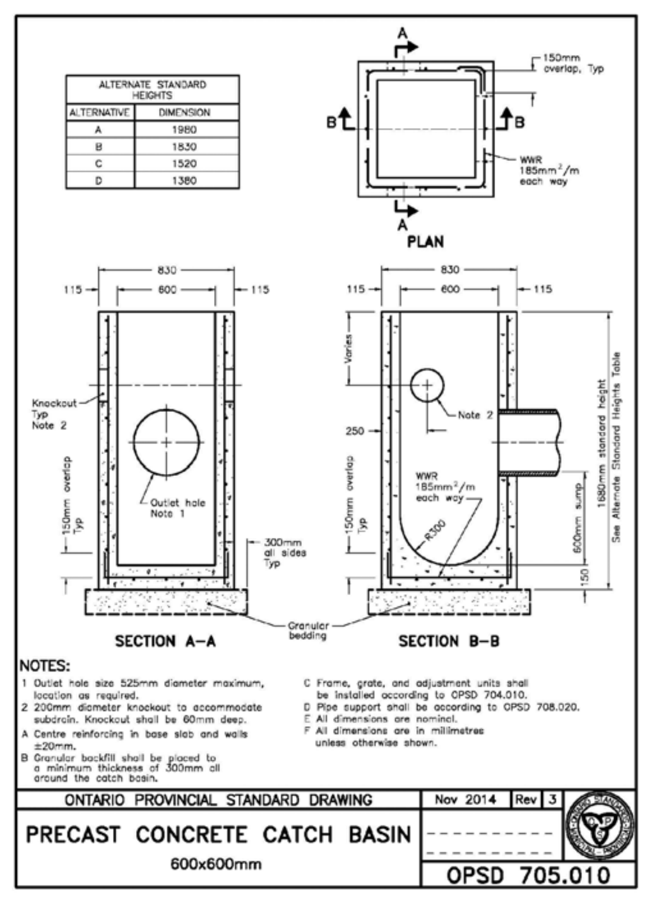
PARSONS — D4

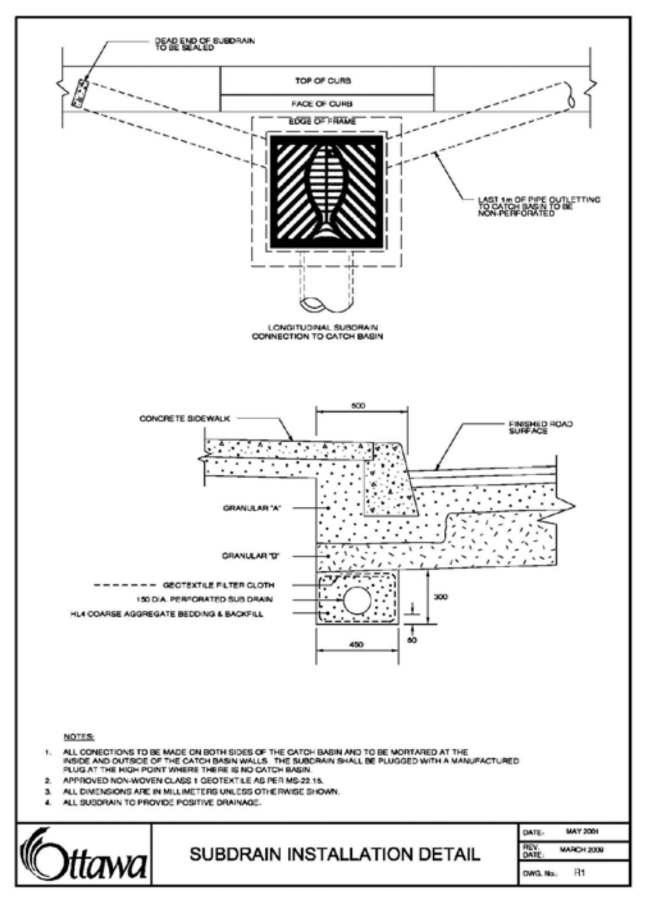

ONTARIO PROVINCIAL STANDARD DRAWING — CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES — OPSD 401.010

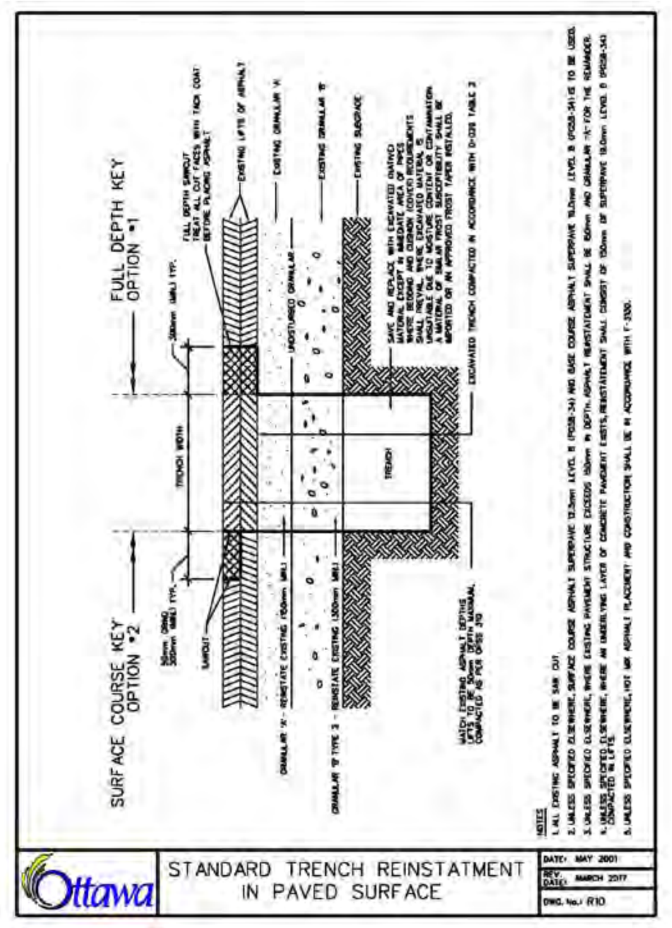

ONTARIO PROVINCIAL STANDARD DRAWING — CAST IRON, SQUARE FRAME WITH SQUARE FLAT GRATE FOR CATCH BASINS, HERRING BONE OPENINGS — OPSD 400.020

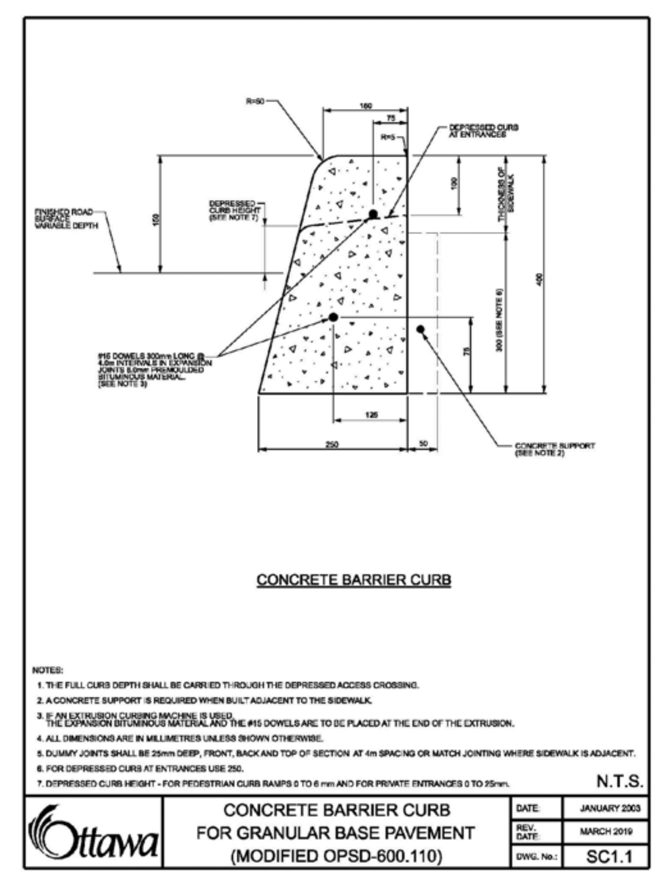

ONTARIO PROVINCIAL STANDARD DRAWING — FLEXIBLE PIPE EMBEDMENT AND BACKFILL ROCK EXCAVATION — OPSD 802.013

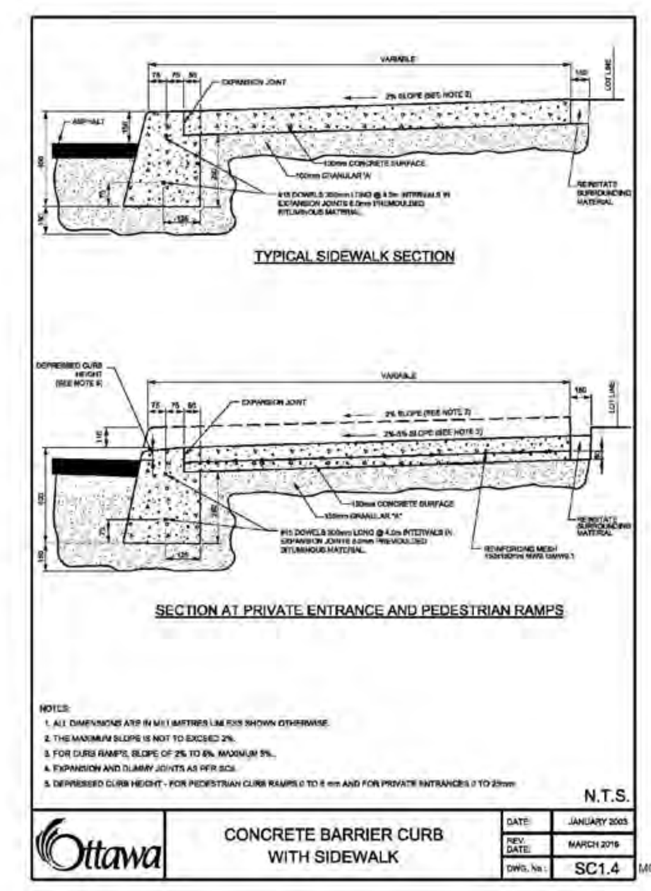

ONTARIO PROVINCIAL STANDARD DRAWING — WALLS RETAINING CONCRETE TOE WALL — OPSD 3120.100

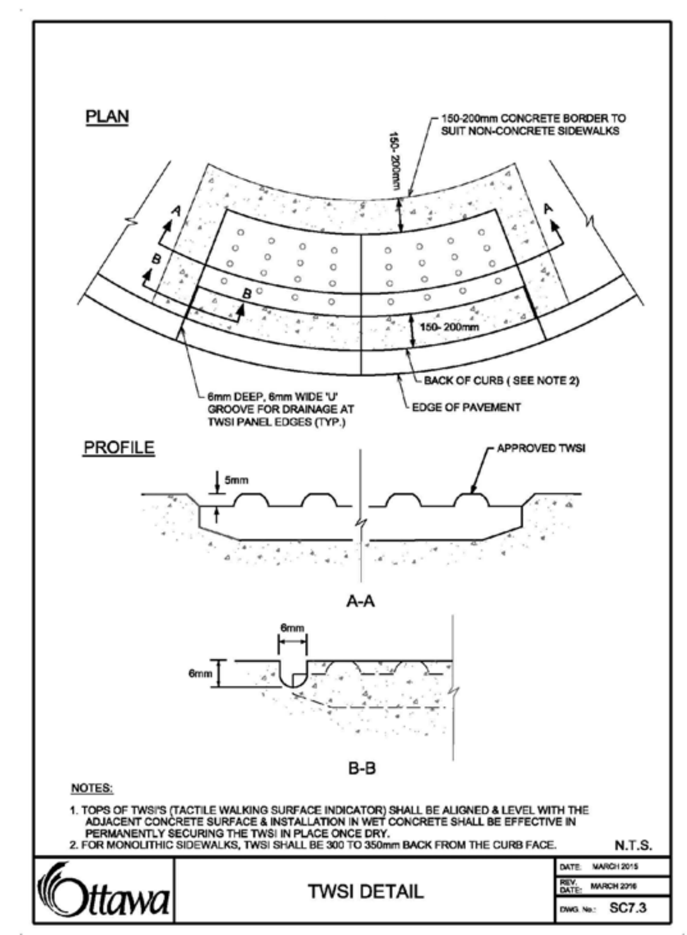

ONTARIO PROVINCIAL STANDARD DRAWING — PRECAST CONCRETE CATCH BASIN 600x600mm — OPSD 705.010

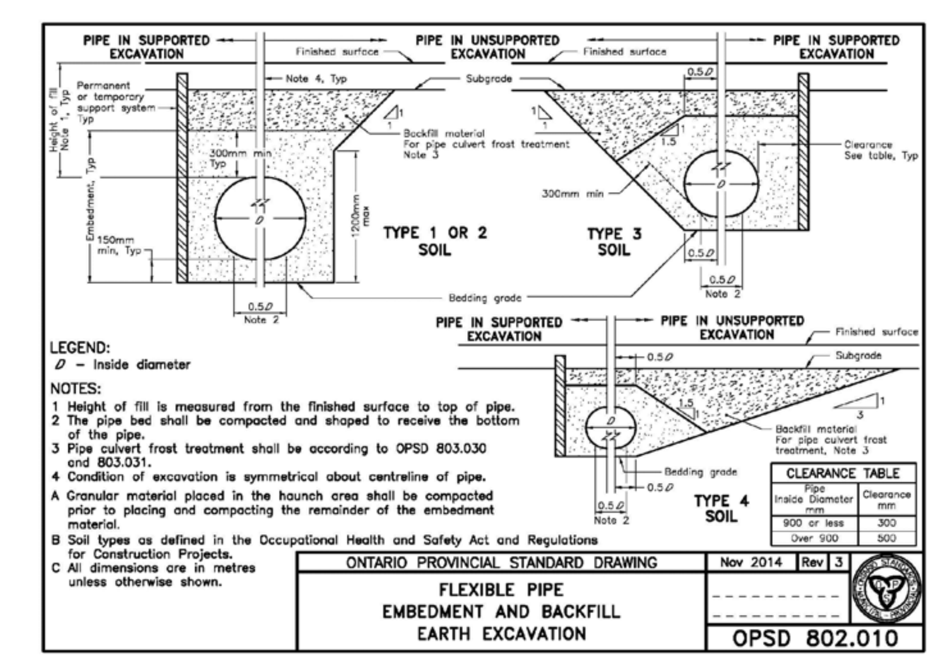

SUBDRAIN INSTALLATION DETAIL

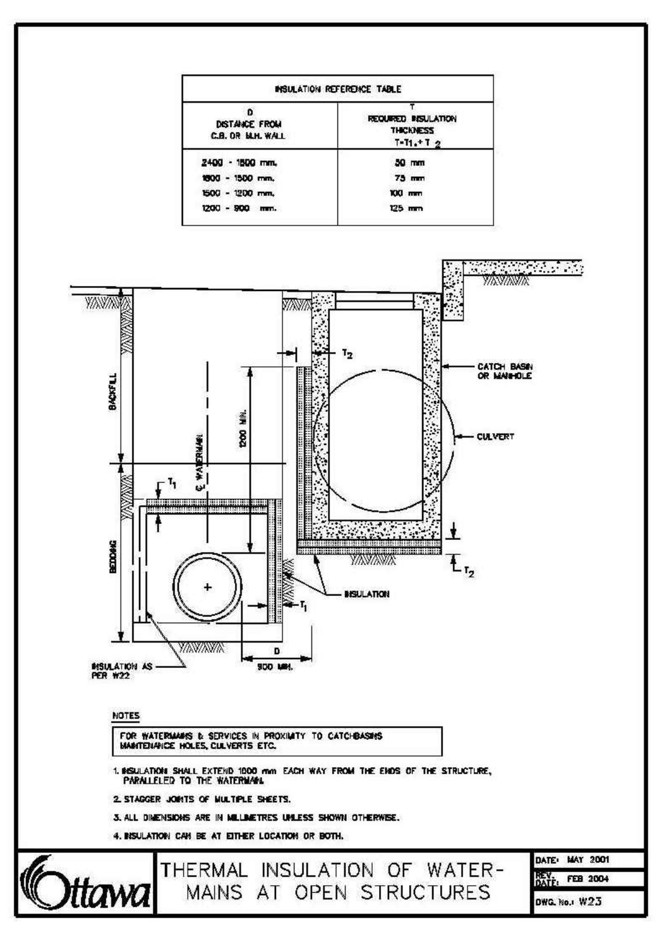

STANDARD TRENCH REINSTATEMENT IN PAVED SURFACE

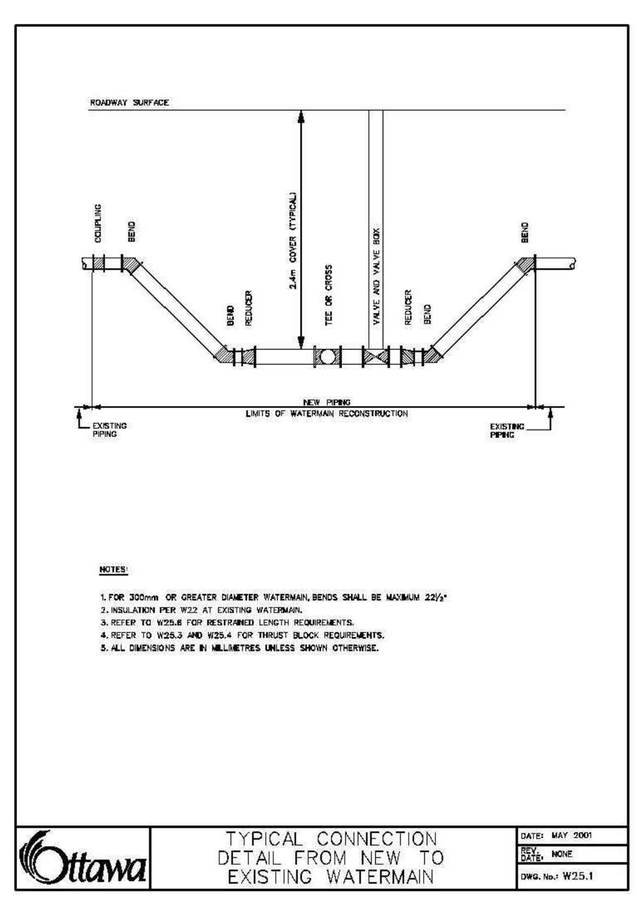

CONCRETE BARRIER CURB FOR GRANULAR BASE PAVEMENT (MODIFIED OPSD-600.110) — SC1.1

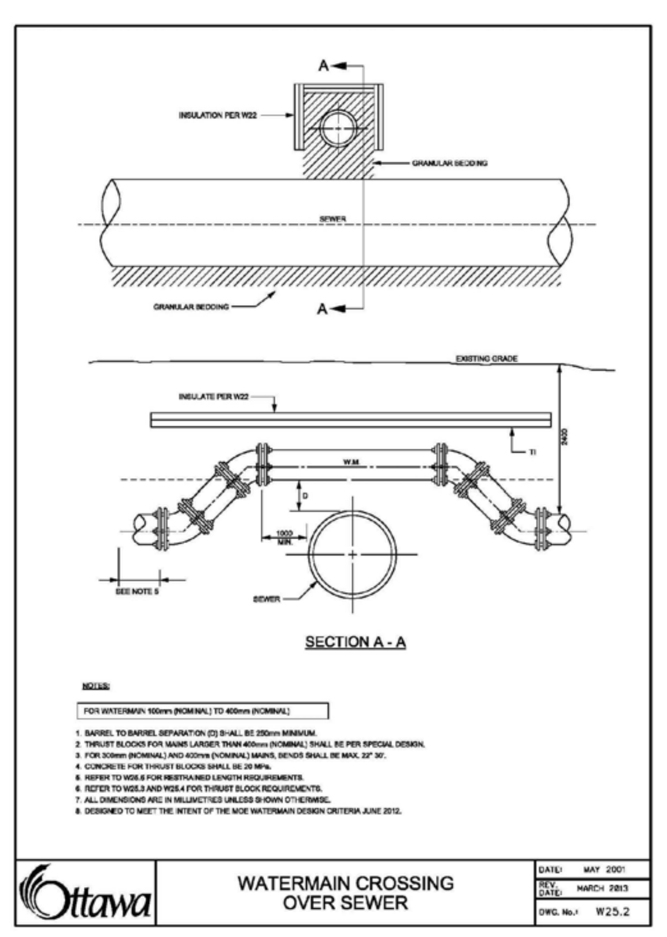

CONCRETE BARRIER CURB WITH SIDEWALK — SC1.4

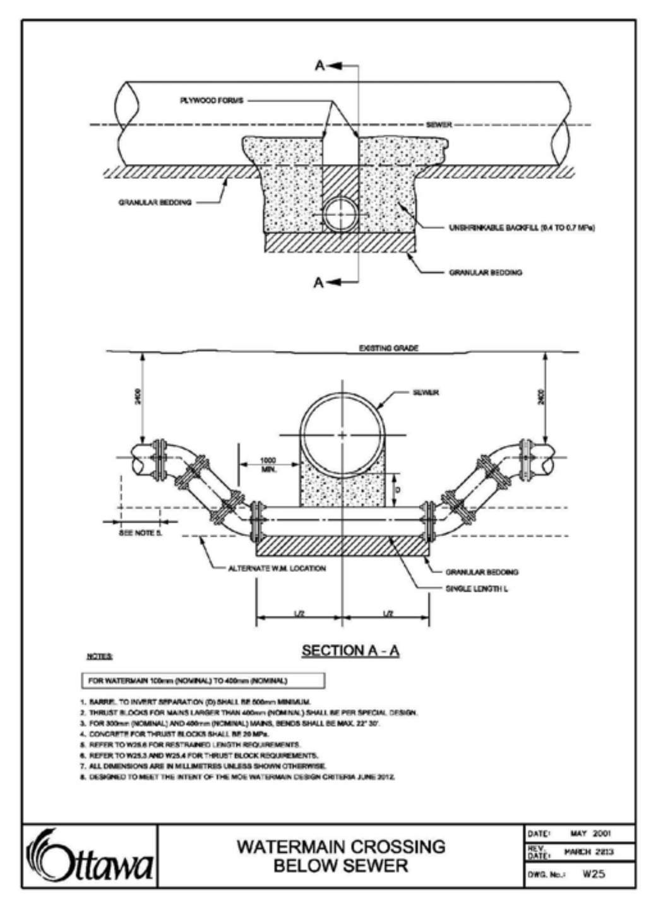

TWSI — SC7.3

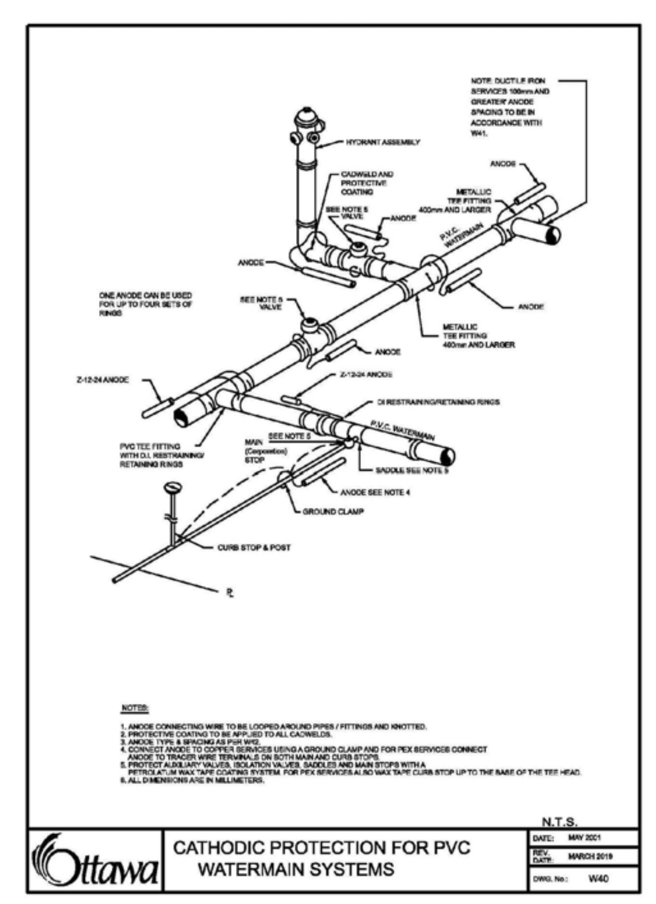

ONTARIO PROVINCIAL STANDARD DRAWING — FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION — OPSD 802.010

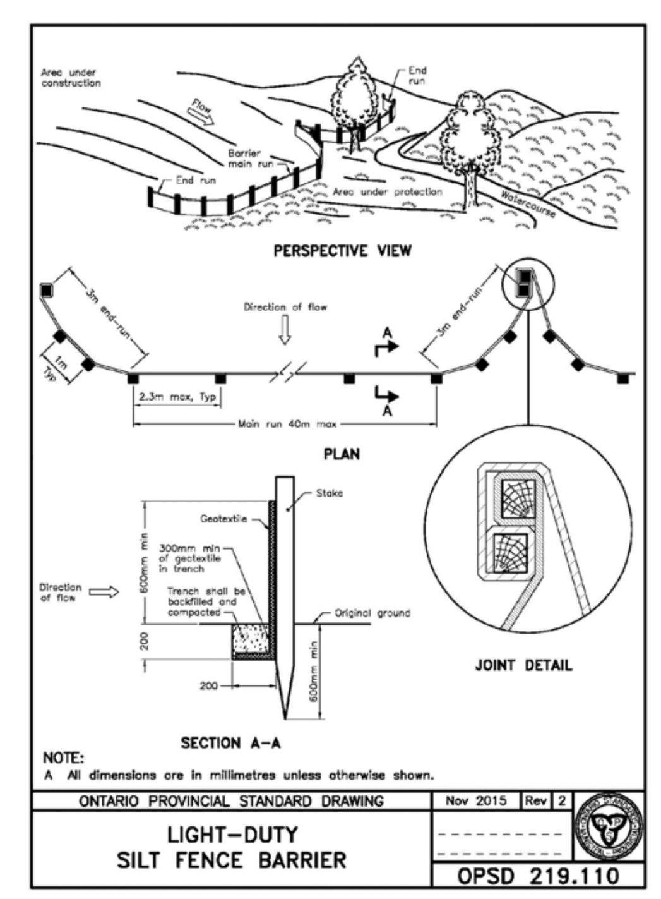

THERMAL INSULATION OF WATERMAINS AT OPEN STRUCTURES

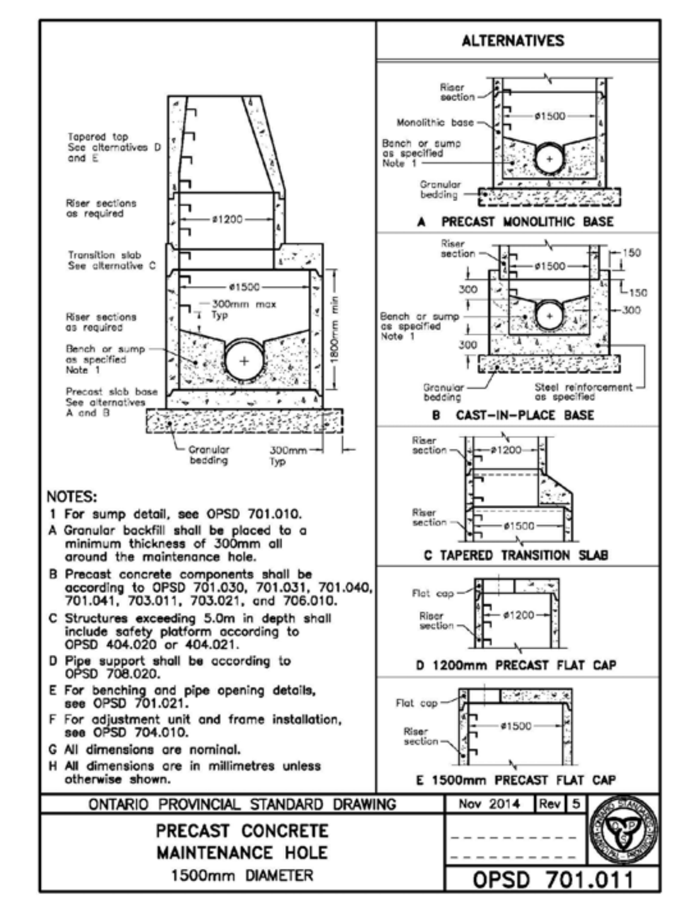

TYPICAL CONNECTION DETAIL FROM NEW TO EXISTING WATERMAIN

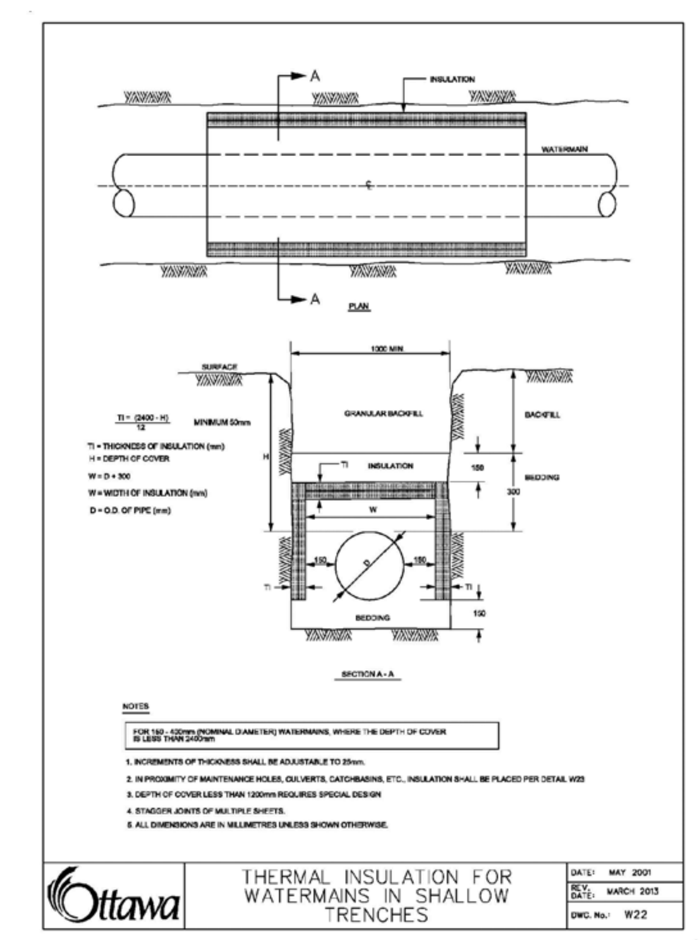

WATERMAIN CROSSING OVER SEWER

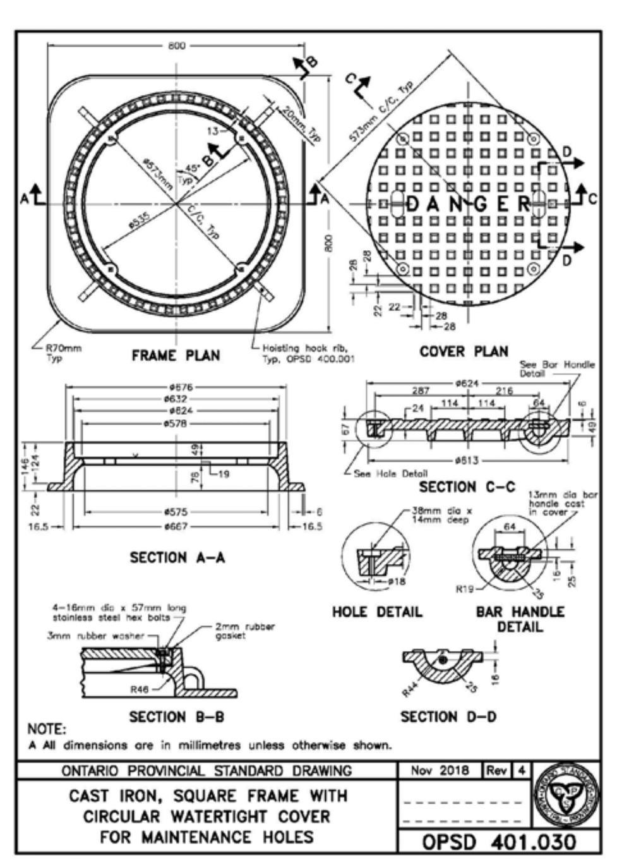

WATERMAIN CROSSING BELOW SEWER

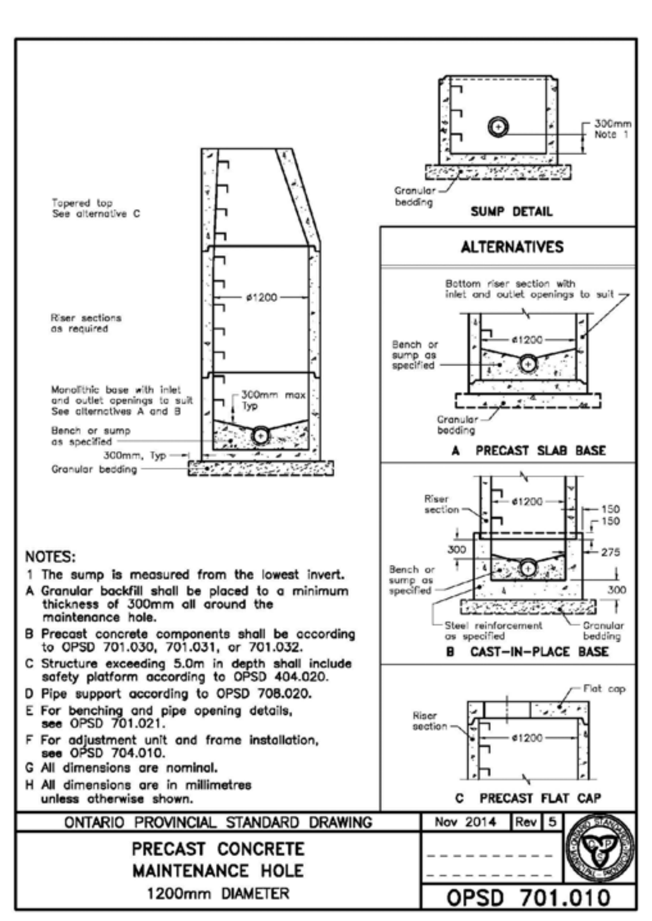

CATHODIC PROTECTION FOR PVC WATERMAIN SYSTEMS

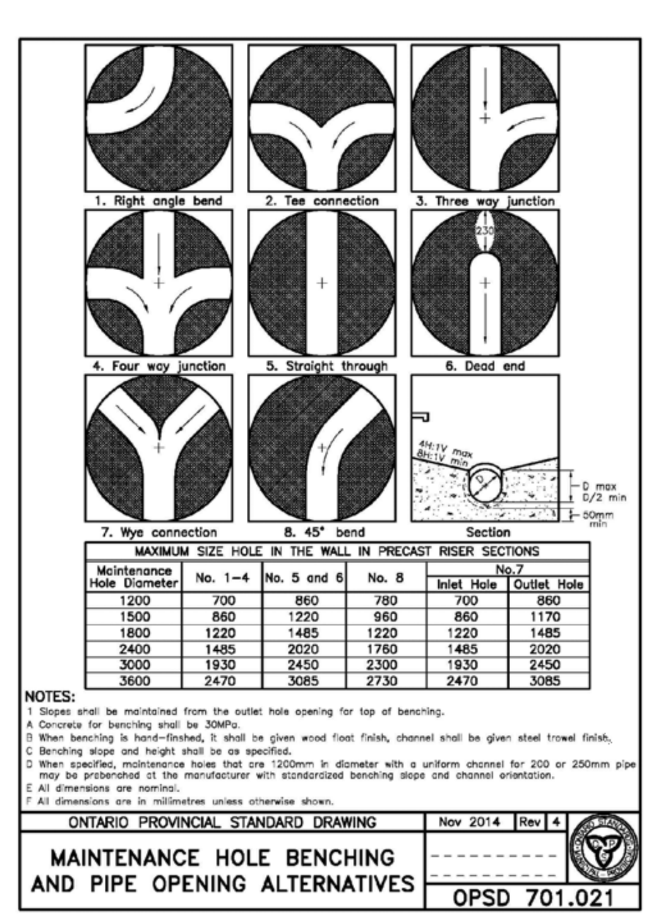

ONTARIO PROVINCIAL STANDARD DRAWING — LIGHT-DUTY SILT FENCE BARRIER — OPSD 219.110

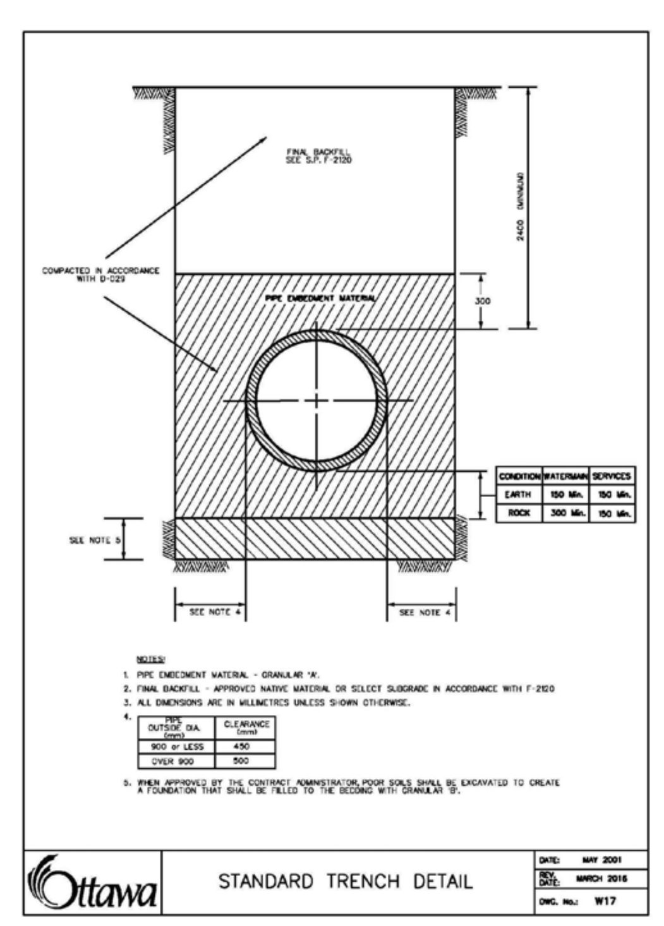

ONTARIO PROVINCIAL STANDARD DRAWING — PRECAST CONCRETE MAINTENANCE HOLE 1500mm DIAMETER — OPSD 701.011

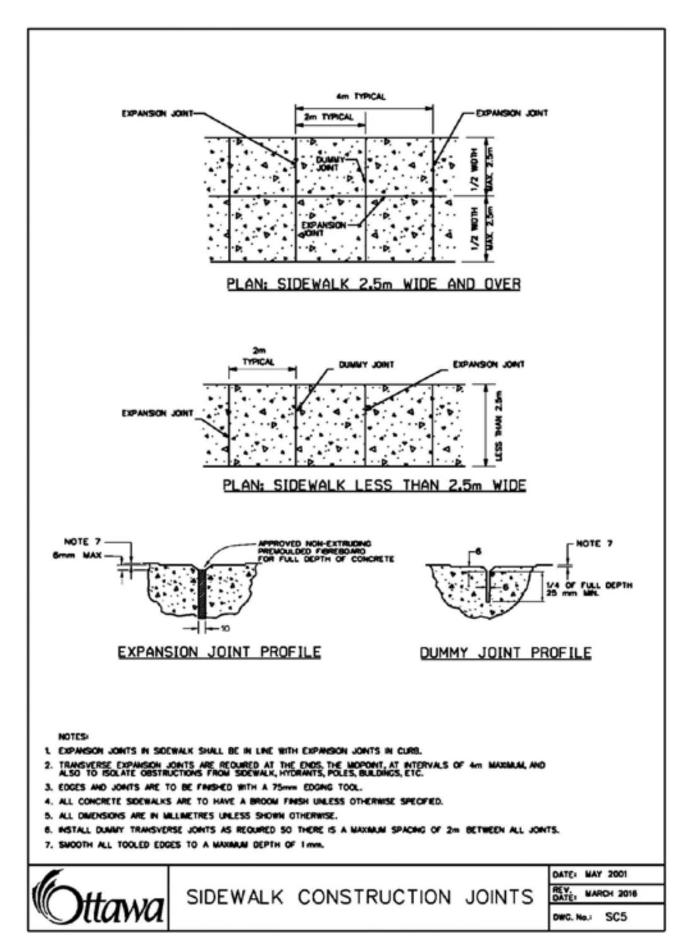

THERMAL INSULATION FOR WATERMAINS IN SHALLOW TRENCHES

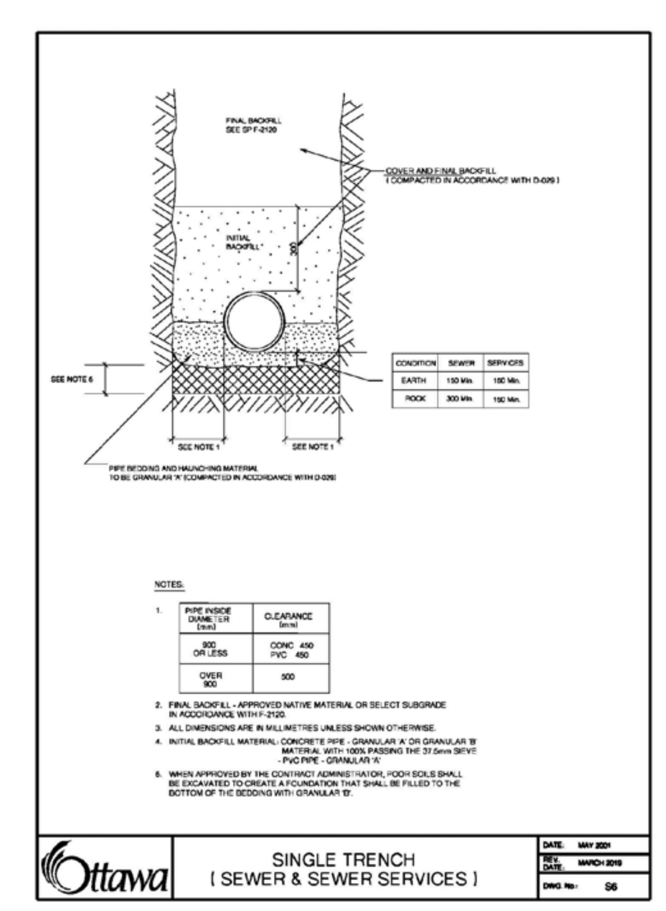

ONTARIO PROVINCIAL STANDARD DRAWING — CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES — OPSD 401.030

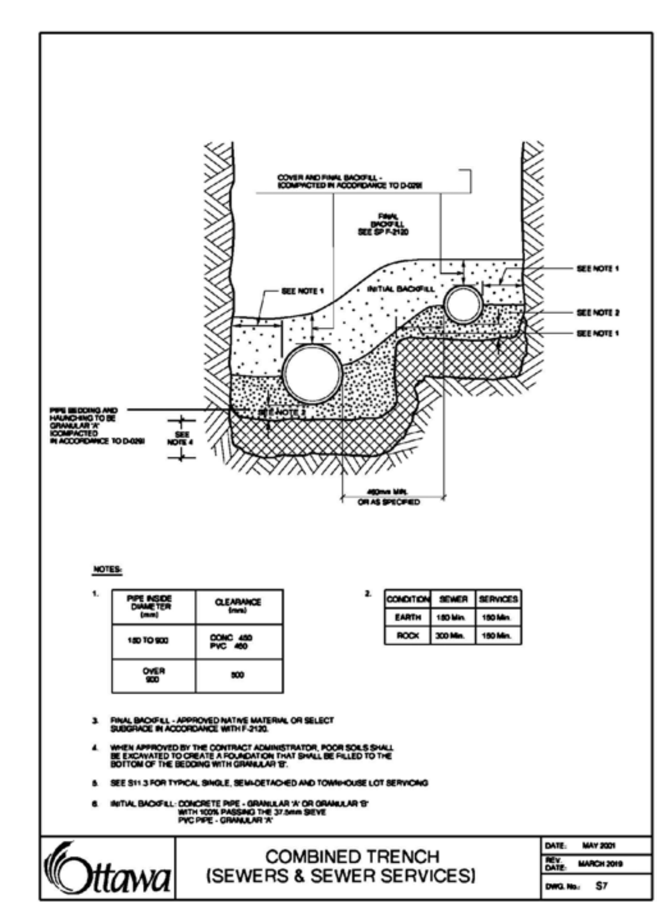

ONTARIO PROVINCIAL STANDARD DRAWING — PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER — OPSD 701.010

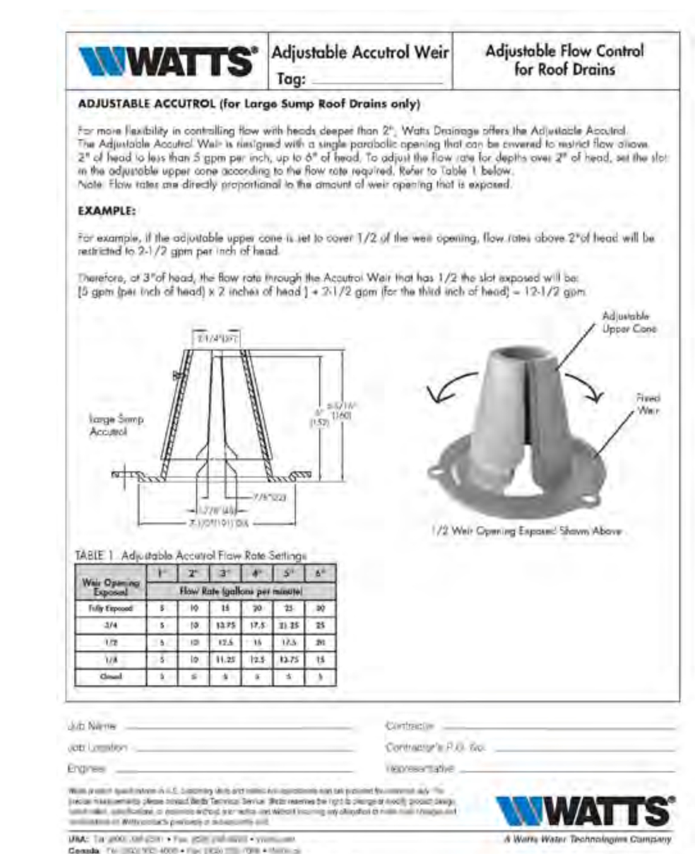

ONTARIO PROVINCIAL STANDARD DRAWING — MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES — OPSD 701.021


STANDARD TRENCH DETAIL


SIDEWALK CONSTRUCTION JOINTS


SINGLE TRENCH (SEWER & SEWER SERVICES)


COMBINED TRENCH (SEWERS & SEWER SERVICES)



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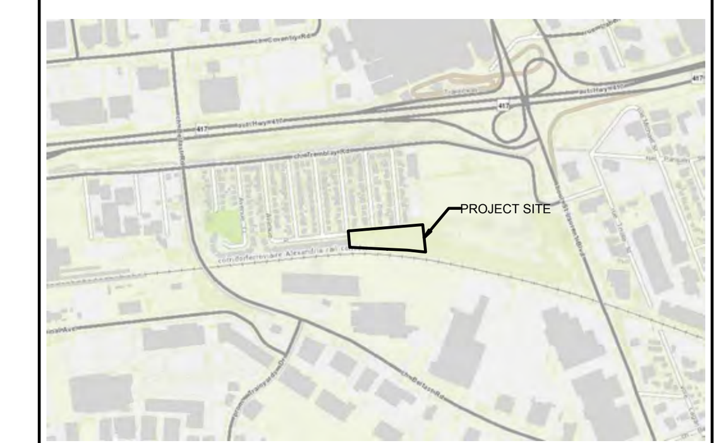


KEY PLAN

CLV GROUP

CLV GROUP
485 Bank Street, Suite 200
Ottawa, Ontario
K2P 1Z2

REVISION RECORD

ISSUED FOR SITE PLAN APPROVAL	2019-10-28
ISSUED FOR REVIEW	2019-10-01
ISSUED FOR COORDINATION	2019-04-30

ISSUE RECORD

PARSONS
1223 MICHAEL STREET, SUITE 100, OTTAWA, ONTARIO K1J 7T2
Tel: 613-738-4160 Fax: 613-739-7105

project1 studio
Project1 Studio Incorporated
|613.255.3636 |mail@project1studio.ca

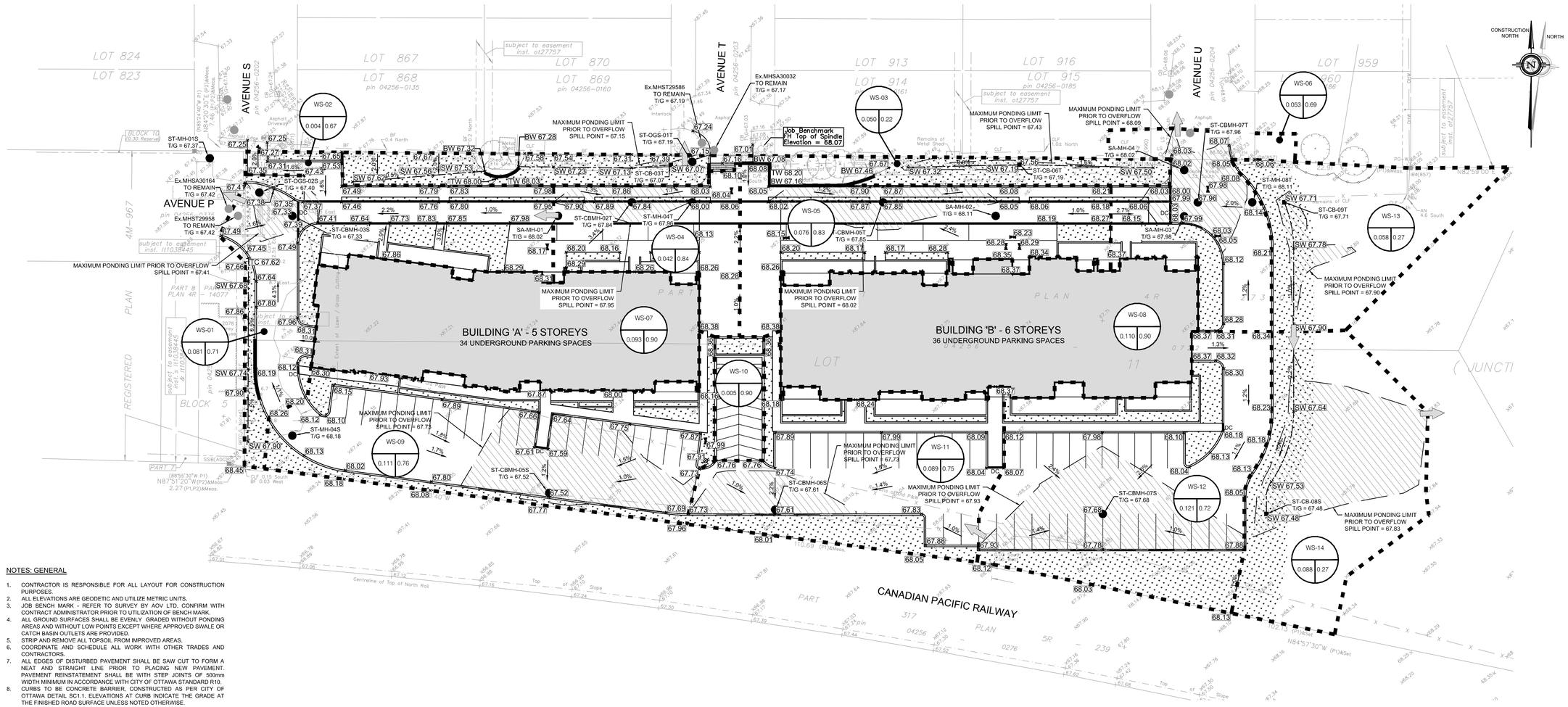
530 TREMBLAY

530 TREMBLAY RD
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
477074	N/A	SS	MM

CONSTRUCTION DETAILS

C103



NOTES: GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
2. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS.
3. JOB BENCH MARK - REFER TO SURVEY BY AOV LTD. CONFIRM WITH CONTRACT ADMINISTRATOR PRIOR TO UTILIZATION OF BENCH MARK.
4. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
5. STRIP AND REMOVE ALL TOPSOIL FROM IMPROVED AREAS.
6. COORDINATE AND SCHEDULE ALL WORK WITH OTHER TRADES AND CONTRACTORS.
7. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM IN ACCORDANCE WITH CITY OF OTTAWA STANDARD R10.
8. CURBS TO BE CONCRETE BARRIER, CONSTRUCTED AS PER CITY OF OTTAWA DETAIL SC1.1, ELEVATIONS AT CURB INDICATE THE GRADE AT THE FINISHED ROAD SURFACE UNLESS NOTED OTHERWISE.
9. RESTORE PAVEMENT STRUCTURE AND SURFACES ON EXISTING ROADS TO A CONDITION AT LEAST EQUAL TO ORIGINAL AND TO THE SATISFACTION OF THE MUNICIPAL AUTHORITIES.
10. ALL MATERIAL SUPPLIED AND PLACED FOR PARKING LOT AND ACCESS ROAD CONSTRUCTION SHALL BE TO OPSS STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE NOTED. CONSTRUCTION TO OPSS 206, 310 & 314. MATERIALS TO OPSS 1001, 1003 & 1010.
11. ABUTTING PROPERTY GRADE TO BE MATCHED.
12. OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION.
13. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
14. FILTER FABRIC TO BE INSTALLED AND MAINTAINED BETWEEN THE FRAME AND COVER OF ALL CATCHBASINS AND CATCHBASIN MANHOLES DURING THE CONSTRUCTION PERIOD TO MINIMIZE SEDIMENTS ENTERING THE STORM SEWER SYSTEM. ALL GRASSED AREAS MUST BE COMPLETED PRIOR TO THE REMOVAL OF THE FILTER FABRIC IN THE CATCH BASINS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS. ANY CONTAMINATED MATERIAL SHALL BE DISPOSED OF AT A LICENSED LANDFILL FACILITY.
16. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS BUT NOT LIMITED TO; ROAD CUT PERMITS, SEWER PERMITS, WATER PERMIT, ETC.
17. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH AND SIZE OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK. PROTECT AND ASSUME RESPONSIBILITY FOR ALL EXISTING UTILITIES.
18. REFER TO GEOTECHNICAL REPORT FOR SUBSURFACE CONDITIONS, CONSTRUCTION RECOMMENDATIONS, AND GEOTECHNICAL INSPECTION REQUIREMENTS.
19. REFER TO ARCHITECT AND LANDSCAPE ARCHITECTS DRAWINGS FOR BUILDING, LANDSCAPE, AND HARD SURFACE AREAS AND DIMENSIONS.

NOTES: WATERMAIN

20. SUPPLY AND INSTALL ALL WATERMAIN AND APPURTENANCES IN ACCORDANCE WITH MOST CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.
21. ALL WATER MAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE REQUIRED, PROVIDE INSULATION IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W22 AND W23.
22. WATER MAIN BEDDING AS PER CITY OF OTTAWA STANDARD W17.
23. CONCRETE THRUST BLOCKS AND RESTRAINING AS PER DETAILS ON DRAWING C103.
24. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER DETAILS ON DRAWING C103.
25. IF WATER MAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.
26. EXCAVATION, INSTALLATION, AND BACKFILL BY CONTRACTOR. CONNECTIONS AND SHUT-OFFS AT THE MAIN BY CITY.

LEGEND:

- EXISTING PROPERTY LINE
- EXISTING CONCRETE CURB
- PROPOSED CONCRETE CURB
- PROPOSED DEPRESSED CURB
- PROPOSED BUILDING OR STRUCTURE
- EXISTING WATERMAIN
- EXISTING V&VB
- EXISTING CURBSTOP
- EXISTING FIRE HYDRANT
- PROPOSED V&VB
- PROPOSED FIRE HYDRANT
- EXISTING SANITARY MANHOLE
- PROPOSED SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN
- EXISTING TREE AND HEDGE
- PROPOSED LANDSCAPE AREA
- TREE PROTECTION FENCE
- PROPOSED BOLLARD
- PROPOSED RETAINING WALL
- PROPOSED TERRANCING (MAX 3:1 SLOPE)
- PROPOSED DITCH
- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED BOTTOM OF WALL GRADE
- PROPOSED TOP OF WALL GRADE
- PROPOSED SWALE GRADE
- PROPOSED MAXIMUM PONDING LIMIT PRIOR TO OVERFLOW
- PROPOSED MAJOR OVERLAND FLOW
- PROPOSED WATERSHED BOUNDARY
- WATERSHED AREA NO.
- RUNOFF COEFFICIENT
- AREA (IN HECTARES)

5m 2 0 5 10m

SCALE: 1:300

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ISSUE RECORD

REGISTERED PROFESSIONAL ENGINEER
M.E. MACSWEEN
100104372
October 28, 2019
PROVINCE OF ONTARIO

PARSONS
1223 MICHAEL STREET, SUITE 100, OTTAWA, ONTARIO K1J 7T2
Tel: 613-738-4160 Fax: 613-739-7105

project1 studio
Project1 Studio Incorporated
|613.255.3636 | mail@project1studio.ca

530 TREMBLAY

530 TREMBLAY RD
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
477074	1:300	SS	MM

DRAINAGE PLAN

C104

APPENDIX D | BOUNDARY CONDITIONS

From: Sharif, Golam
To: MacSween, Meghan
Subject: [EXTERNAL] RE: Boundary Condition Request - 530 Tremblay Road
Date: Tuesday, August 06, 2019 10:37:13 AM
Attachments: 530 Trembaly Aug 2019.pdf

Good Morning Meghan,

Please see the updated boundary condition.

The following are boundary conditions, HGL, for hydraulic analysis at 530 Tremblay (zone 1E) assumed to be connected to the 152mm on Ave. S, 152mm on Ave T and 152mm on Ave U (see attached PDF for location).

The site will be serviced by a private 200mm diameter watermain that will run across the north side of the site with connections to the City watermains at Avenue S, Avenue T and Avenue U.

Current Public Watermains with Future 203mm Private Watermain:

	Connection 1 (Ave S)	Connection 2 (Ave T)	Connection 3 (Ave U)
Minimum HGL	110.2m	110.2m	110.2m
Maximum HGL	118.5m	118.5m	118.5m
MaxDay + FireFlow	92.0m	Available Flow @ 20psi = 175 L/s assuming a ground elevation of 67.4m	Available Flow @ 20psi = 155 L/s assuming a ground elevation of 68.2m

In the near future (by 2020 possibly), Avenue O and Avenue P will be replaced with 203mm watermains. All other Avenue streets are to be 152mm. The following are boundary conditions based on the future public watermains.

Future Public Watermains with Future 203mm Private Watermain:

	Connection 1 (Ave S)	Connection 2 (Ave T)	Connection 3 (Ave U)
Minimum HGL	110.2m	110.2m	110.2m
Maximum HGL	118.5m	118.5m	118.5m
MaxDay + FireFlow	104.5m	98.0m (for FF of 183 L/s)	95.0m

Thanks,

Sharif

From: MacSween, Meghan <Meghan.Macsween@parsons.com>
Sent: July 31, 2019 11:38 AM
To: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: Boundary Condition Request - 530 Tremblay Road

Hi Sharif,

Yes, sorry I should have included the attached figure, we are still proposing the same connections.

Thanks,

Meghan

Meghan MacSween, M.Eng., P.Eng.
Municipal Engineer
1223 Michael St. North, Suite 100, Ottawa, ON K1J 7T2
meghan.macsween@parsons.com – P: +1 613.691.1540 M: +1 343.997.3895
PARSONS - Envision More
www.parsons.com | LinkedIn | Twitter | Facebook

From: Sharif, Golam <sharif.sharif@ottawa.ca>
Sent: Wednesday, July 31, 2019 11:34 AM
To: MacSween, Meghan <Meghan.Macsween@parsons.com>
Subject: [EXTERNAL] RE: Boundary Condition Request - 530 Tremblay Road

Hi Meghan,

Are the location of the connections still same?

Sharif

From: MacSween, Meghan <Meghan.Macsween@parsons.com>
Sent: July 31, 2019 11:14 AM
To: Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: RE: Boundary Condition Request - 530 Tremblay Road

Hi Sharif,

Based on the results of the boundary conditions provided previously we have discussed with the architect and made revisions that would decrease the fire demand. For Building B we have added a 2hr firewall along the corridor that runs down the middle of the building to compartmentalize the structure in to separate fire areas as per the City's 2018 Technical Bulletin. We also increased the sprinkler factor to reflect a Standard Water Supply and Full Supervision. For Building 3, which is not currently proposed but a potential future building, we have updated the floor area to reflect current concept plans, we had overestimated the size originally. The updated FUS calculations are attached. And the new calculated demands are below. We'd like to request updated boundary conditions based on the decreased fire demand.

Please let me know if you have any questions or concerns. Thanks,

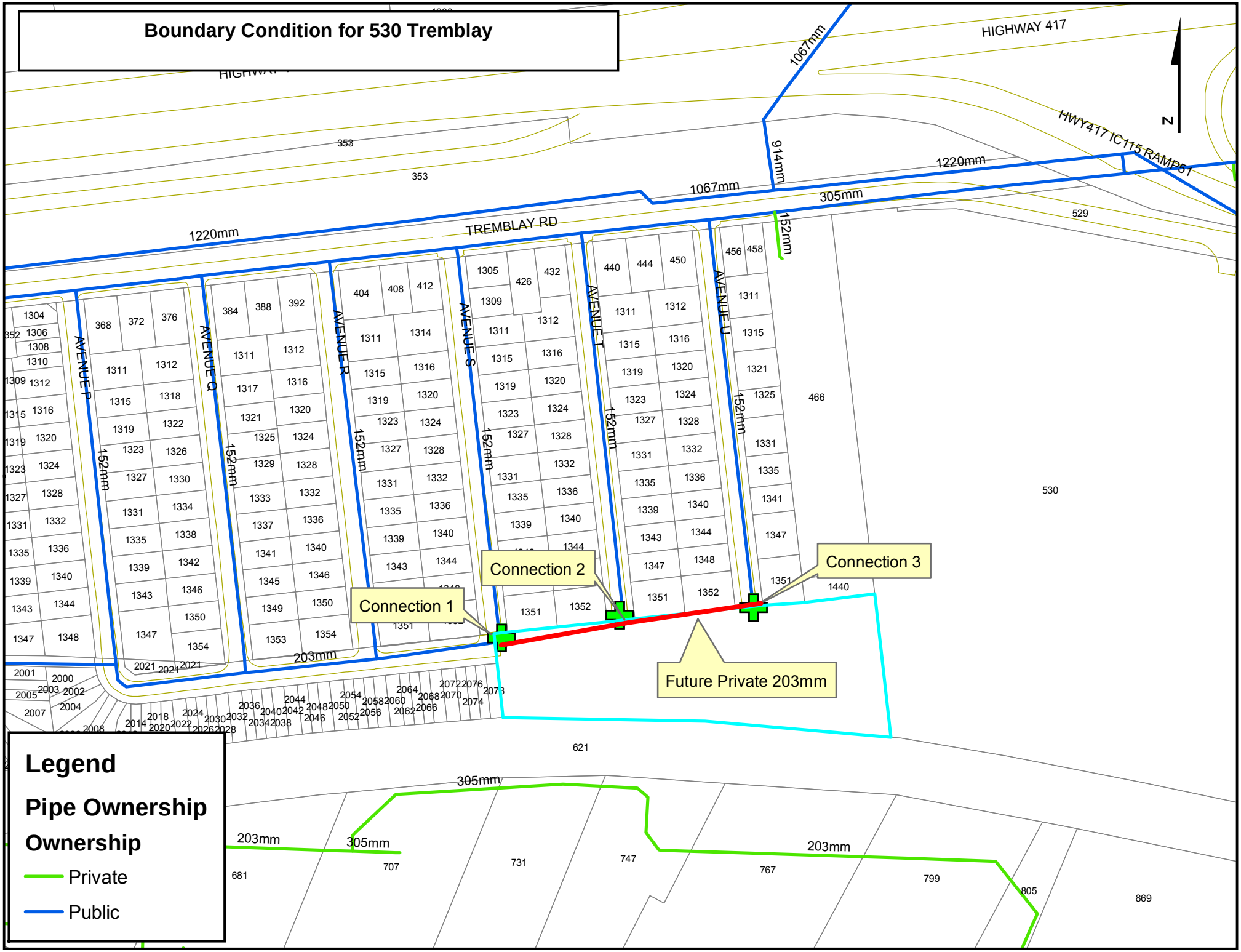
Meghan

Building 1 – Residential
ADD = 0.40 L/s
MDD = 1.44 L/s
PHD = 2.17 L/s
Fire Demand = 150 L/s

Building 2 – Residential (Two compartmentalized fire areas)
ADD = 0.51 L/s
MDD = 1.84 L/s
PHD = 2.76 L/s
Fire Demand (North Half of Building) = 183 L/s
Fire Demand (South Half of Building) = 150 L/s

Building 3 (Future) – Residential
ADD = 0.88 L/s
MDD = 3.15 L/s
PHD = 4.73 L/s
Fire Demand = 167 L/s

Meghan MacSween, M.Eng., P.Eng.
Municipal Engineer
1223 Michael St. North, Suite 100, Ottawa, ON K1J 7T2
meghan.macsween@parsons.com – P: +1 613.691.1540 M: +1 343.997.3895


Boundary Condition for 530 Tremblay
HIGHWAY 417
HWY417 IC115 RAMP51
N
TREMBLAY RD
1220mm
1067mm
914mm
305mm
152mm
AVENUE P
AVENUE Q
AVENUE R
AVENUE S
AVENUE T
AVENUE U
203mm
Connection 1
Connection 2
Connection 3
Future Private 203mm
530
466
621
Legend
Pipe Ownership
Ownership
Private
Public

APPENDIX E | WATER DEMAND

530 TREMBLAY ROAD - DRINKING WATER DEMAND

Building	Units	Population*	Average Daily Demand (ADD)**	Maximum Daily Demand (MDD)***	Peak Hourly Demand (PHD)***	Fire Flow (FF)	MDD + FF
			L/s	3.6*ADD L/s	5.4*ADD L/s	L/s	L/s
Building A	55	99	0.40	1.44	2.17	150	151.4
Building B	70	126	0.51	1.84	2.76	183	184.8
Building C (Future)	150	270	1.09	3.94	5.91	167	170.9

Average Daily Demands

Based on Ottawa Design Guidelines - Water Distribution, 2010 and MOE Design Guidelines for Drinking-Water Systems, 2008

* Residential Persons per Unit for Average Apartment = 1.8

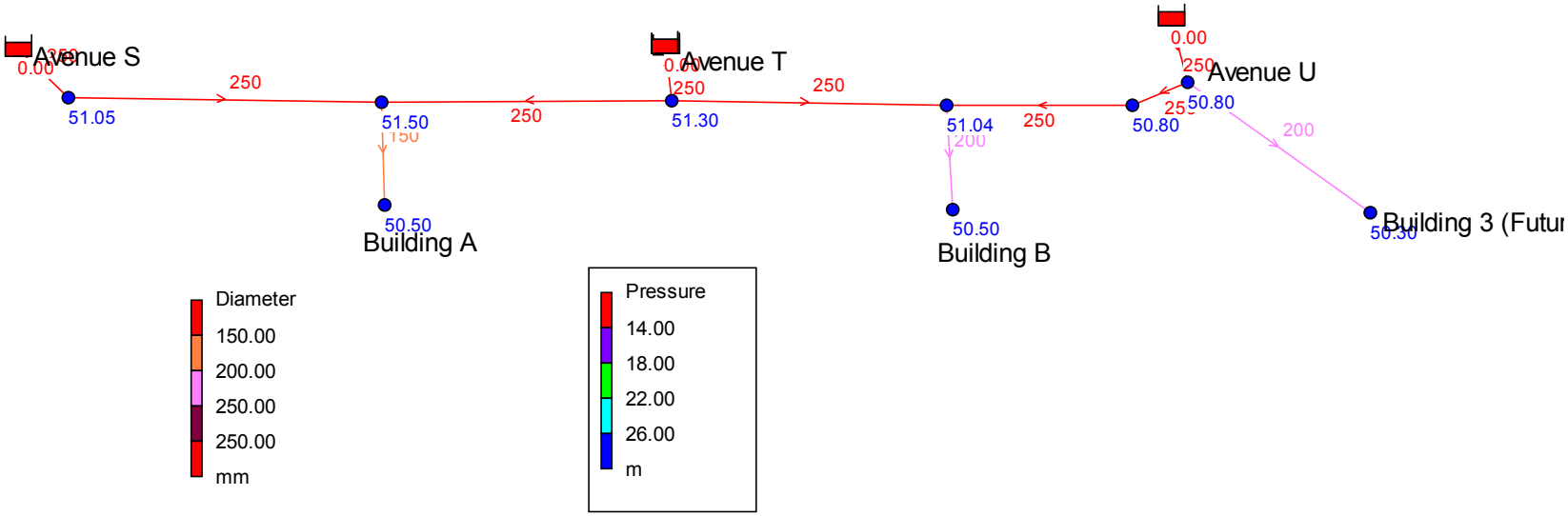
** Average Daily Residential Demand = 350 L/c/d

*** Peaking factors as per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons

APPENDIX F | EPA-NET OUTPUT

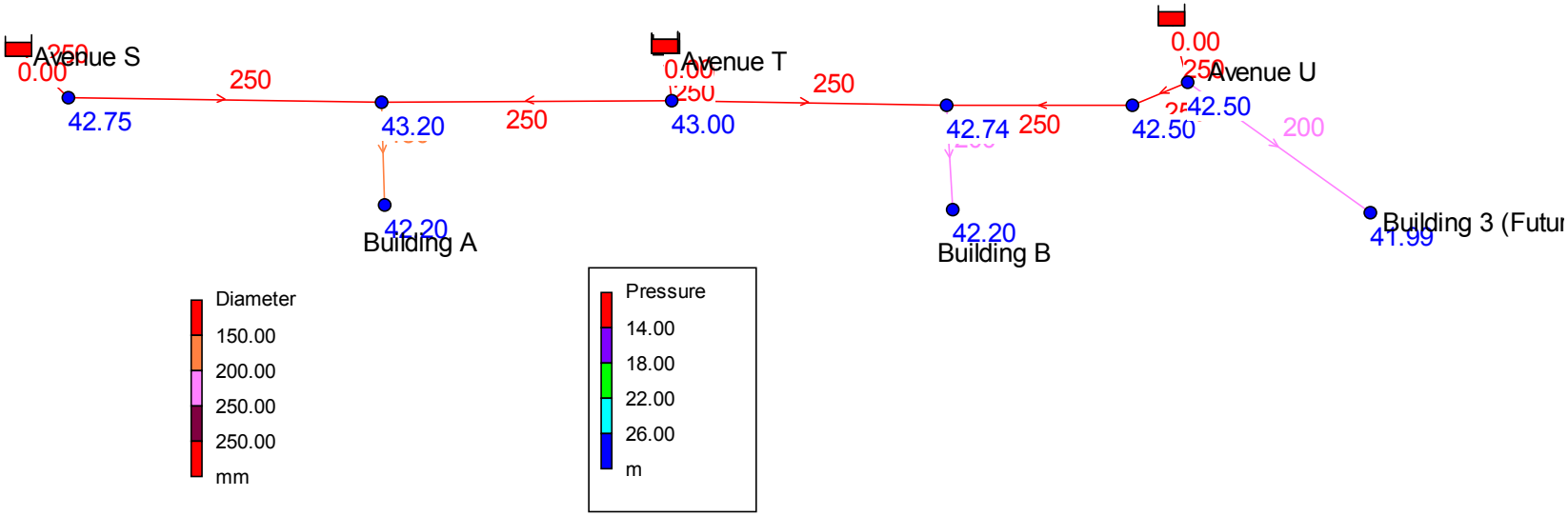
Average Day Demand

Day 1, 12:(



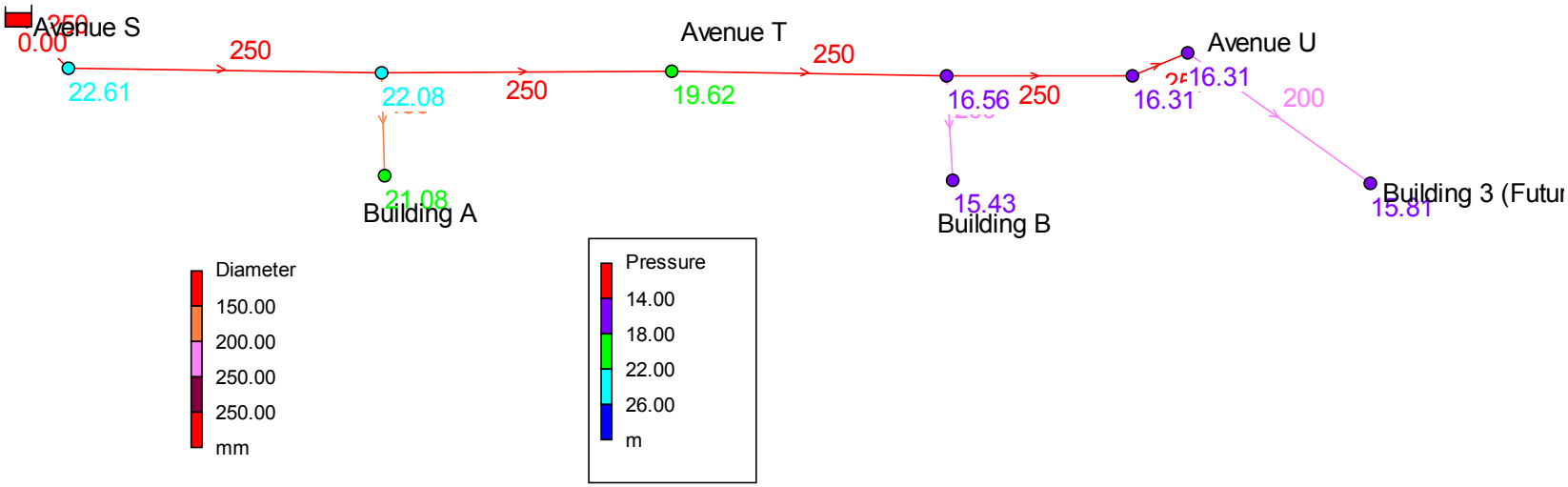
Peak Hour Demand

Day 1, 12:(



Worst Case Fire Demand (183 L/s) at Building B

Day 1, 12:(



APPENDIX G | SANITARY FLOWS AND SEWER DESIGN SHEET

530 TREMBLAY ROAD - SANITARY FLOWS

Drainage Area	Residential						Infiltration	
	Area (ha)	Units/ Houses	Pop. Density	Pop. (capita)	Peaking Factor	Peak Flow (L/s)	Infilt. Flow (L/s)	Total Peak Flow (L/s)
Future								
Building C (Future)	0.41	150	1.8	270	3.48	3.04	0.14	**3.18**
Proposed								
Building B	0.49	70	1.8	126	3.57	1.46	0.16	**1.62**
Building A	0.37	55	1.8	99	3.60	1.15	0.12	**1.28**
Existing								
1352 - 1335 Ave U	0.54	9	3.4	31	3.68	0.37	0.18	**0.55**
1332 - 1321 Ave U	0.40	7	3.4	24	3.70	0.29	0.13	**0.42**
1316 Ave U - Tremblay ROW	0.41	6	3.4	21	3.70	0.25	0.14	**0.39**
Tremblay ROW - Tremblay Sewer								
Total								**7.43**

Design:	E. Blanchette	**Project:**	530 Tremblay Road, Ottawa, ON
Check :	M. MacSween	**Project #:**	477074
Date:	Sep-19	**Client:**	CLV Group Inc.

Average Daily Demands

(Based on City of Ottawa *Sewer Design Guidelines 2012* and *MOE Water Design Guidelines*)

Average Residential Daily Flow = 280 L/p/d

Population Densities

Average suburban residential dev.	60	p/ha
Single family	3.4	p./unit
Semi-detached	2.7	p./unit
Duplex	2.3	p./unit
Townhouse	2.7	p./unit
Appartment average	1.8	p./unit
Bachelor	1.4	p./unit
1 Bedroom	1.4	p./unit
2 Bedrooms	2.1	p./unit
3 Bedrooms	3.1	p./unit

Peaking Factors

Residential : Harmon Equation

$1 + (14/(4+(Capita/1000)^{0.5}))*0.8$

min = 2

max = 4

Infiltration allowance (dry weather)	0.05	L/s/ha
Infiltration allowance (wet weather)	0.28	L/s/ha
I/I (total)	0.33	L/s/ha

530 TREMBLAY ROAD - SANITARY SEWER DESIGN SHEET

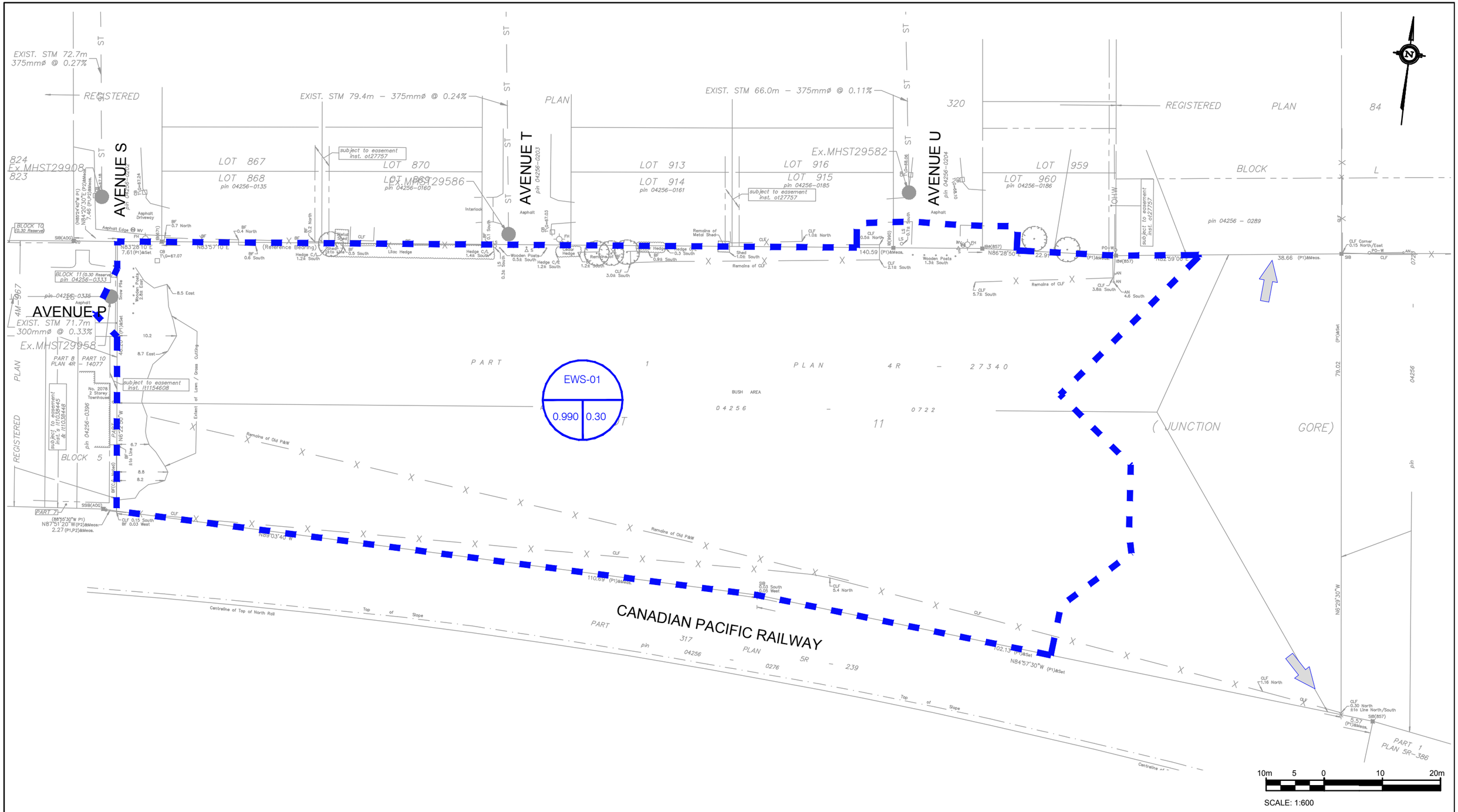
Drainage Area	From	To	Peak Flow Q (L/sec)	Sewer Data									
				Type of Pipe	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)
Building C	Building C (Future)	SA-MH-04	3.18	PVC	150	148.01	1.0	75.0	14.7	0.85	0.58	2.15	0.22
Building A	Building A	SA-MH-01	1.28	PVC	150	148.01	1.0	6.7	14.7	0.85	0.48	0.23	0.09
	SA-MH-01	SA-MH-03	1.28	PVC	150	148.01	1.0	64.3	14.7	0.85	0.48	2.24	0.09
Building B	Building B	SA-MH-03	1.62	PVC	150	148.01	1.0	5.4	14.7	0.85	0.50	0.18	0.11
	SA-MH-03	SA-MH-04	2.90	PVC	150	148.01	1.0	33.1	14.7	0.85	0.57	0.96	0.20
	SA-MH-04	SA-MH-05	6.08	PVC	150	148.01	0.7	7.1	12.3	0.71	0.61	0.19	0.49
	SA-MH-05	*EX MHSA30029*	6.08	PVC	150	148.01	0.7	6.6	12.3	0.71	0.61	0.18	0.49
Existing Avenue U	*EX MHSA30029*	*EX MHSA30030*	*6.62*	*CONC*	*225*	*225.00*	*0.39*	*71.5*	*28.1*	*0.71*	*0.49*	*2.41*	*0.24*
	EX MHSA30030	*EX MHSA30031*	*7.04*	*CONC*	*225*	*225.00*	*0.32*	*71.4*	*25.5*	*0.64*	*0.46*	*2.58*	*0.28*
	EX MHSA30031	*EX MHSA61845*	*7.43*	*CONC*	*225*	*225.00*	*0.41*	*58.6*	*28.7*	*0.72*	*0.51*	*1.90*	*0.26*
	EX MHSA61845	*EX MHSA61843*	*7.43*	*PVC*	*250*	*251.46*	*1.07*	*13.1*	*62.4*	*1.26*	*0.74*	*0.29*	*0.12*

Manning's n = **0.013**

Design:	E. Blanchette
Check:	M. MacSween
Date:	Sep-19

Project Name:	530 Tremblay Road
Parsons Project #:	477074
Client:	CLV Group

APPENDIX H | PRE- AND POST- DEVELOPMENT DRAINAGE PLAN



PARSONS

530 TREMBLAY ROAD
OTTAWA, ON

PRE DRAINAGE PLAN

October, 2019
477074
FIGURE A

H:\(SO\ 477074\ 1000\ DWGS\ 477074_530Tremblay_v10.dwg Sep 27, 2019 - 4:51pm

EXIST. STM 72.7m
375mmØ @ 0.27%

EXIST. STM 79.4m – 375mmØ @ 0.24%

EXIST. STM 66.0m – 375mmØ @ 0.11%

REGISTERED PLAN 84

AVENUE S

AVENUE T

AVENUE U

AVENUE P

EXIST. STM 71.7m
300mmØ @ 0.33%

Ex.MHST29908

Ex.MHST29582

Ex.MHST29586

Ex.MHST29958

LOT 870

LOT 959

LOT 960

BLOCK L

PLAN 04256 – 0289

WS-01
0.081 | 0.71

WS-02
0.004 | 0.67

WS-03
0.050 | 0.22

WS-04
0.042 | 0.84

WS-05
0.076 | 0.83

WS-06
0.053 | 0.69

WS-07
0.093 | 0.90

WS-08
0.110 | 0.90

WS-09
0.111 | 0.76

WS-10
0.005 | 0.90

WS-11
0.089 | 0.75

WS-12
0.121 | 0.72

WS-13
0.058 | 0.27

WS-14
0.088 | 0.27

9.0m - 300mmØ @ 0.34%

ST-MH-01S

ST-OGS-02S

8.9m - 300mmØ @ 0.34%

ST-CBMH-03S

3.1m - 300mmØ @ 0.34%

ST-OGS-01T

5.9m - 300mmØ @ 0.34%

ST-CB-03T

5.5m - 250mmØ @ 1.00%

ST-CBMH-02T

8.9m - 375mmØ @ 0.25%

ST-MH-04T

28.0m - 375mmØ @ 0.25%

ST-CBMH-05T

23.3m - 200mmØ @ 1.00%

ST-CB-06T

5.5m - 250mmØ @ 1.00%

ST-CBMH-07T

46.2m - 375mmØ @ 0.25%

8.0m - 375mmØ @ 0.25%

ST-MH-08T

4.7m - 250mmØ @ 0.43%

ST-CB-09T

7.9m - 300mmØ @ 0.34%

5.9m - 300mmØ @ 0.34%

BUILDING 'A' - 5 STOREYS
34 UNDERGROUND PARKING SPACES

BUILDING 'B' - 6 STOREYS
36 UNDERGROUND PARKING SPACES

32.3m - 600mmØ @ 0.25%

ST-MH-04S

38.6m - 525mmØ @ 0.21%

ST-CBMH-05S

33.3m - 450mmØ @ 0.20%

ST-CBMH-06S

48.1m - 450mmØ @ 0.20%

ST-CBMH-07S

3.3m - 300mmØ @ 0.34%

24.0m - 250mmØ @ 0.43%

ST-CB-08S

CANADIAN PACIFIC RAILWAY

(JUNCTION GORE)

PART 1
PLAN 5R-386

10m 5 0 10 20m

SCALE: 1:600

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PARSONS

530 TREMBLAY ROAD
OTTAWA, ON

POST DRAINAGE PLAN

October, 2019
477074
FIGURE B

APPENDIX I | STORM SEWER DESIGN SHEET

530 TREMBLAY ROAD - STORM SEWER DESIGN SHEET

Rational Method

Q = 2.78*A*I*R

Q = Flow (L/sec)
A = Area (ha)
I = Rainfall Intensity (mm/h)
R = Ave. Runoff Coefficient

Ottawa IDF Curve - 5-y (MacDonald Cartier Airport)

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

Minimum Time of Conc. Tc = **10 min**

Manning's n = **0.013**

Drainage Area	From	To	Area* (ha)	Runoff Parameters: Runoff Coeff. R	Indiv. 2.78AR	Accum. 2.78AR	Time of Conc. (min)	Rainfall Intensity (mm/hr)	Roof Flow* Q (L/sec)	Peak Flow Q (L/sec)	Pipe Dia. nom. (mm)	Pipe Dia. actual (mm)	Slope (%)	Length (m)	Capacity full (L/sec)	Velocity full (m/sec)	Velocity actual (m/sec)	Time of Flow (min)	Q(d) / Q(f)
EXISTING																			
EX WOODLANDS			0.990	0.30	0.83	0.83	22.90	64.47		53.23									
PROPOSED																			
AVENUE S																			
WS-14	ST-CB-08S	ST-CBMH-07S	0.088	0.27	0.07	0.07	10.00	104.19		6.87	250	251.46	0.43	24.0	39.70	0.80	0.52	0.50	0.17
WS-12	ST-CBMH-07S	ST-CBMH-06S	0.121	0.72	0.24	0.31	10.00	104.19		38.93	450	447.87	0.20	48.1	124.32	0.79	0.58	1.02	0.31
WS-11	ST-CBMH-06S	ST-CBMH-05S	0.089	0.75	0.19	0.49	11.02	99.10		87.80	450	447.87	0.20	33.3	124.32	0.79	0.76	0.70	0.71
WS-09	ST-CBMH-05S	ST-MH-04S	0.111	0.76	0.23	0.73	11.72	95.91		157.58	525	527.99	0.21	38.6	200.09	0.91	0.90	0.70	0.79
WS-01	ST-MH-04S	ST-CBMH-03S (ICD)	0.081	0.71	0.16	0.89	12.42	92.94		240.05	600	594.00	0.25	32.3	298.89	1.08	1.07	0.50	0.80
	ST-CBMH-03S (ICD)	ST-OGS-02S								22.22	300	299.36	0.34	6.9	56.07	0.80	0.64	0.14	0.40
	ST-OGS-02S	ST-MH-01S								22.22	300	299.36	0.34	8.9	56.07	0.80	0.64	0.19	0.40
	ST-MH-01S	EX-MHST29908								22.22	300	299.36	0.34	9.0	56.07	0.80	0.64	0.19	0.40
	EX-MHST29908	*EX-MHST29590*	*0.320*	*0.60*	*0.53*	*0.53*	*10.00*	*104.19*		*77.83*	*375*	*375.00*	*0.37*	*72.4*	*107.07*	*0.97*	*0.94*	*1.24*	*0.73*
AVENUE T																			
WS-13	ST-CB-09T	ST-MH-08T	0.058	0.27	0.04	0.04	10.00	104.19		4.56	250	251.46	0.43	4.7	39.61	0.80	0.47	0.10	0.12
NA	ST-MH-08T	ST-CBMH-07T								4.56	375	366.42	0.25	8.0	82.42	0.78	0.39	0.17	0.06
WS-06	ST-CBMH-07T	ST-CBMH-05T	0.053	0.69	0.10	0.14	10.10	103.67		19.55	375	366.42	0.25	46.2	82.42	0.78	0.55	0.99	0.24
WS-05/WS-03	ST-CBMH-05T	ST-MH-04T (ICD)	0.126	0.59	0.21	0.35	11.09	98.77		54.29	375	366.42	0.25	28.0	82.42	0.78	0.73	0.60	0.66
WS-04	ST-CBMH-02T	ST-MH-04T (ICD)	0.042	0.84	0.10	0.45	11.69	96.04		43.29	375	366.42	0.25	8.9	82.42	0.78	0.68	0.19	0.53
	ST-MH-04T (ICD)	ST-OGS-01T								17.20	300	299.36	0.34	5.9	56.07	0.80	0.59	0.12	0.31
	ST-OGS-01T	EX-MHST29586								17.20	300	299.36	0.34	3.1	56.07	0.80	0.59	0.06	0.31
	EX-MHST29586	*EX-MHST29587*	*0.310*	*0.60*	0.52	0.52	10.00	104.19		71.08	*375*	*375.00*	*0.24*	*80.0*	*85.45*	0.77	0.77	1.72	0.83
AVENUE U																			
ROOF A/ROOF B	BLDG B	EX-MHT29582								12.03	200	201.16	1.00	23.3	33.31	1.05	0.82	0.37	0.36
	EX-MHST29582	*EX-MHST29583*	*0.250*	*0.60*	0.42	0.42	10.00	104.19		55.48	*375*	*375.00*	*0.11*	*65.9*	*57.14*	0.52	0.54	2.12	0.97

Note:
Existing Runoff Coefficient Table 5.7 SDG - assuming Woodland in Clay and Silt Loam, flat (0-5%)
* WS-02 will flow uncontrolled to Avenue S and WS-10 will drain to trench drain at bottom of ramp and drain to sanitary system

Controlled 5 year flow to Avenue S
Controlled 5 year flow to Avenue T
Controlled 5 year roof drain flow

Design: E. Blanchette
Check: M. MacSween
Date: Sep-19

Project: 530 Tremblay Road, Ottawa, ON
Project # 477074
Client: CLV Group Inc.

APPENDIX J | STORMWATER MANAGEMENT CALCULATIONS

TABLE I - ALLOWABLE RUNOFF CALCULATIONS BASED ON PRE-EXISTING CONDITIONS

			Minor Storm				Storm = 100 yr		
Area Description	Area (ha)	Time of Conc, Tc (min)		I_5 (mm/hr)	C_{AVG}	Q_{ALLOW} (L/s)	I_{100} (mm/hr)	C_{AVG}	Q_{ALLOW} (L/sec)
EX WOODLANDS	0.990	22.90	Storm = 5 yr	64.47	0.30	**53.2**	109.99	0.38	**113.5**

5-year Storm	$C_{WOODLANDS}$ =	0.30	$C_{ASPHALT/ROOF}$ =	0.90	C_{GRASS} =	0.20		
100-year Storm	$C_{WOODLANDS}$ =	0.38	$C_{ASPHALT/ROOF}$ =	1.00	C_{GRASS} =	0.25		

TABLE II- POST-DEVELOPMENT AVERAGE RUNOFF COEFFICIENTS

Watershed Area No.	Impervious Areas (m^2)	A * $C_{ASPH/ROOF}$	Pervious Grass Areas (m^2)	A * C_{GRASS}	Pervious Woodlands Areas (m^2)	A * $C_{WOODLANDS}$	Sum AC	Total Area (m^2)	$C_{AVG\ (5yr)}$	$C_{AVG(100yr)}$
WS-01	593.61	534	215.82	43	0.00	0	577	809	0.71	0.89
WS-02*	28.82	26	13.94	3	0.00	0	29	43	0.67	0.84
WS-03	14.89	13	489.90	98	0.00	0	111	505	0.22	0.28
WS-04	386.15	348	37.50	8	0.00	0	355	424	0.84	1.00
WS-05	677.97	610	80.28	16	0.00	0	626	758	0.83	1.00
WS-06	369.07	332	156.48	31	0.00	0	363	526	0.69	0.86
WS-07**	930.00	837	0.00	0	0.00	0	837	930	0.90	1.00
WS-08**	1100.00	990	0.00	0	0.00	0	990	1100	0.90	1.00
WS-09	893.02	804	216.28	43	0.00	0	847	1109	0.76	0.95
WS-10	132.77	119	0.00	0	0.00	0	119	133	0.90	1.00
WS-11	701.55	631	187.92	38	0.00	0	669	889	0.75	0.94
WS-12	899.15	809	308.65	62	0.00	0	871	1208	0.72	0.90
WS-13	0.00	0	147.13	29	436.29	131	160	583	0.27	0.34
WS-14	0.00	0	259.79	52	619.27	186	238	879	0.27	0.34
Total	6727		2114		1056		6794	9896		
Total Controlled***	6698		2100		1056		6765	9853		

* Uncontrolled drainage to Avenue S

** Roof top areas

*** Not including WS-02 which is uncontrolled

TABLE III- TOTAL RUNOFF COEFFICIENT FOR CONTROLLED AREAS

$C_{AVG(5yr)} = \frac{\text{Sum AC}}{\text{Total Area}} = \frac{\mathbf{6.765}}{\mathbf{9,853}} = \mathbf{0.69}$ $\quad C_{AVG(100yr)} = \mathbf{0.86}$

Runoff coefficient for controlled areas only, WS-02 is excluded.

TABLE IV- SUMMARY OF POST-DEVELOPMENT RUNOFF

		Storm = 5 yr				Storm = 100 yr			
Area No	Area (ha)	I_5 (mm/hr)	$C_{AVG(5yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)	I_{100} (mm/hr)	$C_{AVG(100yr)}$	Q_{GEN} (L/s)	Q_{CONT} (L/s)
WS-01	0.081	104.19	0.71	16.7		178.56	0.89	35.8	
WS-03	0.050	104.19	0.22	3.2		178.56	0.28	6.9	
WS-04	0.042	104.19	0.84	10.3		178.56	1.00	21.0	
WS-05	0.076	104.19	0.83	18.1		178.56	1.00	37.6	
WS-06	0.053	104.19	0.69	10.5		178.56	0.86	22.6	
WS-07**	0.093	104.19	0.90	24.2		178.56	1.00	46.2	
WS-08**	0.110	104.19	0.90	28.7	**52.4**	178.56	1.00	54.6	**51.4**
WS-09	0.111	104.19	0.76	24.5		178.56	0.95	52.6	
WS-10	0.013	104.19	0.90	3.5		178.56	1.00	6.6	
WS-11	0.089	104.19	0.75	19.4		178.56	0.94	41.5	
WS-12	0.121	104.19	0.72	25.2		178.56	0.90	54.0	
WS-13	0.058	104.19	0.27	4.6		178.56	0.34	9.9	
WS-14	0.088	104.19	0.27	6.9		178.56	0.34	14.8	
WS-02*	0.004	104.19	0.67	0.8	**0.8**	178.56	0.84	1.8	**1.8**
Total	0.990			196.8	**53.2**			405.9	**53.2**

* Uncontrolled drainage to Avenue S

** Roof top areas

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$

$I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

Time of concentration (min), Tc = 10 mins

100-year Allowable Outlet Flow = 100-year Pre-Development Allowable (Table I)	53.2 L/s			
- Uncontrolled area (WS-02) =	1.8			
- 100-year Post-Development Roof Top (Table V) =	12.0 L/s	AVE S	22.2 L/s	
	39.4 L/s	AVE T	17.2 L/s	

Table V - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Site Outletting to Avenue S (Not Including Roof)

C_{AVG} = 0.69 (5-year)
C_{AVG} = 0.86 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.490 (hectares)

	Release Rate = **20.7** (L/sec)					Release Rate = **22.2** (L/sec)				
	Return Period = 5 (years)					Return Period = 100 (years)				
	IDF Parameters, A = 998.071 , B = 0.814					IDF Parameters, A = 1735.688 , B = 0.820				
	$I = A/(T_c+C)B$, C = 6.053					$I = A/(Tc+C)B$, C = 6.014				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	132.0	20.7	111.4	33.4	242.7	283.7	22.2	261.5	78.5
10	104.2	97.4	20.7	76.8	46.1	178.6	208.7	22.2	186.5	111.9
15	83.6	78.1	20.7	57.5	51.7	142.9	167.0	22.2	144.8	130.3
20	70.3	65.7	20.7	45.0	54.0	120.0	140.2	22.2	118.0	141.6
25	60.9	57.0	20.7	36.3	54.4	103.8	121.4	22.2	99.2	148.8
30	53.9	50.4	20.7	29.8	53.6	91.9	107.4	22.2	85.2	153.3
35	48.5	45.4	20.7	24.7	51.9	82.6	96.5	22.2	74.3	156.1
40	44.2	41.3	20.7	20.6	49.5	75.1	87.8	22.2	65.6	157.5
45	40.6	38.0	20.7	17.3	46.8	69.1	80.7	22.2	58.5	158.0
50	37.7	35.2	20.7	14.5	43.6	64.0	74.8	22.2	52.5	157.6
55	35.1	32.8	20.7	12.2	40.2	59.6	69.7	22.2	47.5	156.7
60	32.9	30.8	20.7	10.1	36.5	55.9	65.3	22.2	43.1	155.2
65	31.0	29.0	20.7	8.4	32.6	52.6	61.5	22.2	39.3	153.4
70	29.4	27.5	20.7	6.8	28.5	49.8	58.2	22.2	36.0	151.1
75	27.9	26.1	20.7	5.4	24.3	47.3	55.2	22.2	33.0	148.6
80	26.6	24.8	20.7	4.2	20.0	45.0	52.6	22.2	30.4	145.8
85	25.4	23.7	20.7	3.0	15.5	43.0	50.2	22.2	28.0	142.8
90	24.3	22.7	20.7	2.0	11.0	41.1	48.1	22.2	25.8	139.5
95	23.3	21.8	20.7	1.1	6.4	39.4	46.1	22.2	23.9	136.1
100	22.4	21.0	20.7	0.3	1.7	37.9	44.3	22.2	22.1	132.5
105	21.6	20.2	20.7	-0.5	-3.1	36.5	42.7	22.2	20.4	128.8
110	20.8	19.5	20.7	-1.2	-7.9	35.2	41.2	22.2	18.9	125.0
115	20.1	18.8	20.7	-1.9	-12.8	34.0	39.8	22.2	17.5	121.0
120	19.5	18.2	20.7	-2.5	-17.8	32.9	38.5	22.2	16.2	116.9
Max =					**54.4**					**158.0**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(Tc/60)^B$
3) Release Rate = Existing 5 year Peak Flow Rate
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximum Storage = Max Storage Over Duration

Table VI - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Site Outletting to Avenue T (Not Including Roof)

C_{AVG} = 0.69 (5-year)
C_{AVG} = 0.86 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.280 (hectares)

	Release Rate = **14.3** (L/sec)					Release Rate = **17.2** (L/sec)				
	Return Period = 5 (years)					Return Period = 100 (years)				
	IDF Parameters, A = 998.071 , B = 0.814					IDF Parameters, A = 1735.688 , B = 0.820				
	$I = A/(T_c+C)B$, C = 6.053					I = A/(Tc+C)B , C = 6.014				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	75.4	14.3	61.1	18.3	242.7	162.1	17.2	144.9	43.5
10	104.2	55.7	14.3	41.4	24.8	178.6	119.3	17.2	102.1	61.2
15	83.6	44.7	14.3	30.3	27.3	142.9	95.5	17.2	78.3	70.4
20	70.3	37.5	14.3	23.2	27.9	120.0	80.1	17.2	62.9	75.5
25	60.9	32.5	14.3	18.2	27.3	103.8	69.4	17.2	52.2	78.3
30	53.9	28.8	14.3	14.5	26.1	91.9	61.4	17.2	44.2	79.5
35	48.5	25.9	14.3	11.6	24.4	82.6	55.2	17.2	38.0	79.7
40	44.2	23.6	14.3	9.3	22.3	75.1	50.2	17.2	33.0	79.2
45	40.6	21.7	14.3	7.4	19.9	69.1	46.1	17.2	28.9	78.1
50	37.7	20.1	14.3	5.8	17.4	64.0	42.7	17.2	25.5	76.6
55	35.1	18.8	14.3	4.4	14.7	59.6	39.8	17.2	22.6	74.7
60	32.9	17.6	14.3	3.3	11.8	55.9	37.3	17.2	20.1	72.5
65	31.0	16.6	14.3	2.3	8.8	52.6	35.2	17.2	18.0	70.1
70	29.4	15.7	14.3	1.4	5.8	49.8	33.3	17.2	16.1	67.5
75	27.9	14.9	14.3	0.6	2.6	47.3	31.6	17.2	14.4	64.7
80	26.6	14.2	14.3	-0.1	-0.6	45.0	30.1	17.2	12.9	61.7
85	25.4	13.6	14.3	-0.8	-3.9	43.0	28.7	17.2	11.5	58.6
90	24.3	13.0	14.3	-1.3	-7.3	41.1	27.5	17.2	10.3	55.4
95	23.3	12.5	14.3	-1.9	-10.7	39.4	26.3	17.2	9.1	52.1
100	22.4	12.0	14.3	-2.4	-14.1	37.9	25.3	17.2	8.1	48.7
105	21.6	11.5	14.3	-2.8	-17.6	36.5	24.4	17.2	7.2	45.2
110	20.8	11.1	14.3	-3.2	-21.1	35.2	23.5	17.2	6.3	41.7
115	20.1	10.8	14.3	-3.6	-24.7	34.0	22.7	17.2	5.5	38.1
120	19.5	10.4	14.3	-3.9	-28.2	32.9	22.0	17.2	4.8	34.4
Max =					**27.9**					**79.7**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A
2) Rainfall Intensity, $I = A/(Tc/60)^B$
3) Release Rate = Existing 5 year Peak Flow Rate
4) Storage Rate = Peak Flow - Release Rate
5) Storage = Duration x Storage Rate
6) Maximum Storage = Max Storage Over Duration

Table VII - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Building A

C_{AVG} =	0.90	(5-year)		
C_{AVG} =	1.00	(100-year)	Zurn Z105 Control-Flo Single Notch	
Time Interval =	5	(mins)	Number of Drains =	4
Drainage Area =	0.023	(hectares) per drain	Total Release Rate 5 year =	**2.85 l/s**
	233	(sqm)	Total Release Rate 100 year =	**5.39 l/s**

Duration (min)	Release Rate = **0.71** (L/sec) per drain Return Period = 5 (years) IDF Parameters, A = 998.071, B = 0.814 $I = A/(T_c+C)B$, C = 6.053					Release Rate = **1.35** (L/sec) per drain Return Period = 100 (years) IDF Parameters, A = 1735.688, B = 0.820 $I = A/(Tc+C)B$, C = 6.014				
	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	8.2	0.7	7.5	2.2	242.7	15.7	1.3	14.3	4.3
10	104.2	6.1	0.7	5.3	3.2	178.6	11.5	1.3	10.2	6.1
15	83.6	4.9	0.7	4.1	3.7	142.9	9.2	1.3	7.9	7.1
20	70.3	4.1	0.7	3.4	4.0	120.0	7.8	1.3	6.4	7.7
25	60.9	3.5	0.7	2.8	4.2	103.8	6.7	1.3	5.4	8.0
30	53.9	3.1	0.7	2.4	4.4	91.9	5.9	1.3	4.6	8.3
35	48.5	2.8	0.7	2.1	4.4	82.6	5.3	1.3	4.0	8.4
40	44.2	2.6	0.7	1.9	4.5	75.1	4.9	1.3	3.5	8.4
45	40.6	2.4	0.7	1.7	4.5	69.1	4.5	1.3	3.1	8.4
50	37.7	2.2	0.7	1.5	4.4	64.0	4.1	1.3	2.8	8.4
55	35.1	2.0	0.7	1.3	4.4	59.6	3.9	1.3	2.5	8.3
60	32.9	1.9	0.7	1.2	4.3	55.9	3.6	1.3	2.3	8.2
65	31.0	1.8	0.7	1.1	4.3	52.6	3.4	1.3	2.1	8.0
70	29.4	1.7	0.7	1.0	4.2	49.8	3.2	1.3	1.9	7.9
75	27.9	1.6	0.7	0.9	4.1	47.3	3.1	1.3	1.7	7.7
80	26.6	1.5	0.7	0.8	4.0	45.0	2.9	1.3	1.6	7.5
85	25.4	1.5	0.7	0.8	3.9	43.0	2.8	1.3	1.4	7.3
90	24.3	1.4	0.7	0.7	3.8	41.1	2.7	1.3	1.3	7.1
95	23.3	1.4	0.7	0.6	3.7	39.4	2.5	1.3	1.2	6.8
100	22.4	1.3	0.7	0.6	3.5	37.9	2.4	1.3	1.1	6.6
105	21.6	1.3	0.7	0.5	3.4	36.5	2.4	1.3	1.0	6.4
110	20.8	1.2	0.7	0.5	3.3	35.2	2.3	1.3	0.9	6.1
115	20.1	1.2	0.7	0.5	3.2	34.0	2.2	1.3	0.9	5.9
120	19.5	1.1	0.7	0.4	3.0	32.9	2.1	1.3	0.8	5.6
Max Storage (m^3)=					**4.5**					**8.4**
Average Ponding Depth (mm)					**19.2**					**36.2**
Maximum Ponding Depth (mm)					**57.5**					**108.7**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc/60)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

Table VIII - Storage Volumes (5-Year and 100-Year Storm Events)

Storage Requirement for Roof Building B

C_{AVG} = 0.90 (5-year)
C_{AVG} = 1.00 (100-year)
Time Interval = 5 (mins)
Drainage Area = 0.022 (hectares) per drain
220 (sqm)

Zurn Z105 Control-Flo Single Notch
Number of Drains = 5
Total Release Rate 5 year = **3.51 l/s**
Total Release Rate 100 year = **6.63 l/s**

	5-Year Storm Event					100-Year Storm Event				
	Release Rate = **0.70** (L/sec) per drain Return Period = 5 (years) IDF Parameters, A = 998.071, B = 0.814 $I = A/(T_c+C)B$, C = 6.053					Release Rate = **1.33** (L/sec) per drain Return Period = 100 (years) IDF Parameters, A = 1735.688, B = 0.820 $I = A/(Tc+C)B$, C = 6.014				
Duration (min)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)	Rainfall Intensity, I (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
0	-	-	-	-	-	-	-	-	-	-
5	141.2	7.8	0.7	7.1	2.1	242.7	14.8	1.3	13.5	4.1
10	104.2	5.7	0.7	5.0	3.0	178.6	10.9	1.3	9.6	5.8
15	83.6	4.6	0.7	3.9	3.5	142.9	8.7	1.3	7.4	6.7
20	70.3	3.9	0.7	3.2	3.8	120.0	7.3	1.3	6.0	7.2
25	60.9	3.4	0.7	2.6	4.0	103.8	6.4	1.3	5.0	7.5
30	53.9	3.0	0.7	2.3	4.1	91.9	5.6	1.3	4.3	7.7
35	48.5	2.7	0.7	2.0	4.1	82.6	5.1	1.3	3.7	7.8
40	44.2	2.4	0.7	1.7	4.2	75.1	4.6	1.3	3.3	7.8
45	40.6	2.2	0.7	1.5	4.1	69.1	4.2	1.3	2.9	7.8
50	37.7	2.1	0.7	1.4	4.1	64.0	3.9	1.3	2.6	7.8
55	35.1	1.9	0.7	1.2	4.1	59.6	3.6	1.3	2.3	7.7
60	32.9	1.8	0.7	1.1	4.0	55.9	3.4	1.3	2.1	7.5
65	31.0	1.7	0.7	1.0	3.9	52.6	3.2	1.3	1.9	7.4
70	29.4	1.6	0.7	0.9	3.8	49.8	3.0	1.3	1.7	7.2
75	27.9	1.5	0.7	0.8	3.7	47.3	2.9	1.3	1.6	7.0
80	26.6	1.5	0.7	0.8	3.6	45.0	2.8	1.3	1.4	6.8
85	25.4	1.4	0.7	0.7	3.5	43.0	2.6	1.3	1.3	6.6
90	24.3	1.3	0.7	0.6	3.4	41.1	2.5	1.3	1.2	6.4
95	23.3	1.3	0.7	0.6	3.3	39.4	2.4	1.3	1.1	6.2
100	22.4	1.2	0.7	0.5	3.2	37.9	2.3	1.3	1.0	5.9
105	21.6	1.2	0.7	0.5	3.1	36.5	2.2	1.3	0.9	5.7
110	20.8	1.1	0.7	0.4	2.9	35.2	2.2	1.3	0.8	5.5
115	20.1	1.1	0.7	0.4	2.8	34.0	2.1	1.3	0.8	5.2
120	19.5	1.1	0.7	0.4	2.7	32.9	2.0	1.3	0.7	4.9
Max Storage (m^3)=					**4.2**					**7.8**
Average Ponding Depth (mm)					**18.9**					**35.7**
Maximum Ponding Depth (mm)					**56.6**					**107.0**

Notes

1) Peak flow is equal to the product of 2.78 x C x I x A

2) Rainfall Intensity, $I = A/(Tc/60)^B$

3) Release Rate = LESSER of Min (Release Rate, Peak Flow) - Minus 100 Year Flow Of Uncontroled Areas OR Pipe Outlet Capacity

4) Storage Rate = Peak Flow - Release Rate

5) Storage = Duration x Storage Rate

6) Maximium Storage = Max Storage Over Duration

ICD Design Table - IX

$Q = 0.62 \times A \times [2gh]^{0.5}$ where: g= 9.81

Location	Pipe Outlet Diameter (mm)	Pipe Outlet Invert (m)	HGL (m)		Outlet flow (L/s)		Trial orifice size (mm)	Orifice size (mm)	Orifice Area (sqm)	Head (m)	
			100-year event	5-year event	100-year event	5-year event				100-year event	5-year event
AVENUE S	300	65.85	66.87	66.74	22.2	20.7	**102**	102.30	0.00822	0.97	0.84
AVENUE T	300	65.73	67.11	66.70	17.2	14.3	**83**	83.02	0.00541	1.34	0.93

APPENDIX K | UNDERGROUND STORMWATER STORAGE

CULTEC Stormwater Design Calculator

Date:	September 30, 2019

Project Information:

530 Tremblay Avenue S

Calculations Performed By:

RECHARGER 180HD

Recharger 180HD Chamber Specifications

Height	521	mm
Width	914	mm
Length	2.23	meters
Installed Length	1.93	meters
Bare Chamber Volume	0.62	cu. meters
Installed Chamber Volume	1.05	cu. meters

Breakdown of Storage Provided by Recharger 180HD Stormwater System

Within Chambers	74.99	cu. meters
Within Feed Connectors	0.18	cu. meters
Within Stone	58.57	cu. meters
Total Storage Provided	**133.7**	**cu. meters**
Total Storage Required	127.00	cu. meters

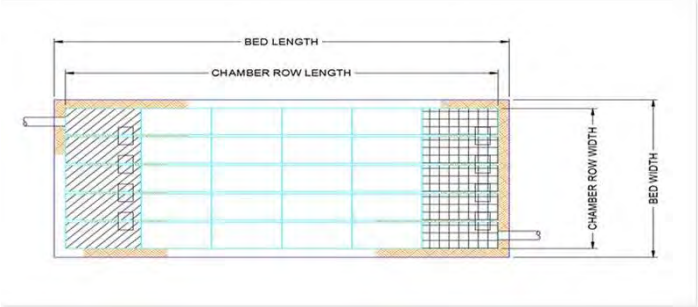
Materials List

Recharger 180HD

Total Number of Chambers Required	**120**	**pieces**
Starter Chambers	8	pieces
Intermediate Chambers	104	pieces
End Chambers	8	pieces
HVLV FC-24 Feed Connectors	14	pieces
CULTEC No. 410 Non-Woven Geotextile	751	sq. meters
CULTEC No. 4800 Woven Geotextile	18	meters
Stone	146	cu. meters

Based on 2 Internal Manifolds

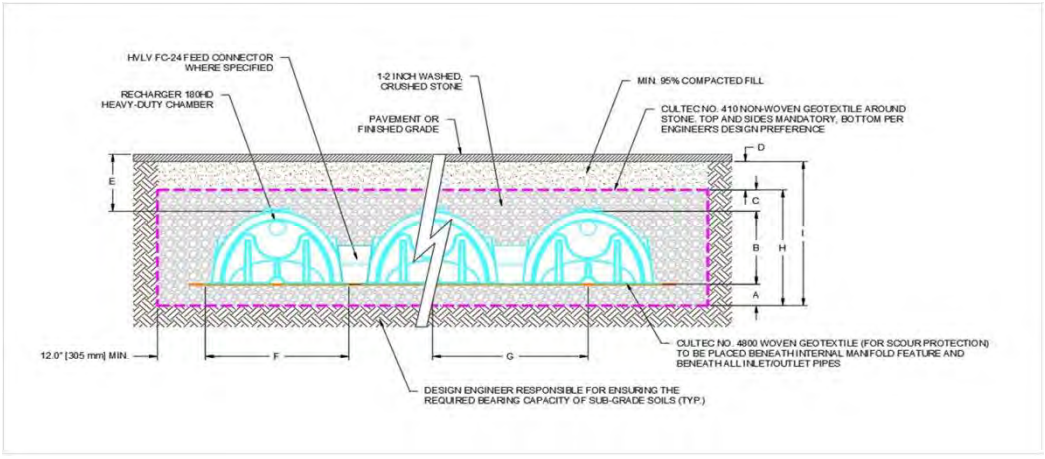
Bed Detail



Bed detail for reference only. Not project specific. Not to scale.

Bed Layout Information

Number of Rows Wide	8	pieces
Number of Chambers Long	15	pieces
Chamber Row Width	8.38	meters
Chamber Row Length	29.25	meters
Bed Width	8.99	meters
Bed Length	29.86	meters
Bed Area Required	268.45	sq. meters
Length of Separator Row	N/A	meters



Conceptual graphic only. Not job specific.

Cross Section Table Reference

A	Depth of Stone Base	152	mm
B	Chamber Height	521	mm
C	Depth of Stone Above Units	152	mm
D	Depth of 95% Compacted Fill	203	mm
E	Max. Depth Allowed Above the Chamber	3.66	meters
F	Chamber Width	914	mm
G	Center to Center Spacing	1.07	meters
H	Effective Depth	0.83	meters
I	Bed Depth	1.03	meters

CULTEC, Inc.
P.O. Box 280
Brookfield, CT 06804 USA

Phone: 203-775-4416
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tech@cultec.com

CULTEC Stage-Storage Calculations

Date:	September 30, 2019

Project Information:

530 Tremblay Avenue S

Project Number:

0

Chamber Model -	**Recharger 180HD**	
Number of Rows-	8	units
Total Number of Chambers -	120	units
HVLV FC-24 Feed Connectors-	14	units
Stone Void -	40	%
Stone Base -	152	mm
Stone Above Units -	152	mm
Area -	268.45	m2
Base of Stone Elevation -	66.04	

Recharger 180HD Incremental Storage Volumes

Height of System		Chamber Volume		HVLV Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume		Elevation		
in	mm	ft^3	m^3	ft3	m3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft	m	
32.5	826	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4719.86	133.65	68.750	66.87	Top of Stone Elevation
31.5	800	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4623.54	130.92	68.670	66.84	
30.5	775	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4527.23	128.20	68.580	66.81	
29.5	749	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4430.91	125.47	68.500	66.79	
28.5	724	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4334.59	122.74	68.420	66.76	
27.5	699	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	4238.27	120.01	68.330	66.74	
26.5	673	0.1	0.0	0.0	0.0	48.1	1.4	48.205	1.4	4141.96	117.29	68.250	66.71	Top of Chamber Elevation
26.0	660	178.9	5.1	0.0	0.0	24.8	0.7	203.628	5.8	4093.75	115.92	68.210	66.70	
25.0	635	170.4	4.8	0.0	0.0	28.2	0.8	198.562	5.6	3890.12	110.16	68.120	66.68	
24.0	610	170.4	4.8	0.0	0.0	28.2	0.8	198.562	5.6	3691.56	104.53	68.040	66.65	
23.0	584	169.6	4.8	0.0	0.0	28.5	0.8	198.101	5.6	3493.00	98.91	67.960	66.62	
22.0	559	168.9	4.8	0.0	0.0	28.8	0.8	197.641	5.6	3294.90	93.30	67.870	66.60	
21.0	533	165.8	4.7	0.0	0.0	30.0	0.8	195.798	5.5	3097.26	87.70	67.790	66.57	
20.0	508	160.4	4.5	0.0	0.0	32.1	0.9	192.575	5.5	2901.46	82.16	67.710	66.55	
19.0	483	158.1	4.5	0.0	0.0	33.1	0.9	191.193	5.4	2708.88	76.71	67.620	66.52	
18.0	457	155.1	4.4	0.1	0.0	34.3	1.0	189.736	5.4	2517.69	71.29	67.540	66.50	
17.0	432	152.0	4.3	0.1	0.0	35.5	1.0	187.823	5.3	2327.96	65.92	67.460	66.47	
16.0	406	148.1	4.2	0.1	0.0	37.1	1.0	185.507	5.3	2140.13	60.60	67.370	66.45	
15.0	381	138.9	3.9	0.1	0.0	40.7	1.2	179.976	5.1	1954.63	55.35	67.290	66.42	
14.0	356	131.3	3.7	0.1	0.0	43.8	1.2	175.364	5.0	1774.65	50.25	67.210	66.40	
13.0	330	123.6	3.5	0.1	0.0	46.9	1.3	170.744	4.8	1599.29	45.29	67.120	66.37	
12.0	305	115.1	3.3	0.1	0.0	50.3	1.4	165.661	4.7	1428.54	40.45	67.040	66.34	
11.0	279	103.6	2.9	0.1	0.0	54.9	1.6	158.742	4.5	1262.88	35.76	66.960	66.32	
10.0	254	89.8	2.5	0.1	0.0	60.4	1.7	150.420	4.3	1104.14	31.27	66.870	66.29	
9.0	229	69.1	2.0	0.0	0.0	68.7	1.9	137.929	3.9	953.72	27.01	66.790	66.27	
8.0	203	46.1	1.3	0.0	0.0	77.9	2.2	124.021	3.5	815.79	23.10	66.710	66.24	
7.0	178	29.2	0.8	0.0	0.0	84.6	2.4	113.864	3.2	691.77	19.59	66.620	66.22	
6.0	152	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	577.91	16.36	66.540	66.19	Bottom of Chamber Elevation
5.0	127	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	481.59	13.64	66.460	66.17	
4.0	102	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	385.27	10.91	66.370	66.14	
3.0	76	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	288.95	8.18	66.290	66.12	
2.0	51	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	192.64	5.45	66.210	66.09	
1.0	25	0.0	0.0	0.0	0.0	96.3	2.7	96.318	2.7	96.32	2.73	66.120	66.07	
0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.00	0.00	66.040	66.04	Bottom of Stone Elevation
-1.0														
-2.0														
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Created on: 9/30/2019

CULTEC Stormwater Design Calculator

Date:	September 30, 2019

Project Information:

530 Tremblay Avenue T

Calculations Performed By:

RECHARGER 330XLHD

Recharger 330XLHD Chamber Specifications		
Height	775	mm
Width	1321	mm
Length	2.59	meters
Installed Length	2.13	meters
Bare Chamber Volume	1.48	cu. meters
Installed Chamber Volume	2.24	cu. meters

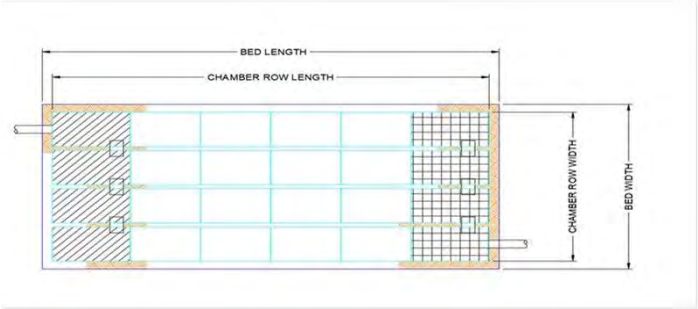
Breakdown of Storage Provided by Recharger 330XLHD Stormwater System		
Within Chambers	48.58	cu. meters
Within Feed Connectors	-	cu. meters
Within Stone	30.29	cu. meters
Total Storage Provided	**78.9**	**cu. meters**
Total Storage Required	74.00	cu. meters

Materials List

Recharger 330XLHD		
Total Number of Chambers Required	**32**	**pieces**
Starter Chambers	4	pieces
Intermediate Chambers	24	pieces
End Chambers	4	pieces
HVLV FC-24 Feed Connectors	6	pieces
CULTEC No. 410 Non-Woven Geotextile	354	sq. meters
CULTEC No. 4800 Woven Geotextile	13	meters
Stone	76	cu. meters

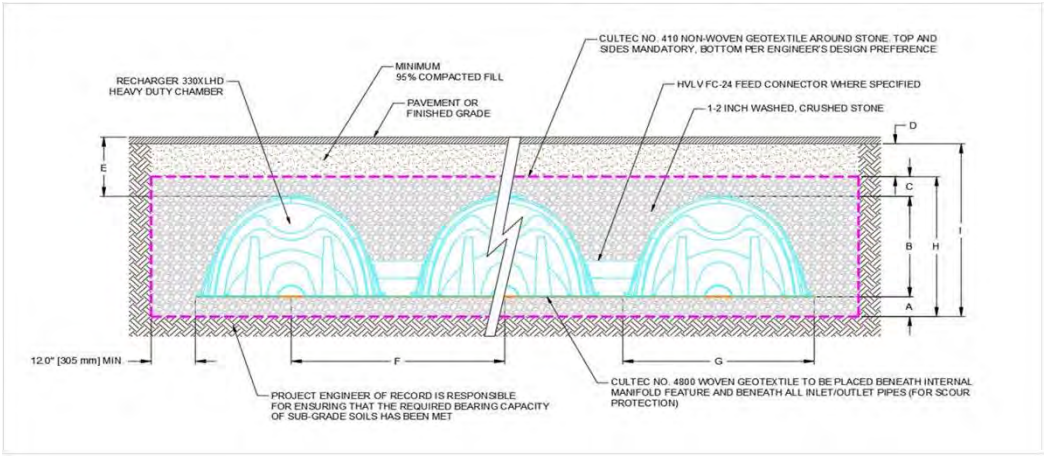
Based on 2 Internal Manifolds

Bed Detail



Bed detail for reference only. Not project specific. Not to scale.

Bed Layout Information		
Number of Rows Wide	4	pieces
Number of Chambers Long	8	pieces
Chamber Row Width	5.74	meters
Chamber Row Length	17.53	meters
Bed Width	6.35	meters
Bed Length	18.14	meters
Bed Area Required	115.16	sq. meters
Length of Separator Row	N/A	meters



Conceptual graphic only. Not job specific.

Cross Section Table Reference			
A	Depth of Stone Base	152	mm
B	Chamber Height	775	mm
C	Depth of Stone Above Units	152	mm
D	Depth of 95% Compacted Fill	254	mm
E	Max. Depth Allowed Above the Chamber	3.66	meters
F	Chamber Width	1321	mm
G	Center to Center Spacing	1.47	meters
H	Effective Depth	1.08	meters
I	Bed Depth	1.33	meters

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CULTEC Stage-Storage Calculations

Date:	September 30, 2019

Project Information:

530 Tremblay Avenue T

Project Number:

0

Chamber Model -	**Recharger 330XLHD**	
Number of Rows-	4	units
Total Number of Chambers -	32	units
HVLV FC-24 Feed Connectors-	6	units
Stone Void -	40	%
Stone Base -	152	mm
Stone Above Units -	152	mm
Area -	115.16	m2
Base of Stone Elevation -	66.03	

Recharger 330XLHD Incremental Storage Volumes

Height of System		Chamber Volume		HVLV Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume		Elevation		
in	mm	ft³	m³	ft3	m3	ft³	m³	ft³	m³	ft³	m³	ft	m	
42.5	1080	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2787.89	78.94	69.570	67.11	Top of Stone Elevation
41.5	1054	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2746.57	77.77	69.490	67.08	
40.5	1029	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2705.25	76.60	69.410	67.06	
39.5	1003	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2663.93	75.43	69.320	67.03	
38.5	978	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2622.61	74.26	69.240	67.01	
37.5	953	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	2581.29	73.09	69.160	66.98	
36.5	927	0.0	0.0	0.0	0.0	20.7	0.6	20.674	0.6	2539.97	71.92	69.070	66.96	Top of Chamber Elevation
36.0	914	4.4	0.1	0.0	0.0	39.6	1.1	43.941	1.2	2519.30	71.34	69.030	66.94	
35.0	889	11.7	0.3	0.0	0.0	36.6	1.0	48.357	1.4	2475.36	70.09	68.950	66.92	
34.0	864	19.3	0.5	0.0	0.0	33.6	1.0	52.911	1.5	2427.00	68.72	68.860	66.89	
33.0	838	28.5	0.8	0.0	0.0	29.9	0.8	58.431	1.7	2374.09	67.23	68.780	66.87	
32.0	813	34.5	1.0	0.0	0.0	27.5	0.8	62.019	1.8	2315.66	65.57	68.700	66.84	
31.0	787	39.8	1.1	0.0	0.0	25.4	0.7	65.193	1.8	2253.64	63.82	68.610	66.82	
30.0	762	43.9	1.2	0.0	0.0	23.7	0.7	67.677	1.9	2188.44	61.97	68.530	66.79	
29.0	737	47.6	1.3	0.0	0.0	22.3	0.6	69.885	2.0	2120.77	60.05	68.450	66.77	
28.0	711	50.8	1.4	0.0	0.0	21.0	0.6	71.817	2.0	2050.88	58.07	68.360	66.74	
27.0	686	53.6	1.5	0.0	0.0	19.9	0.6	73.473	2.1	1979.06	56.04	68.280	66.72	
26.0	660	56.1	1.6	0.0	0.0	18.9	0.5	74.991	2.1	1905.59	53.96	68.200	66.69	
25.0	635	58.4	1.7	0.0	0.0	18.0	0.5	76.371	2.2	1830.60	51.84	68.110	66.67	
24.0	610	60.7	1.7	0.0	0.0	17.0	0.5	77.751	2.2	1754.23	49.67	68.030	66.64	
23.0	584	62.3	1.8	0.0	0.0	16.4	0.5	78.717	2.2	1676.48	47.47	67.950	66.61	
22.0	559	65.1	1.8	0.0	0.0	15.3	0.4	80.373	2.3	1597.76	45.24	67.860	66.59	
21.0	533	67.6	1.9	0.0	0.0	14.3	0.4	81.891	2.3	1517.39	42.97	67.780	66.56	
20.0	508	68.1	1.9	0.0	0.0	14.1	0.4	82.167	2.3	1435.49	40.65	67.700	66.54	
19.0	483	68.8	1.9	0.0	0.0	13.8	0.4	82.581	2.3	1353.33	38.32	67.610	66.51	
18.0	457	69.2	2.0	0.3	0.0	13.6	0.4	83.187	2.4	1270.75	35.98	67.530	66.49	
17.0	432	69.7	2.0	0.3	0.0	13.4	0.4	83.403	2.4	1187.56	33.63	67.450	66.46	
16.0	406	69.9	2.0	0.3	0.0	13.4	0.4	83.529	2.4	1104.15	31.27	67.360	66.44	
15.0	381	70.4	2.0	0.3	0.0	13.2	0.4	83.802	2.4	1020.62	28.90	67.280	66.41	
14.0	356	72.0	2.0	0.2	0.0	12.5	0.4	84.762	2.4	936.82	26.53	67.200	66.39	
13.0	330	73.8	2.1	0.2	0.0	11.8	0.3	85.854	2.4	852.06	24.13	67.110	66.36	
12.0	305	74.1	2.1	0.2	0.0	11.7	0.3	85.977	2.4	766.21	21.70	67.030	66.33	
11.0	279	74.3	2.1	0.2	0.0	11.6	0.3	86.106	2.4	680.23	19.26	66.950	66.31	
10.0	254	74.5	2.1	0.2	0.0	11.5	0.3	86.217	2.4	594.12	16.82	66.860	66.28	
9.0	229	74.8	2.1	0.1	0.0	11.4	0.3	86.307	2.4	507.90	14.38	66.780	66.26	
8.0	203	75.2	2.1	0.1	0.0	11.2	0.3	86.505	2.4	421.60	11.94	66.700	66.23	
7.0	178	76.4	2.2	0.0	0.0	10.8	0.3	87.174	2.5	335.09	9.49	66.610	66.21	
6.0	152	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	247.92	7.02	66.530	66.18	Bottom of Chamber Elevation
5.0	127	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	206.60	5.85	66.450	66.16	
4.0	102	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	165.28	4.68	66.360	66.13	
3.0	76	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	123.96	3.51	66.280	66.11	
2.0	51	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	82.64	2.34	66.200	66.08	
1.0	25	0.0	0.0	0.0	0.0	41.3	1.2	41.319	1.2	41.32	1.17	66.110	66.06	
0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.00	0.00	66.030	66.03	Bottom of Stone Elevation
-1.0														
-2.0														
-3.0														
-4.0														
-5.0														
-6.0														
-7.0														
-8.0														
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tech@cultec.com

Created on: 9/30/2019

APPENDIX L | OIL-GRIT SEPARATORS

Stormceptor® EF Sizing Report

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION
STORMCEPTOR®

Date: 9/5/2019

Green cells require user input	
Grey cells indicate optional user input	
Blue cells indicate sizing results	

Project Name:	530 Tremblay Rd. (Avenue S)	Project Number:	477074
User Contact Information		EOR Contact Information	
Name:	Brandon O'Leary	Name:	Meghan MacSween, P.Eng
Company:	Forterra	Company:	Parsons Corp.
Email / Phone:	Brandon.Oleary@forterrabp.com / 905-630-0359	Email / Phone:	meghan.macsween@parsons.com / (613) 691-1540

Drainage Area (ha):	0.49
Runoff Coefficient 'c':	0.8
Particle Size Distribution:	FINE
Target TSS Removal (%):	80

Province:	Ontario	
City:	Ottawa	
Nearest Rainfall Station:	OTTAWA MACDONALD-CARTIER INT'L AP	
NCDC Rainfall Station ID:	ON6000	Years of Rainfall Data: 36

Require Hydrocarbon Spill Capture?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	27.3
Required Water Quality Runoff Volume Capture (%):	90
Estimated Water Quality Flow Rate (L/s):	14.2
Peak Conveyance (maximum) Flow Rate (L/s):	27.3
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	79
EFO6	86
EFO8	89
EFO10	91
EFO12	92

Recommended Stormceptor EFO Model: EFO6
Estimated Net Annual Sediment (TSS) Load Reduction (%): 86
Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►Stormceptor® EF and Stormceptor® EFO are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators and performance has been third-party verified in accordance with the ISO 14034 Environmental Technology Verification (ETV) protocol.

PERFORMANCE

►Stormceptor® EF and EFO remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

►The Canadian ETV PSD shown in the table below, or particle fractions within this PSD, were used for this sizing. This is the identical PSD that is referenced in the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

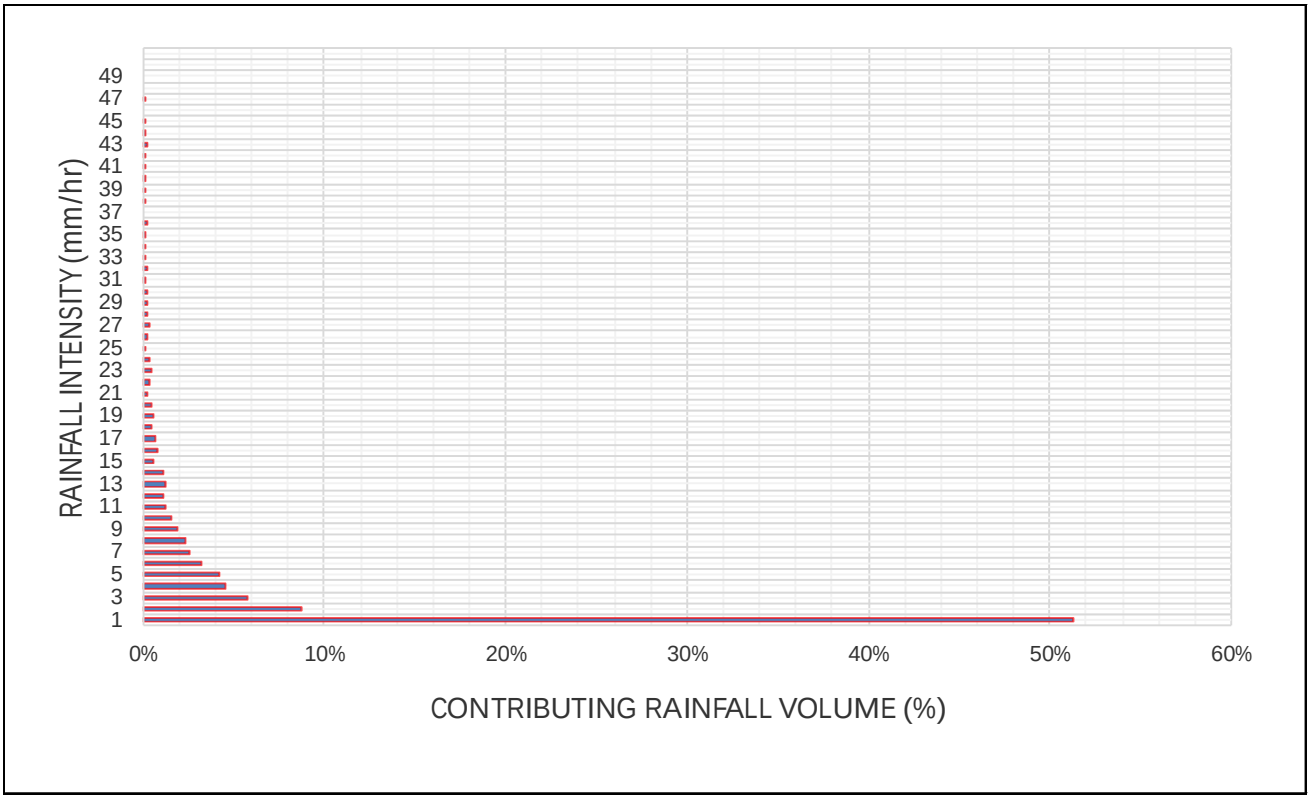
Stormceptor® EF Sizing Report

Upstream Flow Controlled Results

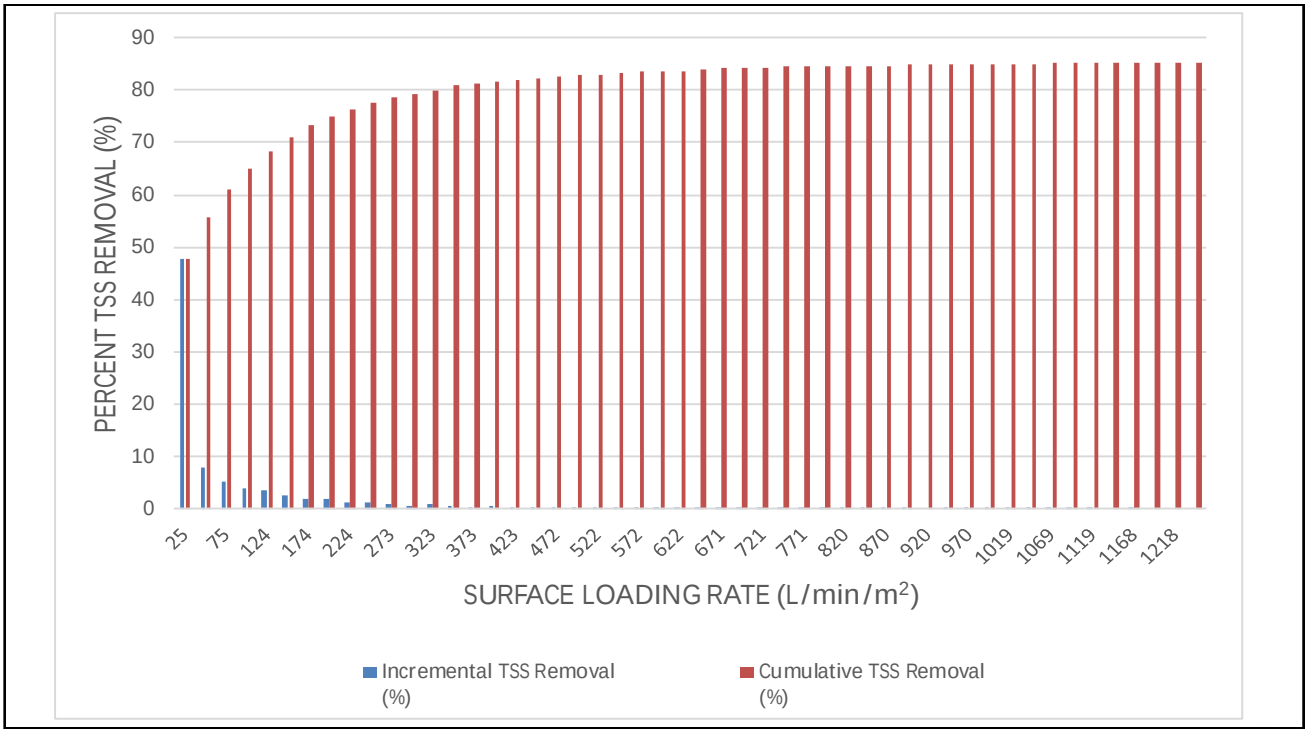
Rainfall Intensity (mm/hr)	Percent Rainfall Volume	Cumulative Rainfall Volume	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m^2)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1.0	51.3%	51.3%	1.09	65.4	24.9	93	47.7	47.7
2.0	8.7%	60.0%	2.18	130.8	49.7	92	8.0	55.7
3.0	5.8%	65.8%	3.27	196.2	74.6	90	5.2	60.9
4.0	4.6%	70.4%	4.36	261.5	99.4	87	4.0	64.9
5.0	4.2%	74.6%	5.45	326.9	124.3	85	3.6	68.5
6.0	3.2%	77.8%	6.54	392.3	149.2	81	2.6	71.1
7.0	2.6%	80.4%	7.63	457.7	174.0	79	2.1	73.1
8.0	2.4%	82.8%	8.72	523.1	198.9	77	1.9	75.0
9.0	1.9%	84.7%	9.81	588.5	223.8	74	1.4	76.4
10.0	1.6%	86.3%	10.90	653.9	248.6	72	1.2	77.6
11.0	1.3%	87.6%	11.99	719.2	273.5	70	0.9	78.5
12.0	1.1%	88.7%	13.08	784.6	298.3	68	0.7	79.2
13.0	1.3%	90.0%	14.17	850.0	323.2	65	0.8	80.1
14.0	1.1%	91.1%	15.26	915.4	348.1	63	0.7	80.8
15.0	0.6%	91.7%	16.35	980.8	372.9	61	0.4	81.1
16.0	0.8%	92.5%	17.44	1046.2	397.8	59	0.5	81.6
17.0	0.7%	93.2%	18.53	1111.6	422.6	57	0.4	82.0
18.0	0.5%	93.7%	19.62	1176.9	447.5	57	0.3	82.3
19.0	0.6%	94.3%	20.71	1242.3	472.4	56	0.3	82.6
20.0	0.5%	94.8%	21.80	1307.7	497.2	55	0.3	82.9
21.0	0.2%	95.0%	22.88	1373.1	522.1	54	0.1	83.0
22.0	0.4%	95.4%	23.97	1438.5	547.0	54	0.2	83.2
23.0	0.5%	95.9%	25.06	1503.9	571.8	53	0.3	83.5
24.0	0.4%	96.3%	26.15	1569.3	596.7	52	0.2	83.7
25.0	3.7%	100.0%	27.24	1634.6	621.5	52	1.9	85.6
26.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
27.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
28.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
29.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
30.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
31.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
32.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
33.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
34.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
35.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
36.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
37.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
38.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
39.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
40.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
41.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
42.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
43.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
44.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
45.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
46.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
47.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
48.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
49.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
50.0	0.0%	100.0%	27.30	1638.0	622.8	52	0.0	85.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**86%**

Stormceptor® EF Sizing Report

RAINFALL DATA FROM THE OTTAWA MACDONALD-CARTIER INT'L AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Table 1.1
Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Minimum Angle Inlet / Outlet Pipes	Maximum Inlet Pipe Diameter		Maximum Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90º	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90º	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90º	1,219	48	1,219	48	1,700	60
EF10 / EFO10	3.0	10	90º	1,828	72	1,828	72	2,830	100
EF12 / EFO12	3.6	12	90º	1,828	72	1,828	72	2,830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

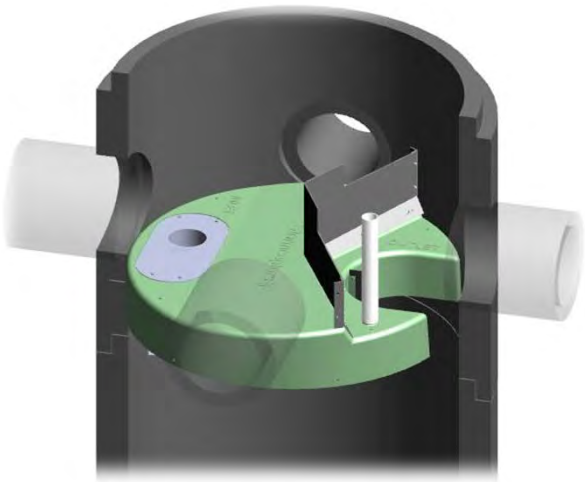
►Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators , and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

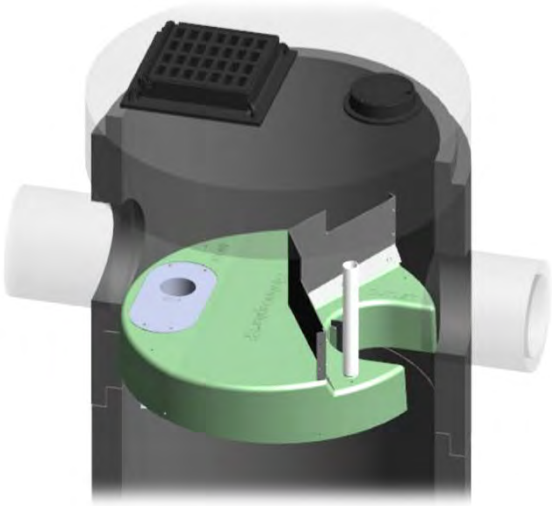
DESIGN FLEXIBILITY

►Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

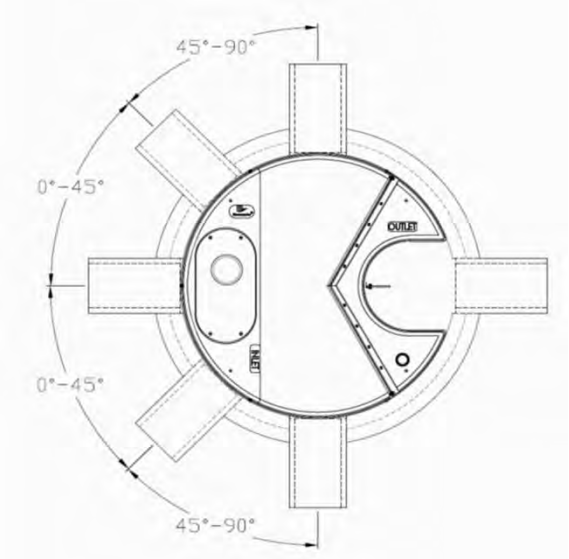
OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, Stormceptor® EFO has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators . Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.





Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP – Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0^o – 45^o: The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45^o – 90^o: The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS
The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Table 1.2
Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	197	52	203	8	1,190	42	1,904	5,250
EF6 / EFO6	1.8	6	1.93	6.3	348	92	305	12	3,470	123	5,552	15,375
EF8 / EFO8	2.4	8	2.59	8.5	545	144	610	24	8,780	310	14,048	38,750
EF10 / EFO10	3.0	10	3.25	10.7	874	231	610	24	17,790	628	28,464	78,500
EF12 / EFO12	3.6	12	3.89	12.8	1,219	322	610	24	31,220	1,103	49,952	137,875
						* Increased sump depth may be added to increase sediment storage capacity						
						** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)						

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS
For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION
For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Stormceptor

FORTERRA

Stormceptor EF Sizing Report

AVENUE T

ESTIMATED NET ANNNUAL SEDIMENT (TSS) LOAD REDUCTION STORMCEPTOR®

Province :	Ontario
City :	Ottawa
Nearest Rainfall Station :	OTTAWA MACDONALD-CARTIER INT'L AP
NCDC Rainfall Station Id :	6000
Years Of Rainfall Data :	37

Site Name :	Avenue T

Drainage Area (ha) :	0.28
Runoff Coefficient 'c' :	0.80

Project Name :	530 Tremblay Rd.
Project Number :	477074
Designer Name :	Brandon O'Leary
Designer Company :	Forterra
Designer Email :	brandon.oleary@forterrabp.com
Designer Phone :	(905) 630-0359
EOR Name :	Meghan MacSween
EOR Company :	Parsons Corp.
EOR Email :	meghan.macsween@parsons.com
EOR Phone :	(613) 691-1540

Partical Size Distribution :	Fine
Target TSS Removal (%) :	80.0
Required Water Quality Runoff Volume Capture (%) :	90.0
Require Hydrocarbon Spill Capture?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s) :	17.0
Peak Conveyance (maximum) Flow Rate (L/s) :	17.0

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	84
EFO6	89
EFO8	91
EFO10	92
EFO12	93

Recommended Stormceptor EFO Model : EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%) : 84

Water Quality Runoff Volume Capture (%) : > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS fromthe frequent rainfall events that contribute the vast majority of annualrunoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICAL SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

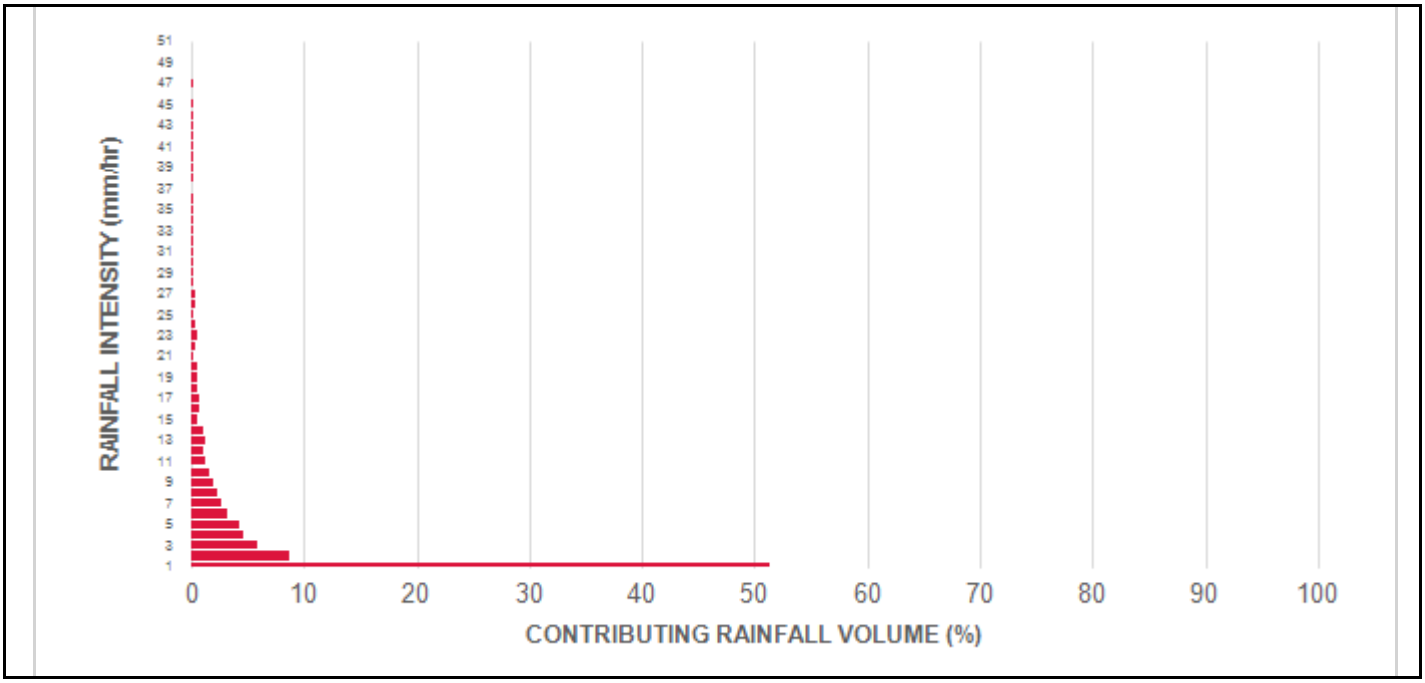
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

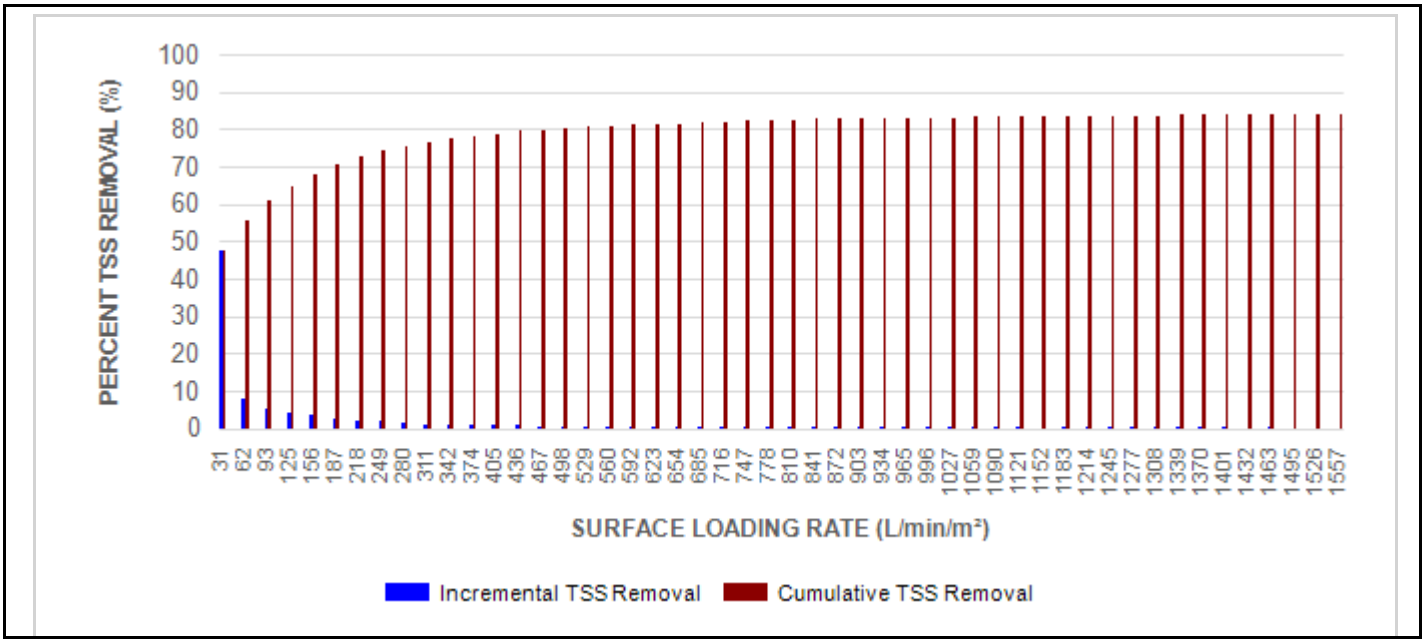
RainFall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	51.3	51.3	0.62	37.0	31.0	93	47.7	47.7
2	8.7	60.0	1.25	75.0	62.0	91	7.9	55.6
3	5.8	65.8	1.87	112.0	93.0	88	5.1	60.7
4	4.6	70.4	2.49	149.0	125.0	85	3.9	64.6
5	4.2	74.6	3.11	187.0	156.0	81	3.4	68.0
6	3.2	77.8	3.74	224.0	187.0	78	2.5	70.5
7	2.6	80.4	4.36	262.0	218.0	75	2.0	72.5
8	2.4	82.8	4.98	299.0	249.0	72	1.7	74.2
9	1.9	84.7	5.60	336.0	280.0	69	1.3	75.5
10	1.6	86.3	6.23	374.0	311.0	66	1.1	76.6
11	1.3	87.6	6.85	411.0	342.0	63	0.8	77.4
12	1.1	88.7	7.47	448.0	374.0	61	0.7	78.1
13	1.3	90.0	8.10	486.0	405.0	58	0.8	78.8
14	1.1	91.1	8.72	523.0	436.0	57	0.6	79.4
15	0.6	91.7	9.34	560.0	467.0	56	0.3	79.8
16	0.8	92.5	9.96	598.0	498.0	55	0.4	80.2
17	0.7	93.2	10.59	635.0	529.0	54	0.4	80.6
18	0.5	93.7	11.21	673.0	560.0	53	0.3	80.9
19	0.6	94.3	11.83	710.0	592.0	52	0.3	81.2
20	0.5	94.8	12.45	747.0	623.0	52	0.3	81.4
21	0.2	95.0	13.08	785.0	654.0	52	0.1	81.5
22	5.0	100.0	13.70	822.0	685.0	52	2.6	84.1
23	0.5	100.5	14.32	859.0	716.0	51	0.3	84.4
24	-0.5	100.0	14.95	897.0	747.0	51	N/A	84.1
25	0.1	100.1	15.57	934.0	778.0	51	0.1	84.2

RainFall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
26	0.3	100.4	16.19	971.0	810.0	51	0.2	84.3
27	-0.4	100.0	16.81	1009.0	841.0	51	N/A	84.1
28	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
29	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
30	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
31	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
32	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
33	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
34	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
35	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
36	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
37	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
38	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
39	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
40	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
41	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
42	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
43	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
44	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
45	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
46	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
47	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
48	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
49	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
50	0.0	100.0	17.00	1020.0	850.0	51	0.0	84.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**84 %**

RAINFALL DATA FROM OTTAWA MACDONALD-CARTIER INT'L AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

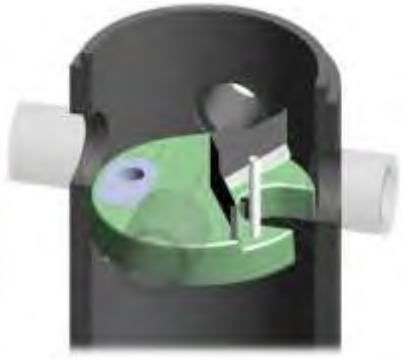
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

DESIGN FLEXIBILITY

►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.



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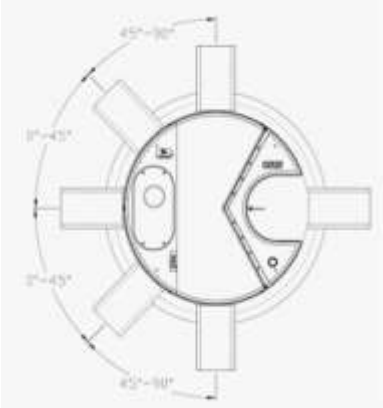

INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0(degree)-45(degree):The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45(degree)-90(degree):The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	197	52	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	348	92	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	545	144	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	874	231	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	1219	322	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

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Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	46	1320	48	1980	35
30	70	690	46	1350	48	2010	34
60	67	720	45	1380	49	2040	34
90	63	750	45	1410	49	2070	33
120	61	780	45	1440	48	2100	33
150	58	810	45	1470	47	2130	32
180	56	840	45	1500	46	2160	32
210	54	870	45	1530	45	2190	31
240	53	900	45	1560	44	2220	31
270	52	930	44	1590	43	2250	30
300	51	960	44	1620	42	2280	30
330	50	990	44	1650	42	2310	30
360	49	1020	44	1680	41	2340	29
390	48	1050	45	1710	40	2370	29
420	48	1080	45	1740	39	2400	29
450	48	1110	45	1770	39	2430	28
480	47	1140	46	1800	38	2460	28
510	47	1170	46	1830	37	2490	28
540	47	1200	47	1860	37	2520	27
570	46	1230	47	1890	36	2550	27
600	46	1260	47	1920	36	2580	27
630	46	1290	48	1950	35		