Sheldon Creek Developments

Servicing Brief Updated

40-60 Emma Street, Grand Valley

Kim Pilon, P.Eng.
6-25-2025
Moorefield Excavating

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APPENDICES

1.0 Introduction

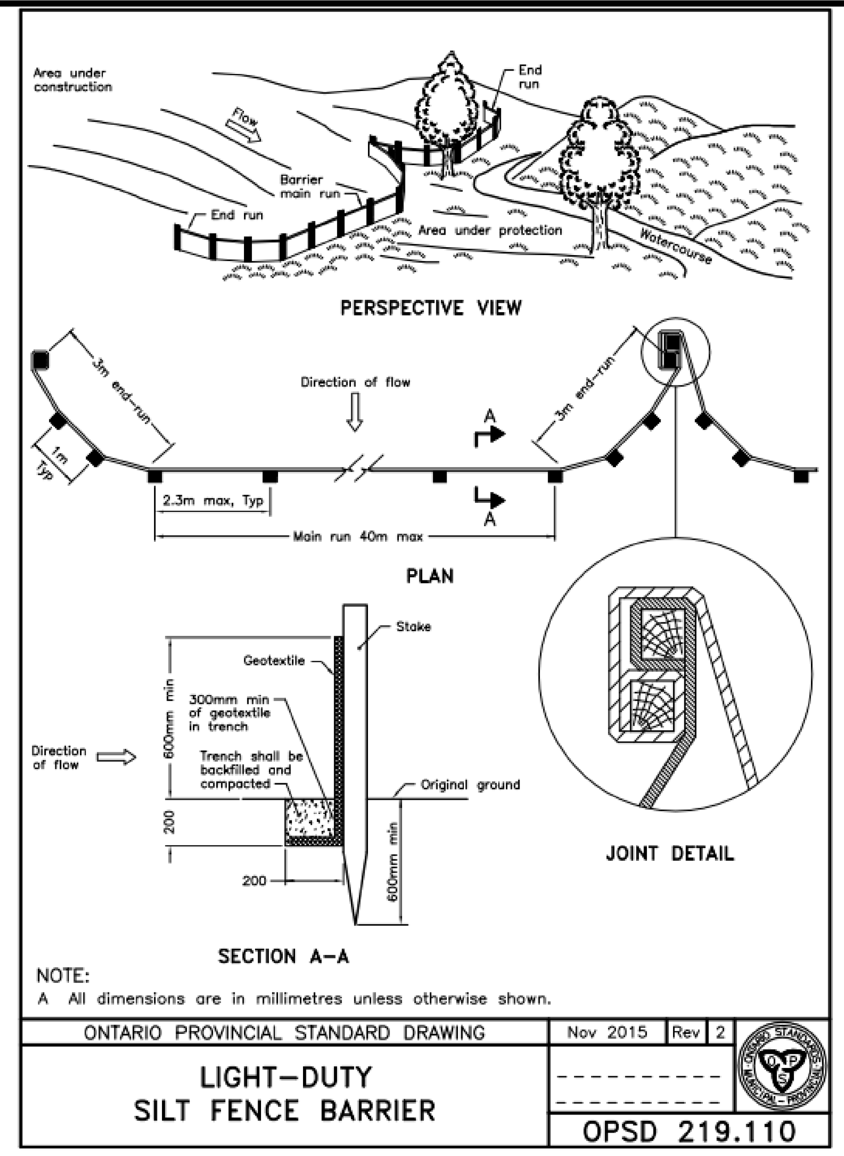
Sheldon Creek Developments is proposing to develop the vacant lands known as 40, 50 and 60 Emma Street in the Town of Grand valley in Dufferin County. To support this development, Moorefield Excavating has prepared this servicing brief to review the required servicing for the proposed residential development of the existing undeveloped parcel. See **Figure 1.1** overleaf for the proposed site plan.

This report will demonstrate the proposed site can be developed while meeting the design criteria of the Town of Grand Valley (Town), Dufferin County (County) and the Grand River Conservation Authority (GRCA).

Moorefield Excavating reviewed the Town's design standards as well MECP's updated Design Criteria for Sanitary Sewers, Storm Sewers, and Forcemains for Alterations Authorized under Environmental Compliance Approval Document (MECP Design Criteria). Further preliminary consultation was completed with the respective approval authorities.

The client also completed a geotechnical investigation of the site and slope stability study which also influenced this report.

GRADING NOTE:
REFER TO GRADING PLAN AND SITE SERVICING DRAWING PREPARED BY MOOREFIELD EXCAVATING



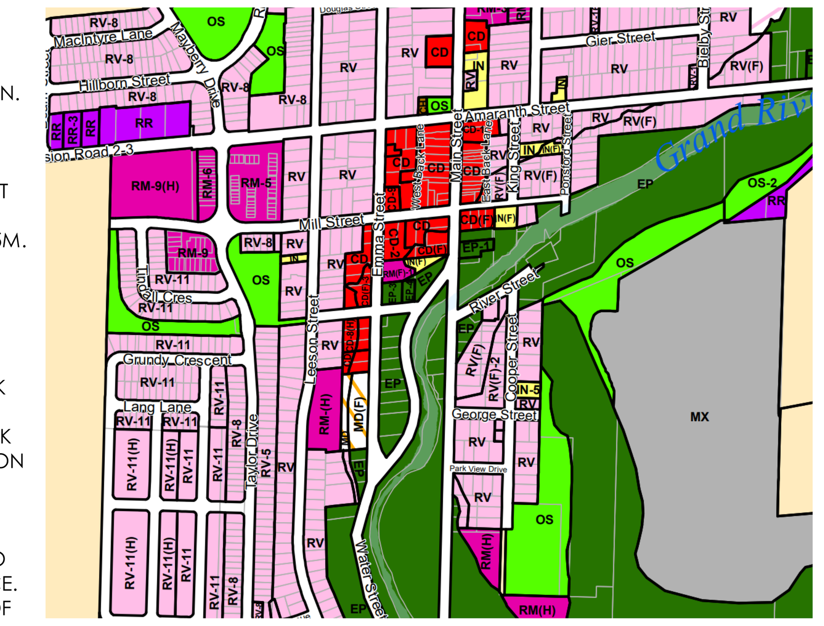
GENERAL NOTES:

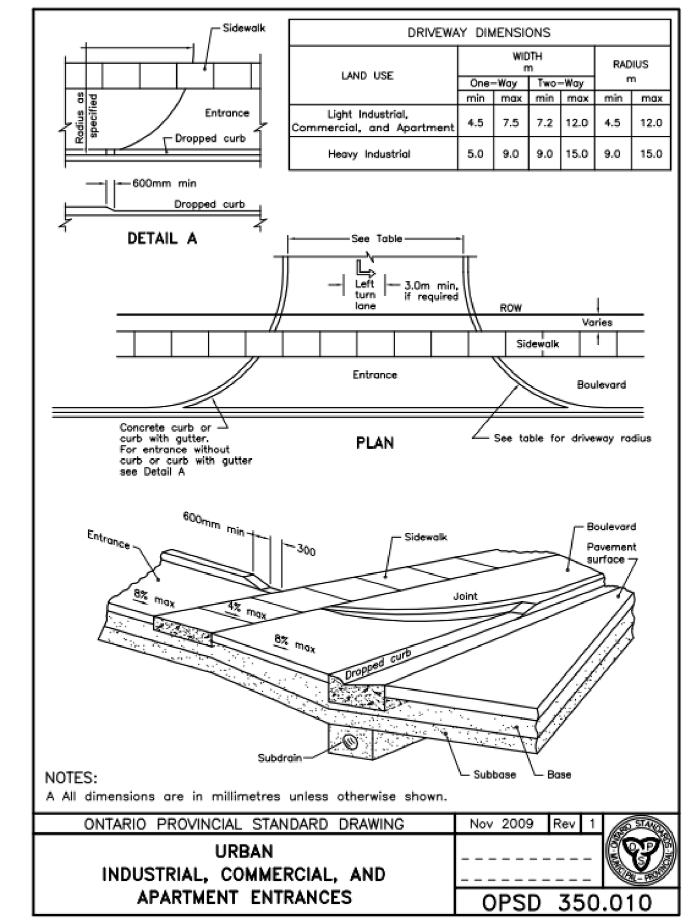
1. ALL EXISTING PAVEMENT, CURBS, SIDEWALKS, DRIVEWAYS AND BOULEVARD AREAS DISTURBED BY THE CONSTRUCTION MUST BE REINSTATED TO THE SATISFACTION OF THE TOWN.
2. UTILITY IS THE RESPONSIBILITY OF THE DEVELOPER/OWNER.
3. THE CONTRACTOR/OWNER IS RESPONSIBLE FOR ALL UTILITY LOCATES AND AND DAMAGE OR DISTURBANCE DURING CONSTRUCTION.
4. ALL BARRIER FREE ENTRANCES AND BARRIER FREE PATHS OF TRAVEL MUST COMPLY WITH O.B.C. 3.8.
5. ALL EXTERIOR ILLUMINATION TO BE DIRECTED DOWNWARD AS WELL AS INWARD AND DESIGNED TO MAINTAIN ZERO CUTOFF LIGHT DISTRIBUTION AS THE PROPERTY LINE.
6. ALL DOWNSPOUTS TO BE CONNECTED TO THE STORM DRAINAGE SYSTEM.
7. THERE WILL BE NO CURBSIDE WASTE COLLECTION.
8. ALL CONDENSING UNITS TO BE SCREENED ON THE ROOF
9. SEPARATE PERMITS ARE REQUIRED FOR ANY SIGNAGE ON THE PROPERTY.
10. WHERE POSSIBLE TREES ARE TO BE PROTECTED FROM CONSTRUCTION.
11. EXCESS SNOW WILL BE REMOVED BY PRIVATE HAULER SUBJECT TO DEMAND FOR PARKING.
12. ALL FIRE ROUTES SHALL BE CONSTRUCTED OF HARD SURFACE MATERIAL SUCH AS ASPHALT OR CONCRETE AND DESIGNED TO SUPPORT A LOAD OF NOT LESS THAN 11,363kg PER AXLE AND HAVE A CHANGE IN GRADIENT OF NOTE MORE THAN 1 IN 12.5 OVER A MIN. DISTANCE OF 15M. ACCESS ROUTE SHALL BE A MIN. WIDTH OF 6.0m AND ALL TURNS IN THE ROUTE SHALL HAVE A CENTERLINE RADIUS OF 12.0m
13. FIRE ROUTES SHALL BE DESIGNATED AS PER BY-LAW AS AMENDED PRIOR TO OCCUPANCY OF THE BUILDING.
14. THE TOPS OF ANY CURBS BORDERING DRIVEWAYS WITHIN THE MUNICIPAL BOULEVARDS WILL BE FLUSH WITH THE MUNICIPAL SIDEWALK AND ROAD CURB.
15. AT THE ENTRANCES TO THE SITE, THE MUNICIPAL CURB AND SIDEWALK WILL BE CONTINUOUS THROUGH THE DRIVEWAY AND A CURB DEPRESSION WILL BE PROVIDED FOR EACH ENTRANCE.
16. CONSTRUCTION CHAINLINK HOARDING MUST BE INSTALLED WITH SEDIMENT CONTROL AS PER CITY STANDARDS AND APPROVALS.
17. ROAD OCCUPANCY PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE.
18. MINUMUM OF 10 FEET (3m) CLEARANCE REQUIRED ON EACH SIDE OF THE CENTRE LINE OF THE HYDRO-ONE OVERHEAD LINE. 10 FT(3m) CLEARANCE TO BE MAINTAINED AT ALL TIMES.

SITE PLAN APPLICATION NO.

-

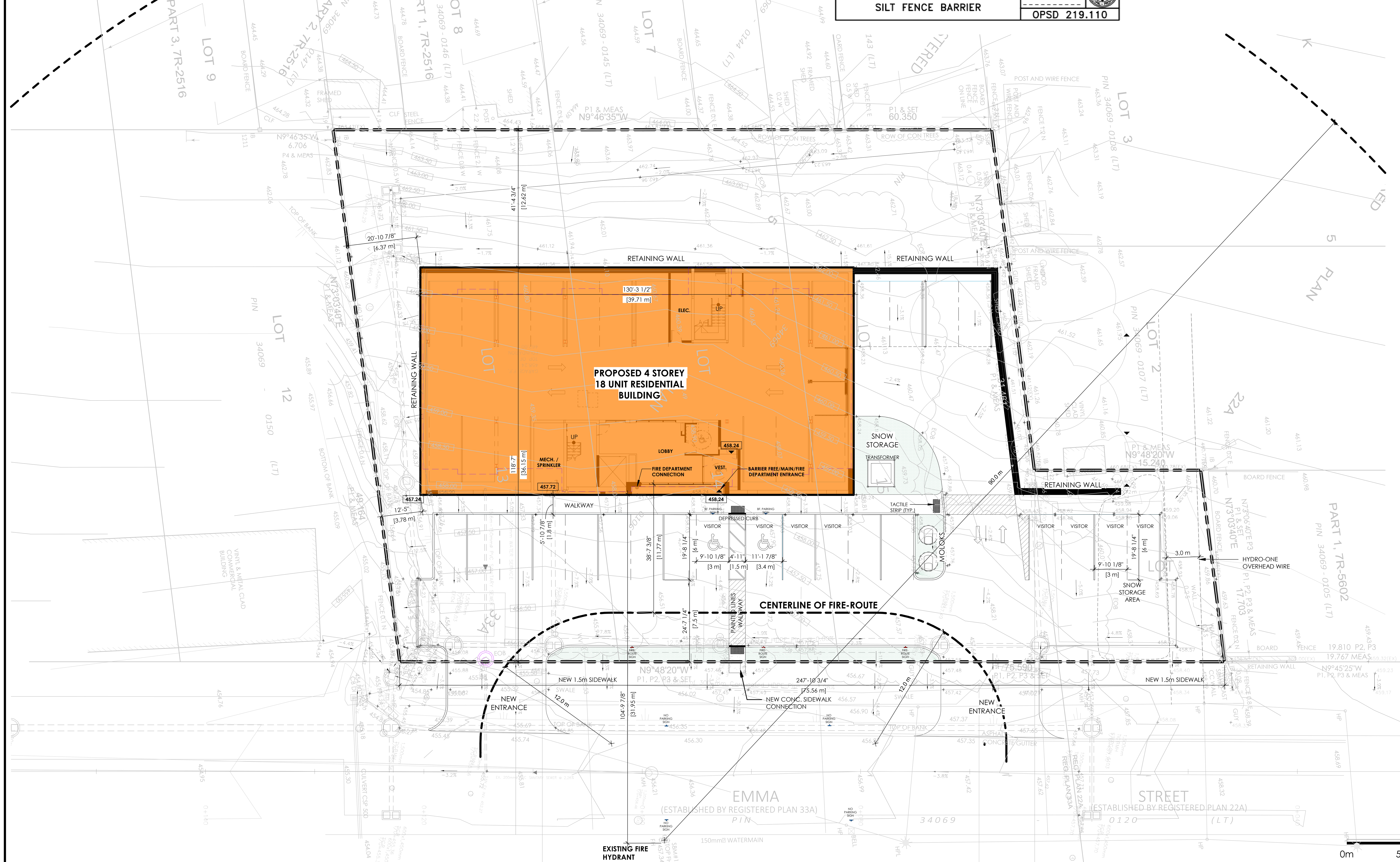
PART OF LOT 1, BLOCK 5
REGISTERED PLAN 22A AND PARTS OF LOTS 13, 14 & 15 BLOCK 5 REGISTERED PLAN 33A
TOWN OF GRAND VALLEY
COUNTY OF DUFFERIN





ZONING TABLE				
ZONE - CD(F)-3 (DOWNTOWN COMMERCIAL)				
	CD		PROPOSED	
MINUMUM LOT AREA	N/A		34,541.78 ft²	
			3209.03 m²	
MINUMUM LOT FRONTAGE	N/A		75.590 m	
MAXIMUM BUILDING AREA	75%		25.77%	
			[827 m²]	
MINUMUM FRONT YARD	N/A		15.25 m	
MINUMUM EXTERIOR SIDE YARD	N/A		N/A	
MINUMUM SIDE YARD	N/A		3.78 m	
MINUMUM REAR YARD	4.5 m		12.62 m	
MAXIMUM BUILDING HEIGHT	12 m		13.36 m	
PROPOSED BUILDING			827 m²	
TOTAL LOT COVERAGE			827 m²	

PARKING / LOADING CALCULATIONS			
	ZONING	REQUIRED	PROVIDED
VEHICLES	2 SPACES PER UNIT	38	38
BARRIER FREE PARKING (included in count)			2
LOADING SPACE			0
TOTAL VEHICLE PRAKING		38	**38**



0m 5m 10m 15m

1 Site Plan
ASP-100 1/16" = 1'-0"

PROJECT NAME
50 EMMA ST. GRAND VALLEY, ON - APARTMENTS

PROJECT ADDRESS
50 EMMA ST. GRAND VALLEY, ON

CLIENT
SHELDON CREEK DEVELOPMENTS

ARCHITECT
KHALSA DESIGN INC.
DESIGN
KHALSA
BRAMPTON, ON
T: 647-468-2940

CONSULTANTS:

REGISTRATION

Project number	24022
Date	07/
Drawn by	ASB
Checked by	KDI
Scale	As indicated

REVISIONS

No.	Description	Date

SITE PLAN

ASP-100

50 EMMA ST. GRAND VALLEY, ON - APARTMENTS

2.0 Property Description

The subject property located at 40-60 Emma Street is 0.32 ha and exists in a vegetated undisturbed state. The site fronts Emma Street on the east, neighbours a Hydro One Site to the north as well as an industrial building to the south. To the west exists established single-family dwellings.

The original site ground profile has a steep gradient towards Emma. The existing residential properties to the west sheet flow towards this development.

The Grand River is located approximately 110m east of the site. The southeast corner of the site is considered part of the floodplain on GRCA mapping, however based on the survey completed the site is out of the floodplain. However, the entirety of the site is within the GRCA's regulated area due to the steep slope on the property. The GRCA has provided the Regulatory Flood Elevation (RFE) for the property as 455.39 CGVD28 as the GRCA was unable to determine if the 1978 datum adjustment was applied to the RFE, a +0.15m vertical differential was applied to the RFE and has been mapped as 455.54 on the drawings as part of this submission.

The proposed development will consist of 18 apartments separated on 4 floors, 6 units per floor. The apartment building will be serviced by a single sanitary service, single water service and single storm service as detailed in this report.

The Town specifies a density of 4.0 persons/ unit.

18 units * 4.0 persons/unit = 72 persons will be used in determining servicing requirements throughout this report.

3.0 Source Water Protection

Source Protection Water Quantity Information indicates that the Site is in a Significant Groundwater Recharge Area (SGRA). A recharge area is considered significant when it helps maintain the water level in an aquifer that supplies a community with drinking water. However, it is noted that the information also indicates that the Site is located in an area currently assessed as not experiencing water quantity stress (i.e. is not located in a WHPA Q1 or WHPA Q2). All three existing lots fall within an area designated as a Highly Vulnerable Aquifer (HVA). This is a measure of the underlying aquifer's vulnerability to adverse impacts on water quality based on factors such as depth of the aquifer, what sort of soil or rock is covering it, and the characteristics of the soil or rock surrounding it.

Table 1: Source Protection Water Quality Information Summary

Assessment Parcel Address:	40, 50 and 60 Emma Street
Source Protection Area:	Grand River
Wellhead Protection Area (WHPA):	C; score 8
Wellhead Protection Area E (GUDI):	No
Intake Protection Zone:	3; score throughout the site ranges from 1 to 4
Issue Contributing Area:	No
Significant Groundwater Recharge Area:	Yes
Highly Vulnerable Aquifer:	Yes; score is 6

It should be noted that while the Site is in an area designated as both a Significant Groundwater Recharge Area (SGRA) and a Highly Vulnerable Aquifer (HVA) there are no existing significant threats to drinking water on the Site. In addition, based on the Vulnerability Score and the assumption that the activities and circumstances would be the same for all three existing lots, the applicable policies related to water quality are the same for all three lots. Based on the proposed land use, activities and circumstances that are likely to exist in the future on the Site, the only potential Significant Drinking Water Threat would be the storage and handling of DNAPLs. Therefore, the only applicable policy in the SPP is DC-GV-CW-8.3 which states the following:

> "To ensure any existing or new handling or storage of a dense non-aqueous phase liquid ceases to be or never becomes a significant drinking water threat, where such an activity is, or would be, a significant drinking water threat, the Town shall develop and implement an education and outreach program to encourage the use of alternative products, where available, and the proper handling/storage and disposal procedures for these products."

It is therefore recommended Education and Outreach materials be distributed to residents of the development.

4.0 Existing Site Services

The following is a general description of the existing municipal services available at the perimeter of the property.

4.1 Roadways

4.1.1 Emma Street

Emma Street intersects with Mill Street West to the north of the proposed development and William Street to the South. It has been constructed to a semi urban standard with asphalt curb along the west and a combination of barrier curb and ditches along the east.

4.2 Water Service

This street is serviced with a 150mm diameter watermain on the east side of the street. A hydrant exists across the street from the proposed development. 3 services exist presently and are terminated at property line as shown on the plans.

4.3 Storm Servicing

Storm sewers currently do not exist on Emma Street between Mill Street West and William Street. It is serviced by a combination of ditches, ditch inlets with culvert outlets which discharge to the William Street storm sewer.

The William Street storm sewer was upgraded in 2013-2014 to accommodate new development lands on the west end of Town. The design report by Gamsby and Mannerow (Design Brief, William Street Storm Outlet, Grand Valley, Revised, August 2011) includes Rational method calculations for both the 5 year and 100-year storm. The storm sewer was designed with the existing residential areas in mind; a runoff coefficient of 0.5 was used for the existing residential area. The William Street trunk sewer is 1500mm upstream from the William and Emma Street intersection and a 1220mm x 1920 mm horizontal elliptical concrete pipe (1500mm equivalent) downstream of the intersection to the outlet at the Grand River. Any development of the property should limit storm discharge to match a runoff coefficient of 0.5 or less.

4.4 Sanitary Servicing

A 200mm sanitary sewers exists on Emma terminating roughly 20m north of the south property line of the proposed development.

5.0 Proposed Development Servicing

The following is a general description of the municipal services necessary to support the proposed development.

5.1 Emma Street

In consultation with the Town, upgrades to the west side of Emma Street will be required including concrete barrier curb (OPSD 600.040), 4m wide asphalt lane and 1.5m wide concrete sidewalk situated 1m off of the property line.

5.2 Water Servicing

A single water service will be provided to the site. The existing services shall be turned off at the main and capped.

Water demands were calculated for the 18 units based on the Town's design criteria. An average daily water demand of 450L/capita/day was used.

Average Day:

$$Q_{max} = \frac{QP}{86400} \quad \text{where Q = 450 L/cap/day and P = 72}$$

$$= 0.38 \text{ L/s}$$

Max Day:

$$Q_{max} = \frac{QP \times 2.75}{86400} \quad \text{where Q = 450 L/cap/day and P = 72}$$

$$= 1.03 \text{ L/s}$$

Peak Hour Flow:

$$Q_{ph} = \frac{QP \times 3.97}{86400}$$

$$= 1.49 \text{ L/s}$$

5.2.1 Fire Protection

To assess the fire flow requirements for the proposed site the Ontario Building Code 2012 Section A-3.2.5.7 was used. The calculations from this method are based on the building occupancy, size, type of construction and exposures. Detailed calculations are provided in **Appendix B** and are summarized below. A minimum residual pressure of 140 kPa is required per the Ministry of Environment guidelines.

Total Minimum Supply of Water Required: 187,564.2 L
Minimum Water Supply Flow Rate: 5400 L/min (90L/s)

Please note that the this is a conservative estimate for comparison purposes only. The mechanical engineer for this development will complete the required analyses for fire protection and the architect will design fire separation methods per the determined fire flow rate, to meet municipally available flows and pressures.

Design flow is defined as the maximum daily demand plus fire flow or peak demand flow, whichever is greater. The calculated design flow is 91.49 L/s.

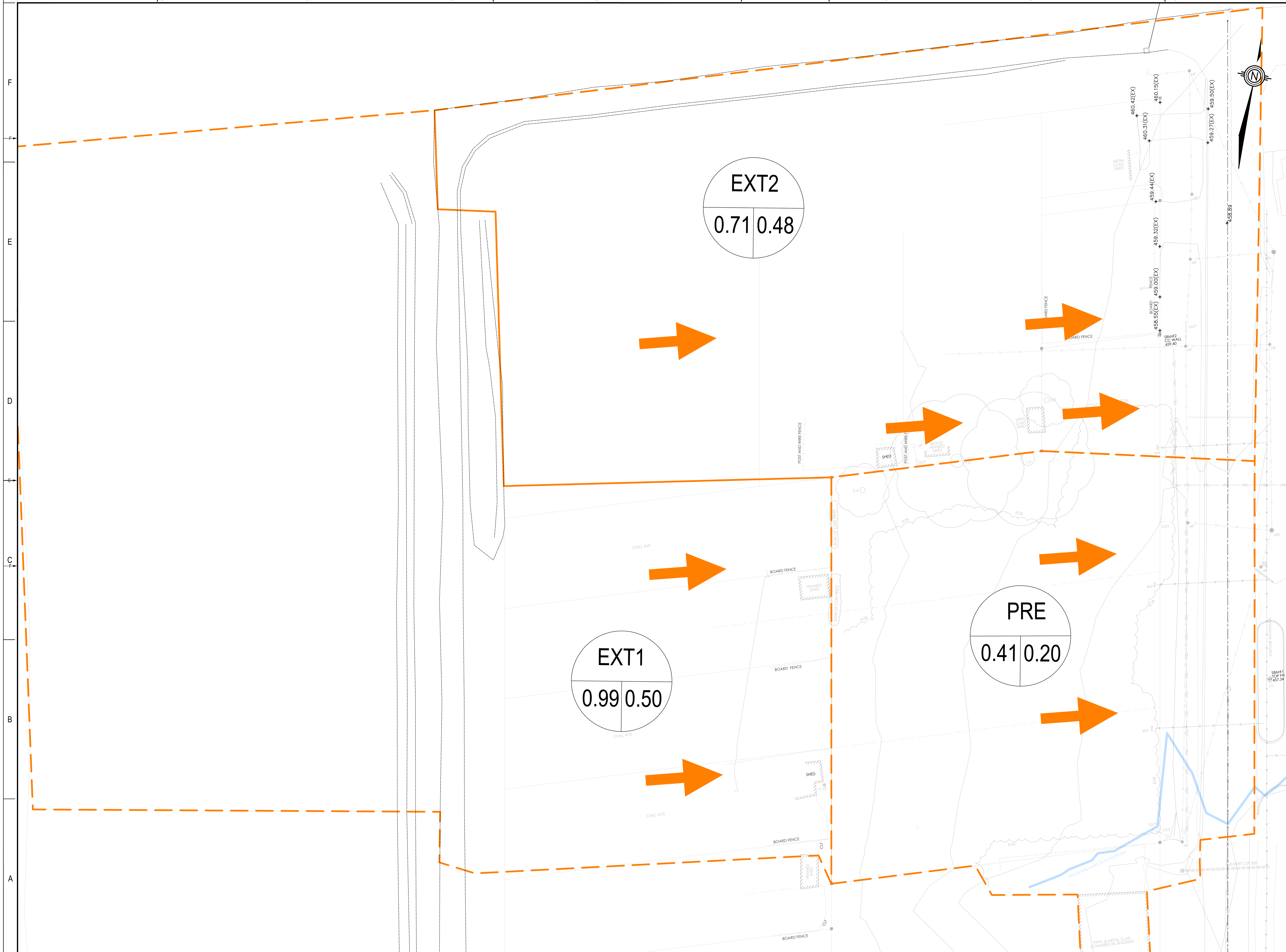
A 150mm diameter service will be supplied to the building to be split for both residential usage and fire suppression requirements.

The existing 150mm diameter municipally designed watermain should be able to service this development without further improvements.

5.3 Storm Servicing

Existing stormwater conditions and associated catchment areas are shown on plan PRE-1, Storm Drainage Plan, Pre-Development Conditions overleaf – **Figure 4.1.** The vacant land generally sheet-flows to the East and is captured by a ditch inlet structure at the southeast corner of the property out letting through a culvert to the east side of the road and into a roadside ditch. Ultimately out letting into the William Street Storm Sewer.

The MECP's Design Criteria (2022) was used for the basis of the design of the proposed stormwater management system. Further, the Town's design standards were followed along with requirements from the GRCA.



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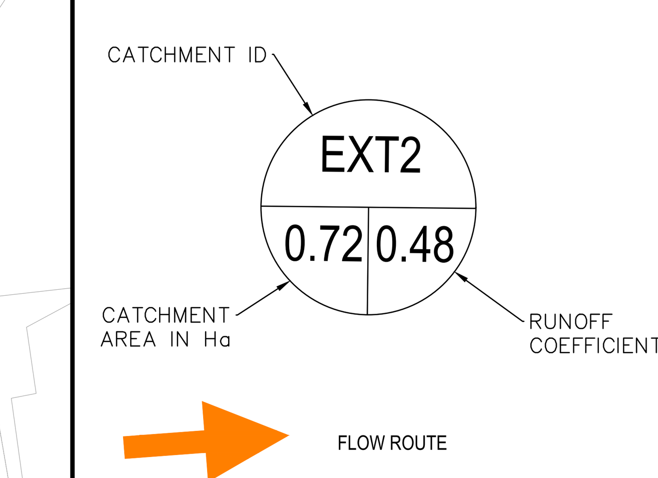


BENCHMARK:

SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS

6297 WELLINGTON COUNTY ROAD RR#3
HARRISTON, ONTARIO
CANADA N0G 1Z0
PHONE: 519-510-3571 FAX: 519-510-3277
WWW.MOOREFIELDEX.CA

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION

PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:250

DESIGNED BY: K.PILON

DRAWN BY: K.PILON

CHECKED BY:

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

TITLE:

STORM DRAINAGE PLAN, PRE-DEVELOPMENT CONDITIONS 40 EMMA STREET GRANDVALLEY

SHEET NUMBER: PRE-1

The proposed development includes a storm sewer system designed for the post development 100-year flows. A preliminary grading and drainage plan as well as a servicing drawing can be found in **Appendix A** with further details. The storm sewer design sheet can be found in **Appendix C**. Pipe sizes and slopes are based on the SWMPD manual and the Town's requirements. Proposed stormwater conditions and associated catchment areas are shown on plan POST-1, Storm Drainage Plan, Post Development Conditions overleaf – **Figure 4.2**.

5.3.1 Determining Overall Catchment Areas

As mentioned, the proposed site sits at the bottom of a relatively steep hill and could be subject to collect runoff water from a large area. The overall catchment area was surveyed to determine catchment boundaries. From a visual inspection and in reviewing the survey data, runoff from the West side of Leeson drains east to Leeson St and then south down the asphalt curb and into catch basins that eventually drain into the William Street Storm sewer. Due to some asphalt degradation, there is an opportunity for some of this runoff to cross over Leeson Street and drain towards the proposed development.

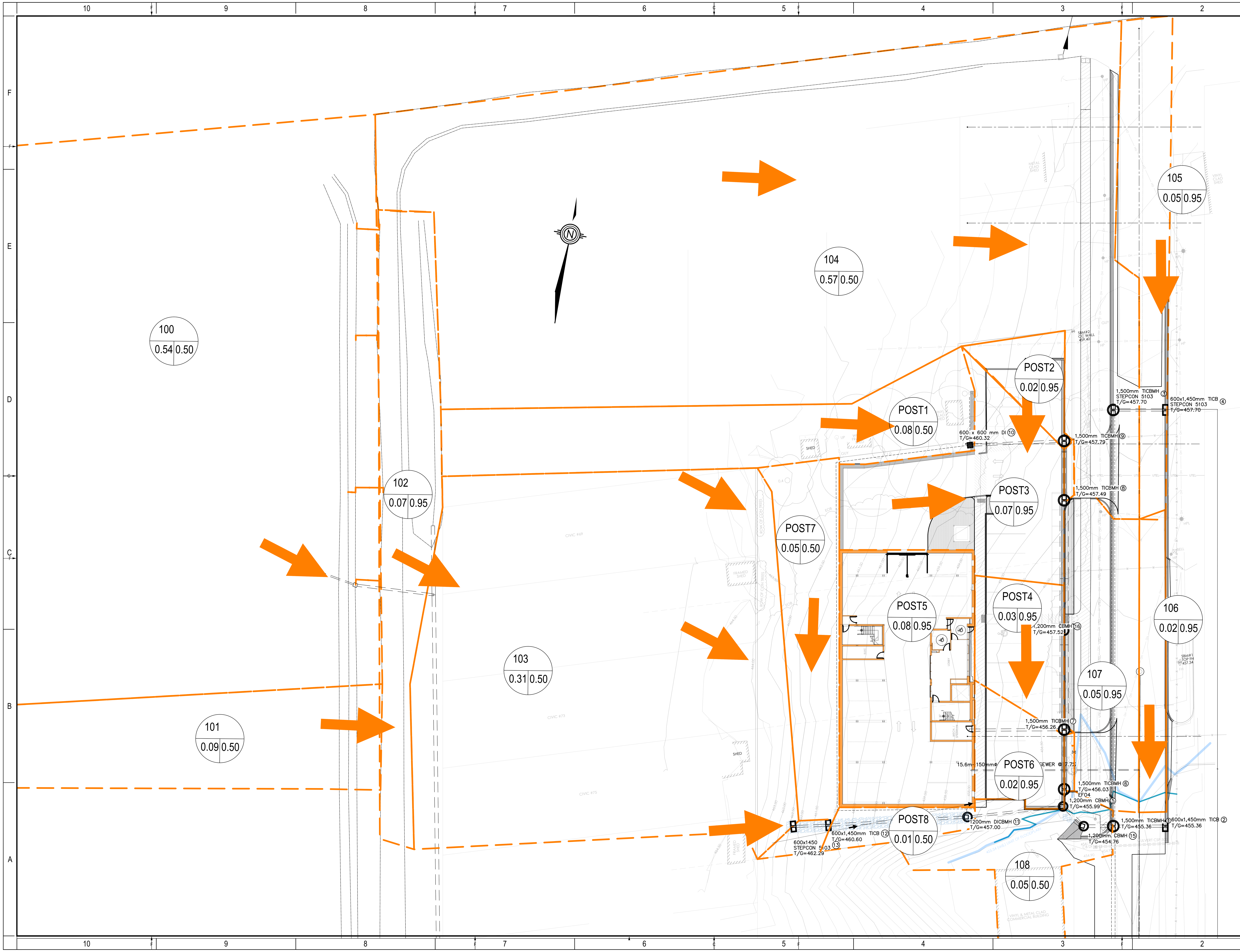
Leeson was evaluated for its ability to handle the 100-year flow. This includes assessing inlet capacity of structures. These calculations can be found in **Appendix C.1**. Catchment area 100 is intercepted by a storm structure. However, this is a single inlet structure and assuming it is 50% blocked approximately 0.04m3/s would continue down the curb and eventually towards the proposed development. Part of Catchment 100 and all of catchments 101 and 102 will flow through catchment 103 and enter the onsite rear yard swale.

5.3.2 Swale Sizing

The on-site swale was sized for the 100-year storm including the above noted catchment areas. These calculations can be found in **Appendix C.1**. It was determined that a 0.3m deep swale, with 3:1 side slopes can handle the 100 year storm flow.

5.3.3 Storm Inlet Capacity

For the development it is required that the 5-to-100-year runoff rates are captured by the storm sewer system. As such, the rational method was used to determine the 5 year and 100-year storm flow run off rates for each individual catchment area. Stormwater inlets were assigned based on the 100-year flow rates. MTO design charts were utilized to determine the type of inlet structure. Each catchment was assessed based on the gutter grade, cross slope and whether they were in a sag condition or not. Each



LEGEND

CATCHMENT ID
EXT2
0.72 | 0.48
CATCHMENT AREA IN Ha
RUNOFF COEFFICIENT
FLOW ROUTE

BENCHMARK:

SEAL:

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ROADS SEWERS WATER MAINS

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CANADA N0G 1Z0
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WWW.MOOREFIELDEX.CA

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION

PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:250

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: K.PILON

DRAWN BY: K.PILON

CHECKED BY:

TITLE:

STORM DRAINAGE PLAN,
POST-DEVELOPMENT CONDITIONS
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: POST-1

structure is assumed to be at 50% capacity to account for blockage. The design charts and associated calculations can be found in **Appendix C.1**.

The upstream catchment 100 to 103 areas that drain to TICB13 will be captured by a high inlet capacity grate. This grate was sized based on open area requirements in consultation with the manufacturer. The high inlet capacity grate has ample capacity for the 100-year design flows even when a 50% blockage rate is utilized.

5.3.4 Quantity Control

The rational method was used to determine the combined 5 year and 100-year storm flows for the proposed development and can be found in Appe**ndix C.** The catchment areas represented by the built development are areas POST2- POST-8. Most of these catchments are hard surfaced and have a C value of greater than 0.5. Stormwater quantity control is therefore required. Areas POST-1 to POST-5 are directed towards the underground storage system, areas POST-6 to 8 leave the site without control and enter into the Emma Street Storm system.

This site was included for in the design of the William Street Sorm Outlet per the Gamsby and Mannerow Report (2011). Storm flows leaving the site will need to be controlled down to the total release rate calculated in this report as to not overwhelm the large trunk sewer. The proposed site is included in Catchment 3 within the report. This overall catchment has an area of 2.37 Ha with a C value of 0.5. The Gamsby and Mannerow Rational method calculations are provided in **Appendix C.2** for reference. Based on the Gamsby and Mannerow Calculations, the total 5-year flow for Catchment 3 is 315L/s (571-256L/s). In order to determine the allowable release rate from the development, an area-based flow rate is to be determined. The proposed development areas with C>0.5 and areas upstream total 0.30 Ha (Areas POST-1 – POST 6). The allowable 5-year release rate for this area is determined as follows:

$$\frac{315\ L/s}{2.37\ Ha} = 132.91 \times 0.30\ Ha = 39.87\ L/s$$

The Gamsby and Mannerow Calculations did not include for the 100-year flows from Catchment 3. As such, an incremental increase will be calculated based on the Gamsby and Mannerow Design Data. The calculations can be found in **Appendix C**. The total Flow for catchment 3 is 502 L/s. Similar to the above, the allowable 100-year release rate for the proposed development areas with C>0.5 is determined as follows:

$$\frac{502\ L/s}{2.37\ Ha} = 211.81 \times 0.30\ Ha = 63.54\ L/s$$

Area POST-6 will flow uncontrolled, as such this is to be removed from the total allowable release rates:

Catchment	C - VALUE	AREA (Ha)	100 YEAR FLOW L/s	5 YEAR FLOW L/s	CONTROL PROVIDED
Total Allowable Release Rate			63.54 L/s	39.87 L/s	
POST-6	0.95	0.02	8	6	NO
Total Adjusted Release Rate			55.54 L/s	33.87 L/s	

Appendix C includes the rational calculations for the storm sewers. Peak flows from Areas Post 1-7 are represented below:

Catchment	C - VALUE	AREA (Ha)	100 YEAR FLOW L/s	5 YEAR FLOW L/s	CONTROL PROVIDED
POST-1	0.5	0.08	17	11	YES
POST-2	0.95	0.02	8	5	YES
POST-3	0.95	0.07	29	18	YES
POST-4	0.95	0.03	12	8	YES
POST-5	0.95	0.08	33	21	YES
POST-6	0.95	0.02	8	6	NO
Total		**0.30 Ha**	**107 L/s**	**69 L/s**	
Total Adjusted Release Rate			55.54 L/s	33.87 L/s	

An underground stormwater storage system will be designed to reduce flows from site to the allowable release rates calculated. The modified rational method determined that in a 100-year storm ~40m3 of storage is required. This was input into PCSWMM 5.2.4 which was utilized to determine the hydraulic grade line for the site and to determine if the required storage was sufficient. PCSWMM model outputs can be found in **Appendix D** along with an assessment of the hydraulic grade line.

It was determined that 95m^3 of storage would be required when analyzing the HGL for the site and the required orifice to attenuate down to the 5-year storm. As such 37.5m (15 units) of 1.2x2.4m Xstream culvert was selected for the site. This provides 105m^3 of storage. Xstream details including sections, end section details can be found in **Appendix E.**

A Stage Storage Discharge Chart is provided overleaf for the 1.2x2.4 Xstream culvert. with a 0.15m orifice at the invert of the outlet pipe:

Description	Elevation (m)	Incremental Storage (m3)	Cumulative Storage (m3)	Controlled Flow (m3/s) Orifice 0.15m
Xstream Obvert	455.50	10.50	105.0	0.051
	455.38	10.50	94.5	0.048
	455.26	10.50	84.0	0.045
	455.14	10.50	73.5	0.042
	455.02	10.50	63.0	0.038
	454.90	10.50	52.5	0.035
	454.78	10.50	42.0	0.030
	454.66	10.50	31.5	0.025
	454.54	10.50	21.0	0.019
	454.42	10.50	10.5	0.010
Xstream Invert	454.30	0.00	0.0	0.000

5.3.4.1 Overland Flows

During regional storm events, stormwater runoff will exceed the storm sewer capacity. Flows will be directed through the swales and along the south property line to the road. Ultimately heading down Emma to William Street and into the Grand River utilizing the existing storm overflow designed for the upstream development lands on the east end of Town.

5.3.5 Quality Control

Most of the discharge from this site is from hard surfaces that could contain sediments due to winter operations and tracking. As such, quality control shall be provided for the on-site discharge of stormwater.

Grassed drainage swales are proposed to be constructed along the west, north and south property line. These swales will provide for drainage of the grassed areas and is considered clean runoff.

An oil grit separator (OGS) EFO4 Stormceptor is being proposed to treat the runoff water from the building's roof and parking lot. Catchment areas directed towards the OGS are Post-1, Post-2, Post, 3, Post 4 and Post 5. Post-1 is considered clean run off and ideally would be routed around the OGS. However, due to site grading concerns this was not possible. Post-1 is a relatively small area, and the OGS can handle the increased flow. Post-6 is not captured by the OGS; this area is quite small. Snow storage is a high contributor to sediment loads. As such, this area is not designated for snow storage to avoid high loads leaving site through the storm sewer system. The design details of the OGS can be found in **Appendix E.** The OGS will require regular maintenance by the owners of the site.

5.3.6 Quality Control – Emma Street

Under the Town of Grand Valley's CLI-ECA extensions and improvements to the storm sewer system on Emma Street will also require an improvement to the quality of the stormwater entering the system.

The existing conditions are currently uncontrolled and rely on boulevards being drained by existing swales and asphalt gutters that collect the storm water on the pavement and direct it to either ditch inlets or road side swales. Dut the existing grade of Emma Street, some erosion is occurring at these ditch inlets. Further sediments are travelling down the asphalt gutters which is being allowed to enter into the William Street Storm system uncontrolled.

The proposed design implements curbs and gutters and new regraded boulevards (without swales) in front of the development. Catchbasins within the right-of-way are being equipped with GOSS traps and sumps in order to promote the settling of sediments and capture of oils/floating debris. Additionally, CBMH15 is also being equipped with a sump and GOSS trap.

The addition of Goss traps and sumps within the road network will reduce the overall sediment entering into the storm sewer system.

The Town already completes regular maintenance (including sediment removal) of its structures and will need to include these new structures in its program.

5.3.7 Erosion & Sedimentation Control During Construction

The following are details regarding the erosion and sediment control measures to be implemented during construction. Details can be found on ESC-1, ESC-2 and ESC-3, Sediment and Erosion Control plan in **Appendix A**. Further, an Erosion Risk Assessment can be found in **Appendix F** and is based on the ESC Guidelines for Urban Construction (2019), TRCA**:**

- Placement of siltation fences in all areas where surface drainage flows over disturbed areas. Siltation fence shall remain erect until construction is completed, and the upstream area is fully re-vegetated;
- Revegetating slopes within 14 days to avoid unnecessary erosion;

- Placement of check dams within swales and any other locations where a concentrated flow of runoff may occur. All proposed drainage swales are to be seeded during construction;
- A mud mat will be placed at the site access to keep public roadways free from debris during the construction period;
- A filter sock to be placed along the entire rear yard;
- A granular construction staging area is to be constructed; and,
- Pumped water will be required to discharge through a dewatering bag.

Once the ground surface of the site has been stabilized, the straw bale check dams and siltation fences can then be removed. Before final acceptance of the site, storm structures shall be cleaned to remove all silt and the storm sewers shall be flushed.

During the construction phase, it is important to ensure that erosion/sediment controls are in place to ensure limited transport of sediment into the existing downstream drainage ditches.

5.3.8 Foundation Drain

A foundation drain complete with at grade cleanouts is to be installed around the foundation's permitter. As per the CMT Geotechnical Investigation (Revised June 2025) "an exterior perimeter weeping tile system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone, and wrapped in a geotextile filter fabric such as Terrafix 270R (or equivalent), must be installed at an elevation that is below any proposed basement slab elevations and provided with positive drainage into a sump pit or other suitable outlet." It is proposed to extend the drains with connection to the onsite storm sewer system. At grade cleanouts will allow for inspection and maintenance if required. This drain discharges above the 100-year hydraulic grade line as such free flow of water around the foundations is to be expected.

5.4 Sanitary Servicing

Design flow calculations were completed in accordance with the Town's Engineering Standards. A peak flow for the proposed development was calculated as follows:

Qp (Peak Flow) = $\frac{MQP}{86.4} + IA$

Where: Q = 450 L/cap/day

M = Peak Flow Factor "Harmon"

= $1 + \frac{14}{\quad}$ = 4.25, therefore max 4.0 per town standard

$4 + P^{0.5}$

	P	=	Population/1000 = 0.072
	I	=	0.20 L/ha. (extraneous flow)
	A	=	Area (site) = (0.32 ha.)
Therefore,	Qp	=	$\frac{4.0 \times 450 \times 0.072}{86.4} + (0.20 \times 0.32)$
		=	1.50 + 0.06
		=	1.56 L/s

Servicing of the condo development will be as per the Town's design standards with a single 150mm diameter sanitary sewer at a slope of 4.6% to the existing sanitary maintenance hole on Emma Street. No extension of the sanitary main is required. Manufactured boots will be utilized, and the existing manhole will be waterproofed.

A 150mm diameter PVC sewer at minimum 4.6% grade reaches a full flow velocity of 1.85m/s which exceeds the ministry's requirement of 0.6m/s. The maximum capacity of this service is 32.66L/s which provides for the required flows from the development.

6.0 Stormwater System Operations and Maintenance

Operation and maintenance manuals for the storage system and for the OGS (EFO4) can be found in **Appendix G.**

Goss traps combined with structure sumps are recommended for structures on Emma Street and will require regular inspection and removal of sediments. Annually is recommended however through bi-annual inspections the frequency can be modified to ensure sediment levels stay below the Goss trap invert.

7.0 Conclusions and Recommendations

Based on the foregoing, the following is concluded regarding the proposed multi-residential development.

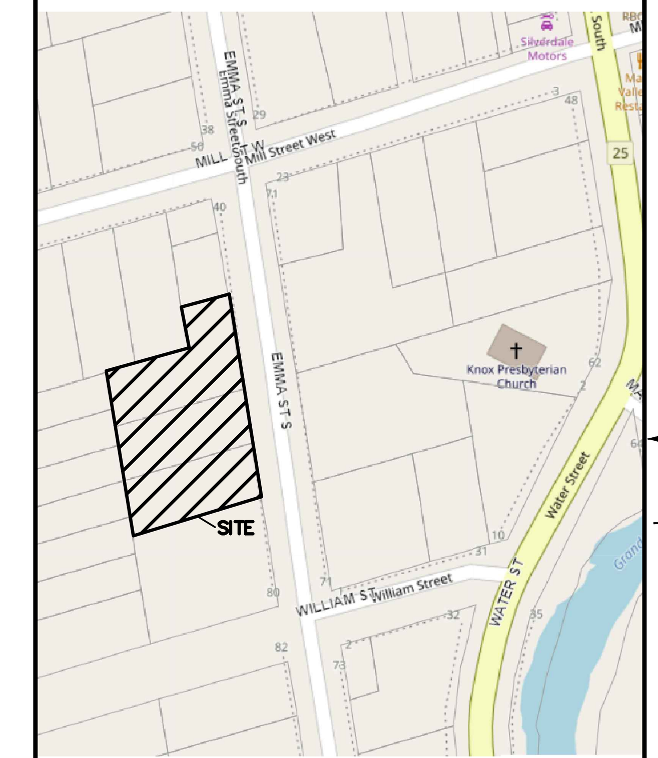
1. Existing public roadway access is available to the site, subject to necessary improvements to the Town's standards and approval.
2. Erosion and sediment controls will be required to limit sediments travelling into the nearby Grand River.
3. Storm Water will be directed to the new sewers in the right of way, quantity control is provided by way of the onsite super pipe. Quality control is provided by way of an oil grit separator on private property. Roof water will drain directed into the proposed storm system upstream of the superpipe outlet.
4. A foundation drain will be installed to collect water seepages and provide free drainage from around the building with outlet into the storm sewer system.
5. A sanitary service will be extended from the existing manhole to the building to provide service to the units.
6. Fire flow and domestic water service will be provided by way of a 150mm diameter main to be split in the mechanical room for domestic and fire flow purposes.

Respectfully submitted,

Kim Pilon, P. Eng.
Civil Engineer

APPENDIX A

Preliminary Servicing and Grading Plans



NOTES:

1. PROPERTY BOUNDARY DERIVED IN PARTS FROM INFORMATION SHOWN ON R PLAN LT 13-15 PL 33A (31972-22) (UTM2010) PROVIDED BY VAN HARTEN SURVEYING INC (PROJECT 31972-22
2. SURVEY COMPLETED BY VAN HARTEN SURVEYING INC AND MOOREFIELD EXCAVATING INC
3. BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTH OF SITE 458.39 AS SHOWN ON THE PLANS.
4. MIN F.F. 455.39 CGVD 28 (DRY LAND ACCESS) PER GRCA
5. TREE REMOVALS NEAR OR ON PROPERTY LINES WILL REQUIRED COORDINATION WITH ADJACENT LAND OWNERS.
6. FIELD LOCATES OF ALL UNDERGROUND UTILITIES INCLUDING BUT NOT LIMITED TO; UNDERGROUND GAS, HYDRO, TELEPHONE, AND CABLE TELEVISION SHALL BE ARRANGED PRIOR TO CONSTRUCTION AND IS THEREFORE RESPONSIBILITY OF THE CONTRACTOR.
7. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNTIL STAMPED 'ISSUED FOR CONSTRUCTION'.
8. ALL CONSTRUCTION SHALL BE COMPLETED IN ACCORDANCE WITH THE TOWN OF GRAND VALLEY ENGINEERING STANDARDS.
9. VEGETATION REMOVAL SHOULD BE CONDUCTED BETWEEN OCT 1ST AND APRIL 1ST.
10. A STOCKPILE OF ECS MATERIALS ARE TO BE KEPT ON SITE AVAILABLE FOR EMERGENCY USE THIS SHALL INCLUDE STRAW BALES AND FILTER SOCKS.
11. NOTE THAT THE ESC PLANS ARE FLEXIBLE AND SUBJECT TO CHANGE BASED ON SITE CONDITIONS AS MAY BE REQUIRED BY THE TOWN.
12. ONGOING MONITORING OF ESC CONDITIONS SHALL BE REQUIRED. AT MINIMUM INSPECTIONS SHALL OCCUR AS FOLLOWS AND ARE TO BE RECORDED. RECORD TO BE MAINTAINED ON SITE:
    - 12.1. AFTER IMPLEMENTATION OR AFTER A CHANGE TO THE ESC PLAN
    - 12.2. DURING ACTIVE CONSTRUCTION WEEKLY REPORTS DURING DRY WEATHER PERIOD, TWICE WEEKLY DURING WET WEATHER PERIODS
    - 12.3. DURING INACTIVE CONSTRUCTION BI-WEEKLY REPORTING DURING DRY WEATHER, WEEKLY DURING WET WEATHER
    - 12.4. IMMEDIATELY AFTER SIGNIFICANT RAINFALL, SNOWMELT, OR OTHER SEVERE WEATHER EVENT
    - 12.5. EVERY INSPECTION RECORD TO INCLUDE THE NAME OF THE INSPECTOR, DATE, VISUAL OBSERVATION AND ANY REMEDIAL MEASURE TO MAINTAIN THE ESC PLAN. ALSO AN INSPECTION OF THE OUTLET PIPE TO THE GRAND RIVER AT THE END OF WILLIAM STREET. PHOTOGRAPHIC RECORD OF THE ONSITE CONDITIONS AND OUTLET PIPE TO THE GRAND RIVER AT THE END OF WILLIAM STREET CAN BE MAINTAINED OFF SITE BUT SHALL BE MADE AVAILABLE UPON REQUEST.

STAGE 1 - ESC

1. COMPLETE TREE REMOVAL GRUBBING FOCUSING ON THE WEST SIDE OF SITE AND RE-SEED.
2. VEGETATION INCLUDING TREE REMOVAL SHOULD BE CONDUCTED BETWEEN OCTOBER 1ST AND APRIL 1ST AS PER THE SITE SCREENING MEMORANDUM DATED SEPTEMBER 12, 2023
3. PLACEMENT OF SILTATION FENCES IN ALL AREAS WHERE SURFACE DRAINAGE FLOWS OVER DISTURBED AREAS. SILTATION FENCE SHALL REMAIN ERECT UNTIL CONSTRUCTION IS COMPLETED AND THE UPSTREAM AREA IS FULLY RE-VEGETATED.
4. COMPLETE CONSTRUCTION OF INTERCEPTOR SWALES, CULVERTS AND SEDIMENT TRAP.
5. PLACEMENT OF TEMPORARY CHECK DAMS WITHIN SWALES AND ANY OTHER LOCATIONS WHERE A CONCENTRATED FLOW OF RUNOFF MAY OCCUR. ALL PROPOSED DRAINAGE SWALES ARE TO BE SEEDED DURING CONSTRUCTION;
6. INSTALLATION OF FILTER CLOTH UNDER ALL NEW AND EXISTING CATCHBASIN GRATES UNTIL PAVING OF THE SITE STREETS ARE COMPLETED;
7. MUD MATS WILL BE PLACED AT CONSTRUCTION ACCESSES TO KEEP PUBLIC ROADWAYS FREE FROM DEBRIS DURING THE CONSTRUCTION PERIOD.
8. FILTER SOCKS TO BE PLACED EVERY 10M ALONG THE ROAD SWALE ON THE EAST SIDE OF EMMA STREET BETWEEN WILLIAM STREET AND THE SOUTH ENTRANCE TO 71 EMMA STREET.
9. PROCEED WITH TOPSOIL STRIPPING AND STOCKPILING, UPON COMPLETION OF ABOVE, IN DESIGNATED AREA. ENCLOSE TOPSOIL PILE WITH SILT FENCE PER DETAILS ON ESC-3

STAGE 2 - ESC

2. AFTER TOPSOIL REMOVAL AND STOCKPILING IN DESIGNATED AREA, THE REAR YARD SLOPE SHALL BE CUT TO FINAL GRADE AND SHALL BE RESEEDED/VEGETATED. THE SLOPE SHALL NOT REMAIN EXPOSED FOR LONGER THEN 14 DAYS. A FILTER SOCK SHALL BE PLACED ALONG THE ENTIRE SLOPE PER THE DETAILS ON PAGE ESC-3.
3. A CONSTRUCTION STAGING AREA SHALL BE CONSTRUCTED TO ROUGHLY FINAL GRADE -0.45m 250mm GRAN B TO BE PLACED.
4. DURING CONSTRUCTION, THE SUBGRADE SHOULD BE SLOPED/DITCHED TO A SUMP (AS REQUIRED) LOCATED OUTSIDE THE BUILDING FOOTPRINT (IF FEASIBLE) IN THE EXCAVATION TO PROMOTE SURFACE DRAINAGE OF RAINWATER OR SEEPAGE AND THE COLLECTED WATER SHOULD BE PUMPED OUT OF THE EXCAVATION. IT IS CRITICAL THAT ALL WATER BE CONTROLLED (NOT ALLOWED TO POND) AND THAT THE SUBGRADE AND FOUNDATION PREPARATION COMMENCE IN DRY CONDITIONS.
5. A DEWATERING BAG IS TO BE PLACED AND BE READY FOR ANY PUMPED DEWATERING REQUIRED WHILE CONSTRUCTING THE FOUNDATION AND DURING BUILDING CONSTRUCTION PER DETAILS ON PAGE ESC-3

STAGE A - ESC (ROAD CONSTRUCTION)

1. A DEWATERING BAG IS TO BE PLACED AND BE READY FOR ANY PUMPED DEWATERING REQUIRED FROM THE TRENCHES OR STORM STRUCTURES PER DETAILS ON PAGE ESC-3. TRENCH WATER SHALL BE PERMITTED TO ENTER THE STORM SEWER SYSTEM.
2. INSTALLATION OF FILTER CLOTH UNDER ALL NEW AND EXISTING CATCHBASIN GRATES UNTIL PAVING OF THE SITE STREETS ARE COMPLETED;
3. FILTER SOCKS TO BE PLACED EVERY 10M ALONG THE ROAD SWALE ON THE EAST SIDE OF EMMA STREET BETWEEN WILLIAM STREET AND THE SOUTH ENTRANCE TO 71 EMMA STREET.
4. A DEWATERING BAG IS TO BE PLACED AND BE READY FOR ANY PUMPED DEWATERING REQUIRED WHILE CONSTRUCTING THE ROAD PER DETAILS ON PAGE ESC-3

BENCHARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 459.40 SHOWN ON THE PLANS.

SEAL:

MOOREFIELD excavating
ROADS · SEWERS · WATER MAINS
6297 WELLINGTON COUNTY ROAD RR#3
HARRISTON, ONTARIO
CANADA N0G 1Z0
PHONE: 519-510-3571 FAX: 519-510-3277
WWW.MOOREFIELDEX.CA

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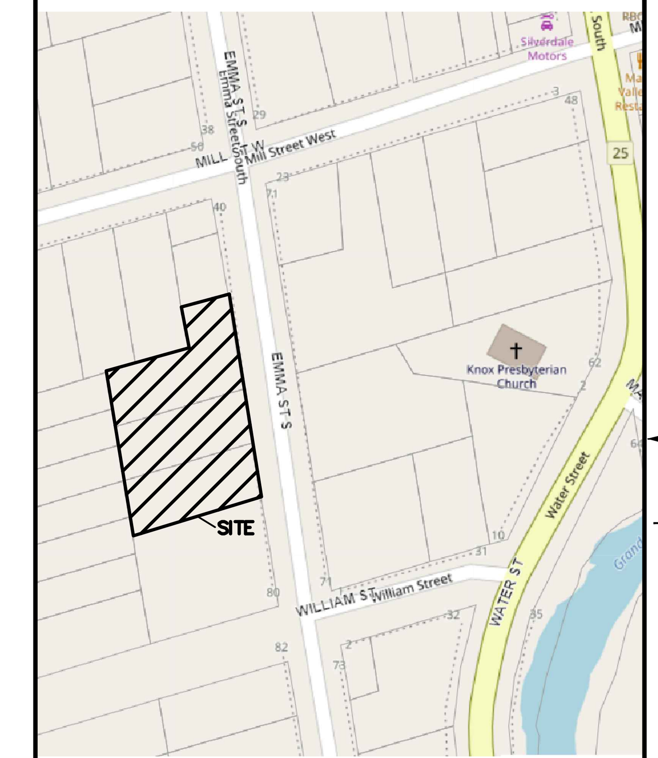
2	0	12-18-2024	SPA SUBMISSION - CONDO
1	0	06-13-2024	ZBA OPA SUBMISSION - CONDO
1	0	10-05-2023	ZBA OPA SUBMISSION

PROJECT NO: 231-103
DATE: JUNE 2024
ORIGINAL SCALE: 1:150
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: K.PILON
DRAWN BY: K.PILON
CHECKED BY:

TITLE:
EROSION AND SEDIMENT CONTROL
STAGE 1
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: ESC-1



BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 459.40 AS SHOWN ON THE PLANS.

SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS

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PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:150

DESIGNED BY: K.PILON

DRAWN BY: K.PILON

CHECKED BY:

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

TITLE:

EROSION AND SEDIMENT CONTROL
STAGE 2
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: ESC-2

C:\Users\kim\OneDrive - Moorefield Exca\Documents\Emma Street Grand Valley\june 20.dwg Jun 25, 2025-1:23pm BY:(kim)

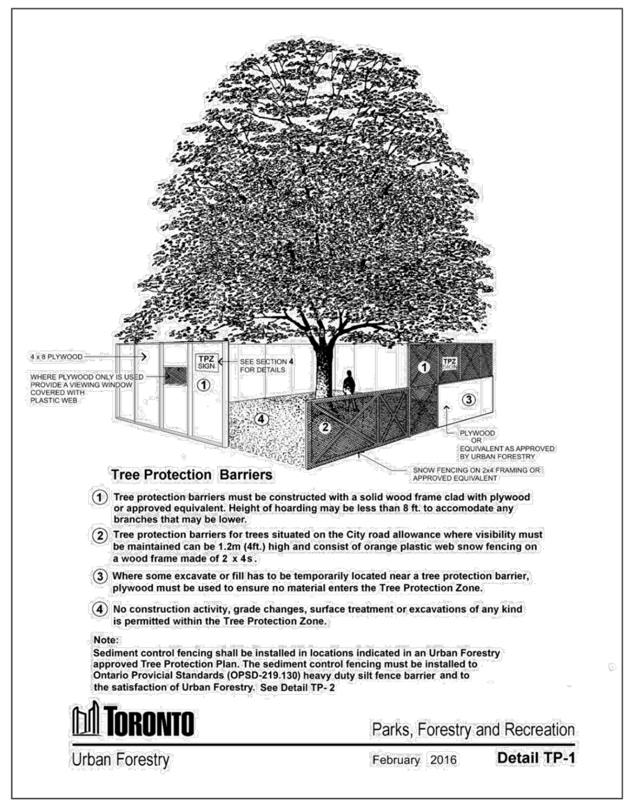


Figure B1-2: City of Toronto tree protection barrier detail (City of Toronto, 2016)

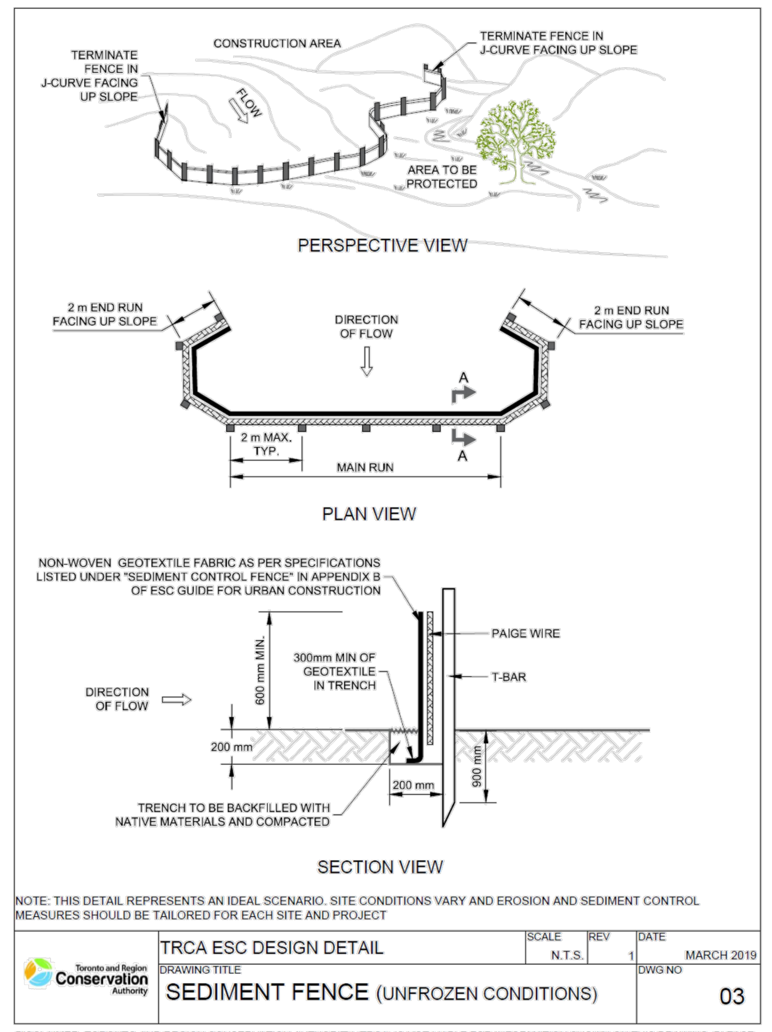


Figure B2-3a: Design detail for sediment control fence (unfrozen conditions).

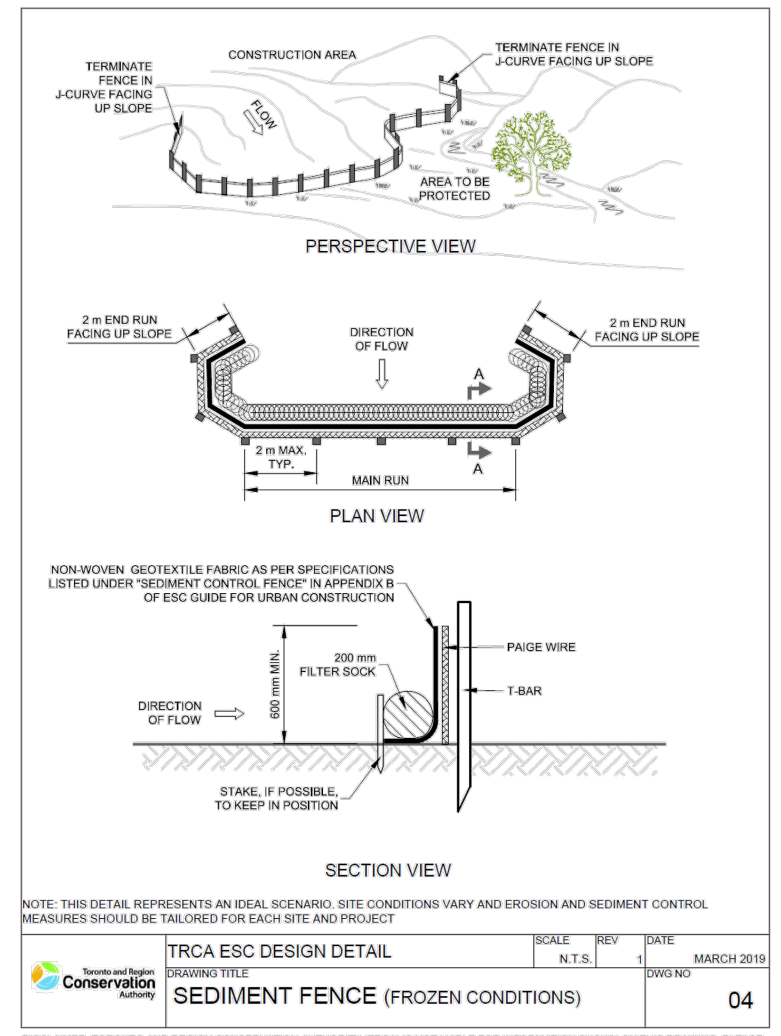


Figure B2-3b: Design detail for sediment control fence (frozen conditions).

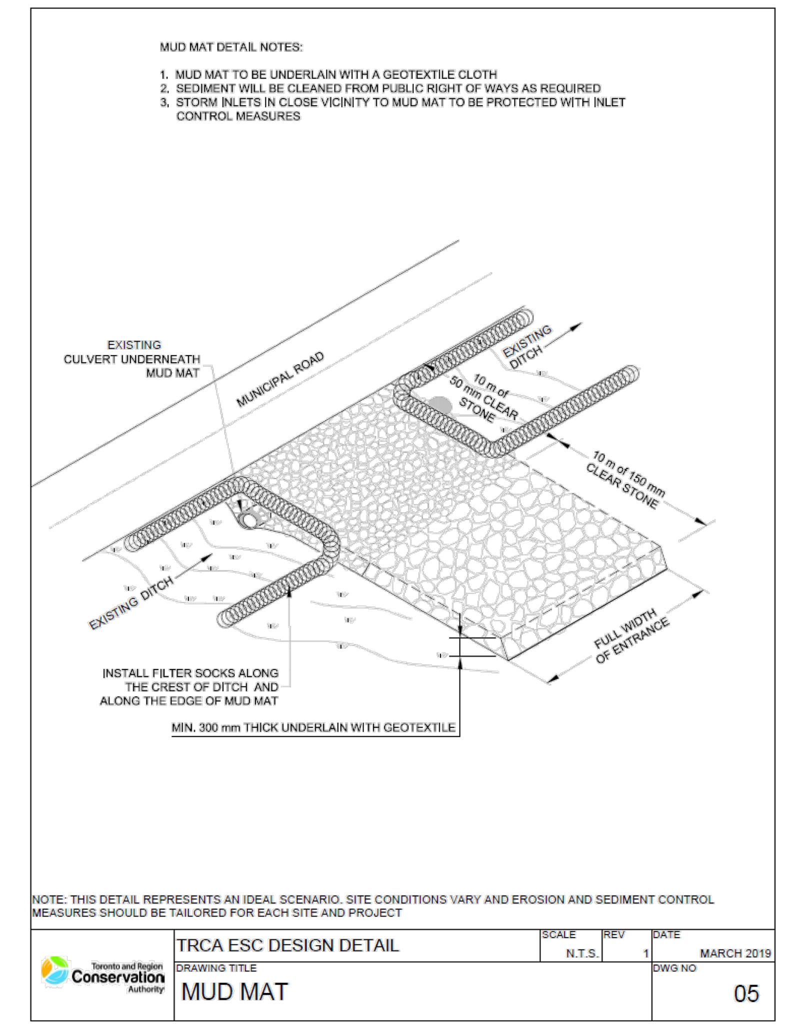


Figure B2-29: Design detail for mud mat for construction site vehicle access

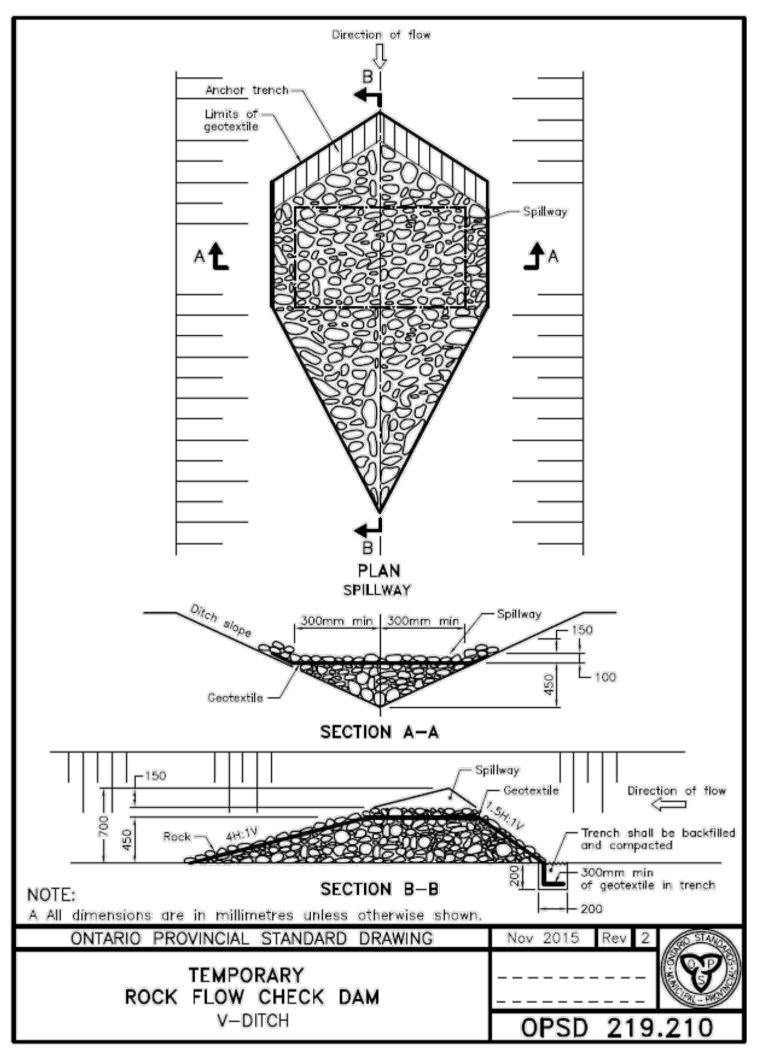


Figure B2-10: Ontario Provincial Standard Drawing (Nov. 2015) for temporary rock check dam in a v-shaped conveyance channel

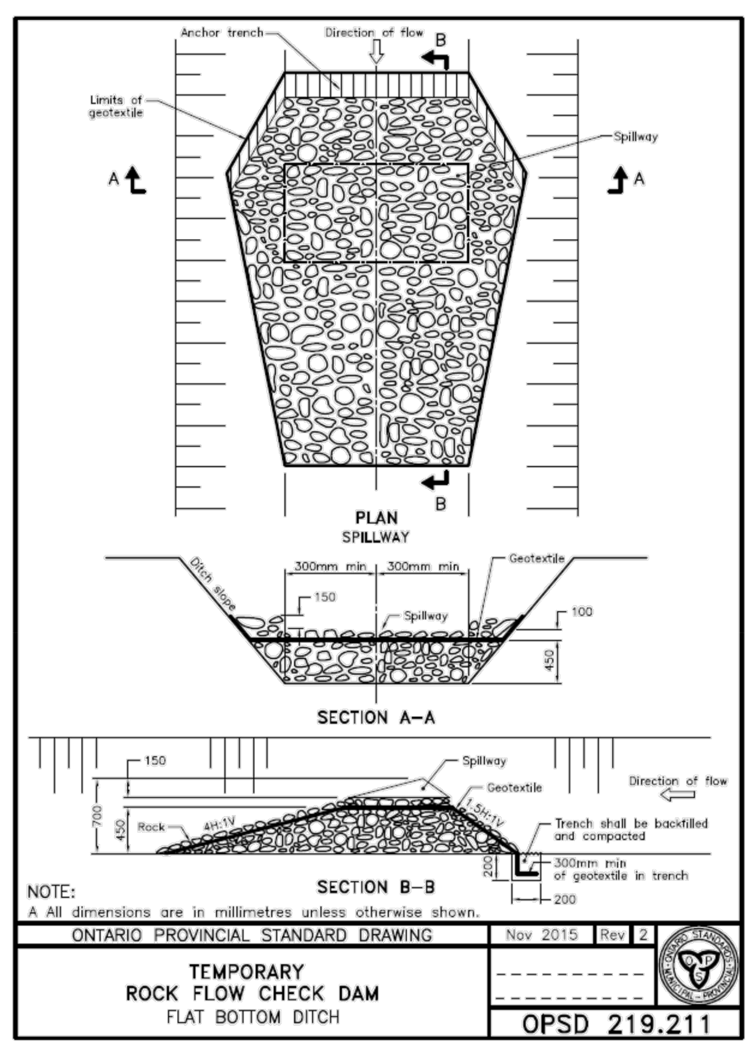


Figure B2-11: Ontario Provincial Standard Drawing (Nov. 2015) for temporary rock check dam in a flat-bottomed conveyance channel

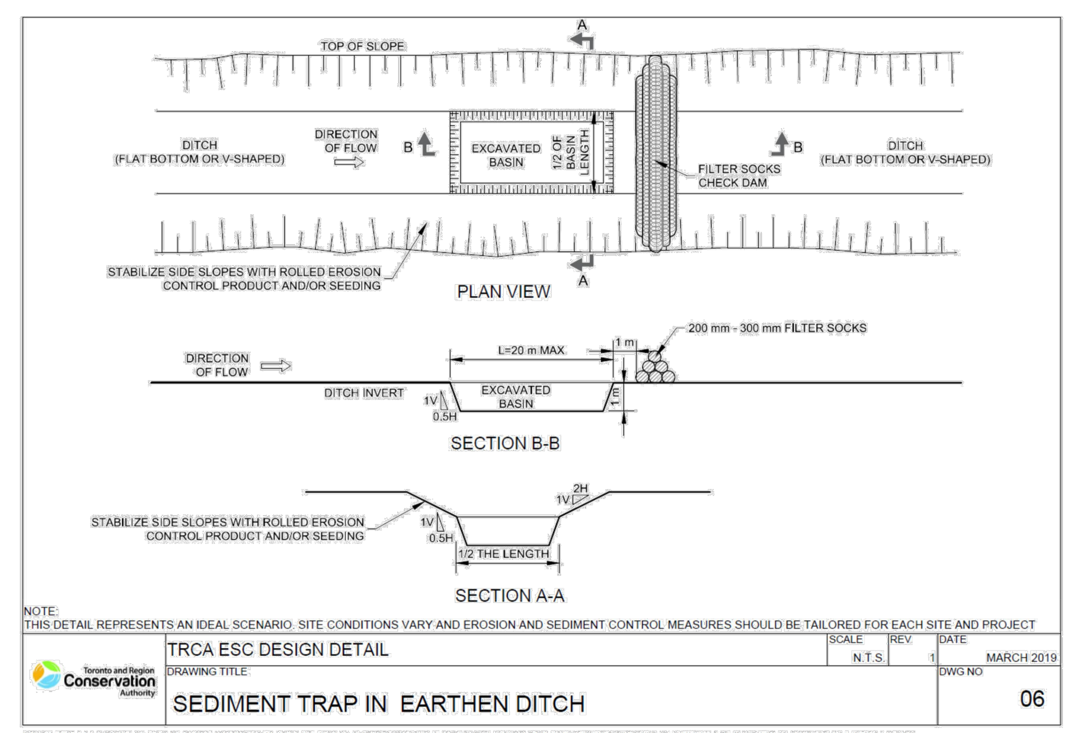


Figure B2-18: Design detail for sediment trap within an earthen ditch

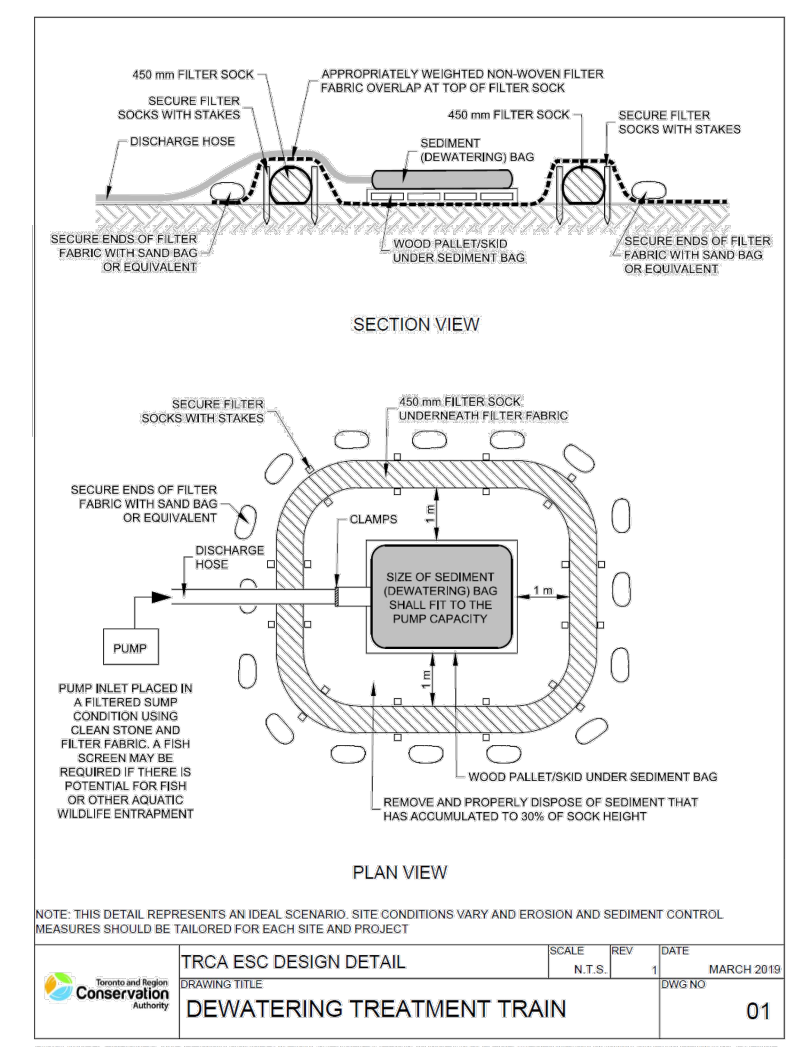
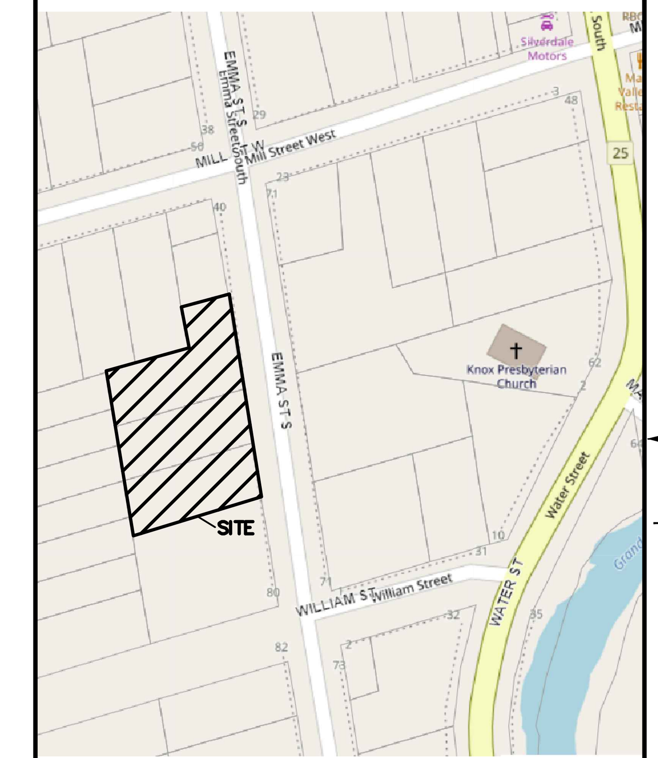


Figure B2-16: Dewatering bag treatment train (unfrozen conditions)



BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 459.40 AS SHOWN ON THE PLANS.

SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS
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PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:150

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: K.PILON

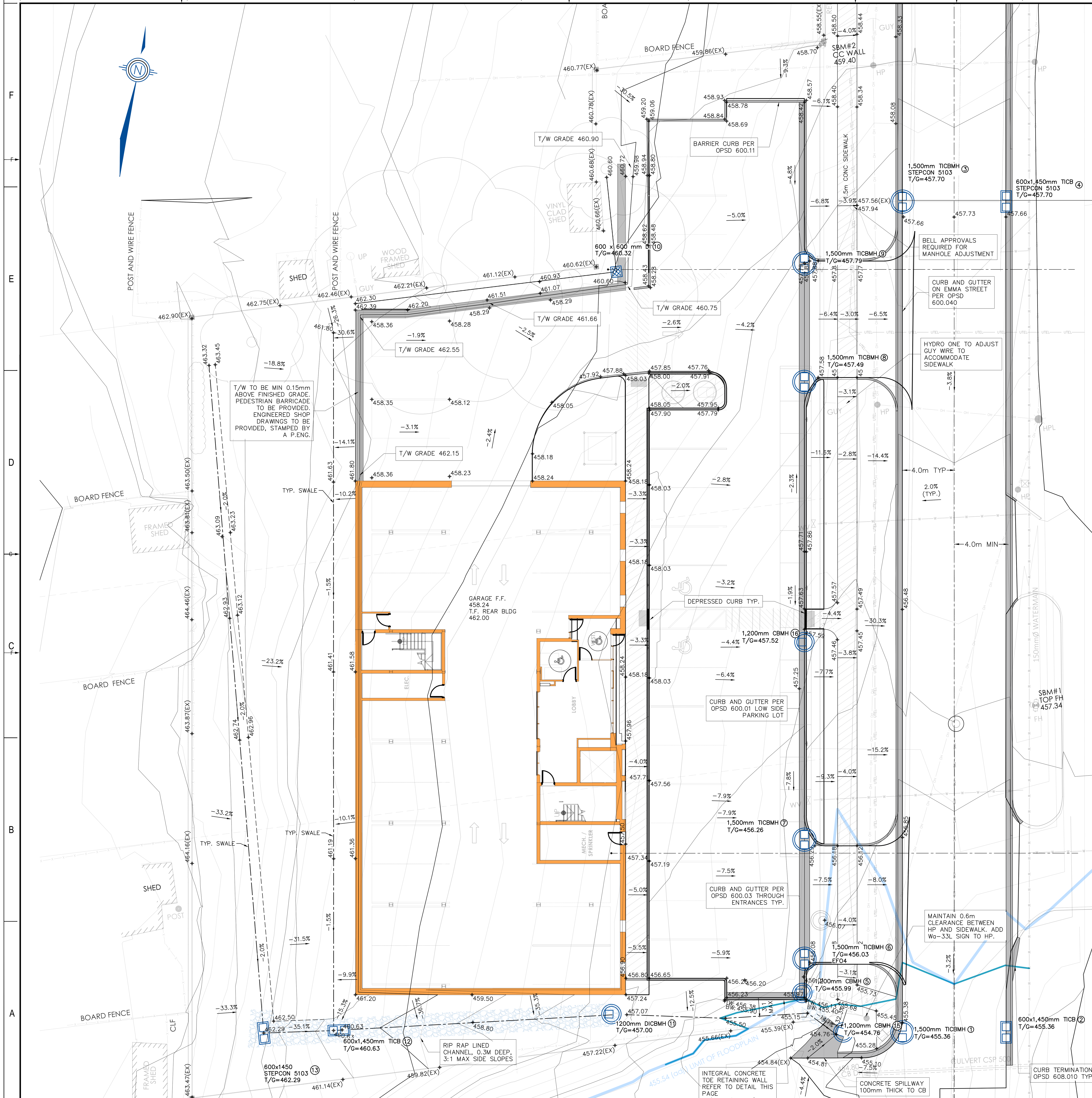
DRAWN BY: K.PILON

CHECKED BY:

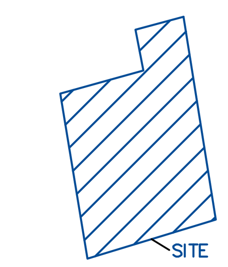
TITLE:

EROSION AND SEDIMENT CONTROL
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: ESC-2



NOTE: IF ONLY ONE ELEVATION IS SHOWN IN THE PARKING LOT IT IS TO BE CONSIDERED A BOTTOM OF CURB ELEVATION



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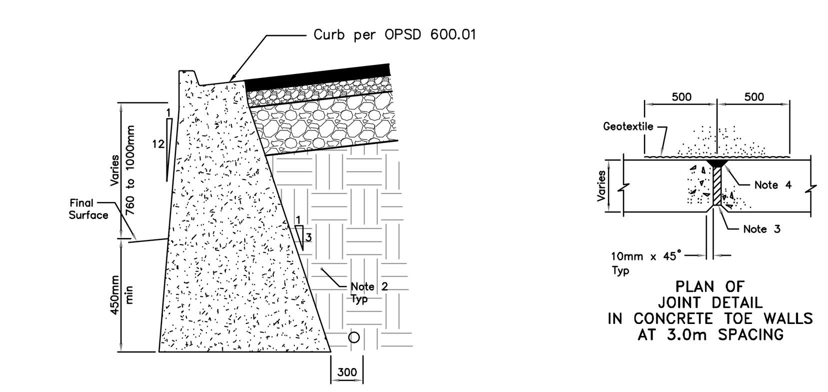
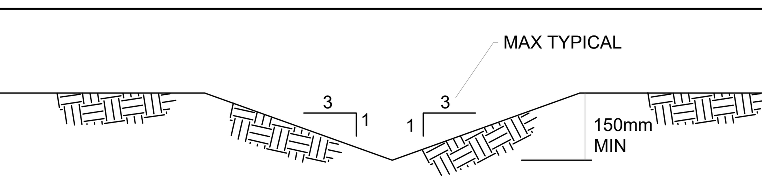
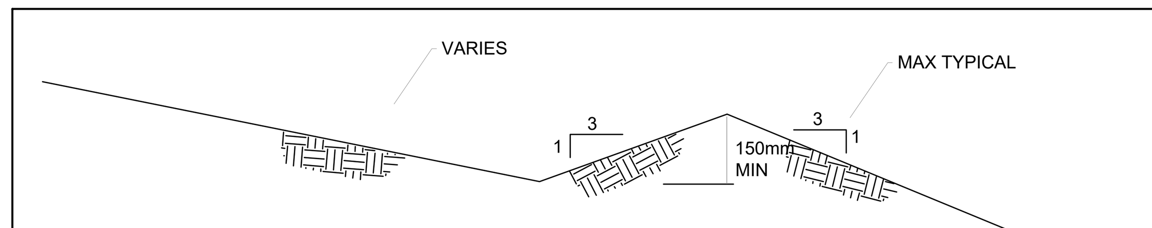


NOTES:
1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
2 Excavation for toe walls shall be backfilled with free draining granular material.
3 10mm preformed joint filler, Type A, non–extruding and resilient bituminous type as specified.
4 Cold applied rubber asphalt joint sealing compound.
5 Where specified, wall drains shall be installed as per OPSD 3190.100.
6 150mm dia perforated pipe subdrain wrapped in geotextile. tie into storm structure CBMH5
A Concrete for toe walls shall be 30MPa.
B All dimensions are in millimetres unless otherwise shown.

CURB AND TOE WALL DETAIL
NOT TO SCALE



TYPICAL SWALE DETAIL
NOT TO SCALE



TYPICAL PERIMETER SWALE DETAIL
NOT TO SCALE

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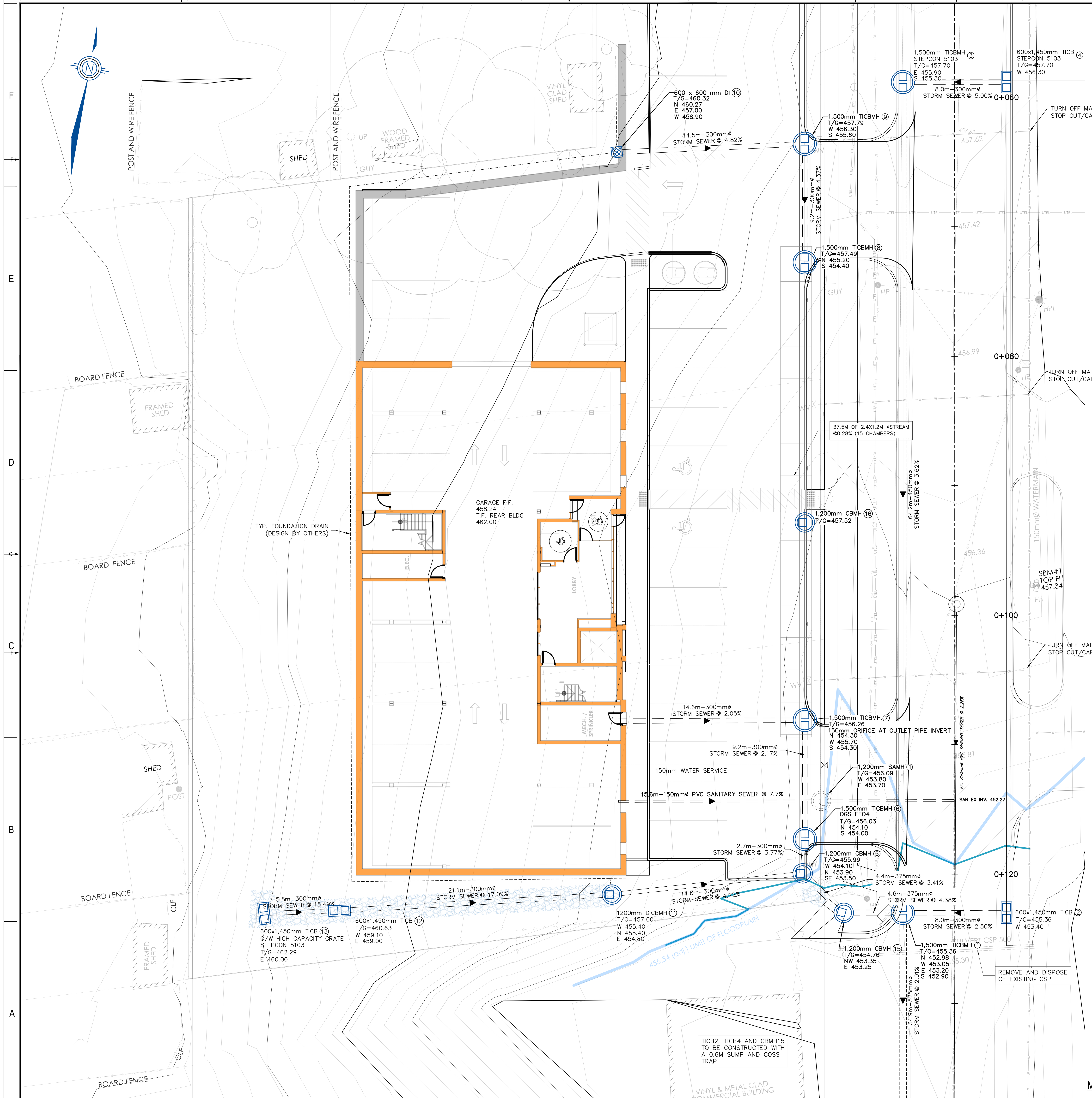
25mm
DESIGNED BY: K.PILON
DRAWN BY: K.PILON
CHECKED BY:

TITLE:
GRADING PLAN
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: GRAD-1



GENERAL NOTES:

GENERAL - CONSTRUCTION

1. ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH TOWN OF GRAND VALLEY ENGINEERING STANDARDS, OPSS AND OPSD. WHERE CONFLICT OCCURS, TOWN STANDARDS GOVERN.
2. DEWATERING TO BE CARRIED OUT IN ACCORDANCE WITH OPSS 517 AND 518 TO MAINTAIN ALL TRENCHES IN A DRY CONDITION.
3. ALL ENGINE DRIVEN PUMPS TO BE ADEQUATELY SILENCED, SUITABLE FOR OPERATION IN A RESIDENTIAL AREA.
4. DISTURBED AREAS TO BE REINSTATED TO EXISTING CONDITION. BOULEVARD AND GRASS AREAS; 200mm SCREENED TOPSOIL AND SOD; FOR ENTRANCES 50mm HL4 OVER 150mm GRAN. 'A' MINIMUM AND 450mm GRAN 'B' GRANULAR BASE. ALL TO BE APPROVED BY THE ENGINEER.
5. ALL MAINTENANCE HOLE FRAMES AND COVERS TO BE INITIALLY SET TO BASE COURSE HL4 ASPHALT ELEVATION AND ULTIMATELY RAISED BY ADDING PRECAST CONCRETE ADJUSTMENT UNITS OR POLYETHYLENE UNITS PRIOR TO PLACING SURFACE COURSE HL3 ASPHALT. MIN 150mm AND MAX 300mm ADJUSTMENT ALLOWED.
6. CONTRACTOR IS RESPONSIBLE TO NOTIFY ALL UTILITY COMPANIES AND RECEIVE LOCATES PRIOR TO COMMENCING WORK AND COORDINATE CONSTRUCTION ACCORDINGLY.
7. TOPSOIL TO BE REMOVED TO ITS FULL DEPTH ALONG THE EAST SIDE OF EMMA STREET FROM MILL STREET TO THE SOUTH SIDE OF THE PROPOSED DEVELOPMENT TO ACCOMMODATE THE NEW CURB, SIDEWALK AND RE-GRADING.
8. HYDRO AUTHORITY TO MODIFY GUY WIRES TO ACCOMMODATE SIDEWALK.
9. HYDRO POLES TO BE 'HELD' BY HYDRO AUTHORITY DURING EXCAVATION WORK IF WITHIN SAFE TRENCH.
10. REFER TO THE GEOTECHNICAL INVESTIGATION BY CMT PROJECT 23-146.R01 REVISED REPORT DATE JUNE 9, 2025.

ROADWAYS

1. CONCRETE CURB AND GUTTER TO OPSD 600.040.
2. CURB AND GUTTER TERMINATION TO OPSD 608.010.
3. CURB AND GUTTER CONSTRUCTION SHALL CONFORM TO OPSS 353.
4. 150Ø PIPE SUBDRAINS C/W FILTER "SOCK" SHALL BE INSTALLED UNDER ALL CURB AND GUTTER IN THE RIGHT OF WAY AND UNDER ALL 'LOW' CURBS IN THE PARKING LOT IN A 300x300mm TRENCH BELOW SUBGRADE IN GRANULAR 'A' BEDDING AND CONNECTED TO NEAREST CB OR CBMH WITH 2m SOLID 150Ø PIPE. ALL SUBDRAINS TO BE INSTALLED AS PER OPSS.PROV 405. WHERE CURB AND GUTTER IS NOT REQUIRED 6m OF SUBDRAIN TO BE INSTALLED UPSTREAM AND DOWNSTREAM OF STORM STRUCTURES.
5. SUBGRADE AND TRENCHES TO BE COMPACTED TO 95% SPDD COMPACTION AS PER OPSS 401 & 402.
6. GRANULAR 'A' AND 'B' MATERIALS TO BE COMPACTED TO 100% SPDD, AS PER OPSS 501.
7. BOULEVARD COMPACTION TO 95% SPDD. MINIMUM 200mm SCREENED TOPSOIL AND SOD IN RESTORED AREAS.
8. ROADWAY SUBGRADE TO BE PROOF ROLLED AND COMPACTED TO 95% SPDD PER GEOTECHNICAL REPORT RECOMMENDATIONS.
9. ROAD AND PARKING LOT CONSTRUCTION TO BE HOT MIX HL8 (50mm) BASE AND HL3 (40mm) TOP OVER 150mm GRAN. 'A' MINIMUM AND 450mm GRAN 'B' GRANULAR BASE.
10. SIDEWALK NORTH 1.5m WIDE, 125mm THICK, CONCRETE SIDEWALK ON MINIMUM 100mm DEPTH GR ANULAR 'A' BASE. SIDEWALK CROSSING ENTRANCES TO BE 175mm THICK CONCRETE ON 150mm THICK GRANULAR BASE . ALL IN ACCORDANCE WITH OPSS 351. SIDEWALK RAMPS TO BE PROVIDED AT ALL INTERSECTIONS AND ROAD CROSSINGS IN ACCORDANCE WITH OPSD 310.033.
11. APARTMENT ENTRANCES TO BE CONSTRUCTED TO OPSD 350.010.

SANITARY SEWERS AND SERVICES

1. SEWERMAINS SHALL BE PVC SDR 35 AT A MINIMUM DEPTH OF 2.4m.
2. MAINTENANCE HOLES TO OPSS 407 & OPSD 701.01 (1200mmØ). SET AS PER OPSD 704.010. (BENCHED AS PER OPSD 701.021). NEW BENCHING REQUIRED IN EX MANHOLE TO TOWN APPROVAL.
3. FRAMES AND COVERS TO BE OPSD 401.010 (TYPE A).
4. SERVICE CONNECTIONS TO BE GREEN 150mm PVC SDR28 WITH BELL AND SPIGOT JOINTS USING ELASTOMERIC GASKETS @ 2% min AND 8% MAX. RESIDENTIAL CONNECTIONS SHALL TERMINATE AT PROPERTY LINE WITH A TEST FITTING, PLUG SUITABLY BRACED TO WITHSTAND TEST PRESSURES AND 89mm X 38mm MARKER PLACED FROM THE INVERT OF THE CONNECTION TO 600mm ABOVE GRADE PAINTED GREEN.
5. CORE HOLE FOR NEW SERVICE AND INSTALL MANUFACTURED BOOT PER MANUFACTURER REQUIREMENTS.
6. SERVICE CONNECTIONS TO OPSD 1006.010 CLEANOUTS AT PROPERTY LINE WITH CLEANOUTS AT PIPE LEVEL.
7. BEDDING FOR SEWERS SHALL BE AS PER OPSD 802.01. BEDDING MATERIAL FOR SANITARY SEWER AND SERVICES SHALL BE GRANULAR 'A' AND OPSD 806.040.
8. BACKFILL AS PER OPSS 401 & 402 USING APPROVED IMPORTED GRANULAR MATERIAL.
9. INSTALLATION AND TESTING TO BE AS PER OPSS 410 AND COMPLY WITH INSPECTION AND TESTING REQUIREMENTS OUTLINED IN THE DESIGN CRITERIA FOR SANITARY SEWERS, STORM SEWERS AND FORCEMAINS FOR ALTERATIONS AUTHORIZED UNDER AN ENVIRONMENTAL COMPLIANCE APPROVAL MECP v.2.0 MAY 31, 2023 OR LATEST AMENDMENT.
10. FROST STRAPS, TWO (2), REQUIRED BETWEEN EACH SECTION OF THE SANITARY MANHOLE FROM THE TOP SECTION DOWN TO AT LEAST 2.5M.
11. MAINTENANCE HOLES TO BE EXTERNALLY WRAPPED WITH WATERPROOF MEMBRANE AROUND ALL PRECAST JOINTS INCLUDING JOINTS BELOW THE MAINTENANCE HOLE FRAME AND COVER WITH A MINIMUM 300MM WIDE STRAP. BENCHING TO BE ADJUSTED FOR NEW SERVICE.

STORM SEWERS

1. CONSTRUCTION OF MANHOLES, CATCH BASINS DITCH INLETS TO BE AS PER OPSS 407, STRUCTURES PER OPSD 701.010 (1200mmØ), 701.011 (1500mmØ), 701.012 (1800mmØ), 705.01 (600X600 CB), 705.02 (600X1450 DCB), 705.03 (600X600 DI). SET AS PER OPSD 704.010. BENCHED AS PER OPSD 701.021 FOR PIPES GREATER THAN 450mm.
2. MANHOLE FRAMES AND COVERS TO OPSD 401.010 (TYPE B) & 704.010.
3. CATCHBASIN AND CATCHBASIN MH FRAME AND GRATES TO OPSD 400.010 DITCH INLETS TO OPSD 403.01 & 704.010. TWIN INLET CATCHBASINS WITHIN SITE AT THE ENTRANCES TO OPSD 400.03. UNLESS OTHERWISE SPECIFIED ON DRAWINGS.
4. STORM SEWER CONSTRUCTION AS PER OPSS 410 & BACKFILL PER OPSS 401 & 402.
5. BEDDING FOR SEWERS SHALL BE AS PER OPSD 802.01, 802..050, 802.051, or 802.052 AS APPLICABLE. BEDDING MATERIAL FOR SANITARY SEWER AND SERVICES SHALL BE GRANULAR 'A' AND OPSD 806.040, 807.010 OR 807.030 AS APPLICABLE
6. BACKFILL, WITH APPROVED IMPORTED GRANULAR MATERIAL AS PER OPSS 401 & 402.
7. BENCHING SHALL BE REQUIRED PER OPSD 701.021 ON ALL MANHOLES. REAR YARD STRUCTURES SHALL BE SUMPLESS. OTHER CBs OR DIs TO BE CONSTRUCTED WITH A 600mm SUMP.
8. 600mm Ø OR LESS SEWERMAINS SHALL BE HDPE AT A MINIMUM DEPTH OF 1.2m. GREATER THAN 600mm Ø SEWERMAINS SHALL BE CONCRETE - CSA A257.2 CL 65D.
9. CATCHBASIN CONNECTIONS SHALL BE PER OPSD 708.010, 708.020 AND/OR 708.030 AS APPLICABLE.
10. ALL ROOF DRAINS SHALL BE DIRECTED TO 300mm STORM SERVICE. ROOF DRAINS TO BE INSTALLED WITH OVERFLOW AT SURFACE.
11. SWALES TO HAVE MINIMUM DEPTH OF 150mm AND MAX 3:1 SIDE SLOPES.
12. INSULATE CATCHBASIN LEADS AND SERVICES IF MINIMUM COVER OF 1.2M IS NOT ACHIEVED. INSULATION DETAIL ON THIS PAGE.
13. WHERE WATERMAIN IS ADJACENT TO STORM STRUCTURES, INSULATE SIDE OF STRUCTURE AS PER DETAIL.

XSTREAM INSTALLATION

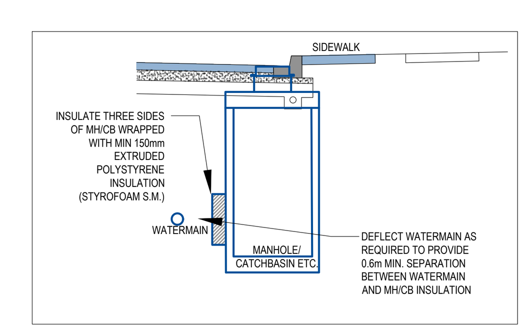
1. DO NOT USE LUBRICANT.
2. MIN 0.6m COVER. INSTALLATION PER OPSS 422 AND OPSD 803.010
3. ENSURE THE BELL AND SPIGOT OF THE BOX SECTIONS ARE CLEAN, DRY AND FREE OF DEBRIS.
4. ENSURE THE 200mm BEDDING IS LEVEL AND AT PROPER GRADE FOR THE BOX SECTIONS.
5. LAY FILTER CLOTH ON THE BEDDING WHERE THE NEXT JOINT WILL BE PLACED.
6. ALIGN THE SPIGOT OF THE BOX SECTION WITH THE BELL OF THE BOX SECTION PREVIOUSLY PLACED.
7. JOIN THE BOX SECTIONS. A COME ALONG CAN BE USED TO JOIN THE BOX SECTIONS. USE A HEAVY WOODEN BLOCK ACROSS THE BELL TO PULL THE SECTIONS TOGETHER AND PREVENT DAMAGE TO THE BELL OF THE BOX SECTION.
8. WRAP THE FILTER CLOTH OVER THE JOINT AND OVERLAP.

WATERMAIN AND WATER SERVICES

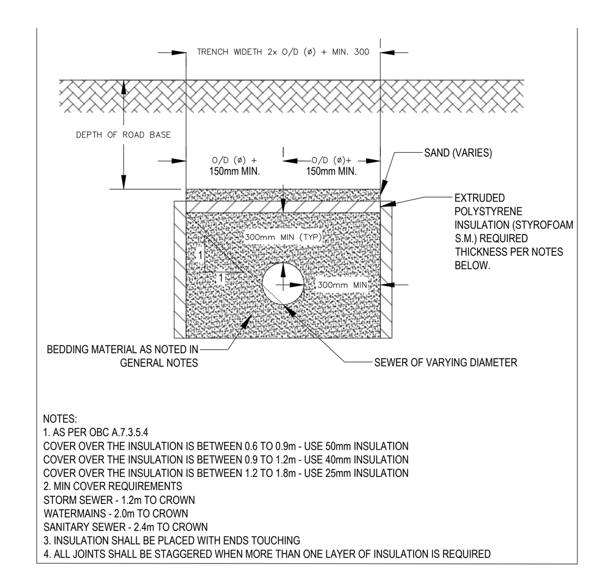
1. USE GRANULAR 'A' BEDDING AND COVER MATERIAL AS PER OPSD - 802.010 AND 806.040. BACKFILL TO BE APPROVED IMPORTED GRANULAR MATERIAL TO OPSS 401 AND 402.
2. 150mm GATE VALVE REQUIRED AT PROPERTY LINE FOR MAIN SERVICE TO TOWN STANDARD.
3. WATERMAIN SERVICES TO BE INSTALLED AS PER OPSS 441. MINIMUM SEPARATION FROM SANITARY SERVICES TO BE 500mm IN ACCORDANCE WITH THE O.B.C. 7.3.5.7. MINIMUM COVER OF 2.0M.
4. ALL CHEMICALS AND MATERIALS USED IN THE ALTERATION OR OPERATION OF THE DRINKING WATER SYSTEM THAT COME INTO CONTACT WITH WATER WITHIN THE SYSTEM SHALL MEET ALL APPLICABLE STANDARDS SET BY BOTH THE AMERICAN WATER WORKS ASSOCIATION (“AWWA”) AND THE AMERICAN NATIONAL STANDARDS INSTITUTE (“ANSI”) SAFETY CRITERIA STANDARDS NSF/60, NSF/61 AND NSF/372.
5. SERVICE SADDLES (ROBAR S.S. 2616 DOUBLE BOLD, WIDE STRAP) WITH TAPPING SADDLE (ROBAR 6906)
6. CURB STOPS (MUELLER B25209) WITH STAINLESS STEEL ROD AND PINS
7. MINIMUM VERTICAL CLEARANCE BETWEEN SEWERS AND WATERMAIN TO BE 0.5M. MINIMUM HORIZONTAL CLEARANCE TO BE 2.5M. SEWERS INCLUDE SANITARY SEWERS, STORM SEWERS AND ASSOCIATED SERVICES OR APPURTENANCES (MANHOLES, CATCHBASINS ETC).

PARKING LOT CONSTRUCTION

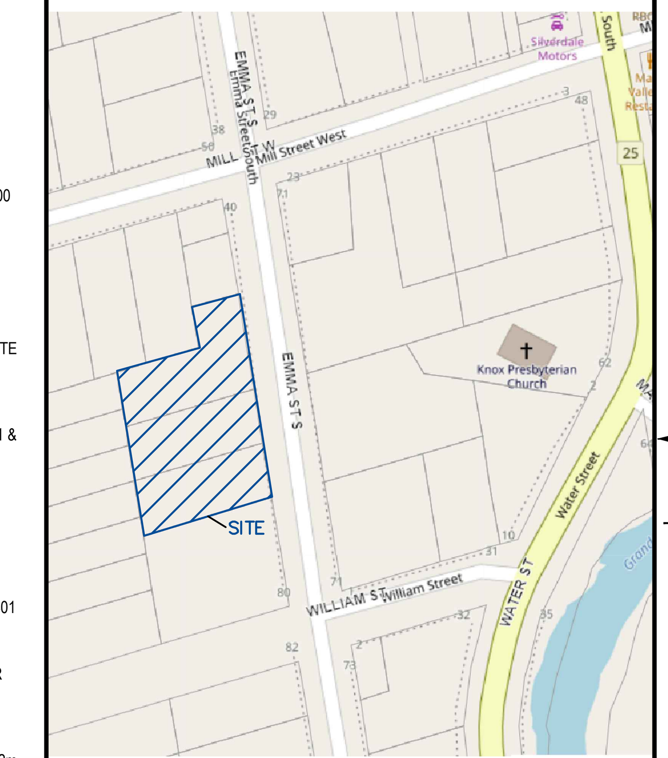
1. 40mm HL3 SURFACE COVER OVER 50mm HL8 BASE COURSE. 150mm GRAN. 'A' MINIMUM AND 450mm GRAN 'B' GRANULAR BASE. ALL TO BE APPROVED BY THE ENGINEER.
2. THE GRANULAR BASE AND SUBBASE MATERIALS MUST CONFORM TO THE PHYSICAL PROPERTY AND GRADATION REQUIREMENTS OF OPSS 1010 AND MUST BE COMPACTED TO 100% SPMDD. ASPHALTIC CONCRETE SHOULD BE SUPPLIED, PLACED, AND COMPACTED TO A MINIMUM 92.0% MARSHALL MAXIMUM RELATIVE DENSITY, IN ACCORDANCE WITH OPSS 1150 AND OPSS 310.
3. CONSTRUCTION JOINTS IN THE SURFACE AND INTERMEDIATE BINDER ASPHALT MUST BE OFFSET A MINIMUM OF 150 MM TO 300 MM (6" TO 12") FROM CONSTRUCTION JOINTS IN THE BINDER ASPHALT SO THAT LONGITUDINAL JOINTS DO NOT COINCIDE.



MANHOLE/CATCHBASIN INSULATION DETAIL
N.T.S.



INSULATION FOR VARIOUS INFRASTRUCTURE
N.T.S.



BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 459.40 AS SHOWN ON THE PLANS.

SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS

6297 WELLINGTON COUNTY ROAD RR#3
HARRISTON, ONTARIO
CANADA N0G 1Z0
PHONE: 519-510-3571 FAX: 519-510-3277
WWW.MOOREFIELDEX.CA

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2	0	12-18-2024	SPA SUBMISSION - CONDO
1	0	06-13-2024	ZBA OPA SUBMISSION - CONDO
1	0	10-05-2023	ZBA OPA SUBMISSION

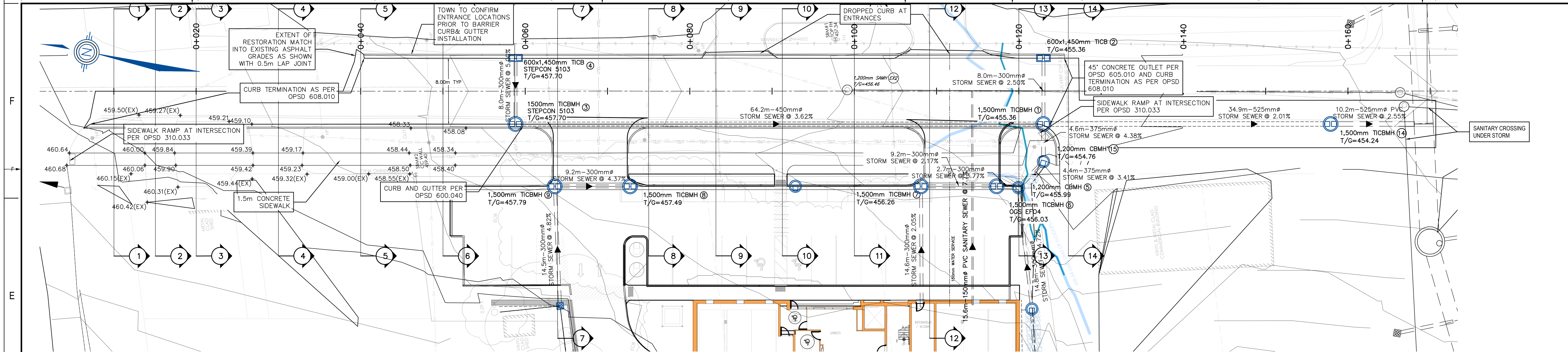
PROJECT NO: 231-103	DATE: JUNE 2024
ORIGINAL SCALE: 1:150	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: K.PILON	
DRAWN BY: K.PILON	
CHECKED BY:	25mm

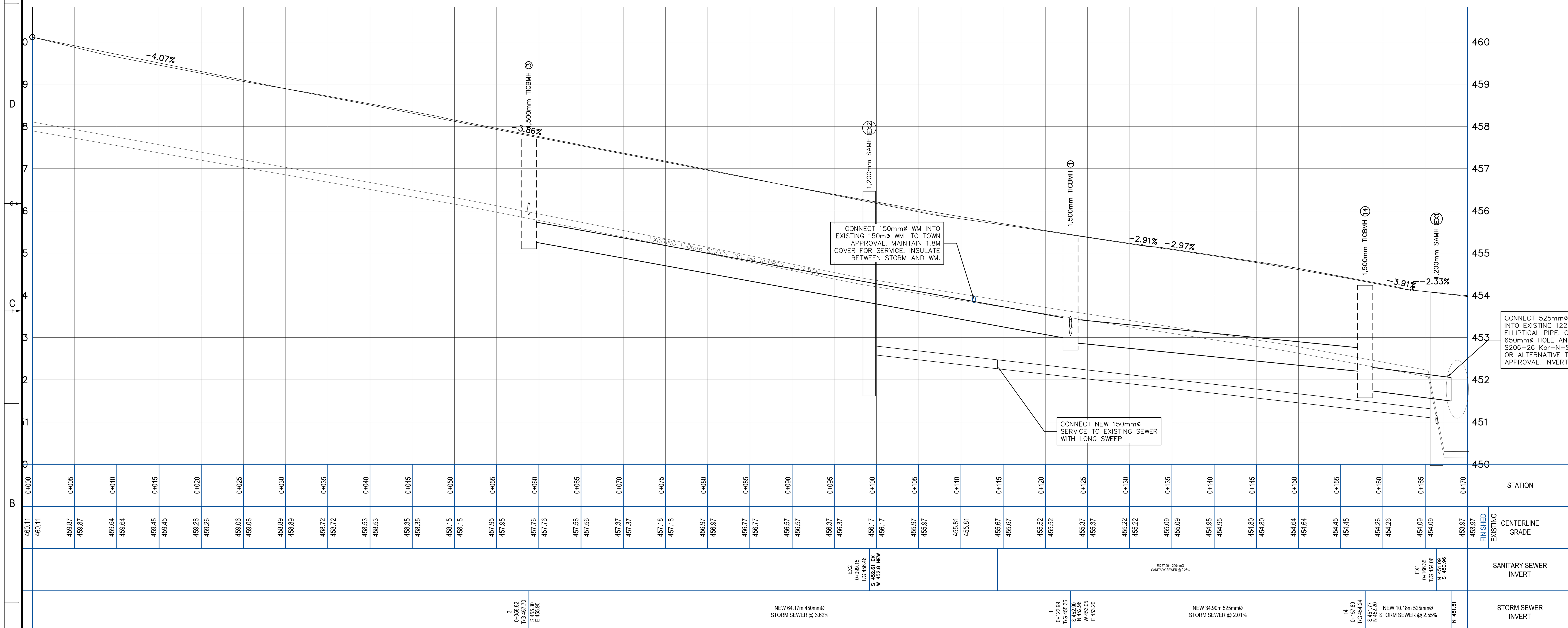
TITLE:

SERVICING PLAN
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: SERV-1

C:\Users\kim\OneDrive - Moorefield Exca\Documents\Emma Street Grand Valley\june 20.dwg Jul 07, 2025-10:42am BY:(kim)





BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 459.40 AS SHOWN ON THE PLANS.

SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS
6297 WELLINGTON COUNTY ROAD RR#3
HARRISTON, ONTARIO
CANADA N0G 1Z0
PHONE: 519-510-3571 FAX: 519-510-3277
WWW.MOOREFIELDEX.CA

ISSUED FOR - REVISION:

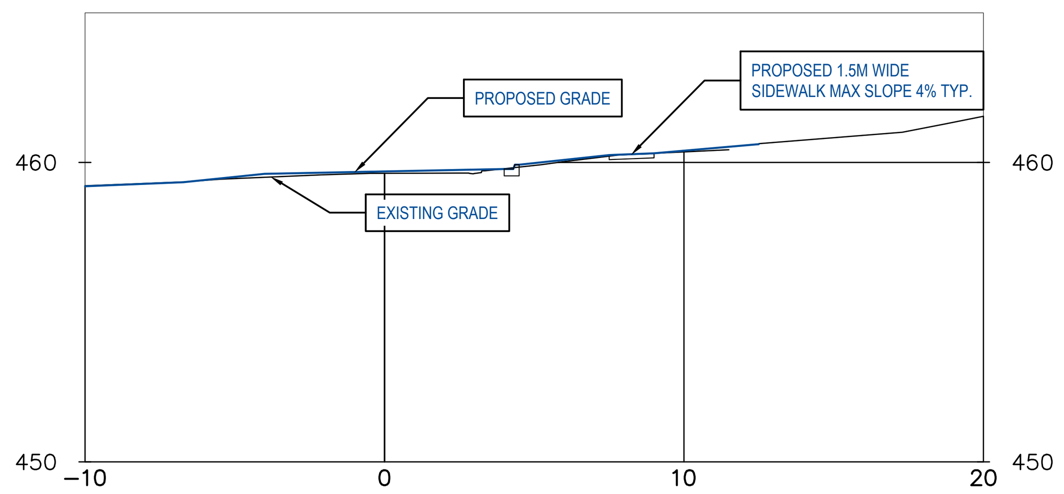
IS	RE	DATE	DESCRIPTION
2	0	12-18-2024	SPA SUBMISSION - CONDO
1	0	06-13-2024	ZBA OPA SUBMISSION - CONDO
1	0	10-05-2023	ZBA OPA SUBMISSION

PROJECT NO: 231-103
DATE: JUNE 2024
ORIGINAL SCALE: 1:250
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: K.PILON
DRAWN BY: K.PILON
CHECKED BY:

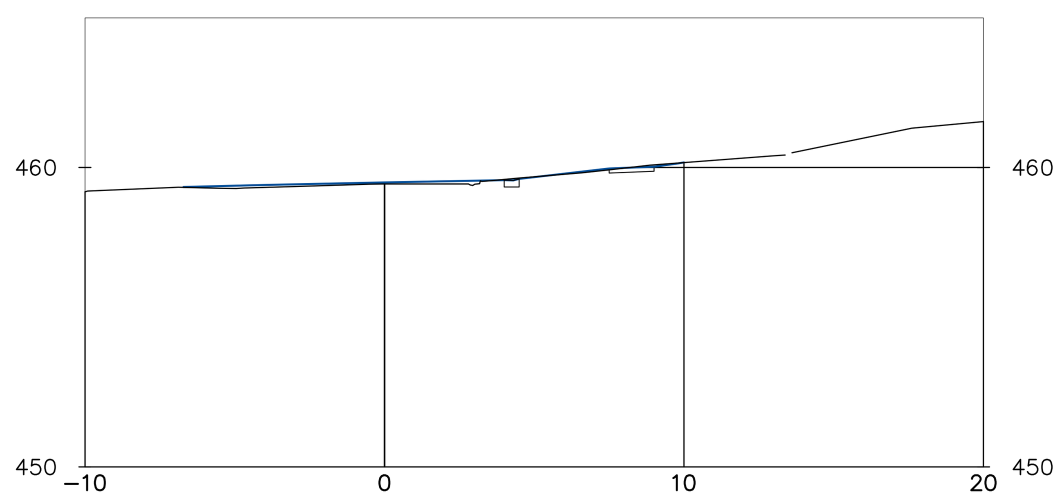
TITLE:
PLAN AND PROFILE
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: P&P1

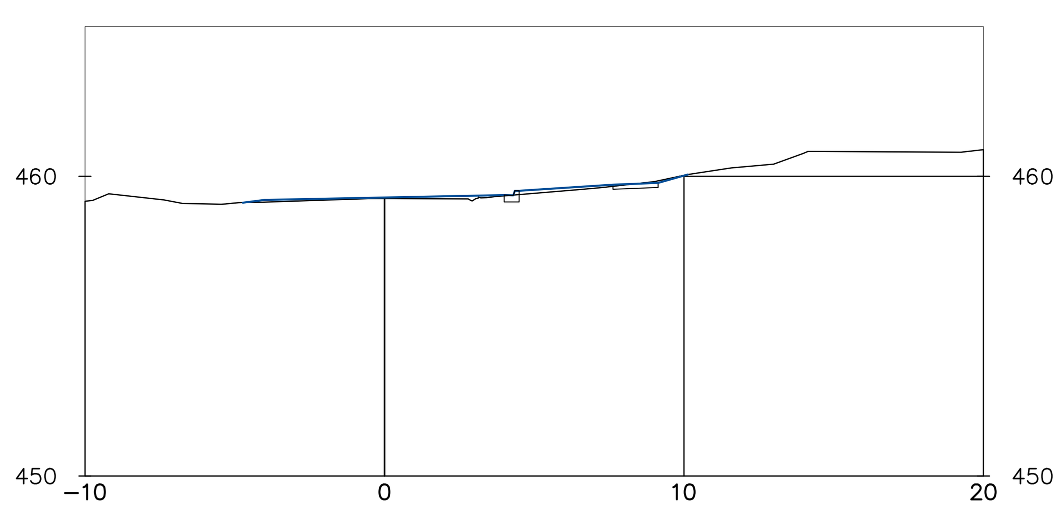
SECTION 1 (0+010.00)



SECTION 2 (0+015.04)



SECTION 3 (0+020.00)



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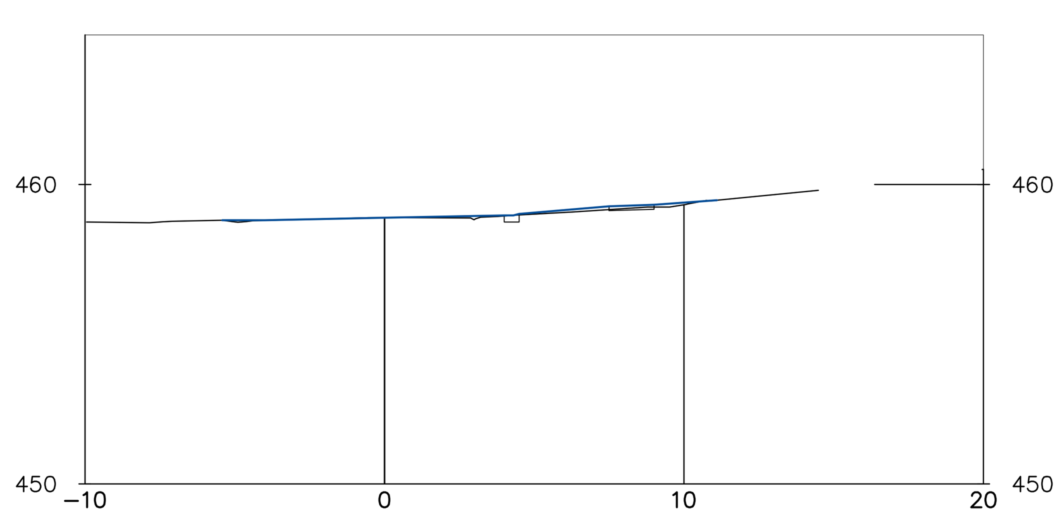
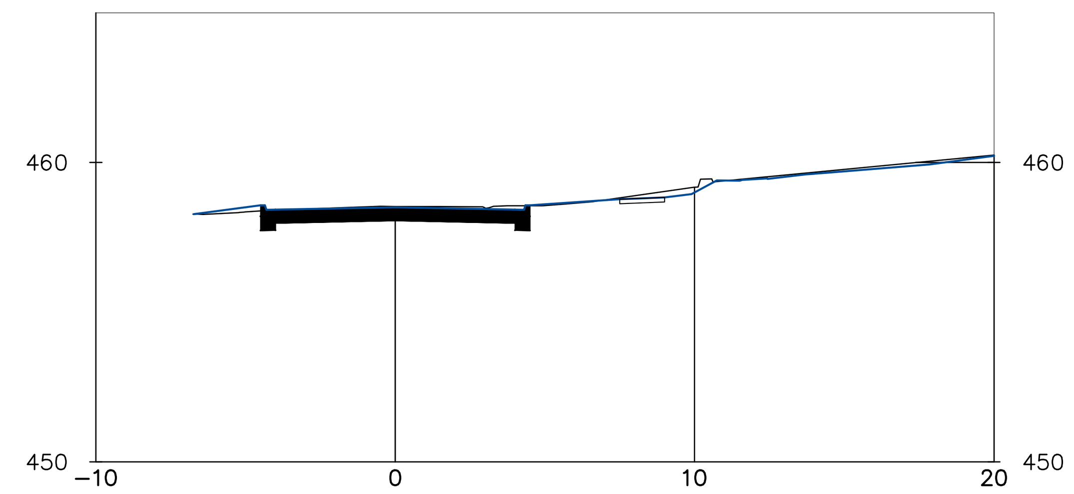
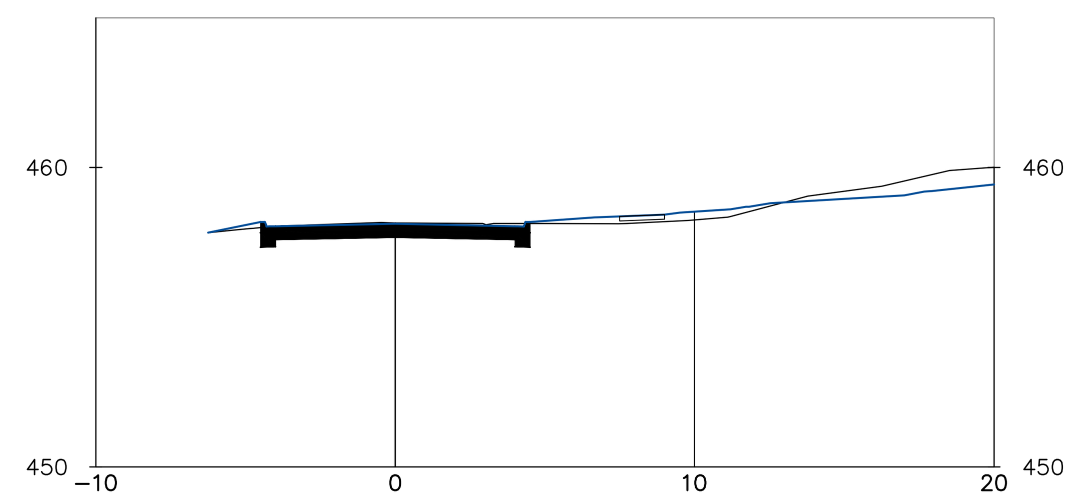


SECTION 5 (0+040.00)



SECTION 6 (0+050.00)



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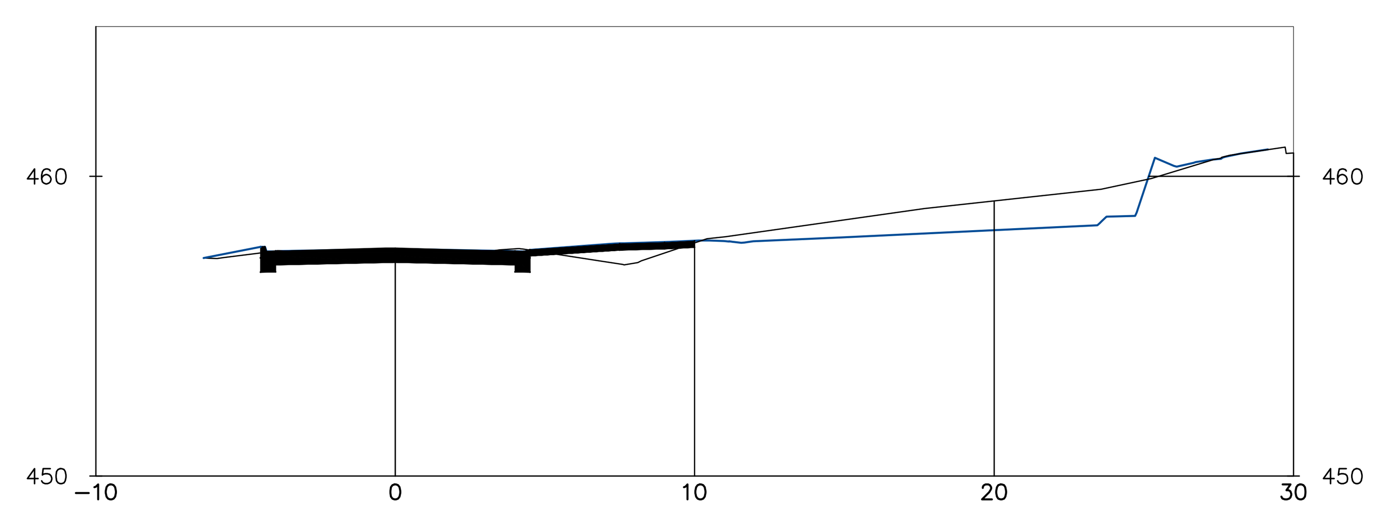

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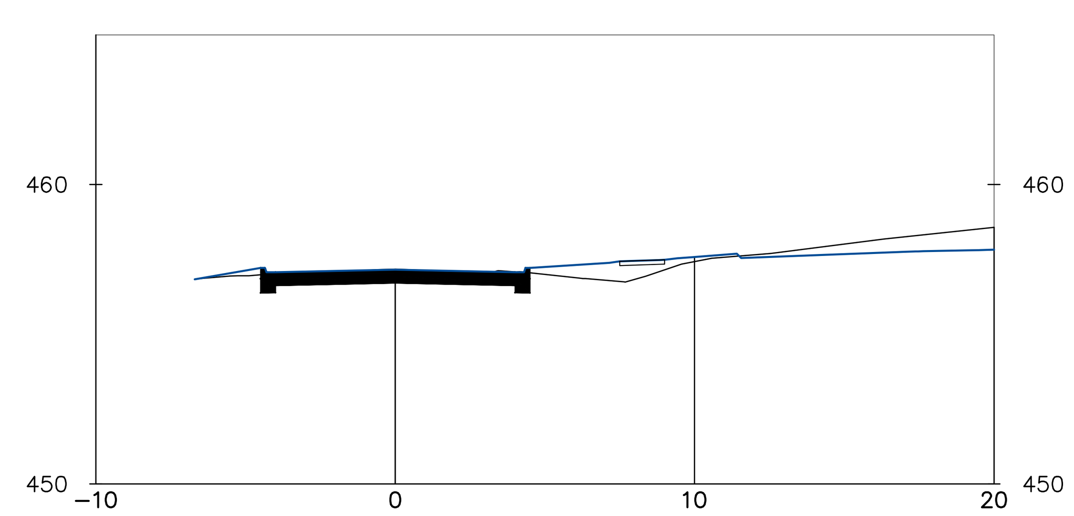
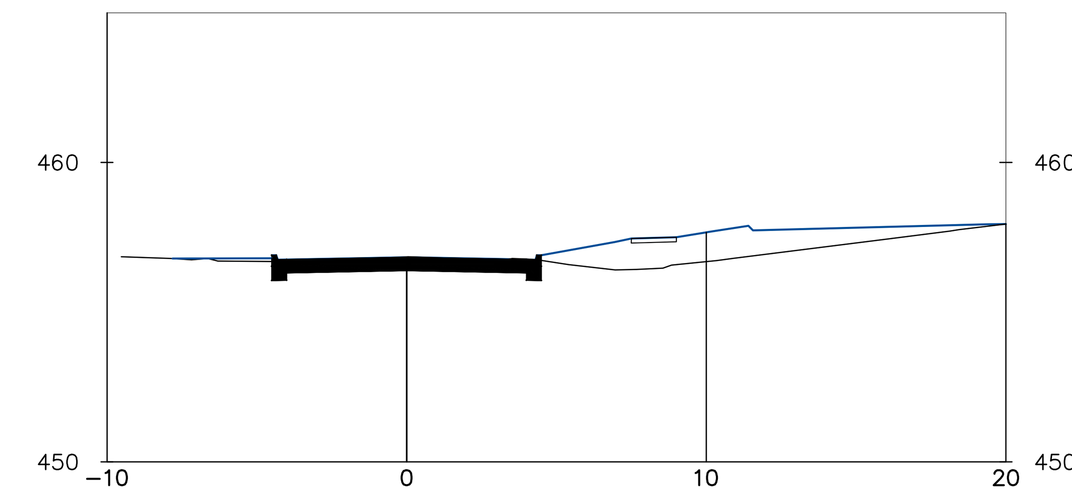
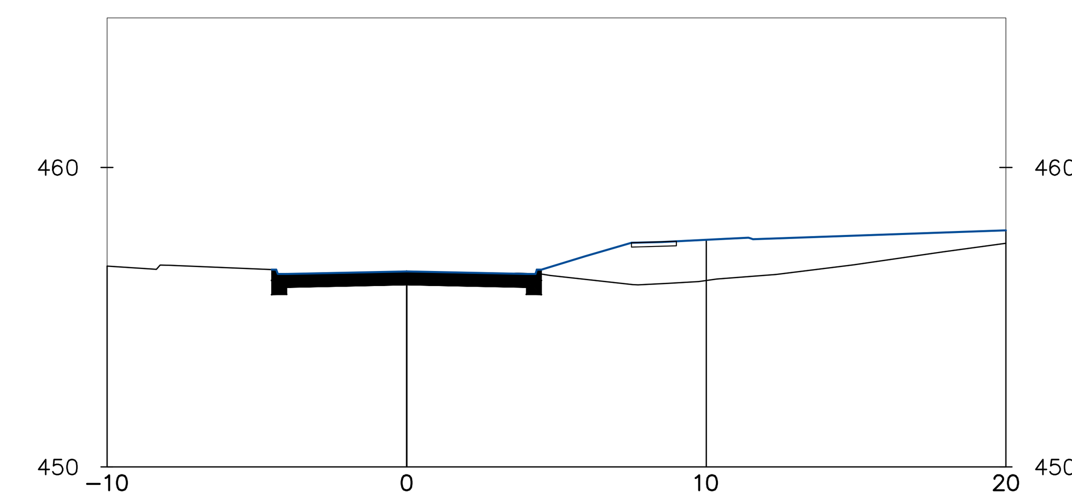


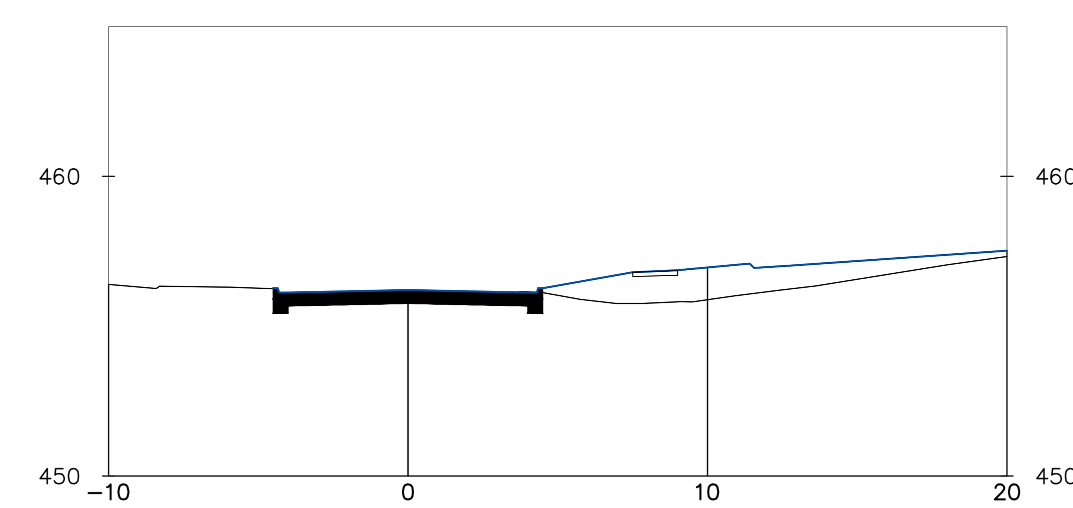
SECTION 9 (0+083.17)



SECTION 10 (0+091.25)



SECTION 11 (0+100.00)



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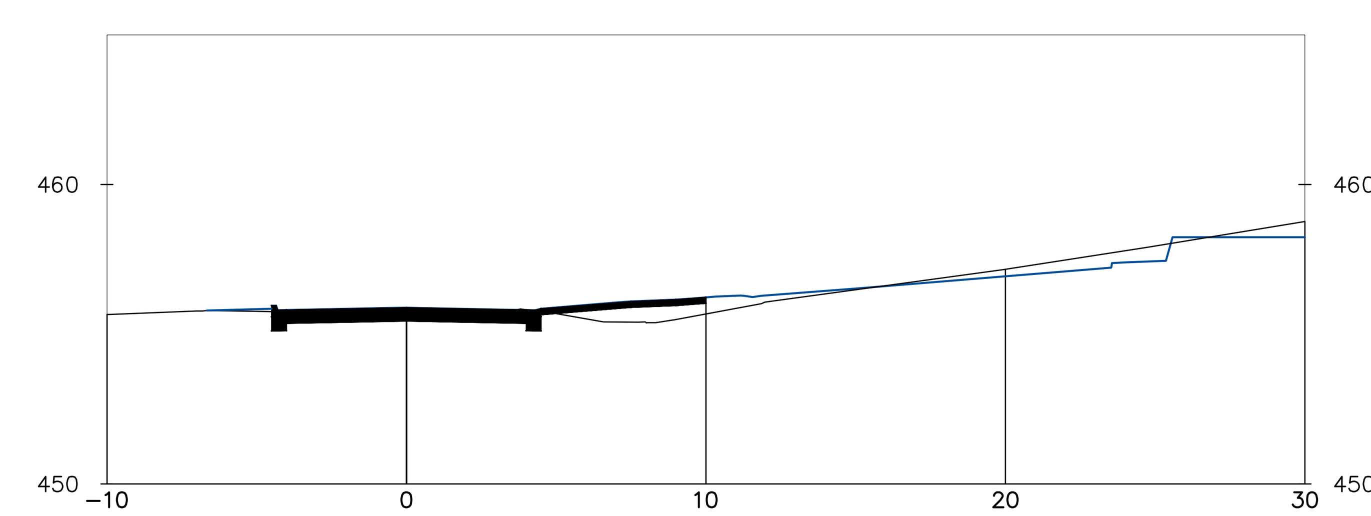

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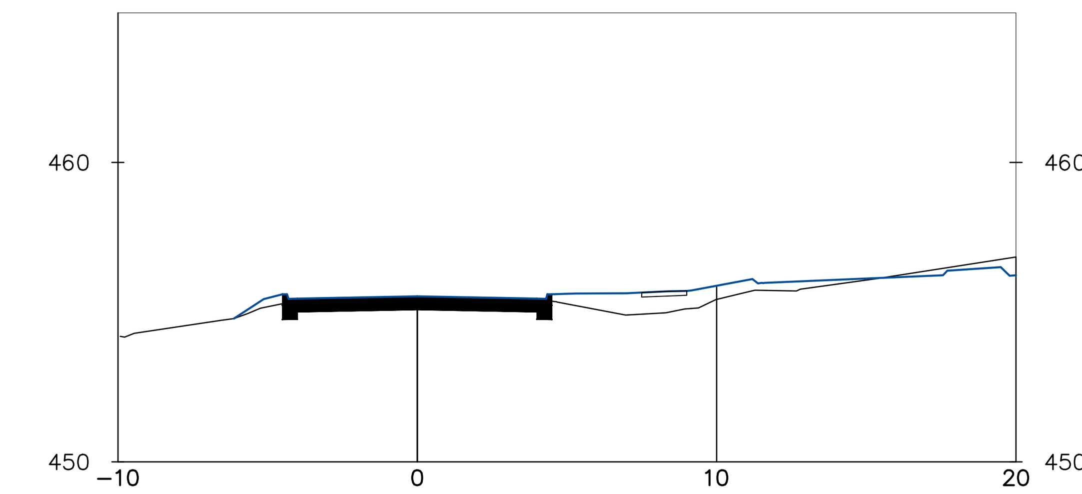

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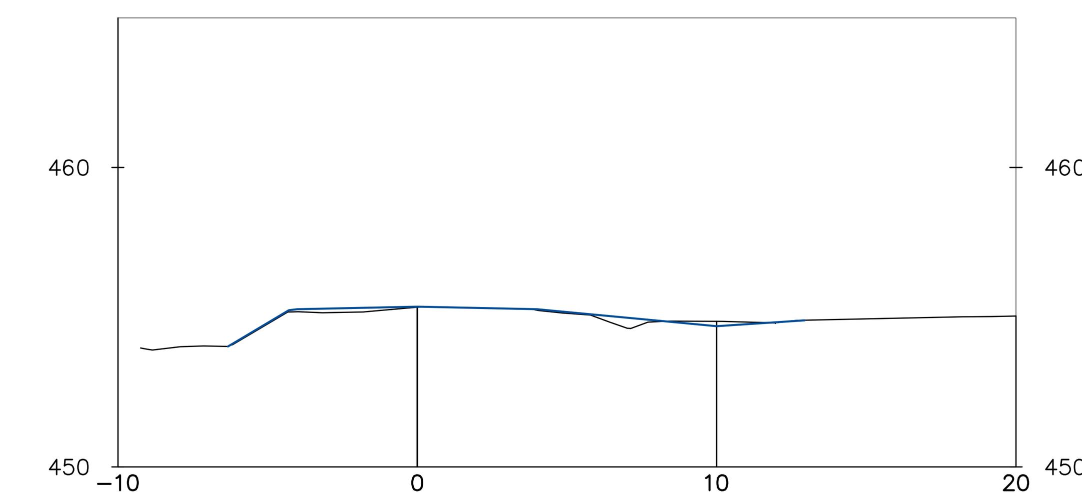
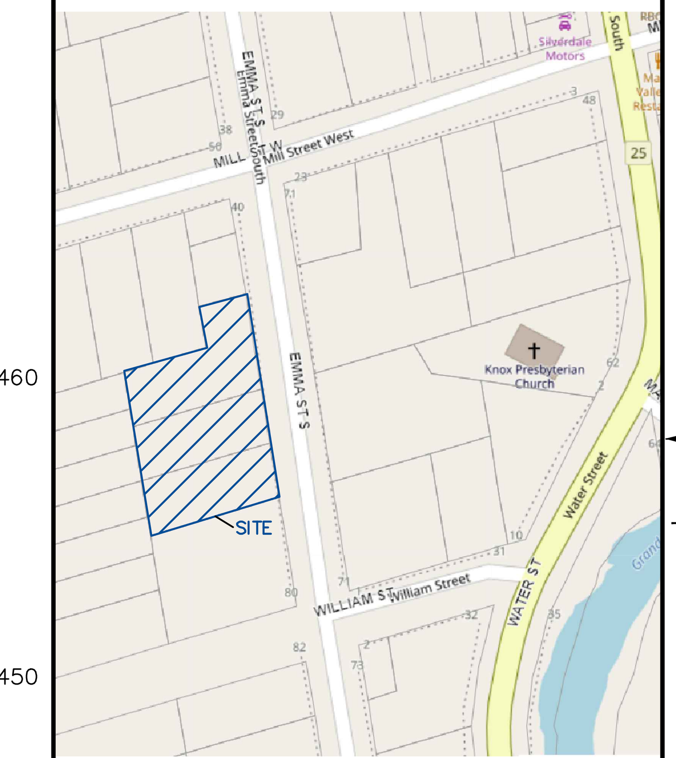




SEAL:

MOOREFIELD excavating
ROADS SEWERS WATER MAINS

6297 WELLINGTON COUNTY ROAD RR#3
HARRISTON, ONTARIO
CANADA N0G 1Z0
PHONE: 519-510-3571 FAX: 519-510-3277
WWW.MOOREFIELDEX.CA

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2	0	12-18-2024	SPA SUBMISSION - CONDO

PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:200

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: K.PILON

DRAWN BY: K.PILON

CHECKED BY:

TITLE:

SECTIONS
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: P&P2

APPENDIX B

Fire Flow Calculations

TABLE 1
WATER SUPPLY COEFFICIENT – K

TYPE OF CONSTRUCTION	Classification by Group or Division in Accordance with Table 3.1.2.1 of the Ontario Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. of the OBC. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. of the OBC.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53

Fire Load Calculations as per the Ontario Building Code (OBC)

1) Determine Building to be Assessed

Emma Street Apartments, Sheldon Creek

2) Determine Building Classification

	Classification Code
Residential	C

3) Determine Building Specific Details

Floors are fire separations, structural members are fire resistive?	Yes
Sprinkler system?	Yes
Stand-pipe system?	Yes

4) Calculate Fire Load and Required Minimum Fire Flow

$$Q = K\ V\ S_{Tot}$$

where
- Q = minimum supply of water available in litres (L)
- K = water supply coefficient
- V= building volume
- S_{tot} = total of spatial coefficient values from property line exposure on all sides, to a maximum of 2

a) Determine K — See Table 1. OBC classification C

K = 18

b) Calculate Building Volume, V

V = (820x3.76) +(3x(689x3.05)) = **9387.6 m^3**

c) Determine Spatial Coefficient, S_{tot}

$S_{tot} = 1 + \Sigma S_x$

S_{tot} = 1.11

The exposure distance can be used to determine the spatial coefficient for each wall of building. Distances greater than 10 m do not have an exposure charge. Max 2.0.

		Exposure Distance
S_{front} =	0.00	>10 m
S_{back} =	0.00	>10 m
S_{left} =	0.11	8.8m<10 m
S_{right} =	0.00	>10 m
ΣS_x =	0.11	

d) Resulting Fire Load

K =	18
V =	9387.6
S_{tot} =	1.11
Q =	**187564.2**

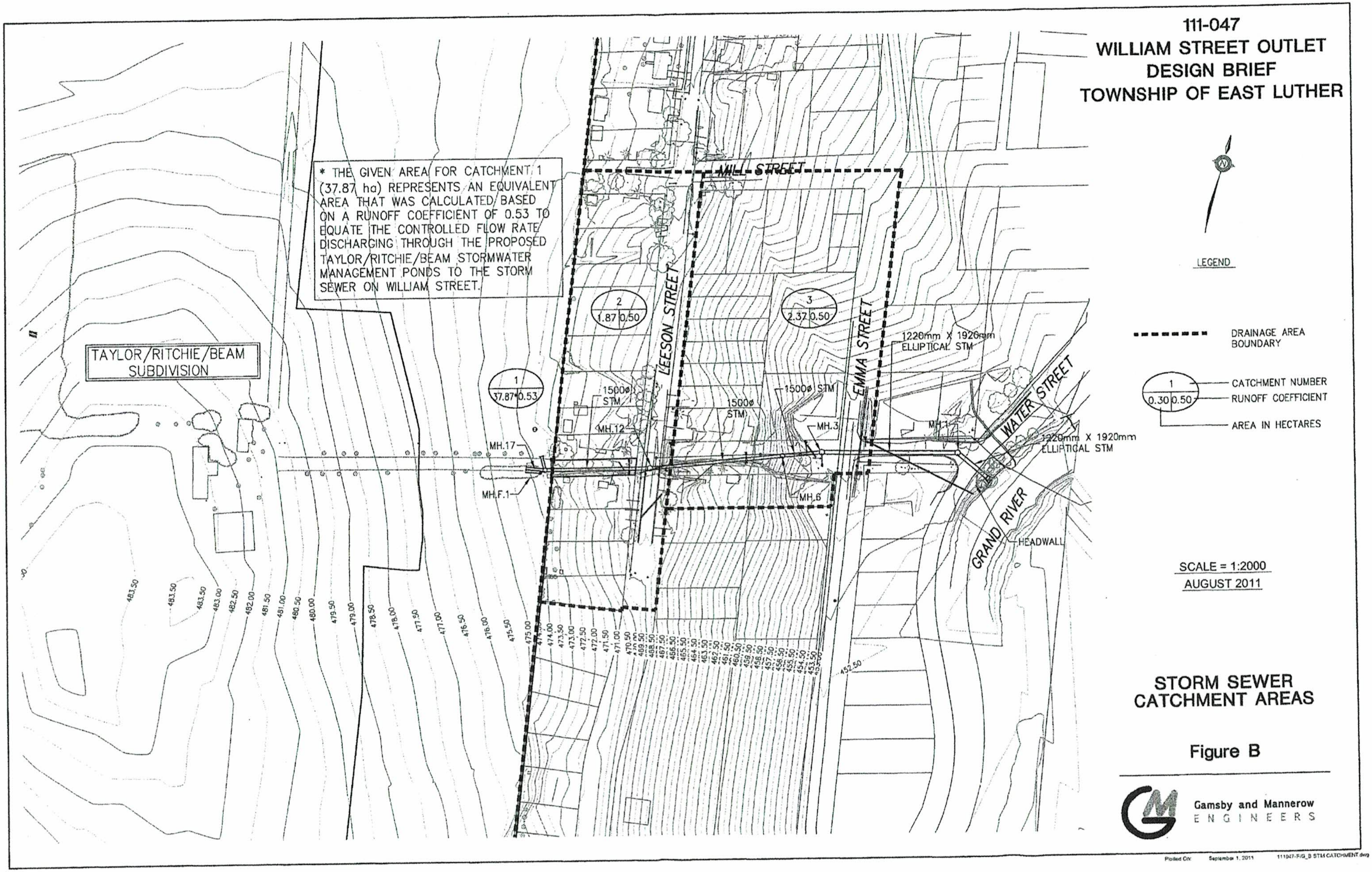
From Table 2:

If Q	Flow Rate L/min
1 storey bldg. <600m2	1800
<=108,000	2700
>108,000 and <=135,000	3600
>135,000 and <=162,000	4500
>162,000 and <=190,000	5400
>190,000 and <=270,000	6300
> 270000	9000

Therefore, the required minimum water supply flow rate is 5400 **L/min**

APPENDIX C

Stormwater Management – Storm Sewer Calculations, Rational Method, Inlet Capacity, Swale Evaluation


111-047
WILLIAM STREET OUTLET
DESIGN BRIEF
TOWNSHIP OF EAST LUTHER
* THE GIVEN AREA FOR CATCHMENT 1 (37.87 ha) REPRESENTS AN EQUIVALENT AREA THAT WAS CALCULATED BASED ON A RUNOFF COEFFICIENT OF 0.53 TO EQUATE THE CONTROLLED FLOW RATE DISCHARGING THROUGH THE PROPOSED TAYLOR/RITCHIE/BEAM STORMWATER MANAGEMENT PONDS TO THE STORM SEWER ON WILLIAM STREET.
TAYLOR/RITCHIE/BEAM SUBDIVISION
MILL STREET
LEESON STREET
EMMA STREET
WATER STREET
GRAND RIVER
HEADWALL
1500ø STM
1220mm X 1920mm ELLIPTICAL STM
MH.17
MH.F.1
MH.12
MH.3
MH.6
MH.1
1 37.87* 0.53
2 1.87 0.50
3 2.37 0.50
LEGEND
DRAINAGE AREA BOUNDARY
CATCHMENT NUMBER
RUNOFF COEFFICIENT
AREA IN HECTARES
1 0.30 0.50
SCALE = 1:2000
AUGUST 2011
STORM SEWER CATCHMENT AREAS
Figure B
Gamsby and Mannerow ENGINEERS

William Street Outlet
Design Brief
Township of East Luther Grand Valley
G&M: 111-047

Rational Method Calculations

Time of Concentration

In watersheds with a C value of 0.40 or more, the time of concentration should be determined using the Bransby Williams Formula:

$$T_c = \frac{0.057 * L}{S_w^{0.2} * A^{0.1}}$$

T_c – Time of Concentration (min)

L – Watershed Length (m)

S_w – Watershed Slope (%)

A – Watershed Area (ha)

The Taylor/Ritchie/Beam proposed development has a C value of 0.53, therefore the Bransby Williams Formula will be used.

$$T_c = \frac{0.057 * L}{S_w^{0.2} * A^{0.1}}$$

$$T_c = \frac{0.057 * (1{,}100m)}{(0.7\%)^{0.2} * (61.97ha)^{0.1}}$$

$$T_c = 44.569 \min$$

T_c – Time of Concentration (min)

L – 1,100 m

S_w – 0.7 %

A – 61.97 ha (From Figure 2)

Equivalent Area Calculation

$$Q = 0.0028CiA$$

$$A = \frac{Q}{0.0028Ci}$$

$$A = \frac{4.919m^3/s}{0.0028 * 0.53 * 88.23mm/hr}$$

$$A = 37.87ha$$

Q – Flow Rate (4.919 m^3/s from model)
C – Runoff Coefficient (0.53 average)
i – Intensity (88.23 mm/hr design sheet)
A – Area (unknown)

Reference: MTO Drainage Manual (1984), Chapter B4-4

Fergus Shad Chicago Storm Parameters
A = 1459.072
B = 13.690
C = 0.850
Intensity = $A / (t + B)^C$

Q = CiA (m^3/s)

STORM SEWER DESIGN

5 Year Design

Grand Valley

Sheet 1 of 1

Street	From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer: Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
Right of Way	MH 18	MH 13	0.00	0.5	0.00	0.00	0.00	157.81	**0.000**	69.2	1500	0.013	3.27	13.750	7.78	0.15
	MH 13	MH 7	1.87	0.5	0.94	0.94	10.00	99.01	**0.257**	79.9	1500	0.013	12.50	26.884	15.21	0.09
	MH 7	MH 4	0.00	0.5	0.00	0.94	10.09	98.70	**0.256**	23.9	1500	0.013	5.32	17.539	9.92	0.04
William Street	MH 4	MH 2	0.00	0.5	0.00	0.94	10.13	98.56	**0.256**	81.5	1500	0.013	0.50	5.377	3.04	0.45
	MH 2	MH 1	2.37	0.5	1.19	2.12	10.57	97.02	**0.571**	12.1	1500	0.013	0.50	5.377	3.04	0.07
	MH 1	HW	0.00	0.5	0.00	2.12	10.64	96.79	**0.570**	12.0	1500	0.013	0.50	5.377	3.04	0.07
100 Year Storm																
	MH 4	MH2	0	0.5	0	0.94	10.13	155.84	0.407							
	MH 2	MH1	2.37	0.5	1.19	2.12	10.57	154.32	0.909							

Minimum diameter = 300 mm
Minimum acceptable velocity = 0.75 m/s
Maximum acceptable velocity = 4.5 m/s

Date:	August 5, 2011	Project:	Taylor/Ritchie/Beam - Storm Outlet
Designed By:	GWC		
Checked By:		File:	111-047

Fergus Shad Chicago Storm Parameters
A = 1459.072
B = 13.690
C = 0.850
Intensity = $A / (t + B)^C$

Q = CiA (m^3/s)

STORM SEWER DESIGN

5 Year Design

Grand Valley

Sheet 1 of 1

Street	From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	Flow (m^3/s)	Proposed Sewer: Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
Right of Way	MH ~~18~~ 17	MH ~~13~~ 12	0.00	0.5	0.00	0.00	0.00	157.81	**0.000**	69.2	1500	0.013	3.27	13.750	7.78	0.15
	MH ~~13~~ 12	MH ~~7~~ 6	1.87	0.5	0.94	0.94	10.00	99.01	**0.257**	79.9	1500	0.013	12.50	26.884	15.21	0.09
	MH ~~7~~ 6	MH ~~4~~ 3	0.00	0.5	0.00	0.94	10.09	98.70	**0.256**	23.9	1500	0.013	5.32	17.539	9.92	0.04
William Street	MH ~~4~~ 3	MH 2	0.00	0.5	0.00	0.94	10.13	98.56	**0.256**	81.5	1500	0.013	0.50	5.377	3.04	0.45
	MH 2	MH 1	2.37	0.5	1.19	2.12	10.57	97.02	**0.571**	12.1	1500	0.013	0.50	5.377	3.04	0.07
	MH 1	HW	0.00	0.5	0.00	2.12	10.64	96.79	**0.570**	12.0	1500	0.013	0.50	5.377	3.04	0.07

MH 2 does not actually exist

Minimum diameter = 300 mm
Minimum acceptable velocity = 0.75 m/s
Maximum acceptable velocity = 4.5 m/s

Date: August 5, 2011
Designed By: GWC
Checked By:

Project: Taylor/Ritchie/Beam - Storm Outlet
File: 111-047

Fergus Shad Chicago Storm Parameters
A = 6933.019
B = 34.699
C = 0.998
Intensity = $A / (t + B)^{C}$

Q = CiA (m^3/s)

STORM SEWER DESIGN

100 Year Design

Grand Valley

Sheet 1 of 1

Street	From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	100 Year Flow (m^3/s)	5 Year Flow (m^3/s)	Combined Flow (m^3/s)	Proposed Sewer: Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
Site	Subdivision	MH ~~18~~ 17	37.87	0.53	20.07	20.07	44.57	88.23	4.919		**4.919**	~~6.0~~ 22	1500	0.013	0.50	5.377	3.04	0.03
Right of Way	MH ~~18~~ 17	MH ~~13~~ 12	0.00	0.5	0.00	20.07	44.60	88.19	4.917	0.000	**4.917**	69.2	1500	0.013	3.27	13.750	7.78	0.15
	MH ~~13~~ 12	MH ~~7~~ 6	0.00	0.5	0.00	20.07	44.75	88.03	4.908	0.257	**5.165**	79.9	1500	0.013	12.50	26.884	15.21	0.09
	MH ~~7~~ 6	MH ~~4~~ 3	0.00	0.5	0.00	20.07	44.84	87.93	4.903	0.256	**5.159**	23.9	1500	0.013	5.32	17.539	9.92	0.04
William Street	MH ~~4~~ 3	MH 2	0.00	0.5	0.00	20.07	44.88	87.89	4.900	0.256	**5.156**	81.5	1500	0.013	0.50	5.377	3.04	0.45
	MH 2	MH 1	0.00	0.5	0.00	20.07	45.33	87.40	4.873	0.571	**5.444**	12.1	1500	0.013	0.50	5.377	3.04	0.07
	MH 1	HW	0.00	0.5	0.00	20.07	45.39	87.33	4.869	0.570	**5.439**	12.0	1500	0.013	0.50	5.377	3.04	0.07

MH 2 doesn't actually exist

Minimum diameter = 300 mm
Minimum acceptable velocity = 0.75 m/s
Maximum acceptable velocity = 4.5 m/s

Date: August 5, 2011
Designed By: GWC
Checked By:

Project: Taylor/Ritchie/Beam - Storm Outlet
File: 111-047

STORM SEWER DESIGN SHEET
5 & 100 YEAR DESIGN STORM - NO CONTROL
PRE AND POST DEVELOPMENT

LOCATION: CATCHMENT	AREA TOTAL	C Value Calculated	FROM	TO	AREAS (ha): at C=0.20 (ha)	at C=0.50 (ha)	at C=0.95 (ha)	INDIV. 2.78 AC	ACCUM. 2.78 AC	TIME OF CONC.	RAINFALL INTENSITY I (mm/hr) 100YR	RAINFALL INTENSITY I (mm/hr) 5YR	PEAK FLOW 100 YEAR PCSWMM Q (L/s)	PEAK FLOW 100 YEAR Q (L/s)	PEAK FLOW 5 YEAR Q (L/s)	Pipe	SEWER DATA: DIAMETER (mm)	SLOPE (%)	LENGTH (m)	CAPACITY (L/s)	VELOCITY (m/s)	TIME (minutes)	Total Time (min)	% Capacity 100 YEAR PCSWMM	% Capacity 100 YEAR	% Capacity 5 YEAR	
PRE-DEVELOPMENT																											
EXT2	0.72	0.62		EMMA ST		0.500	0.220	1.275	1.275	10.00	156.29	99.01		199.27	126.24	Metric											
EXT1	0.29	0.50				0.29		0.403	0.403	11.00	152.87	95.59		61.58	38.50												
PRE	0.41	0.32		EMMA ST	0.34		0.07	0.369	0.369	10.00	156.29	99.01		57.74	36.58	Metric											
Total														318.58	201.33	Metric	1500	0.45	82.20	4792.40	2.71	0.51	0.51	0.0%	6.6%	4.2%	
POST-DEVELOPMENT																											
(Leeson W Side) 100	0.54					0.54		0.750	0.750	10.00	156.29	99.01		117.22	74.26												West side Leeson and Storm System can handle this flow
(Leeson W Side) 101	0.09					0.09		0.122	0.122	10.00	156.29	99.01		18.99	12.03												
(Leeson E Side) 102	0.07						0.07	0.185	0.185	10.00	156.29	99.01		28.87	18.29												
(Leeson st east side properties) 103	0.31		TICB13	TICB12		0.31		0.431	0.997	10.00	156.29	99.01	173.00	155.79	98.70	Metric	300	16.69	5.40	395.06	5.59	0.02	10.02	43.8%	39.4%	25.0%	REAR YARD SWALE DESIGNED FOR 100 YEAR STORM, add 40L/s from Catchment 100
POST-1	0.08		DI10	TICBMH9		0.08		0.111	0.111	10.00	156.29	99.01	27.00	17.37	11.00	Metric	300	4.82	14.50	212.30	3.00	0.08	10.08	12.7%	8.2%	5.2%	
POST-2	0.02		TICBMH9	TICBMH8			0.02	0.053	0.164	10.08	156.01	98.73	76.00	25.57	16.18	Metric	300	4.37	9.20	202.15	2.86	0.05	10.13	37.6%	12.6%	8.0%	
POST-3	0.07		TICBMH8	TICBMH7			0.07	0.185	0.349	10.13	155.82	98.54	89.00	54.32	34.35	Metric	1720	0.43	35.10	6677.05	2.87	0.20	10.34	1.3%	0.8%	0.5%	equivalent pipe
POST-4	0.03		TICBMH7	TICBMH6			0.03	0.079	0.639	10.34	155.12	97.83	65.00	99.10	62.50	Metric	300	2.17	9.20	142.45	2.02	0.08	10.41	45.6%	69.6%	43.9%	
POST-6	0.01		TICBMH6	CBMH5			0.01	0.026	0.665	10.41	154.86	97.57	188.00	103.02	64.91	Metric	300	3.77	2.70	187.76	2.66	0.02	10.43	100.1%	54.9%	34.6%	
POST-5	0.08		ROOF	TICBMH7			0.08	0.211	0.211	10.00	156.29	99.01	48.00	32.99	20.90	Metric	300	4.36	13.80	201.92	2.86	0.08	10.08	23.8%	16.3%	10.4%	
POST-7	0.05		TICB12	CBMH11		0.05		0.069	1.066	10.02	156.23	98.96	145.00	166.58	105.51	Metric	300	16.76	21.50	395.88	5.60	0.06	10.08	36.6%	42.1%	26.7%	
POST-8	0.01		CBMH11	CBMH5		0.01		0.014	1.080	10.08	156.01	98.73	146.00	168.51	106.64	Metric	300	4.72	14.80	210.09	2.97	0.08	10.16	69.5%	80.2%	50.8%	
POST-6A	0.01		CBMH5	CBMH15			0.01	0.026	1.772	10.43	154.80	97.51	262.00	274.28	172.77	Metric	375	3.41	4.40	323.77	2.93	0.03	10.46	80.9%	84.7%	53.4%	
108	0.05		CBMH15	*TICBMH1*		0.05		0.069	1.841	10.00	156.29	99.01	246.00	287.77	182.31	Metric	375	4.38	4.60	366.94	3.32	0.02	10.02	67.0%	78.4%	49.7%	
105	0.05		TICB4	TICBMH3			0.05	0.132	0.132	10.00	156.29	99.01	31.00	20.62	13.06	Metric	300	5.00	8.00	216.23	3.06	0.04	10.04	14.3%	9.5%	6.0%	
104	0.57		TICBMH3	TICBMH1		0.57		0.792	0.924	10.02	156.21	98.93	182.00	144.28	91.38	Metric	450	3.62	64.20	542.45	3.41	0.31	10.34	33.6%	26.6%	16.8%	
106	0.02		TICB2	TICBMH1			0.02	0.053	0.053	10.02	156.21	98.93	125.00	8.24	5.22	Metric	300	2.50	8.00	152.90	2.16	0.06	10.08	81.8%	5.4%	3.4%	
107	**0.05**		**TICBMH1**	**TICBMH14**			**0.05**	**0.132**	**2.950**	**10.46**	**154.71**	**97.42**	**509.00**	**456.35**	**287.36**	**Metric**	**525**	**2.01**	**34.90**	**609.72**	**2.82**	**0.21**	**10.66**	**83.5%**	**74.8%**	**47.1%**	`
			TICBMH14	**PIPE**				**0.000**	**2.950**	**10.66**	**154.01**	**96.72**		**454.27**	**285.29**	**Metric**	**525**	**2.55**	**10.20**	**686.76**	**3.17**	**0.05**	**10.72**	**0.0%**	**66.1%**	**41.5%**	**PCSWMM 100 year flow not accurate due to backflow from William Street**
SUBDIVISION	37.87		UPSTREAM	EXMH17				55.795	55.795	44.57	88.23	46.08		4919.00	2571.01	Metric	1200	0.68	22.00	3214.98	2.84	0.13	44.70	0.0%	153.0%	80.0%	Flows from GM Blue Plan report, model output flow controlled by upstream pond
			EXMH17	EXMH12					55.795	44.57	88.23	46.08		4919.00	2571.01	Metric	1500	3.63	67.20	13468.03	7.62	0.15	44.85	0.0%	36.5%	19.1%	
			EXMH12	EXMH6					55.795	44.57	88.23	46.08		4919.00	2571.01	Metric	1500	12.06	79.90	24548.48	13.89	0.10	44.94	0.0%	20.0%	10.5%	
William Street 1220x1920 pipe outlet	1.78		EXMH6	EXMH3		1.78		2.476	58.270	44.94	87.82	45.83		5117.25	2670.61	Metric	1500	4.58	24.00	15289.01	8.65	0.05	44.99	0.0%	33.5%	17.5%	area from GM Blue Plan Report Catchment 2 less area 101 above
William Street 1220x1920 pipe outlet			EXMH3	Pipe				0.000	58.270	44.99	87.77	45.80		5114.29	2668.82	Metric	1500	0.49	14.40	4948.22	2.80	0.09	45.07	0.0%	103.4%	53.9%	
William Street 1220x1920 pipe outlet	0.98		Pipe	EXMH1		0.98		1.358	62.578	45.07	87.67	45.74		5486.44	2862.55	Metric	1500	0.49	67.80	4948.22	2.80	0.40	45.48	0.0%	110.9%	57.9%	remainder of catchment 3 from GM Blue Plan Report 2.37 HA plus 101 less areas above
William Street 1220x1920 pipe outlet			**EXMH1**	**Outlet**				**0.000**	**62.578**	**45.48**	**87.23**	**45.48**		**5458.88**	**2845.94**	**Metric**	**1500**	**0.52**	**21.07**	**5151.67**	**2.92**	**0.12**	**45.60**	**0.0%**	**106.0%**	**55.2%**	

PROJECT :	40-60 EMMA ST
PROJECT NUMBER :	191-102
CLIENT :	Sheldon Creek Developments
DATE :	June 23, 2025

Designed By : KP

Checked By : KP

Comments:

Roughness Coeff. "n" 0.013

I_{5YR} = 30.7*T^-0.699

I_{100YR} = 51*T^-0.699

*From MTO IDF Lookup for Fergus Shand Dam overleaf

Bransby Williams

tc=0.057*L/(Sw^0.2*A^0.1)

L=watershed length, m

Sw=watershed slope, %

A= watershed Area, ha

Fergus Shand Dam Chicago Storm Parameters

$I=A/(t+B)^c$

	5 Year	100 Year
A	1459.072	6933.019
B	13.69	34.6989
C	0.85	0.998

STORM SEWER DESIGN SHEET
5 & 100 YEAR DESIGN STORM - INLET CHECK
PRE AND POST DEVELOPMENT

LOCATION					AREAS (ha)																
CATCHMENT	AREA TOTAL	C Value Calculated	FROM	TO	at C=0.20 (ha)	at C=0.50 (ha)	at C=0.95 (ha)	INDIV. 2.78 AC	TIME OF CONC.	RAINFALL INTENSITY I (mm/hr) 100YR	RAINFALL INTENSITY I (mm/hr) 5YR	PEAK FLOW 100 YEAR Q (M3/s)	PEAK FLOW 5 YEAR Q (M3/s)	Inlet Type	Roadway Grade	Cross-Slope	Max Depth of Water	Referenced Chart	Max Flow (From Charts) m3/s	50% Capacity	
(Leeson W Side) 100	0.54					0.54		0.750	10.00	156.29	99.01	0.117	0.074	Single Inlet			0.18	MTO 4.19	0.15	0.075	Existing, Sag location, assume .04m3/s flows overland
(Leeson W Side) 101	0.09					0.09		0.122	10.00	156.29	99.01	0.019	0.012								
(Leeson E Side) 102	0.07						0.07	0.185	10.00	156.29	99.01	0.029	0.018								
(Leeson st east side properties) 103	0.31		TICB13	TICB12		0.31		0.431	10.00	156.29	99.01	0.067	0.073	5103	For 0.16m3/s required open length @ 0.65m width is 0.26m, double that to account for blockage is 0.52m. Available open length is 0.92m therefore inlet can handle all flow						Sag location, add additional flow from 100; 0.04 m3/s
												0.000								0	
POST-1	0.08		DI10	TICBMH9		0.08		0.111	10.00	156.29	99.01	0.017	0.011	DI			0.26	MTO 4.19	0.19	0.095	Sag Location
POST-2	0.02		TICBMH9	TICBMH8			0.02	0.053	10.00	156.29	99.01	0.008	0.005	Twin Inlet	6%	6%		MTO 4.16/4.18	0.06	0.028	
POST-3	0.07		TICBMH8	TICBMH7			0.07	0.185	10.00	156.29	99.01	0.029	0.018	Twin Inlet	6%	6%	0.10	MTO 4.19	0.09	0.045	Sag location
POST-4	0.03		TICBMH7	TICBMH6			0.03	0.079	10.00	156.29	99.01	0.012	0.008	Twin Inlet	6%	6%		MTO 4.16/4.18	0.06	0.03	
POST-6	0.01		TICBMH6	CBMH5			0.01	0.026	10.00	156.29	99.01	0.004	0.003	Twin Inlet	6%	6%		MTO 4.16/4.18	0.06	0.03	
POST-5	0.08		ROOF	TICBMH7			0.08	0.211	10.00	156.29	99.01	0.033	0.021							0	
POST-7	0.05		TICB12	DICBMH11		0.05		0.069	10.00	156.29	99.01	0.011	0.007	Twin Inlet			0.30	MTO 4.19	0.40	0.2	Sag location
POST-8	0.01		DICBMH11	CBMH5		0.01		0.014	10.00	156.29	99.01	0.002	0.001	Single Inlet	6%	6%		MTO 4.16	0.04	0.021	
POST-6A	0.01		CBMH5	TICBMH1			0.01	0.026	10.00	156.29	99.01	0.004	0.003	Single Inlet	6%	6%		MTO 4.17	0.04	0.021	
												0.000								0	
108	0.05		CB15	*TICBMH1*		0.05		0.069	10.00	156.29	99.01	0.011	0.007	Ditch Inlet			0.30	MTO 4.19	0.02	0.01	
												0.000								0	
105	0.05		TICB4	TICBMH3			0.05	0.132	10.00	156.29	99.01	0.021	0.008	Twin Inlet	4%	2%		MTO 4.16/4.18	0.07	0.0365	Emma Street
104	0.57		TICBMH3	TICBMH1		0.57		0.792	10.00	156.29	99.01	0.124	0.088	5103.00	4%	2%		MTO 4.16/4.19	0.07	0.0365	Stepcon 5103
106	0.02		TICB2	TICBMH1			0.02	0.053	10.00	156.29	99.01	0.008	0.005	Twin Inlet	4%	2%		MTO 4.16/4.20	0.07	0.0365	Emma Street
107	0.05		TICBMH1	TICBMH14			0.05	0.132	10.00	156.29	99.01	0.021	0.013	Twin Inlet	4%	2%		MTO 4.16/4.21	0.07	0.0365	Emma Street

PROJECT :	40-60 EMMA ST
PROJECT NUMBER :	191-102
CLIENT :	Sheldon Creek Developments
DATE :	June 25, 2025

Designed By : KP

Checked By : KP

Roughness Coeff. "n" 0.013

I_{5YR} = 30.7*T^-0.699

I_{100YR} = 51*T^-0.699

*From MTO IDF Lookup for Fergus Shand Dam overleaf

tc=0.057*L/(Sw^0.2*A^0.1)
L=watershed length, m
Sw=watershed slope, %
A= watershed Area, ha

Fergus Shand Dam Chicago Storm Parameters

$I=A/(t+B)^c$

	5 Year	100 Year
A	1459.072	6933.019
B	13.69	34.6989
C	0.85	0.998

Modified Rational Method - 100 Year Storm

Allowable Release Rate:	55.54	L/s
	3332.4	L/min
Areas POST1-6 Combined:	0.3	Ha
C Combined:	0.83	

Fergus Shand Dam Chicago Storm Parameters:

	5 Year	100 Year
A	1459.072	6933.019
B	13.69	34.6989
C	0.85	0.998

Storm Duration (Mins)	Intensity	Inflow (L)	Outflow (L)	Storage Required (m3)
5	175.93	36505.90	16662	19.84
10	156.29	64860.12	33324	31.54
15	140.59	87520.77	49986	37.53
16	137.83	91517.76	53318.4	38.20
17	135.17	95360.51	56650.8	38.71
18	132.61	99057.76	59983.2	39.07
19	130.14	102617.66	63315.6	39.30
20	127.77	106047.72	66648	39.40
21	125.48	109354.92	69980.4	39.37
25	117.09	121478.54	83310	38.17
30	108.06	134530.30	99972	34.56
45	87.76	163884.19	149958	13.93
60	73.88	183964.05	199944	-15.98
120	45.27	225448.30	399888	-174.44
240	25.52	254217.82	799776	-545.56
480	13.64	271697.14	1599552	-1327.85

Catchment		C - VALUE	AREA (Ha)	CxA
POST-1		0.5	0.08	0.04
POST-2		0.95	0.02	0.019
POST-3		0.95	0.07	0.0665
POST-4		0.95	0.03	0.0285
POST-5		0.95	0.08	0.076
POST-6		0.95	0.02	0.019
		Total	0.3	0.249
			Combined C	0.83

Modified Rational Method - 5 Year Storm

Allowable Release Rate:	33.87	L/s
	2032.2	L/min
Areas POST1-6 Combined:	0.3	Ha
C Combined:	0.83	

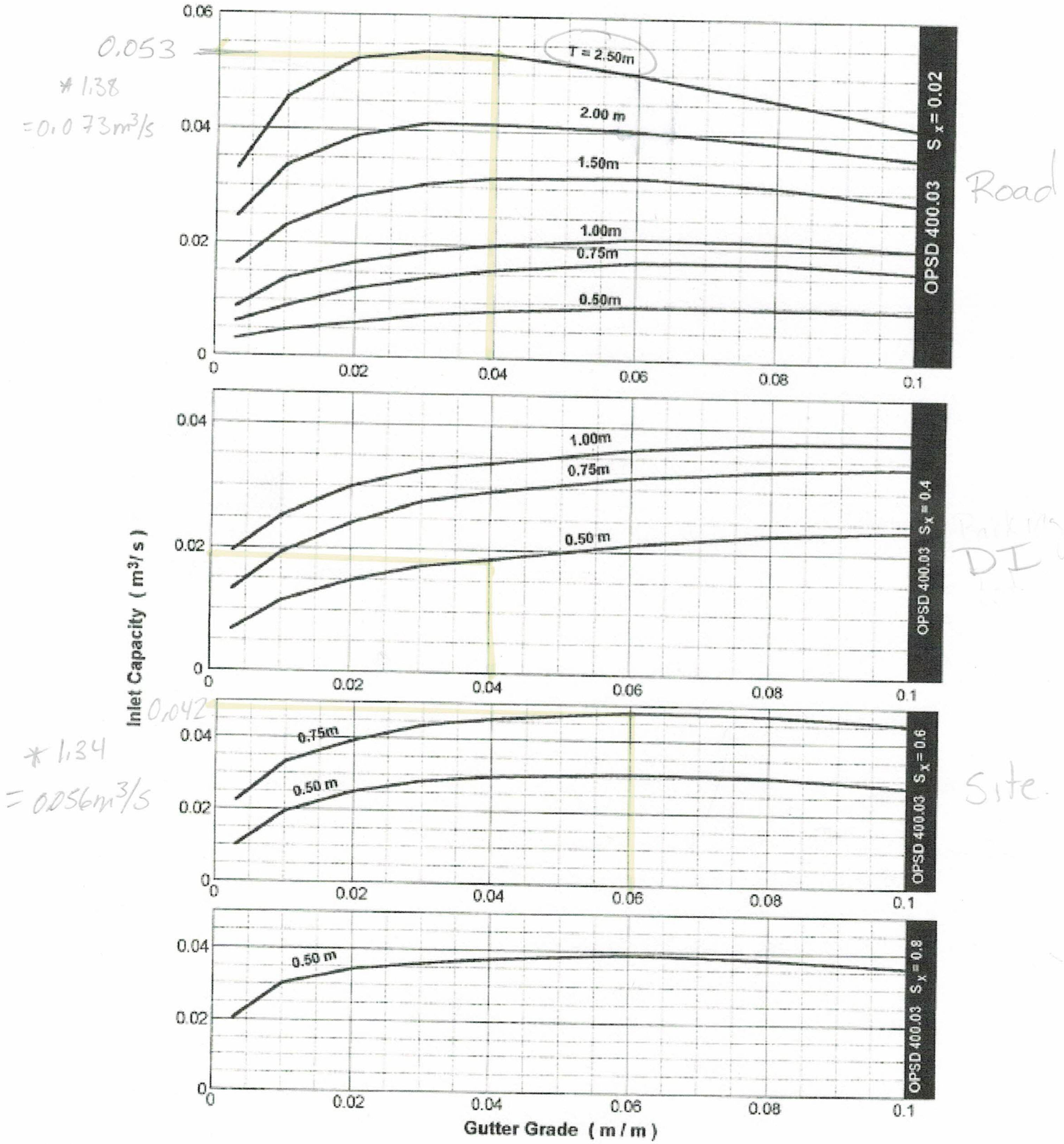
Fergus Shand Dam Chicago Storm Parameters:

	5 Year	100 Year
A	1459.072	6933.019
B	13.69	34.6989
C	0.85	0.998

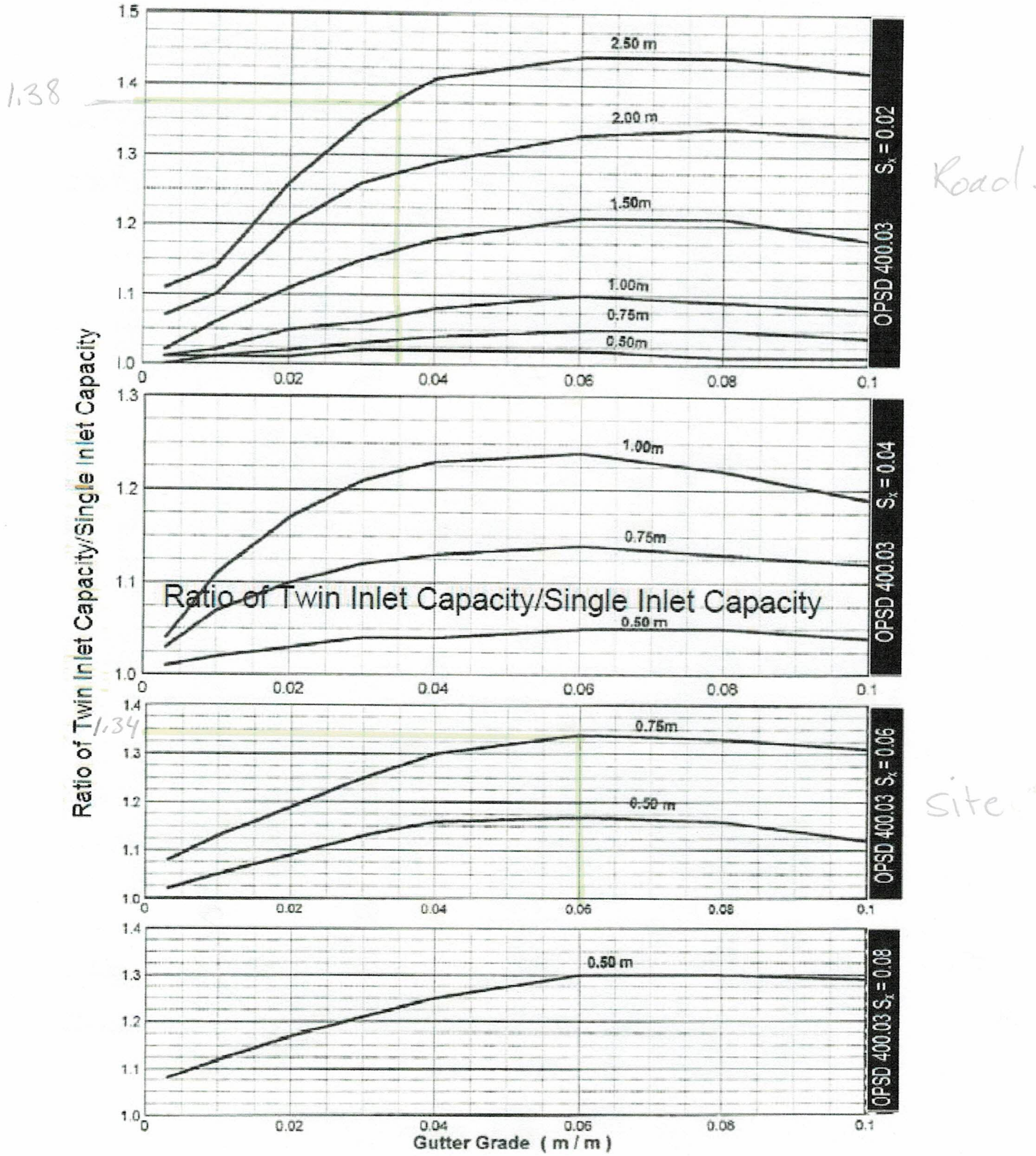
Storm Duration (Mins)	Intensity	Inflow (L)	Outflow (L)	Storage Required (m3)
5	121.12	25132.19	10161	14.97
9	102.71	38362.90	18290	20.07
10	99.01	41091.12	20322	20.77
11	95.59	43639.33	22354	21.29
12	92.42	46026.72	24386	21.64
13	89.47	48269.78	26419	21.85
14	86.72	50382.74	28451	21.93
15	84.14	52377.96	30483	21.89
20	73.40	60923.16	40644	20.28
25	65.26	67703.23	50805	16.90
30	58.85	73269.77	60966	12.30
45	45.79	85518.74	91449	-5.93
60	37.74	93968.50	121932	-27.96
120	22.75	113272.75	243864	-130.59
240	13.20	131426.12	487728	-356.30
480	7.49	149256.53	975456	-826.20

Catchment		C - VALUE	AREA (Ha)	CxA
POST-1		0.5	0.08	0.04
POST-2		0.95	0.02	0.019
POST-3		0.95	0.07	0.0665
POST-4		0.95	0.03	0.0285
POST-5		0.95	0.08	0.076
POST-6		0.95	0.02	0.019
		Total	0.3	0.249
			Combined C	0.83

Design Chart 4.16: Inlet Capacity OPSD 400.03 (C & G OPSD 600.03)

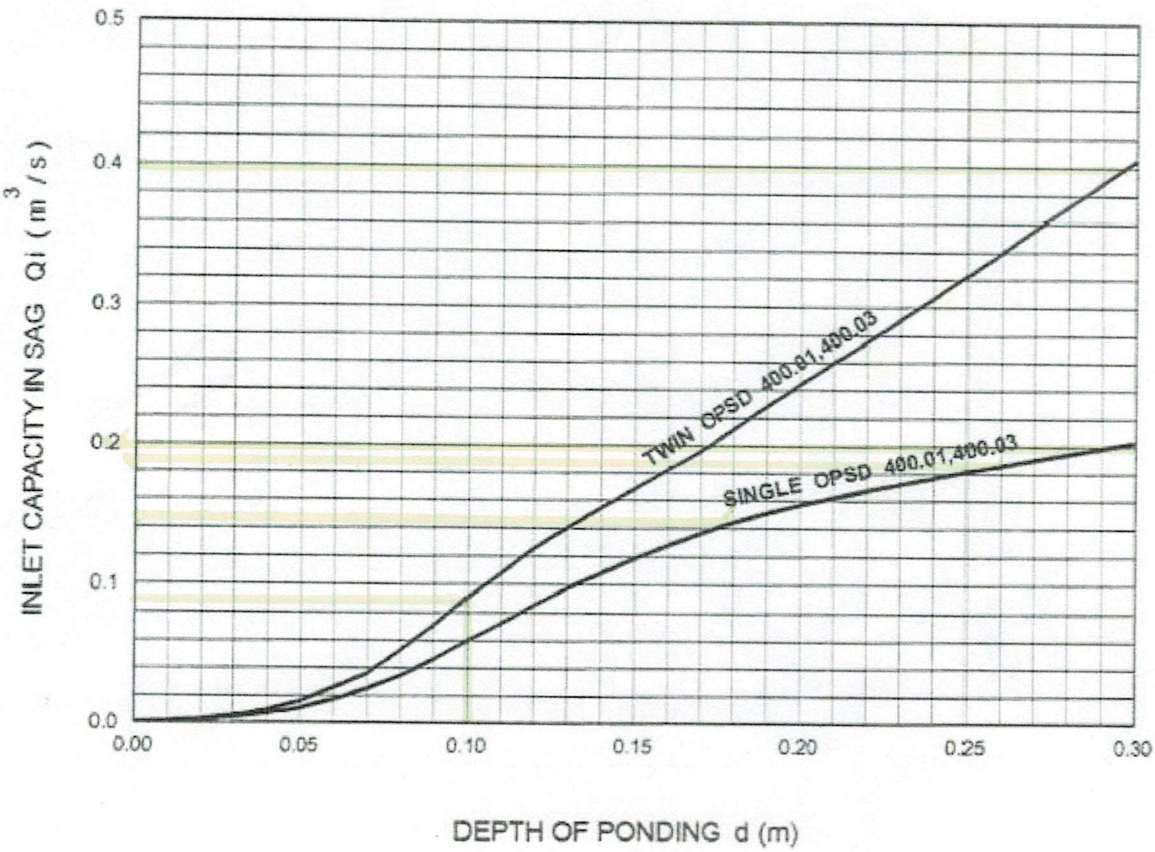


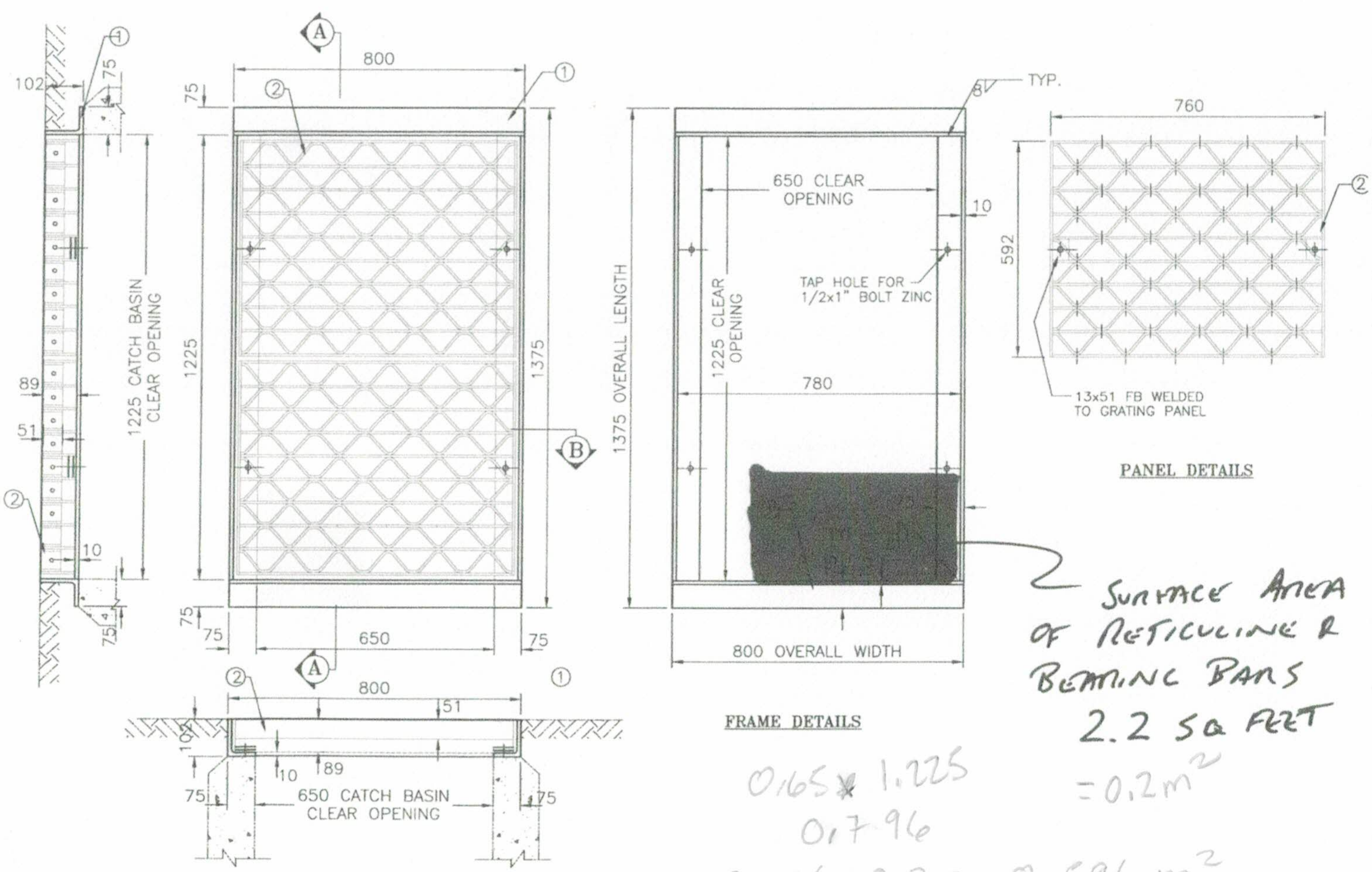
Design Chart 4.18: Twin Inlet Capacity OPSD 400.03



Source: Errata Sheet No. DMM1997-5 (September 2018)

Design Chart 4.19: Inlet Capacity at Road Sag





Surface Area of Reticuline & Bearing Bars 2.2 sq feet = 0.2 m²

0.65 × 1.225
0.796

0.796 − 0.2 = 0.596 m² open area

STEPCON
INDUSTRIES INC.
2364 Haines Rd., Unit 20-21
Mississauga, ONTARIO L4Y 1Y6
VOICE: (905) 897-6000
FAX: (905) 897-6001
Toll Free: 1-888-STEPCON

#	QTY.	MATERIAL	DESCRIPTION
1	1	GALV. STEEL CSA G40.21 M-300W	100x75x10 FRAME ANGLE (LLV)
2	2	GALV. STEEL CSA G40.21 M-300W	STEPCON GRATE RETICULING RIVETS TYPE V MESH AS FOLLOWING 6x89mm BEARING BARS @ 65 O.C RETICULATE BARS 5x51mm END BARS 6x89mm

NOTE:

1) ALL STEEL MEMBERS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
2) WELDING SHALL CONFORM TO CSA W47.1-M1992 CSA W59-M1989
3) WELDING SURFACE REMAIN AS WELDED

PROJECT: MODEL 5103
CONTRACTOR:
AGENT/ENGR:

TITLE: GALVANIZED STEEL GRATING PANEL

REVISION NO.	DATE	DATE	DRN. BY	PROJECT NO.
		APR. 25, 2002	4ADTS	
		SCALE	CHK'D BY	DWG. NO. GR5003

Assume 0.65 width

$\frac{0.596}{0.65} = 0.917$ calculated open length

Storm Water Inlet Design - Gutter Inlet - S.I. units

1. Orifice Equation (submerged inlet)

Catchment 103

Instructions: *Enter values in blue boxes. Spreadsheet calculates values in yellow boxes*

Inputs

Design Storm Water Flow Rate, **Q** =	0.16	m^3/s
Width of opening, **W** =	650	mm
Depth of Storm Water, **d** =	100	mm
Orifice Coeff., C_o =	0.67	

Calculations

Depth of Storm Water, **d** =	0.100	m
Width of opening, **W** =	0.65	m
Width of Curb Opening, **L** =	0.26	m

1. Orifice Equation (submerged inlet)

Catchment 104

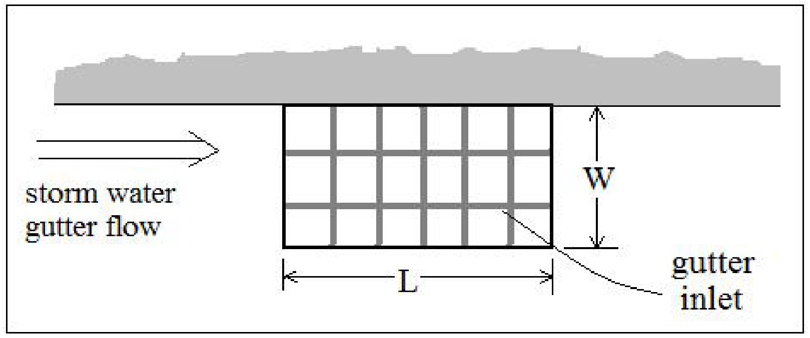
Instructions: *Enter values in blue boxes. Spreadsheet calculates values in yellow boxes*

Inputs

Design Storm Water Flow Rate, **Q** =	0.13	m^3/s
Width of opening, **W** =	650	mm
Depth of Storm Water, **d** =	25	mm
Orifice Coeff., C_o =	0.67	

Calculations

Depth of Storm Water, **d** =	0.025	m
Width of opening, **W** =	0.65	m
Width of Curb Opening, **L** =	0.43	m



Gutter Inlet for Storm Water Drainage

Equation for Gutter Inlet Design using the Orifice Equation

$$Q = C_o (W L) (2g d)^{1/2} \quad \{ L = Q/[C_oW(2gd)^{1/2}] \}$$

Where:

- Q = design storm water flow rate through inlet, m^3/s
- W = width of the gutter opening, m
- d = depth of storm water over the gutter opening, m
- L = length of the gutter opening, m
- g = 9.81 m/s^2
- C_o = orifice coefficient, dimensionless (typically C_o = 0.67)

Leeson Catchment 100

CB - sag. inlet capacity.

0.18m d - depth of ponding.

From MTO design chart. 4.19

$Q = 0.14\ m^3/s$

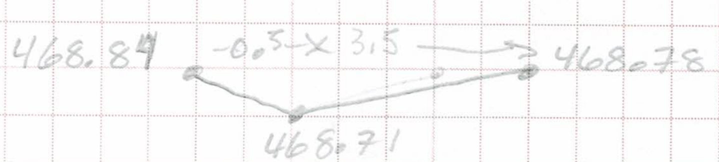
Check for required sewer capacity.

300mm @ 2% = $0.14\ m^3/s$

Catchment Area 100

A = 0.54 HA
C = 0.50
$Q_{100} = 0.12 m^3 S$ < inlet capacity.

Check road cross section capacity upstream of CB



Area Calc: 3.5 * 0.07/2
0.5 * 0.07/2
$A = 0.14 m^2$

Road Slope Longitudinal ~ 4% cross section slope. ~ 2%

use Mannings
$Q = 0.17 m^3/s$
spreadsheet

Catchment 100

$$Q = \frac{1}{2.64 * n} \quad K_n \quad T^{8/3} \quad S_X^{5/3} \quad S_L^{1/2}$$

Where Q= Flow in gutter (m3/s)

n= Manning Roughness (0.016 Asphalt Rough Texture)

K_n = Unit Conversion

T= Top Width (Spread) m

S^X= Cross Slope

S^L= Longitudinal Slope

Q= (1/(2.64*.018))*1*(3.5^(8/3))*(.02^(5/3))*(.04^0.5)

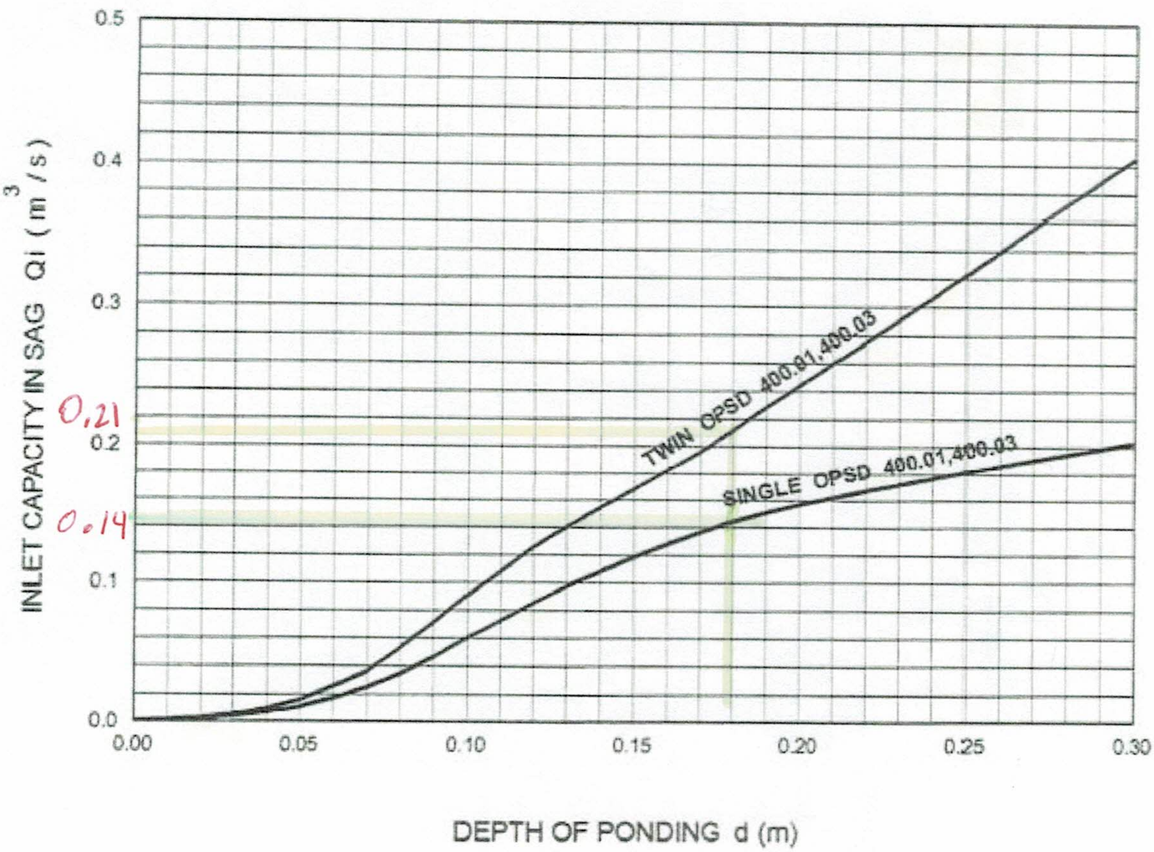
= 0.17514 m3/s

Table 2: Manning's roughness coefficients for gutters and pavement.[1]

type of gutter or pavement	Manning's n*
Concrete Gutter:	
Troweled finish	0.012
Asphalt Pavement:	
Smooth texture	0.013
Rough texture	0.016
Concrete gutter-asphalt pavement:	
Smooth	0.013
Rough	0.015
Concrete pavement:	
Float finish	0.014
Broom finish	0.016

*For gutters with small slope, where sediment may accumulate, evaluate width of spread by increasing the above values of "n" by 0.02.

Design Chart 4.19: Inlet Capacity at Road Sag



Leeson Catchment 101

$A = 0.0875$ HA.
$C = 0.50$
$Q_{100} = 0.019\,m^3/s$

Check gutter

road slope $= 1.1\%$

cross section slope $= 0.8\%$

$Q = 0.19\,m^3/s$

technically ok but will include.

Drain to swale

101 = 0.09
102 = 0.07 ⟩ $A_T = 0.47$
103 = 0.31

Rational method:
$Q_{100} = 0.10\,m^3/s$

// assuming net Area to match above flow

Adjusted $A = 0.3$

Catchment 101

$$Q = \frac{1}{2.64 * n} \quad K_n \quad T^{8/3} \quad S_X^{5/3} \quad S_L^{1/2}$$

Where

	Q=	Flow in gutter (m3/s)
	n=	Manning Roughness (0.016 Asphalt Rough Texture)
	K_n =	Unit Conversion
	T=	Top Width (Spread) m
	S^X=	Cross Slope
	S^L=	Longitudinal Slope

Q= (1/(2.64*.018))*1*(3.5^(8/3))*(.008^(5/3))*(.01^0.5)

= 0.019016 m3/s

Table 2: Manning's roughness coefficients for gutters and pavement.[1]

type of gutter or pavement	Manning's n*
Concrete Gutter:	
Troweled finish	0.012
Asphalt Pavement:	
Smooth texture	0.013
Rough texture	0.016
Concrete gutter-asphalt pavement:	
Smooth	0.013
Rough	0.015
Concrete pavement:	
Float finish	0.014
Broom finish	0.016

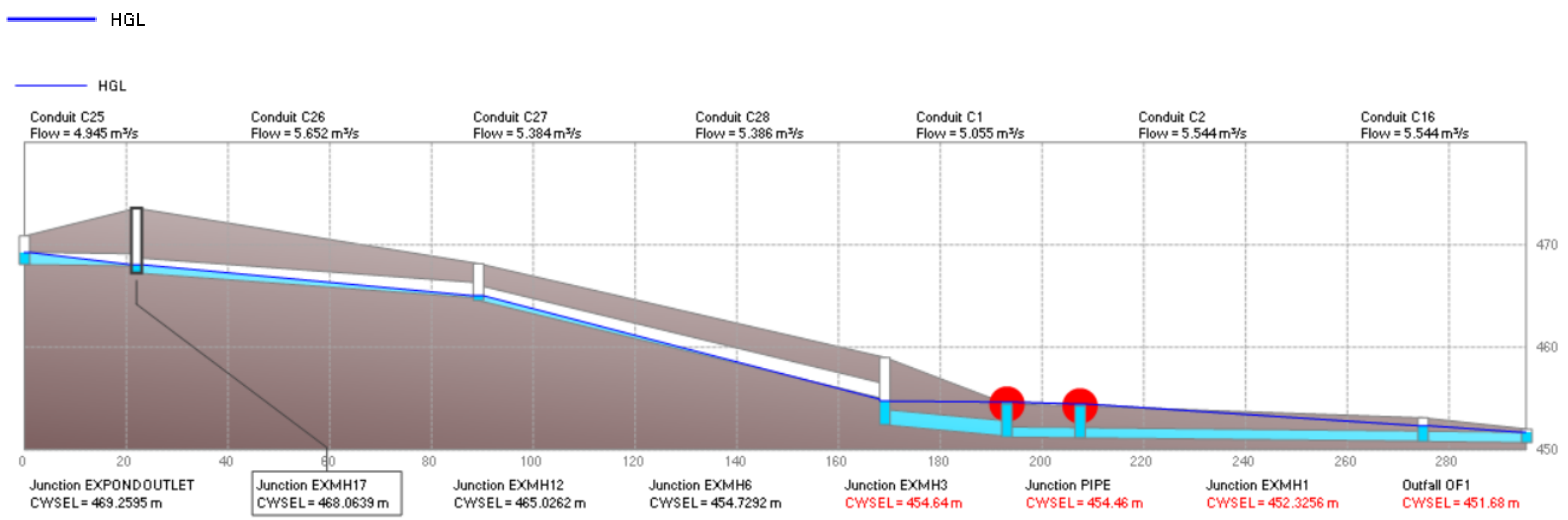
*For gutters with small slope, where sediment may accumulate, evaluate width of spread by increasing the above values of "n" by 0.02.

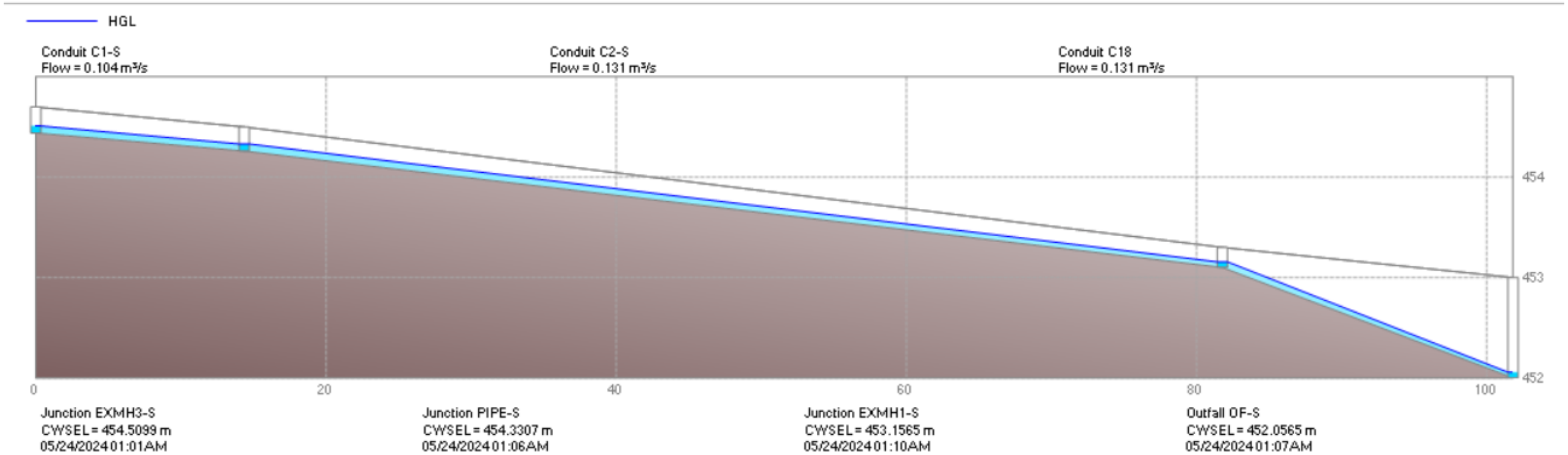
APPENDIX D

PCSWMM Model

J116
104
105
104A
10
9
9-S
POST1
10-S
8
3
4
3-S
4-S
POST2-4
8-S
J1
107
106
100&102&103
S1_2
POST5
7
POST6
6
6-S
2-S
J3
5
1-S
11
15
1
2
103&101
13
12
S1_1
108
15-S
13-S
12-S
EX3REM
EXMH1
EX2REM
14
EXMH1-S
OF1
14-s
EXMH3
PIPE-S
EXPONDOUTLET
EXMH6
EXMH3-S
EXMH12
EXMH17

William Street (100 Year Storm):

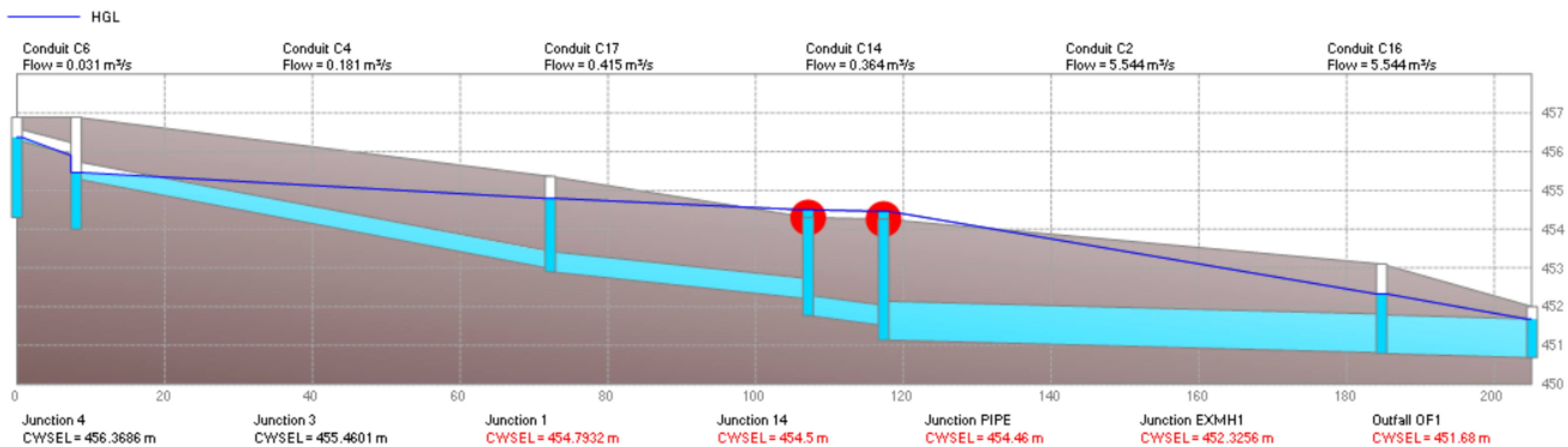


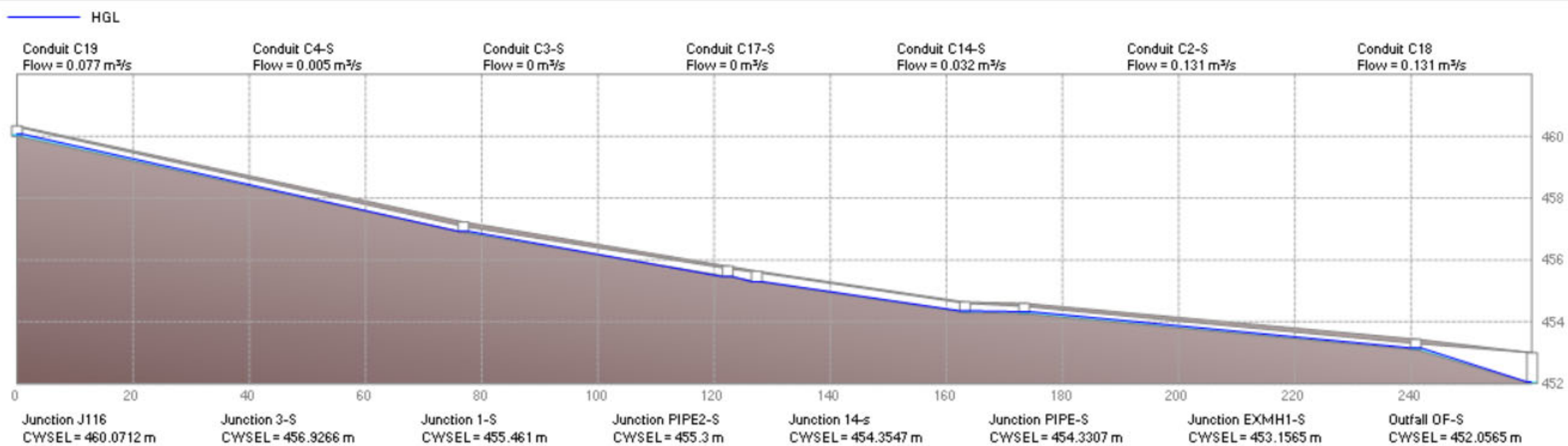


*CWSEL = HGL

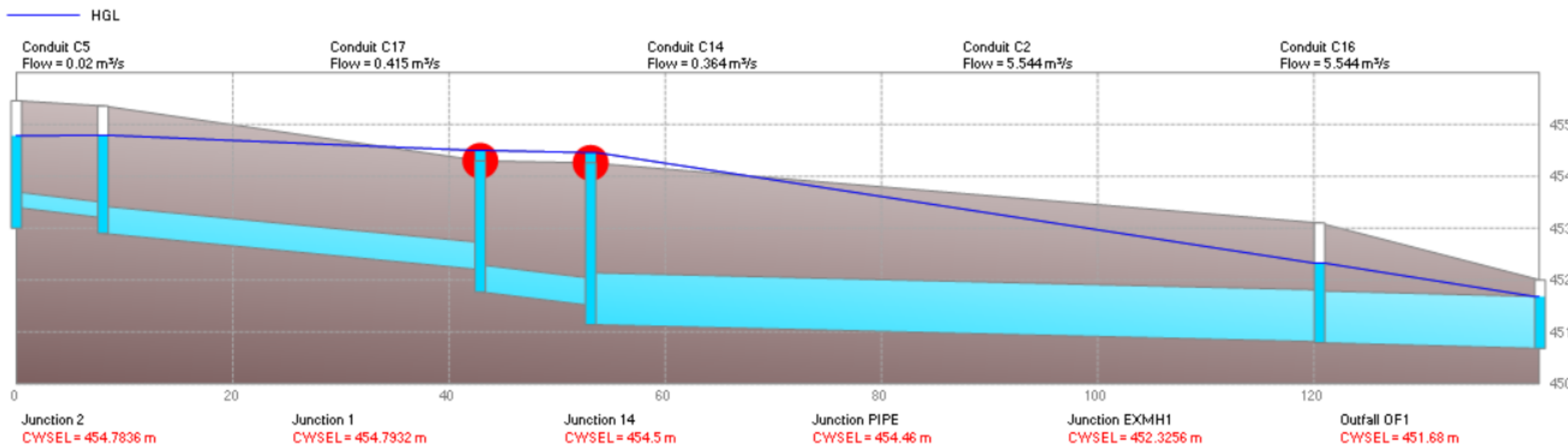
Emma Street (100 Year Storm):

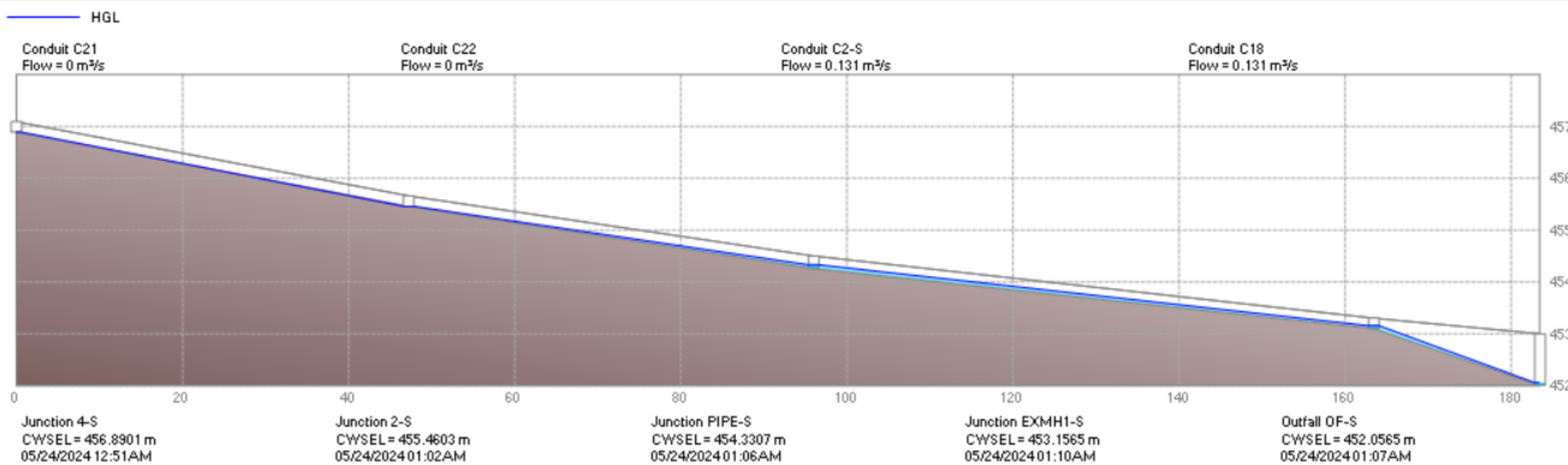
HGL





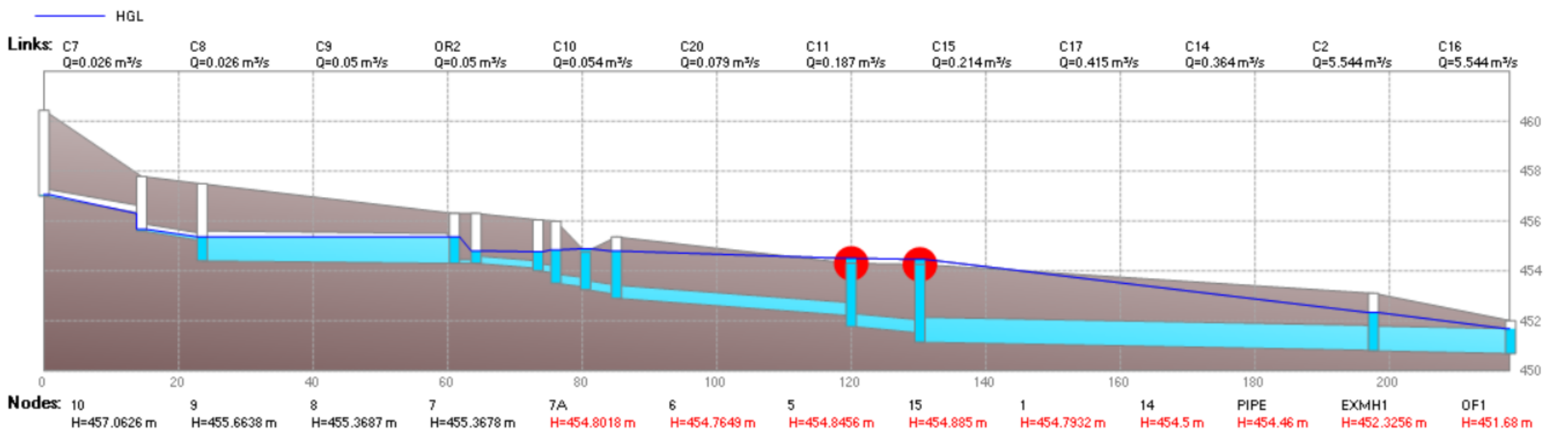
*CWSEL = HGL

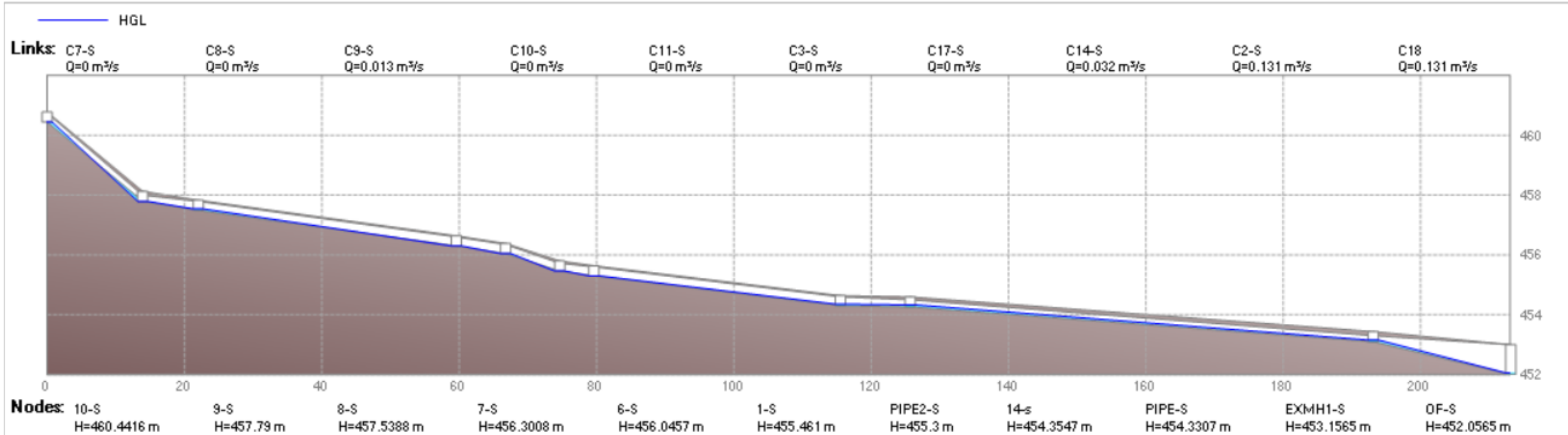

HGL
Conduit C5
Flow = 0.02 m³/s
Conduit C17
Flow = 0.415 m³/s
Conduit C14
Flow = 0.364 m³/s
Conduit C2
Flow = 5.544 m³/s
Conduit C16
Flow = 5.544 m³/s
Junction 2
CWSEL = 454.7836 m
Junction 1
CWSEL = 454.7932 m
Junction 14
CWSEL = 454.5 m
Junction PIPE
CWSEL = 454.46 m
Junction EXMH1
CWSEL = 452.3256 m
Outfall OF1
CWSEL = 451.68 m


HGL
Conduit C21
Flow = 0 m³/s
Conduit C22
Flow = 0 m³/s
Conduit C2-S
Flow = 0.131 m³/s
Conduit C18
Flow = 0.131 m³/s
Junction 4-S
CWSEL = 456.8901 m
05/24/2024 12:51AM
Junction 2-S
CWSEL = 455.4603 m
05/24/2024 01:02AM
Junction PIPE-S
CWSEL = 454.3307 m
05/24/2024 01:06AM
Junction EXMH1-S
CWSEL = 453.1565 m
05/24/2024 01:10AM
Outfall OF-S
CWSEL = 452.0565 m
05/24/2024 01:07AM

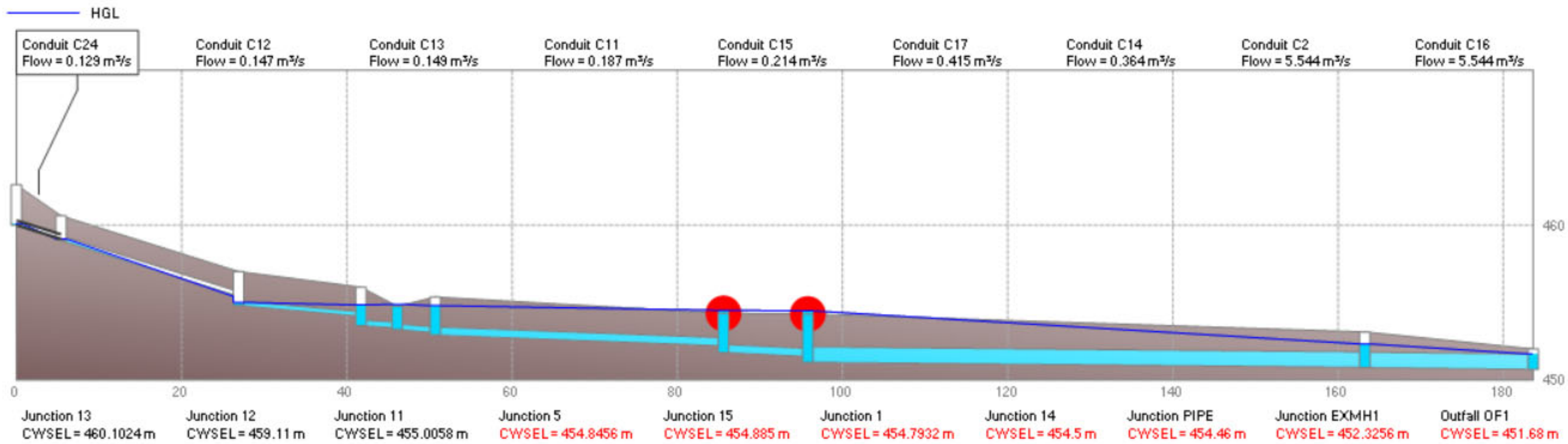
*CWSEL = HGL

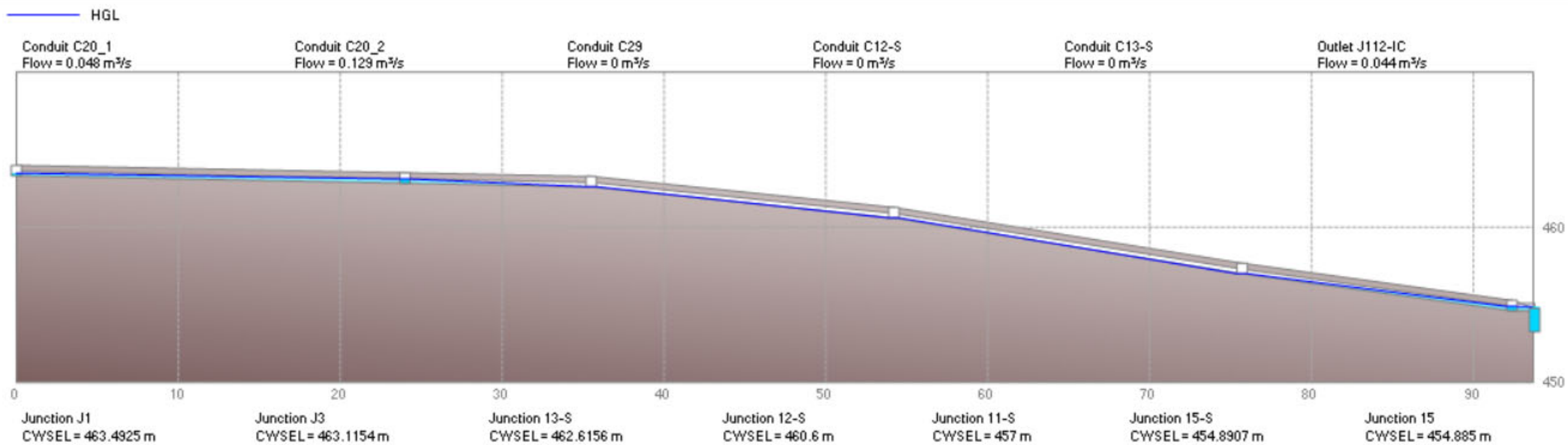
On Site (100 Year Storm):





*CWSEL = HGL


HGL
Conduit C24
Flow = 0.129 m³/s
Conduit C12
Flow = 0.147 m³/s
Conduit C13
Flow = 0.149 m³/s
Conduit C11
Flow = 0.187 m³/s
Conduit C15
Flow = 0.214 m³/s
Conduit C17
Flow = 0.415 m³/s
Conduit C14
Flow = 0.364 m³/s
Conduit C2
Flow = 5.544 m³/s
Conduit C16
Flow = 5.544 m³/s
460
450
0
20
40
60
80
100
120
140
160
180
Junction 13
CWSEL = 460.1024 m
Junction 12
CWSEL = 459.11 m
Junction 11
CWSEL = 455.0058 m
Junction 5
CWSEL = 454.8456 m
Junction 15
CWSEL = 454.885 m
Junction 1
CWSEL = 454.7932 m
Junction 14
CWSEL = 454.5 m
Junction PIPE
CWSEL = 454.46 m
Junction EXMH1
CWSEL = 452.3256 m
Outfall OF1
CWSEL = 451.68 m


HGL
Conduit C20_1
Flow = 0.048 m³/s
Conduit C20_2
Flow = 0.129 m³/s
Conduit C29
Flow = 0 m³/s
Conduit C12-S
Flow = 0 m³/s
Conduit C13-S
Flow = 0 m³/s
Outlet J112-IC
Flow = 0.044 m³/s
460
450
0
10
20
30
40
50
60
70
80
90
Junction J1
CWSEL = 463.4925 m
Junction J3
CWSEL = 463.1154 m
Junction 13-S
CWSEL = 462.6156 m
Junction 12-S
CWSEL = 460.6 m
Junction 11-S
CWSEL = 457 m
Junction 15-S
CWSEL = 454.8907 m
Junction 15
CWSEL = 454.885 m

*CWSEL = HGL

PCSWMM Model Details

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option               Value
FLOW_UNITS             CMS
INFILTRATION           CURVE_NUMBER
FLOW_ROUTING           DYNWAVE
LINK_OFFSETS           ELEVATION
MIN_SLOPE              0
ALLOW_PONDING          NO
SKIP_STEADY_STATE      NO

START_DATE             05/24/2024
START_TIME             00:00:00
REPORT_START_DATE      05/24/2024
REPORT_START_TIME      00:00:00
END_DATE               05/24/2024
END_TIME               06:00:00
SWEEP_START            01/01
SWEEP_END              12/31
DRY_DAYS               0
REPORT_STEP            00:00:30
WET_STEP               00:01:00
DRY_STEP               00:01:00
ROUTING_STEP           0.2
RULE_STEP              00:00:00

INERTIAL_DAMPING       PARTIAL
NORMAL_FLOW_LIMITED    BOTH
FORCE_MAIN_EQUATION    H-W
VARIABLE_STEP          0.75
LENGTHENING_STEP       0
MIN_SURFAREA           0
MAX_TRIALS             10
HEAD_TOLERANCE         0.0015
SYS_FLOW_TOL           5
LAT_FLOW_TOL           5
MINIMUM_STEP           0.05
THREADS                12

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
```

```
DRY_ONLY          NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Chicago_3h       INTENSITY 0:05     1.0      TIMESERIES Chicago_3h
Chicago_3h_100year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_100year
Chicago_3h_100Year_Fergus_Shand_Dam_2016 INTENSITY 0:05     1.0      TIMESERIES
Chicago_3h_100Year_Fergus_Shand_Dam_2016
Chicago_3h_10year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_10year
Chicago_3h_25year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_25year
Chicago_3h_2year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_2year
Chicago_3h_50year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_50year
Chicago_3h_5year INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_5year
Chicago_3h_5Year_2016_Fergus_Shand_Dam INTENSITY 0:05     1.0      TIMESERIES Chicago_3h_5Year_2016_Fergus_Shand_Dam

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
100&102&103      Chicago_3h_5Year_2016_Fergus_Shand_Dam J1 0.17 15    17       7        0
103&101          Chicago_3h_5Year_2016_Fergus_Shand_Dam J3 0.3 15     24.59    8        0
104              Chicago_3h_5Year_2016_Fergus_Shand_Dam J116 0.2377 25 23.77   6        0
104A             Chicago_3h_5Year_2016_Fergus_Shand_Dam 3-S 0.3291 30 21.939   6        0
105              Chicago_3h_5Year_2016_Fergus_Shand_Dam 4-S 0.048 100 6.4      4        0
106              Chicago_3h_5Year_2016_Fergus_Shand_Dam 2-S 0.0203 100 5.486   3        0
107              Chicago_3h_5Year_2016_Fergus_Shand_Dam 1-S 0.0536 100 14.487 3        0
108              Chicago_3h_5Year_2016_Fergus_Shand_Dam 15-S 0.05 25 20        15       0
EX2REM           Chicago_3h_5Year_2016_Fergus_Shand_Dam EXMH12 1.1 25 1100     2        0
EX3REM           Chicago_3h_5Year_2016_Fergus_Shand_Dam PIPE 0.95 25 950       2        0
POST1            Chicago_3h_5Year_2016_Fergus_Shand_Dam 10-S 0.08 25 13.334    10       0
POST2-4          Chicago_3h_5Year_2016_Fergus_Shand_Dam 8-S 0.1097 100 36.567 4        0
POST5            Chicago_3h_5Year_2016_Fergus_Shand_Dam ROOF_DRAIN 0.0834 100 83.4 10    0
POST6            Chicago_3h_5Year_2016_Fergus_Shand_Dam 6-S 0.02 100 13.333    6        0
S1_1             Chicago_3h_5Year_2016_Fergus_Shand_Dam 11 0.01 25    1        0.5      0
S1_2             Chicago_3h_5Year_2016_Fergus_Shand_Dam 12-s 0.085 25 8.5      0.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
100&102&103      0.01       0.1        0.05       0.05       25         PERVIOUS   100
103&101          0.01       0.1        0.05       0.05       25         PERVIOUS   100
104              0.01       0.1        0.05       0.05       25         OUTLET
104A             0.01       0.1        0.05       0.05       30         IMPERVIOUS 100
105              0.01       0.1        0.05       0.05       50         IMPERVIOUS 100
106              0.01       0.1        0.05       0.05       100        IMPERVIOUS 100
107              0.01       0.1        0.05       0.05       100        IMPERVIOUS 100
108              0.01       0.1        0.05       0.05       25         OUTLET
EX2REM           0.01       0.1        0.05       0.05       25         OUTLET
```

EX3REM	0.01	0.1	0.05	0.05	25	OUTLET
POST1	0.01	0.1	0.05	0.05	25	OUTLET
POST2-4	0.01	0.1	0.05	0.05	100	OUTLET
POST5	0.01	0.1	0.05	0.05	100	OUTLET
POST6	0.01	0.1	0.05	0.05	100	OUTLET
S1_1	0.01	0.1	0.05	0.05	25	OUTLET
S1_2	0.01	0.1	0.05	0.05	25	OUTLET

[INFILTRATION]

;;Subcatchment	Param1	Param2	Param3	Param4	Param5
;;--------------	----------	----------	----------	----------	----------
100&102&103	83	0.5	7	0	0
103&101	83	0.5	7	0	0
104	86	0.5	7	0	0
104A	83	0.5	7	0	0
105	90	0.5	7	0	0
106	90	0.5	7	0	0
107	90	0.5	7	0	0
108	80	0.5	7	0	0
EX2REM	85	12.7	7	0	0
EX3REM	85	12.7	7	0	0
POST1	80	0.5	7	0	0
POST2-4	90	0.5	7	0	0
POST5	90	0.5	7	0	0
POST6	90	0.5	7	0	0
S1_1	80	12.7	7	0	0
S1_2	80	12.7	7	0	0

[JUNCTIONS]

;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Aponded
;;--------------	----------	----------	----------	----------	----------
1	452.9	2.46	0	0.2	0
10	457	3.44	0	0.2	0
10-S	460.44	0.3	0	0	0
11	454.8	2.2	0	0.2	0
11-S	457	0.3	0	0	0
12	459	1.6	0	0.2	0
12-S	460.6	0.3	0	0	0
13	460	2.6	0	0	0
13-S	462.6	0.3	0	0	0
14	451.77	2.53	0	0.2	0
14-s	454.3	0.3	0	0	0
15	453.25	1.51	0	0.2	0
15-S	454.6	0.3	0	0	0
1-S	455.46	0.26	0	0	0
2	453	2.46	0	0.2	0
2-S	455.46	0.2	0	0	0
3	454	2.89	0	0.2	0

```
3-S              456.89     0.2        0          0          0
4                454.3      2.59       0          0.2        0
4-S              456.89     0.2        0          0          0
5                453.5      2.49       0          0          0
6                454        2.045      0          0.2        0
6-S              456.045    0.3        0          0          0
7                454.3      2          0          0          0
7A               454.3      2          0          0          0
7-S              456.3      0.3        0          0          0
8                454.4      3.09       0          0.2        0
8-S              457.49     0.3        0          0          0
9                455.6      2.19       0          0.2        0
9-S              457.79     0.21       0          0          0
EXMH1            450.79     2.31       0          0.2        0
EXMH12           464.56     3.61       0          0          0
EXMH17           467.24     6.34       0          0          0
EXMH1-S          453.1      0.2        0          0          0
EXMH3            451.21     3.23       0          0.2        0
EXMH3-S          454.44     0.26       0          0          0
EXMH6            452.41     6.59       0          0          0
EXPONDOUTLET     468.08     2.78       0          0          0
J1               463.32     0.3        0          0          0
J116             460        0.3        0          0          0
J3               462.84     0.3        0          0          0
PIPE             451.14     3.12       0          0.2        0
PIPE2-S          455.3      0.3        0          0          0
PIPE-S           454.26     0.24       0          0          0
ROOF_DRAIN       456        2.24       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              450.68     FREE                        NO
OF-S             452        FREE                        NO

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
C1               EXMH3            PIPE             14.36      0.01       451.21     451.145    0          0
C10              7A               6                9.2        0.01       454.3      454.1      0          0
C10-S            7-S              6-S              7.187      0.01       456.3      456.045    0          0
C11              5                15               4.4        0.01       453.5      453.35     0          0
C11-S            6-S              1-S              7.87       0.01       456.045    455.46     0          0
C12              12               11               21.48      0.01       459        455.4      0          0
C12-S            12-S             11-S             21.528     0.01       460.6      457        0          0
C13              11               5                14.822     0.01       454.8      454.1      0          0
C13-S            11-S             15-S             16.675     0.01       457        454.6      0          0
C14              14               PIPE             10.2       0.01       451.77     451.51     0          0
```

C14-S	14-s	PIPE-S	10.18	0.01	454.3	454.26	0	0
C15	15	1	4.6	0.01	453.25	453.05	0	0
C16	EXMH1	OF1	20.4	0.01	450.79	450.68	0	0
C17	1	14	34.9	0.01	452.9	452.2	0	0
C17-S	PIPE2-S	14-s	35.878	0.01	455.3	454.3	0	0
C18	EXMH1-S	OF-S	20.036	0.01	453.1	452	0	0
C19	J116	3-S	76.856	0.01	460	456.89	0	0
C1-S	EXMH3-S	PIPE-S	14.36	0.01	454.44	454.26	0	0
C2	PIPE	EXMH1	67.43	0.01	451.14	450.81	0	0
C20	6	5	2.65	0.01	454	453.9	0	0
C20_1	J1	J3	24	0.05	463.32	462.84	0	0
C20_2	J3	13-S	11.5	0.05	462.84	462.6	0	0
C21	4-S	2-S	47.228	0.01	456.89	455.46	0	0
C22	2-S	PIPE-S	48.802	0.01	455.46	454.26	0	0
C23_1	ROOF_DRAIN	7	13.247	0.01	456	455.7	0	0
C24	13	12	5.4	0.01	460	459.1	0	0
C25	EXPONDOUTLET	EXMH17	22	0.01	468.08	467.93	0	0
C26	EXMH17	EXMH12	67.2	0.01	467.24	464.8	0	0
C27	EXMH12	EXMH6	79.9	0.01	464.56	454.92	0	0
C28	EXMH6	EXMH3	24	0.01	452.41	451.3	0	0
C29	13-S	12-S	18.698	0.01	462.6	460.6	0	0
C2-S	PIPE-S	EXMH1-S	67.43	0.01	454.26	453.1	0	0
C3-S	1-S	PIPE2-S	4.979	0.01	455.46	455.3	0	0
C4	3	1	64.2	0.01	455.3	452.98	0	0
C4-S	3-S	1-S	45.49	0.01	456.89	455.46	0	0
C5	2	1	8	0.01	453.4	453.2	0	0
C6	4	3	8	0.01	456.3	455.9	0	0
C7	10	9	14.5	0.01	457	456.3	0	0
C7-S	10-S	9-S	13.894	0.01	460.44	457.8	0	0
C8	9	8	9	0.01	455.6	455.2	0	0
C8-S	9-S	8-S	8.115	0.01	457.79	457.49	0	0
C9	8	7	37.5	0.01	454.4	454.3	0	0
C9-S	8-S	7-S	37.574	0.01	457.49	456.3	0	0

[ORIFICES]

;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
;;--------------	----------------	----------------	------------	----------	----------	--------	----------
OR2	7	7A	SIDE	454.3	0.65	NO	0

[OUTLETS]

;;Name	From Node	To Node	Offset	Type	QTable/Qcoeff	Qexpon	Gated
;;--------------	----------------	----------------	----------	---------------	----------------	----------	--------
J100-IC	4-S	4	456.89	TABULAR/DEPTH	stepcon		NO
J101-IC	3-S	3	456.89	TABULAR/DEPTH	stepcon		NO
J102-IC	2-S	2	455.46	TABULAR/DEPTH	TICB		NO
J103-IC	1-S	1	455.46	TABULAR/DEPTH	TICB		NO
J104-IC	6-S	6	456.045	TABULAR/DEPTH	CB		NO
J105-IC	11-S	11	457	TABULAR/DEPTH	CB		NO

J106-IC	12-S	12	460.6	TABULAR/DEPTH	TICB	NO
J107-IC	7-S	7	456.3	TABULAR/DEPTH	CB	NO
J108-IC	8-S	8	457.49	TABULAR/DEPTH	CB	NO
J111-IC	EXMH3-S	EXMH3	454.44	TABULAR/DEPTH	TICB	NO
J112-IC	15-S	15	454.6	TABULAR/DEPTH	CB	NO
J114-IC	14-s	14	454.3	TABULAR/DEPTH	TICB	NO
J98-IC	10-S	10	460.44	TABULAR/DEPTH	CB	NO
J99-IC	9-S	9	457.79	TABULAR/DEPTH	CB	NO
OL1	13-S	13	462.6	TABULAR/DEPTH	stepcon	NO
OR1	PIPE-S	PIPE	454.26	TABULAR/DEPTH	TICB	NO

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
;;--------------	------------	----------------	----------	----------	----------	----------	----------
C1	CIRCULAR	1	0	0	0	1	
C10	CIRCULAR	0.3	0	0	0	1	
C10-S	STREET	Emma_St_half					
C11	CIRCULAR	0.375	0	0	0	1	
C11-S	STREET	Emma_St					
C12	CIRCULAR	0.3	0	0	0	1	
C12-S	TRIANGULAR	0.3	1.8	0	0	1	
C13	CIRCULAR	0.3	0	0	0	1	
C13-S	TRIANGULAR	0.3	1.8	0	0	1	
C14	CIRCULAR	0.525	0	0	0	1	
C14-S	STREET	Emma_St					
C15	CIRCULAR	0.375	0	0	0	1	
C16	CIRCULAR	1	0	0	0	1	
C17	CIRCULAR	0.525	0	0	0	1	
C17-S	STREET	Emma_St_half					
C18	STREET	Emma_St					
C19	STREET	Emma_St_half					
C1-S	STREET	Emma_St					
C2	CIRCULAR	1	0	0	0	1	
C20	CIRCULAR	0.3	0	0	0	1	
C20_1	TRIANGULAR	0.3	1.8	0	0	1	
C20_2	TRIANGULAR	0.3	1.8	0	0	1	
C21	STREET	Emma_St_half					
C22	STREET	Emma_St_half					
C23_1	CIRCULAR	0.3	0	0	0	1	
C24	CIRCULAR	0.3	0	0	0	1	
C25	CIRCULAR	1.2	0	0	0	1	
C26	CIRCULAR	1.5	0	0	0	1	
C27	CIRCULAR	1.5	0	0	0	1	
C28	CIRCULAR	1.5	0	0	0	1	
C29	TRIANGULAR	0.3	1.8	0	0	1	
C2-S	STREET	Emma_St					
C3-S	STREET	Emma_St					
C4	CIRCULAR	0.45	0	0	0	1	

```
C4-S             STREET       Emma_St_half
C5               CIRCULAR     0.3              0           0           0           1
C6               CIRCULAR     0.3              0           0           0           1
C7               CIRCULAR     0.3              0           0           0           1
C7-S             STREET       Emma_St
C8               CIRCULAR     0.3              0           0           0           1
C8-S             STREET       Emma_St_half
C9               RECT_CLOSED  1.2              2.33        0           0           1
C9-S             STREET       Emma_St_half
OR2              CIRCULAR     0.15             0           0           0

[STREETS]
;;Name           Tcrown   Hcurb    Sx       nRoad    a        W        Sides    Tback    Sback    nBack
;;-------------- -------- -------- -------- -------- -------- -------- -------- -------- -------- --------
Emma_St          4        0.15     2        0.016    .01      0.2      2        1.8      2        0.02
Emma_St_half     4        0.15     2        0.016    .01      0.2      1        1.8      2        0.02

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
EXPONDOUTLET     FLOW             ""               FLOW     1.0      1        4.919

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
CB               Rating     0          0
CB                          0.003      0.05
CB                          0.23       0.05

stepcon          Rating     0          0
stepcon                     0.003      0.1
stepcon                     0.025      0.15
stepcon                     0.1        0.17

TICB             Rating     0          0
TICB                        0.003      0.1
TICB                        0.23       0.1

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Rainfall (mm/hr)
Chicago_3h       05/24/2024 00:00:00   7.322
Chicago_3h       05/24/2024 00:05:00   7.779
```

```
Chicago_3h       05/24/2024 00:10:00   8.312
Chicago_3h       05/24/2024 00:15:00   8.943
Chicago_3h       05/24/2024 00:20:00   9.705
Chicago_3h       05/24/2024 00:25:00   10.646
Chicago_3h       05/24/2024 00:30:00   11.846
Chicago_3h       05/24/2024 00:35:00   13.439
Chicago_3h       05/24/2024 00:40:00   15.68
Chicago_3h       05/24/2024 00:45:00   19.124
Chicago_3h       05/24/2024 00:50:00   25.308
Chicago_3h       05/24/2024 00:55:00   41.313
Chicago_3h       05/24/2024 01:00:00   288.515
Chicago_3h       05/24/2024 01:05:00   67.899
Chicago_3h       05/24/2024 01:10:00   42.143
Chicago_3h       05/24/2024 01:15:00   31.005
Chicago_3h       05/24/2024 01:20:00   25.098
Chicago_3h       05/24/2024 01:25:00   21.35
Chicago_3h       05/24/2024 01:30:00   18.726
Chicago_3h       05/24/2024 01:35:00   16.77
Chicago_3h       05/24/2024 01:40:00   15.246
Chicago_3h       05/24/2024 01:45:00   14.021
Chicago_3h       05/24/2024 01:50:00   13.01
Chicago_3h       05/24/2024 01:55:00   12.16
Chicago_3h       05/24/2024 02:00:00   11.433
Chicago_3h       05/24/2024 02:05:00   10.804
Chicago_3h       05/24/2024 02:10:00   10.252
Chicago_3h       05/24/2024 02:15:00   9.765
Chicago_3h       05/24/2024 02:20:00   9.33
Chicago_3h       05/24/2024 02:25:00   8.939
Chicago_3h       05/24/2024 02:30:00   8.586
Chicago_3h       05/24/2024 02:35:00   8.265
Chicago_3h       05/24/2024 02:40:00   7.972
Chicago_3h       05/24/2024 02:45:00   7.702
Chicago_3h       05/24/2024 02:50:00   7.454
Chicago_3h       05/24/2024 02:55:00   7.224
Chicago_3h       05/24/2024 03:00:00   0

;Chicago design storm, a = 898.451, b = 0.067, c = 0.7, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_100year            0:00       7.322
Chicago_3h_100year            0:05       7.779
Chicago_3h_100year            0:10       8.312
Chicago_3h_100year            0:15       8.943
Chicago_3h_100year            0:20       9.705
Chicago_3h_100year            0:25       10.646
Chicago_3h_100year            0:30       11.846
Chicago_3h_100year            0:35       13.439
Chicago_3h_100year            0:40       15.68
Chicago_3h_100year            0:45       19.124
Chicago_3h_100year            0:50       25.308
```

```
Chicago_3h_100year            0:55       41.313
Chicago_3h_100year            1:00       288.515
Chicago_3h_100year            1:05       67.899
Chicago_3h_100year            1:10       42.143
Chicago_3h_100year            1:15       31.005
Chicago_3h_100year            1:20       25.098
Chicago_3h_100year            1:25       21.35
Chicago_3h_100year            1:30       18.726
Chicago_3h_100year            1:35       16.77
Chicago_3h_100year            1:40       15.246
Chicago_3h_100year            1:45       14.021
Chicago_3h_100year            1:50       13.01
Chicago_3h_100year            1:55       12.16
Chicago_3h_100year            2:00       11.433
Chicago_3h_100year            2:05       10.804
Chicago_3h_100year            2:10       10.252
Chicago_3h_100year            2:15       9.765
Chicago_3h_100year            2:20       9.33
Chicago_3h_100year            2:25       8.939
Chicago_3h_100year            2:30       8.586
Chicago_3h_100year            2:35       8.265
Chicago_3h_100year            2:40       7.972
Chicago_3h_100year            2:45       7.702
Chicago_3h_100year            2:50       7.454
Chicago_3h_100year            2:55       7.224
Chicago_3h_100year            3:00       0

;Chicago design storm, a = 4536.306, b = 21.19, c = 0.945, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:00       4.946
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:05       5.593
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:10       6.4
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:15       7.425
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:20       8.76
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:25       10.55
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:30       13.041
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:35       16.671
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:40       22.297
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:45       31.788
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:50       49.947
Chicago_3h_100Year_Fergus_Shand_Dam_2016            0:55       92.7
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:00       207.283
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:05       143.363
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:10       95.74
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:15       66.601
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:20       49.338
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:25       38.226
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:30       30.627
Chicago_3h_100Year_Fergus_Shand_Dam_2016            1:35       25.187
```

Chicago_3h_100Year_Fergus_Shand_Dam_2016	1:40	21.149
Chicago_3h_100Year_Fergus_Shand_Dam_2016	1:45	18.064
Chicago_3h_100Year_Fergus_Shand_Dam_2016	1:50	15.648
Chicago_3h_100Year_Fergus_Shand_Dam_2016	1:55	13.719
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:00	12.151
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:05	10.858
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:10	9.778
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:15	8.865
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:20	8.086
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:25	7.416
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:30	6.833
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:35	6.324
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:40	5.877
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:45	5.48
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:50	5.127
Chicago_3h_100Year_Fergus_Shand_Dam_2016	2:55	4.811
Chicago_3h_100Year_Fergus_Shand_Dam_2016	3:00	0

;Chicago design storm, a = 628.047, b = 0.056, c = 0.7, Duration = 180 minutes, r = 0.35, rain units = mm/hr.

Chicago_3h_10year	0:00	5.118
Chicago_3h_10year	0:05	5.437
Chicago_3h_10year	0:10	5.81
Chicago_3h_10year	0:15	6.251
Chicago_3h_10year	0:20	6.783
Chicago_3h_10year	0:25	7.441
Chicago_3h_10year	0:30	8.279
Chicago_3h_10year	0:35	9.392
Chicago_3h_10year	0:40	10.957
Chicago_3h_10year	0:45	13.363
Chicago_3h_10year	0:50	17.68
Chicago_3h_10year	0:55	28.842
Chicago_3h_10year	1:00	201.989
Chicago_3h_10year	1:05	47.349
Chicago_3h_10year	1:10	29.423
Chicago_3h_10year	1:15	21.656
Chicago_3h_10year	1:20	17.534
Chicago_3h_10year	1:25	14.917
Chicago_3h_10year	1:30	13.085
Chicago_3h_10year	1:35	11.719
Chicago_3h_10year	1:40	10.655
Chicago_3h_10year	1:45	9.798
Chicago_3h_10year	1:50	9.092
Chicago_3h_10year	1:55	8.498
Chicago_3h_10year	2:00	7.991
Chicago_3h_10year	2:05	7.551
Chicago_3h_10year	2:10	7.165
Chicago_3h_10year	2:15	6.825
Chicago_3h_10year	2:20	6.521

```
Chicago_3h_10year            2:25       6.248
Chicago_3h_10year            2:30       6.001
Chicago_3h_10year            2:35       5.777
Chicago_3h_10year            2:40       5.572
Chicago_3h_10year            2:45       5.384
Chicago_3h_10year            2:50       5.21
Chicago_3h_10year            2:55       5.05
Chicago_3h_10year            3:00       0

;Chicago design storm, a = 736.938, b = 0.071, c = 0.7, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_25year            0:00       6.006
Chicago_3h_25year            0:05       6.381
Chicago_3h_25year            0:10       6.818
Chicago_3h_25year            0:15       7.336
Chicago_3h_25year            0:20       7.961
Chicago_3h_25year            0:25       8.733
Chicago_3h_25year            0:30       9.717
Chicago_3h_25year            0:35       11.024
Chicago_3h_25year            0:40       12.862
Chicago_3h_25year            0:45       15.688
Chicago_3h_25year            0:50       20.763
Chicago_3h_25year            0:55       33.902
Chicago_3h_25year            1:00       236.519
Chicago_3h_25year            1:05       55.741
Chicago_3h_25year            1:10       34.583
Chicago_3h_25year            1:15       25.439
Chicago_3h_25year            1:20       20.591
Chicago_3h_25year            1:25       17.515
Chicago_3h_25year            1:30       15.362
Chicago_3h_25year            1:35       13.757
Chicago_3h_25year            1:40       12.507
Chicago_3h_25year            1:45       11.501
Chicago_3h_25year            1:50       10.672
Chicago_3h_25year            1:55       9.975
Chicago_3h_25year            2:00       9.378
Chicago_3h_25year            2:05       8.862
Chicago_3h_25year            2:10       8.41
Chicago_3h_25year            2:15       8.01
Chicago_3h_25year            2:20       7.653
Chicago_3h_25year            2:25       7.333
Chicago_3h_25year            2:30       7.043
Chicago_3h_25year            2:35       6.779
Chicago_3h_25year            2:40       6.539
Chicago_3h_25year            2:45       6.318
Chicago_3h_25year            2:50       6.114
Chicago_3h_25year            2:55       5.926
Chicago_3h_25year            3:00       0
```

```
;Chicago design storm, a = 411.358, b = 0.073, c = 0.701, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_2year            0:00       3.324
Chicago_3h_2year            0:05       3.532
Chicago_3h_2year            0:10       3.774
Chicago_3h_2year            0:15       4.061
Chicago_3h_2year            0:20       4.408
Chicago_3h_2year            0:25       4.836
Chicago_3h_2year            0:30       5.382
Chicago_3h_2year            0:35       6.107
Chicago_3h_2year            0:40       7.127
Chicago_3h_2year            0:45       8.696
Chicago_3h_2year            0:50       11.514
Chicago_3h_2year            0:55       18.816
Chicago_3h_2year            1:00       131.774
Chicago_3h_2year            1:05       30.966
Chicago_3h_2year            1:10       19.194
Chicago_3h_2year            1:15       14.112
Chicago_3h_2year            1:20       11.418
Chicago_3h_2year            1:25       9.71
Chicago_3h_2year            1:30       8.515
Chicago_3h_2year            1:35       7.624
Chicago_3h_2year            1:40       6.93
Chicago_3h_2year            1:45       6.372
Chicago_3h_2year            1:50       5.912
Chicago_3h_2year            1:55       5.525
Chicago_3h_2year            2:00       5.194
Chicago_3h_2year            2:05       4.908
Chicago_3h_2year            2:10       4.657
Chicago_3h_2year            2:15       4.435
Chicago_3h_2year            2:20       4.237
Chicago_3h_2year            2:25       4.06
Chicago_3h_2year            2:30       3.899
Chicago_3h_2year            2:35       3.753
Chicago_3h_2year            2:40       3.62
Chicago_3h_2year            2:45       3.497
Chicago_3h_2year            2:50       3.384
Chicago_3h_2year            2:55       3.28
Chicago_3h_2year            3:00       0

;Chicago design storm, a = 819.918, b = 0.068, c = 0.7, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_50year            0:00       6.682
Chicago_3h_50year            0:05       7.099
Chicago_3h_50year            0:10       7.585
Chicago_3h_50year            0:15       8.161
Chicago_3h_50year            0:20       8.857
Chicago_3h_50year            0:25       9.716
Chicago_3h_50year            0:30       10.811
Chicago_3h_50year            0:35       12.265
```

```
Chicago_3h_50year            0:40       14.31
Chicago_3h_50year            0:45       17.453
Chicago_3h_50year            0:50       23.097
Chicago_3h_50year            0:55       37.706
Chicago_3h_50year            1:00       263.26
Chicago_3h_50year            1:05       61.977
Chicago_3h_50year            1:10       38.464
Chicago_3h_50year            1:15       28.297
Chicago_3h_50year            1:20       22.906
Chicago_3h_50year            1:25       19.485
Chicago_3h_50year            1:30       17.09
Chicago_3h_50year            1:35       15.304
Chicago_3h_50year            1:40       13.914
Chicago_3h_50year            1:45       12.795
Chicago_3h_50year            1:50       11.873
Chicago_3h_50year            1:55       11.097
Chicago_3h_50year            2:00       10.434
Chicago_3h_50year            2:05       9.859
Chicago_3h_50year            2:10       9.356
Chicago_3h_50year            2:15       8.911
Chicago_3h_50year            2:20       8.514
Chicago_3h_50year            2:25       8.158
Chicago_3h_50year            2:30       7.836
Chicago_3h_50year            2:35       7.543
Chicago_3h_50year            2:40       7.275
Chicago_3h_50year            2:45       7.029
Chicago_3h_50year            2:50       6.803
Chicago_3h_50year            2:55       6.593
Chicago_3h_50year            3:00       0

;Chicago design storm, a = 541.298, b = 0.072, c = 0.7, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_5year            0:00       4.412
Chicago_3h_5year            0:05       4.687
Chicago_3h_5year            0:10       5.008
Chicago_3h_5year            0:15       5.388
Chicago_3h_5year            0:20       5.847
Chicago_3h_5year            0:25       6.415
Chicago_3h_5year            0:30       7.138
Chicago_3h_5year            0:35       8.098
Chicago_3h_5year            0:40       9.448
Chicago_3h_5year            0:45       11.524
Chicago_3h_5year            0:50       15.252
Chicago_3h_5year            0:55       24.904
Chicago_3h_5year            1:00       173.704
Chicago_3h_5year            1:05       40.952
Chicago_3h_5year            1:10       25.405
Chicago_3h_5year            1:15       18.687
Chicago_3h_5year            1:20       15.125
```

```
Chicago_3h_5year            1:25      12.866
Chicago_3h_5year            1:30      11.284
Chicago_3h_5year            1:35      10.105
Chicago_3h_5year            1:40      9.187
Chicago_3h_5year            1:45      8.448
Chicago_3h_5year            1:50      7.839
Chicago_3h_5year            1:55      7.327
Chicago_3h_5year            2:00      6.889
Chicago_3h_5year            2:05      6.51
Chicago_3h_5year            2:10      6.177
Chicago_3h_5year            2:15      5.883
Chicago_3h_5year            2:20      5.621
Chicago_3h_5year            2:25      5.386
Chicago_3h_5year            2:30      5.173
Chicago_3h_5year            2:35      4.98
Chicago_3h_5year            2:40      4.803
Chicago_3h_5year            2:45      4.641
Chicago_3h_5year            2:50      4.491
Chicago_3h_5year            2:55      4.353
Chicago_3h_5year            3:00      0

;Chicago design storm, a = 1497.969, b = 12.024, c = 0.86, Duration = 180 minutes, r = 0.35, rain units = mm/hr.
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:00      3.299
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:05      3.62
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:10      4.011
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:15      4.498
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:20      5.117
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:25      5.931
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:30      7.042
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:35      8.639
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:40      11.098
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:45      15.291
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:50      23.681
Chicago_3h_5Year_2016_Fergus_Shand_Dam            0:55      46.327
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:00      130.855
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:05      78.331
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:10      47.746
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:15      31.858
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:20      23.355
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:25      18.186
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:30      14.767
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:35      12.364
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:40      10.596
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:45      9.248
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:50      8.191
Chicago_3h_5Year_2016_Fergus_Shand_Dam            1:55      7.342
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:00      6.648
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:05      6.07
```

```
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:10       5.582
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:15       5.166
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:20       4.807
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:25       4.494
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:30       4.219
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:35       3.976
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:40       3.759
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:45       3.565
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:50       3.39
Chicago_3h_5Year_2016_Fergus_Shand_Dam            2:55       3.231
Chicago_3h_5Year_2016_Fergus_Shand_Dam            3:00       0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Node       10-S             Major_System
Node       11-S             Major_System
Node       12-S             Major_System
Node       14-s             Major_System
Node       15-S             Major_System
Node       1-S              Major_System
Node       2-S              Major_System
Node       3-S              Major_System
Node       4-S              Major_System
Node       6-S              Major_System
Node       7-S              Major_System
Node       8-S              Major_System
Node       9-S              Major_System
Node       EXMH1-S          Major_System
Node       EXMH3-S          Major_System
Node       PIPE2-S          Major_System
Node       PIPE-S           Major_System
Link       C10-S            Major_System
Link       C11-S            Major_System
Link       C12-S            Major_System
Link       C13-S            Major_System
Link       C14-S            Major_System
Link       C17-S            Major_System
Link       C18              MAJOR_SYSTEM
Link       C19              major_system
Link       C1-S             Major_System
Link       C21              Major_System
```

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Link       C22              Major_System
Link       C29              Major_System
Link       C2-S             Major_System
Link       C3-S             Major_System
Link       C4-S             Major_System
Link       C7-S             Major_System
Link       C8-S             Major_System
Link       C9-S             Major_System

[MAP]
DIMENSIONS       554766.90585     4860482.8847     555008.42515     4860693.6073
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1                554899.552         4860558.076
10               554868.255         4860613.924
10-S             554871.3           4860610.879
11               554877.076         4860556.864
11-S             554880.121         4860553.819
12               554856.118         4860551.98
12-S             554859.163         4860548.935
13               554841.499         4860550.487
13-S             554840.487         4860548.199
14               554903.658         4860522.305
14-s             554906.703         4860519.26
15               554893.745         4860556.887
15-S             554896.79          4860553.842
1-S              554901.951         4860559.366
2                554907.202         4860558.624
2-S              554908.678         4860558.778
3                554891.253         4860607.331
3-S              554894.298         4860604.286
4                554899.126         4860608.583
4-S              554902.171         4860605.538
5                554891.418         4860560.587
6                554891.067         4860563.075
6-S              554894.112         4860560.03
7                554889.825         4860570.15
7A               554889.842         4860568.797
7-S              554892.87          4860567.105
8                554883.463         4860607.168
8-S              554886.508         4860604.123
9                554882.089         4860615.163
9-S              554885.134         4860612.118
EXMH1            554973.224         4860528.848
EXMH12           554842.885         4860499.254
```

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EXMH17           554806.855        4860492.463
EXMH1-S          554976.269        4860525.803
EXMH3            554893.185        4860510.611
EXMH3-S          554896.23         4860507.566
EXMH6            554872.691        4860506.234
EXPONDOUTLET     554788.557        4860507.932
J1               554831.771        4860591.835
J116             554879.136        4860679.603
J3               554838.862        4860561.695
PIPE             554904.686        4860513.048
PIPE2-S          554902.454        4860554.872
PIPE-S           554907.731        4860510.003
ROOF_DRAIN       554876.91         4860567.226
OF1              554997.447        4860524.18
OF-S             554995.839        4860521.543

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
100&102&103      554840.398        4860572.349
100&102&103      554794.648        4860558.981
100&102&103      554789.255        4860590.179
100&102&103      554832.026        4860603.218
100&102&103      554838.713        4860586.197
100&102&103      554840.398        4860572.349
103&101          554794.648        4860558.981
103&101          554840.398        4860572.349
103&101          554841.396        4860564.15
103&101          554844.435        4860544.708
103&101          554799.437        4860531.273
103&101          554794.648        4860558.981
104              554875.871        4860656.679
104              554782.033        4860631.364
104              554781.464        4860634.608
104              554777.884        4860653.976
104              554882.012        4860682.609
104              554875.871        4860656.679
104A             554875.285        4860656.521
104A             554875.871        4860656.679
104A             554882.012        4860682.609
104A             554882.317        4860682.693
104A             554895.085        4860607.91
104A             554891.166        4860607.052
104A             554887.823        4860609.158
```

104A	554884.753	4860608.627
104A	554883.618	4860615.535
104A	554882.083	4860615.269
104A	554879.434	4860630.597
104A	554878.566	4860630.447
104A	554873.521	4860629.575
104A	554873.768	4860628.147
104A	554867.856	4860627.125
104A	554848.661	4860616.644
104A	554787.51	4860600.128
104A	554782.033	4860631.364
104A	554875.285	4860656.521
105	554895.085	4860607.91
105	554899.037	4860608.748
105	554887.174	4860684.029
105	554882.317	4860682.693
105	554895.085	4860607.91
106	554895.085	4860607.91
106	554899	4860608.74
106	554907.054	4860562.141
106	554907.331	4860558.554
106	554903.751	4860558.441
106	554902.93	4860562.074
106	554895.085	4860607.91
107	554902.93	4860562.074
107	554903.751	4860558.441
107	554899.569	4860557.587
107	554898.891	4860562.403
107	554892.589	4860563.633
107	554891.397	4860570.531
107	554889.861	4860570.265
107	554883.482	4860607.17
107	554884.811	4860608.637
107	554887.823	4860609.158
107	554891.166	4860607.052
107	554895.085	4860607.91
107	554902.93	4860562.074
108	554892.611	4860551.824
108	554897.33	4860530.993
108	554887.219	4860528.773
108	554882.548	4860549.591
108	554870.044	4860547.359
108	554866.846	4860551.239
108	554878.523	4860555.439
108	554877.692	4860559.796
108	554885.35	4860561.135
108	554885.606	4860559.657
108	554891.518	4860560.679

108	554891.053	4860563.368
108	554892.589	4860563.633
108	554898.891	4860562.403
108	554899.569	4860557.587
108	554900.111	4860554.983
108	554892.611	4860551.824
EX2REM	554847.721	4860524.836
EX2REM	554838.587	4860517.459
EX2REM	554824.36	4860522.552
EX2REM	554835.777	4860531.686
EX2REM	554847.721	4860524.836
EX3REM	554882.823	4860543.596
EX3REM	554882.296	4860525.856
EX3REM	554860.164	4860524.451
EX3REM	554859.989	4860544.123
EX3REM	554882.823	4860543.596
POST1	554868.657	4860621.195
POST1	554869.747	4860613.127
POST1	554852.299	4860607.812
POST1	554848.331	4860607.127
POST1	554848.157	4860608.135
POST1	554789.255	4860590.179
POST1	554787.51	4860600.128
POST1	554848.661	4860616.644
POST1	554867.856	4860627.125
POST1	554868.657	4860621.195
POST2-4	554889.778	4860570.747
POST2-4	554876.387	4860570.388
POST2-4	554872.267	4860597.044
POST2-4	554850.772	4860593.004
POST2-4	554848.331	4860607.127
POST2-4	554852.299	4860607.812
POST2-4	554869.747	4860613.127
POST2-4	554867.856	4860627.125
POST2-4	554873.768	4860628.147
POST2-4	554873.521	4860629.575
POST2-4	554879.513	4860630.646
POST2-4	554882.083	4860615.269
POST2-4	554883.618	4860615.535
POST2-4	554884.811	4860608.637
POST2-4	554883.482	4860607.17
POST2-4	554889.778	4860570.747
POST5	554872.267	4860597.044
POST5	554878.015	4860559.852
POST5	554877.692	4860559.796
POST5	554877.881	4860558.551
POST5	554857.34	4860555.001
POST5	554850.772	4860593.004

```
POST5            554872.267         4860597.044
POST6            554876.387         4860570.388
POST6            554889.778         4860570.747
POST6            554889.861         4860570.265
POST6            554891.397         4860570.531
POST6            554892.589         4860563.633
POST6            554891.053         4860563.368
POST6            554891.518         4860560.679
POST6            554885.606         4860559.657
POST6            554885.35          4860561.135
POST6            554878.015         4860559.852
POST6            554876.387         4860570.388
S1_1             554857.266         4860548.747
S1_1             554857.488         4860555.027
S1_1             554877.881         4860558.551
S1_1             554878.523         4860555.439
S1_1             554857.266         4860548.747
S1_2             554857.488         4860555.027
S1_2             554857.266         4860548.747
S1_2             554844.435         4860544.708
S1_2             554841.396         4860564.15
S1_2             554840.398         4860572.349
S1_2             554838.713         4860586.197
S1_2             554832.133         4860603.25
S1_2             554848.157         4860608.135
S1_2             554857.34          4860555.001
S1_2             554857.488         4860555.027

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
```

5 Year Storm – Control

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 9
Number of subcatchments ... 16
Number of nodes ........... 47
Number of links ........... 60
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
------------------------------------------------------------------------
Chicago_3h           Chicago_3h                     INTENSITY    5 min.
Chicago_3h_100year   Chicago_3h_100year             INTENSITY    5 min.
Chicago_3h_100Year_Fergus_Shand_Dam_2016 Chicago_3h_100Year_Fergus_Shand_Dam_2016 INTENSITY    5 min.
Chicago_3h_10year    Chicago_3h_10year              INTENSITY    5 min.
Chicago_3h_25year    Chicago_3h_25year              INTENSITY    5 min.
Chicago_3h_2year     Chicago_3h_2year               INTENSITY    5 min.
Chicago_3h_50year    Chicago_3h_50year              INTENSITY    5 min.
Chicago_3h_5year     Chicago_3h_5year               INTENSITY    5 min.
Chicago_3h_5Year_2016_Fergus_Shand_Dam Chicago_3h_5Year_2016_Fergus_Shand_Dam INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                           Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
100&102&103                    0.17     17.00     15.00    7.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam J1
103&101                        0.30     24.59     15.00    8.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam J3
104                            0.24     23.77     25.00    6.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam J116
104A                           0.33     21.94     30.00    6.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam 3-S
105                            0.05      6.40    100.00    4.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam 4-S
106                            0.02      5.49    100.00    3.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam 2-S
107                            0.05     14.49    100.00    3.0000 Chicago_3h_5Year_2016_Fergus_Shand_Dam 1-S
```

108	0.05	20.00	25.00	15.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 15-S
EX2REM	1.10	1100.00	25.00	2.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam EXMH12
EX3REM	0.95	950.00	25.00	2.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam PIPE
POST1	0.08	13.33	25.00	10.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 10-S
POST2-4	0.11	36.57	100.00	4.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 8-S
POST5	0.08	83.40	100.00	10.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam ROOF_DRAIN
POST6	0.02	13.33	100.00	6.0000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 6-S
S1_1	0.01	1.00	25.00	0.5000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 11
S1_2	0.08	8.50	25.00	0.5000	Chicago_3h_5Year_2016_Fergus_Shand_Dam 12-S

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.90	2.46	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.80	2.20	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	459.00	1.60	0.0	
12-S	JUNCTION	460.60	0.30	0.0	
13	JUNCTION	460.00	2.60	0.0	
13-S	JUNCTION	462.60	0.30	0.0	
14	JUNCTION	451.77	2.53	0.0	
14-s	JUNCTION	454.30	0.30	0.0	
15	JUNCTION	453.25	1.51	0.0	
15-S	JUNCTION	454.60	0.30	0.0	
1-S	JUNCTION	455.46	0.26	0.0	
2	JUNCTION	453.00	2.46	0.0	
2-S	JUNCTION	455.46	0.20	0.0	
3	JUNCTION	454.00	2.89	0.0	
3-S	JUNCTION	456.89	0.20	0.0	
4	JUNCTION	454.30	2.59	0.0	
4-S	JUNCTION	456.89	0.20	0.0	
5	JUNCTION	453.50	2.49	0.0	
6	JUNCTION	454.00	2.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.30	2.00	0.0	
7A	JUNCTION	454.30	2.00	0.0	
7-S	JUNCTION	456.30	0.30	0.0	
8	JUNCTION	454.40	3.09	0.0	
8-S	JUNCTION	457.49	0.30	0.0	
9	JUNCTION	455.60	2.19	0.0	
9-S	JUNCTION	457.79	0.21	0.0	
EXMH1	JUNCTION	450.79	2.31	0.0	

EXMH12	JUNCTION	464.56	3.61	0.0	
EXMH17	JUNCTION	467.24	6.34	0.0	
EXMH1-S	JUNCTION	453.10	0.20	0.0	
EXMH3	JUNCTION	451.21	3.23	0.0	
EXMH3-S	JUNCTION	454.44	0.26	0.0	
EXMH6	JUNCTION	452.41	6.59	0.0	
EXPONDOUTLET	JUNCTION	468.08	2.78	0.0	Yes
J1	JUNCTION	463.32	0.30	0.0	
J116	JUNCTION	460.00	0.30	0.0	
J3	JUNCTION	462.84	0.30	0.0	
PIPE	JUNCTION	451.14	3.12	0.0	
PIPE2-S	JUNCTION	455.30	0.30	0.0	
PIPE-S	JUNCTION	454.26	0.24	0.0	
ROOF_DRAIN	JUNCTION	456.00	2.24	0.0	
OF1	OUTFALL	450.68	1.00	0.0	
OF-S	OUTFALL	452.00	0.20	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXMH3	PIPE	CONDUIT	14.4	0.4527	0.0100
C10	7A	6	CONDUIT	9.2	2.1744	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	3.5503	0.0160
C11	5	15	CONDUIT	4.4	3.4111	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	17.0002	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	16.9612	0.0100
C13	11	5	CONDUIT	14.8	4.7280	0.0100
C13-S	11-S	15-S	CONDUIT	16.7	14.5442	0.0100
C14	14	PIPE	CONDUIT	10.2	2.5498	0.0100
C14-S	14-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	15	1	CONDUIT	4.6	4.3519	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.5392	0.0100
C17	1	14	CONDUIT	34.9	2.0061	0.0100
C17-S	PIPE2-S	14-s	CONDUIT	35.9	2.7883	0.0160
C18	EXMH1-S	OF-S	CONDUIT	20.0	5.4984	0.0160
C19	J116	3-S	CONDUIT	76.9	4.0498	0.0160
C1-S	EXMH3-S	PIPE-S	CONDUIT	14.4	1.2536	0.0160
C2	PIPE	EXMH1	CONDUIT	67.4	0.4894	0.0100
C20	6	5	CONDUIT	2.6	3.7763	0.0100
C20_1	J1	J3	CONDUIT	24.0	2.0004	0.0500
C20_2	J3	13-S	CONDUIT	11.5	2.0874	0.0500
C21	4-S	2-S	CONDUIT	47.2	3.0293	0.0160
C22	2-S	PIPE-S	CONDUIT	48.8	2.4597	0.0160
C23_1	ROOF_DRAIN	7	CONDUIT	13.2	2.2652	0.0100

C24	13	12	CONDUIT	5.4	16.9031	0.0100
C25	EXPONDOUTLET	EXMH17	CONDUIT	22.0	0.6818	0.0100
C26	EXMH17	EXMH12	CONDUIT	67.2	3.6333	0.0100
C27	EXMH12	EXMH6	CONDUIT	79.9	12.1539	0.0100
C28	EXMH6	EXMH3	CONDUIT	24.0	4.6300	0.0100
C29	13-S	12-S	CONDUIT	18.7	10.7581	0.0100
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	64.2	3.6161	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	2.5008	0.0100
C6	4	3	CONDUIT	8.0	5.0063	0.0100
C7	10	9	CONDUIT	14.5	4.8332	0.0100
C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160
C8	9	8	CONDUIT	9.0	4.4488	0.0100
C8-S	9-S	8-S	CONDUIT	8.1	3.6994	0.0160
C9	8	7	CONDUIT	37.5	0.2667	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	3.1687	0.0160
OR2	7	7A	ORIFICE			
J100-IC	4-S	4	OUTLET			
J101-IC	3-S	3	OUTLET			
J102-IC	2-S	2	OUTLET			
J103-IC	1-S	1	OUTLET			
J104-IC	6-S	6	OUTLET			
J105-IC	11-S	11	OUTLET			
J106-IC	12-S	12	OUTLET			
J107-IC	7-S	7	OUTLET			
J108-IC	8-S	8	OUTLET			
J111-IC	EXMH3-S	EXMH3	OUTLET			
J112-IC	15-S	15	OUTLET			
J114-IC	14-s	14	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	OUTLET			
OL1	13-S	13	OUTLET			
OR1	PIPE-S	PIPE	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	2.10
C10	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.88
C11	CIRCULAR	0.38	0.11	0.09	0.38	1	0.42
C11-S	Emma_St	0.20	1.23	0.13	11.60	1	5.41

C12	CIRCULAR	0.30	0.07	0.07	0.30	1	0.52
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.03
C13	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
C13-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	2.81
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.89
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.38	0.11	0.09	0.38	1	0.48
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	2.29
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.79
C17-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.67
C18	Emma_St	0.20	1.23	0.13	11.60	1	4.65
C19	Emma_St_half	0.20	0.62	0.13	5.80	1	2.01
C1-S	Emma_St	0.20	1.23	0.13	11.60	1	2.22
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	2.18
C20	CIRCULAR	0.30	0.07	0.07	0.30	1	0.24
C20_1	TRIANGULAR	0.30	0.27	0.14	1.80	1	0.21
C20_2	TRIANGULAR	0.30	0.27	0.14	1.80	1	0.21
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.74
C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.56
C23_1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C24	CIRCULAR	0.30	0.07	0.07	0.30	1	0.52
C25	CIRCULAR	1.20	1.13	0.30	1.20	1	4.19
C26	CIRCULAR	1.50	1.77	0.38	1.50	1	17.52
C27	CIRCULAR	1.50	1.77	0.38	1.50	1	32.04
C28	CIRCULAR	1.50	1.77	0.38	1.50	1	19.78
C29	TRIANGULAR	0.30	0.27	0.14	1.80	1	2.41
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3-S	Emma_St	0.20	1.23	0.13	11.60	1	3.56
C4	CIRCULAR	0.45	0.16	0.11	0.45	1	0.70
C4-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.77
C5	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.28
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.28
C7-S	Emma_St	0.20	1.23	0.13	11.60	1	8.72
C8	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.92
C9	RECT_CLOSED	1.20	2.80	0.40	2.33	1	7.79
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.77

```
**************
Street Summary
**************

Street Emma_St
Area:
            0.0002     0.0007     0.0016     0.0029     0.0054
            0.0090     0.0139     0.0201     0.0275     0.0361
```

0.0460	0.0572	0.0696	0.0832	0.0980
0.1142	0.1315	0.1501	0.1700	0.1911
0.2134	0.2370	0.2618	0.2872	0.3126
0.3380	0.3634	0.3888	0.4142	0.4396
0.4650	0.4904	0.5158	0.5412	0.5666
0.5920	0.6174	0.6428	0.6682	0.6936
0.7190	0.7452	0.7727	0.8014	0.8314
0.8627	0.8951	0.9288	0.9638	1.0000

Hrad:

0.0140	0.0280	0.0419	0.0460	0.0505
0.0608	0.0731	0.0863	0.0999	0.1138
0.1279	0.1421	0.1564	0.1708	0.1852
0.1997	0.2142	0.2287	0.2432	0.2578
0.2724	0.2870	0.3021	0.3311	0.3601
0.3889	0.4178	0.4465	0.4753	0.5039
0.5325	0.5611	0.5896	0.6180	0.6464
0.6748	0.7030	0.7313	0.7594	0.7876
0.8157	0.8432	0.8688	0.8928	0.9152
0.9362	0.9559	0.9745	0.9919	1.0000

Width:

0.0097	0.0193	0.0290	0.0490	0.0828
0.1166	0.1503	0.1841	0.2179	0.2517
0.2855	0.3193	0.3531	0.3869	0.4207
0.4545	0.4883	0.5221	0.5559	0.5897
0.6234	0.6572	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6959	0.7297	0.7634	0.7972	0.8310
0.8648	0.8986	0.9324	0.9662	1.0000

Street Emma_St_half

Area:

0.0002	0.0007	0.0016	0.0029	0.0054
0.0090	0.0139	0.0201	0.0275	0.0361
0.0460	0.0572	0.0696	0.0832	0.0980
0.1142	0.1315	0.1501	0.1700	0.1911
0.2134	0.2370	0.2618	0.2872	0.3126
0.3380	0.3634	0.3888	0.4142	0.4396
0.4650	0.4904	0.5158	0.5412	0.5666
0.5920	0.6174	0.6428	0.6682	0.6936
0.7190	0.7452	0.7727	0.8014	0.8314
0.8627	0.8951	0.9288	0.9638	1.0000

Hrad:

0.0139	0.0277	0.0416	0.0456	0.0501
0.0603	0.0725	0.0855	0.0990	0.1128
0.1268	0.1409	0.1551	0.1694	0.1837
0.1980	0.2124	0.2268	0.2412	0.2556

	0.2701	0.2846	0.2996	0.3284	0.3571
	0.3857	0.4143	0.4428	0.4713	0.4997
	0.5281	0.5564	0.5847	0.6129	0.6410
	0.6691	0.6972	0.7252	0.7531	0.7810
	0.8089	0.8362	0.8616	0.8854	0.9076
	0.9284	0.9480	0.9664	0.9837	1.0000
Width:					
	0.0097	0.0193	0.0290	0.0490	0.0828
	0.1166	0.1503	0.1841	0.2179	0.2517
	0.2855	0.3193	0.3531	0.3869	0.4207
	0.4545	0.4883	0.5221	0.5559	0.5897
	0.6234	0.6572	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6959	0.7297	0.7634	0.7972	0.8310
	0.8648	0.8986	0.9324	0.9662	1.0000

```
****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/24/2024 00:00:00
Ending Date .............. 05/24/2024 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:30
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 0.20 sec
Variable Time Step ....... YES
Maximum Trials ........... 10
Number of Threads ........ 12
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
```

```
Runoff Quantity Continuity     hectare-m           mm
**************************     ---------      -------
Total Precipitation ......         0.178       48.858
Evaporation Loss .........         0.000        0.000
Infiltration Loss ........         0.061       16.658
Surface Runoff ...........         0.117       32.100
Final Storage ............         0.000        0.117
Continuity Error (%) .....        -0.036


**************************        Volume       Volume
Flow Routing Continuity        hectare-m     10^6 ltr
**************************     ---------    ---------
Dry Weather Inflow .......         0.000        0.000
Wet Weather Inflow .......         0.117        1.171
Groundwater Inflow .......         0.000        0.000
RDII Inflow ..............         0.000        0.000
External Inflow ..........        10.624      106.240
External Outflow .........        10.709      107.090
Flooding Loss ............         0.013        0.132
Evaporation Loss .........         0.000        0.000
Exfiltration Loss ........         0.000        0.000
Initial Stored Volume ....         0.000        0.000
Final Stored Volume ......         0.023        0.233
Continuity Error (%) .....        -0.041


*************************
Highest Continuity Errors
*************************
Node 12-S (-43.95%)
Node 13-S (-15.37%)
Node 2 (10.91%)
Node 4 (9.31%)
Node 14-s (-4.95%)


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
Link OL1 (113)
Link J106-IC (102)
```

Link J100-IC (76)
Link C15 (60)
Link C11 (56)

```
*********************************
Most Frequent Nonconverging Nodes
*********************************
Node OF1 (39.08%)
Node OF-S (39.08%)
Node 2 (32.12%)
Node 1 (21.96%)
Node 15 (19.27%)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.07 sec
Average Time Step           :     0.20 sec
Maximum Time Step           :     0.20 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     5.99
% of Steps Not Converging   :    39.08
Time Step Frequencies       :
    0.200 -  0.152 sec      :    99.99 %
    0.152 -  0.115 sec      :     0.01 %
    0.115 -  0.087 sec      :     0.00 %
    0.087 -  0.066 sec      :     0.00 %
    0.066 -  0.050 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
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Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
100&102&103	48.86	0.00	0.00	21.61	7.33	27.04	27.04	0.05	0.02	0.554

103&101	48.86	0.00	0.00	21.66	7.33	26.96	26.96	0.08	0.03	0.552
104	48.86	0.00	0.00	16.90	12.22	19.57	31.79	0.08	0.03	0.651
104A	48.86	0.00	0.00	17.85	30.77	16.13	30.77	0.10	0.04	0.630
105	48.86	0.00	0.00	0.00	48.85	0.00	48.85	0.02	0.02	1.000
106	48.86	0.00	0.00	0.00	48.89	0.00	48.89	0.01	0.01	1.001
107	48.86	0.00	0.00	0.00	48.89	0.00	48.89	0.03	0.02	1.001
108	48.86	0.00	0.00	20.71	12.21	15.89	28.10	0.01	0.01	0.575
EX2REM	48.86	0.00	0.00	17.53	12.21	19.07	31.28	0.34	0.23	0.640
EX3REM	48.86	0.00	0.00	17.53	12.21	19.07	31.28	0.30	0.20	0.640
POST1	48.86	0.00	0.00	20.71	12.22	15.85	28.07	0.02	0.01	0.574
POST2-4	48.86	0.00	0.00	0.00	48.90	0.00	48.90	0.05	0.04	1.001
POST5	48.86	0.00	0.00	0.00	48.90	0.00	48.90	0.04	0.03	1.001
POST6	48.86	0.00	0.00	0.00	48.91	0.00	48.91	0.01	0.01	1.001
S1_1	48.86	0.00	0.00	21.61	12.21	14.49	26.70	0.00	0.00	0.547
S1_2	48.86	0.00	0.00	21.61	12.21	14.49	26.70	0.02	0.01	0.547

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
1	JUNCTION	1.02	2.66	455.56	0	00:01	1.70
10	JUNCTION	0.01	0.04	457.04	0	01:05	0.04
10-S	JUNCTION	0.00	0.00	460.44	0	01:05	0.00
11	JUNCTION	0.03	0.09	454.89	0	01:10	0.09
11-S	JUNCTION	0.00	0.00	457.00	0	00:00	0.00
12	JUNCTION	0.02	0.07	459.07	0	01:10	0.07
12-S	JUNCTION	0.00	0.00	460.60	0	01:10	0.00

13	JUNCTION	0.02	0.06	460.06	0	01:11	0.06
13-S	JUNCTION	0.00	0.00	462.60	0	01:23	0.00
14	JUNCTION	2.14	2.73	454.50	0	00:00	2.73
14-s	JUNCTION	0.00	0.05	454.35	0	00:01	0.04
15	JUNCTION	0.67	1.71	454.96	0	00:01	1.27
15-S	JUNCTION	0.00	0.00	454.60	0	01:04	0.00
1-S	JUNCTION	0.00	0.00	455.46	0	00:01	0.00
2	JUNCTION	0.92	2.66	455.66	0	00:01	1.67
2-S	JUNCTION	0.00	0.01	455.47	0	00:01	0.00
3	JUNCTION	1.27	1.41	455.41	0	01:05	1.41
3-S	JUNCTION	0.00	0.00	456.89	0	01:05	0.00
4	JUNCTION	1.84	2.05	456.35	0	01:05	2.05
4-S	JUNCTION	0.00	0.00	456.89	0	01:10	0.00
5	JUNCTION	0.42	1.26	454.76	0	01:04	0.89
6	JUNCTION	0.04	0.72	454.72	0	01:04	0.39
6-S	JUNCTION	0.00	0.00	456.05	0	01:05	0.00
7	JUNCTION	0.08	0.46	454.76	0	01:14	0.46
7A	JUNCTION	0.03	0.13	454.43	0	01:05	0.13
7-S	JUNCTION	0.00	0.00	456.30	0	01:02	0.00
8	JUNCTION	0.04	0.36	454.76	0	01:15	0.36
8-S	JUNCTION	0.00	0.00	457.49	0	01:05	0.00
9	JUNCTION	0.01	0.04	455.64	0	01:05	0.04
9-S	JUNCTION	0.00	0.00	457.79	0	00:00	0.00
EXMH1	JUNCTION	1.41	2.51	453.30	0	00:00	1.57
EXMH12	JUNCTION	0.40	0.58	465.14	0	00:00	0.47
EXMH17	JUNCTION	0.54	0.83	468.07	0	00:00	0.82
EXMH1-S	JUNCTION	0.00	0.05	453.15	0	01:06	0.05
EXMH3	JUNCTION	3.06	3.43	454.64	0	00:00	3.43
EXMH3-S	JUNCTION	0.00	0.07	454.51	0	00:01	0.07
EXMH6	JUNCTION	1.93	2.70	455.11	0	00:00	2.30
EXPONDOUTLET	JUNCTION	1.17	2.78	470.86	0	00:00	1.18
J1	JUNCTION	0.04	0.12	463.44	0	01:10	0.12
J116	JUNCTION	0.02	0.06	460.06	0	01:05	0.06
J3	JUNCTION	0.07	0.20	463.04	0	01:11	0.20
PIPE	JUNCTION	2.77	3.32	454.46	0	00:00	3.32
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	00:01	0.00
PIPE-S	JUNCTION	0.00	0.06	454.32	0	01:05	0.06
ROOF_DRAIN	JUNCTION	0.01	0.08	456.08	0	01:02	0.08
OF1	OUTFALL	1.00	1.00	451.68	0	00:00	1.00
OF-S	OUTFALL	0.00	0.05	452.05	0	01:06	0.05

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Node Inflow Summary
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		Maximum	Maximum		Lateral	Total	Flow

Node	Type	Lateral Inflow CMS	Total Inflow CMS	Time of Max Occurrence days	hr:min	Inflow Volume 10^6 ltr	Inflow Volume 10^6 ltr	Balance Error Percent
1	JUNCTION	0.000	0.509	0	00:01	0	0.581	2.115
10	JUNCTION	0.000	0.012	0	01:05	0	0.0226	0.362
10-S	JUNCTION	0.012	0.012	0	01:05	0.0225	0.0225	-0.449
11	JUNCTION	0.001	0.059	0	01:10	0.00267	0.179	-0.031
11-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
12	JUNCTION	0.000	0.067	0	01:10	0	0.177	0.350
12-S	JUNCTION	0.009	0.009	0	01:05	0.0227	0.0227	-30.531
13	JUNCTION	0.000	0.072	0	01:06	0	0.146	1.118
13-S	JUNCTION	0.000	0.049	0	01:11	0	0.127	-13.324
14	JUNCTION	0.000	1.754	0	00:00	0	0.599	1.186
14-s	JUNCTION	0.000	0.100	0	00:00	0	0.00497	-4.713
15	JUNCTION	0.000	0.188	0	00:01	0	0.331	0.078
15-S	JUNCTION	0.009	0.026	0	00:02	0.0141	0.0141	-0.093
1-S	JUNCTION	0.019	0.050	0	00:01	0.0262	0.0262	-0.085
2	JUNCTION	0.000	0.116	0	00:01	0	0.0114	12.245
2-S	JUNCTION	0.007	0.075	0	00:01	0.00992	0.00995	0.731
3	JUNCTION	0.000	0.094	0	01:05	0	0.203	0.940
3-S	JUNCTION	0.043	0.075	0	01:05	0.101	0.177	-0.300
4	JUNCTION	0.000	0.038	0	01:02	0	0.0286	10.261
4-S	JUNCTION	0.017	0.017	0	01:05	0.0234	0.0234	-18.061
5	JUNCTION	0.000	0.133	0	01:17	0	0.313	0.242
6	JUNCTION	0.000	0.053	0	01:17	0	0.128	0.035
6-S	JUNCTION	0.007	0.007	0	01:05	0.00978	0.00978	-0.141
7	JUNCTION	0.000	0.057	0	01:04	0	0.117	0.125
7A	JUNCTION	0.000	0.031	0	01:15	0	0.117	-0.017
7-S	JUNCTION	0.000	0.000	0	01:05	0	4.37e-07	-0.126 ltr
8	JUNCTION	0.000	0.052	0	01:05	0	0.0761	0.031
8-S	JUNCTION	0.040	0.040	0	01:05	0.0536	0.0536	-0.045
9	JUNCTION	0.000	0.012	0	01:05	0	0.0225	0.004
9-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
EXMH1	JUNCTION	0.000	5.396	0	01:05	0	107	0.009
EXMH12	JUNCTION	0.229	6.982	0	00:00	0.344	107	0.026
EXMH17	JUNCTION	0.000	5.061	0	00:00	0	106	0.033
EXMH1-S	JUNCTION	0.000	0.079	0	01:05	0	0.0196	4.466
EXMH3	JUNCTION	0.000	8.811	0	00:00	0	106	0.025
EXMH3-S	JUNCTION	0.000	0.100	0	00:00	0	0.0333	-7.082
EXMH6	JUNCTION	0.000	8.234	0	00:00	0	106	0.026
EXPONDOUTLET	JUNCTION	4.919	4.919	0	00:00	106	106	0.023
J1	JUNCTION	0.019	0.019	0	01:10	0.046	0.046	0.013
J116	JUNCTION	0.034	0.034	0	01:05	0.0756	0.0756	0.021
J3	JUNCTION	0.031	0.049	0	01:10	0.0809	0.127	0.027
PIPE	JUNCTION	0.198	8.477	0	00:00	0.297	107	0.041
PIPE2-S	JUNCTION	0.000	0.000	0	00:01	0	3.93e-09	0.004 ltr
PIPE-S	JUNCTION	0.000	0.167	0	00:01	0	0.0347	3.234

ROOF_DRAIN	JUNCTION	0.030	0.030	0	01:05	0.0408	0.0408	-0.000
OF1	OUTFALL	0.000	5.396	0	01:05	0	107	0.000
OF-S	OUTFALL	0.000	0.071	0	01:06	0	0.0187	0.000

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
1	JUNCTION	5.98	2.060	0.000
14	JUNCTION	5.98	1.775	0.000
15	JUNCTION	5.96	1.235	0.000
2	JUNCTION	5.97	1.960	0.000
5	JUNCTION	0.01	0.362	1.228
6	JUNCTION	0.01	0.317	1.328
EXMH1	JUNCTION	5.99	1.490	0.000
EXMH3	JUNCTION	5.99	1.840	0.000
EXPONDOUTLET	JUNCTION	0.01	1.580	0.000
PIPE	JUNCTION	5.99	2.315	0.000

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Node Flooding Summary
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Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
1	0.01	0.135	0 00:01	0.000	0.200
14	0.16	1.708	0 00:00	0.024	0.200
15	0.01	0.085	0 00:01	0.000	0.200
2	0.01	0.066	0 00:01	0.000	0.200
EXMH1	0.01	1.472	0 00:00	0.002	0.200
EXMH3	0.27	4.072	0 00:00	0.054	0.200
EXPONDOUTLET	0.01	3.364	0 00:00	0.006	0.000
PIPE	0.06	7.533	0 00:00	0.046	0.200

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.86	4.964	5.396	107.070
OF-S	6.56	0.013	0.071	0.019
System	53.21	4.978	5.433	107.089

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Street Flow Summary
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Street Conduit	Peak Flow CMS	Maximum Spread m	Maximum Depth m	Inlet Design	Inlet Location	Inlet	Peak Flow Capture Pcnt	Avg. Flow Capture Pcnt	Bypass Flow Freq Pcnt	Back Flow Freq Pcnt	Peak Capture / Inlet CMS	Peak Bypass Flow CMS
C10-S	0.000	0.054	0.000									
C11-S	0.000	0.049	0.002									
C14-S	0.015	1.694	0.044									
C17-S	0.000	0.764	0.025									
C18	0.071	1.836	0.047									
C19	0.033	1.099	0.032									
C1-S	0.101	2.656	0.063									
C21	0.000	0.054	0.004									
C22	0.000	1.032	0.031									
C2-S	0.079	2.170	0.053									
C3-S	0.000	0.049	0.002									
C4-S	0.000	0.049	0.002									
C7-S	0.000	0.054	0.000									
C8-S	0.000	0.050	0.001									
C9-S	0.000	0.050	0.001									

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	8.477	0	00:00	10.79	4.04	1.00
C10	CONDUIT	0.036	0	01:05	1.95	0.19	0.71
C10-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C11	CONDUIT	0.136	0	00:02	1.46	0.32	1.00
C11-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C12	CONDUIT	0.058	0	01:10	4.84	0.11	0.23
C12-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C13	CONDUIT	0.059	0	01:10	2.99	0.21	0.64
C13-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C14	CONDUIT	1.754	0	00:00	8.10	1.96	1.00
C14-S	CONDUIT	0.015	0	00:01	0.62	0.01	0.22
C15	CONDUIT	0.188	0	00:01	1.70	0.40	1.00
C16	CONDUIT	5.396	0	01:05	6.87	2.36	1.00
C17	CONDUIT	0.509	0	00:01	3.12	0.64	1.00
C17-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.13
C18	CONDUIT	0.071	0	01:06	1.02	0.02	0.24
C19	CONDUIT	0.033	0	01:05	2.51	0.02	0.16
C1-S	CONDUIT	0.101	0	01:04	1.61	0.05	0.32
C2	CONDUIT	5.396	0	01:05	6.87	2.47	1.00
C20	CONDUIT	0.082	0	01:17	4.44	0.34	1.00
C20_1	CONDUIT	0.018	0	01:10	0.24	0.09	0.53
C20_2	CONDUIT	0.049	0	01:11	1.61	0.23	0.34
C21	CONDUIT	0.000	0	01:02	0.00	0.00	0.02
C22	CONDUIT	0.000	0	00:01	0.42	0.00	0.16
C23_1	CONDUIT	0.030	0	01:05	1.97	0.16	0.27
C24	CONDUIT	0.049	0	01:11	4.59	0.10	0.21
C25	CONDUIT	5.061	0	00:00	4.52	1.21	0.97
C26	CONDUIT	6.982	0	00:00	10.28	0.40	0.47
C27	CONDUIT	8.234	0	00:00	16.41	0.26	0.36
C28	CONDUIT	8.811	0	00:00	4.99	0.45	1.00
C29	CONDUIT	0.000	0	01:06	0.00	0.00	0.01
C2-S	CONDUIT	0.079	0	01:05	1.10	0.03	0.27
C3-S	CONDUIT	0.000	0	00:01	0.00	0.00	0.01
C4	CONDUIT	0.093	0	01:05	0.90	0.13	0.62
C4-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
C5	CONDUIT	0.116	0	00:01	1.87	0.58	1.00
C6	CONDUIT	0.019	0	01:05	2.35	0.07	0.18
C7	CONDUIT	0.012	0	01:05	1.95	0.04	0.14
C7-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00

C8	CONDUIT	0.012	0	01:05	1.90	0.04	0.14
C8-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C9	CONDUIT	0.027	0	01:09	0.06	0.00	0.34
C9-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
OR2	ORIFICE	0.031	0	01:15			1.00
J100-IC	DUMMY	0.038	0	01:02			
J101-IC	DUMMY	0.075	0	01:05			
J102-IC	DUMMY	0.075	0	00:01			
J103-IC	DUMMY	0.054	0	00:01			
J104-IC	DUMMY	0.007	0	01:05			
J105-IC	DUMMY	0.000	0	00:00			
J106-IC	DUMMY	0.025	0	01:05			
J107-IC	DUMMY	0.000	0	01:02			
J108-IC	DUMMY	0.040	0	01:05			
J111-IC	DUMMY	0.100	0	00:00			
J112-IC	DUMMY	0.038	0	01:04			
J114-IC	DUMMY	0.100	0	00:00			
J98-IC	DUMMY	0.012	0	01:05			
J99-IC	DUMMY	0.000	0	00:00			
OL1	DUMMY	0.072	0	01:06			
OR1	DUMMY	0.100	0	00:00			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.03	0.02	0.00	0.95	0.04	0.00
C10-S	1.00	0.59	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C11-S	1.00	0.50	0.09	0.00	0.41	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C12-S	1.00	0.61	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.01	0.04	0.00	0.94	0.05	0.00
C13-S	1.00	0.56	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C14-S	1.00	0.93	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00
C15	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C17-S	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	0.70	0.30	0.00	0.00	0.12	0.00

C19	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
C1-S	1.00	0.91	0.00	0.00	0.01	0.08	0.00	0.00	0.01	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.00	0.00	0.00	0.08	0.11	0.00	0.81	0.04	0.00
C20_1	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.95	0.00
C20_2	1.00	0.03	0.00	0.00	0.10	0.87	0.00	0.00	0.00	0.00
C21	1.00	0.54	0.19	0.00	0.26	0.00	0.00	0.00	0.17	0.00
C22	1.00	0.65	0.00	0.00	0.35	0.00	0.00	0.00	0.83	0.00
C23_1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C24	1.00	0.05	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00
C25	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C26	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C27	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C28	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C29	1.00	0.24	0.29	0.00	0.47	0.00	0.00	0.00	0.00	0.00
C2-S	1.00	0.00	0.93	0.00	0.04	0.03	0.00	0.00	0.97	0.00
C3-S	1.00	0.58	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.06	0.00	0.94	0.00	0.00	0.00	0.94	0.00
C4-S	1.00	0.25	0.01	0.00	0.73	0.02	0.00	0.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.13	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7-S	1.00	0.46	0.00	0.00	0.00	0.00	0.00	0.54	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8-S	1.00	0.47	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.79	0.00
C9-S	1.00	0.47	0.00	0.00	0.53	0.01	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	5.99	5.99	5.99	5.99	5.98
C10	0.01	0.01	0.01	0.01	0.01
C11	3.07	3.07	5.96	0.01	0.01
C13	0.01	0.01	0.01	0.01	0.01
C14	5.99	5.99	5.99	0.01	0.10
C15	5.97	5.97	5.98	0.01	0.01
C16	0.01	5.99	0.01	5.98	0.01
C17	5.98	5.98	5.98	0.01	0.02
C2	5.99	5.99	5.99	5.99	5.99
C20	0.14	0.14	0.29	0.01	0.01

C25	0.01	0.01	0.01	6.00	0.01
C28	5.98	5.98	5.99	0.01	0.01
C4	0.01	0.01	5.98	0.01	0.01
C5	5.96	5.96	5.98	0.01	0.01

Analysis begun on: Wed Jun 25 09:42:14 2025
Analysis ended on: Wed Jun 25 09:42:29 2025
Total elapsed time: 00:00:15

100 Year Storm – Control

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
------------------------------------------------------------


*************
Element Count
*************
Number of rain gages ...... 9
Number of subcatchments ... 16
Number of nodes ........... 47
Number of links ........... 60
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
------------------------------------------------------------------------
Chicago_3h           Chicago_3h                     INTENSITY    5 min.
Chicago_3h_100year   Chicago_3h_100year             INTENSITY    5 min.
Chicago_3h_100Year_Fergus_Shand_Dam_2016 Chicago_3h_100Year_Fergus_Shand_Dam_2016 INTENSITY    5 min.
Chicago_3h_10year    Chicago_3h_10year              INTENSITY    5 min.
Chicago_3h_25year    Chicago_3h_25year              INTENSITY    5 min.
Chicago_3h_2year     Chicago_3h_2year               INTENSITY    5 min.
Chicago_3h_50year    Chicago_3h_50year              INTENSITY    5 min.
Chicago_3h_5year     Chicago_3h_5year               INTENSITY    5 min.
Chicago_3h_5Year_2016_Fergus_Shand_Dam Chicago_3h_5Year_2016_Fergus_Shand_Dam INTENSITY    5 min.


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Subcatchment Summary
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Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
100&102&103                0.17     17.00     15.00    7.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 J1
103&101                    0.30     24.59     15.00    8.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 J3
104                        0.24     23.77     25.00    6.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 J116
104A                       0.33     21.94     30.00    6.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 3-S
105                        0.05      6.40    100.00    4.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 4-S
106                        0.02      5.49    100.00    3.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 2-S
107                        0.05     14.49    100.00    3.0000 Chicago_3h_100Year_Fergus_Shand_Dam_2016 1-S
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108	0.05	20.00	25.00	15.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	15-S
EX2REM	1.10	1100.00	25.00	2.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	EXMH12
EX3REM	0.95	950.00	25.00	2.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	PIPE
POST1	0.08	13.33	25.00	10.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	10-S
POST2-4	0.11	36.57	100.00	4.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	8-S
POST5	0.08	83.40	100.00	10.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	ROOF_DRAIN
POST6	0.02	13.33	100.00	6.0000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	6-S
S1_1	0.01	1.00	25.00	0.5000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	11
S1_2	0.08	8.50	25.00	0.5000	Chicago_3h_100Year_Fergus_Shand_Dam_2016	12-S

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.90	2.46	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.80	2.20	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	459.00	1.60	0.0	
12-S	JUNCTION	460.60	0.30	0.0	
13	JUNCTION	460.00	2.60	0.0	
13-S	JUNCTION	462.60	0.30	0.0	
14	JUNCTION	451.77	2.53	0.0	
14-s	JUNCTION	454.30	0.30	0.0	
15	JUNCTION	453.25	1.51	0.0	
15-S	JUNCTION	454.60	0.30	0.0	
1-S	JUNCTION	455.46	0.26	0.0	
2	JUNCTION	453.00	2.46	0.0	
2-S	JUNCTION	455.46	0.20	0.0	
3	JUNCTION	454.00	2.89	0.0	
3-S	JUNCTION	456.89	0.20	0.0	
4	JUNCTION	454.30	2.59	0.0	
4-S	JUNCTION	456.89	0.20	0.0	
5	JUNCTION	453.50	2.49	0.0	
6	JUNCTION	454.00	2.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.30	2.00	0.0	
7A	JUNCTION	454.30	2.00	0.0	
7-S	JUNCTION	456.30	0.30	0.0	
8	JUNCTION	454.40	3.09	0.0	
8-S	JUNCTION	457.49	0.30	0.0	
9	JUNCTION	455.60	2.19	0.0	
9-S	JUNCTION	457.79	0.21	0.0	
EXMH1	JUNCTION	450.79	2.31	0.0	

EXMH12	JUNCTION	464.56	3.61	0.0	
EXMH17	JUNCTION	467.24	6.34	0.0	
EXMH1-S	JUNCTION	453.10	0.20	0.0	
EXMH3	JUNCTION	451.21	3.23	0.0	
EXMH3-S	JUNCTION	454.44	0.26	0.0	
EXMH6	JUNCTION	452.41	6.59	0.0	
EXPONDOUTLET	JUNCTION	468.08	2.78	0.0	Yes
J1	JUNCTION	463.32	0.30	0.0	
J116	JUNCTION	460.00	0.30	0.0	
J3	JUNCTION	462.84	0.30	0.0	
PIPE	JUNCTION	451.14	3.12	0.0	
PIPE2-S	JUNCTION	455.30	0.30	0.0	
PIPE-S	JUNCTION	454.26	0.24	0.0	
ROOF_DRAIN	JUNCTION	456.00	2.24	0.0	
OF1	OUTFALL	450.68	1.00	0.0	
OF-S	OUTFALL	452.00	0.20	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXMH3	PIPE	CONDUIT	14.4	0.4527	0.0100
C10	7A	6	CONDUIT	9.2	2.1744	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	3.5503	0.0160
C11	5	15	CONDUIT	4.4	3.4111	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	17.0002	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	16.9612	0.0100
C13	11	5	CONDUIT	14.8	4.7280	0.0100
C13-S	11-S	15-S	CONDUIT	16.7	14.5442	0.0100
C14	14	PIPE	CONDUIT	10.2	2.5498	0.0100
C14-S	14-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	15	1	CONDUIT	4.6	4.3519	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.5392	0.0100
C17	1	14	CONDUIT	34.9	2.0061	0.0100
C17-S	PIPE2-S	14-s	CONDUIT	35.9	2.7883	0.0160
C18	EXMH1-S	OF-S	CONDUIT	20.0	5.4984	0.0160
C19	J116	3-S	CONDUIT	76.9	4.0498	0.0160
C1-S	EXMH3-S	PIPE-S	CONDUIT	14.4	1.2536	0.0160
C2	PIPE	EXMH1	CONDUIT	67.4	0.4894	0.0100
C20	6	5	CONDUIT	2.6	3.7763	0.0100
C20_1	J1	J3	CONDUIT	24.0	2.0004	0.0500
C20_2	J3	13-S	CONDUIT	11.5	2.0874	0.0500
C21	4-S	2-S	CONDUIT	47.2	3.0293	0.0160
C22	2-S	PIPE-S	CONDUIT	48.8	2.4597	0.0160
C23_1	ROOF_DRAIN	7	CONDUIT	13.2	2.2652	0.0100

C24	13	12	CONDUIT	5.4	16.9031	0.0100
C25	EXPONDOUTLET	EXMH17	CONDUIT	22.0	0.6818	0.0100
C26	EXMH17	EXMH12	CONDUIT	67.2	3.6333	0.0100
C27	EXMH12	EXMH6	CONDUIT	79.9	12.1539	0.0100
C28	EXMH6	EXMH3	CONDUIT	24.0	4.6300	0.0100
C29	13-S	12-S	CONDUIT	18.7	10.7581	0.0100
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	64.2	3.6161	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	2.5008	0.0100
C6	4	3	CONDUIT	8.0	5.0063	0.0100
C7	10	9	CONDUIT	14.5	4.8332	0.0100
C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160
C8	9	8	CONDUIT	9.0	4.4488	0.0100
C8-S	9-S	8-S	CONDUIT	8.1	3.6994	0.0160
C9	8	7	CONDUIT	37.5	0.2667	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	3.1687	0.0160
OR2	7	7A	ORIFICE			
J100-IC	4-S	4	OUTLET			
J101-IC	3-S	3	OUTLET			
J102-IC	2-S	2	OUTLET			
J103-IC	1-S	1	OUTLET			
J104-IC	6-S	6	OUTLET			
J105-IC	11-S	11	OUTLET			
J106-IC	12-S	12	OUTLET			
J107-IC	7-S	7	OUTLET			
J108-IC	8-S	8	OUTLET			
J111-IC	EXMH3-S	EXMH3	OUTLET			
J112-IC	15-S	15	OUTLET			
J114-IC	14-s	14	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	OUTLET			
OL1	13-S	13	OUTLET			
OR1	PIPE-S	PIPE	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	1.00	0.79	0.25	1.00	1	2.10
C10	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.88
C11	CIRCULAR	0.38	0.11	0.09	0.38	1	0.42
C11-S	Emma_St	0.20	1.23	0.13	11.60	1	5.41

C12	CIRCULAR	0.30	0.07	0.07	0.30	1	0.52
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.03
C13	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
C13-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	2.81
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.89
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.38	0.11	0.09	0.38	1	0.48
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	2.29
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.79
C17-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.67
C18	Emma_St	0.20	1.23	0.13	11.60	1	4.65
C19	Emma_St_half	0.20	0.62	0.13	5.80	1	2.01
C1-S	Emma_St	0.20	1.23	0.13	11.60	1	2.22
C2	CIRCULAR	1.00	0.79	0.25	1.00	1	2.18
C20	CIRCULAR	0.30	0.07	0.07	0.30	1	0.24
C20_1	TRIANGULAR	0.30	0.27	0.14	1.80	1	0.21
C20_2	TRIANGULAR	0.30	0.27	0.14	1.80	1	0.21
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.74
C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.56
C23_1	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C24	CIRCULAR	0.30	0.07	0.07	0.30	1	0.52
C25	CIRCULAR	1.20	1.13	0.30	1.20	1	4.19
C26	CIRCULAR	1.50	1.77	0.38	1.50	1	17.52
C27	CIRCULAR	1.50	1.77	0.38	1.50	1	32.04
C28	CIRCULAR	1.50	1.77	0.38	1.50	1	19.78
C29	TRIANGULAR	0.30	0.27	0.14	1.80	1	2.41
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3-S	Emma_St	0.20	1.23	0.13	11.60	1	3.56
C4	CIRCULAR	0.45	0.16	0.11	0.45	1	0.70
C4-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.77
C5	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.28
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.28
C7-S	Emma_St	0.20	1.23	0.13	11.60	1	8.72
C8	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.92
C9	RECT_CLOSED	1.20	2.80	0.40	2.33	1	7.79
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.77

****
Street Summary
****

Street Emma_St
Area:

0.0002	0.0007	0.0016	0.0029	0.0054
0.0090	0.0139	0.0201	0.0275	0.0361

0.0460	0.0572	0.0696	0.0832	0.0980
0.1142	0.1315	0.1501	0.1700	0.1911
0.2134	0.2370	0.2618	0.2872	0.3126
0.3380	0.3634	0.3888	0.4142	0.4396
0.4650	0.4904	0.5158	0.5412	0.5666
0.5920	0.6174	0.6428	0.6682	0.6936
0.7190	0.7452	0.7727	0.8014	0.8314
0.8627	0.8951	0.9288	0.9638	1.0000

Hrad:

0.0140	0.0280	0.0419	0.0460	0.0505
0.0608	0.0731	0.0863	0.0999	0.1138
0.1279	0.1421	0.1564	0.1708	0.1852
0.1997	0.2142	0.2287	0.2432	0.2578
0.2724	0.2870	0.3021	0.3311	0.3601
0.3889	0.4178	0.4465	0.4753	0.5039
0.5325	0.5611	0.5896	0.6180	0.6464
0.6748	0.7030	0.7313	0.7594	0.7876
0.8157	0.8432	0.8688	0.8928	0.9152
0.9362	0.9559	0.9745	0.9919	1.0000

Width:

0.0097	0.0193	0.0290	0.0490	0.0828
0.1166	0.1503	0.1841	0.2179	0.2517
0.2855	0.3193	0.3531	0.3869	0.4207
0.4545	0.4883	0.5221	0.5559	0.5897
0.6234	0.6572	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6897	0.6897	0.6897	0.6897	0.6897
0.6959	0.7297	0.7634	0.7972	0.8310
0.8648	0.8986	0.9324	0.9662	1.0000

Street Emma_St_half
Area:

0.0002	0.0007	0.0016	0.0029	0.0054
0.0090	0.0139	0.0201	0.0275	0.0361
0.0460	0.0572	0.0696	0.0832	0.0980
0.1142	0.1315	0.1501	0.1700	0.1911
0.2134	0.2370	0.2618	0.2872	0.3126
0.3380	0.3634	0.3888	0.4142	0.4396
0.4650	0.4904	0.5158	0.5412	0.5666
0.5920	0.6174	0.6428	0.6682	0.6936
0.7190	0.7452	0.7727	0.8014	0.8314
0.8627	0.8951	0.9288	0.9638	1.0000

Hrad:

0.0139	0.0277	0.0416	0.0456	0.0501
0.0603	0.0725	0.0855	0.0990	0.1128
0.1268	0.1409	0.1551	0.1694	0.1837
0.1980	0.2124	0.2268	0.2412	0.2556

	0.2701	0.2846	0.2996	0.3284	0.3571
	0.3857	0.4143	0.4428	0.4713	0.4997
	0.5281	0.5564	0.5847	0.6129	0.6410
	0.6691	0.6972	0.7252	0.7531	0.7810
	0.8089	0.8362	0.8616	0.8854	0.9076
	0.9284	0.9480	0.9664	0.9837	1.0000
Width:					
	0.0097	0.0193	0.0290	0.0490	0.0828
	0.1166	0.1503	0.1841	0.2179	0.2517
	0.2855	0.3193	0.3531	0.3869	0.4207
	0.4545	0.4883	0.5221	0.5559	0.5897
	0.6234	0.6572	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6897	0.6897	0.6897	0.6897	0.6897
	0.6959	0.7297	0.7634	0.7972	0.8310
	0.8648	0.8986	0.9324	0.9662	1.0000

```
****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 05/24/2024 00:00:00
Ending Date .............. 05/24/2024 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:30
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 0.20 sec
Variable Time Step ....... YES
Maximum Trials ........... 10
Number of Threads ........ 12
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
```

```
  Runoff Quantity Continuity     hectare-m          mm
  **************************     ---------     -------
  Total Precipitation ......         0.330      90.556
  Evaporation Loss .........         0.000       0.000
  Infiltration Loss ........         0.079      21.553
  Surface Runoff ...........         0.251      68.907
  Final Storage ............         0.000       0.123
  Continuity Error (%) .....        -0.030


  **************************        Volume      Volume
  Flow Routing Continuity        hectare-m    10^6 ltr
  **************************     ---------   ---------
  Dry Weather Inflow .......         0.000       0.000
  Wet Weather Inflow .......         0.251       2.513
  Groundwater Inflow .......         0.000       0.000
  RDII Inflow ..............         0.000       0.000
  External Inflow ..........        10.624     106.240
  External Outflow .........        10.817     108.173
  Flooding Loss ............         0.041       0.407
  Evaporation Loss .........         0.000       0.000
  Exfiltration Loss ........         0.000       0.000
  Initial Stored Volume ....         0.000       0.000
  Final Stored Volume ......         0.023       0.233
  Continuity Error (%) .....        -0.055


  *************************
  Highest Continuity Errors
  *************************
  Node 9-S (-35.67%)
  Node 12-S (-32.88%)
  Node 15-S (8.59%)
  Node 13-S (-5.81%)
  Node 4 (5.32%)


  ***************************
  Time-Step Critical Elements
  ***************************
  None


  ********************************
  Highest Flow Instability Indexes
  ********************************
  Link J106-IC (112)
  Link OL1 (105)
```

Link J100-IC (81)
Link C15 (58)
Link C11 (56)

****
Most Frequent Nonconverging Nodes
****
Node OF1 (41.40%)
Node OF-S (41.40%)
Node 2 (36.61%)
Node 1 (25.10%)
Node 15 (24.84%)

****
Routing Time Step Summary
****
Minimum Time Step : 0.07 sec
Average Time Step : 0.20 sec
Maximum Time Step : 0.20 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 6.03
% of Steps Not Converging : 41.40
Time Step Frequencies :
0.200 - 0.152 sec : 99.99 %
0.152 - 0.115 sec : 0.01 %
0.115 - 0.087 sec : 0.00 %
0.087 - 0.066 sec : 0.00 %
0.066 - 0.050 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
100&102&103	90.56	0.00	0.00	28.31	13.59	62.04	62.04	0.11	0.05	0.685

103&101	90.56	0.00	0.00	28.36	13.59	61.96	61.96	0.19	0.08	0.684
104	90.56	0.00	0.00	21.42	22.64	46.32	68.97	0.16	0.08	0.762
104A	90.56	0.00	0.00	23.38	66.92	39.77	66.92	0.22	0.09	0.739
105	90.56	0.00	0.00	0.00	90.56	0.00	90.56	0.04	0.03	1.000
106	90.56	0.00	0.00	0.00	90.60	0.00	90.60	0.02	0.01	1.001
107	90.56	0.00	0.00	0.00	90.60	0.00	90.60	0.05	0.03	1.001
108	90.56	0.00	0.00	27.99	22.64	39.89	62.53	0.03	0.02	0.690
EX2REM	90.56	0.00	0.00	22.49	22.64	45.40	68.03	0.75	0.47	0.751
EX3REM	90.56	0.00	0.00	22.49	22.64	45.40	68.03	0.65	0.40	0.751
POST1	90.56	0.00	0.00	28.03	22.64	39.81	62.46	0.05	0.03	0.690
POST2-4	90.56	0.00	0.00	0.00	90.61	0.00	90.61	0.10	0.06	1.001
POST5	90.56	0.00	0.00	0.00	90.60	0.00	90.60	0.08	0.05	1.001
POST6	90.56	0.00	0.00	0.00	90.62	0.00	90.62	0.02	0.01	1.001
S1_1	90.56	0.00	0.00	28.97	22.64	38.35	60.99	0.01	0.00	0.674
S1_2	90.56	0.00	0.00	28.97	22.64	38.35	60.99	0.05	0.02	0.674

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
1	JUNCTION	1.07	2.66	455.56	0	00:01	1.89
10	JUNCTION	0.01	0.06	457.06	0	01:05	0.06
10-S	JUNCTION	0.00	0.00	460.44	0	01:05	0.00
11	JUNCTION	0.04	0.21	455.01	0	01:10	0.21
11-S	JUNCTION	0.00	0.00	457.00	0	00:00	0.00
12	JUNCTION	0.03	0.11	459.11	0	01:10	0.11
12-S	JUNCTION	0.00	0.00	460.60	0	01:33	0.00

13	JUNCTION	0.02	0.10	460.10	0	01:10	0.10
13-S	JUNCTION	0.00	0.02	462.62	0	01:10	0.02
14	JUNCTION	2.19	2.73	454.50	0	00:00	2.73
14-s	JUNCTION	0.00	0.05	454.35	0	01:05	0.05
15	JUNCTION	0.72	1.71	454.96	0	00:01	1.63
15-S	JUNCTION	0.01	0.29	454.89	0	01:10	0.29
1-S	JUNCTION	0.00	0.00	455.46	0	01:05	0.00
2	JUNCTION	0.97	2.66	455.66	0	00:01	1.78
2-S	JUNCTION	0.00	0.00	455.46	0	00:01	0.00
3	JUNCTION	1.30	1.46	455.46	0	01:05	1.46
3-S	JUNCTION	0.00	0.04	456.93	0	01:10	0.04
4	JUNCTION	1.88	2.07	456.37	0	01:05	2.07
4-S	JUNCTION	0.00	0.00	456.89	0	01:00	0.00
5	JUNCTION	0.48	1.75	455.25	0	01:15	1.35
6	JUNCTION	0.08	1.20	455.20	0	01:00	0.76
6-S	JUNCTION	0.00	0.00	456.05	0	01:05	0.00
7	JUNCTION	0.19	1.07	455.37	0	01:20	1.07
7A	JUNCTION	0.05	0.58	454.88	0	01:11	0.50
7-S	JUNCTION	0.00	0.00	456.30	0	01:05	0.00
8	JUNCTION	0.14	0.97	455.37	0	01:19	0.97
8-S	JUNCTION	0.00	0.05	457.54	0	01:05	0.05
9	JUNCTION	0.01	0.06	455.66	0	01:05	0.06
9-S	JUNCTION	0.00	0.00	457.79	0	01:18	0.00
EXMH1	JUNCTION	1.41	2.51	453.30	0	00:00	1.54
EXMH12	JUNCTION	0.40	0.58	465.14	0	00:00	0.47
EXMH17	JUNCTION	0.54	0.83	468.07	0	00:00	0.82
EXMH1-S	JUNCTION	0.00	0.06	453.16	0	01:10	0.06
EXMH3	JUNCTION	3.09	3.43	454.64	0	00:00	3.43
EXMH3-S	JUNCTION	0.01	0.07	454.51	0	01:00	0.07
EXMH6	JUNCTION	1.96	2.70	455.11	0	00:00	2.32
EXPONDOUTLET	JUNCTION	1.17	2.78	470.86	0	00:00	1.18
J1	JUNCTION	0.05	0.17	463.49	0	01:10	0.17
J116	JUNCTION	0.03	0.07	460.07	0	01:05	0.07
J3	JUNCTION	0.08	0.28	463.12	0	01:10	0.28
PIPE	JUNCTION	2.81	3.32	454.46	0	00:00	3.32
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	00:01	0.00
PIPE-S	JUNCTION	0.01	0.07	454.33	0	01:06	0.07
ROOF_DRAIN	JUNCTION	0.02	0.10	456.10	0	01:01	0.10
OF1	OUTFALL	1.00	1.00	451.68	0	00:00	1.00
OF-S	OUTFALL	0.00	0.06	452.06	0	01:10	0.06

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*******************
Node Inflow Summary
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-----------------------------------------------------------------------------------------------
                               Maximum  Maximum                 Lateral       Total        Flow
```

Node	Type	Lateral Inflow CMS	Total Inflow CMS	Time of Max Occurrence days	hr:min	Inflow Volume 10^6 ltr	Inflow Volume 10^6 ltr	Balance Error Percent	
1	JUNCTION	0.000	0.514	0	00:01	0	1.18	1.426	
10	JUNCTION	0.000	0.026	0	01:05	0	0.0501	0.176	
10-S	JUNCTION	0.026	0.026	0	01:05	0.05	0.05	-0.217	
11	JUNCTION	0.002	0.149	0	01:10	0.0061	0.38	-0.019	
11-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
12	JUNCTION	0.000	0.166	0	01:10	0	0.375	0.235	
12-S	JUNCTION	0.017	0.017	0	01:05	0.0518	0.052	-24.744	
13	JUNCTION	0.000	0.129	0	01:10	0	0.308	0.691	
13-S	JUNCTION	0.000	0.129	0	01:10	0	0.291	-5.491	
14	JUNCTION	0.000	1.755	0	00:00	0	1.2	0.476	
14-s	JUNCTION	0.000	0.100	0	00:00	0	0.0315	-1.621	
15	JUNCTION	0.000	0.233	0	01:10	0	0.659	-1.722	
15-S	JUNCTION	0.019	0.049	0	00:01	0.0313	0.0314	9.398	
1-S	JUNCTION	0.031	0.033	0	01:05	0.0486	0.0502	-0.057	
2	JUNCTION	0.000	0.119	0	00:01	0	0.0199	3.822	
2-S	JUNCTION	0.012	0.050	0	00:01	0.0184	0.0184	0.026	
3	JUNCTION	0.000	0.182	0	01:05	0	0.434	0.439	
3-S	JUNCTION	0.089	0.164	0	01:10	0.22	0.384	-0.123	
4	JUNCTION	0.000	0.063	0	01:05	0	0.0535	5.619	
4-S	JUNCTION	0.027	0.027	0	01:05	0.0435	0.0435	-18.704	
5	JUNCTION	0.000	0.197	0	01:10	0	0.631	0.864	
6	JUNCTION	0.000	0.062	0	00:57	0	0.245	-0.443	
6-S	JUNCTION	0.012	0.012	0	01:05	0.0181	0.0181	-0.068	
7	JUNCTION	0.000	0.090	0	01:04	0	0.225	0.087	
7A	JUNCTION	0.000	0.050	0	01:21	0	0.225	0.002	
7-S	JUNCTION	0.000	0.013	0	01:05	0	0.00291	-0.008	
8	JUNCTION	0.000	0.076	0	01:05	0	0.146	-0.007	
8-S	JUNCTION	0.063	0.063	0	01:05	0.0994	0.0994	-0.017	
9	JUNCTION	0.000	0.027	0	01:05	0	0.05	0.035	
9-S	JUNCTION	0.000	0.000	0	01:05	0	3.75e-06	-1.338	ltr
EXMH1	JUNCTION	0.000	5.544	0	01:05	0	108	0.008	
EXMH12	JUNCTION	0.467	6.982	0	00:00	0.748	107	0.026	
EXMH17	JUNCTION	0.000	5.061	0	00:00	0	106	0.033	
EXMH1-S	JUNCTION	0.000	0.131	0	01:06	0	0.156	0.689	
EXMH3	JUNCTION	0.000	8.812	0	00:00	0	107	0.024	
EXMH3-S	JUNCTION	0.000	0.100	0	00:00	0	0.153	-2.060	
EXMH6	JUNCTION	0.000	8.234	0	00:00	0	107	0.026	
EXPONDOUTLET	JUNCTION	4.919	4.919	0	00:00	106	106	0.023	
J1	JUNCTION	0.048	0.048	0	01:10	0.105	0.105	0.001	
J116	JUNCTION	0.076	0.076	0	01:05	0.164	0.164	-0.021	
J3	JUNCTION	0.082	0.130	0	01:10	0.186	0.291	0.014	
PIPE	JUNCTION	0.403	8.478	0	00:00	0.646	108	0.040	
PIPE2-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
PIPE-S	JUNCTION	0.000	0.173	0	01:15	0	0.177	0.329	

ROOF_DRAIN	JUNCTION	0.048	0.048	0	01:03	0.0756	0.0756	-0.000
OF1	OUTFALL	0.000	5.544	0	01:05	0	108	0.000
OF-S	OUTFALL	0.000	0.131	0	01:10	0	0.155	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
1	JUNCTION	5.98	2.060	0.000
14	JUNCTION	5.99	1.775	0.000
15	JUNCTION	5.96	1.235	0.000
2	JUNCTION	5.97	1.960	0.000
5	JUNCTION	0.37	0.852	0.738
6	JUNCTION	0.38	0.797	0.848
7A	JUNCTION	0.25	0.282	1.418
EXMH1	JUNCTION	5.99	1.490	0.000
EXMH3	JUNCTION	5.99	1.840	0.000
EXPONDOUTLET	JUNCTION	0.01	1.580	0.000
PIPE	JUNCTION	5.99	2.315	0.000

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
1	0.01	0.162	0 00:01	0.000	0.200
14	0.51	1.709	0 00:00	0.062	0.200
15	0.01	0.065	0 00:02	0.000	0.200
2	0.01	0.107	0 00:01	0.000	0.200
EXMH1	0.01	1.495	0 00:00	0.002	0.200
EXMH3	0.65	4.072	0 00:00	0.272	0.200
EXPONDOUTLET	0.01	3.364	0 00:00	0.006	0.000
PIPE	0.36	7.534	0 00:00	0.065	0.200

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.86	5.008	5.544	108.017
OF-S	11.75	0.061	0.131	0.155
System	55.80	5.069	5.675	108.173

****
Street Flow Summary
****

Street Conduit	Peak Flow CMS	Maximum Spread m	Maximum Depth m	Inlet Design	Inlet Location	Inlet	Peak Flow Capture Pcnt	Avg. Flow Capture Pcnt	Bypass Flow Freq Pcnt	Back Flow Freq Pcnt	Peak Capture / Inlet CMS	Peak Bypass Flow CMS
C10-S	0.000	0.052	0.001									
C11-S	0.000	0.051	0.001									
C14-S	0.032	2.638	0.063									
C17-S	0.000	0.875	0.027									
C18	0.131	2.323	0.056									
C19	0.077	2.119	0.052									
C1-S	0.104	2.910	0.068									
C21	0.000	0.049	0.002									
C22	0.000	1.275	0.035									
C2-S	0.131	2.679	0.064									
C3-S	0.000	0.053	0.001									
C4-S	0.005	0.434	0.019									
C7-S	0.000	0.049	0.002									
C8-S	0.000	0.722	0.024									
C9-S	0.013	0.741	0.025									

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Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	8.477	0	00:00	10.79	4.04	1.00
C10	CONDUIT	0.058	0	01:19	2.18	0.31	1.00
C10-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C11	CONDUIT	0.200	0	01:10	1.81	0.47	1.00
C11-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.00
C12	CONDUIT	0.147	0	01:10	6.31	0.28	0.37
C12-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C13	CONDUIT	0.153	0	01:10	3.14	0.56	0.85
C13-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.49
C14	CONDUIT	1.755	0	00:00	8.11	1.97	1.00
C14-S	CONDUIT	0.032	0	01:05	0.74	0.03	0.32
C15	CONDUIT	0.227	0	01:12	2.05	0.48	1.00
C16	CONDUIT	5.544	0	01:05	7.06	2.42	1.00
C17	CONDUIT	0.513	0	00:01	3.13	0.65	1.00
C17-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
C18	CONDUIT	0.131	0	01:10	1.18	0.03	0.29
C19	CONDUIT	0.077	0	01:05	2.59	0.04	0.27
C1-S	CONDUIT	0.104	0	01:01	1.71	0.05	0.35
C2	CONDUIT	5.544	0	01:05	7.06	2.54	1.00
C20	CONDUIT	0.090	0	01:37	4.21	0.37	1.00
C20_1	CONDUIT	0.048	0	01:10	0.32	0.23	0.75
C20_2	CONDUIT	0.129	0	01:10	2.03	0.61	0.49
C21	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
C22	CONDUIT	0.000	0	00:01	0.00	0.00	0.18
C23_1	CONDUIT	0.048	0	01:01	2.24	0.26	0.35
C24	CONDUIT	0.129	0	01:10	6.05	0.25	0.34
C25	CONDUIT	5.061	0	00:00	4.52	1.21	0.97
C26	CONDUIT	6.982	0	00:00	10.28	0.40	0.47
C27	CONDUIT	8.234	0	00:00	16.41	0.26	0.36
C28	CONDUIT	8.812	0	00:00	4.99	0.45	1.00
C29	CONDUIT	0.000	0	01:10	2.55	0.00	0.03
C2-S	CONDUIT	0.131	0	01:06	1.10	0.05	0.32
C3-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C4	CONDUIT	0.182	0	01:05	1.59	0.26	0.68
C4-S	CONDUIT	0.005	0	01:10	1.62	0.00	0.10
C5	CONDUIT	0.119	0	00:01	1.82	0.60	1.00
C6	CONDUIT	0.031	0	01:05	2.69	0.11	0.23
C7	CONDUIT	0.026	0	01:05	2.47	0.10	0.21

C7-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
C8	CONDUIT	0.026	0	01:05	2.40	0.10	0.36
C8-S	CONDUIT	0.000	0	01:08	0.00	0.00	0.12
C9	CONDUIT	0.051	0	01:09	0.07	0.01	0.85
C9-S	CONDUIT	0.013	0	01:05	1.99	0.01	0.13
OR2	ORIFICE	0.050	0	01:21			1.00
J100-IC	DUMMY	0.063	0	01:05			
J101-IC	DUMMY	0.153	0	01:10			
J102-IC	DUMMY	0.050	0	00:01			
J103-IC	DUMMY	0.033	0	01:05			
J104-IC	DUMMY	0.012	0	01:05			
J105-IC	DUMMY	0.000	0	00:00			
J106-IC	DUMMY	0.038	0	01:05			
J107-IC	DUMMY	0.013	0	01:05			
J108-IC	DUMMY	0.050	0	01:00			
J111-IC	DUMMY	0.100	0	00:00			
J112-IC	DUMMY	0.050	0	01:05			
J114-IC	DUMMY	0.100	0	00:00			
J98-IC	DUMMY	0.026	0	01:05			
J99-IC	DUMMY	0.000	0	01:08			
OL1	DUMMY	0.129	0	01:10			
OR1	DUMMY	0.100	0	00:00			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
C1	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.00	0.00	0.00	0.09	0.03	0.00	0.88	0.03	0.00
C10-S	1.00	0.52	0.46	0.00	0.02	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C11-S	1.00	0.47	0.06	0.00	0.47	0.01	0.00	0.00	1.00	0.00
C12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C12-S	1.00	0.59	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.00	0.00	0.00	0.01	0.11	0.00	0.87	0.07	0.00
C13-S	1.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C14-S	1.00	0.85	0.05	0.00	0.10	0.01	0.00	0.00	0.80	0.00
C15	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C17-S	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C18	1.00	0.00	0.00	0.00	0.64	0.35	0.00	0.00	0.13	0.00
C19	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C1-S	1.00	0.82	0.00	0.00	0.01	0.17	0.00	0.00	0.05	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.00	0.00	0.00	0.17	0.15	0.00	0.68	0.05	0.00
C20_1	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.96	0.00
C20_2	1.00	0.02	0.00	0.00	0.08	0.90	0.00	0.00	0.00	0.00
C21	1.00	0.52	0.20	0.00	0.28	0.00	0.00	0.00	0.16	0.00
C22	1.00	0.60	0.00	0.00	0.40	0.00	0.00	0.00	0.85	0.00
C23_1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C24	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
C25	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C26	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C27	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C28	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C29	1.00	0.20	0.30	0.00	0.47	0.04	0.00	0.00	0.00	0.00
C2-S	1.00	0.00	0.85	0.00	0.06	0.09	0.00	0.00	0.91	0.00
C3-S	1.00	0.52	0.00	0.00	0.48	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.04	0.00	0.96	0.00	0.00	0.00	0.94	0.00
C4-S	1.00	0.21	0.01	0.00	0.70	0.08	0.00	0.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.10	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C7-S	1.00	0.40	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.03	0.03	0.00	0.94	0.06	0.00
C8-S	1.00	0.46	0.54	0.00	0.00	0.00	0.00	0.00	0.82	0.00
C9	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.66	0.00
C9-S	1.00	0.46	0.00	0.00	0.51	0.03	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

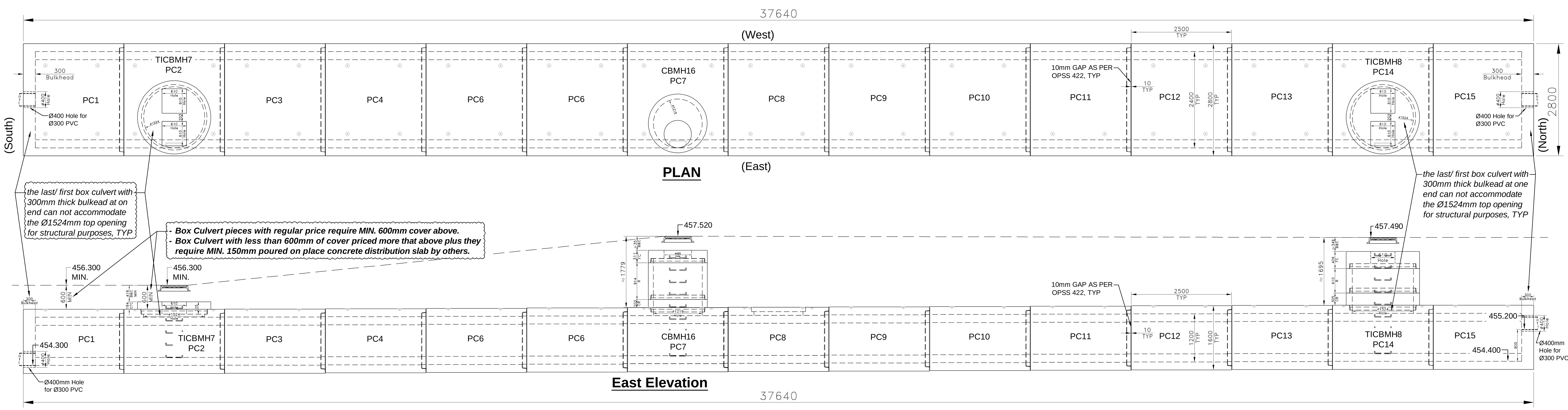
Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	5.99	5.99	5.99	5.99	5.98
C10	0.25	0.25	0.38	0.01	0.01
C11	3.25	3.25	5.96	0.01	0.17
C13	0.01	0.01	0.37	0.01	0.01
C14	5.99	5.99	5.99	0.01	0.15
C15	5.97	5.97	5.98	0.01	0.07
C16	0.01	5.99	0.01	5.98	0.01
C17	5.98	5.98	5.99	0.01	0.04
C2	5.99	5.99	5.99	5.99	5.99

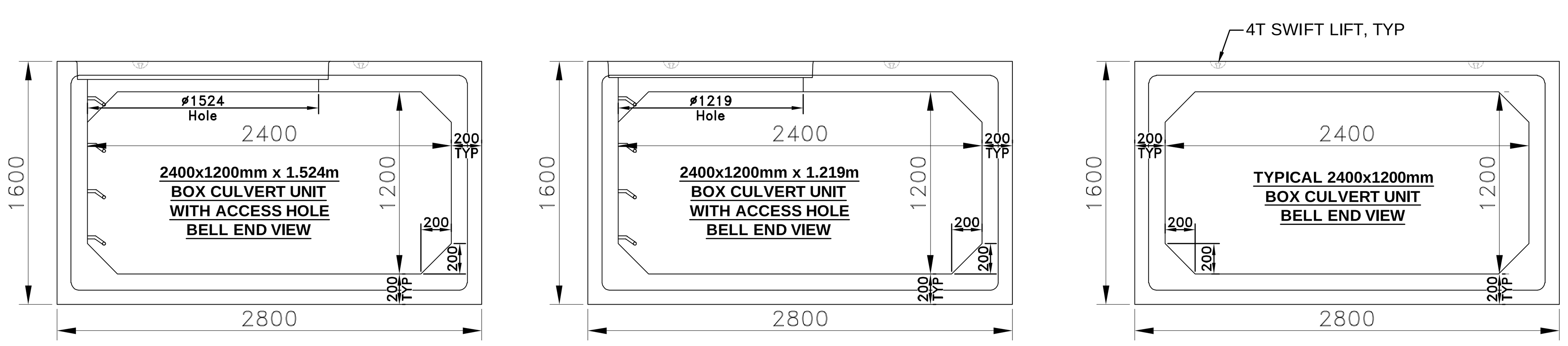
C20	0.51	0.51	0.70	0.01	0.01
C25	0.01	0.01	0.01	6.00	0.01
C28	5.98	5.98	5.99	0.01	0.01
C4	0.01	0.01	5.98	0.01	0.01
C5	5.97	5.97	5.98	0.01	0.01

Analysis begun on: Mon Jun 23 15:03:39 2025
Analysis ended on: Mon Jun 23 15:03:55 2025
Total elapsed time: 00:00:16

APPENDIX E

Xstream Details & OGS Sizing





NOTES

1. DESIGNED TO CHBDC CSA-S6-19
2. MANUFACTURED IN ACCORDANCE WITH OPSS1821
3. CL-625-ONT TRUCK LOAD
4. EARTH COVER ABOVE: 0.6-3.6m
5. KENT SEAL SUPPLIED FOR JOINTS
6. S106-16A KORN-N-SEAL BOOT FOR Ø300mm PVC IS OPTIONAL

REINFORCING COVER:
7. 40 ± 5mm

LIFTING
8. 4pcs - 4T SWIFT LIFT ANCHORS
9. DISTRIBUTE LIFTING LOADS EVENLY ON ALL 4 LIFTING POINTS

INSTALLATION
8. AS PER OPSS422 AND OPSD803.010
9. RESPONSIBILITY FOR CONSTRUCTION REVIEW, ADEQUACY, AND SUITABILITY OF EXCAVATION, DEWATERING, SHORING, HANDLING EQUIPMENT, AND SOIL STABILITY BY OTHERS

APPROXIMATE MASSES:
10. 2400x1200mm X 2.5m Box Culvert = 10,600 kg/pc
11. 2400x1200mm X 2.5m BOX CULVERT w/ BULKHEAD = 12,650 kg/pc

- 15 PIECES OF 2.4x1.2 x 2.5m BOX CULVERTS
- TOTAL FOOTPRINT = 105.4m²
- TOTAL VOLUME CAPACITY = 103m³
  [(2.4x1.2 Box waterway m² x 2.5m x 15) - 2 x (bulkhead volume)] = [(2.8m² x 2.5m x 15) - 2 x (2.8m² x 0.3m)] = [(7m³ x 15) - (2 x 0.84m³] = [105m³ - 1.68m³] = [103.32m³] = **103m³**

DESIGNED TO CHBDC CA-S6-19
WWR: ASTM A1061, 500 MPa
REBAR: SCA G30.18, GRADE 400W
CONC. EXPOSURE CLASS: C-1
CEMENT TYPE: HS (T50)
CONC. STRENGTH: 40 MPa
CONC. STRIPPING STRENGTH: 19MPa

EARTH COVER ABOVE: **0.6-3.6m**
LOADING: CL-625 ONT TRUCK LOAD
ALL DIMENSIONS ARE IN mm
LIFTING & APPROXIMATE MASS: AS PER PRODUCTION SHOP DRAWING

REV	DESCRIPTION	DATE	BY
2			
1			
0	Issued for Approval	26/ Jun/ 2025	HUS

Rinker Materials - CANADA
CAMBRIDGE I OTTAWA I 1-888-888-3222

TITLE: Xstream Tank (15-2400x1200mmX2.5m Box C.) Layout & Details

PROJECT:

CONTRACTOR:

ORDER NO:

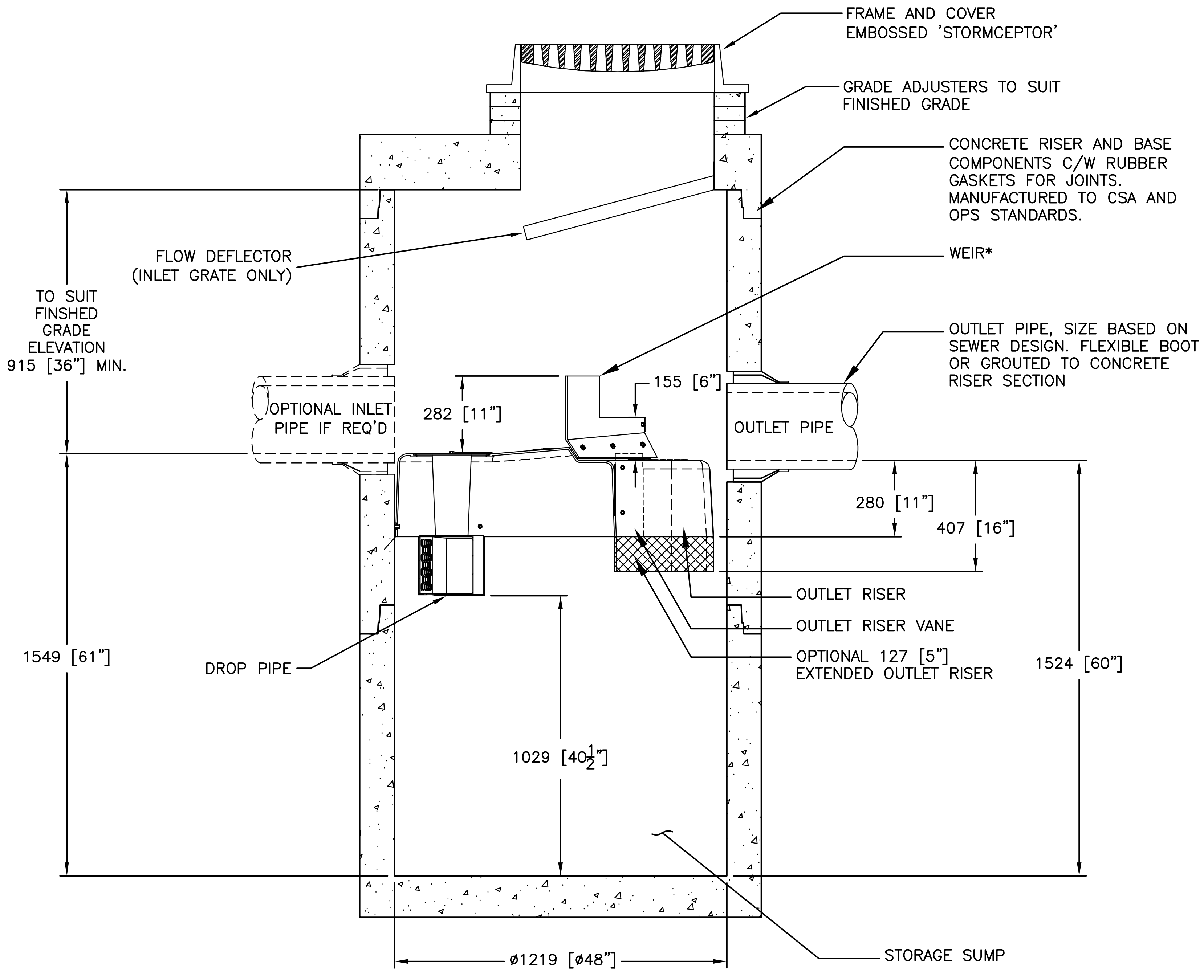
DATE: 26/ Jun/ 2025

PAGE: 1 of 1

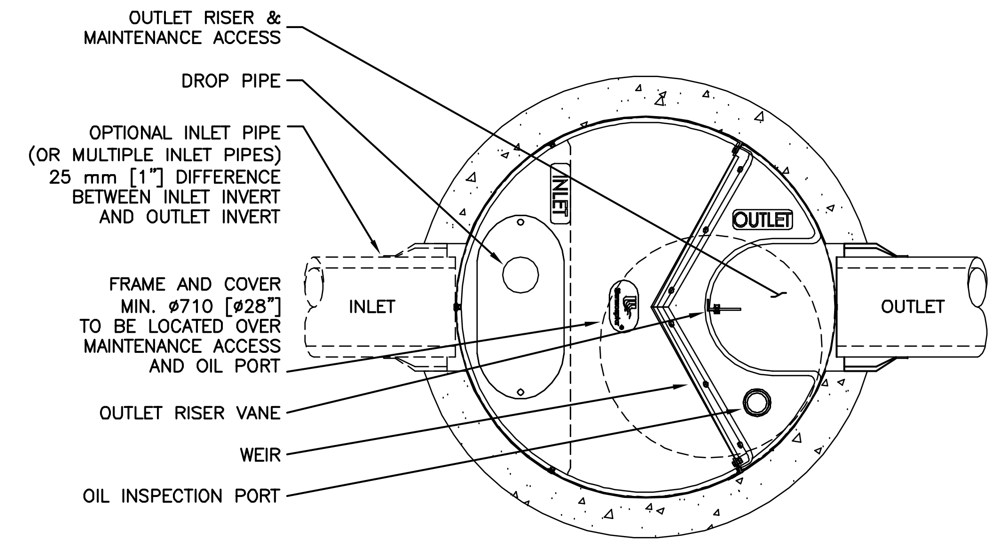
DRAWN BY: Hussein Sadeqi

CHECKED BY:

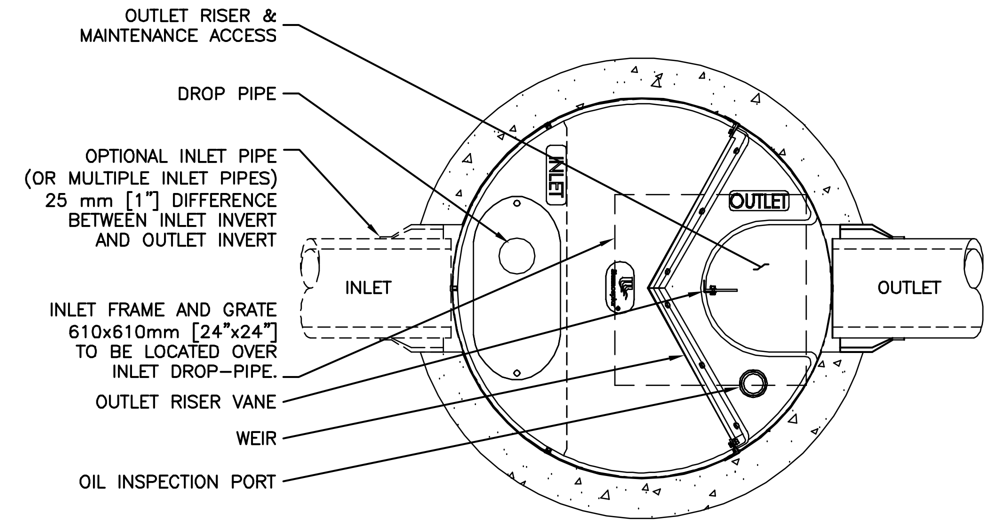
c:\users\hussein.sadeqi\the quikrete companies\tor-cp-1290-share - documents\techmin\personal\hussein s\job&q&...-2015-2025\2025\quotes-2025\morefiled-xstream\morefield-xstream.dwg



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY
####	####	####	####
####	####	####	####
####	####	####	####
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium

407 FAIRVIEW DRIVE, WHITBY, ON L1N 3A9
TF 800-565-4801 CA 416-960-9900 INTL +1-416-960-9900

DATE: 10/13/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EFO4	SEQUENCE No.: *
SHEET: 1 OF 1	

Stormceptor®

Rinker MATERIALS® A QUIKRETE® COMPANY

Stormceptor®EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

10/10/2024

Province:	Ontario
City:	Grand Valley
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	EFO Post 1 - Post 5

Drainage Area (ha):	0.28
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	9.55
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	321
Estimated Average Annual Sediment Volume (L/yr):	261

Project Name:	40 Emma St
Project Number:	231-103
Designer Name:	Kent Campbell
Designer Company:	Rinker Pipe
Designer Email:	stanley.campbell@rinkerpipe.com
Designer Phone:	519-622-7574
EOR Name:	Kim Pilon
EOR Company:	Moorefield Excavating
EOR Email:	
EOR Phone:	519-386-4857

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	89
EFO6	96
EFO8	98
EFO10	99
EFO12	100

Recommended Stormceptor EFO Model:	**EFO4**
Estimated Net Annual Sediment (TSS) Load Reduction (%):	**89**
Water Quality Runoff Volume Capture (%):	**> 90**

imbrium

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 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.

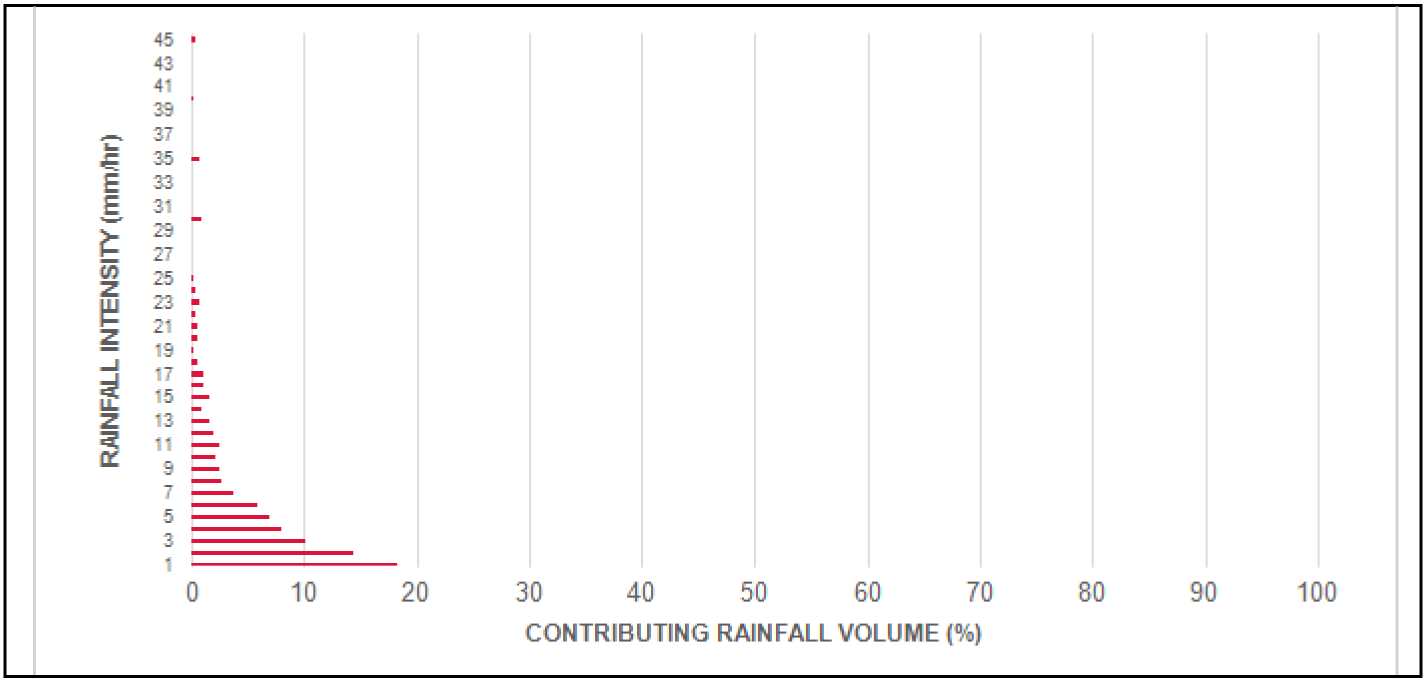
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

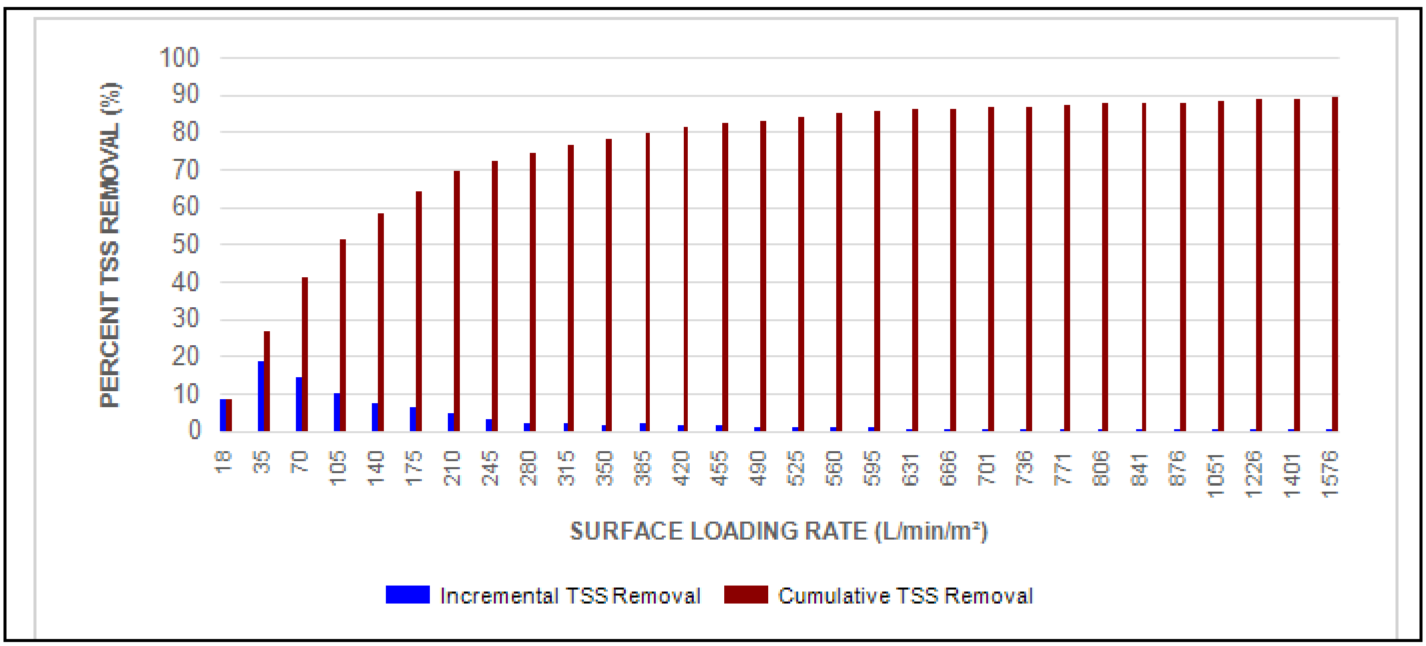
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.35	21.0	18.0	100	8.5	8.5
1.00	18.3	26.8	0.70	42.0	35.0	100	18.3	26.8
2.00	14.4	41.3	1.40	84.0	70.0	100	14.4	41.3
3.00	10.2	51.5	2.10	126.0	105.0	96	9.8	51.1
4.00	8.0	59.5	2.80	168.0	140.0	91	7.3	58.3
5.00	6.9	66.4	3.50	210.0	175.0	87	6.0	64.3
6.00	5.9	72.3	4.20	252.0	210.0	83	4.9	69.2
7.00	3.8	76.1	4.90	294.0	245.0	81	3.1	72.3
8.00	2.6	78.7	5.60	336.0	280.0	79	2.1	74.3
9.00	2.5	81.1	6.31	378.0	315.0	78	1.9	76.3
10.00	2.2	83.3	7.01	420.0	350.0	76	1.7	77.9
11.00	2.5	85.8	7.71	462.0	385.0	75	1.9	79.8
12.00	2.0	87.8	8.41	504.0	420.0	73	1.5	81.2
13.00	1.6	89.4	9.11	546.0	455.0	72	1.2	82.4
14.00	0.9	90.4	9.81	588.0	490.0	70	0.7	83.0
15.00	1.6	91.9	10.51	631.0	525.0	68	1.1	84.1
16.00	1.1	93.0	11.21	673.0	560.0	66	0.7	84.8
17.00	1.0	94.0	11.91	715.0	595.0	65	0.7	85.5
18.00	0.5	94.6	12.61	757.0	631.0	64	0.4	85.9
19.00	0.2	94.8	13.31	799.0	666.0	64	0.1	86.0
20.00	0.6	95.4	14.01	841.0	701.0	64	0.4	86.4
21.00	0.6	96.1	14.71	883.0	736.0	64	0.4	86.8
22.00	0.3	96.4	15.41	925.0	771.0	63	0.2	87.0
23.00	0.8	97.2	16.11	967.0	806.0	63	0.5	87.5
24.00	0.4	97.6	16.81	1009.0	841.0	63	0.3	87.8
25.00	0.2	97.8	17.51	1051.0	876.0	63	0.1	87.9
30.00	0.9	98.7	21.02	1261.0	1051.0	60	0.5	88.4
35.00	0.8	99.5	24.52	1471.0	1226.0	56	0.5	88.9
40.00	0.2	99.7	28.02	1681.0	1401.0	52	0.1	89.0
45.00	0.3	100.0	31.53	1892.0	1576.0	47	0.1	89.1
							Estimated Net Annual Sediment (TSS) Load Reduction =	**89 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

RAINFALL DATA FROM WATERLOO WELLINGTON 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

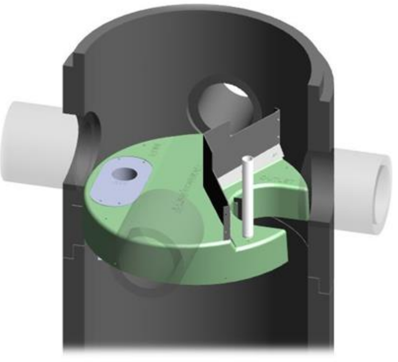
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

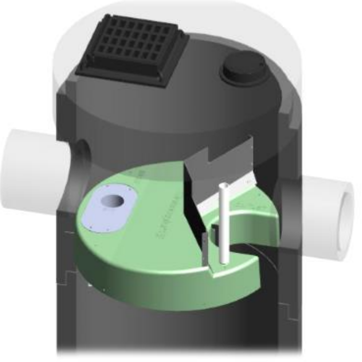
DESIGN FLEXIBILITY

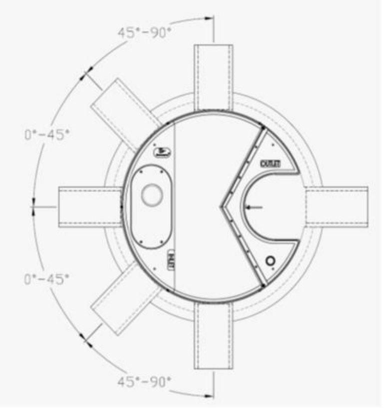
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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







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° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : 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)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	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

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

APPENDIX F

Erosion Risk Assessment (ERA) – ESC Guidelines for Urban Construction (2019), TRCA

Erosion Risk Assessment (ERA)

Site:	40-60 Emma Street
Site Size:	0.37 Ha

Step 1: Site Information

Soil Type:	BH-1 silty, gravelly sand, some clay, 2.29 m to 2.90 m, Coefficient of permeability k = 1.7 x 10-6 cm/sec BH 4 silty clay, some sand, trace gravel, 1.52 m to 2.13 m, Coefficient of permeability k = 5.2 x 10-7 cm/sec
Topography Description:	Site sloping from rear yard to front yard, average slope 16%, some slopes up to 35%
On Site Findings:	23-Nov

Step 2: Divide Site in Polygons for sites >0.5Ha

N/A

Step 3: Erosion Risk Factors

Table 6.2 – Erosion risk classification according to soil type

Soil Type	Erodibility Classification	Soil Erodibility Rating
Well Graded Gravel	Least	Low
Poorly Graded Gravel		Low
Sand		Low
Loamy Sand		Low
Heavy Clay		Low
Clay		Low
Sandy Clay		Low
Silty Clay		Moderate
Sandy Clay Loam		Moderate
Silty Clay Loam		Moderate
Sandy Loam		Moderate
Silty Sand		High
Loam		High
Silt Loam		High
Silt	Most	High

***Source:** Adapted from Guidelines on Erosion and Sediment Control for Urban Construction Site (MNRF, 1987)*

Table 6.3: Erosion risk classification according to slope gradient, soil erodibility, and slope length

Slope gradient	Soil erodibility	Erosion risk classification	
		slope length <30 m	slope length >30m
<2%	Low	Low	Moderate
	Moderate	Moderate	Moderate
	High	Moderate	High
2-10 %	Low	Low	Moderate
	Moderate	Moderate	High
	High	High	High
>10%	Low	Low	Moderate
	Moderate	High	High
	High	High	High

Source: Adapted from *Guidelines on Erosion and Sediment Control for Urban Construction Sites* (MNRF, 1987)

Table 6.4: Erosion risk classification according to soil cover type

Cover Management	Erodibility	Erosion risk classification
Densely vegetated areas	Least	Low
Sodded/Established Vegetated Areas		Low
Soil Sealant and Rolled Erosion Controls		Moderate to Low[1]
Hydroseeded/Hydromulch Areas Prior to Significant Vegetation Growth		Moderate to Low[1]
Established temporary crop covered/vegetated lands[2]		Moderate
Seeded lands prior to significant vegetation growth		High
Sparsely vegetated lands		High
Bare lands (exposed soil) following topsoil stripping and/or grading	Most	High

[1] Depends on the quality of the cover (e.g. good ground preparation and coverage, even application, rolled erosion control products properly secured in place). [2] Assumes planting and growth occurs during optimum growing conditions.

Source: RUSLE for Application in Canada: *A Handbook for Estimating Soil Loss from Water Erosion in Canada* (Wall et al., 2002)

Step 4: Overall Risk Determination

Table 6.5: Overall erosion risk classification

Slope/soil erodibility classification (based on Table 6.3)	Cover classification (based on Table 6.4)	Overall polygon erosion risk classification
Low	Low	Low
Moderate	Low	Low
High	Low	Moderate
Low	Moderate	Moderate
Moderate	Moderate	Moderate
High	Moderate	High
Low	High	Moderate
Moderate	High	High
High	high	High

Step 5: Apply ERA Outcome to Determine BMPs

Table 6.6: Best management practices recommended at different erosion risk levels

Minimum best practices recommended	Low risk	Moderate risk	High risk
Procedural ESC Measures	yes	yes	yes
ESC Plan	yes	yes	yes
Routine inspection of ESC effectiveness	yes	yes	yes
Flow/Runoff Diversion	optional	where possible	yes
Phased Construction and Progressive Rehabilitation	optional	where possible	yes
More intensive ESC measures[1]	optional	optional	yes
Turbidity monitoring	optional	Recommended after significant rainfall/snowmelt	Continuous recommended[2]

Source: Adapted from *Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects* (MTO, 2015).

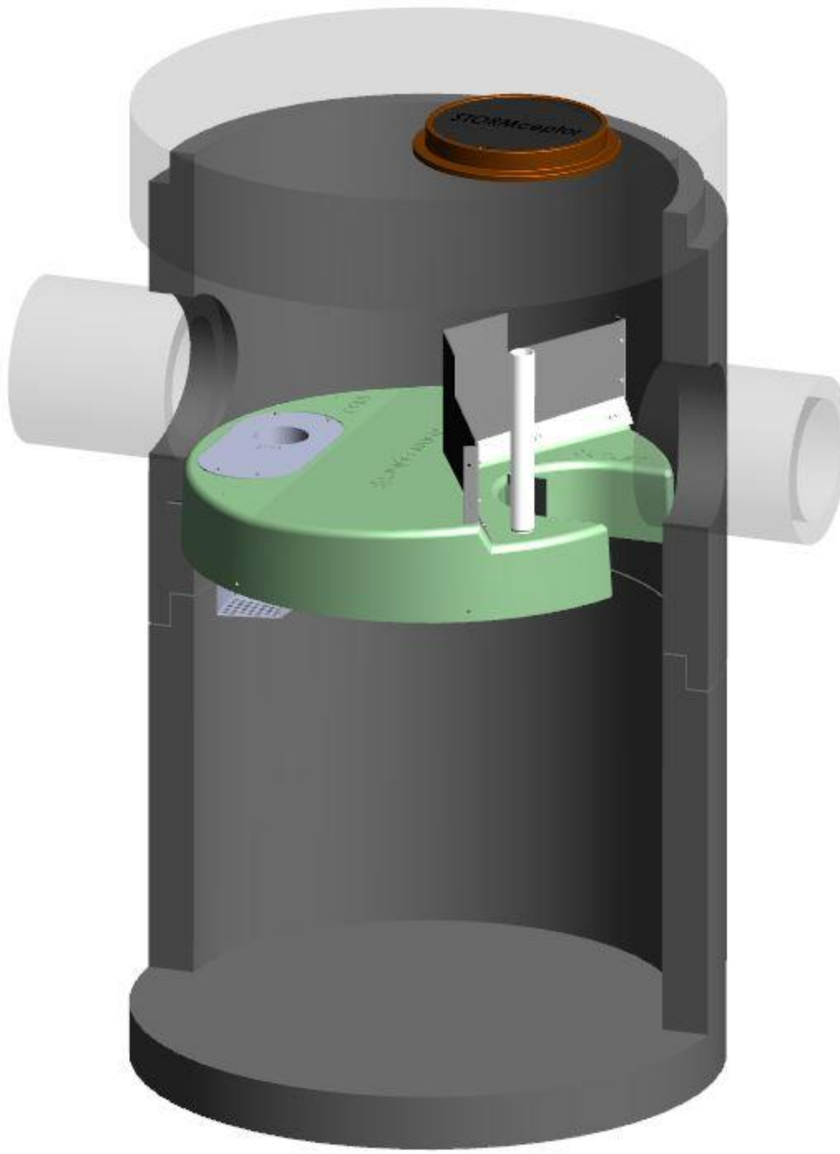
[1]As described in section 6.2.4. [2]See Chapter 10 for more information on turbidity monitoring requirements.

APPENDIX G

Operations and Maintenance

Stormceptor® EF

Owner’s Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

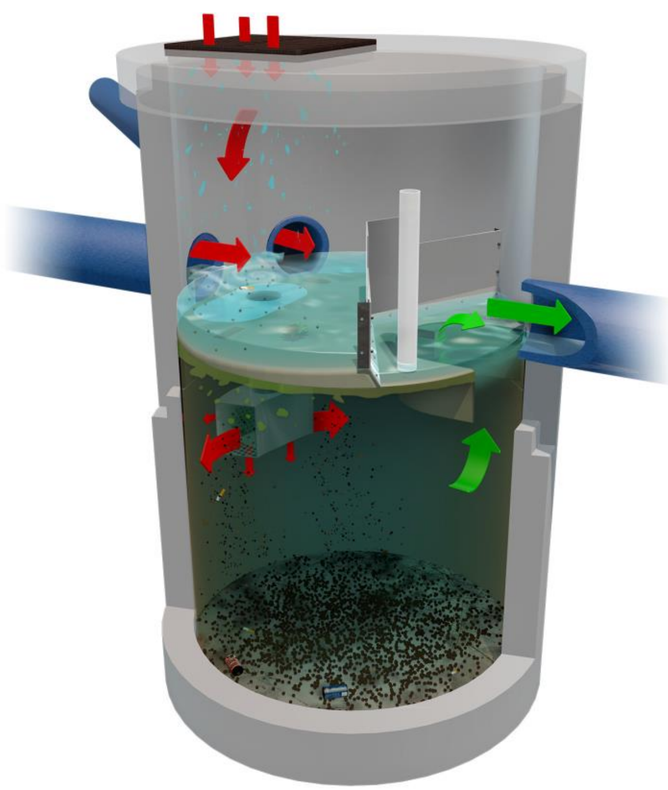
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - ***Stormceptor®***. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

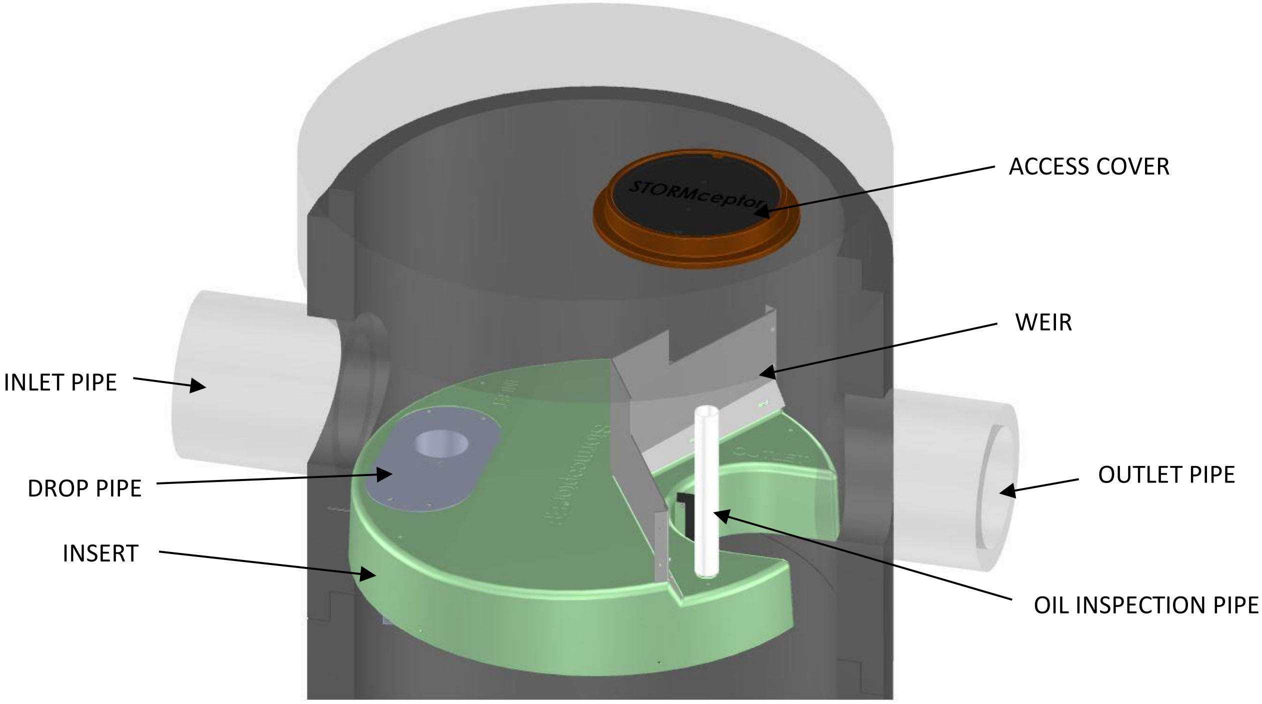


Figure 1

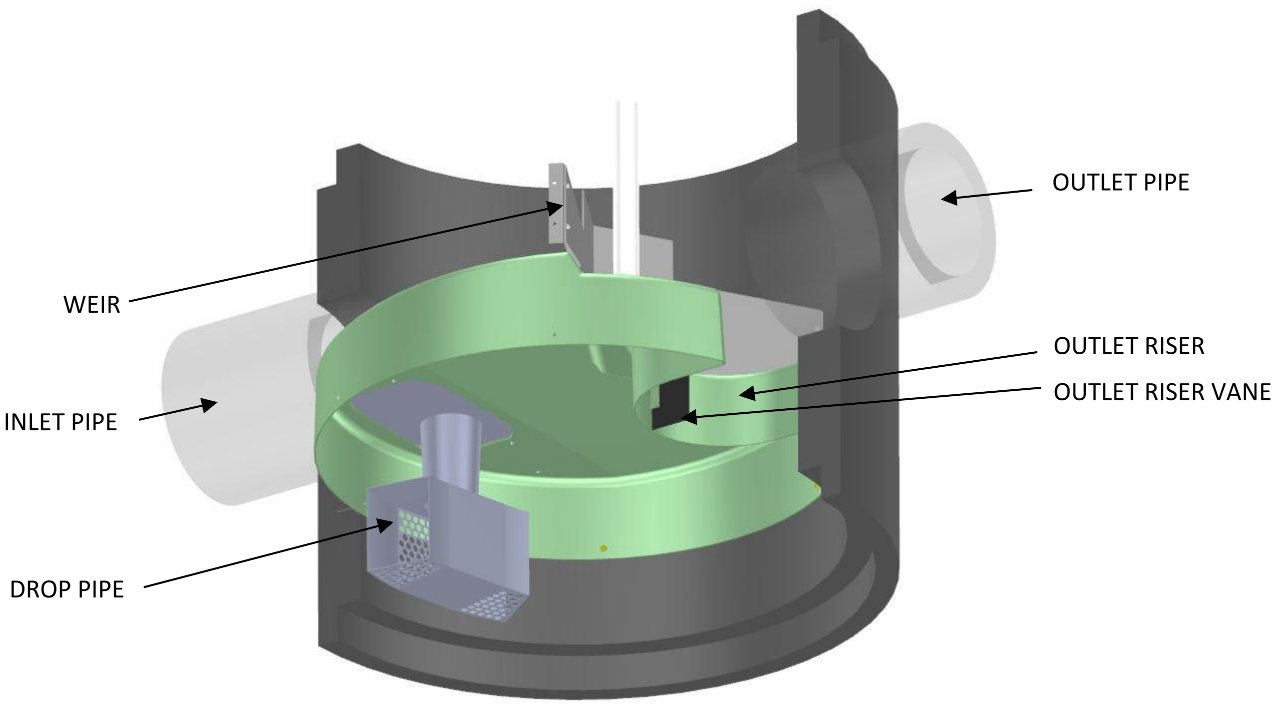


Figure 2

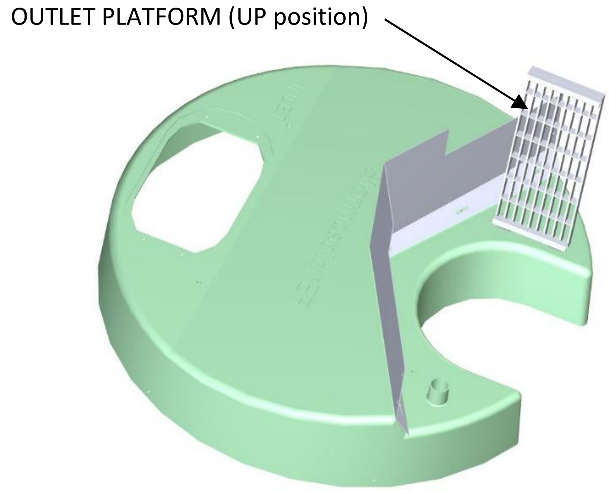


Figure 3A

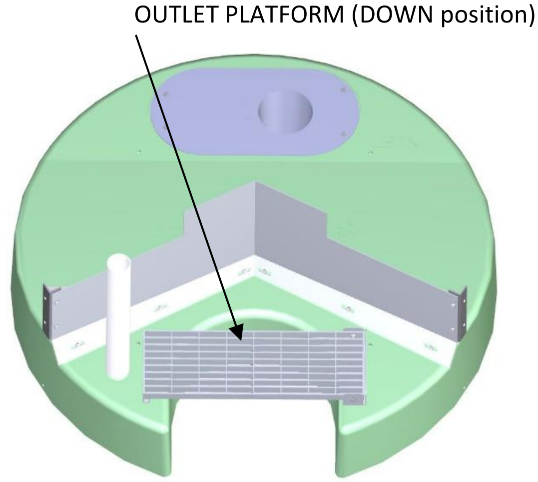


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity [1] (m^3)	Hydrocarbon Storage Capacity [2] (L)	Maximum Flow Rate into Lower Chamber [3] (L/s)	Peak Conveyance Flow Rate [4] (L/s)
EF4 / EFO4	1.22	1219/914	1524	1780	1.19	265	22.1 / 10.4	425
EF5/EFO5	1.52	1219	1626	3150	1.95	420	34.6 / 16.2	708
EF6 / EFO6	1.83	1219	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1219	3886	40800	31.22	2475	198.7 / 93.7	2830

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity [1] (ft^3)	Hydrocarbon Storage Capacity [2] (gal)	Maximum Flow Rate into Lower Chamber [3] (cfs)	Peak Conveyance Flow Rate [4] (cfs)
EF4 / EFO4	4	48 / 36	60	471	42	70	0.78 / 0.37	15
EF5 / EFO5	5	48	64	833	75	111	1.22 / 0.57	25
EF6 / EFO6	6	48	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	48	153	10779	1103	655	7.02 / 3.31	100

[1] Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[2] Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.
[3] EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft^2.
EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft^2.
[4] Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name ***Stormceptor®*** embossed on the access cover at grade as shown in **Figure 3**. The tradename ***Stormceptor®*** is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

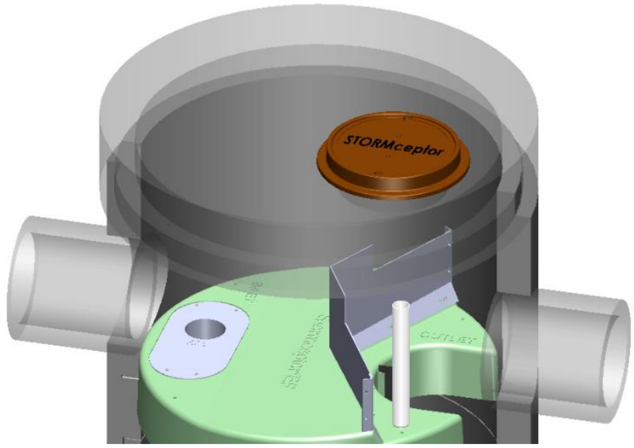


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

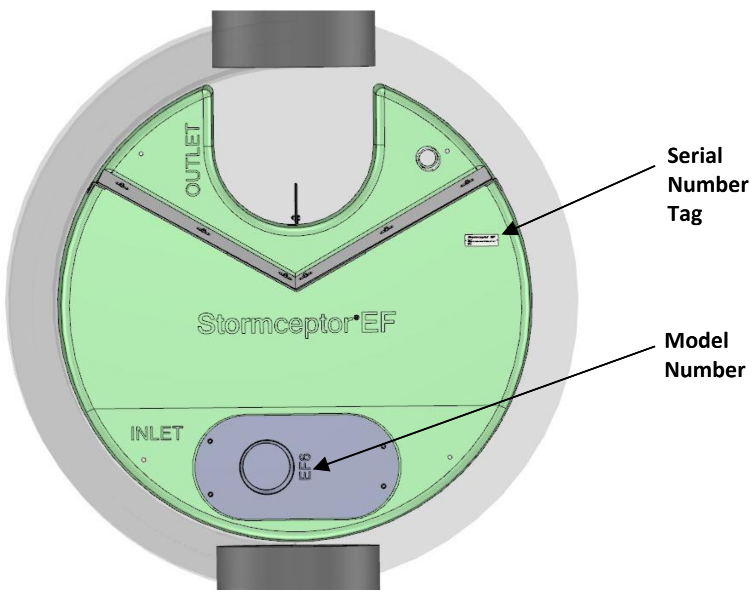


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
  NOTE: EF4/EFO4 & EF5/EFO5 require the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4 & EF5/EFO5), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF5 / EFO5	12 /305
EF6 / EFO6	12 /305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 41 inches (1,041 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

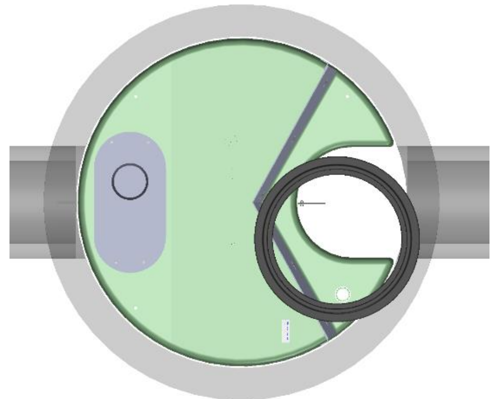


Figure 6

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.
- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

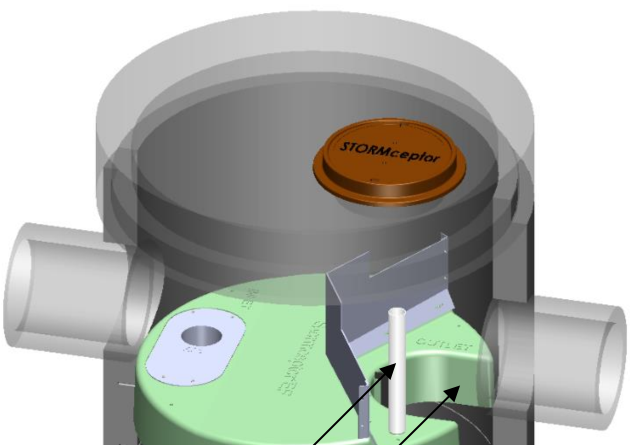


Figure 7

Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.

Figure 9

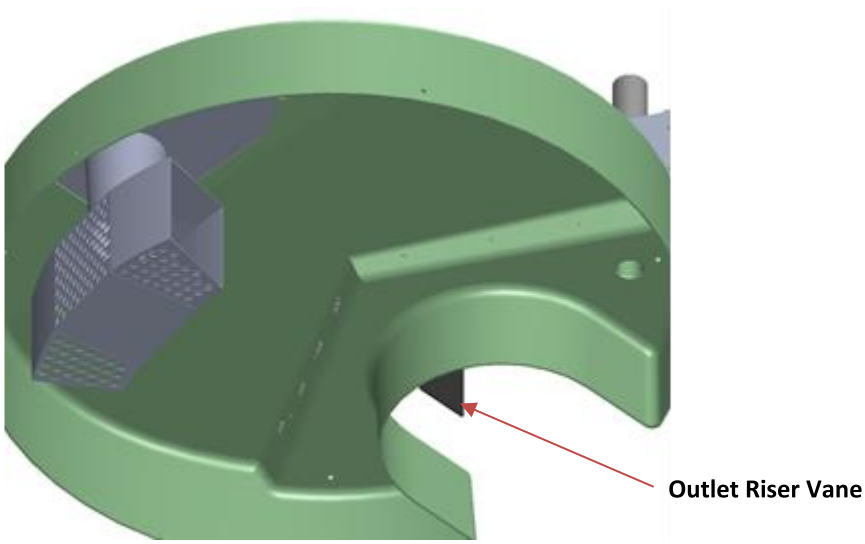


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 & EF5/EFO5 models require a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.

How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle

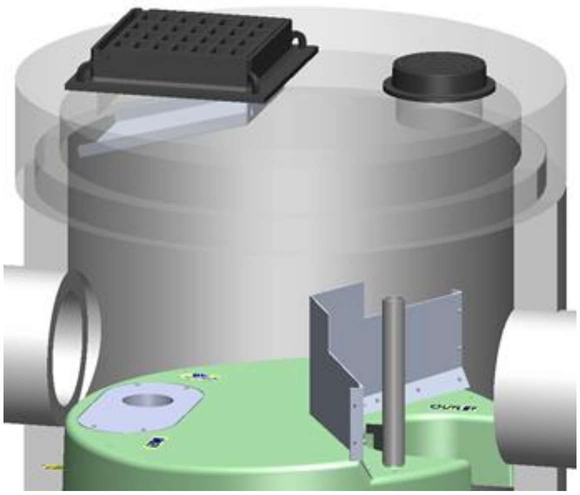
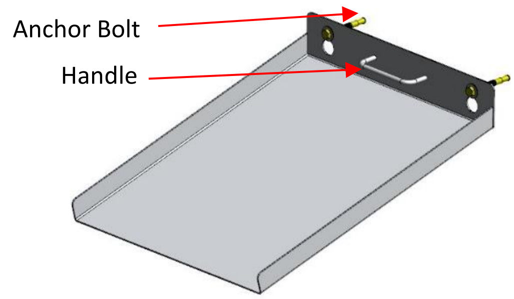


Figure 11



Removable Flow Deflector

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal
Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens
When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm
To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems.

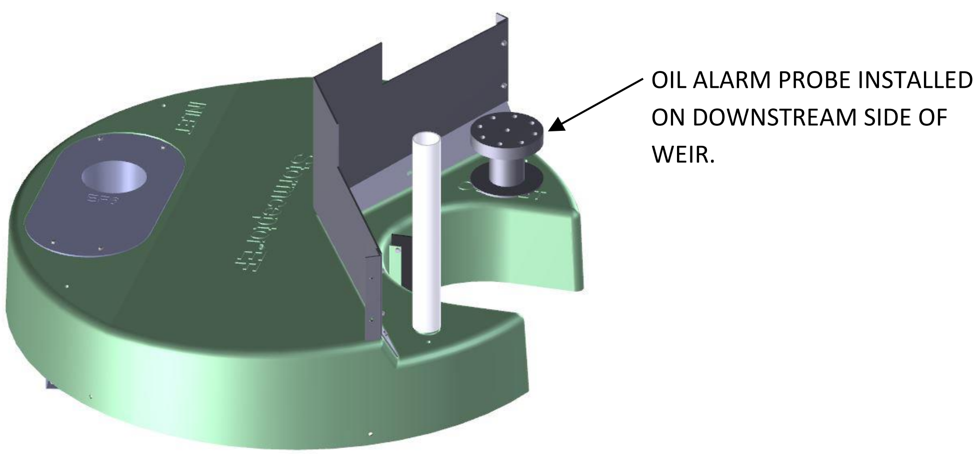


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ________________________

Serial Number: ________________________

Installation Date: ________________________

Location Description of Unit: ________________________

Recommended Sediment Maintenance Depth: ________________________

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Imbrium representative or by visiting our website at www.imbriumsystems.com.

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
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www.imbriumsystems.com
info@imbriumsystems.com

INSPECTION & MAINTENANCE

Regular inspection and maintenance of the XSTREAM Retention System is vital for the performance and service life of the stormwater management system.

All local and provincial permits and regulations must be followed for system compliance.

Most local regulations require that all stormwater facilities be inspected and maintained to ensure they are operating as designed and providing protection to receiving water bodies.

Standard maintenance hole (MH) access locations are provided on every XSTREAM Retention System for ease of routine inspection and maintenance activities.

First 12 Months

It is recommended that inspections be performed multiple times during the first 12 months of service to assess the site-specific conditions. Inspection after the first major storm event (>25mm) and at quarterly intervals is recommended. Pollutant loading and pollutant characteristics can vary greatly from site to site due to variables such as nearby soil erosion or construction sites, winter maintenance on roads, amount of daily traffic and land use.

The first 12 months of inspections can be used to set the inspection and maintenance frequency for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance the XSTREAM Retention System can exceed its storage capacity, become blocked, or damaged, which can negatively affect its continued performance.

Inspection Equipment

The following is a list of equipment to allow for simple and effective inspection:

- ☐ FORTERRA Inspection and Maintenance Report Form
- ☐ Personal protective equipment (PPE)
- ☐ Appropriate traffic control signage and procedures, for vehicles or pedestrians
- ☐ Appropriate tools to remove MH access covers
- ☐ Flashlight
- ☐ Measuring pole or tape measure

WARNING: Entering the XSTREAM Retention System is generally not required for routine inspections. Work procedures must comply with the Occupational Health and Safety Act (OHSA) and Confined Spaces Regulation (O.Reg. 632/05). Failure to observe the above warnings may lead to property damage, personnel injury or death.

Inspection Steps

The key to any successful stormwater facility maintenance program is routine inspections. The inspection steps required on the XSTREAM Retention System are quick and easy. As mentioned above, the first 12 months should be the site-specific maintenance frequency establishment phase. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The XSTREAM Retention System can typically be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or maintenance hole.

Once the MH access covers have been safely opened the inspection process can proceed:

- ☐ Prepare the *FORTERRA Inspection and Maintenance Report* form by writing in the necessary information including project name, location, date & time, and other information (see inspection form at end of this document).
- ☐ Observe the upstream drainage area and look for sources of sediment, trash and debris.
- ☐ Observe the inside of the system through the access openings. If vision into the unit is impaired, utilize a flashlight to see inside the system and all precast sections.
- ☐ Look for any out of the ordinary obstructions in the inlet and outlet pipes. Check pipes for movement or leakage. Write down any observations on the inspection form.
- ☐ Through observation and/or digital photographs, estimate the amount of floatable debris accumulated in the system. Record this information on the inspection form. Next, utilizing a tape measure or measuring stick, estimate the amount of sediment accumulated in the system. Sediment depth may vary throughout the system, depending on the flow path. Record this depth on the inspection form.
- ☐ Observe any movement of precast sections, or concrete cracks and signs of deterioration.
- ☐ For detention and retention systems, inspect for any signs of leakage.
- ☐ For infiltration systems, inspect for any signs of blockage or reasons that the stormwater is not infiltrating into the underlying soils.
- ☐ Finalize inspection report to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- ☐ Damaged inlet and outlet pipes.
- ☐ Obstructions in the system.
- ☐ Excessive accumulation of trash or debris.
- ☐ Excessive accumulation of sediment (more than 150mm in depth).
- ☐ Damaged concrete or joint sealant.

Maintenance Equipment

While maintenance can be done manually, it is recommended that a vacuum truck be utilized to minimize time requirements to maintain the XSTREAM Retention System.

The following is a list of equipment recommended for maintenance activities:

- ☐ FORTERRA Inspection and Maintenance Report Form
- ☐ Personal protective equipment (PPE)
- ☐ Appropriate traffic control signage and procedures, for vehicles or pedestrians
- ☐ Appropriate tools to remove MH access covers
- ☐ Flashlight
- ☐ Measuring pole or tape measure
- ☐ Trash can
- ☐ Pressure washer

WARNING: Entering the XSTREAM Retention System may be required for maintenance. Work procedures must comply with the Occupational Health and Safety Act (OHSA) and Confined Spaces Regulation (O.Reg. 632/05). Failure to observe the above warnings may lead to property damage, personnel injury or death.

Maintenance Procedures

It is recommended that maintenance occurs several days (typically 72 hours) after the most recent wet weather event to allow for drain down of the system and any upstream detention systems designed to drain down over an extended period. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Once all safety measures have been set up cleaning of the system can proceed as follows:

- ☐ Using an extension on a vacuum truck boom, position the hose over the access opening into the system. Remove all floating debris, standing water (as needed), and sediment from the system.
- ☐ A power washer can be used to assist if sediments have become hardened and stuck to the walls. Be sure not to pressure wash the infiltration area as it may scour.
- ☐ Repeat the same procedure at each access opening until the system has been fully maintained.

If maintenance requires entry into the system, refer to O.Reg. 632/05 Confined Spaces:

- ☐ Ensure acceptable atmospheric levels with a gas meter to detect the presence of any hazardous gases. If hazardous gases are present, do not enter the system. Follow appropriate confined space procedures to address any hazards, such as utilizing a venting system. Once it is determined to be safe, utilizing an adequate means for entering and exiting the system.
- ☐ The last step is to replace all MH covers and remove all traffic controls.
- ☐ All removed debris and pollutants must be disposed of following local regulations.

For additional information contact FORTERRA Pipe & Precast at 1-888-888-3222.

FORTERRA

INSPECTION AND MAINTENANCE REPORT

Project Name: ______________________________

Project Address: ______________________________

Owner: ______________________________

Contact: ____________________ **Phone:** ____________________

Inspector Name: ____________________

Inspection Date: ____________________ **Time:** ____________________

Inspection Type: ☐ Routine ☐ Follow-up ☐ Complaint ☐ Storm

Weather Condition: ______________________________

Additional Notes:

GPS Coordinates	Model # or Box Size	Inspection of Inlet & Outlet Pipes, Joints, and Connections Between Cells	Trash Build-up (kg) and Sediment Depth (mm)	Structural Notes, Concrete Damage	Hydraulic Operation of the Facility
Latitude: Longitude:					

Recommended Action: