Sheldon Creek Developments

Servicing Brief

40-60 Emma Street, Grand Valley

Kim Pilon, P.Eng.
6-10-2024
Moorefield Excavating

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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).

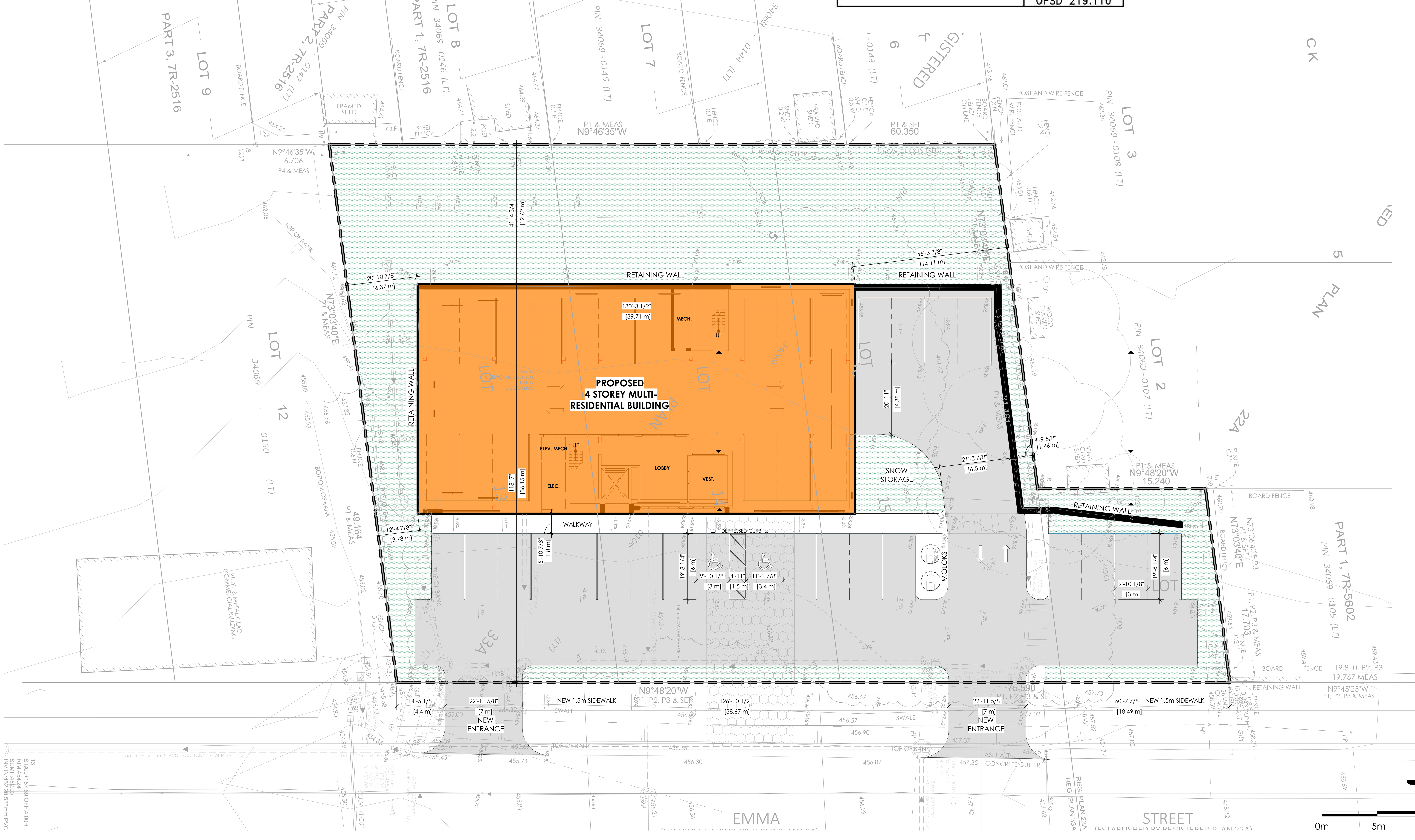
Moorefield Excavating reviewed the Town's design standards as well MECP's updated Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval Document (MECP Design Criteria). Further preliminary consultation was completed with the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

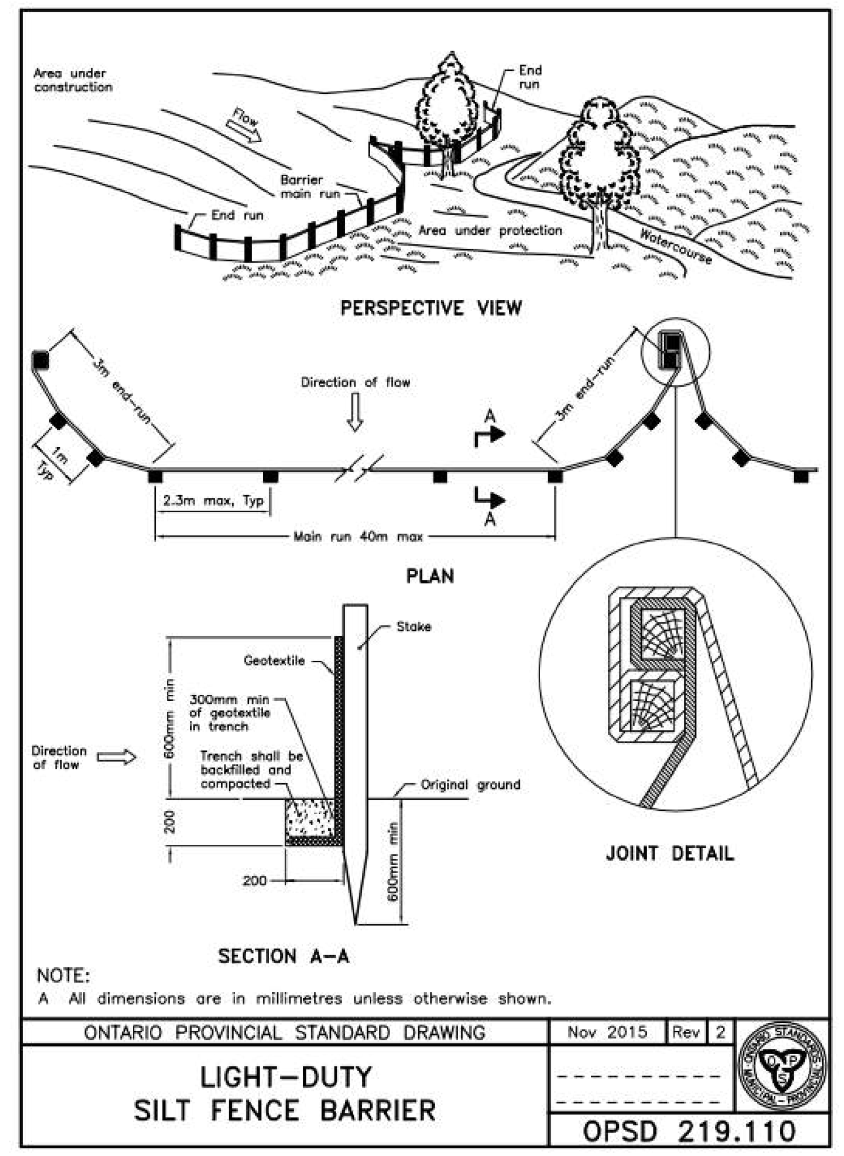
The client also completed a geotechnical investigation of the site and slope stability study which also influenced this report.

SITE PLAN APPLICATION NO.

SP XX-XXX

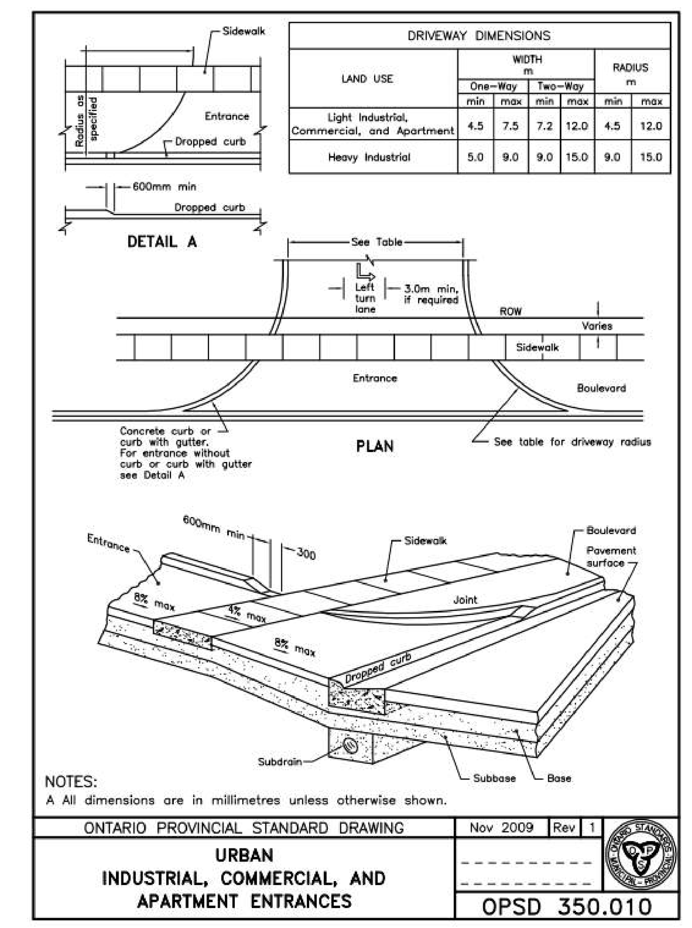
PART OF LOT 1, BLOCK 5
REGISTERED PLAN 22A AND PARTS OF
LOTS 13, 14 & 15 BLOCK 5 REGISTERED
PLAN 33A
TOWN OF GRAND VALLEY
COUNTY OF DUFFERIN





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.



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%		25.78%	
			[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		13.06 m	
PROPOSED BUILDING			827 m²	
TOTAL LOT COVERAGE			827 m²	

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

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

0m 5m 10m 15m

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.
KHALSA
BRAMPTON, ON
T: 647-468-2940

CONSULTANTS:

REGISTRATION
ONTARIO ASSOCIATION OF ARCHITECTS
06 - 16 - 2024
AMRITPAL SINGH BANSAL
LICENCE
9524
ISSUED FOR SITE PLAN APPROVAL

Project number	24022
Date	06/16/2024
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 floodplan. 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. This has been mapped on the drawings as part of this submission.

The proposed development will consist of 18 apartments separated on 3 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 Existing Site Services

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

3.1 Roadways

3.1.1 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.

3.2 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.

3.3 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.

3.4 Sanitary Servicing

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

4.0 Proposed Development Servicing

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

4.1 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.

4.2 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:

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

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

Max Day:

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

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

Peak Hour Flow:

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

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

4.2.1 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 pressures 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, in order 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.

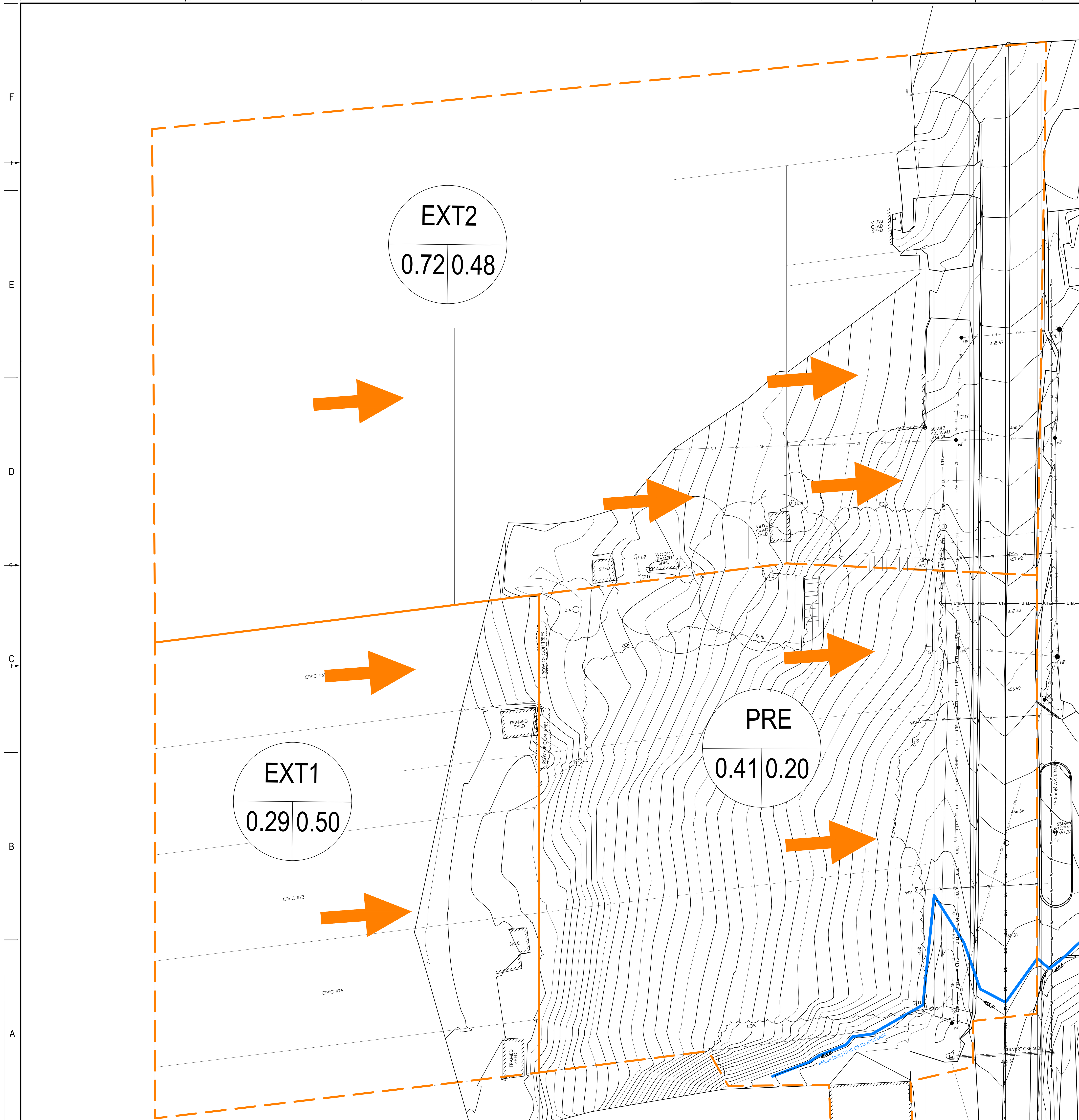
A 150mm diameter service will be supplied to the building to be split for both residential usage and fire suppression requirements.

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

4.3 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 road side 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.



LEGEND

CATCHMENT ID

EXT2

0.72 | 0.48

CATCHMENT AREA IN Ha

RUNOFF COEFFICIENT

FLOW ROUTE

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

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, 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**.

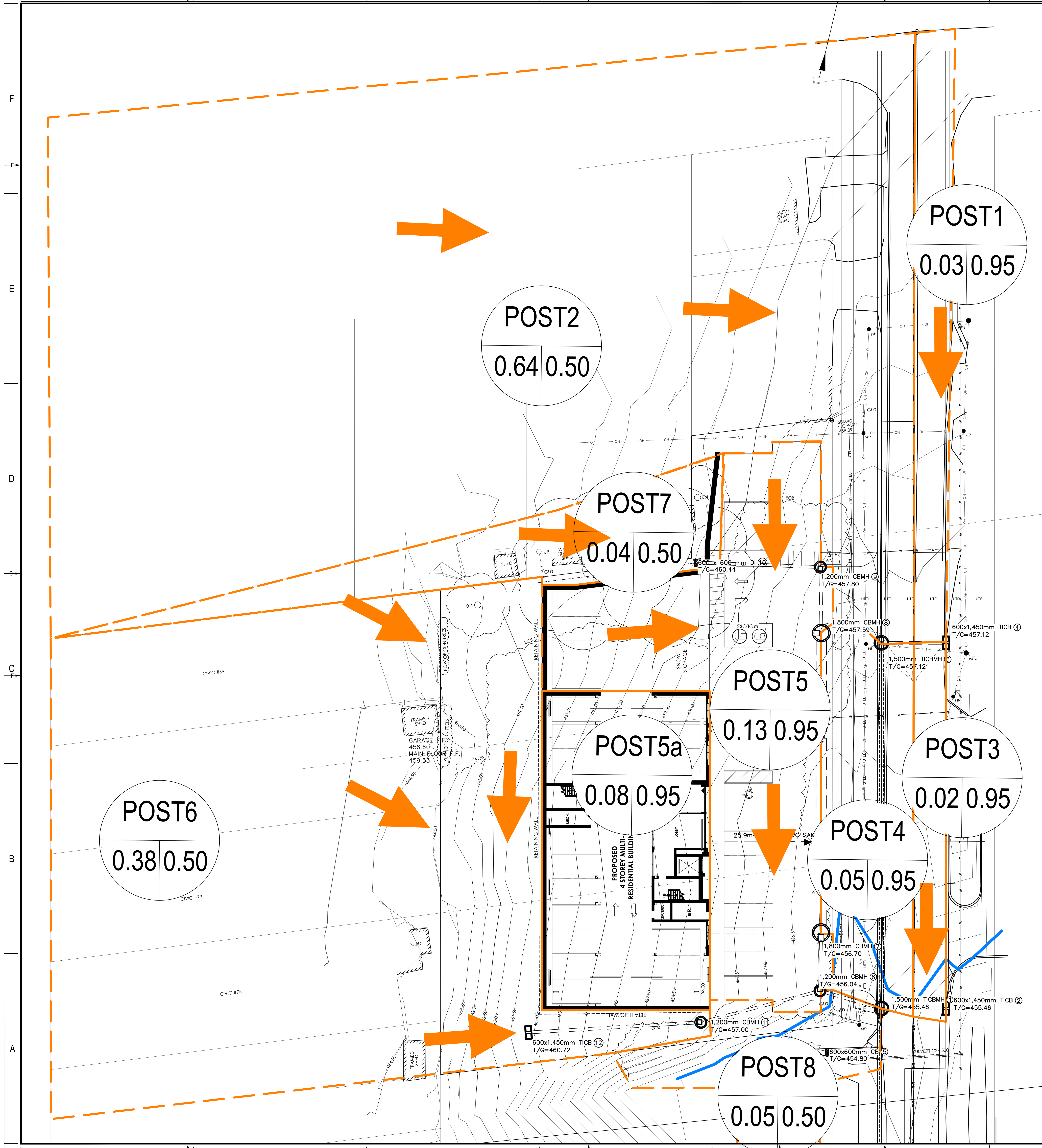
In the Gamsby and Mannerow Report (2011) the proposed site is included in Catchment 3. This overall catchment has an area of 2.37 Ha with a C value of 0.5. The proposed development and upstream catchments total 1.42 Ha (Post 1-8). The remainder downstream catchment area is 0.95 Ha (Downstream Catchment area EX3REM in PCSWMM). These areas are represented as separate catchments in order to properly assess the storm sewer's capacity. The Gamsby and Mannerow Rational method calculations are provided in **Appendix C** for reference.

The rational method was used to determine the 5 Year and 100 Year storm flows. The catchment areas represented by the development are 5, 5a 6 and 7. These catchment areas combined have a post-development C coefficient of 0.65 which is greater than 0.5. Therefore, stormwater control is to be provided. PCSWMM 5.2.4 was utilized to determine flow control requirements. PCSWMM and rational method storm flows are different because of modelling philosophies. In order to compare we will factor the rational method flows down to a C coefficient of 0.5 and apply this same coefficient to the PCSWMM model in order to determine the appropriate orifice size.

	5 Year (L/s)	100 Year (L/s)
Post-development (Rational) Catchment 7, 5/5a and 6 @ C=0.5	86.64	136.75
Post-development (Rational) Catchment 7, 5/5a and 6 @ C=0.65 (calculated weighted avg)	111.19	176.35

Dividing the controlled flows by the uncontrolled flows you get a factor of 0.78. We will apply the same factor as our control rate in the PCSWMM model for the 100 year and 5 year storm.

	5 Year (L/s)	100 Year (L/s)
Post-development (PCSWMM) Conduit C11 - MH 6 to 1 Uncontrolled (100 year storm)	120	225
Post-development (PCSWMM) - Max Allowable Flow *Conduit C11 - MH 6 to 1 Controlled Limit (Uncontrolled *0.78)*	*93.6*	*176*
Post-development (PCSWMM) Conduit C11 - MH 6 to 1 Controlled Limit (Model Output)	88	170



LEGEND

CATCHMENT ID

POST2

0.64 | 0.50

RUNOFF COEFFICIENT

CATCHMENT AREA IN Ha

FLOW ROUTE

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	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: K.PILON	
DRAWN BY: K.PILON	
CHECKED BY:	25mm

TITLE:

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

SHEET NUMBER: POST-1

C:\Users\kim\OneDrive - Moorefield Exca\Documents\Emma Street Grand Valley\JUNE 13 2024.dwg Jun 14, 2024-10:54am BY:(kim)

In order to control the flows down to 0.78 a 150mm orifice controlling Post Areas 7, 5 and 5a will be utilized in MH7 at the invert of the outlet pipe. 37.5 m of 1050mm pipe will be utilized to store the stormwater.

PCSWMM model outputs can be found in **Appendix E** along with an assessment of the hydraulic grade line.

4.3.1.1 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.

4.3.2 Quality Control

The majority of the discharge from this site is from a hard surface that could contain sediments due to winter operations and tracking. As such, quality control shall be provide for the on site discharge of stormwater.

All catchbasins and manholes within the right of way and site will be provided with minimum 600 mm sump. This will assist in removing a portion of the sediment contained in the runoff from the street. Catchbasins could be fitted with catchbasin shields and sump depths increased to a maximum of 1.2m in order to improve sediment collection if necessary.

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. The design details of the OGS can be found in **Appendix C.**

4.3.3 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 D** 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.

4.3.4 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 (June 2024) “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.

4.4 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:

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

Where: Q = 450 L/cap/day

M = Peak Flow Factor “Harmon”

$$= 1 + \frac{14}{4 + P^{0.5}} = 4.27\text{, therefore max 4.0 per town standard}$$

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 5% 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 5.0% grade reaches a full flow velocity of 1.93m/s which exceeds the ministry’s requirement of 0.6m/s. The maximum capacity of this service is 34.05L/s which provides for the required flows from the development.

5.0 Conclusions and Recommendations

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

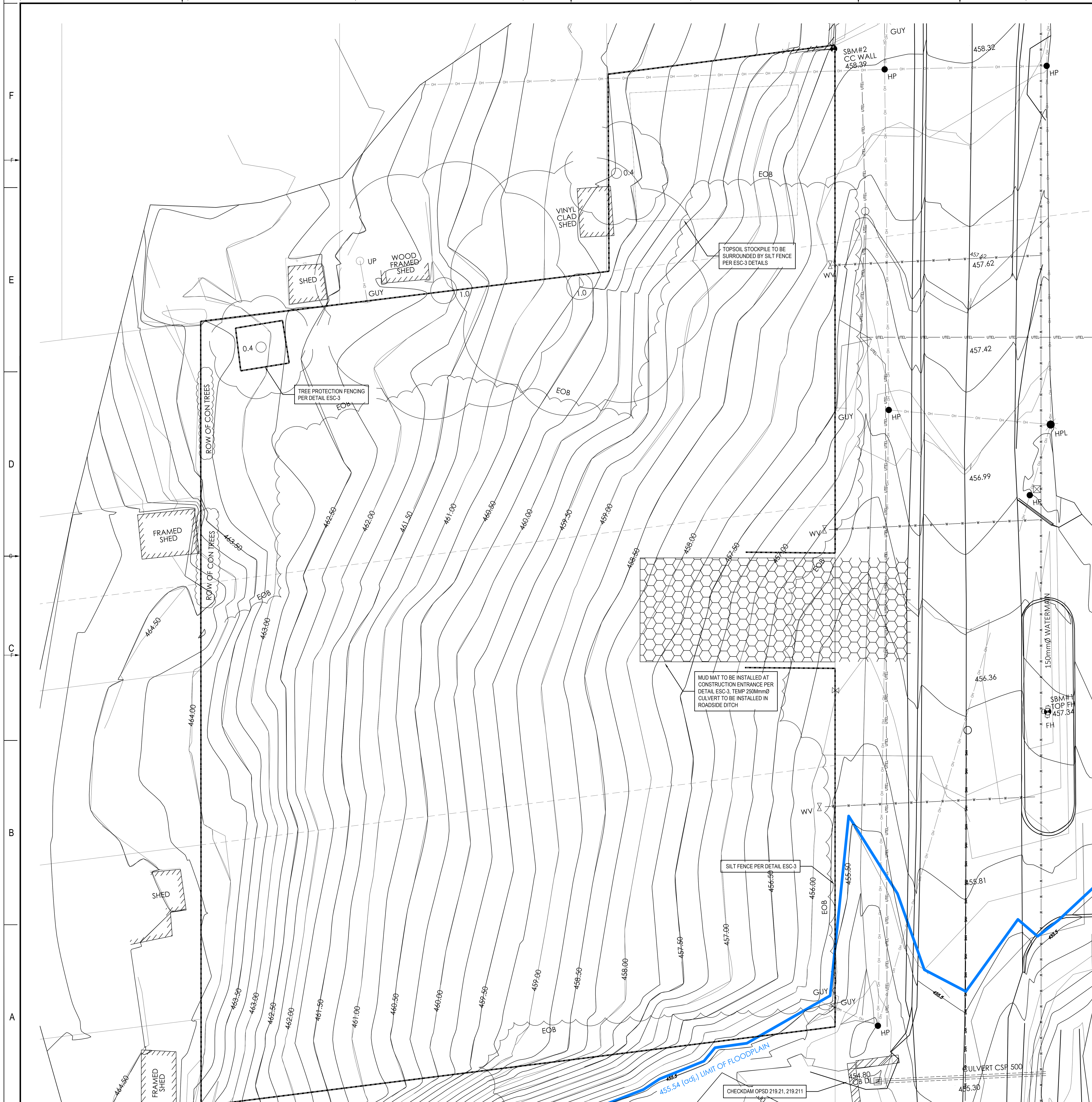
1. Existing public roadway access is available to the site, subject to necessary improvements to the Town's standards and approval.
2. Erosion and sediment controls will be required to limit sediments travelling into the nearby Grand River.
3. Storm Water will be directed to the new sewers in the right 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 directly 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 in order 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.

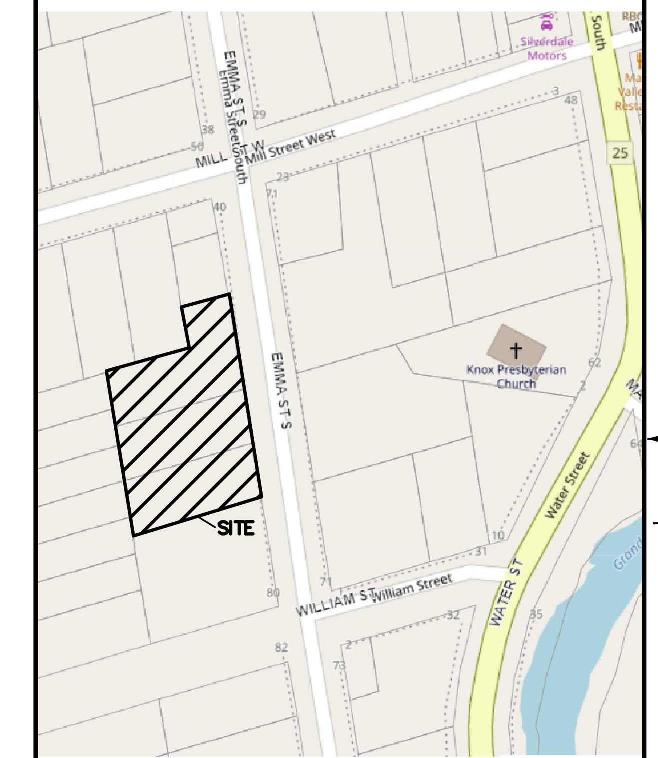
Respectfully submitted,

Kim Pilon, P. Eng.
Civil Engineer

APPENDIX A

Preliminary Servicing and Grading Plans





BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 458.39 AS SHOWN ON THE PLANS.

SEAL:

LICENSED PROFESSIONAL ENGINEER
K. PILON
100174821
06/13/24
PROVINCE OF ONTARIO

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. ALL STORM CATCHBASINS TO HAVE A MINIMUM SUMP OF 600mm AND ALL STORM MAINTENANCE HOLES TO HAVE A MINIMUM SUMP OF 300mm.
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. PRIOR TO REMOVAL OF ANY GRUBBING OR TOPSOIL ESC-1 SHALL BE IMPLEMENTED.
2. 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.
3. 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;
4. INSTALLATION OF FILTER CLOTH UNDER ALL NEW AND EXISTING CATCHBASIN GRATES UNTIL PAVING OF THE SITE STREETS ARE COMPLETED;
5. MUD MATS WILL BE PLACED AT CONSTRUCTION ACCESSES TO KEEP PUBLIC ROADWAYS FREE FROM DEBRIS DURING THE CONSTRUCTION PERIOD.
2. 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.
3. UPON COMPLETION OF TREE PROTECTION FENCING, SILT FENCE PERIMETER AND MUD MAT INSTALLATION PROCEED WITH TOPSOIL STRIPPING AND STOCKPILING IN DESIGNATED AREA. ENCLOSE TOPSOIL PILE WITH SILT FENCE PER DETAILS ON ESC-3

STAGE 2 - ESC

1. 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.
2. A CONSTRUCTION STAGING AREA SHALL BE CONSTRUCTED TO ROUGHLY FINAL GRADE -0.45m 250mm GRAN B TO BE PLACED.
3. 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.
4. 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 3 - 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.

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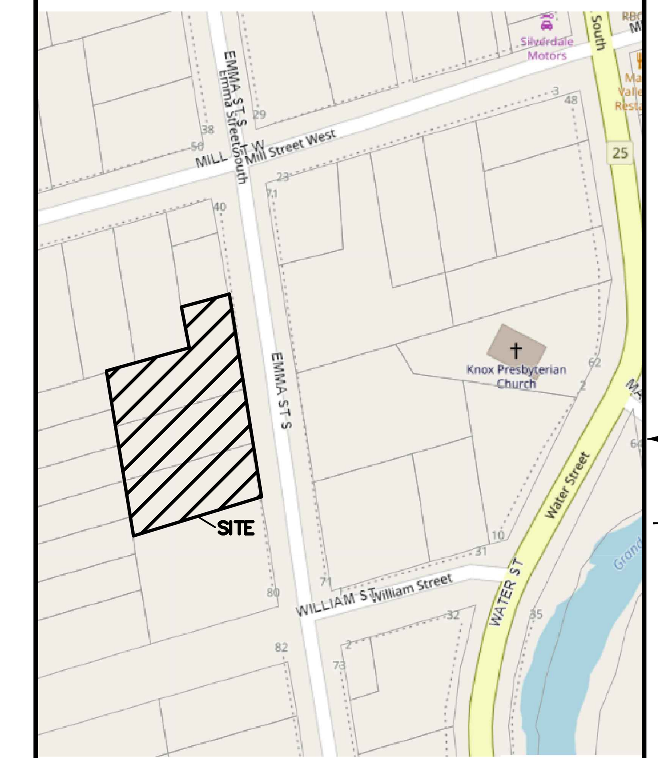
1	0	06-13-2024	ZBA OPA SUBMISSION - CONDO
1	0	10-05-2023	ZBA OPA SUBMISSION

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:

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 458.39 AS SHOWN ON THE PLANS.

SEAL:

LICENSED PROFESSIONAL ENGINEER
K. PILON
100174821
06/13/24
PROVINCE OF ONTARIO

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PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:150

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25mm

DESIGNED BY: K.PILON

DRAWN BY: K.PILON

CHECKED BY:

TITLE:

EROSION AND SEDIMENT CONTROL STAGE 2 40 EMMA STREET GRANDVALLEY

SHEET NUMBER: ESC-2

Erosion and Sediment Control Guide for Urban Construction

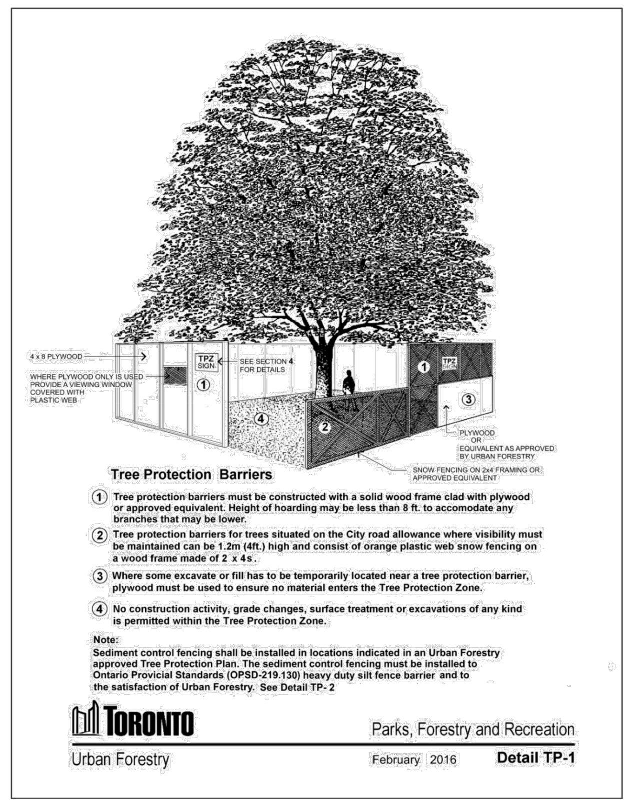


Figure B1-2: City of Toronto tree protection barrier detail (City of Toronto, 2016)

Appendix B: Erosion and Sediment Control Best Management Practices   Page B1-4

Erosion and Sediment Control Guide for Urban Construction

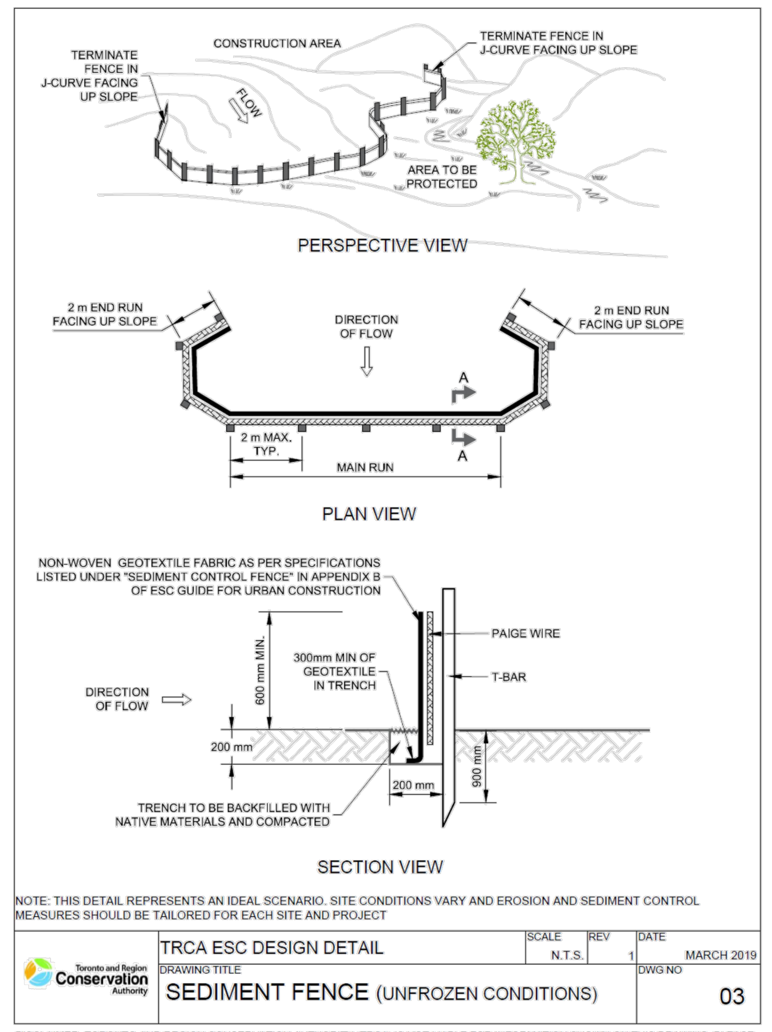


Figure B2-3a: Design detail for sediment control fence (unfrozen conditions).

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-6

Erosion and Sediment Control Guide for Urban Construction

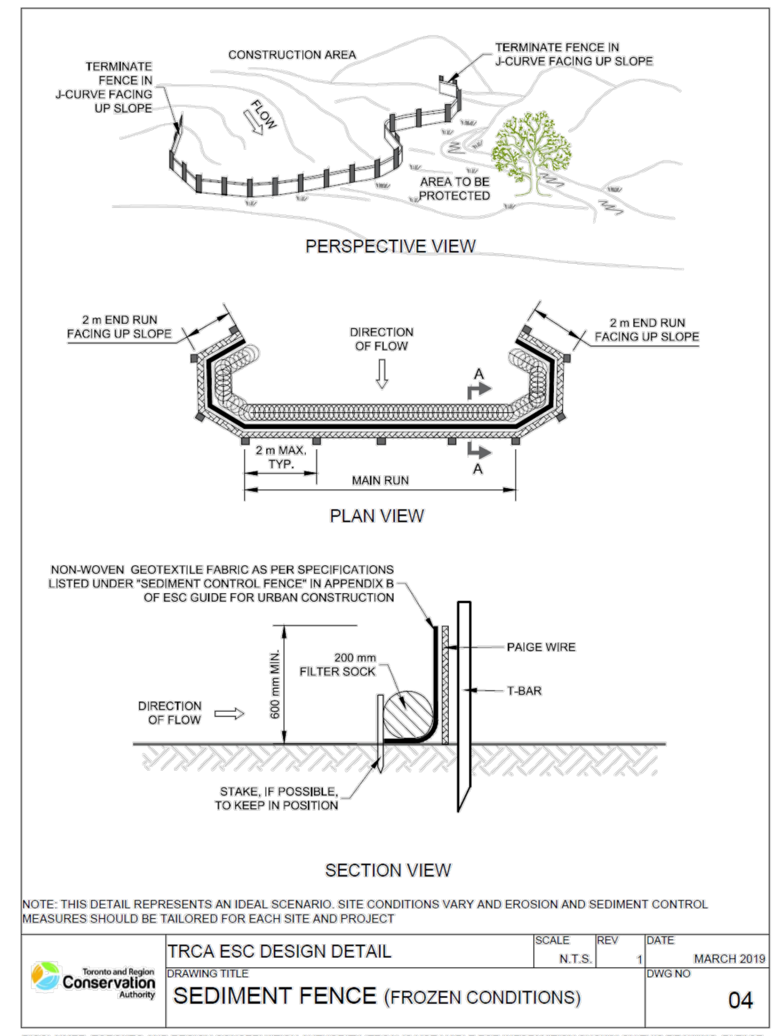


Figure B2-3b: Design detail for sediment control fence (frozen conditions).

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-7

Erosion and Sediment Control Guide for Urban Construction

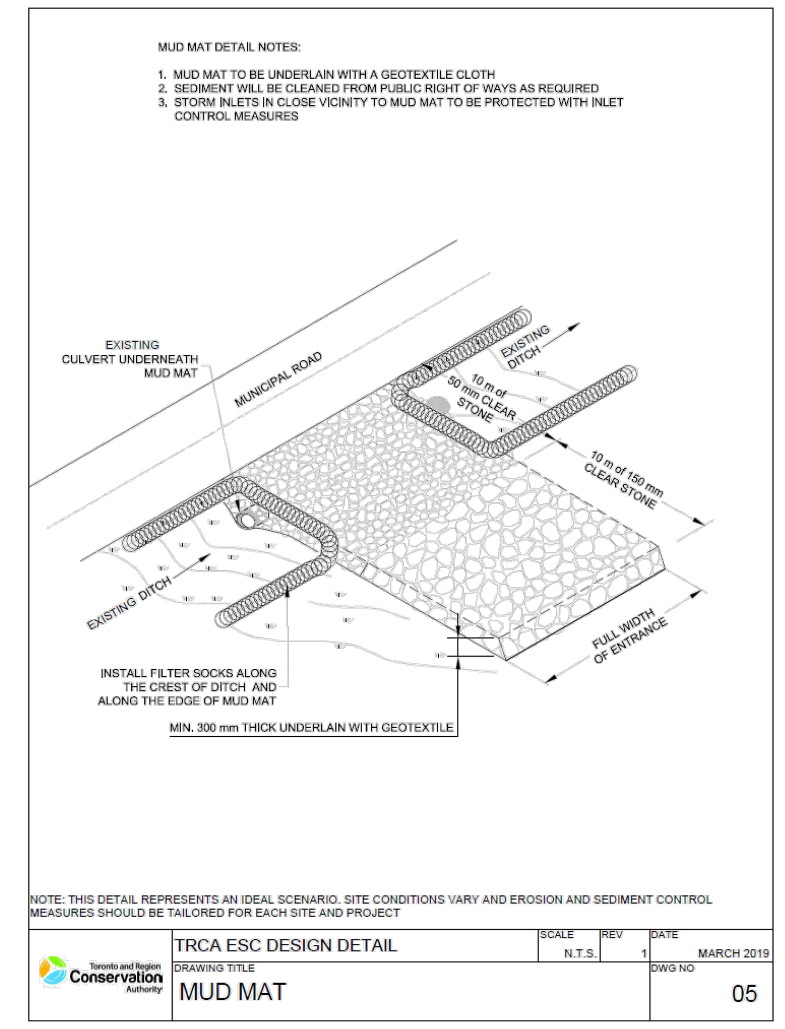


Figure B2-29: Design detail for mud mat for construction site vehicle access

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-51

Erosion and Sediment Control Guide for Urban Construction

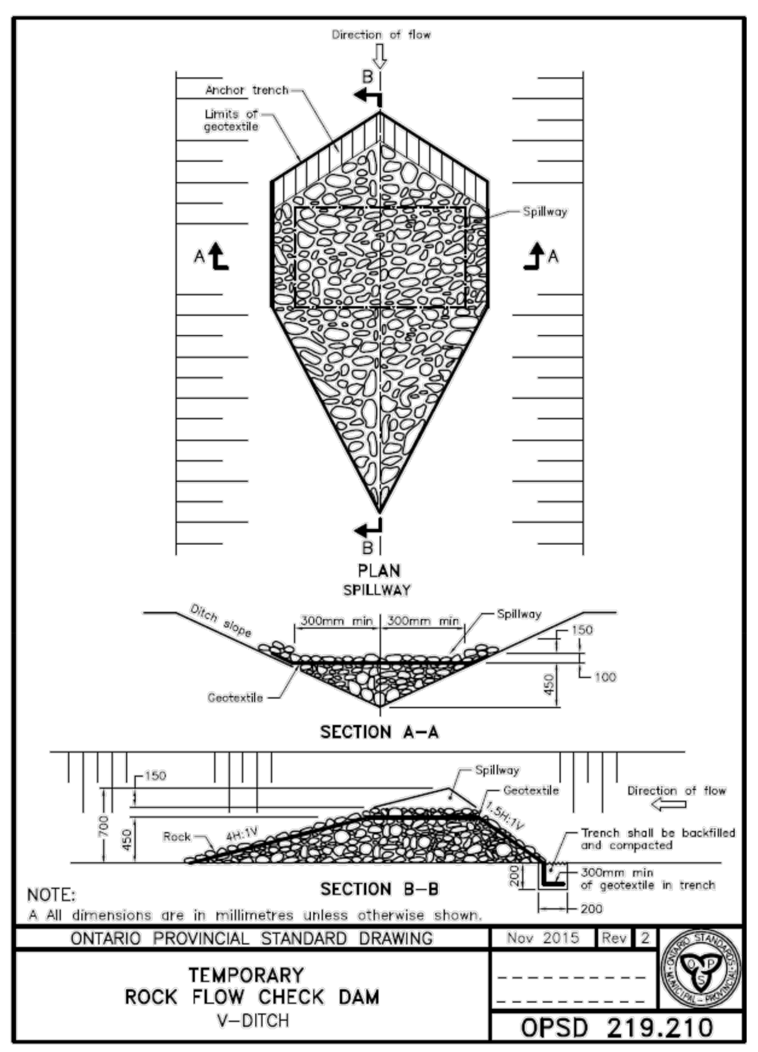


Figure B2-10: Ontario Provincial Standard Drawing (Nov. 2015) for temporary rock check dam in a v-shaped conveyance channel

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-19

Erosion and Sediment Control Guide for Urban Construction

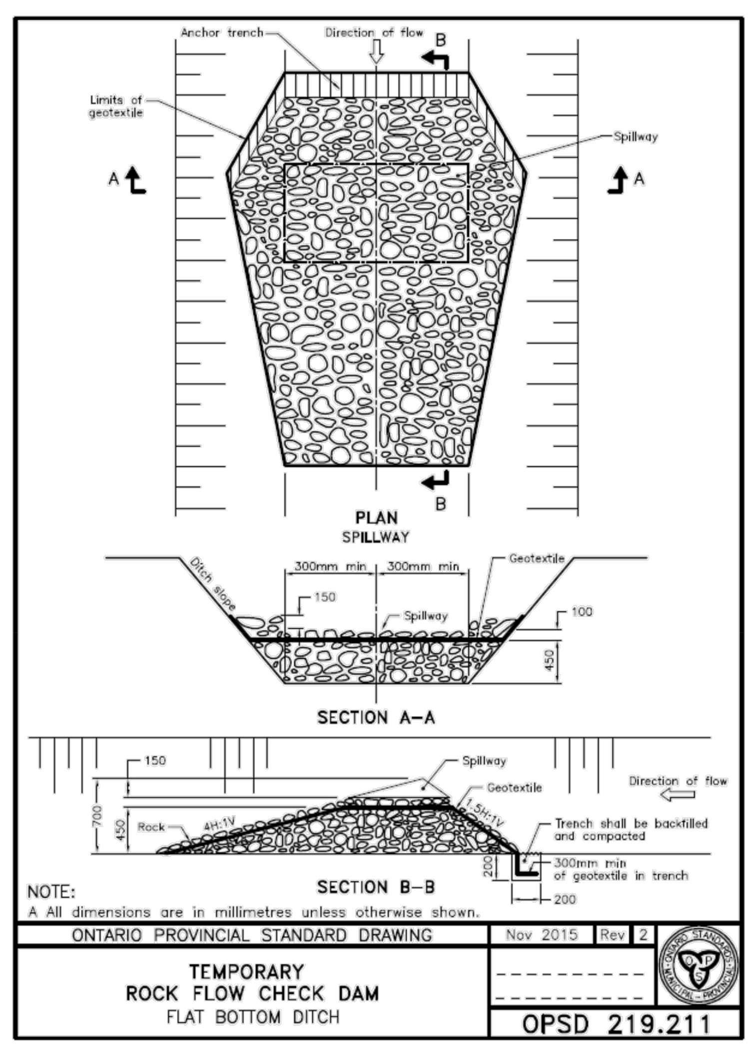


Figure B2-11: Ontario Provincial Standard Drawing (Nov. 2015) for temporary rock check dam in a flat-bottomed conveyance channel

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-20

Erosion and Sediment Control Guide for Urban Construction

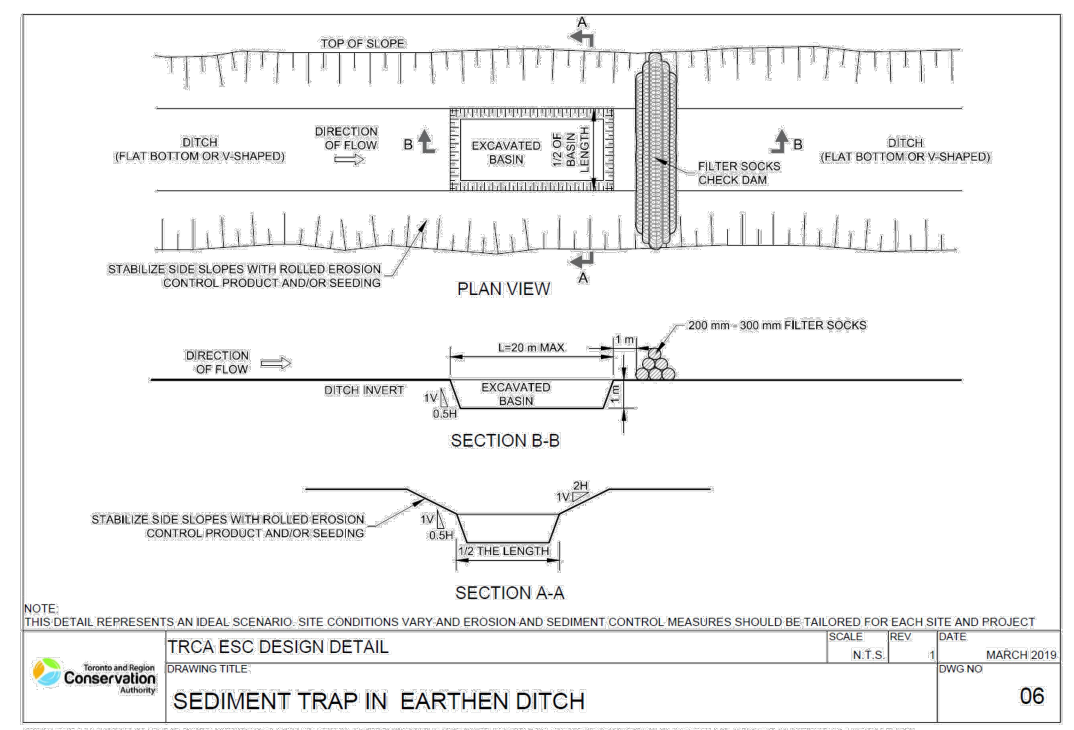


Figure B2-18: Design detail for sediment trap within an earthen ditch

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-31

Erosion and Sediment Control Guide for Urban Construction

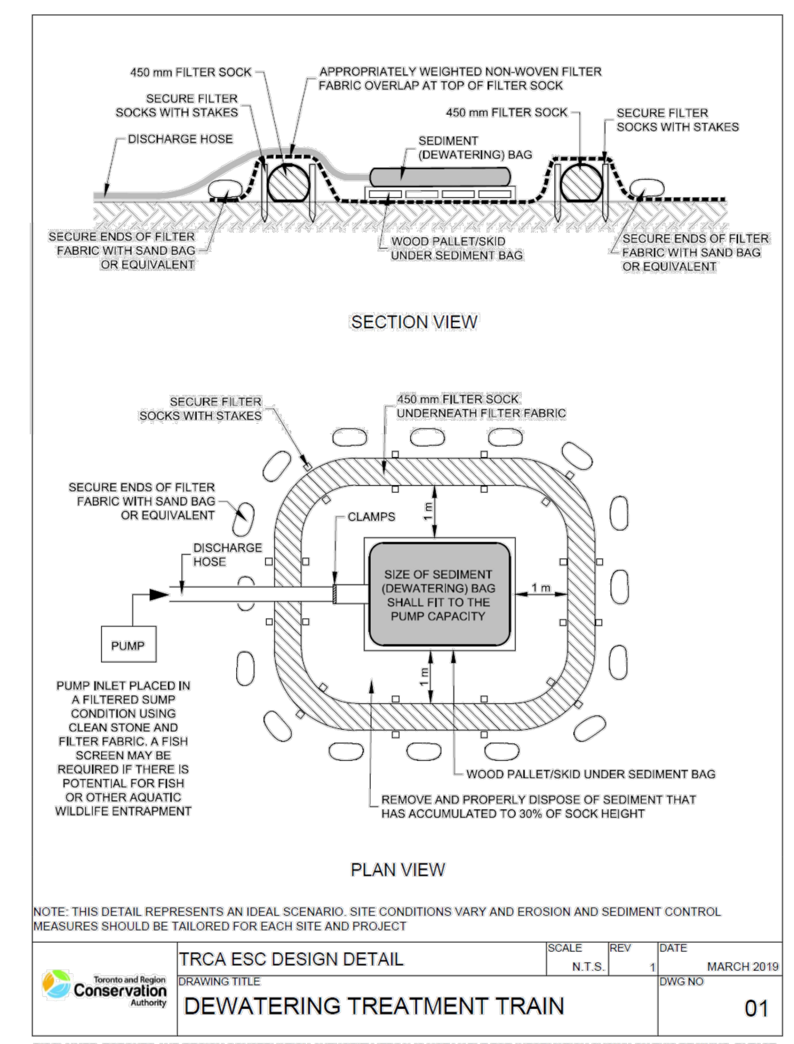
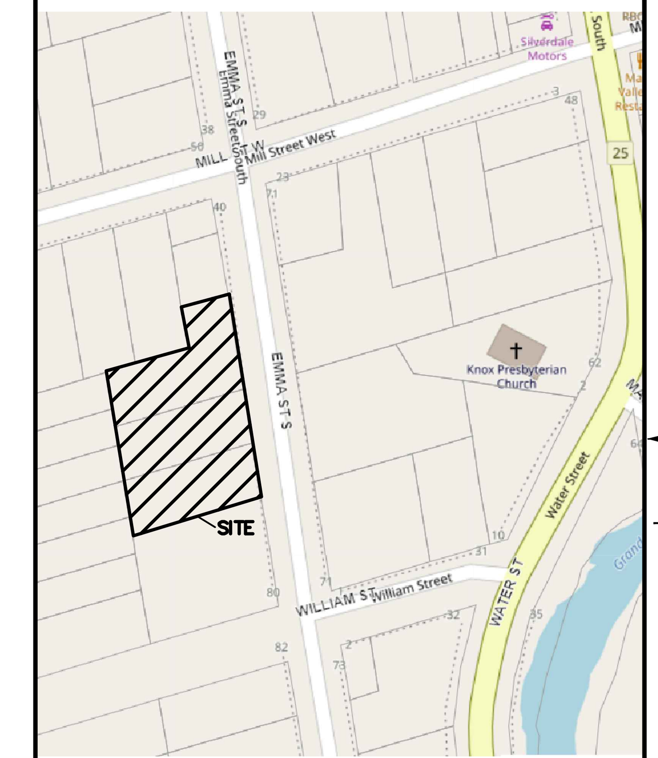


Figure B2-16: Dewatering bag treatment train (unfrozen conditions)

Appendix B: Erosion and Sediment Control Best Management Practices   Page B2-27



BENCHMARK TOP OF FIRE HYDRANT 457.34 AND CONCRETE RETAINING WALL NORTHEAST CORNER OF SITE 458.39 AS SHOWN ON THE PLANS.

SEAL:

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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 40 EMMA STREET GRANDVALLEY

SHEET NUMBER: ESC-2

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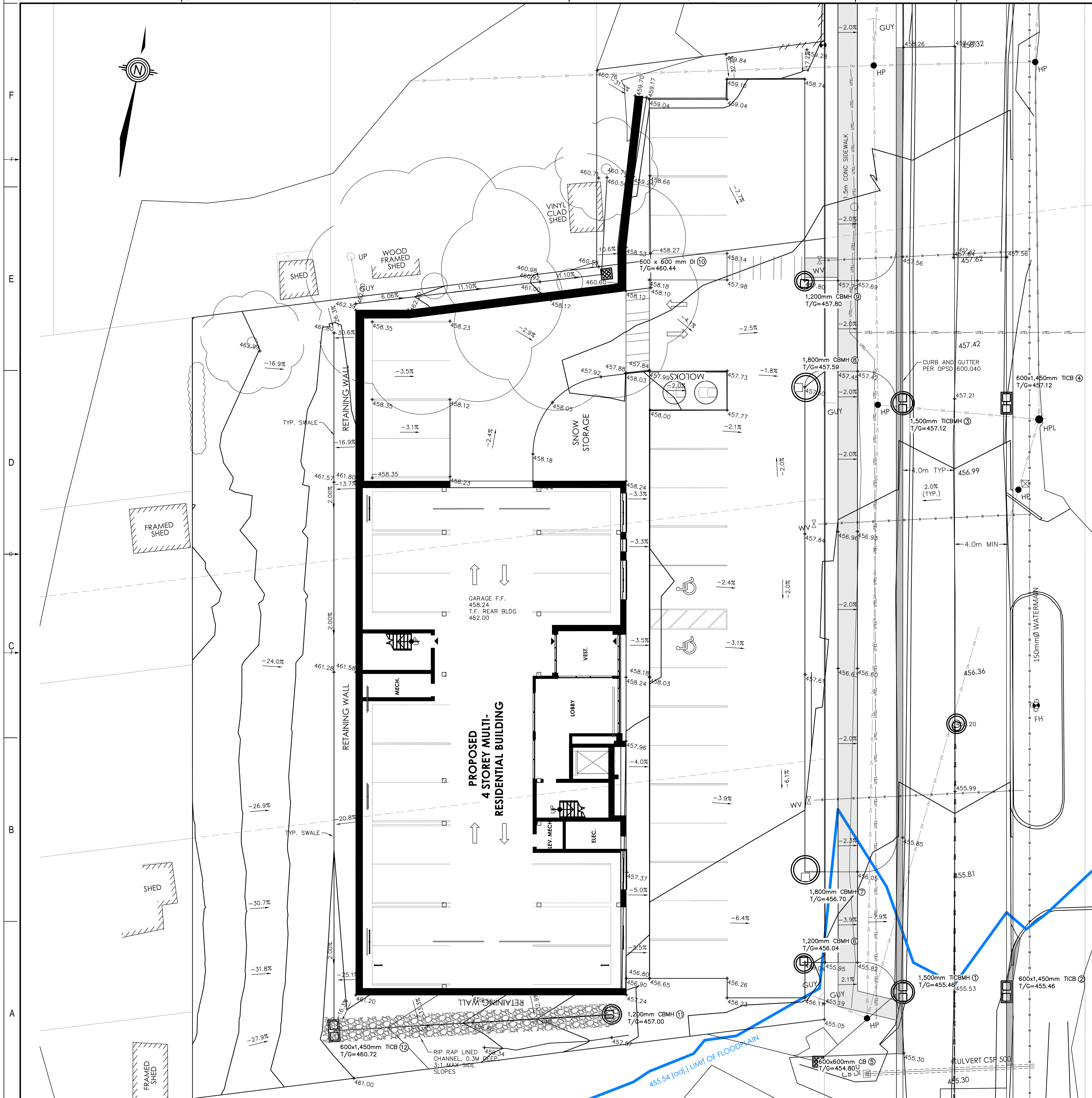

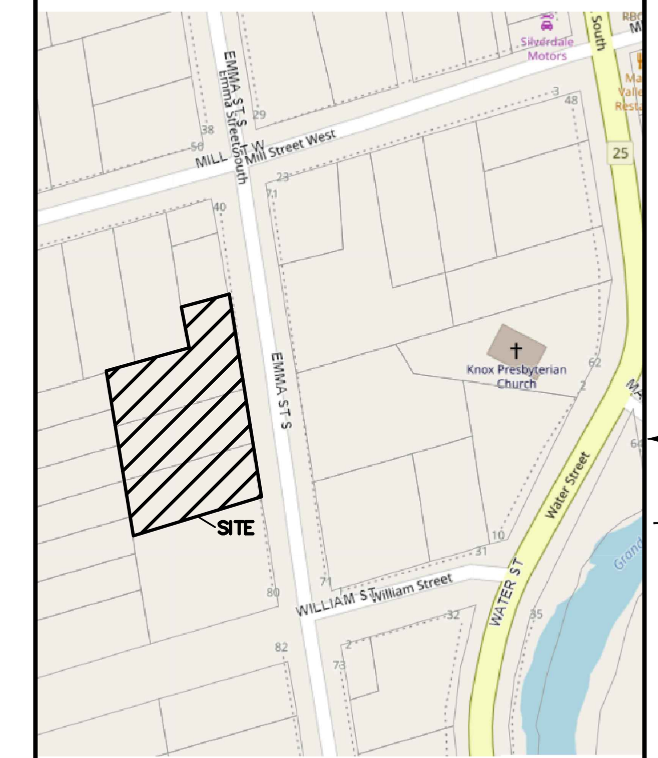

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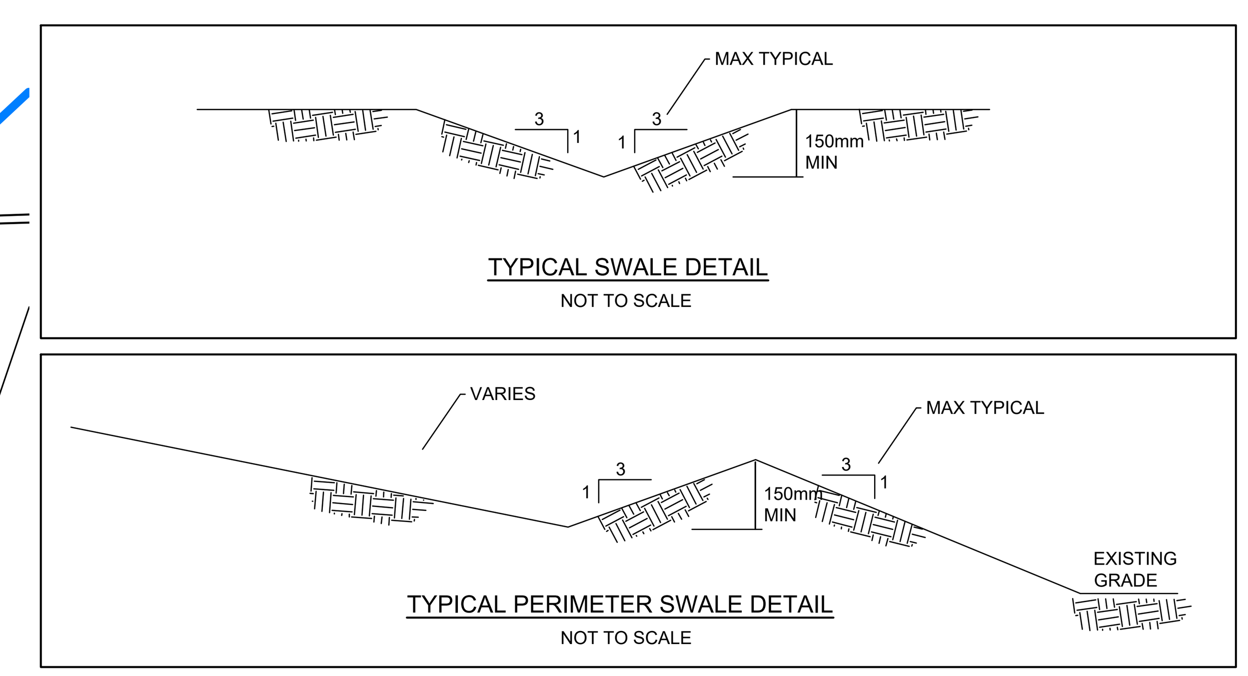

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PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:150

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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

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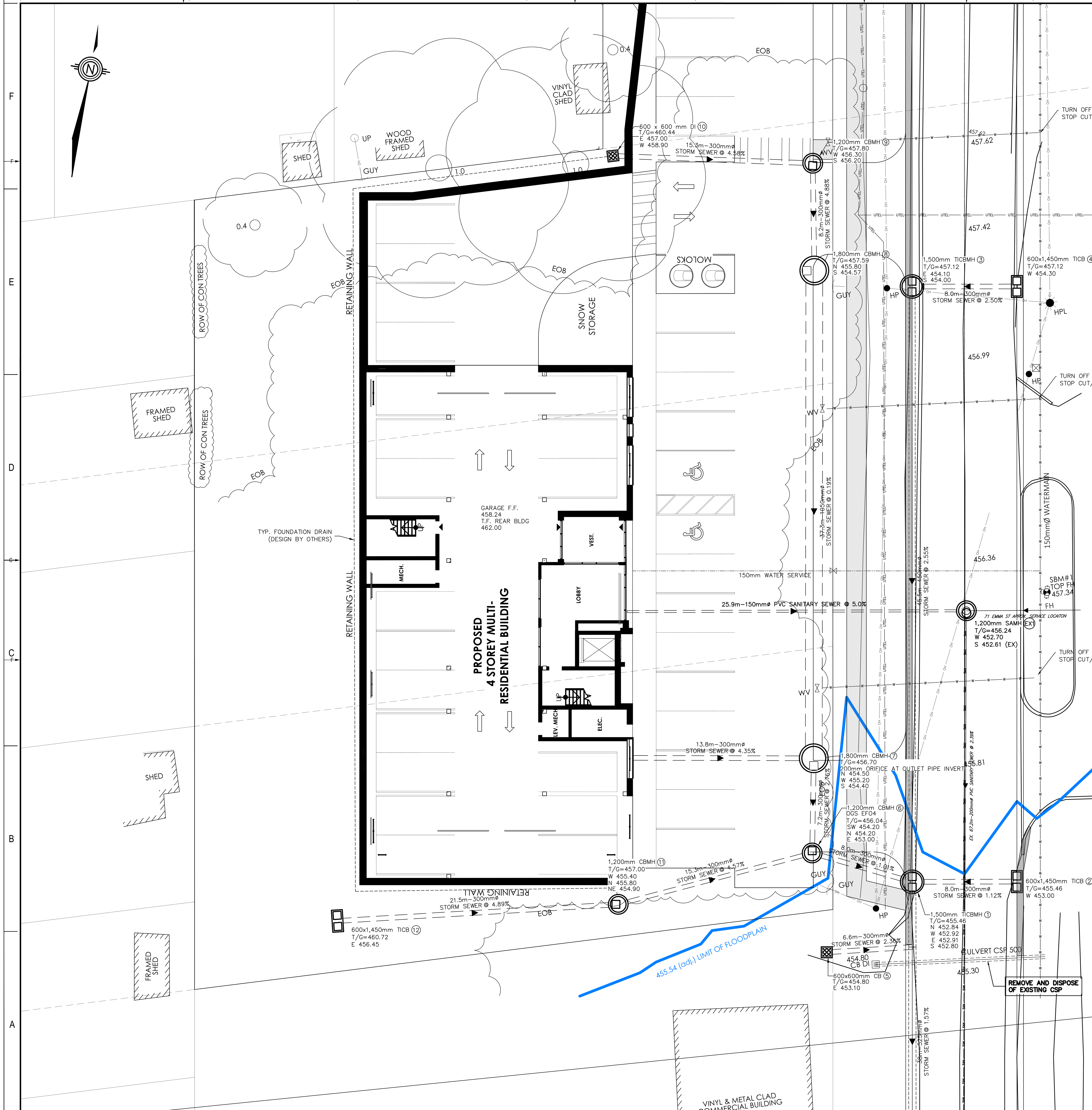

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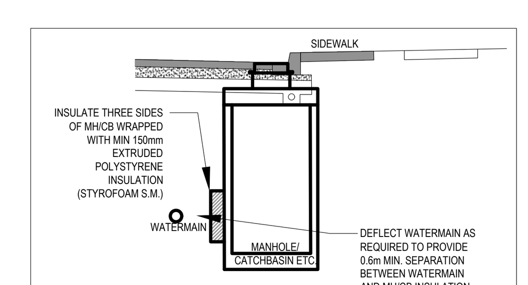
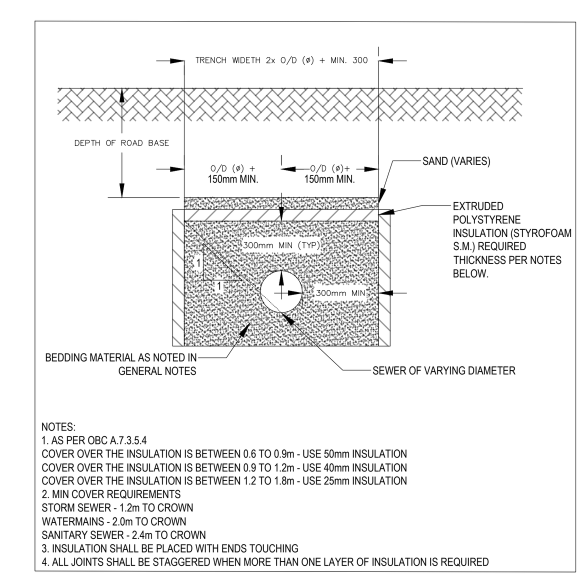


MANHOLE/CATCHBASIN INSULATION DETAIL
N.T.S.



INSULATION FOR VARIOUS INFRASTRUCTURE
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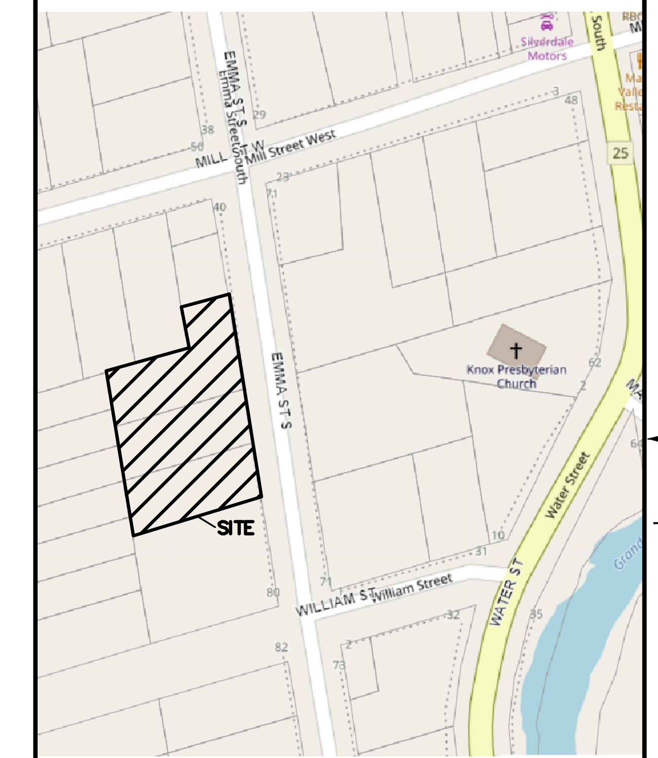

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SEAL:

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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
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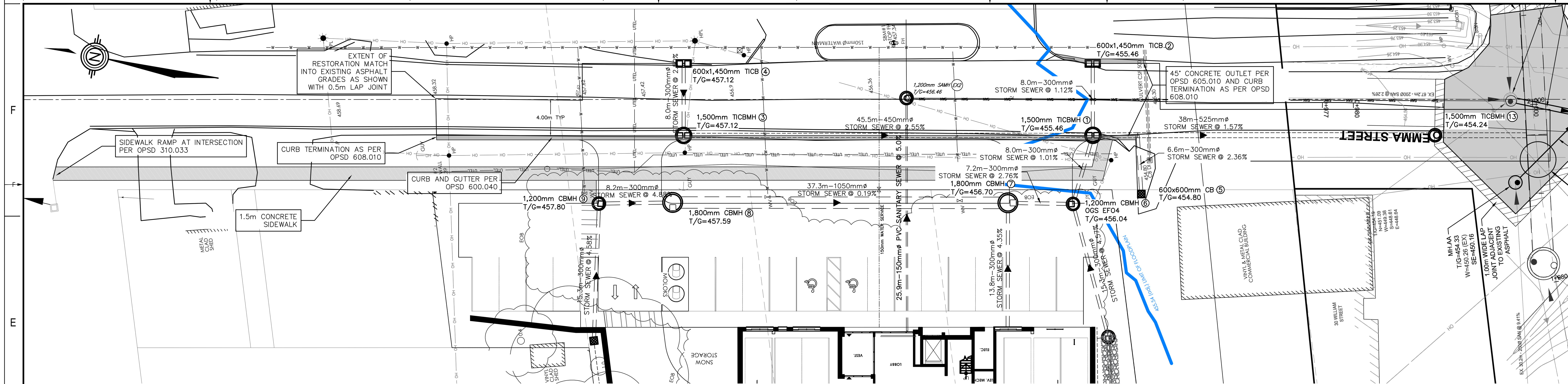
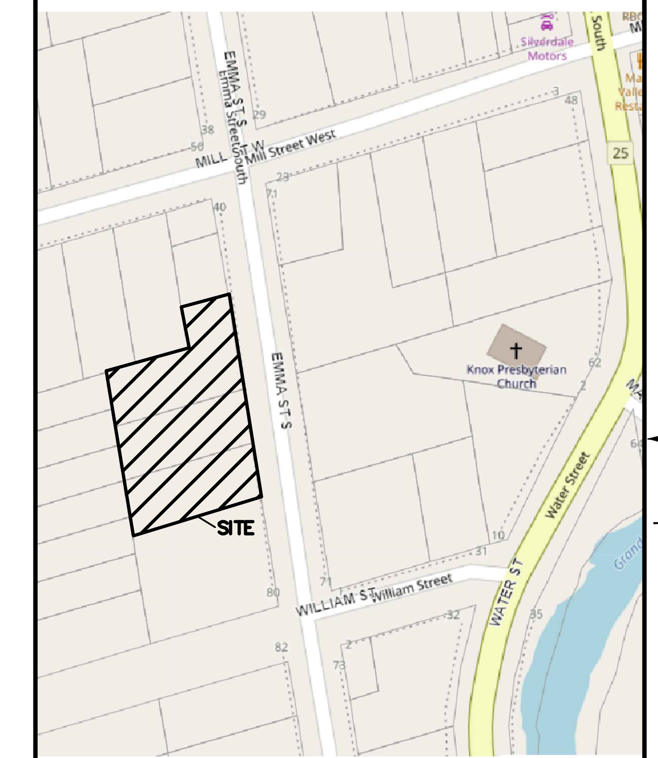
DRAWN BY: K.PILON
CHECKED BY:

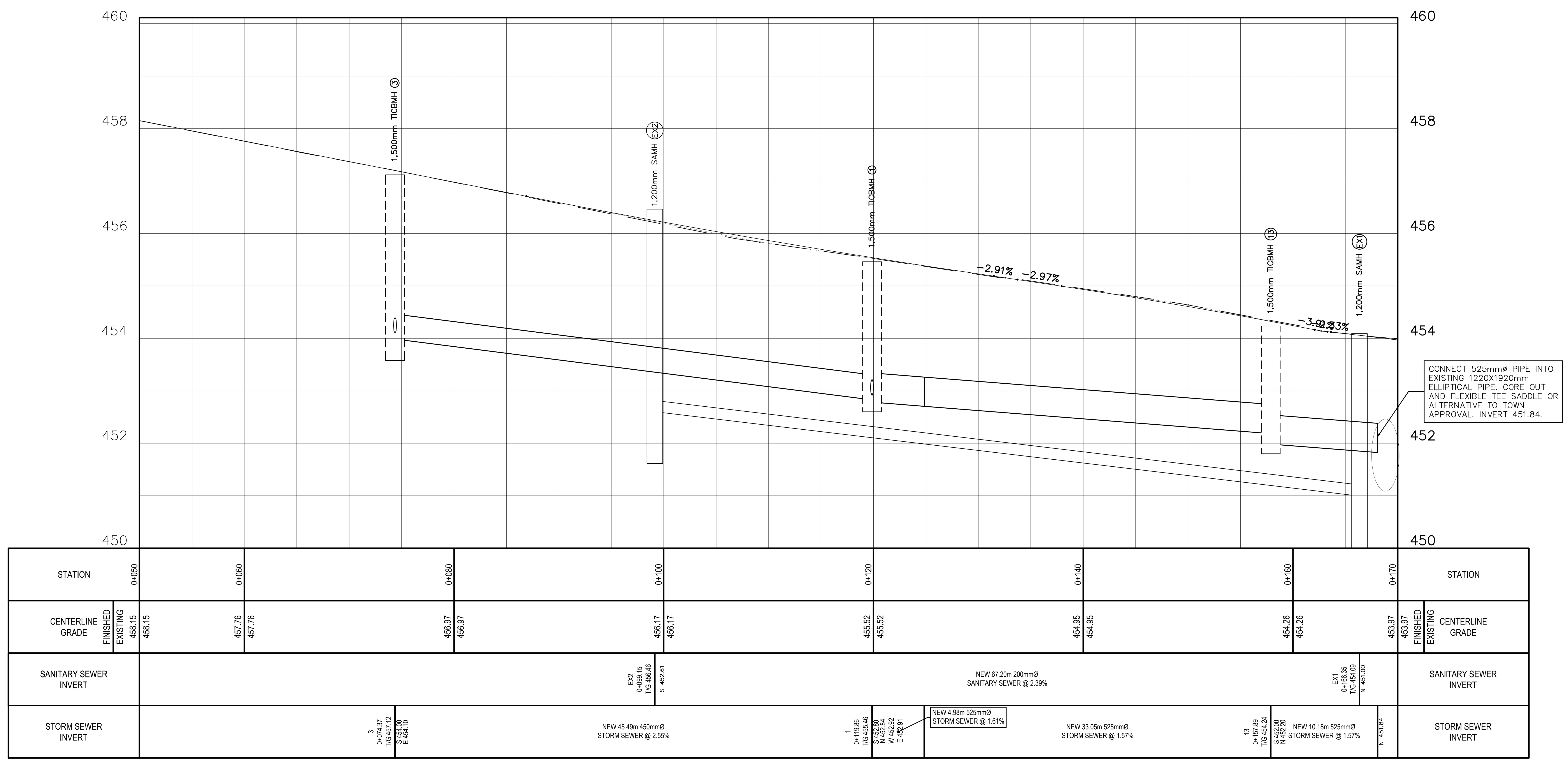
TITLE:

SERVICING PLAN
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: SERV-1







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PROJECT NO: 231-103

DATE: JUNE 2024

ORIGINAL SCALE: 1:250

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DRAWN BY: K.PILON

CHECKED BY:

TITLE:

PLAN AND PROFILE
40 EMMA STREET
GRANDVALLEY

SHEET NUMBER: P&P1

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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 and OGS

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

	LOCATION				AREAS (ha)												SEWER DATA									
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	WEIGHTED C VALUE	ACCUM. 2.78 AC	TIME OF CONC.	RAINFALL INTENSITY I (mm/hr) 100YR	RAINFALL INTENSITY I (mm/hr) 5YR	PEAK FLOW 100 YEAR Q (L/s)	PEAK FLOW 5 YEAR Q (L/s)	Pipe	DIAMETER (mm)	SLOPE (%)	LENGTH (m)	CAPACITY (L/s)	VELOCITY (m/s)	TIME (minutes)	Total Time (min)	% 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	6.6%	4.2%	
POST-DEVELOPMENT																										
Post 7, 5/5a, and 6 at C=0.5	*0.63*					*0.63*		0.875		0.875	10.00	156.29	99.01	136.75	86.64											
																										Pre development flows compared to post development flows
POST-1	0.03		TICB4	TICBMH3			0.03	0.079	0.950	0.079	10.00	156.29	99.01	12.37	7.84	Metric	300	2.50	8.00	152.90	2.16	0.06	10.06	8.1%	5.1%	
POST-2	0.64		TICBMH3	TICBMH1		0.64		0.889	0.500	0.968	10.00	156.29	99.01	151.30	95.85	Metric	450	2.55	45.50	455.28	2.86	0.26	10.26	33.2%	21.1%	
POST-3	0.02		TICB2	TICBMH1			0.02	0.053	0.950	0.053	10.00	156.29	99.01	8.25	5.23	Metric	300	1.12	8.00	102.34	1.45	0.09	10.09	8.1%	5.1%	
POST-4	**0.05**		**TICBMH1**	**PIPE**			**0.05**	**0.132**	**0.950**	**2.097**	**10.26**	**155.39**	**98.10**	**325.89**	**205.74**	**Metric**	**525**	**1.57**	**38.00**	**538.87**	**2.49**	**0.25**	**10.51**	**60.5%**	**38.2%**	`
POST-5/5a	0.21		CBMH8	CBMH7		0.21		0.292	0.500	0.347	10.00	156.29	99.01	54.27	34.38	Metric	1050	0.19	37.30	1190.30	1.37	0.45	10.45	4.6%	2.9%	COEFFICIENT REDUCED TO 0.5 BASED ON QUANTITY CONTROL
POST-6	0.38		TICB12	CBMH11		0.38		0.528	0.500	0.528	10.00	156.29	99.01	82.49	52.26	Metric	300	4.89	21.50	213.84	3.03	0.12	10.12	38.6%	24.4%	
			CBMH11	CBMH6						0.528	10.12	155.88	98.60	82.27	52.04	Metric	300	4.57	15.30	206.72	2.92	0.09	10.21	39.8%	25.2%	
POST-7	0.04		DI10	CBMH9		0.04		0.056	0.500	0.056	10.00	156.29	99.01	8.68	5.50	Metric	300	4.58	15.30	206.95	2.93	0.09	10.09	4.2%	2.7%	
			CBMH9	CBMH8						0.056	10.09	155.98	98.71	8.67	5.48	Metric	300	4.88	8.20	213.62	3.02	0.05	10.13	4.1%	2.6%	
			CBMH7	CBMH6						0.347	10.13	155.83	98.55	54.11	34.22	Metric	300	2.76	7.20	160.65	2.27	0.05	10.19	33.7%	21.3%	
			CBMH6	TICBMH1						0.875	10.19	155.64	98.36	136.19	86.07	Metric	450	1.01	8.00	286.53	1.80	0.07	10.26	47.5%	30.0%	Total flows from 7, 5/5a and 6
POST-8	0.05		CB5	TICBMH1		0.05		0.069	0.500	0.069	10.00	156.29	99.01	10.85	6.88	Metric	300	2.36	6.60	148.55	2.10	0.05	10.05	7.3%	4.6%	
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	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	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	20.0%	10.5%	
William Street 1220x1920 pipe outlet	1.87		EXMH6	EXMH3		1.87		2.597		58.392	44.94	87.82	45.83	5127.93	2676.18	Metric	1500	4.58	24.00	15289.01	8.65	0.05	44.99	33.5%	17.5%	area from GM Blue Plan Report Catchment 2
William Street 1220x1920 pipe outlet			EXMH3	Pipe				0.000		58.392	44.99	87.77	45.80	5124.96	2674.39	Metric	1500	0.45	14.40	4741.95	2.68	0.09	45.08	108.1%	56.4%	
William Street 1220x1920 pipe outlet	0.95		Pipe	EXMH1		0.95		1.319		61.809	45.08	87.67	45.74	5418.76	2827.21	Metric	1500	0.45	67.80	4741.95	2.68	0.42	45.50	114.3%	59.6%	remainder of catchment 3 from GM Blue Plan Report 2.37 HA less Post 1-8
William Street 1220x1920 pipe outlet			**EXMH1**	**Outlet**				**0.000**		**61.809**	**45.50**	**87.21**	**45.46**	**5390.37**	**2810.11**	**Metric**	**1500**	**0.39**	**20.40**	**4461.48**	**2.52**	**0.13**	**45.63**	**120.8%**	**63.0%**	

PROJECT :	40-60 EMMA ST
PROJECT NUMBER :	191-102
CLIENT :	Sheldon Creek Developments
DATE :	June 14, 2024

Post 5/5a, 6 and 7
0.50 >0.5
SWM to be provided

Designed By : KP

Checked By : KP

Comments:

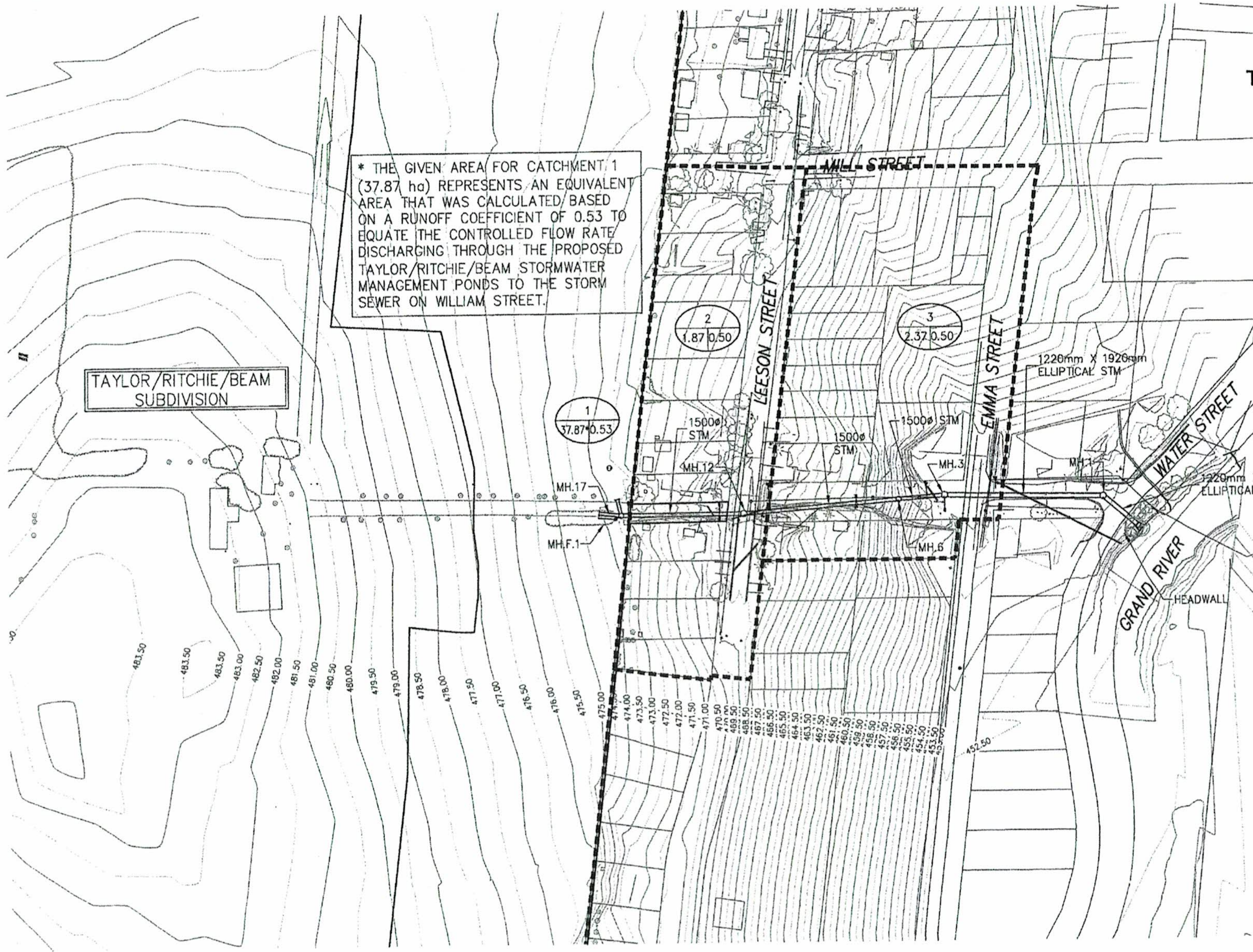
Roughness Coeff. "n" 0.013

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



111-047
WILLIAM STREET OUTLET
DESIGN BRIEF
TOWNSHIP OF EAST LUTHER

LEGEND

DRAINAGE AREA BOUNDARY

CATCHMENT NUMBER (1)
RUNOFF COEFFICIENT (0.50)
AREA IN HECTARES (0.30)

SCALE = 1:2000

AUGUST 2011

STORM SEWER CATCHMENT AREAS

Figure B

Gamsby and Mannerow
ENGINEERS

Plotted On: September 1, 2011 111047-FIG_B STM CATCHMENT.dwg

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

										Proposed Sewer						
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)	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	Project:	Taylor/Ritchie/Beam - Storm Outlet
Designed By:	GWC		
Checked By:		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

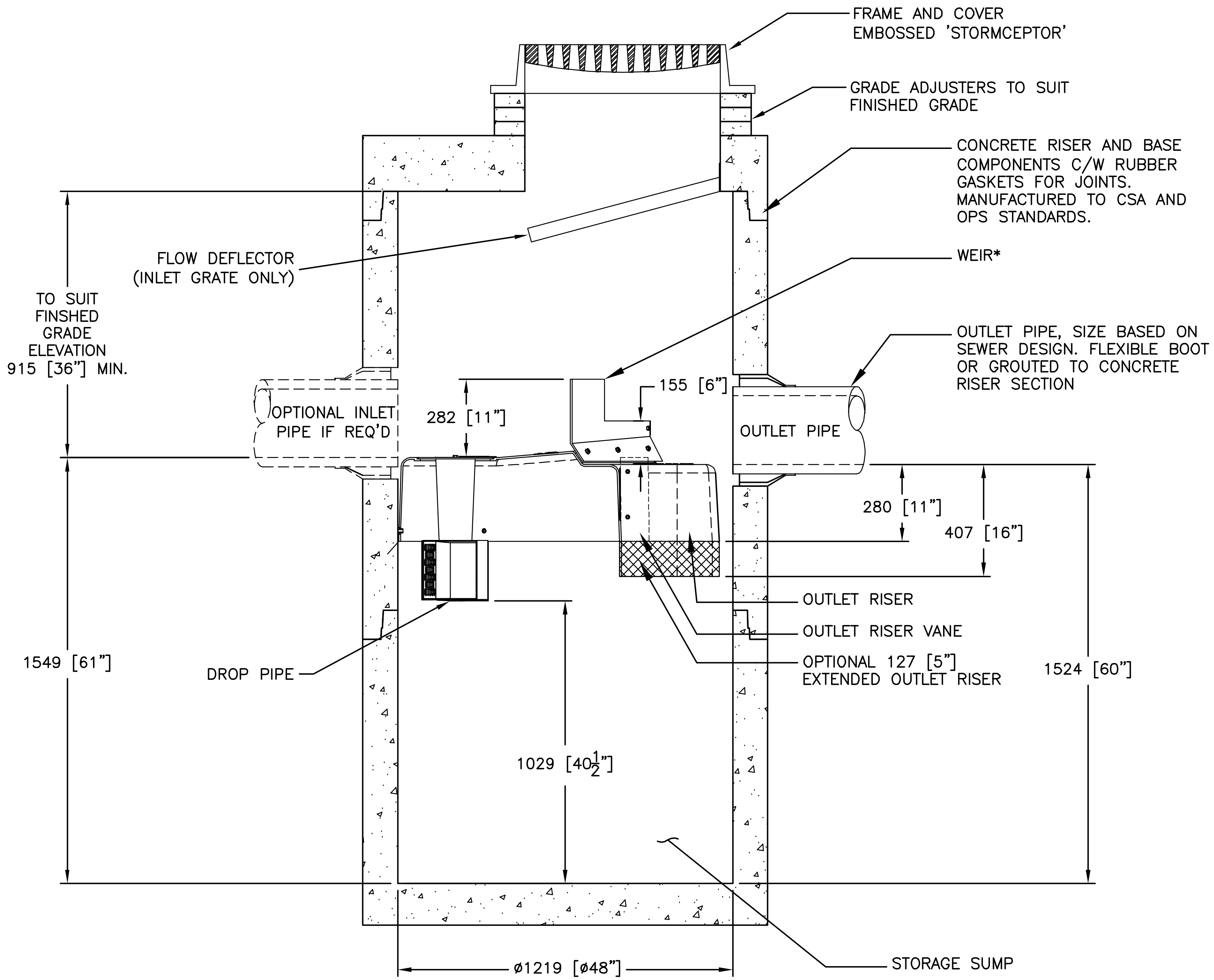
Street	From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	Time of Conc. (min.)	Intensity (mm/hr)	100 Year Flow (m^3/s)	5 Year Flow (m^3/s)	Combined Flow (m^3/s)	Proposed Sewer: Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)
Site	Subdivision	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

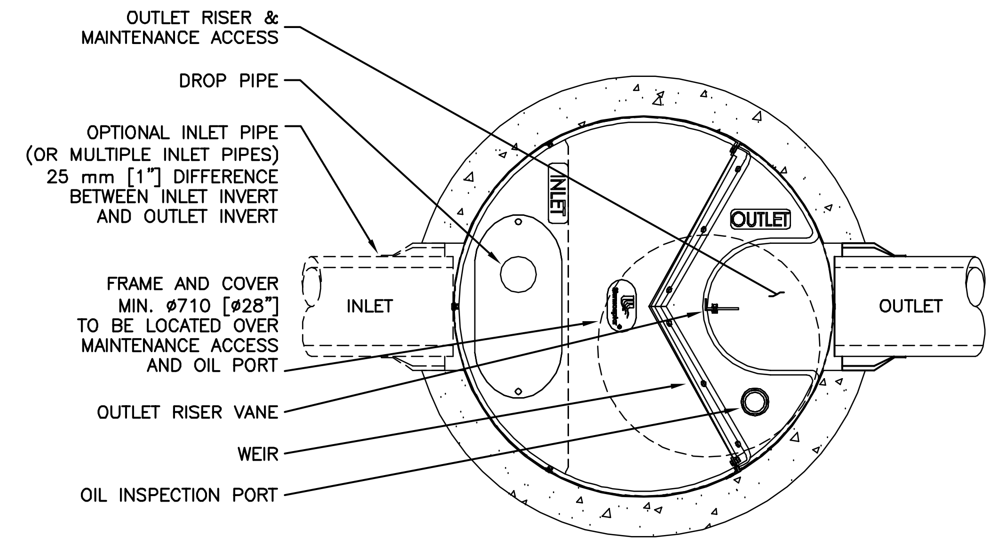
Minimum diameter = 300 mm
Minimum acceptable velocity = 0.75 m/s
Maximum acceptable velocity = 4.5 m/s

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

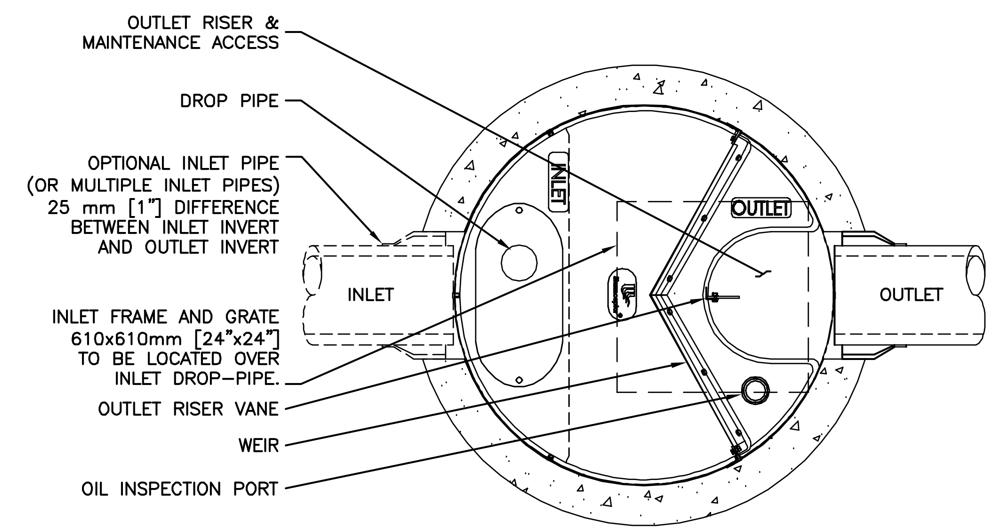
Project: Taylor/Ritchie/Beam - Storm Outlet
File: 111-047



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

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

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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

06/14/2024

Province:	Ontario
City:	Grand Valley
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34
Site Name:	CBMH 6
Drainage Area (ha):	0.63
Runoff Coefficient 'c':	0.65
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	15.52
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):	432
Estimated Average Annual Sediment Volume (L/yr):	351

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	84
EFO6	92
EFO8	96
EFO10	98
EFO12	99

Recommended Stormceptor EFO Model:	**EFO4**
Estimated Net Annual Sediment (TSS) Load Reduction (%):	**84**
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.

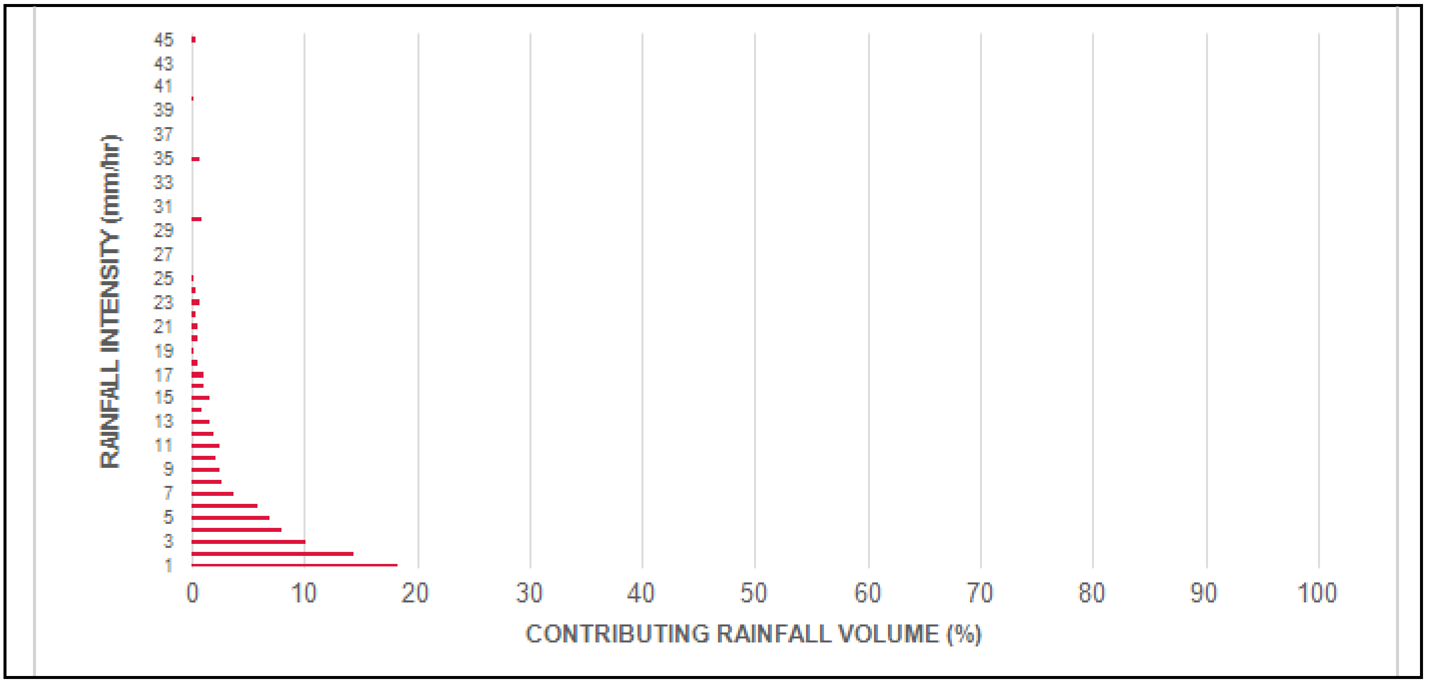
Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

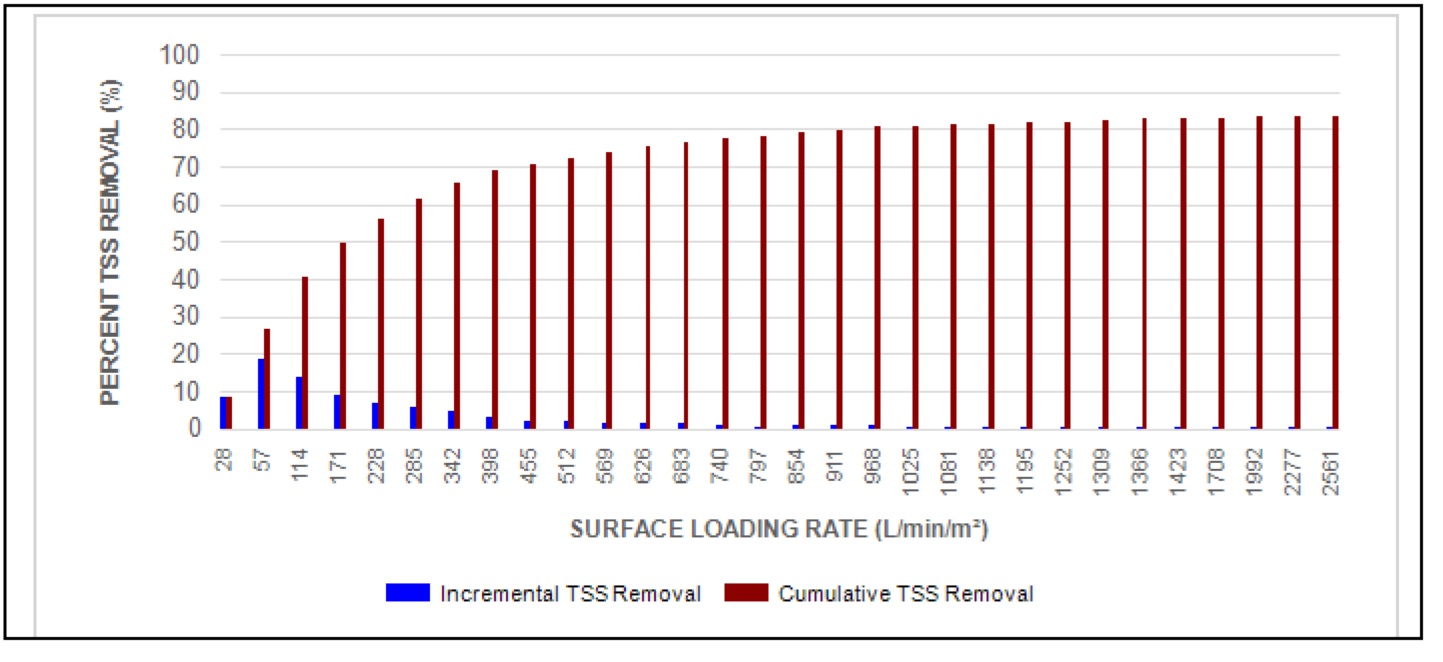
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.57	34.0	28.0	100	8.5	8.5
1.00	18.3	26.8	1.14	68.0	57.0	100	18.3	26.8
2.00	14.4	41.3	2.28	137.0	114.0	95	13.7	40.5
3.00	10.2	51.5	3.42	205.0	171.0	87	8.9	49.4
4.00	8.0	59.5	4.55	273.0	228.0	82	6.6	55.9
5.00	6.9	66.4	5.69	342.0	285.0	79	5.5	61.4
6.00	5.9	72.3	6.83	410.0	342.0	77	4.5	65.9
7.00	3.8	76.1	7.97	478.0	398.0	74	2.8	68.8
8.00	2.6	78.7	9.11	546.0	455.0	72	1.9	70.6
9.00	2.5	81.1	10.25	615.0	512.0	69	1.7	72.3
10.00	2.2	83.3	11.38	683.0	569.0	66	1.4	73.7
11.00	2.5	85.8	12.52	751.0	626.0	64	1.6	75.3
12.00	2.0	87.8	13.66	820.0	683.0	64	1.3	76.6
13.00	1.6	89.4	14.80	888.0	740.0	64	1.0	77.6
14.00	0.9	90.4	15.94	956.0	797.0	63	0.6	78.2
15.00	1.6	91.9	17.08	1025.0	854.0	63	1.0	79.2
16.00	1.1	93.0	18.21	1093.0	911.0	62	0.7	79.9
17.00	1.0	94.0	19.35	1161.0	968.0	62	0.6	80.5
18.00	0.5	94.6	20.49	1229.0	1025.0	61	0.3	80.9
19.00	0.2	94.8	21.63	1298.0	1081.0	60	0.1	81.0
20.00	0.6	95.4	22.77	1366.0	1138.0	59	0.4	81.4
21.00	0.6	96.1	23.91	1434.0	1195.0	57	0.4	81.8
22.00	0.3	96.4	25.05	1503.0	1252.0	56	0.2	81.9
23.00	0.8	97.2	26.18	1571.0	1309.0	54	0.5	82.4
24.00	0.4	97.6	27.32	1639.0	1366.0	53	0.2	82.6
25.00	0.2	97.8	28.46	1708.0	1423.0	52	0.1	82.7
30.00	0.9	98.7	34.15	2049.0	1708.0	43	0.4	83.0
35.00	0.8	99.5	39.84	2391.0	1992.0	37	0.3	83.4
40.00	0.2	99.7	45.54	2732.0	2277.0	32	0.1	83.4
45.00	0.3	100.0	51.23	3074.0	2561.0	29	0.1	83.5
							Estimated Net Annual Sediment (TSS) Load Reduction =	**84 %**

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

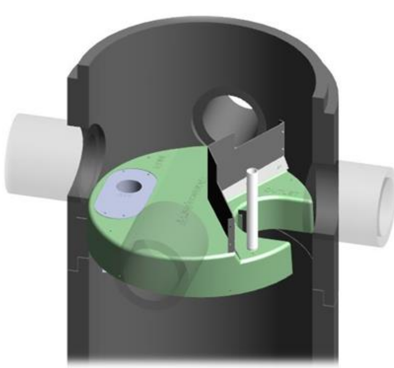
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

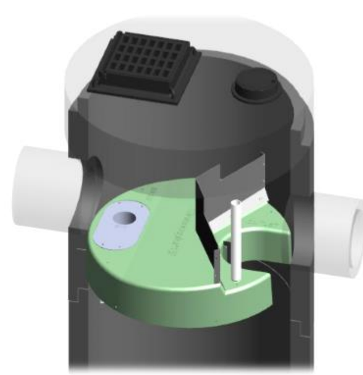
DESIGN FLEXIBILITY

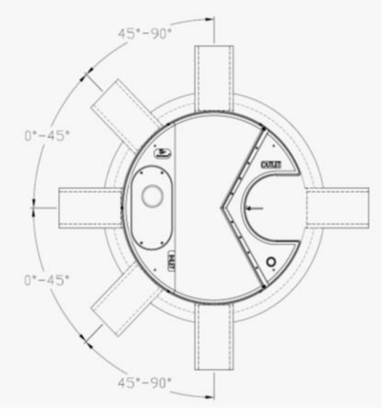
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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/ft³)

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 <u>WORK INCLUDED</u>

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 <u>REFERENCE STANDARDS & PROCEDURES</u>

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 <u>SUBMITTALS</u>

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 <u>OGS POLLUTANT STORAGE</u>

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.

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF and EFO Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

Registration: GPS-ETV_VR2023-11-15_Imbrium-SC

In accordance with

ISO 14034:2016

Environmental management —
Environmental technology verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

November 15, 2023
Vancouver, BC, Canada

GLOBE PERFORMANCE SOLUTIONS

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Stormceptor® EF and EFO are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

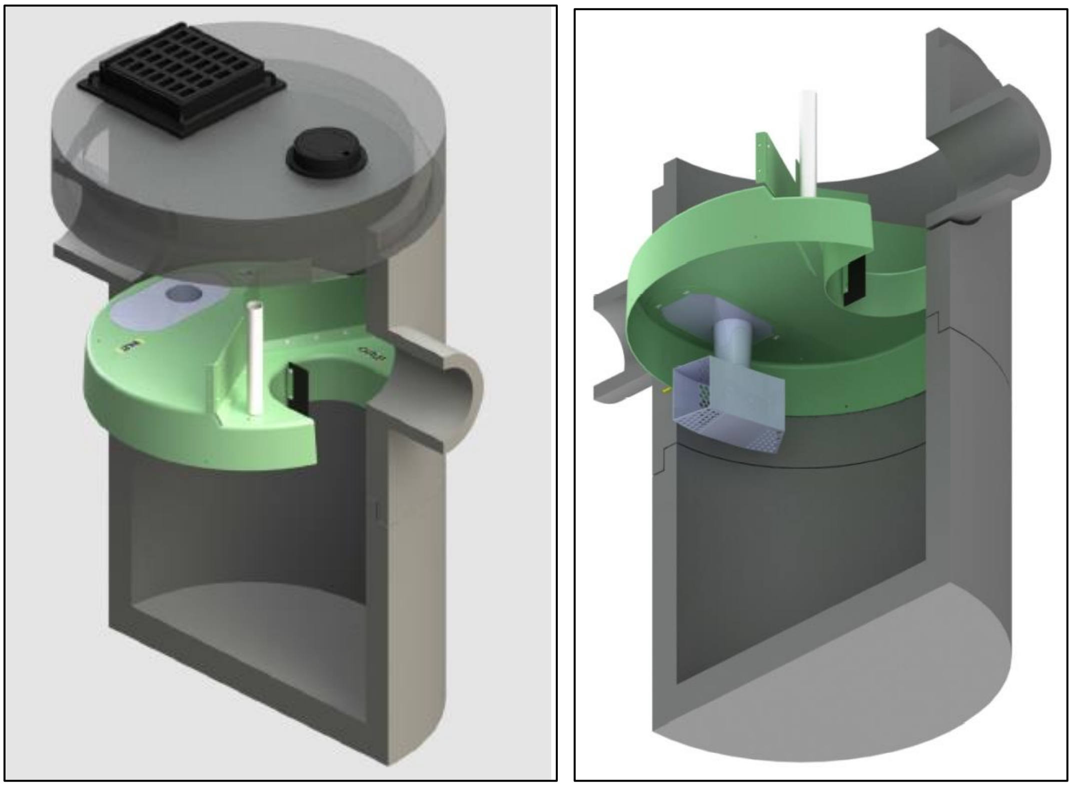


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m^2 (27.9 gal/min/ft^2) and 535 L/min/m^2 (13.1 gal/min/ft^2) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® EF4 and EFO4 Oil-Grit Separators, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test [a]:

During the capture test, the Stormceptor® EF4 OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Stormceptor® EFO4, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m^2, respectively.

Scour test [a]:

During the scour test, the Stormceptor® EF4 and Stormceptor® EFO4 OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Stormceptor® EFO4 OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2.

[a] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

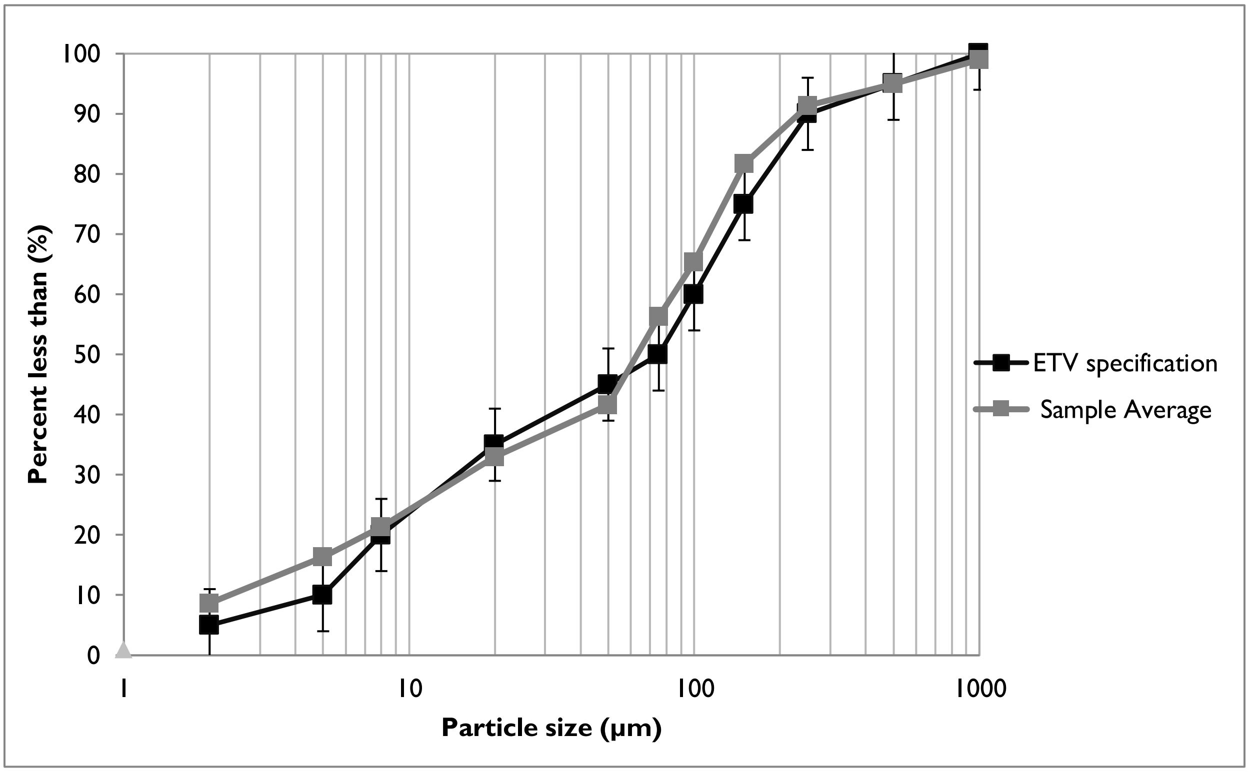


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m^2 (13.1 gpm/ft^2), sediment capture tests at surface loading rates from 40 to 400 L/min/m^2 were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m^2 were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	Surface loading rate (L/min/m^2)						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined [a]	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 – 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	**70.4**	**63.8**	**53.9**	**47.5**	**46.0**	**43.7**	**49.0**

[a] An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.
* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and Bulletin # CETV 2016-11-0001 for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m^2

Particle size fraction (µm)	Surface loading rate (L/min/m^2)		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 – 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	**41.7**	**39.7**	**34.2**

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m^2.

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

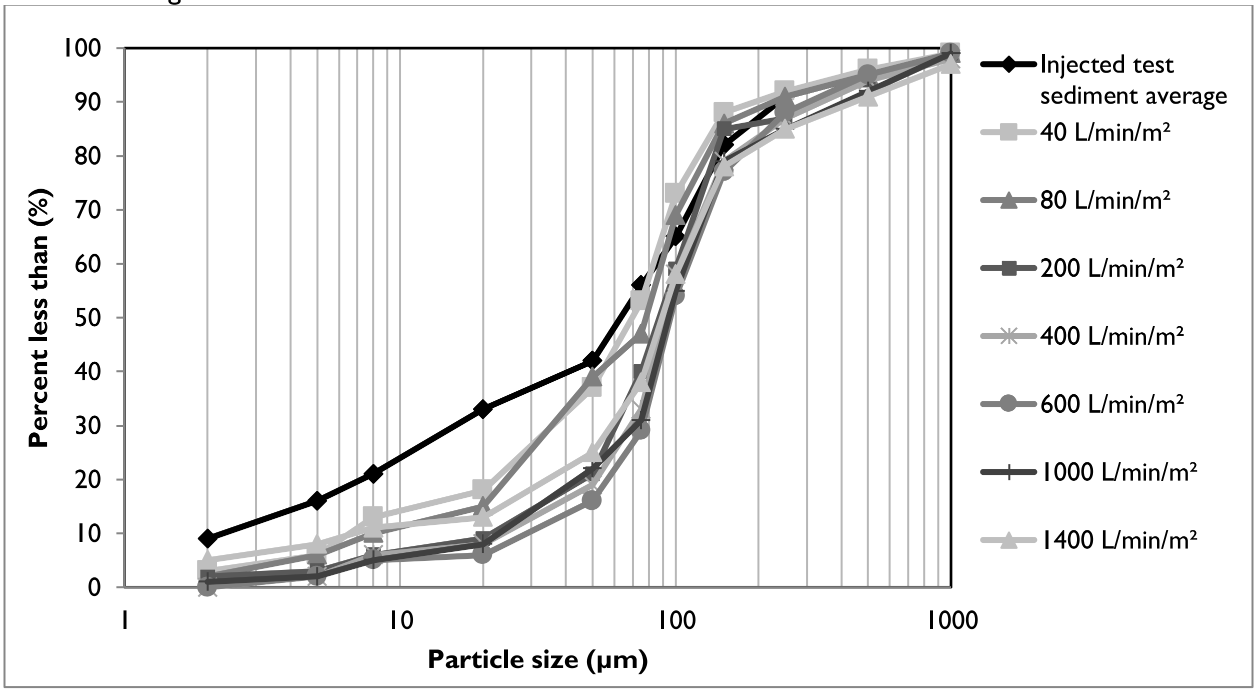


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

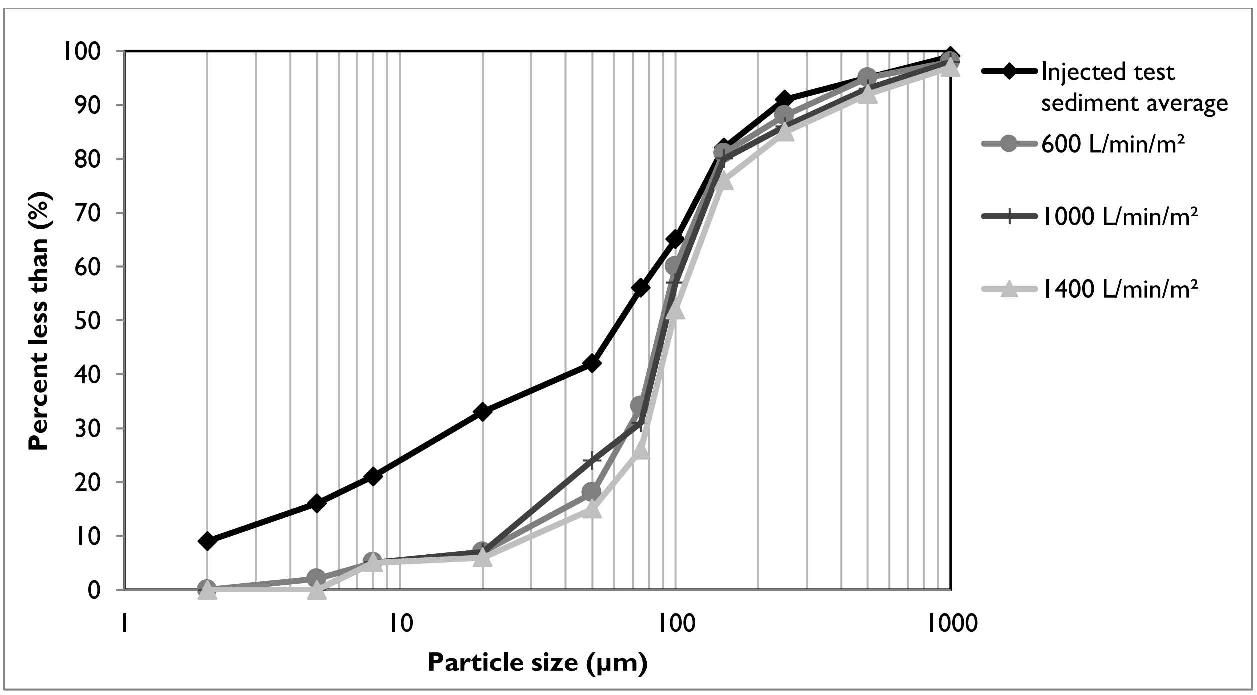


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) [a]	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	
		24:00		0.4	

5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

[a] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m2)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)[a]	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

[a] Determined from bead bulk density of 0.56074 g/cm^3

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. During the capture test, the 40 L/min/m^2 and 80 L/min/m^2 surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m^2) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m^2 run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.

3. Due to pressure build up in the filters, the runs at 1000 L/min/m^2 for the Stormceptor® EF4 and 1000 and 1400 L/min/m^2 for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF and EFO OGS please contact:

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APPENDIX D

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.

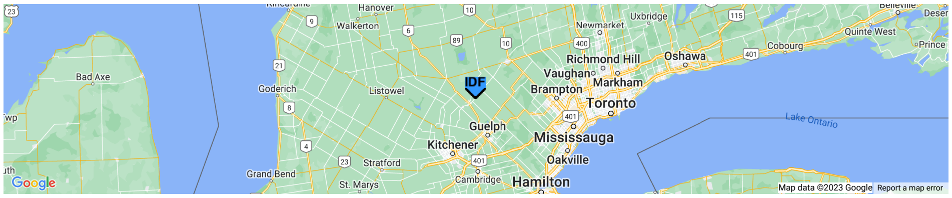
APPENDIX E

PCSWMM Model

Active coordinate

43° 43' 45" N, 80° 19' 44" W (43.729167,-80.329167)

Retrieved: Mon, 20 Nov 2023 16:19:46 GMT



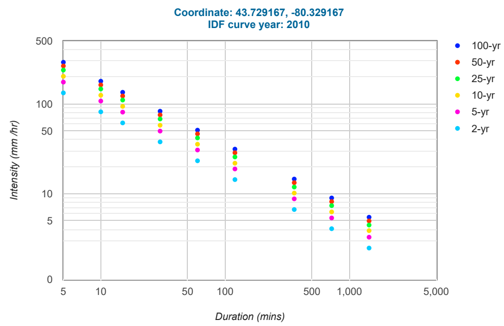
Location summary

These are the locations in the selection.

IDF Curve: 43° 43' 45" N, 80° 19' 44" W (43.729167,-80.329167)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 43° 43' 45" N, 80° 19' 44" W (43.729167,-80.329167)

Retrieved: Mon, 20 Nov 2023 16:19:46 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	23.3	30.7	35.6	41.8	46.4	51.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

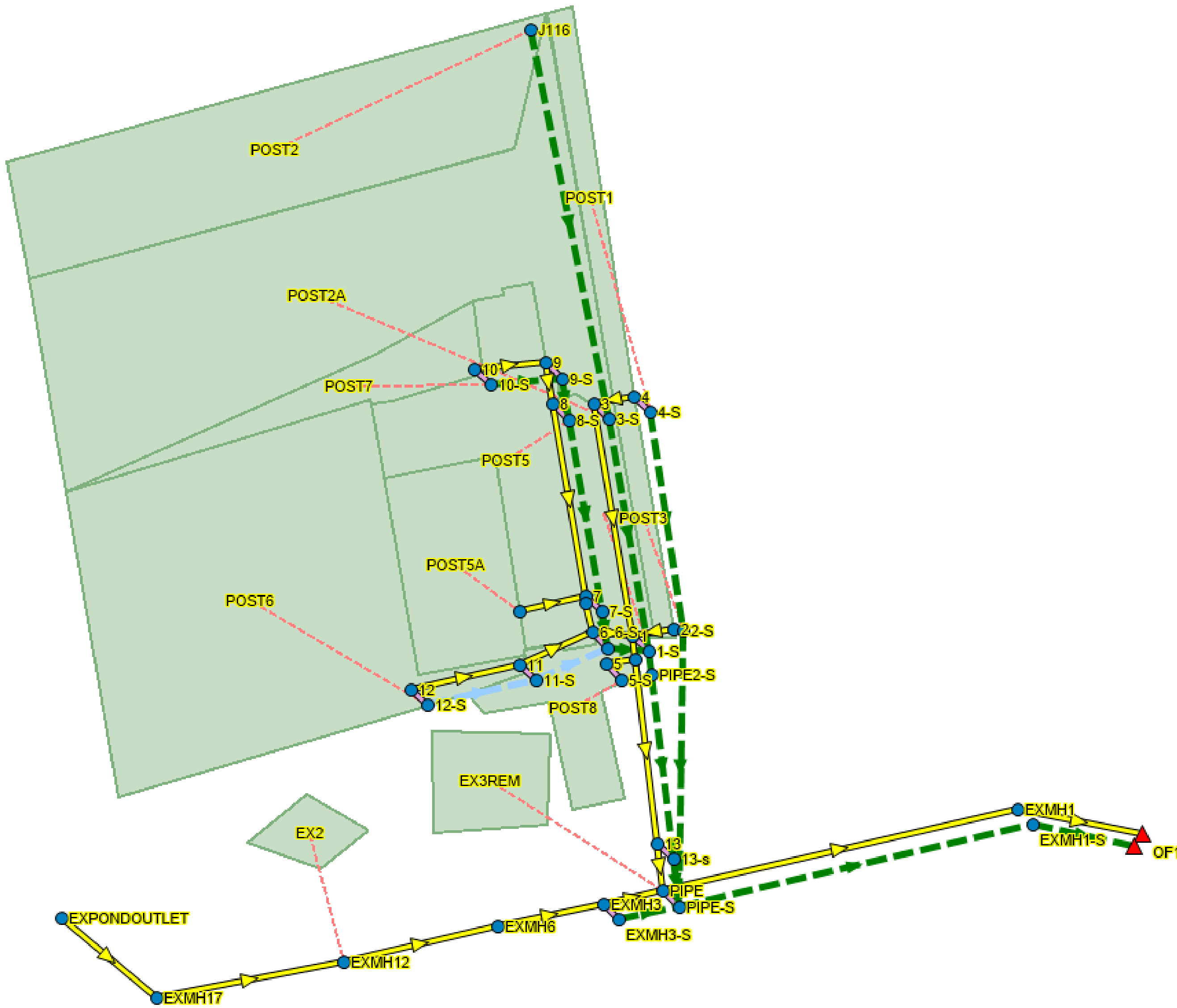
Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	132.3	81.5	61.4	37.8	23.3	14.4	6.7	4.1	2.5
5-yr	174.4	107.4	80.9	49.8	30.7	18.9	8.8	5.4	3.3
10-yr	202.2	124.6	93.8	57.8	35.6	21.9	10.2	6.3	3.9
25-yr	237.4	146.3	110.2	67.9	41.8	25.7	11.9	7.4	4.5
50-yr	263.6	162.3	122.3	75.3	46.4	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

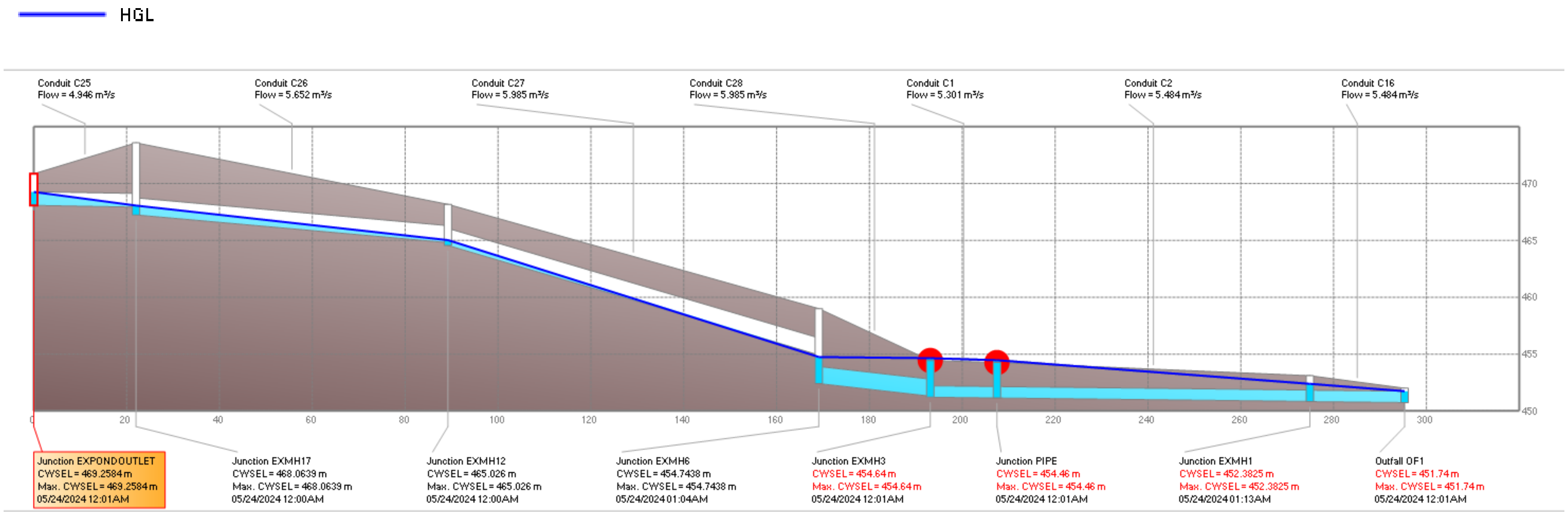
Rainfall depth (mm)

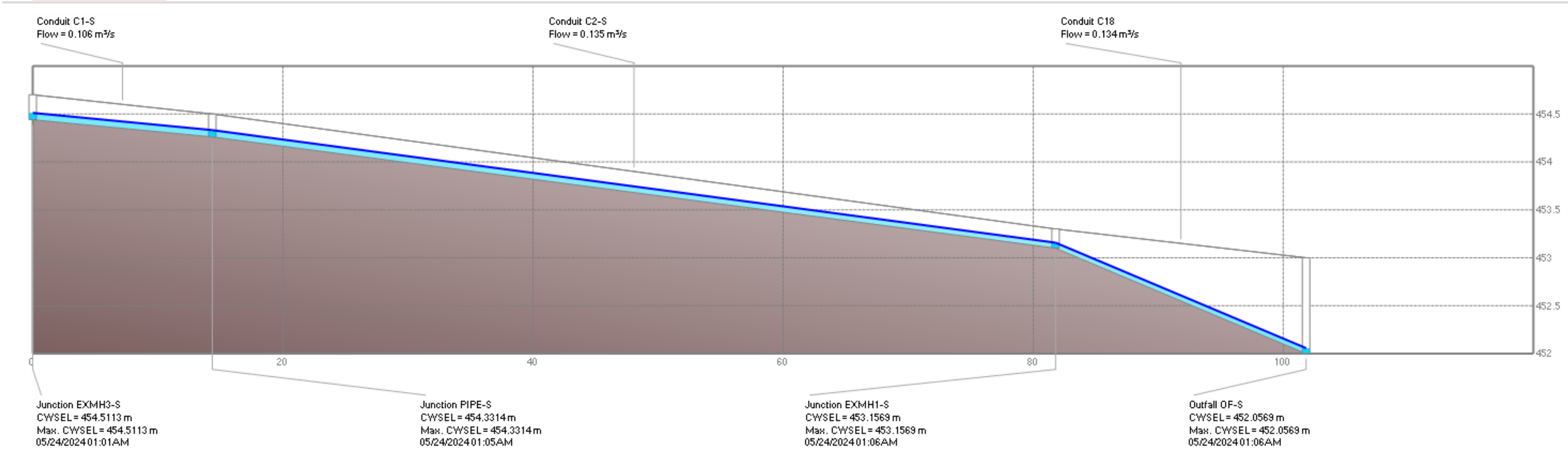
Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	11.0	13.6	15.4	18.9	23.3	28.7	40.0	49.2	60.6
5-yr	14.5	17.9	20.2	24.9	30.7	37.8	52.6	64.9	79.9
10-yr	16.9	20.8	23.5	28.9	35.6	43.9	61.0	75.2	92.7
25-yr	19.8	24.4	27.5	33.9	41.8	51.5	71.7	88.3	108.8
50-yr	22.0	27.1	30.6	37.7	46.4	57.2	79.6	98.0	120.8
100-yr	24.1	29.7	33.6	41.4	51.0	62.8	87.5	107.7	132.7

Terms of Use


J116
POST2
POST1
POST2A
10
9
POST7
10-S
9-S
8
3
4
8-S
3-S
4-S
POST5
POST3
POST5A
POST6
7
7-S
6
6-S
1
2
2-S
1-S
11
5
PIPE2-S
12
11-S
5-S
12-S
POST8
EX3REM
EX2
EXMH1
EXMH1-S
OF1
13
13-s
PIPE
PIPE-S
EXMH3
EXMH3-S
EXPONDOUTLET
EXMH6
EXMH12
EXMH17

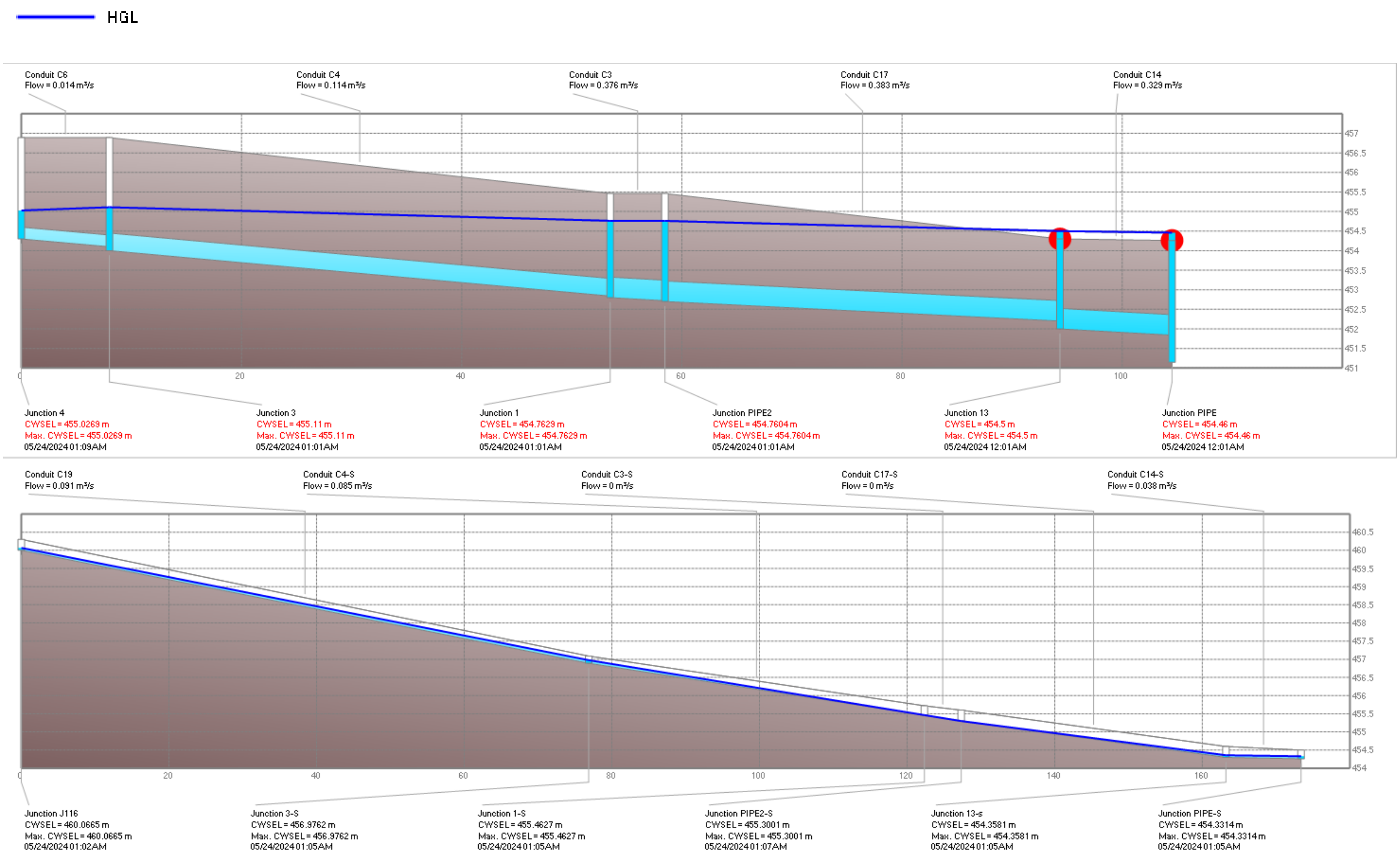
William Street (100 Year Storm):



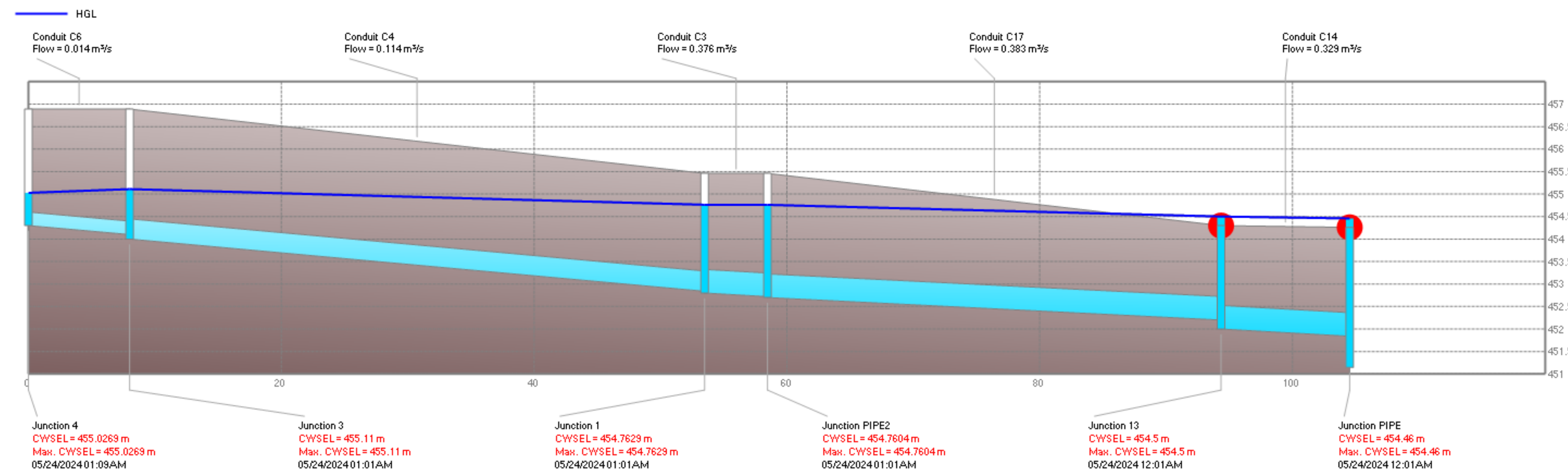


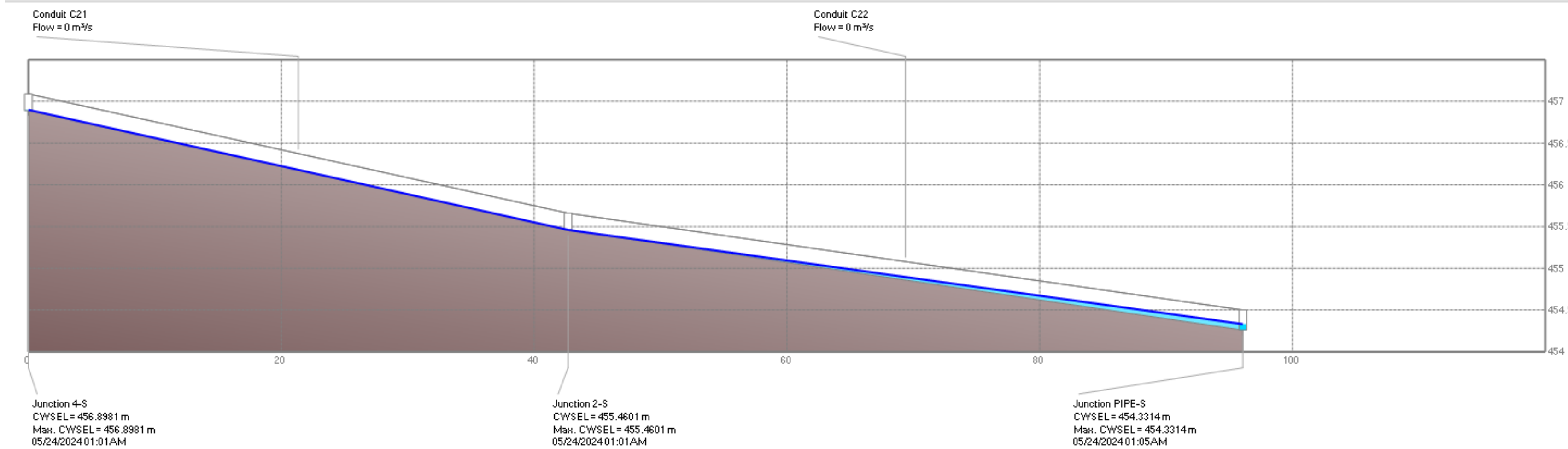
*CWSEL = HGL

Emma Street (100 Year Storm):



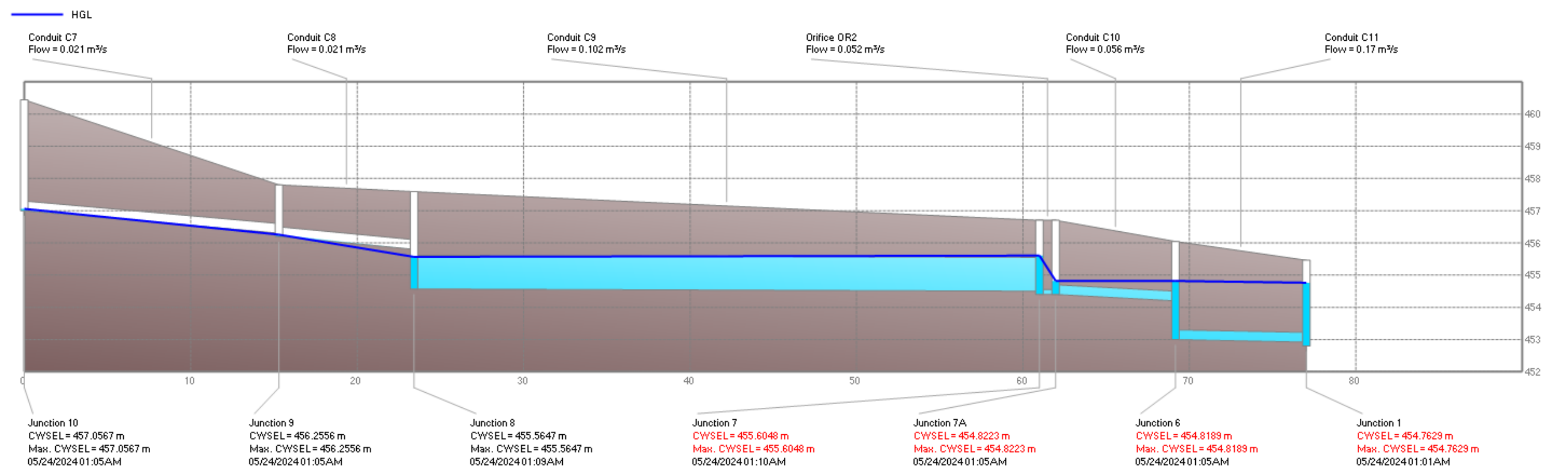
*CWSEL = HGL

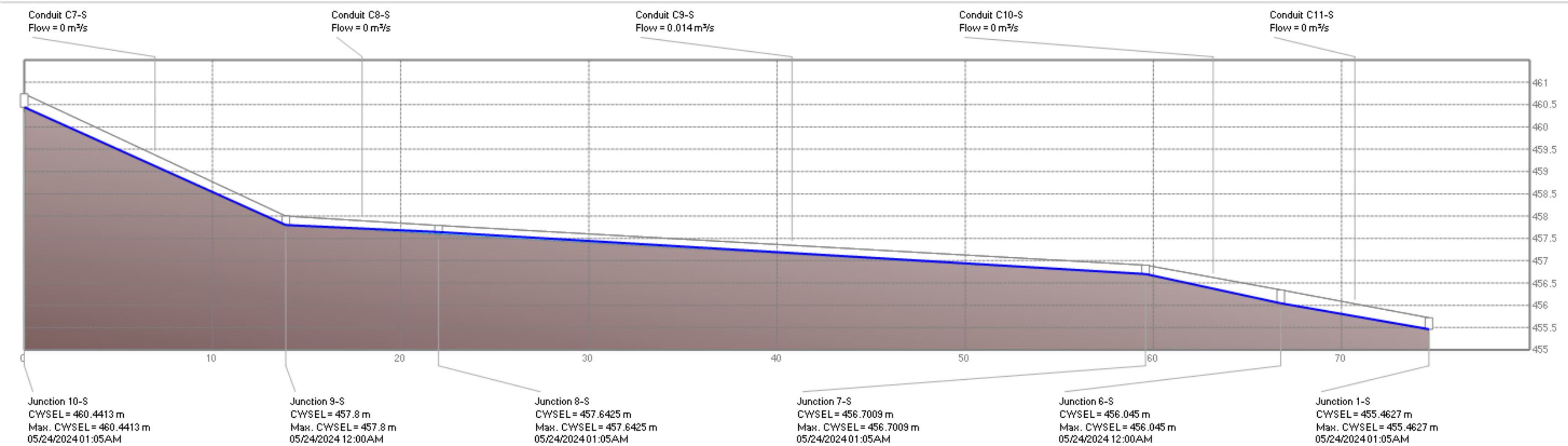

HGL
Conduit C6
Flow = 0.014 m³/s
Conduit C4
Flow = 0.114 m³/s
Conduit C3
Flow = 0.376 m³/s
Conduit C17
Flow = 0.383 m³/s
Conduit C14
Flow = 0.329 m³/s
Junction 4
CWSEL = 455.0269 m
Max. CWSEL = 455.0269 m
05/24/2024 01:09AM
Junction 3
CWSEL = 455.11 m
Max. CWSEL = 455.11 m
05/24/2024 01:01AM
Junction 1
CWSEL = 454.7629 m
Max. CWSEL = 454.7629 m
05/24/2024 01:01AM
Junction PIPE2
CWSEL = 454.7604 m
Max. CWSEL = 454.7604 m
05/24/2024 01:01AM
Junction 13
CWSEL = 454.5 m
Max. CWSEL = 454.5 m
05/24/2024 12:01AM
Junction PIPE
CWSEL = 454.46 m
Max. CWSEL = 454.46 m
05/24/2024 12:01AM


Conduit C21
Flow = 0 m³/s
Conduit C22
Flow = 0 m³/s
Junction 4-S
CWSEL = 456.8981 m
Max. CWSEL = 456.8981 m
05/24/2024 01:01AM
Junction 2-S
CWSEL = 455.4601 m
Max. CWSEL = 455.4601 m
05/24/2024 01:01AM
Junction PIPE-S
CWSEL = 454.3314 m
Max. CWSEL = 454.3314 m
05/24/2024 01:05AM

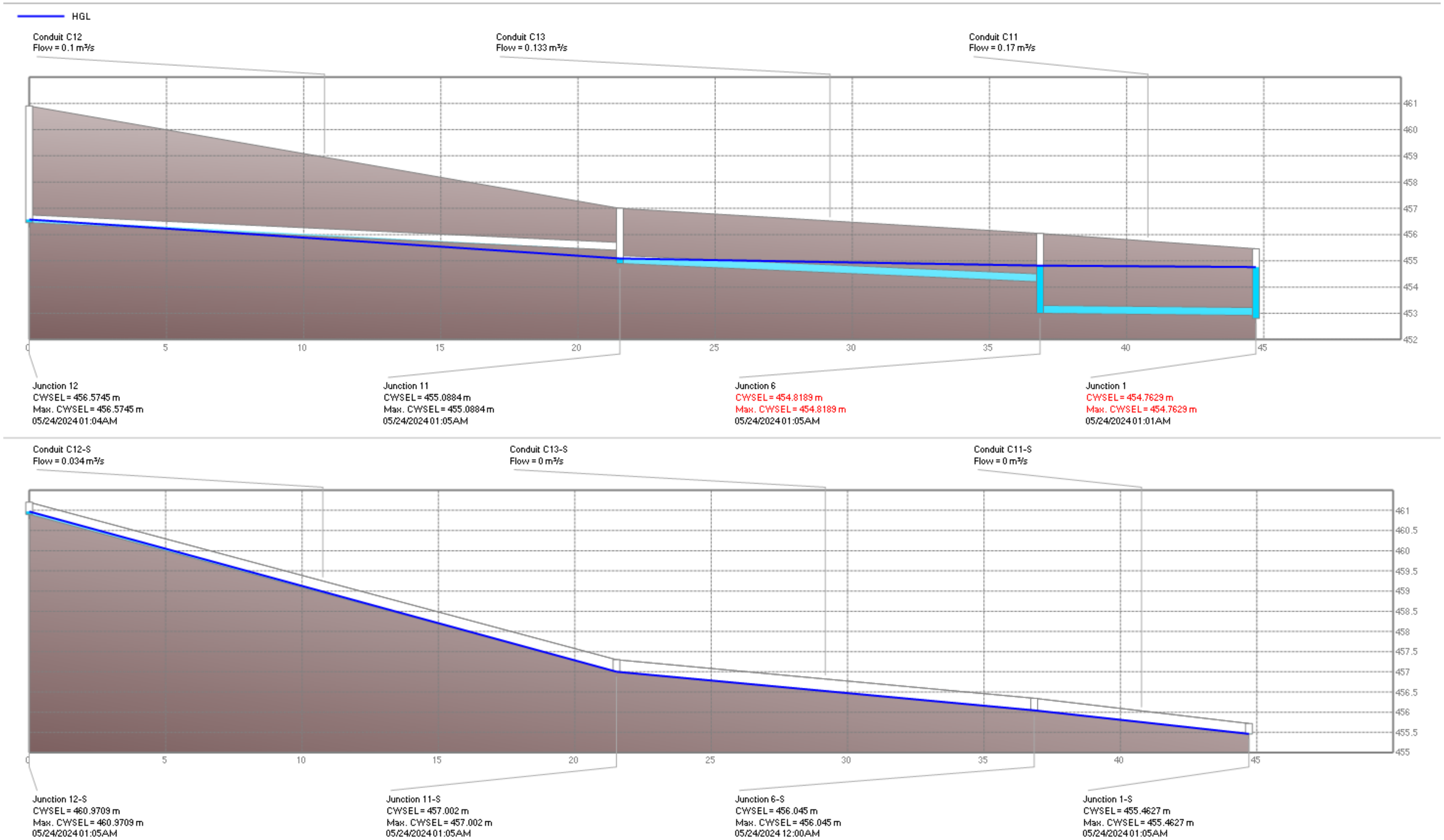
*CWSEL = HGL

On Site (100 Year Storm):





*CWSEL = HGL


HGL
Conduit C12
Flow = 0.1 m³/s
Conduit C13
Flow = 0.133 m³/s
Conduit C11
Flow = 0.17 m³/s
Junction 12
CWSEL = 456.5745 m
Max. CWSEL = 456.5745 m
05/24/2024 01:04AM
Junction 11
CWSEL = 455.0884 m
Max. CWSEL = 455.0884 m
05/24/2024 01:05AM
Junction 6
CWSEL = 454.8189 m
Max. CWSEL = 454.8189 m
05/24/2024 01:05AM
Junction 1
CWSEL = 454.7629 m
Max. CWSEL = 454.7629 m
05/24/2024 01:01AM
Conduit C12-S
Flow = 0.034 m³/s
Conduit C13-S
Flow = 0 m³/s
Conduit C11-S
Flow = 0 m³/s
Junction 12-S
CWSEL = 460.9709 m
Max. CWSEL = 460.9709 m
05/24/2024 01:05AM
Junction 11-S
CWSEL = 457.002 m
Max. CWSEL = 457.002 m
05/24/2024 01:05AM
Junction 6-S
CWSEL = 456.045 m
Max. CWSEL = 456.045 m
05/24/2024 12:00AM
Junction 1-S
CWSEL = 455.4627 m
Max. CWSEL = 455.4627 m
05/24/2024 01:05AM

*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_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

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack        
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
EX2              Chicago_3h_100year EXMH12           1.87     25       1870     2        0                        
EX3REM           Chicago_3h_100year PIPE             0.95     25       950      2        0                        
POST1            Chicago_3h_100year 4-S              0.03     25       4        4        0                        
POST2            Chicago_3h_100year J116             0.2377   25       23.77    6        0                        
POST2A           Chicago_3h_100year 3-S              0.3949   25       26.326   6        0                        
POST3            Chicago_3h_100year 2-S              0.02     25       5.405    3        0                        
POST4            Chicago_3h_100year 1-S              0.05     25       13.514   3        0                        
POST5            Chicago_3h_100year 8-S              0.1246   25       41.533   2.5      0                        
POST5A           Chicago_3h_100year ROOF_DRAIN       0.0834   25       83.4     10       0                        
POST6            Chicago_3h_100year 12-S             0.38     25       38       10       0                        
POST7            Chicago_3h_100year 10-S             0.0497   25       8.284    10       0                        
POST8            Chicago_3h_100year 5-S              0.05     25       20       15       0                        

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted 
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
EX2              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       50         IMPERVIOUS 100       
POST2            0.01       0.1        0.05       0.05       25         OUTLET    
POST2A           0.01       0.1        0.05       0.05       25         IMPERVIOUS 100       
POST3            0.01       0.1        0.05       0.05       100        IMPERVIOUS 100       
POST4            0.01       0.1        0.05       0.05       100        IMPERVIOUS 100       
POST5            0.01       0.1        0.05       0.05       100        OUTLET    
POST5A           0.01       0.1        0.05       0.05       100        OUTLET    
POST6            0.01       0.1        0.05       0.05       25         PERVIOUS   100       
POST7            0.01       0.1        0.05       0.05       25         OUTLET    
POST8            0.01       0.1        0.05       0.05       25         OUTLET    

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5    
;;-------------- ---------- ---------- ---------- ---------- ----------
```

EX2	85	12.7	7	0	0
EX3REM	85	12.7	7	0	0
POST1	90	0.5	7	0	0
POST2	86	0.5	7	0	0
POST2A	83	0.5	7	0	0
POST3	90	0.5	7	0	0
POST4	90	0.5	7	0	0
POST5	90	0.5	7	0	0
POST5A	90	0.5	7	0	0
POST6	83	0.5	7	0	0
POST7	80	0.5	7	0	0
POST8	80	0.5	7	0	0

[JUNCTIONS]

;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Aponded
;;--------------	----------	----------	----------	----------	----------
1	452.8	2.66	0	0.2	0
10	457	3.44	0	0.2	0
10-S	460.44	0.3	0	0	0
11	454.9	2.1	0	0.2	0
11-S	457	0.3	0	0	0
12	456.45	4.45	0	0.2	0
12-S	460.9	0.3	0	0	0
13	452	2.3	0	0.2	0
13-s	454.3	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	453.1	1.7	0	0.2	0
5-S	454.8	0.4	0	0	0
6	453	3.045	0	0.2	0
6-S	456.045	0.3	0	0	0
7	454.4	2.3	0	0.2	0
7A	454.4	2.3	0	0	0
7-S	456.7	0.2	0	0	0
8	454.57	3.02	0	0.2	0
8-S	457.59	0.2	0	0	0
9	456.2	1.6	0	0.2	0
9-S	457.8	0.2	0	0	0
EXMH1	450.82	2.28	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
J116             460        0.3        0          0          0
PIPE             451.145    3.115      0          0.2        0
PIPE2            452.7      2.76       0          0.2        0
PIPE2-S          455.3      0.3        0          0          0
PIPE-S           454.26     0.24       0          0          0
ROOF_DRAIN       455.8      2.44       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              450.74     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                7.2        0.01       454.4      454.2      0          0
C10-S            7-S              6-S              7.187      0.01       456.7      456.045    0          0
C11              6                1                7.87       0.01       453        452.92     0          0
C11-S            6-S              1-S              7.87       0.01       456.045    455.46     0          0
C12              12               11               21.528     0.01       456.45     455.4      0          0
C12-S            12-S             11-S             21.528     0.01       460.9      457        0          0
C13              11               6                15.313     0.01       454.9      454.2      0          0
C13-S            11-S             6-S              15.313     0.01       457        456.045    0          0
C14              13               PIPE             10.18      0.01       452        451.84     0          0
C14-S            13-s             PIPE-S           10.18      0.01       454.3      454.26     0          0
C15              5                PIPE2            6.55       0.01       453.1      452.945    0          0
C16              EXMH1            OF1              20.4       0.01       450.82     450.74     0          0
C17              PIPE2            13               35.878     0.01       452.7      452.2      0          0
C17-S            PIPE2-S          13-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       451.145    450.84     0          0
C21              4-S              2-S              42.688     0.01       456.89     455.46     0          0
C22              2-S              PIPE-S           53.389     0.01       455.46     454.26     0          0
C23              ROOF_DRAIN       7                13.247     0.01       455.8      455.2      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
C2-S             PIPE-S           EXMH1-S          67.43      0.01       454.26     453.1      0          0
C3               1                PIPE2            4.979      0.01       452.8      452.72     0          0
C3-S             1-S              PIPE2-S          4.979      0.01       455.46     455.3      0          0
```

C4	3	1	45.49	0.01	454	452.84	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	452.91	0	0
C6	4	3	8	0.01	454.3	454.1	0	0
C7	10	9	15.3	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	8.115	0.01	456.2	455.8	0	0
C8-S	9-S	8-S	8.115	0.01	457.8	457.59	0	0
C9	8	7	37.574	0.01	454.57	454.5	0	0
C9-S	8-S	7-S	37.574	0.01	457.59	456.7	0	0

[ORIFICES]

;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
OR2	7	7A	SIDE	454.4	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	TICB		NO
J101-IC	3-S	3	456.89	TABULAR/DEPTH	TICB		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	460.9	TABULAR/DEPTH	TICB		NO
J107-IC	7-S	7	456.7	TABULAR/DEPTH	CB		NO
J108-IC	8-S	8	457.59	TABULAR/DEPTH	CB		NO
J111-IC	EXMH3-S	EXMH3	454.44	TABULAR/DEPTH	TICB		NO
J112-IC	5-S	5	454.91	TABULAR/DEPTH	CB		NO
J114-IC	13-s	13	454.3	TABULAR/DEPTH	TICB		NO
J98-IC	10-S	10	460.44	TABULAR/DEPTH	CB		NO
J99-IC	9-S	9	457.8	TABULAR/DEPTH	CB		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	0.3	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    0.3              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
C21              STREET      Emma_St_half
C22              STREET      Emma_St_half
C23              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
C2-S             STREET      Emma_St
C3               CIRCULAR    0.525            0          0          0          1
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               CIRCULAR    1.05             0          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

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 = 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

[REPORT]
;;Reporting Options
INPUT      YES
```

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL
```

5 Year Storm – No Control

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


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 12
Number of nodes ........... 42
Number of links ........... 54
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_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.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet              
-----------------------------------------------------------------------------------------------------------
EX2                        1.87   1870.00     25.00    2.0000 Chicago_3h_5year     EXMH12              
EX3REM                     0.95    950.00     25.00    2.0000 Chicago_3h_5year     PIPE                
POST1                      0.03      4.00     25.00    4.0000 Chicago_3h_5year     4-S                 
POST2                      0.24     23.77     25.00    6.0000 Chicago_3h_5year     J116                
POST2A                     0.39     26.33     25.00    6.0000 Chicago_3h_5year     3-S                 
POST3                      0.02      5.41     25.00    3.0000 Chicago_3h_5year     2-S                 
POST4                      0.05     13.51     25.00    3.0000 Chicago_3h_5year     1-S                 
POST5                      0.12     41.53     25.00    2.5000 Chicago_3h_5year     8-S                 
POST5A                     0.08     83.40     25.00   10.0000 Chicago_3h_5year     ROOF_DRAIN          
```

POST6	0.38	38.00	25.00	10.0000	Chicago_3h_5year	12-S
POST7	0.05	8.28	25.00	10.0000	Chicago_3h_5year	10-S
POST8	0.05	20.00	25.00	15.0000	Chicago_3h_5year	5-S

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.80	2.66	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.90	2.10	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	456.45	4.45	0.0	
12-S	JUNCTION	460.90	0.30	0.0	
13	JUNCTION	452.00	2.30	0.0	
13-s	JUNCTION	454.30	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	453.10	1.70	0.0	
5-S	JUNCTION	454.80	0.40	0.0	
6	JUNCTION	453.00	3.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.40	2.30	0.0	
7-S	JUNCTION	456.70	0.20	0.0	
8	JUNCTION	454.57	3.02	0.0	
8-S	JUNCTION	457.59	0.20	0.0	
9	JUNCTION	456.20	1.60	0.0	
9-S	JUNCTION	457.80	0.20	0.0	
EXMH1	JUNCTION	450.82	2.28	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
J116	JUNCTION	460.00	0.30	0.0	
PIPE	JUNCTION	451.14	3.12	0.0	
PIPE2	JUNCTION	452.70	2.76	0.0	

PIPE2-S	JUNCTION	455.30	0.30	0.0
PIPE-S	JUNCTION	454.26	0.24	0.0
ROOF_DRAIN	JUNCTION	455.80	2.44	0.0
OF1	OUTFALL	450.74	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	7	6	CONDUIT	7.2	2.7789	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	9.1518	0.0160
C11	6	1	CONDUIT	7.9	1.0166	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	4.8832	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	18.4207	0.0100
C13	11	6	CONDUIT	15.3	4.5761	0.0100
C13-S	11-S	6-S	CONDUIT	15.3	6.2487	0.0100
C14	13	PIPE	CONDUIT	10.2	1.5719	0.0100
C14-S	13-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	5	PIPE2	CONDUIT	6.5	2.3671	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.3922	0.0100
C17	PIPE2	13	CONDUIT	35.9	1.3937	0.0100
C17-S	PIPE2-S	13-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	0.4523	0.0100
C21	4-S	2-S	CONDUIT	42.7	3.3518	0.0160
C22	2-S	PIPE-S	CONDUIT	53.4	2.2482	0.0160
C23	ROOF_DRAIN	7	CONDUIT	13.2	4.5340	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
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3	1	PIPE2	CONDUIT	5.0	1.6070	0.0100
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	45.5	2.5508	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	1.1251	0.0100
C6	4	3	CONDUIT	8.0	2.5008	0.0100
C7	10	9	CONDUIT	15.3	4.5800	0.0100
C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160
C8	9	8	CONDUIT	8.1	4.9351	0.0100

C8-S	9-S	8-S	CONDUIT	8.1	2.5887	0.0160
C9	8	7	CONDUIT	37.6	0.1863	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	2.3693	0.0160
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	5-S	5	OUTLET			
J114-IC	13-s	13	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	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	0.21
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	3.02
C11	CIRCULAR	0.30	0.07	0.07	0.30	1	0.13
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	0.28
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.16
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	1.84
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.70
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.66
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	2.10
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.83
C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.50
C23	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27

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
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	0.71
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	0.59
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	0.13
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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	0.28
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.60
C9	CIRCULAR	1.05	0.87	0.26	1.05	1	1.53
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.53

****
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 ......         0.182        42.830
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.070        16.470
Surface Runoff ...........         0.110        25.981
Final Storage ............         0.000         0.099
Continuity Error (%) .....         0.653


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.110         1.102
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         5.553        55.528
External Outflow .........         5.648        56.481
Flooding Loss ............         0.001         0.005
Evaporation Loss .........         0.000         0.000
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Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.016         0.157
Continuity Error (%) .....        -0.025


*************************
Highest Continuity Errors
*************************
Node 2-S (-50.14%)
Node 1-S (-25.00%)
Node 4 (18.61%)
Node 2 (16.94%)
Node 13-s (11.52%)


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


********************************
Highest Flow Instability Indexes
********************************
Link J106-IC (115)
Link J100-IC (73)
Link J103-IC (55)
Link J101-IC (34)
Link J108-IC (33)


*********************************
Most Frequent Nonconverging Nodes
*********************************
Node OF1 (0.07%)
Node OF-S (0.07%)
Node PIPE (0.05%)
Node EXMH1 (0.02%)
Node 13 (0.01%)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.02 sec
Average Time Step           :     0.20 sec
Maximum Time Step           :     0.20 sec
```

```
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.04
% of Steps Not Converging   :     0.07
Time Step Frequencies       :
    0.200 -  0.152 sec      :   100.00 %
    0.152 -  0.115 sec      :     0.00 %
    0.115 -  0.087 sec      :     0.00 %
    0.087 -  0.066 sec      :     0.00 %
    0.066 -  0.050 sec      :     0.00 %
```

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***************************
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
EX2	42.83	0.00	0.00	16.43	10.72	15.67	26.38	0.49	0.51	0.616
EX3REM	42.83	0.00	0.00	16.43	10.72	15.67	26.38	0.25	0.26	0.616
POST1	42.83	0.00	0.00	12.88	29.81	19.09	29.81	0.01	0.01	0.696
POST2	42.83	0.00	0.00	15.95	10.73	16.00	26.73	0.06	0.04	0.624
POST2A	42.83	0.00	0.00	17.99	24.58	13.87	24.58	0.10	0.06	0.574
POST3	42.83	0.00	0.00	12.78	10.74	19.25	10.74	0.00	0.00	0.251
POST4	42.83	0.00	0.00	12.78	10.74	19.25	10.74	0.01	0.01	0.251
POST5	42.83	0.00	0.00	12.78	10.74	19.27	30.01	0.04	0.03	0.701
POST5A	42.83	0.00	0.00	12.76	10.71	19.36	30.08	0.03	0.03	0.702
POST6	42.83	0.00	0.00	17.81	10.73	24.91	24.91	0.09	0.05	0.582
POST7	42.83	0.00	0.00	19.18	10.73	12.86	23.59	0.01	0.01	0.551

POST8	42.83	0.00	0.00	19.18	10.71	12.91	23.62	0.01
0.01	0.551							

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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	0.04	0.22	453.02	0	01:05	0.21
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	0.02	0.09	454.99	0	01:06	0.09
11-S	JUNCTION	0.00	0.00	457.00	0	01:05	0.00
12	JUNCTION	0.02	0.09	456.54	0	01:06	0.09
12-S	JUNCTION	0.00	0.00	460.90	0	01:05	0.00
13	JUNCTION	0.24	2.50	454.50	0	00:01	0.92
13-s	JUNCTION	0.00	0.02	454.32	0	00:01	0.00
1-S	JUNCTION	0.00	0.00	455.46	0	01:05	0.00
2	JUNCTION	0.00	0.03	453.03	0	01:01	0.03
2-S	JUNCTION	0.00	0.00	455.46	0	01:01	0.00
3	JUNCTION	0.03	0.13	454.13	0	01:05	0.13
3-S	JUNCTION	0.00	0.00	456.89	0	01:05	0.00
4	JUNCTION	0.01	0.04	454.34	0	01:04	0.04
4-S	JUNCTION	0.00	0.00	456.89	0	01:04	0.00
5	JUNCTION	0.01	0.05	453.15	0	01:05	0.05
5-S	JUNCTION	0.11	0.12	454.92	0	01:01	0.11
6	JUNCTION	0.04	0.24	453.24	0	01:05	0.24
6-S	JUNCTION	0.00	0.00	456.05	0	00:00	0.00
7	JUNCTION	0.02	0.12	454.52	0	01:05	0.12
7-S	JUNCTION	0.00	0.00	456.70	0	00:00	0.00
8	JUNCTION	0.02	0.12	454.69	0	01:05	0.12
8-S	JUNCTION	0.00	0.00	457.59	0	01:05	0.00
9	JUNCTION	0.01	0.04	456.24	0	01:05	0.04
9-S	JUNCTION	0.00	0.00	457.80	0	00:00	0.00
EXMH1	JUNCTION	0.95	2.48	453.30	0	00:01	1.19
EXMH12	JUNCTION	0.29	0.42	464.98	0	00:00	0.32
EXMH17	JUNCTION	0.39	0.61	467.85	0	00:00	0.61
EXMH1-S	JUNCTION	0.00	0.00	453.10	0	00:01	0.00
EXMH3	JUNCTION	1.13	1.83	453.04	0	01:05	1.83
EXMH3-S	JUNCTION	0.00	0.00	454.44	0	00:00	0.00
EXMH6	JUNCTION	0.37	0.78	453.19	0	00:00	0.50
EXPONDOUTLET	JUNCTION	0.68	1.08	469.16	0	00:00	0.73
J116	JUNCTION	0.02	0.07	460.07	0	01:05	0.07

PIPE	JUNCTION	1.10	3.31	454.46	0	00:00	1.75
PIPE2	JUNCTION	0.04	0.25	452.95	0	01:05	0.24
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	00:00	0.00
PIPE-S	JUNCTION	0.00	0.02	454.28	0	00:00	0.01
ROOF_DRAIN	JUNCTION	0.01	0.07	455.87	0	01:05	0.07
OF1	OUTFALL	0.90	1.00	451.74	0	01:03	1.00
OF-S	OUTFALL	0.00	0.00	452.00	0	00:00	0.00

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Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
1	JUNCTION	0.000	0.234	0	01:05	0	0.357	0.291
10	JUNCTION	0.000	0.010	0	01:05	0	0.012	1.988
10-S	JUNCTION	0.010	0.010	0	01:05	0.0117	0.0117	-2.147
11	JUNCTION	0.000	0.056	0	01:06	0	0.102	0.001
11-S	JUNCTION	0.000	0.000	0	01:07	0	1.35e-07	-0.069 ltr
12	JUNCTION	0.000	0.081	0	01:04	0	0.112	10.038
12-S	JUNCTION	0.055	0.055	0	01:06	0.0947	0.0947	-15.714
13	JUNCTION	0.000	0.765	0	00:00	0	0.379	0.201
13-s	JUNCTION	0.000	0.100	0	00:01	0	6.5e-05	13.021
1-S	JUNCTION	0.006	0.006	0	01:05	0.00537	0.00537	-20.001
2	JUNCTION	0.000	0.006	0	01:01	0	0.00323	20.397
2-S	JUNCTION	0.002	0.002	0	01:05	0.00215	0.00215	-33.395
3	JUNCTION	0.000	0.105	0	01:05	0	0.171	0.281
3-S	JUNCTION	0.057	0.098	0	01:05	0.0971	0.161	-0.421
4	JUNCTION	0.000	0.016	0	01:04	0	0.0125	22.860
4-S	JUNCTION	0.006	0.006	0	01:05	0.00894	0.00894	-28.233
5	JUNCTION	0.000	0.025	0	01:01	0	0.0115	1.016
5-S	JUNCTION	0.012	0.012	0	01:05	0.0118	0.0118	2.673
6	JUNCTION	0.000	0.124	0	01:05	0	0.176	0.004
6-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
7	JUNCTION	0.000	0.069	0	01:05	0	0.0743	0.002
7-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
8	JUNCTION	0.000	0.042	0	01:05	0	0.0493	0.268
8-S	JUNCTION	0.033	0.033	0	01:05	0.0374	0.0374	-0.456
9	JUNCTION	0.000	0.010	0	01:05	0	0.0117	0.004
9-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
EXMH1	JUNCTION	0.000	3.564	0	01:05	0	56.5	0.020
EXMH12	JUNCTION	0.513	4.151	0	00:00	0.493	56	0.032
EXMH17	JUNCTION	0.000	3.497	0	00:00	0	55.5	0.040

EXMH1-S	JUNCTION	0.000	0.000	0	00:00	0	9.19e-07	0.919 ltr
EXMH3	JUNCTION	0.000	5.383	0	00:00	0	56	0.026
EXMH3-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
EXMH6	JUNCTION	0.000	4.697	0	00:00	0	56	0.010
EXPONDOUTLET	JUNCTION	2.571	2.571	0	00:00	55.5	55.5	0.026
J116	JUNCTION	0.044	0.044	0	01:05	0.0635	0.0635	0.031
PIPE	JUNCTION	0.261	5.545	0	00:00	0.251	56.6	0.117
PIPE2	JUNCTION	0.000	0.244	0	01:05	0	0.368	-0.058
PIPE2-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
PIPE-S	JUNCTION	0.000	0.100	0	00:00	0	0.000225	-1.788
ROOF_DRAIN	JUNCTION	0.030	0.030	0	01:05	0.0251	0.0251	0.001
OF1	OUTFALL	0.000	3.564	0	01:05	0	56.5	0.000
OF-S	OUTFALL	0.000	0.000	0	00:00	0	0	0.000 ltr

****
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
13	JUNCTION	0.05	1.775	0.000
5-S	JUNCTION	5.70	0.007	0.283
EXMH1	JUNCTION	0.24	1.460	0.000
EXMH3	JUNCTION	0.05	0.239	1.401
PIPE	JUNCTION	0.27	2.095	0.000

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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
13	0.01	0.348	0 00:01	0.000	0.200
EXMH1	0.01	0.661	0 00:01	0.000	0.200
PIPE	0.01	4.063	0 00:00	0.005	0.200

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.84	2.619	3.564	56.481
OF-S	0.00	0.000	0.000	0.000
System	49.92	2.619	3.564	56.481

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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	0.056	0.000									
C11-S	0.000	0.055	0.000									
C14-S	0.000	0.151	0.011									
C17-S	0.000	0.131	0.009									
C18	0.000	0.055	0.000									
C19	0.042	1.226	0.035									
C1-S	0.000	0.124	0.009									
C21	0.000	0.053	0.001									
C22	0.000	0.124	0.009									
C2-S	0.000	0.124	0.009									
C3-S	0.000	0.055	0.000									
C4-S	0.000	0.049	0.002									
C7-S	0.000	0.054	0.000									
C8-S	0.000	0.051	0.001									
C9-S	0.000	0.051	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	5.545	0	00:00	7.42	2.64	1.00
C10	CONDUIT	0.069	0	01:05	2.67	0.33	0.40
C10-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C11	CONDUIT	0.124	0	01:05	2.06	0.98	0.80
C11-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C12	CONDUIT	0.056	0	01:06	3.09	0.20	0.31
C12-S	CONDUIT	0.000	0	01:07	0.00	0.00	0.01
C13	CONDUIT	0.056	0	01:06	3.01	0.21	0.31
C13-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C14	CONDUIT	0.765	0	00:00	4.28	1.09	1.00
C14-S	CONDUIT	0.000	0	00:01	0.06	0.00	0.05
C15	CONDUIT	0.012	0	01:05	1.53	0.06	0.17
C16	CONDUIT	3.564	0	01:05	4.54	1.83	1.00
C17	CONDUIT	0.260	0	01:05	1.97	0.39	0.74
C17-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.05
C18	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C19	CONDUIT	0.042	0	01:05	2.59	0.02	0.18
C1-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
C2	CONDUIT	3.564	0	01:05	4.54	1.70	1.00
C21	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C22	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
C23	CONDUIT	0.029	0	01:05	2.50	0.11	0.22
C25	CONDUIT	3.497	0	00:00	4.71	0.84	0.75
C26	CONDUIT	4.150	0	00:00	9.14	0.24	0.35
C27	CONDUIT	4.697	0	00:00	13.73	0.15	0.26
C28	CONDUIT	5.383	0	00:00	4.85	0.27	0.68
C2-S	CONDUIT	0.000	0	00:00	0.80	0.00	0.04
C3	CONDUIT	0.233	0	01:05	2.89	0.33	0.43
C3-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C4	CONDUIT	0.104	0	01:05	2.35	0.18	0.34
C4-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
C5	CONDUIT	0.002	0	01:01	0.73	0.02	0.22
C6	CONDUIT	0.007	0	01:04	1.32	0.03	0.13
C7	CONDUIT	0.010	0	01:05	1.79	0.04	0.13
C7-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C8	CONDUIT	0.010	0	01:05	1.84	0.03	0.13
C8-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C9	CONDUIT	0.041	0	01:05	0.83	0.03	0.11
C9-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01

J100-IC	DUMMY	0.016	0	01:04
J101-IC	DUMMY	0.098	0	01:05
J102-IC	DUMMY	0.006	0	01:01
J103-IC	DUMMY	0.006	0	01:05
J104-IC	DUMMY	0.000	0	00:00
J105-IC	DUMMY	0.000	0	01:08
J106-IC	DUMMY	0.081	0	01:04
J107-IC	DUMMY	0.000	0	00:00
J108-IC	DUMMY	0.033	0	01:05
J111-IC	DUMMY	0.000	0	00:00
J112-IC	DUMMY	0.025	0	01:01
J114-IC	DUMMY	0.100	0	00:01
J98-IC	DUMMY	0.010	0	01:05
J99-IC	DUMMY	0.000	0	00:00
OR1	DUMMY	0.100	0	00:00

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Flow Classification Summary
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	Adjusted	---------- Fraction of Time in Flow Class ----------								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	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	0.00	0.00	0.00	1.00	0.00	0.00
C10-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11-S	1.00	0.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C12-S	1.00	0.54	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C13-S	1.00	1.00	0.00	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	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	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	0.05	0.28	0.00	0.67	0.32	0.00
C17-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C1-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.56	0.10	0.00	0.35	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.82	0.00	0.00	0.18	0.00	0.00	0.00	1.00	0.00
C23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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	0.02	0.97	0.00	0.00	0.01	0.00
C2-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C3-S	1.00	0.75	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.05	0.00	0.95	0.05	0.00
C4-S	1.00	0.20	0.00	0.00	0.78	0.01	0.00	0.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.96	0.04	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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	0.51	0.00	0.00	0.49	0.00	0.00	0.00	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	0.42	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9-S	1.00	0.42	0.00	0.00	0.58	0.00	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	5.98	5.99	5.98	5.98	5.97
C14	0.11	0.11	0.27	0.01	0.01
C16	0.01	0.43	0.01	5.98	0.01
C17	0.01	0.01	0.05	0.01	0.01
C2	0.24	5.98	0.24	5.98	0.24
C28	0.01	0.01	0.05	0.01	0.01

Analysis begun on: Sat Jun 15 13:47:08 2024
Analysis ended on: Sat Jun 15 13:47:15 2024
Total elapsed time: 00:00:07

5 Year Storm – Control

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
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*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 12
Number of nodes ........... 43
Number of links ........... 55
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_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.


********************
Subcatchment Summary
********************
Name                          Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
EX2                           1.87   1870.00     25.00    2.0000 Chicago_3h_5year     EXMH12
EX3REM                        0.95    950.00     25.00    2.0000 Chicago_3h_5year     PIPE
POST1                         0.03      4.00     25.00    4.0000 Chicago_3h_5year     4-S
POST2                         0.24     23.77     25.00    6.0000 Chicago_3h_5year     J116
POST2A                        0.39     26.33     25.00    6.0000 Chicago_3h_5year     3-S
POST3                         0.02      5.41     25.00    3.0000 Chicago_3h_5year     2-S
POST4                         0.05     13.51     25.00    3.0000 Chicago_3h_5year     1-S
POST5                         0.12     41.53     25.00    2.5000 Chicago_3h_5year     8-S
POST5A                        0.08     83.40     25.00   10.0000 Chicago_3h_5year     ROOF_DRAIN
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POST6	0.38	38.00	25.00	10.0000	Chicago_3h_5year	12-S
POST7	0.05	8.28	25.00	10.0000	Chicago_3h_5year	10-S
POST8	0.05	20.00	25.00	15.0000	Chicago_3h_5year	5-S

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.80	2.66	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.90	2.10	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	456.45	4.45	0.0	
12-S	JUNCTION	460.90	0.30	0.0	
13	JUNCTION	452.00	2.30	0.0	
13-s	JUNCTION	454.30	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	453.10	1.70	0.0	
5-S	JUNCTION	454.80	0.40	0.0	
6	JUNCTION	453.00	3.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.40	2.30	0.0	
7A	JUNCTION	454.40	2.30	0.0	
7-S	JUNCTION	456.70	0.20	0.0	
8	JUNCTION	454.57	3.02	0.0	
8-S	JUNCTION	457.59	0.20	0.0	
9	JUNCTION	456.20	1.60	0.0	
9-S	JUNCTION	457.80	0.20	0.0	
EXMH1	JUNCTION	450.82	2.28	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
J116	JUNCTION	460.00	0.30	0.0	
PIPE	JUNCTION	451.14	3.12	0.0	

PIPE2	JUNCTION	452.70	2.76	0.0
PIPE2-S	JUNCTION	455.30	0.30	0.0
PIPE-S	JUNCTION	454.26	0.24	0.0
ROOF_DRAIN	JUNCTION	455.80	2.44	0.0
OF1	OUTFALL	450.74	1.00	0.0
OF-S	OUTFALL	452.00	0.20	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXMH3	PIPE	CONDUIT	14.4	0.4527	0.0100
C10	7A	6	CONDUIT	7.2	2.7789	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	9.1518	0.0160
C11	6	1	CONDUIT	7.9	1.0166	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	4.8832	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	18.4207	0.0100
C13	11	6	CONDUIT	15.3	4.5761	0.0100
C13-S	11-S	6-S	CONDUIT	15.3	6.2487	0.0100
C14	13	PIPE	CONDUIT	10.2	1.5719	0.0100
C14-S	13-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	5	PIPE2	CONDUIT	6.5	2.3671	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.3922	0.0100
C17	PIPE2	13	CONDUIT	35.9	1.3937	0.0100
C17-S	PIPE2-S	13-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	0.4523	0.0100
C21	4-S	2-S	CONDUIT	42.7	3.3518	0.0160
C22	2-S	PIPE-S	CONDUIT	53.4	2.2482	0.0160
C23	ROOF_DRAIN	7	CONDUIT	13.2	4.5340	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
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3	1	PIPE2	CONDUIT	5.0	1.6070	0.0100
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	45.5	2.5508	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	1.1251	0.0100
C6	4	3	CONDUIT	8.0	2.5008	0.0100
C7	10	9	CONDUIT	15.3	4.5800	0.0100
C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160

C8	9	8	CONDUIT	8.1	4.9351	0.0100
C8-S	9-S	8-S	CONDUIT	8.1	2.5887	0.0160
C9	8	7	CONDUIT	37.6	0.1863	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	2.3693	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	5-S	5	OUTLET			
J114-IC	13-s	13	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	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	0.21
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	3.02
C11	CIRCULAR	0.30	0.07	0.07	0.30	1	0.13
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	0.28
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.16
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	1.84
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.70
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.66
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	2.10
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.83

C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.50
C23	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	0.71
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	0.59
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	0.13
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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	0.28
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.60
C9	CIRCULAR	1.05	0.87	0.26	1.05	1	1.53
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.53

****
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 ......         0.182        42.830
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.070        16.470
Surface Runoff ...........         0.110        25.981
Final Storage ............         0.000         0.099
Continuity Error (%) .....         0.653


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.110         1.102
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         5.553        55.528
External Outflow .........         5.648        56.481
```

```
Flooding Loss ...........         0.001         0.005
Evaporation Loss ........         0.000         0.000
Exfiltration Loss .......         0.000         0.000
Initial Stored Volume ....        0.000         0.000
Final Stored Volume ......        0.016         0.157
Continuity Error (%) .....       -0.025


*************************
Highest Continuity Errors
*************************
Node 2-S (-50.25%)
Node 1-S (-25.03%)
Node 4 (18.61%)
Node 2 (16.92%)
Node 13-s (11.52%)


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


********************************
Highest Flow Instability Indexes
********************************
Link J106-IC (115)
Link J100-IC (73)
Link J103-IC (55)
Link J101-IC (34)
Link J108-IC (33)


*********************************
Most Frequent Nonconverging Nodes
*********************************
Node OF1 (0.07%)
Node OF-S (0.07%)
Node PIPE (0.04%)
Node EXMH1 (0.03%)
Node 13 (0.01%)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.05 sec
```

```
  Average Time Step           :     0.20 sec
  Maximum Time Step           :     0.20 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.04
  % of Steps Not Converging   :     0.07
  Time Step Frequencies       :
      0.200 -  0.152 sec      :   100.00 %
      0.152 -  0.115 sec      :     0.00 %
      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
EX2	42.83	0.00	0.00	16.43	10.72	15.67	26.38	0.49	0.51	0.616
EX3REM	42.83	0.00	0.00	16.43	10.72	15.67	26.38	0.25	0.26	0.616
POST1	42.83	0.00	0.00	12.88	29.81	19.09	29.81	0.01	0.01	0.696
POST2	42.83	0.00	0.00	15.95	10.73	16.00	26.73	0.06	0.04	0.624
POST2A	42.83	0.00	0.00	17.99	24.58	13.87	24.58	0.10	0.06	0.574
POST3	42.83	0.00	0.00	12.78	10.74	19.25	10.74	0.00	0.00	0.251
POST4	42.83	0.00	0.00	12.78	10.74	19.25	10.74	0.01	0.01	0.251
POST5	42.83	0.00	0.00	12.78	10.74	19.27	30.01	0.04	0.03	0.701
POST5A	42.83	0.00	0.00	12.76	10.71	19.36	30.08	0.03	0.03	0.702
POST6	42.83	0.00	0.00	17.81	10.73	24.91	24.91	0.09	0.05	0.582

POST7	42.83	0.00	0.00	19.18	10.73	12.86	23.59	0.01	0.01	0.551
POST8	42.83	0.00	0.00	19.18	10.71	12.91	23.62	0.01	0.01	0.551

****
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	0.04	0.19	452.99	0	01:05	0.19
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	0.02	0.09	454.99	0	01:06	0.09
11-S	JUNCTION	0.00	0.00	457.00	0	01:12	0.00
12	JUNCTION	0.02	0.09	456.54	0	01:06	0.09
12-S	JUNCTION	0.00	0.00	460.90	0	01:07	0.00
13	JUNCTION	0.24	2.50	454.50	0	00:01	0.90
13-s	JUNCTION	0.00	0.02	454.32	0	00:01	0.00
1-S	JUNCTION	0.00	0.00	455.46	0	01:05	0.00
2	JUNCTION	0.00	0.03	453.03	0	01:01	0.03
2-S	JUNCTION	0.00	0.00	455.46	0	01:01	0.00
3	JUNCTION	0.03	0.13	454.13	0	01:05	0.13
3-S	JUNCTION	0.00	0.00	456.89	0	01:05	0.00
4	JUNCTION	0.01	0.04	454.34	0	01:04	0.04
4-S	JUNCTION	0.00	0.00	456.89	0	01:04	0.00
5	JUNCTION	0.01	0.05	453.15	0	01:04	0.05
5-S	JUNCTION	0.11	0.11	454.91	0	01:01	0.11
6	JUNCTION	0.04	0.19	453.19	0	01:05	0.18
6-S	JUNCTION	0.00	0.00	456.05	0	00:00	0.00
7	JUNCTION	0.06	0.52	454.92	0	01:06	0.51
7A	JUNCTION	0.02	0.08	454.48	0	01:06	0.08
7-S	JUNCTION	0.00	0.00	456.70	0	00:00	0.00
8	JUNCTION	0.03	0.35	454.92	0	01:07	0.34
8-S	JUNCTION	0.00	0.00	457.59	0	01:05	0.00
9	JUNCTION	0.01	0.04	456.24	0	01:05	0.04
9-S	JUNCTION	0.00	0.00	457.80	0	00:00	0.00
EXMH1	JUNCTION	0.95	2.48	453.30	0	00:01	1.19
EXMH12	JUNCTION	0.29	0.42	464.98	0	00:00	0.32
EXMH17	JUNCTION	0.39	0.61	467.85	0	00:00	0.61
EXMH1-S	JUNCTION	0.00	0.00	453.10	0	00:01	0.00
EXMH3	JUNCTION	1.13	1.82	453.03	0	01:05	1.82
EXMH3-S	JUNCTION	0.00	0.00	454.44	0	00:00	0.00

EXMH6	JUNCTION	0.37	0.78	453.19	0	00:00	0.50
EXPONDOUTLET	JUNCTION	0.68	1.08	469.16	0	00:00	0.73
J116	JUNCTION	0.02	0.07	460.07	0	01:05	0.07
PIPE	JUNCTION	1.10	3.31	454.46	0	00:00	1.74
PIPE2	JUNCTION	0.04	0.20	452.90	0	01:05	0.20
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	00:00	0.00
PIPE-S	JUNCTION	0.00	0.02	454.28	0	00:00	0.01
ROOF_DRAIN	JUNCTION	0.01	0.07	455.87	0	01:05	0.07
OF1	OUTFALL	0.90	1.00	451.74	0	01:03	1.00
OF-S	OUTFALL	0.00	0.00	452.00	0	00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
1	JUNCTION	0.000	0.196	0 01:05	0	0.356	0.228	
10	JUNCTION	0.000	0.010	0 01:05	0	0.012	1.989	
10-S	JUNCTION	0.010	0.010	0 01:05	0.0117	0.0117	-2.147	
11	JUNCTION	0.000	0.056	0 01:06	0	0.102	0.001	
11-S	JUNCTION	0.000	0.000	0 01:04	0	1.42e-07	-0.062	ltr
12	JUNCTION	0.000	0.082	0 01:04	0	0.112	10.067	
12-S	JUNCTION	0.055	0.055	0 01:06	0.0947	0.0947	-15.749	
13	JUNCTION	0.000	0.765	0 00:00	0	0.379	0.230	
13-s	JUNCTION	0.000	0.100	0 00:01	0	6.5e-05	13.021	
1-S	JUNCTION	0.006	0.006	0 01:05	0.00537	0.00537	-20.018	
2	JUNCTION	0.000	0.006	0 01:01	0	0.00323	20.368	
2-S	JUNCTION	0.002	0.002	0 01:05	0.00215	0.00215	-33.446	
3	JUNCTION	0.000	0.105	0 01:05	0	0.171	0.433	
3-S	JUNCTION	0.057	0.098	0 01:05	0.0971	0.161	-0.421	
4	JUNCTION	0.000	0.016	0 01:04	0	0.0125	22.859	
4-S	JUNCTION	0.006	0.006	0 01:05	0.00894	0.00894	-28.223	
5	JUNCTION	0.000	0.038	0 01:04	0	0.0115	0.924	
5-S	JUNCTION	0.012	0.012	0 01:05	0.0118	0.0118	2.615	
6	JUNCTION	0.000	0.089	0 01:06	0	0.176	0.004	
6-S	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
7	JUNCTION	0.000	0.076	0 01:05	0	0.0744	-0.015	
7A	JUNCTION	0.000	0.034	0 01:06	0	0.0743	-0.007	
7-S	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
8	JUNCTION	0.000	0.042	0 01:05	0	0.0495	0.311	
8-S	JUNCTION	0.033	0.033	0 01:05	0.0374	0.0374	-0.457	
9	JUNCTION	0.000	0.010	0 01:05	0	0.0117	0.004	

9-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
EXMH1	JUNCTION	0.000	3.539	0	01:05	0	56.5	0.020	
EXMH12	JUNCTION	0.513	4.151	0	00:00	0.493	56	0.032	
EXMH17	JUNCTION	0.000	3.497	0	00:00	0	55.5	0.040	
EXMH1-S	JUNCTION	0.000	0.000	0	00:00	0	9.19e-07	0.919	ltr
EXMH3	JUNCTION	0.000	5.383	0	00:00	0	56	0.027	
EXMH3-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
EXMH6	JUNCTION	0.000	4.697	0	00:00	0	56	0.010	
EXPONDOUTLET	JUNCTION	2.571	2.571	0	00:00	55.5	55.5	0.026	
J116	JUNCTION	0.044	0.044	0	01:05	0.0635	0.0635	0.031	
PIPE	JUNCTION	0.261	5.545	0	00:00	0.251	56.6	0.117	
PIPE2	JUNCTION	0.000	0.207	0	01:05	0	0.368	-0.055	
PIPE2-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
PIPE-S	JUNCTION	0.000	0.100	0	00:00	0	0.000225	-1.788	
ROOF_DRAIN	JUNCTION	0.030	0.030	0	01:05	0.0251	0.0251	0.001	
OF1	OUTFALL	0.000	3.539	0	01:05	0	56.5	0.000	
OF-S	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr

****
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
13	JUNCTION	0.04	1.775	0.000
5-S	JUNCTION	5.70	0.004	0.286
EXMH1	JUNCTION	0.25	1.460	0.000
EXMH3	JUNCTION	0.05	0.227	1.413
PIPE	JUNCTION	0.29	2.095	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
13	0.01	0.348	0 00:01	0.000	0.200

EXMH1	0.01	0.661	0	00:01	0.000	0.200
PIPE	0.01	4.063	0	00:00	0.005	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	99.84	2.619	3.539	56.481
OF-S	0.00	0.000	0.000	0.000
System	49.92	2.619	3.539	56.481

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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	0.056	0.000									
C11-S	0.000	0.055	0.000									
C14-S	0.000	0.151	0.011									
C17-S	0.000	0.131	0.009									
C18	0.000	0.055	0.000									
C19	0.042	1.226	0.035									
C1-S	0.000	0.124	0.009									
C21	0.000	0.053	0.001									
C22	0.000	0.124	0.009									
C2-S	0.000	0.124	0.009									
C3-S	0.000	0.055	0.000									
C4-S	0.000	0.049	0.002									
C7-S	0.000	0.054	0.000									

C8-S	0.000	0.051	0.001
C9-S	0.000	0.051	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	5.545	0	00:00	7.42	2.64	1.00
C10	CONDUIT	0.034	0	01:06	2.18	0.16	0.27
C10-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C11	CONDUIT	0.089	0	01:06	1.94	0.70	0.62
C11-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C12	CONDUIT	0.056	0	01:06	3.09	0.20	0.31
C12-S	CONDUIT	0.000	0	01:04	0.00	0.00	0.01
C13	CONDUIT	0.056	0	01:06	3.01	0.21	0.31
C13-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C14	CONDUIT	0.765	0	00:00	4.28	1.09	1.00
C14-S	CONDUIT	0.000	0	00:01	0.06	0.00	0.05
C15	CONDUIT	0.012	0	01:05	1.53	0.06	0.17
C16	CONDUIT	3.539	0	01:05	4.51	1.81	1.00
C17	CONDUIT	0.207	0	01:05	2.24	0.31	0.69
C17-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.05
C18	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C19	CONDUIT	0.042	0	01:05	2.59	0.02	0.18
C1-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
C2	CONDUIT	3.539	0	01:05	4.51	1.69	1.00
C21	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C22	CONDUIT	0.000	0	00:00	0.00	0.00	0.04
C23	CONDUIT	0.029	0	01:05	2.50	0.11	0.22
C25	CONDUIT	3.497	0	00:00	4.71	0.84	0.75
C26	CONDUIT	4.150	0	00:00	9.14	0.24	0.35
C27	CONDUIT	4.697	0	00:00	13.73	0.15	0.26
C28	CONDUIT	5.383	0	00:00	4.85	0.27	0.68
C2-S	CONDUIT	0.000	0	00:00	0.80	0.00	0.04
C3	CONDUIT	0.196	0	01:05	2.81	0.28	0.36
C3-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C4	CONDUIT	0.104	0	01:05	2.56	0.18	0.31
C4-S	CONDUIT	0.000	0	01:05	0.00	0.00	0.01
C5	CONDUIT	0.002	0	01:01	0.73	0.02	0.18
C6	CONDUIT	0.007	0	01:04	1.33	0.03	0.13
C7	CONDUIT	0.010	0	01:05	1.79	0.04	0.13
C7-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00

C8	CONDUIT	0.010	0	01:05	1.84	0.03	0.13
C8-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C9	CONDUIT	0.049	0	01:06	0.54	0.03	0.35
C9-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
OR2	ORIFICE	0.034	0	01:06			1.00
J100-IC	DUMMY	0.016	0	01:04			
J101-IC	DUMMY	0.098	0	01:05			
J102-IC	DUMMY	0.006	0	01:01			
J103-IC	DUMMY	0.006	0	01:05			
J104-IC	DUMMY	0.000	0	00:00			
J105-IC	DUMMY	0.000	0	01:07			
J106-IC	DUMMY	0.082	0	01:04			
J107-IC	DUMMY	0.000	0	00:00			
J108-IC	DUMMY	0.033	0	01:05			
J111-IC	DUMMY	0.000	0	00:00			
J112-IC	DUMMY	0.038	0	01:04			
J114-IC	DUMMY	0.100	0	00:01			
J98-IC	DUMMY	0.010	0	01:05			
J99-IC	DUMMY	0.000	0	00:00			
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	0.00	0.00	0.00	1.00	0.00	0.00
C10-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C11-S	1.00	0.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C12-S	1.00	0.54	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C13-S	1.00	1.00	0.00	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	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	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	0.06	0.27	0.00	0.67	0.32	0.00
C17-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00

C1-S	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.56	0.09	0.00	0.35	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.82	0.00	0.00	0.17	0.00	0.00	0.00	1.00	0.00
C23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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	0.02	0.97	0.00	0.00	0.01	0.00
C2-S	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C3-S	1.00	0.75	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.06	0.00	0.94	0.06	0.00
C4-S	1.00	0.20	0.00	0.00	0.78	0.01	0.00	0.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.95	0.05	0.00
C6	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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	0.51	0.00	0.00	0.49	0.00	0.00	0.00	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	0.42	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.07	0.00	0.00	0.93	0.01	0.00
C9-S	1.00	0.42	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	5.98	5.99	5.98	5.98	5.97
C14	0.12	0.12	0.29	0.01	0.01
C16	0.01	0.43	0.01	5.98	0.01
C17	0.01	0.01	0.04	0.01	0.01
C2	0.25	5.98	0.25	5.98	0.25
C28	0.01	0.01	0.05	0.01	0.01

Analysis begun on: Sat Jun 15 13:46:47 2024
Analysis ended on: Sat Jun 15 13:46:54 2024
Total elapsed time: 00:00:07

100 Year Storm – No Control

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

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Element Count
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Number of rain gages 7
Number of subcatchments ... 12
Number of nodes 42
Number of links 54
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
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Name	Data Source	Data Type	Recording Interval
Chicago_3h	Chicago_3h	INTENSITY	5 min.
Chicago_3h_100year	Chicago_3h_100year	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.

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Subcatchment Summary
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Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EX2	1.87	1870.00	25.00	2.0000	Chicago_3h_100year	EXMH12
EX3REM	0.95	950.00	25.00	2.0000	Chicago_3h_100year	PIPE
POST1	0.03	4.00	25.00	4.0000	Chicago_3h_100year	4-S
POST2	0.24	23.77	25.00	6.0000	Chicago_3h_100year	J116
POST2A	0.39	26.33	25.00	6.0000	Chicago_3h_100year	3-S
POST3	0.02	5.41	25.00	3.0000	Chicago_3h_100year	2-S
POST4	0.05	13.51	25.00	3.0000	Chicago_3h_100year	1-S

POST5	0.12	41.53	25.00	2.5000	Chicago_3h_100year	8-S
POST5A	0.08	83.40	25.00	10.0000	Chicago_3h_100year	ROOF_DRAIN
POST6	0.38	38.00	25.00	10.0000	Chicago_3h_100year	12-S
POST7	0.05	8.28	25.00	10.0000	Chicago_3h_100year	10-S
POST8	0.05	20.00	25.00	15.0000	Chicago_3h_100year	5-S

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.80	2.66	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.90	2.10	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	456.45	4.45	0.0	
12-S	JUNCTION	460.90	0.30	0.0	
13	JUNCTION	452.00	2.30	0.0	
13-s	JUNCTION	454.30	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	453.10	1.70	0.0	
5-S	JUNCTION	454.80	0.40	0.0	
6	JUNCTION	453.00	3.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.40	2.30	0.0	
7-S	JUNCTION	456.70	0.20	0.0	
8	JUNCTION	454.57	3.02	0.0	
8-S	JUNCTION	457.59	0.20	0.0	
9	JUNCTION	456.20	1.60	0.0	
9-S	JUNCTION	457.80	0.20	0.0	
EXMH1	JUNCTION	450.82	2.28	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
J116	JUNCTION	460.00	0.30	0.0	

PIPE	JUNCTION	451.14	3.12	0.0
PIPE2	JUNCTION	452.70	2.76	0.0
PIPE2-S	JUNCTION	455.30	0.30	0.0
PIPE-S	JUNCTION	454.26	0.24	0.0
ROOF_DRAIN	JUNCTION	455.80	2.44	0.0
OF1	OUTFALL	450.74	1.00	0.0
OF-S	OUTFALL	452.00	0.20	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXMH3	PIPE	CONDUIT	14.4	0.4527	0.0100
C10	7	6	CONDUIT	7.2	2.7789	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	9.1518	0.0160
C11	6	1	CONDUIT	7.9	1.0166	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	4.8832	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	18.4207	0.0100
C13	11	6	CONDUIT	15.3	4.5761	0.0100
C13-S	11-S	6-S	CONDUIT	15.3	6.2487	0.0100
C14	13	PIPE	CONDUIT	10.2	1.5719	0.0100
C14-S	13-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	5	PIPE2	CONDUIT	6.5	2.3671	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.3922	0.0100
C17	PIPE2	13	CONDUIT	35.9	1.3937	0.0100
C17-S	PIPE2-S	13-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	0.4523	0.0100
C21	4-S	2-S	CONDUIT	42.7	3.3518	0.0160
C22	2-S	PIPE-S	CONDUIT	53.4	2.2482	0.0160
C23	ROOF_DRAIN	7	CONDUIT	13.2	4.5340	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
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3	1	PIPE2	CONDUIT	5.0	1.6070	0.0100
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	45.5	2.5508	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	1.1251	0.0100
C6	4	3	CONDUIT	8.0	2.5008	0.0100
C7	10	9	CONDUIT	15.3	4.5800	0.0100

C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160
C8	9	8	CONDUIT	8.1	4.9351	0.0100
C8-S	9-S	8-S	CONDUIT	8.1	2.5887	0.0160
C9	8	7	CONDUIT	37.6	0.1863	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	2.3693	0.0160
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	5-S	5	OUTLET			
J114-IC	13-s	13	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	OUTLET			
OR1	PIPE-S	PIPE	OUTLET			

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Cross Section Summary
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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	0.21
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	3.02
C11	CIRCULAR	0.30	0.07	0.07	0.30	1	0.13
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	0.28
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.16
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	1.84
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.70
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.66
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	2.10
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.83

C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.50
C23	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	0.71
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	0.59
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	0.13
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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	0.28
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.60
C9	CIRCULAR	1.05	0.87	0.26	1.05	1	1.53
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.53

****
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 ......         0.301        71.091
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.088        20.718
Surface Runoff ...........         0.211        49.720
Final Storage ............         0.000         0.102
Continuity Error (%) .....         0.776


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.211         2.108
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........        10.624       106.240
External Outflow .........        10.849       108.493
```

```
Flooding Loss ...........         0.051         0.513
Evaporation Loss .........        0.000         0.000
Exfiltration Loss ........        0.000         0.000
Initial Stored Volume ....        0.000         0.000
Final Stored Volume ......        0.023         0.232
Continuity Error (%) .....       -0.821


*************************
Highest Continuity Errors
*************************
Node 6-S (27.33%)
Node 2 (25.27%)
Node 13-s (-3.51%)
Node EXMH1-S (1.21%)


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


********************************
Highest Flow Instability Indexes
********************************
Link J106-IC (115)
Link J100-IC (83)
Link C3 (59)
Link J103-IC (52)
Link C1 (48)


*********************************
Most Frequent Nonconverging Nodes
*********************************
Node OF1 (48.92%)
Node OF-S (48.92%)
Node 2 (37.43%)
Node 5 (32.08%)
Node PIPE (31.74%)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.15 sec
Average Time Step           :     0.20 sec
```

```
Maximum Time Step           :     0.20 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     6.23
% of Steps Not Converging   :    48.92
Time Step Frequencies       :
    0.200 -  0.152 sec      :   100.00 %
    0.152 -  0.115 sec      :     0.00 %
    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
EX2	71.09	0.00	0.00	20.62	17.78	32.71	50.49	0.94	1.07	0.710
EX3REM	71.09	0.00	0.00	20.62	17.78	32.71	50.49	0.48	0.54	0.710
POST1	71.09	0.00	0.00	15.32	55.66	37.85	55.66	0.02	0.01	0.783
POST2	71.09	0.00	0.00	19.88	17.82	33.28	51.10	0.12	0.10	0.719
POST2A	71.09	0.00	0.00	23.08	47.77	29.98	47.77	0.19	0.12	0.672
POST3	71.09	0.00	0.00	15.22	17.83	38.04	17.83	0.00	0.00	0.251
POST4	71.09	0.00	0.00	15.22	17.83	38.04	17.83	0.01	0.01	0.251
POST5	71.09	0.00	0.00	15.20	17.82	38.06	55.89	0.07	0.07	0.786
POST5A	71.09	0.00	0.00	15.15	17.78	38.22	56.00	0.05	0.06	0.788
POST6	71.09	0.00	0.00	22.82	17.82	48.21	48.21	0.18	0.14	0.678
POST7	71.09	0.00	0.00	25.26	17.81	28.00	45.81	0.02	0.02	0.644

POST8	71.09	0.00	0.00	25.16	17.78	28.16	45.94	0.02

0.03 0.646

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
1	JUNCTION	1.24	2.86	455.66	0 00:01	2.03
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	0.03	0.23	455.13	0 01:05	0.23
11-S	JUNCTION	0.00	0.00	457.00	0 01:05	0.00
12	JUNCTION	0.03	0.13	456.58	0 01:03	0.12
12-S	JUNCTION	0.00	0.07	460.97	0 01:05	0.07
13	JUNCTION	2.03	2.50	454.50	0 00:00	2.50
13-s	JUNCTION	0.00	0.06	454.36	0 01:05	0.06
1-S	JUNCTION	0.00	0.00	455.46	0 01:05	0.00
2	JUNCTION	1.04	2.66	455.66	0 00:01	2.49
2-S	JUNCTION	0.00	0.00	455.46	0 00:01	0.00
3	JUNCTION	0.07	3.09	457.09	0 01:00	0.88
3-S	JUNCTION	0.00	0.09	456.98	0 01:05	0.09
4	JUNCTION	0.02	2.79	457.09	0 01:00	2.31
4-S	JUNCTION	0.00	0.00	456.89	0 01:00	0.00
5	JUNCTION	0.95	1.90	455.00	0 00:01	1.90
5-S	JUNCTION	0.16	0.17	454.97	0 01:00	0.17
6	JUNCTION	1.05	3.24	456.25	0 01:00	1.96
6-S	JUNCTION	0.00	0.00	456.05	0 01:00	0.00
7	JUNCTION	0.03	0.61	455.01	0 01:05	0.61
7-S	JUNCTION	0.00	0.00	456.70	0 01:05	0.00
8	JUNCTION	0.03	0.44	455.01	0 01:06	0.44
8-S	JUNCTION	0.00	0.05	457.64	0 01:05	0.05
9	JUNCTION	0.01	0.06	456.26	0 01:05	0.06
9-S	JUNCTION	0.00	0.00	457.80	0 00:00	0.00
EXMH1	JUNCTION	1.45	2.48	453.30	0 00:00	1.56
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 01:06	0.06
EXMH3	JUNCTION	3.17	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	2.04	2.58	454.99	0 00:01	2.33
EXPONDOUTLET	JUNCTION	1.17	2.78	470.86	0 00:00	1.18
J116	JUNCTION	0.03	0.07	460.07	0 01:01	0.07

PIPE	JUNCTION	2.88	3.31	454.46	0	00:00	3.32
PIPE2	JUNCTION	1.34	2.96	455.66	0	00:01	2.02
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	01:07	0.00
PIPE-S	JUNCTION	0.00	0.07	454.33	0	01:05	0.07
ROOF_DRAIN	JUNCTION	0.01	0.09	455.89	0	01:05	0.09
OF1	OUTFALL	1.00	1.00	451.74	0	00:00	1.00
OF-S	OUTFALL	0.00	0.06	452.06	0	01:06	0.06

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
1	JUNCTION	0.000	0.634	0 00:01	0	0.705	0.605
10	JUNCTION	0.000	0.021	0 01:05	0	0.0229	0.367
10-S	JUNCTION	0.021	0.021	0 01:05	0.0228	0.0228	-0.408
11	JUNCTION	0.000	0.135	0 01:05	0	0.209	-0.020
11-S	JUNCTION	0.000	0.035	0 01:05	0	0.00512	-0.002
12	JUNCTION	0.000	0.100	0 01:02	0	0.205	0.654
12-S	JUNCTION	0.136	0.136	0 01:05	0.183	0.183	-12.794
13	JUNCTION	0.000	1.668	0 00:00	0	1.57	0.158
13-s	JUNCTION	0.000	0.100	0 00:00	0	0.0211	-3.389
1-S	JUNCTION	0.010	0.092	0 01:05	0.00891	0.0331	0.101
2	JUNCTION	0.000	0.111	0 00:01	0	0.00431	33.806
2-S	JUNCTION	0.004	0.050	0 00:01	0.00357	0.00359	0.217
3	JUNCTION	0.000	0.121	0 01:01	0	0.31	0.143
3-S	JUNCTION	0.116	0.206	0 01:05	0.189	0.31	-0.011
4	JUNCTION	0.000	0.110	0 01:00	0	0.0223	0.816
4-S	JUNCTION	0.012	0.012	0 01:05	0.0167	0.0167	-24.036
5	JUNCTION	0.000	0.125	0 00:01	0	0.849	-0.571
5-S	JUNCTION	0.026	0.050	0 00:01	0.023	0.0234	-97.240
6	JUNCTION	0.000	0.225	0 01:06	0	0.352	0.356
6-S	JUNCTION	0.000	0.025	0 01:00	0	5.01e-06	1.368 ltr
7	JUNCTION	0.000	0.118	0 01:04	0	0.139	0.182
7-S	JUNCTION	0.000	0.015	0 01:05	0	0.00157	-0.003
8	JUNCTION	0.000	0.071	0 01:05	0	0.091	-0.114
8-S	JUNCTION	0.069	0.069	0 01:05	0.0696	0.0696	-0.202
9	JUNCTION	0.000	0.021	0 01:05	0	0.0228	0.002
9-S	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
EXMH1	JUNCTION	0.000	5.484	0 01:05	0	108	0.007
EXMH12	JUNCTION	1.072	6.984	0 00:00	0.944	107	0.026
EXMH17	JUNCTION	0.000	5.061	0 00:00	0	106	0.033

EXMH1-S	JUNCTION	0.000	0.140	0	01:05	0	0.102	1.227
EXMH3	JUNCTION	0.000	8.666	0	00:00	0	107	0.003
EXMH3-S	JUNCTION	0.000	0.100	0	00:00	0	0.136	-4.295
EXMH6	JUNCTION	0.000	8.234	0	00:00	0	107	0.024
EXPONDOUTLET	JUNCTION	4.919	4.919	0	00:00	106	106	0.023
J116	JUNCTION	0.095	0.095	0	01:05	0.121	0.121	-0.312
PIPE	JUNCTION	0.545	8.668	0	00:00	0.48	109	0.059
PIPE2	JUNCTION	0.000	0.636	0	00:01	0	1.56	0.623
PIPE2-S	JUNCTION	0.000	0.000	0	00:01	0	9.93e-07	0.992 ltr
PIPE-S	JUNCTION	0.000	0.186	0	00:01	0	0.125	-0.082
ROOF_DRAIN	JUNCTION	0.056	0.056	0	01:05	0.0467	0.0467	-0.000
OF1	OUTFALL	0.000	5.485	0	01:05	0	108	0.000
OF-S	OUTFALL	0.000	0.138	0	01:06	0	0.101	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	2.335	0.000
13	JUNCTION	5.98	1.775	0.000
2	JUNCTION	5.98	2.360	0.000
3	JUNCTION	0.19	2.640	0.000
4	JUNCTION	0.16	2.490	0.000
5	JUNCTION	5.98	1.600	0.000
5-S	JUNCTION	5.89	0.060	0.230
6	JUNCTION	0.18	1.745	0.000
EXMH1	JUNCTION	5.99	1.460	0.000
EXMH3	JUNCTION	5.99	1.840	0.000
EXPONDOUTLET	JUNCTION	0.01	1.580	0.000
PIPE	JUNCTION	5.99	2.095	0.000
PIPE2	JUNCTION	5.98	2.415	0.000

****
Node Flooding Summary
****

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

	Maximum	Time of Max	Total Flood	Maximum Ponded

Node	Hours Flooded	Rate CMS	Occurrence days	hr:min	Volume 10^6 ltr	Depth Meters
1	0.01	0.194	0	00:01	0.000	0.200
13	0.36	1.617	0	00:00	0.043	0.200
2	0.01	0.066	0	00:01	0.000	0.200
3	0.01	0.080	0	01:00	0.000	0.200
4	0.01	0.079	0	01:00	0.000	0.200
5	0.07	0.098	0	00:01	0.003	0.200
6	0.01	0.058	0	01:00	0.000	0.200
EXMH1	0.01	1.430	0	00:00	0.002	0.200
EXMH3	0.69	2.237	0	00:00	0.400	0.200
EXPONDOUTLET	0.01	3.364	0	00:00	0.006	0.000
PIPE	0.23	7.568	0	00:00	0.058	0.200
PIPE2	0.01	0.423	0	00:01	0.000	0.200

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.86	5.026	5.485	108.391
OF-S	9.70	0.048	0.138	0.101
System	54.78	5.074	5.623	108.492

****
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	0.051	0.001
C11-S	0.000	0.049	0.002
C14-S	0.043	2.811	0.066
C17-S	0.000	1.015	0.030
C18	0.138	2.377	0.058
C19	0.091	3.291	0.076
C1-S	0.106	2.949	0.069
C21	0.000	0.051	0.003
C22	0.000	1.309	0.036
C2-S	0.140	2.742	0.065
C3-S	0.000	0.049	0.002
C4-S	0.085	1.723	0.044
C7-S	0.000	0.052	0.001
C8-S	0.000	0.831	0.027
C9-S	0.015	0.853	0.027

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	8.666	0 00:00	11.03	4.13	1.00
C10	CONDUIT	0.107	0 01:07	2.00	0.51	1.00
C10-S	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C11	CONDUIT	0.225	0 01:06	3.18	1.77	1.00
C11-S	CONDUIT	0.000	0 01:00	0.00	0.00	0.01
C12	CONDUIT	0.101	0 01:03	3.62	0.36	0.42
C12-S	CONDUIT	0.035	0 01:05	8.73	0.01	0.12
C13	CONDUIT	0.136	0 01:05	2.81	0.51	0.89
C13-S	CONDUIT	0.000	0 00:00	0.00	0.00	0.00
C14	CONDUIT	1.668	0 00:00	7.71	2.38	1.00
C14-S	CONDUIT	0.043	0 01:05	0.74	0.03	0.34
C15	CONDUIT	0.125	0 00:01	1.77	0.64	1.00
C16	CONDUIT	5.485	0 01:05	6.98	2.81	1.00
C17	CONDUIT	0.636	0 00:01	3.13	0.96	1.00
C17-S	CONDUIT	0.000	0 01:07	0.00	0.00	0.15
C18	CONDUIT	0.138	0 01:06	1.20	0.03	0.29
C19	CONDUIT	0.091	0 01:05	2.47	0.05	0.39
C1-S	CONDUIT	0.106	0 01:00	1.72	0.05	0.35
C2	CONDUIT	5.484	0 01:05	6.98	2.62	1.00
C21	CONDUIT	0.000	0 01:01	0.00	0.00	0.02
C22	CONDUIT	0.000	0 00:01	0.02	0.00	0.18
C23	CONDUIT	0.056	0 01:05	3.02	0.21	0.31

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	8.666	0	00:00	4.90	0.44	1.00
C2-S	CONDUIT	0.140	0	01:05	1.12	0.05	0.33
C3	CONDUIT	0.634	0	00:01	3.90	0.89	1.00
C3-S	CONDUIT	0.000	0	00:01	0.00	0.00	0.01
C4	CONDUIT	0.119	0	01:11	0.75	0.20	1.00
C4-S	CONDUIT	0.085	0	01:05	2.78	0.05	0.23
C5	CONDUIT	0.111	0	00:01	1.71	0.83	1.00
C6	CONDUIT	0.096	0	01:00	1.45	0.48	1.00
C7	CONDUIT	0.021	0	01:05	2.27	0.08	0.19
C7-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C8	CONDUIT	0.021	0	01:05	2.33	0.08	0.19
C8-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
C9	CONDUIT	0.082	0	01:06	0.84	0.05	0.45
C9-S	CONDUIT	0.015	0	01:05	1.83	0.01	0.14
J100-IC	DUMMY	0.050	0	01:00			
J101-IC	DUMMY	0.100	0	01:00			
J102-IC	DUMMY	0.050	0	00:01			
J103-IC	DUMMY	0.092	0	01:05			
J104-IC	DUMMY	0.025	0	01:00			
J105-IC	DUMMY	0.035	0	01:05			
J106-IC	DUMMY	0.100	0	01:02			
J107-IC	DUMMY	0.015	0	01:05			
J108-IC	DUMMY	0.050	0	01:02			
J111-IC	DUMMY	0.100	0	00:00			
J112-IC	DUMMY	0.050	0	00:01			
J114-IC	DUMMY	0.100	0	00:00			
J98-IC	DUMMY	0.021	0	01:05			
J99-IC	DUMMY	0.000	0	00:00			
OR1	DUMMY	0.100	0	00:00			

****
Flow Classification Summary
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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	0.04	0.02	0.00	0.94	0.03	0.00
C10-S	1.00	0.99	0.00	0.00	0.01	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	0.69	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00

C12	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C12-S	1.00	0.52	0.00	0.00	0.47	0.01	0.00	0.00	0.00	0.00
C13	1.00	0.01	0.00	0.00	0.01	0.05	0.00	0.93	0.03	0.00
C13-S	1.00	0.99	0.00	0.00	0.01	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	0.72	0.20	0.00	0.07	0.01	0.00	0.00	0.04	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	0.17	0.01	0.00	0.82	0.00	0.00	0.00	0.82	0.00
C18	1.00	0.00	0.00	0.00	0.67	0.33	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	0.02	0.00
C1-S	1.00	0.65	0.00	0.00	0.01	0.34	0.00	0.00	0.03	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.53	0.14	0.00	0.33	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.59	0.11	0.00	0.29	0.00	0.00	0.00	1.00	0.00
C23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	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
C2-S	1.00	0.00	0.72	0.00	0.22	0.06	0.00	0.00	0.94	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3-S	1.00	0.07	0.62	0.00	0.29	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.64	0.00
C4-S	1.00	0.22	0.00	0.00	0.74	0.04	0.00	0.00	0.17	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	0.00	0.00	0.00	0.11	0.03	0.00	0.86	0.09	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	0.47	0.00	0.00	0.53	0.00	0.00	0.00	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	0.36	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
C9-S	1.00	0.36	0.00	0.00	0.62	0.02	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
****

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	0.16	0.16	0.18	0.01	0.01
C11	5.98	5.98	5.98	0.17	0.24

C13	0.01	0.01	0.18	0.01	0.01
C14	5.99	5.99	5.99	0.01	0.15
C15	5.97	5.97	5.98	0.01	0.14
C16	0.01	5.99	0.01	5.99	0.01
C17	5.98	5.98	5.98	0.01	0.04
C2	5.99	5.99	5.99	5.99	5.99
C25	0.01	0.01	0.01	6.00	0.01
C28	5.98	5.98	5.99	0.01	0.01
C3	5.98	5.98	5.98	0.01	0.02
C4	0.19	0.19	5.98	0.01	0.01
C5	5.98	5.98	5.98	0.01	0.07
C6	0.15	0.15	0.21	0.01	0.01

```
Analysis begun on:  Sat Jun 15 13:50:01 2024
Analysis ended on:  Sat Jun 15 13:50:16 2024
Total elapsed time: 00:00:15
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100 Year Storm – Control

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


*************
Element Count
*************
Number of rain gages ...... 7
Number of subcatchments ... 12
Number of nodes ........... 43
Number of links ........... 55
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_10year    Chicago_3h_10year                    INTENSITY    5 min.
Chicago_3h_25year    Chicago_3h_25year                    INTENSITY    5 min.
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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.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EX2	1.87	1870.00	25.00	2.0000	Chicago_3h_100year	EXMH12
EX3REM	0.95	950.00	25.00	2.0000	Chicago_3h_100year	PIPE
POST1	0.03	4.00	25.00	4.0000	Chicago_3h_100year	4-S
POST2	0.24	23.77	25.00	6.0000	Chicago_3h_100year	J116
POST2A	0.39	26.33	25.00	6.0000	Chicago_3h_100year	3-S
POST3	0.02	5.41	25.00	3.0000	Chicago_3h_100year	2-S
POST4	0.05	13.51	25.00	3.0000	Chicago_3h_100year	1-S
POST5	0.12	41.53	25.00	2.5000	Chicago_3h_100year	8-S
POST5A	0.08	83.40	25.00	10.0000	Chicago_3h_100year	ROOF_DRAIN
POST6	0.38	38.00	25.00	10.0000	Chicago_3h_100year	12-S
POST7	0.05	8.28	25.00	10.0000	Chicago_3h_100year	10-S
POST8	0.05	20.00	25.00	15.0000	Chicago_3h_100year	5-S

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
1	JUNCTION	452.80	2.66	0.0	
10	JUNCTION	457.00	3.44	0.0	
10-S	JUNCTION	460.44	0.30	0.0	
11	JUNCTION	454.90	2.10	0.0	
11-S	JUNCTION	457.00	0.30	0.0	
12	JUNCTION	456.45	4.45	0.0	
12-S	JUNCTION	460.90	0.30	0.0	
13	JUNCTION	452.00	2.30	0.0	
13-s	JUNCTION	454.30	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	453.10	1.70	0.0	
5-S	JUNCTION	454.80	0.40	0.0	

6	JUNCTION	453.00	3.04	0.0	
6-S	JUNCTION	456.05	0.30	0.0	
7	JUNCTION	454.40	2.30	0.0	
7A	JUNCTION	454.40	2.30	0.0	
7-S	JUNCTION	456.70	0.20	0.0	
8	JUNCTION	454.57	3.02	0.0	
8-S	JUNCTION	457.59	0.20	0.0	
9	JUNCTION	456.20	1.60	0.0	
9-S	JUNCTION	457.80	0.20	0.0	
EXMH1	JUNCTION	450.82	2.28	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
J116	JUNCTION	460.00	0.30	0.0	
PIPE	JUNCTION	451.14	3.12	0.0	
PIPE2	JUNCTION	452.70	2.76	0.0	
PIPE2-S	JUNCTION	455.30	0.30	0.0	
PIPE-S	JUNCTION	454.26	0.24	0.0	
ROOF_DRAIN	JUNCTION	455.80	2.44	0.0	
OF1	OUTFALL	450.74	1.00	0.0	
OF-S	OUTFALL	452.00	0.20	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	EXMH3	PIPE	CONDUIT	14.4	0.4527	0.0100
C10	7A	6	CONDUIT	7.2	2.7789	0.0100
C10-S	7-S	6-S	CONDUIT	7.2	9.1518	0.0160
C11	6	1	CONDUIT	7.9	1.0166	0.0100
C11-S	6-S	1-S	CONDUIT	7.9	7.4539	0.0160
C12	12	11	CONDUIT	21.5	4.8832	0.0100
C12-S	12-S	11-S	CONDUIT	21.5	18.4207	0.0100
C13	11	6	CONDUIT	15.3	4.5761	0.0100
C13-S	11-S	6-S	CONDUIT	15.3	6.2487	0.0100
C14	13	PIPE	CONDUIT	10.2	1.5719	0.0100
C14-S	13-s	PIPE-S	CONDUIT	10.2	0.3929	0.0160
C15	5	PIPE2	CONDUIT	6.5	2.3671	0.0100
C16	EXMH1	OF1	CONDUIT	20.4	0.3922	0.0100
C17	PIPE2	13	CONDUIT	35.9	1.3937	0.0100
C17-S	PIPE2-S	13-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	0.4523	0.0100
C21	4-S	2-S	CONDUIT	42.7	3.3518	0.0160
C22	2-S	PIPE-S	CONDUIT	53.4	2.2482	0.0160
C23	ROOF_DRAIN	7	CONDUIT	13.2	4.5340	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
C2-S	PIPE-S	EXMH1-S	CONDUIT	67.4	1.7206	0.0160
C3	1	PIPE2	CONDUIT	5.0	1.6070	0.0100
C3-S	1-S	PIPE2-S	CONDUIT	5.0	3.2152	0.0160
C4	3	1	CONDUIT	45.5	2.5508	0.0100
C4-S	3-S	1-S	CONDUIT	45.5	3.1451	0.0160
C5	2	1	CONDUIT	8.0	1.1251	0.0100
C6	4	3	CONDUIT	8.0	2.5008	0.0100
C7	10	9	CONDUIT	15.3	4.5800	0.0100
C7-S	10-S	9-S	CONDUIT	13.9	19.3536	0.0160
C8	9	8	CONDUIT	8.1	4.9351	0.0100
C8-S	9-S	8-S	CONDUIT	8.1	2.5887	0.0160
C9	8	7	CONDUIT	37.6	0.1863	0.0100
C9-S	8-S	7-S	CONDUIT	37.6	2.3693	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	5-S	5	OUTLET			
J114-IC	13-s	13	OUTLET			
J98-IC	10-S	10	OUTLET			
J99-IC	9-S	9	OUTLET			
OR1	PIPE-S	PIPE	OUTLET			

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Cross Section Summary
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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	0.21
C10-S	Emma_St_half	0.20	0.62	0.13	5.80	1	3.02
C11	CIRCULAR	0.30	0.07	0.07	0.30	1	0.13
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	0.28
C12-S	TRIANGULAR	0.30	0.27	0.14	1.80	1	3.16
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	1.84
C14	CIRCULAR	0.53	0.22	0.13	0.53	1	0.70
C14-S	Emma_St	0.20	1.23	0.13	11.60	1	1.24
C15	CIRCULAR	0.30	0.07	0.07	0.30	1	0.19
C16	CIRCULAR	1.00	0.79	0.25	1.00	1	1.95
C17	CIRCULAR	0.53	0.22	0.13	0.53	1	0.66
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	2.10
C21	Emma_St_half	0.20	0.62	0.13	5.80	1	1.83
C22	Emma_St_half	0.20	0.62	0.13	5.80	1	1.50
C23	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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
C2-S	Emma_St	0.20	1.23	0.13	11.60	1	2.60
C3	CIRCULAR	0.53	0.22	0.13	0.53	1	0.71
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	0.59
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	0.13
C6	CIRCULAR	0.30	0.07	0.07	0.30	1	0.20
C7	CIRCULAR	0.30	0.07	0.07	0.30	1	0.27
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	0.28
C8-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.60
C9	CIRCULAR	1.05	0.87	0.26	1.05	1	1.53
C9-S	Emma_St_half	0.20	0.62	0.13	5.80	1	1.53

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Street Summary
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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
```

```
**************************        hectare-m             mm
Runoff Quantity Continuity        ---------        -------
**************************
Total Precipitation ......            0.301         71.091
Evaporation Loss .........            0.000          0.000
Infiltration Loss ........            0.088         20.718
Surface Runoff ...........            0.211         49.720
Final Storage ............            0.000          0.102
Continuity Error (%) .....            0.776


**************************           Volume         Volume
Flow Routing Continuity           hectare-m       10^6 ltr
**************************        ---------      ---------
Dry Weather Inflow .......            0.000          0.000
Wet Weather Inflow .......            0.211          2.108
Groundwater Inflow .......            0.000          0.000
RDII Inflow ..............            0.000          0.000
External Inflow ..........           10.624        106.240
External Outflow .........           10.850        108.502
Flooding Loss ............            0.049          0.493
Evaporation Loss .........            0.000          0.000
Exfiltration Loss ........            0.000          0.000
Initial Stored Volume ....            0.000          0.000
Final Stored Volume ......            0.023          0.232
Continuity Error (%) .....           -0.812


*************************
Highest Continuity Errors
*************************
Node 2 (28.30%)
Node 6-S (22.11%)
Node 13-s (-3.38%)
Node EXMH1-S (1.18%)


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


********************************
Highest Flow Instability Indexes
********************************
Link J106-IC (115)
Link J100-IC (84)
Link C3 (60)
```

Link J103-IC (53)
Link C1 (48)

****
Most Frequent Nonconverging Nodes
****
Node OF1 (48.93%)
Node OF-S (48.93%)
Node 2 (37.44%)
Node 5 (32.28%)
Node PIPE (31.82%)

****
Routing Time Step Summary
****

Minimum Time Step	:	0.03 sec
Average Time Step	:	0.20 sec
Maximum Time Step	:	0.20 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	6.23
% of Steps Not Converging	:	48.93
Time Step Frequencies	:	
0.200 - 0.152 sec	:	100.00 %
0.152 - 0.115 sec	:	0.00 %
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
EX2	71.09	0.00	0.00	20.62	17.78	32.71	50.49	0.94	1.07	0.710

EX3REM	71.09	0.00	0.00	20.62	17.78	32.71	50.49	0.48	0.54	0.710
POST1	71.09	0.00	0.00	15.32	55.66	37.85	55.66	0.02	0.01	0.783
POST2	71.09	0.00	0.00	19.88	17.82	33.28	51.10	0.12	0.10	0.719
POST2A	71.09	0.00	0.00	23.08	47.77	29.98	47.77	0.19	0.12	0.672
POST3	71.09	0.00	0.00	15.22	17.83	38.04	17.83	0.00	0.00	0.251
POST4	71.09	0.00	0.00	15.22	17.83	38.04	17.83	0.01	0.01	0.251
POST5	71.09	0.00	0.00	15.20	17.82	38.06	55.89	0.07	0.07	0.786
POST5A	71.09	0.00	0.00	15.15	17.78	38.22	56.00	0.05	0.06	0.788
POST6	71.09	0.00	0.00	22.82	17.82	48.21	48.21	0.18	0.14	0.678
POST7	71.09	0.00	0.00	25.26	17.81	28.00	45.81	0.02	0.02	0.644
POST8	71.09	0.00	0.00	25.16	17.78	28.16	45.94	0.02	0.03	0.646

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
1	JUNCTION	1.24	2.86	455.66	0 00:01	1.96
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	0.03	0.19	455.09	0 01:05	0.19
11-S	JUNCTION	0.00	0.00	457.00	0 01:05	0.00
12	JUNCTION	0.03	0.13	456.58	0 01:03	0.12
12-S	JUNCTION	0.00	0.07	460.97	0 01:05	0.07
13	JUNCTION	2.03	2.50	454.50	0 00:00	2.50
13-s	JUNCTION	0.00	0.06	454.36	0 01:05	0.06
1-S	JUNCTION	0.00	0.00	455.46	0 01:05	0.00
2	JUNCTION	1.04	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	0.07	3.09	457.09	0 01:00	1.11
3-S	JUNCTION	0.00	0.09	456.98	0 01:05	0.09
4	JUNCTION	0.02	2.79	457.09	0 01:00	0.73

4-S	JUNCTION	0.00	0.01	456.90	0	01:01	0.01
5	JUNCTION	0.95	1.90	455.00	0	00:01	1.90
5-S	JUNCTION	0.14	0.15	454.95	0	01:00	0.15
6	JUNCTION	1.05	3.24	456.25	0	01:01	1.82
6-S	JUNCTION	0.00	0.00	456.05	0	01:01	0.00
7	JUNCTION	0.12	2.16	456.56	0	01:08	1.20
7A	JUNCTION	0.03	0.95	455.35	0	01:08	0.42
7-S	JUNCTION	0.00	0.00	456.70	0	01:05	0.00
8	JUNCTION	0.08	1.00	455.57	0	01:10	0.99
8-S	JUNCTION	0.00	0.05	457.64	0	01:05	0.05
9	JUNCTION	0.01	0.06	456.26	0	01:05	0.06
9-S	JUNCTION	0.00	0.00	457.80	0	00:00	0.00
EXMH1	JUNCTION	1.45	2.48	453.30	0	00:00	1.56
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	01:06	0.06
EXMH3	JUNCTION	3.17	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	2.04	2.58	454.99	0	00:01	2.33
EXPONDOUTLET	JUNCTION	1.17	2.78	470.86	0	00:00	1.18
J116	JUNCTION	0.03	0.07	460.07	0	01:01	0.07
PIPE	JUNCTION	2.88	3.31	454.46	0	00:00	3.32
PIPE2	JUNCTION	1.34	2.96	455.66	0	00:01	2.06
PIPE2-S	JUNCTION	0.00	0.00	455.30	0	01:07	0.00
PIPE-S	JUNCTION	0.00	0.07	454.33	0	01:05	0.07
ROOF_DRAIN	JUNCTION	0.01	0.09	455.89	0	01:05	0.09
OF1	OUTFALL	1.00	1.00	451.74	0	00:00	1.00
OF-S	OUTFALL	0.00	0.06	452.06	0	01:06	0.06

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
1	JUNCTION	0.000	0.634	0 00:01	0	0.706	0.474
10	JUNCTION	0.000	0.021	0 01:05	0	0.0229	0.366
10-S	JUNCTION	0.021	0.021	0 01:05	0.0228	0.0228	-0.404
11	JUNCTION	0.000	0.135	0 01:05	0	0.209	-0.015
11-S	JUNCTION	0.000	0.035	0 01:05	0	0.00512	-0.001
12	JUNCTION	0.000	0.100	0 01:02	0	0.205	0.651
12-S	JUNCTION	0.136	0.136	0 01:05	0.183	0.183	-12.807
13	JUNCTION	0.000	1.668	0 00:00	0	1.56	0.119

13-s	JUNCTION	0.000	0.100	0	00:00	0	0.02	-3.272	
1-S	JUNCTION	0.010	0.092	0	01:05	0.00891	0.0331	0.092	
2	JUNCTION	0.000	0.111	0	00:01	0	0.00443	39.465	
2-S	JUNCTION	0.004	0.050	0	00:01	0.00357	0.00359	0.078	
3	JUNCTION	0.000	0.122	0	01:03	0	0.31	0.127	
3-S	JUNCTION	0.116	0.206	0	01:05	0.189	0.31	-0.009	
4	JUNCTION	0.000	0.106	0	01:00	0	0.0224	0.710	
4-S	JUNCTION	0.012	0.056	0	01:00	0.0167	0.0167	-24.524	
5	JUNCTION	0.000	0.125	0	00:01	0	0.84	-0.404	
5-S	JUNCTION	0.026	0.050	0	00:01	0.023	0.0237	-97.171	
6	JUNCTION	0.000	0.216	0	00:01	0	0.353	0.370	
6-S	JUNCTION	0.000	0.025	0	01:01	0	5.01e-06	1.108	ltr
7	JUNCTION	0.000	0.186	0	01:05	0	0.146	-0.120	
7A	JUNCTION	0.000	0.067	0	01:01	0	0.14	-0.015	
7-S	JUNCTION	0.000	0.015	0	01:05	0	0.00157	-0.003	
8	JUNCTION	0.000	0.155	0	01:05	0	0.0979	0.126	
8-S	JUNCTION	0.069	0.069	0	01:05	0.0696	0.0696	-0.203	
9	JUNCTION	0.000	0.021	0	01:05	0	0.0228	0.002	
9-S	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
EXMH1	JUNCTION	0.000	5.484	0	01:05	0	108	0.007	
EXMH12	JUNCTION	1.072	6.984	0	00:00	0.944	107	0.026	
EXMH17	JUNCTION	0.000	5.061	0	00:00	0	106	0.033	
EXMH1-S	JUNCTION	0.000	0.135	0	01:05	0	0.103	1.195	
EXMH3	JUNCTION	0.000	8.666	0	00:00	0	107	0.003	
EXMH3-S	JUNCTION	0.000	0.100	0	00:00	0	0.139	-4.120	
EXMH6	JUNCTION	0.000	8.234	0	00:00	0	107	0.024	
EXPONDOUTLET	JUNCTION	4.919	4.919	0	00:00	106	106	0.023	
J116	JUNCTION	0.095	0.095	0	01:05	0.121	0.121	-0.325	
PIPE	JUNCTION	0.545	8.668	0	00:00	0.48	109	0.061	
PIPE2	JUNCTION	0.000	0.636	0	00:01	0	1.55	0.671	
PIPE2-S	JUNCTION	0.000	0.000	0	00:01	0	9.95e-07	0.994	ltr
PIPE-S	JUNCTION	0.000	0.186	0	00:01	0	0.126	-0.376	
ROOF_DRAIN	JUNCTION	0.056	0.056	0	01:05	0.0467	0.0467	0.148	
OF1	OUTFALL	0.000	5.485	0	01:05	0	108	0.000	
OF-S	OUTFALL	0.000	0.134	0	01:06	0	0.102	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	2.335	0.000

13	JUNCTION	5.98	1.775	0.000
2	JUNCTION	5.98	2.360	0.000
3	JUNCTION	0.20	2.640	0.000
4	JUNCTION	0.14	2.490	0.000
5	JUNCTION	5.98	1.600	0.000
5-S	JUNCTION	5.89	0.039	0.251
6	JUNCTION	0.18	1.745	0.000
7	JUNCTION	0.01	1.012	0.138
7A	JUNCTION	0.08	0.655	1.345
EXMH1	JUNCTION	5.99	1.460	0.000
EXMH3	JUNCTION	5.99	1.840	0.000
EXPONDOUTLET	JUNCTION	0.01	1.580	0.000
PIPE	JUNCTION	5.99	2.095	0.000
PIPE2	JUNCTION	5.98	2.415	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	0.194	0 00:01	0.000	0.200
13	0.38	1.617	0 00:00	0.046	0.200
2	0.01	0.066	0 00:01	0.000	0.200
3	0.01	0.100	0 01:00	0.000	0.200
4	0.01	0.075	0 01:00	0.000	0.200
5	0.10	0.098	0 00:01	0.005	0.200
6	0.01	0.081	0 01:01	0.000	0.200
EXMH1	0.01	1.430	0 00:00	0.002	0.200
EXMH3	0.70	2.237	0 00:00	0.376	0.200
EXPONDOUTLET	0.01	3.364	0 00:00	0.006	0.000
PIPE	0.24	7.568	0 00:00	0.058	0.200
PIPE2	0.01	0.423	0 00:01	0.000	0.200

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CMS	CMS	10^6 ltr
OF1	99.86	5.026	5.485	108.400
OF-S	9.95	0.047	0.134	0.102
System	54.91	5.073	5.618	108.501

****
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	0.050	0.001									
C11-S	0.000	0.049	0.002									
C14-S	0.039	2.737	0.065									
C17-S	0.000	0.959	0.029									
C18	0.134	2.346	0.057									
C19	0.091	3.291	0.076									
C1-S	0.106	2.929	0.069									
C21	0.000	0.066	0.005									
C22	0.000	1.289	0.036									
C2-S	0.135	2.708	0.064									
C3-S	0.000	0.049	0.002									
C4-S	0.085	1.723	0.044									
C7-S	0.000	0.052	0.001									
C8-S	0.000	0.831	0.027									
C9-S	0.015	0.853	0.027									

****
Link Flow Summary
****

	Maximum |Flow|	Time of Max Occurrence	Maximum |Veloc|	Max/ Full	Max/ Full

Link	Type	CMS	days	hr:min	m/sec	Flow	Depth
C1	CONDUIT	8.666	0	00:00	11.03	4.13	1.00
C10	CONDUIT	0.064	0	01:10	2.34	0.30	1.00
C10-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.01
C11	CONDUIT	0.216	0	00:01	3.06	1.71	1.00
C11-S	CONDUIT	0.000	0	01:01	0.00	0.00	0.01
C12	CONDUIT	0.101	0	01:03	3.62	0.36	0.42
C12-S	CONDUIT	0.035	0	01:05	8.73	0.01	0.12
C13	CONDUIT	0.137	0	01:05	2.68	0.51	0.82
C13-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C14	CONDUIT	1.668	0	00:00	7.71	2.38	1.00
C14-S	CONDUIT	0.039	0	01:05	0.60	0.03	0.33
C15	CONDUIT	0.125	0	00:01	1.77	0.64	1.00
C16	CONDUIT	5.485	0	01:05	6.98	2.81	1.00
C17	CONDUIT	0.636	0	00:01	3.13	0.96	1.00
C17-S	CONDUIT	0.000	0	01:07	0.00	0.00	0.15
C18	CONDUIT	0.134	0	01:06	1.19	0.03	0.29
C19	CONDUIT	0.091	0	01:05	2.47	0.05	0.39
C1-S	CONDUIT	0.106	0	01:00	1.63	0.05	0.35
C2	CONDUIT	5.484	0	01:05	6.98	2.62	1.00
C21	CONDUIT	0.000	0	01:01	0.38	0.00	0.02
C22	CONDUIT	0.000	0	00:01	0.02	0.00	0.18
C23	CONDUIT	0.056	0	01:05	3.02	0.21	0.59
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	8.666	0	00:00	4.90	0.44	1.00
C2-S	CONDUIT	0.135	0	01:05	1.12	0.05	0.33
C3	CONDUIT	0.634	0	00:01	3.90	0.89	1.00
C3-S	CONDUIT	0.000	0	00:01	0.00	0.00	0.01
C4	CONDUIT	0.118	0	01:10	0.74	0.20	1.00
C4-S	CONDUIT	0.085	0	01:05	2.78	0.05	0.23
C5	CONDUIT	0.111	0	00:01	1.71	0.83	1.00
C6	CONDUIT	0.090	0	01:00	1.60	0.45	1.00
C7	CONDUIT	0.021	0	01:05	2.27	0.08	0.19
C7-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C8	CONDUIT	0.021	0	01:05	2.33	0.08	0.19
C8-S	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
C9	CONDUIT	0.148	0	01:06	0.53	0.10	0.97
C9-S	CONDUIT	0.015	0	01:05	1.83	0.01	0.14
OR2	ORIFICE	0.061	0	01:08			1.00
J100-IC	DUMMY	0.094	0	01:01			
J101-IC	DUMMY	0.100	0	01:00			
J102-IC	DUMMY	0.050	0	00:01			
J103-IC	DUMMY	0.092	0	01:05			
J104-IC	DUMMY	0.025	0	01:01			
J105-IC	DUMMY	0.035	0	01:05			

J106-IC	DUMMY	0.100	0	01:02
J107-IC	DUMMY	0.015	0	01:05
J108-IC	DUMMY	0.050	0	01:02
J111-IC	DUMMY	0.100	0	00:00
J112-IC	DUMMY	0.050	0	00:01
J114-IC	DUMMY	0.100	0	00:00
J98-IC	DUMMY	0.021	0	01:05
J99-IC	DUMMY	0.000	0	00:00
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	0.04	0.02	0.00	0.94	0.02	0.00
C10-S	1.00	0.99	0.00	0.00	0.01	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	0.69	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C12-S	1.00	0.52	0.00	0.00	0.46	0.01	0.00	0.00	0.00	0.00
C13	1.00	0.01	0.00	0.00	0.01	0.06	0.00	0.92	0.04	0.00
C13-S	1.00	0.99	0.00	0.00	0.01	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	0.72	0.19	0.00	0.07	0.01	0.00	0.00	0.04	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	0.17	0.01	0.00	0.82	0.00	0.00	0.00	0.82	0.00
C18	1.00	0.00	0.00	0.00	0.66	0.33	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	0.02	0.00
C1-S	1.00	0.65	0.00	0.00	0.01	0.34	0.00	0.00	0.03	0.00
C2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.53	0.14	0.00	0.32	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.59	0.11	0.00	0.29	0.00	0.00	0.00	1.00	0.00
C23	1.00	0.00	0.00	0.00	0.03	0.01	0.00	0.96	0.04	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
C2-S	1.00	0.00	0.72	0.00	0.21	0.06	0.00	0.00	0.94	0.00
C3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

C3-S	1.00	0.07	0.62	0.00	0.29	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.64	0.00
C4-S	1.00	0.22	0.00	0.00	0.74	0.04	0.00	0.00	0.17	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	0.00	0.00	0.00	0.11	0.03	0.00	0.86	0.09	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	0.44	0.00	0.00	0.56	0.00	0.00	0.00	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	0.36	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.13	0.00	0.00	0.87	0.01	0.00
C9-S	1.00	0.36	0.00	0.00	0.62	0.02	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	0.08	0.08	0.18	0.01	0.01
C11	5.98	5.98	5.98	0.13	0.23
C13	0.01	0.01	0.18	0.01	0.01
C14	5.99	5.99	5.99	0.01	0.18
C15	5.97	5.97	5.98	0.01	0.22
C16	0.01	5.99	0.01	5.99	0.01
C17	5.98	5.98	5.98	0.01	0.05
C2	5.99	5.99	5.99	5.99	5.99
C23	0.01	0.01	0.07	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
C3	5.98	5.98	5.98	0.01	0.03
C4	0.20	0.20	5.98	0.01	0.01
C5	5.98	5.98	5.98	0.01	0.10
C6	0.14	0.14	0.22	0.01	0.01
C9	0.01	0.01	0.01	0.01	0.01

Analysis begun on: Fri Jun 14 12:33:08 2024
Analysis ended on: Fri Jun 14 12:33:34 2024
Total elapsed time: 00:00:26