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5494-5510 Boundary Road Day and Ross

SERVICEABILITY REPORT

Engineering excellence.

Planning progress.

Liveable landscapes.

**5494-5510 BOUNDARY ROAD
DAY AND ROSS
OTTAWA, ONTARIO**

SERVICEABILITY REPORT

Prepared by:

NOVATECH
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

April 27, 2021
Revised: October 18, 2021

Ref: R-2021-040
Novatech File: 118168

October 18, 2021

BY COURIER

City of Ottawa
Planning Infrastructure and Economic Development Department
110 Laurier Avenue West, 4th Floor
Ottawa, ON
K1P 1J1

Attention: Anissa McAlpine MCIP, RPP – Planner I

**Reference: 5494-5510 Boundary Road
Serviceability Report
Our File No.: 118168**

Please find enclosed the 'Serviceability Report' for the above noted project. This report has been revised as per City of Ottawa and South Nation Conservation Authority comments for the Zoning By-law and Official Plan Amendment and is hereby submitted for review and approval.

If you have any questions, please contact the undersigned.

Yours truly,

NOVATECH



Matt Hrehoriak, P.Eng.
Project Engineer | Land Development Engineering

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1.0. INTRODUCTION

Novatech has been retained to prepare a Serviceability Report to outline the servicing options for the proposed development located at 5494-5510 Boundary Road within the City of Ottawa. This report has been prepared in support of a Zoning By-law and Official Plan Amendment for the subject site. **Figure 1** is a Key Plan showing the site location.

2.0. EXISTING CONDITIONS

The subject site is approximately 8.46 hectares in size and is currently undeveloped. The site is generally covered with areas of tall grass and bare soil, bordered by wooded areas. There are two existing gravel entrances to the site from Boundary Rd. The topography of the site is relatively flat with general drainage to perimeter watercourse. There is ponding water along the north property line which is a result of extensive grade changes on the site over the past approximately 20 years. It is our understanding that the site was previously used as a pit where the native sand material was removed and replaced with miscellaneous fill material. The grade changes on site have trapped water on site from out-letting to the roadside ditch on Boundary Road. **Figure 2** shows the existing site conditions

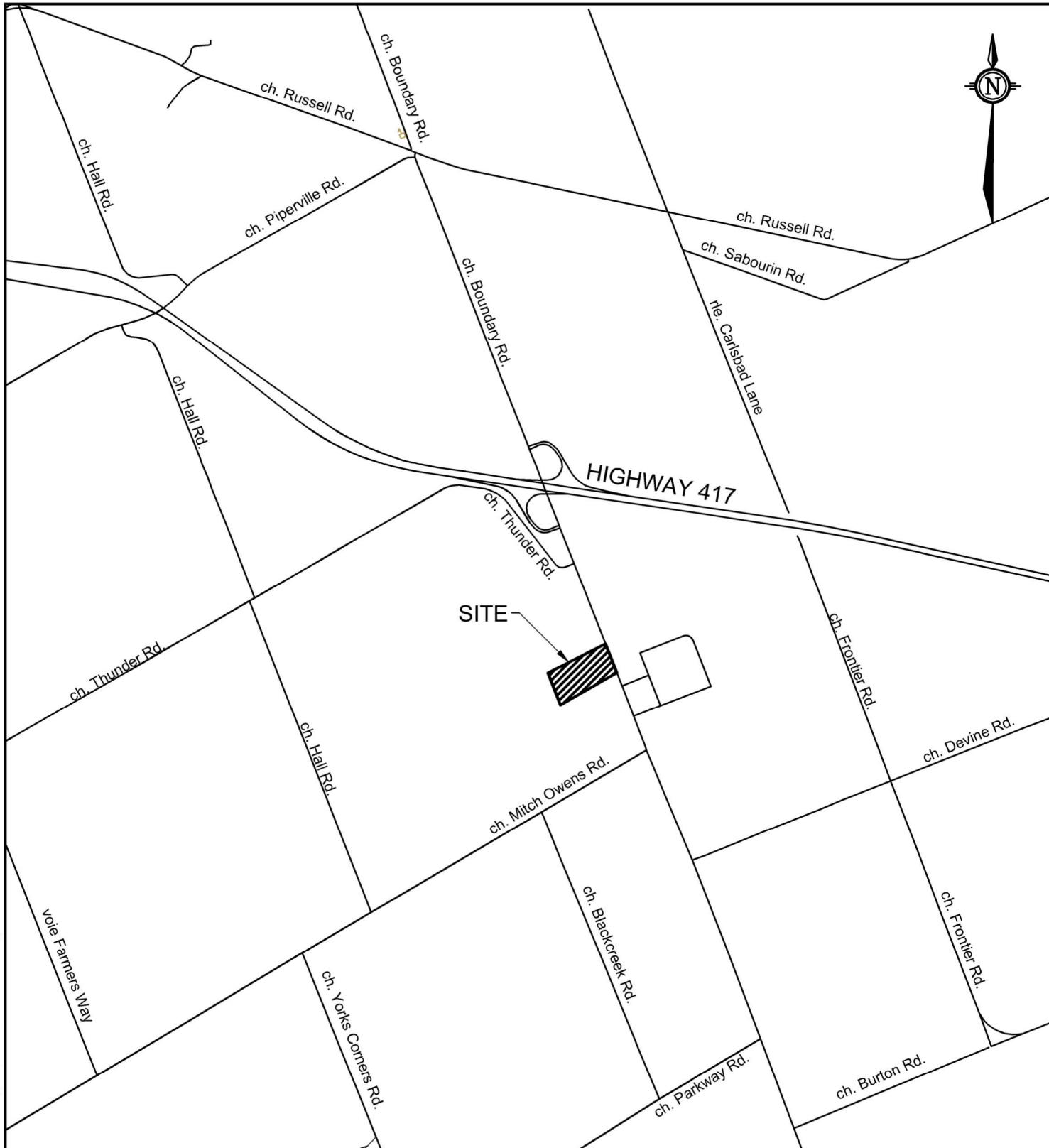
3.0. PROPOSED DEVELOPMENT

It is proposed to develop the site with a cross dock warehouse facility with approximately 5000m² of warehouse floor space and 650m² of office floor space. The warehouse component will consist of 96 loading bays and will include associated secured truck and trailer parking. The office component will include associated car parking lots fronting the development. It is proposed to access the development from two paved entrances from Boundary Road. **Figure 3** shows the proposed development site plan.

4.0. SITE CONSTRAINTS

A geotechnical investigation was completed for the subject development and a report provided entitled 'Geotechnical Investigation Proposed Warehouse Complex – 5510 Boundary Road Ottawa, Ontario' prepared by Paterson Group dated September 10, 2018. The following is a summary of the findings of this report:

- From available geological mapping the bedrock is shale and at depth of 25-35m below ground surface.
- Groundwater levels are expected to be 2-3m below existing ground surface.
- A category 3 permit to take water (PTTW) may be required during construction if more than 400,000 L/day of surface and/ or ground water is to be pumped during the construction phase. A time allowance of 4-5 months is required to obtain a permit from the Ministry of Environment Conservation and Parks MECP.
- For typical ground and/ or surface water pumping (50,000-400,000 L/day) during construction a MECP permit to take water (PTTW) and registry with the Environmental Activity and Sector Registry (EASR) is required. A time allowance of 2-4 weeks should be allocated to complete the EASR registry and PTTW discharge plan.
- Due to the presence of a silty clay deposit, the site will be subject to a permissible grade raise restriction. It is anticipated that due to time constraints a surcharge program is not realistic and lightweight fill and granular material will be required on site to manage long-term settlement.
 - A permissible grade raise of 1.0-1.2m is recommended for slab-on-grade using 400mm EPS geofoam blocks to compensate for sustained slab on grade loading.



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Engineers, Planners & Landscape Architects
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 Ottawa, Ontario, Canada K2M 1P6

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 Facsimile (613) 254-5867
 Website www.novatech-eng.com

KEY PLAN
5510 BOUNDARY ROAD
CITY OF OTTAWA

5510 BOUNDARY ROAD

DATE	JOB	FIGURE
MAR 2021	118168	1

M:\2018\118168 CAD\Design\Figures\118168-XCON.dwg, EX, Mar 19, 2021 - 3:58pm, mhrehoniek



LEGEND

- PROPERTY LINE
- EXISTING TOP OF BANK
- EXISTING DITCH
- EXISTING CULVERT
- CONTOUR LINES

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5510 BOUNDARY ROAD

EXISTING CONDITIONS

SCALE 1 : 1250

DATE APR 2021 JOB 118168 FIGURE 2

REFERENCE
 A - DETAIL NUMBER
 B - DETAIL LOCATION
 C - SHEET NUMBER - WHERE DETAILED

THIS DRAWING IS THE PROPERTY OF HATCHARD ENGINEERING LTD. AND HAS BEEN PREPARED SOLELY FOR THIS PROJECT. THIS DRAWING IS NOT TO BE USED BY ANY PARTIES ON OTHER PROJECTS OR EXTENSIONS TO THIS PROJECT EXCEPT BY AGREEMENT AND APPROPRIATE COMPENSATION TO HATCHARD ENGINEERING LTD.

Issued for tender/lançament de l'appel d'offres
 Revisions / Révisions No/N° Date

Project Title / Titre du projet

DAY AND ROSS
 OTTAWA, ON

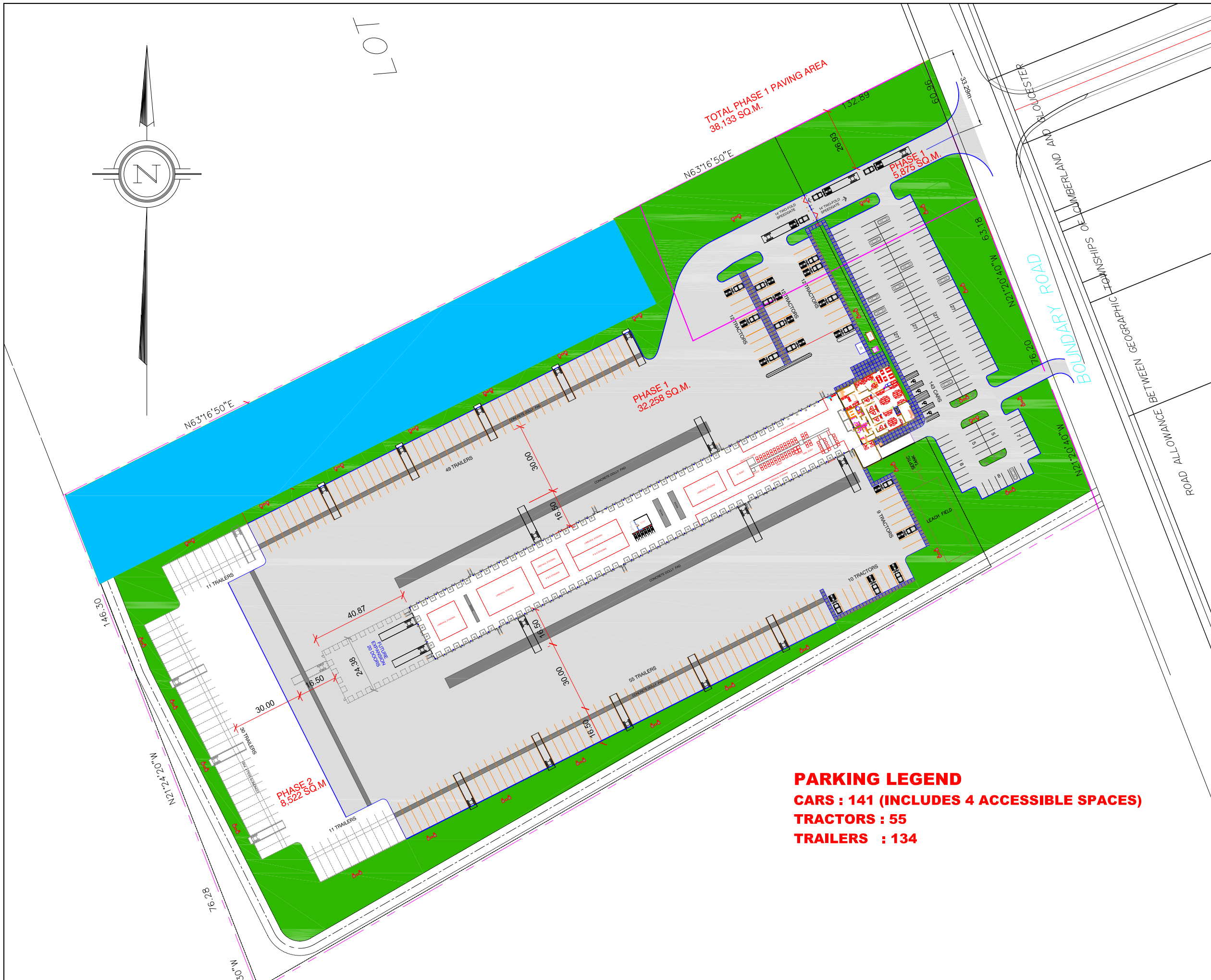
Sheet Title / Titre de la feuille

SITE PLAN
 ENTRANCE OPTION 2

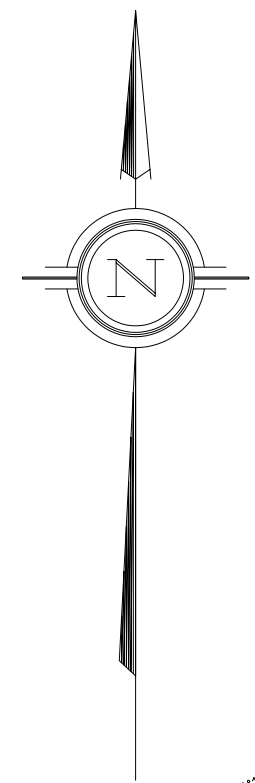
Date 19 DEC, 2019 Date
 Scale 1:500 Échelle
 Drawn by BAP Dessiné par
 Approved by Approuvé par

Stamp / Sceau

FIGURE 3



LOT



TOTAL PHASE 1 PAVING AREA
 38,133 SQ.M.

PHASE 1
 32,258 SQ.M.

PHASE 2
 8,522 SQ.M.

BOLINDARY ROAD

ROAD ALLOWANCE BETWEEN SHIPSHAW AND BLOOMFIELD AND BLOOMFIELD

- A permissible grade raise of 1.4m is recommended for parking and loading areas away from the building foundations.
- It is recommended to limit plantings around structures and provide clay dikes on service trenches to reduce long term ground water lowering.
- Catchbasins are to be equipped with subdrains extending in four orthogonal directions and longitudinally when placed along curbs. Subdrains are to be placed 300mm below the subgrade level. Subgrade is to be shaped to promote water flow to the subdrains.

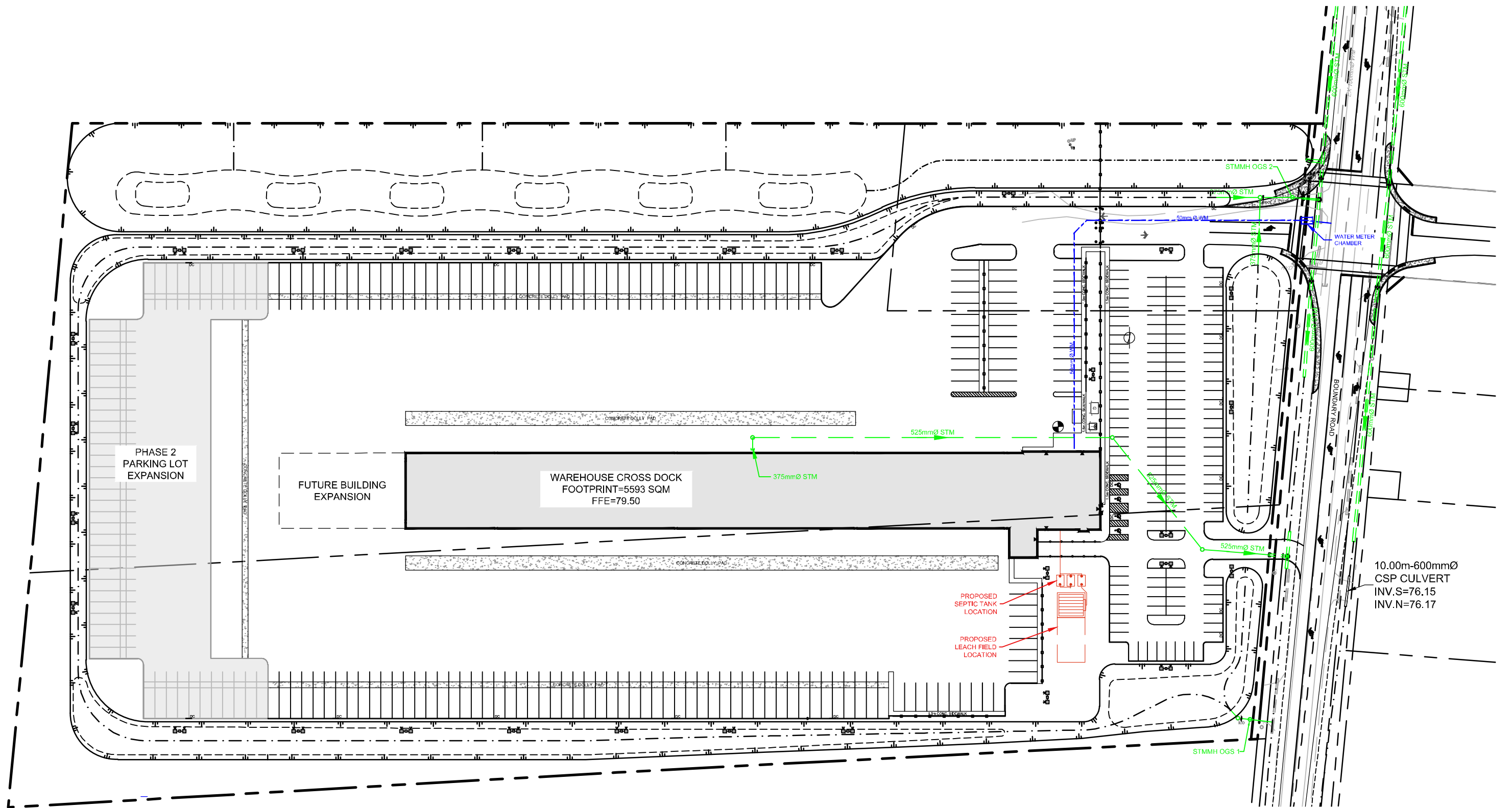
An environmental impact study was completed for the subject development and a report provided entitled 'Environmental Impact Statement and Tree Conservation Report (EIS/TCR) – 5494-5510 Boundary Road Ottawa, Ontario' prepared by Holly Bickerton, BAsC, MES. dated February 15, 2021. The subject site is designated as a Rural Natural Feature Area in the Official Plan. The EIS/TCR was required to determine that no negative impacts will occur to any natural heritage features on or within 120m of the property. The following is a summary of the findings of this report:

- There are no provincially significant or local wetlands on the subject site however, local wetlands exist to the north and south. Mitigating setbacks of 45m will be employed adjacent to wetlands.
- There are no species at risk observed within 120m of the site. Two regulated species the Bank Swallow and Barn Swallow were observed on site.
- The permanent headwater drainage features around the perimeter of the site are considered significant wildlife habitat as snapping turtle were observed on site.
- Fish habitats were observed on site and will be maintained in the proposed development. A proposed 15m setback will be maintained from limits of the fish habitat to the proposed development.
- Significant woodlands are present to the north and south of the site which are to be protected by restored naturalized setbacks.
- Any tree clearing on site is to occur outside the bird breeding season (April 15 – August 15) unless authorized by a qualified biologist.
- By implementing the mitigation measures identified in the EIS/TCR, the proposed development will have no negative impacts on the ecological features and functions of the applicable natural heritage features.




An Environmental Impact Statement Fisheries Component was prepared by Bowfin Environmental Consulting Inc. dated April 2021. Several potential fish habitats were identified on site, generally confined to the perimeter and were likely a result of the fill brought to site by the previous owner. These features are part of the Upper Bear Brook sub watershed which is tributary to the South Nation River. The Fisheries Impact Statement outlines the potential impacts to fish and fish habitat and the required mitigation measures. The following is a summary of the findings of this report:

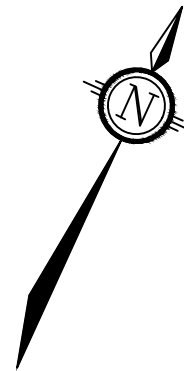
- Eight different features were identified on site plus the roadside ditch. Of these features only feature 5 along the north property line and the roadside ditch will be directly impacted by the proposed development.
- The roadside ditch will need to be piped and filled in for a portion of the ditch fronting the site. The culvert will need to be designed and installed to promote fish passage.
- Feature 5 will need to be realigned out of the development area, the total area of the fish habitat will be maintained in the proposed development.
- A minimum 15m buffer will be provided from the proposed development to the existing and realigned features.

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LEGEND

-  PROPERTY LINE
-  PROPOSED STORM SEWER & MANHOLE
-  PROPOSED WATERMAIN




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5510 BOUNDARY ROAD

CONCEPTUAL SERVICING PLAN

SCALE 1 : 1250 

DATE APR 2021 JOB 118168 FIGURE 4

- To maintain water quantity and quality reaching all features on site and infiltration berm will be constructed in the proposed conveyance ditches to promote filtration of water to the existing features.
- All in water works are required to be completed outside fish spawning periods (work between July 1 and March 14).

5.0. WATER SERVICING

There is an existing 100mm dia. municipal watermain in Boundary Road which terminates in front of the proposed site. This existing watermain infrastructure is part of the Carlsbad Springs Trickle Feed Water System which was recently extended to service the Amazon distribution facility to the north of the site. This municipal water system would provide potable water for domestic use only at the proposed warehouse facility. Fire suppression requirements will not be provided by the trickle feed connection.

It is proposed to service the site by connecting into the existing 100mm dia. watermain in Boundary road and extending a 50mm dia. private watermain into the site. A water meter will be housed in a concrete underground chamber at the north entrance to the site from Boundary Road, located within the City of Ottawa right of way. The meter chamber will be owned and operated by the City of Ottawa.

Domestic Demands

The domestic demands are based on criteria from Section 4.0 of the City of Ottawa Water Distribution Guidelines. The domestic water demands were calculated to be 4,875 L/day based on 65 employees at 75 L/day. In addition to the domestic demands a hose bib allowance of 3,225 L/day is included which equates to a total daily flow of 8,100 L/day.

The supply to the facility will be 3 Equivalent connections: $2,700\text{L/Day} \times 3 = 8,100\text{ Liters/day}$ [0.09 L/s continuous flow]. The water meter chamber will be designed to accommodate this continuous flow rate while not exceeding it. Refer to **Figure 4** for the conceptual servicing details. Details on the water meter chamber will be determined during detailed design.

Fire Suppression

Fire suppression water will be provided by way of underground storage tanks. A preliminary total storage volume of 270m³ of water will be required to supply the proposed fire suppression system. The required fire flows for the development were calculated to be 150L/s using criteria from Appendix A-3.2.5.7 of the Ontario Building Code. The fire suppression system will be a private system, owned and maintained by the property owner. Fire flow requirements and water storage volumes will need to be confirmed by the fire consultant during detailed design. Refer to **Appendix A** for detailed fire flow calculations.

6.0. SANITARY SERVICING

There is currently no existing municipal sanitary sewer fronting the development in Boundary Road as the site is not located within the City of Ottawa sanitary service area. A private onsite septic system with associated tank and leaching bed is proposed. The septic system will be designed Paterson Group for a total peak flow of 3,500 L/day. A preliminary septic design has been completed and is provided in **Appendix B** for reference.

7.0. STORM SERVICING & STORMWATER MANAGEMENT

There is no municipal storm sewer fronting the development, the site currently drains to the existing roadside ditch. It is proposed to service the development with a combination of a private storm sewer system and ditches that will outlet to the Boundary Road ditch. The private storm sewer system will be sized to convey the uncontrolled 2-year flows from the roof drains for the proposed cross-dock facility. The remainder of the site will sheet drain to a perimeter ditch system which will convey stormwater flows to the roadside ditch. The ditch drainage system has been sized to ensure no surface ponding occurs in the parking area during the 2-year event.

The stormwater management criteria and objectives for the site are as follows, per the City of Ottawa's requirements:

For storm flows being directed to the Boundary Road ditch:

- Control post-development storm flows, up to an including the 100-year design event, to the pre-development levels.
- Provide a dual drainage system (i.e. minor and major system flows);
- Ensure that no surface ponding will occur on the paved surfaces during the 2-year storm event;
- Provide on-site water quality control equivalent to an 'Enhanced' Level of Protection (i.e., minimum 80% long-term TSS removal), as required by the Conservation Authority; and,
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

As previously stated, the site in its current condition is relatively flat with general drainage to perimeter swales at the property limits. There is currently no municipal storm sewer fronting the development in Boundary Road. Boundary Road is a rural cross section which includes roadside ditches on both sides of the road. Most of the site currently drains to the existing roadside ditch on Boundary Road. Refer to the existing stormwater management drainage area plan **Figure 5**, in **Appendix C**, which shows the existing site drainage.

A technical memorandum was prepared by Novatech titled Proposed Warehouse Complex, 5510 Boundary Road, Supplemental SWM Modeling Information, dated October 5, 2020. This memo provides detailed hydrologic modeling of the existing site conditions and the pre-development/allowable release rates for the proposed site. The memo is provided in **Appendix C** for reference. A summary of the pre-development flows is provided below in **Table 1**.

Table 1: Pre-development Release Rate Summary

Area ID	Drainage Area (ha)	Peak Flow (L/s)		
		2-year	5-year	100-year
PRE	6.94	129.0	221.0	519.0

To control the post-development flows from the site to pre-development levels it is proposed to implement flow control roof drains and inlet control devices in the stormwater management design. The use of flow control devices will require stormwater to back up and be stored on site. It is anticipated that stormwater storage could be provided on building roofs, and in the perimeter ditch system. Preliminary stormwater calculations were completed for site based on the current site plan. Stormwater storage requirements for each of the proposed drainage areas is summarized below in **Table 2** and detailed calculations are included in **Appendix C** for reference.

Table 2: Stormwater Storage Summary

Area ID	Area (ha)	Outlet Location	2 Year Required Storage (m ³)	5 Year Required Storage (m ³)	100 Year Required Storage (m ³)
A-01	0.027	Boundary Rd.	N/A	N/A	N/A
A-02	0.559	Boundary Rd.	93	135	258
A-03	3.033	Boundary Rd.	349	498	820
A-04	3.316	Boundary Rd.	449	660	1140
Total	6.94		891	1293	2218

The total 100-year storage volume relates to a per hectare storage requirement of approximately 320 m³/ha which is a reasonable given the type of development.

It should be noted that the proposed storm sewer outlets to a shallow roadside ditch. The storm sewer will have minimal cover and will require insulation over the pipe to provide frost protection for the pipe bedding.

During storms events in excess of the 100-year storm event, site grading will provide an overland flow route from the site directly to the Boundary Road ditch.

Quality control of stormwater shall be provided to an *Enhanced* level of treatment or 80% removal of total suspended solids. Quality control for stormwater from parking and paved surfaces will be provided through the installation of two oil grit separator units. The proposed OGS units will be located at the outlets to the Boundary Road ditch from the onsite storage ditches. The OGS units will provide enhanced levels of water quality prior to discharging into the roadside ditch system. The target level of protection for long term removal of TSS is 80% with an overall treatment of 100% of the total runoff. Refer to **Appendix C** for preliminary OGS unit sizing and schematics. In addition to the OGS units a sand berm will be constructed between the south perimeter ditch systems to promote infiltration and recharge to the existing watercourse. The roof area will outlet directly to the roadside ditch via the private storm sewer system. Quality control is not required for roof drainage as it is considered clean.

In summary, the Boundary Road ditch system can service the proposed development and appropriate stormwater management methods can be used to meet the allowable release rates. Refer to **Appendix C** for preliminary stormwater management calculations and pre and post development drainage area figures.

8.0. EROSION AND SEDIMENT CONTROL MEASURES

Temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter socks will be placed in existing catchbasins and manholes, and will remain in place until vegetation has been established and construction is completed;
- Silt fencing will be placed along the surrounding construction limits;
- Mud mats will be installed at the site entrances;

- The contractor will be required to perform regular street sweeping and cleaning as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site;

The erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken

9.0. CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this report are as follows:

- The existing 100mm diameter dead end watermain fronting the development can service the proposed development for domestic use. A water storage tank and private fire suppression system will be required to provide adequate volumes and flow to meet the fire demands for the proposed development.
- The site can be serviced by a private septic system. The septic detailed design will be provided by others.
- The existing Boundary Road ditch can service the proposed development. Storage of stormwater will be provided on the building roof and in the perimeter ditch system. The stormflows will be controlled through the implementation of flow control roof drains and inlet control devices.
- Quality control for the site can be provided through the implementation of Oil Grit Separator units to achieve 80% TSS removal or enhanced level treatment.
- The overland flow route to the Boundary Road ditch is to be maintained.
- Erosion and sediment control measures will be implemented during construction.

NOVATECH

Prepared by:



Matt Hrehoriak, P.Eng.
Project Engineer
Land Development Engineering

Reviewed by:

A handwritten signature in black ink, appearing to read "J. Lee Sheets".

J. Lee Sheets, C.E.T.
Director
Land Development & Public Sector
Infrastructure

APPENDIX A
Water Servicing

OBC Water Supply for Firefighting Calculation

Based on OBC 2012 (Div. B, Article 3.2.5.7)

References: [Ontario Fire Marshal - OBC Fire Fighting Water Supply](#)
[Ontario Building Code 2012, Appendix A, Vol 2., A-3.2.5.7](#)



Novatech Project #: 118168
Project Name: 5510 Boundary Rd
Date: 3/10/2021
Input By: Matt Hrehoriak
Reviewed By: Lee Sheets

Legend
 Input by User
 No Input Required

Building Description: Single Storey Warehouse Fire Protection Provided by Underground Tank

Unsprinklered

Step	Calculation Inputs	Calculation Notes	Value
Minimum Fire Protection Water Supply Volume			
1	Water Supply Coefficient		
	Building Classification = Water Supply Coefficient - K =	F-3 From Table 3.1.2.1 From Table 1 (A3.2.5.7)	19
2	Total Building Volume		
	Building Width - W	N/A m	
	Building Length - L	N/A m	Area (W * L) = 6590 m ²
	Building Height - H	10 m	
	Total Building Volume - V =	W * L * H	65900 m ³
3	Spatial Coefficient Value		
	Exposure Distances: (Exterior building face to property/lot line, to street centre, or to mid-point between proposed building and another building on same lot)		Spatial Coefficients: From Figure 1 (Spatial Coefficient vs Exposure Distance)
	North	10.00 m	Sside 1 = 0.00
	East	10.00 m	Sside 2 = 0.00
	South	10.00 m	Sside 3 = 0.00
	West	10.00 m	Sside 4 = 0.00
	Total of Spacial Coefficient Values - S-Tot as obtained from the formula =	1.0 + (Sside 1 + Sside 2 + Sside 3 + Sside 4) (Max. value = 2.0)	1.00
4	Minimum Fire Protection Water Supply Volume		
	Q =	$K * V * S_{Tot}$	1,252,100 L
Required Minimum Water Supply Flow Rate			
5	Minimum Water Supply Flow Rate =	From Table 2 (For water supply from a municipal or industrial water supply system, min. pressure is 140 kPa)	9,000 L/min or 150 L/s
Minimum Fire Protection Water Supply Volume for 30 minutes			
6	Q =	= Minimum Water Supply Flow Rate (L/min) * 30 minutes	270,000 L
Required Fire Protection Water Supply Volume			
7	Q =	Highest volume out of (4) and (6)	1,252,100 L
Notes			



CITY OF MONCTON
**WATER AND
 WASTEWATER
 INVOICE**

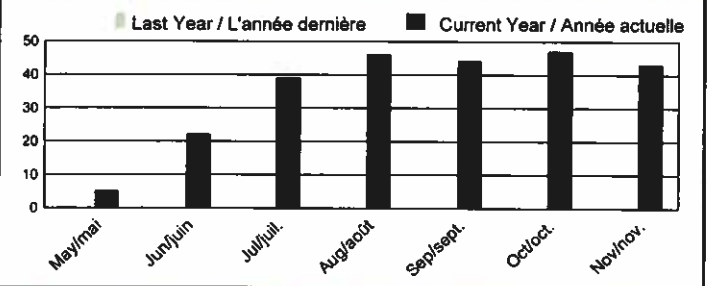
VILLE DE MONCTON
**FACTURE D'EAU
 ET D'EAUX
 USÉES**

14752

Account # / N° de compte	524990
Customer # / N° de client	002117
Address / Adresse	651 FRENETTE AVE
Statement # / N° de relevé	2287927
Bill Date / Date de facturation	12/01/2020
Total due / Total dû	\$228.95
Due date / Date d'échéance	01/05/2021

Meter / Compteur	Size / Taille	Service From / Du	Service To / Au	Present read / Relevé actuel	Previous read / Relevé précédent	Consumption * / Consommation *	Days / Jours	Avg m³ per day / Moyenne par jour en m³
524990	1-1/2"	11/01/2020	12/01/2020	246	203	43	30	1.43
				Actual / Actuel	Actual / Actuel	*Usage in cubic meters / Utilisation en mètres cubes (m³)		

Billed consumption / Consommation facturée (m³)



Previous activity / Activité antérieure

Last Bill / Dernière facture	\$240.93
Payment Received - Thank You / Paiement reçu - merci	-\$240.93
Late Fees / Frais de retard	\$0.00
Adjustments / ajustement	\$0.00
Balance Forward / Solde impayé	\$0.00

Current activity / Activité actuelle

Meter / Compteur 524990	(670175 / 1.00)
Consumption - Water/Eau - consommation	\$65.96
Fixed Charge - Wastewater/Eaux usées - Frais fixe	\$38.17
Fixed Charge - Water/Eau - Frais fixe	\$62.13
Usage - Wastewater/Eaux usées - Utilisation	\$21.84
Usage - TransAqua - Utilisation	\$40.85
Current Charges / Charges actuelles	\$228.95

1.5 % interest per month charged after due date.
 Des intérêts de 1,5 % par mois seront facturés après la date d'échéance.

Total due / Total dû (Balance forward + current charges / Solde du compte + charges actuelles)	\$228.95
--	-----------------

Important

Sign up for paperless billing and water use tracking at:
myaccount.moncton.ca / Inscrivez-vous pour la facturation
 électronique et surveillez consommation d'eau à :
Moncompte.moncton.ca

10111 50
 20111 10
 61032 33
 61031 34
 61004 33

PLEASE DETACH AND RETURN BOTTOM PORTION WITH PAYMENT IF PAYING BY MAIL / SI VOUS PAYEZ PAR COURRIER, DÉTACHEZ ET RETOURNEZ LA PARTIE INFÉRIEURE



CITY OF MONCTON
**WATER AND
 WASTEWATER
 INVOICE**

VILLE DE MONCTON
**FACTURE D'EAU
 ET D'EAUX
 USÉES**

Account # / N° de compte	Customer # / N° du client	Bill Date / Date de facturation	Due date / Date d'échéance	Total due / Total dû
524990	002117	12/01/2020	01/05/2021	\$ 228.95
Address / Adresse			Statement # / N° de relevé	
651 FRENETTE AVE			2287927	

Methods of payment

online moncton.ca or
 at your financial institution.



Options de paiement

en ligne moncton.ca ou à
 votre institution financière.

Phone / Pre-authorized payment

City of Moncton's Revenue Office
 506-853-3588



Téléphone / Paiement préautorisé

Bureau du Revenu, Ville de Moncton
 506-853-3588

Cheque

payable to City of Moncton



libellé à l'ordre de la Ville de Moncton

In person

Mon. to Fri. 8:30 am - 4:30 pm



En personne
 lun. au ven., de 8 h 30 à 16 h 30

DAY & ROSS INC.
 SHERYL BELYEA
 398 MAIN ST
 HARTLAND, NB E7P 1C6
 CANADA

655, rue Main St., Moncton NB, E1C 1E8

☎ 743 7900 ☎

96

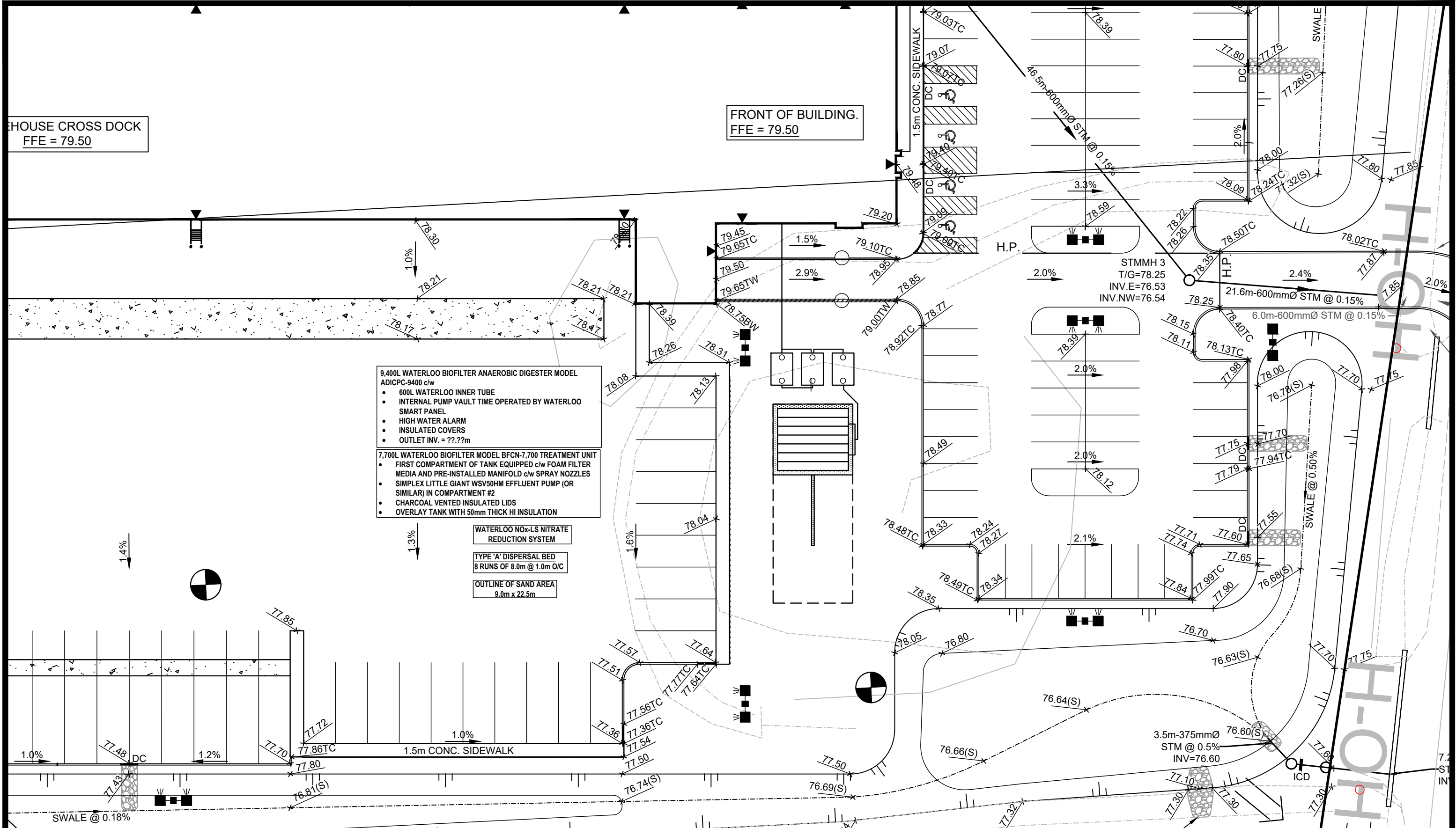
APPENDIX B
Sanitary Servicing

HOUSE CROSS DOCK
FFE = 79.50

FRONT OF BUILDING.
FFE = 79.50

- 9,400L WATERLOO BIOFILTER ANAEROBIC DIGESTER MODEL ADICPC-9400 c/w**
- 600L WATERLOO INNER TUBE
 - INTERNAL PUMP VAULT TIME OPERATED BY WATERLOO SMART PANEL
 - HIGH WATER ALARM
 - INSULATED COVERS
 - OUTLET INV. = ???.??m
- 7,700L WATERLOO BIOFILTER MODEL BFCN-7,700 TREATMENT UNIT**
- FIRST COMPARTMENT OF TANK EQUIPPED c/w FOAM FILTER MEDIA AND PRE-INSTALLED MANIFOLD c/w SPRAY NOZZLES
 - SIMPLEX LITTLE GIANT WSV50HM EFFLUENT PUMP (OR SIMILAR) IN COMPARTMENT #2
 - CHARCOAL VENTED INSULATED LIDS
 - OVERLAY TANK WITH 50mm THICK HI INSULATION

- WATERLOO NOx-LS NITRATE REDUCTION SYSTEM**
- TYPE 'A' DISPERSAL BED**
8 RUNS OF 8.0m @ 1.0m O/C
- OUTLINE OF SAND AREA**
9.0m x 22.5m



patersongroup
consulting engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

DD/MM/YY	Description	Rev.

Client
DAY AND ROSS

Project
PROPOSED CROSS DOCK BUILDING
5510 BOUNDARY ROAD
OTTAWA (CARLSBAD SPRINGS), ONTARIO

Drawing
PRELIMINARY SEWAGE SYSTEM LAYOUT PLAN

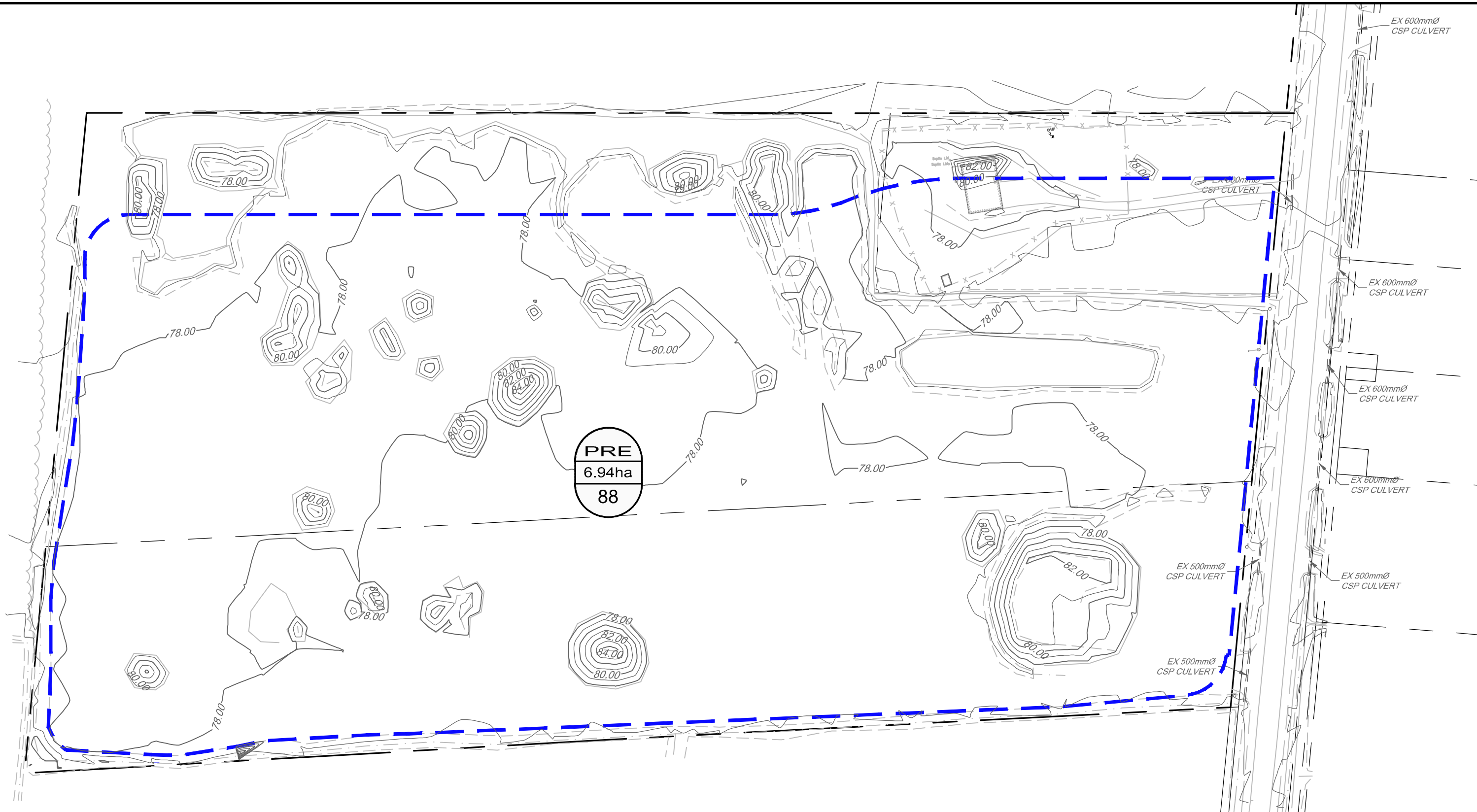
Scale: 1:400
Date: 03/2021
Drawing no.: **PH4216-1**

Drawn by: HV
Checked by: MK

p:\autocad\drawings\hydrology\ph4216-1\ph4216-1.dwg


APPENDIX C
Storm Servicing and Stormwater Management

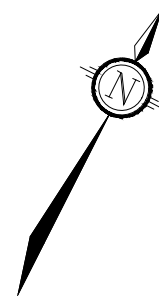
M:\2018\118168\CAD\Design\Figures\118168-EX-SWM.dwg, EX SWM, Mar 15, 2021 - 12:17pm, mhrehorjak



LEGEND

 EXISTING STORM DRAINAGE AREA

 DRAINAGE AREA ID
 DRAINAGE AREA (ha)
 SCS CURVE NUMBER



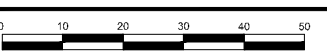
NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

5510 BOUNDARY ROAD

PRE-DEVELOPMENT
DRAINAGE AREA PLAN

SCALE 1 : 1250 

DATE MAR 2021 JOB 118168 FIGURE 5

MEMORANDUM

DATE: OCTOBER 5, 2020
TO: MATT HREHORIAK
FROM: CONRAD STANG
RE: PROPOSED WAREHOUSE COMPLEX
5510 BOUNDARY ROAD (OTTAWA, ON)
SUPPLEMENTAL SWM MODELLING INFORMATION

PROJECT NO: 118168

This memorandum provides the supplemental stormwater management (SWM) modelling information for the proposed warehouse complex at 5510 Boundary Road (Ottawa, Ontario) in support of the detailed design report, prepared by Novatech.

The Visual Otthymo hydrologic model was used to estimate pre-development peak flows (quantity control targets) for the site. The pre-development drainage area is based on the proposed development area. Refer to the Pre-Development Storm Drainage Area Plan provided in the detailed design report.

Design Storms

The design storms are based on the IDF parameters presented in the City of Ottawa Sewer Design Guidelines (October 2012). Storm distributions include the 3-hour Chicago and 12-hour SCS Type II storm distributions. Design storms were created for the 2, 5, and 100-year return periods (i.e. storm events).

Model Parameters

Pre-development conditions were established using data collected through the latest aerial photography (current site conditions), latest topographic mapping and geotechnical investigations.

The pre-development catchments were modelled using the CALIB NASHYD routine with the following parameters:

- The “standard” CN values were estimated based on area weighting the CN values for each associated land cover and soil types (extracted from reference TR-55 CN values).
- The surficial soil type is primarily fill material consisting of silty clay with sand, gravel and cobbles overlying thin layer of very loose to compact silty sand (estimated hydrologic soil group (HSG) ‘C’). The geotechnical investigation was performed by Paterson Group; report dated September 10, 2018 (Report No. PG4592-1).
- The Ia values were estimated based on CN values using $0.10 * S$.

- The number of linear reservoirs (N) was estimated to be $N = 3.0$, which is typical for catchments within Ontario.
- Time-to-peak (T_p) values were calculated using Airport Method, with a minimum 10-minute time-of-concentration (T_c). $T_p = 0.67 * T_c$.

A summary of the pre-development model parameters, model schematic and detailed model output for the 2-year, 5-year, and 100-year storm events are attached.

Peak Flows

The estimated pre-development peak flows are presented in Table 1 below.

Table 1: Summary of Pre-development Peak Flows

Area ID	Drainage Area (ha)	Peak Flow (m ³ /s)					
		3-hour Chicago Storm			12-hour SCS Type II Storm		
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
Area 'A'							
PRE	6.94	0.129	0.221	0.519	0.168	0.270	0.574

As the 3-hour Chicago storm distribution results in lower peak flows, the post-development quantity control requirements and release rates will need to adhere to these peak flows.

ATTACHMENTS:

- Visual Otthymo Model Parameters
- Visual Otthymo Detailed Model Output (3-hour Chicago & 12-hour SCS storm distributions)

Proposed Warehouse Complex - 5510 Boundary Road (Ottawa, ON)
 Visual Otthymo Model Parameters (118168)



NASHYD's (Pre-Development)				
Land Cover	Hydrologic Soil Group (HSG)	Area (ha)	SCS Curve Number (CN)	Initial Abstraction (Ia)* (mm)
Open Water	HSG 'C'	0.29	50	25.4
Meadow	HSG 'C'	0.50	71	10.4
Fallow Field (Bare Soil)	HSG 'C'	6.15	91	2.5
TOTAL (PRE)	-	6.94	88	5.0

*Initial Abstraction based on $0.10 * S$. $S = 25400 / CN - 254$

Time-to-Peak (Tp) Calculations (Airport Method) (NASHYD's)				
Runoff Coefficient (C)	Average Slope (%)	Flow Path Length (m)	Time-of-Concentration (Tc) (min)	Time-to-Peak (Tp)* (hours)
0.20	0.25	150	57	0.63

* $Tp = 0.67 * Tc$

Visual Otthymo Model Schematic



Storm Distributions:

- Run 01: 2-year, 3-hour Chicago Storm
- Run 02: 5-year, 3-hour Chicago Storm
- Run 03: 100-year, 3-hour Chicago Storm

- Run 04: 2-year, 12-hour SCS Storm
- Run 05: 5-year, 12-hour SCS Storm
- Run 06: 100-year, 12-hour SCS Storm

=====

```
V V I SSSSS U U A L (v 5.1.2000)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO
```

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***** D E T A I L E D O U T P U T *****

```
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Output filename: C:\Users\cstang\AppData\Local\Civica\VH5\6c732c44-3f8e-4d1e-b713-5e03d621a144\0a3a2f80-fc19-4e8b-a3a4-fca80fbc9b41\scena
Summary filename: C:\Users\cstang\AppData\Local\Civica\VH5\6c732c44-3f8e-4d1e-b713-5e03d621a144\0a3a2f80-fc19-4e8b-a3a4-fca80fbc9b41\scena
```

DATE: 10/05/2020 TIME: 12:46:55

USER:

COMMENTS: _____

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



** SIMULATION : Run 01 **

READ STORM	Filename: C:\Users\cstang\AppData ata\Local\Temp\ 3423a1c4-1884-4f21-baad-4d458bc37917\d23ad515
Ptotal= 31.86 mm	Comments: C3-2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.81	1.00	76.81	1.83	5.09	2.67	2.68
0.33	3.50	1.17	24.08	2.00	4.29	2.83	2.46
0.50	4.69	1.33	12.36	2.17	3.72	3.00	2.28
0.67	7.30	1.50	8.32	2.33	3.29		
0.83	18.21	1.67	6.30	2.50	2.95		

CALIB			
NASHYD (0001)	Area (ha)= 6.94	Curve Number (CN)= 88.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res. (N)= 3.00	
	U.H. Tp(hrs)= 0.63		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.81	0.833	18.21	1.583	6.30	2.33	3.29
0.167	2.81	0.917	76.81	1.667	6.30	2.42	2.95
0.250	3.50	1.000	76.81	1.750	5.09	2.50	2.95
0.333	3.50	1.083	24.08	1.833	5.09	2.58	2.68
0.417	4.69	1.167	24.08	1.917	4.29	2.67	2.68
0.500	4.69	1.250	12.36	2.000	4.29	2.75	2.46
0.583	7.30	1.333	12.36	2.083	3.72	2.83	2.46
0.667	7.30	1.417	8.32	2.167	3.72	2.92	2.28
0.750	18.21	1.500	8.32	2.250	3.29	3.00	2.28

Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.129 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 11.729
 TOTAL RAINFALL (mm)= 31.857
 RUNOFF COEFFICIENT = 0.368

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



** SIMULATION : Run 02 **

```

-----
| READ STORM |      Filename: C:\Users\cstang\AppData
|             |      ata\Local\Temp\
|             |      3423a1c4-1884-4f21-baad-4d458bc37917\b96d6d94
| Ptotal= 42.51 mm |      Comments: C3-5
-----

```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	3.68	1.00	104.19	1.83	6.69	2.67	3.51
0.33	4.58	1.17	32.04	2.00	5.63	2.83	3.22
0.50	6.15	1.33	16.34	2.17	4.87	3.00	2.98
0.67	9.61	1.50	10.96	2.33	4.30		
0.83	24.17	1.67	8.29	2.50	3.86		

```

-----
| CALIB |
| NASHYD ( 0001) | Area (ha)= 6.94 Curve Number (CN)= 88.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res. (N)= 3.00
-----
| U.H. Tp(hrs)= 0.63
-----

```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.68	0.833	24.17	1.583	8.29	2.33	4.30
0.167	3.68	0.917	104.19	1.667	8.29	2.42	3.86
0.250	4.58	1.000	104.19	1.750	6.69	2.50	3.86
0.333	4.58	1.083	32.04	1.833	6.69	2.58	3.51
0.417	6.15	1.167	32.04	1.917	5.63	2.67	3.51
0.500	6.15	1.250	16.34	2.000	5.63	2.75	3.22
0.583	9.61	1.333	16.34	2.083	4.87	2.83	3.22
0.667	9.61	1.417	10.96	2.167	4.87	2.92	2.98
0.750	24.17	1.500	10.96	2.250	4.30	3.00	2.98

Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.221 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 19.503
 TOTAL RAINFALL (mm)= 42.512
 RUNOFF COEFFICIENT = 0.459

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



** SIMULATION : Run 03 **

```

-----
| READ STORM |
|            |
| Ptotal= 71.67 mm |
|            |
-----
Filename: C:\Users\cstang\AppData
          ata\Local\Temp\
          3423a1c4-1884-4f21-baad-4d458bc37917\el438c1c
Comments: C3-100
    
```

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.17	6.05	1.00	178.56		1.83	11.06	2.67	5.76
0.33	7.54	1.17	54.05		2.00	9.29	2.83	5.28
0.50	10.16	1.33	27.32		2.17	8.02	3.00	4.88
0.67	15.97	1.50	18.24		2.33	7.08		
0.83	40.65	1.67	13.74		2.50	6.35		

```

-----
| CALIB |
| NASHYD ( 0001) |
| ID= 1 DT= 5.0 min |
|            |
-----
Area      (ha)= 6.94 Curve Number (CN)= 88.0
Ia        (mm)= 5.00 # of Linear Res. (N)= 3.00
U.H. Tp (hrs)= 0.63
    
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.083	6.05	0.833	40.65		1.583	13.74	2.33	7.08
0.167	6.05	0.917	178.56		1.667	13.74	2.42	6.35
0.250	7.54	1.000	178.56		1.750	11.06	2.50	6.35
0.333	7.54	1.083	54.05		1.833	11.06	2.58	5.76
0.417	10.16	1.167	54.05		1.917	9.29	2.67	5.76
0.500	10.16	1.250	27.32		2.000	9.29	2.75	5.28
0.583	15.97	1.333	27.32		2.083	8.02	2.83	5.28
0.667	15.97	1.417	18.24		2.167	8.02	2.92	4.88
0.750	40.65	1.500	18.24		2.250	7.08	3.00	4.88

Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.519 (i)
 TIME TO PEAK (hrs)= 1.667
 RUNOFF VOLUME (mm)= 43.872
 TOTAL RAINFALL (mm)= 71.667
 RUNOFF COEFFICIENT = 0.612

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



** SIMULATION : Run 04 **

READ STORM	Filename: C:\Users\cstang\AppData Local\Temp\ 3423a1c4-1884-4f21-baad-4d458bc37917\fceefce
Ptotal= 42.34 mm	Comments: S12-2

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.50	1.27	3.50	1.69	6.50	9.23	9.50	1.27
1.00	0.59	4.00	1.69	7.00	4.06	10.00	1.02
1.50	1.10	4.50	2.29	7.50	2.71	10.50	1.44
2.00	1.10	5.00	2.88	8.00	2.37	11.00	0.93
2.50	1.44	5.50	4.57	8.50	1.86	11.50	0.85
3.00	1.27	6.00	36.24	9.00	1.95	12.00	0.85

CALIB	Area (ha)= 6.94	Curve Number (CN)= 88.0
NASHYD (0001)	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.63	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.27	3.083	1.69	6.083	9.23	9.08	1.27
0.167	1.27	3.167	1.69	6.167	9.23	9.17	1.27
0.250	1.27	3.250	1.69	6.250	9.23	9.25	1.27
0.333	1.27	3.333	1.69	6.333	9.23	9.33	1.27
0.417	1.27	3.417	1.69	6.417	9.23	9.42	1.27
0.500	1.27	3.500	1.69	6.500	9.23	9.50	1.27
0.583	0.59	3.583	1.69	6.583	4.06	9.58	1.02
0.667	0.59	3.667	1.69	6.667	4.06	9.67	1.02
0.750	0.59	3.750	1.69	6.750	4.06	9.75	1.02
0.833	0.59	3.833	1.69	6.833	4.06	9.83	1.02
0.917	0.59	3.917	1.69	6.917	4.06	9.92	1.02
1.000	0.59	4.000	1.69	7.000	4.06	10.00	1.02
1.083	1.10	4.083	2.29	7.083	2.71	10.08	1.44
1.167	1.10	4.167	2.29	7.167	2.71	10.17	1.44
1.250	1.10	4.250	2.29	7.250	2.71	10.25	1.44
1.333	1.10	4.333	2.29	7.333	2.71	10.33	1.44
1.417	1.10	4.417	2.29	7.417	2.71	10.42	1.44
1.500	1.10	4.500	2.29	7.500	2.71	10.50	1.44
1.583	1.10	4.583	2.88	7.583	2.37	10.58	0.93
1.667	1.10	4.667	2.88	7.667	2.37	10.67	0.93
1.750	1.10	4.750	2.88	7.750	2.37	10.75	0.93
1.833	1.10	4.833	2.88	7.833	2.37	10.83	0.93
1.917	1.10	4.917	2.88	7.917	2.37	10.92	0.93
2.000	1.10	5.000	2.88	8.000	2.37	11.00	0.93
2.083	1.44	5.083	4.57	8.083	1.86	11.08	0.85
2.167	1.44	5.167	4.57	8.167	1.86	11.17	0.85
2.250	1.44	5.250	4.57	8.250	1.86	11.25	0.85
2.333	1.44	5.333	4.57	8.333	1.86	11.33	0.85
2.417	1.44	5.417	4.57	8.417	1.86	11.42	0.85
2.500	1.44	5.500	4.57	8.500	1.86	11.50	0.85
2.583	1.27	5.583	36.24	8.583	1.95	11.58	0.85
2.667	1.27	5.667	36.24	8.667	1.95	11.67	0.85

Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON) Visual OTTHYMO Model Output (118168)



2.750	1.27	5.750	36.24	8.750	1.95	11.75	0.85
2.833	1.27	5.833	36.24	8.833	1.95	11.83	0.85
2.917	1.27	5.917	36.24	8.917	1.95	11.92	0.85
3.000	1.27	6.000	36.24	9.000	1.95	12.00	0.85

Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.168 (i)
 TIME TO PEAK (hrs)= 6.583
 RUNOFF VOLUME (mm)= 19.367
 TOTAL RAINFALL (mm)= 42.335
 RUNOFF COEFFICIENT = 0.457

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION : Run 05 **

READ STORM	Filename: C:\Users\cstang\AppData ata\Local\Temp\ 3423a1c4-1884-4f21-baad-4d458bc37917\8f07cf7d
Ptotal= 56.19 mm	Comments: S12-5

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.50	1.69	3.50	2.25	6.50	12.25	9.50	1.69
1.00	0.79	4.00	2.25	7.00	5.39	10.00	1.35
1.50	1.46	4.50	3.03	7.50	3.60	10.50	1.91
2.00	1.46	5.00	3.82	8.00	3.15	11.00	1.24
2.50	1.91	5.50	6.07	8.50	2.47	11.50	1.12
3.00	1.69	6.00	48.08	9.00	2.58	12.00	1.12

CALIB			
NASHYD (0001)	Area (ha)= 6.94	Curve Number (CN)= 88.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res. (N)= 3.00	
	U.H. Tp (hrs)= 0.63		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.69	3.083	2.25	6.083	12.25	9.08	1.69
0.167	1.69	3.167	2.25	6.167	12.25	9.17	1.69
0.250	1.69	3.250	2.25	6.250	12.25	9.25	1.69
0.333	1.69	3.333	2.25	6.333	12.25	9.33	1.69
0.417	1.69	3.417	2.25	6.417	12.25	9.42	1.69
0.500	1.69	3.500	2.25	6.500	12.25	9.50	1.69
0.583	0.79	3.583	2.25	6.583	5.39	9.58	1.35
0.667	0.79	3.667	2.25	6.667	5.39	9.67	1.35
0.750	0.79	3.750	2.25	6.750	5.39	9.75	1.35
0.833	0.79	3.833	2.25	6.833	5.39	9.83	1.35
0.917	0.79	3.917	2.25	6.917	5.39	9.92	1.35
1.000	0.79	4.000	2.25	7.000	5.39	10.00	1.35
1.083	1.46	4.083	3.03	7.083	3.60	10.08	1.91
1.167	1.46	4.167	3.03	7.167	3.60	10.17	1.91
1.250	1.46	4.250	3.03	7.250	3.60	10.25	1.91
1.333	1.46	4.333	3.03	7.333	3.60	10.33	1.91
1.417	1.46	4.417	3.03	7.417	3.60	10.42	1.91

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



1.500	1.46	4.500	3.03	7.500	3.60	10.50	1.91
1.583	1.46	4.583	3.82	7.583	3.15	10.58	1.24
1.667	1.46	4.667	3.82	7.667	3.15	10.67	1.24
1.750	1.46	4.750	3.82	7.750	3.15	10.75	1.24
1.833	1.46	4.833	3.82	7.833	3.15	10.83	1.24
1.917	1.46	4.917	3.82	7.917	3.15	10.92	1.24
2.000	1.46	5.000	3.82	8.000	3.15	11.00	1.24
2.083	1.91	5.083	6.07	8.083	2.47	11.08	1.12
2.167	1.91	5.167	6.07	8.167	2.47	11.17	1.12
2.250	1.91	5.250	6.07	8.250	2.47	11.25	1.12
2.333	1.91	5.333	6.07	8.333	2.47	11.33	1.12
2.417	1.91	5.417	6.07	8.417	2.47	11.42	1.12
2.500	1.91	5.500	6.07	8.500	2.47	11.50	1.12
2.583	1.69	5.583	48.08	8.583	2.58	11.58	1.12
2.667	1.69	5.667	48.08	8.667	2.58	11.67	1.12
2.750	1.69	5.750	48.08	8.750	2.58	11.75	1.12
2.833	1.69	5.833	48.08	8.833	2.58	11.83	1.12
2.917	1.69	5.917	48.08	8.917	2.58	11.92	1.12
3.000	1.69	6.000	48.08	9.000	2.58	12.00	1.12

Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.270 (i)
 TIME TO PEAK (hrs)= 6.583
 RUNOFF VOLUME (mm)= 30.527
 TOTAL RAINFALL (mm)= 56.185
 RUNOFF COEFFICIENT = 0.543

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 ** SIMULATION : Run 06 **

READ STORM	Filename: C:\Users\cstang\AppData\Local\Temp\3423a1c4-1884-4f21-baad-4d458bc37917\4c999c78
Ptotal= 93.91 mm	Comments: S12-100

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.50	2.82	3.50	3.76	6.50	20.47	9.50	2.82
1.00	1.31	4.00	3.76	7.00	9.02	10.00	2.25
1.50	2.44	4.50	5.07	7.50	6.01	10.50	3.19
2.00	2.44	5.00	6.39	8.00	5.26	11.00	2.07
2.50	3.19	5.50	10.14	8.50	4.13	11.50	1.88
3.00	2.82	6.00	80.38	9.00	4.32	12.00	1.88

CALIB	Area (ha)= 6.94	Curve Number (CN)= 88.0
NASHYD (0001)	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.63	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.82	3.083	3.76	6.083	20.47	9.08	2.82
0.167	2.82	3.167	3.76	6.167	20.47	9.17	2.82

**Proposed Warehouse Complex – 5510 Boundary Road (Ottawa, ON)
Visual OTTHYMO Model Output (118168)**



0.250	2.82	3.250	3.76	6.250	20.47	9.25	2.82
0.333	2.82	3.333	3.76	6.333	20.47	9.33	2.82
0.417	2.82	3.417	3.76	6.417	20.47	9.42	2.82
0.500	2.82	3.500	3.76	6.500	20.47	9.50	2.82
0.583	1.31	3.583	3.76	6.583	9.02	9.58	2.25
0.667	1.31	3.667	3.76	6.667	9.02	9.67	2.25
0.750	1.31	3.750	3.76	6.750	9.02	9.75	2.25
0.833	1.31	3.833	3.76	6.833	9.02	9.83	2.25
0.917	1.31	3.917	3.76	6.917	9.02	9.92	2.25
1.000	1.31	4.000	3.76	7.000	9.02	10.00	2.25
1.083	2.44	4.083	5.07	7.083	6.01	10.08	3.19
1.167	2.44	4.167	5.07	7.167	6.01	10.17	3.19
1.250	2.44	4.250	5.07	7.250	6.01	10.25	3.19
1.333	2.44	4.333	5.07	7.333	6.01	10.33	3.19
1.417	2.44	4.417	5.07	7.417	6.01	10.42	3.19
1.500	2.44	4.500	5.07	7.500	6.01	10.50	3.19
1.583	2.44	4.583	6.39	7.583	5.26	10.58	2.07
1.667	2.44	4.667	6.39	7.667	5.26	10.67	2.07
1.750	2.44	4.750	6.39	7.750	5.26	10.75	2.07
1.833	2.44	4.833	6.39	7.833	5.26	10.83	2.07
1.917	2.44	4.917	6.39	7.917	5.26	10.92	2.07
2.000	2.44	5.000	6.39	8.000	5.26	11.00	2.07
2.083	3.19	5.083	10.14	8.083	4.13	11.08	1.88
2.167	3.19	5.167	10.14	8.167	4.13	11.17	1.88
2.250	3.19	5.250	10.14	8.250	4.13	11.25	1.88
2.333	3.19	5.333	10.14	8.333	4.13	11.33	1.88
2.417	3.19	5.417	10.14	8.417	4.13	11.42	1.88
2.500	3.19	5.500	10.14	8.500	4.13	11.50	1.88
2.583	2.82	5.583	80.38	8.583	4.32	11.58	1.88
2.667	2.82	5.667	80.38	8.667	4.32	11.67	1.88
2.750	2.82	5.750	80.38	8.750	4.32	11.75	1.88
2.833	2.82	5.833	80.38	8.833	4.32	11.83	1.88
2.917	2.82	5.917	80.38	8.917	4.32	11.92	1.88
3.000	2.82	6.000	80.38	9.000	4.32	12.00	1.88

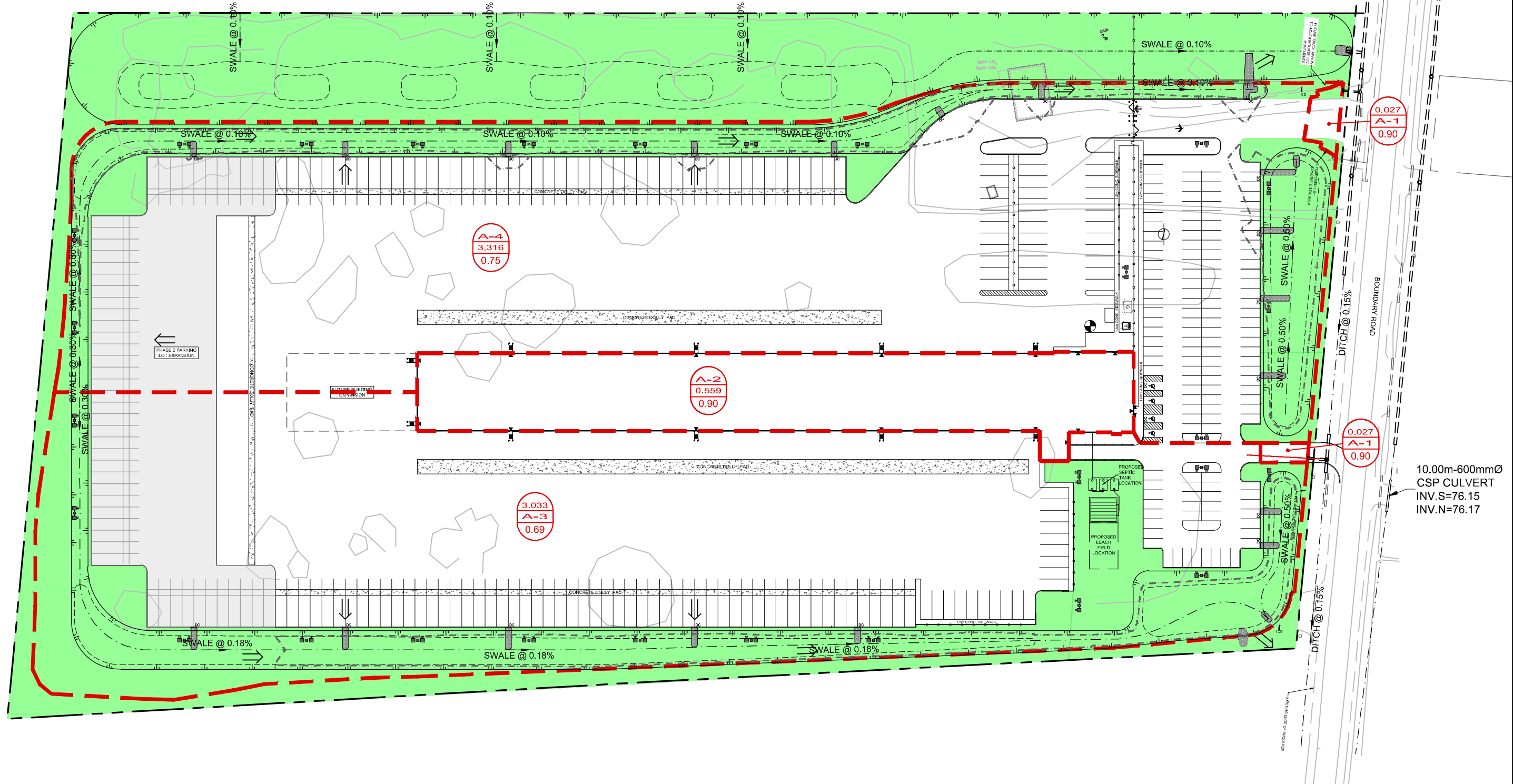
Unit Hyd Qpeak (cms)= 0.421

PEAK FLOW (cms)= 0.574 (i)
 TIME TO PEAK (hrs)= 6.500
 RUNOFF VOLUME (mm)= 63.982
 TOTAL RAINFALL (mm)= 93.910
 RUNOFF COEFFICIENT = 0.681

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 FINISH
 =====

M:\2018\118188\CAD\Design\118188-SWM.dwg, SWM, Sep 24, 2021 - 3:31pm, mhrehorak

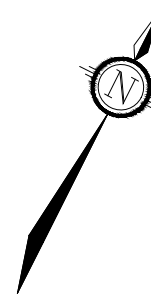


LEGEND

POST STORM DRAINAGE AREA

A-2
0.559
0.90

DRAINAGE AREA ID
DRAINAGE AREA (ha)
RUNOFF COEFFICIENT



NOVATECH

Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowland Drive
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Facsimile (613) 254-5867
Website www.novatech-eng.com

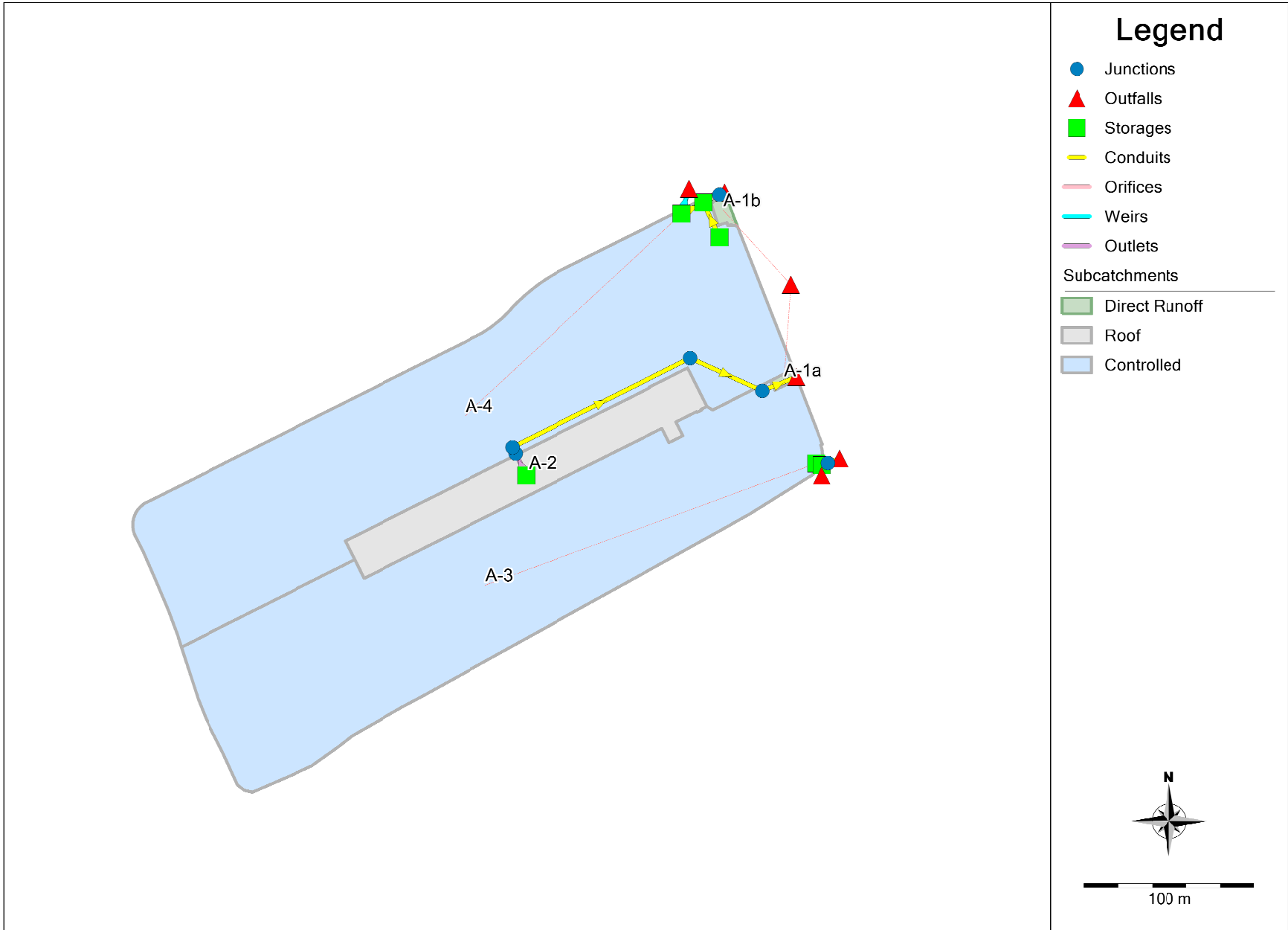
5110 BOUNDARY ROAD

**POST-DEVELOPMENT
DRAINAGE AREA PLAN**

SCALE 1 : 1250

DATE **OCT 2021** JOB **118188** FIGURE **6**

SHT11V17 DWG 270mm X 132mm



Element Count

Number of rain gages 1
 Number of subcatchments ... 5
 Number of nodes 18
 Number of links 14
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage1	C3-100	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-1a	0.01	6.00	100.00	1.5000	Raingage1	OF1
A-1b	0.02	18.00	90.00	1.5000	Raingage1	OF1
A-2	0.56	465.83	100.00	1.5000	Raingage1	RD1
A-3	3.03	68.16	70.00	1.5000	Raingage1	DA
A-4	3.32	74.52	79.00	1.5000	Raingage1	DB

Node Summary

Invert Max. Poned External

Name	Type	Elev.	Depth	Area	Inflow
CAP	JUNCTION	77.06	0.42	0.0	
OGS_1	JUNCTION	76.54	1.03	0.0	
OGS_2	JUNCTION	76.81	1.13	0.0	
STM1	JUNCTION	76.86	1.39	0.0	
STM2	JUNCTION	76.68	2.06	0.0	
STM3	JUNCTION	76.60	1.65	0.0	
BRD1	OUTFALL	76.50	0.38	0.0	
OF1	OUTFALL	0.00	0.00	0.0	
OF2	OUTFALL	76.20	0.00	0.0	
OF3	OUTFALL	76.65	0.00	0.0	
STM100	OUTFALL	76.80	0.38	0.0	
STM101	OUTFALL	76.57	0.53	0.0	
DA	STORAGE	76.60	0.70	0.0	
DB	STORAGE	76.90	0.60	0.0	
DC	STORAGE	76.92	0.58	0.0	
RD1	STORAGE	84.35	0.15	0.0	
STM4	STORAGE	76.57	0.88	0.0	
STM5	STORAGE	76.85	1.07	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1-2	STM1	STM2	CONDUIT	116.4	0.1503	0.0130
2-3	STM2	STM3	CONDUIT	46.5	0.1504	0.0130
3-101	STM3	STM101	CONDUIT	21.6	0.1391	0.0130
CAP-1	CAP	STM1	CONDUIT	4.0	1.0001	0.0130
DA-4	DA	STM4	CONDUIT	3.5	0.4860	0.0130
DB-5	DB	STM5	CONDUIT	14.3	0.2791	0.0130
DC-5	DC	STM5	CONDUIT	22.3	0.2686	0.0130
OGS1-BRD1	OGS_1	BRD1	CONDUIT	7.2	0.5533	0.0130
OGS2-100	OGS_2	STM100	CONDUIT	3.3	0.2992	0.0130
4-OGS1	STM4	OGS_1	ORIFICE			
5-OGS2	STM5	OGS_2	ORIFICE			
W1	DA	OF2	WEIR			
W2	DB	OF3	WEIR			
RD-100	RD1	CAP	OUTLET			

 Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1-2	CIRCULAR	0.53	0.22	0.13	0.53	1	166.74
2-3	CIRCULAR	0.53	0.22	0.13	0.53	1	166.80
3-101	CIRCULAR	0.53	0.22	0.13	0.53	1	160.40
CAP-1	CIRCULAR	0.38	0.11	0.09	0.38	1	175.35
DA-4	CIRCULAR	0.38	0.11	0.09	0.38	1	122.24
DB-5	CIRCULAR	0.38	0.11	0.09	0.38	1	92.63
DC-5	CIRCULAR	0.38	0.11	0.09	0.38	1	90.88
OGS1-BRD1	CIRCULAR	0.38	0.11	0.09	0.38	1	130.42
OGS2-100	CIRCULAR	0.38	0.11	0.09	0.38	1	95.91

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN

Starting Date 09/22/2021 00:00:00
 Ending Date 09/23/2021 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001524 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
-----	-----	-----
Total Precipitation	0.497	71.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.084	12.082
Surface Runoff	0.408	58.893
Final Storage	0.008	1.092
Continuity Error (%)	-0.557	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
-----	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.408	4.084
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.408	4.085
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.022	

 Time-Step Critical Elements

 Link OGS2-100 (59.95%)
 Link DA-4 (9.21%)
 Link CAP-1 (1.78%)

 Highest Flow Instability Indexes

 Link RD-100 (1)

 Routing Time Step Summary

 Minimum Time Step : 0.29 sec
 Average Time Step : 2.45 sec
 Maximum Time Step : 5.00 sec
 Percent in Steady State : -0.00
 Average Iterations per Step : 2.01
 Percent Not Converging : 0.00
 Time Step Frequencies :
 5.000 - 3.155 sec : 33.41 %
 3.155 - 1.991 sec : 5.04 %
 1.991 - 1.256 sec : 10.42 %
 1.256 - 0.792 sec : 47.02 %
 0.792 - 0.500 sec : 4.11 %

 Subcatchment Runoff Summary

Peak Runoff		Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff	Coeff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff

Subcatchment		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
LPS									
A-1a		71.67	0.00	0.00	0.00	70.28	0.00	70.28	0.01
4.46	0.981								
A-1b		71.67	0.00	0.00	4.38	63.18	3.24	66.42	0.01
8.80	0.927								
A-2		71.67	0.00	0.00	0.00	71.80	0.00	71.80	0.40
277.26	1.002								
A-3		71.67	0.00	0.00	15.88	49.42	5.67	55.09	1.67
959.45	0.769								
A-4		71.67	0.00	0.00	10.72	55.75	4.38	60.12	1.99
1143.20	0.839								

 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
CAP	JUNCTION	0.05	0.09	77.14	0 01:44	0.09
OGS_1	JUNCTION	0.09	0.18	76.72	0 01:32	0.18
OGS_2	JUNCTION	0.13	0.24	77.05	0 02:20	0.24
STM1	JUNCTION	0.07	0.13	77.00	0 01:46	0.13
STM2	JUNCTION	0.07	0.13	76.81	0 01:48	0.13
STM3	JUNCTION	0.07	0.13	76.73	0 01:48	0.13
BRD1	OUTFALL	0.09	0.18	76.68	0 01:32	0.18
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	76.20	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	76.65	0 00:00	0.00
STM100	OUTFALL	0.13	0.24	77.04	0 02:20	0.24
STM101	OUTFALL	0.07	0.13	76.70	0 01:48	0.13
DA	STORAGE	0.21	0.57	77.17	0 01:32	0.57
DB	STORAGE	0.23	0.57	77.47	0 01:29	0.57
DC	STORAGE	0.19	0.46	77.38	0 02:20	0.46
RD1	STORAGE	0.06	0.14	84.49	0 01:45	0.14
STM4	STORAGE	0.23	0.60	77.17	0 01:32	0.60

STM5 STORAGE 0.24 0.53 77.38 0 02:20 0.53

Node Inflow Summary

Node	Type	Maximum		Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
		Lateral Inflow LPS	Total Inflow LPS				
CAP	JUNCTION	0.00	21.68	0 01:45	0	0.403	0.021
OGS_1	JUNCTION	0.00	61.45	0 01:32	0	0.977	0.001
OGS_2	JUNCTION	0.00	70.31	0 02:20	0	1.32	0.001
STM1	JUNCTION	0.00	21.68	0 01:45	0	0.403	0.159
STM2	JUNCTION	0.00	21.69	0 01:47	0	0.402	-0.036
STM3	JUNCTION	0.00	21.68	0 01:48	0	0.402	0.013
BRD1	OUTFALL	0.00	61.45	0 01:32	0	0.977	0.000
OF1	OUTFALL	13.26	13.26	0 01:10	0.0183	0.0183	0.000
OF2	OUTFALL	0.00	179.89	0 01:32	0	0.693	0.000
OF3	OUTFALL	0.00	166.68	0 01:29	0	0.67	0.000
STM100	OUTFALL	0.00	70.31	0 02:20	0	1.32	0.000
STM101	OUTFALL	0.00	21.68	0 01:48	0	0.402	0.000
DA	STORAGE	959.45	959.45	0 01:10	1.67	1.67	-0.000
DB	STORAGE	1143.20	1143.20	0 01:10	1.99	1.99	0.004
DC	STORAGE	0.00	116.11	0 01:19	0	0.345	-0.013
RD1	STORAGE	277.26	277.26	0 01:10	0.401	0.401	-0.345
STM4	STORAGE	0.00	61.45	0 01:32	0	0.977	0.000
STM5	STORAGE	0.00	179.82	0 01:20	0	1.67	-0.011

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt		Pcnt		
	1000 m3	Full	Loss	Loss	1000 m3	Full	days hr:min	LPS
DA	0.209	16	0	0	0.820	64	0 01:32	241.34
DB	0.188	20	0	0	0.797	83	0 01:29	341.96
DC	0.116	21	0	0	0.343	63	0 02:20	21.00
RD1	0.084	29	0	0	0.258	90	0 01:45	21.68
STM4	0.000	26	0	0	0.001	68	0 01:32	61.45
STM5	0.000	23	0	0	0.001	49	0 02:20	179.58

Outfall Loading Summary

Outfall Node	Flow	Avg	Max	Total
	Freq	Flow	Flow	Volume
	Pcnt	LPS	LPS	10^6 ltr
BRD1	80.51	32.04	61.45	0.977
OF1	25.75	1.80	13.26	0.018
OF2	25.02	73.31	179.89	0.693
OF3	27.68	63.97	166.68	0.670
STM100	87.50	39.21	70.31	1.323
STM101	75.15	13.89	21.68	0.402
System	53.60	224.22	496.17	4.085

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1-2	CONDUIT	21.69	0 01:47	0.55	0.13	0.24
2-3	CONDUIT	21.68	0 01:48	0.55	0.13	0.24
3-101	CONDUIT	21.68	0 01:48	0.52	0.14	0.25
CAP-1	CONDUIT	21.68	0 01:45	1.08	0.12	0.24
DA-4	CONDUIT	61.45	0 01:32	0.56	0.50	1.00
DB-5	CONDUIT	179.82	0 01:20	1.63	1.94	1.00
DC-5	CONDUIT	116.11	0 01:19	1.24	1.28	1.00
OGS1-BRD1	CONDUIT	61.45	0 01:32	1.16	0.47	0.48
OGS2-100	CONDUIT	70.31	0 02:20	0.95	0.73	0.64
4-OGS1	ORIFICE	61.45	0 01:32			1.00
5-OGS2	ORIFICE	70.31	0 02:20			1.00
W1	WEIR	179.89	0 01:32			0.87
W2	WEIR	166.68	0 01:29			0.83
RD-100	DUMMY	21.68	0 01:45			

 Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
1-2	1.00	0.00	0.00	0.00	0.72	0.00	0.00	0.27	0.02	0.00
2-3	1.00	0.00	0.00	0.00	0.63	0.00	0.00	0.36	0.00	0.00
3-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.71	0.00
CAP-1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
DA-4	1.00	0.01	0.00	0.00	0.61	0.00	0.00	0.37	0.00	0.00
DB-5	1.00	0.01	0.00	0.00	0.66	0.00	0.00	0.33	0.03	0.00

DC-5	1.00	0.02	0.00	0.00	0.63	0.00	0.00	0.35	0.01	0.00
OGS1-BRD1	1.00	0.01	0.00	0.00	0.56	0.43	0.00	0.00	0.77	0.00
OGS2-100	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.61	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
DA-4	2.95	2.95	3.13	0.01	0.01
DB-5	3.26	3.31	3.74	1.09	0.97
DC-5	2.40	2.40	3.74	0.49	0.01

Analysis begun on: Fri Oct 15 12:08:54 2021
 Analysis ended on: Fri Oct 15 12:08:55 2021
 Total elapsed time: 00:00:01

Element Count

Number of rain gages 1
 Number of subcatchments ... 5
 Number of nodes 18
 Number of links 14
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage1	C3-5	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-1a	0.01	6.00	100.00	1.5000	Raingage1	OF1
A-1b	0.02	18.00	90.00	1.5000	Raingage1	OF1
A-2	0.56	465.83	100.00	1.5000	Raingage1	RD1
A-3	3.03	68.16	70.00	1.5000	Raingage1	DA
A-4	3.32	74.52	79.00	1.5000	Raingage1	DB

Node Summary

Invert Max. Poned External

Name	Type	Elev.	Depth	Area	Inflow
CAP	JUNCTION	77.06	0.42	0.0	
OGS_1	JUNCTION	76.54	1.03	0.0	
OGS_2	JUNCTION	76.81	1.13	0.0	
STM1	JUNCTION	76.86	1.39	0.0	
STM2	JUNCTION	76.68	2.06	0.0	
STM3	JUNCTION	76.60	1.65	0.0	
BRD1	OUTFALL	76.50	0.38	0.0	
OF1	OUTFALL	0.00	0.00	0.0	
OF2	OUTFALL	76.20	0.00	0.0	
OF3	OUTFALL	76.65	0.00	0.0	
STM100	OUTFALL	76.80	0.38	0.0	
STM101	OUTFALL	76.57	0.53	0.0	
DA	STORAGE	76.60	0.70	0.0	
DB	STORAGE	76.90	0.60	0.0	
DC	STORAGE	76.92	0.58	0.0	
RD1	STORAGE	84.35	0.15	0.0	
STM4	STORAGE	76.57	0.88	0.0	
STM5	STORAGE	76.85	1.07	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1-2	STM1	STM2	CONDUIT	116.4	0.1503	0.0130
2-3	STM2	STM3	CONDUIT	46.5	0.1504	0.0130
3-101	STM3	STM101	CONDUIT	21.6	0.1391	0.0130
CAP-1	CAP	STM1	CONDUIT	4.0	1.0001	0.0130
DA-4	DA	STM4	CONDUIT	3.5	0.4860	0.0130
DB-5	DB	STM5	CONDUIT	14.3	0.2791	0.0130
DC-5	DC	STM5	CONDUIT	22.3	0.2686	0.0130
OGS1-BRD1	OGS_1	BRD1	CONDUIT	7.2	0.5533	0.0130
OGS2-100	OGS_2	STM100	CONDUIT	3.3	0.2992	0.0130
4-OGS1	STM4	OGS_1	ORIFICE			
5-OGS2	STM5	OGS_2	ORIFICE			
W1	DA	OF2	WEIR			
W2	DB	OF3	WEIR			
RD-100	RD1	CAP	OUTLET			

 Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1-2	CIRCULAR	0.53	0.22	0.13	0.53	1	166.74
2-3	CIRCULAR	0.53	0.22	0.13	0.53	1	166.80
3-101	CIRCULAR	0.53	0.22	0.13	0.53	1	160.40
CAP-1	CIRCULAR	0.38	0.11	0.09	0.38	1	175.35
DA-4	CIRCULAR	0.38	0.11	0.09	0.38	1	122.24
DB-5	CIRCULAR	0.38	0.11	0.09	0.38	1	92.63
DC-5	CIRCULAR	0.38	0.11	0.09	0.38	1	90.88
OGS1-BRD1	CIRCULAR	0.38	0.11	0.09	0.38	1	130.42
OGS2-100	CIRCULAR	0.38	0.11	0.09	0.38	1	95.91

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN

Starting Date 09/22/2021 00:00:00
 Ending Date 09/23/2021 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001524 m

 Runoff Quantity Continuity Volume Depth
 hectare-m mm

 Total Precipitation 0.295 42.512
 Evaporation Loss 0.000 0.000
 Infiltration Loss 0.066 9.453
 Surface Runoff 0.223 32.160
 Final Storage 0.008 1.091
 Continuity Error (%) -0.455

 Flow Routing Continuity Volume Volume
 hectare-m 10^6 ltr

 Dry Weather Inflow 0.000 0.000
 Wet Weather Inflow 0.223 2.230
 Groundwater Inflow 0.000 0.000
 RDII Inflow 0.000 0.000
 External Inflow 0.000 0.000
 External Outflow 0.223 2.232
 Flooding Loss 0.000 0.000
 Evaporation Loss 0.000 0.000
 Exfiltration Loss 0.000 0.000
 Initial Stored Volume 0.000 0.000
 Final Stored Volume 0.000 0.000
 Continuity Error (%) -0.109

 Time-Step Critical Elements

 Link OGS2-100 (48.89%)
 Link DA-4 (15.72%)
 Link CAP-1 (2.51%)

 Highest Flow Instability Indexes

 Link RD-100 (3)
 Link CAP-1 (2)

 Routing Time Step Summary

 Minimum Time Step : 0.50 sec
 Average Time Step : 2.63 sec
 Maximum Time Step : 5.00 sec
 Percent in Steady State : -0.00
 Average Iterations per Step : 2.01
 Percent Not Converging : 0.00
 Time Step Frequencies :
 5.000 - 3.155 sec : 37.73 %
 3.155 - 1.991 sec : 6.59 %
 1.991 - 1.256 sec : 10.64 %
 1.256 - 0.792 sec : 39.66 %
 0.792 - 0.500 sec : 5.38 %

 Subcatchment Runoff Summary

Peak Runoff		Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff	Coeff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff

Subcatchment		mm	mm	mm	mm	mm	mm	mm	10 ⁶ ltr
LPS									
A-1a		42.51	0.00	0.00	0.00	41.14	0.00	41.14	0.00
2.60	0.968								
A-1b		42.51	0.00	0.00	3.59	36.99	0.71	37.70	0.01
5.02	0.887								
A-2		42.51	0.00	0.00	0.00	42.63	0.00	42.63	0.24
161.78	1.003								
A-3		42.51	0.00	0.00	12.29	28.83	0.47	29.31	0.89
488.27	0.689								
A-4		42.51	0.00	0.00	8.51	32.53	0.42	32.95	1.09
577.12	0.775								

 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
CAP	JUNCTION	0.04	0.08	77.14	0 01:34	0.08
OGS_1	JUNCTION	0.08	0.17	76.71	0 01:46	0.17
OGS_2	JUNCTION	0.11	0.22	77.03	0 02:18	0.22
STM1	JUNCTION	0.06	0.12	76.99	0 01:35	0.12
STM2	JUNCTION	0.06	0.12	76.80	0 01:36	0.12
STM3	JUNCTION	0.05	0.12	76.72	0 01:37	0.12
BRD1	OUTFALL	0.08	0.17	76.67	0 01:46	0.17
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	76.20	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	76.65	0 00:00	0.00
STM100	OUTFALL	0.11	0.22	77.02	0 02:18	0.22
STM101	OUTFALL	0.05	0.12	76.69	0 01:37	0.12
DA	STORAGE	0.18	0.46	77.06	0 01:46	0.46
DB	STORAGE	0.18	0.45	77.35	0 01:33	0.45
DC	STORAGE	0.15	0.38	77.30	0 02:17	0.38
RD1	STORAGE	0.04	0.11	84.46	0 01:34	0.11
STM4	STORAGE	0.19	0.48	77.05	0 01:46	0.48

STM5 STORAGE 0.20 0.45 77.30 0 02:18 0.45

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CAP	JUNCTION	0.00	18.29	0 01:34	0	0.241	0.179
OGS_1	JUNCTION	0.00	53.86	0 01:46	0	0.811	0.001
OGS_2	JUNCTION	0.00	63.39	0 02:18	0	1.04	0.000
STM1	JUNCTION	0.00	18.29	0 01:34	0	0.241	0.234
STM2	JUNCTION	0.00	18.29	0 01:36	0	0.24	-0.034
STM3	JUNCTION	0.00	18.29	0 01:37	0	0.241	0.023
BRD1	OUTFALL	0.00	53.86	0 01:46	0	0.811	0.000
OF1	OUTFALL	7.63	7.63	0 01:10	0.0105	0.0105	0.000
OF2	OUTFALL	0.00	24.14	0 01:46	0	0.0775	0.000
OF3	OUTFALL	0.00	22.45	0 01:33	0	0.0542	0.000
STM100	OUTFALL	0.00	63.39	0 02:18	0	1.04	0.000
STM101	OUTFALL	0.00	18.29	0 01:37	0	0.24	0.000
DA	STORAGE	488.27	488.27	0 01:10	0.889	0.889	0.000
DB	STORAGE	577.12	577.12	0 01:10	1.09	1.09	0.008
DC	STORAGE	0.00	89.29	0 01:20	0	0.247	-0.014
RD1	STORAGE	161.78	161.78	0 01:10	0.238	0.238	-1.328
STM4	STORAGE	0.00	53.86	0 01:46	0	0.811	-0.000
STM5	STORAGE	0.00	146.75	0 01:23	0	1.29	-0.018

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DA	0.149	12	0	0	0.498	39	0 01:46	78.00
DB	0.112	12	0	0	0.414	43	0 01:33	166.17
DC	0.081	15	0	0	0.246	45	0 02:17	20.38
RD1	0.033	11	0	0	0.135	47	0 01:34	18.29
STM4	0.000	22	0	0	0.001	55	0 01:46	53.86
STM5	0.000	19	0	0	0.001	42	0 02:18	146.54

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
BRD1	78.20	29.03	53.86	0.811
OF1	25.93	1.05	7.63	0.010
OF2	17.18	12.40	24.14	0.078
OF3	16.27	9.15	22.45	0.054
STM100	85.39	33.73	63.39	1.038
STM101	73.19	9.29	18.29	0.240
System	49.36	94.66	176.85	2.232

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1-2	CONDUIT	18.29	0 01:36	0.52	0.11	0.22
2-3	CONDUIT	18.29	0 01:37	0.53	0.11	0.22
3-101	CONDUIT	18.29	0 01:37	0.49	0.11	0.23
CAP-1	CONDUIT	18.29	0 01:34	1.03	0.10	0.22
DA-4	CONDUIT	53.86	0 01:46	0.56	0.44	1.00
DB-5	CONDUIT	146.75	0 01:23	1.33	1.58	1.00
DC-5	CONDUIT	89.29	0 01:20	1.09	0.98	1.00
OGS1-BRD1	CONDUIT	53.86	0 01:46	1.12	0.41	0.45
OGS2-100	CONDUIT	63.39	0 02:18	0.93	0.66	0.59
4-OGS1	ORIFICE	53.86	0 01:46			1.00
5-OGS2	ORIFICE	63.39	0 02:18			1.00
W1	WEIR	24.14	0 01:46			0.28
W2	WEIR	22.45	0 01:33			0.26
RD-100	DUMMY	18.29	0 01:34			

 Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
1-2	1.00	0.00	0.00	0.00	0.70	0.00	0.00	0.29	0.01	0.00
2-3	1.00	0.00	0.00	0.00	0.51	0.00	0.00	0.49	0.00	0.00
3-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.73	0.00
CAP-1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
DA-4	1.00	0.02	0.00	0.00	0.57	0.00	0.00	0.41	0.00	0.00
DB-5	1.00	0.02	0.00	0.00	0.61	0.00	0.00	0.37	0.03	0.00

DC-5	1.00	0.02	0.01	0.00	0.58	0.00	0.00	0.40	0.01	0.00
OGS1-BRD1	1.00	0.02	0.00	0.00	0.43	0.55	0.00	0.00	0.74	0.00
OGS2-100	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.64	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
DA-4	2.19	2.19	2.40	0.01	0.01
DB-5	2.07	2.22	2.59	0.86	0.62
DC-5	0.61	0.61	2.59	0.01	0.01

Analysis begun on: Fri Oct 15 12:13:26 2021
 Analysis ended on: Fri Oct 15 12:13:27 2021
 Total elapsed time: 00:00:01

Element Count

Number of rain gages 1
 Number of subcatchments ... 5
 Number of nodes 18
 Number of links 14
 Number of pollutants 0
 Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage1	C3-2	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A-1a	0.01	6.00	100.00	1.5000	Raingage1	OF1
A-1b	0.02	18.00	90.00	1.5000	Raingage1	OF1
A-2	0.56	465.83	100.00	1.5000	Raingage1	RD1
A-3	3.03	68.16	70.00	1.5000	Raingage1	DA
A-4	3.32	74.52	79.00	1.5000	Raingage1	DB

Node Summary

Invert Max. Poned External

Name	Type	Elev.	Depth	Area	Inflow
CAP	JUNCTION	77.06	0.42	0.0	
OGS_1	JUNCTION	76.54	1.03	0.0	
OGS_2	JUNCTION	76.81	1.13	0.0	
STM1	JUNCTION	76.86	1.39	0.0	
STM2	JUNCTION	76.68	2.06	0.0	
STM3	JUNCTION	76.60	1.65	0.0	
BRD1	OUTFALL	76.50	0.38	0.0	
OF1	OUTFALL	0.00	0.00	0.0	
OF2	OUTFALL	76.20	0.00	0.0	
OF3	OUTFALL	76.65	0.00	0.0	
STM100	OUTFALL	76.80	0.38	0.0	
STM101	OUTFALL	76.57	0.53	0.0	
DA	STORAGE	76.60	0.70	0.0	
DB	STORAGE	76.90	0.60	0.0	
DC	STORAGE	76.92	0.58	0.0	
RD1	STORAGE	84.35	0.15	0.0	
STM4	STORAGE	76.57	0.88	0.0	
STM5	STORAGE	76.85	1.07	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1-2	STM1	STM2	CONDUIT	116.4	0.1503	0.0130
2-3	STM2	STM3	CONDUIT	46.5	0.1504	0.0130
3-101	STM3	STM101	CONDUIT	21.6	0.1391	0.0130
CAP-1	CAP	STM1	CONDUIT	4.0	1.0001	0.0130
DA-4	DA	STM4	CONDUIT	3.5	0.4860	0.0130
DB-5	DB	STM5	CONDUIT	14.3	0.2791	0.0130
DC-5	DC	STM5	CONDUIT	22.3	0.2686	0.0130
OGS1-BRD1	OGS_1	BRD1	CONDUIT	7.2	0.5533	0.0130
OGS2-100	OGS_2	STM100	CONDUIT	3.3	0.2992	0.0130
4-OGS1	STM4	OGS_1	ORIFICE			
5-OGS2	STM5	OGS_2	ORIFICE			
W1	DA	OF2	WEIR			
W2	DB	OF3	WEIR			
RD-100	RD1	CAP	OUTLET			

 Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1-2	CIRCULAR	0.53	0.22	0.13	0.53	1	166.74
2-3	CIRCULAR	0.53	0.22	0.13	0.53	1	166.80
3-101	CIRCULAR	0.53	0.22	0.13	0.53	1	160.40
CAP-1	CIRCULAR	0.38	0.11	0.09	0.38	1	175.35
DA-4	CIRCULAR	0.38	0.11	0.09	0.38	1	122.24
DB-5	CIRCULAR	0.38	0.11	0.09	0.38	1	92.63
DC-5	CIRCULAR	0.38	0.11	0.09	0.38	1	90.88
OGS1-BRD1	CIRCULAR	0.38	0.11	0.09	0.38	1	130.42
OGS2-100	CIRCULAR	0.38	0.11	0.09	0.38	1	95.91

 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

 Analysis Options

Flow Units LPS
 Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN

Starting Date 09/22/2021 00:00:00
 Ending Date 09/23/2021 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 5.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 1
 Head Tolerance 0.001524 m

 Runoff Quantity Continuity Volume Depth
 hectare-m mm

 Total Precipitation 0.221 31.857
 Evaporation Loss 0.000 0.000
 Infiltration Loss 0.051 7.386
 Surface Runoff 0.163 23.510
 Final Storage 0.008 1.091
 Continuity Error (%) -0.408

 Flow Routing Continuity Volume Volume
 hectare-m 10^6 ltr

 Dry Weather Inflow 0.000 0.000
 Wet Weather Inflow 0.163 1.630
 Groundwater Inflow 0.000 0.000
 RDII Inflow 0.000 0.000
 External Inflow 0.000 0.000
 External Outflow 0.163 1.634
 Flooding Loss 0.000 0.000
 Evaporation Loss 0.000 0.000
 Exfiltration Loss 0.000 0.000
 Initial Stored Volume 0.000 0.000
 Final Stored Volume 0.000 0.000
 Continuity Error (%) -0.258

 Time-Step Critical Elements

 Link OGS2-100 (32.01%)
 Link DA-4 (29.90%)
 Link CAP-1 (2.92%)

 Highest Flow Instability Indexes

 Link RD-100 (6)
 Link CAP-1 (3)

 Routing Time Step Summary

 Minimum Time Step : 0.50 sec
 Average Time Step : 2.73 sec
 Maximum Time Step : 5.00 sec
 Percent in Steady State : -0.00
 Average Iterations per Step : 2.02
 Percent Not Converging : 0.00
 Time Step Frequencies :
 5.000 - 3.155 sec : 40.55 %
 3.155 - 1.991 sec : 8.47 %
 1.991 - 1.256 sec : 11.00 %
 1.256 - 0.792 sec : 28.43 %
 0.792 - 0.500 sec : 11.55 %

 Subcatchment Runoff Summary

Peak Runoff	Runoff Coeff	Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff
-------------	--------------	--------------	-------------	------------	-------------	---------------	-------------	--------------	--------------

Subcatchment	mm	mm	mm	mm	mm	mm	mm	mm	10^6 ltr
LPS									
A-1a	31.86	0.00	0.00	0.00	30.46	0.00	30.46	0.00	
1.92 0.956									
A-1b	31.86	0.00	0.00	3.16	27.37	0.08	27.45	0.00	
3.50 0.862									
A-2	31.86	0.00	0.00	0.00	31.96	0.00	31.96	0.18	
119.27 1.003									
A-3	31.86	0.00	0.00	9.56	21.32	0.00	21.32	0.65	
329.22 0.669									
A-4	31.86	0.00	0.00	6.69	24.05	0.00	24.05	0.80	
386.36 0.755									

 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
CAP	JUNCTION	0.03	0.08	77.13	0 01:32	0.08
OGS_1	JUNCTION	0.08	0.16	76.70	0 01:54	0.16
OGS_2	JUNCTION	0.10	0.21	77.02	0 02:12	0.21
STM1	JUNCTION	0.05	0.12	76.98	0 01:33	0.12
STM2	JUNCTION	0.05	0.11	76.79	0 01:34	0.11
STM3	JUNCTION	0.05	0.11	76.71	0 01:34	0.11
BRD1	OUTFALL	0.08	0.16	76.66	0 01:54	0.16
OF1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OF2	OUTFALL	0.00	0.00	76.20	0 00:00	0.00
OF3	OUTFALL	0.00	0.00	76.65	0 00:00	0.00
STM100	OUTFALL	0.10	0.21	77.01	0 02:12	0.21
STM101	OUTFALL	0.05	0.11	76.68	0 01:34	0.11
DA	STORAGE	0.15	0.38	76.98	0 01:54	0.38
DB	STORAGE	0.15	0.38	77.28	0 01:33	0.38
DC	STORAGE	0.13	0.33	77.25	0 02:11	0.33
RD1	STORAGE	0.03	0.10	84.45	0 01:32	0.10
STM4	STORAGE	0.17	0.41	76.98	0 01:54	0.41

STM5 STORAGE 0.17 0.40 77.25 0 02:12 0.40

Node Inflow Summary

Node	Type	Maximum		Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
		Lateral Inflow LPS	Total Inflow LPS				
CAP	JUNCTION	0.00	16.72	0 01:32	0	0.184	0.458
OGS_1	JUNCTION	0.00	48.73	0 01:54	0	0.646	0.001
OGS_2	JUNCTION	0.00	58.09	0 02:12	0	0.797	0.000
STM1	JUNCTION	0.00	16.72	0 01:32	0	0.183	0.256
STM2	JUNCTION	0.00	16.72	0 01:33	0	0.183	0.025
STM3	JUNCTION	0.00	16.72	0 01:34	0	0.183	0.027
BRD1	OUTFALL	0.00	48.73	0 01:54	0	0.646	0.000
OF1	OUTFALL	5.42	5.42	0 01:10	0.00768	0.00768	0.000
OF2	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
OF3	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
STM100	OUTFALL	0.00	58.09	0 02:12	0	0.797	0.000
STM101	OUTFALL	0.00	16.72	0 01:34	0	0.183	0.000
DA	STORAGE	329.22	329.22	0 01:10	0.646	0.646	0.000
DB	STORAGE	386.36	386.36	0 01:10	0.797	0.797	0.009
DC	STORAGE	0.00	72.57	0 01:23	0	0.186	-0.006
RD1	STORAGE	119.27	119.27	0 01:10	0.179	0.179	-2.924
STM4	STORAGE	0.00	48.73	0 01:54	0	0.646	-0.000
STM5	STORAGE	0.00	126.49	0 01:24	0	0.983	-0.028

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum
	Volume	Pcnt	Pcnt	Pcnt		Pcnt		
	1000 m3	Full	Loss	Loss	1000 m3	Full	days hr:min	LPS
DA	0.112	9	0	0	0.349	27	0 01:54	48.73
DB	0.073	8	0	0	0.264	28	0 01:33	126.49
DC	0.059	11	0	0	0.185	34	0 02:11	19.12
RD1	0.022	8	0	0	0.093	32	0 01:32	16.72
STM4	0.000	19	0	0	0.000	47	0 01:54	48.73
STM5	0.000	16	0	0	0.000	37	0 02:12	126.34

Outfall Loading Summary

Outfall Node	Flow	Avg	Max	Total
	Freq	Flow	Flow	Volume
	Pcnt	LPS	LPS	10^6 ltr
BRD1	76.84	26.23	48.73	0.646
OF1	32.18	0.67	5.42	0.008
OF2	0.00	0.00	0.00	0.000
OF3	0.00	0.00	0.00	0.000
STM100	83.92	29.52	58.09	0.797
STM101	72.22	8.16	16.72	0.183
System	44.19	64.58	123.12	1.634

 Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
1-2	CONDUIT	16.72	0 01:33	0.51	0.10	0.21
2-3	CONDUIT	16.72	0 01:34	0.51	0.10	0.21
3-101	CONDUIT	16.72	0 01:34	0.48	0.10	0.22
CAP-1	CONDUIT	16.72	0 01:32	1.00	0.10	0.21
DA-4	CONDUIT	48.73	0 01:54	0.56	0.40	1.00
DB-5	CONDUIT	126.49	0 01:24	1.16	1.37	1.00
DC-5	CONDUIT	72.57	0 01:23	0.98	0.80	0.94
OGS1-BRD1	CONDUIT	48.73	0 01:54	1.09	0.37	0.42
OGS2-100	CONDUIT	58.09	0 02:12	0.91	0.61	0.56
4-OGS1	ORIFICE	48.73	0 01:54			1.00
5-OGS2	ORIFICE	58.09	0 02:12			1.00
W1	WEIR	0.00	0 00:00			0.00
W2	WEIR	0.00	0 00:00			0.00
RD-100	DUMMY	16.72	0 01:32			

 Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
1-2	1.00	0.00	0.00	0.00	0.69	0.00	0.00	0.30	0.01	0.00
2-3	1.00	0.00	0.00	0.00	0.58	0.00	0.00	0.42	0.00	0.00
3-101	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.76	0.00
CAP-1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
DA-4	1.00	0.02	0.00	0.00	0.54	0.00	0.00	0.44	0.00	0.00
DB-5	1.00	0.02	0.00	0.00	0.56	0.00	0.00	0.42	0.03	0.00

DC-5	1.00	0.03	0.01	0.00	0.53	0.00	0.00	0.43	0.02	0.00
OGS1-BRD1	1.00	0.02	0.00	0.00	0.46	0.51	0.00	0.00	0.75	0.00
OGS2-100	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.67	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
DA-4	0.66	0.66	1.14	0.01	0.01
DB-5	0.01	0.40	0.83	0.67	0.01
DC-5	0.01	0.01	0.83	0.01	0.01

Analysis begun on: Fri Oct 15 12:14:21 2021
 Analysis ended on: Fri Oct 15 12:14:21 2021
 Total elapsed time: < 1 sec

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Area = 3.03 ha	Upstream Storage:	Engineer: Novatech Engineering
Impervious: 67 %	100yr Storage 820 m ³	Contact: Matthew Hrwhoriak, P. Eng.
CDS Model: PMSU52025_5		Date: 23-Sep-21
Flowrate: 45 l/s		
IDF Data: Ottawa		Project: 5494-5510 Boundary Rd.
PSD: FINE		Location: Ottawa, ON
		OGS ID: OGS 1

Return	Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	8.44	95.08	38396	38396	100.00	8.44	8.44	0.00	100.00
2-M	0.17	13.36	92.85	61265	61265	99.75	13.36	13.36	0.00	100.00
3-M	0.25	17.39	91.00	80325	80325	98.17	17.39	17.39	0.00	100.00
4-M	0.33	20.98	89.33	97664	97664	95.04	20.98	20.98	0.00	100.00
5-M	0.42	26.79	86.58	126808	126808	90.91	26.79	26.79	0.00	100.00
6-M	0.50	32.61	83.83	155951	155951	86.47	32.61	32.61	0.00	100.00
7-M	0.58	34.08	83.11	163655	163655	82.01	34.08	34.08	0.00	100.00
8-M	0.67	35.55	82.40	171358	171358	77.67	35.55	35.55	0.00	100.00
9-M	0.75	37.02	81.69	179061	179061	73.64	37.02	37.02	0.00	100.00
10-M	0.83	39.64	80.39	193256	193256	69.90	39.64	39.64	0.00	100.00
11-M	0.92	42.25	79.09	207450	207450	66.40	42.25	42.25	0.00	100.00
1-Yr	1	44.87	77.79	221644	221644	63.21	44.87	44.87	0.00	100.00
2-Yr	2	48.73	75.28	239958	243336	39.35	48.73	45.31	3.42	98.61
5-Yr	5	53.86	71.46	260492	273095	18.13	53.86	45.31	8.55	95.39
10-Yr	10	54.72	70.81	263648	278194	9.52	54.72	45.31	9.41	94.77
25-Yr	25	56.63	69.34	270408	289627	3.92	56.63	45.31	11.32	93.36
50-Yr	50	59.15	67.40	278748	304953	1.98	59.15	45.31	13.84	91.41
100-Yr	100	64.45	63.32	294363	338127	1.00	64.45	45.31	19.14	87.06

Average Annual TSS Removal Efficiency [%]:	85.6	Ave. Ann. T. Volume [%]:	99.8
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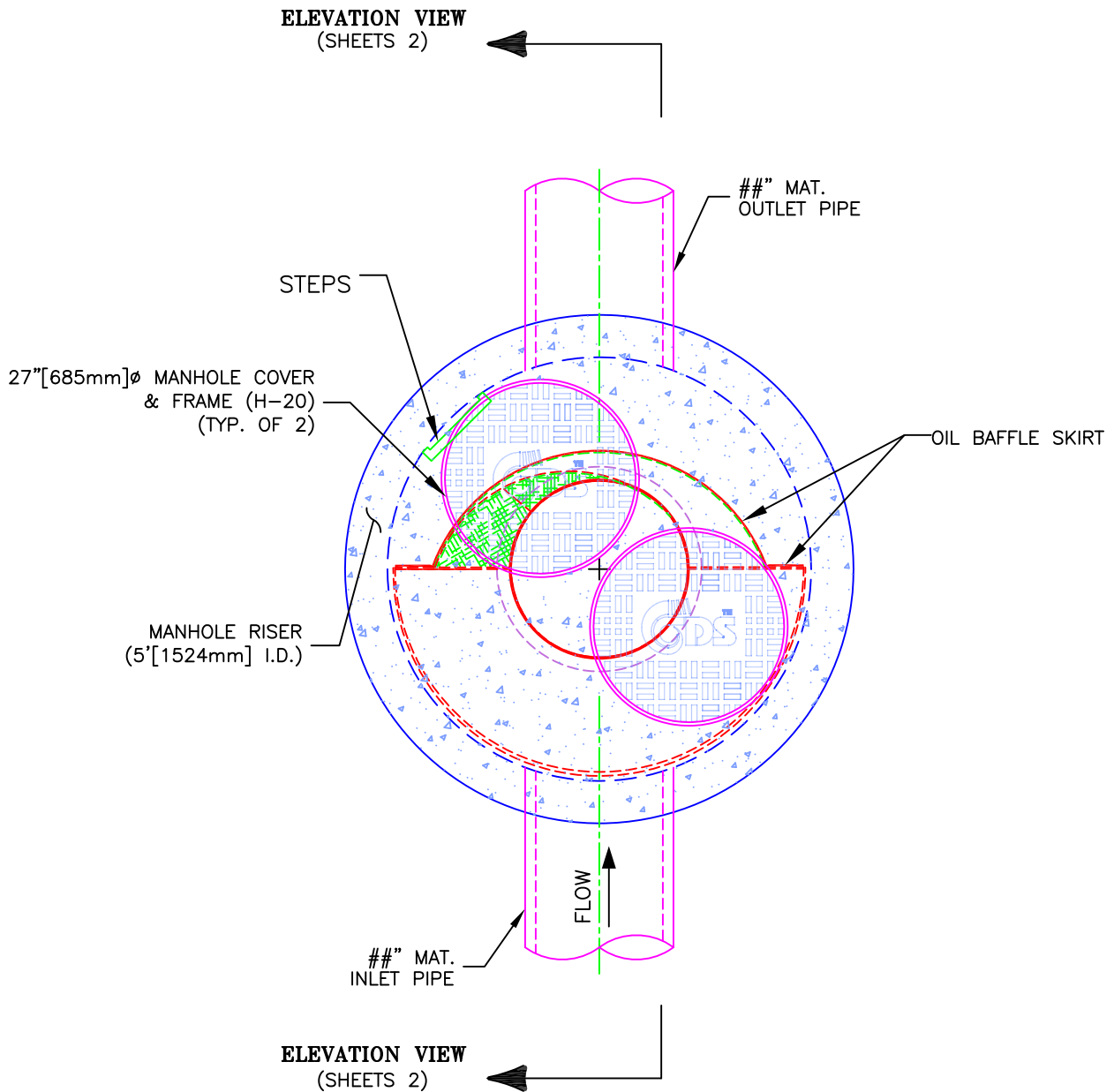
Notes:

- 1) CDS Efficiency based on testing conducted at the University of Central Florida
- 2) CDS design flowrate and scaling based on standard manufacturer model & product specifications





PLAN VIEW

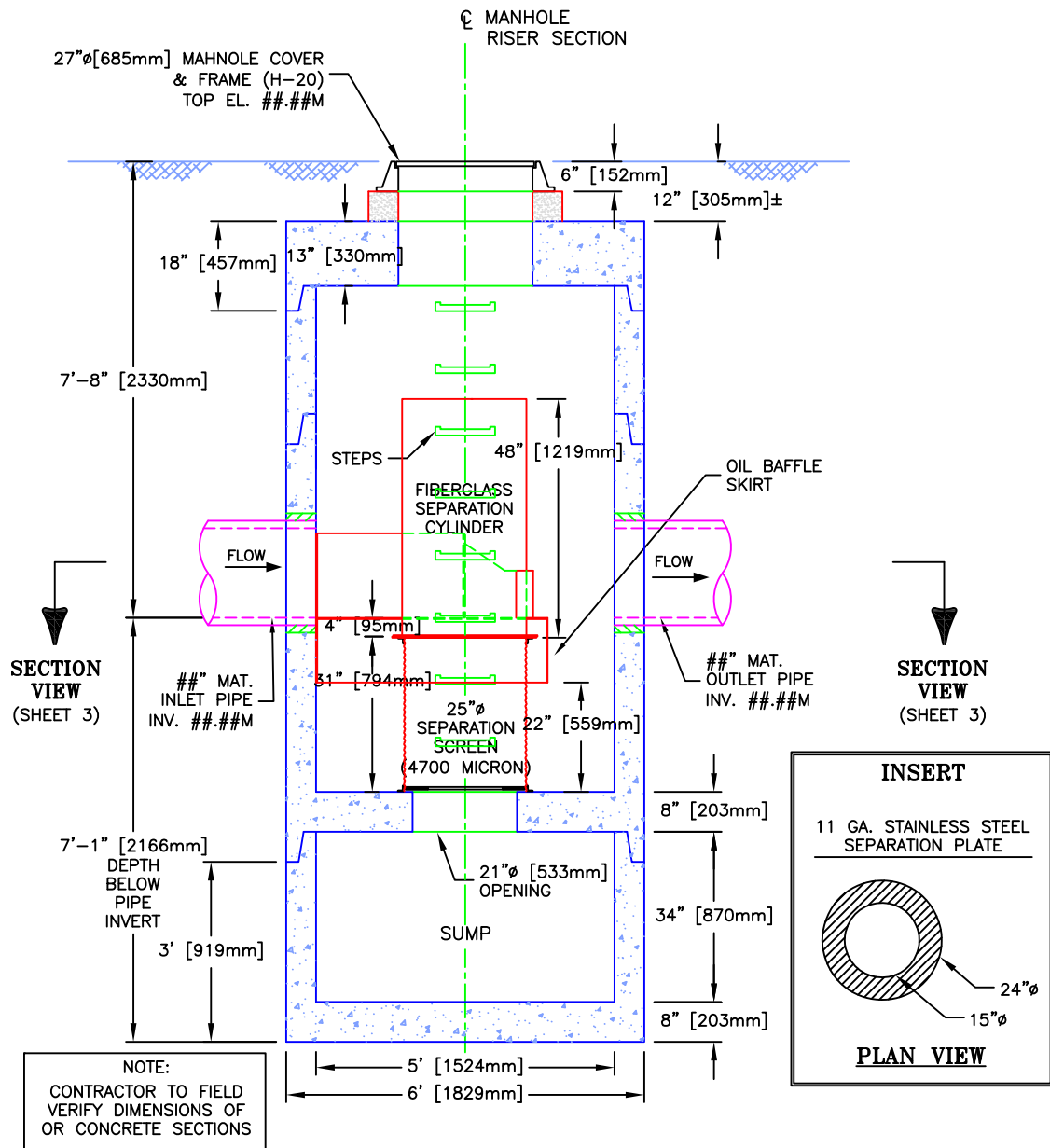


CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

	<h3>PROJECT NAME</h3> <p>CITY, STATE</p>	JOB#	XX-##-###	SCALE	1" = 2'
		DATE	##/##/##	SHEET	
		DRAWN	INITIALS	1	
		APPROV.			



ELEVATION VIEW



CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

	<h3>PROJECT NAME</h3> <p>CITY, STATE</p>	JOB#	XX-##-###	SCALE	1" = 3'
		DATE	##/##/##	SHEET	
		DRAWN	INITIALS		
		APPROV.			2

CDS Average Annual Efficiency For TSS Removal & Total Annual Volume Treated

Area = 3.32 ha	Upstream Storage:	Engineer: Novatech Engineering
Impervious: 77 %	100yr Storage 1,140 m ³	Contact: Matthew Hrwhoriak, P. Eng.
CDS Model: PMSU52025_5		Date: 23-Sep-21
Flowrate: 45 l/s		
IDF Data: Ottawa		Project: 5494-5510 Boundary Rd.
PSD: FINE		Location: Ottawa, ON
		OGS ID: OGS 2

Return	Period	Peak Flow	TSS Percentage Captured	Treated Flow Volume	Total Flow Volume	Annual Exceedance Probability	System Flow	CDS Flow	By-Pass Flow	Volume Percentage Treated
month / yr	Yr	l/s	%	litres	litres	%	l/s	l/s	l/s	%
1-M	0.08	10.39	94.20	47402	47402	100.00	10.39	10.39	0.00	100.00
2-M	0.17	16.46	91.43	75907	75907	99.75	16.46	16.46	0.00	100.00
3-M	0.25	21.37	89.15	99587	99587	98.17	21.37	21.37	0.00	100.00
4-M	0.33	25.73	87.11	121064	121064	95.04	25.73	25.73	0.00	100.00
5-M	0.42	32.66	83.77	156909	156909	90.91	32.66	32.66	0.00	100.00
6-M	0.50	39.59	80.43	192755	192755	86.47	39.59	39.59	0.00	100.00
7-M	0.58	41.31	79.57	202149	202149	82.01	41.31	41.31	0.00	100.00
8-M	0.67	43.02	78.71	211543	211543	77.67	43.02	43.02	0.00	100.00
9-M	0.75	44.74	77.86	220937	220937	73.64	44.74	44.74	0.00	100.00
10-M	0.83	47.74	75.76	233982	238099	69.90	47.74	45.31	2.44	98.49
11-M	0.92	50.74	73.65	247027	255261	66.40	50.74	45.31	5.44	96.98
1-Yr	1	53.75	71.55	260072	272423	63.21	53.75	45.31	8.44	95.47
2-Yr	2	58.09	68.21	275305	298471	39.35	58.09	45.31	12.78	92.24
5-Yr	5	63.39	64.13	291436	331375	18.13	63.39	45.31	18.08	87.95
10-Yr	10	65.21	62.74	296396	342990	9.52	65.21	45.31	19.90	86.42
25-Yr	25	67.72	60.83	302712	359311	3.92	67.72	45.31	22.41	84.25
50-Yr	50	68.85	59.97	305366	366769	1.98	68.85	45.31	23.54	83.26
100-Yr	100	70.31	58.87	308634	376521	1.00	70.31	45.31	25.00	81.97

Average Annual TSS Removal Efficiency [%]:	82.5	Ave. Ann. T. Volume [%]:	98.9
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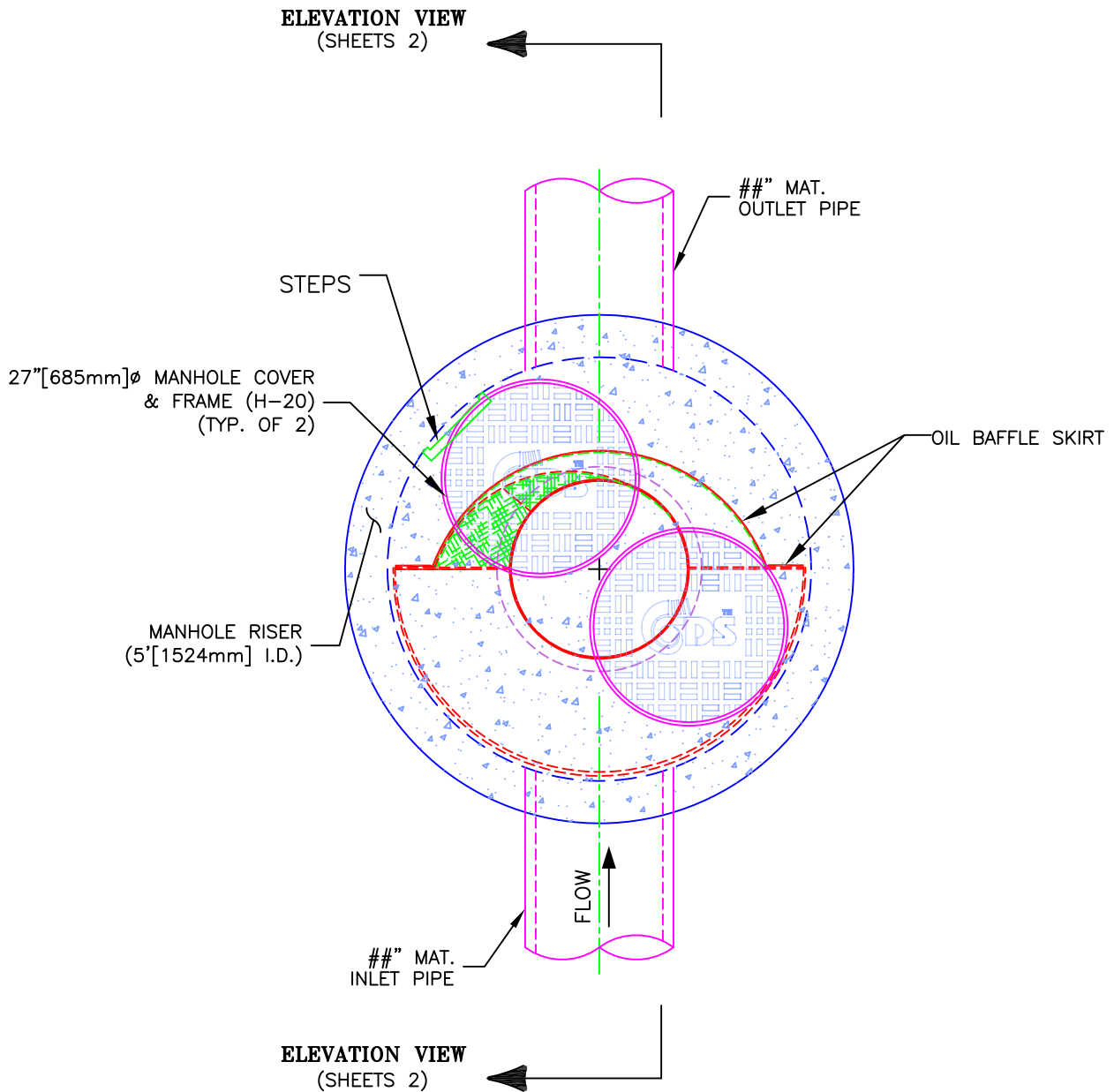
Notes:

- 1) CDS Efficiency based on testing conducted at the University of Central Florida
- 2) CDS design flowrate and scaling based on standard manufacturer model & product specifications





PLAN VIEW

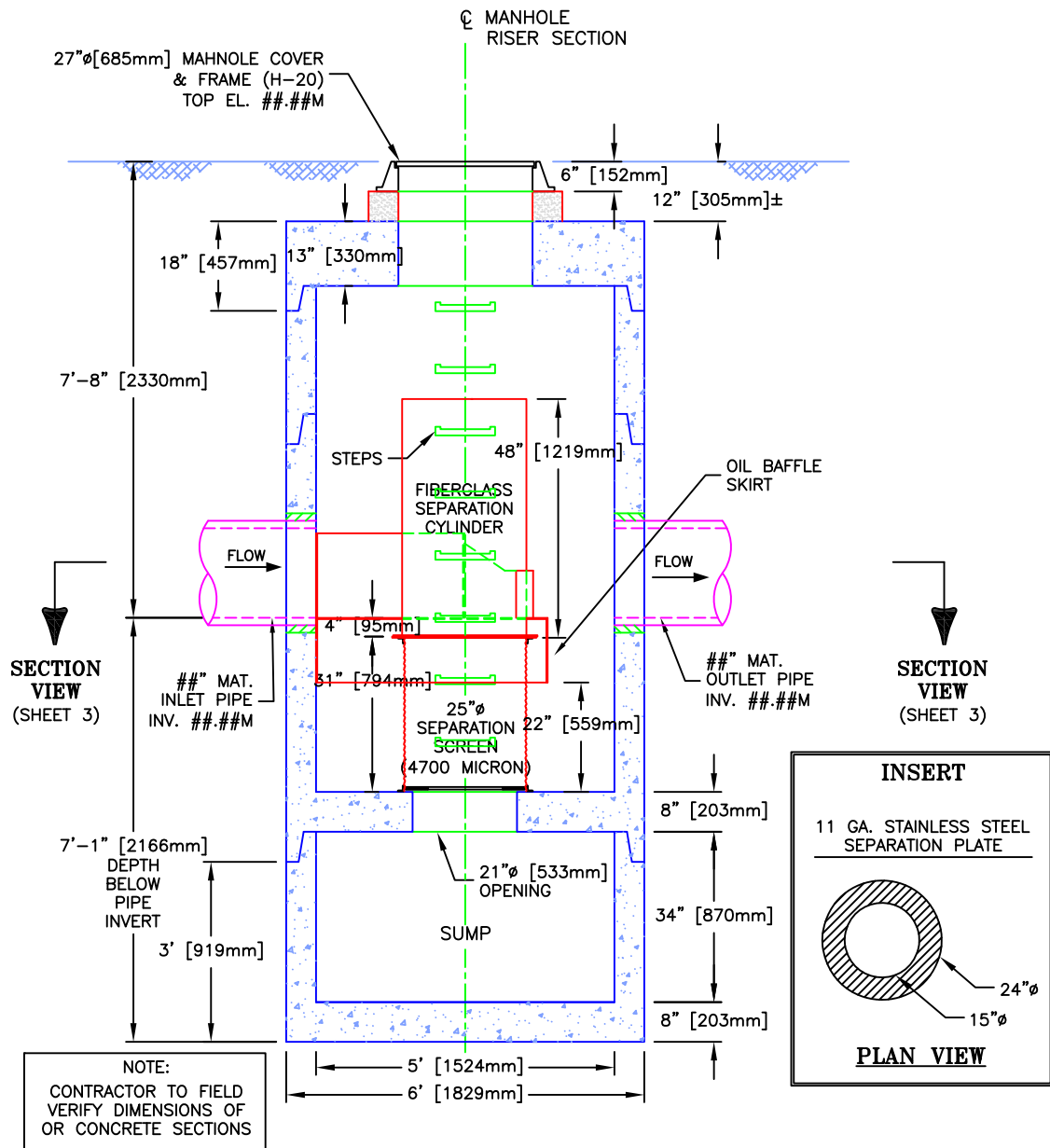


CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT

	<h3>PROJECT NAME</h3> <p>CITY, STATE</p>	JOB#	XX-##-###	SCALE	1" = 2'
		DATE	##/##/##	SHEET	
		DRAWN	INITIALS	1	
		APPROV.			



ELEVATION VIEW



CDS MODEL PMSU20_25m, 45 L/s TREATMENT CAPACITY STORM WATER TREATMENT UNIT



PROJECT NAME
CITY, STATE

JOB#	XX-##-###	SCALE	1" = 3'
DATE	##/##/##	SHEET	2
DRAWN	INITIALS		
APPROV.			