NOVATECH

Engineers, Planners & Landscape Architects

Engineering
- Land/Site Development
- Municipal Infrastructure
- Environmental/ Water Resources
- Traffic/ Transportation
- Recreational

Planning
- Land/Site Development
- Planning Application Management
- Municipal Planning
- Urban Design
- Expert Witness (OLT)
- Wireless Industry

Landscape Architecture
- Streetscapes & Public Amenities
- Open Space, Parks & Recreation
- Community & Residential
- Commercial & Institutional
- Environmental Restoration

5494-5510 Boundary Road
Day and Ross

Servicing and Stormwater Management Report

SERVICING AND STORMWATER MANAGEMENT REPORT

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

Prepared by:

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

October 3, 2024

Novatech File: 118168
Ref No. R-2024-095

NOVATECH
Engineers, Planners & Landscape Architects

October 3, 2024

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

Attention: Adam Brown

Dear Mr. Brown:

Reference: 5494-5510 Boundary Road
Ottawa, ON
Servicing and Stormwater Management Report
Our File No. : 118168

Please find enclosed the 'Servicing and Stormwater Management Report' for the above noted development. This report is submitted in support of a Site Plan Application for the proposed development.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

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

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 EXISTING CONDITIONS 1
3.0 PROPOSED DEVELOPMENT 1
4.0 SITE CONSTRAINTS 1
5.0 WATER SERVICING 3
6.0 SANITARY SERVICING 5
7.0 STORM SERVICING & STORMWATER MANAGEMENT 5
7.1 Stormwater Management Criteria 6
7.2 Quantity Control 6
7.3 Stormwater Management Modeling 6
7.3.1. Design Storms 7
7.3.2. Modelling Parameters 7
7.4 Proposed Stormwater System 8
7.5 PCSWMM Model Results 9
7.6 Quality Control 9
7.7 Major Overland Flow Route 10
8.0 EROSION AND SEDIMENT CONTROL 10
9.0 CONCLUSIONS AND RECOMMENDATIONS 10
10.0 CLOSURE 11

LIST OF FIGURES

Figure 1 Key Plan
Figure 2 Existing Conditions Plan
Figure 3 Proposed Site Plan
Figure 4 Existing Drainage Area Plan

LIST OF APPENDICIES

Appendix A Water Servicing Information
Appendix B Sanitary Servicing Information
Appendix C Stormwater Management Calculations
Appendix D Referenced Reports
Appendix E Drawings

LIST OF ENGINEERING DRAWINGS

General Plan of Services (118168-GP)
Grading Plan (118168-GR1, GR2)
Erosion Sediment Control Plan (118168-ESC)
Notes and Detail (118168-ND)

1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed development located at 5494-5510 Boundary Road within the City of Ottawa. This report will support a Site Plan Application for the subject development. **Figure 1** Key Plan shows the site location.

2.0 EXISTING CONDITIONS

The subject site is approximately 8.5 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.

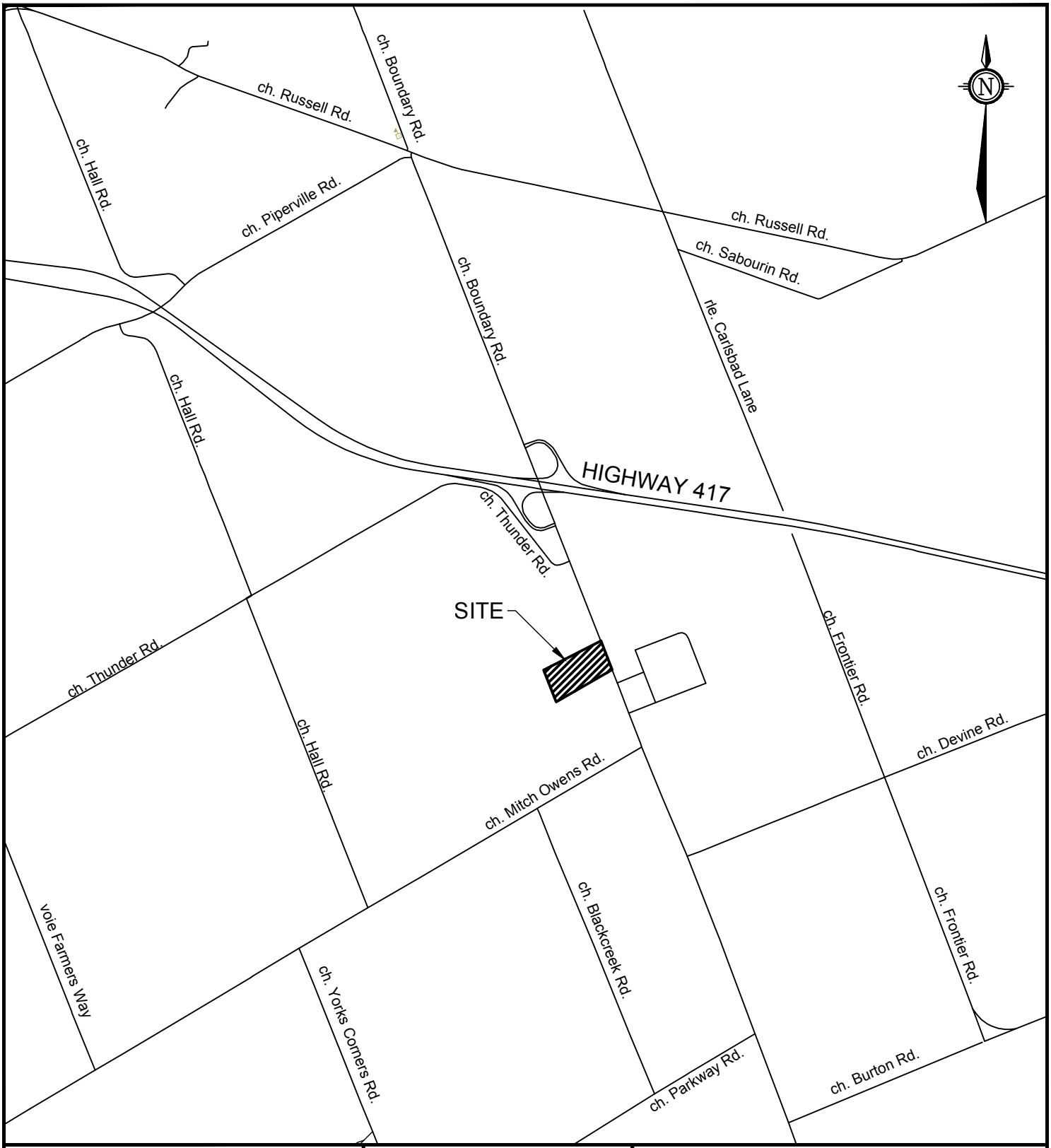
3.0 PROPOSED DEVELOPMENT

It is proposed to develop the site with a cross-dock facility with 3,758m² of industrial floor space and 642m² of office floor space. The cross-dock facility will consist of 72 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.



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

KEY PLAN

5510 BOUNDARY ROAD
CITY OF OTTAWA

5510 BOUNDARY ROAD

DATE	JOB	FIGURE
AUG 2024	118168	1

M:\2018\118168\CAD\Design\118168-KP.dwg, Sheet 8x11 Keyplan, Jan 18, 2024 - 3:34pm, mhrehoriak

SHT8X11.DWG - 216mmx279mm

LEGEND

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

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

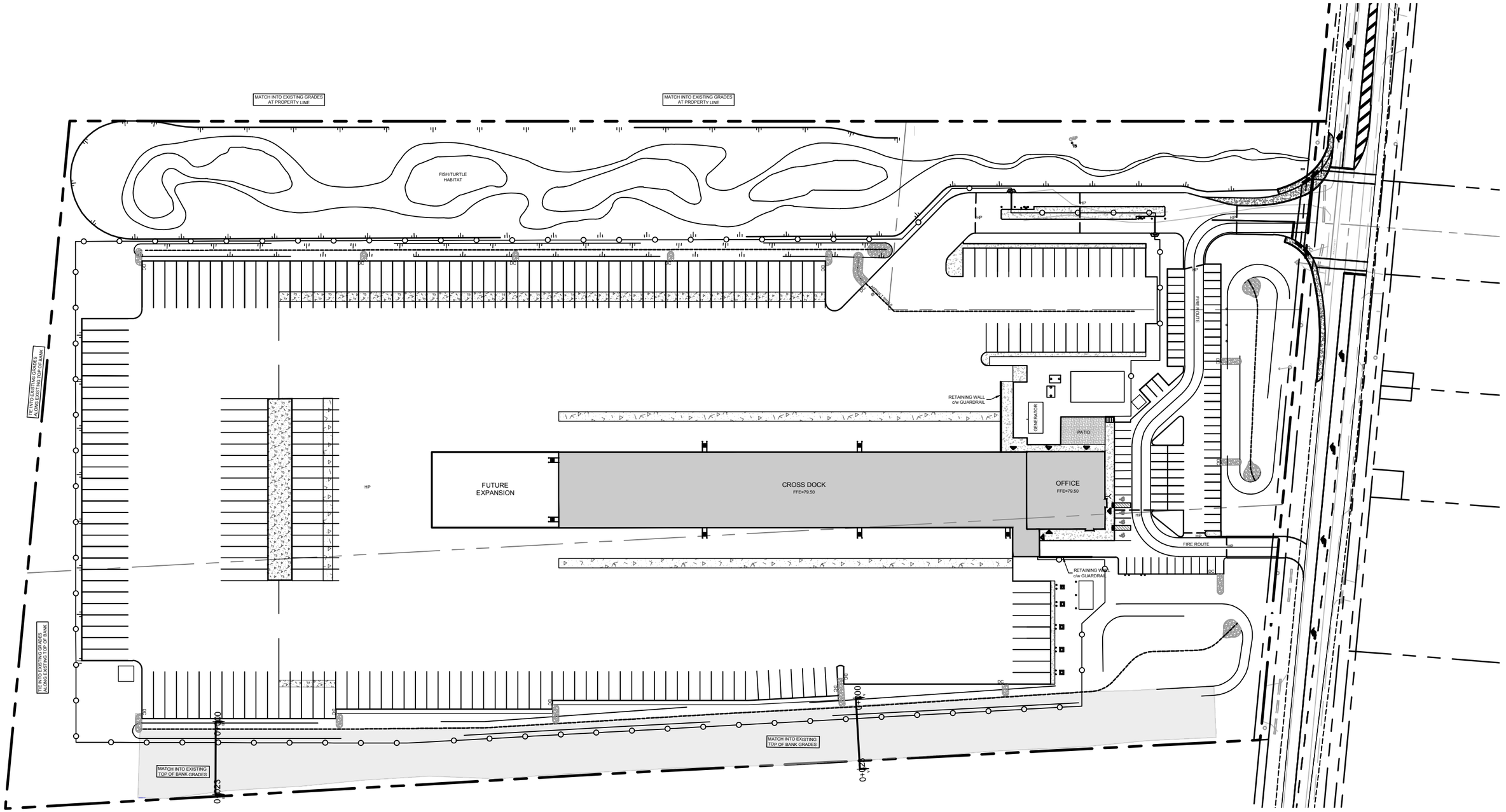
EXISTING CONDITIONS

SCALE 1 : 1250 (0 10 20 30 40 50)

DATE AUG 2024 | JOB 118168 | FIGURE 2

SHT11X17.DWG - 279mmX432mm

M:\2018\118168\CAD\Design\Figures\118168-XCON.dwg, EX, Apr 14, 2021 - 10:50am, mhrehoriak



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

PROPOSED SITE PLAN

SCALE 1 : 1250 (0 10 20 30 40 50)

DATE SEPT 2024 | JOB 118168 | FIGURE 3

SHT11X17 DWG - 279mmX432mm

M:\2018\118168\CAD\Design\Figures\118168-SP.dwg, SP, Aug 08, 2024 - 9:28am, madeoti

    - 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.

A subsequent memo was prepared by Paterson Group entitled 'Settlement Surcharge Monitoring Program Proposed Commercial development – 5510 Boundary Road, Ottawa, Ontario' dated August 12, 2024. The settlement surcharge memo outlines the requirements for surcharging the site to reduce and/or remove the requirements for lightweight fill on site. The following is a summary of the settlement surcharge program requirements:

- Surcharge pile to be constructed to a geodetic elevation of 81.50m and extend 2.4m horizontally beyond the limits of the building foundation.
- The surcharge pile will be constructed from imported granular material, placed in maximum 300mm thick loose lifts and compacted with the tracks of the leveling equipment.
- 4 settlement plates will be installed at the underside of footing elevation, 1 temporary benchmark settlement plate will be installed 1.8m below existing ground level a minimum of 30m away from the surcharge pile.
- Settlement monitoring surveys will be conducted monthly using a high accuracy, digital level.
- It is anticipated that a total of 18 months will be required to complete the settlement monitoring program.

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, updated November 9, 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, updated November 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.
- 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).

A subsequent report titled Environmental Impact Statement Update was prepared by CIMA+ dated October 3, 2024. The report was prepared for the recent updates to the Site Plan application and to update the mitigation measures to current guidelines. The following is a summary of the findings of this report:

- Consultation with DFO is required prior to any disturbance to the fish habitat.
- A complete flora Species at Risk inventory must be completed no earlier than 2 years prior to construction.
- Butternut and Black Ash inventories must be completed at the appropriate time of year.
- As a condition of Site Plan Approval, review and update the list of avoidance and mitigation measures, as needed, at the time of construction.

The City of Ottawa has recently adopted Zoning By Law 2024-238, which has rezoned the developable area of the Site to RG-Rural Geneal Industrial which permits the proposed cross-dock facility. The rezoning also captures and designates the realigned headwater feature along the northern property limits and the setback to the wetland on the neighboring property to south as Open Space O1R Zone. The proposed development respects the required setbacks as per the Zoning Amendment.

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.

The domestic water supply to the facility from the Carlsbad water system will be 3 Equivalent connections: 2,700L/Day x 3 = 8,100/ Litres/day [5.63l/min continuous flow]. The water meter and flow control valve will be designed to accommodate this continuous flow rate while not exceeding it.

It is proposed to service the development by connecting to the existing 100mm dia. watermain in Boundary Road and extending a 50mm dia. private watermain into the site. The 50mm water service will supply the internal water system which consists of a 9,445 Litre domestic water storage tank, booster pump and pressure tank to maintain the internal operating pressures while not exceeding the equivalent connection flow rate. Refer to the Water Entry Room figure in **Appendix A** for details on the internal water system configuration.

Design Criteria from Section 4 of the City of Ottawa Water Distribution Guidelines and section 8 of the Ontario Building Code were used to calculate the theoretical water demands for the proposed development. The average water demand for the proposed development is calculated as follows:

Average Day Water Demand

The water demand is calculated for a total of 34 employees at the facility which includes office and cross-dock workers.

29 cross-dock employees
Average demand per employee = 125 Litres/day (includes shower allotment)

5 office employees
Average demand per employee = 75 Litres/day

(29 x 125) + (5 x 75) = 4,000 Litres/day

There will also be a miscellaneous external hose bib use throughout the day. Assuming the hoses could run for 3 hrs. at a rate of 20 Litres/min., the average day flows are calculated as follows:

3 hrs. x 20Litres/minute = 3,600 Litres/day

Average Day Summary

Employee use + hose bibs
4,000 Litres/day + 3,600 Litres/day

= 7,600 Litres / day

Fire Suppression

As previously indicated the Carlsbad system will not provide fire suppression for the development. Fire suppression will be provided by a 400m³ underground storage tank located under the office component of the building. The required fire flows for the development were calculated based FM Global criteria to be 97.8L/s (1550GPM). The flow rate accounts for a 1300GPM sprinkler

requirement and a 250GPM hose allowance. As per the FM Global criteria the required fire flow will need to be provided for a minimum duration of 60 minutes which equates to a required water storage volume of 352m³ (93,000 gallons). The fire flow requirements for the development were also calculated using the FUS and NFPA methods, a comparison of the flow and storage requirements is provided below in Table 5.1.

Table 5.1: Fire Protection Requirement Comparison

Fire Protection Method	Fire Flow (LPS)	Duration (min)	Storage Volume (m^3)
FM Global	97.8	60	352
Fire Underwriter Survey - FUS	133.0	120	960
National Fire Protection Association - NFPA	90.4	90	488

In the event of a fire, the fire department will draw water from the storage tank to pressurize the internal fire suppression system. A Siamese connection will be located near the main entrance to the office and a tank pull port will be located along the fire route in the landscaped island fronting the building. The pull port will be provided as per City of Ottawa Standard detail W51/52. Refer to the General Plan of Services (118168-GP) for additional details.

Based on the preceding it can be concluded that the municipal water supply along with the internal water system as designed, will provide adequate system pressures and flow for the domestic demand and the water storage tank will provide an adequate volume of water to meet the fire suppression requirements of the development.

6.0 SANITARY SERVICING

There is currently no existing municipal sanitary sewer fronting the development in Boundary Road as the development is not located within the City of Ottawa sanitary service area. A private onsite septic system is proposed to service the development as the daily flow rates are less than 10,000 L/day. The septic system was designed by Paterson Group for a total peak flow of 4,000L/day. Paterson has designed a Waterloo Biofilter system for the site, design drawings and details of the system are provided in **Appendix B** for reference.

7.0 STORM SERVICING & STORMWATER MANAGEMENT

There is no municipal storm sewer fronting the development. As previously indicated the site currently sheet drains to a perimeter watercourse which outlets to the existing Boundary Road ditch. The storm drainage system has been designed to ensure there will be no negative impacts to the provincially significant wetland (PSW) northwest of the development, the realigned headwater feature along the north property limits and the wetland to the south. It is proposed to service the development with a perimeter ditch system that will collect and convey surface runoff from the development directly to the Boundary Road ditch. Site runoff will not be conveyed to the PSW, the realigned headwater feature or wetland to the south. Stormwater flows from the site to the roadside ditch will be attenuated by inlet control devices to match pre-development levels. The drainage system includes a dry pond at the north and south ditch outlets to provide additional storage to meet the pre-development release rates. The perimeter ditch system has been sized to ensure no surface ponding on the parking area during the 2-year event and that the major

overland flow route spills directly to the roadside ditch and not the realigned headwater feature or wetlands adjacent to the site. Refer to the General Plan of Services (118168-GP) for details on the storm servicing design.

7.1 Stormwater Management Criteria

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).
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

7.2 Quantity 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 on 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 4,** 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. The allowable release rates in the 2020 Memo were based on an assumed development area of 6.94 ha, however the development area has been since reduced to 6.14 ha due to increased development setbacks. The allowable release rate for the development has been revised to account for the development area reduction. A summary of the pre-development flow rates is provided in **Table 7.1**.

Table 7.1: Adjusted Pre-development Release Rate Summary

Area ID	Drainage Area (ha)	Peak Flow (L/s)		
		2-year	5-year	100-year
PRE	6.14	118	188	445

7.3 Stormwater Management Modeling

The City of Ottawa Sewer Design Guidelines (October 2012) requires hydrologic / hydraulic modeling for all dual drainage systems. The performance of the proposed storm drainage system is evaluated using the PCSWMM model for this site. The results of the analysis were used to:

- Calculate the total post-development runoff from the proposed site.
- Calculate the required storage volume for both proposed ponds within the site.

A PCSWMM model version has been prepared as part of this design submission. Model schematics and output files are provided in **Appendix C** for reference.

7.3.1. Design Storms

The hydrologic / hydraulic analysis was completed using the following synthetic design storms and historical storms. The IDF parameters used to generate the design storms were taken from the City of Ottawa Sewer Design Guidelines (October 2012).

3 Hour Chicago Storms:	*24 Hour Chicago Storms*:
2-Year 3hr Chicago storm	100-year 24hr Chicago storm
5-year 3hr Chicago storm	
100-year 3hr Chicago storm	
100-year+20% 3hr Chicago storm	
12 Hour SCS Type II Storms:	*Historical Storms*:
5-year 24-hour SCS Type II storm	July 1, 1979 storm
100-year 24-hour SCS Type II storm	August 4, 1988 storm
	August 8, 1996 storm

The 3-hour Chicago distribution generates the highest peak flows for both the minor and major systems and was determined to be the critical storm distribution for the design of the storm drainage system.

The proposed drainage system has also been stress tested using a 3-hour Chicago design storm that has a 20% higher intensity and total volume compared to the 100-year event. This storm distribution is provided in **Appendix C**.

7.3.2. Modelling Parameters

The hydrologic parameters for each subcatchment were developed based on the proposed land use and grading. Subcatchments were modeled using the standard SWMM5 runoff module with Horton's Equation for infiltration.

Infiltration

Infiltration losses for all subcatchments were modeled using Horton's infiltration equation, which defines the infiltration capacity of soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The default values for the City of Ottawa were used for all catchments.

Horton's Equation:	Initial infiltration rate:	f_o = 76.2 mm/hr
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$	Final infiltration rate:	f_c = 13.2 mm/hr
	Decay Coefficient:	k = 4.14/hr

Depression Storage

The default values for depression storage in the City of Ottawa were used for all catchments. Rooftops were assumed to provide no depression storage (zero-impervious parameter).

- Depression Storage (pervious areas): 4.67 mm
- Depression Storage (impervious areas): 1.57 mm

Equivalent Width

'Equivalent Width' refers to the width of the subcatchment flow path. This parameter is calculated as described in Section 5.4.5.6 of the *City of Ottawa Sewer Design Guidelines* (October 2012).

Impervious Values

Runoff coefficients for each subcatchment were determined based on the proposed site plan. Percent impervious values were calculated using the following equation:

$$\%imp = (C - 0.20) / 0.70$$

A table with the subcatchment parameters for each of the site drainage areas is provided in **Appendix C**.

7.4 Proposed Stormwater System

In order to effectively manage the post-development water flows from the site and maintain them at pre-development levels, the following measures are being proposed:

- Controlled flow roof drains will be provided to attenuate runoff from the roof area and to effectively utilize the roof storage.
- Swales were designed around the north and south boundaries of the site to ensure efficient conveyance of water and to provide sufficient storage capacity.
- Depressed curb spillways have been provided along the curb in the parking lot and truck court to convey sheet drainage from the pavement surface to the perimeter swales. Each subcatchment area in the PCSWMM model outlets to a storage node that represents the surface storage in parking lot locally at each depressed curb. The stage storage curves for each depressed curb were generated by surface contours from the Civil 3D surface model.
- Two dry ponds were strategically located at the downstream end of north and south swale systems to effectively control the volume of stormwater during infrequent storm events. Ponds stage storage curves were also generated by surface contours from the Civil 3D surface model.
- An open-ended 600mm storm pipe system is proposed to convey stormwater from the north swale under the main driveway entrance to the north dry pond.
- Inlet control devices and weirs will be incorporated at the pond outlets to effectively regulate the outflow from the site and align it with pre-development flow levels.

It should be noted that the outlet elevation in the roadside ditch doesn't allow for adequate cover on the storm pipes to meet frost protection requirements. The storm sewer will require insulation over the pipe to provide frost protection for the pipe bedding.

7.5 PCSWMM Model Results

The Chicago 3-hour storm distribution is used to calculate storm runoff from the site for storms with 2, 5, and 100-year return periods. This model for storm runoff is further stress-tested using a 100-year + 20% storm distribution to ensure its resilience.

The flow rate from the post-development condition is summarized in **Table 7.2**. By comparing this table with the pre-development condition flow rate in **Table 7.1**, it is apparent that the proposed condition is designed to closely align with the pre-development condition. This demonstrates a conscious effort to maintain consistency and balance in the development.

Table 7.2: Post-development Flow Rate Summary

Outlet ID	Contributing Area (ha)	Peak Flow (L/s)			
		2-year	5-year	100-year	Stress Test
North Outlet	3.09	54	60	64	65
North Weir		0	48	208	250
Direct Runoff	0.05	10	14	24	29
South Outlet	2.96	42	46	58	60
South Weir		0	0	37	125
Total	**6.14**	**106**	**168**	**391**	**529**
Allowable	**6.14**	**118**	**188**	**445**	**-**

7.6 Quality Control

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 complete with ADS Stormtech isolator row chambers. The proposed OGS units are ADS model FD-4HC and the isolator rows are ADS Stormtech SC-740. The OGS units and isolator rows will be located downstream of the inlet control device at the outlets from the dry ponds to the Boundary Road roadside ditch. The OGS units in combination with the isolator row will provide a net annual removal efficiency of 86% while treating greater than 90% of the total runoff based on the ETV particle size distribution. Refer to **Appendix C** for the detailed sizing and schematics of the OGS units and Stormtech Isolator rows. In addition to the OGS units a sand berm will be constructed on the back slope of the south perimeter ditch systems to promote infiltration and recharge to the existing watercourse. The sand berm will provide additional treatment through infiltration of the sand layer. A summary of the OGS unit and Isolator Row treatment is provided below in **Table 7.3**.

Table 8.3: Oil Grit Separator Sizing Parameters

Location	Drainage Area (Ha)	Runoff Coefficient 'C'	OGS ADS Model	No. ADS SC-740 Chambers	Total TSS Removal
North Outlet	3.02	0.80	FD-4HC	26	86.1%
South Outlet	3.12	0.80	FD-4HC	26	86.0%
TOTAL	**6.14**	**0.80**	**-**	**52**	**86%**

7.7 Major Overland Flow Route

A major overland flow route will be provided for storms greater than the 100-year storm event. Stormwater will be directed to Boundary Road right-of-way. The major overland system is shown on the Grading Plan (118168-GR).

8.0 EROSION AND SEDIMENT CONTROL

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 (catchbasin inserts) will be placed in existing and proposed catchbasins and catchbasin 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.
- Strawbale or rock check dams will be installed in swales and ditches.
- 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.

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (Drawing 118168-ESC) for additional information.

9.0 CONCLUSIONS AND RECOMMENDATIONS

- 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 installed to provide adequate volumes and flow to meet the fire demands for the proposed development.
- The site will be serviced by a private septic system. The detailed septic detailed design has been completed by Paterson to treat a daily sewage volume of 4,000 L/day.
- 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 / dry pond 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 combined with isolator row chambers to achieve 80% TSS for the ETV particle size distribution.
- The overland flow route to the Boundary Road ditch is to be maintained.
- Erosion and sediment control measures will be implemented prior to and during construction.

10.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:

Michael Adeoti, E.I.T, M.Eng
Engineer in Training
Land Development Engineering

Reviewed by:

Matt Hrehoriak, P.Eng
Project Manager
Land Development Engineering

Vahid Mehdipour

Vahid Mehdipour, M.Sc.
Engineer in Training
Water Resources

APPENDIX A
Water Servicing Information

Project No. 118168
Project Name: 5510 Boundary Rd.
Project Location: Ottawa

NOVATECH
Engineers, Planners & Landscape Architects

Date: October 2021
Revised: September 2024

Domestic Water Demands

Daily Demands from OBC Table 8.2.1.3

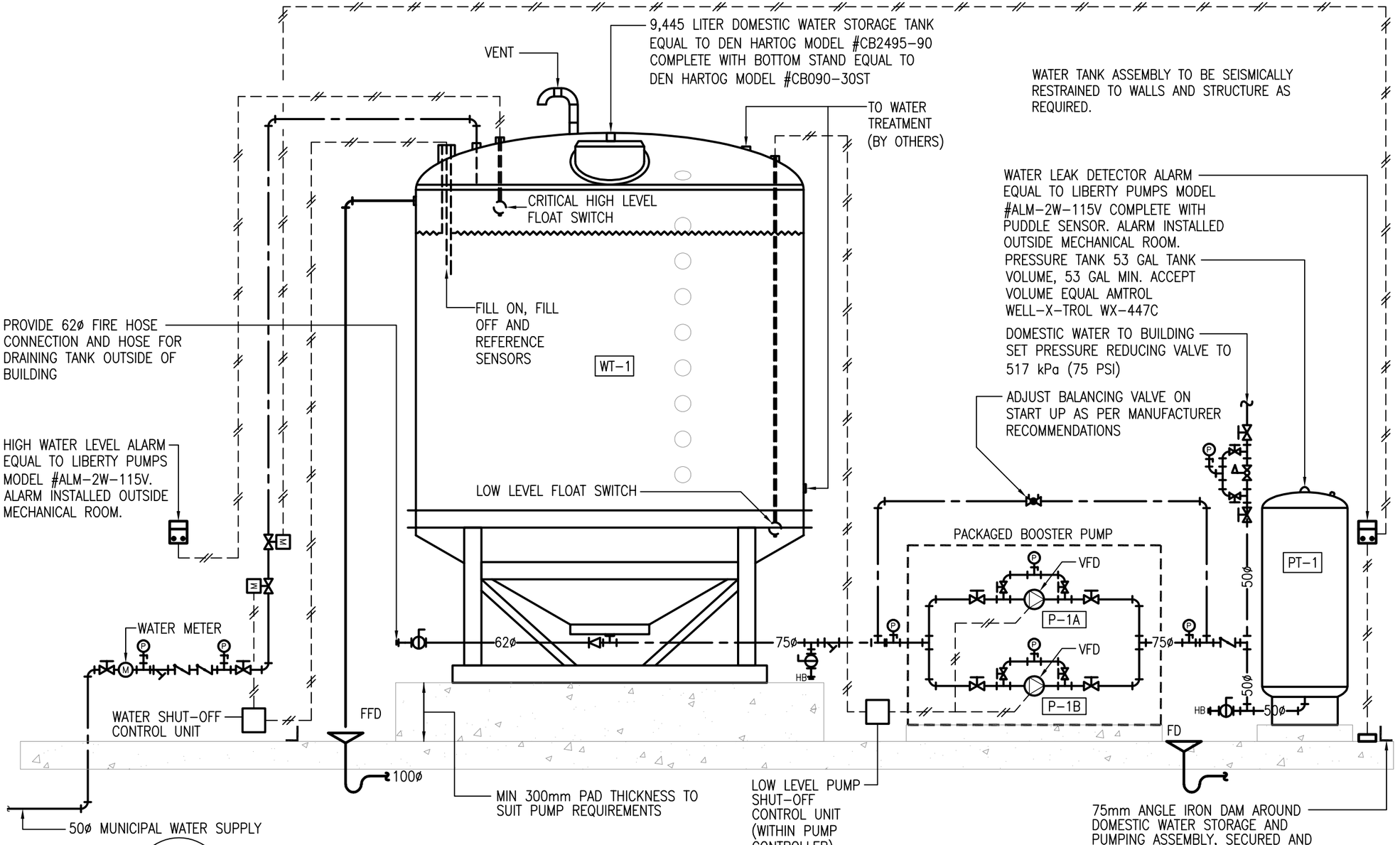
Establishment	Daily Demand Volume	
Factory (including shower)	125	L/employee/8hr shift
Office Building	75	L/employee/8hr shift

Industrial Peaking Factors City of Ottawa Water Distrubution Guidelines

Conditions	Peaking Factor	
Maximum Day	1.5	x avg day
Peak Hour	1.8	x max day

Proposed Development Conditions

		Average Day Demand		Maximum Day Demand		Peak Hour Demand	
	No. of Employees	L/Day	L/Sec	L/Day	L/Sec	L/Day	L/Sec
Factory	29	3625	0.042	5438	0.06	9788	0.11
Office Building	5	375	0.004	675	0.01	1215	0.01
Totals		4000	0.046	6113	0.07	11003	0.12



1 / M003 **WATER ENTRY ROOM DETAIL**

N.T.S.

NO.	REVISION	DATE
1.	ISSUED FOR SITE PLAN APPLCATION	SEPT 18/24

McKEE ENGINEERING

PROJECT: DAY & ROSS
5494-5510 BOUNDARY ROAD GLOUCESTER, ON

DRAWING NAME: WATER ENTRY ROOM DETAIL

SCALE: N.T.S

DRAWING No. Part of M003

JOB No. 24052

FUS - Fire Flow Calculations

As per 2020 Fire Underwriter's Survey Guidelines

NOVATECH
Engineers, Planners & Landscape Architects

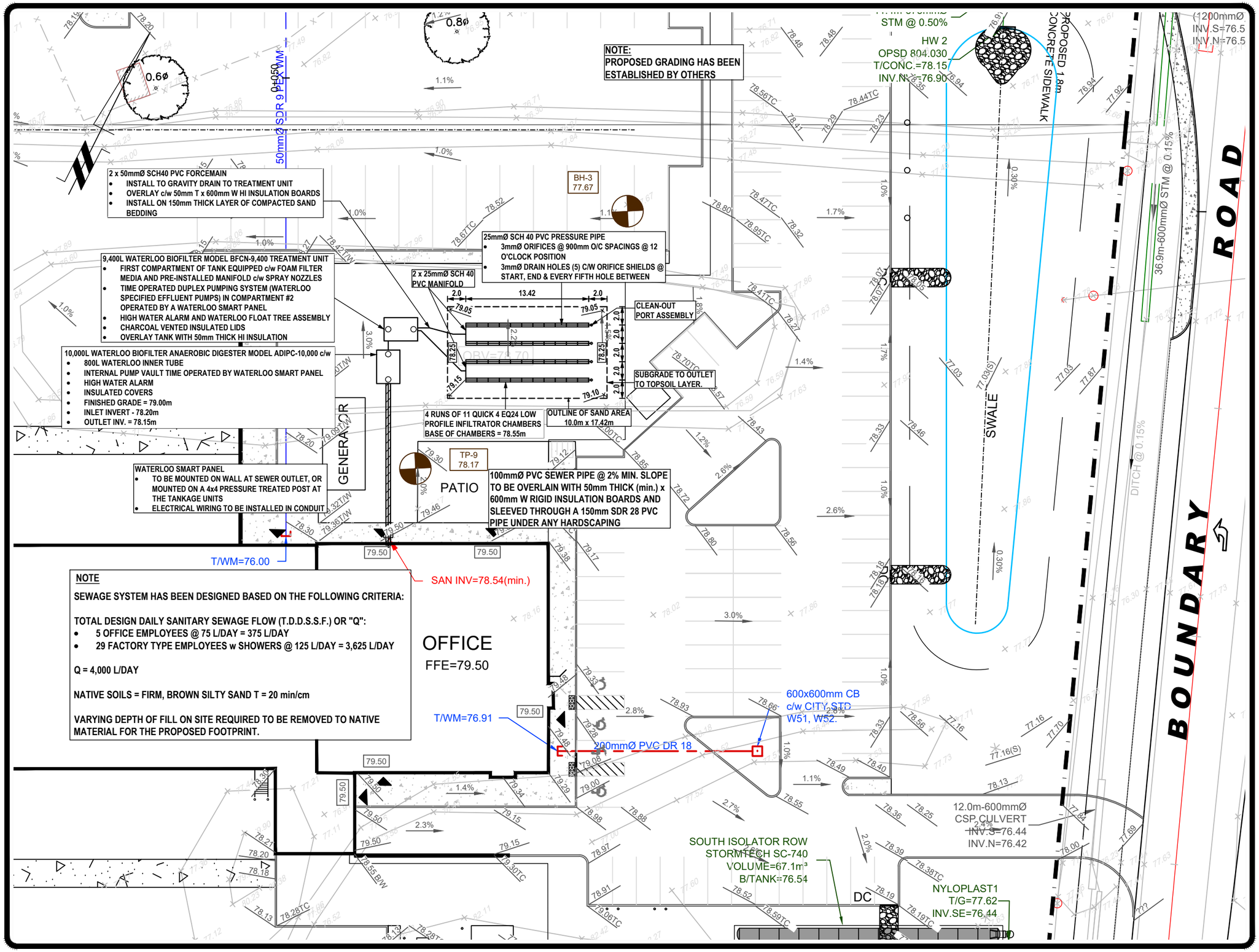
Novatech Project #: 118168
Project Name: 5510 Boundary Road
Date: 7/3/2024
Input By: Matt Hrehoriak
Reviewed By:

Legend: Input by User; No Information or Input Required

Building Description: Single Story Warehouse
Non-combustile construction

Step			Input		Value Used	Total Fire Flow (L/min)
Base Fire Flow						
1	**Construction Material**			**Multiplier**		
	Coefficient related to type of construction **C**	Type V - Wood frame		1.5	0.8	
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction	Yes	0.8		
		Type I - Fire resistive construction (2 hrs)		0.6		
2	**Floor Area**					
	A	Building Footprint (m^2)	4400			
		Number of Floors/Storeys	1			
		Area of structure considered (m^2)			**4,400**	
	F	**Base fire flow without reductions**				**12,000**
		F = 220 **C** (**A**)$^{0.5}$				
Reductions or Surcharges						
3	**Occupancy hazard reduction or surcharge**			**Reduction/Surcharge**		
	(1)	Non-combustible		-25%	0%	**12,000**
		Limited combustible		-15%		
		Combustible	Yes	0%		
		Free burning		15%		
		Rapid burning		25%		
4	**Sprinkler Reduction (100% sprinkler coverage of building used)**			**Reduction**		
	(2)	Adequately Designed System (NFPA 13)	Yes	-30%	-30%	**-3,600**
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
				Cumulative Total	**-30%**	
5	**Exposure Surcharge (cumulative %, Maximum Exposure Adjsutement Charge Used)**				**Surcharge**	
	(3)	North Side	> 45.1m		0%	**0**
		East Side	> 45.1m		0%	
		South Side	> 45.1m		0%	
		West Side	> 45.1m		0%	
				Cumulative Total	**0%**	
Results						
6	**(1) + (2) + (3)**	**Total Required Fire Flow, rounded to nearest 1000L/min**			**L/min**	**8,000**
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	**133**
				or	USGPM	2,114
7	**Storage Volume**	Required Duration of Fire Flow (hours)			Hours	2
		Required Volume of Fire Flow (m^3)			m^3	960

APPENDIX B
Sanitary Servicing Information



LEGEND:

	Test Pit / Borehole Location
x 100.99	Existing Ground Surface Elev. (m)
x 102.30	Proposed Ground Surface Elev. (m)
T/C	Top of Foundation Wall
	Proposed Structure

All units are in meters unless otherwise specified.

BENCHMARK INFORMATION:

Refer to Grading Plan No. 118168-GR, dated March 2024, by Novatech Engineers, PLanners & Landscape Architects

REFERENCE:

Base Plan and Topographic Information obtained from Grading Plan No. 118168-GR, dated March 2024, by Novatech Engineers, PLanners & Landscape Architects

DD/MM/YY	DESCRIPTION	REV.
12/09/24	Reviser Dispersal Bed	2
22/08/24	Reviser Dispersal Bed	1
14/08/24	Issued for Preliminary Review	0

Consultant:
PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7S9
TEL: (613) 226-7381

Client:

DAY AND ROSS TRANSPORTATION

Project:

PROPOSED CROSS DOCK BUILDING

5510 BOUNDARY ROAD
OTTAWA (CARLSBAD SPRINGS), ONTARIO

Drawing:

SEWAGE SYSTEM LAYOUT PLAN

Scale:	Drawn by:
1:400	HV
Date: 09/2024	Checked by: MK

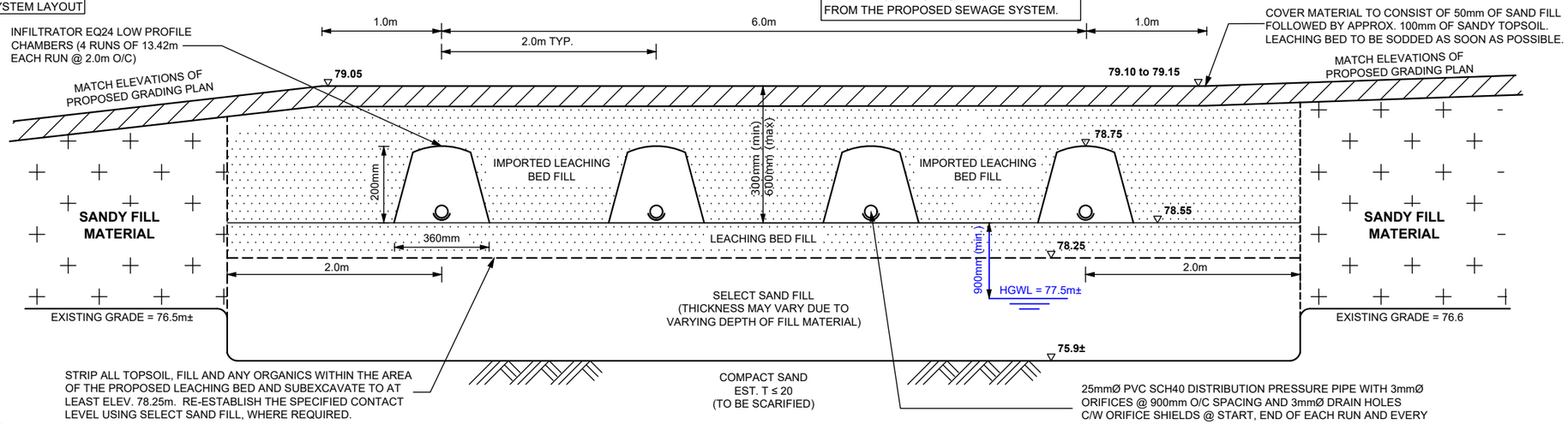
Drawing No.:

PH4942-1(rev.2)

p:\autocad drawings\hydrogeology\ph49xx\ph4942 - day and ross transportation - 5510 boundary road\ph4942-1(rev.2).dwg

REFER TO PATERSON GROUP DRAWING No. PH4942-1(rev.1) FOR SEWAGE SYSTEM LAYOUT

FINAL GRADING SHALL BE SUITABLY SHAPED TO DIRECT SURFACE WATER AWAY FROM THE PROPOSED SEWAGE SYSTEM.



PROFILE

N.T.S.

NOTES:

1) ESTIMATE OF DAILY SEWAGE FLOW (Q)

TOTAL DESIGN DAILY SANITARY SEWAGE FLOW (T.D.D.S.S.F) HAS BEEN DESIGNED IN ACCORDANCE WITH ONTARIO BUILDING CODE (OBC) TABLE 8.2.1.3.B. AND HAS BEEN REVIEWED / PRE-APPROVED BY THE OTTAWA SEPTIC SYSTEM OFFICE. (OSSO)

- OFFICE EMPLOYEES @ 75 L/DAY = 5 x 75 L/DAY = 375 L/DAY
- FACTORY TYPE EMPLOYEES w SHOWERS @ 125 L/DAY = 29 x 125 L/DAY = 3,625 L/DAY

TOTAL SEWAGE FLOW = 4,000 L/DAY

2) SOIL CONDITIONS

SOILS INFORMATION GATHERED BY PATERSON GROUP INC. ON AUGUST, 2018 (REFER TO PGI REPORT No. PG4592-1)

BH 3, ELEV. 77.67m		TP 9 ELEV. 78.17m	
0-0.05	TOPSOIL	0-3.50	FILL:BROWN, SILTY SAND, SOME CLAY GRAVEL, COBBLES, BOULDERS AND CONSTRUCTION DEBRIS
0.05-1.83	FILL: BROWNSILTY CLAY, SOME SAND		
1.83-2.44	COMPACT BROWN SAND		
2.44-9.75	SOFT GREY SILTY CLAY		
- G.W.L.@ 1.29m (76.4m±)		- G.W.L. @ 0.65m (77.52m±)	

3) ANAEROBIC DIGESTER

- REFER TO WATERLOO DESIGN AND INSTALLATION GUIDE WITH REGARDS TO MINIMUM TANKAGE SIZING, AND ADDITIONAL INSTALLATION REQUIREMENTS.
- TANK SHALL BE CONNECTED TO THE PROPOSED BUILDING BY A 100mm PVC SEWER PIPE.
- SEWER PIPE SHALL BE INSTALLED AT 2.0% MINIMUM SLOPE AND SHALL BE OVERLAIN WITH 50mm T x 600 mm WIDE RIGID INSULATION BOARDS.
- SEWER PIPE SHALL BE SLEEVED THROUGH A 150 mmØ SDR 28 PVC PIPE UNDER ANY HARDSCAPING (CONCRETE, ASPHALT, ETC.)
- SEWER PIPE SHALL BE BEDDED ON A 150mm THICK LAYER OF GRANULAR 'A' WHICH SHALL BE COMPACTED TO 95% SPMDD.
- IT IS RECOMMENDED THAT A NEW SINGLE-COMPARTMENT 10,000L CONCRETE ANAEROBIC DIGESTER WATERLOO MODEL ADIPC-10,000 BE INSTALLED.
- TANK SHALL BE BEDDED ON A LAYER OF OPSS GRANULAR 'A' OF AT LEAST 150mm IN THICKNESS AND SHALL BE COMPACTED TO AT LEAST 95% SPMDD.
- TANK SHALL BE EQUIPPED WITH WATERTIGHT CONNECTIONS (I.E. STAINLESS LINK SEALS OR APPROVED EQUIVALENT).
- INLET PIPE OF DIGESTER SHALL BE EQUIPPED WITH A 800L (min.) WATERLOO INNER TUBE.
- THE DIGESTER TANK SHALL BE COVERED WITH 50mm (2") DOW HI-40 INSULATION BOARDS AND SHALL BE PROVIDED WITH 510 mm OF SOIL COVER PER THE DESIGN MANUAL.
- A POLY RISER AND INSULATED COVER ASSEMBLY, WHICH EXTENDS TO THE GROUND SURFACE, SHALL BE INSTALLED OVER THE EACH OF THE TANK OPENINGS.
- INTERNAL PUMP VAULT WITH, TIME CONTROLLED EFFLUENT PUMP (WATERLOO SPECIFIED EFFLUENT PUMP) OPERATED BY A WATERLOO SMART PANEL.
- ALL ELECTRICAL WORKS SHALL BE CARRIED OUT BY A QUALIFIED ELECTRICAL CONTRACTOR.
- ACCESS LIDS SHALL INCLUDE SAFETY DEVICES AS PER CSA B66-21.

4) TREATMENT UNIT

- THE TREATMENT UNIT SHALL BE INSTALLED IN SERIES AND DOWNSTREAM FROM THE ANAEROBIC DIGESTER TANK.
- THE TREATMENT UNIT SHALL CONSIST OF A BULK FILLED CONCRETE WATERLOO BIOFILTER MODEL BFCN-9,400 WASTEWATER TREATMENT.
- TANK SHALL BE BEDDED ON A LAYER OF OPSS GRANULAR 'A' OF AT LEAST 150mm IN THICKNESS AND SHALL BE COMPACTED TO AT LEAST 95% SPMDD.
- A 50mmØ SCH 40 PVC FORCEMAIN SHALL BE USED TO CARRY THE EFFLUENT FROM THE PUMP TANK IN THE ANAEROBIC DIGESTER TO THE BULK FILLED BIOFILTER IN THE FIRST COMPARTMENT OF THE TREATMENT UNIT.
- THE FIRST COMPARTMENT OF THE BIOFILTER TANK SHALL BE BULK FILLED WITH THE BIOFILTER FOAM FILTER MEDIA.
- THE SECOND COMPARTMENT OF THE TREATMENT UNIT SHALL BE EQUIPPED WITH A TIME OPERATED DUPLEX EFFLUENT PUMPS SPECIFIED BY WATERLOO. THE FINAL TREATED EFFLUENT COLLECTS ON THE FLOOR OF THE SECOND COMPARTMENT AND THE EFFLUENT PUMP, DOSES THE LEACHING BED.
- MINIMUM RESIDUAL PRESSURE HEAD AT THE FURTHEST POINT FROM THE PUMP SHALL BE 600mm TO BE VERIFIED IN THE FIELD.
- THE DOSING TIME OPERATED DUPLEX PUMPING SYSTEM SHALL OPERATE HOURLY AND SHALL ALTERNATE BETWEEN THE LEACHING BED "CELLS".
- THE RECOMMENDED PUMP TIME DOSING CYCLE IS 167L + CHARGE (28L) (TOTAL OF 195 L), THE PUMP DISCHARGE TAKES A DURATION OF 75 SECONDS FOR EACH PUMP.
- THE TREATMENT UNIT SHALL BE PROVIDED WITH A MINIMUM OF 510 mm SOIL COVER AND OVERLAIN WITH 50mm THICK HI INSULATION BOARDS.
- A POLYLOK RISER AND CHARCOAL VENTED INSULATED COVER ASSEMBLY, WHICH EXTENDS TO THE GROUND SURFACE, SHALL BE INSTALLED OVER EACH OF THE TANK OPENINGS.
- ALL ELECTRICAL WORKS SHALL BE CARRIED OUT BE A QUALIFIED ELECTRICAL CONTRACTOR.
- ACCESS LIDS SHALL INCLUDE SAFETY DEVICES AS PER CSA B66-21.

5) FORCEMAIN (TO SHALLOW BURIED TRENCH)

- 2 x 50mmØ SCH40 PVC FORCEMAINS SHALL BE USED TO CARRY THE EFFLUENT FROM THE TREATMENT UNIT TO THE DISPOSAL FIELD.
- THE FORCEMAINS SHALL BE INSTALLED TO GRAVITY DRAIN TO TREATMENT UNIT AND OVERLAY WITH 50mm T x 600mm W WITH INSULATION BOARDS.
- FORCEMAIN SHALL BE INSTALLED ON A 150mm THICK LAYER OF COMPACTED SAND BEDDING.

6) DISPOSAL FIELD

- THE DISPOSAL FIELD SHALL CONSIST OF SHALLOW BURIED TRENCHES (SBT) USING QUICK 4 EQ24 LOW PROFILE INFILTRATOR CHAMBERS.
- SBT LENGTH REQUIRED = Q/50 = 4000/75 = 53.3 LINEAR METERS/1.22 = 43.7 CHAMBERS.
- USE 4 RUNS OF 11 CHAMBERS, 44 CHAMBERS TOTAL (13.42m LENGTH EACH RUN) FOR A TOTAL LENGTH OF 53.7 LINEAR METRES.
- REMOVE ALL EXISTING TOPSOIL, FILL AND ANY ORGANIC MATERIAL AND SUBEXCAVATE TO AT LEAST ELEVATION 78.25m, ACTUAL FILL REMOVAL WILL BE TO APPROXIMATELY 75.9m±, WHICHEVER IS GREATER. ESTABLISH THE SPECIFIED CONTACT LEVEL WITH SELECT SAND FILL, WHERE REQUIRED.
- SCARIFY THE BASE AND SIDES OF EXCAVATED AREA USING A HAND RAKE. DO NOT WALK ON THE SCARIFIED SURFACES.
- ESTABLISH THE SPECIFIED CONTACT LEVEL, ELEV. 78.55m, WITH LEACHING BED FILL OVER THE APPROVED SUBGRADE SURFACE.
- LEACHING BED SAND FILL SHALL BE UNIFORM SAND WITH GRADING LIMITS SIMILAR TO 100% PASSING 13.2mm SIEVE, LESS THAN 5% PASSING 0.075mm SIEVE AND HAVING A PERCOLATION RATE OF 6 TO 8 min/cm.
- PREPARE THE 25mmØ PVC SCH 40 PRESSURE PIPE BY DRILLING 3mmØ HOLES @ 900mm SPACINGS ALONG THE TOP OF THE PIPE (I.E. 12 O'CLOCK POSITION). THE FIRST HOLE SHALL BE LOCATED 450mm FROM THE MANIFOLD.
- DRILL A 3mmØ (1/8"Ø) DRAIN HOLE NEAR THE START, END OF EACH RUN AND EVERY 5TH HOLE. THE DRAIN HOLES SHOULD BE LOCATED AT THE 6 O'CLOCK POSITION. AN ORIFICE SHIELD SHALL BE INSTALLED OVER EACH DRAIN HOLE.
- THE PRESSURE PIPE SHALL BE INSTALLED ONTO THE PREPARED SAND LAYER @ DESIGN ELEVATION AND IN THE CONFIGURATION AS SPECIFIED ON THE PLAN VIEW. PIPES SHALL REST ON ORIFICE SHIELDS.
- THE PRESSURE SYSTEM MUST BE TESTED AND SQUIRT HEIGHTS VERIFIED PRIOR TO INSTALLING THE CHAMBERS.
- RUN THE PRESSURE PIPE THROUGH THE END PLATE OF THE CHAMBER.
- PLACE THE FIRST CHAMBER OVER THE PIPE AND ENSURE THE HOLES IN THE PRESSURE PIPE ARE FACING UP (I.E. 12 O'CLOCK POSITION).
- INSERT THE END PLATE TO THE FIRST CHAMBER.
- CONNECT EACH SUBSEQUENT CHAMBER TO THE END OF THE PROCEEDING CHAMBER. ENSURE THAT THE CHAMBERS ARE PROPERLY INTERLOCKED AS PER MANUFACTURER'S REQUIREMENTS.
- ATTACH AN END PLATE TO THE END OF EACH CHAMBER RUN.
- TO ALLOW FOR SERVICING, IT IS RECOMMENDED THAT THE END OF EACH PRESSURE PIPE BE SLEEVED THROUGH THE END PLATE AND BE FITTED WITH A 25mmØ PVC LONG RADIUS 90° SWEEP C/W 1-25mmØ PVC FPT x SLIP FIT ADAPTER AND 1-MPT PVC END CAP, COVER CLEAN-OUT ASSEMBLY WITH 150mmØ IRRIGATION VALVE COVER (OR APPROVED EQUAL).
- BACKFILL THE CHAMBERS IN LIFTS, USING SELECT SAND FILL. BACKFILL MUST CONSIST OF SELECT SAND FILL FOLLOWED BY 100mm OF SANDY TOPSOIL IT IS RECOMMENDED THAT THE LEACHING BED AREA BE SODDED AS SOON AS POSSIBLE.
- START BACKFILLING AT THE JOINTS, COMPACT THE BACKFILL ALONG THE SIDE OF THE CHAMBERS BY WALKING ALONG THE EDGES OF THE TRENCHES.
- THE GROUND SURFACE OVER THE LEACHING BED SHOULD BE CROWNED TO SHED SURFACE WATER AND SODDED IMMEDIATELY.

7) MINIMUM CLEARANCE DISTANCE FROM LEACHING BED

- 7.1m FROM ANY PROPERTY LINE
- 9.1m FROM ANY STRUCTURE
- 19.1m FROM ANY EXISTING DRILLED WELL

8) MINIMUM CLEARANCE DISTANCE FROM TANK(S)

- 1.5m FROM ANY STRUCTURE
- 15.0m FROM ANY DRILLED OR DUG WELL
- 3.0m FROM ANY PROPERTY LINE

9) GENERAL

- SNOW STORAGE SHALL NOT BE LOCATED OVER PROPOSED SEWAGE SYSTEM.
- THE SEWAGE SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT TRAFFIC LOADING.
- THE BACKFILLING OF THE SEWAGE SYSTEM SHOULD MINIMIZE THE RISK OF OVER COMPACTION WITH THE USE RUBBER TRACKED EQUIPMENT AND BY AVOIDING THE CREATION OF ANY CONSTRUCTION ROUTES OR PATHWAYS OVER THE SYSTEM.
- ANY NEW IRRIGATION / SPRINKLER SYSTEM SHOULD NOT BE USED IN PROXIMITY OF THE PROPOSED SEWAGE SYSTEM.
- ENSURE WALKWAYS AND/OR SHRUBBERY ARE NOT PLACED WITHIN PROXIMITY OF THE TANKAGE.
- THE BACKWASH WATERS FROM ANY WATER TREATMENT UNIT, SUCH AS WATER SOFTENER, SHOULD NOT DISCHARGE INTO THE SEWAGE SYSTEM.
- THE SEWAGE SYSTEM HAS NOT BEEN DESIGNED FOR THE USE OF A GARBAGE DISPOSAL.
- SEWAGE SYSTEM INSTALLER SHALL BE QUALIFIED AND REGISTERED UNDER PART 8 OF THE ONTARIO BUILDING CODE AND SHALL BE AN AUTHORIZED WATERLOO TREATMENT SYSTEM INSTALLER.
- ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST BY-LAWS, CODES AND REGULATIONS.
- CONTRACTOR SHALL REVIEW DRAWINGS IN DETAIL AND SHALL INFORM THE CONSULTANT OF ANY ERRORS AND/OR OMISSIONS ON DESIGN DRAWINGS IMMEDIATELY.
- CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE AND PROTECT ALL EXISTING UNDERGROUND SERVICES.
- CONTRACTOR SHALL VISIT THE SITE AND REVIEW ALL DOCUMENTATION TO BECOME FAMILIAR WITH THE SITE AND SUBSURFACE SOIL CONDITIONS TO DETERMINE SUITABLE METHODS OF CONSTRUCTION.
- THE MANUFACTURER PROVIDES A LIMITED WARRANTY OF THE SYSTEM COMPONENTS. THE OWNER OF THE SYSTEM MUST SIGN A MAINTENANCE AGREEMENT WITH THE MANUFACTURER'S REPRESENTATIVE. THE SYSTEM OWNER IS RESPONSIBLE FOR THE ANNUAL FEES ASSOCIATED WITH THE MAINTENANCE.
- THE FIRM OF PATERSON GROUP INC. HAS PROVIDED DESIGN SERVICES ONLY FOR THE SUBJECT SEWAGE SYSTEM. THE DESIGN HAS BEEN CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES AND OUR INTERPRETATION OF PART 8 OF THE ONTARIO BUILDING CODE.
- THE PROPERTY LINE / SEPARATION DISTANCES SHOULD BE CONFIRMED PRIOR TO CONSTRUCTION.
- CONSTRUCTION INSPECTIONS DURING THE INSTALLATION OF THE SEWAGE SYSTEM MAY BE REQUIRED BY THE REGULATING AUTHORITY AND ARE STRONGLY RECOMMENDED BY THIS FIRM. IF THIS FIRM IS TO COMPLETE ANY CONSTRUCTION INSPECTION(S), ADDITIONAL FEES MAY BE APPLIED. CONFIRMATION OF PAYMENT WILL BE REQUIRED PRIOR TO THE INSPECTION.
- THE TEST HOLE INFORMATION PROVIDED, IS INTENDED TO BE USED FOR DESIGN PURPOSES ONLY, AND SHOULD NOT BE RELIED UPON FOR CONSTRUCTION PURPOSES. IF DISCREPANCIES ARE FOUND DURING THE CONSTRUCTION PROCESS, IT IS THE CLIENT'S RESPONSIBILITY TO CONTACT THIS FIRM TO MAKE ANY NECESSARY COMMENTS OR REVISIONS. ADDITIONAL REVISIONS ARE NOT CONSIDERED PART OF THE DESIGN WORKS AND WILL BE CONSIDERED AS AN ADDITIONAL COST.

DD/MM/YY	DESCRIPTION	REV.
22/08/24	Reviser Dispersal Bed	1
14/08/24	Issued for Preliminary Review	0

Consultant:
PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7Z9
TEL: (613) 226-7381

Client:

DAY AND ROSS TRANSPORTATION

Project:

PROPOSED CROSS DOCK BUILDING

5510 BOUNDARY ROAD
OTTAWA (CARLSBAD SPRINGS), ONTARIO

Drawing:

SEWAGE SYSTEM DETAIL & NOTES

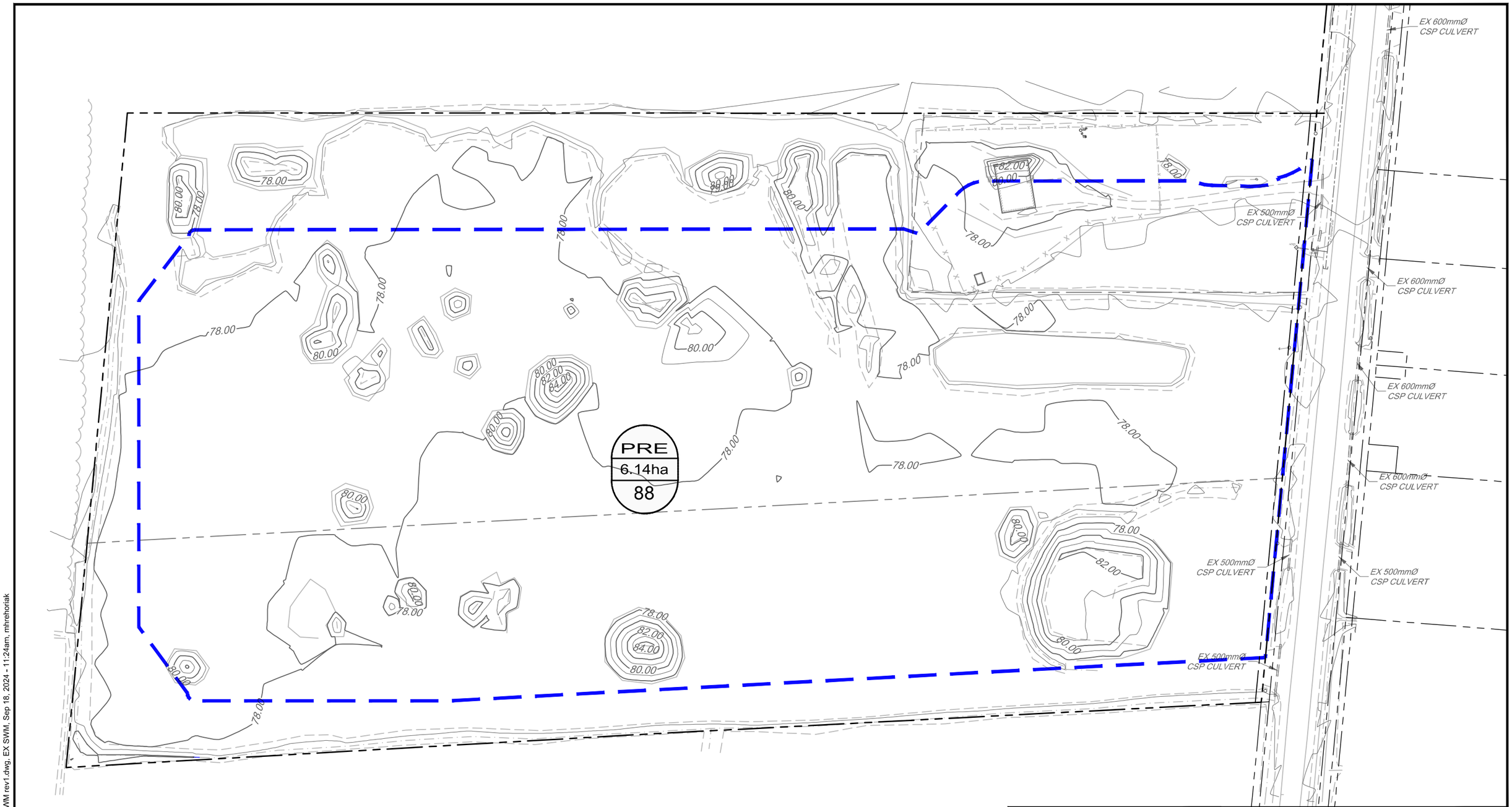
Scale:	Drawn by:
N.T.S.	KB
Date:	Checked by:
08/2024	HV

Drawing No.:

PH4942-2(rev.1)

p:\autocad drawings\hydrogeology\ph49xx\ph4942 - day and ross transportation - 5510 boundary road\ph4942-2(rev.1).dwg

APPENDIX C
Stormwater Management Calculations



LEGEND

EXISTING STORM DRAINAGE AREA

PRE
6.94ha
88

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

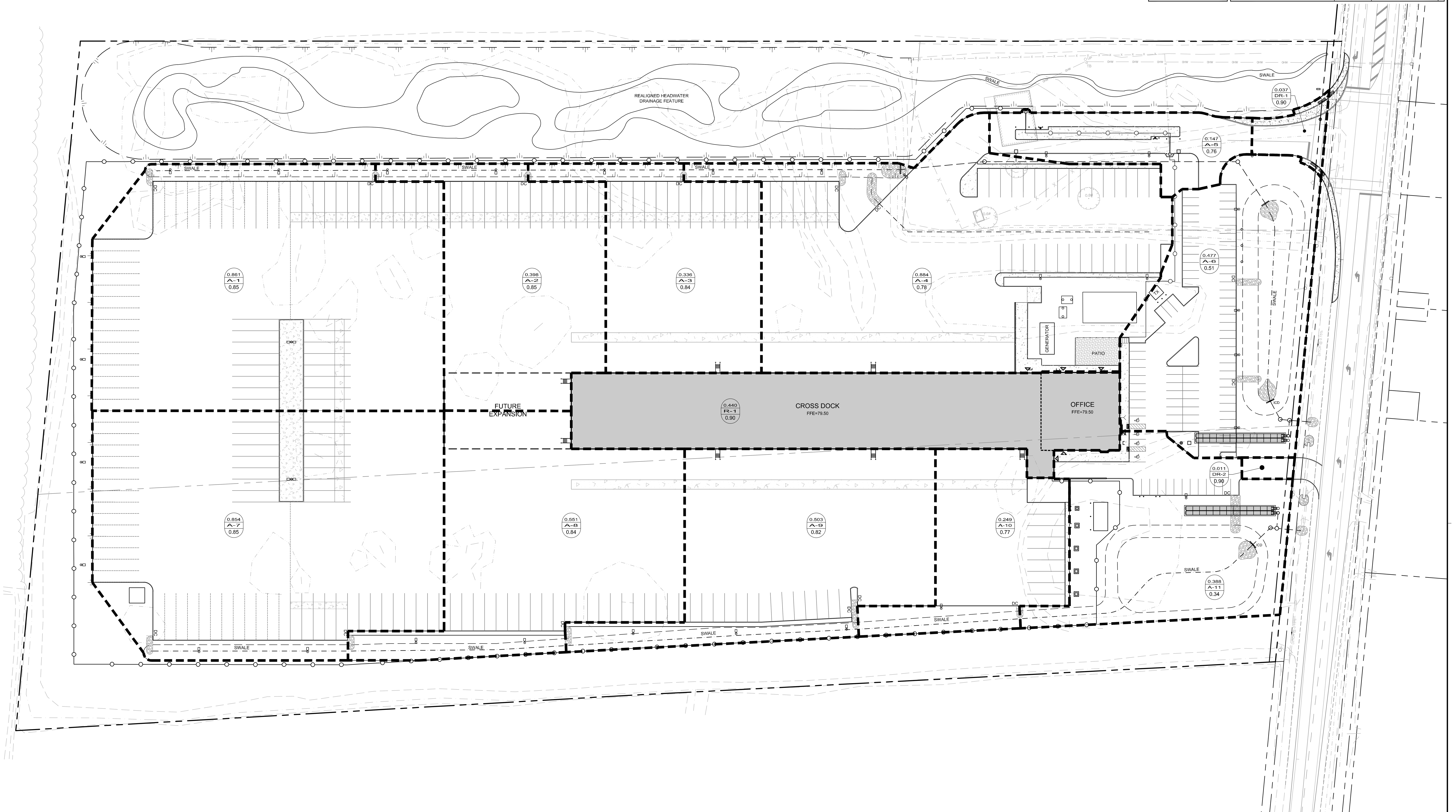
5510 BOUNDARY ROAD

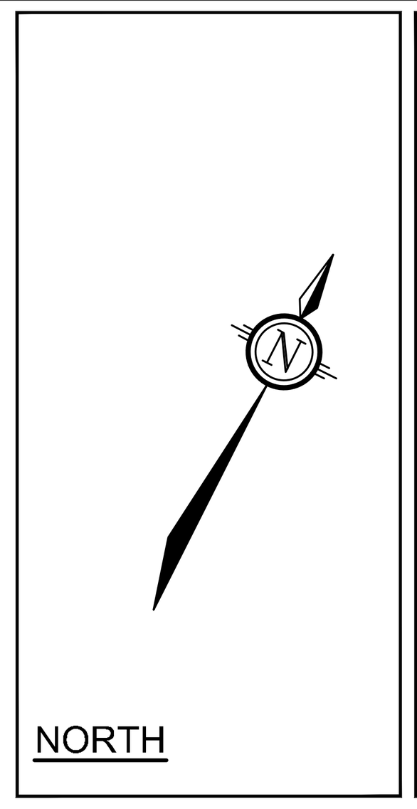
PRE-DEVELOPMENT DRAINAGE AREA PLAN

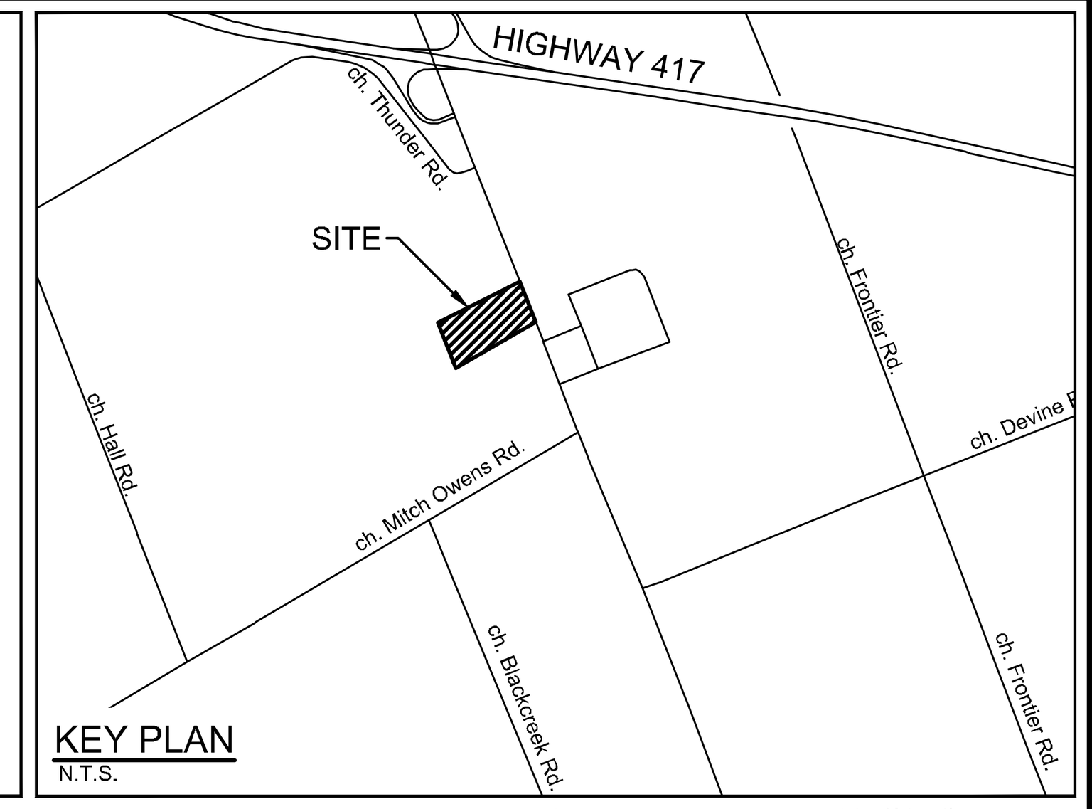
SCALE 1 : 1250 (0 10 20 30 40 50)
DATE SEPT 2024
JOB 118168
FIGURE 4

SHT11X17 DWG - 279mmX432mm

M:\2018\118168\CAD\Design\Figures\118168-EXSWM rev1.dwg, EX SWM, Sep 18, 2024 - 11:24am, mhrehoriak







LEGEND

- BOREHOLE
- TEST PIT
- PROPERTY LINE
- PROPOSED SECURITY FENCE (REFER TO LANDSCAPE)
- PROPOSED CURB
- DC — PROPOSED DEPRESSED CURB
- TACTILE WALKING SURFACE INDICATOR (TWSI) PER CITY DETAIL SC7.3
- SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
- TERRACING 2.5:1 SLOPE MAX (UNLESS OTHERWISE INDICATED)
- BOTOM OF SLOPE
- 2.0% — SLOPE AND DIRECTION
- PROPOSED SITE LIGHTING (REFER TO ARCHITECTURAL DRAWINGS)
- 77.50 / 76.45 — PROPOSED ELEVATION / EXISTING ELEVATION
- 76.60(S) — PROPOSED SWALE ELEVATION
- 78.00TC — PROPOSED TOP OF CURB ELEVATION
- 79.65TW — PROPOSED TOP OF WALE ELEVATION
- 79.65TW — PROPOSED BOTTOM OF WALL ELEVATION
- PROPOSED BUILDING ENTRANCE
- DIRECTION OF MAJOR OVERLAND FLOW
- PROPOSED RIP RAP c/w NON WOVEN GEOTEXTILE
- PROPOSED STORM SEWER AND MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- ICD — PROPOSED INLET CONTROL DEVICE
- 100-YEAR PONDING LIMITS

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
1.	ISSUED FOR SPA	OCT 3/2024	MJH

SCALE 1:500

DESIGN MJH | CHECKED JLS | DRAWN MJH | CHECKED JLS | APPROVED MJH

FOR REVIEW ONLY

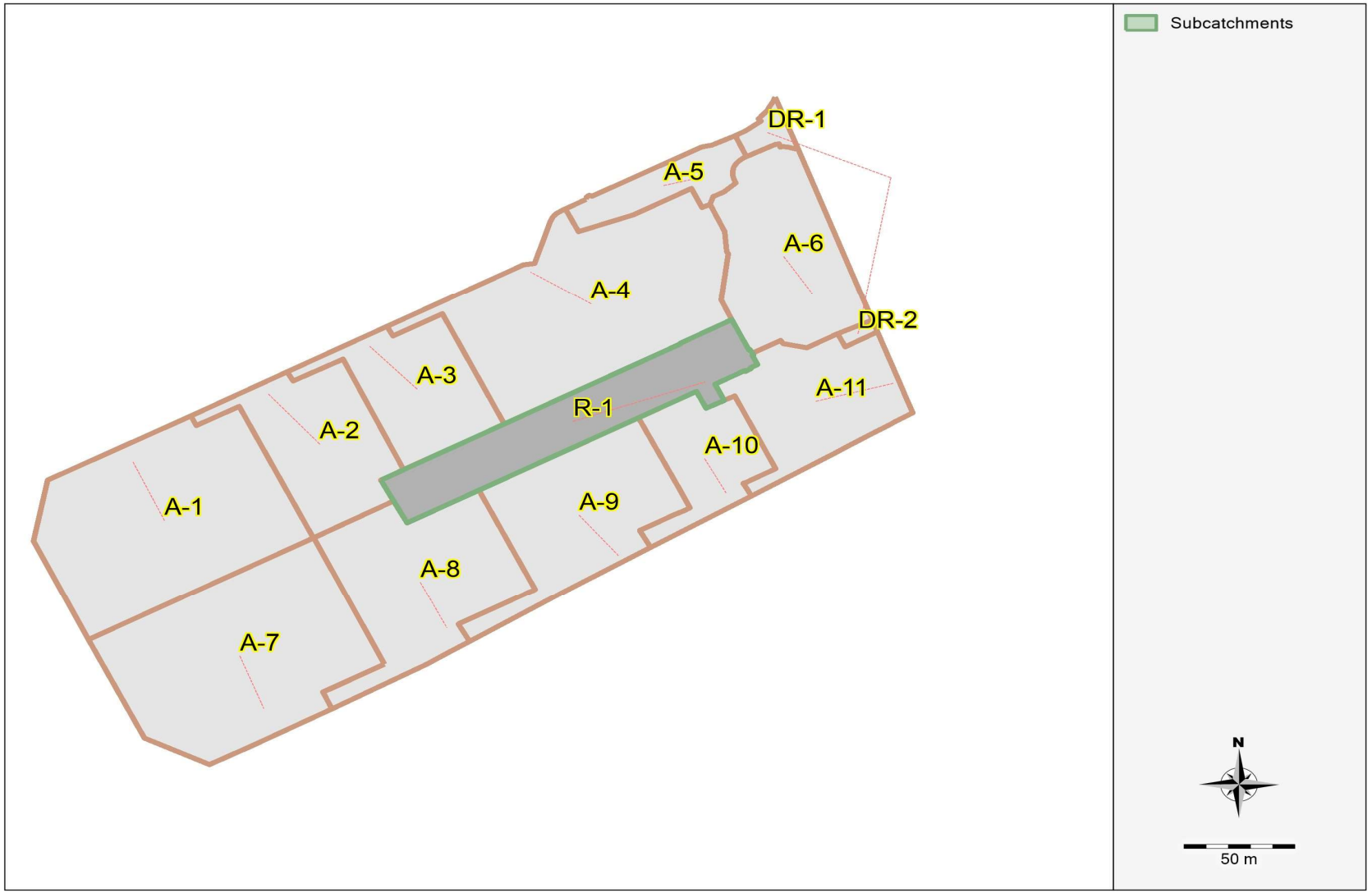
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
5110 BOUNDARY ROAD

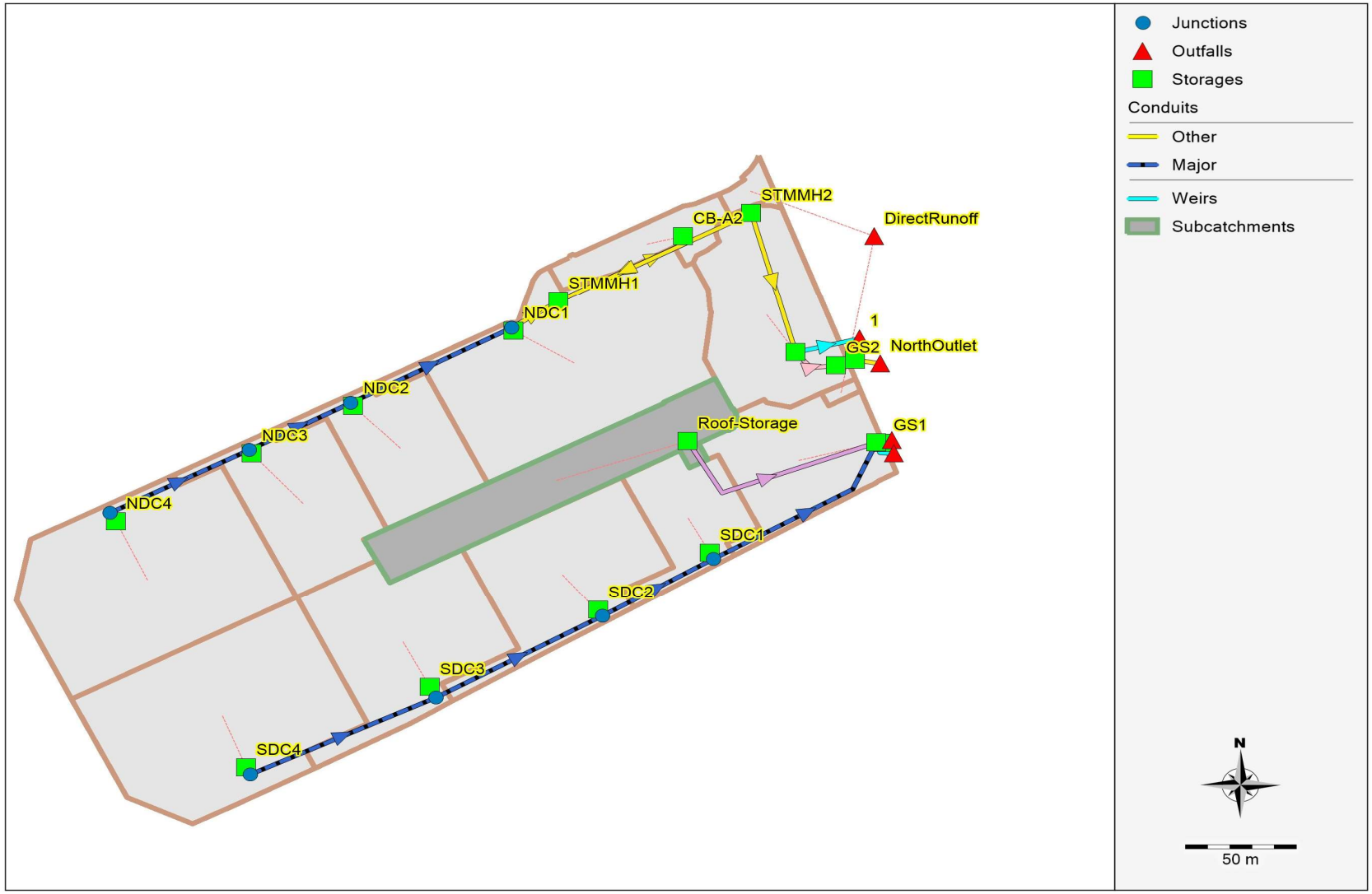
DRAWING NAME
STORMWATER MANAGEMENT PLAN

PROJECT No. 118168
REV REV # 1
DRAWING No. 118168-SWM

Subcatchments



Model Details



118168

Name	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)	Zero Imperv (%)	Runoff Coeff.
A-1	0.86	111	77	1.0	93	25	0.85
A-10	0.25	46	54	1.5	81	25	0.77
A-11	0.39	54	72	1.5	20	50	0.34
A-2	0.40	54	74	1.5	93	25	0.85
A-3	0.34	55	62	1.5	91	25	0.84
A-4	0.88	117	75	1.5	83	25	0.78
A-5	0.15	98	15	1.5	80	50	0.76
A-6	0.48	60	80	1.5	44	50	0.51
A-7	0.85	103	82	1.5	93	25	0.85
A-8	0.55	72	76	1.5	91	25	0.84
A-9	0.50	78	64	1.5	89	25	0.82
DR-1	0.04	16	23	1.5	100	50	0.90
DR-2	0.01	7	16	1.5	100	50	0.90
R-1	0.44	193	23	1.0	100	0	0.90
Total =	6.14					Average =	0.78

5yr 12hr SCS		100yr 12hr SCS		100yr +20% 12hr SCS	
Time (h:mm)	**Intensity (mm/hr)**	**Time (h:mm)**	**Intensity (mm/hr)**	**Time (h:mm)**	**Intensity (mm/hr)**
0:00	0.00	0:00	0.00	0:00	0.00
0:30	1.69	0:30	2.82	0:30	3.38
1:00	0.79	1:00	1.31	1:00	1.58
1:30	1.46	1:30	2.44	1:30	2.93
2:00	1.46	2:00	2.44	2:00	2.93
2:30	1.91	2:30	3.19	2:30	3.83
3:00	1.69	3:00	2.82	3:00	3.38
3:30	2.25	3:30	3.76	3:30	4.51
4:00	2.25	4:00	3.76	4:00	4.51
4:30	3.03	4:30	5.07	4:30	6.09
5:00	3.82	5:00	6.39	5:00	7.66
5:30	6.07	5:30	10.14	5:30	12.17
6:00	48.08	6:00	80.38	6:00	96.46
6:30	12.25	6:30	20.47	6:30	24.57
7:00	5.39	7:00	9.02	7:00	10.82
7:30	3.60	7:30	6.01	7:30	7.21
8:00	3.15	8:00	5.26	8:00	6.31
8:30	2.47	8:30	4.13	8:30	4.96
9:00	2.58	9:00	4.32	9:00	5.18
9:30	1.69	9:30	2.82	9:30	3.38
10:00	1.35	10:00	2.25	10:00	2.70
10:30	1.91	10:30	3.19	10:30	3.83
11:00	1.24	11:00	2.07	11:00	2.48
11:30	1.12	11:30	1.88	11:30	2.25
12:00	1.12	12:00	1.88	12:00	2.25
Total Rainfall	**56.17 mm**	**Total Rainfall**	**93.91 mm**	**Total Rainfall**	**112.69 mm**

July 1 1979		August 4 1988		August 8 1996	
Time (h:mm)	**Intensity (mm/hr)**	**Time (h:mm)**	**Intensity (mm/hr)**	**Time (h:mm)**	**Intensity (mm/hr)**
0:00	0.0	0:00	0.0	0:00	0.0
0:05	2.3	0:05	0.1	0:05	4.0
1:05	2.3	1:05	0.1	1:05	11.9
2:05	8.9	2:05	0.0	2:05	26.5
3:05	8.9	3:05	3.7	3:05	13.3
4:05	8.9	4:05	6.2	4:05	0.0
5:05	8.9	5:05	101.5	5:05	2.7
6:05	38.1	6:05	15.5	6:05	0.0
7:05	38.1	7:05	29.3	7:05	8.0

Design Storm Time Series Data **City of Ottawa**

NOVATECH
Engineers, Planners & Landscape Architects

8:05	38.1	8:05	19.8	8:05	18.6
9:05	38.1	9:05	1.5	9:05	10.6
10:05	38.1	10:05	1.7	10:05	21.2
11:05	38.1	11:05	5.4	11:05	2.7
12:05	38.1	12:05	24.6	12:05	2.7
13:05	50.8	13:05	26.5	13:05	15.9
14:05	50.8	14:05	34.9	14:05	66.3
15:05	76.2	15:05	10.2	15:05	55.7
16:05	106.7	16:05	27.1	16:05	122.0
17:05	106.7	17:05	104.4	17:05	88.9
18:05	71.1	18:05	27.5	18:05	9.3
19:05	71.1	19:05	62.5	19:05	8.0
20:05	30.5	20:05	31.8	20:05	4.0
21:05	30.5	21:05	79.8	21:05	0.0
22:05	30.5	22:05	67.5	22:05	2.7
23:05	30.5	23:05	156.2	23:05	0.0
0:05	3.8	0:05	5.1	0:05	0.0
1:05	3.8	1:05	0.2	1:05	0.0
2:05	3.8	2:05	0.2	2:05	5.3
3:05	3.8	3:05	0.2	3:05	0.0
4:05	3.8	4:05	0.2	4:05	0.0
5:05	3.8	5:05	0.2	5:05	0.0
6:05	3.8	6:05	0.2	6:05	0.0
7:05	3.8	7:05	0.2	7:05	0.0
8:05	3.8	8:05	0.2	8:05	0.0
9:05	3.8	9:05	0.2	9:05	4.0
10:05	3.8	10:05	0.2	10:05	53.1
11:05	3.8	11:05	12.8	11:05	69.0
		12:05	14.0	12:05	63.7
Total Rainfall	**83.99 mm**	13:05	22.2	13:05	58.4
		14:05	21.8	14:05	47.8
		15:05	1.4	15:05	15.9
		16:05	0.2	16:05	13.3
		17:05	0.2	17:05	8.0
		18:05	0.2	18:05	5.3
		19:05	0.2	19:05	6.6
		20:05	0.2	20:05	2.7
		21:05	0.2	21:05	4.0
		22:05	0.2	22:05	2.7
		23:05	0.2	23:05	4.0
		0:05	0.2	0:05	2.7
		1:05	0.2	1:05	5.3
		2:05	0.2	2:05	4.0
		3:05	0.2	3:05	2.7
		4:05	0.2	4:05	4.0
		5:05	0.2	5:05	2.7
		6:05	0.2	6:05	1.3

7:05	0.2	7:05	1.3
8:05	0.2	8:05	0.0
9:05	0.2	9:05	0.0
10:05	0.2	10:05	0.0
11:05	2.9	11:05	0.0
12:05	7.8	12:05	2.7
13:05	10.0	13:05	0.0
14:05	6.3	14:05	0.0
15:05	5.1	15:05	0.0
16:05	9.8	16:05	0.0
17:05	2.6	17:05	0.0
18:05	1.7	18:05	0.0
19:05	0.0	19:05	0.0
20:05	0.0	20:05	1.3
21:05	0.0	21:05	0.0
22:05	0.0	22:05	0.0
23:05	0.0	23:05	0.0
Total Rainfall	**80.59 mm**	**Total Rainfall**	**73.90 mm**

5yr 3hr Chicago

Time (h:mm)	Intensity (mm/hr)
0:00	0.00
0:10	3.68
0:20	4.58
0:30	6.15
0:40	9.61
0:50	24.17
1:00	104.19
1:10	32.04
1:20	16.34
1:30	10.96
1:40	8.29
1:50	6.69
2:00	5.63
2:10	4.87
2:20	4.30
2:30	3.86
2:40	3.51
2:50	3.22
3:00	2.98
Total Rainfall	**42.51 mm**

100yr 3hr Chicago

Time (h:mm)	Intensity (mm/hr)
0:00	0.00
0:10	6.05
0:20	7.54
0:30	10.16
0:40	15.97
0:50	40.65
1:00	178.56
1:10	54.05
1:20	27.32
1:30	18.24
1:40	13.74
1:50	11.06
2:00	9.29
2:10	8.02
2:20	7.08
2:30	6.35
2:40	5.76
2:50	5.28
3:00	4.88
Total Rainfall	**71.67 mm**

100yr +20% 3hr Chicago

Time (h:mm)	Intensity (mm/hr)
0:00	0.00
0:10	7.26
0:20	9.05
0:30	12.19
0:40	19.16
0:50	48.78
1:00	214.27
1:10	64.86
1:20	32.78
1:30	21.89
1:40	16.49
1:50	13.27
2:00	11.15
2:10	9.62
2:20	8.50
2:30	7.62
2:40	6.91
2:50	6.34
3:00	5.86
Total Rainfall	**86.00 mm**

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

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

Boundary Road Project

Vahid Mehdipour

Created 20240621

****

Element Count

****

Number of rain gages 1

Number of subcatchments ... 14

Number of nodes 30

Number of links 28

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

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

A-1	0.86	110.99	93.00	1.0000	Raingage1	NDC4
A-10	0.25	46.03	81.00	1.5000	Raingage1	SDC1
A-11	0.39	53.98	20.00	1.5000	Raingage1	SouthPond
A-2	0.40	53.71	93.00	1.5000	Raingage1	NDC3
A-3	0.34	54.61	91.00	1.5000	Raingage1	NDC2
A-4	0.88	117.31	83.00	1.5000	Raingage1	NDC1
A-5	0.15	98.28	80.00	1.5000	Raingage1	CB-A2
A-6	0.48	60.25	44.00	1.5000	Raingage1	NorthPond
A-7	0.85	103.14	93.00	1.5000	Raingage1	SDC4
A-8	0.55	71.94	91.00	1.5000	Raingage1	SDC3
A-9	0.50	77.58	89.00	1.5000	Raingage1	South-DepCurb2
DR-1	0.04	16.22	100.00	1.5000	Raingage1	DirectRunoff
DR-2	0.01	6.98	100.00	1.5000	Raingage1	DirectRunoff
R-1	0.44	193.16	100.00	1.0000	Raingage1	Roof-Storage

****

Node Summary

****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
North-DepCurb1	JUNCTION	76.90	0.90	0.0	
North-DepCurb2	JUNCTION	77.04	0.81	0.0	
North-DepCurb3	JUNCTION	77.14	0.76	0.0	
North-DepCurb4	JUNCTION	77.24	0.71	0.0	
South-DepCurb1	JUNCTION	76.82	0.93	0.0	
South-DepCurb2	JUNCTION	76.92	0.85	0.0	
South-DepCurb3	JUNCTION	77.11	0.65	0.0	
South-DepCurb4	JUNCTION	77.25	0.85	0.0	
1	OUTFALL	0.00	0.00	0.0	

DirectRunoff	OUTFALL	0.00	0.00	0.0
NorthOutlet	OUTFALL	76.50	0.60	0.0
SouthOutlet	OUTFALL	76.51	0.60	0.0
SouthWeir	OUTFALL	76.50	0.00	0.0
CB-A2	STORAGE	77.05	2.10	0.0
GS1	STORAGE	76.57	0.89	0.0
GS2	STORAGE	76.52	1.47	0.0
NDC1	STORAGE	77.40	1.00	0.0
NDC2	STORAGE	77.45	1.00	0.0
NDC3	STORAGE	77.45	1.00	0.0
NDC4	STORAGE	77.50	1.00	0.0
NorthPond	STORAGE	76.55	1.05	0.0
Roof-Storage	STORAGE	77.02	1.23	0.0
SDC1	STORAGE	77.35	1.00	0.0
SDC2	STORAGE	77.30	1.00	0.0
SDC3	STORAGE	77.40	1.00	0.0
SDC4	STORAGE	77.45	1.00	0.0
SouthPond	STORAGE	76.65	1.25	0.0
STMMH1	STORAGE	76.82	1.57	0.0
STMMH2	STORAGE	76.64	1.98	0.0
STMMH3	STORAGE	76.51	1.36	0.0

****

Link Summary

****

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	North-DepCurb4	North-DepCurb3	CONDUIT	50.0	0.2000	0.0350
10	STMMH3	NorthOutlet	CONDUIT	7.4	0.1351	0.0130
2	North-DepCurb2	North-DepCurb1	CONDUIT	50.0	0.2800	0.0350
3	North-DepCurb3	North-DepCurb2	CONDUIT	50.0	0.2000	0.0350

4 South-DepCurb4 South-DepCurb3 CONDUIT 70.0 0.2000 0.0350

5 South-DepCurb3 South-DepCurb2 CONDUIT 92.0 0.2065 0.0350

6 South-DepCurb2 South-DepCurb1 CONDUIT 53.0 0.1887 0.0350

7 South-DepCurb1 SouthPond CONDUIT 30.0 0.5667 0.0350

9 GS2 STMMH3 CONDUIT 2.0 0.0152 0.0130

C1 North-DepCurb1 STMMH1 CONDUIT 27.1 0.2583 0.0130

C11 GS1 SouthOutlet CONDUIT 9.8 0.6123 0.0130

C3 STMMH1 STMMH2 CONDUIT 81.3 0.2090 0.0130

C5 STMMH2 NorthPond CONDUIT 16.1 0.1863 0.0130

CB1LEAD CB-A2 STMMH1 CONDUIT 5.0 0.6000 0.0130

CB2LEAD CB-A2 STMMH1 CONDUIT 5.0 0.6000 0.0130

NDCW1 NDC1 North-DepCurb1 CONDUIT 5.0 10.0504 0.0350

NDCW2 NDC2 North-DepCurb2 CONDUIT 5.0 8.2277 0.0350

NDCW3 NDC3 North-DepCurb3 CONDUIT 5.0 6.2120 0.0350

NDCW4 NDC4 North-DepCurb4 CONDUIT 5.0 5.2070 0.0350

SDCW1 SDC1 South-DepCurb1 CONDUIT 5.0 10.6601 0.0350

SDCW2 SDC2 South-DepCurb2 CONDUIT 5.0 7.6220 0.0350

SDCW3 SDC3 South-DepCurb3 CONDUIT 5.0 5.8098 0.0350

SDCW4 SDC4 South-DepCurb4 CONDUIT 5.0 4.0032 0.0350

8 NorthPond GS2 ORIFICE

C10 SouthPond GS1 ORIFICE

NorthPond-Weir NorthPond 1 WEIR

SouthPond-Weir SouthPond SouthWeir WEIR

OR3 Roof-Storage SouthPond OUTLET

****

Cross Section Summary

****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow

---

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

1	TRAPEZOIDAL	0.70	1.82	0.37	4.70	1	1197.27
10	CIRCULAR	0.60	0.28	0.15	0.60	1	225.73
2	TRAPEZOIDAL	0.80	2.32	0.42	5.30	1	1958.78
3	TRAPEZOIDAL	0.75	2.06	0.39	5.00	1	1414.88
4	TRAPEZOIDAL	0.50	1.00	0.27	3.50	1	537.82
5	TRAPEZOIDAL	0.65	1.59	0.35	4.40	1	1017.92
6	TRAPEZOIDAL	0.85	2.59	0.44	5.60	1	1864.82
7	TRAPEZOIDAL	0.90	2.88	0.47	5.90	1	3718.67
9	CIRCULAR	0.60	0.28	0.15	0.60	1	75.80
C1	CIRCULAR	0.60	0.28	0.15	0.60	1	312.08
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	480.47
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	280.70
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	265.06
CB1LEAD	CIRCULAR	0.20	0.03	0.05	0.20	1	25.41
CB2LEAD	CIRCULAR	0.20	0.03	0.05	0.20	1	25.41
NDCW1	TRAPEZOIDAL	0.15	0.52	0.13	3.90	1	1209.48
NDCW2	TRAPEZOIDAL	0.15	0.29	0.12	2.40	1	581.46
NDCW3	TRAPEZOIDAL	0.15	0.29	0.12	2.40	1	505.24
NDCW4	TRAPEZOIDAL	0.15	0.52	0.13	3.90	1	870.57
SDCW1	TRAPEZOIDAL	0.15	0.29	0.12	2.40	1	661.85
SDCW2	TRAPEZOIDAL	0.15	0.29	0.12	2.40	1	559.65
SDCW3	TRAPEZOIDAL	0.15	0.29	0.12	2.40	1	488.61
SDCW4	TRAPEZOIDAL	0.15	0.52	0.13	3.90	1	763.33

****

Transect Summary

****

Transect NS-XS1

Area:

0.0002 0.0010 0.0022 0.0039 0.0061

0.0088 0.0120 0.0156 0.0198 0.0244

0.0295 0.0352 0.0413 0.0491 0.0589

0.0706 0.0843 0.1000 0.1177 0.1377

0.1599 0.1844 0.2112 0.2389 0.2668

0.2947 0.3228 0.3510 0.3793 0.4077

0.4362 0.4649 0.4936 0.5225 0.5515

0.5806 0.6098 0.6391 0.6686 0.6981

0.7278 0.7576 0.7875 0.8175 0.8476

0.8779 0.9082 0.9387 0.9693 1.0000

Hrad:

0.0153 0.0306 0.0459 0.0612 0.0765

0.0918 0.1071 0.1224 0.1377 0.1530

0.1683 0.1835 0.1867 0.1720 0.1684

0.1707 0.1765 0.1847 0.1933 0.2016

0.2114 0.2221 0.2358 0.2656 0.2953

0.3249 0.3543 0.3836 0.4128 0.4419

0.4708 0.4996 0.5283 0.5569 0.5854

0.6138 0.6421 0.6702 0.6983 0.7262

0.7540 0.7818 0.8094 0.8369 0.8643

0.8917 0.9189 0.9460 0.9731 1.0000

Width:

0.0159 0.0318 0.0476 0.0635 0.0794

0.0953 0.1111 0.1270 0.1429 0.1588

0.1746 0.1905 0.2204 0.2849 0.3495

0.4140 0.4786 0.5431 0.6111 0.6854

0.7596 0.8339 0.8998 0.9035 0.9072

0.9109 0.9146 0.9184 0.9221 0.9258

0.9295 0.9332 0.9369 0.9406 0.9443

0.9480 0.9518 0.9555 0.9592 0.9629

0.9666 0.9703 0.9740 0.9777 0.9814

0.9852 0.9889 0.9926 0.9963 1.0000

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

Transect NS-XS2

Area:

0.0002	0.0009	0.0020	0.0035	0.0055
0.0080	0.0109	0.0142	0.0179	0.0221
0.0268	0.0319	0.0374	0.0434	0.0498
0.0567	0.0640	0.0717	0.0799	0.0886
0.0977	0.1072	0.1171	0.1277	0.1399
0.1539	0.1698	0.1877	0.2076	0.2294
0.2533	0.2790	0.3068	0.3365	0.3682
0.4021	0.4382	0.4764	0.5169	0.5596
0.6030	0.6466	0.6903	0.7342	0.7781
0.8222	0.8665	0.9109	0.9554	1.0000

Hrad:

0.0222	0.0444	0.0666	0.0888	0.1110
0.1331	0.1553	0.1775	0.1997	0.2219
0.2441	0.2663	0.2885	0.3107	0.3329
0.3551	0.3772	0.3994	0.4216	0.4438
0.4660	0.4882	0.5104	0.5010	0.4758
0.4586	0.4475	0.4433	0.4441	0.4486
0.4560	0.4656	0.4769	0.4897	0.5025
0.5141	0.5271	0.5411	0.5559	0.5771
0.6200	0.6627	0.7053	0.7478	0.7901
0.8323	0.8744	0.9164	0.9583	1.0000

Width:

0.0099	0.0198	0.0297	0.0396	0.0495
0.0594	0.0693	0.0793	0.0892	0.0991
0.1090	0.1189	0.1288	0.1387	0.1486
0.1585	0.1684	0.1783	0.1882	0.1981
0.2080	0.2179	0.2279	0.2533	0.2926
0.3342	0.3783	0.4224	0.4665	0.5106
0.5547	0.5988	0.6429	0.6870	0.7327
0.7822	0.8316	0.8810	0.9304	0.9704

0.9733 0.9763 0.9793 0.9822 0.9852

0.9881 0.9911 0.9941 0.9970 1.0000

Transect SS-XS1

Area:

0.0004 0.0016 0.0035 0.0063 0.0098

0.0142 0.0193 0.0252 0.0318 0.0393

0.0476 0.0566 0.0665 0.0771 0.0885

0.1007 0.1136 0.1274 0.1419 0.1573

0.1734 0.1903 0.2080 0.2265 0.2458

0.2658 0.2866 0.3083 0.3307 0.3539

0.3779 0.4026 0.4282 0.4545 0.4817

0.5096 0.5383 0.5678 0.5981 0.6291

0.6610 0.6936 0.7270 0.7615 0.7976

0.8351 0.8741 0.9146 0.9566 1.0000

Hrad:

0.0219 0.0438 0.0658 0.0877 0.1096

0.1315 0.1535 0.1754 0.1973 0.2192

0.2412 0.2631 0.2850 0.3069 0.3289

0.3508 0.3727 0.3946 0.4166 0.4385

0.4604 0.4823 0.5043 0.5262 0.5481

0.5700 0.5920 0.6139 0.6358 0.6577

0.6797 0.7016 0.7235 0.7454 0.7674

0.7893 0.8112 0.8331 0.8550 0.8770

0.8989 0.9208 0.9427 0.9462 0.9516

0.9594 0.9682 0.9780 0.9886 1.0000

Width:

0.0178 0.0356 0.0534 0.0712 0.0891

0.1069 0.1247 0.1425 0.1603 0.1781

0.1959 0.2137 0.2315 0.2494 0.2672

0.2850 0.3028 0.3206 0.3384 0.3562

0.3740 0.3918 0.4097 0.4275 0.4453

0.4631 0.4809 0.4987 0.5165 0.5343

0.5522 0.5700 0.5878 0.6056 0.6234

0.6412 0.6590 0.6768 0.6946 0.7125

0.7303 0.7481 0.7659 0.7999 0.8341

0.8673 0.9005 0.9336 0.9668 1.0000

Transect SS-XS2

Area:

0.0004 0.0014 0.0032 0.0056 0.0088

0.0127 0.0173 0.0226 0.0286 0.0353

0.0427 0.0508 0.0596 0.0692 0.0794

0.0903 0.1020 0.1143 0.1274 0.1412

0.1556 0.1708 0.1867 0.2033 0.2206

0.2386 0.2573 0.2767 0.2968 0.3176

0.3391 0.3614 0.3843 0.4079 0.4323

0.4573 0.4831 0.5096 0.5367 0.5649

0.5948 0.6263 0.6596 0.6956 0.7359

0.7803 0.8289 0.8818 0.9388 1.0000

Hrad:

0.0288 0.0576 0.0865 0.1153 0.1441

0.1729 0.2017 0.2305 0.2594 0.2882

0.3170 0.3458 0.3746 0.4035 0.4323

0.4611 0.4899 0.5187 0.5476 0.5764

0.6052 0.6340 0.6628 0.6916 0.7205

0.7493 0.7781 0.8069 0.8357 0.8646

0.8934 0.9222 0.9510 0.9798 1.0087

1.0375 1.0663 1.0951 1.1239 1.1519

1.1774 1.2010 1.2230 1.1633 1.1118

1.0725 1.0429 1.0210 1.0056 1.0000

Width:

0.0112 0.0224 0.0335 0.0447 0.0559

0.0671 0.0783 0.0895 0.1006 0.1118

0.1230	0.1342	0.1454	0.1566	0.1677
0.1789	0.1901	0.2013	0.2125	0.2236
0.2348	0.2460	0.2572	0.2684	0.2796
0.2907	0.3019	0.3131	0.3243	0.3355
0.3467	0.3578	0.3690	0.3802	0.3914
0.4026	0.4138	0.4249	0.4361	0.4595
0.4865	0.5136	0.5406	0.6042	0.6708
0.7374	0.8040	0.8706	0.9372	1.0000

****

Analysis Options

****

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... YES

Water Quality ..... NO

Infiltration Method ..... HORTON

Flow Routing Method ..... DYNWAVE

Surcharge Method ..... EXTRAN

Starting Date 09/22/2021 00:00:00

Ending Date 09/22/2021 12:00:00

Antecedent Dry Days 0.0

Report Time Step 00:01:00

Wet Time Step 00:00:30

Dry Time Step 00:00:30

Routing Time Step ..... 1.00 sec

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

Variable Time Step ..... YES

Maximum Trials 8

Number of Threads 4

Head Tolerance ..... 0.001500 m

**********	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
**********	---------	-------
Total Precipitation	0.440	71.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.051	8.365
Surface Runoff	0.383	62.344
Final Storage	0.006	0.972
Continuity Error (%)	-0.019	

**********	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.383	3.826
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.373	3.734
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	0.010	0.095
Continuity Error (%)	-0.088	

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

****

Time-Step Critical Elements

****

Link 9 (53.42%)

****

Highest Flow Instability Indexes

****

All links are stable.

****

Most Frequent Nonconverging Nodes

****

Convergence obtained at all time steps.

****

Routing Time Step Summary

****

Minimum Time Step : 0.50 sec

Average Time Step : 0.91 sec

Maximum Time Step : 1.00 sec

% of Time in Steady State : 0.00

Average Iterations per Step : 2.00

% of Steps Not Converging : 0.00

Time Step Frequencies :

1.000 - 0.871 sec : 59.62 %

0.871 - 0.758 sec : 40.34 %

0.758 - 0.660 sec : 0.01 %

0.660 - 0.574 sec : 0.01 %

0.574 - 0.500 sec : 0.03 %

****

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	Peak Runoff 10^6 ltr	Runoff LPS	Coeff
A-1	71.67	0.00	0.00	3.11	67.46	1.91	67.46	0.58	411.03	0.941
A-10	71.67	0.00	0.00	8.52	62.20	5.10	62.20	0.16	113.27	0.868
A-11	71.67	0.00	0.00	39.12	32.39	18.21	32.39	0.13	67.87	0.452
A-2	71.67	0.00	0.00	3.10	67.48	1.92	67.48	0.27	193.10	0.942
A-3	71.67	0.00	0.00	3.99	66.62	2.46	66.62	0.23	163.40	0.930
A-4	71.67	0.00	0.00	7.67	63.03	4.52	63.03	0.55	395.92	0.879
A-5	71.67	0.00	0.00	11.72	56.73	59.36	59.36	0.09	73.05	0.828
A-6	71.67	0.00	0.00	26.86	44.48	13.28	44.48	0.21	133.10	0.621
A-7	71.67	0.00	0.00	3.10	67.47	1.91	67.47	0.57	408.82	0.941
A-8	71.67	0.00	0.00	4.00	66.60	2.45	66.60	0.37	262.26	0.929
A-9	71.67	0.00	0.00	4.89	65.73	2.99	65.73	0.33	237.23	0.917
DR-1	71.67	0.00	0.00	0.00	70.90	0.00	70.90	0.03	18.35	0.989
DR-2	71.67	0.00	0.00	0.00	70.91	0.00	70.91	0.01	5.46	0.989
R-1	71.67	0.00	0.00	0.00	70.12	0.00	70.12	0.31	218.23	0.978

****

Node Depth Summary

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
North-DepCurb1	JUNCTION	0.22	0.85	77.75	0 01:23	0.85
North-DepCurb2	JUNCTION	0.16	0.71	77.75	0 01:22	0.71
North-DepCurb3	JUNCTION	0.12	0.61	77.75	0 01:22	0.61
North-DepCurb4	JUNCTION	0.09	0.51	77.75	0 01:21	0.51
South-DepCurb1	JUNCTION	0.32	0.65	77.47	0 01:41	0.65
South-DepCurb2	JUNCTION	0.24	0.55	77.47	0 01:41	0.55
South-DepCurb3	JUNCTION	0.11	0.48	77.59	0 01:11	0.48
South-DepCurb4	JUNCTION	0.06	0.42	77.67	0 01:11	0.42
1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
DirectRunoff	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
NorthOutlet	OUTFALL	0.12	0.22	76.72	0 01:37	0.22
SouthOutlet	OUTFALL	0.11	0.14	76.65	0 01:42	0.14
SouthWeir	OUTFALL	0.00	0.00	76.50	0 00:00	0.00
CB-A2	STORAGE	0.14	0.71	77.76	0 01:10	0.71
GS1	STORAGE	0.11	0.14	76.71	0 01:42	0.14
GS2	STORAGE	0.12	0.21	76.73	0 01:37	0.21
NDC1	STORAGE	0.04	0.35	77.75	0 01:22	0.35
NDC2	STORAGE	0.03	0.30	77.75	0 01:23	0.30
NDC3	STORAGE	0.03	0.30	77.75	0 01:22	0.30
NDC4	STORAGE	0.03	0.26	77.76	0 01:11	0.26
NorthPond	STORAGE	0.38	0.98	77.53	0 01:37	0.98
Roof-Storage	STORAGE	0.14	0.22	77.24	0 04:04	0.22
SDC1	STORAGE	0.02	0.12	77.47	0 01:41	0.12
SDC2	STORAGE	0.03	0.17	77.47	0 01:40	0.17
SDC3	STORAGE	0.01	0.23	77.63	0 01:11	0.23

SDC4	STORAGE	0.01	0.26	77.71	0	01:10	0.26
SouthPond	STORAGE	0.47	0.82	77.47	0	01:42	0.82
STMMH1	STORAGE	0.25	0.88	77.70	0	01:28	0.88
STMMH2	STORAGE	0.33	0.91	77.55	0	01:35	0.91
STMMH3	STORAGE	0.12	0.22	76.73	0	01:37	0.22

****

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
North-DepCurb1	JUNCTION	0.00	446.73	0 01:03	0	1.63	0.089
North-DepCurb2	JUNCTION	0.00	364.18	0 01:03	0	1.08	0.053
North-DepCurb3	JUNCTION	0.00	350.27	0 01:03	0	0.851	-0.009
North-DepCurb4	JUNCTION	0.00	296.83	0 01:10	0	0.58	-0.214
South-DepCurb1	JUNCTION	0.00	753.34	0 01:10	0	1.43	0.056
South-DepCurb2	JUNCTION	237.23	700.63	0 01:10	0.329	1.28	0.135
South-DepCurb3	JUNCTION	0.00	512.74	0 01:10	0	0.942	-0.242
South-DepCurb4	JUNCTION	0.00	339.65	0 01:10	0	0.574	-0.351
1	OUTFALL	0.00	208.45	0 01:37	0	0.808	0.000
DirectRunoff	OUTFALL	23.81	23.81	0 01:10	0.034	0.034	0.000
NorthOutlet	OUTFALL	0.00	63.88	0 01:37	0	1.13	0.000
SouthOutlet	OUTFALL	0.00	57.72	0 01:42	0	1.67	0.000
SouthWeir	OUTFALL	0.00	37.29	0 01:42	0	0.0983	0.000
CB-A2	STORAGE	73.05	73.05	0 01:10	0.089	0.089	0.023
GS1	STORAGE	0.00	57.72	0 01:42	0	1.67	0.007

GS2	STORAGE	0.00	63.88	0	01:37	0	1.13	0.000
NDC1	STORAGE	395.92	395.92	0	01:10	0.555	0.555	-0.009
NDC2	STORAGE	163.40	163.40	0	01:10	0.226	0.229	-0.010
NDC3	STORAGE	193.10	193.10	0	01:10	0.27	0.27	-0.009
NDC4	STORAGE	411.03	411.03	0	01:10	0.58	0.58	-0.007
NorthPond	STORAGE	133.10	543.65	0	01:08	0.213	1.93	-0.099
Roof-Storage	STORAGE	218.23	218.23	0	01:10	0.308	0.563	-0.000
SDC1	STORAGE	113.27	113.27	0	01:10	0.155	0.155	-0.007
SDC2	STORAGE	0.00	18.03	0	01:08	0	0.0108	0.024
SDC3	STORAGE	262.26	262.26	0	01:10	0.366	0.366	-0.007
SDC4	STORAGE	408.82	408.82	0	01:10	0.573	0.573	-0.005
SouthPond	STORAGE	67.87	828.03	0	01:10	0.126	2.12	0.243
STMMH1	STORAGE	0.00	429.21	0	01:07	0	1.72	0.028
STMMH2	STORAGE	0.00	423.09	0	01:08	0	1.72	-0.115
STMMH3	STORAGE	0.00	63.88	0	01:37	0	1.13	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
North-DepCurb1	JUNCTION	0.63	0.045	0.055

****

Node Flooding Summary

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

****

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
CB-A2	0.000	6.8	0.0	0.0	0.000	33.9	0 01:10	72.57
GS1	0.000	12.7	0.0	0.0	0.000	15.8	0 01:42	57.72
GS2	0.000	7.9	0.0	0.0	0.000	14.5	0 01:37	63.88
NDC1	0.008	0.5	0.0	0.0	0.103	6.0	0 01:22	267.86
NDC2	0.006	0.4	0.0	0.0	0.080	5.0	0 01:23	125.56
NDC3	0.005	0.4	0.0	0.0	0.068	5.1	0 01:22	123.48
NDC4	0.003	0.3	0.0	0.0	0.045	3.9	0 01:11	296.83
NorthPond	0.213	30.0	0.0	0.0	0.639	90.2	0 01:37	272.33
Roof-Storage	0.246	0.8	0.0	0.0	0.536	1.7	0 04:04	24.61
SDC1	0.000	0.0	0.0	0.0	0.002	0.4	0 01:41	113.13
SDC2	0.001	0.0	0.0	0.0	0.007	0.3	0 01:40	11.84
SDC3	0.001	0.1	0.0	0.0	0.034	2.6	0 01:11	185.16
SDC4	0.001	0.1	0.0	0.0	0.041	4.0	0 01:10	339.65
SouthPond	0.409	29.5	0.0	0.0	0.807	58.2	0 01:42	119.62
STMMH1	0.000	16.1	0.0	0.0	0.001	55.8	0 01:28	423.09
STMMH2	0.000	16.6	0.0	0.0	0.001	46.1	0 01:35	419.41
STMMH3	0.000	8.7	0.0	0.0	0.000	16.1	0 01:37	63.88

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

****

Outfall Loading Summary

****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
1	20.78	106.12	208.45	0.808
DirectRunoff	30.77	2.77	23.81	0.034
NorthOutlet	88.10	32.55	63.88	1.129
SouthOutlet	98.11	40.45	57.72	1.666
SouthWeir	13.61	19.77	37.29	0.098
System	50.27	201.65	369.03	3.734

****

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	CONDUIT	273.52	0 01:10	0.39	0.23	0.80
10	CONDUIT	63.88	0 01:37	0.69	0.28	0.36
2	CONDUIT	227.58	0 01:13	0.29	0.12	0.94
3	CONDUIT	274.57	0 01:09	0.38	0.19	0.88

4	CONDUIT	329.56	0	01:10	0.40	0.61	0.90
5	CONDUIT	492.73	0	01:12	0.48	0.48	0.78
6	CONDUIT	652.24	0	01:11	0.66	0.35	0.70
7	CONDUIT	744.36	0	01:10	0.96	0.20	0.81
9	CONDUIT	63.88	0	01:37	0.72	0.84	0.35
C1	CONDUIT	356.76	0	01:07	1.26	1.14	1.00
C11	CONDUIT	57.72	0	01:42	1.15	0.12	0.23
C3	CONDUIT	423.09	0	01:08	1.54	1.51	1.00
C5	CONDUIT	419.41	0	01:08	1.77	1.58	1.00
CB1LEAD	CONDUIT	36.29	0	01:10	1.16	1.43	1.00
CB2LEAD	CONDUIT	36.29	0	01:10	1.16	1.43	1.00
NDCW1	CONDUIT	267.86	0	01:03	0.72	0.22	1.00
NDCW2	CONDUIT	125.56	0	01:03	0.65	0.22	1.00
NDCW3	CONDUIT	123.48	0	01:02	0.62	0.24	1.00
NDCW4	CONDUIT	296.83	0	01:10	0.60	0.34	1.00
SDCW1	CONDUIT	113.13	0	01:10	0.61	0.17	0.89
SDCW2	CONDUIT	18.03	0	01:08	0.07	0.03	1.00
SDCW3	CONDUIT	185.16	0	01:10	0.68	0.38	1.00
SDCW4	CONDUIT	339.65	0	01:10	0.66	0.44	1.00
8	ORIFICE	63.88	0	01:37		1.00	
C10	ORIFICE	57.72	0	01:42		1.00	
NorthPond-Weir	WEIR	208.45	0	01:37		0.59	
SouthPond-Weir	WEIR	37.29	0	01:42		0.22	
OR3	DUMMY	24.61	0	01:11			

****

Flow Classification Summary

****

Adjusted ---------- Fraction of Time in Flow Class ----------

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

Conduit	/Actual Length	Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.70	0.00
10	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.34	0.00
2	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.64	0.00
3	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.63	0.00
4	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.72	0.00
5	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.54	0.00
6	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.11	0.00
7	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.03	0.00
9	1.00	0.01	0.00	0.00	0.72	0.01	0.00	0.25	0.00	0.00
C1	1.00	0.01	0.00	0.00	0.50	0.00	0.00	0.49	0.04	0.00
C11	1.00	0.02	0.00	0.00	0.04	0.95	0.00	0.00	0.05	0.00
C3	1.00	0.02	0.00	0.00	0.61	0.00	0.00	0.37	0.13	0.00
C5	1.00	0.02	0.00	0.00	0.60	0.00	0.00	0.38	0.03	0.00
CB1LEAD	1.00	0.68	0.01	0.00	0.30	0.00	0.00	0.01	0.00	0.00
CB2LEAD	1.00	0.06	0.00	0.00	0.37	0.00	0.00	0.57	0.02	0.00
NDCW1	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.82	0.00
NDCW2	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.84	0.00
NDCW3	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.84	0.00
NDCW4	1.00	0.01	0.00	0.00	0.98	0.00	0.00	0.00	0.86	0.00
SDCW1	1.00	0.01	0.02	0.00	0.96	0.01	0.00	0.00	0.82	0.00
SDCW2	1.00	0.01	0.76	0.00	0.23	0.00	0.00	0.00	0.70	0.00
SDCW3	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.85	0.00
SDCW4	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.91	0.00

****

Conduit Surcharge Summary

****

5494-5510 BOUNDARY ROAD

DAY AND ROSS
PCSWMM Model Output
100-year, 3-Hour Chicago Storm

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full: Normal Flow	Capacity Limited
2	0.01	0.01	0.63	0.01	0.01
C1	1.45	1.45	1.71	0.22	0.20
C3	1.67	1.77	2.86	0.36	0.24
C5	2.91	2.92	3.08	0.42	0.28
CB1LEAD	2.36	2.37	2.56	0.15	0.17
CB2LEAD	3.01	3.01	3.18	0.15	0.20
NDCW1	1.31	1.31	4.45	0.01	0.01
NDCW2	1.14	1.14	3.57	0.01	0.01
NDCW3	1.16	1.16	2.99	0.01	0.01
NDCW4	0.99	0.99	2.26	0.01	0.01
SDCW1	0.01	0.01	9.25	0.01	0.01
SDCW2	0.66	0.66	10.95	0.01	0.01
SDCW3	0.24	0.24	3.12	0.01	0.01
SDCW4	0.26	0.26	1.96	0.01	0.01

Analysis begun on: Thu Sep 26 13:53:52 2024

Analysis ended on: Thu Sep 26 13:53:54 2024

Total elapsed time: 00:00:02

APPENDIX D
Referenced Reports

NOVATECH
Engineers, Planners & Landscape Architects

M E M O R A N D U M

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.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

- 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

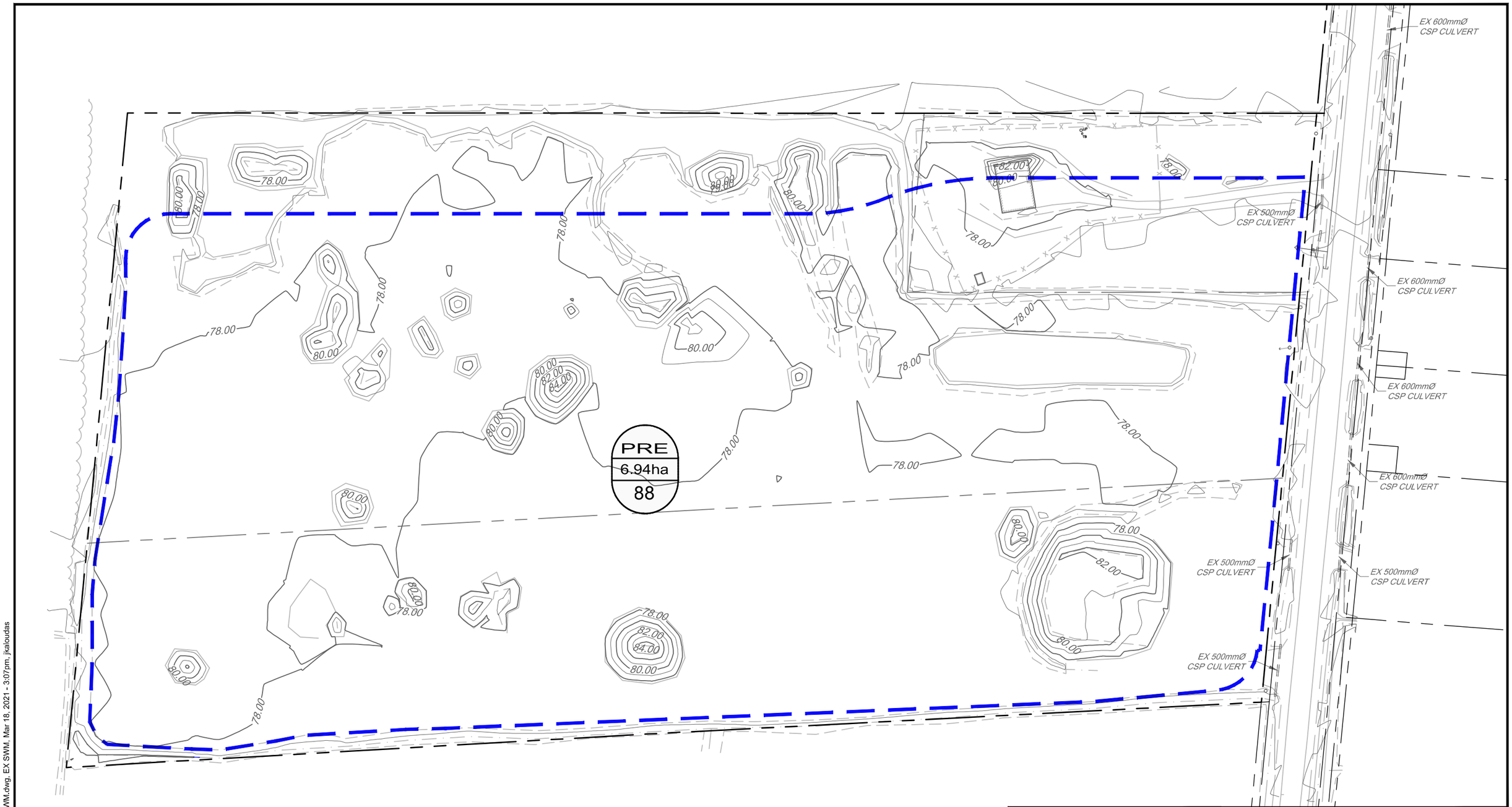
Area ID	Drainage Area (ha)	Peak Flow (m^3/s)					
		3-hour Chicago Storm			*12-hour SCS Type II Storm*		
		2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
Area 'A'							
PRE	6.94	0.129	0.221	0.519	0.168	0.270	0.574

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)

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com



LEGEND

EXISTING STORM DRAINAGE AREA

PRE
6.94ha
88

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 (0 10 20 30 40 50)

DATE MAR 2021 | JOB 118168 | FIGURE 5

SHT11X17.DWG - 279mmX432mm

M:\2018\118168\CAD\Design\Figures\118168-EXSWM.dwg, EX SWM, Mar 18, 2021 - 3:07pm, jkaloudas

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

NOVATECH
Engineers, Planners & Landscape Architects

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   TTTTT  TTTTT  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
Developed and Distributed by Civica Infrastructure
Copyright 2007 - 2013 Civica Infrastructure
All rights reserved.

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


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 5.1\VO2\voin.dat
  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: _____________________________________________________________
```

```
  **********************************************
  ** SIMULATION : Run 01                      **
  **********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\cstang\AppD
|                  |              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.

--------------------------------------------------------------------------------
```

```
  **********************************************
  ** SIMULATION : Run 02                      **
  **********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\cstang\AppD
|                  |              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.

--------------------------------------------------------------------------------
```

```
  **********************************************
  ** SIMULATION : Run 03                      **
  **********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\cstang\AppD
|                  |              ata\Local\Temp\
|                  |              3423a1c4-1884-4f21-baad-4d458bc37917\e1438c1c
| Ptotal= 71.67 mm |    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)|   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     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.

--------------------------------------------------------------------------------
```

```
  **********************************************
  ** SIMULATION : Run 04                      **
  **********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\cstang\AppD
|                  |              ata\Local\Temp\
|                  |              3423a1c4-1884-4f21-baad-4d458bc37917\fceeafce
| Ptotal= 42.34 mm |    Comments: S12-2
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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            |
| 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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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

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\Local\Temp\3423a1c4-1884-4f21-baad-4d458bc37917\8f07cf7d
Ptotal= 56.19 mm | Comments: S12-5

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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

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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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
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 hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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

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
===========================================================================================================
```

APPENDIX E
Drawings

General Plan of Services (118168-GP)
Grading Plan (118168-GR)
Erosion and Sediment Control Plan (118168-ESC)
Notes and Details Plan (118168-ND)