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STATION MEADOWS WEST, SMITHVILLE
PLAN OF SUBDIVISION

Township of West Lincoln

FUNCTIONAL SERVICING REPORT

Prepared For:

P. Budd Development Inc.

August 21, 2020

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1. INTRODUCTION

1.1 Background

The Odan/Detech Group Inc. was retained by P. Budd Development Inc. to complete a functional servicing study in support of a proposed subdivision development in the Community of Smithville, Township of West Lincoln. This report will evaluate the serviceability of the site with respect to sanitary, water and storm servicing and also evaluate the SWM strategy that will be implemented to meet the SWM requirements set out by regulatory agencies.

1.2 Site Description

The subject property is an area of 14.84 ha bounded by vacant land to the north, TH&B rail lands to the south, South Grimsby Road Five to the West, and existing Station Meadows subdivision to the east. An aerial view of the site can be found in Appendix A. The property is legally known as Lot 1, Plan M-94, Township of West Lincoln, Regional Municipality of Niagara. The subject site currently consists of pasture and the topography of the site is relatively flat (average slope about 0.5%). Please refer to the topographic survey prepared by the Mackay Mackay & Peters Limited for detailed topography of the existing site conditions.

1.3 Proposed Development

The proposed subdivision will consist of 53 single detached residential units, 144 conventional freehold town house units, 18 bungalow freehold, 91 apartment units, 78 condo town house units, and 1 ha of neighbourhood park. The north edge of the site consists of two future residential blocks which is expected to allow for an additional 30 single residential lots. The final layout of these lots will depend on the ultimate location of Spring Creek Rd which is currently being assessed by a third party peer review to re-evaluate the road patterns of the current Secondary Plan in this area, including an alternate location for the alignment of Spring Creek Rd. The outcome of the peer review and recommendations of the on-going urban boundary expansion will determine the ultimate location of Spring Creek Rd.

The existing stormwater management (SWM) pond located at the southeast corner of the existing Station Meadows subdivision will be upgraded to provide quantity and quality control of stormwater runoff from both the existing and proposed subdivisions as well as the external area to the north of the proposed and existing subdivisions. The road network of the proposed subdivision will be connected to existing Van Woudenberg Way in the Station Meadows subdivision to the East, South Grimsby Road 5 to the West. A future connection will be provided to the north once the layout of the future residential blocks is determined. It is proposed to develop the site in eight (8) phases as shown in Appendix A.

2. SANITARY SERVICING

2.1 Existing Sanitary Sewer Infrastructure

The majority of the sanitary flows from the proposed subdivision will be allocated to the existing sanitary sewer stub connection that terminates at the West limit of Lot 54, Registered Plan 30M-310 in the existing Station Meadows Subdivision. A small portion of the sanitary flows from the proposed subdivision will be directed to a proposed extension of the sanitary sewer on South Grimsby Road 5. Both of these systems drain to the existing pumping station located on the south side of St. Catharines Street and Dufferin Avenue which then conveys sewage to the Baker Road Wastewater Treatment Plant in Grimsby. Please refer to Appendix B for the original sanitary sewer design sheets for the existing Station Meadows subdivision.

It is our understanding that the Township of West Lincoln has retained a consultant to provide a dynamic model of the sanitary sewer system as an update to the servicing study completed by Amec in May 2015. Sanitary flows generated by the proposed subdivision will be provided to the Township for inclusion in this dynamic model.

2.2 Proposed Sanitary Servicing

The proposed Station Meadows West development will be serviced through the existing sanitary stub provided at the West limit of Lot 54, Registered Plan 30M-210 in the existing Station Meadows Subdivision and through an extension of the existing sanitary sewer on South Grimsby Road 5. Please refer to Figure S-1 in Appendix E for the layout of the proposed conceptual sanitary sewer layout.

2.2.1 Sanitary Sewer Design Considerations

The existing Station Meadows Subdivision was designed using a persons per unit population calculation. Since the Township’s Engineering Standards have been updated, the sanitary design calculations have been completed using land use and density. Additionally, this is the method used to complete the Wastewater Servicing Study in 2015.

The population densities established in the Township of West Lincoln guidelines were used to determine the population in the contributing areas of the proposed site as shown in Table 2-1 below. For the purposes of this report and the associated design calculations, the highest recommended density for the park land use was used.

Table 2-1. Population Density by Land Use

Land Use	Population Density (ppha)	Area (ha)	Population
Single Houses	60	3.53	212
Low Density (Townhouses)	110	6.86	755
Parks	12-**25**	1.19	30
TOTAL		**11.58***	**996**

**This area represents the total sanitary tributary area, not the sum of each land use (Blocks 100 to 102 are not included in the land use area determination)*

Based on the above calculation, the proposed average density for the contributing area is 86 persons per hectare.

As shown in Table 2-2 below, the proposed contributing area is less than the previously assumed contributing area established in 2015, however the contributing population is greater. This is due to the density in the proposed subdivision being higher than was originally anticipated.

Table 2-2. Comparison between 2015 Assumption and Proposed Scenario for Contributing Area and Population

	2015 Assumption	Proposed
Contributing Area (ha)	15.7	11.58
Average Population Density	60	86
Population from Average Density	942	996

2.2.2 Sanitary Sewer Design & Downstream Pipe Capacity

The sanitary sewer design for the site will follow the Township of West Lincoln's servicing standards and requirements. Please refer to Figure S-1 in Appendix E for the conceptual sanitary sewer pipe layout for the proposed development.

A sanitary sewer design sheet was compiled based on this plan which includes the pipe information for the existing Station Meadows subdivision to ensure the system immediately downstream of the proposed subdivision would not be negatively affected by the proposed development. Existing sanitary sewer pipe information was obtained from the as-built drawings for the existing Station Meadows subdivision. Sanitary tributary areas and densities for the existing Station Meadows subdivision were derived from the Wastewater Servicing Study completed by AMEC in 2013.

As shown in the sanitary sewer design sheets found in Appendix B and Figure S-1, the existing pipes along Van Woudenberg Way and continuing South along Hornak Road to Station Street will require upsizing to adequately convey flow through the existing Station Meadows subdivision.

In 2015, AMEC updated The Waste Water Servicing and presented nine scenarios representing various land development sequencing within the Town of Smithville. The option (Option 8) which represents the development of Station Meadows West demonstrates that the required sewer upgrade to facilitate the development of Station Meadows West is consistent with above findings; that the existing sewers within Station Meadows are to be upsized to Station Street.

Presently the municipality is in the process of creating a dynamic model of the Town's sanitary system. Design flows for the proposed Station Meadows West subdivision will be provided to the Township of West Lincoln following the completion of the detailed design for incorporation into the dynamic analysis of the sewer.

As noted previously, the proposed site ultimately drains to the Smithville pumping station located south of St. Catharine's Street which has a current capacity of 120 L/s. In discussion with the Region it has been confirmed that the existing pumping station and outlet forcemain has the capacity of for the subject site. Some adjustment of the pumps may be required by the Region as development phases are brought on to the system.

2.2.3 Sanitary Servicing to South Grimsby Road 5

As shown on Figures S-1 and S-11, there are sixteen (16) single family units proposed along South Grimsby Road 5 which will be serviced by a proposed extension of the existing sanitary sewer on South Grimsby Road 5. These lots will be developed in a future phase of the proposed subdivision once the neighbouring westerly developers finalize the engineering design and construction of the Grimsby Rd 5 urbanization.

Due to the relatively small area of the proposed development to be serviced by the existing sewers on South Grimsby Road 5, it is anticipated that there is sufficient capacity in the receiving sewer on South Grimsby Road 5 to accept the generated sanitary flows. Design flows for this portion of the proposed Station Meadows West subdivision will be coordinated with the neighbouring developers and will be provided to the Township of West Lincoln for incorporation into the proposed dynamic sanitary sewer model being undertaken by the Town of West Lincoln.

3. WATER SUPPLY AND DISTRIBUTION

Municipal water services for the proposed subdivision can be serviced by connecting to the existing 150mm diameter watermain in Block 54, Plan 30M-310 at Van Woudenberg Way and Las Road as well as the existing 200mm diameter watermain on South Grimsby Road 5 at Westlea Acres Drive.

The water servicing for Phase 1 construction will terminate at gate valves on Street B, C, D and E at the limit of Phase 1 and at the blow-off valves at the limit of Block 81, 83 and 85. The remaining watermain and services will be constructed as part of each Phase of construction. A conceptual water network layout plan can be found in Appendix E, Figure S-2.

Water demand for the proposed Station Meadows West subdivision were calculated using the following criteria:

Table 3-1. Station Meadows West Water Demand Criteria	
Average Daily Domestic Demand (see Sanitary Design Sheet for Population)	320 L/cap/day
Peak Day Demand	2.75 x Daily Demand
Peak Hour Demand	4 x Daily Demand
Fire Flow (FUS Booklet Part 2)	$F=220*C*\sqrt{A}$

The water demand requirements for the subdivision are outlined in the Table 3-3 below. Detailed Fire Flow calculations for the each governing unit type per phase can be found in Appendix C. In Phase 1 and full build out, the townhouse blocks in Block 76 is the unit and lot type that yields the highest fire flow requirements due to its size and proximity to neighboring units. Two fire flow calculations are included in Appendix C and Table 3-2, due to significantly lower fire flow demand as a results of there being a lack of exposure to the East following Phase 1 construction.

Table 3-2. Township of West Lincoln Water Demand Results

Average Daily Domestic Demand	5.1 L/s
Peak Day Demand	14 L/s
Peak Hour Demand	20.4 L/s
Fire Flow (FUS Booklet Part 2)	167 L/s Phase 1 183 L/s Full Subdivision Build-out

The pressures and volumes must be adequate for peak hour conditions and under fire conditions as established by the Ministry of Environment and the Fire Underwriters Survey booklet (1999). The minimal residual pressure under peak day and fire conditions is 140 kpa (20.3 psi)

According to the MOE criteria the allowable pressures are as follows:

Table 3-3. MOE Water Pressure Criteria

Condition	**Allowable Pressures (kPa)**	
	Min.	**Max.**
Min. Hour	275	700
Peak Hour	275	700
Peak Day + Fire Flow	140	700

It is assumed that there will be sufficient pressure and flow available for the construction of Phase1 utilizing water service connection to the existing 150mm diameter watermain at Van Woudenberg Way and 200mm at South Grimsby Road 5 at Westlea Acres Drive. See Figure S-2 in Appendix E for the conceptual water servicing layout.

The Region of Niagara has retained AECOM to evaluate water servicing strategy for west Smithville that will include recommendations for watermain sizing to accommodate the required fire flows for full build-out. The watermain sizes shown on Figure S-2 are subject to change depending on the results of AECOM’s study. The current proposed watermain sizes are place holders for zoning purposes.

4. STORMWATER MANAGEMENT

4.1 Design Criteria

The proposed Station Meadows West subdivision is part of the Smithville Northwest Watershed which is part of the Smithville North Master Drainage Plan. Stormwater management for the proposed development will follow the stormwater management criteria set out by the Township of West Lincoln, Ontario Ministry of the Environment, Conservation and Parks and the Regional Municipality of Niagara. A summary of the stormwater management criteria applicable to the site are as follows:

Quantity Control: Quantity control measures are to be designed to ensure that Post-development flows from site are equal to or less than the pre-development flows for the 2 year to 100 year design storm events.

Quality Control: Quality control measures are to be designed to provide *Enhanced Protection* - long term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the proposed development site based on the post-development level of imperviousness.

Erosion Control: Detention and release of the 25 mm storm over a 24 hour period.

Runoff Conveyance: The minor system is to be designed to accommodate the 5 year storm when flowing full, while the major overland system is to be designed for the 100 year event.

4.2 Existing Conditions and Surrounding Drainage Patterns

The existing topography of the subject site and its surrounding areas is such that there are multiple existing storm outlets for the site. A pre-development tributary plan has been prepared based on a drainage pattern analysis of the site's digital terrain model created from existing topographic survey and digital terrain modelling acquired from First Base Solutions. The pre-development storm tributary plan is included as Figure S-7 in Appendix E.

There are four existing drainage areas that are to be considered for the subject site as follows:

Area 1 – A 1.25 ha area of the subject site and adjacent property to the North alongside South Grimsby Road 5 designated as Areas 101 and 102 drain to an existing ditch along the east side of South Grimsby Road 5 and from there into an existing ditch along the North side of the Toronto Hamilton & Buffalo Railway.

Area 2 – A 15.61 ha area of the subject site and adjacent property designated as Areas 103 and 104 drain to the South through the existing low berm along the railway directly into the existing ditch along the North side of the Toronto Hamilton & Buffalo Railway property.

Area 3 – A 13.48 ha area of the subject site and adjacent property designated as Area 105 drains to a headwall located in Block 25, Registered Plan 30M-342.

Area 4 – A 0.97 ha area of the subject site designated as Area 106 drains to two rear yard catch basins located in Lots 20 and 23, Registered Plan 30M-342.

The stormwater management pond for the subject site is located at the south eastern limit of the existing Station Meadows subdivision. This pond also receives drainage from a 13.91 ha external area designated EXT1 as well as the existing Station Meadows subdivision as shown on Figure S-7.

4.3 Predevelopment Flow Rates

For the original design of the Station Meadows Stormwater Management Pond, older IDF equations were used compared to the current IDF equations found in the Town of West Lincoln Engineering Guidelines. The predevelopment runoff rates were reevaluated using the latest IDF equations and a detailed assessment of the size of the external areas contributing to the existing headwall into the existing stormwater management pond. A storm sewer design sheet for the recalculated existing Station Meadows subdivision storm sewers can be found in Appendix D.

The following design storm IDF equation for the 5 storm event as found in the Township of West Lincoln's Engineering Standards was used to re-evaluate the existing storm runoff rate:

$$i_5 = \frac{3175}{Tc+20}$$

A comparison of predevelopment 5 year flow rates and contributing areas are summarized in the following table.

Table 4-1. Predevelopment 5 Year Flow and Area Comparison (Rational Method)

	Station Meadows Pond Design Calculations (2002)	**Existing Station Meadows Recalculated (2019)**
Contributing Area (ha)	59.54	46.53
Total Flow @ Ex Pond (L/s)	2,555	1,815

4.4 Proposed Stormwater Management Strategy

Stormwater for the proposed subdivision will be conveyed to a redesigned pond to replace the existing facility in the pond block south of the existing Station Meadows subdivision.

The stormwater management pond (wet pond) has been designed for quantity, quality and erosion control for the stormwater runoff from both the existing Station Meadows subdivision and the proposed Station Meadows West subdivision, external areas (tributary area EXT2, EXT2A and 0.54 ha of EXT2B) north of the proposed subdivision as well as quality control for the external areas (tributary area EXT1 and 1.09 ha of EXT2B) to the north of existing Station Meadows subdivision. Quantity control has to be provided for the external area EXT1 and part of EXT2B when developed to ensure that the release rate for the 100 year return period storm event (24 hour 100 year Chicago Storm) does not exceed 1,005 l/s. The existing stormwater management (SWM) pond located at the southeast corner of the existing Station Meadows subdivision will be upgraded according to MOE guidelines outlined in the MOE Stormwater Management Planning and Design Manual, March 2003.

Storm sewers (upstream of MH14, MH14 to MH15, upstream of MH13, MH13 to MH21) for the proposed subdivision was designed to accommodate the 5 year storm event runoff. The storm sewers downstream of MH15 and MH21 as well as the sewer from HW1 to MH15 have been designed to convey the 100 year storm event flow from the proposed development and external areas (Areas 2, 2A and part of 2B). See the Post Development Storm Tributary Plans, Figures S-8, S-9 and S-10 in Appendix E for more detail.

4.5 Post Development Drainage Pattern

Where the 100 year hydraulic grade line reaches the surface, the major overland flow for the proposed Station Meadows West subdivision will be conveyed using the road network and collected at 100 year collection points on Van Woudenberg Way near its intersection with Street G. The general path of overland drainage will be from Northwest to Southeast. Overland drainage from the site plan located in Blocks 81 will be conveyed to Van Woudenberg Way to the 100 year collection points. Please refer to the Conceptual Grading Plan (S-5 and S-6) and the Conceptual Post Development Storm Tributary Plans (S8 & S-9) in Appendix E for details.

Emergency overland flow for the subdivision will be conveyed to Van Wodenberg Way and follow the overland flow routes of the existing subdivision. Emergency overland flows for a small portion of the Northeast side of the subdivision (Areas 10-A, HW1-1 and 15-1) will be conveyed overland through the storm conveyance block to the existing headwall in Block 25, Plan 30M-342.

The properties fronting South Grimsby Road 5 (Areas 200 and 201) will drain to an existing ditch alongside the roadway which ultimately drains into the existing ditch along the North side of the TH&B Railway. These lots will not be included in the drainage going to the redesigned pond. The front of these lots (Figure S-8, Areas 102) already drains to this ditch. It is anticipated that due to the removal of a large portion of the lands currently draining to the existing ditch alongside the Railway, there will be sufficient capacity to convey flows from these properties. Refer to the predevelopment and post-development storm tributary plans included in Appendix E for details.

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4.6 Allowable Flow

Since the outlet location of the proposed pond will be at the same location of the existing pond that was built for the existing Station Meadows residential subdivision, the proposed allowable flows will be limited to the allowable flows from the existing pond as listed in the following Table 4-2 (refer to Final Engineering Report for Station Meadows Subdivision prepared by The Odan/Detech Group Inc., May 30, 2000).

Table 4-2. Allowable Peak Flows at the Pond Outlet

Storm Event	Storm Type	Peak Flow (m^3/s)
25 mm*	4hr Chicago	0.66
2 Year	12hr SCS	1.44
5 Year	12hr SCS	2.59
10 Year	12hr SCS	3.48
25 Year	12hr SCS	4.75
50 Year	12hr SCS	5.73
100 Year	12hr SCS	6.77

*This storm is included for comparison purposes; this is not target flow rate (allowable flow)

4.7 Hydrologic and Hydraulic Modelling

4.7.1 Model Overview

Based on the review of the post-development hydrologic and hydraulic analysis requirement, it was decided to use XPSWMM model (1D module) which allows to fully evaluate the interaction of all system elements – catchments, pipes, manholes, catchbasins, ponds, orifices, weirs, streets, channels, culverts and more in a single model. The XPSWMM 1D module can easily and accurately couple underground flows (minor system, such as sewer infrastructure) with surface flows routed overland (major system such as road, swales, storage areas). The XPSWMM 1D analytical engine performs all numerical computations based on the EPA SWMM engine. It uses the finite difference Runge-Kutta explicit scheme to solve all terms of the St. Venant equations for 1D calculation. XPSWMM dynamic modeling allows the effects of storage and backwater in conduits and the timing of the hydrograph to yield a true representation of hydraulic conditions.

4.7.2 Model Setup

The XPSWMM post-development model was developed based on the Odan/Detech storm servicing plan and storm tributary area plan for the proposed Station Meadows West and existing Station Meadows subdivision (Figures S-3, S-8 and S-9, Appendix E). The storage and outlet information along with the surface characteristics of the catchment areas was used in XP-SWMM to determine the storage requirements and discharge from the proposed SWM pond facility. The model schematic is presented in Appendix D.

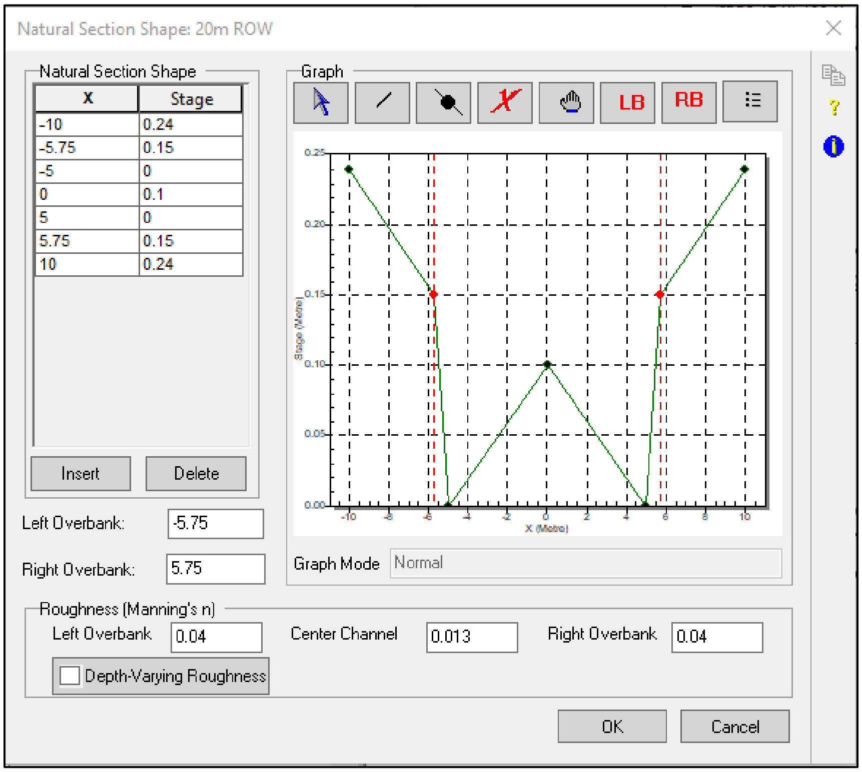
The proposed pond was modeled as storage nodes in XPSWMM. A future quantity control pond also was modelled as a storage node with preliminary data for storage area and outlet parameters. To define the storage capacity of the pond, the stepwise linear storage method that requires an area and depth was used. The pond outlet orifice was modeled by adding a multilink and inputting the orifice area, coefficient and invert; the pond outlet weir was also modeled using a multilink and inputting length, discharge coefficient, weir crest and weir crown. It is notable that unlike some other modelling software where ponding and outflow from reservoirs/storage nodes are determined based on a stage-storage-discharge relationship, XP-SWMM is a dynamic model where the outlet structures (e.g. orifice and weir) are built into the program therefore, a rating curve is not required to model the pond.

The roadways have been modelled as per the following channel design (Exhibit 1 and 2) which represents the road cross-section at grade. The existing channel downstream of the proposed pond outlet culvert was modelled as shown in Exhibit 3. The data required to model the existing channel were obtained from as-built drawings and the Final Engineering Report of existing Station Meadows Subdivision – Phase I. The XP-SWMM input and output information for the proposed storm sewer system and pond storage data are presented in Appendix D.

The physical characteristics (area, % imperviousness, width, slope, infiltration data, time to peak etc.) of the tributary areas were input into the runoff node in XPSWMM model. Refer to Appendix D for XPSWMM Catchment Input Data.

The SWMM Runoff Non-linear Reservoir Method was used to generate the hydrograph from the effective rainfall over the tributary areas that includes both pervious and impervious area of the existing, proposed subdivision and future development area. The Nash unit hydrograph method was used to model the park using 10 minutes time of concentration.

The percentage imperviousness for the existing Station Meadows Subdivision, proposed Station Meadows Subdivision, future development in the external areas and the park area are 45%, 72%,57% and 20%, respectively.



Natural Section Shape: 20m ROW

Natural Section Shape

X	Stage
-10	0.24
-5.75	0.15
-5	0
0	0.1
5	0
5.75	0.15
10	0.24

Left Overbank: -5.75

Right Overbank: 5.75

Graph Mode: Normal

Roughness (Manning's n)

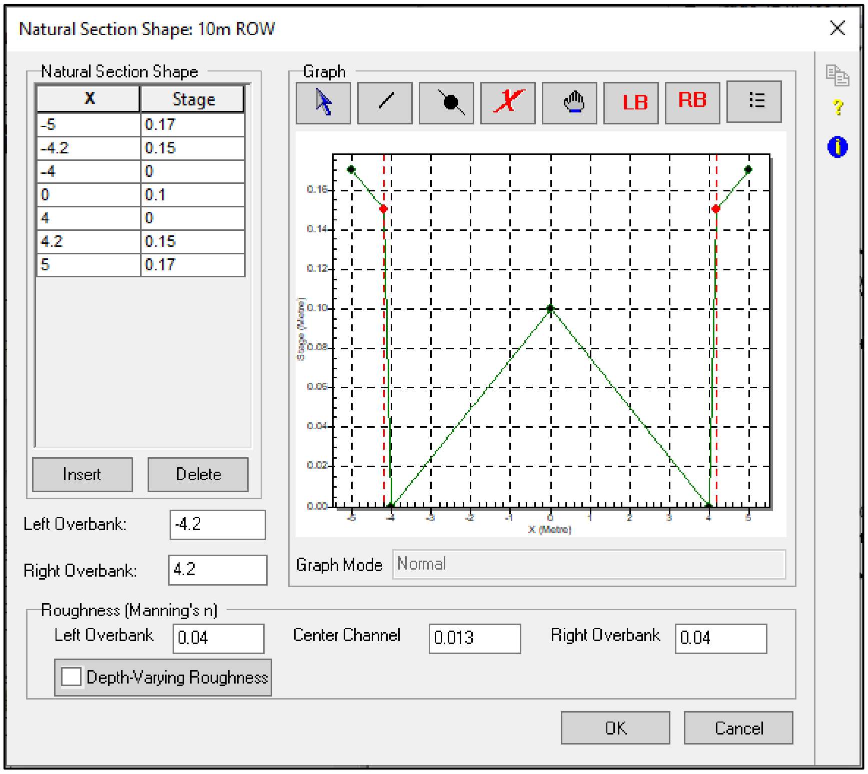
Left Overbank: 0.04

Center Channel: 0.013

Right Overbank: 0.04

☐ Depth-Varying Roughness

Exhibit 1. 20m Right-of-Way Channel Design



Natural Section Shape: 10m ROW

Natural Section Shape

X	Stage
-5	0.17
-4.2	0.15
-4	0
0	0.1
4	0
4.2	0.15
5	0.17

Left Overbank: -4.2

Right Overbank: 4.2

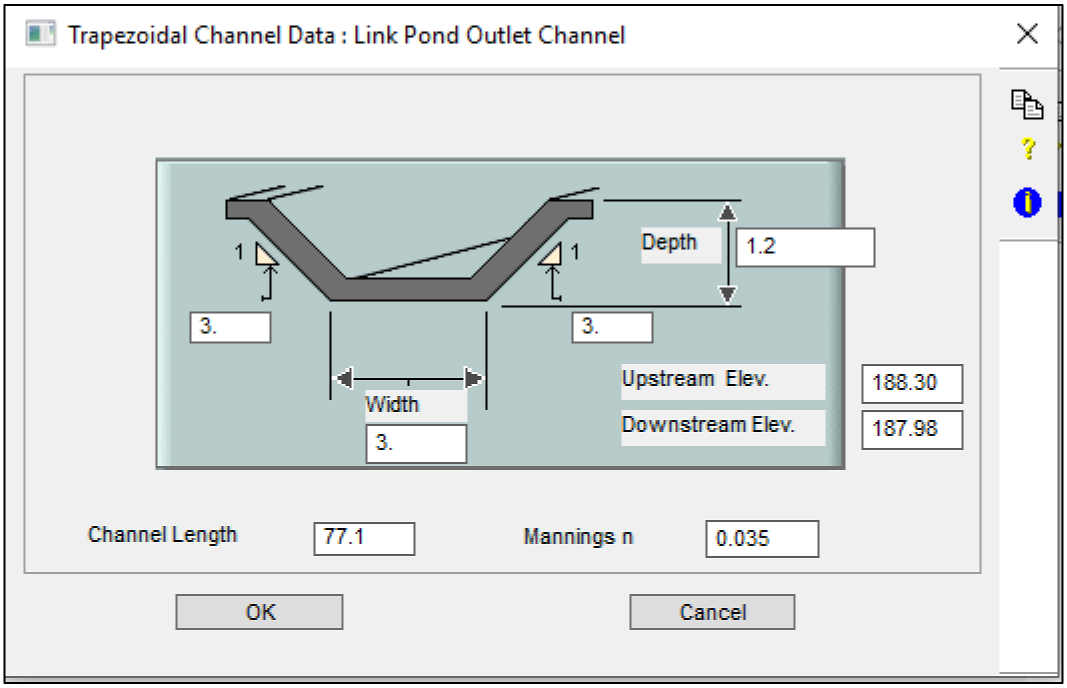
Graph Mode: Normal

Roughness (Manning's n)

Left Overbank: 0.04
Center Channel: 0.013
Right Overbank: 0.04

☐ Depth-Varying Roughness

Exhibit 2. 10m Right-of-Way Channel Design



Trapezoidal Channel Data : Link Pond Outlet Channel

Left side slope: 3.
Right side slope: 3.
Depth: 1.2
Width: 3.
Upstream Elev.: 188.30
Downstream Elev.: 187.98
Channel Length: 77.1
Mannings n: 0.035

Exhibit 3. Existing Channel at Downstream of the Proposed Pond Outlet Culvert

4.7.3 Rainfall Data

The following types of temporal rainfall distributions were used for the proposed stormwater management system modeling.

1. SCS Type-II 12-hour distribution was used for the 2, 5, 10, 25, 50 and 100 year return period storm events; this distribution was used to determine the allowable peak flows at the outlet of the existing pond based on sensitivity analysis results presented in the Master Drainage Plan, Township of West Lincoln – Smithville North (December, 1990). The storm hyetographs were obtained from the Township of West Lincoln's Storm Drainage Policies and Criteria (1990).
2. The most recent Municipal Engineering Standards of the Township of West Lincoln provides Intensity-Duration-Frequency (IDF) equations for 5yr and 100yr return period design storms are as follows:

   $i_5 = \frac{3175}{Tc+20}$

   $i_{100} = \frac{6300}{Tc+15}$

   In addition to SCS Type -II 12-hour storm hyetograph, SCS Type-II 24 -hour, Chicago 4-hour, 12-hour and 24-hour temporal distributions were used for the 5-year and 100-year return storm period based on the these two IDF equations for determining the most conservative storm distribution. The Chicago 4-hour temporal distribution was also used for the 25mm storm event.

4.7.4 Model Results

The XPSWMM model's hydraulic simulation was performed for 24 hours with a time step of 15 seconds and the results show that overall continuity error was excellent for all storm events.

The XPSWMM model was used to analyse post-developed condition hydrology and hydraulics including post-development condition flows, sizing of pond outlet structure – orifice and weir, quantification of pond storage requirement, and hydraulic grade lines/water surface elevations. The model results will be presented in the subsequent relevant sections.

4.8 Post-Development Analysis Results

The following Table 4-3 is a summary of the modelled post-development peak flows from the proposed SWM facility compared to the target pre-development flows

Table 4-3. Peak Flows at the Existing/Proposed Pond Outlet

Storm Event	Storm Type	Allowable Peak Flow (m3/s)	Post-Development Peak Flow (m3/s)
25 mm*	4hr Chicago	0.66	0.115
2 Year	12hr SCS	1.44	0.344
5 Year	12hr SCS	2.59	0.987
	12hr SCS IDF	**2.59	0.775
	24hr SCS IDF	**2.59	0.594
	4hr Chicago	**2.59	1.124
	12hr Chicago	**2.59	1.185
	24hr Chicago	**2.59	1.194
10 Year	12hr SCS	3.48	1.600
25 Year	12hr SCS	4.75	2.662
50 year	12hr SCS	5.73	3.611
100 Year	12hr SCS	**6.77	4.569
	12hr SCS IDF	**6.77	5.092
	24hr SCS IDF	**6.77	4.341
	4hr Chicago	**6.77	6.460
	12hr Chicago	**6.77	6.654
	24hr Chicago	**6.77	**6.684**

*This storm is included for comparison purposes; this is not a target flow rate (allowable flow)
** These allowable flows were determined using 12hr SCS temporal distribution storm

The above tables demonstrate that the post-development peak flows do not exceed the allowable peak flows for the proposed SWM facility, and the Chicago 24hr storm is the most conservative design storm as the peak flows from this storm at the outlet of the pond and the storage requirement in the pond (as shown in Table 4-4) are higher than those from the other modelled storms.

4.9 SWM Pond Design

The proposed SWM pond has been sized according to the MOE guidelines outlined in the MOE Stormwater Management Planning and Design Manual, March 2003. Quantity control will be achieved within the active storage component of the proposed SWM wet pond facility. The quantity control requirement for the proposed pond was determined using the XPSWMM model simulated results as shown in the following Table 4-4. The results in the Table 4-3 and Table 4-4 show that the 24 -hour Chicago storm produces the most conservative release rates and storage volumes and therefore governs the design of the SWM pond.

Table 4-4. Summary of SWM Pond Storage Volume Requirement for Quantity Control

Storm Event	Storm Type	Storage Volume Requirement (m3)	Storage Elevation (m)
25 mm	4hr Chicago	6,631	189.508
2 Year	12hr SCS	9,602	189.819
5 Year	12hr SCS	10,950	189.956
	12hr SCS IDF	10,553	189.916
	24hr SCS IDF	10,190	189.879
	4hr Chicago	11,202	189.981
	12hr Chicago	11,310	189.992
	24hr Chicago	11,326	189.994
10 Year	12hr SCS	12,010	190.061
25 Year	12hr SCS	13,565	190.213
50 year	12hr SCS	14,792	190.330
100 Year	12hr SCS	15,937	190.438
	12hr SCS IDF	16,533	190.494
	24hr SCS IDF	15,672	190.413
	4hr Chicago	18,024	190.630
	12hr Chicago	18,227	190.649
	24hr Chicago	**18,260**	190.652
Provided Storage	-	**19,123**	*190.73

*Storage volume elevation corresponded to maximum Active Storage depth of 2 m; pond top/spill crest will be set at 191.14 that includes a 0.49 m freeboard.

The SWM pond will also provide the quality control of storm runoff for *Enhanced Protection* - long term average removal of 80% of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the proposed SWM pond based on the post-development level of imperviousness. The following Table 4-5 summarizes the pond sizing parameters, and the required and provided storage volume for the permanent pool and the active storage volume to meet the MOE Enhanced Protection Level requirements.

Table 4-1. Summary of MOE SWM Pond Quality Control Storage Requirements*

Total Drainage Area	*63.59 ha*	
Average % Impervious	*56.95 %*	
Storage Volume Requirement	*195 m^3/ha*	
Storage Description	**MOE Requirement**	**Provided**
Permanent Pool (155m^3/ha)	9,828m^3	10,187 m^3
Extended Storage (40m^3/ha)	2,544m^3	19,123 m^3

** This table represents the minimum requirements as per MOE 2003. For the actual modelled requirements refer to Table 4-4.*

Table 4-2. Summary of SWM Pond Storage Requirements and Pond Detail

Storage Items	Pond Storage Volume Required (m^3)	Pond Storage Volume Provided (m^3)	Pond Invert Elev (m)
Permanent Pool	9,828	10,187	186.48
Active Storage (quality control)	6,631	19,123	188.73
Active Storage (quantity control)	18,260	19,123	188.73

The outlet for redesigned pond is a proposed box culvert (2.4 m x 1.2m) with a custom 4m wide weir structure on the upstream side with a 300mm diameter orifice plate. The invert of the orifice plate will be set to 188.73 m; the crest and the crown of the weir will be set to 189.73m and 191.14m, respectively. The crown of the weir will be 0.49m above the high water level. Please refer to Figure S-12 in Appendix E and pond storage calculation in Appendix D for the outlet parameters. The details of the outlet structure will be provided at the final design stage.

This outlet structure will provide the necessary detention and release of the 25mm storm flow to ensure minimum 24 hour drawdown time required for quality and erosion control. The following Exhibit 4 is the drawdown curve for the 25mm storm event which demonstrates that the minimum 24 hour drawdown time is achieved. Note that the dates and times shown on the graph are arbitrary.

The inspection and maintenance guide for the pond will be provided at the final design stage. It is proposed that sediment removal from the forebay will done using a vac truck as space is limited to allow for excavating sediment to a sediment drying area within the pond block. This will also allow the sediment to be immediately disposed of at a proper facility and avoid odours in the neighbourhood during the drying period.

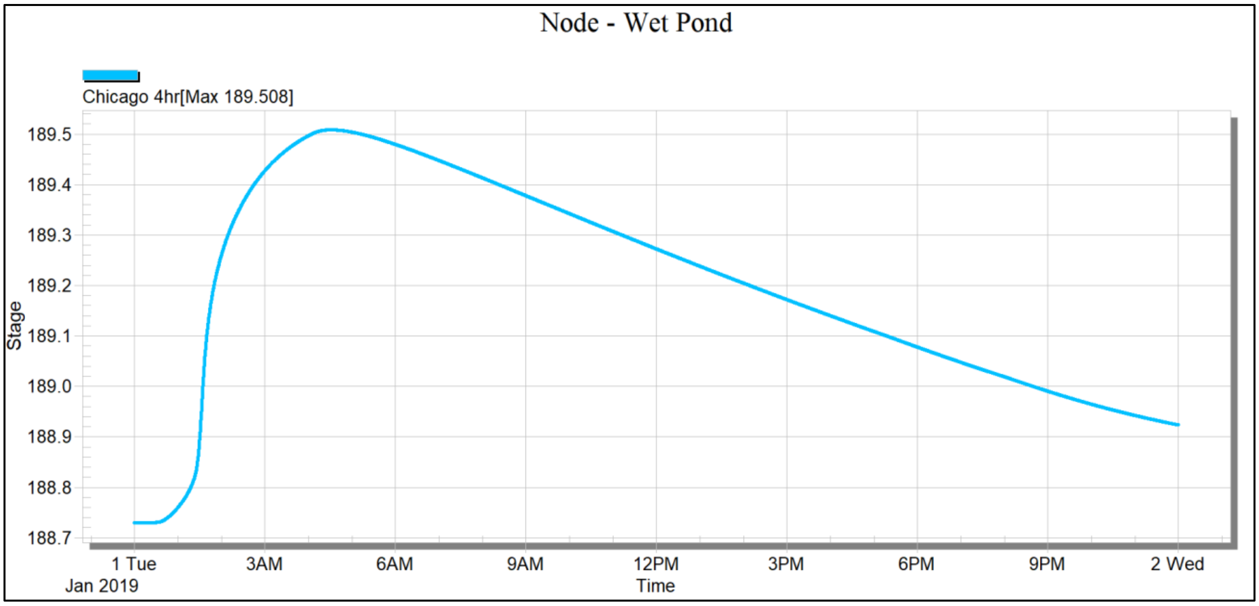


Exhibit 4. XPSWMM 25mm Chicago Storm Drawdown Curve

4.10 Existing Channel Capacity Assessment

The XPSWMM model results demonstrated that the depths of water at the upstream and downstream end of the existing channel downstream of the proposed pond outlet culvert are 0.88 m and 0.639 m, respectively. These water depths are less than the existing channel depth of 1.2 m which ensures a minimum 0.3 m freeboard. The full flow capacity, maximum flow (100yr 24hr Chicago) and percentage of full flow capacity are 12.01 m3/s, 6.683 m3/s and 56%, respectively.

4.11 Storm Sewer Assessment & Design

As mentioned earlier, storm sewers except the sewers from HW1 up to the pond for the proposed subdivision was designed to accommodate the 5 year storm event runoff and the proposed sewers were designed using the rational method and Manning’s formula. In addition to the rational calculations provided (see Appendix D), the sewers capacities have been verified using XPSWMM model simulated hydraulic grade lines and flows. The storm sewers from HW1 up to the pond were designed to convey 100 year storm flow from the proposed development and external areas (Areas EXT2, 2A and part of 2B) and these pipes were analyzed using XPSWMM to ensure that the 100 year hydraulic grade lines will be below the proposed surface. Please refer to Appendix D for XPSWMM Plot showing 100 yr hydraulic grade line from HW 1 to the Proposed Pond.

The following Intensity-Duration-Frequency (IDF) equation for 5yr return period storms obtained from the Municipal Engineering Standards of the Township of West Lincoln (2017) was used for minor system design. The Chicago 24hr distribution was used in XPSWMM model for hydraulic grade lines assessment of the minor system.

$i_5 = \frac{3175}{Tc+20}$

The Chicago 24hr distribution was used in XPSWMM for designing the sewers which will convey the 100 year storm. Note that these 100 year storm sewers are designed such that the hydraulic grade line will not reach the surface.

5. GRADING CONSIDERATIONS

5.1 Pedestrian Walkway

A 3m wide pedestrian walkway will be along the north side of the CP Rail Railway Protection Berm connection South Grimsby Rd 5 to Hornack Rd. This pedestrian walkway will be designed such that it is accessible and meets the Township of West Lincoln’s requirements for a pedestrian walkway. A portion of this walkway between Block 85 and the existing SWM block will be a raised walkway. This walkway will be designed by a structural engineer.

See Conceptual Pond Plan and Sections on Figures S-13 and S-14 for additional information.

5.2 Railway Protection Berm

A railway protection berm at the south limit of the site is required. This berm has been designed such that the Railway side of the berm has a slope of 2.5:1. A 1 m wide strip at the top of the berm will be sloped towards the site at 2% and will have a noise wall placed on top. This noise wall has been designed as per recommendation in a noise and vibration feasibility study completed by HGC Engineering. Please refer to Figure S-14 for additional information.

6. EROSION AND SEDIMENT CONTROL

Erosion and sediment controls for the site will be implemented according to the Golden Horseshoe Area Conservation Authorities’ Erosion and Sediment Control Guidelines for Urban Construction and Township of West Lincoln’s Guidelines. A detailed erosion control plan will be prepared upon final design.

7. CONCLUSIONS

Based on our investigation, the Site is serviceable utilizing existing sanitary and watermain infrastructure adjacent to the site.

Stormwater management for the site will be accommodated using a proposed redesigned SWM facility located on the same site as the existing SWM facility at the south side of the existing Station Meadows subdivision. The facility has been designed to accommodate the proposed site however at the time of its design, the location of the urban boundary precluded any development on the proposed site. The pond has been sized for quantity control to meet pre-development peak flow targets and MOE Level 1 quality control requirements.

It has been determined that the subject site is favourable for the proposed residential development shown on the Plan of Subdivision for the Site and as detailed in this report.

Respectfully Submitted:
The Odan Detech Group Inc.

LICENSED PROFESSIONAL ENGINEER
P. J. HECIMOVIC
100126980
PROVINCE OF ONTARIO

Paul Hecimovic, P.Eng

Frank Borger, C. Tech

Sadik Ahmed

Sadik Ahmed, Ph.D., P.Eng

8. REFERENCES

1. GGHA CAs (December, 2006). Erosion and Sediment Control Guideline for Urban Construction, Greater Golden Horseshoe Area Conservation Authorities, Ontario.

2. NPCA March (17, 2010). Stormwater Management Guidelines, Niagara Peninsula Conservation Authority. Prepared by AECOM, Kitchener, ON.

3. Ontario Ministry of the Environment (March, 2003). Stormwater Management Planning and Design Manual. Ministry of Environment, Ontario. ISBN 0-7794-2969-9.

4. The Odan/Detech Group Inc. (Original April 3, 2000; Updated May 30, 2000). Final Engineering Report for Station Meadows, Plan of Subdivision, Station Street, Smithville, Township of West Lincoln. Prepared for P. Budd Developments Inc. The Odan/Detech Group Inc, 5230 South Service Road, Burlington, ON.

5. West Lincoln (December 7, 2018). Draft Plan of Subdivision Preliminary Planning review, Memorandum, Planning and Development Department, Township of West Lincoln, ON.

6. West Lincoln (October, 2018). Official Plan, Township of West Lincoln, ON.

7. West Lincoln (2017). Municipal Engineering Standards, Township of West Lincoln, ON.

8. West Lincoln (December, 1990). Storm Drainage Policies and Criteria, Township of West Lincoln. Prepared by Philips Planning and Engineering Limited, Burlington, ON.

9. West Lincoln (December, 1990). Master Drainage Plan, Township of West Lincoln – Smithville North, Master Drainage Plan. Prepared by Philips Planning and Engineering Limited, Burlington, ON.

10. West Lincoln (June, 2013). Community of Smithville Water and Wastewater Servicing Study, Township of West Lincoln. Prepared by AMEC Environment & Infrastructure, Burlington, ON

11. Niagara Region (August 2019). Water-Wastewater Project Design Manual

12. Ministry of Environment and Climate Change (2008). Design Guidelines for Drinking-Water Systems

13. Ministry of Environment and Climate Change (2008). Design Guidelines for Sewage Works

14. HGC Engineering (2020). Noise and Vibration Feasibility Study, Proposed Residential Development, Station Meadows West Subdivision, Township of West Lincoln, Ontario.

APPENDIX A

Aerial Photo of Existing Site
Draft Plan (including Phasing) of the Proposed Development (reduced)

Aerial Photo of Existing Site

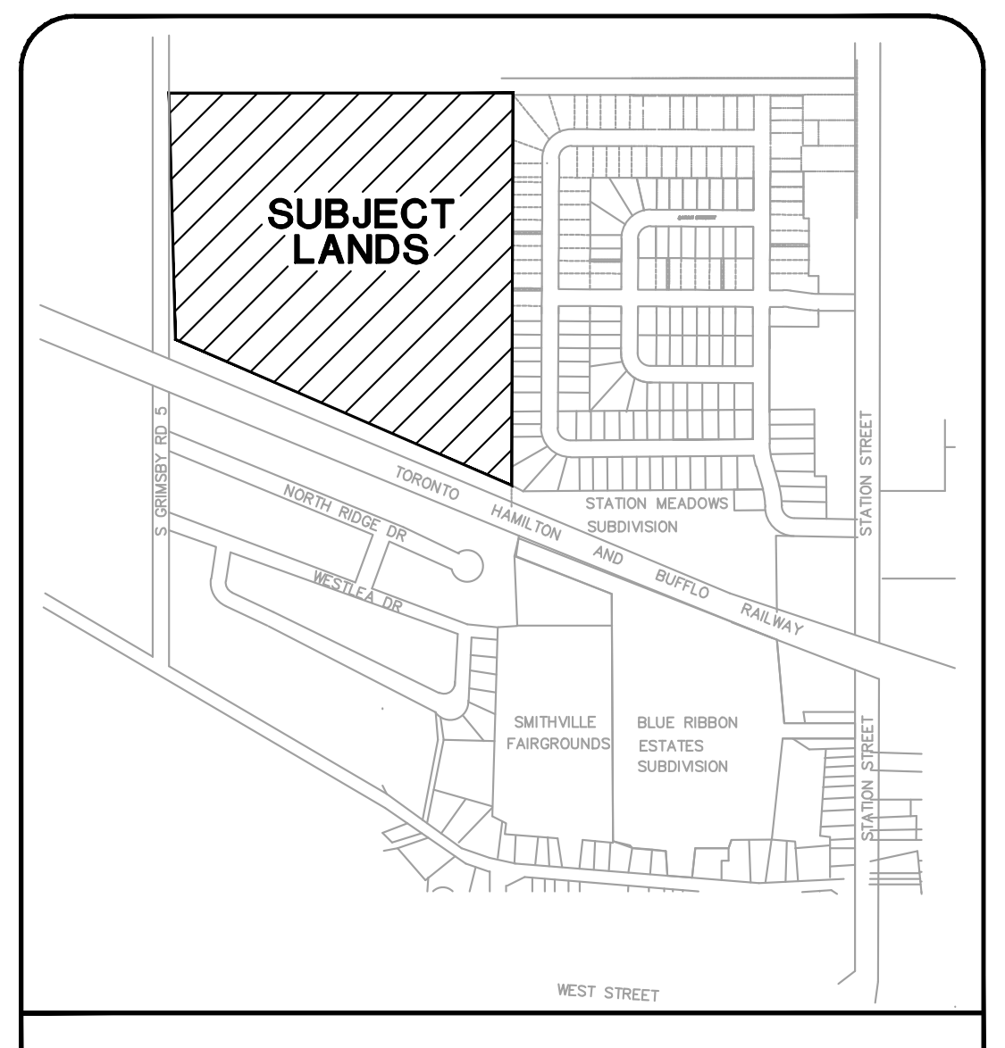
STATION MEADOWS WEST UNIT COUNT PER PHASE

UNIT TYPE	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PHASE 7	PHASE 8	TOTAL
SINGLE DETACHED	19	0	13	0	0	0	5/*30	16	53/*83
FREEHOLD TOWN HOUSE	12	0	24	48	48	0	12	0	144
BUNGALOW FREEHOLD	18	0	0	0	0	0	0	0	18
APARTMENT UNITS	91	0	0	0	0	0	0	0	91
CONDO TOWN HOUSE	0	30	0	0	0	48	0	0	78
TOTAL	140	30	37	48	48	48	17/50*	16	384/414*

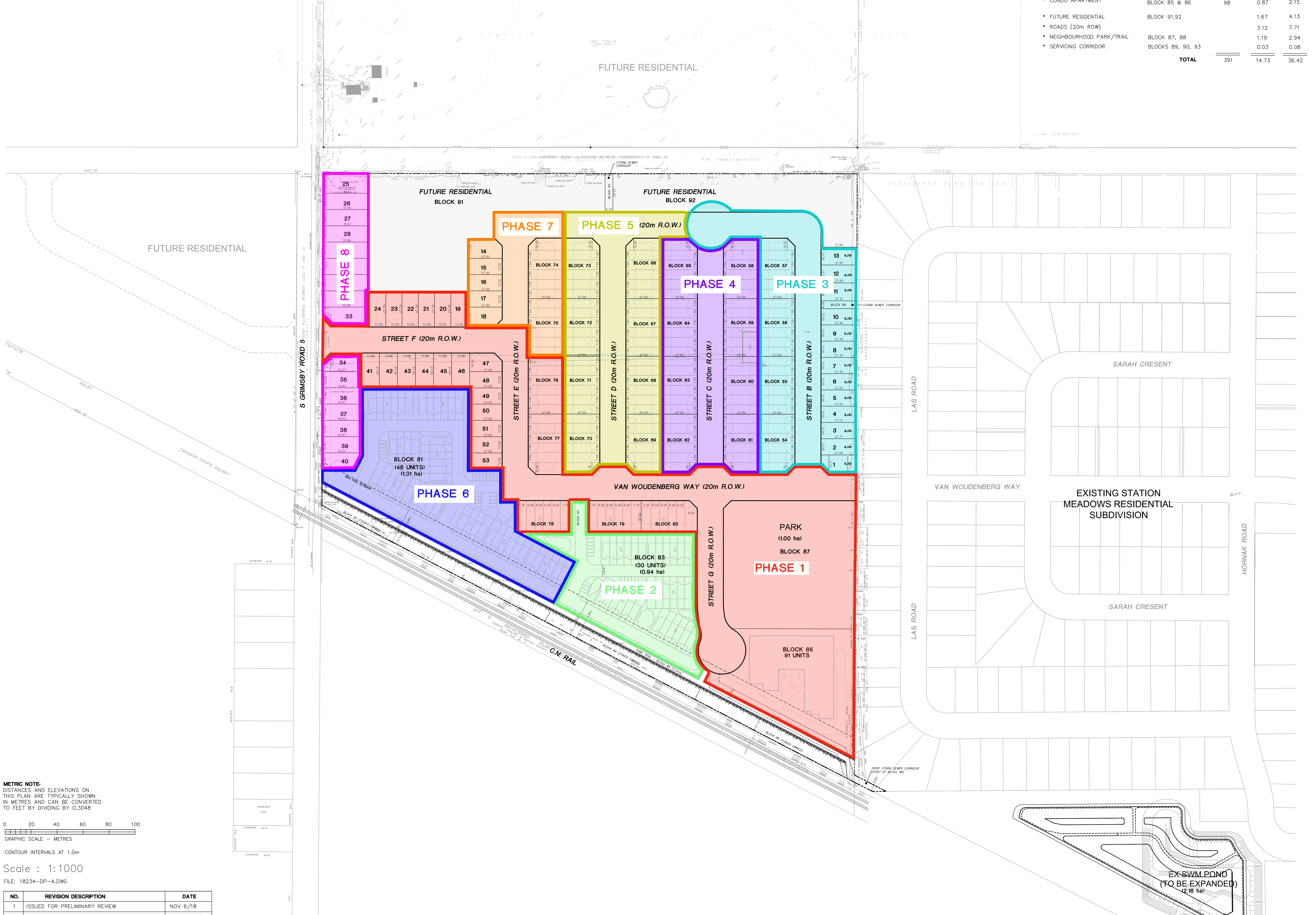
* INCLUDING FUTURE RESIDENTIAL (30 SINGLE DETACHED)

LAND USE SCHEDULE

LAND USE	LOTS/BLOCKS	No. of UNITS	AREA (ha)	AREA (ac)
* SINGLE DETACHED RESIDENTIAL (13.78m)	11–13, 41–46	9	0.22	0.56
* SINGLE DETACHED RESIDENTIAL (12.50m)	1–10, 14–40, 47–53	44	1.64	4.05
* CONVENTIONAL FREEHOLD TOWN HOMES (7.0m)	BLOCK 54–77	144	2.98	7.36
* BUNGALOW FREEHOLD * TOWN HOMES (6.5m)	BLOCK 78–80	18	0.31	0.77
* CONDO TOWN HOMES (5.5m)	BLOCK 81–84	78	2.70	6.67
* CONDO APARTMENT	BLOCK 85 & 86	98	0.87	2.15
* FUTURE RESIDENTIAL	BLOCK 91,92		1.67	4.13
* ROADS (20m ROW)			3.12	7.71
* NEIGHBOURHOOD PARK/TRAIL	BLOCK 87, 88		1.19	2.94
* SERVICING CORRIDOR	BLOCKS 89, 90, 93		0.03	0.08
	TOTAL	391	14.73	36.42



KEY PLAN
N.T.S.
Subject lands : ▨



DRAFT PLAN OF STATION MEADOWS WEST
FOR A PROPOSED SUBDIVISION OF
PART OF LOT 1
REGISTERED PLAN M-94
TOWNSHIP OF WEST LINCOLN
REGIONAL MUNICIPALITY OF NIAGARA

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

A) AS SHOWN ON THE DRAFT PLAN
B) AS SHOWN ON THE DRAFT PLAN
C) AS SHOWN ON THE DRAFT PLAN
D) REFER TO LAND USE SCHEDULE
E) AS SHOWN ON THE DRAFT PLAN
F) AS SHOWN ON THE DRAFT PLAN
G) AS SHOWN ON THE DRAFT PLAN
H) MUNICIPAL PIPE WATER SUPPLY
I) GLACIOLACUSTRTINE SILT AND CLAY, HALTON TILL
J) AS SHOWN ON THE DRAFT PLAN
K) SANITARY, STORM, MUNICIPAL WATER, HYDRO, GAS
L) AS SHOWN ON THE DRAFT PLAN

METRIC NOTE:
DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

0 20 40 60 80 100
GRAPHIC SCALE – METRES

CONTOUR INTERVALS AT 1.0m

Scale : 1:1000

FILE: 18234–DP–A.DWG

NO.	REVISION DESCRIPTION	DATE
1	ISSUED FOR PRELIMINARY REVIEW	NOV 6/18
2	AS PER PRELIMINARY REVIEW COMMENTS	MARCH 20/19
3	REMOVE LANE WAY AT REAR OF BLOCK 65–85	APRIL 9/19
4	REMOVED SWM POND BLOCK	AUG 1/19
5	ADD FUTURE NORTH EXPANSION CONCEPT	AUG 9/19
6	ISSUED FOR DRAFT PLAN APPROVAL	DEC 20/19
7	ISSUED AS PER TOWN COMMENTS (DRAFT REVIEW)	APRIL 3/20
8	ADD APARTMENT BLOCK & TRAIL ALIGNMENT	JUNE 10/20

OWNER'S CERTIFICATE

WE BEING THE REGISTERED OWNERS OF THE SUBJECT LANDS HEREBY AUTHORIZE THE ODAN/DETECH GROUP INC. TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATED ______________ ______________________________
AUTHORIZED SIGNING OFFICER
P. BUDD DEVELOPMENTS

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATED ______________ ______________________________
ONTARIO LAND SURVEYOR

ODAN·DETECH
CONSULTING ENGINEERS

The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

APPENDIX B

Proposed Sanitary Sewer Design Sheets – Station Meadows (including Existing Sanitary Sewer Calculations updated to Township of West Lincoln 2017 Engineering Standards)
Proposed Sanitary Sewer Design Sheet – South Grimsby Road 5

SANITARY SEWER DESIGN SHEET - PROPOSED SUBDIVISION + EXISTING UPSIZING

ODAN·DETECH
CONSULTING ENGINEERS

PROJECT: **STATION MEADOWS WEST**
PROJECT No.: **18234**
LOCATION: **SPRINGCREEK ROAD/VANWOUDENBERG WAY**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**

DESIGNED BY: **FWB**
CHECKED BY: **PH**
DATE: **2020-Aug-17**

DESIGN PARAMETERS

Peaking Factor, M= √(P/1000)^0.2 where P=Population
Min. Peaking Factor= 2
Max. Peaking Factor= 5
Avg Daily Per Capita Flow, q= 320 L/cap/day
Unit of Peak Extraneous Flow, i= 0.200 L/sec/ha
Allowable Velocities, Vmin= 0.60 m/sec
Vmax= 3.00 m/sec

Min. Diameter = 200 mm
Mannings 'n'= 0.013
Max. Percent Full= 80 %

Peak Design Flow, Q(d)= Q(p)+Q(i)
Population Flow, Q(p)= q*P*M/86400
Infiltration, Q(i)= IA

LOCATION				POPULATION						FLOW				SEWER DESIGN						
STREET	AREA LABEL	UPPER MANHOLE	LOWER MANHOLE	AVERAGE POPULATION DENSITY (per HA)	SECTION AREA	ACCUMULATED AREA (ha)	INCREMENTAL POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR (M)	INCREMENTAL FLOW Qinc(p), (L/s)	SECTION PEAK FLOW Q(p), (L/s)	INFILTRATION Q(i), (L/s)	TOTAL FLOW Q(d), (L/s)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L3/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)	ACTUAL VELOCITY (m/s)	REMARKS
STREET A CDS	A1	MH1A	MH2A	60	0.84	0.84	50	50	5.0	0.19	0.93	0.17	1.09	200	1.00	32.8	1.044	3.33%	0.035	
STREET E	A2	MH2A	MH5A	88	0.60	1.44	53	103	5.0	0.38	1.91	0.29	2.19	200	0.60	25.4	0.809	8.64%	0.070	
STREET F	A3	MH3A	MH4A	60	0.19	0.19	11	11	5.0	0.04	0.20	0.04	0.24	200	1.00	32.8	1.044	0.74%	0.008	
STREET F	A4	MH4A	MH5A	60	0.46	0.65	27	38	5.0	0.14	0.70	0.13	0.83	200	0.50	23.2	0.738	3.59%	0.027	
STREET E	A5-1 , A5-2	MH5A	MH7A	86	0.68	2.77	59	200	5.0	0.74	3.70	0.55	4.26	200	0.50	23.2	0.738	18.36%	0.136	
	A6	MH6A	MH7A	110	1.15	1.15	126	126	5.0	0.47	2.33	0.23	2.56	200	2.00	46.4	1.476	5.53%	0.082	
VWW	A7	MH7A	MH10A	110	0.31	4.23	34	360	5.0	1.33	6.67	0.85	7.51	200	0.60	25.4	0.809	29.57%	0.239	
														200	0.60	25.4	0.809			
STREET B	A8	MH2A	MH8A	60	0.38	1.22	23	73	5.0	0.27	1.35	0.24	1.60	200	1.00	32.8	1.044	4.86%	0.051	
														200	1.00	32.8	1.044			
STREET D	A9	MH8A	MH9A	110	0.58	1.80	63	136	5.0	0.50	2.52	0.36	2.88	200	1.00	32.8	1.044	8.77%	0.092	
STREET D	A10	MH9A	MH10A	110	0.81	2.60	89	225	5.0	0.83	4.17	0.52	4.69	200	1.00	32.8	1.044	14.29%	0.149	
														200	0.60	25.4	0.809			
VWW	A11	MH10A	MH18A	110	0.29	7.12	32	617	5.0	2.29	11.43	1.42	12.85	200	0.60	25.4	0.809	50.58%	0.409	
														200	0.60	25.4	0.809			
STREET B	A12	MH8A	MH11A	60	0.36	1.58	22	95	5.0	0.35	1.76	0.32	2.08	200	1.00	32.8	1.044	6.33%	0.066	
														200	2.00	46.4	1.476			
STREET C	A13	MH11A	MH12A	110	0.58	2.16	63	158	5.0	0.59	2.93	0.43	3.36	200	1.00	32.8	1.044	10.24%	0.107	
STREET C	A14	MH12A	MH18A	110	0.81	2.96	89	247	5.0	0.91	4.57	0.59	5.17	200	0.60	25.4	0.809	20.34%	0.164	
STREET G	A15	MH14A	MH15A	110	0.93	0.93	102	102	5.0	0.38	1.89	0.19	2.07	200	1.00	32.8	1.044	6.33%	0.066	
STREET G	A16	MH13A	MH15A	110	0.98	0.98	108	108	5.0	0.40	2.00	0.20	2.20	200	1.00	32.8	1.044	6.70%	0.070	
STREET G	A17	MH15A	MH17A		0.20	2.11		210	5.0	0.78	3.89	0.42	4.31	200	1.00	32.8	1.044	13.14%	0.137	
STREET G	A18	MH16A	MH17A	110	0.52	0.52	57	57	5.0	0.21	1.06	0.10	1.16	200	0.60	25.4	0.809	4.56%	0.037	
STREET G	A19	MH17A	MH18A		0.12	2.75		267	5.0	0.99	4.94	0.55	5.49	200	0.60	25.4	0.809	21.62%	0.175	
														200	0.60	25.4	0.809			
VWW	A20-1 , A20-2	MH18A	MH22A		0.77	13.61		1131	4.9	4.19	20.44	2.72	23.16	250	0.60	46.1	0.938	50.27%	0.472	
														200	2.50	51.9	1.651			
STREET B	A21	MH19A	MH20A	60	0.19	0.19	12	12	5.0	0.04	0.22	0.04	0.26	200	1.00	32.8	1.044	0.80%	0.008	
STREET B	A22	MH11A	MH20A	60	0.33	1.91	20	115	5.0	0.43	2.13	0.38	2.51	200	1.00	32.8	1.044	7.66%	0.080	
STREET B	A23-1 , A23-2	MH20A	MH21A	84	0.62	2.72	51	178	5.0	0.66	3.30	0.54	3.84	200	0.60	25.4	0.809	15.11%	0.122	
STREET B	A24-1 , A24-2	MH21A	MH22A	85	0.79	3.51	67	245	5.0	0.91	4.54	0.70	5.24	200	0.50	23.2	0.738	22.59%	0.167	
VWW	A25-1 , A25-2	MH22A	322		0.51	17.62		1376	4.7	5.10	23.91	3.52	27.43	300	0.30	53.0	0.749	51.79%	0.388	**SANITARY SEWERS BELOW THIS LINE ARE EXISTING**

ODAN·DETECH
CONSULTING ENGINEERS

SANITARY SEWER DESIGN SHEET - PROPOSED SUBDIVISION + EXISTING UPSIZING

PROJECT: **STATION MEADOWS WEST**
PROJECT No.: **18234**
LOCATION: **SPRINGCREEK ROAD/VANWOUDENBERG WAY**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**

DESIGNED BY: **FWB**
CHECKED BY: **PH**
DATE: **2020-Aug-17**

DESIGN PARAMETERS

Peaking Factor, M=	/(P/1000)^0.2	where P=Population	Min. Diameter =	200	mm
Min. Peaking Factor=	2		Mannings 'n'=	0.013	
Max. Peaking Factor=	5		Max. Percent Full=	80	%
Avg Daily Per Capita Flow, q=	320	L/cap/day			
Unit of Peak Extraneous Flow, i=	0.200	L/sec/ha	Peak Design Flow, Q(d)=	Q(p)+Q(i)	
Allowable Velocities, Vmin=	0.60	m/sec	Population Flow, Q(p)=	q*P*M/86400	
Vmax=	3.00	m/sec	Infiltration, Q(i)=	IA	

LOCATION				POPULATION						FLOW				SEWER DESIGN						
STREET	AREA LABEL	UPPER MANHOLE	LOWER MANHOLE	AVERAGE POPULATION DENSITY (per HA)	SECTION AREA	ACCUMULATED AREA (ha)	INCREMENTAL POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR (M)	INCREMENTAL FLOW Qinc(p), (L/s)	SECTION PEAK FLOW Q(p), (L/s)	INFILTRATION Q(i), (L/s)	TOTAL FLOW Q(d), (L/s)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L3/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)	ACTUAL VELOCITY (m/s)	REMARKS
LAS ROAD		327	452	60	0.73	0.73	44	44	4.5	0.16	0.73	0.15	0.88	200	0.68	27.1	0.863	3.25%	0.028	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		452	453	60	0.42	1.15	25	69	4.5	0.26	1.15	0.23	1.38	200	0.40	20.8	0.662	6.64%	0.044	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		451	453	60	0.17	0.17	10	10	4.5	0.04	0.17	0.03	0.20	200	0.58	25.0	0.797	0.80%	0.006	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		453	328	60	0.38	1.70	23	102	4.5	0.38	1.70	0.34	2.04	200	0.64	26.2	0.834	7.78%	0.065	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		329	328	60	0.38	0.38	23	23	4.5	0.09	0.38	0.08	0.46	200	1.03	33.2	1.058	1.38%	0.015	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		328	340	60	0.45	2.53	27	152	4.5	0.56	2.53	0.51	3.04	200	0.89	30.9	0.985	9.82%	0.097	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		327-1	326	60	0.58	0.58	35	35	4.5	0.13	0.58	0.12	0.70	200	0.71	27.6	0.880	2.53%	0.022	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		326	325	60	0.25	0.83	15	50	4.5	0.19	0.83	0.17	1.00	200	0.42	21.2	0.675	4.72%	0.032	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		325	324	60	0.22	1.05	13	63	4.5	0.23	1.05	0.21	1.26	200	0.42	21.2	0.675	5.94%	0.040	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		324	323	60	0.43	1.48	26	89	4.5	0.33	1.48	0.30	1.78	200	0.64	26.3	0.836	6.78%	0.057	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		323	322	60	0.62	2.10	37	126	4.5	0.47	2.10	0.42	2.52	200	0.35	19.3	0.614	13.06%	0.080	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		321	322	60	0.93	0.93	56	56	4.5	0.21	0.93	0.19	1.12	200	0.66	26.6	0.847	4.21%	0.036	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
VANWOUDENBERG WAY		322	333	60		20.66		1558	4.5	5.77	25.97	4.13	30.10	300	0.30	53.0	0.749	56.83%	0.426	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		329-1	330	60	0.48	0.48	29	29	4.5	0.11	0.48	0.10	0.58	200	0.82	29.6	0.943	1.96%	0.018	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		330	331	60	0.25	0.73	15	44	4.5	0.16	0.73	0.15	0.88	200	0.99	32.7	1.040	2.69%	0.028	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		331	332	60	0.27	1.00	16	60	4.5	0.22	1.00	0.20	1.20	200	0.89	30.9	0.984	3.88%	0.038	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		332	333	60	0.32	1.32	19	79	4.5	0.29	1.32	0.26	1.58	200	0.67	26.8	0.852	5.90%	0.050	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
VANWOUDENBERG WAY		333	341	60	0.42	22.39	25	1662	4.5	6.16	27.70	4.48	32.18	300	0.30	53.0	0.749	60.75%	0.455	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
VANWOUDENBERG WAY		341	340	60		22.39		1662	4.5	6.16	27.70	4.48	32.18	300	0.30	53.0	0.749	60.75%	0.455	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		340	339	60	0.37	25.29	22	1836	4.5	6.80	30.60	5.06	35.66	300	0.25	48.4	0.684	73.75%	0.504	UPSIZED; INFO FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		334	335	60	0.20	0.20	12	12	4.5	0.04	0.20	0.04	0.24	200	0.53	23.8	0.759	1.01%	0.008	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		335	336	60	0.20	0.40	12	24	4.5	0.09	0.40	0.08	0.48	200	0.73	28.1	0.894	1.71%	0.015	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		336	337	60	0.27	0.67	16	40	4.5	0.15	0.67	0.13	0.80	200	0.42	21.2	0.676	3.77%	0.025	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		337	338	60	0.37	1.03	22	62	4.5	0.23	1.03	0.21	1.24	200	0.51	23.5	0.748	5.28%	0.039	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
SARAH CRESCENT		338	339	60	0.43	1.47	26	88	4.5	0.33	1.47	0.29	1.76	200	0.59	25.2	0.803	6.98%	0.056	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		339	312	60	0.18	26.94	11	1935	4.5	7.17	32.25	5.39	37.64	300	0.25	48.4	0.684	77.84%	0.532	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		312	311	60	0.18	27.12	11	1946	4.5	7.21	32.43	5.42	37.86	300	0.25	48.4	0.684	78.30%	0.536	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		314	313	60	0.83	0.83	50	50	4.5	0.19	0.83	0.17	1.00	200	0.50	23.3	0.740	4.30%	0.032	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
LAS ROAD		313	311	60	0.78	1.62	47	97	4.5	0.36	1.62	0.32	1.94	200	0.47	22.6	0.719	8.59%	0.062	AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)

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SANITARY SEWER DESIGN SHEET - PROPOSED SUBDIVISION + EXISTING UPSIZING

PROJECT: **STATION MEADOWS WEST**
PROJECT No.: **18234**
LOCATION: **SPRINGCREEK ROAD/VANWOUDENBERG WAY**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**

DESIGNED BY: **FWB**
CHECKED BY: **PH**
DATE: **2020-Aug-17**

DESIGN PARAMETERS

Peaking Factor, M= √(P/1000)^0.2 where P=Population
Min. Peaking Factor= 2
Max. Peaking Factor= 5
Avg Daily Per Capita Flow, q= 320 L/cap/day
Unit of Peak Extraneous Flow, i= 0.200 L/sec/ha
Allowable Velocities, Vmin= 0.60 m/sec
Vmax= 3.00 m/sec

Min. Diameter = 200 mm
Mannings 'n'= 0.013
Max. Percent Full= 80 %

Peak Design Flow, Q(d)= Q(p)+Q(i)
Population Flow, Q(p)= q*P*M/86400
Infiltration, Q(i)= IA

LOCATION				POPULATION						FLOW				SEWER DESIGN						
STREET	AREA LABEL	UPPER MANHOLE	LOWER MANHOLE	AVERAGE POPULATION DENSITY (per HA)	SECTION AREA	ACCUMULATED AREA (ha)	INCREMENTAL POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR (M)	INCREMENTAL FLOW Qinc(p), (L/s)	SECTION PEAK FLOW Q(p), (L/s)	INFILTRATION Q(i), (L/s)	TOTAL FLOW Q(d), (L/s)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L3/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)	ACTUAL VELOCITY (m/s)	REMARKS
HORNACK ROAD		311	310	60	0.50	29.24	30	2073	4.5	7.68	34.55	5.85	40.40	300	0.25	48.4	0.684	83.55%	0.572	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		310	309			29.24		2073	4.5	7.68	34.55	5.85	40.40	300	0.25	48.4	0.684	83.55%	0.572	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)
HORNACK ROAD		309	167	60	1.05	30.29	63	2136	4.5	7.91	35.60	6.06	41.66	300	0.25	48.4	0.684	86.16%	0.589	UPSIZED; AREA DERIVED FROM AMEC WW REPORT (JUNE 2013)

SANITARY SEWER DESIGN SHEET - SMITHVILLE SUBDIVISION

ODAN·DETECH
CONSULTING ENGINEERS

PROJECT: **SMITHVILLE SUBDIVISION**
PROJECT No.: **18234**
LOCATION: **SPRINGCREEK ROAD/VAN WOUDENBERG WAY**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**

DESIGNED BY: **FWB**
CHECKED BY: **PH**
DATE: **2019-Dec-12**

DESIGN PARAMETERS

Peaking Factor, M= /(P/1000)^0.2 where P=Population
Min. Peaking Factor= 2
Max. Peaking Factor= 5
Avg Daily Per Capita Flow, q= 320 L/cap/day
Unit of Peak Extraneous Flow, i= 0.29 L/sec/ha
Allowable Velocities, Vmin= 0.60 m/sec
Vmax= 3.00 m/sec

Min. Diameter = 200 mm
Mannings 'n'= 0.013
Max. Percent Full= 80 %
Peak Design Flow, Q(d)= Q(p)+Q(i)
Population Flow, Q(p)= q*P*M/86400
Infiltration, Q(i)= IA

LOCATION				POPULATION						FLOW				SEWER DESIGN						
STREET	AREA LABEL	UPPER MANHOLE	LOWER MANHOLE	AVERAGE POPULATION DENSITY (per HA)	SECTION AREA	ACCUMULATED AREA (ha)	INCREMENTAL POPULATION	ACCUMULATED POPULATION	PEAKING FACTOR (M)	INCREMENTAL FLOW Qinc(p), (L/s)	SECTION PEAK FLOW Q(p), (L/s)	INFILTRATION Q(i), (L/s)	TOTAL FLOW Q(d), (L/s)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L3/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)	ACTUAL VELOCITY (m/s)	REMARKS
SOUTH GRIMSBY RD 5	SGR1	100A	101A	60	0.35	0.35	21	21	5.0	0.08	0.39	0.10	0.49	200	1.00	32.8	1.044	1.49%	0.016	
SOUTH GRIMSBY RD 5	SGR2	101A	102A	60	0.62	0.97	37	58	5.0	0.21	1.07	0.28	1.36	200	0.50	23.2	0.738	5.84%	0.043	
SOUTH GRIMSBY RD 5	SGR3	102A	103A	60	0.25	1.22	15	73	5.0	0.27	1.35	0.35	1.70	200	0.50	23.2	0.738	7.35%	0.054	
SOUTH GRIMSBY RD 5		103A	165			1.22		73	5.0	0.27	1.35	0.35	1.70	200	0.50	23.2	0.738	7.35%	0.054	

APPENDIX C

Proposed Fire Flow & Water Demand Calculations

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FIRE FLOW CALCULATOR

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

F = 220 x C x √ A
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters
(excluding basements) in the building
considered

LOCATION: BLOCK 76 - SOUTH HALF
OBC OCCUPANCY: Residential
BUILDING FOOT PRINT (m2): 568
OF STOREYS: 2

PROJECT: STATION MEADOWS WEST SUBDIVISION
PROJECT No: 18234

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

CONSTRUCTION CLASS: Wood Frame

`

AUTOMATED SPRINKLER PROTECTION

		Credit	Total
NFPA 13 sprinkler standard	No	0%	0%
Standard Water Supply	No	0%	
Fully Supervised System	No	0%	

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

CONTENTS FACTOR: Limited Combustible CHARGE: -15%

		Separation	Charge
EXPOSURE 1 (south)	Distance to Exposure Building (m) Length - Height	2.4	25
EXPOSURE 2 (east)	Distance to Exposure Building (m) Length - Height	14.0	15
EXPOSURE 3 (west)	Distance to Exposure Building (m) Length - Height	32.0	5
EXPOSURE 4 (north)	Distance to Exposure Building (m) Length - Height	Firewall	10
		Total Charge (%):	55

no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS: No

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating? No

CALCULATIONS

	C =	1.5		Wood Frame
	A =	568	m2	Total
	F =	7865	L/min	
Round to Nearest 1000 L/min	F =	8000	L/min	must be > 2000 L/min

STOREY AREAS m2	
284	1
284	2

CORRECTION FACTORS:

OCCUPANCY	-1200	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	6800	L/min
REDUCTION FOR SPRINKLER	0	L/min
EXPOSURE CHARGE	3740	L/min

REQUIRED FIRE FLOW **F =** 10540 L/min

Round to Nearest 1000 L/min
F = 11000 L/min 2906 usgm
F = 183 L/sec

FIRE FLOW CALCULATOR

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

$F = 220 \times C \times \sqrt{A}$

Where:

F = required fire flow in liters per minute

C= Coefficient related to the type of construction

A = the total floor area in square meters (excluding basements) in the building considered

LOCATION: BLOCK 76 - SOUTH HALF
OBC OCCUPANCY: Residential
BUILDING FOOT PRINT (m2): 568
OF STOREYS 2

PROJECT: STATION MEADOWS WEST SUBDIVISION
PROJECT No: 18234

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Buring	25%

CONSTRUCTION CLASS: Wood Frame

AUTOMATED SPRINKLER PROTECTION		Credit	Total
NFPA 13 sprinkler standard	No	0%	0%
Standard Water Supply	No	0%	
Fully Supervised System	No	0%	

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

CONTENTS FACTOR: Limited Combustible CHARGE: -15%

		Separation	Charge
EXPOSURE 1 (south)	Distance to Exposure Building (m) Length - Height	2.4	25
EXPOSURE 2 (east)	Distance to Exposure Building (m) Length - Height	>45	0
EXPOSURE 3 (west)	Distance to Exposure Building (m) Length - Height	32.0	5
EXPOSURE 4 (north)	Distance to Exposure Building (m) Length - Height	Firewall	10
		Total Charge (%):	40

no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%
Firewall	10%

ARE BUILDINGS CONTIGUOUS: No

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating? No

CALCULATIONS

C = 1.5 Wood Frame
A = 568 m2 Total

F = 7865 L/min
Round to Nearest 1000 L/min F = 8000 L/min must be > 2000 L/min

STOREY AREAS m2	
284	1
284	2

CORRECTION FACTORS:

OCCUPANCY	-1200	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	6800	L/min
REDUCTION FOR SPRINKLER	0	L/min
EXPOSURE CHARGE	2720	L/min

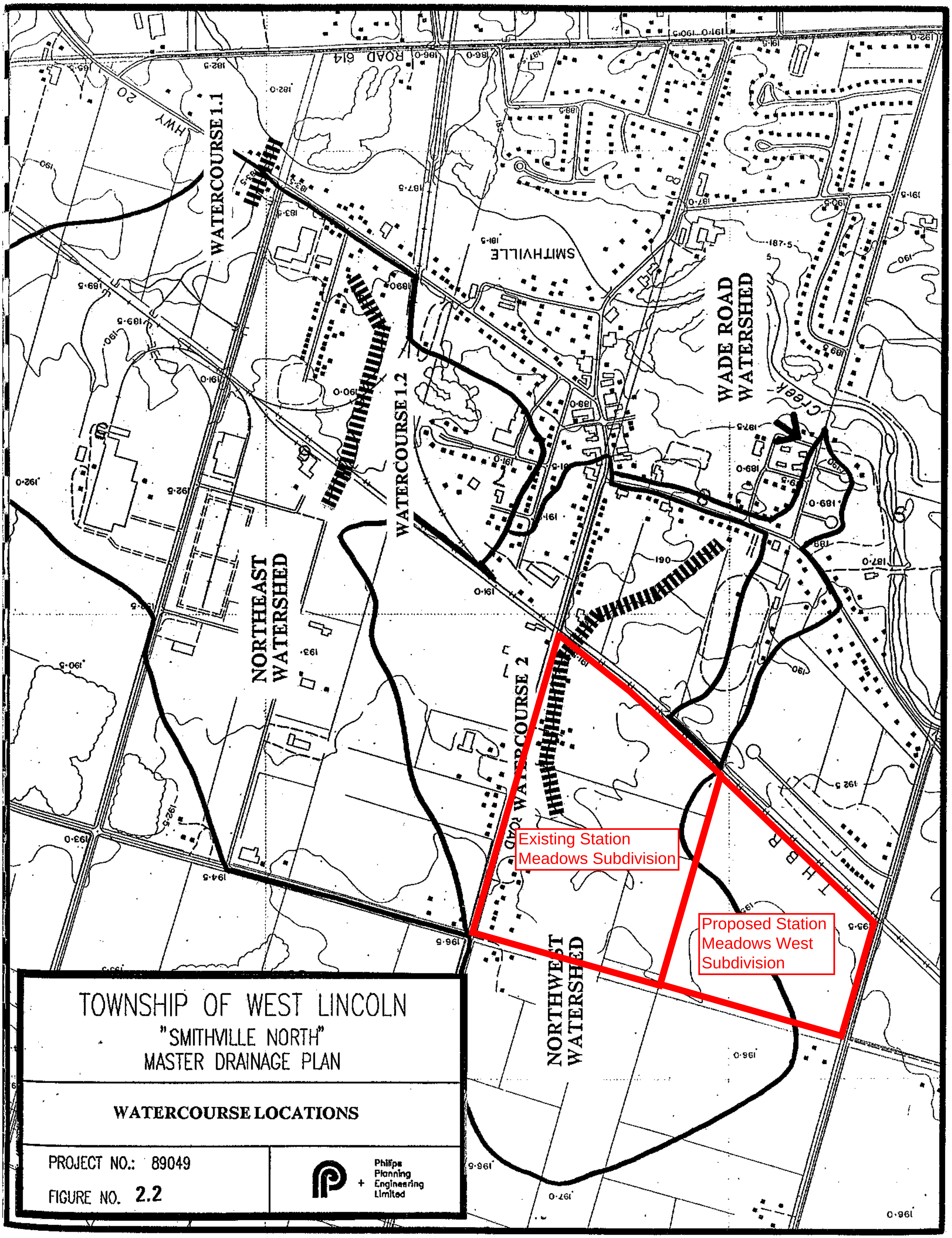
REQUIRED FIRE FLOW

F = 9520 L/min

Round to Nearest 1000 L/min

F = 10000 L/min 2642 usgm
F = 167 L/sec

APPENDIX D



TOWNSHIP OF WEST LINCOLN

"SMITHVILLE NORTH"
MASTER DRAINAGE PLAN

WATERCOURSE LOCATIONS

PROJECT NO.: 89049

FIGURE NO. 2.2

Philips
Planning
+ Engineering
Limited

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STORM SEWER DESIGN SHEET - EXISTING STATION MEADOWS (UPDATED)

PROJECT: **EXISTING STATION MEADOWS (UPDATED)**
PROJECT No.: **01267 & 99208**
LOCATION: **SMITHVILLE**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**
DESIGNED BY: **B.C.**
CHECKED BY: **F.W.B**
DATE: **2019-Dec-12**

DESIGN PARAMETERS:

Min. Pipe Size= 300 mm
Mannings, n= 0.013
Minimum Tc = 10 min
Max. Percent Full= 100 %
Min. Pipe Cover= 1.2 m
Min. Full Flow Velocity= 0.75 m/s
Max. Full Flow Velocity= 4.5 m/s

RAINFALL DATA:

	LOCATION	FORMULA
5 Yr Storm:	Smithville	i=3175 / (Tc+20)
100 Yr Storm:	Smithville	i=6300 / (Tc+15)

LOCATION				STORM WATER ANALYSIS												STORM SEWER DATA					
TRIBUTARY ID #	STREET NAME	UPPER MANHOLE	LOWER MANHOLE	AREA (ha)	RUNOFF COEFFICIENT (C)	A*C	ACCUMULATED A*C	INITIAL TIME OF CONCENTRATION (min)	FLOW TIME (min)	ACCUMULATED TIME OF CONCENTRATION (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s) (m3/s)	CONSTANT FLOW (L/s)	ACCUMULATED CONSTANT FLOW (L/s)(m3/s)	TOTAL PEAK FLOW (L/s)**	LENGTH (m)	HEIGHT/ DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)
22	LAS ROAD	MH 26	MH 25	0.70	0.40	0.280	0.280	10.00	0.59	10.59	105.83	82			82.315	41.0	375	0.54	129	1.17	64%
	LAS ROAD	MH 25	MH 24		0.40		0.280	10.59	0.28	10.87	103.81	81			80.738	17.9	375	0.45	118	1.06	69%
21	LAS ROAD	MH 24	MH 23	0.28	0.40	0.112	0.392	10.87	0.18	11.05	102.86	112			112.007	12.4	450	0.40	180	1.13	62%
	LAS ROAD (EXISTING)	MH 23	MH 22		0.40		0.392	11.05	0.36	11.40	102.26	111			111.350	31.7	525	0.56	322	1.49	35%
5	LAS ROAD (EXISTING)	Headwall	MH 22	13.48	0.20	2.734	2.734	38.00	0.19	38.19	54.74	416			415.730	39.1	675	2.12	1224	3.42	34%
15	LAS ROAD (EXISTING)	MH 22	MH 21	0.38	0.40	0.152	3.278	38.19	0.61	38.80	54.56	497			496.819	52.6	825	0.29	773	1.45	64%
14 & 6	LAS ROAD (EXISTING)	MH 21	MH 11	1.61	0.28	0.448	3.726	38.80	0.96	39.76	54.00	559			558.895	90.1	975	0.27	1164	1.56	48%
5	LAS ROAD (EXISTING)	MH 13	MH 12	0.51	0.40	0.204	0.204	10.00	1.19	11.19	105.83	60			59.972	54.4	300	0.31	54	0.76	111%
6	LAS ROAD (EXISTING)	MH 12	MH 11	0.41	0.40	0.164	0.368	11.19	0.88	12.08	101.79	104			104.056	48.4	375	0.33	101	0.91	103%
8	VAN WOUDENBERG WAY (EXISTING)	MH 11	MH 10	0.33	0.40	0.132	4.226	39.76	0.89	40.65	53.13	624			623.685	94.8	1050	0.32	1545	1.78	40%
16	SARAH CRESCENT (EXISTING)	MH 18	MH 17	0.44	0.40	0.176	0.176	10.00	0.11	10.11	105.83	52			51.741	10.8	375	1.11	185	1.67	28%
18	SARAH CRESCENT (EXISTING)	MH 17	MH 10	0.51	0.40	0.204	0.380	10.11	1.24	11.34	105.45	111			111.312	74.0	450	0.31	159	1.00	70%
9	VAN WOUDENBERG WAY (EXISTING)	MH 10	MH 9	0.53	0.40	0.212	4.818	40.65	0.69	41.34	52.35	701			700.668	66.9	1050	0.26	1392	1.61	50%
12	VAN WOUDENBERG WAY (EXISTING)	MH 9	MH 8	0.76	0.40	0.304	5.122	41.34	0.64	41.97	51.76	736			736.452	90.1	1200	0.47	2673	2.36	28%
17	SARAH CRESCENT (EXISTING)	MH 19	MH 20	0.49	0.40	0.196	0.196	10.00	0.84	10.84	105.83	58			57.620	44.6	375	0.31	98	0.88	59%
13	SARAH CRESCENT (EXISTING)	MH 20	MH 14	0.93	0.40	0.372	0.568	10.84	0.58	11.42	102.95	162			162.429	73.4	675	0.80	752	2.10	22%
EXT 1	SPRING CREEK ROAD	DI 4	MH 16	13.91	0.20	2.782	2.782	43.41	0.85	44.26	50.07	387			386.937	84.3	675	0.50	594	1.66	65%
25	HORNAK ROAD	MH 16	MH 15	0.30	0.40	0.120	2.902	44.26	0.59	44.85	49.41	398			398.315	61.8	675	0.55	623	1.74	64%
23	LAS ROAD	MH 27	MH 28	0.66	0.40	0.264	0.264	10.00	0.90	10.90	105.83	78			77.611	64.0	375	0.56	131	1.19	59%
26	LAS ROAD	MH 28	MH 15	0.51	0.40	0.204	0.468	10.90	0.77	11.67	102.76	134			133.585	59.2	450	0.51	204	1.28	66%
24	HORNAK ROAD	MH 15	MH 29	0.69	0.40	0.276	3.646	44.85	0.46	45.30	48.96	496			495.874	49.7	750	0.52	803	1.82	62%
27	HORNAK ROAD (EXISTING)	MH 29	MH 14	0.37	0.40	0.148	3.794	45.30	0.47	45.77	48.62	512			512.401	45.8	825	0.37	873	1.63	59%
11	HORNAK ROAD (EXISTING)	MH 14	MH 8	0.51	0.40	0.204	4.566	45.77	0.78	46.55	48.27	612			612.282	99.5	900	0.56	1355	2.13	45%
10	VAN WOUDENBERG WAY	MH 7	MH 8	0.47	0.40	0.188	0.188	10.00	1.20	11.20	105.83	55			55.269	46.3	300	0.22	45	0.64	122%
1	HORNAK ROAD (EXISTING)	MH 8	MH 1	0.44	0.40	0.176	10.052	46.55	0.65	47.20	47.71	1332			1332.160	93.1	1200	0.48	2701	2.39	49%
7	SARAH CRESCENT	MH 6	MH 5	0.49	0.40	0.196	0.196	10.00	1.00	11.00	105.83	58			57.620	53.0	300	0.42	63	0.89	92%
	SARAH CRESCENT	MH 5	MH 4				0.196	11.00	0.17	11.17	102.43	56			55.768	15.1	375	0.86	163	1.47	34%
4	SARAH CRESCENT	MH 4	MH 3	0.67	0.40	0.268	0.464	11.17	0.23	11.40	101.87	131			131.299	16.4	375	0.55	130	1.18	101%
3	SARAH CRESCENT	MH 3	MH 2	0.46	0.40	0.184	0.648	11.40	1.19	12.59	101.12	182			182.009	72.6	525	0.26	219	1.01	83%
2	SARAH CRESCENT	MH 2	MH 1	0.48	0.40	0.192	0.840	12.59	0.90	13.49	97.41	227			227.290	62.4	525	0.34	251	1.16	91%
	HORNAK ROAD	MH 1	MH 3PH1				10.892	47.20	0.30	47.50	47.25	1430			1429.529	43.9	1200	0.50	2757	2.44	52%

ODAN·DETECH
CONSULTING ENGINEERS

STORM SEWER DESIGN SHEET - EXISTING STATION MEADOWS (UPDATED)

PROJECT: **EXISTING STATION MEADOWS (UPDATED)**
PROJECT No.: **01267 & 99208**
LOCATION: **SMITHVILLE**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**
DESIGNED BY: **B.C.**
CHECKED BY: **F.W.B**
DATE: **2019-Dec-12**

DESIGN PARAMETERS:

Min. Pipe Size= 300 mm
Mannings, n= 0.013
Minimum Tc = 10 min
Max. Percent Full= 100 %
Min. Pipe Cover= 1.2 m
Min. Full Flow Velocity= 0.75 m/s
Max. Full Flow Velocity= 4.5 m/s

RAINFALL DATA:

	LOCATION	FORMULA
5 Yr Storm:	Smithville	i=3175 / (Tc+20)
100 Yr Storm:	Smithville	i=6300 / (Tc+15)

LOCATION				STORM WATER ANALYSIS												STORM SEWER DATA					
TRIBUTARY ID #	STREET NAME	UPPER MANHOLE	LOWER MANHOLE	AREA (ha)	RUNOFF COEFFICIENT (C)	A*C	ACCUMULATED A*C	INITIAL TIME OF CONCENTRATION (min)	FLOW TIME (min)	ACCUMULATED TIME OF CONCENTRATION (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s) (m3/s)	CONSTANT FLOW (L/s)	ACCUMULATED CONSTANT FLOW (L/s)(m3/s)	TOTAL PEAK FLOW (L/s)**	LENGTH (m)	HEIGHT/ DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)
	HORNAK ROAD	MH 3PH1	MH 2PH1				10.892	47.50	0.35	47.85	47.04	1423			1423.178	45.5	1200	0.40	2466	2.18	58%
PH 2B	LAS ROAD	MH 6PH2	MH 5PH2	0.72	0.40	0.288	0.288	10.00	0.37	10.37	105.83	85			84.667	33.2	300	1.17	105	1.48	81%
PH 2A	LAS ROAD	MH 5PH2	MH 4PH1	0.58	0.40	0.232	0.520	10.37	2.06	12.44	104.53	151			150.987	113.0	375	0.33	101	0.91	150%
PH 1A	LAS ROAD	MH 4PH1	MH 2PH1	0.77	0.40	0.308	0.828	12.44	1.29	13.73	97.88	225			225.118	102.0	450	0.54	210	1.32	107%
PH 1B	HORNAK ROAD	MH 2PH1	MH 1PH1	0.94	0.40	0.376	12.096	47.85	0.64	48.49	46.80	1572			1572.393	76.6	1200	0.33	2240	1.98	70%
	HORNAK ROAD	MH 1PH1	HW1				12.096	48.49	0.12	48.61	46.36	1558			1557.598	19.6	1200	0.61	3045	2.69	51%
28	PARK	CB1	POND	1.73	0.25	0.433	0.433	10.00	1.48	11.48	105.83	127			127.147	103.5	450	0.42	185	1.16	69%

STORM SEWER DESIGN SHEET - STATION MEADOWS WEST

PROJECT: **STATION MEADOWS WEST**
PROJECT No.: **18234**
LOCATION: **SMITHVILLE**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**
DESIGNED BY: **FWB/SA**
CHECKED BY: **PH**
DATE: **2020-Aug-11**

DESIGN PARAMETERS:

Min. Pipe Size= 300 mm
Mannings, n= 0.013
Minimum Tc = 10 min
Max. Percent Full= 80 %
Min. Pipe Cover= 1.2 m
Min. Full Flow Velocity= 0.75 m/s
Max. Full Flow Velocity= 4.5 m/s

RAINFALL DATA:

	LOCATION	FORMULA
5 Yr Storm:	Smithville	i=3175 / (Tc+20)
100 Yr Storm:	Smithville	i=6300 / (Tc+15)

LOCATION				STORM WATER ANALYSIS												STORM SEWER DATA				
TRIBUTARY ID #	STREET NAME	UPPER MANHOLE	LOWER MANHOLE	AREA (ha)	RUNOFF COEFFICIENT (C)	A*C	ACCUMULATED A*C	INITIAL TIME OF CONCENTRATION (min)	FLOW TIME (min)	ACCUMULATED TIME OF CONCENTRATION (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s) (m3/s)	CONSTANT FLOW (L/s)	ACCUMULATED CONSTANT FLOW (L/s)(m3/s)	TOTAL PEAK FLOW (L/s)**	LENGTH (m)	HEIGHT/ DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)
1-1, 2-1	STREET E	MH2	MH4	1.00	0.70	0.699	0.699	10.00	1.05	11.05	105.83	206			205.581	88.4	525	0.50	304	1.40	68%
3-1	STREET F	MH3	MH4	0.70	0.70	0.490	0.490	10.00	1.42	11.42	105.83	144			144.051	107.6	450	0.50	202	1.27	71%
4-1	STREET E	MH4	MH6	0.51	0.70	0.356	1.545	11.42	1.14	12.55	101.07	434			433.713	113.4	675	0.50	594	1.66	73%
5-1	Site Plan Block 81	MH5	MH6	1.16	0.70	0.812	0.812	10.00	0.10	10.10	105.83	239			238.713	8.1	525	0.50	304	1.40	78%
6-1	VAN WOUDENBERG WAY	MH6	MH9	0.30	0.70	0.209	2.566	12.55	0.66	13.21	97.53	695			695.059	75.0	825	0.50	1015	1.90	68%
2-A	STREET A	MH2A	MH7	0.37	0.70	0.261	0.261	10.00	0.91	10.91	105.83	77			76.759	75.0	300	1.00	97	1.37	79%
7-1	STREET D	MH7	MH8	0.69	0.70	0.484	0.746	10.91	1.17	12.09	102.71	213			212.685	98.8	525	0.50	304	1.40	70%
8-1	STREET D	MH8	MH9	0.69	0.70	0.484	1.230	12.09	1.12	13.20	98.95	338			338.060	103.0	600	0.50	434	1.54	78%
9-1	VAN WOUDENBERG WAY	MH9	MH13	0.31	0.70	0.216	4.012	13.21	0.55	13.76	95.60	1065			1065.328	69.8	975	0.50	1585	2.12	67%
7-A	STREET A	MH7A	MH10	0.36	0.70	0.250	0.250	10.00	0.91	10.91	105.83	73			73.466	75.0	300	1.00	97	1.37	76%
10-1	STREET C	MH10	MH11	0.97	0.70	0.680	0.930	10.91	1.07	11.99	102.71	265			265.208	98.8	600	0.50	434	1.54	61%
11-1	STREET C	MH11	MH12	0.97	0.70	0.679	1.609	11.99	0.98	12.97	99.26	444			443.536	97.8	675	0.50	594	1.66	75%
	VAN WOUDENBERG WAY	MH12	MH13				1.609	12.97	0.05	13.02	96.31	430			430.329	7.3	675	1.00	841	2.35	51%
	VAN WOUDENBERG WAY	MH13	MH21				5.620	13.76	0.08	13.84	94.05	1468			1468.258	14.4	975	1.00	2241	3.00	66%
10-A	STREET A	MH10A	MH14	0.32	0.70	0.223	0.223	10.00	0.82	10.82	105.83	65			65.440	67.4	300	1.00	97	1.37	68%
	STREET A	MH14	MH15				0.223	10.82	0.14	10.96	103.01	64			63.696	9.7	375	0.50	124	1.12	51%
xt2, Ext2a, Pa	STREET B	HW1	MH15	16.47	0.68	11.200	11.200	10.00	0.27	10.27	105.83	3292			3292.475	48.4	1650	0.50	6445	3.01	51%
15-1	STREET B	MH15	MH16	0.64	0.70	0.450	11.872	10.96	0.52	11.49	102.54	3381			3381.488	94.2	1650	0.50	6445	3.01	52%
16-1	STREET B	MH16	MH17	0.60	0.70	0.421	12.293	11.49	0.50	11.99	100.84	3443			3443.394	90.8	1650	0.50	6445	3.01	53%
	VAN WOUDENBERG WAY	MH17	MH19				12.293	11.99	0.08	12.07	99.26	3389			3389.363	14.2	1650	0.50	6445	3.01	53%
18-1	VAN WOUDENBERG WAY	CBMH18	MH19	0.07	0.70	0.048	0.048	10.00	0.72	10.72	105.83	14			14.199	48.7	375	0.50	124	1.12	11%
19-1	VAN WOUDENBERG WAY	MH19	MH20	0.15	0.70	0.103	12.444	12.07	0.27	12.34	99.01	3423			3422.662	49.1	1650	0.50	6445	3.01	53%
	VAN WOUDENBERG WAY	MH20	MH21				12.444	12.34	0.08	12.42	98.18	3394			3393.954	14.4	1650	0.50	6445	3.01	53%

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STORM SEWER DESIGN SHEET - STATION MEADOWS WEST

PROJECT: **STATION MEADOWS WEST**
PROJECT No.: **18234**
LOCATION: **SMITHVILLE**
MUNICIPALITY: **TOWNSHIP OF WEST LINCOLN**
DESIGNED BY: **FWB/SA**
CHECKED BY: **PH**
DATE: **2020-Aug-11**

DESIGN PARAMETERS:

Min. Pipe Size=	300	mm
Mannings, n=	0.013	
Minimum Tc =	10	min
Max. Percent Full=	80	%
Min. Pipe Cover=	1.2	m
Min. Full Flow Velocity=	0.75	m/s
Max. Full Flow Velocity=	4.5	m/s

RAINFALL DATA:

	LOCATION	FORMULA
5 Yr Storm:	Smithville	i=3175 / (Tc+20)
100 Yr Storm:	Smithville	i=6300 / (Tc+15)

LOCATION				STORM WATER ANALYSIS												STORM SEWER DATA					
TRIBUTARY ID #	STREET NAME	UPPER MANHOLE	LOWER MANHOLE	AREA (ha)	RUNOFF COEFFICIENT (C)	A*C	ACCUMULATED A*C	INITIAL TIME OF CONCENTRATION (min)	FLOW TIME (min)	ACCUMULATED TIME OF CONCENTRATION (min)	5 YR RAINFALL INTENSITY (mm/hr)	5 YR PEAK FLOW (L/s) (m3/s)	CONSTANT FLOW (L/s)	ACCUMULATED CONSTANT FLOW (L/s)(m3/s)	TOTAL PEAK FLOW (L/s)**	LENGTH (m)	HEIGHT/ DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	PERCENT FULL (%)
21-1, 21-1	STREET G	MH21	MH23	1.14	0.31	0.354	18.418	13.84	0.34	14.18	93.83	4800			4800.246	54.8	1800x2400 (BOX)	0.30	11683	2.70	41%
22-1	Site Plan Block 83	MH22	MH23	0.56	0.70	0.392	0.392	10.00	0.15	10.15	105.83	115			115.241	14.0	375	1.00	175	1.59	66%
23-1	STREET G	MH23	MH25	0.15	0.70	0.105	18.915	14.18	0.52	14.70	92.90	4881			4881.039	84.6	1800x2400 (BOX)	0.30	11683	2.70	42%
24-1	Site Plan Block 83	MH24	MH25	0.74	0.70	0.518	0.518	10.00	0.16	10.16	105.83	152			152.282	17.2	450	1.00	285	1.79	53%
	BLOCK 88	MH25	MH27				19.433	14.70	0.11	14.81	91.50	4939			4939.326	18.3	1800x2400 (BOX)	0.30	11683	2.70	42%
26-1	Site Plan Block 83	MH26	MH27	0.84	0.70	0.585	0.585	10.00	0.04	10.04	105.83	172			172.038	4.8	450	1.00	285	1.79	60%
	BLOCK 88	MH27	MH28				20.018	14.81	0.57	15.38	91.20	5072			5071.565	92.3	1800x2400 (BOX)	0.30	11683	2.70	43%
	BLOCK 88	MH28	MH29				20.018	15.38	0.13	15.51	89.74	4990			4990.075	20.9	1800x2400 (BOX)	0.30	11683	2.70	43%
	BLOCK 88 & Block 19, Plan 30M-288	MH29	MH30				20.018	15.51	0.24	15.75	89.41	4972			4971.958	38.3	1800x2400 (BOX)	0.30	11683	2.70	43%
	Block 19, Plan 30M-288	MH30	HW2				20.018	15.75	0.60	16.35	88.82	4939			4939.137	98.2	1800x2400 (BOX)	0.30	11683	2.70	42%

Project Number: **18234**
Project Name: **Station Meadows West - East Forebay**

Date: **21-Aug-20**
Designed by: **FWB**
Reviewed by: **PH**

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Wet Pond East Forebay Sizing Calculations

Forebay Length

(The forebay length should be greater than or equal to the larger of the settling length and dispersion length)

Settling Length Guideline:

MOE Eq 4.5 Dist(m) = $\sqrt{\left(\frac{r \times Q_p}{v_s}\right)}$

Dis= 23.2

Dist = calculated settling length (m)

r =	4.48	length-to-width ratio of forebay[1]
Q_p =	0.036	peak flow rate from the pond during design quality storm (m^3/s)
V_s =	0.0003	settling velocity (m/s)[1]

Dispersion Length Guideline:

MOE Eq 4.6 Dist(m) = $8 \times \frac{Q}{d \times v_s}$

Dis= 15.5

Dist = calculated dispersion length (m)

Q =	2.174	inlet flowrate (m^3/s) (need not be greater than 5 year storm)
d =	2.25	depth of permanent pool in the forebay (m)
V_f =	0.5	desired velocity in the forebay (m/s)[1]

Therefore, the minimum length (Dist) to settle out sediment and to slow jet discharge = **23.2 m**

Forebay Bottom Width Guideline

MOE Eq 4.7 Width(m) = Dist/8

Dis= 2.90

Therefore, the recommended bottom width of the forebay deep zone = **2.90 m**

Velocity Check

A check was made using the entire forebay cross-sectional area to ensure that the average velocity in the forebay is less than, or equal to, 0.15 m/s which is empirically recognized as the maximum permissible velocity before which erosion will occur in a channel. (MOECC, 2003)

V(m/s) = $\frac{Q}{A}$

= 0.05 ≤ 0.15m/s

Q =	2.174	inlet flowrate (m^3/s)
A =	44.54	forebay cross-sectional area @ 5 yr water level (m^2)

The calculated average velocity of 0.05m/s is less than the maximum permissible velocity of 0.15m/s.

Design

A forebay with a length 89.36m and bottom width 5.41m was provided.

Reference: MOE (2003). Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change, Ontario. ISBN 0-7794-2969-9.

[1] MOECC (2003) recommended.

Project Number: **18234**
Project Name: **Smithville - West Forbay**

Date: **21-Aug-20**
Designed by: **FWB**
Reviewed by: **PH**

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Wet Pond West Forebay Sizing Calculations

Forebay Length

(The forebay length should be greater than or equal to the larger of the settling length and dispersion length)

Settling Length Guideline:

MOE Eq 4.5 Dist(m) = $\sqrt{\left(\frac{r \times Q_p}{v_s}\right)}$

Dist = calculated settling length (m)

r = 4.11 length-to-width ratio of forebay[1]

Dis= 31.9

Q_p = 0.079 contributing peak flow rate from the pond during design quality storm (m^3/s)

V_s = 0.0003 settling velocity (m/s)[1]

Dispersion Length Guideline:

MOE Eq 4.6 Dist(m) = $8 \times \frac{Q}{d \times v_s}$

Dist = calculated dispersion length (m)

Q = 4.806 inlet flowrate (m^3/s) (need not be greater than 5 year storm)

Dis= 34.2

d = 2.25 depth of permanent pool in the forebay (m)

V_f = 0.5 desired velocity in the forebay (m/s)[1]

Therefore, the minimum recommended length (Dist) to settle out sediment and to slow jet discharge = **34.2 m**

Forebay Bottom Width Guideline:

MOE Eq 4.7 Width(m) = Dist/8

Dis= 4.28

Therefore, the recommended bottom width of the forebay deep zone = **4.28 m**

Velocity Check

A check was made using the entire forebay cross-sectional area to ensure that the average velocity in the forebay is less than, or equal to, 0.15 m/s which is empirically recognized as the maximum permissible velocity before which erosion will occur in a channel. (MOECC, 2003)

V(m/s) = $\frac{Q}{A}$

Q = 4.806 inlet flowrate (m^3/s)

A = 42.70 forebay cross-sectional area @ 5yr water level (m^2)

= 0.11 ≤ 0.15m/s

The calculated average velocity of 0.11m/s is less than the maximum permissible velocity of 0.15m/s.

Design

A forebay with a length 80.15m and bottom width 4.8m was provided.

Reference: MOE (2003). Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change, Ontario. ISBN 0-7794-2969-9.

[1] MOECC (2003) recommended.

Project Number: **18234**
Project Name: **Station Meadows West**
Date: **19-Aug-20**
Designed by: **FWB**
Reviewed by: **PH**

Forebay-East Sediment Accumulation and Clearout Frequency Calculations

Catchment Imperviousness* (A) =	51%	
Sediment Loading (B)[1] =	1.64	m^3/ha/annum
Catchment Area C=	31.15	ha
Sediment Removal Efficiency (D) =	80	%
Annual Sediment Loading (E = B*C*D/100) =	40.9	m^3/annum
Desired Removal Frequency (F)=	10	years
Projected sediment accumulation (G =E*F) =	409	m^3
Forebay Volume (H)=	2168	m^3
Sediment Storage Volume (H/3) =	723	m^3
Available frequency (J =I/E)=	**18**	**years**

[1] The annual sediment loading value have been interpolated from the following Table 6.3 (MOECC, 2003)

Table 6.3: Annual Sediment Loadings

Catchment Imperviousness	*Annal Loading* kg/ha	*Wet Density* kg/m^3	*Annual Loading* m^3/ha
35%	770	1,230	0.6
55%	2,300	1,230	1.9
70%	3,495	1,230	2.8
85%	4,680	1,230	3.8

Reference: MOE (2003). Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change, Ontario. ISBN 0-7794-2969-9.

Project Number: **18234**
Project Name: **Station Meadows West**

Date: **19-Aug-20**
Designed by: **FWB**
Reviewed by: **PH**

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Forebay-West Sediment Accumulation and Clearout Frequency Calculations

Catchment Imperviousness* (A) =	62%	
Sediment Loading (B)[1] =	2.32	m^3/ha/annum
Catchment Area** C=	29.71	ha
Sediment Removal Efficiency (D) =	80	%
Annual Sediment Loading (E = B*C*D/100) =	55.1	m^3/annum
Desired Removal Frequency (F)=	10	years
Projected sediment accumulation (G =E*F) =	551	m^3
Forebay Volume (H)=	1765	m^3
Sediment Storage Volume (H/3) =	588	m^3
Available frequency (J =I/E)=	**11**	**years**

[1] The annual sediment loading value have been interpolated from the following Table 6.3 (MOECC, 2003)

Table 6.3: Annual Sediment Loadings

Catchment Imperviousness	*Annal Loading* kg/ha	*Wet Density* kg/m^3	*Annual Loading* m^3/ha
35%	770	1,230	0.6
55%	2,300	1,230	1.9
70%	3,495	1,230	2.8
85%	4,680	1,230	3.8

Reference: MOE (2003). Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change, Ontario. ISBN 0-7794-2969-9.

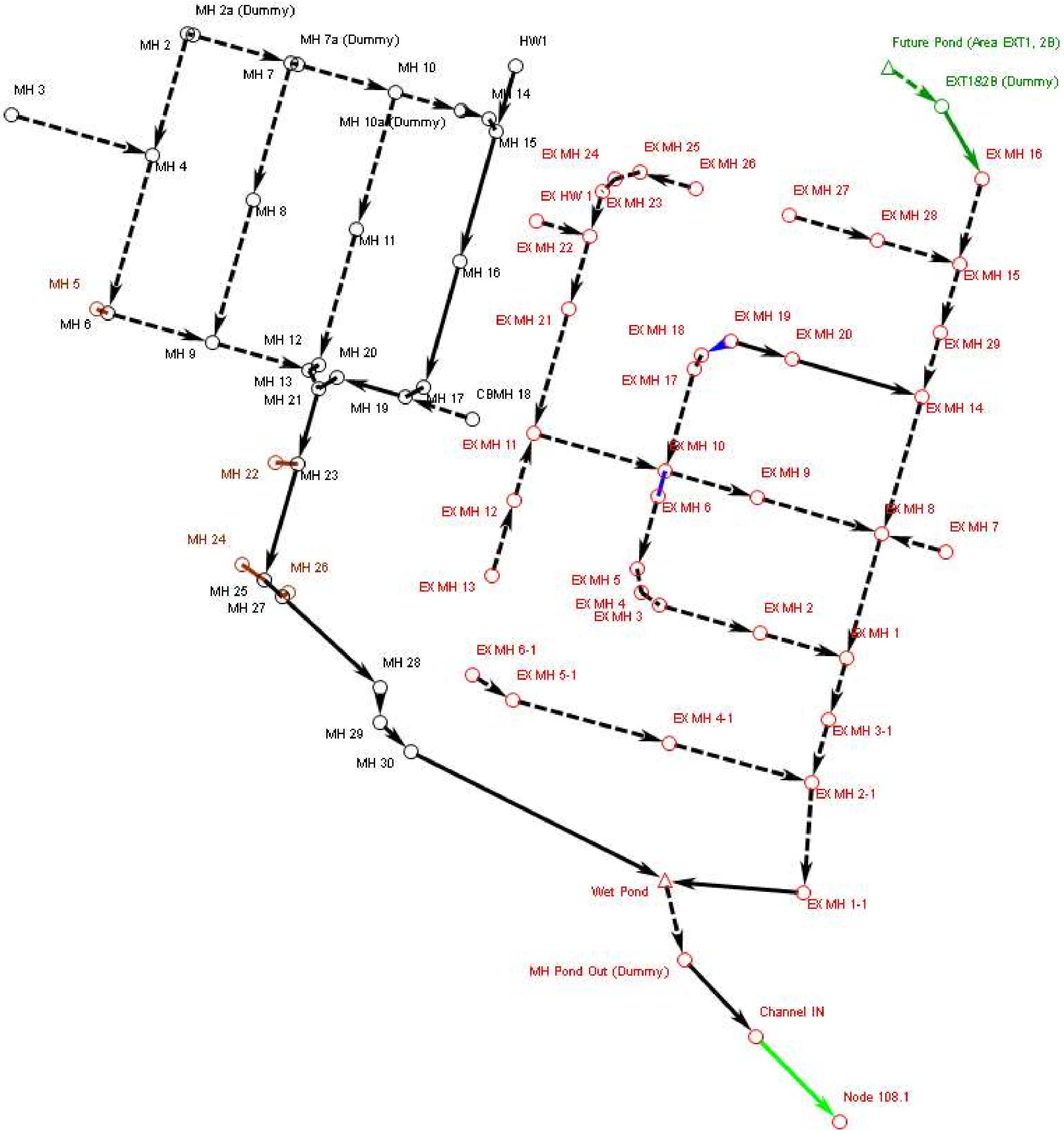


Figure D1: XPSWMM Model Schematic showing Hydraulic Nodes and Conduits

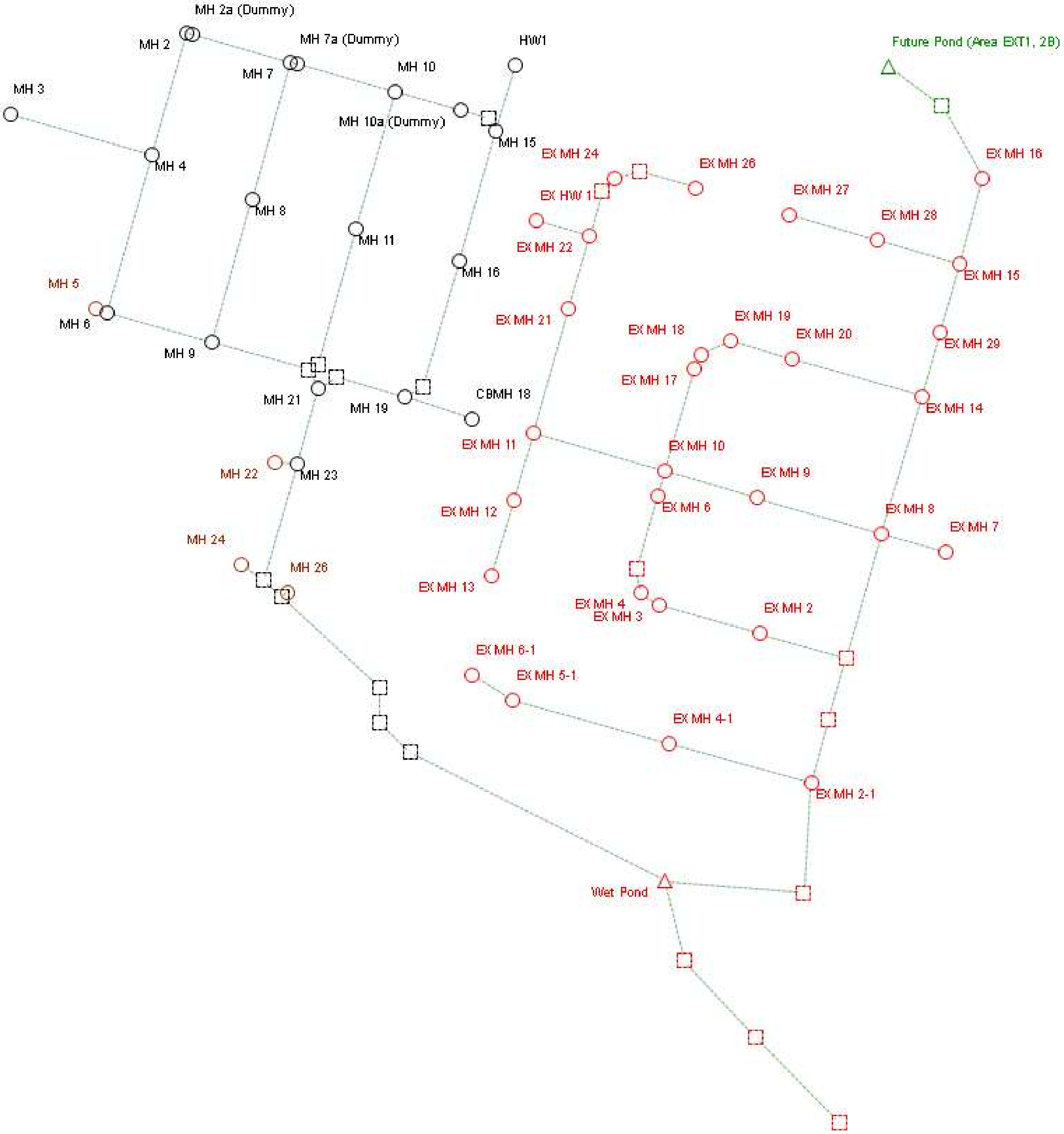


Figure D2: XPSWMM Model Schematic showing Runoff Nodes (circles and tringle)

Catchment information inputted into the runoff nodes in XPSWMM model are presented in the following table – XPSWMM Catchment Input Data

XPSWMM Catchment Input Data

Runoff Node in Model	Sub-catchment	Tributary ID*	Area (ha)	Imp (%)	Width (m)**	Slope (m/m)	Routing Method
EX HW 1	1	19	0.19	45	27	0.01	RUNOFF
EX MH 22	1	15	0.38	45	38	0.01	RUNOFF
EX MH 21	1	14	0.63	45	49	0.01	RUNOFF
EX MH 11	1	8	0.33	45	35	0.01	RUNOFF
EX MH 10	1	9	0.53	45	45	0.01	RUNOFF
EX MH 9	1	12	0.76	45	53	0.01	RUNOFF
EX MH 8	1	1	0.44	45	41	0.01	RUNOFF
EX MH 2-1	1	PH 1B	0.94	45	59	0.01	RUNOFF
Wet Pond	1	100	2.73	72	101	0.01	RUNOFF
EX MH 26	1	22	0.7	45	51	0.01	RUNOFF
EX MH 24	1	21	0.28	45	32	0.01	RUNOFF
EX MH 27	1	23	0.66	45	50	0.01	RUNOFF
EX MH 28	1	26	0.51	45	44	0.01	RUNOFF
EX MH 15	1	24	0.7	45	51	0.01	RUNOFF
EX MH 29	1	27	0.37	45	37	0.01	RUNOFF
EX MH 14	1	11	0.51	45	44	0.01	RUNOFF
EX MH 13	1	5	0.51	45	44	0.01	RUNOFF
EX MH 12	1	6	0.41	45	39	0.01	RUNOFF
EX MH 19	1	17	0.49	45	43	0.01	RUNOFF
EX MH 20	1	13	0.93	45	59	0.01	RUNOFF
EX MH 16	1	25	0.3	45	34	0.01	RUNOFF
EX MH 18	1	16	0.44	45	41	0.01	RUNOFF
EX MH 17	1	18	0.51	45	44	0.01	RUNOFF
EX MH 6	1	7	0.48	45	42	0.01	RUNOFF
EX MH 4	1	4	0.67	45	50	0.01	RUNOFF
EX MH 3	1	3	0.46	45	42	0.01	RUNOFF
EX MH 2	1	2	0.48	45	42	0.01	RUNOFF
EX MH 7	1	10	0.48	45	42	0.01	RUNOFF
EX MH 6-1	1	PH 2B	0.71	45	52	0.01	RUNOFF
EX MH 5-1	1	PH 2A	0.58	45	47	0.01	RUNOFF
EX MH 4-1	1	PH 1A	0.77	45	54	0.01	RUNOFF
MH 2	1	1-1	0.61	72	48	0.01	RUNOFF
MH 2	2	2-1	0.389	72	38	0.01	RUNOFF
MH 4	1	4-1	0.508	72	44	0.01	RUNOFF
MH 6	1	6-1	0.298	72	33	0.01	RUNOFF
MH 9	1	9-1	0.309	72	34	0.01	RUNOFF

Runoff Node in Model	**Sub-catchment**	**Tributary ID***	**Area (ha)**	**Imp (%)**	**Width (m)****	**Slope (m/m)**	**Routing Method**
MH 7	1	7-1	0.692	72	51	0.01	RUNOFF
MH 8	1	8-1	0.692	72	51	0.01	RUNOFF
MH 10	1	10-1	0.971	72	60	0.01	RUNOFF
MH 11	1	11-1	0.97	72	60	0.01	RUNOFF
MH 15	1	15-1	0.643	72	49	0.01	RUNOFF
MH 16	1	16-1	0.601	72	47	0.01	RUNOFF
MH 3	1	3-1	0.7	72	51	0.01	RUNOFF
MH 5	1	5-1	1.163	72	66	0.01	RUNOFF
HW1	1	EXT2	12.74	57	411	0.01	RUNOFF
HW1	2	EXT2A	2.99	57	283	0.01	RUNOFF
HW1	3	Part of EXT2B	0.54	57	45	0.01	RUNOFF
HW1	4	HW1-1	0.198	72	27	0.01	RUNOFF
MH 2a (Dummy)	1	2-A	0.373	72	37	0.01	RUNOFF
MH 7a (Dummy)	1	7-A	0.357	72	37	0.01	RUNOFF
MH 10a (Dummy)	1	10-A	0.318	72	35	0.01	RUNOFF
MH 19	1	19-1	0.147	72	23	0.01	RUNOFF
MH 21	1	21-1	1	20	61	0.01	Unit Hydrograph
MH 21	2	21-2	0.141	72	23	0.01	RUNOFF
MH 23	1	23-1	0.15	72	24	0.01	RUNOFF
CBMH 18	1	18-1	0.069	72	16	0.01	RUNOFF
MH 26	1	26-1	0.836	72	56	0.01	RUNOFF
MH 24	1	24-1	0.741	72	53	0.01	RUNOFF
MH 22	1	22-1	0.562	72	46	0.01	RUNOFF
Future Pond (Area EXT1, 2B)	1	EXT1	13.91	57	370	0.01	RUNOFF
Future Pond (Area EXT1, 2B)	2	Part of EXT2B	1.09	57	64	0.01	RUNOFF

*Please refer to Post-development Tributary Area plan for tributary ID corresponds to Runoff Node
** Width is taken as A/(2L), except when known/measured (Widths of external tributary area Ext 1, Ext 2 and Ext 2A were measured.)

XPSWMM Infiltration Data

Subcatchment infiltration was modeled using SCS Curve Number Method

Existing Station Meadows, Proposed Station Meadows West Subdivision, Future Development north to the Proposed and Existing Subdivision
Pervious Curve Number: 80
Initial Abstraction: 5

	Impervious Area	Pervious Area
Depression Storage (mm)	1.0	5.0
Manning's "n"	0.013	0.25
Zero Detention (%)	90	

Park Area modeled using Nash Unit Hydrograph

Pervious Curve Number: 78
Initial Abstraction: 7.2

XPSWMM Node Data and Results (HGL)

Node Name	Ground Elevation /Spill Crest (m)	Invert Elevation (m)	HGL (5 Year)	HGL (100 Year)
EX HW 1	194.660	193.100	193.169	194.435
EX MH 22	194.270	192.030	192.335	194.046
EX MH 21	193.960	191.690	192.032	193.750
EX MH 11	193.710	191.380	191.796	193.526
EX MH 10	193.550	191.050	191.561	193.365
EX MH 9	193.300	190.670	191.145	193.196
EX MH 8	193.570	190.190	190.933	193.058
EX MH 1	192.620	189.710	190.588	192.462
EX MH 3-1	192.210	189.410	190.377	192.070
EX MH 2-1	191.850	189.130	190.200	191.739
EX MH 1-1	191.320	188.850	190.017	191.291
Wet Pond	191.140	188.730	189.994	190.652
EX MH 26	195.000	193.100	193.349	194.814
EX MH 25	194.690	192.850	193.112	194.495
EX MH 24	194.570	192.670	192.965	194.339
EX MH 23	194.530	192.500	192.786	194.207
EX MH 27	195.030	192.690	192.922	194.847
EX MH 28	194.620	192.290	192.599	194.468
EX MH 15	194.580	191.690	192.151	194.326
EX MH 29	194.730	191.300	191.800	193.997
EX MH 14	194.270	191.040	191.556	193.780
EX MH 13	193.970	192.520	192.913	193.833
EX MH 12	193.950	192.270	192.644	193.781
EX MH 19	194.280	192.400	192.632	194.093
EX MH 20	194.500	192.020	192.253	194.018
EX MH 16	195.590	192.130	192.561	194.755
EX MH 18	194.040	192.020	192.246	193.863
EX MH 17	193.960	191.890	192.204	193.792
EX MH 6	193.350	191.460	191.721	193.324
EX MH 5	193.500	191.150	191.434	193.306
EX MH 4	193.430	190.990	191.414	193.256
EX MH 3	193.340	190.820	191.264	193.155
EX MH 2	192.890	190.610	191.076	192.738
EX MH 7	193.300	191.220	191.555	193.213
EX MH 6-1	193.470	191.050	192.398	193.297
EX MH 5-1	193.210	190.850	192.091	193.055

Node Name	Ground Elevation /Spill Crest (m)	Invert Elevation (m)	HGL (5 Year)	HGL (100 Year)
EX MH 4-1	192.420	190.350	191.084	192.281
Node 108.1	189.200	187.980	188.212	188.619
Channel IN	189.500	188.300	188.681	189.180
MH Pond Out (Dummy)	191.140	188.730	189.007	189.900
MH 2	197.680	194.874	195.238	197.491
MH 4	196.710	194.282	194.747	196.583
MH 6	196.266	193.565	194.130	196.113
MH 9	195.780	193.040	193.723	195.395
MH 17	194.795	191.635	192.550	194.490
MH 29	192.922	189.139	190.148	191.417
MH 30	195.304	189.024	189.999	191.100
MH 7	197.340	194.499	194.856	197.158
MH 8	196.530	193.930	194.390	196.363
MH 10	196.950	193.984	194.349	196.781
MH 11	196.160	193.460	193.921	195.981
MH 14	197.100	193.943	194.179	196.375
MH 15	196.830	192.620	193.450	196.267
MH 16	195.683	192.119	192.977	195.407
MH 3	197.160	195.045	195.346	196.999
MH 5	196.326	193.830	194.265	196.186
HW1	196.880	192.892	193.732	196.760
MH 2a (Dummy)	197.657	195.424	195.621	197.490
MH 7a (Dummy)	197.314	195.049	195.241	197.151
MH 10a (Dummy)	197.140	194.232	194.449	196.901
MH 19	195.210	190.612	191.521	194.123
MH 20	195.085	190.322	191.243	193.502
MH 21	195.420	190.105	191.024	193.132
MH 23	195.393	189.910	190.836	192.829
MH 25	196.224	189.582	190.609	192.407
MH 28	195.583	189.202	190.263	191.670
MH 12	195.440	192.926	193.443	194.617
MH 13	195.430	192.646	193.375	194.311
CBMH 18	194.190	192.262	192.344	194.081
MH 27	196.178	189.527	190.489	192.182
MH 26	196.132	192.298	192.652	193.208
MH 24	196.273	191.990	192.284	193.047
MH 22	195.532	192.194	192.479	193.612

Node Name	**Ground Elevation /Spill Crest (m)**	**Invert Elevation (m)**	**HGL (5 Year)**	**HGL (100 Year)**
EXT1&2B (Dummy)	195.800	193.500	193.783	195.245
Future Pond (Area EXT1, 2B)	195.800	193.500	194.497	195.585

*Depth of 0.24m (for 20m ROW) and 0.17m (for 10m ROW) were added to the rim elevations to get the spill crest elevations at MH locations where a link for road was added into the XPSWW model.

XPSWMM Conduit Data

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
278.1	EX HW 1	EX MH 22	193.1	192.27	0.675	0	38.952	2.131	0.013		Circular	0.2	0.2
Oveland Ex HW1-MH22	EX HW 1	EX MH 22	194.42	194.03	0.24	3	38.952	1.001	0.013	20m ROW	Trapezoidal	0	0
277.1	EX MH 22	EX MH 21	192.03	191.88	0.825	0	52.604	0.285	0.013		Circular	0.2	0.2
Ex ROW22-21	EX MH 22	EX MH 21	194.03	193.72	0.24	0	52.604	0.589	0.013	20m ROW	Natural	0	0
276.1	EX MH 21	EX MH 11	191.69	191.45	0.975	0	90.072	0.266	0.013		Circular	0.2	0.2
Ex ROW21-11	EX MH 21	EX MH 11	193.72	193.47	0.24	0	90.072	0.278	0.013	20m ROW	Natural	0	0
275.1	EX MH 11	EX MH 10	191.38	191.09	1.05	0	94.823	0.306	0.013		Circular	0.2	0.2
Ex ROW11-10	EX MH 11	EX MH 10	193.47	193.31	0.24	0	94.823	0.169	0.013	20m ROW	Natural	0	0
Ex ROW 10-6	EX MH 10	EX MH 6	193.31	193.11	0.24	0	17.3	1.156	0.013	20m ROW	Natural	0	0
274.1	EX MH 10	EX MH 9	191.05	190.86	1.05	0	66.938	0.284	0.013		Circular	0.2	0.2
Ex ROW10-9	EX MH 10	EX MH 9	193.31	192.8	0	0	66.938	0.762	0.013	20m ROW	Natural	0	0
273.1	EX MH 9	EX MH 8	190.67	190.25	1.2	0	90.063	0.466	0.013		Circular	0.2	0.2
Ex ROW9-8	EX MH 9	EX MH 8	192.8	193.33	0.24	0	90.063	-0.588	0.013	20m ROW	Natural	0	0
272.1	EX MH 8	EX MH 1	190.19	189.74	1.2	0	90.84	0.495	0.013		Circular	0.2	0.2
Ex ROW8-1	EX MH 8	EX MH 1	193.33	192.38	0.24	0	90.84	0	0.014	20m ROW	Natural	0	0
271.1	EX MH 1	EX MH 3-1	189.71	189.49	1.2	0	43.923	0.501	0.013		Circular	0.2	0.2
Ex ROW1-3-1	EX MH 1	EX MH 3-1	192.38	191.97	0.24	0	43.923	0	0.014	20m ROW	Natural	0	0
270.1	EX MH 3-1	EX MH 2-1	189.41	189.23	1.2	0	45.224	0.398	0.013		Circular	0.2	0.2
Ex ROW3-1-2-1	EX MH 3-1	EX MH 2-1	191.97	191.61	0.24	0	45.224	0	0.014	20m ROW	Natural	0	0
269.1	EX MH 2-1	EX MH 1-1	189.13	188.88	1.2	0	76.572	0.326	0.013		Circular	0.2	0.2

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
Ex ROW2-1-1.1	EX MH 2-1	EX MH 1-1	191.61	191.08	0.24	0	76.572	0	0.014	20m ROW	Natural	0	0
Ex Pipe - 1-1	EX MH 1-1	Wet Pond	188.85	188.73	1.2	0	19.612	0.61	0.013		Circular	0.2	0.9
Pond Outlet Weir	Wet Pond	MH Pond Out (Dummy)											
Pond Outlet Orifice	Wet Pond	MH Pond Out (Dummy)											
267.1	EX MH 26	EX MH 25	193.1	192.88	0.375	0	41.009	0.536	0.013		Circular	0.2	0.2
Ex ROW26-25	EX MH 26	EX MH 25	194.76	194.45	0.24	0	41.009	0.756	0.013	20m ROW	Natural	0	0
266.1	EX MH 25	EX MH 24	192.85	192.769	0.375	0	17.904	0.45	0.013		Circular	0.2	0.2
Ex ROW25-24	EX MH 25	EX MH 24	194.45	194.33	0.24	0	17.904	0.67	0.013	20m ROW	Natural	0	0
265.1	EX MH 24	EX MH 23	192.67	192.62	0.45	0	12.399	0.403	0.013		Circular	0.2	0.2
Ex ROW24-23	EX MH 24	EX MH 23	194.33	194.29	0.24	0	12.399	0.323	0.013	20m ROW	Natural	0	0
264.1	EX MH 23	EX MH 22	192.54	192.36	0.525	0	31.729	0.567	0.013		Circular	0.2	0.2
Ex ROW23-22	EX MH 23	EX MH 22	194.29	194.03	0.24	0	31.729	0	0.013	20m ROW	Natural	0	0
263.1	EX MH 27	EX MH 28	192.69	192.33	0.375	0	64.007	0.562	0.013		Circular	0.2	0.2
Ex ROW27-28	EX MH 27	EX MH 28	194.79	194.38	0.24	0	64.007	0.641	0.013	20m ROW	Natural	0	0
262.1	EX MH 28	EX MH 15	192.29	191.99	0.45	0	59.22	0.507	0.013		Circular	0.2	0.2
Ex ROW28-15	EX MH 28	EX MH 15	194.38	194.18	0.24	0	59.22	0.338	0.013	20m ROW	Natural	0	0
261.1	EX MH 15	EX MH 29	191.69	191.43	0.75	0	49.696	0.523	0.013		Circular	0.2	0.2
Ex ROW15-29	EX MH 15	EX MH 29	194.18	194.33	0.4	0	49.696	-0.302	0.013	20m ROW.1	Natural	0	0
260.1	EX MH 29	EX MH 14	191.3	191.13	0.825	0	45.804	0.371	0.013		Circular	0.2	0.2
Ex ROW29-14	EX MH 29	EX MH 14	194.33	194.03	0.24	0	45.804	0.655	0.013	20m ROW	Natural	0	0
259.1	EX MH 14	EX MH 8	191.04	190.48	0.9	0	99.5	0.563	0.013		Circular	0.2	0.2
Ex ROW14-8	EX MH 14	EX MH 8	194.03	193.33	0	0	99.5	0.704	0.013	20m ROW	Natural	0	0

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
258.1	EX MH 13	EX MH 12	192.52	192.35	0.3	0	54.395	0.313	0.013		Circular	0.2	0.2
Ex ROW13-12	EX MH 13	EX MH 12	193.73	193.71	0.24	0	54.395	0.037	0.013	20m ROW	Natural	0	0
257.1	EX MH 12	EX MH 11	192.27	192.11	0.375	0	48.417	0.33	0.013		Circular	0.2	0.2
Ex ROW12-11	EX MH 12	EX MH 11	193.71	193.47	0.24	0	48.417	0.496	0.013	20m ROW	Natural	0	0
EX Pipe - 19	EX MH 19	EX MH 20	192.4	192.26	0.375	0	44.588	0.314	0.013		Circular	0.2	0.2
Ex ROW 19-18	EX MH 19	EX MH 18	194.04	193.8	0.24	0	23.5	1.021	0.013	20m ROW	Natural	0	0
EX Pipe - 20	EX MH 20	EX MH 14	192.02	191.27	0.675	0	93.347	0.803	0.013		Circular	0.2	0.2
254.1	EX MH 16	EX MH 15	192.13	191.79	0.675	0	61.757	0.551	0.013		Circular	0.2	0.2
Ex ROW16-15	EX MH 16	EX MH 15	195.29	194.18	0.3	0	61.757	1.797	0.013	20m ROW.1	Natural	0	0
253.1	EX MH 18	EX MH 17	192.02	191.98	0.375	0	10.838	0.369	0.013		Circular	0.2	0.2
ROW18-17	EX MH 18	EX MH 17	193.8	193.72	0.24	0	10.838	0.738	0.013	20m ROW	Natural	0	0
252.1	EX MH 17	EX MH 10	191.89	191.66	0.45	0	73.997	0.311	0.013		Circular	0.2	0.2
Ex ROW17-10	EX MH 17	EX MH 10	193.72	193.31	0.24	0	73.997	0.554	0.013	20m ROW	Natural	0	0
251.1	EX MH 6	EX MH 5	191.46	191.24	0.3	0	52.999	0.415	0.013		Circular	0.2	0.2
Ex ROW6-5	EX MH 6	EX MH 5	193.11	193.26	0.24	0	52.999	-0.283	0.013	20m ROW	Natural	0	0
250.1	EX MH 5	EX MH 4	191.15	191.02	0.375	0	15.097	0.861	0.013		Circular	0.2	0.2
Ex ROW5-4	EX MH 5	EX MH 4	193.26	193.19	0.24	0	15.097	0	0.013	20m ROW	Natural	0	0
279.1	EX MH 4	EX MH 3	190.99	190.9	0.375	0	16.409	0.548	0.013		Circular	0.2	0.2
Ex ROW4-3	EX MH 4	EX MH 3	193.19	193.1	0.24	0	16.409	0	0.013	20m ROW	Natural	0	0
249.1	EX MH 3	EX MH 2	190.82	190.63	0.525	0	72.614	0.262	0.013		Circular	0.2	0.2
Ex ROW3-2	EX MH 3	EX MH 2	193.1	192.65	0.24	0	72.614	0.62	0.013	20m ROW	Natural	0	0
247.1	EX MH 2	EX MH 1	190.61	190.4	0.525	0	62.419	0.336	0.013		Circular	0.2	0.2

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
Ex ROW2-1	EX MH 2	EX MH 1	192.65	192.38	0.24	0	62.419	0.433	0.013	20m ROW	Natural	0	0
246.1	EX MH 7	EX MH 8	191.22	191.12	0.3	0	46.307	0.216	0.013		Circular	0.2	0.2
Ex ROW7-8	EX MH 7	EX MH 8	193.06	193.33	0.24	0	46.307	0	0.013	20m ROW	Natural	0	0
245.1	EX MH 6-1	EX MH 5-1	191.05	190.96	0.3	0	33.227	0.271	0.013		Circular	0.2	0.2
Ex ROW6-1-5-1	EX MH 6-1	EX MH 5-1	193.23	192.97	0.24	0	33.227	0.782	0.013	20m ROW	Natural	0	0
244.1	EX MH 5-1	EX MH 4-1	190.85	190.49	0.375	0	112.945	0.319	0.013		Circular	0.2	0.2
ExROW5-1-4-1	EX MH 5-1	EX MH 4-1	192.97	192.18	0.24	0	112.945	0.699	0.013	20m ROW	Natural	0	0
243.1	EX MH 4-1	EX MH 2-1	190.35	189.8	0.45	0	101.993	0.539	0.013		Circular	0.2	0.2
Ex ROW4-1-2-1	EX MH 4-1	EX MH 2-1	192.18	191.61	0.24	0	101.993	0.559	0.013	20m ROW	Natural	0	0
Pond Outlet Channel	Channel IN	Node 108.1	188.3	187.98	1.2	3	77.1	0.415	0.035		Trapezoidal	0	0
Pond Outlet Pipe	MH Pond Out (Dummy)	Channel IN	188.73	188.3	1.2	2.4	36.754	1.17	0.013		Rectangular	0.5	1
445.1	MH 2	MH 4	194.874	194.432	0.525	0	88.397	0.5	0.013		Circular	0.5	0.5
ROW2-4	MH 2	MH 4	197.44	196.47	0.24	0	88.397	1.094	0.013	20m ROW	Natural	0	0
446.1	MH 2	MH 2a (Dummy)	195.474	195.424	0.3	0	5	1	0.013		Circular	0.5	0.5
ROW2-2a	MH 2	MH 2a (Dummy)	197.44	197.417	0.24	0	5	0.48	0.013	20m ROW	Natural	0	0
444.1	MH 4	MH 6	194.282	193.715	0.675	0	113.403	0.5	0.013		Circular	0.2	0.2
ROW4-6	MH 4	MH 6	196.47	196.026	0.24	0	113.403	0.376	0.013	20m ROW	Natural	0	0
443.1	MH 6	MH 9	193.565	193.19	0.825	0	75	0.5	0.013		Circular	0.2	0.2
ROW6-9	MH 6	MH 9	196.026	195.54	0.24	0	75	0.683	0.013	20m ROW	Natural	0	0
442.1	MH 9	MH 13	193.04	192.691	0.975	0	69.826	0.5	0.013		Circular	0.2	0.2
ROW9-13	MH 9	MH 13	195.536	195.19	0.24	0	69.826	0.5	0.013	20m ROW	Natural	0	0
STM-PIPE-17	MH 17	MH 19	191.635	191.564	1.65	0	14.383	0.494	0.013		Circular	0.2	0.2

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
STM-PIPE-29	MH 29	MH 30	189.139	189.024	1.8	2.4	38.287	0.3	0.013		Rectangular	0.2	0.2
STM-PIPE-30	MH 30	Wet Pond	189.024	188.73	1.8	2.4	98.156	0.3	0.013		Rectangular	0.2	0.9
433.1	MH 7	MH 8	194.499	194.005	0.525	0	98.816	0.5	0.013		Circular	0.5	0.5
ROW7-8	MH 7	MH 8	197.1	196.29	0.24	0	98.816	0.79	0.013	20m ROW	Natural	0	0
434.1	MH 7	MH 7a (Dummy)	195.099	195.049	0.3	0	5	1	0.013		Circular	0.5	0.5
ROW7-7a	MH 7	MH 7a (Dummy)	197.1	197.074	0.24	0	5	0.48	0.013	20m ROW	Natural	0	0
432.1	MH 8	MH 9	193.93	193.415	0.6	0	102.984	0.5	0.013		Circular	0.5	0.5
ROW8-9	MH 8	MH 9	196.29	195.54	0	0	102.984	0.736	0.013	20m ROW	Natural	0	0
430.1	MH 10	MH 11	193.984	193.49	0.6	0	98.797	0.5	0.013		Circular	0.5	0.5
ROW10-11	MH 10	MH 11	196.71	195.92	0.24	0	98.797	0.801	0.013	20m ROW	Natural	0	0
431.1	MH 10	MH 10a (Dummy)	194.692	194.232	0.3	0	46	1	0.013		Circular	0.5	0.5
ROW10-10a	MH 10	MH 10a (Dummy)	196.71	196.9	0.24	0	46	-0.413	0.013	20m ROW	Natural	0	0
429.1	MH 11	MH 12	193.46	192.971	0.675	0	97.829	0.5	0.013		Circular	0.2	0.2
ROW11-12	MH 11	MH 12	195.92	195.2	0.24	0	97.829	0.736	0.013	20m ROW	Natural	0	0
428.1	MH 14	MH 15	193.943	193.895	0.375	0	9.657	0.497	0.013		Circular	0.5	0.5
ROW14-15	MH 14	MH 15	196.86	196.59	0.24	0	9.657	2.796	0.013	20m ROW	Natural	0	0
STM-PIPE-15	MH 15	MH 16	192.62	192.149	1.65	0	94.188	0.5	0.013		Circular	0.2	0.2
STM-PIPE-16	MH 16	MH 17	192.119	191.665	1.65	0	90.774	0.5	0.013		Circular	0.2	0.2
425.1	MH 3	MH 4	195.045	194.507	0.45	0	107.627	0.5	0.013		Circular	0.5	0.5
ROW3-4	MH 3	MH 4	196.92	196.47	0.24	0	107.627	0.602	0.013	20m ROW	Natural	0	0
424.1	MH 5	MH 6	193.83	193.79	0.525	0	8.083	0.495	0.013		Circular	0.5	0.5
ROW5-6	MH 5	MH 6	196.086	196.026	0.17	0	8.083	-0.074	0.013	10m ROW	Natural	0	0

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
STM-PIPE-HW1	HW1	MH 15	192.892	192.65	1.65	0	48.406	0.5	0.013		Circular	0.2	0.2
484.1	MH 2a (Dummy)	MH 7	195.424	194.724	0.3	0	70	1	0.013		Circular	0.5	0.5
ROW2a-7	MH 2a (Dummy)	MH 7	197.417	197.1	0.24	0	70	0.489	0.013	20m ROW	Natural	0	0
486.1	MH 7a (Dummy)	MH 10	195.049	194.349	0.3	0	70	1	0.013		Circular	0.5	0.5
ROW7a-10	MH 7a (Dummy)	MH 10	197.074	196.71	0.24	0	70	0.487	0.013	20m ROW	Natural	0	0
488.1	MH 10a (Dummy)	MH 14	194.232	194.018	0.3	0	21.422	0.999	0.013		Circular	0.5	0.5
ROW10a-14	MH 10a (Dummy)	MH 14	196.9	196.86	0.24	0	21.422	0.093	0.013	20m ROW	Natural	0	0
STM-PIPE-19	MH 19	MH 20	190.612	190.367	1.65	0	49.05	0.499	0.013		Circular	0.2	0.2
STM-PIPE-20	MH 20	MH 21	190.322	190.25	1.65	0	14.385	0.501	0.013		Circular	0.2	0.2
STM-PIPE-21	MH 21	MH 23	190.105	189.94	1.8	2.4	54.827	0.301	0.013		Rectangular	0.2	0.2
STM-PIPE-23	MH 23	MH 25	189.91	189.658	1.8	2.4	84.635	0.298	0.013		Rectangular	0.2	0.2
STM-PIPE-25	MH 25	MH 27	189.582	189.527	1.8	2.4	18.315	0.3	0.013		Rectangular	0.2	0.2
STM-PIPE-28	MH 28	MH 29	189.202	189.139	1.8	2.4	20.918	0.301	0.013		Rectangular	0.2	0.2
541.1	MH 12	MH 13	192.926	192.853	0.675	0	7.316	0.998	0.013		Circular	0.2	0.2
ROW12-13	MH 12	MH 13	195.2	195.19	0.24	0	7.316	0	0.014	20m ROW	Natural	0	0
540.1	MH 13	MH 21	192.646	192.502	0.975	0	14.387	1.001	0.013		Circular	0.2	0.2
ROW13-21	MH 13	MH 21	195.19	195.18	0.24	0	14.387	0	0.014	20m ROW	Natural	0	0
539.1	CBMH 18	MH 19	192.262	191.897	0.375	0	48.723	0.75	0.013		Circular	0.5	0.5
ROW18-19	CBMH 18	MH 19	193.95	194.97	0.24	0	48.723	-2.083	0.014	20m ROW	Natural	0	0
STM-PIPE-27	MH 27	MH 28	189.527	189.247	1.8	2.4	92.255	0.304	0.013		Rectangular	0.2	0.2
STM-PIPE-26	MH 26	MH 27	192.298	192.25	0.45	0	4.75	1.011	0.013		Circular	0.5	0.5
STM-PIPE-24	MH 24	MH 25	191.99	191.818	0.45	0	17.192	1	0.013		Circular	0.5	0.5

Conduit Name	Upstream Node Name	Downstream Node Name	Upstream Invert Elevation m	Downstream Invert Elevation m	Diameter (Height) m	Bottom Width m	Length m	Conduit Slope	Roughness	Natural Section Shape GLDB Reference	Shape	Entrance Loss	Exit Loss
STM-PIPE-22	MH 22	MH 23	192.194	192.054	0.375	0	14	1	0.013		Circular	0.5	0.5
Future Pond Outlet Pipe	EXT1&2B (Dummy)	EX MH 16	193.5	192.18	0.675	0	70	1.886	0.013		Circular	0.2	0.2
DryPondOrifice1	Future Pond (Area EXT1, 2B)	EXT1&2B (Dummy)											
DryPondOrifice2	Future Pond (Area EXT1, 2B)	EXT1&2B (Dummy)											

XPSWMM Conduit Results

Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
278.1	EX HW 1	EX MH 22	0.675	0.013	0.011	0.013	0.011	0.026	0.021	0.026	0.021	0.034	0.027	0.04	0.032	-0.232	0.28
Oveland Ex HW1-MH22	EX HW 1	EX MH 22	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.005
277.1	EX MH 22	EX MH 21	0.825	0.104	0.136	0.105	0.138	0.203	0.265	0.195	0.255	0.25	0.327	0.294	0.384	0.714	1.05
Ex ROW22-21	EX MH 22	EX MH 21	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.004	0.001
276.1	EX MH 21	EX MH 11	0.975	0.145	0.125	0.148	0.128	0.285	0.246	0.272	0.235	0.348	0.301	0.405	0.35	0.938	0.82
Ex ROW21-11	EX MH 21	EX MH 11	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.004
275.1	EX MH 11	EX MH 10	1.05	0.225	0.149	0.232	0.153	0.443	0.293	0.425	0.281	0.545	0.361	0.613	0.406	1.107	0.733
Ex ROW11-10	EX MH 11	EX MH 10	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.047	0.023
Ex ROW 10-6	EX MH 10	EX MH 6	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.129	0.024
274.1	EX MH 10	EX MH 9	1.05	0.315	0.217	0.329	0.226	0.63	0.433	0.602	0.414	0.772	0.53	0.844	0.58	1.563	1.075
Ex ROW10-9	EX MH 10	EX MH 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.098	0.023
273.1	EX MH 9	EX MH 8	1.2	0.358	0.134	0.377	0.142	0.721	0.271	0.687	0.258	0.831	0.312	0.874	0.328	1.363	0.512
Ex ROW9-8	EX MH 9	EX MH 8	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
272.1	EX MH 8	EX MH 1	1.2	0.736	0.268	0.94	0.343	1.587	0.578	1.638	0.597	1.907	0.695	2.028	0.739	2.83	1.031
Ex ROW8-1	EX MH 8	EX MH 1	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
271.1	EX MH 1	EX MH 3-1	1.2	0.869	0.315	1.077	0.391	1.844	0.669	1.869	0.678	2.168	0.786	2.341	0.849	3.051	1.106
Ex ROW1-3-1	EX MH 1	EX MH 3-1	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.328	0.069
270.1	EX MH 3-1	EX MH 2-1	1.2	0.87	0.354	1.077	0.438	1.848	0.752	1.854	0.754	2.164	0.88	2.34	0.952	2.996	1.218
Ex ROW3-1-2-1	EX MH 3-1	EX MH 2-1	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.518	0.118
269.1	EX MH 2-1	EX MH 1-1	1.2	1.044	0.469	1.252	0.562	2.18	0.979	2.145	0.963	2.567	1.152	2.796	1.255	3.878	1.741
Ex ROW2-1-1.1	EX MH 2-1	EX MH 1-1	0.24	0	0	0	0	0	0	0	0	0	0	0	0	1.019	0.25
Ex Pipe - 1-1	EX MH 1-1	Wet Pond	1.2	1.067	0.35	1.246	0.409	2.174	0.716	2.133	0.7	2.558	0.839	2.794	0.916	3.956	1.297

Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
Pond Outlet	Wet Pond	MH Pond Out		0	0	0.197	0	0.996	0	1.403	0	2.47	0	3.424	0	6.512	0
Pond Outlet	Wet Pond	MH Pond Out		0.115	1.081	0.147	1.382	0.198	1.863	0.198	1.866	0.198	1.864	0.199	1.867	0.198	1.861
267.1	EX MH 26	EX MH 25	0.375	0.047	0.367	0.048	0.371	0.092	0.718	0.087	0.679	0.111	0.863	0.129	1.008	0.232	1.811
Ex ROW26-25	EX MH 26	EX MH 25	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.097	0.023
266.1	EX MH 25	EX MH 24	0.375	0.047	0.398	0.048	0.404	0.092	0.779	0.087	0.736	0.11	0.935	0.129	1.095	0.232	1.998
Ex ROW25-24	EX MH 25	EX MH 24	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.056	0.014
265.1	EX MH 24	EX MH 23	0.45	0.066	0.365	0.067	0.369	0.129	0.712	0.123	0.68	0.157	0.869	0.184	1.017	0.342	1.893
Ex ROW24-23	EX MH 24	EX MH 23	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
264.1	EX MH 23	EX MH 22	0.525	0.066	0.203	0.067	0.206	0.129	0.397	0.123	0.379	0.157	0.484	0.183	0.567	0.398	1.229
Ex ROW23-22	EX MH 23	EX MH 22	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
263.1	EX MH 27	EX MH 28	0.375	0.045	0.34	0.045	0.343	0.087	0.661	0.082	0.627	0.105	0.797	0.12	0.917	0.2	1.521
Ex ROW27-28	EX MH 27	EX MH 28	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.101	0.026
262.1	EX MH 28	EX MH 15	0.45	0.079	0.387	0.08	0.392	0.153	0.755	0.145	0.716	0.185	0.911	0.212	1.044	0.355	1.779
Ex ROW28-15	EX MH 28	EX MH 15	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.233	0.082
261.1	EX MH 15	EX MH 29	0.75	0.219	0.272	0.361	0.449	0.493	0.613	0.592	0.735	0.714	0.887	0.765	0.951	1.128	1.401
Ex ROW15-29	EX MH 15	EX MH 29	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260.1	EX MH 29	EX MH 14	0.825	0.222	0.254	0.384	0.439	0.534	0.611	0.634	0.725	0.767	0.877	0.827	0.948	1.167	1.334
Ex ROW29-14	EX MH 29	EX MH 14	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
259.1	EX MH 14	EX MH 8	0.9	0.326	0.24	0.508	0.374	0.769	0.567	0.861	0.634	1.036	0.763	1.063	0.783	1.519	1.127
Ex ROW14-8	EX MH 14	EX MH 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
258.1	EX MH 13	EX MH 12	0.3	0.035	0.642	0.035	0.648	0.067	1.239	0.064	1.189	0.082	1.528	0.097	1.791	0.099	1.837
Ex ROW13-12	EX MH 13	EX MH 12	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.146	0.156

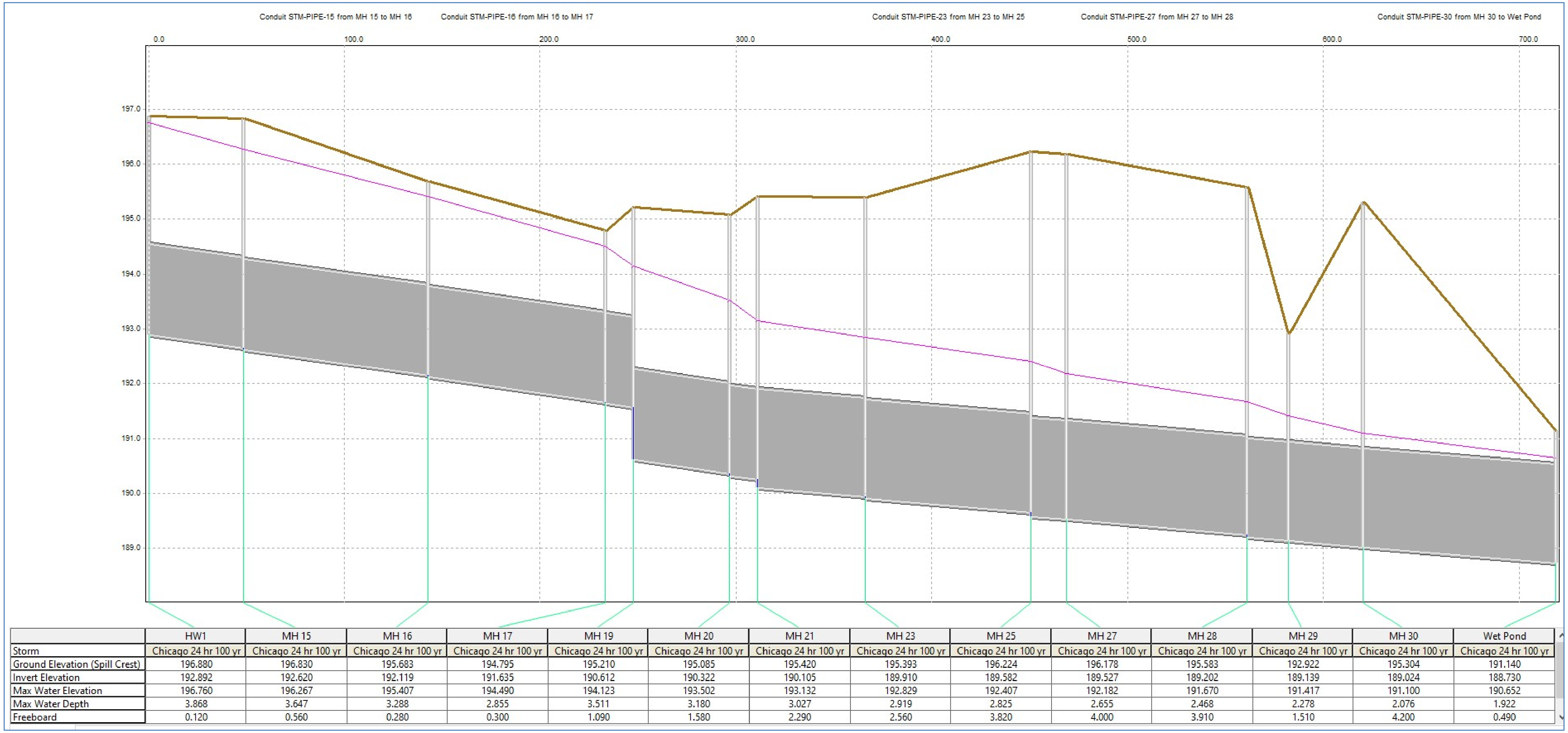
Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
257.1	EX MH 12	EX MH 11	0.375	0.062	0.615	0.063	0.623	0.118	1.17	0.115	1.141	0.149	1.482	0.176	1.747	0.245	2.44
Ex ROW12-11	EX MH 12	EX MH 11	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.163	0.047
EX Pipe - 19	EX MH 19	EX MH 20	0.375	0.033	0.34	0.034	0.342	0.065	0.659	0.062	0.63	0.079	0.806	0.093	0.946	0.156	1.593
Ex ROW 19-18	EX MH 19	EX MH 18	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.106	0.022
EX Pipe - 20	EX MH 20	EX MH 14	0.675	0.094	0.125	0.097	0.129	0.186	0.247	0.175	0.233	0.222	0.295	0.252	0.334	0.45	0.621
254.1	EX MH 16	EX MH 15	0.675	0.204	0.327	0.289	0.463	0.415	0.666	0.429	0.687	0.543	0.871	0.662	1.062	1.02	1.635
Ex ROW16-15	EX MH 16	EX MH 15	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
253.1	EX MH 18	EX MH 17	0.375	0.03	0.286	0.03	0.285	0.059	0.55	0.057	0.531	0.072	0.68	0.085	0.797	0.144	1.427
ROW18-17	EX MH 18	EX MH 17	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.146	0.035
252.1	EX MH 17	EX MH 10	0.45	0.064	0.404	0.065	0.408	0.125	0.786	0.119	0.752	0.153	0.96	0.178	1.121	0.323	2.041
Ex ROW17-10	EX MH 17	EX MH 10	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.181	0.05
251.1	EX MH 6	EX MH 5	0.3	0.033	0.524	0.033	0.527	0.063	1.014	0.06	0.969	0.075	1.203	0.09	1.45	0.139	2.235
Ex ROW6-5	EX MH 6	EX MH 5	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.122	0.047
250.1	EX MH 5	EX MH 4	0.375	0.033	0.201	0.033	0.202	0.065	0.401	0.063	0.385	0.079	0.486	0.097	0.596	0.14	0.86
Ex ROW5-4	EX MH 5	EX MH 4	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.015
279.1	EX MH 4	EX MH 3	0.375	0.078	0.598	0.078	0.604	0.15	1.159	0.143	1.102	0.177	1.366	0.207	1.598	0.248	1.913
Ex ROW4-3	EX MH 4	EX MH 3	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0.039
249.1	EX MH 3	EX MH 2	0.525	0.108	0.493	0.11	0.499	0.21	0.954	0.2	0.909	0.249	1.132	0.293	1.331	0.384	1.752
Ex ROW3-2	EX MH 3	EX MH 2	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.092	0.024
247.1	EX MH 2	EX MH 1	0.525	0.138	0.552	0.141	0.566	0.27	1.081	0.256	1.027	0.324	1.299	0.38	1.527	0.525	2.109
Ex ROW2-1	EX MH 2	EX MH 1	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.258	0.08
246.1	EX MH 7	EX MH 8	0.3	0.033	0.726	0.033	0.731	0.063	1.409	0.06	1.346	0.078	1.732	0.089	1.984	0.145	3.297
Ex ROW7-8	EX MH 7	EX MH 8	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
245.1	EX MH 6-1	EX MH 5-1	0.3	0.048	0.949	0.048	0.963	0.09	1.799	0.085	1.694	0.116	2.31	0.102	2.034	0.113	2.336

Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
Ex ROW6-1-5-1	EX MH 6-1	EX MH 5-1	0.24	0	0	0	0	0	0	0	0	0.021	0.005	0.047	0.011	0.177	0.041
244.1	EX MH 5-1	EX MH 4-1	0.375	0.083	0.837	0.086	0.87	0.164	1.657	0.156	1.573	0.189	1.917	0.188	1.902	0.226	2.296
ExROW 5-1-4-1	EX MH 5-1	EX MH 4-1	0.24	0	0	0	0	0	0	0	0	0.003	0.001	0.056	0.014	0.311	0.076
243.1	EX MH 4-1	EX MH 2-1	0.45	0.13	0.62	0.137	0.652	0.261	1.248	0.248	1.185	0.302	1.441	0.321	1.535	0.383	1.835
Ex ROW4-1-2-1	EX MH 4-1	EX MH 2-1	0.24	0	0	0	0	0	0	0	0	0	0	0.004	0.001	0.449	0.123
Pond Outlet Channel	Channel IN	Node 108.1	1.2	0.115	0.01	0.344	0.029	1.194	0.099	1.6	0.133	2.662	0.222	3.611	0.301	6.683	0.556
Pond Outlet Pipe	MH Pond Out (Dummy)	Channel IN	1.2	0.115	0.009	0.344	0.026	1.194	0.092	1.6	0.123	2.662	0.205	3.611	0.278	6.684	0.514
445.1	MH 2	MH 4	0.525	0.104	0.342	0.109	0.36	0.216	0.709	0.197	0.647	0.248	0.815	0.285	0.938	0.427	1.446
ROW2-4	MH 2	MH 4	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.101	0.02
446.1	MH 2	MH 2a (Dummy)	0.3	-0.003	0.031	-0.003	0.033	-0.011	0.11	-0.009	0.094	-0.014	0.141	-0.018	0.189	-0.1	1.054
ROW2-2a	MH 2	MH 2a (Dummy)	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.028	0.009
444.1	MH 4	MH 6	0.675	0.218	0.367	0.234	0.394	0.452	0.76	0.417	0.702	0.524	0.882	0.597	1.004	0.915	1.549
ROW4-6	MH 4	MH 6	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.509	0.166
443.1	MH 6	MH 9	0.825	0.354	0.349	0.384	0.379	0.741	0.73	0.682	0.672	0.851	0.838	0.967	0.953	1.544	1.526
ROW6-9	MH 6	MH 9	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.319	0.081
442.1	MH 9	MH 13	0.975	0.553	0.349	0.6	0.378	1.148	0.725	1.062	0.67	1.316	0.831	1.489	0.94	2.5	1.578
ROW9-13	MH 9	MH 13	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STM-PIPE-17	MH 17	MH 19	1.65	1.345	0.21	1.486	0.232	2.836	0.443	2.639	0.412	3.283	0.513	3.781	0.59	7.686	1.203
STM-PIPE-29	MH 29	MH 30	1.8	2.29	0.196	2.55	0.218	4.824	0.413	4.5	0.385	5.568	0.476	6.376	0.545	12.788	1.094
STM-PIPE-30	MH 30	Wet Pond	1.8	2.304	0.197	2.538	0.217	4.806	0.412	4.45	0.381	5.501	0.471	6.306	0.54	12.797	1.096
433.1	MH 7	MH 8	0.525	0.106	0.347	0.112	0.369	0.217	0.714	0.199	0.656	0.246	0.811	0.275	0.906	0.382	1.258
ROW7-8	MH 7	MH 8	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.123	0.028
434.1	MH 7	MH 7a (Dummy)	0.3	-0.003	0.029	-0.003	0.03	-0.01	0.102	-0.008	0.087	-0.013	0.13	-0.016	0.17	-0.084	0.873
ROW7-7a	MH 7	MH 7a (Dummy)	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.081	0.023

Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
432.1	MH 8	MH 9	0.6	0.169	0.39	0.183	0.422	0.35	0.805	0.323	0.744	0.399	0.918	0.451	1.039	0.689	1.596
ROW8-9	MH 8	MH 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.214	0.051
430.1	MH 10	MH 11	0.6	0.129	0.296	0.137	0.316	0.259	0.596	0.238	0.548	0.292	0.673	0.33	0.761	0.608	1.454
ROW10-11	MH 10	MH 11	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.206	0.047
431.1	MH 10	MH 10a (Dummy)	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0.119	1.235
ROW10-10a	MH 10	MH 10a (Dummy)	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
429.1	MH 11	MH 12	0.675	0.217	0.365	0.235	0.396	0.448	0.755	0.414	0.697	0.508	0.854	0.572	0.963	0.996	1.676
ROW11-12	MH 11	MH 12	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.134	0.032
428.1	MH 14	MH 15	0.375	0.034	0.271	0.034	0.278	0.067	0.539	0.061	0.497	0.076	0.616	0.087	0.706	0.229	1.865
ROW14-15	MH 14	MH 15	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STM-PIPE-15	MH 15	MH 16	1.65	1.302	0.202	1.432	0.222	2.734	0.425	2.546	0.395	3.167	0.491	3.647	0.566	7.377	1.145
STM-PIPE-16	MH 16	MH 17	1.65	1.35	0.209	1.489	0.231	2.842	0.441	2.644	0.41	3.289	0.51	3.787	0.588	7.696	1.196
425.1	MH 3	MH 4	0.45	0.068	0.336	0.073	0.363	0.14	0.694	0.129	0.64	0.162	0.803	0.185	0.916	0.318	1.578
ROW3-4	MH 3	MH 4	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.197	0.062
424.1	MH 5	MH 6	0.525	0.112	0.37	0.121	0.401	0.232	0.769	0.213	0.704	0.263	0.871	0.302	0.997	0.51	1.688
ROW5-6	MH 5	MH 6	0.17	0	0	0	0	0	0	0	0	0	0	0	0	0.366	0.254
STM-PIPE-HW1	HW1	MH 15	1.65	1.207	0.188	1.334	0.207	2.547	0.396	2.372	0.368	2.953	0.458	3.403	0.528	6.91	1.072
484.1	MH 2a (Dummy)	MH 7	0.3	0.036	0.374	0.037	0.384	0.067	0.693	0.062	0.645	0.075	0.776	0.083	0.863	0.121	1.254
ROW2a-7	MH 2a (Dummy)	MH 7	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.164	0.05
486.1	MH 7a (Dummy)	MH 10	0.3	0.035	0.361	0.036	0.369	0.065	0.668	0.06	0.622	0.072	0.75	0.081	0.839	0.158	1.634
ROW7a-10	MH 7a (Dummy)	MH 10	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0.206	0.059
488.1	MH 10a (Dummy)	MH 14	0.3	0.034	0.348	0.034	0.356	0.067	0.69	0.062	0.637	0.076	0.789	0.087	0.903	0.228	2.358
ROW10a-14	MH 10a (Dummy)	MH 14	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STM-PIPE-19	MH 19	MH 20	1.65	1.364	0.212	1.505	0.234	2.873	0.446	2.677	0.416	3.326	0.517	3.828	0.595	7.763	1.207
STM-PIPE-20	MH 20	MH 21	1.65	1.362	0.211	1.504	0.233	2.872	0.445	2.674	0.415	3.323	0.516	3.826	0.593	7.754	1.205
STM-PIPE-21	MH 21	MH 23	1.8	2.145	0.183	2.378	0.203	4.521	0.387	4.239	0.362	5.267	0.45	6.032	0.516	11.56	0.988

Conduit Name	Upstream Node Name	Downstream Node Name	Diameter m	25mm Max Flow cms	25mm Max Flow/Design Flow (fraction)	2 Year Max Flow cms	2 Year Max Flow/Design Flow (fraction)	5 Year Max Flow cms	5 Year Max Flow/Design Flow (fraction)	10 Year Max Flow cms	10 Year Max Flow/Design Flow (fraction)	25 Year Max Flow cms	25 Year Max Flow/Design Flow (fraction)	50 Year Max Flow cms	50 Year Max Flow/Design Flow (fraction)	100 Year Max Flow cms	100 year Max Flow/Design Flow (fraction)
STM-PIPE-23	MH 23	MH 25	1.8	2.197	0.189	2.438	0.21	4.631	0.398	4.34	0.373	5.385	0.463	6.167	0.53	11.954	1.027
STM-PIPE-25	MH 25	MH 27	1.8	2.242	0.192	2.498	0.214	4.74	0.406	4.441	0.38	5.504	0.471	6.302	0.539	12.354	1.057
STM-PIPE-28	MH 28	MH 29	1.8	2.288	0.196	2.554	0.218	4.831	0.413	4.517	0.386	5.589	0.478	6.399	0.547	12.79	1.093
541.1	MH 12	MH 13	0.675	0.217	0.258	0.235	0.28	0.445	0.529	0.412	0.491	0.504	0.6	0.569	0.678	1.087	1.295
ROW12-13	MH 12	MH 13	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
540.1	MH 13	MH 21	0.975	0.769	0.343	0.834	0.372	1.591	0.71	1.472	0.657	1.818	0.811	2.057	0.918	3.587	1.6
ROW13-21	MH 13	MH 21	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
539.1	CBMH 18	MH 19	0.375	0.008	0.051	0.008	0.05	0.015	0.097	0.014	0.092	0.017	0.115	0.02	0.131	0.279	1.844
ROW18-19	CBMH 18	MH 19	0.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STM-PIPE-27	MH 27	MH 28	1.8	2.298	0.196	2.563	0.218	4.863	0.414	4.545	0.387	5.627	0.479	6.443	0.548	12.79	1.088
STM-PIPE-26	MH 26	MH 27	0.45	0.084	0.292	0.089	0.309	0.17	0.594	0.156	0.544	0.193	0.673	0.221	0.771	0.452	1.576
STM-PIPE-24	MH 24	MH 25	0.45	0.075	0.262	0.079	0.276	0.151	0.531	0.139	0.486	0.172	0.602	0.197	0.69	0.398	1.397
STM-PIPE-22	MH 22	MH 23	0.375	0.058	0.331	0.06	0.344	0.116	0.663	0.106	0.608	0.132	0.752	0.151	0.862	0.304	1.736
Future Pond Outlet Pipe	EXT1&2B (Dummy)	EX MH 16	0.675	0.202	0.175	0.286	0.248	0.408	0.353	0.421	0.364	0.533	0.462	0.649	0.563	1.009	0.874
DryPond Orifice1	Future Pond (Area EXT1, 2B)	EXT1&2B (Dummy)		0.202	0.53	0.286	0.75	0.408	1.071	0.42	1.102	0.487	1.278	0.529	1.389	0.547	1.435
DryPond Orifice2	Future Pond (Area EXT1, 2B)	EXT1&2B (Dummy)		0	0	0	0	0	0	0.001	0.001	0.046	0.076	0.12	0.2	0.589	0.979

*5 year and 100 year flows are from 24hr Chicago distribution; 2yr, 10yr, 25yr and 50yr flows are from 12hr SCS type II distribution; 25mm storm flows from 4hr Chicago distribution.



	HW1	MH 15	MH 16	MH 17	MH 19	MH 20	MH 21	MH 23	MH 25	MH 27	MH 28	MH 29	MH 30	Wet Pond
Storm	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr	Chicago 24 hr 100 yr
Ground Elevation (Spill Crest)	196.880	196.830	195.683	194.795	195.210	195.085	195.420	195.393	196.224	196.178	195.583	192.922	195.304	191.140
Invert Elevation	192.892	192.620	192.119	191.635	190.612	190.322	190.105	189.910	189.582	189.527	189.202	189.139	189.024	188.730
Max Water Elevation	196.760	196.267	195.407	194.490	194.123	193.502	193.132	192.829	192.407	192.182	191.670	191.417	191.100	190.652
Max Water Depth	3.868	3.647	3.288	2.855	3.511	3.180	3.027	2.919	2.825	2.655	2.468	2.278	2.076	1.922
Freeboard	0.120	0.560	0.280	0.300	1.090	1.580	2.290	2.560	3.820	4.000	3.910	1.510	4.200	0.490

Figure D3: XPSWMM Profile Plot showing 100 Year Hydraulic Grade Line from HW1 to Proposed Pond

Project Number	**18234**	**Date**	**: 08/21/2020**
Project Name	**Station Meadows West**	**Designed by**	**: SA**
		Reviewed by	**: PH**

Subject **: Pond Storage Analysis**

Quality Control Storage

Protection Level[1]	80	% long-term removal of TSS, Enhanced
Drainage Area	63.59	ha *(Refer to Figure S-10 in Appendix E)*
Imperviousness	56.95	%
Total storage volume per hectare[1]	195	m^3/ha
Total storage volume for the drainge area	12371	m^3
Total extended detention volume per hectare[1]	40	m^3/ha
Total extended detention volume for the drainge area	2544	m^3
Total Permanent Pool Volume	9828	m^3

Outlet Control

ORIFICE

Outlet Orifice Size	300 mm
Invert Elevation	188.73
Orifice Coefficient	0.62
Oulet Culvert Size	2.4 m x 1.2 m
Start Invert	188.73 m
End Invert	188.30 m
Length	36.754
Slope	1.17%

WEIR

Outlet Weir Type	Rectangular
Weir Crest Elev	189.73 m
Weir Crown Elev	191.14
Weir Coefficient	1.84
Length of Weir	4 m

Quantity Control Storage

Storage requirement to attenuate post-development peak flows to allowable peak flows

Storm Event	Allowable peak flow (m^3/s)	Post-Development[2] Peak Flow (m^3/s)	Required Storage[2] Volume (m^3)	Storage Eevation[2] (m)
25 mm	0.66	0.115	6,630	189.508
2	1.44	0.344	9,602	189.819
5	2.59	1.194	11,326	189.994
10	3.48	1.600	12,009	190.061
25	4.75	2.662	13,564	190.213
50	5.73	3.611	14,792	190.330
100	6.77	6.684	18,259	190.652

Summary

Storage Type	Required	Provided[3]		
		Total	Forebay	Micropool
Permanent Pool (m^3)	9828	10,187	3933	6254
Active Storage (m^3)	6,631 (quality) 18,260 (quantity)	19,123		

Reference: MOECC (2003). Stormwater Management Planning and Design Manual, Ministry of the Environment and Climate Change, Ontario. ISBN 0-7794-2969-9.

[1] Please refer to section 3.3.2, MOECC (2003)

[2] obtained from XPSWMM model simulation

[3] obtained from Civil 3D

POND STAGE-AREA-VOLUME CALCULATIONS

Active Storage

Description	ID	Elevation (m)	Stage (m)	Area (m2)	Area (ha)	Calculated Volume (m3)
Normal Water Level	1	188.73	0.00	7395.49	0.73955	0
	2	188.75	0.02	7454.38	0.74544	141
	3	188.8	0.07	7610.07	0.76101	518
	4	188.85	0.12	7766.80	0.77668	902
	5	188.9	0.17	8071.18	0.80712	1298
	6	188.95	0.22	8184.63	0.81846	1704
	7	189	0.27	8298.86	0.82989	2116
	8	189.05	0.32	8413.87	0.84139	2534
	9	189.1	0.37	8529.66	0.85297	2958
	10	189.15	0.42	8646.23	0.86462	3387
	11	189.2	0.47	8763.58	0.87636	3823
	12	189.25	0.52	8881.71	0.88817	4264
	13	189.3	0.57	9000.62	0.90006	4711
	14	189.35	0.62	9101.48	0.91015	5163
	15	189.4	0.67	9172.50	0.91725	5620
	16	189.45	0.72	9243.79	0.92438	6081
	17	189.5	0.77	9315.37	0.93154	6544
	18	189.55	0.82	9387.22	0.93872	7012
	19	189.6	0.87	9459.36	0.94594	7483
	20	189.65	0.92	9531.78	0.95318	7958
	21	189.7	0.97	9604.47	0.96045	8436
	22	189.75	1.02	9677.45	0.96775	8918
	23	189.8	1.07	9750.71	0.97507	9404
	24	189.85	1.12	9824.25	0.98243	9894
	25	189.9	1.17	9898.06	0.98981	10387
	26	189.95	1.22	9972.16	0.99722	10883
	27	190	1.27	10046.54	1.00465	11384
	28	190.05	1.32	10121.20	1.01212	11888
	29	190.1	1.37	10196.14	1.01961	12396
	30	190.15	1.42	10271.36	1.02714	12908
	31	190.2	1.47	10346.86	1.03469	13423
	32	190.25	1.52	10422.64	1.04226	13942
	33	190.3	1.57	10498.70	1.04987	14465
	34	190.35	1.62	10575.04	1.05750	14992
	35	190.4	1.67	10651.66	1.06517	15523
	36	190.45	1.72	10728.56	1.07286	16057
	37	190.5	1.77	10805.74	1.08057	16596
	38	190.55	1.82	10883.20	1.08832	17138
High Water Level	39	190.6	1.87	10960.95	1.09610	17684
	40	190.65	1.92	11038.97	1.10390	18234
	41	190.7	1.97	11117.27	1.11173	18788
	42	190.75	2.02	11195.85	1.11959	19346
Top of Pond/Spill Crest		191.14				

POND STAGE-AREA-VOLUME CALCULATIONS

Permanent Pool (Forebay and Micropool)

Description	ID	Elevation (m)	Stage (m)	Forebay East Area (m2)	Forebay West Area (m2)	Micropool Area (m2)	Forebay East Volume (m3)	Forebay West Volume (m3)	Micropool Volume (m3)	Total Area (m2)	Total Volume (m3)
Bottom of Pond	pp	186.48	-2.25	378	267	1735				2380	0
	pp	186.50	-2.23	386	274	1750	7	5	33	2410	46
	pp	186.55	-2.18	408	294	1790	27	19	122	2491	168
	pp	186.60	-2.13	430	313	1830	48	35	212	2573	295
	pp	186.65	-2.08	453	332	1870	70	51	305	2656	425
	pp	186.70	-2.03	476	352	1912	93	68	399	2740	560
	pp	186.75	-1.98	499	372	1953	118	86	496	2824	699
	pp	186.80	-1.93	522	392	1995	143	105	594	2909	843
	pp	186.85	-1.88	546	412	2037	170	125	695	2995	990
	pp	186.90	-1.83	570	433	2080	198	146	798	3082	1142
	pp	186.95	-1.78	594	453	2123	227	168	903	3170	1298
	pp	187.00	-1.73	618	474	2166	257	192	1010	3258	1459
	pp	187.05	-1.68	642	495	2210	289	216	1120	3347	1624
	pp	187.10	-1.63	667	516	2254	321	241	1231	3437	1794
	pp	187.15	-1.58	692	538	2298	355	267	1345	3528	1968
	pp	187.20	-1.53	717	559	2343	391	295	1461	3620	2147
	pp	187.25	-1.48	743	581	2389	427	323	1580	3712	2330
	pp	187.30	-1.43	768	602	2434	465	353	1700	3805	2518
	pp	187.35	-1.38	794	624	2480	504	384	1823	3899	2711
	pp	187.40	-1.33	821	647	2527	544	415	1948	3994	2908
	pp	187.45	-1.28	847	669	2574	586	448	2076	4090	3110
	pp	187.50	-1.23	874	691	2621	629	482	2206	4186	3317
	pp	187.55	-1.18	901	714	2669	673	517	2338	4284	3529
	pp	187.60	-1.13	928	737	2717	719	554	2472	4382	3745
	pp	187.65	-1.08	955	760	2765	766	591	2610	4481	3967
	pp	187.70	-1.03	983	783	2814	815	630	2749	4580	4193
	pp	187.75	-0.98	1011	807	2863	865	669	2891	4681	4425
	pp	187.80	-0.93	1039	830	2913	916	710	3035	4782	4661
	pp	187.85	-0.88	1067	854	2963	968	752	3182	4884	4903
	pp	187.90	-0.83	1096	878	3013	1023	796	3332	4987	5150
	pp	187.95	-0.78	1125	902	3064	1078	840	3484	5091	5402
	pp	188.00	-0.73	1154	926	3115	1135	886	3638	5195	5659
	pp	188.05	-0.68	1183	951	3167	1193	933	3795	5301	5921
	pp	188.10	-0.63	1213	975	3219	1253	981	3955	5407	6189
	pp	188.15	-0.58	1246	1042	3279	1315	1031	4117	5566	6463
	pp	188.20	-0.53	1284	1079	3348	1378	1084	4283	5711	6745
	pp	188.25	-0.48	1322	1116	3418	1443	1139	4452	5856	7034
	pp	188.30	-0.43	1361	1154	3488	1510	1196	4625	6003	7331
	pp	188.35	-0.38	1400	1193	3559	1579	1255	4801	6152	7635
	pp	188.40	-0.33	1440	1233	3630	1650	1315	4980	6302	7946
	pp	188.45	-0.28	1479	1273	3702	1723	1378	5164	6454	8265
	pp	188.50	-0.23	1520	1313	3775	1798	1443	5351	6607	8592
	pp	188.55	-0.18	1560	1354	3848	1875	1509	5541	6762	8926
	pp	188.60	-0.13	1601	1396	3922	1954	1578	5736	6919	9268
	pp	188.65	-0.08	1642	1438	3996	2035	1649	5934	7076	9618
	pp	188.70	-0.03	1684	1481	4071	2119	1722	6135	7236	9976
Nornmal Water Level	pp	188.73	0.00	1708	1506	4115	2168	1765	6254	7329	10187

APPENDIX E

Figure S-1 - Conceptual Sanitary Servicing Layout Plan
Figure S-2 - Conceptual Water Servicing Layout Plan
Figure S-3 - Conceptual Storm Servicing Layout Plan
Figure S-4 - Conceptual Parking Plan
Figures S-5 & S-6 - Conceptual Grading Plans
Figures S-7 - Pre-Development Storm Tributary Plan
Figures S-8,S-9 & S-10 - Conceptual Post Development Storm Tributary Plans
Figure S-11 - Conceptual Sanitary Tributary Plan
Figure S-12 - Conceptual Pond Layout Plan & Sections
Figure S-13 - Conceptual Noise Berm and Walkway Sections
Figure S-14 – Noise Berm Grading Section

FIGURE :

CONCEPTUAL SANITARY SERVICING LAYOUT PLAN

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO : S-1
SCALE : 1:1000
PROJECT NO : 18234

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CONSULTING ENGINEERS

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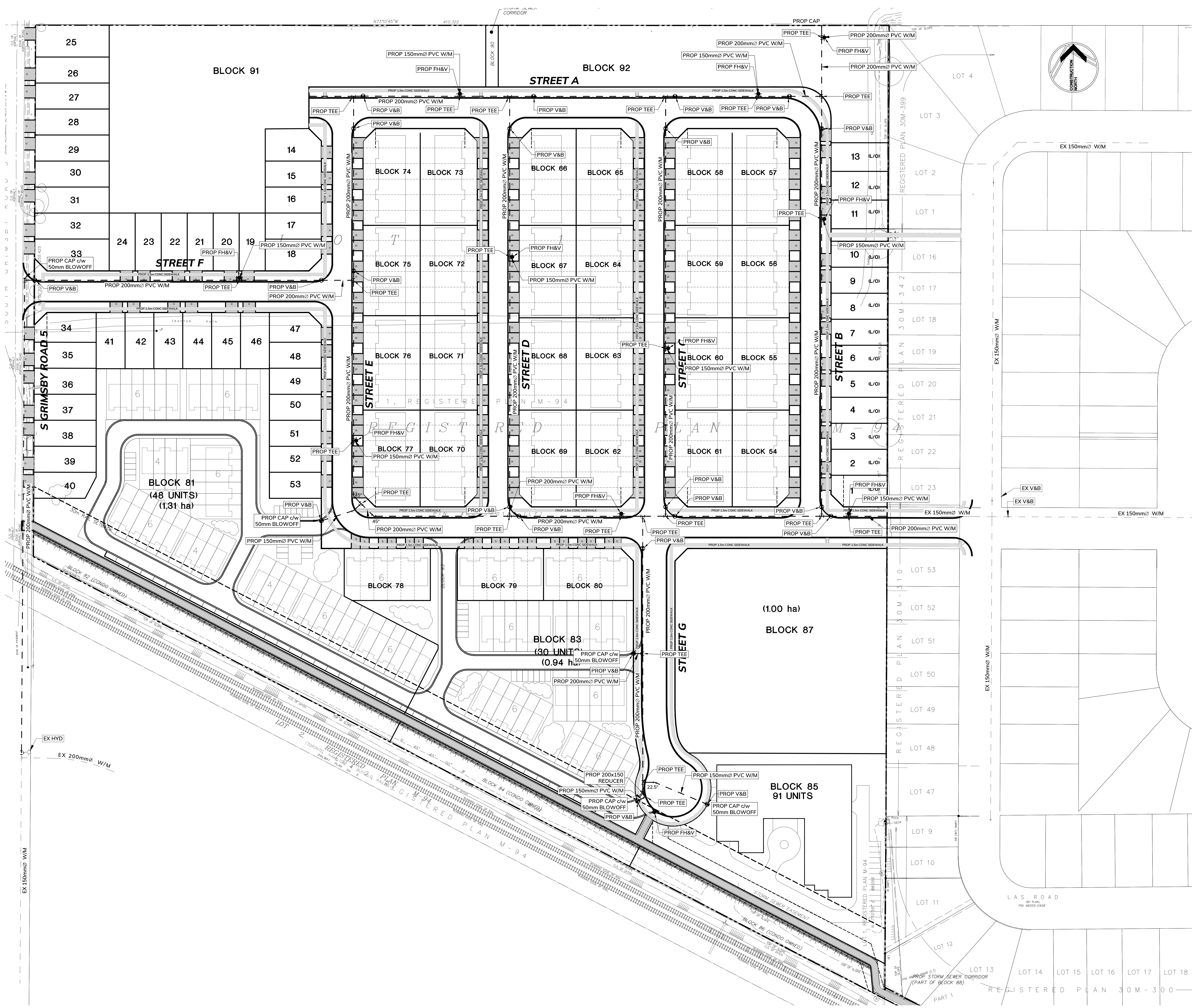

FIGURE :

CONCEPTUAL WATER SERVICING LAYOUT PLAN

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-2
SCALE : 1:1000
PROJECT NO : 18234

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FIGURE :

CONCEPTUAL STORM SERVICING LAYOUT PLAN

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-3

SCALE : 1:1000

PROJECT NO : 18234

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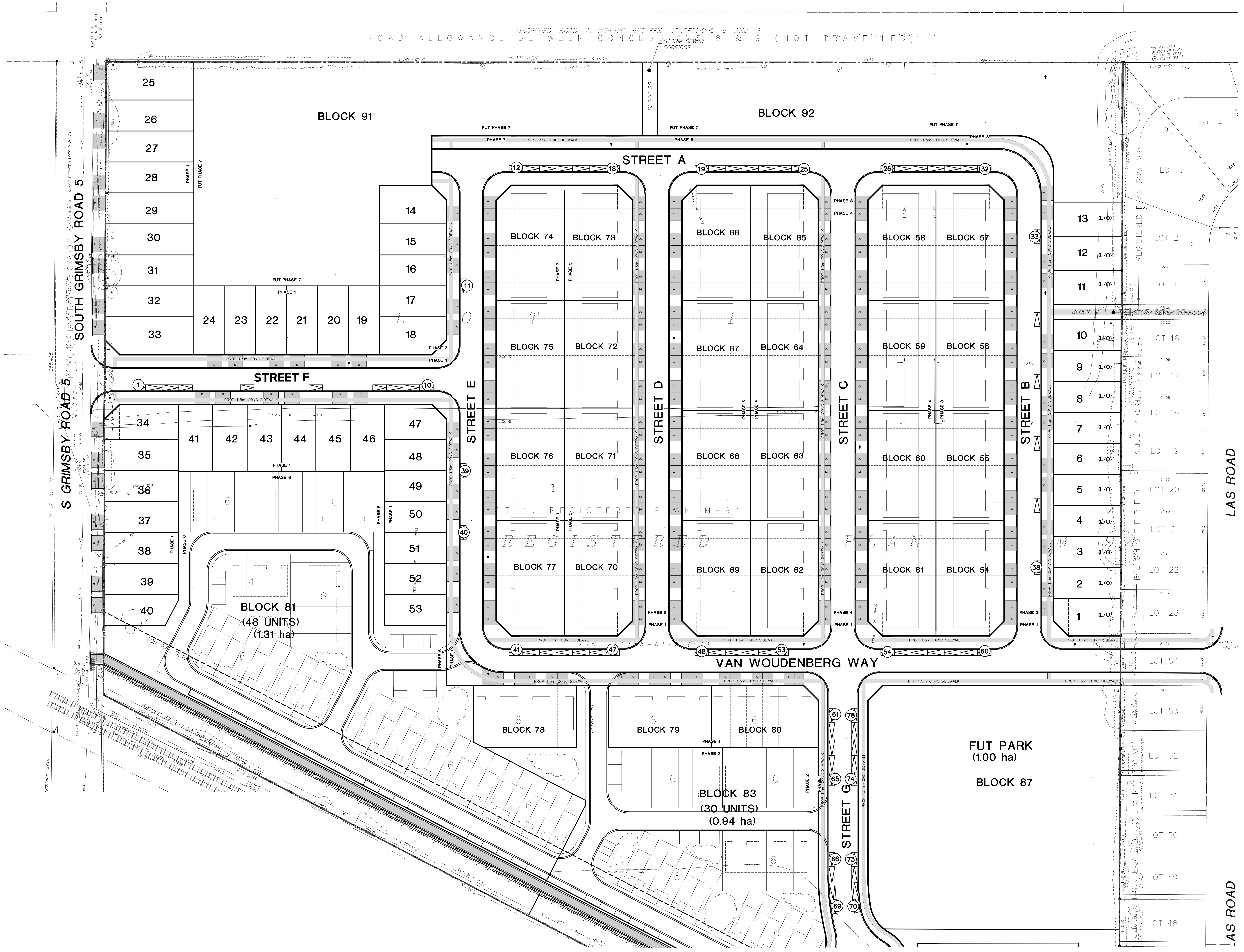

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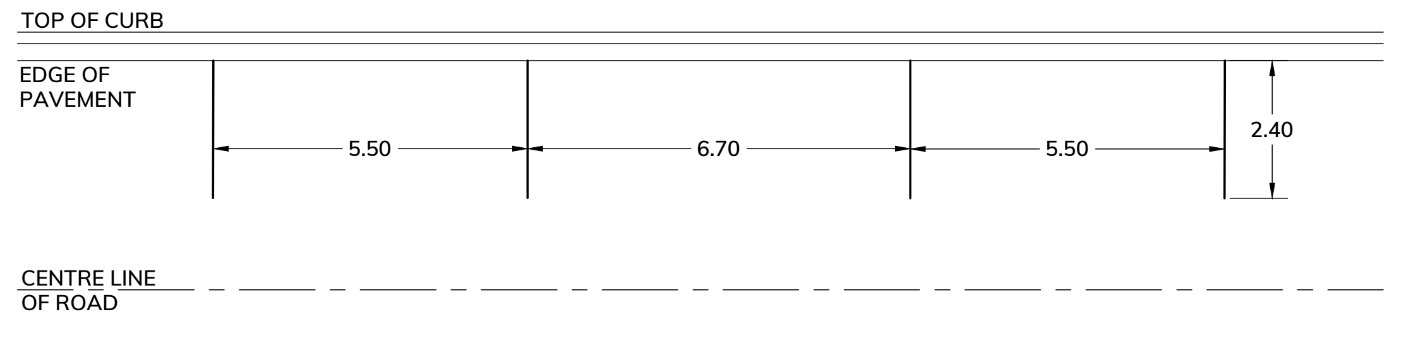
STATION MEADOWS PARKING PLAN

ON-STREET PARKING REQUIREMENT:

50% OF UNITS = 215 x 0.5
= 108 SPACES

PARKING PROVIDED:

ON-STREET PARKING: 78 SPACES
DOUBLE WIDTH DRIVEWAYS: 215 SPACES
TOTAL PROVIDED = 284 SPACES



TYPICAL PARKING SPACE DIMENSIONS

N.T.S.

LEGEND:

(00)	PROPOSED STREET-SIDE PARKING COUNTER
▨	PROPOSED DRIVEWAY (S=SINGLE, D=DOUBLE)
⊠	PROPOSED STREET-SIDE PARKING
▭	PROPOSED/ FUTURE CONCRETE SIDEWALK
— - - —	PROPERTY LINE

FIGURE :
CONCEPTUAL PARKING PLAN

PROJECT :
STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-4
SCALE : 1:750
PROJECT NO : 18234

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LEGEND:

○	EXISTING STORM MANHOLE	⋈	PROPOSED WATER VALVE & BOX	1.0% →	PROPOSED FLOW ARROW AND SLOPE
○	PROPOSED STORM MANHOLE	⊗	EXISTING VALVE CHAMBER	→	PROPOSED FLOW ARROW
⊡	EXISTING CATCH BASIN MANHOLE	⊗	PROPOSED VALVE CHAMBER	➡	PROPOSED EMERGENCY OVERLAND FLOW
⊡	PROPOSED CATCH BASIN MANHOLE	× *100.00*	EXISTING SPOT ELEVATION	195.50	EXISTING CONTOUR
Ⓢ	PROPOSED STORMCEPTOR	× (100.00)	PROPOSED ELEVATION	▨	PROPOSED CONCRETE SIDEWALK
□	EXISTING CATCH BASIN	× (100.00)TC	PROPOSED TOP OF CURB ELEVATION	S D	PROPOSED DRIVEWAY
■	PROPOSED CATCH BASIN	× (100.00)GL	PROPOSED GUTTER LINE ELEVATION	┴┴┴	PROPOSED SLOPE (3:1 OR HIGHER)
●	EXISTING SANITARY MANHOLE	× (100.00)HP	PROPOSED HIGH POINT	— - - —	PROPERTY LINE
●	PROPOSED SANITARY MANHOLE	× (100.00)LP	PROPOSED LOW POINT	- - - -	LIMIT OF CONSTRUCTION
⌖	EXISTING HYDRANT	× (100.00)	PROPOSED SWALE INVERT ELEVATION	○	PROPOSED 100 YEAR CAPTURE POINT
⌖	PROPOSED HYDRANT	× [100.00]	INTERIM ELEVATION		
⋈	EXISTING WATER VALVE & BOX	(100.00)	PROPOSED APRON ELEVATION		

FIGURE :

CONCEPTUAL GRADING PLAN
(1 OF 2)

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-5

SCALE : 1:500

PROJECT NO : 18234

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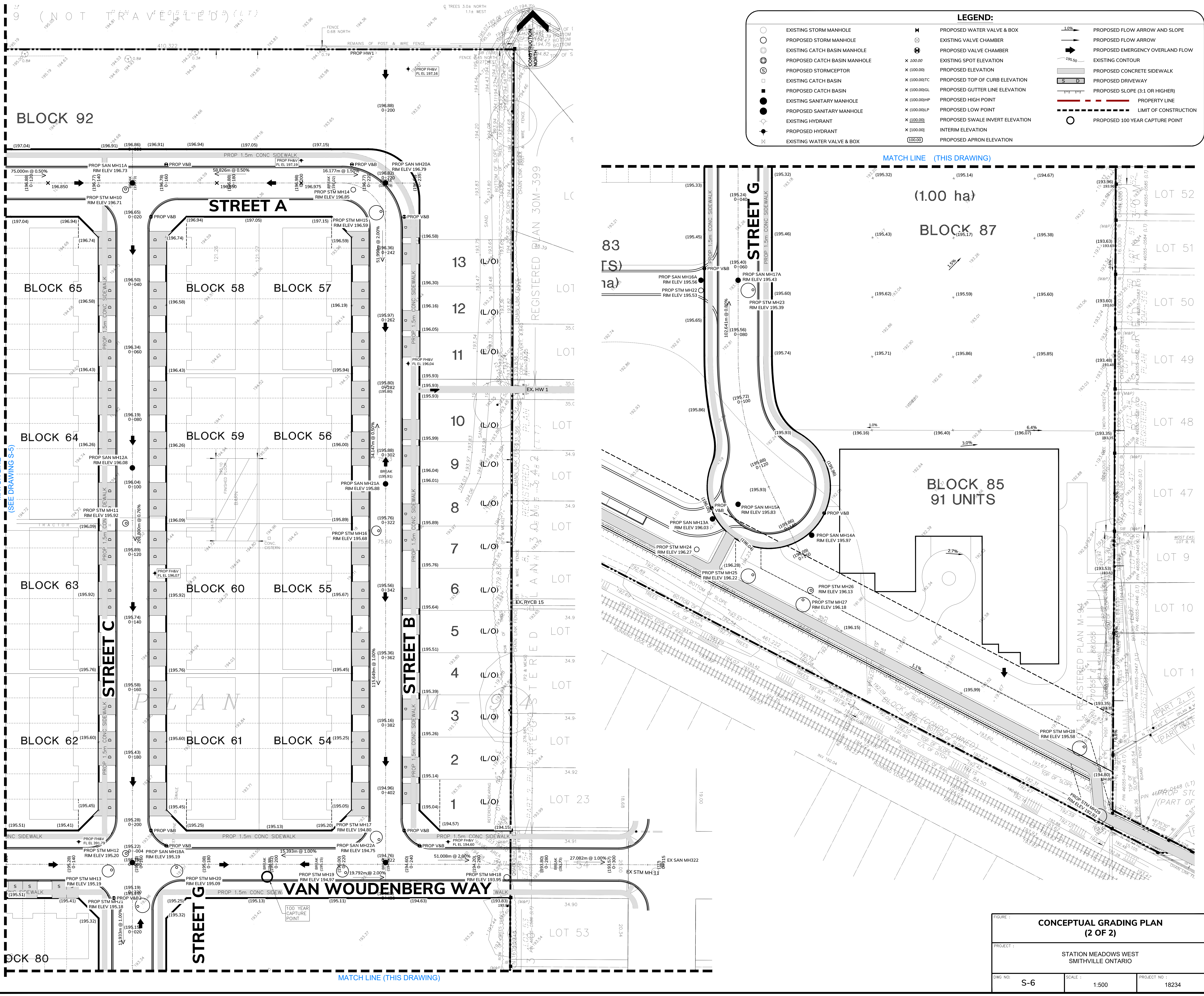

LEGEND:

○	EXISTING STORM MANHOLE	⧓	PROPOSED WATER VALVE & BOX	1.0% →	PROPOSED FLOW ARROW AND SLOPE
○	PROPOSED STORM MANHOLE	⊗	EXISTING VALVE CHAMBER	→	PROPOSED FLOW ARROW
▢	EXISTING CATCH BASIN MANHOLE	⊗	PROPOSED VALVE CHAMBER	➡	PROPOSED EMERGENCY OVERLAND FLOW
▢	PROPOSED CATCH BASIN MANHOLE	× 100.00	EXISTING SPOT ELEVATION	195.50	EXISTING CONTOUR
Ⓢ	PROPOSED STORMCEPTOR	× (100.00)	PROPOSED ELEVATION	▭	PROPOSED CONCRETE SIDEWALK
□	EXISTING CATCH BASIN	× (100.00)TC	PROPOSED TOP OF CURB ELEVATION	S D	PROPOSED DRIVEWAY
■	PROPOSED CATCH BASIN	× (100.00)GL	PROPOSED GUTTER LINE ELEVATION		PROPOSED SLOPE (3:1 OR HIGHER)
●	EXISTING SANITARY MANHOLE	× (100.00)HP	PROPOSED HIGH POINT		PROPERTY LINE
●	PROPOSED SANITARY MANHOLE	× (100.00)LP	PROPOSED LOW POINT		LIMIT OF CONSTRUCTION
	EXISTING HYDRANT	× (100.00)	PROPOSED SWALE INVERT ELEVATION	○	PROPOSED 100 YEAR CAPTURE POINT
	PROPOSED HYDRANT	× [100.00]	INTERIM ELEVATION		
⧓	EXISTING WATER VALVE & BOX	100.00	PROPOSED APRON ELEVATION		

FIGURE :

CONCEPTUAL GRADING PLAN
(2 OF 2)

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-6
SCALE : 1:500
PROJECT NO : 18234

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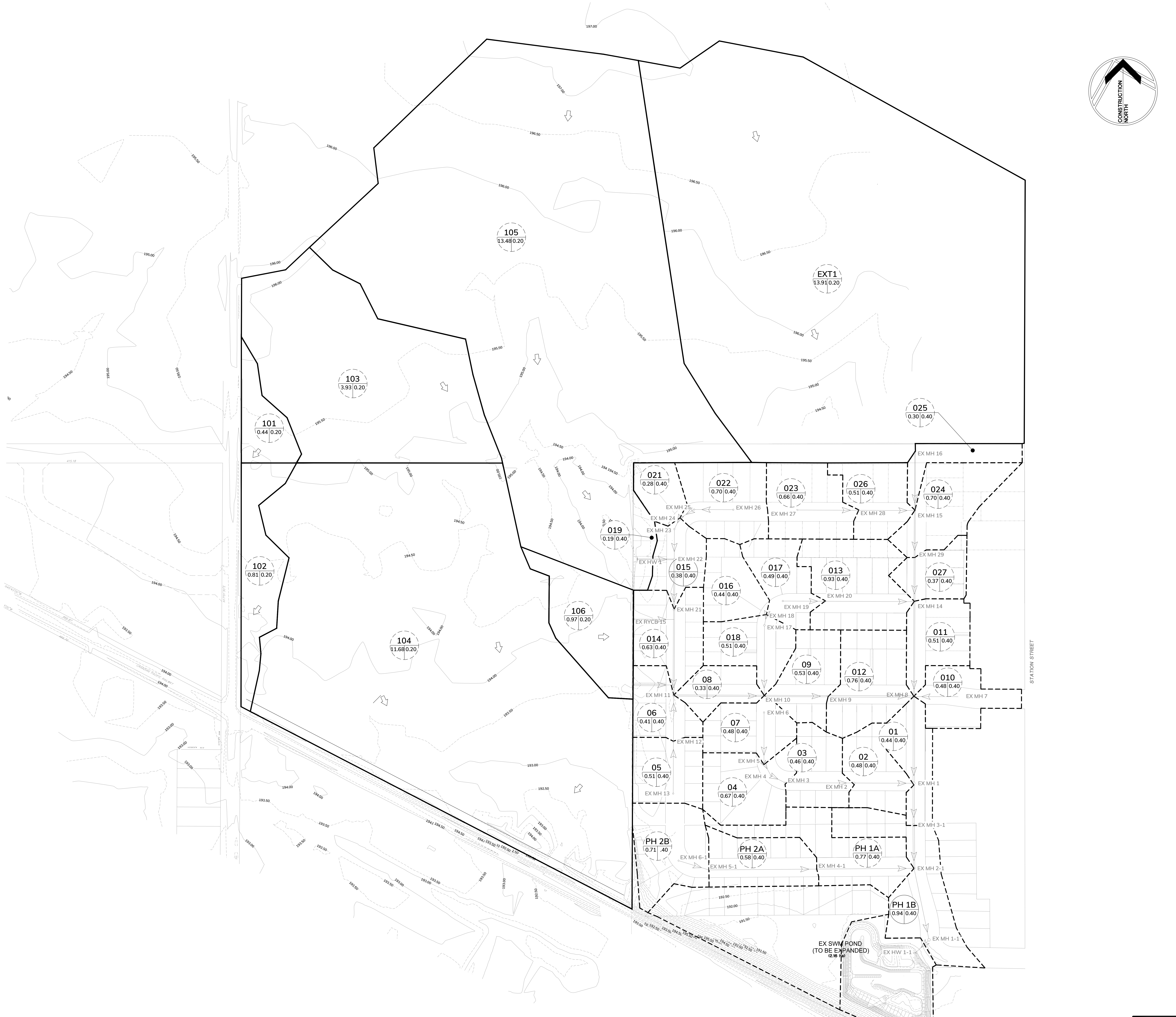

LEGEND:

◎	PROPOSED STORM MANHOLE
▣	PROPOSED CATCH BASIN MANHOLE
■	PROPOSED CATCH BASIN
▬	PROPOSED DOUBLE CATCH BASIN
→	PROPOSED STORM SEWER
195.50	EXISTING CONTOUR
▬ ▪ ▪ ▬	PROPERTY LINE
10	TRIBUTARY AREA ID NO.
	LABEL BORDER: SOLID LINE (PROPOSED) DASHED LINE (EXISTING)
0.60	RUNOFF COEFFICIENT
1.00	TRIBUTARY AREA (HA)
➡	PROPOSED MAJOR STORM OVERLAND FLOW
⇨	EXISTING MAJOR STORM OVERLAND FLOW

FIGURE :

PRE-DEVELOPMENT STORM TRIBUTARY PLAN

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-7	1:2000	18234

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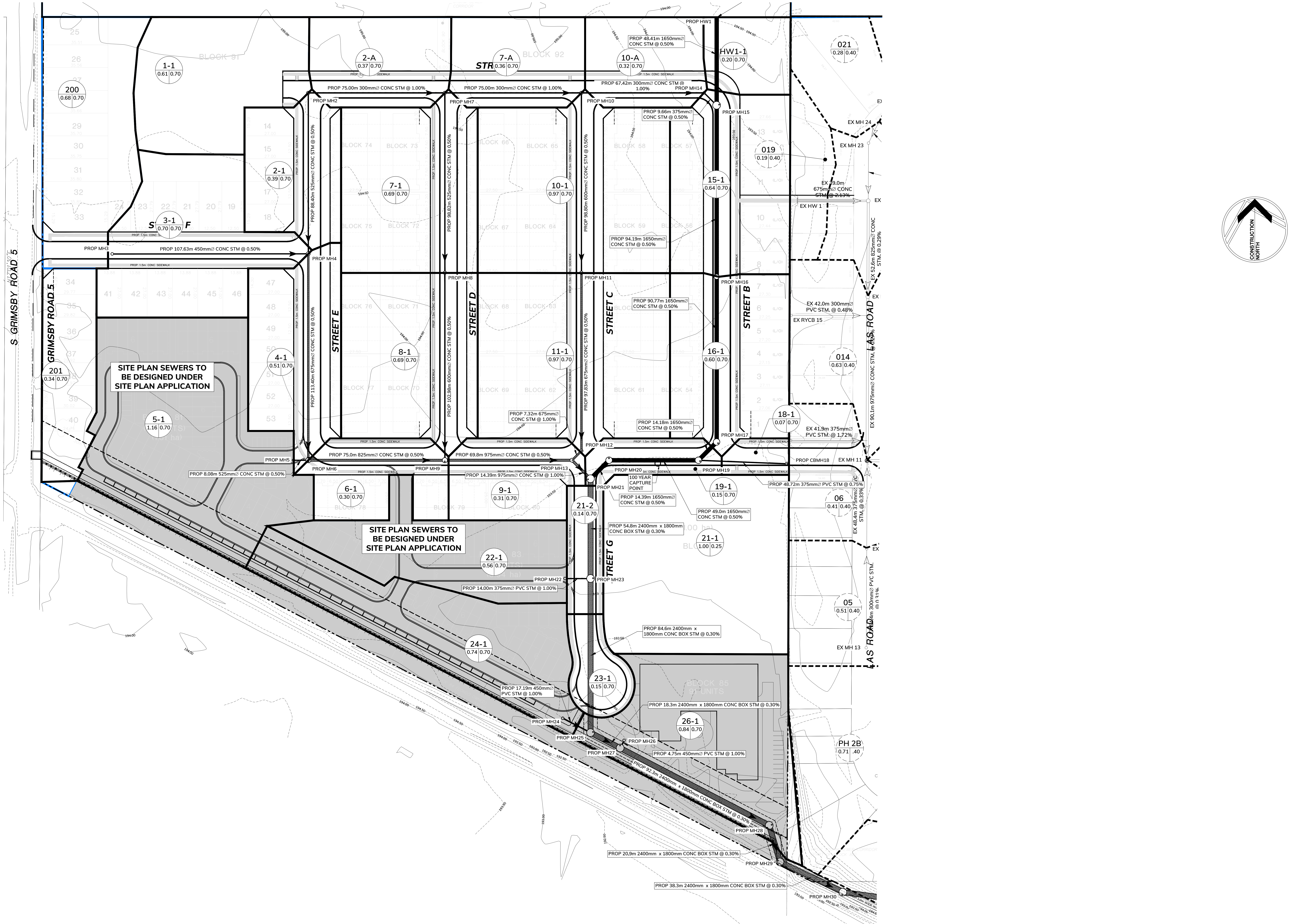

LEGEND:

- ◎ PROPOSED STORM MANHOLE
- ⊡ PROPOSED CATCH BASIN MANHOLE
- ■ PROPOSED CATCH BASIN
- ▬ PROPOSED DOUBLE CATCH BASIN
- → PROPOSED STORM SEWER
- 195.50 EXISTING CONTOUR
- PROPERTY LINE
- TRIBUTARY AREA ID NO.
- LABEL BORDER: SOLID LINE (PROPOSED)
  DASHED LINE (EXISTING)
- RUNOFF COEFFICIENT
- TRIBUTARY AREA (HA)
- ➡ PROPOSED MAJOR STORM OVERLAND FLOW
- ⇨ EXISTING MAJOR STORM OVERLAND FLOW

10
1.00 | 0.60

FIGURE :
CONCEPTUAL POST DEVELOPMENT STORM DRAINAGE AREA PLAN (INTERNAL AREA)

PROJECT :
STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-8
SCALE : 1:1000
PROJECT NO : 18234

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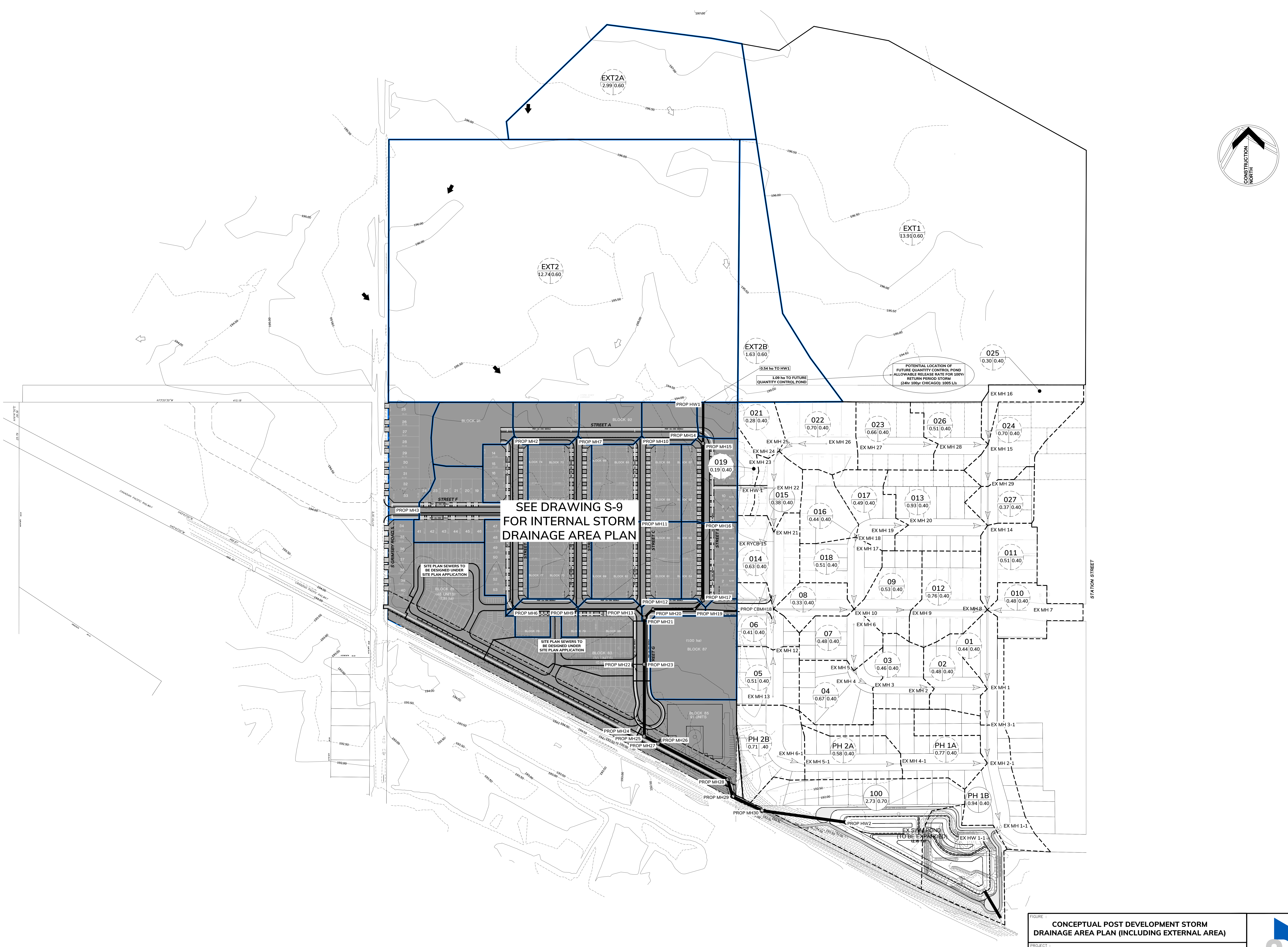

CONCEPTUAL POST DEVELOPMENT STORM DRAINAGE AREA PLAN (INCLUDING EXTERNAL AREA)

LEGEND:

◎	PROPOSED STORM MANHOLE
▣	PROPOSED CATCH BASIN MANHOLE
■	PROPOSED CATCH BASIN
▬	PROPOSED DOUBLE CATCH BASIN
—➤—	PROPOSED STORM SEWER
195.50	EXISTING CONTOUR
▬ ▪ ▪ ▬	PROPERTY LINE
10	TRIBUTARY AREA ID NO.
	LABEL BORDER: SOLID LINE (PROPOSED) DASHED LINE (EXISTING)
0.60	RUNOFF COEFFICIENT
1.00	TRIBUTARY AREA (HA)
➡	PROPOSED MAJOR STORM OVERLAND FLOW
⇨	EXISTING MAJOR STORM OVERLAND FLOW

FIGURE :
CONCEPTUAL POST DEVELOPMENT STORM
DRAINAGE AREA PLAN (INCLUDING EXTERNAL AREA)

PROJECT :
STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-9	1:2000	18234

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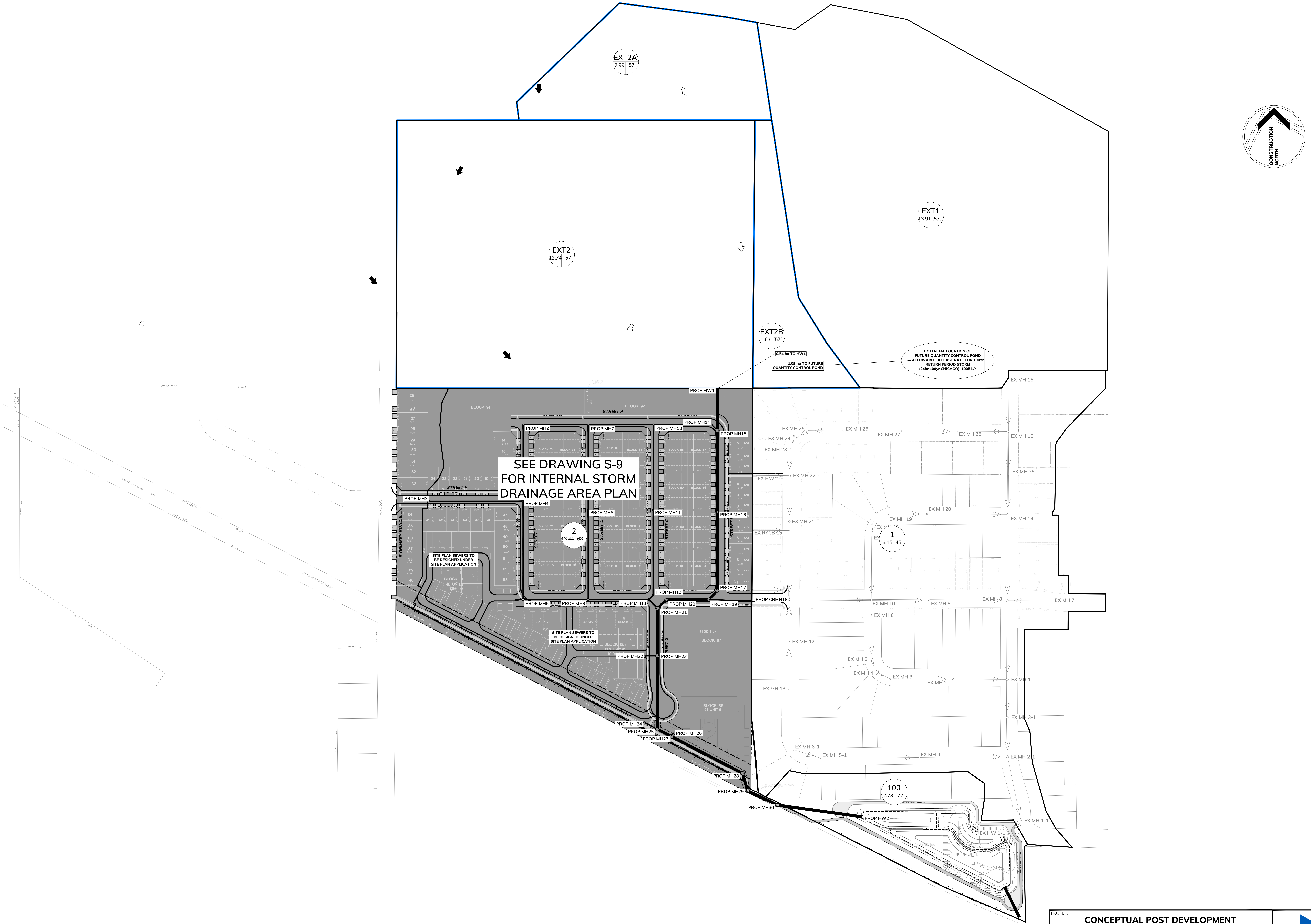

LEGEND:

◎	PROPOSED STORM MANHOLE
▣	PROPOSED CATCH BASIN MANHOLE
■	PROPOSED CATCH BASIN
▬	PROPOSED DOUBLE CATCH BASIN
→	PROPOSED STORM SEWER
195.50	EXISTING CONTOUR
▬ ▪ ▪ ▬	PROPERTY LINE
10	TRIBUTARY AREA ID NO.
	LABEL BORDER: SOLID LINE (PROPOSED) DASHED LINE (EXISTING)
0.60	% IMPERVIOUS
1.00	TRIBUTARY AREA (HA)
➡	PROPOSED MAJOR STORM OVERLAND FLOW
⇨	EXISTING MAJOR STORM OVERLAND FLOW

FIGURE :

CONCEPTUAL POST DEVELOPMENT SWM POND DRAINAGE AREA

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-10	1:2000	18234

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FIGURE :

CONCEPTUAL SANITARY TRIBUTARY PLAN

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-11	1:1000	18234

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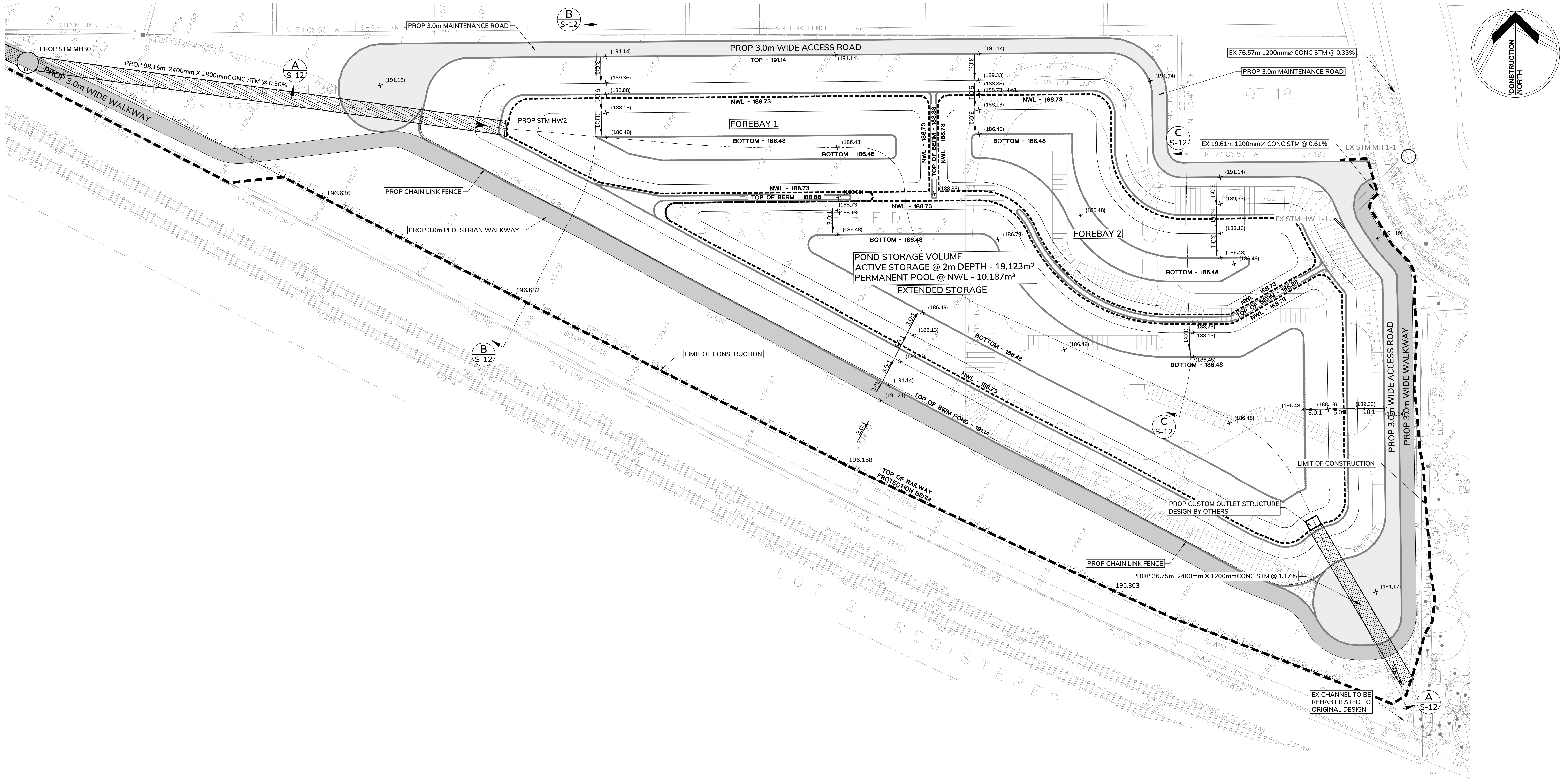
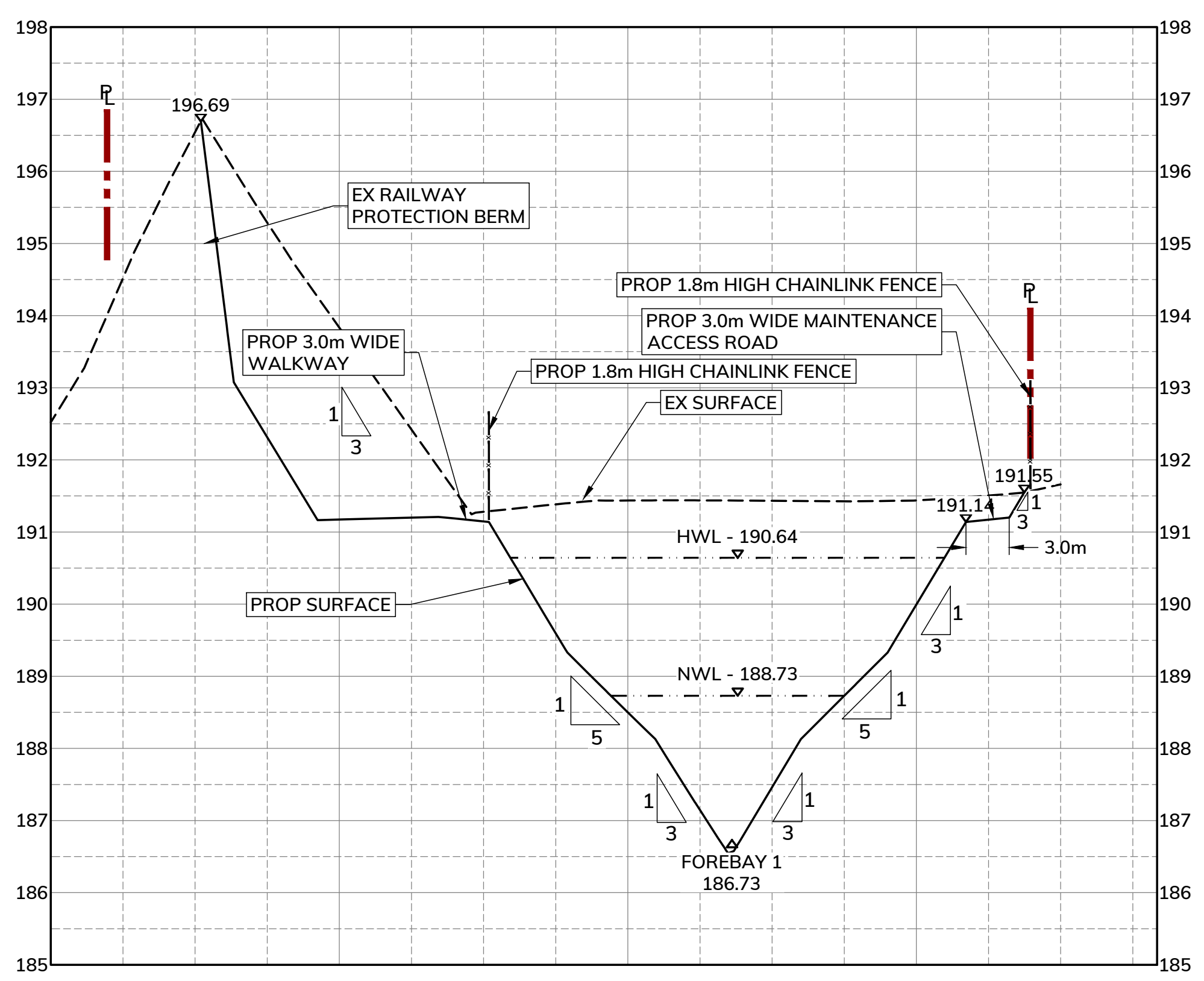
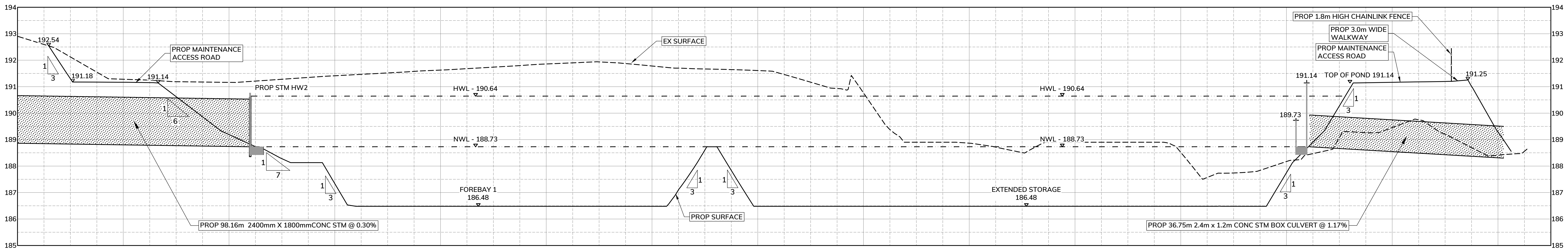
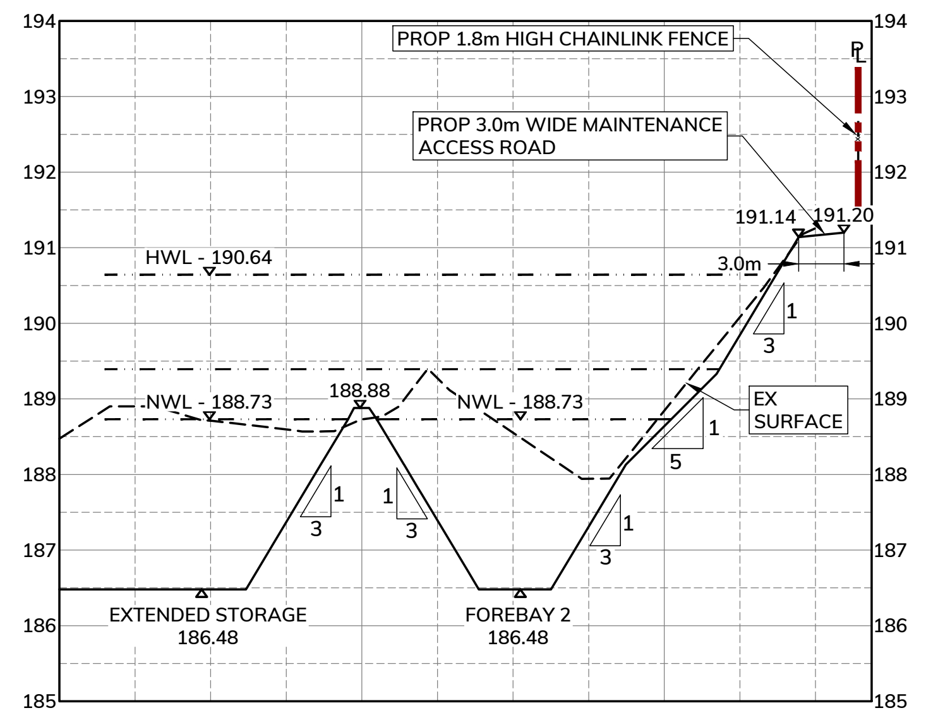




SECTION B-B
HOR - 1:500
VER - 1:100



SECTION A-A
HOR - 1:500
VER - 1:100



SECTION C-C
HOR - 1:500
VER - 1:100

FIGURE :

CONCEPTUAL POND LAYOUT PLAN & SECTIONS

PROJECT :

STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-12	1:500	18234

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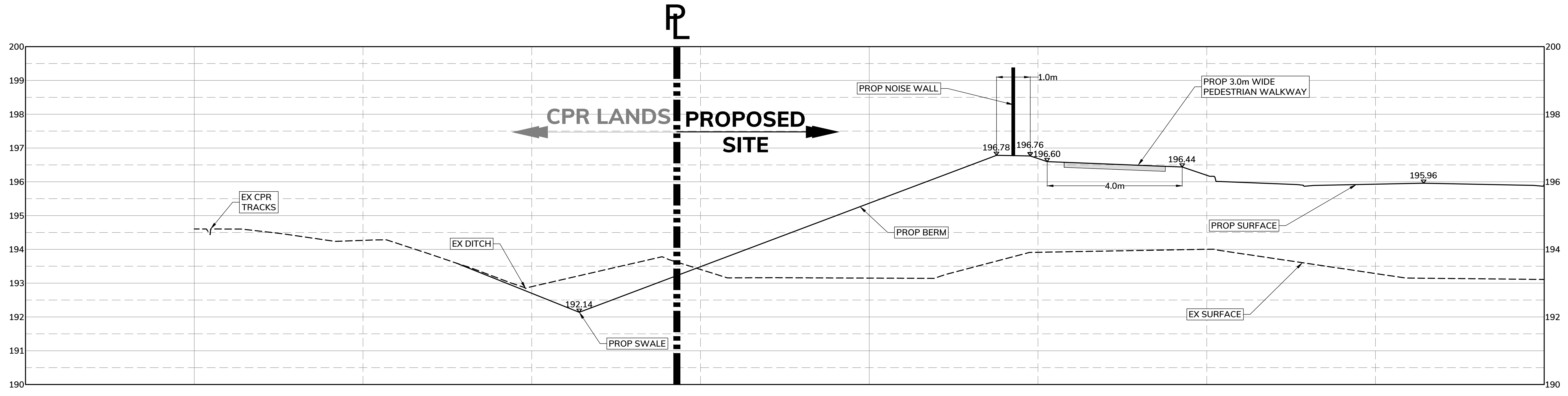
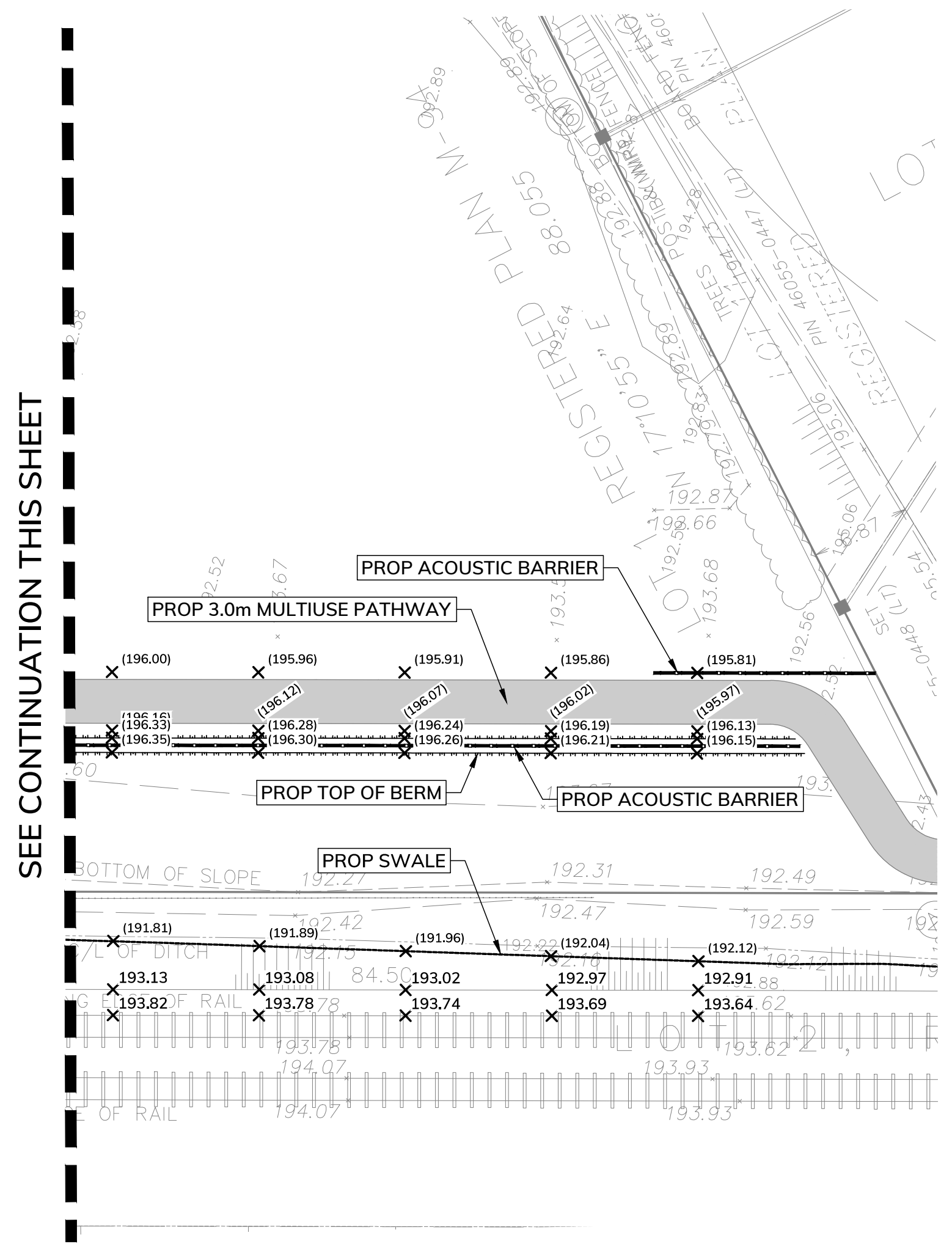


TYPICAL BERM SECTION
SCALE - 1:250



LEGEND:

○	EXISTING STORM MANHOLE	⧓	PROPOSED WATER VALVE & BOX	1.0% →	PROPOSED FLOW ARROW AND SLOPE
○	PROPOSED STORM MANHOLE	⊗	EXISTING VALVE CHAMBER	→	PROPOSED FLOW ARROW
▢	EXISTING CATCH BASIN MANHOLE	⊗	PROPOSED VALVE CHAMBER	➡	PROPOSED EMERGENCY OVERLAND FLOW
▣	PROPOSED CATCH BASIN MANHOLE	× 100.00	EXISTING SPOT ELEVATION	195.50	EXISTING CONTOUR
Ⓢ	PROPOSED STORMCEPTOR	× (100.00)	PROPOSED ELEVATION	▨	PROPOSED CONCRETE WALKWAY
□	EXISTING CATCH BASIN	× (100.00)TC	PROPOSED TOP OF CURB ELEVATION	—□—□—□	PROPOSED NOISE WALL
■	PROPOSED CATCH BASIN	× (100.00)GL	PROPOSED GUTTER LINE ELEVATION	—×—×—	PROPOSED CHAINLINK FENCE
●	EXISTING SANITARY MANHOLE	× (100.00)HP	PROPOSED HIGH POINT	—○—○—	PROPOSED PEDESTRIAN BARRIER
●	PROPOSED SANITARY MANHOLE	× (100.00)LP	PROPOSED LOW POINT	┬┬┬	PROPOSED SLOPE (3:1 OR HIGHER)
⌖	EXISTING HYDRANT	× (100.00)	PROPOSED SWALE INVERT ELEVATION	— - - —	PROPERTY LINE
⌖	PROPOSED HYDRANT	× [100.00]	INTERIM ELEVATION	- - -▶- - -	PROPOSED SWALE
⧓	EXISTING WATER VALVE & BOX	(100.00)	PROPOSED APRON ELEVATION	■ ■ ■ ■	LIMIT OF CONSTRUCTION

FIGURE :
NOISE BERM GRADING SECTION

PROJECT :
STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO:	SCALE :	PROJECT NO :
S-14	1:500	18234

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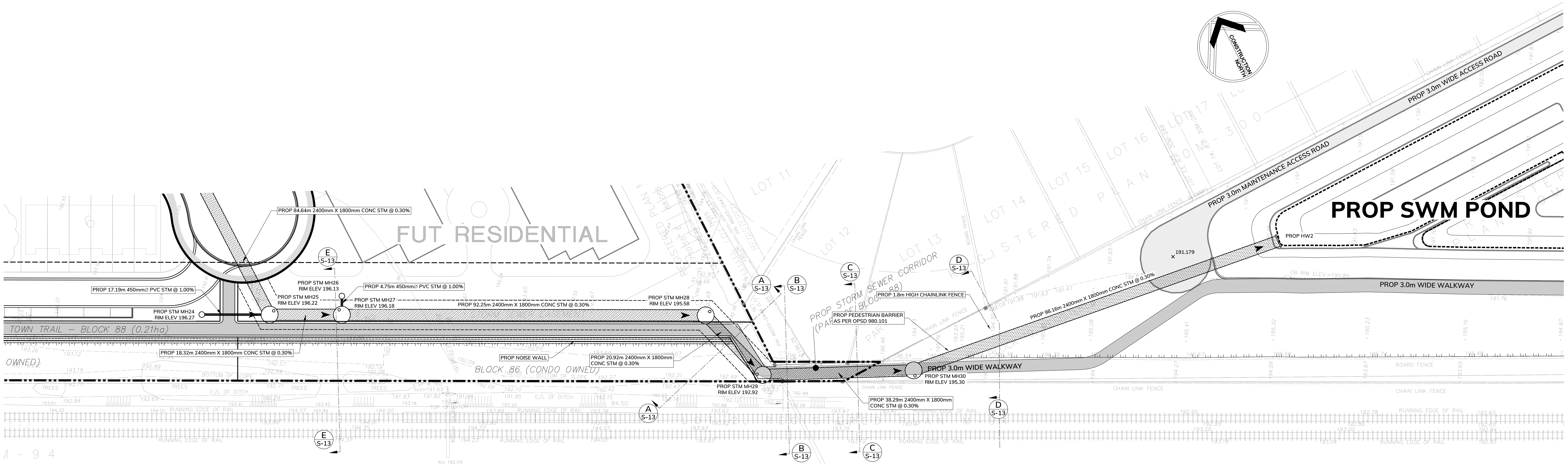

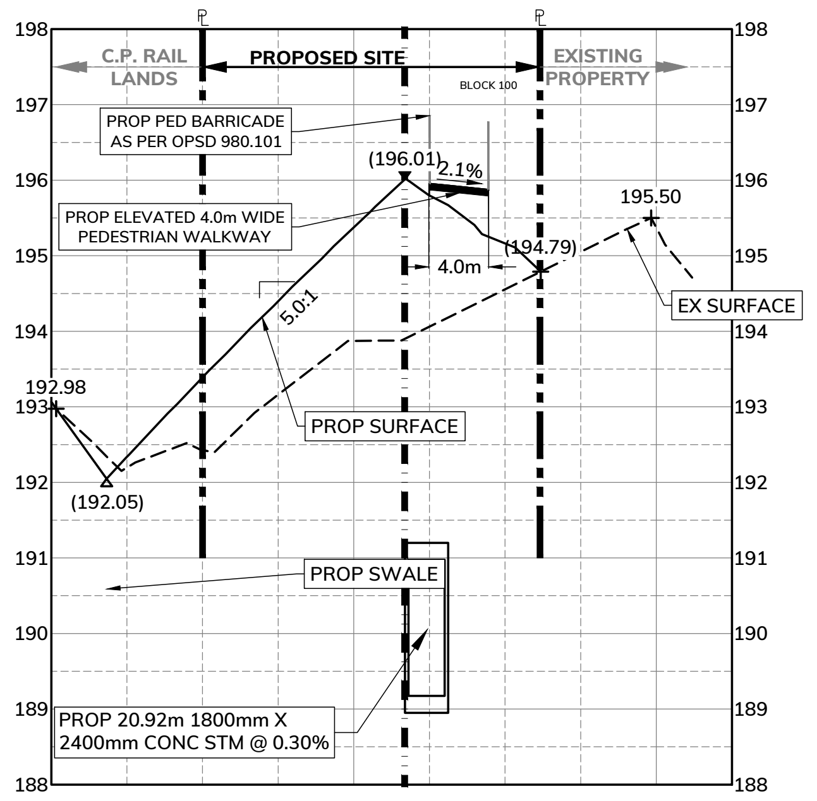

SECTION A-A

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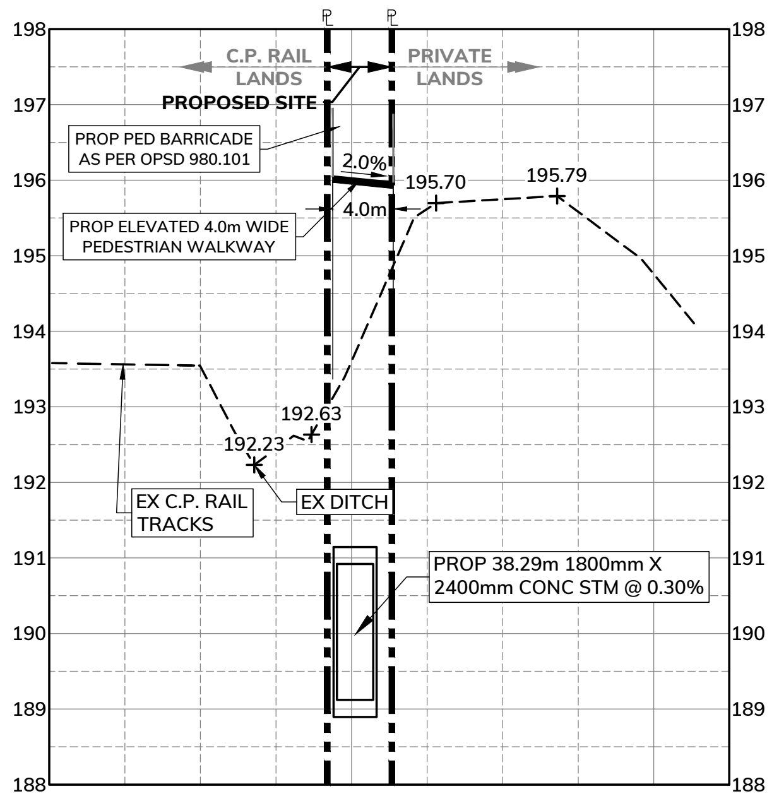
VER - 1:100



SECTION B-B

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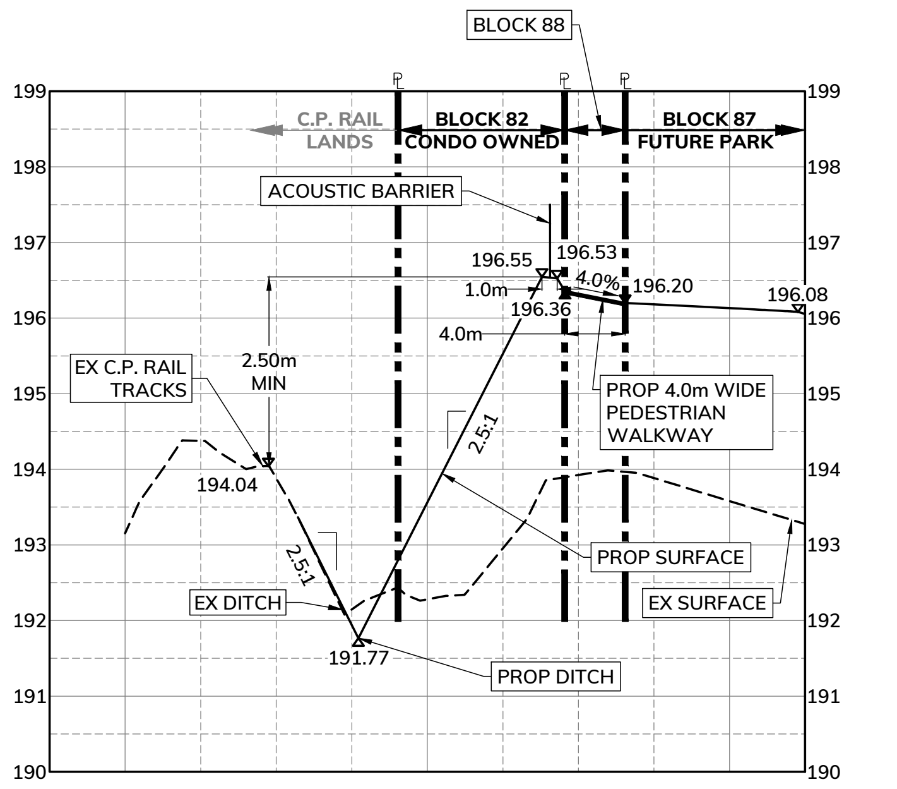
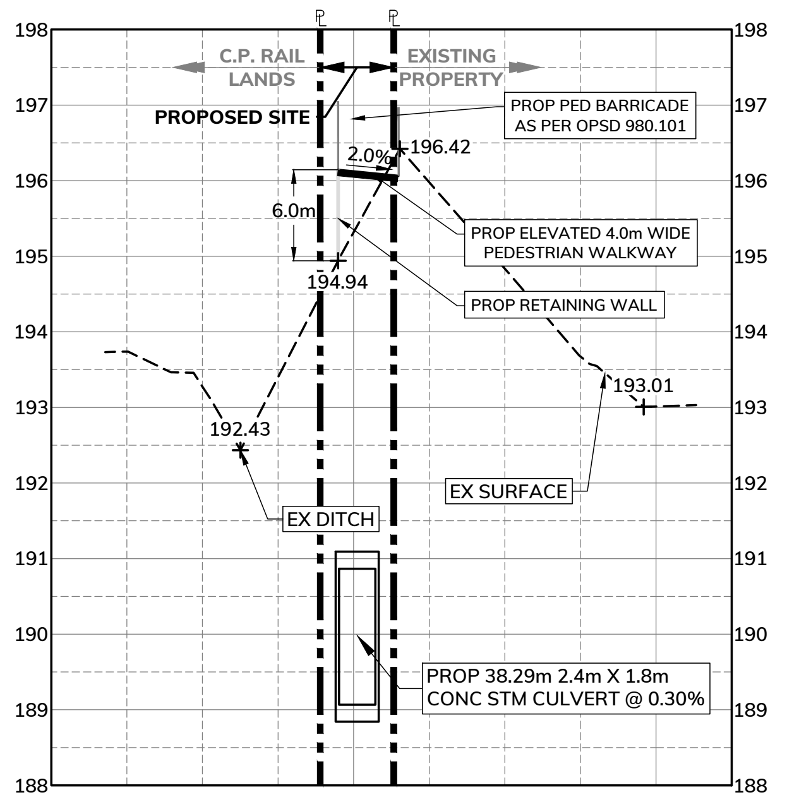
VER - 1:100



SECTION E-E

TYPICAL BERM SECTION
HOR - 1:500
VER - 1:100



SECTION C-C

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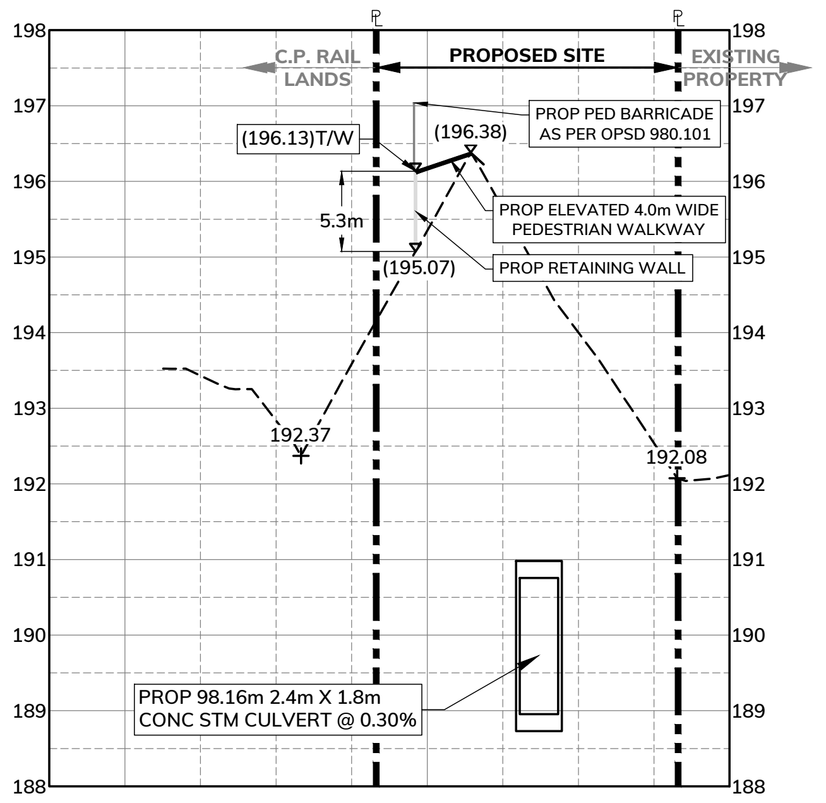
VER - 1:100



SECTION D-D

HOR - 1:500
VER - 1:100

LEGEND:

○	EXISTING STORM MANHOLE	⧓	PROPOSED WATER VALVE & BOX	1.0% →	PROPOSED FLOW ARROW AND SLOPE
○	PROPOSED STORM MANHOLE	⊗	EXISTING VALVE CHAMBER	→	PROPOSED FLOW ARROW
▢	EXISTING CATCH BASIN MANHOLE	⊗	PROPOSED VALVE CHAMBER	➡	PROPOSED EMERGENCY OVERLAND FLOW
▣	PROPOSED CATCH BASIN MANHOLE	× 100.00	EXISTING SPOT ELEVATION	195.50	EXISTING CONTOUR
Ⓢ	PROPOSED STORMCEPTOR	× (100.00)	PROPOSED ELEVATION	▭	PROPOSED CONCRETE WALKWAY
□	EXISTING CATCH BASIN	× (100.00)TC	PROPOSED TOP OF CURB ELEVATION	—□—□—□	PROPOSED NOISE WALL
■	PROPOSED CATCH BASIN	× (100.00)GL	PROPOSED GUTTER LINE ELEVATION	—×—×—×—	PROPOSED CHAINLINK FENCE
●	EXISTING SANITARY MANHOLE	× (100.00)HP	PROPOSED HIGH POINT	—○—○—○—	PROPOSED PEDESTRIAN BARRIER
●	PROPOSED SANITARY MANHOLE	× (100.00)LP	PROPOSED LOW POINT		PROPOSED SLOPE (3:1 OR HIGHER)
	EXISTING HYDRANT	× (100.00)	PROPOSED SWALE INVERT ELEVATION	— ‒ ‒ —	PROPERTY LINE
	PROPOSED HYDRANT	× [100.00]	INTERIM ELEVATION	- - -▶- - -	PROPOSED SWALE
⧓	EXISTING WATER VALVE & BOX	(100.00)	PROPOSED APRON ELEVATION	■ ■ ■ ■	LIMIT OF CONSTRUCTION

FIGURE :
CONCEPTUAL NOISE BERM AND WALKWAY SECTIONS

PROJECT :
STATION MEADOWS WEST
SMITHVILLE ONTARIO

DWG NO: S-13
SCALE : 1:500
PROJECT NO : 18234

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