FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

SCHOUT COMMUNITIES INC.

3770 Hazel Street, Fort Erie, ON
Project No.: 2022-0365-10

November 2, 2023

WALTERFEDY

SCHOUT COMMUNITIES INC.

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1.0 INTRODUCTION

WalterFedy was retained by Schout Communities Inc. to provide consulting engineering services for a proposed 93 unit townhouse condominium development located at 3770 Hazel Street in Fort Erie, ON. The site fronts onto both Hazel Street and Belleview Boulevard and will provide entrance connections off both streets. Refer to Figure 1.0 for the site location.

The purpose of this Functional Servicing and Stormwater Management Report is to identify how the development will be serviced, including water, sanitary, and storm connections to the existing municipal infrastructure in support of the Draft Plan of Condominium and Site Plan Applications. The report will discuss existing boundary servicing conditions and summarize the servicing demands of the development for confirmation of capacity by the Town of Fort Erie. Stormwater management (SWM) design for the development will include quality and quantity controls. The general grading strategy is also discussed.

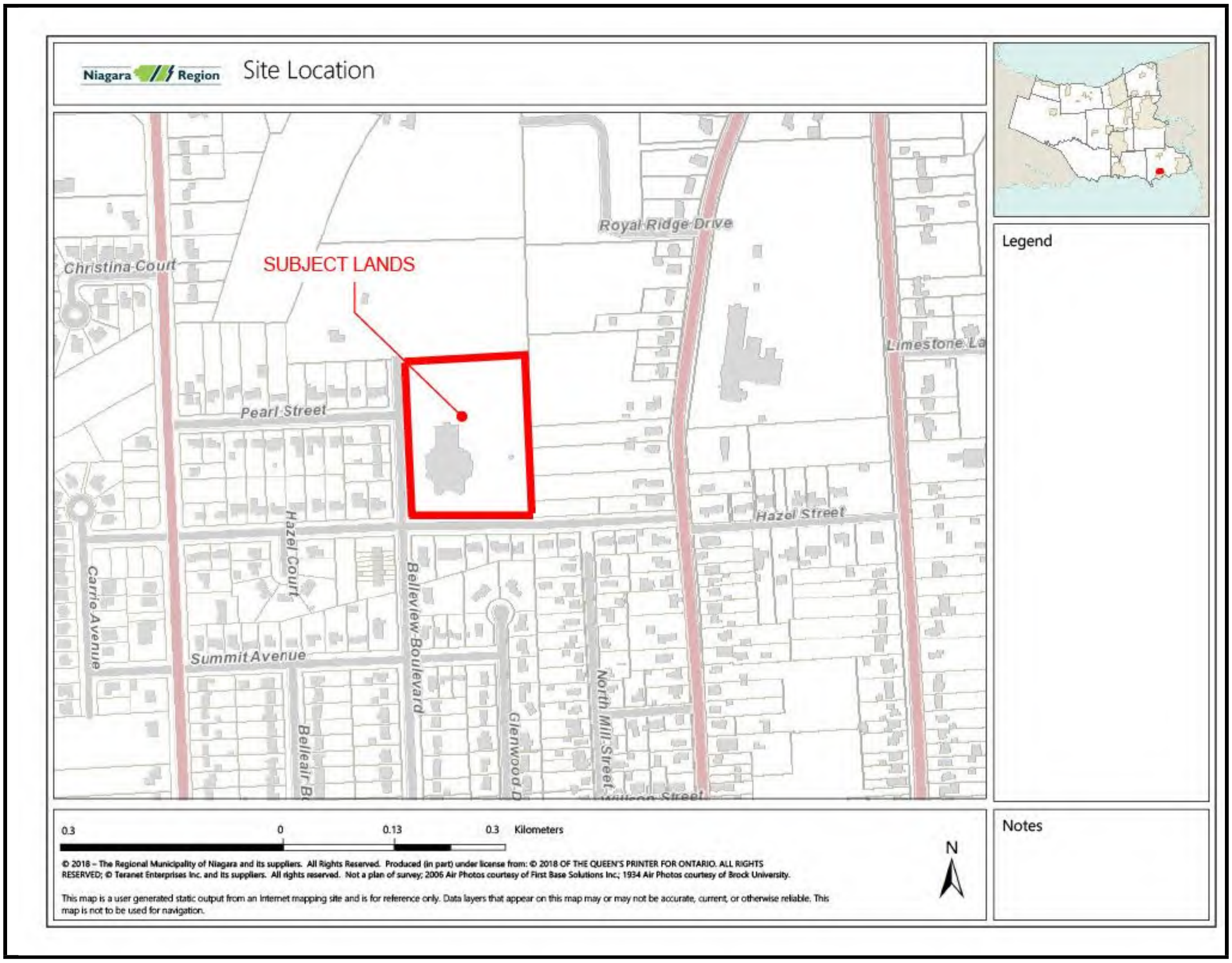

Figure 1.0: Site Location Plan

1.1 Background

The site has an area of approximately 2.58 hectares. The proposed development is supported by the Town of Fort Erie, as it will contribute to the intensification target of 15%, as outlined in the Regional Official Plan.

The property is a former school and currently sits vacant with all former buildings demolished. It is assumed that all servicing (water, sanitary, and storm) to the former school has been decommissioned to the satisfaction of the Town of Fort Erie. The site is bound to the west and the south by Belleview Boulevard and Hazel Street, respectively, with a mix of existing multi-unit and single-family residential to the south, and single-family residential to the west. The lands to the north of the site are open space, and the lands immediately to the east are large estate lot residential-type land use. The proposed residential development will consist of 13 townhouse blocks with a total of 93 units complete with internal private roads and common areas.

1.2 Reference Reports

In the preparation of this report, the following material was referenced:

1. *Pre-Consultation Agrement, 3770 Hazel Street*, The Town of Fort Erie, dated June 23, 2002.
2. *Subdivision Control - Guidelines for Development of New Subdivisions*, The Town of Fort Erie, dated 2021.
3. *Design Guidelines for Drinking-Water Systems*, by Ministry of the Environment, Conservation and Parks (MECP) dated May 2019.
4. *MOE Stormwater Management Practices Planning and Design Manual*, Ministry of the Environment dated March 2003.
5. *Erosion & Sediment Control Guidelines for Urban Construction*, Toronto and Region Conservation Authority, 2019.
6. *Water Supply for Public Protection*, Fire Underwriters Survey (FUS), 2020
7. *Hydrant Flow Testing Report,* completed by Aquacom Contracting, dated November 29, 2022.
8. *Geotechnial Investigation – Proposed Infiltration Gallery,* Soil-Mat Engineers , dated October 31, 2023.
9. Plan, profile, storm, sanitary and watermain Information provided by Town of Fort Erie.

2.0 EXISTING INFORMATION

2.1 Topography and Geotechnical Conditions

The majority of the property is open greenfield with no buildings or structures occupying the lands. The centre portion of the site contains a gravel area of approximately 0.67 ha where the old asphalt parking lot existed for the now demolished school.

In general, drainage is collected by three catchbasins. The outlets for these structures may be to the Hazel Street ditch. A ditch enters the southwestern corner of the property and drains north just inside the eastern property line, with an outlet to the existing woodlot northeast of the site. A ditch is also located along the northern property line that drains west towards the Belleview Boulevard storm sewer system. Elevations on the site range from 186.00 m at the southeastern corner to 184.00 m at the northwestern corner, adjacent to Belleview Boulevard. A topographic survey was completed by Chambers and Associates Surveying Ltd. and provided to WalterFedy for use in undertaking the site engineering design.

A geotechnical investigation was undertaken by Soil Mat Engineers in October 2023. The investigation revealed that below the 0.30 to 0.60 m of surface topsoil or sand and gravel fill, the site is generally underlain by stiff to very stiff silty clay/clayey silt. An assessment of the infiltration characteristics based on grain size analysis indicated a hydraulic conductivity (k) of 10^{-8} cm/s with a related estimated infiltration rate of less than 5 mm/hr.

Based on these results, the soils are effectively impermeable and on-site infiltration is not recommended. The test pits were dry upon completion but, based on other available information, the groundwater level is estimated to be 3 m to 4 m below the ground surface. A copy of the geotechnical report has been included in Appendix E.

2.2 Servicing and Utilities

Servicing information was provided by the Town of Fort Erie by way of historic drawings. Based on a review of the provided information, the servicing adjacent to the site can be summarized as follows:

- Hazel Street
  - A 200-mm-diameter concrete sanitary sewer flowing east-to-west is located under the northern edge-of-pavement of the road, along the entire frontage of the subject lands.
  - A 300-mm-diameter sanitary forcemain is located under the centre line of the roadway and also drains east-to-west.
  - 375-mm- and 300-mm-diameter storm culverts are located along the centre of the ditch system draining east-to-west and outletting to Belleview Boulevard ditch system.
  - A 150 mm PVC watermain is located along the southern gravel shoulder of roadway, opposite the entire site frontage.
- Belleview Boulevard
  - A 200-mm-diameter concrete sanitary sewer flowing south-to-north is located under the eastern edge-of-pavement of the road, along half of the frontage of the subject lands.
  - There is an underground storm sewer system located directly below the centre of the eastern ditch. 375 mm and 450 mm storm sewers convey drainage to a catch basin maintenance hole, which ultimately outlets to the storm sewer system on Pearl Street.
- Site Servicing
  - Services to the property have been terminated as part of the demolition former school.

With respect to storm drainage in the immediate area, a drainage swale that carries external flows from east of the property along Hazel Street enters the southeastern corner of the property and flows in a northerly direction inside the eastern property line, where it outlets to the woodlot feature northeast of the subject site. This drainage feature will be maintained as part of the future site development.

Two hydrant flow tests were performed on the local hydrants adjacent to the site by Aquacom Contracting on November 11, 2022. The results are summarized in Table 2.1. See Appendix B for full testing results and hydrant locations.

Table 2.1 – Existing Hydrant Flow Data

Parameter	Test 1	Test 2
Test Date	11-Nov-2022	11-Nov-2022
Flow Hydrant Location	3759 Hazel St.	559 Belleview Blvd.
Residual Hydrant Location	3711 Hazel St.	3711 Hazel St.
Static Pressure	65 psi	65 psi
Residual Pressure at Test Flow	43 psi	46 psi
Test Flow Rate	1958 USGPM (123 l/s)	1611 USGPM (102 l/s)
Theoretical Flow @ 20 psi	2882 USGPM (182 l/s)	2566 USGPM (162 l/s)

A desktop review of the available information, including satellite imagery (Google Maps), topographic survey, and historical drawings from the Town of Fort Erie regarding the utilities was undertaken. Proper locates will be required at the time of construction to confirm the existence and location of untilities, but the desktop review found the following:

- Hazel Street
    - There is a 50 mm gas main along the right-of-way, opposite the site.
    - There is a bell pedestal box at the southeastern corner of the property. This box is serviced from the southern side of the right-of-way.
    - Site includes street lighting, complete with underground wiring on the southern side of the right-of-way.
    - An underground fibre optic cable enters the site from Hazel Street at the southwestern corner of the property.
- Belleview Boulevard
    - There is a gas main along the right-of-way, opposite the site.
    - Aerial hydro lines with poles are located adjacent to the two entrances to the site, complete with street lights.
- Site Servicing
    - Services to the property have been terminated as part of the demolishing of the former school.

2.3 Natural Heritage Features

The Site Plan has identified a dripline with 10 m setback that was established by GeoProcess Research Associates in November 2022 around the northeastern corner of the property.

3.0 DESIGN POPULATION

The proposed residential development is considered to be medium-density with a prescribed population of 80 people per hectare (ppha) according to the Town of Fort Erie Subdivision Control Guidelines. For the 2.58 ha site, this equates to a total population of 207 people, or 2.23 people per unit (ppu) for the 93 units. For the purposes of the sanitary and water analysis presented in this report, a unit population of 4.0 ppu is considered for the proposed two-storey townhomes. The design population calculations for the proposed development are summarized in Table 3.1.

Table 3.1 - Design Population Calculations

Site Area	2.58 ha
Number of Residential Units	93
Number of (ppu)	4.0
Residential Design Population	**372 people**

4.0 SANITARY SERVICING

The Town of Fort Erie design criteria dictates that residential sanitary flows for proposed developments are to be sized based on an average daily flow of 0.32 m^3/c/d (320 l/c/d) and a maximum peaking factor (M) of 4.5. The peaked flow is to be coupled with an allowance for extraneous flows amounting to 0.15 l/s/ha to calculate the peak design flow (Q). The sanitary design flow calculations are summarized in Table 4.1.

Table 4.1 - Proposed Sanitary Flows

Site Area	2.58 ha
Average Residential Daily Flow	320 l/c/d
Residential Population	372 persons
Average Sanitary Flow	1.38 l/s
Peak Factor (M) = $5/P^{0.2}$	4.5
Residential Sanitary Flow	**6.21 l/s**
Extraneous Flow Allowance	0.15 l/s/ha
Total Extraneous Flow	**0.39 l/s**
Total Peak Sanitary Flow (Q)	**6.60 l/s**

The proposed sanitary service exiting the development is 200-mm-diameter at 1.05% slope, providing a full flow rate of 34 L/s. Based on the calculated peak sanitary flow, the service will operate at 19% of the full flow capacity. Each unit will be serviced with a 100-mm-diameter sanitary lead with a minimum 2% slope. Refer to drawing C3-1 for the proposed sanitary sewer layout for the development.

5.0 WATER SERVICING

5.1 Design Criteria

The design criteria for the Town of Fort Erie require that the watermain distribution systems be able to convey the larger of the maximum daily demand and fire flow or the peak hourly demand. Additionally, it is mandated that the average daily flow be conveyed with a resulting pressure of no less than 275 kPa (40 psi), and 140 kPa (20 psi) under fire flow conditions.

5.2 Domestic Water Demand

Calculations of the water demand for the proposed development have been determined using the guidelines outlined in the Town of Fort Erie design criteria and the MECP drinking water guidelines. Table 5.1 lists the Town's Average Day, Maximum Day, and Peak Hour per-captia domestic demands. The respective total water demands for the proposed development are summarized in Table 5.2.

Table 5.1 - Town of Fort Erie per Capita Water Demands

Average Day (l/c/d)	320
Maximum Day (l/c/d)	570
Peak Hour (l/c/d)	860

Table 5.2 - Proposed Domestic Water Demands

Residential Population	372
Average Day Demand (l/s)	1.38
Maximum Day Demand (l/s)	2.45
Peak Hour Demand (l/s)	3.70

5.3 Fire Flow Demand and Water Modeling

In addition to the daily domestic demands from the proposed development, the water distribution system within the development is required to provide fire fighting water for fire protection. The Town of Fort Erie specifies that all fire flow requirements shall be determined per the current issue of the FUS. The fire demands for this development were assessed based on the parameters indicated in Table 5.3.

Table 5.3 – FUS Fire Flow Demands

Gross Floor Area	350 m^2 ± (2 Townhouse units)
Type of Construction	Wood Frame (C=1.5)
Occupancy Charge	Limited Combustible Contents (-15%)
Exposure Charge	Varies
Automated Sprinkler Protection	No Sprinklers
Required FUS Fire Flow Demand	**117 l/s - 133 l/s (1854 - 2108 USGPM)**
Max. Day + Fire Demand	2.45 l/s + 133 l/s = 135.45 l/s

Based on the hydrant flow testing, the available flow on Hazel Street and Belleview Boulevard at 20 psi (140 kPa) ranges from 162 l/s to 182 l/s (see Table 2.1). For a townhouse development with large building blocks, this is insufficient flow to support the development without implementing 2-hour rated firewalls within the buildings to reduce the effective gross floor area. The required Maximum Day + Fire Flow reported in Table 5.3 was determined with EPANET modeling trials. Initially, the private system was sized with a 150-mm-diameter watermain loop through the site, but that resulted in excessive pressure losses that could only support a fire flow of approximately 100 l/s and would require firewalls between every unit. If firewalls are placed between every second unit, the resulting FUS fire flow ranged from 117 l/s to 133 l/s. To achieve this fire flow, the incoming service from the road to the proposed internal fire hydrants on the eastern and western sides of the site was upsized to 200-mm-diameter to limit pressure losses. The remainder of the watermain is 150-mm-diameter. Table 5.4 summarizes the Peak Hour and Max. Day + Fire Flow modeling results and shows that the system will operate within the Town criteria.

Table 5.4 – EPANET Model Results

Demand Scenario	Flow (l/s)	Minimum Calculated Pressure (kPa / psi)	Pressure Criteria (kPa / psi)
Peak Hour Flow	3.70	441 / 64 (J13 & J6)	Max. Working = 690 / 100 Min. Working = 275 / 40 Fire Conditions = 140 / 20
Maximum Day + Fire Flow[A]	135.45	166 / 24	

[A] Worst case with Max. Day + Fire Demand at Hyd-1 on east side of site

The hydrants located on both Belleview Boulevard and Hazel Street will not provide full coverage for all the proposed condominiums. Two private hydrants are proposed for the eastern and western sides of the development to ensure full coverage to all units. Please refer to Drawing C3-1 for the proposed watermain servicing layout.

5.4 Water Servcing

The proposed site is only permitted one water service connection to the municipal system. As indicated above, it was determined that a 200 mm water service connection and 200-mm-diameter watermain from Hazel Street to the internal fire hydrants is required to maintain reasonable fire flows within the development. The remainder of the watermain loop will be 150 mm diameter. The two dead-end streets at the northern end of the property will be serviced with 100-mm-diameter watermains since they will service a limited number of units and the smaller pipe size will improve water turnover within the mains. The incoming service from Hazel Street will be metered within a meter chamber inside the property line complete with a Neptune Mach 10 Ultrasonic Compound Meter and a double detector check valve assembly. The individual units will be serviced with 20 mm diameter copper water services.

Refer to Drawing C3-1 for the proposed watermain layout.

6.0 STORMWATER MANAGEMENT AND STORM SERVICING

6.1 Stormwater Management Requirements

The redevelopment of the property will be subject to the following stormwater management requirements:

- Quantity – Control post-development flows to pre-development levels for the 2-year through 100-year storm events.
- Quality – Storm runoff from the site will ultimtley drain to Beaver Creek, a Type I fish habitat. Therefore, the site design should provide an "Enhanced" (80% TSS removal) level of water quality protection.

The site was reviewed for the potential implementation of Low Impact Development (LID) infiltration practices. However, since the infiltration assessment deemed the existing clay silt/clayey silt soils effecitively impermeable, infiltration measures would not be suitable for the proposed development.

6.2 Pre-Development Conditions

The site is vacant, but served as an elementary school for over 50 years until its demolition in 2019. The pre-development conditions depicted in this analysis represent the site with the school building. The school site did not appear to have any on-site storm sewer infrastructure of any significance. Most storm runoff drained off the site via overland flow. Three catchbasins were located beside the eastern side of the school building and the northeastern corner of the existing parking area with what is believed to have been an outlet via a shallow storm sewer to the ditch on Hazel Street. The property had no stormwater quality control measures/devices. The pre-development conditions were discretized into two catchment areas. Catchment 101 represents the majority of the school site (building, asphalt parking, and lawn areas) that drained by sheet flow to Belleview Boulevard and Hazel Street and the ditch along the north property line; runoff is conveyed in the road ditches and municipal storm sewers to approximately the intersection of Belleview Boulevard and Pearl Street. Catchment 102 represents the lawn area on the eastern side of the site that drains to the drainage ditch on the eastern side of the site that drains north, where it outlets into the woodlot off the northeastern corner of the property. The pre-development catchments are summarized in Table 6.1 and depticed in Figure 2.0.

Table 6.1 – Pre-Developoment Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious
101	Existing school building, asphalt parking and lawn areas draining to Hazel St. and Belleville Blvd. rights-of-way	2.097	32%
102	Existing lawn on east side draining to existing ditch and outlet to woodlot	0.480	0
	Total	**2.577**	**26**

The pre-development conditions were modelled with the SWMHYMO hydrologic modelling program for the 2-, 5-, and 100-year (4-hour duration) Fort Erie City design storms. Table 6.2 summarizes the pre-development peak flows to the Belleview Boulevard and northeastern outlets, as well as the total site peak flows. See Appendix C for storm IDF information and SWMHYMO modeling input/output for both the pre- and post-development conditions.

Table 6.2 – Pre-Development Site Discharge (m^3/s)

Storm Event	Northeast to existing woodlot	North, South & West Outletting to Belleview Blvd.	TOTAL SITE
2-year	0.008	0.098	**0.103**
5-year	0.019	0.126	**0.139**
100-year	0.056	0.220	**0.265**

6.3 Post-Development Conditions

Under post-development conditions, the site will be redeveloped into a residendial townhouse community consisting of 13 townhouse blocks with a total of 93 units. Refer to Appendix A for the proposed Site Plan.

The site was discretized into five catchment areas. The post-development conditions are summarized in Table 6.3 and depicted in Figure 3.0. Catchments 201 to 204 represent site areas that will ultimately drain to Belleview Boulevard. Catchment 201 represents the bulk of the proposed development's internal driveway/parking, building roof areas, and landscaped areas. Catchments 202, 203, and 204 represent permimeter areas along the northern, southern, and western sides of the site, respectively, that will drain uncontrolled to Bellview Boulevard. These areas have lower impervious coverage or have indirectly-connected impervious area (ie. roof areas draining onto landscaping). Catchment 205 represents uncontrolled drainage from the eastern side of the proposed development consisting of rear-yard and partial roof areas that will outlet to the ditch that drains to the woodlot northeast of the site.

Table 6.3 – Post-Developoment Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious
201	Proposed site to be controlled with on-site SWM. Outlet to Belleview Blvd.	1.807	72
202	Perimeter landscaped area on northern side draining uncontrolled to ditch. Outlet to Belleview Blvd.	0.089	0
203	Landscaping and partial roofs on southern side draining uncontrolled to Hazel Street ditch. Outlet to Belleview Blvd.	0.079	30
204	Rear yard and half roof areas on western side draining uncontrolled to Belleview Blvd. ditch	0.263	49
205	East side draining to ditch and outletting northeast to woodlot	0.339	35
	Total Site	**2.577**	**61**
	Outlet to Belleview Blvd. (Catchments 201, 202, 203, and 204)	2.238	65
	Outlet Northeast to Woodlot (Catchment 205)	0.339	35

The increased impervious coverage in the post-development conditions and the requirement to control the post-development discharge to pre-development rates will necessitate the need for on-site SWM controls and related storage. Therefore, it is proposed to control discharge from Catchment 201 by installing a 205-mm-diameter orifice at the downstream end of the proposed storm sewer system and allowing excess flows to surcharge into approximately 432 m^3 of StormCon underground storage tanks located in the proposed amenity area. Table 6.4 summarizes the stage-storage-discharge characteristics for the on-site storage (see Appendix C for a detailed worksheet) that is incorporated into the post-development modeling. As indicated earlier, the remaining Catchments 202, 203, and 204 will drain uncontrolled. Controlled discharge from Catchment 201 will outlet to the existing 525-mm storm sewer on Belleview Boulevard.

Table 6.4 – Underground Storage - Stage-Storage-Discharge Characteristics

Elevation (m)	Discharge (m^3/s) [A]	Volume (m^3)	Description
182.56	0.0000	0	Orifice Invert (205mm) MH1
183.25	0.0674	0	Bottom of storage tanks
183.45	0.0787	86	Tank storage
183.65	0.0885	173	Tank storage
183.85	0.0973	259	Tank storage
184.05	0.1054	346	Tank storage
184.25	0.1130	432	Top of storage tanks
[A] Discharge based on 205-mm-diameter orifice plate on MH1. See Appendix C			

The post-development conditions were modelled using SWMHYMO for the 2-, 5-, and 100-year (4-hour duration) Fort Erie City design storms. Table 6.5 summarizes the post-development peak flows from the total site area as well as the two outlets. Pre-development peak flows (from Table 6.2) have been shown for comparison. The required tank storage volume is also included. See Appendix C for the SWMHYMO input/output files.

Table 6.5 – Post-Development Site Discharge Comparison and Volume Summary

Storm Event	Total Site Area (all outlets) (m^3/s)		Belleview Boulevard Outlet (201 controlled + uncontrolled 202, 203, and 204) (m^3/s)			Northeast Outlet (Catchment 205 to woodlot) (m^3/s)	
	Post	Pre	**Post**	Pre	**Req'd Storage Volume (m^3)**	**Post**	Pre
2-year	**0.099**	0.103	**0.096**	0.098	**102**	**0.006**	0.008
5-year	**0.125**	0.139	**0.117**	0.126	**171**	**0.014**	0.019
100-year	**0.216**	0.265	**0.183**	0.220	**407**	**0.044**	0.056

The results of the analysis show that post-development peak flows are less than pre-development flows for the total site and to the individual outlets. There is also sufficient storage available in the underground storage area to contain and control up to the 100-year storm event.

Water quality control for the site will be provided by a HydroStorm HS-10 Oil/Grit separator unit. The unit was sized to service Catchment 201 (1.807 ha at 72% impervious), representing all the impervious driveways and parking areas, roof areas, and landscaped surface areas. The impevious coverage for the remaining catchment areas (202 to 205) is comprised of roof runoff that is considered clean. Based on the City of St. Catharines (the nearest rain gauge in the sizing software), and City of Toronto particle size distribution (20µm to 1000 µm), the HS-10 unit will provide 85% TSS removal for 99% of the annual flow. The proposed oil/grit unit will be located downsteam of the site orifice control, which improves unit performance; however, to be conservative, the effects of controlled flow into the oil/grit unit were not considered in the design. See Appendix C for oil/grit sizing and maintenance information.

7.0 SITE GRADING

The grading of the site respects the existing grades along the property boundary, with the site graded to comply with slopes outlined as part of the Accessibility for Ontarians with Disabilities Act (AODA).

The grading also allows for the SWM objectives of capturing the runoff from the site and directing flows from the appropriate catchments towards the SWM infrastructure via an internal storm system. Grading within the 10 m dripline setback along the northern property line will be limited to the area immediately adjacent to the proposed buildings. The existing top-of-ditch elevations on the southern side will be maintained. Similarly for the ditch located inside the eastern property line, all proposed grading will match into the existing top-of-bank elevations such that the ditch is maintained in its existing condition. The grading also provides an emergency overland flow route to Belleview Boulevard via the northern site entrance. Refer to Drawing C2-1 for the proposed grading design.

8.0 EROSION AND SEDIMENT CONTROL

Sediment tracked onto the roadway during the course of construction will be monitored and cleaned by the Contractor daily or as required. A mud mat will be installed at the construction access to mitigate mud tracking onto the local roads. A silt fence will be installed around the development area to eliminate sediment from leaving the site and will remain in place and be maintained until landscaping has been completed and the soil has been vegetated. A silt fence will also be installed around stockpiles on the site, with the stockpiles kept a minimum of 2.5 m from the property boundary.

Filter fabric will be wrapped around storm structures to prevent silt or sediment-laden water from entering inlets. These will be inspected periodically to ensure that they have been properly installed and function as designed throughout construction.

The controls will be maintained, and accumulated sediments removed once their capture capacity has been decreased by one-third. It is proposed that, during construction activities, visual monitoring will be conducted periodically including after all major rain events. During the construction period, monitoring will consist of visual observation for the effectiveness of the sediment and erosion controls and sediment migration off-site. Inspections will be conducted until such time as the construction activities are complete and vegetation has established itself to a density equivalent to 70% of the background native vegetation density. The Contractor will keep in mind weather conditions when scheduling work to minimize dust to the neighbouring residential properties from construction activities.

A detailed sediment and erosion control plan will be prepared as part of the future Site Plan Application.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented above, it is concluded that the site can be developed to satisfy the requirements of the Town of Fort Erie, the Region of Niagara, and the Niagara Penninsula Convervation Authority. Therefore it is recommended that:

- The site will be serviced with 200-mm-diameter sanitary sewers with an outlet to the existing 200-mm-municipal sanitary sewer on Belleview Boulevard near the Pearl Street intersection.

- A 200-mm-diameter water service connection will be provided from the existing 150 mm watermain on Hazel Street near the southwestern site entrace to the proposed private hydrant location. The remainder of the private watermain can be 100 mm or 150 mm as shown on the plans. A meter chamber with backflow device will be installed inside the property to meter domestic and fire flows. Two new private fire hydrants will be installed on the eastern and western sides of the property. Two-hour rated fire firewalls will be placed between every two units.

- A private storm sewer system will be installed on site that will collect the controlled minor and major flows from the majority of the site area. The storm sewer will outlet to the existing 525 mm storm sewer on Belleview Boulevard. In conjunction with the uncontrolled drainage areas, on-site quantity control will be provided to control post-development flows to pre-development levels for the 2-year to 100-year storm events via a 205 mm orifice plate and 432 m^3 of underground stormwater storage tanks.

- Quality control will be provided by a HydroStorm HG-10 oil/grit unit.
- Erosion control measures will be implemented, monitored, and maintained during the construction period.

All of which are respectfully submitted,

WALTERFEDY

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02-Nov-2023
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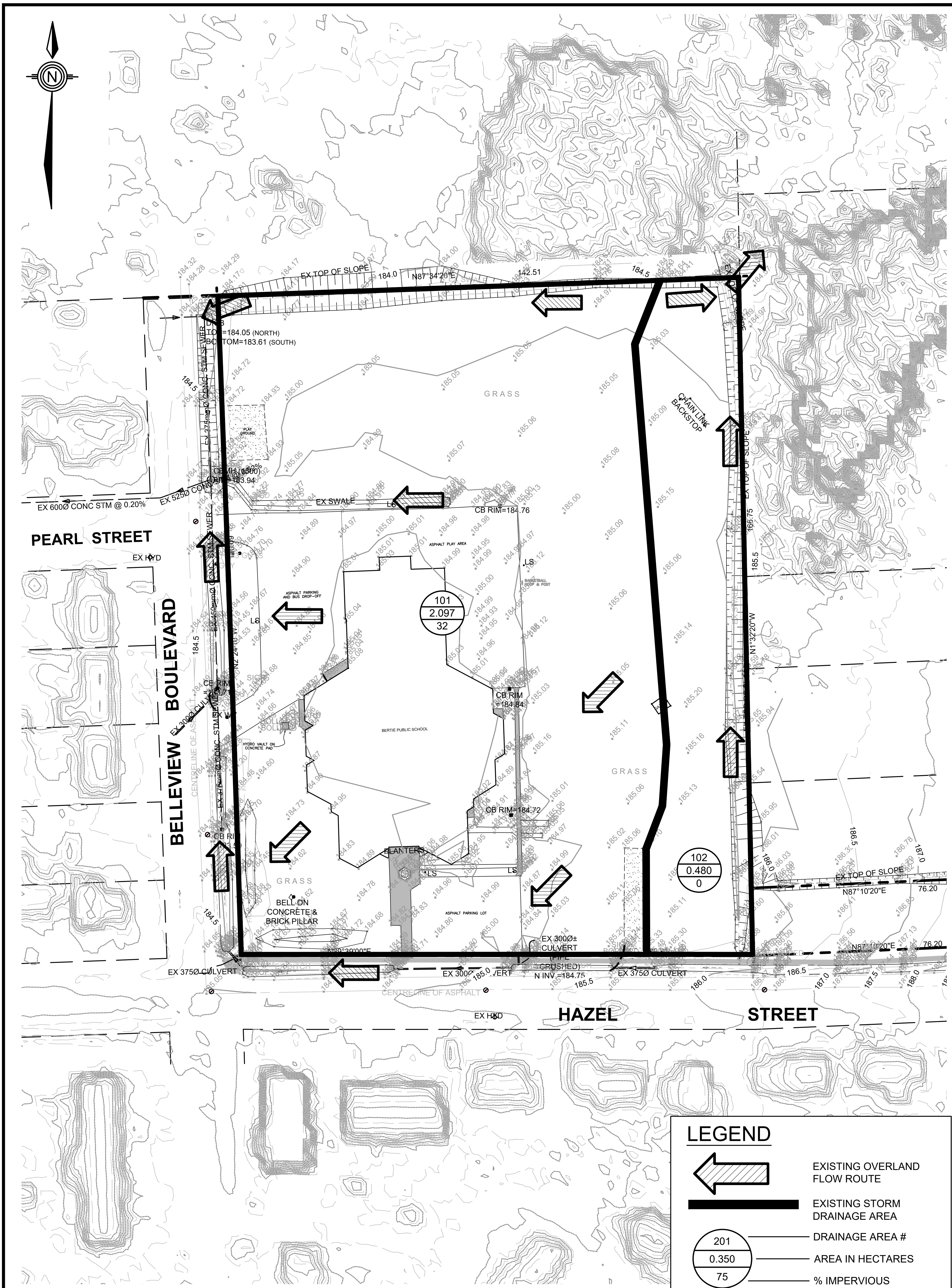

PROJECT:

3770 HAZEL STREET, TOWN OF FORT ERIE

TITLE:

PRE-DEVELOPMENT STORM DRAINAGE CATCHMENT FIGURE

WALTERFEDY
KITCHENER OFFICE
675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
T: 519.576.2150 F: 519.576.5499 walterfedy.com

SCALE:	1:1000	DATE:	2022-11-25
DRAWN BY:	MPB	PROJECT NO.:	2022-0365-10
CHECKED BY:	JO	FILE:	2022.0365.10_SWM_PRE

SHEET NO.:

FIGURE 2.0

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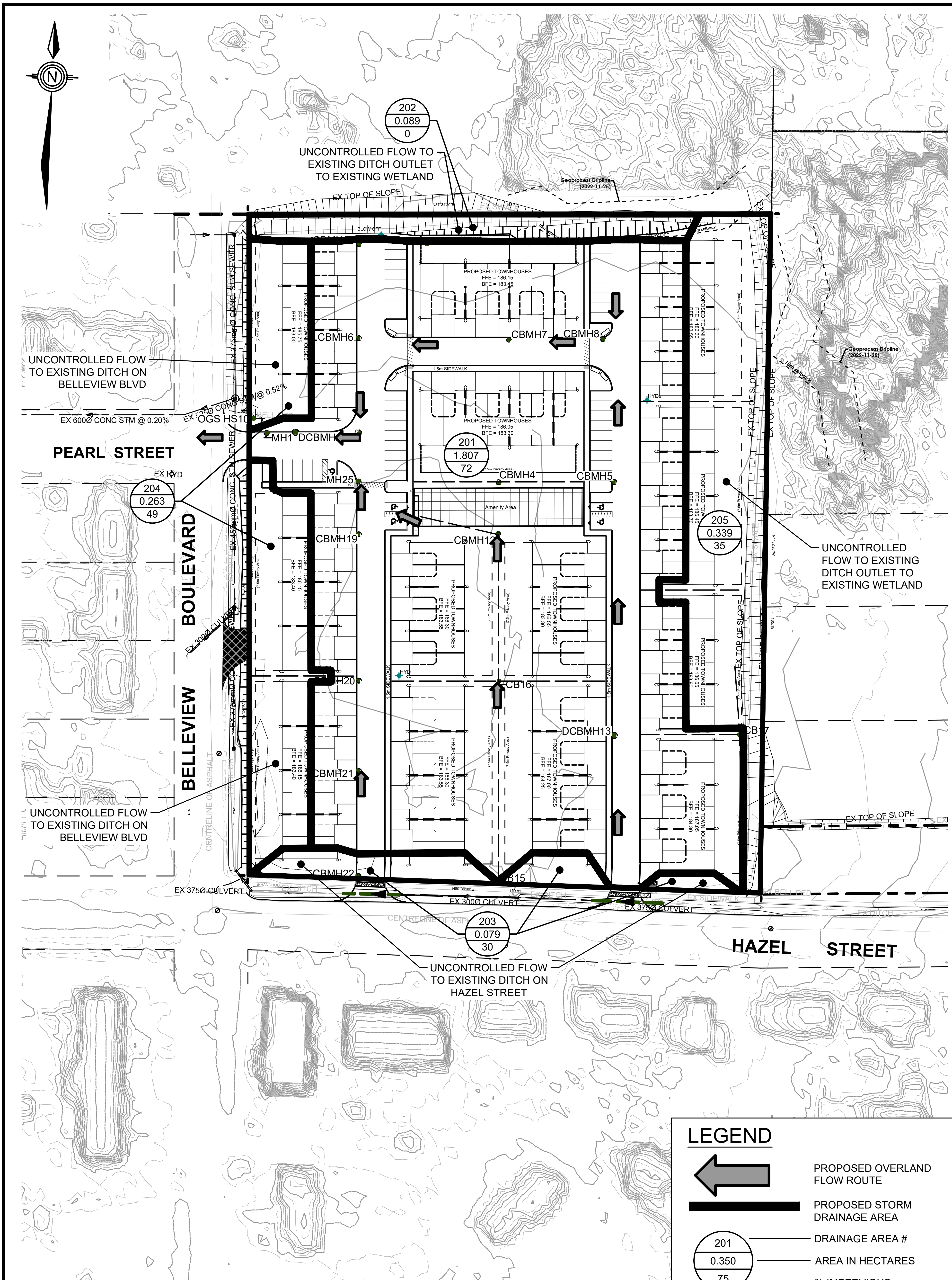

PROJECT:

3770 HAZEL STREET, TOWN OF FORT ERIE

TITLE:

POST-DEVELOPMENT STORM DRAINAGE CATCHMENT FIGURE

WALTERFEDY

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675 Queen Street South, Suite 111, Kitchener, Ontario N2M 1A1
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SCALE:	1:1000	DATE:	2023-10-26
DRAWN BY:	MPB	PROJECT NO.:	2022-0365-10
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SHEET NO.:

FIGURE 3.0

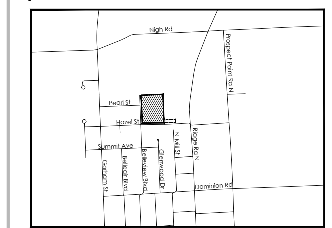
APPENDIX A

Site Plan

Legal Description

Lt 42 Pl 500 Bertie; Pt Lt 23 Con 2 Lake Erie Bertie Being Part 1 On 59r15291 Town Of Fort Erie

Key Plan



SITE STATISTICS

Residential Multiple 1 (RM-1) Zone		
	Required	Provided
Lot Area (min.)	4,000 m²	25,769 m² (2.57 ha)
Lot Frontage (min.)	50.0 m	139.8 m
Front Yard Setback (min.)	6.0 m (to garage) 4.0 m (to other parts of building)	6.0 m (to garage) 4.5 m (to other parts of building)
Interior Yard Setback (min.)	1.5 m	12.9 m
Exterior Yard Setback (min.)	3.0 m 6.0 m (when attached garage faces the exterior side yard)	9.5 m
Rear Yard (min.)	6.0 m	7.59 m
Height (max.)	3 Storeys 12.0 m	2 Storeys 12.0 m
Landscaped Area (min.)	50.0 % (including privacy areas)	45.5% (including privacy areas)
Units in a Row (max.)	8	8
Distance Between Buildings (min.)	15.0 m 3.0 m (between end walls) 9.0 m (between end wall + rear wall)	18.5 m 3.1 m (between end walls) 26.46 (between end wall + rear wall)
Proposed Units	-	93
Density (max.)	35 uph	36.1 uph
Lot Coverage (max.)	40.0 %	31.4 %
Distance Between Building to Internal Driveways and Parking Areas (min.)	3.0 m (front or rear face) 1.5 m (side wall)	3.29 m (front or rear face) 3.15 (side wall)
Off Street Parking	140 spaces (93 units x 1.5)	141 spaces
Accessible Parking	5 Spaces (Type A- 2% of total + Type B- 1% of total)	5 Spaces (2 Type A + 3 Type B)

Building Coverage (8,099 m²)	31.4%
Landscaped Area (11,735 m²)	45.5%
'Hard Surface' Area (5,935 m²)	23.1%
Total (25,769 m²)	100.0%

NOTES:
- All dimensions are in metres unless otherwise noted.

Revision No.	Date	Issued / Revision	By
1.	July 17, 2023	Preliminary Site Plan	GC

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

200-540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Stamp

Date July 17, 2023
Drawn By GC
Plan Scale 1:400 (Arch D)
File No. 1119B
Checked By CW

Project

3770 Hazel Street
Town of Fort Erie
Schout Communities Inc.

File Name SITE PLAN

Dwg No. 1 of 1

Scale Bar 5 0 5 10 20m

K:\1119B- 3770 Hazel St\SP\SP_July17_2023.dwg

APPENDIX B

Water Distribution and Fire Flow

2-HOUR RATED FIREWALL LOCATIONS

Legal Description

Lt 42 Pl 500 Bertie; Pt Lt 23 Con 2 Lake Erie Bertie Being Part 1 On 59r15291 Town Of Fort Erie

Key Plan

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NOTES:
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Revision No.	Date	Issued / Revision	By
1.	July 17, 2023	Preliminary Site Plan	GC

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE

200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Stamp

Date	July 17, 2023
Drawn By	GC
Plan Scale	1:400 (Arch D)
File No.	1119B
Checked By	CW

Project
3770 Hazel Street
Town of Fort Erie
Schout Communities Inc.

File Name: SITE PLAN

Dwg No. 1 of 1

Scale Bar 5 0 5 10 20m

K:\1119B- 3770 Hazel St\SP\SP_July17_2023.dwg

81 Todd Road Suite 202 Georgetown Ont. L7G 4R8
(o) 905-467-5853 (c) 905-971-9956 (e) mark@aquacom.ca

November 29, 2022

Rob Barnett
Walter Feddy
20 Hughson Street
Hamilton, Ontario
L8N 2A1

Reference: **L8N 2A1**
Town of Fort Erie
Hydrant Flow Testing

The flow testing was completed on Tuesday 22 November 2022 as scheduled.

As these hydrants are on a municipal watermain in the Town of Fort Erie their Water and Wastewater Division were scheduled to assist with the operation of the hydrants.

Please find the attached summary of test results. For your information;

the hydrants were flowed from one than two nozzles, using flow diffusers

residual pressures were recorded from an adjacent fire hydrant

theoretical flows were produced from the attached chart, using a .90 nozzle coefficient

all discharge water was dechlorinated as per Ministry requirements

the hydrant was not colour coded

If you should require any further information please do not hesitate to contact the undersigned.

Sincerely yours,

Aquacom Contracting
Mark Kilbourne

AQUACOM CONTRACTING
81 Todd Road Suite 202 Georgetown Ont. L7G 4R8
(o) 905-467-5853 (C) 905-971-9956 (e) mark@aquacom.ca

SITE NAME	3370 HAZEL STREET
TEST DATE TIME	TUESDAY 22 NOVEMBER 2022 @ 12:45
SITE ADDRESS	3370 HAZEL STREET, TOWN OF FORT ERIE
TECHNICIANS	MARC COULTER & JEFF DAM
COMMENTS	MUNICIPAL HYDRANTS, ASSISTED BY T of FE

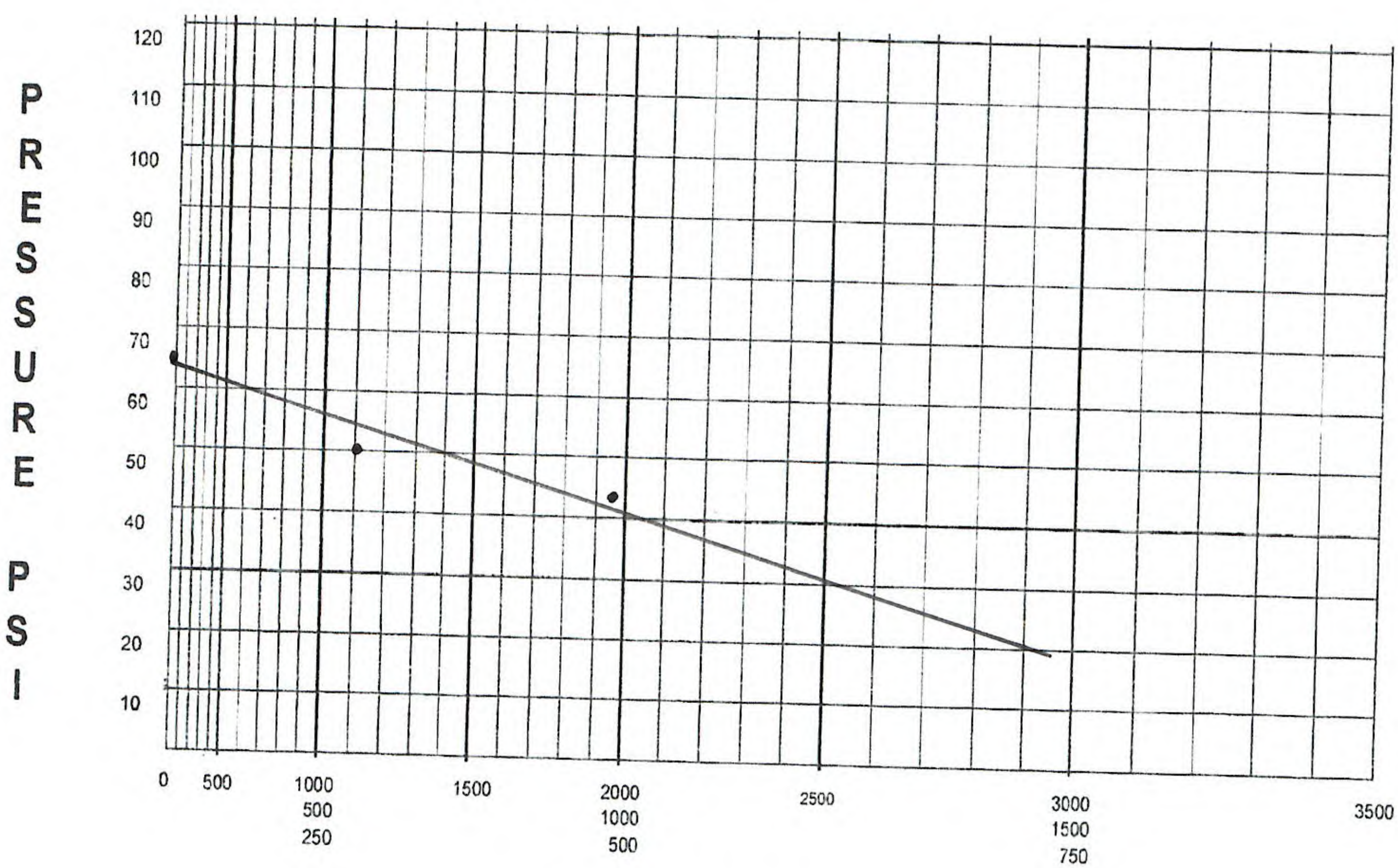
LOCATION OF FLOW HYDRANT

3759 HAZEL STREET

LOCATION OF RESIDUAL HYDRANT

3711 HAZEL STREET

# OUTLETS	SIZE INCHES	PITO PSI	FLOW USGPM	RESIDUAL PSI	STATIC PSI	PIPE DIA. MM
ONE	2.50	43	1100	50	65	150
TWO	2.50	34	1958	43		PVC
		THEORETICAL	2882	20	TEST #	ONE
NOZZLE COEFF.		.90				



FLOW US GPM

AQUACOM CONTRACTING
81 Todd Road Suite 202 Georgetown Ont. L7G 4R8
(o) 905-467-5853 (C) 905-971-9956 (e) mark@aquacom.ca

SITE NAME	3370 HAZEL STREET
TEST DATE TIME	TUESDAY 22 NOVEMBER 2022 @ 13:05
SITE ADDRESS	3370 HAZEL STREET, TOWN OF FORT ERIE
TECHNICIANS	MARC COULTER & JEFF DAM
COMMENTS	MUNICIPAL HYDRANTS, ASSISTED BY T of FE

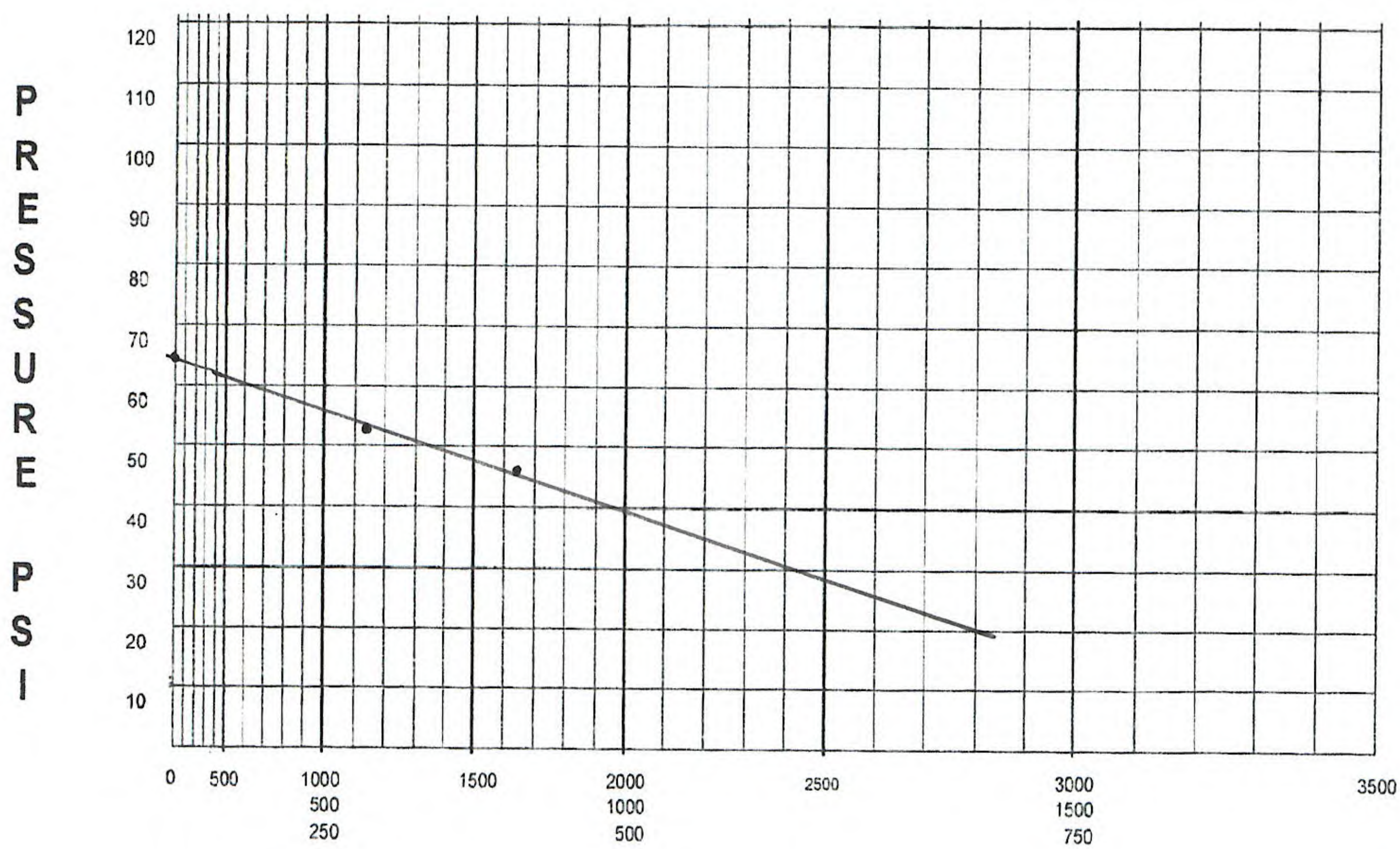
LOCATION OF FLOW HYDRANT

559 BELLVIEW BLVD

LOCATION OF RESIDUAL HYDRANT

3711 HAZEL STREET

# OUTLETS	SIZE INCHES	PITO PSI	FLOW USGPM	RESIDUAL PSI	STATIC PSI	PIPE DIA. MM
ONE	2.50	45	1125	52	65	150
TWO	2.50	23	1611	46		PVC
		THEORETICAL	2566	20	TEST #	ONE
NOZZLE COEFF.		.90				



FLOW US GPM

AQUACOM CONTRACTING

81 Todd Road Suite 202 Georgetown Ont. L7G 4R8

(o) 905-467-5853 (c) 905-971-9956 (e) mark@aquacom.ca

HYDRANT FLOW TEST REPORT

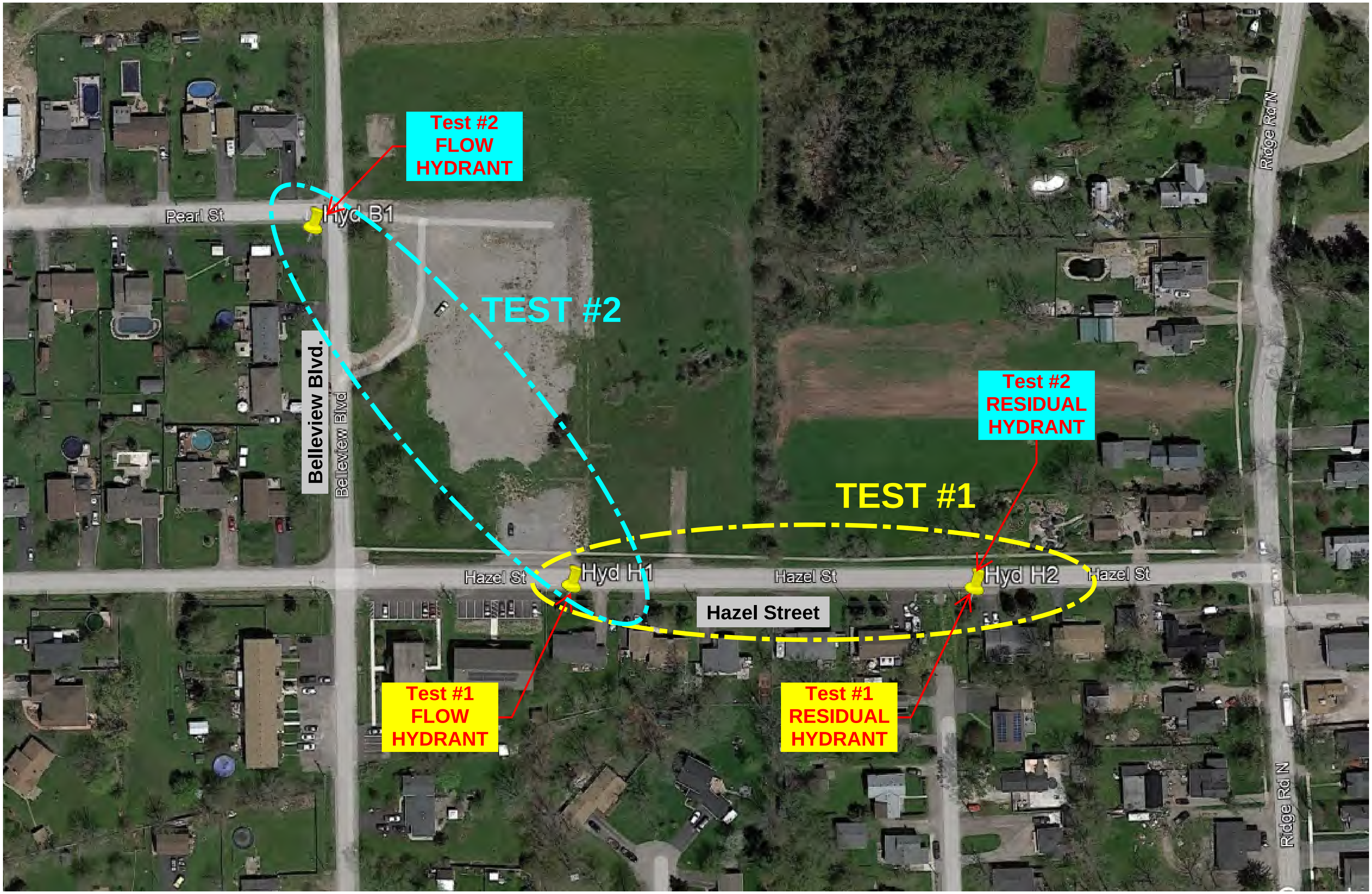
Test		Address	HYDRANT MAKE	SEC. VALVE CONDITION	TECH.	TIME	STATIC PSI	PITO 1-2.50" PSI	FLOW 1-2.50" US GPM	RESIDUAL 1-2.50" PSI	PITO 2-2.50" PSI	FLOW 2-2.50" US GPM	RESIDUAL 2-2.50" PSI	THEORETICAL FLOW @ 20PSI RESIDUAL	COLOUR CODE
TEST 1	F1	3759 HAZEL STREET	M67	OK/OPEN	JD	12:45		43	1100		34	1958		2882	BLUE
TEST 1	R1	3711 HAZEL STREET	M67	OK/OPEN	MC		65		*(69 l/s)*	50		*(123 l/s)*	43	*(182 l/s)*	
TEST 2	F2	559 BELLVIEW BLVD	B50B18	OK/OPEN	JD	13:05		45	1125		43	1611		2566	BLUE
TEST 2	R2	3711 HAZEL STREET	M67	OK/OPEN	MC		65		*(71 l/s)*	52		*(102 l/s)*	46	*(162 l/s)*	
	F3														
	R3														
	F4														
	R4														
	F5														
	R5														

CUSTOMER	SERVICE DATE	LOCATION	CONTACTS ON SITE
WALTER FEDDY	22-11-2022	3370 HAZEL STREET	TOWN OF FORT ERIE OPERATOR
		TOWN OF FORT ERIE	

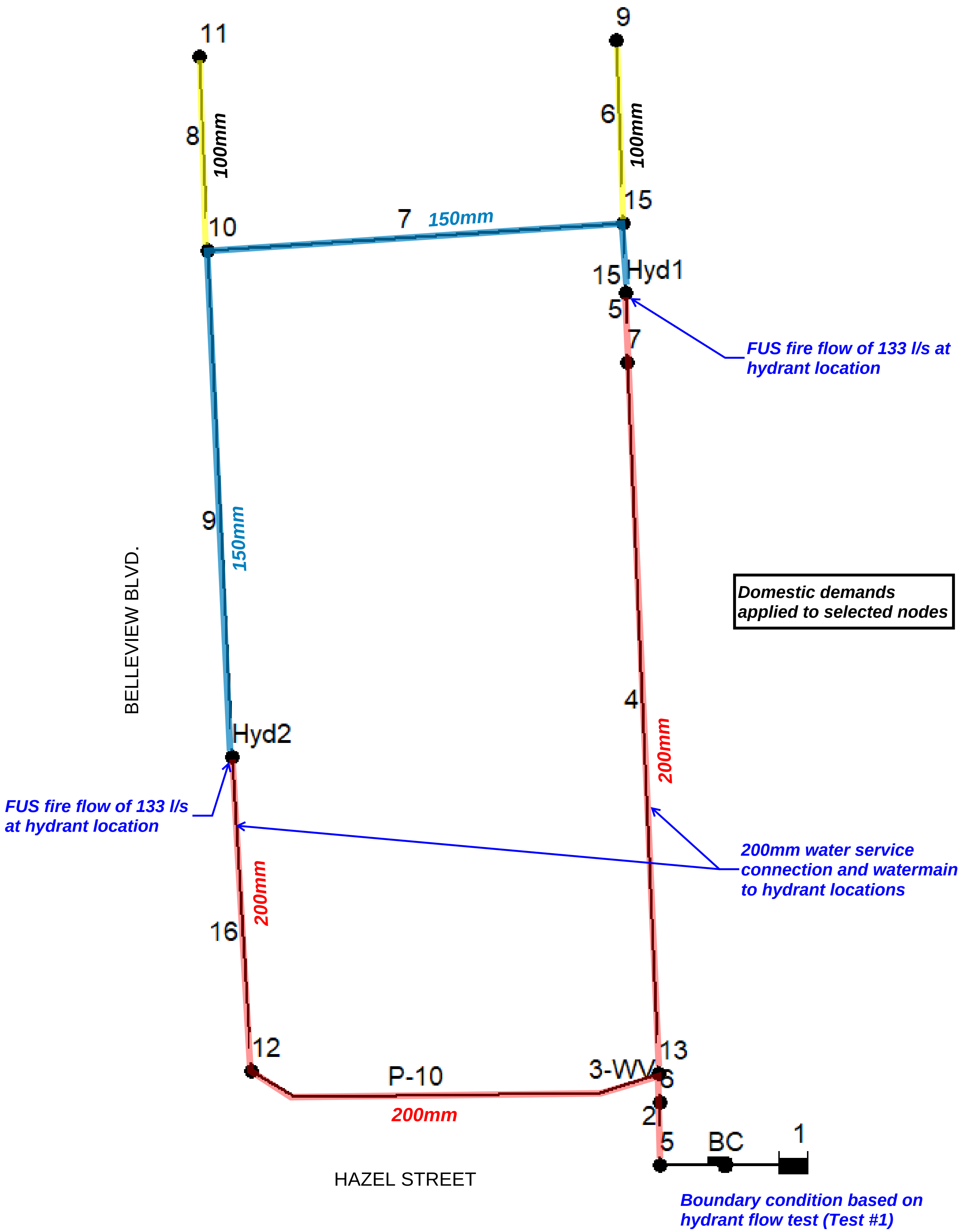
3770 HAZEL STREET
TOWN OF FORT ERIE

HYDRANT FLOW TESTING

PROJECT NO.: 2022.0365.10



EPANET MODEL SCHEMATIC



EPANET ANALYSIS RESULTS - MAX DAY + FIRE FLOW DEMAND @ HYD1

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Resvr 1	185.5	-135.45	185.50	0.00
Junc Hyd1	185.4	133.00	202.29	16.89
Junc 7	185.4	0.89	202.88	17.48
Junc 15	185.2	0.00	202.69	17.49
Junc 9	185	0.37	202.68	17.68
Junc 11	185	0.39	205.49	20.49
Junc 10	185.00	0.37	205.50	20.50
Junc Hyd2	185.40	0.00	209.09	23.69
Junc 12	185	0.43	209.61	24.61
Junc 13	185.6	0.00	210.36	24.76
Junc 6	185.6	0.00	210.81	25.21
Junc 5	185.5	0.00	212.47	26.97

166 kPa / 24 psi (> 20 psi ...ok)

EPANET ANALYSIS RESULTS - MAX DAY + FIRE FLOW DEMAND @ HYD2

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Resvr 1	185.5	-135.45	185.50	0.00
Junc Hyd2	185.40	133.00	202.95	17.55
Junc 12	185	0.43	206.00	21.00
Junc 11	185	0.39	206.03	21.03
Junc 10	185.00	0.37	206.03	21.03
Junc 15	185.2	0.00	208.64	23.44
Junc Hyd1	185.4	0.00	209.03	23.63
Junc 9	185	0.37	208.64	23.64
Junc 7	185.4	0.89	209.12	23.72
Junc 13	185.6	0.00	210.36	24.76
Junc 6	185.6	0.00	210.81	25.21
Junc 5	185.5	0.00	212.47	26.97

172 kPa / 25 psi (> 20 psi ...ok)

EPANET ANALYSIS RESULTS - PEAK HOUR DEMAND

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Resvr 1	185.5	-3.70	185.50	0.00
Junc 13	185.6	0.00	230.63	45.03
Junc 6	185.6	0.00	230.63	45.03
Junc 5	185.5	0.00	230.63	45.13
Junc Hyd1	185.4	0.00	230.62	45.22
Junc 7	185.4	1.35	230.62	45.22
Junc Hyd2	185.40	0.00	230.63	45.23
Junc 15	185.2	0.00	230.62	45.42
Junc 11	185	0.58	230.62	45.62
Junc 9	185	0.56	230.62	45.62
Junc 10	185.00	0.56	230.62	45.62
Junc 12	185	0.64	230.63	45.63

441 kPa / 64 psi
(> 40 psi, < 100 psi ...ok)

APPENDIX C

Stormwater Management Information

WALTERFEDY

Town of Fort IDF Curve Parameters

Source: *Subdvision Control Guidelines for Development of New Subdivisions* , Town of Fort Erie, 2021

TABLE 2 – RAINFALL INTENSITY DATA

Return Frequency	A	B	C
2 Year	628.05	6.652	0.796
5 Year	747.93	6.800	0.768
100 Year	1083.55	6.618	0.735

STAGE-STORAGE-DISCHARGE CALCULATIONS FOR ON-SITE STORAGE - CATCHMENT 201

Outlet Device No. 1 (Quality & Erosion)

Type:	Circular Orifice
Diameter (mm)	**205**
Area (m^2)	0.03301
Invert Elev. (m)	182.56
C/L Elev. (m)	182.66
Disch. Coeff. (C_d)	0.62
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1

Outlet Device No. 2 (Quantity)

Type:	Circular Orifice
Diameter (mm)	0
Area (m^2)	0.00000
Invert Elev. (m)	0.00
C/L Elev. (m)	0.00
Disch. Coeff. (C_d)	0.62
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1
Spill into DICB structure elev. (m)	0.00

Outlet Device No. 3

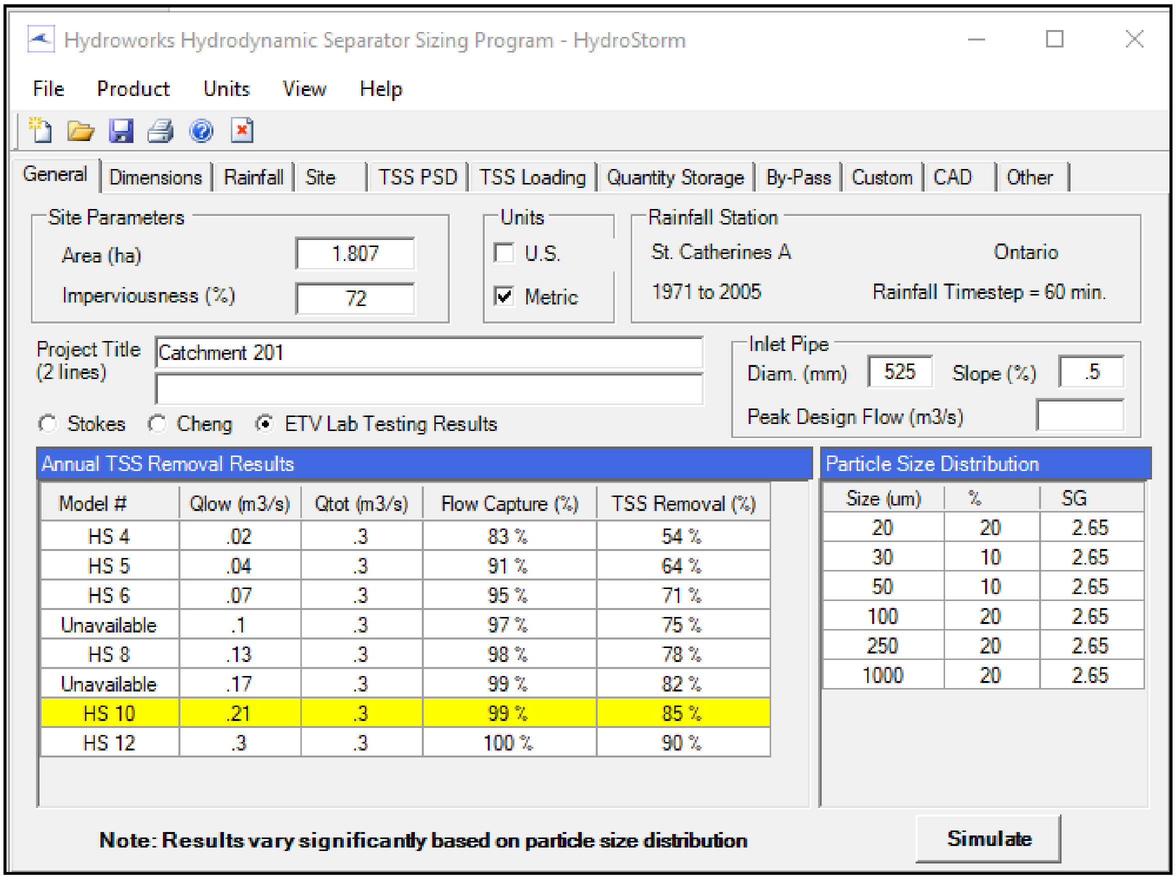
Type:	
Diameter (mm)	0
Area (m^2)	0.00000
Invert Elev. (m)	0.00
C/L Elev. (m)	0.00
Disch. Coeff. (C_d)	0
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	0

Outlet No. 4 (Quantity)

Type:	Broad crested overflow weir
Sill Elevation (m)	0.00
Length (m)	0.0
Discharge (Q) =	$1.67 L H^{1.5}$

		SWM Pond Volumes				Outlet No. 1		Outlet No. 2		Outlet No. 3		Outlet No. 4		
	Elevation m	Area m^2	Incremental Volume m^3	Active Volume m^3	**96% of Active Volume m^3**	H m	Discharge m^3/s	H m	Discharge m^3/s	H m	Discharge m^3/s	H m	Discharge m^3/s	**Total Discharge m^3/s**
Orifice Invert	182.56	0	0	0	0	0.00	0.000							0.0000
Bottom Stormcon Tank	183.25	450	0	0	0	0.69	0.067							0.0674
	183.45	450	90	90	86	0.89	0.079							0.0787
	183.65	450	90	180	173	1.09	0.089							0.0885
	183.85	450	90	270	259	1.29	0.097							0.0973
	184.05	450	90	360	346	1.49	0.105							0.1054
Top of Stormcon Tank	184.25	450	90	450	432	1.69	0.113							0.1130

Water Quality Unit Sizing



Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units View Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Other

Site Parameters
Area (ha) 1.807
Imperviousness (%) 72

Units
U.S.
☑ Metric

Rainfall Station
St. Catherines A Ontario
1971 to 2005 Rainfall Timestep = 60 min.

Project Title (2 lines) Catchment 201

Inlet Pipe
Diam. (mm) 525 Slope (%) .5
Peak Design Flow (m3/s)

○ Stokes ○ Cheng ◉ ETV Lab Testing Results

Annual TSS Removal Results

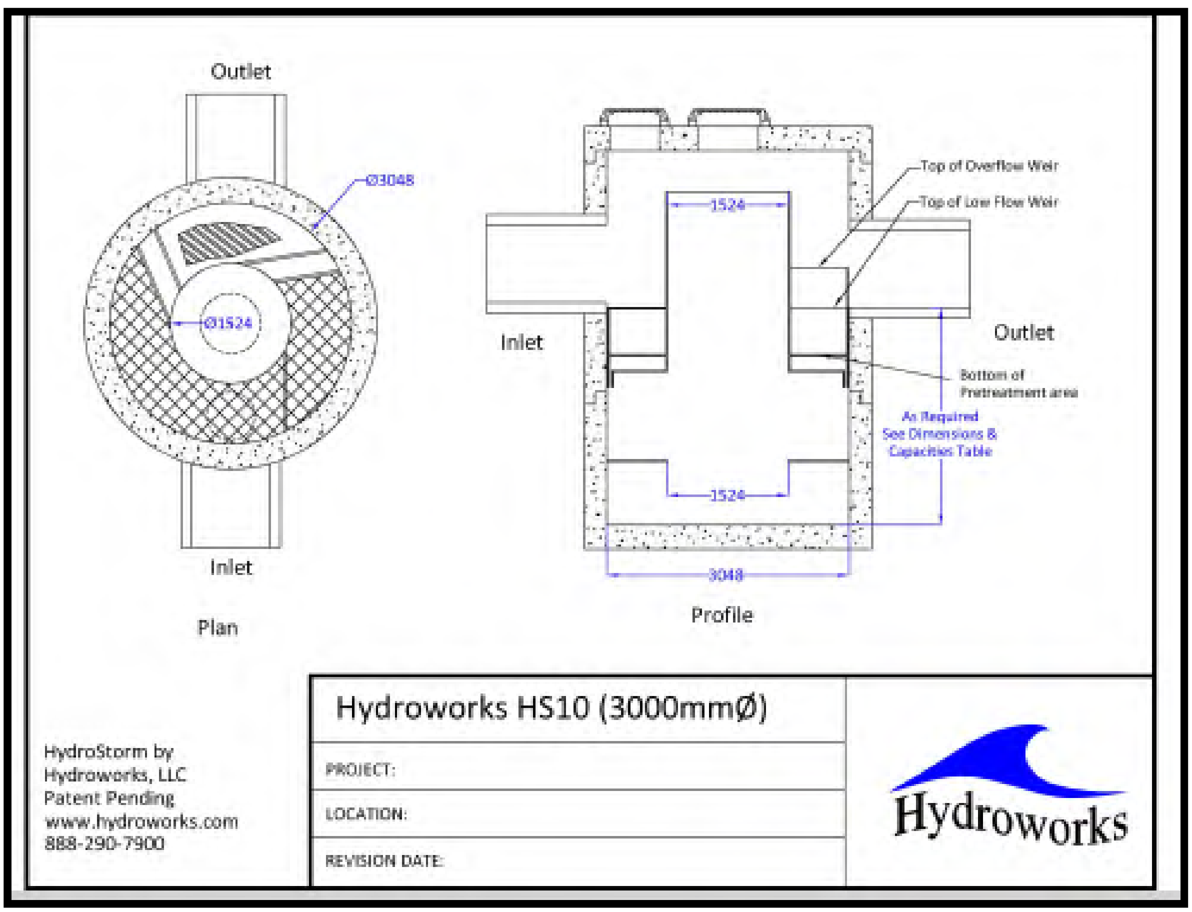
Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
HS 4	.02	.3	83 %	54 %
HS 5	.04	.3	91 %	64 %
HS 6	.07	.3	95 %	71 %
Unavailable	.1	.3	97 %	75 %
HS 8	.13	.3	98 %	78 %
Unavailable	.17	.3	99 %	82 %
HS 10	.21	.3	99 %	85 %
HS 12	.3	.3	100 %	90 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
30	10	2.65
50	10	2.65
100	20	2.65
250	20	2.65
1000	20	2.65

Note: Results vary significantly based on particle size distribution

Simulate



```
2     Metric units
*#*************************************************************************|
*#  Project Name: 3770 HAZEL STREET
*#               FORT ERIE (RIDEWAY), ONTARIO
*#  JOB NUMBER  : 2022-0365-10
*#       Date   : JANUARY 2023
*#    Revised   :
*#    Company   : WALTER FEDY
*#       File   : 22-0365.DAT
*#*************************************************************************|
*
START                TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
                     FE4-002.STM
*
READ STORM           STORM_FILENAME "STORM.001"
*
*#*************************************************************************|
*#        EXISTING CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#*************************************************************************|
*# CATCHMENT 101 - EXISTING SCHOOL SITE DRAINAING NORTH, SOUTH AND WEST
CALIB STANDHYD       ID=[1], NHYD=["102"], DT=[1](min), AREA=[2.097](ha),
                     XIMP=[0.25], TIMP=[0.32], DWF=[0](cms), LOSS=[2],
                     SCS curve number CN=[70],
                     Pervious   surfaces: IAper=[8.57](mm), SLPP=[0.5](%),
                                          LGP=[70](m), MNP=[0.250], SCP=[0](min),
                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[0.5](%),
                                          LGI=[20](m), MNI=[0.015], SCI=[0](min),
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*# CATCHMENT 102 - EXISTING SCHOOL YARD DRAINING EAST TO EXISTING DITCH
CALIB NASHYD         ID=[2], NHYD=["102"], DT=[1]min, AREA=[0.480](ha),
                     DWF=[0](cms),  CN/C=[75], IA=[8.47](mm),
                     N=[3], TP=[0.11]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
*# TOTAL EXISTING CONDITIONS SITE DISCHARGE
ADD HYD              IDsum=[3], NHYD=["EXIST"], IDs to add=[1 2]
*%-----------------|-------------------------------------------------------|
*#
*%-----------------|-------------------------------------------------------|
*#        PROPOSED CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#*************************************************************************|
*#########################################
*# BELLVIEW BLVD OUTLET
*#########################################
*# CATCHMENT 201 - MAIN SITE AREA
CALIB STANDHYD       ID=[1], NHYD=["201"], DT=[1](min), AREA=[1.807](ha),
                     XIMP=[0.72], TIMP=[0.72], DWF=[0](cms), LOSS=[2],
                     SCS curve number CN=[75],
                     Pervious   surfaces: IAper=[8.57](mm), SLPP=[2.0](%),
                                          LGP=[20](m), MNP=[0.250], SCP=[0](min),
                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.0](%),
                                          LGI=[30](m), MNI=[0.015], SCI=[0](min),
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*# ROUTE FLOWS THROUGH UNDERGROUND STOARGE TANKS FOR CENTRAL PORTION
*
ROUTE RESERVOIR      IDout=[6],   NHYD=["201SWM"],  IDin=[1],
```

```
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
  0 0
  0.0674   0.0000
  0.0787   0.0086
  0.0885   0.0173
  0.0973   0.0259
  0.1054   0.0346
  0.1130   0.0432
                                      -1       -1   (max twenty pts)
                          IDovf=[7], NHYDovf=["201OFL"]
*%-----------------|------------------------------------------------------------|
*# CATCHMENTS 202 - UNCONTROLLED PERIMERTER AREA DRAINING INTO NORTH DITCH UNCON
CALIB NASHYD        ID=[2], NHYD=["202"], DT=[1]min, AREA=[0.089](ha),
                    DWF=[0](cms),  CN/C=[75], IA=[8.57](mm),
                    N=[3], TP=[0.11]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|------------------------------------------------------------|
*# CATCHMENT 203 - SOUTH SIDE - UNCONTROLLED FLOW TO ROADSIDE DITCH
CALIB STANDHYD      ID=[3], NHYD=["203"], DT=[1](min), AREA=[0.079](ha),
                    XIMP=[0.15], TIMP=[0.30], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[75],
                    Pervious   surfaces: IAper=[8.57](mm), SLPP=[2.0](%),
                                         LGP=[7](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[20](%),
                                         LGI=[5](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*# CATCHMENT 204 - WEST SIDE REARLOT AND HALF ROOF UNCONTROLLED
CALIB STANDHYD      ID=[4], NHYD=["204"], DT=[1](min), AREA=[0.263](ha),
                    XIMP=[0.01], TIMP=[0.49], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[75],
                    Pervious   surfaces: IAper=[8.57](mm), SLPP=[2.0](%),
                                         LGP=[20](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[20](%),
                                         LGI=[7](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*
********************************************************************************
*########################################
*# NORTHEAST OUTLET TO WOODLOT
*########################################
*# CATCHMENT 205 - NORTHEAST CORNER OF SITE DRAINING TO WOODLOT
CALIB STANDHYD      ID=[5], NHYD=["205"], DT=[1](min), AREA=[0.339](ha),
                    XIMP=[0.01], TIMP=[0.38], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[75],
                    Pervious   surfaces: IAper=[8.57](mm), SLPP=[1.0](%),
                                         LGP=[60](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[20](%),
                                         LGI=[7](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*# TOTAL UNCONTROLLED DISCHARGE FROM SITE 201 + 202 + 203 + 204 + 205
ADD HYD             IDsum=[8], NHYD=["UNCON-1"], IDs to add=[1 2 3 4 5]
*%-----------------|------------------------------------------------------------|
*# TOTAL UNCONTROLLED DISCHARGE TO BELLEVIEW BLVD. 201 + 202 + 203 + 204
ADD HYD             IDsum=[9], NHYD=["UNCON-2"], IDs to add=[1 2 3 4]
*%-----------------|------------------------------------------------------------|
```

```
*%-----------------|-----------------------------------------------------------|
*# TOTAL CONTROLLED DISCHARGE TO BELLEVIEW BLVD. (201 w/SWM) + (202+203+204)
ADD HYD             IDsum=[10], NHYD=["UNCON-3"], IDs to add=[6 7 2 3 4]
*%-----------------|-----------------------------------------------------------|
*# TOTAL SITE DISCHARGE - CONTROLLED AND UNCONTROLLED TO ALL OUTLETS
ADD HYD             IDsum=[1], NHYD=["UNCON-4"], IDs to add=[6 7 2 3 4 5]
*%-----------------|-----------------------------------------------------------|
*
*%-----------------|-----------------------------------------------------------|
* RUN REMAINING FORT ERIE DESIGN STORMS
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    FE4-005.STM
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    FE4-100.STM
*
*%-----------------|-----------------------------------------------------------|
FINISH
```

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

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO       999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9  9   9   Ver  4.05
       S   W W   M   M  H   H    Y    M   M  O   O      9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9   =========
                                                       9   9  9   9   # 2018430
        StormWater Management HYdrologic Model          999    999    =========

 *******************************************************************************
 ***************************** SWMHYMO Ver/4.05  *****************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                OTTHYMO-83 and OTTHYMO-89.                   *********
 *******************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.           *********
 *********                  Ottawa,  Ontario: (613) 836-3884            *********
 *********                  Gatineau, Quebec: (819) 243-6858            *********
 *********                  E-Mail: swmhymo@jfsa.Com                    *********
 *******************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: WalterFedy                                   +++++++++
 +++++++++               Kitchener             SERIAL#:2018430         +++++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *******************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 *******************************************************************************


 *********************  D E T A I L E D   O U T P U T  *********************
 *******************************************************************************
 *         DATE: 2023-02-01     TIME: 12:48:31     RUN COUNTER: 000367        *
 *******************************************************************************
 * Input   filename: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1\22-0365.dat   *
 * Output  filename: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1\22-0365.out   *
 * Summary filename: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1\22-0365.sum   *
 * User comments:                                                              *
 * 1:__________________________________________________________________________*
 * 2:__________________________________________________________________________*
 * 3:__________________________________________________________________________*
 *******************************************************************************

-------------------------------------------------------------------------------
001:0001-----------------------------------------------------------------------
*#***************************************************************************|
*#  Project Name: 3770 HAZEL STREET
*#                FORT ERIE (RIDEWAY), ONTARIO
*#  JOB NUMBER  : 2022-0365-10
*#       Date   : JANUARY 2023
*#    Revised   :
*#    Company   : WALTER FEDY
*#       File   : 22-0365.DAT
*#***************************************************************************|
*
```

```
  ** END OF RUN :   1

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
--------------------  Rainfall dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=FE4-002.STM
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
*#*************************************************************************|
*#  Project Name: 3770 HAZEL STREET
*#                FORT ERIE (RIDEWAY), ONTARIO
*#  JOB NUMBER  : 2022-0365-10
*#       Date   : JANUARY 2023
*#    Revised   :
*#    Company   : WALTER FEDY
*#       File   : 22-0365.DAT
*#*************************************************************************|
*
--------------------------------------------------------------------------------
002:0002------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: FORT ERIE - 2YR - 4HR CHICAGO STORM
| Ptotal=  31.33 mm|    Comments: FORT ERIE - 2YR - 4HR CHICAGO STORM
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   1.888 |   1.17   5.295 |   2.17   7.340 |   3.17   2.649
               .33   2.096 |   1.33   8.092 |   2.33   5.576 |   3.33   2.413
               .50   2.363 |   1.50  18.397 |   2.50   4.523 |   3.50   2.219
               .67   2.720 |   1.67  66.943 |   2.67   3.821 |   3.67   2.056
               .83   3.222 |   1.83  21.501 |   2.83   3.320 |   3.83   1.918
              1.00   3.985 |   2.00  10.891 |   3.00   2.943 |   4.00   1.799

--------------------------------------------------------------------------------
002:0003------------------------------------------------------------------------
*
*#*************************************************************************|
*#        EXISTING CONDITIONS HYDROLOGIC MODELING
*#        ========================================
*#*************************************************************************|
*# CATCHMENT 101 - EXISTING SCHOOL SITE DRAINAING NORTH, SOUTH AND WEST
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.10
| 01:102    DT= 1.00 |   Total Imp(%)=   32.00   Dir. Conn.(%)=   25.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .67          1.43
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=        .50           .50
```

```
     Length            (m)=      20.00        70.00
     Mannings n          =       .015         .250

     Max.eff.Inten.(mm/hr)=      66.94         9.96
                over (min)        2.00        39.00
     Storage Coeff.  (min)=       1.53 (ii)   39.18 (ii)
     Unit Hyd. Tpeak (min)=       2.00        39.00
     Unit Hyd. peak  (cms)=        .66          .03
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .10          .01           .098 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.43          1.667
     RUNOFF VOLUME    (mm)=      30.33         4.54         10.987
     TOTAL RAINFALL   (mm)=      31.33        31.33         31.329
     RUNOFF COEFFICIENT   =        .97          .14           .351

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004------------------------------------------------------------------------
*# CATCHMENT 102 - EXISTING SCHOOL YARD DRAINING EAST TO EXISTING DITCH
----------------------
| CALIB NASHYD       |   Area    (ha)=     .48   Curve Number   (CN)=75.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.470   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=     .167

     PEAK FLOW       (cms)=     .008 (i)
     TIME TO PEAK    (hrs)=    1.783
     RUNOFF VOLUME    (mm)=    4.859
     TOTAL RAINFALL   (mm)=   31.329
     RUNOFF COEFFICIENT   =     .155

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

--------------------------------------------------------------------------------
002:0005------------------------------------------------------------------------
*# TOTAL EXISTING CONDITIONS SITE DISCHARGE
------------------------
| ADD HYD (EXIST     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:102          2.10      .098    1.67  10.99    .000
                    +ID2 02:102           .48      .008    1.78   4.86    .000
                     ===========================================================
                     SUM 03:EXIST         2.58      .103    1.67   9.85    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0006------------------------------------------------------------------------
*#
*#        PROPOSED CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#**************************************************************************|
*#########################################
*# BELLVIEW BLVD OUTLET
```

```
*#########################################
*# CATCHMENT 201 - MAIN SITE AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.81
| 01:201    DT= 1.00 |   Total Imp(%)=   72.00   Dir. Conn.(%)=   72.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.30           .51
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      30.00         20.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      66.94          7.07
                over (min)        2.00         15.00
     Storage Coeff.  (min)=       1.59 (ii)    15.02 (ii)
     Unit Hyd. Tpeak (min)=       2.00         15.00
     Unit Hyd. peak  (cms)=        .64           .08
                                                                *TOTALS*
     PEAK FLOW       (cms)=        .24           .01              .243 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.97             1.667
     RUNOFF VOLUME    (mm)=      30.33          4.82            23.187
     TOTAL RAINFALL   (mm)=      31.33         31.33            31.329
     RUNOFF COEFFICIENT   =        .97           .15              .740

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0007------------------------------------------------------------------------
*# ROUTE FLOWS THROUGH UNDERGROUND STOARGE TANKS FOR CENTRAL PORTION
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201   )   |
| OUT<06:(201SWM)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |   (cms)    (ha.m.)
                            .000  .0000E+00   |     .097  .2590E-01
                            .067  .0000E+00   |     .105  .3460E-01
                            .079  .8600E-02   |     .113  .4320E-01
                            .089  .1730E-01   |     .000  .0000E+00

     ROUTING RESULTS             AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )        1.81      .243     1.667     23.187
     OUTFLOW<06: (201SWM)        1.81      .080     1.833     23.251
    OVERFLOW<07: (201OFL)         .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   33.153
                   TIME SHIFT OF PEAK FLOW         (min)=    10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1013E-01
```

```
------------------------------------------------------------------------------------
002:0008---------------------------------------------------------------------------
*# CATCHMENTS 202 - UNCONTROLLED PERIMERTER AREA DRAINING INTO NORTH DITCH UNCON
----------------------
| CALIB NASHYD       |   Area    (ha)=     .09   Curve Number   (CN)=75.00
| 02:202    DT= 1.00 |   Ia      (mm)=   8.570   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=     .031

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.783
     RUNOFF VOLUME    (mm)=    4.819
     TOTAL RAINFALL   (mm)=   31.329
     RUNOFF COEFFICIENT   =     .154

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

------------------------------------------------------------------------------------
002:0009---------------------------------------------------------------------------
*# CATCHMENT 203 - SOUTH SIDE - UNCONTROLLED FLOW TO ROADSIDE DITCH
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .08
| 03:203    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   15.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .02           .06
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=      20.00          2.00
     Length            (m)=       5.00          7.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      66.94         17.96
                over (min)       1.00          5.00
     Storage Coeff.  (min)=        .22 (ii)     5.15 (ii)
     Unit Hyd. Tpeak (min)=       1.00          5.00
     Unit Hyd. peak  (cms)=       1.68           .22
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .00           .00            .004 (iii)
     TIME TO PEAK    (hrs)=       1.60          1.72           1.667
     RUNOFF VOLUME    (mm)=      30.33          6.27           9.876
     TOTAL RAINFALL   (mm)=      31.33         31.33          31.329
     RUNOFF COEFFICIENT   =        .97           .20            .315

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------------
002:0010---------------------------------------------------------------------------
*# CATCHMENT 204 - WEST SIDE REARLOT AND HALF ROOF UNCONTROLLED
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .26
| 04:204    DT= 1.00 |   Total Imp(%)=   49.00   Dir. Conn.(%)=    1.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13           .13
```

```
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=      20.00          2.00
     Length            (m)=       7.00         20.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      66.94         46.18
                over (min)        1.00          7.00
     Storage Coeff.  (min)=        .27 (ii)     6.61 (ii)
     Unit Hyd. Tpeak (min)=       1.00          7.00
     Unit Hyd. peak  (cms)=       1.66           .17
                                                                *TOTALS*
     PEAK FLOW       (cms)=        .00           .01              .012 (iii)
     TIME TO PEAK    (hrs)=       1.62          1.75             1.750
     RUNOFF VOLUME    (mm)=      30.33         10.27            10.471
     TOTAL RAINFALL   (mm)=      31.33         31.33            31.329
     RUNOFF COEFFICIENT   =        .97           .33              .334

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0011------------------------------------------------------------------------
*
********************************************************************************
*#########################################
*# NORTHEAST OUTLET TO WOODLOT
*#########################################
*# CATCHMENT 205 - NORTHEAST CORNER OF SITE DRAINING TO WOODLOT
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 05:205    DT= 1.00 |   Total Imp(%)=   38.00   Dir. Conn.(%)=    1.00
----------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13           .21
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=      20.00          1.00
     Length            (m)=       7.00         60.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=      66.94         18.83
                over (min)        1.00         22.00
     Storage Coeff.  (min)=        .27 (ii)    21.88 (ii)
     Unit Hyd. Tpeak (min)=       1.00         22.00
     Unit Hyd. peak  (cms)=       1.66           .05
                                                                *TOTALS*
     PEAK FLOW       (cms)=        .00           .01              .006 (iii)
     TIME TO PEAK    (hrs)=       1.60          2.03             2.017
     RUNOFF VOLUME    (mm)=      30.33          8.53             8.751
     TOTAL RAINFALL   (mm)=      31.33         31.33            31.329
     RUNOFF COEFFICIENT   =        .97           .27              .279

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
002:0012------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE FROM SITE 201 + 202 + 203 + 204 + 205
------------------------
| ADD HYD (UNCON-1   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:201            1.81      .243    1.67  23.19    .000
                   +ID2 02:202             .09      .002    1.78   4.82    .000
                   +ID3 03:203             .08      .004    1.67   9.88    .000
                   +ID4 04:204             .26      .012    1.75  10.47    .000
                   +ID5 05:205             .34      .006    2.02   8.75    .000
                    ============================================================
                    SUM 08:UNCON-1        2.58      .258    1.67  18.95    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0013------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE TO BELLEVIEW BLVD. 201 + 202 + 203 + 204
------------------------
| ADD HYD (UNCON-2   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:201            1.81      .243    1.67  23.19    .000
                   +ID2 02:202             .09      .002    1.78   4.82    .000
                   +ID3 03:203             .08      .004    1.67   9.88    .000
                   +ID4 04:204             .26      .012    1.75  10.47    .000
                    ============================================================
                    SUM 09:UNCON-2        2.24      .257    1.67  20.49    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0014------------------------------------------------------------------------
*# TOTAL CONTROLLED DISCHARGE TO BELLEVIEW BLVD. (201 w/SWM) + (202+203+204)
------------------------
| ADD HYD (UNCON-3   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 06:201SWM         1.81      .080    1.83  23.25    .000
                   +ID2 07:201OFL          .00      .000     .00    .00    .000
                   +ID3 02:202             .09      .002    1.78   4.82    .000
                   +ID4 03:203             .08      .004    1.67   9.88    .000
                   +ID5 04:204             .26      .012    1.75  10.47    .000
                    ============================================================
                    SUM 10:UNCON-3        2.24      .096    1.75  20.54    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0015------------------------------------------------------------------------
*# TOTAL SITE DISCHARGE - CONTROLLED AND UNCONTROLLED TO ALL OUTLETS
------------------------
| ADD HYD (UNCON-4   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 06:201SWM         1.81      .080    1.83  23.25    .000
                   +ID2 07:201OFL          .00      .000     .00    .00    .000
                   +ID3 02:202             .09      .002    1.78   4.82    .000
                   +ID4 03:203             .08      .004    1.67   9.88    .000
                   +ID5 04:204             .26      .012    1.75  10.47    .000
                   +ID6 05:205             .34      .006    2.02   8.75    .000
                    ============================================================
```

```
                    SUM 01:UNCON-4        2.58     .099    1.75  18.99    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
002:0016------------------------------------------------------------------------
*
* RUN REMAINING FORT ERIE DESIGN STORMS
*
  ** END OF RUN :   4

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
--------------------  Rainfall dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=FE4-005.STM
--------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
*#****************************************************************************|
*#  Project Name: 3770 HAZEL STREET
*#                FORT ERIE (RIDEWAY), ONTARIO
*#  JOB NUMBER  : 2022-0365-10
*#       Date   : JANUARY 2023
*#    Revised   :
*#    Company   : WALTER FEDY
*#       File   : 22-0365.DAT
*#****************************************************************************|
*
--------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: FORT ERIE - 5YR - 4HR CHICAGO STORM
| Ptotal=  43.51 mm|    Comments: FORT ERIE - 5YR - 4HR CHICAGO STORM
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   2.935 |   1.17   7.819 |   2.17  10.649 |   3.17   4.054
               .33   3.243 |   1.33  11.671 |   2.33   8.212 |   3.33   3.709
               .50   3.636 |   1.50  25.288 |   2.50   6.735 |   3.50   3.424
               .67   4.156 |   1.67  85.669 |   2.67   5.741 |   3.67   3.185
               .83   4.882 |   1.83  29.337 |   2.83   5.024 |   3.83   2.980
              1.00   5.974 |   2.00  15.453 |   3.00   4.480 |   4.00   2.803

--------------------------------------------------------------------------------
005:0003------------------------------------------------------------------------
*
*#****************************************************************************|
*#        EXISTING CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#****************************************************************************|
```

```
*# CATCHMENT 101 - EXISTING SCHOOL SITE DRAINAING NORTH, SOUTH AND WEST
----------------------
| CALIB STANDHYD      |   Area    (ha)=    2.10
| 01:102    DT= 1.00 |   Total Imp(%)=   32.00   Dir. Conn.(%)=   25.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .67          1.43
     Dep. Storage     (mm)=        1.00          8.57
     Average Slope     (%)=         .50           .50
     Length            (m)=       20.00         70.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       85.67          9.58
                over (min)        1.00         40.00
     Storage Coeff.  (min)=        1.39 (ii)   39.63 (ii)
     Unit Hyd. Tpeak (min)=        1.00         40.00
     Unit Hyd. peak  (cms)=         .87           .03
                                                              *TOTALS*
     PEAK FLOW       (cms)=         .12           .02            .126 (iii)
     TIME TO PEAK    (hrs)=        1.67          2.43           1.667
     RUNOFF VOLUME    (mm)=       42.51          9.50          17.753
     TOTAL RAINFALL   (mm)=       43.51         43.51          43.510
     RUNOFF COEFFICIENT   =         .98           .22            .408

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0004------------------------------------------------------------------------
*# CATCHMENT 102 - EXISTING SCHOOL YARD DRAINING EAST TO EXISTING DITCH
----------------------
| CALIB NASHYD        |   Area    (ha)=     .48   Curve Number   (CN)=75.00
| 02:102    DT= 1.00 |   Ia       (mm)=   8.470   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=      .167

     PEAK FLOW       (cms)=      .019 (i)
     TIME TO PEAK    (hrs)=     1.750
     RUNOFF VOLUME    (mm)=    10.256
     TOTAL RAINFALL   (mm)=    43.510
     RUNOFF COEFFICIENT   =      .236

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

--------------------------------------------------------------------------------
005:0005------------------------------------------------------------------------
*# TOTAL EXISTING CONDITIONS SITE DISCHARGE
------------------------
| ADD HYD (EXIST     ) | ID: NHYD        AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:102          2.10      .126    1.67  17.75    .000
                    +ID2 02:102           .48      .019    1.75  10.26    .000
                     ============================================================
                     SUM 03:EXIST        2.58      .139    1.67  16.36    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------------------------------------------------------------------
005:0006------------------------------------------------------------------------
*#
*#         PROPOSED CONDITIONS HYDROLOGIC MODELING
*#         ================================================
*#*************************************************************************|
*#########################################
*# BELLVIEW BLVD OUTLET
*#########################################
*# CATCHMENT 201 - MAIN SITE AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.81
| 01:201    DT= 1.00 |   Total Imp(%)=   72.00   Dir. Conn.(%)=   72.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.30           .51
     Dep. Storage     (mm)=       1.00          8.57
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      30.00         20.00
     Mannings n          =        .015          .250

     Max.eff.Inten.(mm/hr)=      85.67         16.50
                over (min)        1.00         11.00
     Storage Coeff.  (min)=       1.44 (ii)    11.01 (ii)
     Unit Hyd. Tpeak (min)=       1.00         11.00
     Unit Hyd. peak  (cms)=        .85           .10
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .31           .02            .316 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.83           1.667
     RUNOFF VOLUME    (mm)=      42.51         10.21          33.465
     TOTAL RAINFALL   (mm)=      43.51         43.51          43.510
     RUNOFF COEFFICIENT   =        .98           .23            .769

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0007------------------------------------------------------------------------
*# ROUTE FLOWS THROUGH UNDERGROUND STOARGE TANKS FOR CENTRAL PORTION
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201   )   |
| OUT<06:(201SWM)   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |    (cms)     (ha.m.)
                            .000  .0000E+00   |      .097  .2590E-01
                            .067  .0000E+00   |      .105  .3460E-01
                            .079  .8600E-02   |      .113  .4320E-01
                            .089  .1730E-01   |      .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )       1.81      .316     1.667     33.465
     OUTFLOW<06: (201SWM)       1.81      .088     1.867     33.543
    OVERFLOW<07: (201OFL)        .00      .000      .000       .000
```

```
                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   27.947
                   TIME SHIFT OF PEAK FLOW         (min)=    12.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1709E-01

--------------------------------------------------------------------------------
005:0008------------------------------------------------------------------------
*# CATCHMENTS 202 - UNCONTROLLED PERIMERTER AREA DRAINING INTO NORTH DITCH UNCON
----------------------
| CALIB NASHYD       |   Area    (ha)=     .09   Curve Number   (CN)=75.00
| 02:202    DT= 1.00 |   Ia      (mm)=   8.570   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=     .031

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    1.750
     RUNOFF VOLUME    (mm)=   10.204
     TOTAL RAINFALL   (mm)=   43.510
     RUNOFF COEFFICIENT   =     .235

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

--------------------------------------------------------------------------------
005:0009------------------------------------------------------------------------
*# CATCHMENT 203 - SOUTH SIDE - UNCONTROLLED FLOW TO ROADSIDE DITCH
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .08
| 03:203    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   15.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .02          .06
     Dep. Storage     (mm)=       1.00         8.57
     Average Slope     (%)=      20.00         2.00
     Length            (m)=       5.00         7.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=      85.67        35.08
                over (min)       1.00         4.00
     Storage Coeff.  (min)=        .20 (ii)     3.97 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.69          .28
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .00          .00           .007 (iii)
     TIME TO PEAK    (hrs)=       1.55         1.70          1.667
     RUNOFF VOLUME    (mm)=      42.51        12.51         17.014
     TOTAL RAINFALL   (mm)=      43.51        43.51         43.510
     RUNOFF COEFFICIENT   =        .98          .29           .391

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
005:0010------------------------------------------------------------------------
*# CATCHMENT 204 - WEST SIDE REARLOT AND HALF ROOF UNCONTROLLED
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .26
| 04:204    DT= 1.00 |   Total Imp(%)=   49.00   Dir. Conn.(%)=    1.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=          .13          .13
     Dep. Storage     (mm)=         1.00         8.57
     Average Slope     (%)=        20.00         2.00
     Length            (m)=         7.00        20.00
     Mannings n           =         .015         .250

     Max.eff.Inten.(mm/hr)=        85.67        82.40
                over (min)          1.00         5.00
     Storage Coeff.  (min)=          .24 (ii)     5.28 (ii)
     Unit Hyd. Tpeak (min)=         1.00         5.00
     Unit Hyd. peak  (cms)=         1.67          .22
                                                                *TOTALS*
     PEAK FLOW       (cms)=          .00          .02              .023 (iii)
     TIME TO PEAK    (hrs)=         1.55         1.70             1.700
     RUNOFF VOLUME    (mm)=        42.51        18.48            18.719
     TOTAL RAINFALL   (mm)=        43.51        43.51            43.510
     RUNOFF COEFFICIENT   =          .98          .42              .430

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0011------------------------------------------------------------------------
*
********************************************************************************
*#########################################
*# NORTHEAST OUTLET TO WOODLOT
*#########################################
*# CATCHMENT 205 - NORTHEAST CORNER OF SITE DRAINING TO WOODLOT
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .34
| 05:205    DT= 1.00 |   Total Imp(%)=   38.00   Dir. Conn.(%)=    1.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=          .13          .21
     Dep. Storage     (mm)=         1.00         8.57
     Average Slope     (%)=        20.00         1.00
     Length            (m)=         7.00        60.00
     Mannings n           =         .015         .250

     Max.eff.Inten.(mm/hr)=        85.67        39.12
                over (min)          1.00        16.00
     Storage Coeff.  (min)=          .24 (ii)    16.38 (ii)
     Unit Hyd. Tpeak (min)=         1.00        16.00
     Unit Hyd. peak  (cms)=         1.67          .07
                                                                *TOTALS*
     PEAK FLOW       (cms)=          .00          .01              .014 (iii)
     TIME TO PEAK    (hrs)=         1.55         1.92             1.917
     RUNOFF VOLUME    (mm)=        42.51        15.96            16.224
```

```
     TOTAL RAINFALL   (mm)=      43.51        43.51         43.510
     RUNOFF COEFFICIENT   =        .98          .37           .373

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
005:0012------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE FROM SITE 201 + 202 + 203 + 204 + 205
------------------------
| ADD HYD (UNCON-1   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            1.81      .316    1.67  33.46    .000
                    +ID2 02:202             .09      .003    1.75  10.20    .000
                    +ID3 03:203             .08      .007    1.67  17.01    .000
                    +ID4 04:204             .26      .023    1.70  18.72    .000
                    +ID5 05:205             .34      .014    1.92  16.22    .000
                     ===========================================================
                     SUM 08:UNCON-1        2.58      .352    1.67  28.38    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0013------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE TO BELLEVIEW BLVD. 201 + 202 + 203 + 204
------------------------
| ADD HYD (UNCON-2   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            1.81      .316    1.67  33.46    .000
                    +ID2 02:202             .09      .003    1.75  10.20    .000
                    +ID3 03:203             .08      .007    1.67  17.01    .000
                    +ID4 04:204             .26      .023    1.70  18.72    .000
                     ===========================================================
                     SUM 09:UNCON-2        2.24      .346    1.67  30.23    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0014------------------------------------------------------------------------
*# TOTAL CONTROLLED DISCHARGE TO BELLEVIEW BLVD. (201 w/SWM) + (202+203+204)
------------------------
| ADD HYD (UNCON-3   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:201SWM         1.81      .088    1.87  33.54    .000
                    +ID2 07:201OFL          .00      .000     .00    .00    .000
                    +ID3 02:202             .09      .003    1.75  10.20    .000
                    +ID4 03:203             .08      .007    1.67  17.01    .000
                    +ID5 04:204             .26      .023    1.70  18.72    .000
                     ===========================================================
                     SUM 10:UNCON-3        2.24      .117    1.72  30.29    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0015------------------------------------------------------------------------
*# TOTAL SITE DISCHARGE - CONTROLLED AND UNCONTROLLED TO ALL OUTLETS
------------------------
```

```
| ADD HYD (UNCON-4   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:201SWM        1.81      .088    1.87  33.54    .000
                    +ID2 07:201OFL         .00      .000     .00    .00    .000
                    +ID3 02:202            .09      .003    1.75  10.20    .000
                    +ID4 03:203            .08      .007    1.67  17.01    .000
                    +ID5 04:204            .26      .023    1.70  18.72    .000
                    +ID6 05:205            .34      .014    1.92  16.22    .000
                     ============================================================
                     SUM 01:UNCON-4       2.58      .125    1.72  28.44    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0016------------------------------------------------------------------------
*
* RUN REMAINING FORT ERIE DESIGN STORMS
*
--------------------------------------------------------------------------------
005:0002------------------------------------------------------------------------
*
  ** END OF RUN :  99

*******************************************************************************




--------------------
| START            |  Project  dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
--------------------  Rainfall dir.: C:\USERS\JORESK~1\Desktop\JOHNOW~1\2-0365~1
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=FE4-100.STM
--------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 3770 HAZEL STREET
*#                FORT ERIE (RIDEWAY), ONTARIO
*#  JOB NUMBER  : 2022-0365-10
*#       Date   : JANUARY 2023
*#    Revised   :
*#    Company   : WALTER FEDY
*#       File   : 22-0365.DAT
*#*****************************************************************************|
*
--------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: FORT ERIE - 100YR - 4HR CHICAGO STORM
| Ptotal=  75.64 mm|    Comments: FORT ERIE - 100YR - 4HR CHICAGO STORM
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   5.718 |   1.17  14.355 |   2.17  19.163 |   3.17   7.753
               .33   6.283 |   1.33  20.869 |   2.33  15.032 |   3.33   7.131
```

```
               .50   6.998 |   1.50  42.978 |   2.50  12.487 |   3.50   6.614
               .67   7.937 |   1.67 137.317 |   2.67  10.751 |   3.67   6.177
               .83   9.234 |   1.83  49.472 |   2.83   9.486 |   3.83   5.801
              1.00  11.159 |   2.00  27.136 |   3.00   8.519 |   4.00   5.476

--------------------------------------------------------------------------------
100:0003------------------------------------------------------------------------
*
*#*************************************************************************|
*#        EXISTING CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#*************************************************************************|
*# CATCHMENT 101 - EXISTING SCHOOL SITE DRAINAING NORTH, SOUTH AND WEST
----------------------
| CALIB STANDHYD      |   Area    (ha)=    2.10
| 01:102    DT= 1.00 |   Total Imp(%)=   32.00   Dir. Conn.(%)=   25.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .67         1.43
     Dep. Storage     (mm)=       1.00         8.57
     Average Slope     (%)=        .50          .50
     Length            (m)=      20.00        70.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     137.32        36.19
                over (min)        1.00        24.00
     Storage Coeff.  (min)=       1.15 (ii)   23.62 (ii)
     Unit Hyd. Tpeak (min)=       1.00        24.00
     Unit Hyd. peak  (cms)=        .99          .05
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .20          .09           .220 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.05          1.667
     RUNOFF VOLUME    (mm)=      74.64        27.65         39.401
     TOTAL RAINFALL   (mm)=      75.64        75.64         75.641
     RUNOFF COEFFICIENT   =        .99          .37           .521

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  70.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0004------------------------------------------------------------------------
*# CATCHMENT 102 - EXISTING SCHOOL YARD DRAINING EAST TO EXISTING DITCH
----------------------
| CALIB NASHYD        |   Area    (ha)=     .48   Curve Number   (CN)=75.00
| 02:102    DT= 1.00 |   Ia       (mm)=   8.470   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=      .167

     PEAK FLOW       (cms)=      .056 (i)
     TIME TO PEAK    (hrs)=     1.733
     RUNOFF VOLUME    (mm)=    29.715
     TOTAL RAINFALL   (mm)=    75.641
     RUNOFF COEFFICIENT   =      .393

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

```
--------------------------------------------------------------------------------
100:0005------------------------------------------------------------------------
*# TOTAL EXISTING CONDITIONS SITE DISCHARGE
------------------------
| ADD HYD (EXIST     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                    ID1 01:102           2.10      .220    1.67  39.40    .000
                   +ID2 02:102            .48      .056    1.73  29.72    .000
                    ============================================================
                    SUM 03:EXIST         2.58      .265    1.67  37.60    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
100:0006------------------------------------------------------------------------
*#
*#        PROPOSED CONDITIONS HYDROLOGIC MODELING
*#        ================================================
*#***************************************************************************|
*#########################################
*# BELLVIEW BLVD OUTLET
*#########################################
*# CATCHMENT 201 - MAIN SITE AREA
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.81
| 01:201    DT= 1.00 |   Total Imp(%)=   72.00   Dir. Conn.(%)=   72.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        1.30          .51
     Dep. Storage     (mm)=        1.00         8.57
     Average Slope     (%)=        1.00         2.00
     Length            (m)=       30.00        20.00
     Mannings n          =         .015         .250

     Max.eff.Inten.(mm/hr)=      137.32        58.29
                over (min)         1.00         7.00
     Storage Coeff.  (min)=        1.19 (ii)    6.97 (ii)
     Unit Hyd. Tpeak (min)=        1.00         7.00
     Unit Hyd. peak  (cms)=         .97          .16
                                                               *TOTALS*
     PEAK FLOW       (cms)=         .50          .06              .542 (iii)
     TIME TO PEAK    (hrs)=        1.67         1.73             1.667
     RUNOFF VOLUME    (mm)=       74.64        29.65            62.042
     TOTAL RAINFALL   (mm)=       75.64        75.64            75.641
     RUNOFF COEFFICIENT   =         .99          .39              .820

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0007------------------------------------------------------------------------
*# ROUTE FLOWS THROUGH UNDERGROUND STOARGE TANKS FOR CENTRAL PORTION
*
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>01:(201   )   |
| OUT<06:(201SWM)   |    =========  OUTLFOW STORAGE TABLE  =========
```

```
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)    |   (cms)    (ha.m.)
                           .000  .0000E+00    |     .097  .2590E-01
                           .067  .0000E+00    |     .105  .3460E-01
                           .079  .8600E-02    |     .113  .4320E-01
                           .089  .1730E-01    |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >01: (201   )       1.81      .542     1.667     62.042
     OUTFLOW<06: (201SWM)       1.81      .111     2.017     62.144
    OVERFLOW<07: (201OFL)        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   20.448
                   TIME SHIFT OF PEAK FLOW         (min)=    21.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4066E-01

--------------------------------------------------------------------------------
100:0008------------------------------------------------------------------------
*# CATCHMENTS 202 - UNCONTROLLED PERIMERTER AREA DRAINING INTO NORTH DITCH UNCON
----------------------
| CALIB NASHYD       |   Area    (ha)=     .09   Curve Number   (CN)=75.00
| 02:202    DT= 1.00 |   Ia      (mm)=   8.570   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .110

     Unit Hyd Qpeak  (cms)=     .031

     PEAK FLOW       (cms)=     .010 (i)
     TIME TO PEAK    (hrs)=    1.733
     RUNOFF VOLUME    (mm)=   29.644
     TOTAL RAINFALL   (mm)=   75.641
     RUNOFF COEFFICIENT   =     .392

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

--------------------------------------------------------------------------------
100:0009------------------------------------------------------------------------
*# CATCHMENT 203 - SOUTH SIDE - UNCONTROLLED FLOW TO ROADSIDE DITCH
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .08
| 03:203    DT= 1.00 |   Total Imp(%)=   30.00   Dir. Conn.(%)=   15.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .02          .06
     Dep. Storage     (mm)=       1.00         8.57
     Average Slope     (%)=      20.00         2.00
     Length            (m)=       5.00         7.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     137.32        90.31
                over (min)        1.00         3.00
     Storage Coeff.  (min)=        .17 (ii)    2.75 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.70          .40
                                                                *TOTALS*
```

```
     PEAK FLOW       (cms)=        .00          .01           .017 (iii)
     TIME TO PEAK    (hrs)=       1.55         1.67          1.667
     RUNOFF VOLUME    (mm)=      74.64        34.01         40.103
     TOTAL RAINFALL   (mm)=      75.64        75.64         75.641
     RUNOFF COEFFICIENT   =        .99          .45           .530

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0010------------------------------------------------------------------------
*# CATCHMENT 204 - WEST SIDE REARLOT AND HALF ROOF UNCONTROLLED
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .26
| 04:204    DT= 1.00 |   Total Imp(%)=   49.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .13
     Dep. Storage     (mm)=       1.00         8.57
     Average Slope     (%)=      20.00         2.00
     Length            (m)=       7.00        20.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     137.32       183.84
                over (min)       1.00         4.00
     Storage Coeff.  (min)=        .20 (ii)     3.85 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.69          .29
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .00          .06           .058 (iii)
     TIME TO PEAK    (hrs)=       1.55         1.68          1.683
     RUNOFF VOLUME    (mm)=      74.64        44.17         44.480
     TOTAL RAINFALL   (mm)=      75.64        75.64         75.641
     RUNOFF COEFFICIENT   =        .99          .58           .588

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0011------------------------------------------------------------------------
*
********************************************************************************
*########################################
*# NORTHEAST OUTLET TO WOODLOT
*########################################
*# CATCHMENT 205 - NORTHEAST CORNER OF SITE DRAINING TO WOODLOT
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 05:205    DT= 1.00 |   Total Imp(%)=   38.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .13          .21
     Dep. Storage     (mm)=       1.00         8.57
     Average Slope     (%)=      20.00         1.00
```

```
     Length            (m)=       7.00         60.00
     Mannings n           =       .015          .250

     Max.eff.Inten.(mm/hr)=     137.32        114.77
                over (min)        1.00         11.00
     Storage Coeff.  (min)=        .20 (ii)    10.69 (ii)
     Unit Hyd. Tpeak (min)=       1.00         11.00
     Unit Hyd. peak  (cms)=       1.69           .10
                                                               *TOTALS*
     PEAK FLOW       (cms)=        .00           .04              .044 (iii)
     TIME TO PEAK    (hrs)=       1.55          1.80             1.800
     RUNOFF VOLUME    (mm)=      74.64         40.05            40.399
     TOTAL RAINFALL   (mm)=      75.64         75.64            75.641
     RUNOFF COEFFICIENT   =        .99           .53              .534

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
100:0012------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE FROM SITE 201 + 202 + 203 + 204 + 205
------------------------
| ADD HYD (UNCON-1   ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)    (hrs)   (mm)   (cms)
                     ID1 01:201            1.81      .542     1.67  62.04    .000
                    +ID2 02:202             .09      .010     1.73  29.64    .000
                    +ID3 03:203             .08      .017     1.67  40.10    .000
                    +ID4 04:204             .26      .058     1.68  44.48    .000
                    +ID5 05:205             .34      .044     1.80  40.40    .000
                     ===========================================================
                     SUM 08:UNCON-1        2.58      .653     1.67  55.61    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
100:0013------------------------------------------------------------------------
*# TOTAL UNCONTROLLED DISCHARGE TO BELLEVIEW BLVD. 201 + 202 + 203 + 204
------------------------
| ADD HYD (UNCON-2   ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)    (hrs)   (mm)   (cms)
                     ID1 01:201            1.81      .542     1.67  62.04    .000
                    +ID2 02:202             .09      .010     1.73  29.64    .000
                    +ID3 03:203             .08      .017     1.67  40.10    .000
                    +ID4 04:204             .26      .058     1.68  44.48    .000
                     ===========================================================
                     SUM 09:UNCON-2        2.24      .625     1.67  57.92    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
100:0014------------------------------------------------------------------------
*# TOTAL CONTROLLED DISCHARGE TO BELLEVIEW BLVD. (201 w/SWM) + (202+203+204)
------------------------
| ADD HYD (UNCON-3   ) | ID: NHYD         AREA     QPEAK    TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)    (hrs)   (mm)   (cms)
                     ID1 06:201SWM         1.81      .111     2.02  62.14    .000
                    +ID2 07:201OFL          .00      .000      .00    .00    .000
```

```
                    +ID3 02:202            .09     .010    1.73  29.64    .000
                    +ID4 03:203            .08     .017    1.67  40.10    .000
                    +ID5 04:204            .26     .058    1.68  44.48    .000
                     =======================================================
                     SUM 10:UNCON-3       2.24     .183    1.68  58.00    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
100:0015------------------------------------------------------------------------
*# TOTAL SITE DISCHARGE - CONTROLLED AND UNCONTROLLED TO ALL OUTLETS
------------------------
| ADD HYD (UNCON-4   ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:201SWM        1.81     .111    2.02  62.14    .000
                    +ID2 07:201OFL         .00     .000     .00    .00    .000
                    +ID3 02:202            .09     .010    1.73  29.64    .000
                    +ID4 03:203            .08     .017    1.67  40.10    .000
                    +ID5 04:204            .26     .058    1.68  44.48    .000
                    +ID6 05:205            .34     .044    1.80  40.40    .000
                     =======================================================
                     SUM 01:UNCON-4       2.58     .216    1.70  55.68    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
100:0016------------------------------------------------------------------------
*
* RUN REMAINING FORT ERIE DESIGN STORMS
*
--------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------
*
--------------------------------------------------------------------------------
100:0002------------------------------------------------------------------------
*
      FINISH
--------------------------------------------------------------------------------
********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2023-02-01     at 12:48:32
================================================================================
```

APPENDIX D

SWM Features – Brochures and O&M Manuals

Maintenance manual
Rigofill ST

1. Maintenance intervals

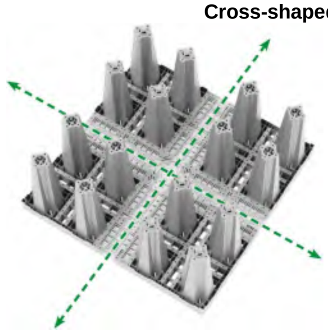
During the construction phase, always make sure that no dirt or foreign particle enters the shafts. During and immediately after the construction phase, increased contaminant load from the connected areas can be expected.
The first check (and possible adjustment) of the infiltration system should be made after completion and before the handover of the system.
A visual inspection of the system including a camera inspection of blocks and shafts is recommended. The result should be recorded in a log.
Further controls and, if necessary, cleaning should be carried out twice during the first year of use. These controls provide information regarding the intervals at which the inspection and cleaning are to be carried out in the future.
In the case of exceptional weather conditions, additional checks or maintenance are recommended.

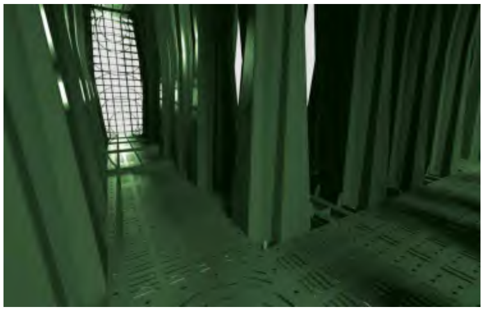
2. Cleaning

2.1. Rigofill ST

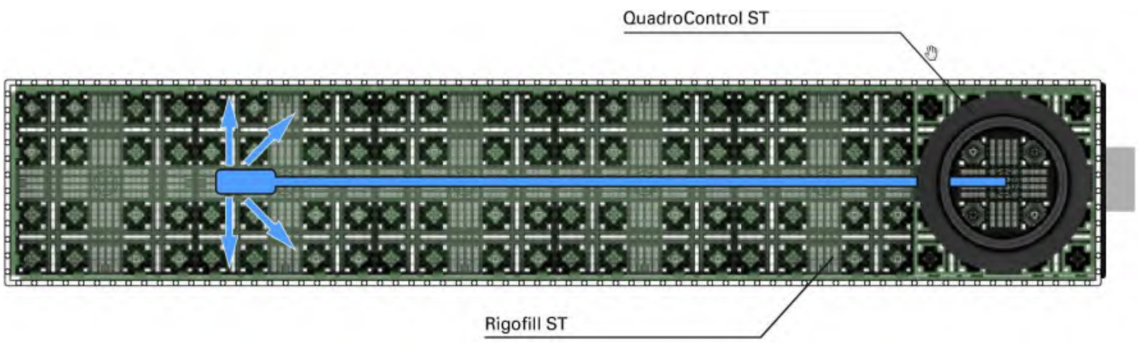
The tank can be flushed by means of a sewer cleaning system via the cross-shaped tunnels of Rigofill ST.

Cross-shaped inspections-/maintenance tunnel





Rigofill ST can be cleaned with a flushing pressure of approx. **90 - 120 bar.** The flush water transports the dirt to the control shaft QuadroControl ST and is sucked off there



Please use the bottom tunnel of the shaft for shaft!

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The material like sludge and sand as well as the flushing water taken out of the tank may contain hydrocarbons and heavy metals. These have to be disposed of according to the local regulations.

1.1. Filter Sets

The filter sets consisting of sand catcher (bucket) and filter sack (please keep the size of the connected area in mind), respectively the strainer bucket for throttle shafts are based on the principle of keeping back and accumulating solid. The accumulated dirt has to be disposed of regularly. Regular maintenance is important for a long standing operation of the complete detention facility.

Depending on the dirt transported in the incoming water and the calculated security factor much shorter cleaning intervals may be required (in some cases within a few weeks only) – especially shortly before the rain season (autumn). We therefore recommend to start with control and cleaning intervals of a few weeks only and depending on the respective degree if soiling the interval may be extended. In Europe the critical time usually is spring because of the pollen in the air.

The filter sack is to be interconnected with the bucket by pulling the cord of the rim over its rim.
Via the handle the bucket may be pulled out of the shaft – a hock may make it easier to bull the bucket out. If there is dirt in the filter sack this has to be disposed of as well. If necessary the dirt may me flushed out.

The original permeability of the geotextile may not be reached again, thus eventually (after several years) the filter sack may have to be exchanged – please revert to our replacement set if necessary.
Taking out the filter set constantly is not permitted and may lead to a blockage of the whole detention and infiltration unit.

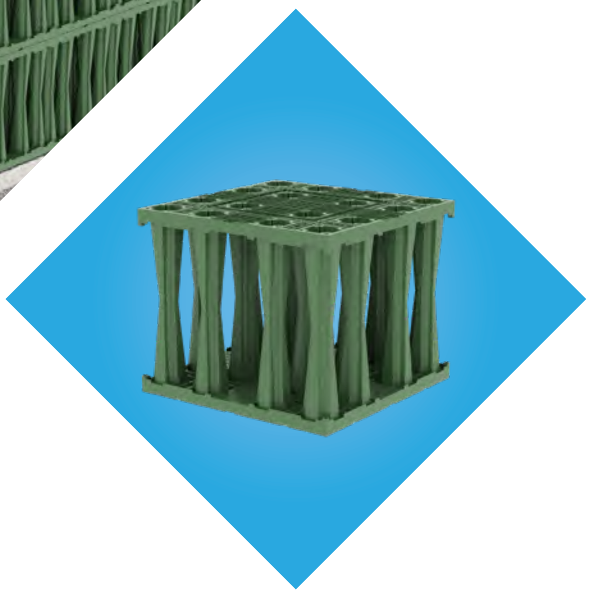
STORMCON

STORMWATER MANAGEMENT SOLUTIONS.

GreenStorm ST

Rigofill ST product by FRÄNKISCHE

Underground storage infiltration modules



www.stormcon.ca

Table of contents

*Rigofill ST product by FRÄNKISCHE

Storing stormwater with storage/infiltration systems

Basic element for underground water storage facilities

GreenStorm ST* are plastic tanks to be installed underground (storage/ infiltration modules) in which water is collected and stored. Storage/infiltration systems temporarily collect stormwater and discharge it later. In addition to infiltration using underdrained swale systems, pipe swales, and gravel swales common in the past, increasingly more storage/infiltration systems are being built today.

The storage space of the storage/ infiltration system consists of numerous GreenStorm ST* modules which can be combined three-dimensionally to form large systems.

The advantage of this method is that the void ratio is up to three times larger in these infiltration systems than in gravel swales which saves space and excavation work.

GreenStorm ST* is a modular system which is characterised by high flexibility, rapid installation and a high level of user-friendliness.

*Rigofill ST product by FRÄNKISCHE

Application – infiltration

Stormwater infiltration – giving back to nature

Large amounts of stormwater can reduce the performance of wastewater treatment systems. Infiltrating unpolluted stormwater nearby has therefore several advantages.

A constant growth in built-up areas and increase in impervious surfaces prevent natural infiltration of stormwater into the soil. Special infiltration systems are used in order to discharge it to the water cycle. In addition to infiltration using pipe swales, increasingly more storage/infiltration systems are being built.

The advantage of this method is that the storage volume of the infiltration system is increased, and space and excavation are saved as compared to gravel swales. Stormwater is thus returned to the natural water cycle and can contribute to producing new groundwater. Infiltration systems are subject to very high requirements. Consequently, they have become an important component of urban drainage.

Storage/infiltration systems considerably increase the underground storage volume. High-performance storage/infiltration systems can be installed even in confined space.

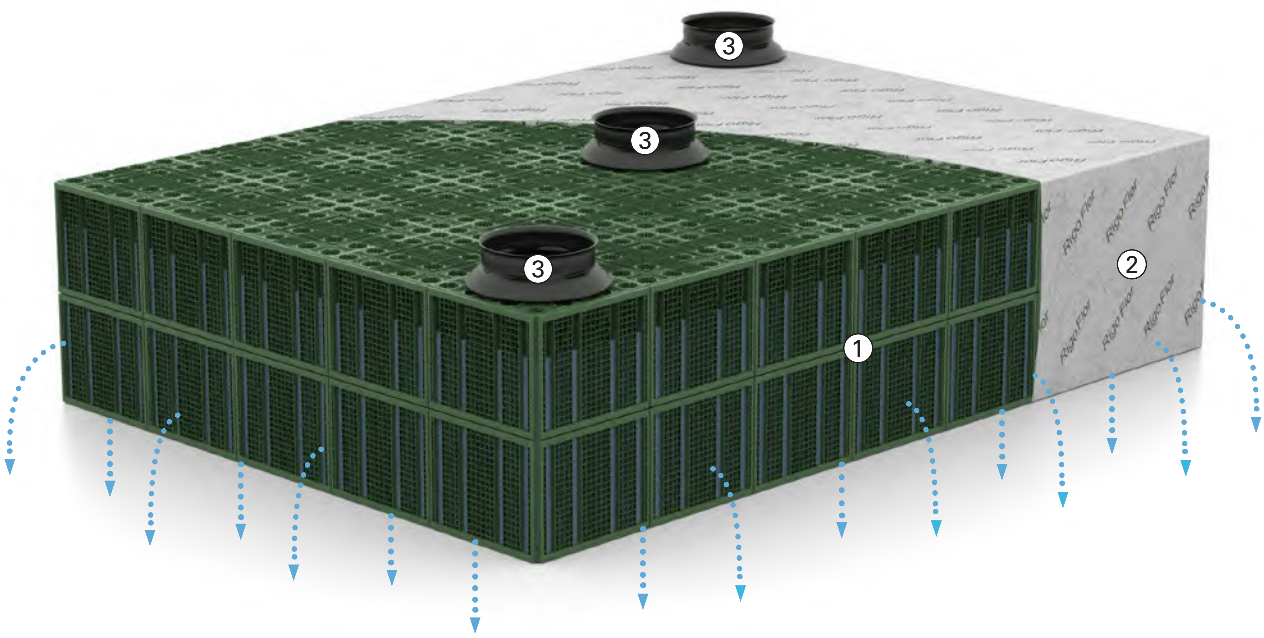
In particular in urban construction no additional space is required and precious building ground is saved.

Légende

① GreenStorm ST* storage /infiltration module

② Geotextile

③ QuadroControl ST system shaft



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Application – retention

Retaining stormwater – instead of flooding

If subsoil conditions are unfavourable to infiltration, the goal is to retain the stormwater and ensure a retarded, timelagged discharge. Exposure to impulsive stress can be eliminated or reduced in sewer networks, wastewater treatment systems and waterbodies.

Stormwater retention systems retard the infiltration of stormwater. They are comprised of a watertight retaining element, an inlet and a vortex outlet.

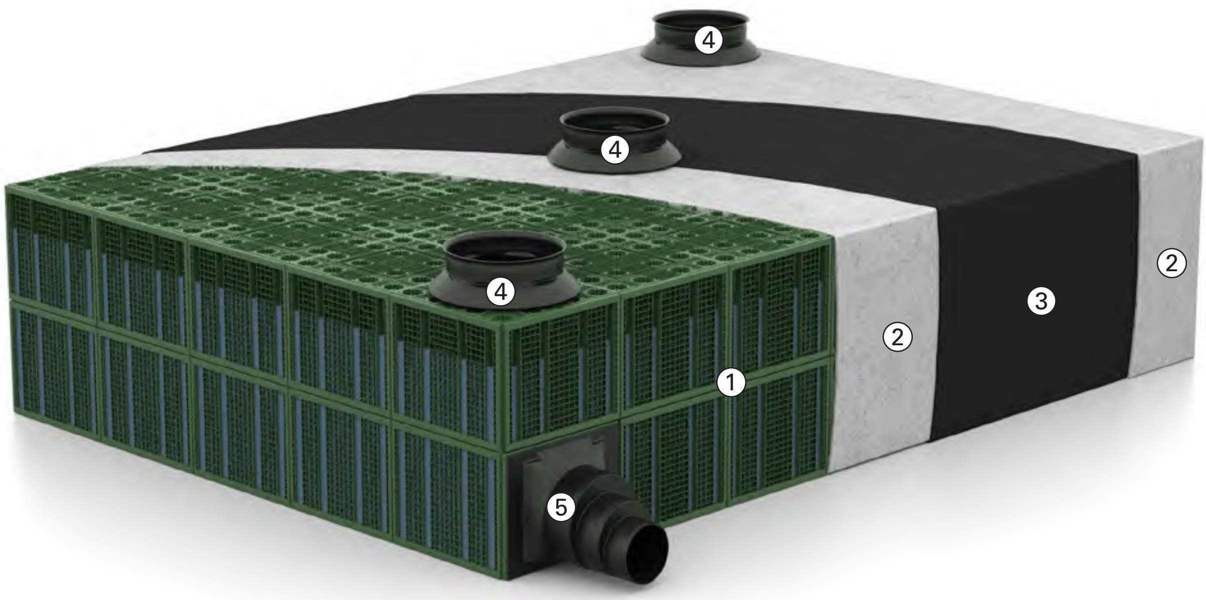
The stormwater distributes evenly in the system where it can be stored and is then discharged in a controlled manner through throttle shafts. If infiltration must be avoided or to prevent unintended discharge of groundwater or strata water (e.g., in case of contaminated soil), it is necessary to waterproof the retention system.

Stormwater runoff from impervious surfaces that cannot infiltrate naturally leads to peak loads in sewer systems.

Stormwater retention facilities collect stormwater in an underground storage tank and discharge it in a retarded manner but continuously. Their very short construction times make storage/ infiltration systems an inexpensive alternative to conventional retention facilities such as retention channels or underground concrete tanks.

Légende

1. GreenStorm ST* storage /infiltration module
2. Geotextile
3. Impermeable membrane
4. QuadroControl ST system shaft
5. Adapter



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Application – harvesting / fire water storage

Harvesting stormwater – saving drinking water

Water – particularly drinking water – is a priceless resource which should be treated responsibly and used sparingly.
It is therefore wise to collect, store and use stormwater if the water must not necessarily be suitable for drinking purposes, instead of allowing the water to infiltrate into the soil unused or diverting it into the sewer system.

There are many examples: irrigation for greens, car wash, use in toilets, etc.

Water is diverted into a waterproof storage/infiltration system and can be supplied for use via a pumping system.

The use of the GreenStorm inspect system allows for finding solutions that fit project-specific requirements – even under the most difficult conditions such as very tight space, narrow conditions, low cover, high groundwater level, etc.

Stormwater harvesting systems provide water for different domestic and industrial water uses. They comprise a watertight retaining element, an inlet with upstream stormwater treatment system, a pump shaft and a system control.

Using GreenStorm ST* for fire water storage also saves water, since system checks can be made in a filled state and water does not have to be pumped out as is the case with conventional concrete tanks.

Légende

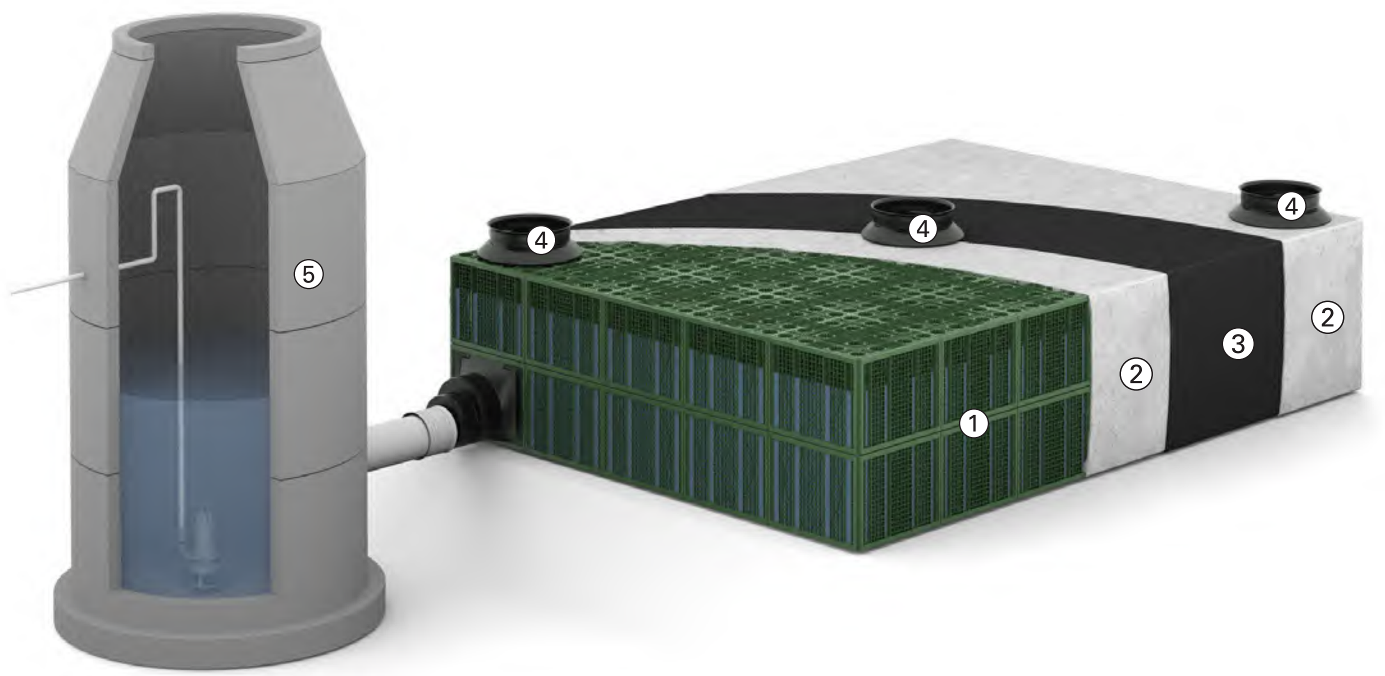
① GreenStorm ST* storage/infiltration module

② Geotextile

③ Impermeable membrane

④ QuadroControl ST system shaft

⑤ Tapping shaft (on-site)



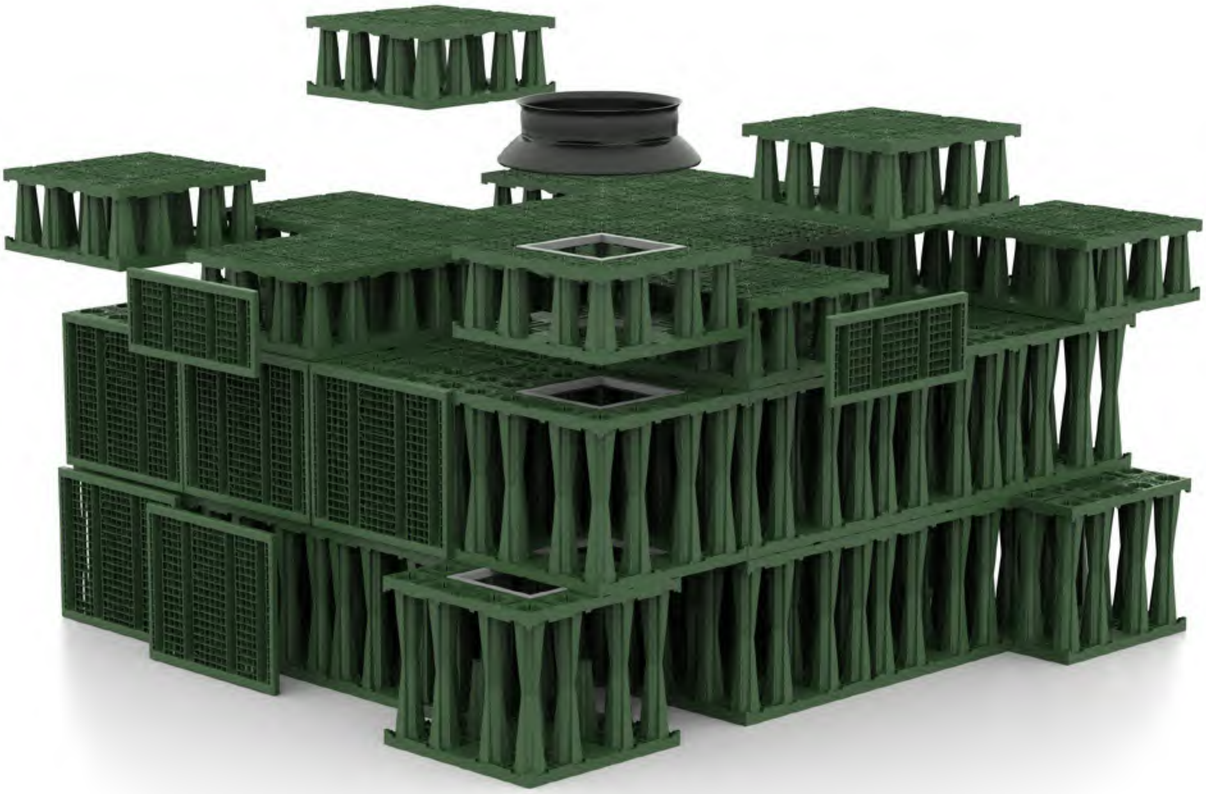
Modular design

Individual system geometries due to modular design

Sizes (length and width) of GreenStorm ST*orage/infiltration systems can be freely designed with hardly any limitations. The 800 mm cellular block type structure can easily be adapted to fit nearly any layout.

With heights of 660 mm (full block) and 350 mm (half block), systems can be built in various sizes to accommodate any single- or multi-layer combination. Therefore, the system can very easily be adapted to on-site requirements. Under high groundwater conditions or low permeability of backfill soil, for example, rather shallow depth systems are to be preferred.

For soils with good permeability, however, high and compact systems are favourable and may be built accordingly. The maximum space available is used.



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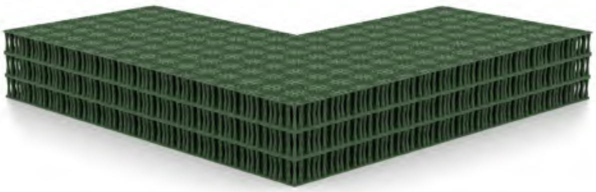
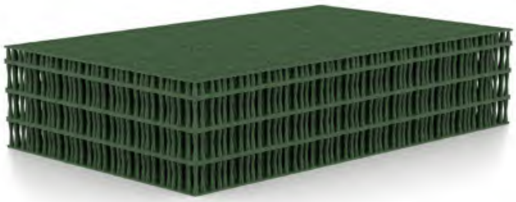
Possible system geometries

GreenStorm ST*
2-layer

GreenStorm ST*
1-layer



GreenStorm ST*
3-layer



GreenStorm ST*
3 1/2-layer

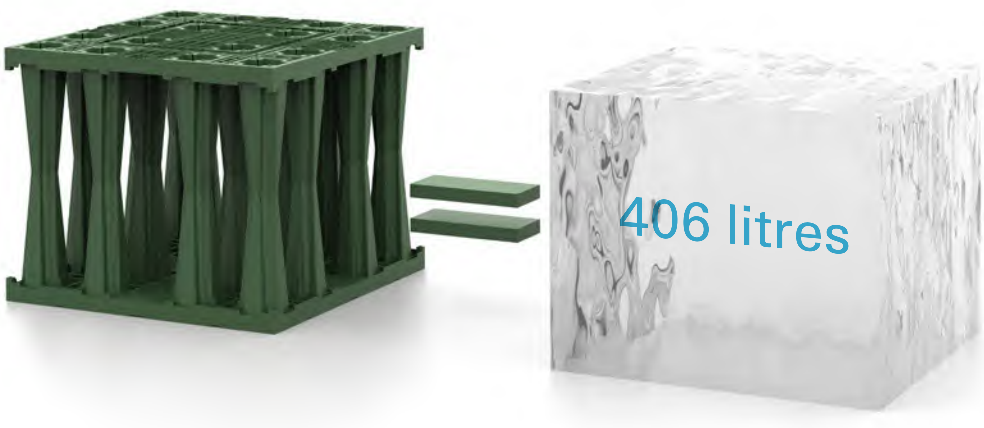
Storage volume

Extremely high volume

The GreenStorm ST* full block provides a storage volume of 406 litres with a gross volume of 422 litres. With a storage volume of more than 96 %, it stores three times as much water as gravel swales.

The half block has a height of 350 mm and is used if shallow systems are required, e.g., in case of high groundwater levels. With a gross volume of 224 litres, it offers a storage volume of 212 litres.

Column void
The column void of the storage/infiltration module is 100 % available as storage space. Large openings at the column base and at the column connection allow unrestricted filling and emptying of the columns.



Storage/infiltration systems as compared to gravel swales

Pipe and gravel swales only use approx. 30 % of their volume to store water. Therefore, three times the required water storage volume must be provided by excavation. This requires lots of space which is frequently not available in urban areas.

GreenStorm ST* storage/infiltration systems save an enormous amount of space and excavation work. Thus, subsoil storage spaces for stormwater can be built in a very efficient and cost-saving way.

Storage/infiltration systems considerably increase the storage space. High-performance storage/infiltration systems can be installed even in confined space.

*Rigofill ST product by FRÄNKISCHE

Installation

Easy construction site handling

Requires little space for storage
The storage/infiltration modules are delivered in compact, stacked units with 17 modules per pallet.
The easy stackability of the GreenStorm ST* and ST-B modules allows them to be stored even in confined construction space, even outside the excavation pit.
This facilitates installation, since no additional storage space must be provided in the excavation pit. Installation is neither impeded nor constrained.

Pre-assembly
Depending on the requirements, GreenStorm
ST and GreenStorm ST*-B modules can be pre-assembled in no time at all, both outside and inside the excavation pit with just one easy move. Easy high tensile strength snap connections allow for combining two half elements to create a reliable unit in only a short period of time. This can easily be done by one person alone without requiring any additional tools. The moveable parts of the snap connection are recessed and thus protected from damage.

Easy assembly
There is no need to adhere to any complex installation pattern – the pre-assembled modules or half blocks can just as well be connected to create a single unit.
The low weight allows this to be done by one person only. Connectors establish firm connections between the individual modules. The surface can be accessed immediately without any risk of accidents, since the hole size of the columns is dimensioned respectively (< 100 mm).
Thus, no additional covers of column holes are required.

Montage dans la fouille

Up to

88 %

storage space saved as compared to unstackable storage/infiltration modules

Inspection

CCTV inspection even when filled

Storage/infiltration systems are durable structures for urban drainage; they must work reliably for decades. Durability and reliability are essential requirements.
The best way to inspect the state of a system using state-of-the-art technology is CCTV inspection. Thus, a storage/infiltration system can be inspected excellently – for final acceptance or later. This provides safety for authorities, engineers, construction companies, customers, and operators.

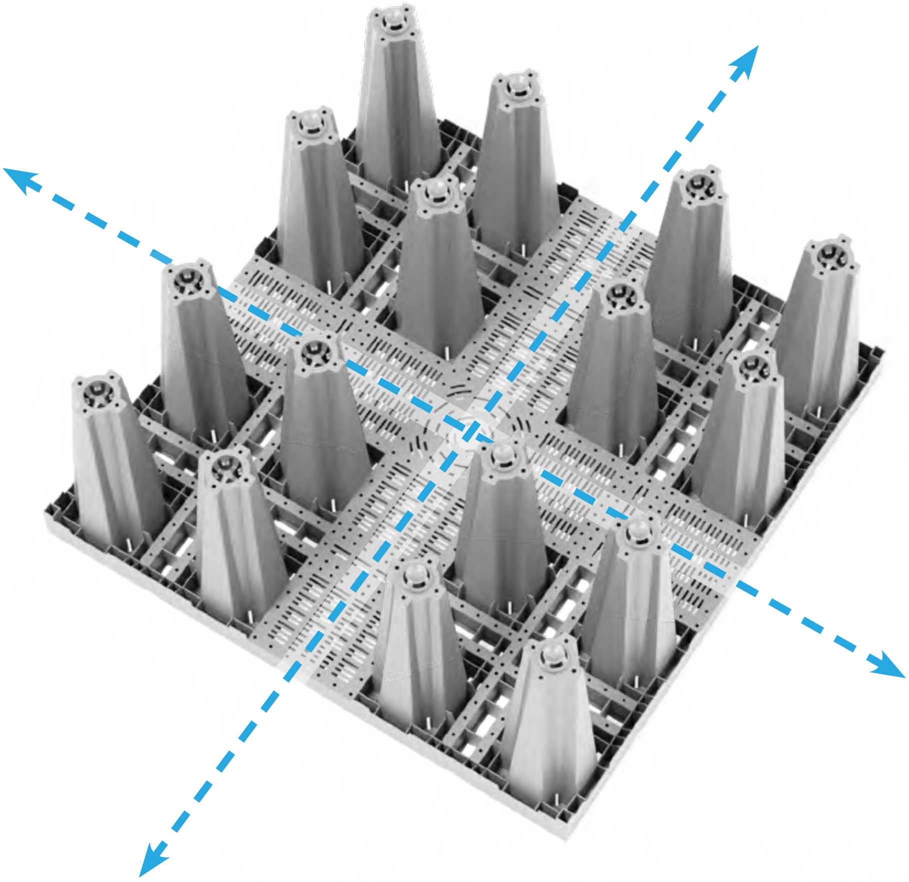
Cross-shaped inspection tunnel

GreenStorm ST* modules have a cross-shaped tunnel which makes the storage/infiltration system camera-accessible and flushable in two axes and thus in four dimensions.
The special and open design of the inspection tunnel allows for an unobstructed view of the entire interior and not only the inspection tunnel.

For example, the statically relevant load-bearing elements, the condition of the geotextile and the entire soil area can be viewed. GreenStorm ST* and GreenStorm ST*-B thus provide excellent options to control the "inner life" of a storage/infiltration system at any time.

The ideal, level and vibration-free running surface and the slim column structure allow for an unobstructed view of the entire module volume. The Quadro Control ST shaft for GreenStorm ST*, which can be integrated, allows for easy access of the automotive dolly for both professional final acceptance inspection and flushing technology.

100 %
inspectable



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Inspection

Recommended camera equipment

A standard sewer camera is sufficient for camera inspection.
A rotatable and height-adjustable camera head allows for an optimal view of the lateral soil area, a controllable carriage ensures a centred positioning, and high-performance optics together with lighting allow for a perfect picture.

Certified CCTV accessibility

GreenStorm ST* has been designed for the use of modern CCTV inspection technology.
The inspectability of the GreenStorm ST* and QuadroControl ST system unit has been tested and confirmed by leading manufacturers of pipe CCTV inspection technology!

Recommended: tender invitation for final acceptance inspection

Final acceptance of sewers using camera inspection has long since become a matter of course in sewer construction.
Also in the construction of storage/infiltration systems, the final acceptance inspection is important! Planning engineers should absolutely include this in their tender documents. For instructions on the professional system configuration of the CCTV inspection technology, please refer to **www.fraenkische.com**

Loading

GreenStorm ST* Heavy traffic

Certification CSTB

Storage/infiltration systems are subsoil structures and must have sufficient load-carrying capacity against impacting soil and traffic loads.

GreenStorm ST* storage/ infiltration systems are extremely strong and have been designed with various applications in mind:
While GreenStorm ST* has been designed in
particular for traffic loads of up to 13 tons axle load.

High resistance

When installed under traffic areas, relevant national guidelines must be observed.

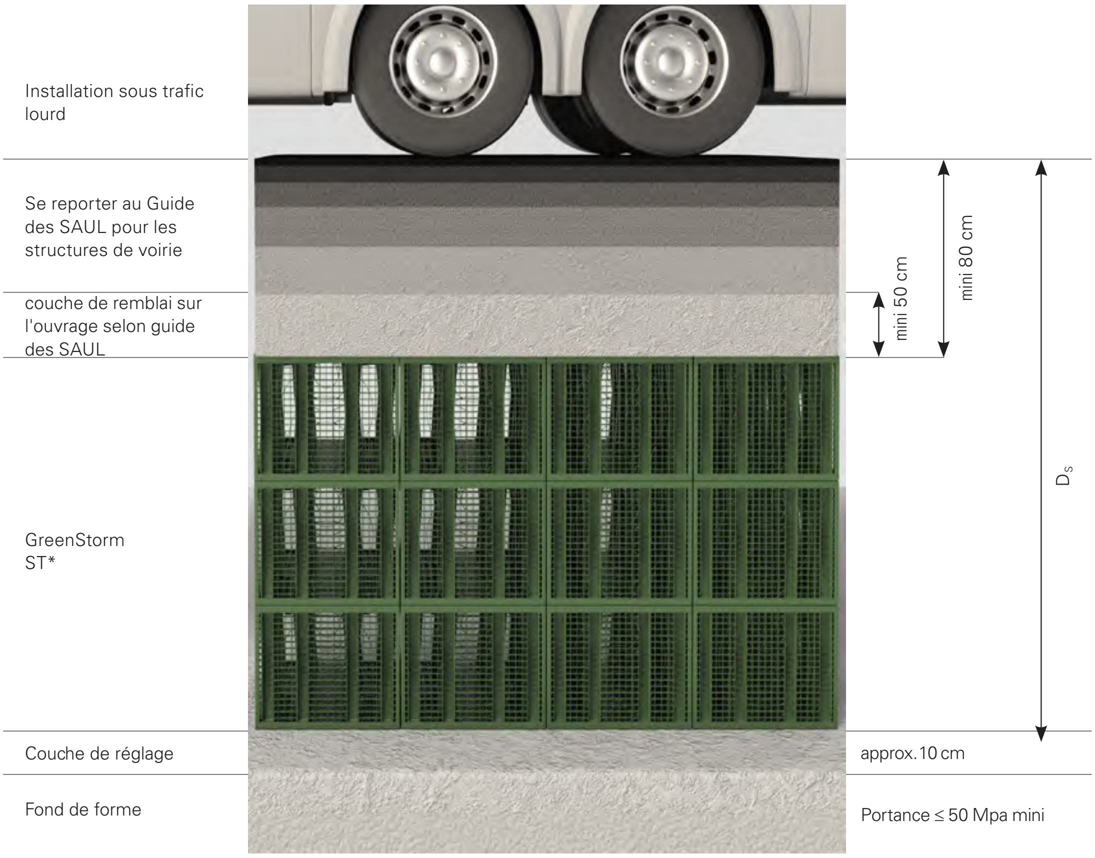
To build the planum for the road construction, an upper levelling layer must be provided. It should preferably be built as a gravel sub-base with a thickness of at least 350 mm, other materials usually result in larger covers.

Generally, a uniform modulus of deformation EV2 ≥ 45 MN/m² must be proven on the planum.

Installation under traffic area

The subsoil structures must have sufficient load-carrying capacity against impacting soil and traffic loads to ensure reliable stability.

This is why GreenStorm ST* is suitable for traffic loads of up to 15 tons axle load (20 tons possible, please refer to our technical department).



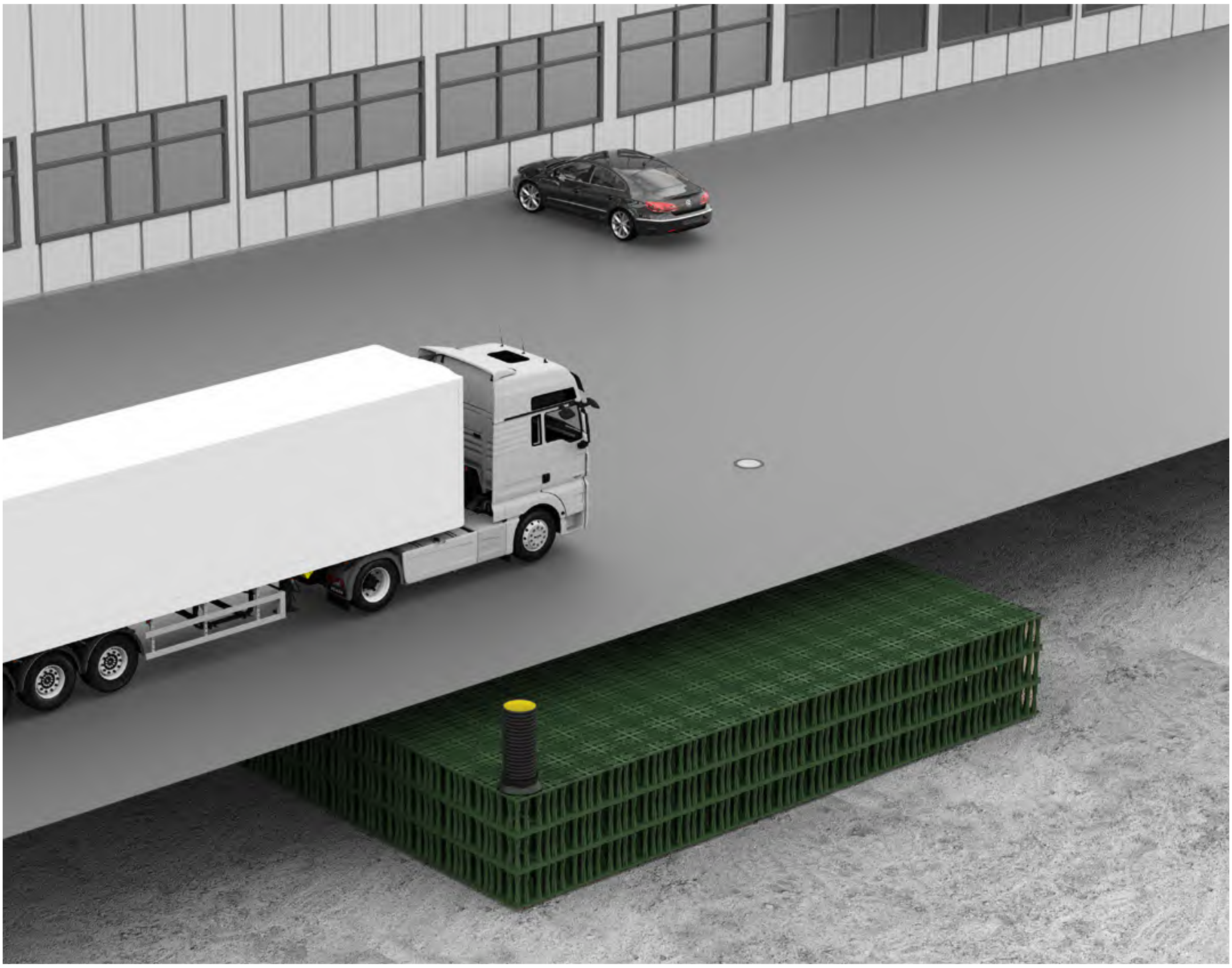
With conventional installation parameters*, depths of cover of DC 4 m and soil depths DSof 6 m are possible for infiltration systems. A project-specific stability analysis can be prepared by STORMCON.

*specific weight of soil 18 kN/m³
Mean soil temperature max. 23 °C,
6 m soil depth,   = 0.3, 4-laye

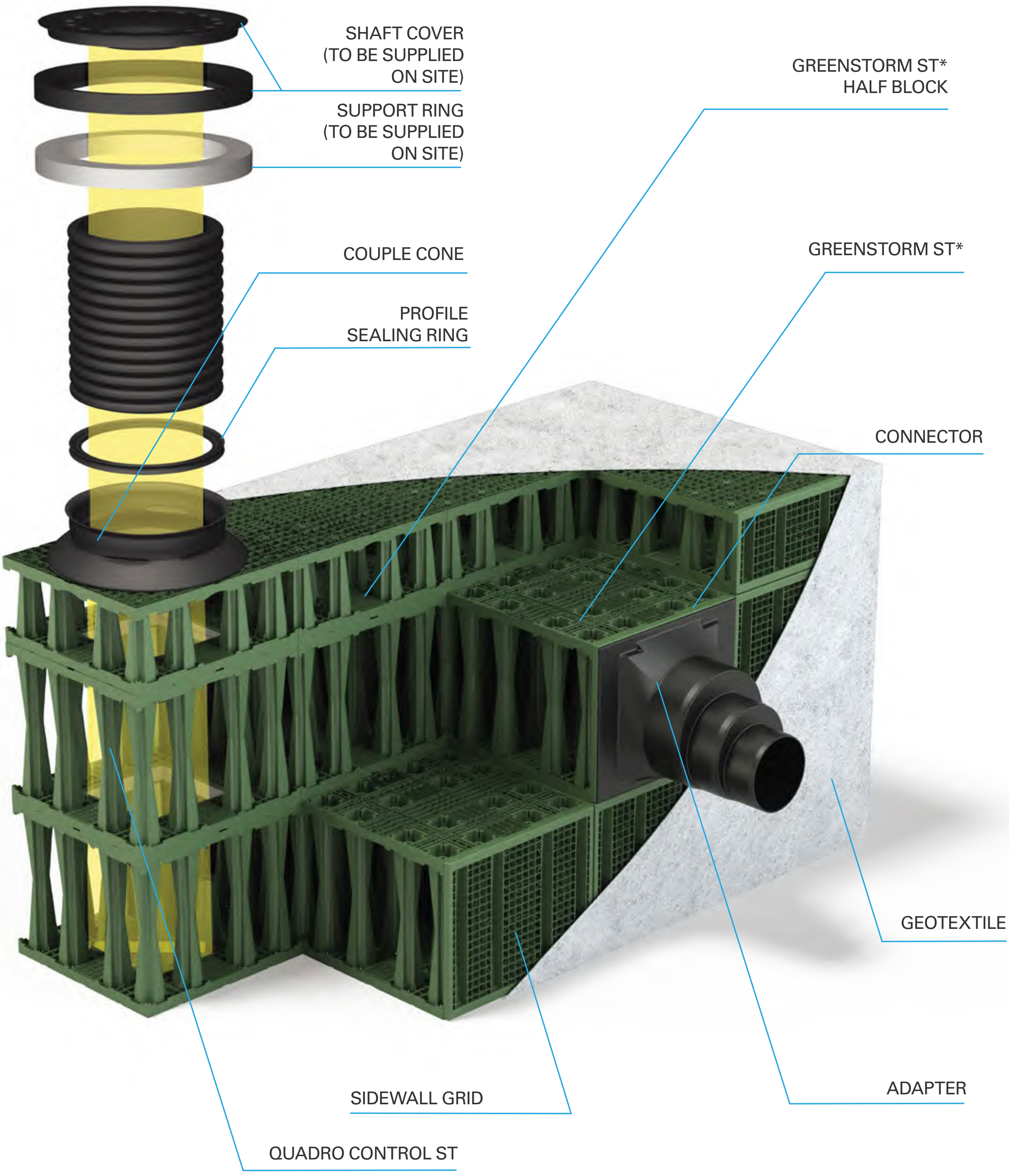
*Rigofill ST product by FRÄNKISCHE

Example

GreenStorm ST* Heavy traffic



Quadro® Control ST – system shaft



*Rigofill ST product by FRÄNKISCHE

Quadro® Control ST – system shaft

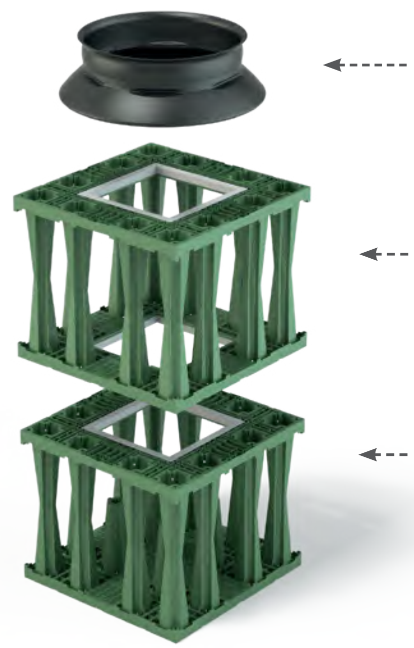
Integrated inspection shafts

Quadro® Control ST is a polypropylene inspection shaft which can be integrated in the storage/infiltration system.

It is square with a base of 800 x 800 mm and can be used in any position of the layout.

Its height results from the number of layers of the connected storage/infiltration system. The shaft allows for comfortable access to the inspection tunnel from aboveground. High-performance inspection and flushing equipment can easily be inserted into the inspection tunnel. The shaft is integrated in the storage/infiltration system and grows layer by layer as construction progresses. QuadroControl ST is delivered with all required components and will be assembled on site.

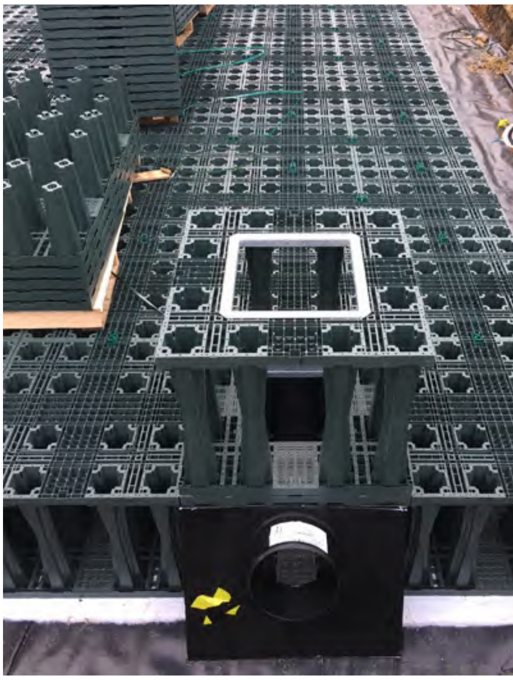
Structure



The shaft cone is the transition to the extension pipe. The length of the extension pipe is chosen depending on the installation depth.

The shaft is integrated in the storage/infiltration system and grows layer by layer as construction progresses.

The shaft components are stackable and delivery includes the cone with all required components as shaft package.

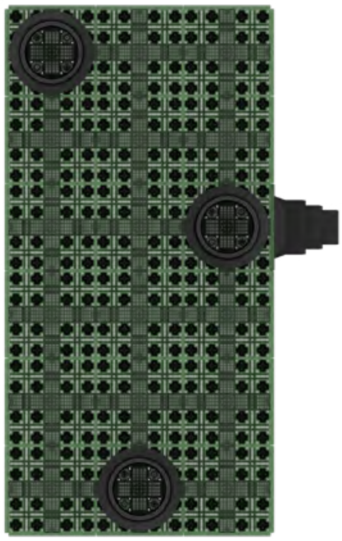


Arrangement of inspection shafts

Number of and position in the system are above all determined by the size of the system, access, pipe connections and design of the outdoor facilities.

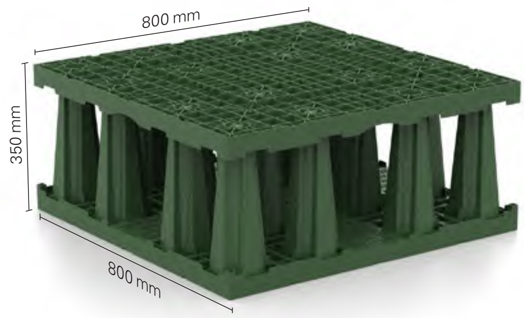
In order to ensure that flushing of the complete system is possible, each module should comprise at least one inspection shaft. In addition, the shafts should be positioned such that the shaft covers do not interfere with the design of the outdoor facilities, but can easily be accessed by vehicles for maintenance purposes.

Adjacent shafts should be staggered in the layout.



GreenStorm ST* – Design-relevant dimensions

Dimensions



Sidewall grid connection options

Full block connection options
Dia 100 mm, 135 mm, 150 mm, 200 mm,
250 mm, 300 mm, 375 mm et 450 mm

This allows all available nominal diameters to be realised both at the top and the bottom of the module.

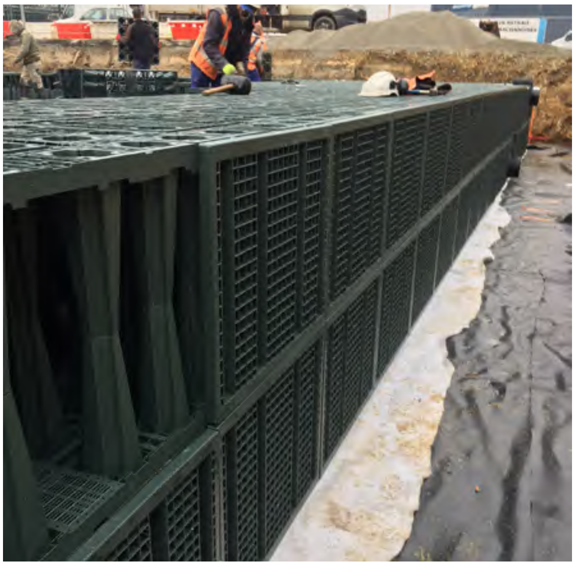
*Rigofill ST product by FRÄNKISCHE

GreenStorm ST* – Design-relevant dimensions

Sidewall grid connection options

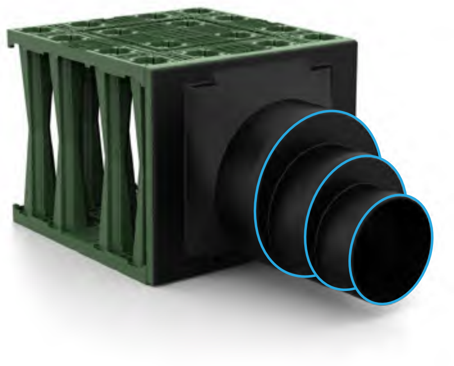
Half block connection options
Dia 100 mm, 135 mm, 150 mm, 200 mm
et 250 mm

The side plates can be drilled to the height and desired position within the frame.



Adapter connection options

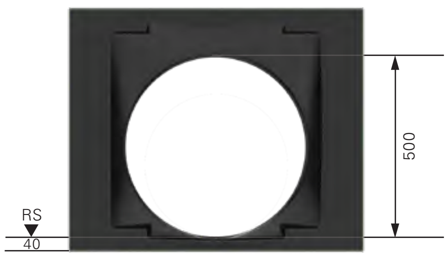
Connections:
Dia 300 mm, 450 mm
et 525 mm



Outside diameter 315 mm for a pipe diameter 300 mm PVC

Outside diameter 400 mm for a pipe diameter 450 mm PVC. A flexible sleeve off center is required.

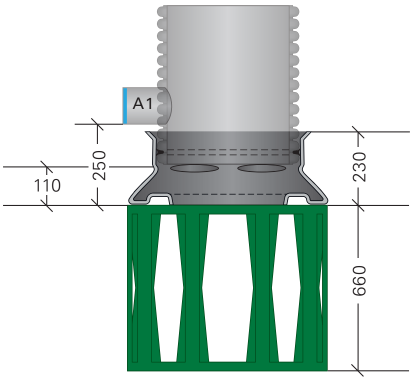
Outside diameter 500 mm for a pipe of diameter 525 mm. A flexible sleeve off center is required



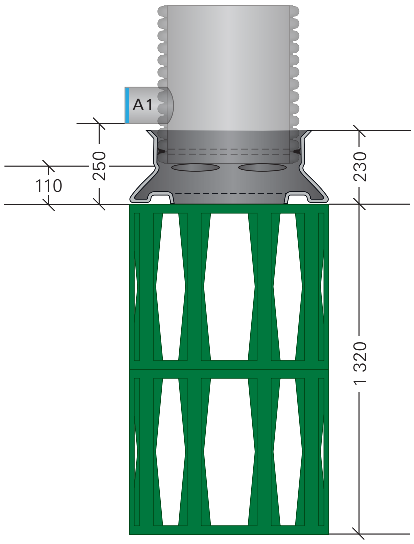
Quadro® Control ST – Design-relevant dimensions

Dimensions of Quadro® Control ST

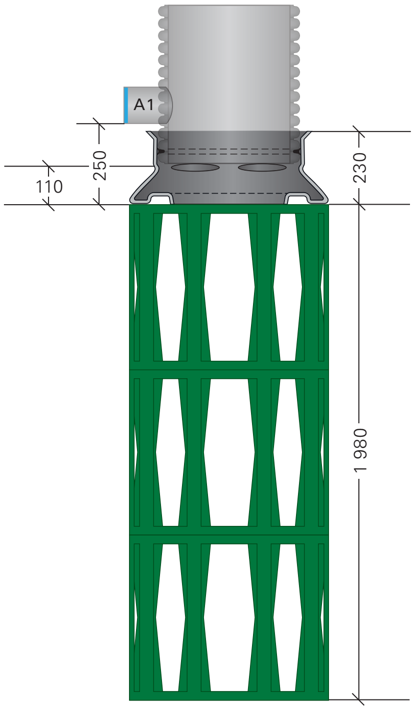
Connection options	
A1	DN/OD 200 or DN/OD 315 connection possible



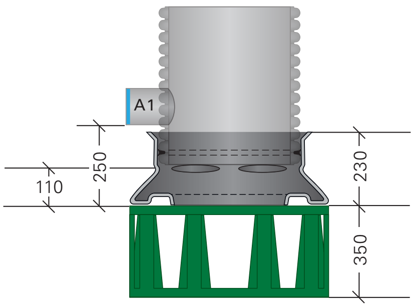
1-layer



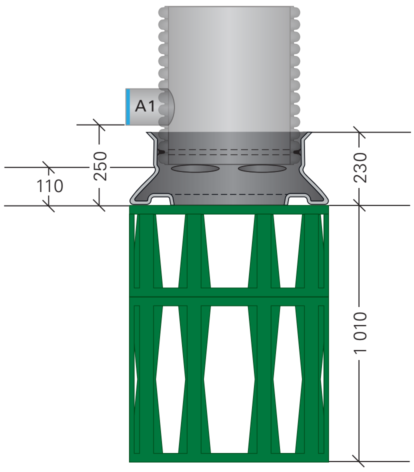
2-layer



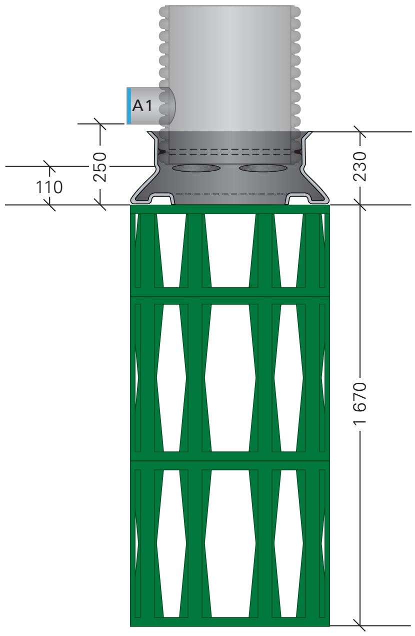
3-layer



1/2-layer



1 1/2-layer



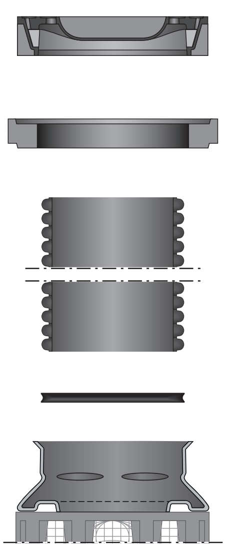
2 1/2-layer

*Rigofill ST product by FRÄNKISCHE

Quadro® Control ST – Design-relevant dimensions

Shaft design of Quadro® Control ST

Structure of inspection shaft

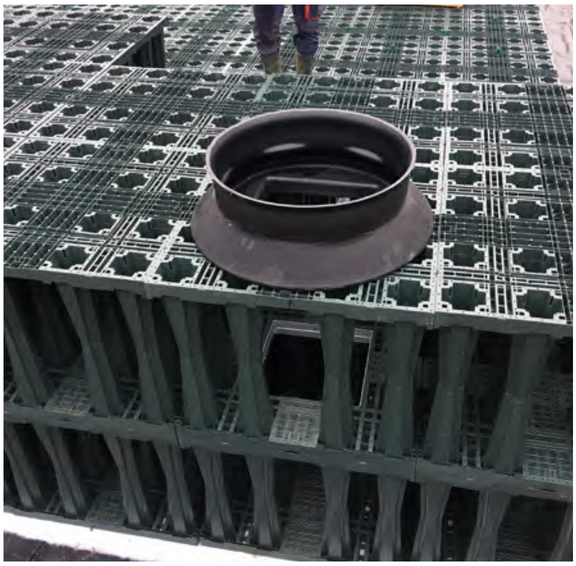


Class B or D
shaft cover acc. to DIN EN 124,
CW 610

Support ring acc. to DIN 4034,
D_I = 625 mm

Extension pipe
D_O 600

Sealing ring



*Rigofill ST product by FRÄNKISCHE

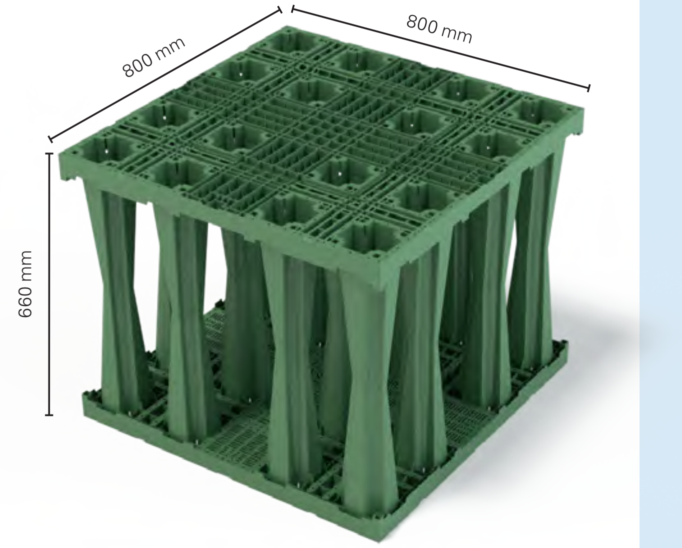
GreenStorm ST*

GreenStorm ST*

GreenStorm ST* IS highly durable and hard-wearing storage/infiltration module with a base of 800 x 800 mm and a height of 660 mm full blocks.

The polypropylene full block consists of two half elements to be installed on site and has a void ratio of more than 96 %. Water can flow through the module three-dimensionally almost without any obstacles. GreenStorm ST* allows for virtually any size and geometry of the systems.

The cross-shaped inspection tunnel in the storage/infiltration modules has been designed for the use of automotive dollies. This allows the effective drainage surface and the entire system volume with all statically relevant bearing-type fixtures to be inspected.

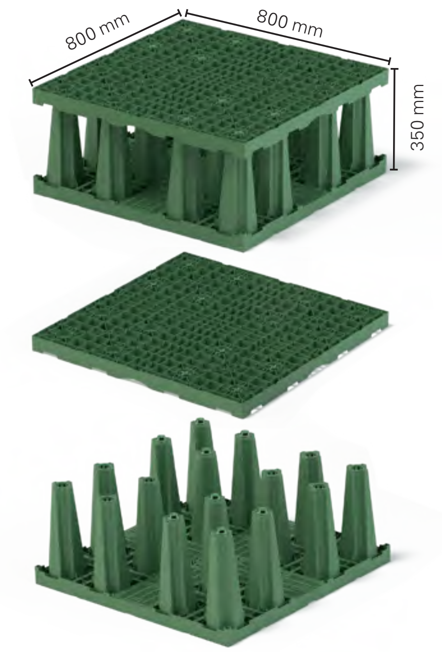


GreenStorm ST* – half block

The GreenStorm ST* half block has a base of 800 x 800 mm and a height of 350 mm.

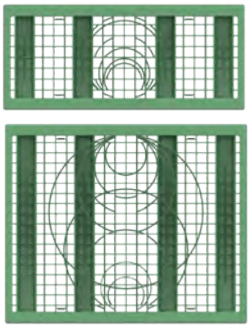
It consists of only one half element which must be assembled with a roof slab on site. This roof slab is only required for the half block. The GreenStorm ST* half block is used in particular for systems with shallow installation depths, e.g., in case of high groundwater levels.

Systems in various heights can be realised in 35 cm steps and adjusted to almost any layout in combination with the full block.



*Rigofill ST product by FRÄNKISCHE

GreenStorm ST* – Accessories



Différentes hauteurs de connexion (indépendamment du diamètre nominal) sont requises au-dessus du fond selon le nombre d'étages :

Nombre d'étages	Hauteur de raccord
0.5-layer	40 mm
1-layer	40 mm
1.5-layer	700 mm
2-layer	700 mm
2.5-layer	1 360 mm
3-layer	1 360 mm

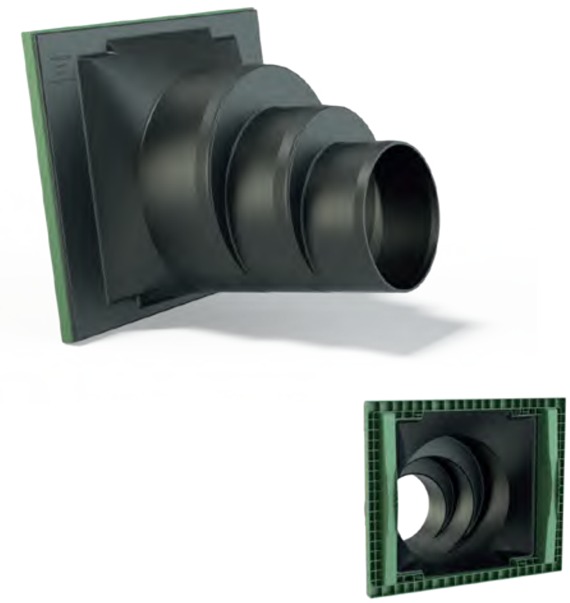
Sidewall grid

The sidewall grids serve as external boundary.

They can be assembled easily using snap connections. The predefined position of the connections at the sidewall grids guarantees that the connections of inlet pipe and outlet pipe and the tunnel are same level. The sidewall grids can be assembled easily also outside the excavation pit.

The sidewall grid for the full block and Quadro® Control ST has a size of W x D x H = 800 x 30 x 660 mm and is suited for connecting lateral solid wall pipes DN 110, 125, 160, 200, 225, 250, 315, 400 and 500.

The sidewall grid for the half block or the half-layer shaft has a size of W x D x H = 800 x 30 x 350 mm and is suited for connecting lateral solid wall pipes DN 110, 125, 160, 200, 225 and 250. In storage/infiltration designs with inside corners, shortened sidewall grids are used at one side.



Adapter

The adapter for GreenStorm ST* has a length of 800 mm and a height of 660 mm and serves as an inlet and outlet connection.

It provides an inlet connection with an optimised flow design with diffusor effect for solid wall pipes DN 315, 400 and 500. It can be connected to GreenStorm ST* easily and quickly thanks to the snap connection.

The predefined position of the snap connection at the module guarantees that inlet pipe and outlet pipe and tunnel connect same level.

The adapter ensures a connection with the same crown, as it is installed turned by 180°.

STORMCON
STORMWATER MANAGEMENT SOLUTIONS.

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Hydroworks® HydroStorm

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Introduction

The HydroStorm is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroStorm is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroStorm.

Hydroworks® HydroStorm Operation

The Hydroworks HydroStorm (HS) separator is a unique hydrodynamic by-pass separator. It incorporates a protected submerged pretreatment zone to collect larger solids, a treatment tank to remove finer solids, and a dual set of weirs to create a high flow bypass. High flows are conveyed directly to the outlet and do not enter the treatment area, however, the submerged pretreatment area still allows removal of coarse solids during high flows.

Under normal or low flows, water enters an inlet area with a horizontal grate. The area underneath the grate is submerged with openings to the main treatment area of the separator. Coarse solids fall through the grate and are either trapped in the pretreatment area or conveyed into the main treatment area depending on the flow rate. Fines are transported into the main treatment area. Openings and weirs in the pretreatment area allow entry of water and solids into the main treatment area and cause water to rotate in the main treatment area creating a vortex motion. Water in the main treatment area is forced to rise along the walls of the separator to discharge from the treatment area to the downstream pipe.

The vortex motion forces solids and floatables to the middle of the inner chamber. Floatables are trapped since the inlet to the treatment area is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while water must flow up the walls of the separator to discharge into the downstream pipe.

A set of high flow weirs near the outlet pipe create a high flow bypass over both the pretreatment area and main treatment chamber. The rate of flow into the treatment area is regulated by the number and size of openings into the treatment chamber and the height of by-pass weirs. High flows flow over the weirs directly to the outlet pipe preventing the scour and resuspension of any fines collected in the treatment chamber.

A central access tube is located in the structure to provide access for cleaning. The arrangement of the inlet area and bypass weirs near the outlet pipe facilitate the use of multiple inlet pipes.

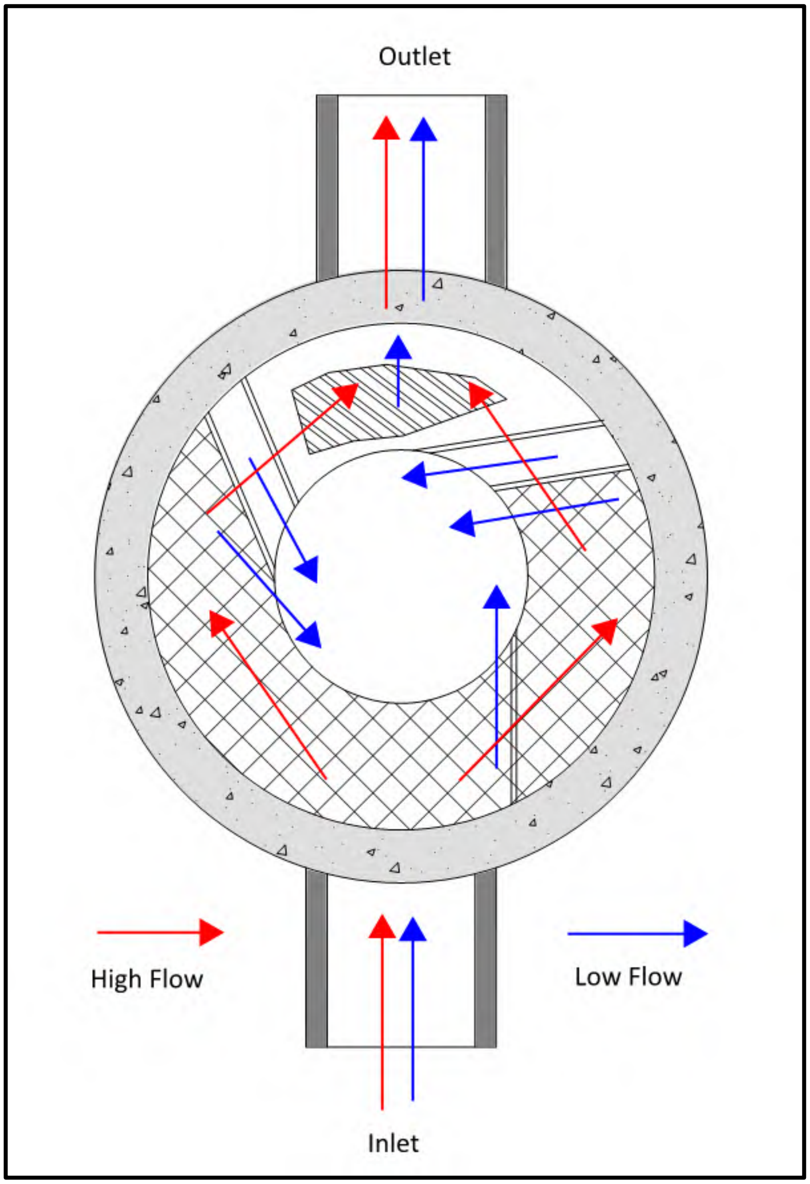


Figure 1. Hydroworks HydroStorm Operation – Plan View

Figure 2 is a profile view of the HydroStorm separator showing the flow patterns for low and high flows.

Hydroworks

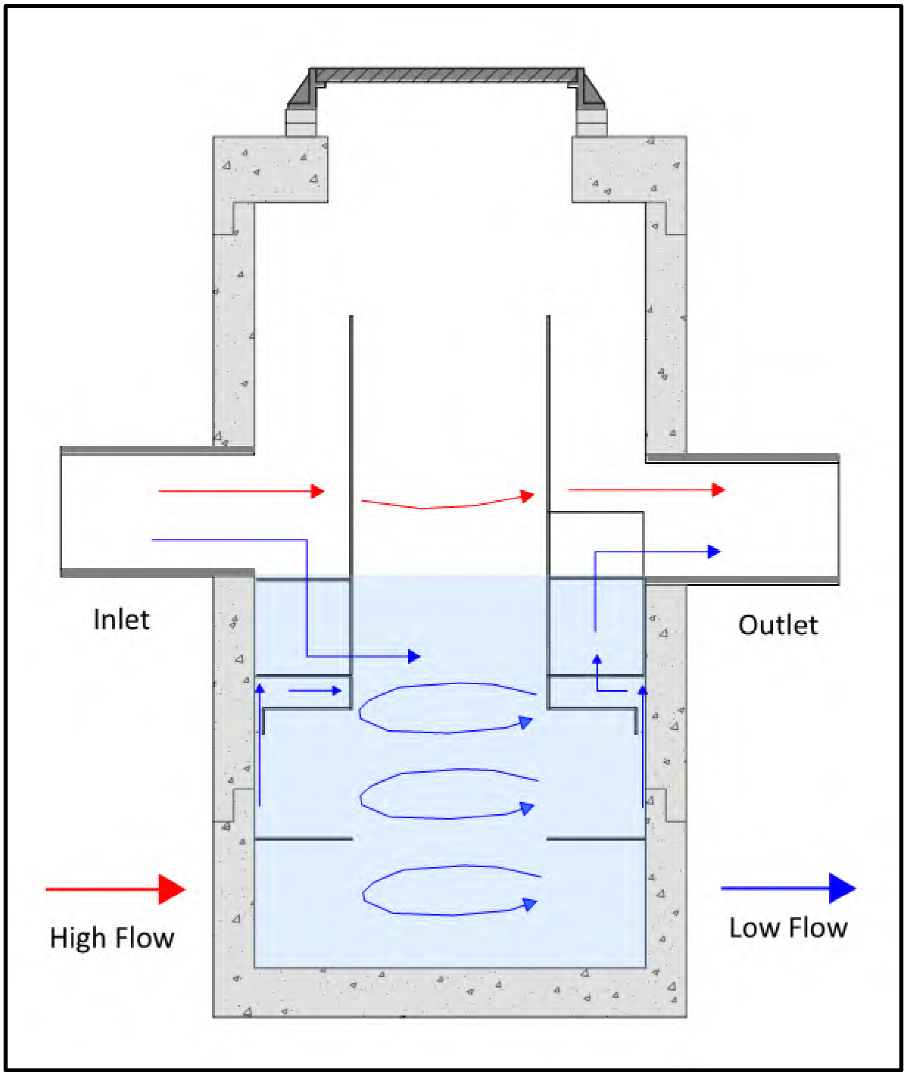


Figure 2. Hydroworks HydroStorm Operation – Profile View

The HS 4i is an inlet version of the HS 4 separator. There is a catch-basin grate on top of the HS 4i. A funnel sits sits underneath the grate on the frame and directs the water to the inlet side of the separator to ensure all lows flows are properly treated. The whole funnel is removed for inspection and cleaning.

Hydroworks

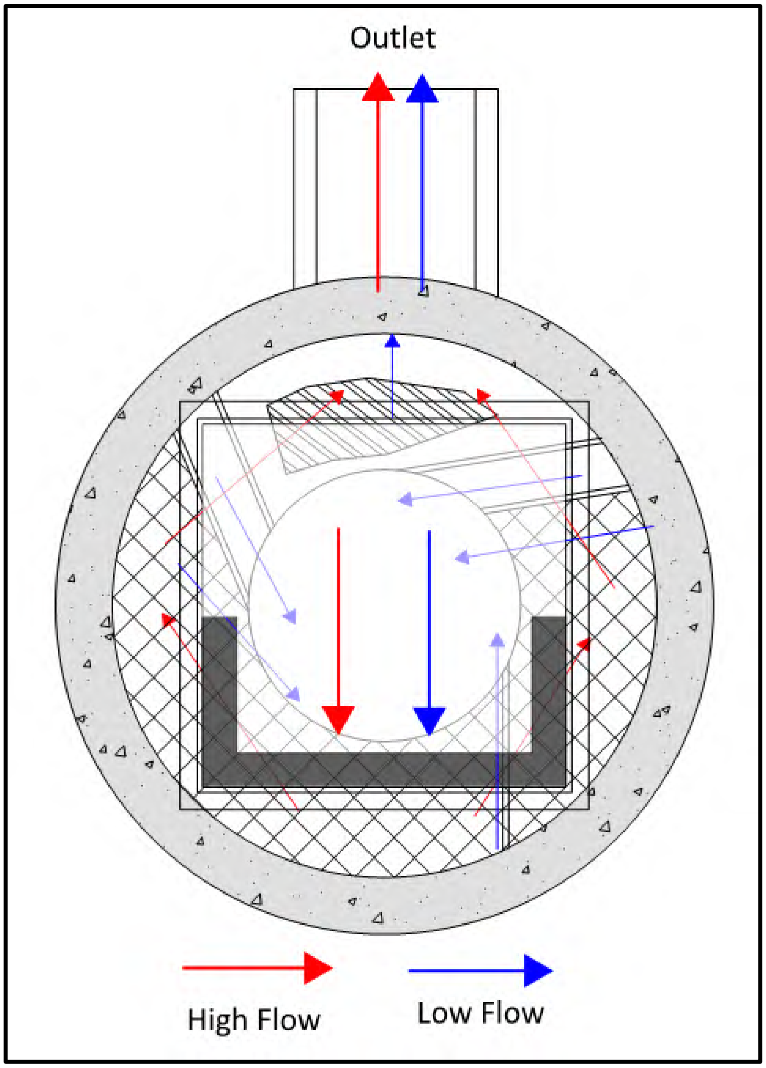


Figure 3. Hydroworks HS 4i Funnel

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the center access tube of the separator. Separators with an inlet grate (HS 4i or custom separator) will have a plastic funnel located under the grate that must be removed from the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HydroStorm separator should be inspected every four weeks and after every large storm (over 0.5” (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroStorm separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HydroStorm separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroStorm unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroStorm separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

A central access opening (24" or greater) is provided to the gain access to the lower treatment tank of the unit. This is the primary location to maintain by vacuum truck. The pretreatment area can also be vacuumed and/or flushed into the lower treatment tank of the separator for cleaning via the central access once the water level is lowered below the pretreatment floor.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature. Disposal of the water will depend on local requirements. Disposal options for the decanted water may include:

1. Discharge into a nearby sanitary sewer manhole
2. Discharge into a nearby LID practice (grassed swale, bioretention)
3. Discharge through a filter bag into a downstream storm drain connection

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HydroStorm unit will typically take 1 to 2 hours based on a vacuum truck and longer for other cleaning methods (i.e. clamshell bucket).

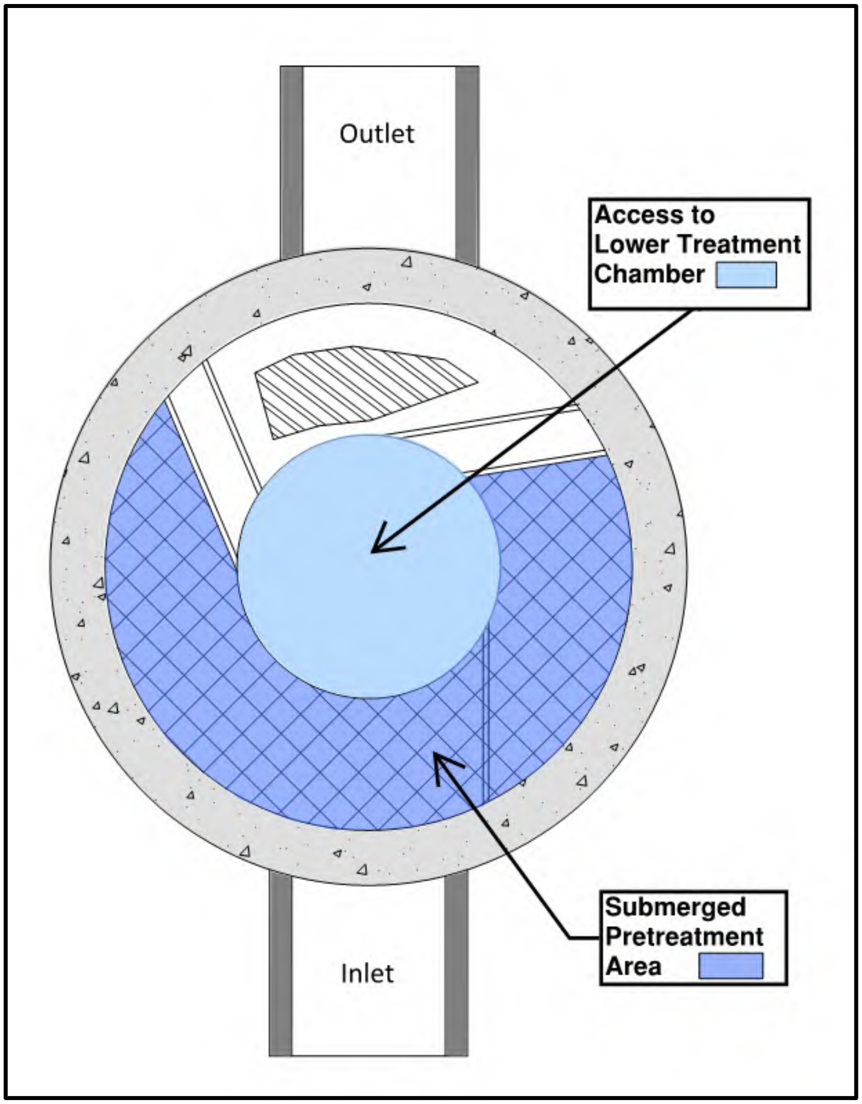


Figure 3. Maintenance Access

Frequency

Construction Period

A HydroStorm separator can fill with construction sediment quickly during the construction period. The HydroStorm must be maintained during the construction period when the depth of TSS/sediment reaches 24" (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroStorm separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The HydroStorm was independently tested by Alden Research Laboratory in 2017. A HydroStorm HS 4 was tested for scour with a 50% sediment depth of 0.5 ft. Therefore, maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. A measurement of the total water depth in the separator through the central access tube should be taken and compared to water depth given in Table 1. The standard water depth from Table 1 should be subtracted from the measured water depth and the resulting extra depth should be added to the 1 ft to determine the site-specific sediment maintenance depth for that separator.

For example, if the measured water depth in the HS-7 is 7 feet, then the sediment maintenance depth for that HS-7 is 2 ft (= 1 + 7 – 6) and the separator does not need to be cleaned for sediment accumulation until the measure sediment depth is 2 ft.

The HydroStorm separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroStorm Models

Model	Diameter (ft)	Total Water Depth (ft)	Sediment Maintenance Depth for Table 1 Total Water Depth(ft)
HS-3	3	3	1
HS-4	4	4	1
HS-5	5	4	1
HS-6	6	4	1
HS-7	7	6	1
HS-8	8	7	1
HS-9	9	7.5	1
HS-10	10	8	1
HS-11	11	9	1
HS-12	12	9.5	1

HYDROSTORM INSPECTION SHEET

Date	______________________
Date of Last Inspection	______________________
Site	______________________
City	______________________
State	______________________
Owner	______________________
GPS Coordinates	______________________
Date of last rainfall	______________________

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroStorm	**Yes**	**No**
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐
Water level depth below outlet pipe invert ________“		

Routine Measurements				
Floating debris depth	**< 0.5” (13mm)**	☐	**>0.5” 13mm)**	☐ *
Floating debris coverage	**< 50% of surface area**	☐	**> 50% surface area**	☐ *
Sludge depth	**< 12” (300mm)**	☐	**> 12” (300mm)**	☐ *

* Maintenance required
** Repairs required
*** Further investigation is required

Hydroworks

Other Comments:

Hydroworks® HydroStorm

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroStorm to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroStorm are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroStorm, or the cost of other goods or services related to the purchase and installation of the HydroStorm. For this Limited Warranty to apply, the HydroStorm must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroStorm arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroStorm, whether the claim is based upon contract, tort, or other legal basis.

APPENDIX E

Geotechncial Report

PROJECT NO.: SM 230509-G October 31, 2023

SCHOUT COMMUNITIES
C/O WALTERFEDY
20 Hughson St. South, Suite 1000
L8N 2A1

Attention: Mr. Rob Barnett, C.E.T.

GEOTECHNICAL INVESTIGATION
PROPOSED INFILTRATION GALLERY
3770 HAZEL STREET
FORT ERIE, ONTARIO

Dear Mr. Barnett,

Further to your authorisation, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has completed the fieldwork, and report preparation in connection with the above noted project. The scope of work was completed in general accordance with our proposal P230509, dated June 22, 2023. Our comments and recommendations based on our findings at the six [6] test pit locations are presented in the following paragraphs.

1. INTRODUCTION

We understand that the project will involve the construction of town house development at the property located at 3770 Hazel Street in Fort Erie, Ontario. The site servicing will include an associated stormwater management system consisting of below grade storage chambers. The potential for infiltration of stormwater from the storage chambers is also being considered. As such, geotechnical assessment of the site is warranted to confirm the subsurface soil conditions.

The purpose of this geotechnical investigation work is to assess the site subsurface soil conditions, and to provide our comments and recommendations with respect to the design and construction of on-site stormwater management systems, from a geotechnical point of view.

This report is based on the above summarised project description, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are made to the proposed design, this office must be consulted to review the new design with respect to the results of this investigation. It is noted that some preliminary background sampling has been conducted, which has been reported under a separate Soil Characterisation Report.

2. PROCEDURE

A total of six [6] sampled test pits were advanced at the locations illustrated in the attached Drawing No.1 Test pit Location Plan. The test pits were advanced using rubber track excavator equipment on October 2, 2023 under the direction and supervision of a representative of SOIL-MAT ENGINEERS AND CONSULTANTS LTD., to termination at depths of between approximately 1.8 to 3.0 metres below the existing ground surface.

Representative samples of the subsoils were recovered at selected depth intervals from the test pit s. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on all soil samples recovered from the excavations. Upon competition of excavation, the test pits were backfilled and nominally 'bucket packed' with the excavation equipment, and the ground surface was reinstated even with the surrounding grade.

The test pits were located in the field by representatives of SOIL-MAT ENGINEERS, based on accessibility over the site and clearance of underground utilities. The ground surface elevation at the test pit locations has been referenced to a geodetic benchmark, described as the as the top of a manhole cover on Hazel Street, as illustrated in the attached Drawing No.1, Test pit Location Plan. This benchmark has a know elevation of 186.56 m. as described in the drawing supplied to this office [Servicing Plan, 3770 Hazel Street, Town of Fort Erie., Drawn by WalterFedy, Project No 2022.0365.10, dated 2023/02/10]

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The subject site is located at 3770 Hazel Street in Fort Erie, Ontario and consists predominantly of undeveloped land with a gravel surfaced parking area in the south west third of the site. The property is bounded by residential properties to the east, Hazel Street to the south, Belleview Boulevard to the west and undeveloped property to the north. The subject site has a relatively flat and even with the surrounding roadways.

The subsurface conditions encountered at the test pit locations are summarized as follows:

Topsoil

A surficial veneer of topsoil/organic disturbed material approximately 300 to 600 millimetres in thickness was encountered at all test pit locations with the exception of Test Pit Nos. 5 and 6. It is noted that the depth of topsoil may vary across the site and from the depths encountered at the test pit locations. It is also noted that the term 'topsoil' has been used from a geotechnical point of view and does not necessarily reflect its nutrient content or its ability to support plant life. As such, it is recommended that a conservative approach be taken when estimating topsoil quantities across the site.

Sand and Gravel Fill

Test pit Nos. 5 and 6 were advanced through the sand and gravel fill of the pre-existing paved parking lot. The surficial fill was approximately 300 millimetres in thickness, and was noted to have occasional construction debris through out and was generally in a compact condition.

Silty Sand Fill

Silty sand fill was encountered beneath the topsoil layer in Test Pit Nos. 3 and 4. The fine-grained granular material was brown in colour and was generally is a loose to compact state. The fill soils were proven to depths of approximately 0.8 metres below the ground surface.

Silty Clay/Clayey Silt

Native silty clay/clayey silt was encountered beneath the sand and gravel fill or topsoil layers at all at test pit locations. The fine grained cohesive soil was brown in colour and contained some gravel and occasional cobbles with depth. A transition to grey was noted within Test pit Nos. 1, 2, 3, and 4 at depths of between approximately 3.0 to 3.5 metres below the existing ground surface. The native silty clay/clayey silt was generally noted to be stiff to very stiff in consistency and was proven to termination at depths of approximately 1.8 to 3.0 metres below the existing ground surface where encountered.

A summary of the conditions encountered in the test pits are summarised as follows:

TABLE A – SOIL DESCRIPTION

Test Pit No.	Elevation (m)	Depth (m)	Soil Description
1	186.28 – 185.68	0 – 0.6	**Topsoil** – Approximately 600 millimetres of topsoil.
	185.68 – 183.88	0.6 – 2.4	**Silty Clay/Clayey Silt** – Brown, trace gravel, stiff to very stiff.
2	186.32 – 186.02	0 – 0.3	**Topsoil** – Approximately 300 millimetres of topsoil.
	186.02 – 183.32	0.3 – 3.0	**Silty Clay/Clayey Silt** – Brown, trace gravel, occasional cobbles with depth, stiff to very stiff.
3	186.53 – 186.23	0 – 0.3	**Topsoil** – Approximately 300 millimetres of topsoil.
	186.23 – 185.73	0.3 – 0.8	**Silty Sand Fill** – Brown, loose to compact.
	185.73 – 183.53	0.8 – 3.0	**Silty Clay/Clayey Silt** – Brown, trace gravel, stiff to very stiff.
4	186.14 – 185.84	0 – 0.3	**Topsoil** – Approximately 300 millimetres of topsoil.
	185.84 – 185.34	0.3 – 0.8	**Silty Sand Fill** – Brown, loose to compact.
	185.34 – 184.34	0.8 – 1.8	**Silty Clay/Clayey Silt** – Brown, trace gravel, stiff to very stiff.
5	186.03 – 185.73	0 – 0.3	**Sand and Gravel Fill** – Approximately 300 millimetres of sand and gravel fill, compact.
	185.73 – 183.93	0.3 – 2.1	**Silty Clay/Clayey Silt** – Brown, trace gravel, stiff to very stiff.
6	186.25 – 185.95	0 – 0.3	**Sand and Gravel Fill** – Approximately 300 millimetres of sand and gravel fill, compact.
	185.95 – 184.45	0.3 – 1.8	**Silty Clay/Clayey Silt** – Brown, trace gravel, stiff to very stiff.

A review of available published information [Quaternary Geology of Ontario, Southern Sheet Map 2556] indicate the subsurface soils to be fine textured glaciolacustrine deposits of silt and clay, with minor sand and gravel. These conditions are consistent with our observations during drilling and experience in the area.

Grain size analysis was conducted on a selected representative sample of the native silty clay soils. The results of this grain size testing can be found appended to the end of this report, and are summarized as follows:

TABLE B - GRAIN SIZE ANALYSES

Sample ID	Depth	% Clay	% Silt	% Sand	% Gravel	Hydraulic Conductivity, k [cm/s]	Estimated Infiltration Rate, [mm/hr]
TP6 S1	1.8 m	63	34	3	0	10^{-8}	<5

The field and laboratory testing demonstrate the native soils to generally consist of a silty clay/clayey silt mixture with trace sand resulting in an effectively impermeable soil. According to the Unified Soil Classification System (USCS), the upper silty clay/clayey silt soils are classified as C.L. – silty clays.

LID Stormwater Management – In-situ Permeability Testing

In-situ infiltration testing was performed in the base of Test Pit No 6 resulting in effectively impermeable conditions. This is consistent with the above noted grain size analysis result. With such soils an LID stormwater management solution making use of on-site infiltration is not considered feasible for this project and other storage solutions should be explored.

Groundwater Observations

All test pits were noted as being open and 'dry' [i.e. no free groundwater present] upon completion of excavation. It is noted that insufficient time would have passed for the static groundwater level to stabilise in the open boreholes. It is also noted that the transition of colour to grey in clays and silts is generally indicative of the static groundwater level. Based on our observations on site, and other available information, the groundwater level is estimated as a depth of 3 to 4 metres.

4. EXCAVATIONS

Excavations for the installation of foundations and underground services are anticipated to extend to depths of approximately 2 to 3 metres below the existing grade. Excavations should be relatively straight forward, with sides slopes through the fine-grained cohesive soils remaining stable for short construction periods at inclinations of up to 45 to 60 degrees to the horizontal. Where wet or more permeable seams are encountered, during periods of extended precipitation, the sides of the excavation should be expected to 'slough in' to as flat as 3 horizontal to 1 vertical, or flatter.

Notwithstanding the above, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects. The fill soils would be considered as Type 3, while the native silty clay/clayey silt soils encountered would generally be considered a Type 2, as outlined in the Ontario Health and Safety Act III – Excavation. Excavations sloped steeper than those required in the Safety Act must be supported and a senior geotechnical engineer from this office should monitor the work.

As noted above, the observations during excavation anticipate a groundwater level on the order of approximately 3 to 4 metres below the existing grade, though shallower 'perched' deposits should be anticipated across the site, in particular within any granular fill deposits above the low permeable native silty clay, especially during 'wet' times of the year. The proposed excavations are anticipated to be above the groundwater level, such that significant or sustained dewatering is not anticipated to be required. Regardless, some amount of short-term construction dewatering should be anticipated, especially during the 'wet' times of the year. It should be possible, however, to control such infiltration with typical construction dewatering methods as noted above, i.e. pumping from sumps in the base of excavations, even for excavations extending slightly below the ground water level. Where excavations extend to greater depths, to and below the groundwater level, the rate of infiltration may be greater and additional pumping or more sophisticated dewatering methods may be required. The rate of infiltration for the short construction period is anticipated to be less than 50,000 L/day, and certainly less than 400,000 L/day, such that an EASR or PTTW would not be expected. More water should be expected when connections are made to existing services. Surface water should be directed away from the excavations.

The base of the excavations in the native soils, above the groundwater level, encountered in the boreholes should generally remain firm and stable. Where excavations extend to greater depths, or where 'perched' water is encountered, some base instability might be experienced, especially during 'wet' times of the year. Areas of base instability may be stabilised with the placement of additional bedding or ballast stone, the use of coarser stone material, etc. The appropriate measures are best assessed based on the actual conditions at the time of construction. With a firm and stable base condition, stabilised where warranted, standard pipe bedding material as specified by the Ontario Provincial Standard Specification [OPSS] or Town of Lincoln should be satisfactory. The bedding should be well compacted to provide sufficient support to the pipes and components (i.e. valve chambers, manholes etc.), and to minimize settlements of the roadway above the service trenches. Special attention should be paid to compaction under the pipe haunches.

We recommend that the invert elevations of any storm sewer pipes for rear yard catch basins be located above the proposed underside of footing elevations of adjacent residential structures, where possible, or that the trench excavations should be filled with 5 MPa 'lean mix' concrete product to the proposed underside of footing level where the excavations extend below an imaginary 10 horizontal to 7 vertical line extending outwards and down from a point 0.3 metres beyond the proposed townhouse foundations.

Any utility poles, light poles, etc. located within 3 metres of the top of an excavation slope should be braced to ensure their stability. Likewise, temporary support might be required for other existing above and below ground structures, including existing underground services, roadways, etc. depending on their proximity to the trench excavations.

5. BACKFILL CONSIDERATIONS

The excavated material will consist primarily of the silty clay/clayey silt soils encountered in the boreholes as described above. These soils are generally considered suitable for use as engineered fill, trench backfill, etc., provided they are free of organics, construction debris, or other deleterious material, and that its moisture content can be controlled to within 3 percent of its standard Proctor optimum moisture content.

It is noted that the on-site soils encountered are not considered to be free draining and should not be used where this characteristic is necessary. The silty clay/clayey silt soils encountered are generally considered to be near to slightly 'wet' of their standard Proctor optimum moisture content. Some moisture conditioning will be required depending upon the weather conditions at the time of construction. It is noted that these fine grained to cohesive soils will become nearly impossible to compact when wet of its optimum moisture content. Any material that becomes wet to saturated should be spread out to allow to dry, or removed and discarded, or utilised in non-settlement sensitive areas.

We note that where backfill material is placed near or slightly above its optimum moisture content, the potential for long-term settlements due to the ingress of groundwater and collapse of fill structure for long term settlement is reduced. Correspondingly, the shear strength of the 'wet' backfill material is also lowered, thereby reducing its ability to support construction traffic and therefore impacting roadway construction. If the soil is well dry of its optimum value, it will appear to be very strong when compacted, but will tend to settle with time as the moisture content in the fill increases to equilibrium condition. The soils encountered may require high compaction energy to achieve acceptable densities if the moisture content is not close to its standard Proctor optimum value. It is therefore very important that the moisture content of the soils be within 3 percent of its Proctor optimum moisture content placement and compaction to minimize long term subsidence [settlement] of the fill mass. Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 percent of its optimum moisture content and meet the necessary environmental guidelines.

A representative of SOIL-MAT should be present on-site during the backfilling and compaction operations to confirm the uniform compaction of the backfill material to project specification requirements. Close supervision is prudent in areas that are not readily accessible to compaction equipment, for instance near the end of compaction 'runs'. All structural fill should be compacted to 100 percent of its standard Proctor maximum dry density [SPMDD]. Backfill within service trenches, areas to be paved, etc., should be places in loose lifts not exceeding 300 millimetres in thickness and compacted to a minimum of 98 percent of its SPMDD. The appropriate compaction equipment should be employed based on soil type, i.e. pad-toe for cohesive soils and smooth drum/vibratory plate for granular soils. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

6. MANHOLES, CATCH BASINS AND THRUST BLOCKS

Properly prepared bearing surfaces for manholes, valve chambers, etc., in the native competent soils, stabilized where required, will be practically non-yielding under the anticipated loads. Proper preparation of the founding soils will tend to accentuate the protrusion of these structures above the pavement surface if the compaction of the fill around these structures are not adequate, causing the settlement of the surrounding paved surfaces. Conversely, the pavement surfaces may rise above the valve chambers and around manholes under frost action. To alleviate the potential for these types of differential movements, free-draining non-frost susceptible material should be employed as backfill around the structures located within the paved roadway limits, and compacted to within 100 percent if its standard Proctor maximum dry density.

The thrust blocks in the native soils may be conservatively sized as recommended by the applicable Ontario Provincial Standard Specification conservatively using a horizontal allowable bearing pressure of up to 150 kPa [~3,000 psf]. Any backfill required behind the blocks should be a well-graded granular product and should be compacted to 100 percent of its standard Proctor maximum dry density.

7. PAVEMENT STRUCTURE DESIGN CONSIDERATIONS.

All areas to be paved must be cleared of all organic and otherwise unsuitable materials, and the exposed subgrade proof rolled with 3 to 4 passes of a loaded tandem-axle truck in the presence of a representative of SOIL-MAT ENGINEERS & CONSULTANTS LTD., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this or other means should be sub excavated and replaced with suitable backfill material. Where the subgrade condition is poorer it may be necessary to implement more aggressive stabilisation methods, such as the use of coarse aggregate [50-millimetre clear stone, 'rip rap' etc.] 'punched' into the soft areas. In severe cases where the subgrade is well wet to saturated and presenting significant instability, the provision of a stabilising geogrid or geofabric separator between subgrade and granular sub-base layers may be warranted. This assessment would be best made at the time of construction pending assessment of the subgrade, weather conditions, etc.

Good drainage provisions will optimise the long-term performance of the pavement structure. The subgrade must be properly crowned and shaped to promote the drainage to the subdrain system. Subdrains should be installed to intercept excess subsurface water and to prevent the softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved areas.

The most severe loading conditions on the subgrade typically occur during the course of construction, therefore precautionary measures may have to be taken to ensure that the subgrade is not unduly disturbed by construction traffic. SOIL-MAT should be given the opportunity to review the final pavement structure design and subdrain scheme prior to the construction to ensure that they are consistent with the recommendations of this report.

If construction is conducted under adverse weather conditions, additional subgrade preparation may be required. During wet weather conditions, such as during the fall and spring months, it should be anticipated that additional subgrade preparation will be required, such as additional depth of Ontario Provincial Standard Specification [OPSS] Granular 'B' Type II (crushed limestone bedrock) sub-base material. It is also important that the sub-base and base granular layers of the pavement structure be placed as soon as possible after exposure, preparation and approval of the subgrade level.

The proposed private roadways through the residential condominium subdivision would be required to adequately support cars, trucks, and intermittent delivery and garbage trucks. It is understood that the proposed road structure is to consist of 400 millimetres of OPSS Granular 'A' base course, 50 millimetres of HL8 binder course asphaltic concrete, and 40 millimetres of HL3 surface course asphaltic concrete. This structure would be considered suitable for the proposed development, provided that the subgrade has been prepared as specified, and is good and firm before the placement of granular material. Consideration may be given to reducing the thickness of OPSS Granular ‘A’ base course to 150 millimetres and placing an initial 250 millimetres of sub-base course granular [OPSS Granular ‘B’, Type II], which would assist in stabilizing the subgrade and enhancing the drainage of the pavement structure. Where the roads are to be assumed by the Town of Fort Erie, the pavement structure should conform to the relevant Town of Fort Erie standards. It is in our opinion that this design is suitable for use on a typical local residential roadway section, provided that the subgrade has been prepared as specified and is good and firm before the sub-base material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented and/or the sub-base course thickness may have to be increased. The granular sub-base and base courses and asphaltic concrete layers should be compacted to OPSS or Town of Fort Erie requirements. This would typically be a minimum of 98% of Standard Proctor maximum dry density [SPMDD] for granular layers, and a minimum of 92% of Maximum Relative Density [MRD] for asphalt layers. A program of in-place density testing must be carried out to monitor that compaction requirements are being met. We note that this pavement structure is not to be considered as a construction roadway design.

To minimise segregation of the finished asphalt mat, the asphalt temperature must be maintained uniform throughout the mat during placement and compaction. All to often significant temperature gradients exist in the delivered and placed asphalt with the cooler portions of the mat resisting compaction and presenting a honeycomb surface. As the spreader moves forward, a responsible member of the paving crew should monitor the pavement surface, to ensure a smooth uniform surface. The contractor can mitigate the surface segregation by ‘back-casting’ or scattering shovels of the full mix material over the segregated areas and racking out the coarse particles during compaction operations. Of course, the above assumes that the asphalt mix is sufficiently hot to allow the ‘back-casting’ to be performed.

Asphalt paving of driveways should be consistent with the general recommendations provided above. Proper preparation of the subgrade soils is essential to good long-term performance of the pavement. Likewise, sufficient depth and compaction of granular base materials and adequate drainage will be important in achieving good long-term performance, i.e. preventing/limiting premature cracking, subgrade failure, rutting, etc. A typical recommended light duty pavement structure for residential driveways would consist of a minimum of 200 millimetres of OPSS Granular ‘A’ base course, compacted to 100 percent standard Proctor maximum dry density, followed by a minimum of 50 millimetres of HL3 or HL3F asphaltic concrete, compacted to a minimum of 92 per cent of their Marshall maximum relative density [MRD].

8. HOUSE CONSTRUCTION

The native soils encountered at the test pit locations are considered capable of supporting the loads associated with typical residential dwelling and townhouse structures on conventional spread footings below any fill, organic, organic, or otherwise unsuitable materials. It is recommended that a nominal bearing capacity of 150 kPa [~3,000 psf] SLS, and 225 kPa [~4,500 psf] ULS may be considered in the competent native soils. The founding surfaces must be hand cleaned of any loose or disturbed material, along with any ponded water, immediately prior to placement of foundation concrete.

The support conditions afforded by the native soils are generally not uniform across the building footprint, nor are the loads on the various foundation elements. As such it is recommended that consideration be given to the provision of nominal reinforcement in the footings and foundation walls to account for the variable support and loading conditions. The use of nominal reinforcement is considered good construction practice as it will act to reduce the potential for cracking in the foundation walls due to settlements, heaving, shrinkage, etc. and will assist in resisting the pressures generated against the foundation walls by the backfill. Such nominal reinforcement would typically consist of two continuous 15M steel bars placed in the footings [directly below the foundation wall], and similarly two steel bars placed approximately 300 millimetres from the top of the foundation walls at a minimum depending on the ground conditions exposed during construction. These reinforcement bars would be bent to reinforce all corners and under basement windows, and be provided with sufficient overlap at staggered splice locations. At 'steps' in the foundations and at window locations, the reinforcing steel should transition diagonally, rather then at 90 degrees, to maintain the tensile capacity of the reinforcement.

As noted above, the groundwater level is conservatively estimated at depths of approximately 3to 4 metres below the existing ground surface. Based on our observations, it is estimated that the basement levels of the new dwellings would be sufficiently above the estimated groundwater level, such that long-term dewatering would not be required. Regardless, typical foundation drainage should be provided to account for any infiltration against the foundations, associated with surface runoff and rainfall events, should be provided. All basement foundation walls should be suitably damp proofed, including the provision of a 'dimple board' type drainage product, and provided with a perimeter drainage tile system outlet to a gravity sewer connection or positive sump pit a minimum of 150 millimetres below the basement floor slab. The clear stone material surrounding the weeping tile should be encased with a geotextile material to prevent the migration of fines from the foundation wall backfill into the clear stone product.

All footings exposed to the environment must be provided with a minimum of 1.2 metres of earth or equivalent insulation to protect against frost penetration. This frost protection would also be required if construction were undertaken during the winter months. All footings must be proportioned to satisfy the requirements of the Ontario Provincial Building Code.

It is imperative that a soils engineer be retained from this office to provide geotechnical engineering services during the excavation and foundation construction phases of the project. This is to observe compliance with the design concepts and recommendations outlined in this report, and to allow changes to be made in the event that subsurface conditions differ from the conditions identified at the test pit locations.

9. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The material in it reflects SOIL-MAT ENGINEERS' best judgement in light of the information available at the time of preparation. The subsurface descriptions and test pit information are intended to describe conditions at the test pit locations only. It is the contractors' responsibility to determine how these conditions will affect the scheduling and methods of construction for the project. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. SOIL-MAT ENGINEERS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarification as to the contents of this document, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

Kevin Reid, EIT, B. Eng.
Junior Engineer

Ian Shaw, P. Eng, QP ESA
Senior Engineer

LICENSED PROFESSIONAL ENGINEER
Oct 31/23
L. D. SHAW
100042315
IS
PROVINCE OF ONTARIO

Enclosures: Drawing No. 1, Test Pit Location Plan
Grain Size Analyses
Drawing No. 2, Recommended Design Requirements for Basement Construction

Distribution: Schout Communities C/O WalterFedy [PDF]

LEGEND

Test Pit Location (BH#)

Benchmark (BM)
Manhole Cover
Elevation = 186.56

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Report No. SM 230509-G.

2. Test Pit locations are approximate.

SOIL-MAT
ENGINEERS & CONSULTANTS LTD.

Geotechnical Investigation
Proposed Residential Development
3770 Hazel Street
Fort Erie, Ontario

Test Pit Location Plan

Project No. SM 230509-G

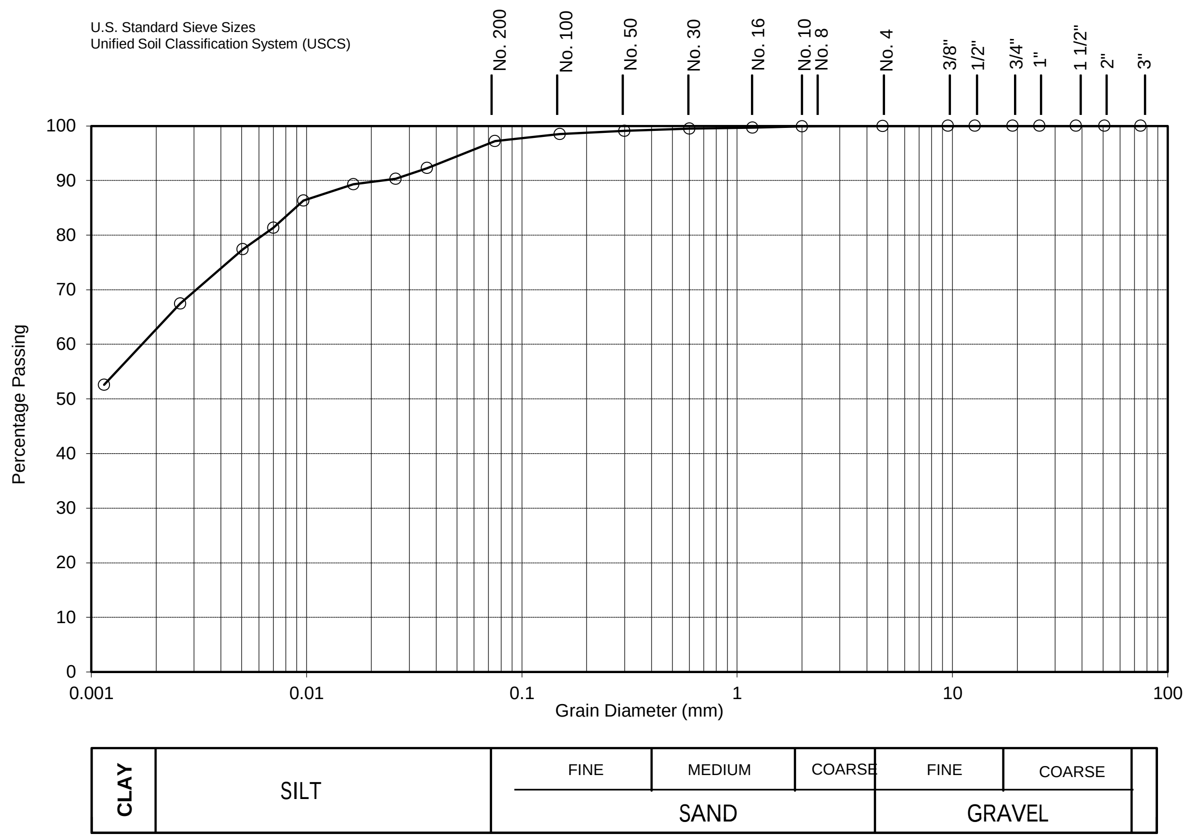
Date October 2023

Drawn: KJR	Checked: IS

SM 230509-G Test Pit Location Plan

Drawing No. 1

Mechanical & Hydrometer Analyses

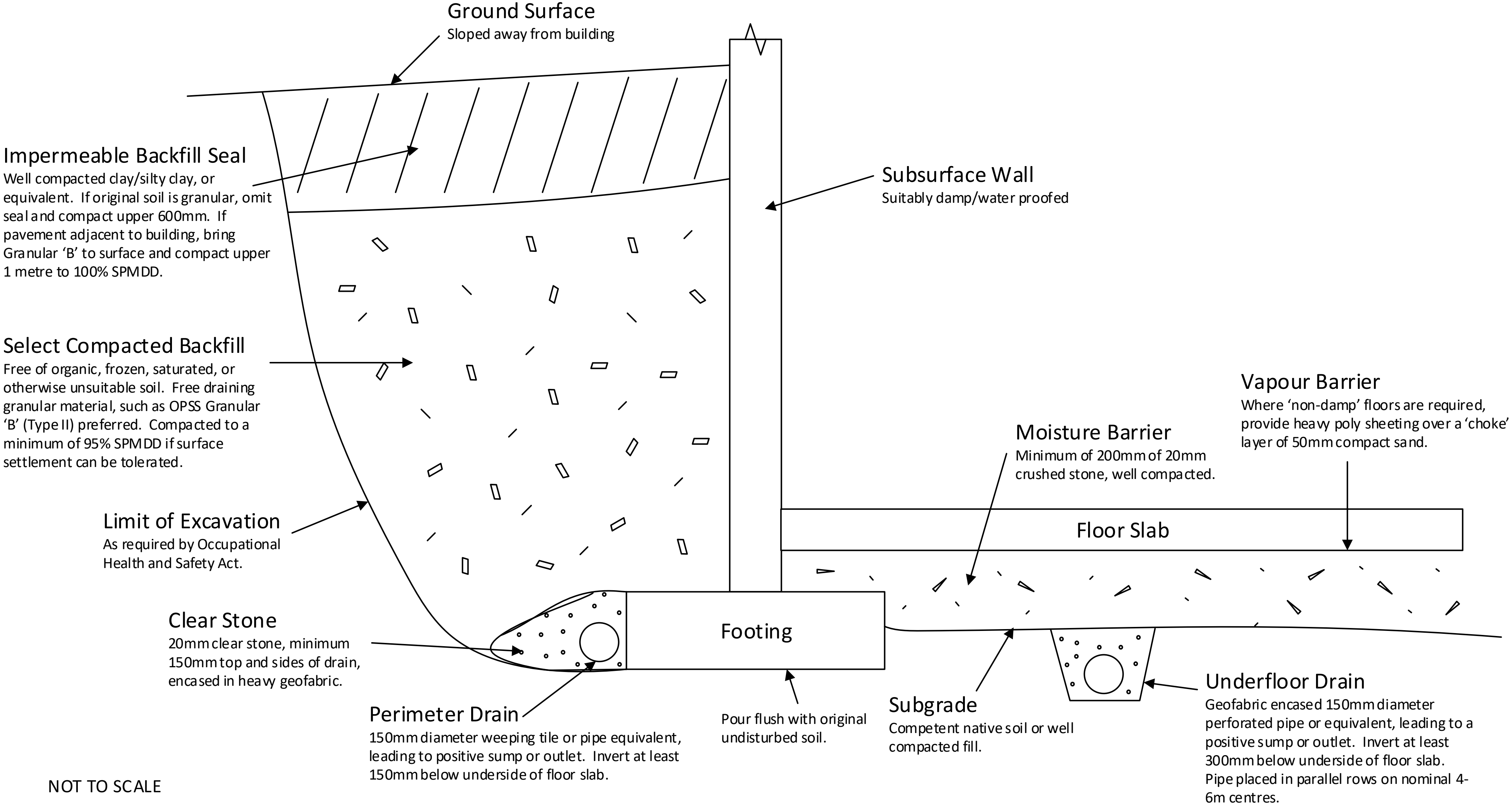


Lab No.:	**23-375**	Notes: Depth: 6'			
Borehole No.:	**TP 6**				
Sample No.:	**1**				
CLAY [%]:	**63**	Soil Description:	**Brown Silty Clay w/ a trace of Sand**		
SILT [%]:	**34**		**C.L. - Silty clays**		
SAND [%]:	**3**				
GRAVEL [%]:	**0**	Estimated Infiltration Rate [mm/hr] :	**< 5**	Estimated Permeability, k [cm/s]	**10^{-8}**
D_{10} (Effective Diam. in mm):	**0.0001**	Coefficient of Uniformity C_U:	**17.0**	Coefficient of Curvature C_C:	**0.5**

SOIL-MAT ENGINEERS & CONSULTANTS LTD.

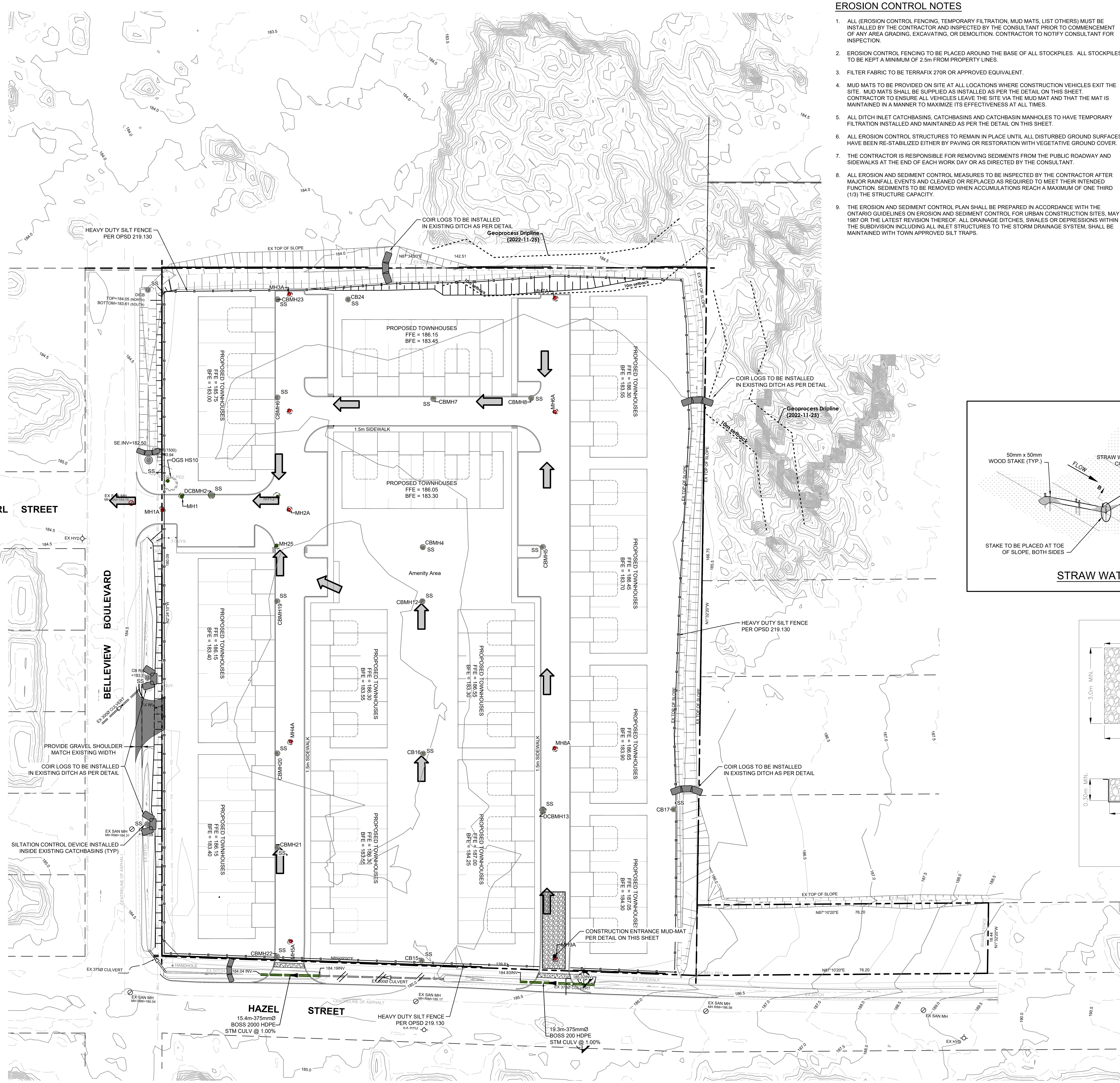
3770 Hazel Street, Fort Erie ON

October 2023	**Grain Size Analysis No. 1**	**Project No.: SM 230509-T**



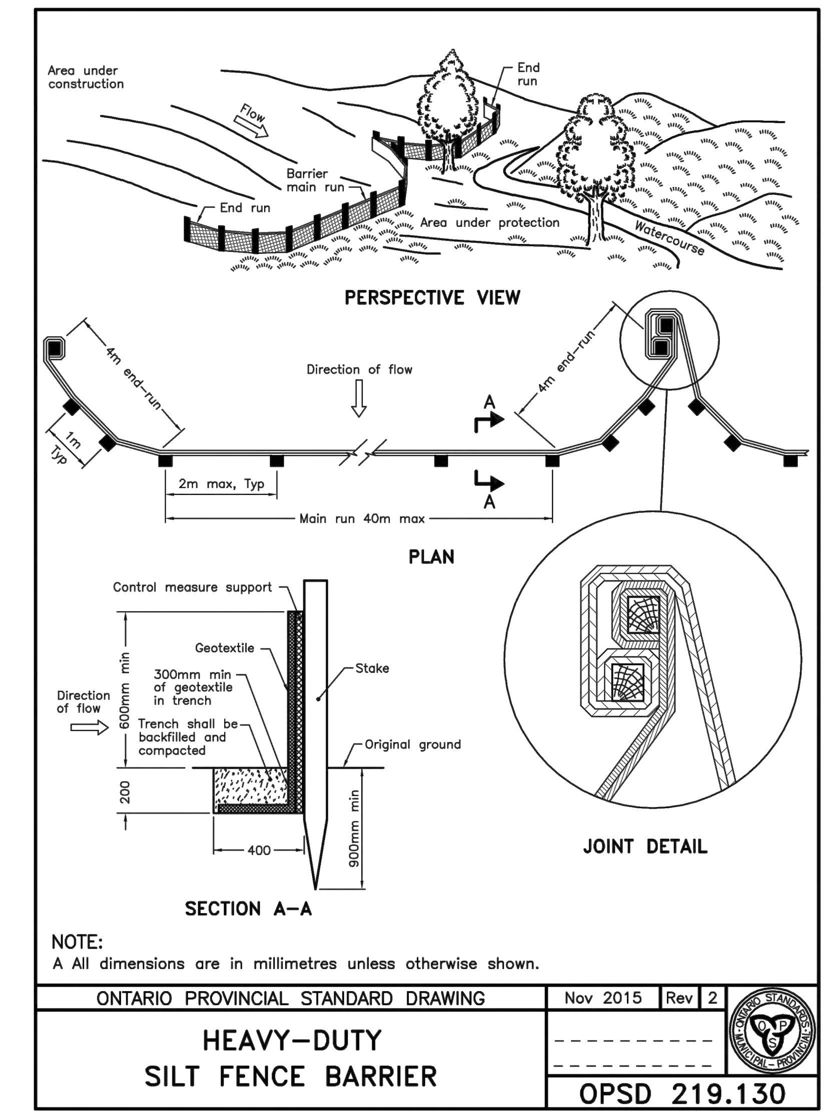
Soil-Mat	Soil-Mat Engineers & Consultants Ltd.	Project No.:	SM 230509-G
		Date:	October 2023
	Typical Design Requirements Drainage and Backfill for Basement Walls	**Drawing No.** 2	

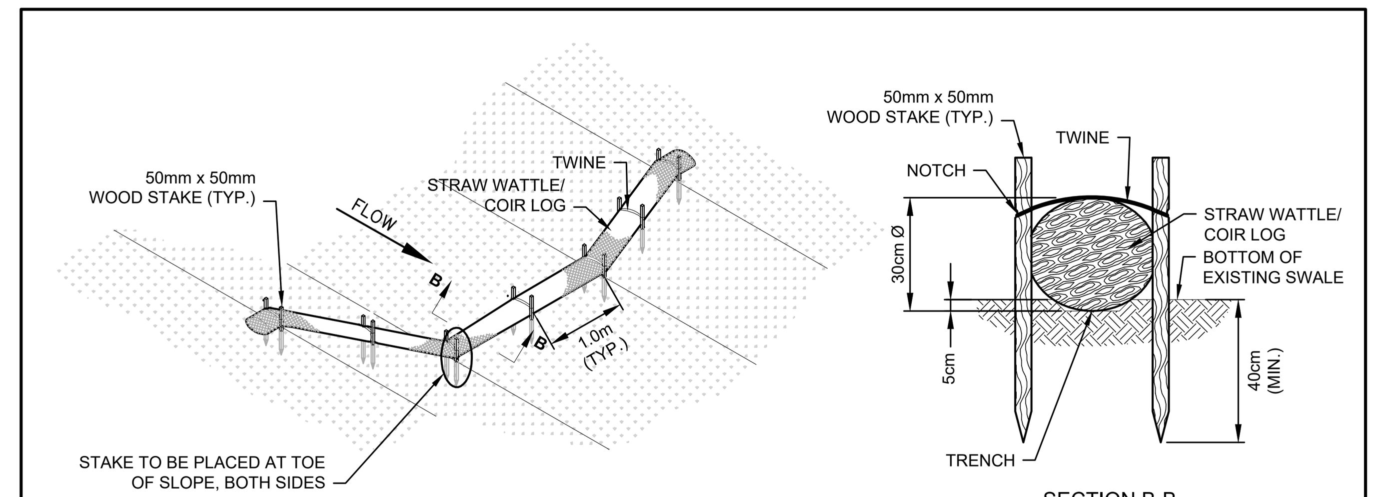
DRAWINGS



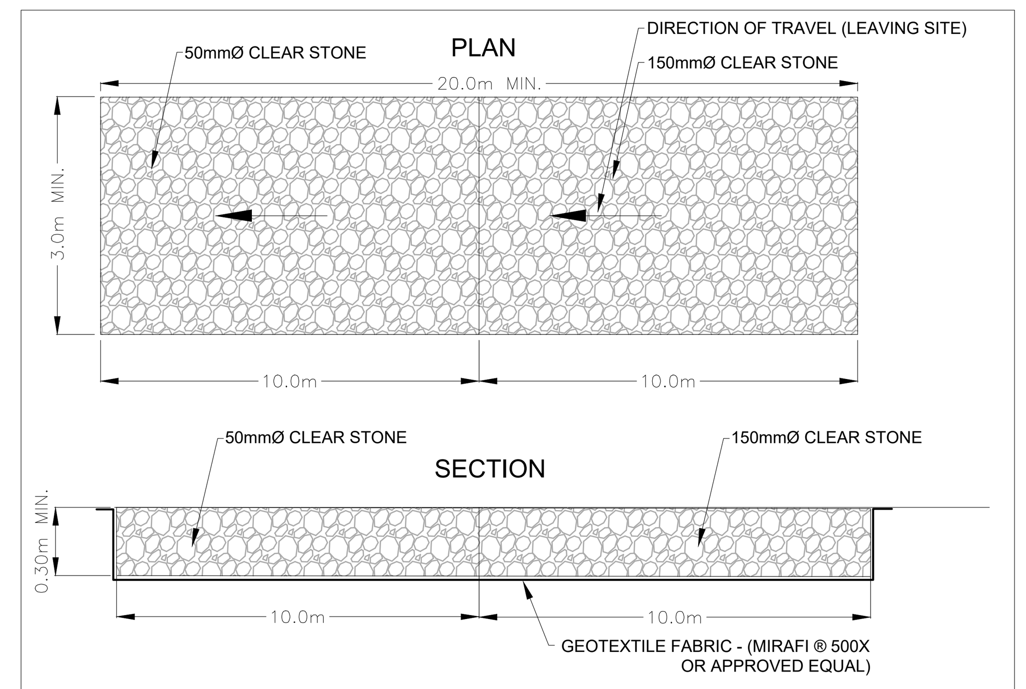
EROSION CONTROL NOTES

1. ALL (EROSION CONTROL FENCING, TEMPORARY FILTRATION, MUD MATS, LIST OTHERS) MUST BE INSTALLED BY THE CONTRACTOR AND INSPECTED BY THE CONSULTANT PRIOR TO COMMENCEMENT OF ANY AREA GRADING, EXCAVATING, OR DEMOLITION. CONTRACTOR TO NOTIFY CONSULTANT FOR INSPECTION.
2. EROSION CONTROL FENCING TO BE PLACED AROUND THE BASE OF ALL STOCKPILES. ALL STOCKPILES TO BE KEPT A MINIMUM OF 2.5m FROM PROPERTY LINES.
3. FILTER FABRIC TO BE TERRAFIX 270R OR APPROVED EQUIVALENT.
4. MUD MATS TO BE PROVIDED ON SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. MUD MATS SHALL BE SUPPLIED AS INSTALLED AS PER THE DETAIL ON THIS SHEET. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE ITS EFFECTIVENESS AT ALL TIMES.
5. ALL DITCH INLET CATCHBASINS, CATCHBASINS AND CATCHBASIN MANHOLES TO HAVE TEMPORARY FILTRATION INSTALLED AND MAINTAINED AS PER THE DETAIL ON THIS SHEET.
6. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RE-STABILIZED EITHER BY PAVING OR RESTORATION WITH VEGETATIVE GROUND COVER.
7. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING SEDIMENTS FROM THE PUBLIC ROADWAY AND SIDEWALKS AT THE END OF EACH WORK DAY OR AS DIRECTED BY THE CONSULTANT.
8. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSPECTED BY THE CONTRACTOR AFTER MAJOR RAINFALL EVENTS AND CLEANED OR REPLACED AS REQUIRED TO MEET THEIR INTENDED FUNCTION. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF ONE THIRD (1/3) THE STRUCTURE CAPACITY.
9. THE EROSION AND SEDIMENT CONTROL PLAN SHALL BE PREPARED IN ACCORDANCE WITH THE ONTARIO GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES, MAY 1987 OR THE LATEST REVISION THEREOF. ALL DRAINAGE DITCHES, SWALES OR DEPRESSIONS WITHIN THE SUBDIVISION INCLUDING ALL INLET STRUCTURES TO THE STORM DRAINAGE SYSTEM, SHALL BE MAINTAINED WITH TOWN APPROVED SILT TRAPS.

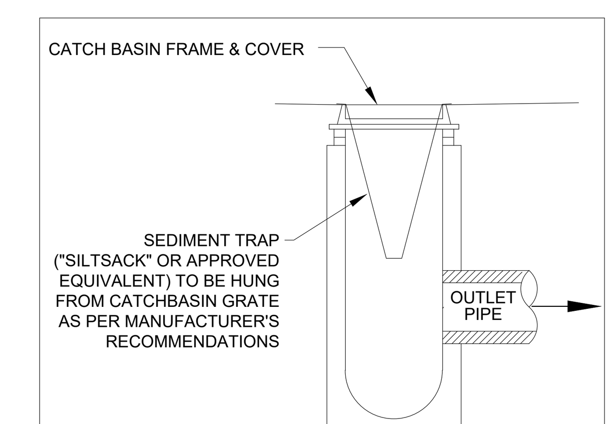




STRAW WATTLE/COIR LOG CHECK DAM DETAIL
N.T.S.

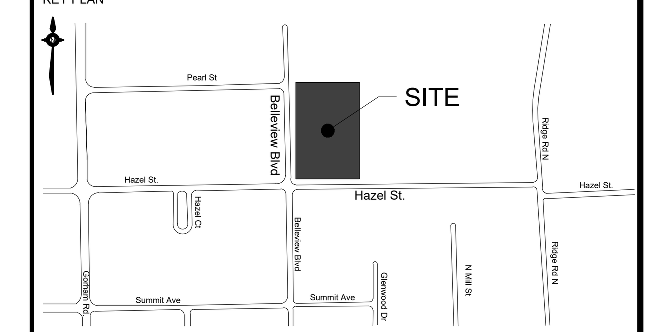


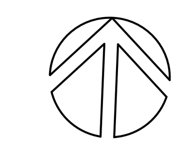
CONSTRUCTION ENTRANCE "MUD MAT"
N.T.S.



CATCH BASIN SEDIMENT TRAP
N.T.S.

KEY PLAN





DATE	ISSUANCE	NO.
2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
2023.11.03	ISSUED FOR 2nd DRAFT CONDO PLAN SUBMISSION	2

LEGEND

- HEAVY DUTY SILT FENCE
- CATCHBASIN SILT SACK
- EXISTING DRAINAGE ARROW/SLOPE
- PROPOSED OVERLAND FLOW ROUTE
- MH — PROPOSED STORM MANHOLE
- MHA — PROPOSED SANITARY MANHOLE
- CB — PROPOSED CATCHBASIN
- EX CB — EXISTING CATCHBASIN
- EX MH — EXISTING STORM MANHOLE
- EXISTING MAJOR CONTOUR
- EXISTING EXTERNAL SITE CONTOUR (BASED ON 2015 SWOOP LIDAR)
- EXISTING DITCH CENTRELINE
- EXISTING DECIDUOUS TREE
- TEMPORARY CONSTRUCTION ENTRANCE MUD-MAT
- TEMPORARY COIR LOGS CHECK DAM

TOPOGRAPHIC SURVEY INFORMATION:
TOPOGRAPHIC SURVEY COMPLETED BY CHAMBERS AND ASSOCIATES SURVEYING LTD, DWG NO. 14019-5_TOPO, DATED DECEMBER 18, 2018.
BENCHMARK: ELEVATIONS HEREON ARE GEODETIC AND WERE DERIVED FROM THE TOPNET RKT NETWORK, NAD83 CSRS, VERSION 3, EPOC 2010.

REFERENCE MATERIAL INFORMATION:
EXISTING SEWER AND WATERMAIN INFORMATION OBTAINED FROM AS-RECORDED PLAN AND PROFILES PREPARED BY DENCO ENGINEERING LTD. DWG NO. 90057, DATED FEBRUARY 19, 1991 AND CONSTRUCTION PLAN AND PROFILES PREPARED BY TOWN OF FORT ERIE ENGINEERING DIVISION, DWG SET NO. IS08PEAR, DATED SEPTEMBER 23, 2008.

CLIENT
SCHOUT COMMUNITIES INC.
45 REINHART PLACE, PETERSBURG, ON

PROJECT
3770 HAZEL STREET
TOWN OF FORT ERIE

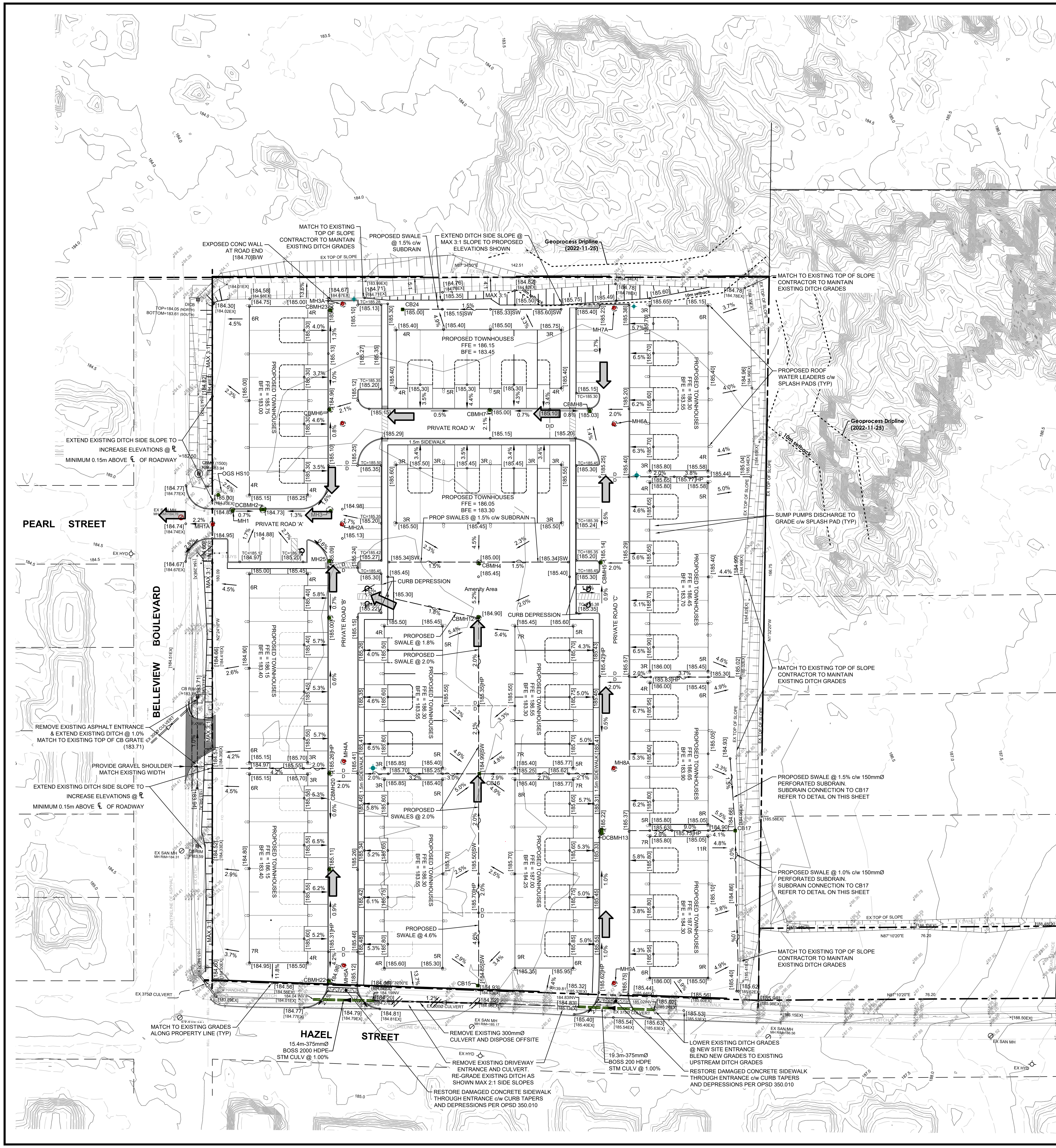
TITLE
EROSION & SEDIMENT CONTROL PLAN

WALTERFEDY
KITCHENER | HAMILTON | TORONTO | CALGARY
A PART OF WF GROUP
800.685.1378 walterfedy.com

LICENSED PROFESSIONAL ENGINEER 03-Nov-2023 J. G. ORESKOVIC PROVINCE OF ONTARIO

SCALE:	1:500
DATE:	2023-11-02
PROJECT NO:	2022.0365.10
DRAWN BY:	MPB
CHECKED BY:	JGO

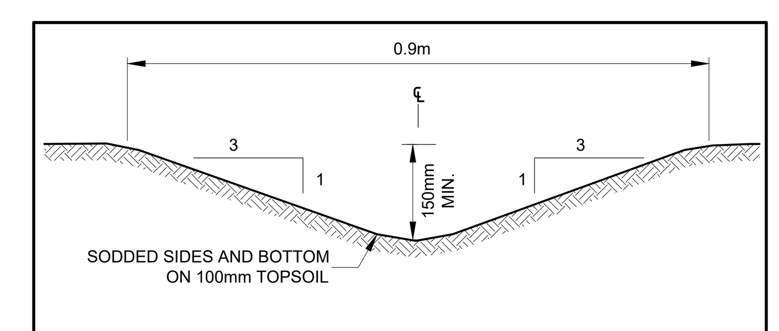
SHEET NO.: C1-1



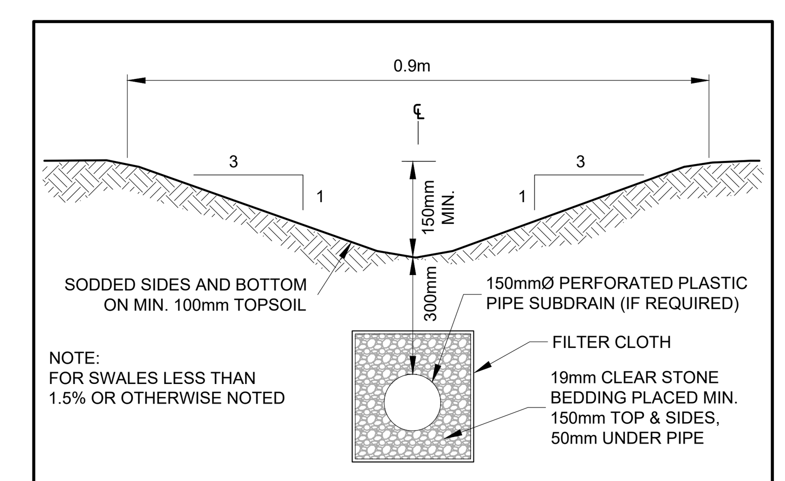
GENERAL GRADING NOTES

1. THIS PLAN IS NOT FOR CONSTRUCTION UNTIL SEALED BY THE ENGINEER AND APPROVED BY THE TOWN OF FORT ERIE.
2. ALL MATERIALS AND CONSTRUCTION METHODS TO BE AS PER THE TOWN OF FORT ERIE (LATEST REVISIONS) AND THE ONTARIO STANDARDS AND SPECIFICATIONS (LATEST REVISION)
3. THE MAXIMUM LOT SURFACE GRADE FOR REAR YARDS WITHIN THE MINIMUM AMENITY AREA SETBACK SHALL BE 6%. A SLOPE OF 3:1 (3 PARTS HORIZONTAL TO 1 PART VERTICAL) SHALL BE USED TO TAKE UP ANY ADDITIONAL GRADE DIFFERENCE. OTHERWISE, AN APPROVED RETAINING WALL IS REQUIRED.
4. ALL BOULEVARD AREAS SHALL BE GRADED WITH A CONSTANT SLOPE FROM THE CURB TO THE STREET LIMIT (MINIMUM SLOPE TO BE 2%; MAXIMUM SLOPE TO BE 8%) AND ALL WATER BOXES, MANHOLE COVERS, VALVE BOXES, ETC. SHALL BE SET FLUSH WITH THE FINISHED SOD SURFACE. WHERE SIDEWALKS ARE REQUIRED WITHIN THE BOULEVARD THE MAXIMUM SLOPE FROM CURB TO PROPERTY LINE SHALL BE 4%.
5. ALL LANDSCAPED SURFACES SHALL BE CONSTRUCTED TO A MINIMUM GRADE OF 2% (EXCLUDING REAR YARD SWALES WITH SUBDRAINS).
6. THE MINIMUM ROADWAY GRADE SHALL BE 0.5% AND MAXIMUM GRADE SHALL NOT EXCEED 6%.
7. ALL REAR YARD DRAINAGE SHALL BE DIRECTED AWAY FROM THE BUILDINGS IN DEFINED SWALES WHICH OUTLET AT THE CURB, SIDEWALK, OR A CATCHBASIN.
8. REAR AND SIDE YARD SWALES SHALL HAVE A MINIMUM SLOPE OF 2.0%. MAXIMUM DEPTH FOR ALL SWALES SHALL BE 0.5m. MAXIMUM SIDE SLOPE ON ANY SWALE SHALL BE 3:1.
   SWALE SLOPES LESS THAN 2.0% SHALL REQUIRE 150mm PERFORATED SUBDRAIN AND CONNECTED TO A SUITABLE OUTLET.
9. ALL RETAINING WALLS 0.60m OR HIGHER REQUIRE PLACEMENT OF FENCING OR A GUARD ALONG THE TOP OF THE WALL, IN ACCORDANCE WITH THE ONTARIO BUILDING CODE. WALLS EXCEEDING A HEIGHT OF 1.0m SHALL BE DESIGN BY A QUALIFIED STRUCTURAL ENGINEER AND BE APPROVED BY THE TOWN OF FORT ERIE.
10. FOUNDATION DRAINS SHALL BE PUMPED BY A SUMP PUMP IN EACH HOUSE DISCHARGING VIA SPLASH PADS OR OTHER MEANS WHICH SHALL EXTEND A DISTANCE AT LEAST 1.2 METRES AWAY FROM THE STRUCTURE AND MUST DIRECT FLOW AWAY FROM THE BUILDING, TO SIDE OR REAR YARD SWALES.
11. ***THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE CONSULTING ENGINEER 72 HOURS PRIOR TO COMMENCING THE SITE WORKS TO REQUEST INSPECTION. THE CONSULTING ENGINEER SHALL DETERMINE THE EXTENT OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION ON THE UNDERGROUND SERVICE INSTALLATION AS MANDATED BY THE ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO MAKE SUITABLE ARRANGEMENTS FOR INSPECTION WILL LEAD TO POST CONSTRUCTION TESTING AND INSPECTION AS DETERMINED BY THE ENGINEER. ALL COSTS ASSOCIATED WITH ANY REQUIRED POST CONSTRUCTION TESTING AND INSPECTION SHALL BE BORNE BY THE CONTRACTOR, INCLUDING ANY DELAYS TO CONSTRUCTION, NECESSARY REWORK AND RESTORATION OF DISTURBED WORKS. FINAL CERTIFICATION OF THE WORKS WILL BE WITHHELD UNTIL ALL POST CONSTRUCTION INSPECTION OF THE UN-INSPECTED WORKS IS COMPLETE TO THE SATISFACTION OF THE CONSULTING ENGINEER. FULL PAYMENT FOR UN-INSPECTED WORKS MAY BE WITHHELD UNTIL.***

INTERNAL ROAD PAVEMENT STRUCTURE PER SOIL-MAT GEOTECHNICAL REPORT (OCTOBER 31, 2023):
- 40mm HL3 SURFACE ASPHALT (COMPACTED TO MIN 92% MRD)
- 50mm HL8 BINDER ASPHALT (COMPACTED TO MIN 92% MRD)
- 150mm GRANULAR 'A' (COMPACTED TO MIN 98% SPMDD)
- 250mm GRANULAR 'B', TYPE II (COMPACTED TO MIN 98% SPMDD)

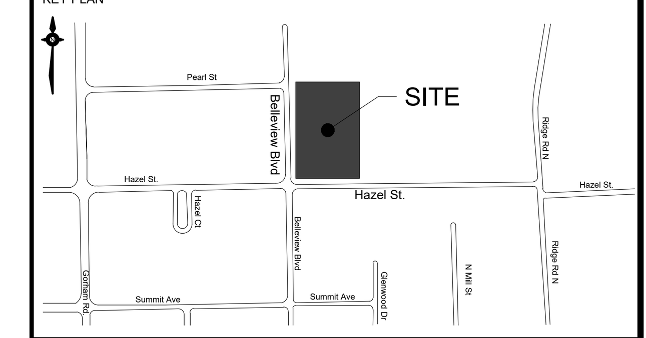


TYPICAL SWALE X-SECTION
N.T.S.



TYPICAL SWALE X-SECTION WITH SUBDRAIN
N.T.S.

KEY PLAN



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LEGEND

[195.00]	PROPOSED ELEVATION
[195.00]HP	PROPOSED HIGH POINT ELEVATION
[195.50EX]	MATCH TO EXISTING GRADE
195.50	EXISTING GRADE
2.0%	PROPOSED DRAINAGE ARROW/SLOPE
	PROPOSED SWALE
	EXISTING DRAINAGE ARROW/SLOPE
	PROPOSED OVERLAND FLOW ROUTE
D/D	PROPOSED DRAINAGE DIVIDE
195.0	EXISTING MAJOR CONTOUR
195.0	EXISTING EXTERNAL SITE CONTOUR (BASED ON 2015 SWOOP LIDAR)
	EXISTING DITCH CENTRELINE
	REMOVALS
3R	NUMBER OF BUILDING RISERS
FFE	FINISH FLOOR ELEVATION
BFE	BASEMENT FLOOR ELEVATION
MH	PROPOSED STORM MANHOLE
MHA	PROPOSED SANITARY MANHOLE
CB	PROPOSED CATCHBASIN
EX CB	EXISTING CATCHBASIN
EX MH	EXISTING STORM MANHOLE
EX SAN MH	EXISTING SANITARY MANHOLE

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TITLE
GRADING PLAN

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LICENSED PROFESSIONAL ENGINEER
03-Nov-2023
J. G. ORESKOVIC
PROVINCE OF ONTARIO

SCALE:	1:500	SHEET NO.:
DATE:	2023-11-02	C2-1
PROJECT NO.:	2022.0365.10	
DRAWN BY:	MPB	
CHECKED BY:	JGO	

SERVICING NOTES

GENERAL

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2. ALL MATERIALS AND CONSTRUCTION METHODS TO BE AS PER THE TOWN OF FORT ERIE (LATEST REVISIONS) AND THE ONTARIO STANDARDS AND SPECIFICATIONS (LATEST REVISION)
3. ***THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE CONSULTING ENGINEER 72 HOURS PRIOR TO COMMENCING THE SITE WORKS TO REQUEST INSPECTION. THE CONSULTING ENGINEER SHALL DETERMINE THE EXTENT OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION ON THE UNDERGROUND SERVICE INSTALLATION AS MANDATED BY THE ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO MAKE SUITABLE ARRANGEMENTS FOR INSPECTION WILL LEAD TO POST CONSTRUCTION TESTING AND INSPECTION AS DETERMINED BY THE ENGINEER. ALL COSTS ASSOCIATED WITH ANY REQUIRED POST CONSTRUCTION TESTING AND INSPECTION SHALL BE BORNE BY THE CONTRACTOR, INCLUDING ANY DELAYS TO CONSTRUCTION, NECESSARY REWORK AND RESTORATION OF DISTURBED WORKS. FINAL CERTIFICATION OF THE WORKS WILL BE WITHHELD UNTIL ALL POST CONSTRUCTION INSPECTION OF THE UN-INSPECTED WORKS IS COMPLETE TO THE SATISFACTION OF THE CONSULTING ENGINEER. FULL PAYMENT FOR UN-INSPECTED WORKS MAY BE WITHHELD UNTIL.***
4. PAVEMENT STRUCTURE RECOMMENDATIONS OUTLINED IN THE GEOTECHNICAL INVESTIGATION PREPARED BY SOIL-MAT ENGINEERS (OCTOBER 31, 2023).

SANITARY SEWERS/SERVICES

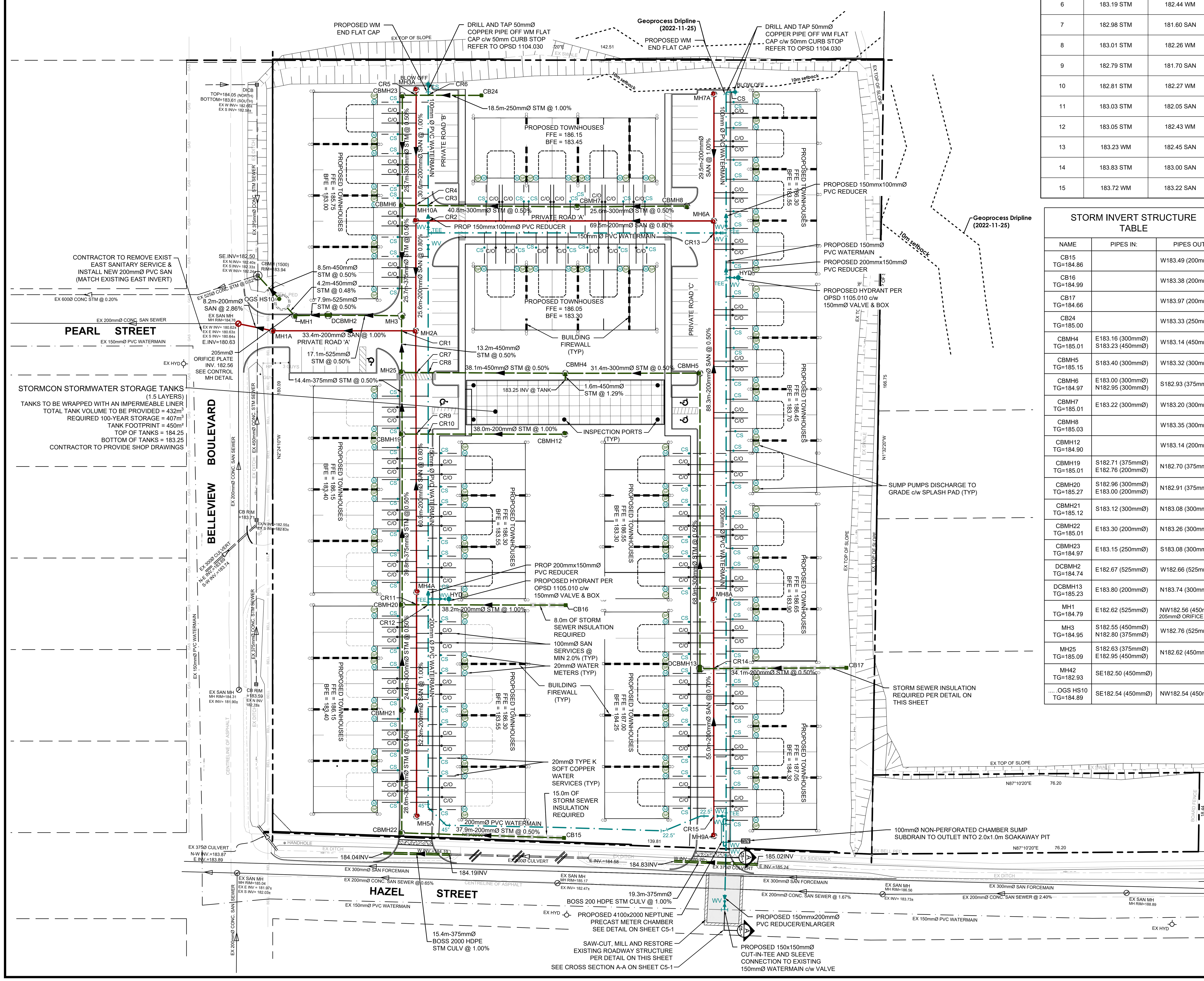
1. THE MINIMUM PIPE SIZE IN ROADWAYS SHALL BE 200mm. SERVICE LATERALS SHALL BE 100mm AND AT A MINIMUM SLOPE OF 2.0%.
2. THE MINIMUM COVER FOR SANITARY SEWERS SHALL BE 2.40m BELOW GRADE.
3. IF NECESSARY, CONCRETE ENCASED RISERS SHALL BE PROVIDED FOR CONNECTION WITH THE MAIN SEWER. 2% MINIMUM GRADE SHALL BE MAINTAINED FOR CONNECTION PIPES.
4. HORIZONTAL SEPARATION FROM WATER SERVICE CONNECTIONS OF NOT LESS THAN 2.44m MEASURED HORIZONTALLY FROM UNDISTURBED OR COMPACTED EARTH OR AS APPROVED BY THE MANGER OF ENVIRONMENTAL SERVICES.
5. ALL SANITARY SEWER LATERAL CONNECTIONS SHALL BE INSTALLED USING PREFABRICATED TEES. ALL CONNECTIONS SHALL CONFORM TO CURRENT OPSD 1006.010 AND OPSS 410.

STORM SEWERS

6. THE MINIMUM SIZE OF STORM SEWER IN THE ROADWAY SHALL BE 300mm WITH A MINIMUM OF 1.2m COVER BELOW GRADE. MINIMUM SIZE FOR A CATCHBASIN STORM LEADS SHALL BE 200mm AND 250mm FOR DOUBLE CATCHBASINS.
7. THE CONNECTION OF THE STORM DRAIN TO THE STORM SEWER MAY BE MADE AT AN EXISTING MANHOLE OR DIRECTLY TO THE STORM SEWER (IF THE SIZE OF THE CONNECTION IS LESS THAN HALF OF THE SIZE OF THE STORM SEWER). IF THE CONNECTION SIZE IS EQUAL TO OR GREATER THAN ONE HALF THE SIZE OF THE MAIN SEWER, THE CONNECTION MUST BE MADE TO A MANHOLE, EXISTING OR NEW, ON THE STORM SEWER.
8. FOUNDATION DRAINS (WEEPING TILES) SHALL BE CONNECTED DIRECTLY TO A SUMP AND DRAINED VIA A SUMP PUMP AND THE SUMP PUMP SHALL DISCHARGE ON GROUND VIA SPLASH PADS AS ROOF LEADERS OR DOWNSPOUTS. ROOF DRAIN CONNECTIONS TO THE STORM SERVICE CONNECTION IS PROHIBITED. ROOF LEADERS SHALL DISCHARGE ON GROUND VIA SPLASH PADS AT LEAST 1.2m AWAY FROM THE BUILDING FOUNDATION WALLS.
   FLOWS SHALL BE DIRECTED AWAY FROM THE BUILDING TOWARDS SIDE OR REAR YARD SWALE WITHOUT ANY EROSION OR INCONVENIENCE TO ADJACENT PROPERTY.

WATERMAINS/SERVICES

1. FOR EACH RESIDENTIAL UNIT, A 20mm DIAMETER TYPE K SOFT COPPER SERVICE SHALL EXTEND FROM THE MAIN TO THE PROPERTY LINE COMPLETE WITH A CURB STOP AND BOX PER OPSD 1104.010. ALL SERVICE CONNECTIONS SHALL BE INSTALLED WITH MAGNESIUM OR ZINC SACRIFICIAL ANODE FOR CORROSION PROTECTION.
2. MINIMUM COVER FOR WATERMAINS SHALL BE 1.70m BELOW GRADE.
3. ALL VALVES INSTALLED SHALL BE THE SAME SIZE AS THE WATERMAIN.
4. ALL VALVES SHALL BE RESILIENT-SEATED GATE VALVES WHICH CONFORM TO AWWA C509 AND SHALL OPEN LEFT (COUNTER CLOCKWISE) AND CLOSE RIGHT (CLOCKWISE). ALL GATE VALVES SHALL HAVE NON-RISING STEMS, 50MM OPERATING NUTS AND MECHANICAL JOINT ENDS.
5. ALL WATER SERVICES SHALL BE INSTALLED AT RIGHT ANGLES TO THE WATERMAIN.
6. HYDRANT LEADS SHALL BE 150mm AND SHALL BE CONNECTED USING A GATE VALVE AND ANCHOR TEE.
7. HYDRANTS SHALL BE IN ACCORDANCE WITH OPSD 1105.010 WITH A MINIMUM 150mm DIAMETER LEADS AND DRAIN HOLES PLUGGED BY THE MANUFACTURER.
8. HYDRANTS ACCEPTABLE TO THE TOWN OF FORT ERIE SHALL BE CANADA VALVE CENTURY, MCAVITY M67, AMERICAN AVK, DARLING B50B WITH TWO (2) 65MM HOSE NOZZLES AND ONE (1) 114MM PUMPER NOZZLE INCLUDING STORTZ CONNECTION.
9. A MINIMUM VERTICAL SEPARATION OF 0.50m IS MAINTAINED BETWEEN THE INVERT OF THE CONFLICTING SEWER AND THE OBVERT OF THE WATERMAIN.



*NOTE:
VERTICAL SEPARATION BETWEEN SEWER DRAINS AND WATERMAINS SHALL BE MINIMUM 0.5m PER MINISTRY OF ENVIRONMENT (MOE) GUIDELINES.

INTERNAL ROAD PAVEMENT STRUCTURE PER SOIL-MAT GEOTECHNICAL REPORT (OCTOBER 31, 2023):
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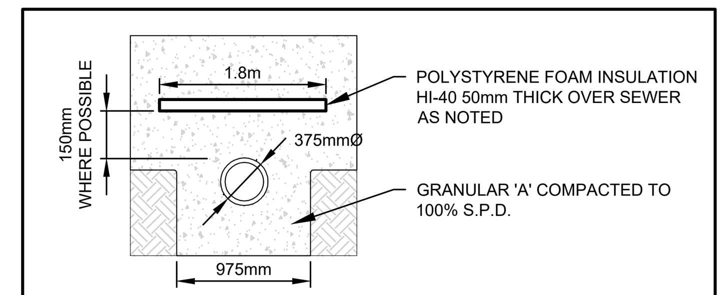
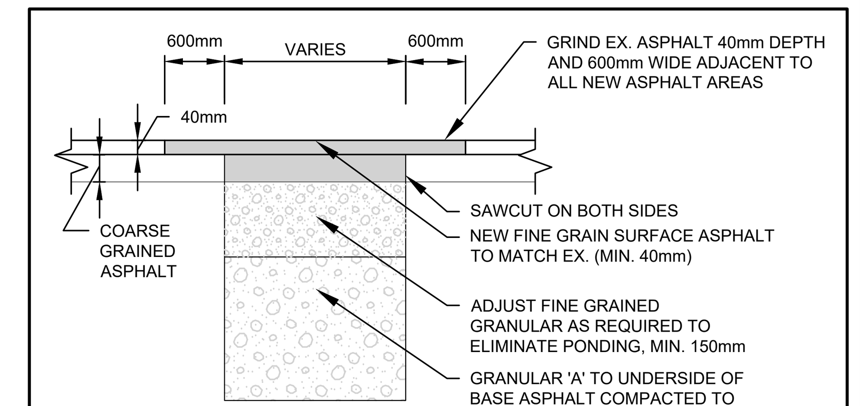


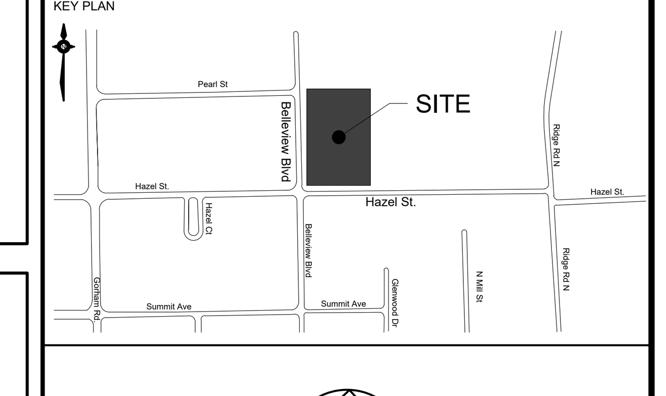
PIPE INSULATION DETAIL
N.T.S.



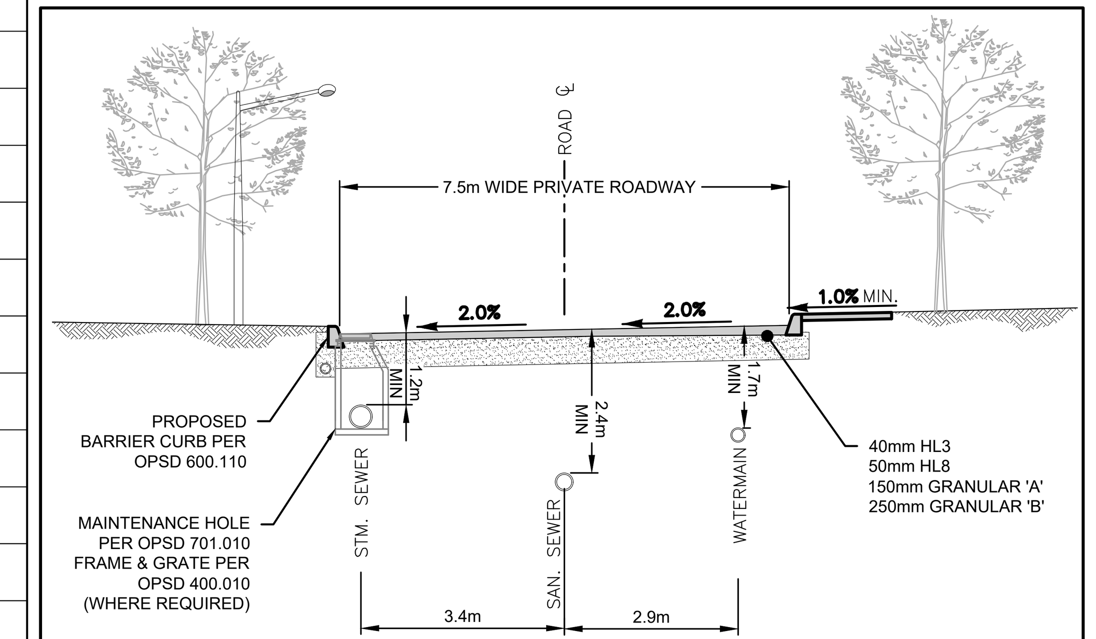
NOTE:
1. TACK COAT TO BE APPLIED TO ALL CONSTRUCTION JOINTS PRIOR TO COMPACTING ASPHALT

ASPHALT RESTORATION DETAIL
N.T.S.

KEY PLAN



SEWER CROSSING TABLE			
CROSSING #	INVERT	OBVERT	DIFFERENCE
1	182.57 STM	181.40 SAN	1.17m
2	182.33 WM	181.83 SAN	*0.50m
3	183.03 STM	182.42 WM	0.61m
4	183.02 STM	181.76 SAN	1.26m
5	183.17 STM	182.03 SAN	1.14m
6	183.19 STM	182.44 WM	0.75m
7	182.98 STM	181.60 SAN	1.38m
8	183.01 STM	182.26 WM	0.75m
9	182.79 STM	181.70 SAN	1.09m
10	182.81 STM	182.27 WM	0.54m
11	183.03 STM	182.05 SAN	0.98m
12	183.05 STM	182.43 WM	0.62m
13	183.23 WM	182.45 SAN	0.78m
14	183.83 STM	183.00 SAN	0.83m
15	183.72 WM	183.22 SAN	*0.50m



TYPICAL PRIVATE ROADWAY SECTION
SCALE 1:100

North

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2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
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STORM INVERT STRUCTURE TABLE		
NAME	PIPES IN:	PIPES OUT
CB15 TG=184.86		W183.49 (200mmØ)
CB16 TG=184.99		W183.38 (200mmØ)
CB17 TG=184.66		W183.97 (200mmØ)
CB24 TG=185.00		W183.33 (250mmØ)
CBMH4 TG=185.01	E183.16 (300mmØ) S183.23 (450mmØ)	W183.14 (450mmØ)
CBMH5 TG=185.15	S183.40 (300mmØ)	W183.32 (300mmØ)
CBMH6 TG=184.97	E183.00 (300mmØ) N182.95 (300mmØ)	S182.93 (375mmØ)
CBMH7 TG=185.01	E183.22 (300mmØ)	W183.20 (300mmØ)
CBMH8 TG=185.03		W183.35 (300mmØ)
CBMH12 TG=184.90		W183.14 (200mmØ)
CBMH19 TG=185.01	S182.71 (375mmØ) E182.76 (200mmØ)	N182.70 (375mmØ)
CBMH20 TG=185.27	S182.96 (300mmØ) E183.00 (200mmØ)	N182.91 (375mmØ)
CBMH21 TG=185.12	S183.12 (300mmØ)	N183.08 (300mmØ)
CBMH22 TG=185.01	E183.30 (200mmØ)	N183.26 (300mmØ)
CBMH23 TG=184.97	E183.15 (250mmØ)	S183.08 (300mmØ)
DCBMH2 TG=184.74	E182.67 (525mmØ)	W182.66 (525mmØ)
DCBMH13 TG=185.23	E183.80 (200mmØ)	N183.74 (300mmØ)
MH1 TG=184.79	E182.62 (525mmØ)	NW182.56 (450mmØ) 205mmØ ORIFICE PLATE
MH3 TG=184.95	S182.55 (450mmØ) N182.80 (375mmØ)	W182.76 (525mmØ)
MH25 TG=185.09	S182.63 (375mmØ) E182.95 (450mmØ)	N182.62 (450mmØ)
MH42 TG=182.93	SE182.50 (450mmØ)	
.... .OGS HS10 TG=184.89	SE182.54 (450mmØ)	NW182.54 (450mmØ)

SANITARY INVERT STRUCTURE TABLE		
NAME	PIPES IN:	PIPES OUT
MH1A TG=184.89	E180.90 (200mmØ)	W180.86 (200mmØ)
MH2A TG=185.06	N181.31 (200mmØ) S181.31 (200mmØ)	W181.23 (200mmØ)
MH3A TG=185.05		S181.85 (200mmØ)
MH4A TG=185.33	S181.82 (200mmØ)	N181.80 (200mmØ)
MH5A TG=185.23		N182.34 (200mmØ)
MH6A TG=185.17	S182.23 (200mmØ) N182.23 (200mmØ)	W182.16 (200mmØ)
MH7A TG=185.30		S182.53 (200mmØ)
MH8A TG=185.37	S182.68 (200mmØ)	N182.67 (200mmØ)
MH9A TG=185.69		N183.06 (200mmØ)
MH10A TG=185.07	N181.54 (200mmØ)	S181.52 (200mmØ)
MHEX SAN MH TG=184.75	E180.63 (200mmØ) S180.64 (200mmØ)	W180.62 (200mmØ)

UNDERGROUND STORAGE	
TYPE	STORMCON OR APPROVED EQUAL
SIZE (h x w x l)	1.0 x 10.4x 46.1m (1.5 LAYERS)
STORAGE TO BE PROVIDED	432m³
TOP OF CLEAR STONE ELEVATION	184.40
TOP OF CHAMBER UNIT ELEVATION	184.25
BOTTOM OF CHAMBER UNIT ELEVATION	183.25
BOTTOM OF BASE CLEAR STONE ELEVATION	183.10

NOTE: ALL JOINTS AND PIPE CONNECTIONS TO BE SEALED PER SUPPLIERS SPECS. BACKFILL AND INSTALLATION DETAILS PER SUPPLIER'S SPECS. SEE SHOP DRAWINGS (BY OTHERS) FOR DESIGN DETAILS AND SPECIFICATIONS. INSTALLATION TO BE CERTIFIED BY AN APPROVED REPRESENTATIVE OF STORMCON. TANKS TO BE WRAPPED WITH AN IMPERMEABLE LAYER.

LEGEND

- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED INSULATED STORM SEWER
- PROPOSED WATERMAIN/SERVICE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- WV — PROPOSED WATERMAIN VALVE
- (M) — PROPOSED WATER METER
- CS — PROPOSED CURB STOP
- C/O — PROPOSED SANITARY CLEANOUT
- MH — PROPOSED STORM MANHOLE
- MHA — PROPOSED SANITARY MANHOLE
- SP — PROPOSED SUMP PUMP
- CB — PROPOSED CATCHBASIN
- EX CB — EXISTING CATCHBASIN
- EX MH — EXISTING STORM MANHOLE
- EX SAN MH — EXISTING SANITARY MANHOLE
- EX HYD — EXISTING FIRE HYDRANT
- REMOVALS

TOPOGRAPHIC SURVEY INFORMATION:
TOPOGRAPHIC SURVEY COMPLETED BY CHAMBERS AND ASSOCIATES SURVEYING LTD, DWG NO. 14019-5_TOPO, DATED DECEMBER 18, 2018.
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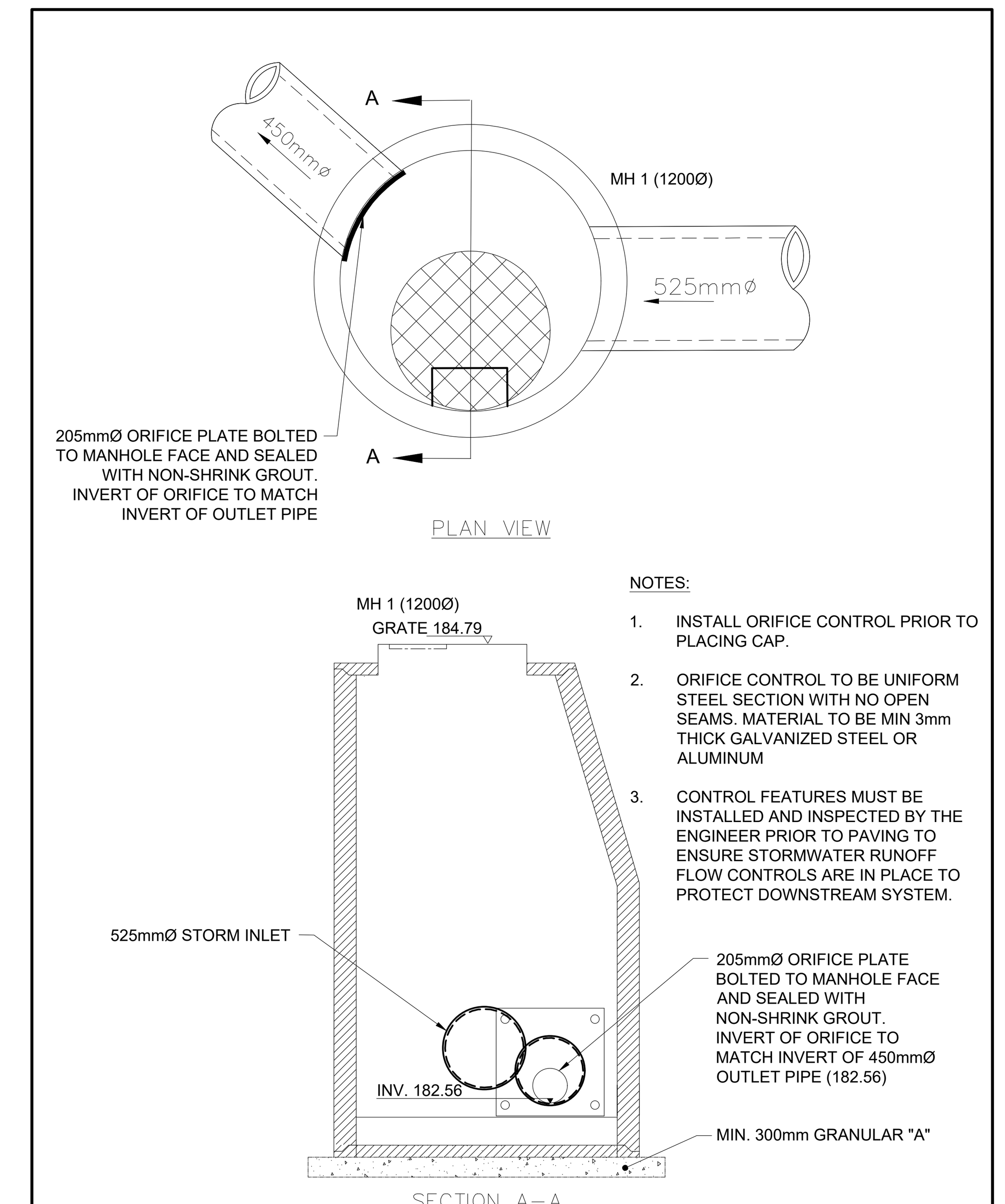

NOTES:
1. INSTALL ORIFICE CONTROL PRIOR TO PLACING CAP.
2. ORIFICE CONTROL TO BE UNIFORM STEEL SECTION WITH NO OPEN SEAMS. MATERIAL TO BE MIN 3mm THICK GALVANIZED STEEL OR ALUMINUM
3. CONTROL FEATURES MUST BE INSTALLED AND INSPECTED BY THE ENGINEER PRIOR TO PAVING TO ENSURE STORMWATER RUNOFF FLOW CONTROLS ARE IN PLACE TO PROTECT DOWNSTREAM SYSTEM.

CONTROL MANHOLE (MH1)
(SHOP DRAWINGS TO BE PROVIDED)
N.T.S - MANHOLE STRUCTURE MAY NOT BE EXACTLY AS SHOWN

CLIENT
SCHOUT COMMUNITIES INC.
45 REINHART PLACE, PETERSBURG, ON

PROJECT
3770 HAZEL STREET
TOWN OF FORT ERIE

TITLE
SERVICING PLAN

WALTERFEDY
KITCHENER | **HAMILTON** | TORONTO | CALGARY
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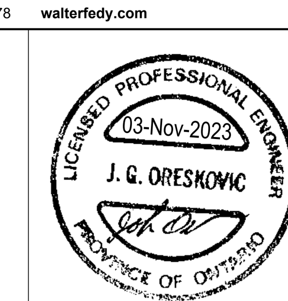
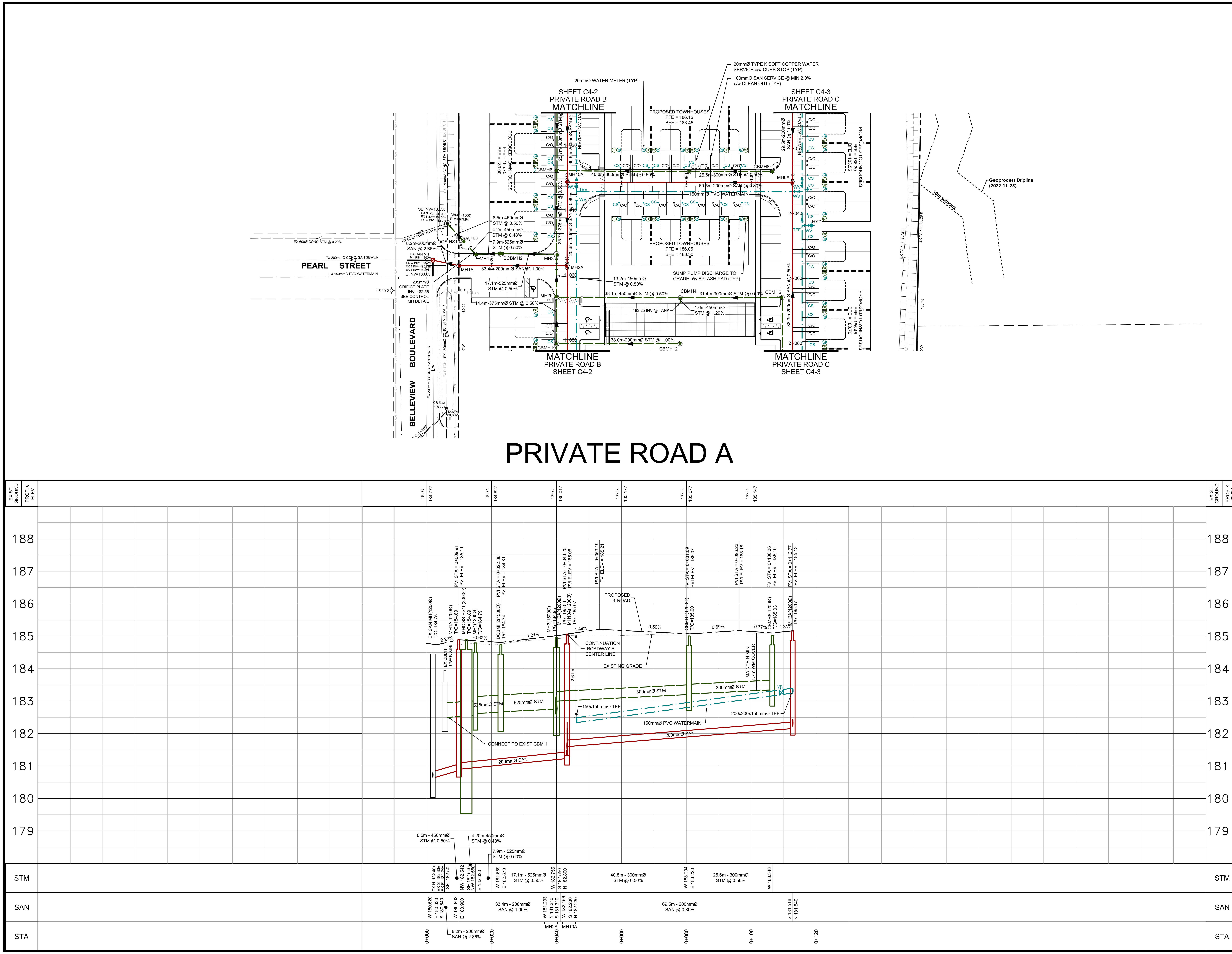


SCALE:	1:500
DATE:	2023-11-03
PROJECT NO.:	2022.0365.10
DRAWN BY:	MPB
CHECKED BY:	JGO

SHEET NO.: **C3-1**



KEY PLAN

SITE

North

DATE	ISSUANCE	NO.
2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
2023.11.03	ISSUED FOR 2nd DRAFT CONDO PLAN SUBMISSION	2

LEGEND

- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED INSULATED STORM SEWER
- PROPOSED WATERMAIN/SERVICE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- WV — PROPOSED WATERMAIN VALVE
- PROPOSED WATER METER
- MH — PROPOSED STORM MANHOLE
- MHA — PROPOSED SANITARY MANHOLE
- PROPOSED SUMP PUMP
- CB — PROPOSED CATCHBASIN
- EX CB — EXISTING CATCHBASIN
- EX MH — EXISTING STORM MANHOLE
- EX SAN MH — EXISTING SANITARY MANHOLE
- EX HYD — EXISTING FIRE HYDRANT
- REMOVALS

TOPOGRAPHIC SURVEY INFORMATION:
TOPOGRAPHIC SURVEY COMPLETED BY CHAMBERS AND ASSOCIATES SURVEYING LTD, DWG NO. 14019-5_TOPO, DATED DECEMBER 18, 2018.
BENCHMARK: ELEVATIONS HEREON ARE GEODETIC AND WERE DERIVED FROM THE TOPNET RKT NETWORK, NAD83 CSRS, VERSION 3, EPOC 2010.

REFERENCE MATERIAL INFORMATION:
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CLIENT
SCHOUT COMMUNITIES INC.
45 REINHART PLACE, PETERSBURG, ON

PROJECT
3770 HAZEL STREET
TOWN OF FORT ERIE

TITLE
PLAN AND PROFILE
PRIVATE ROAD A
STA 0+000 TO 0+113

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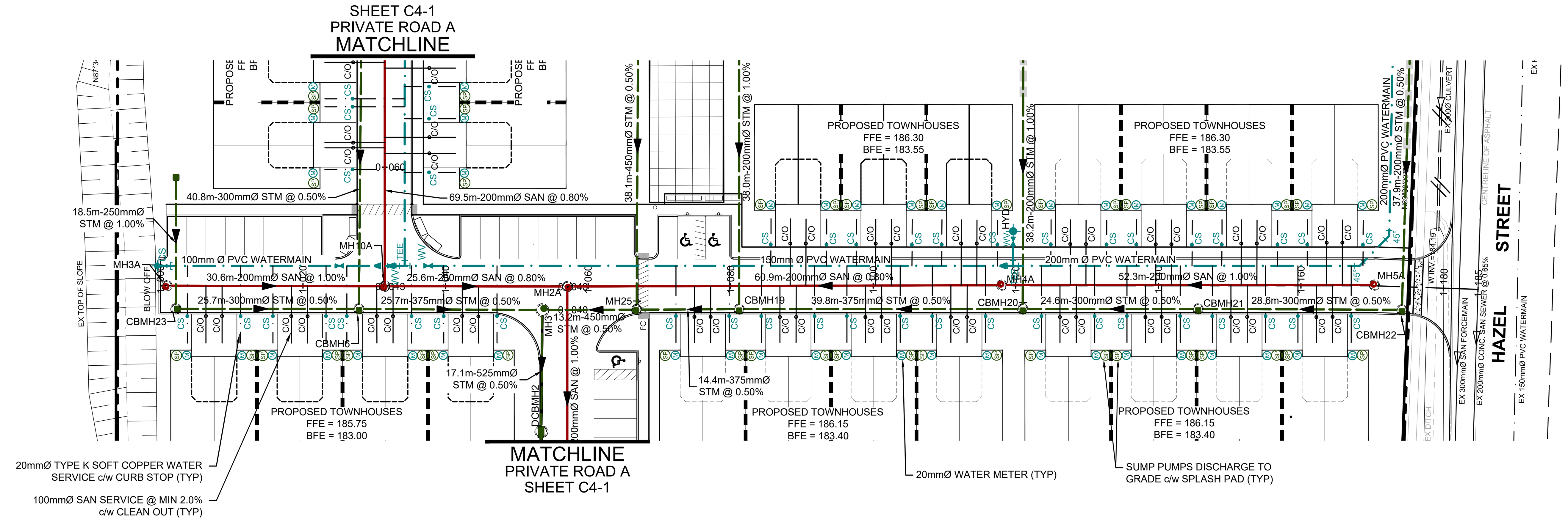
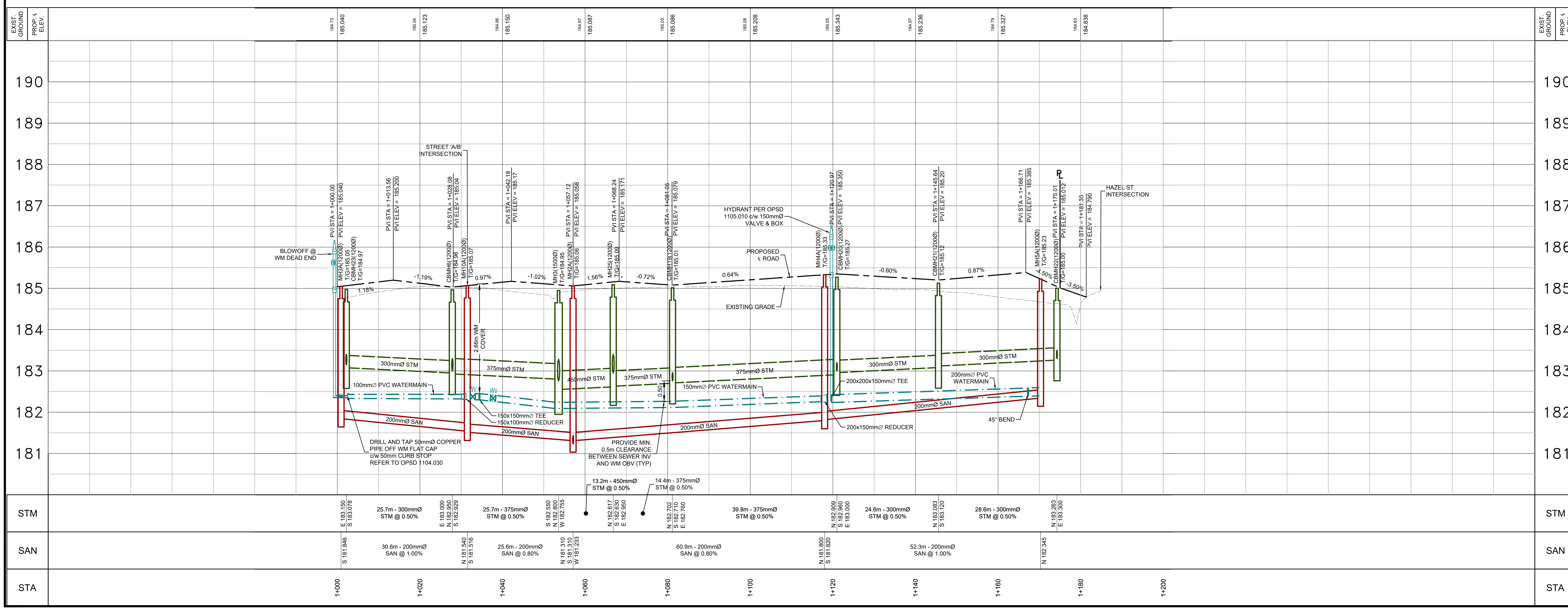
LICENSED PROFESSIONAL ENGINEER
03-Nov-2023
J. G. ORESKOVIC
PROVINCE OF ONTARIO

SCALE:	H1:500 V1:50	SHEET NO.: C4-1
DATE:	2023-11-02	
PROJECT NO:	2022.0365.10	
DRAWN BY:	MPB	
CHECKED BY:	JGO	

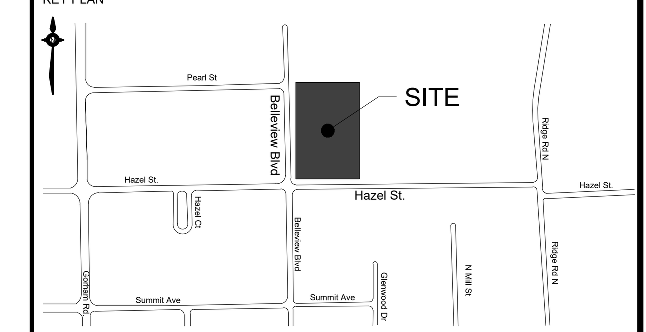
H1:500 V1:50



PRIVATE ROAD B



KEY PLAN



North

DATE	ISSUANCE	NO.
2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
2023.11.03	ISSUED FOR 2nd DRAFT CONDO PLAN SUBMISSION	2

LEGEND

- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED INSULATED STORM SEWER
- PROPOSED WATERMAIN/SERVICE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- WV — PROPOSED WATERMAIN VALVE
- M — PROPOSED WATER METER
- MH — PROPOSED STORM MANHOLE
- MHA — PROPOSED SANITARY MANHOLE
- SP — PROPOSED SUMP PUMP
- CB — PROPOSED CATCHBASIN
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- EX SAN MH — EXISTING SANITARY MANHOLE
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SCHOUT COMMUNITIES INC.
45 REINHART PLACE, PETERSBURG, ON

PROJECT
3770 HAZEL STREET
TOWN OF FORT ERIE

TITLE
PLAN AND PROFILE
PRIVATE ROAD B
STA 1+000 TO 1+185

WALTERFEDY
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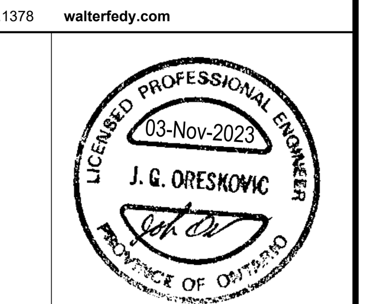
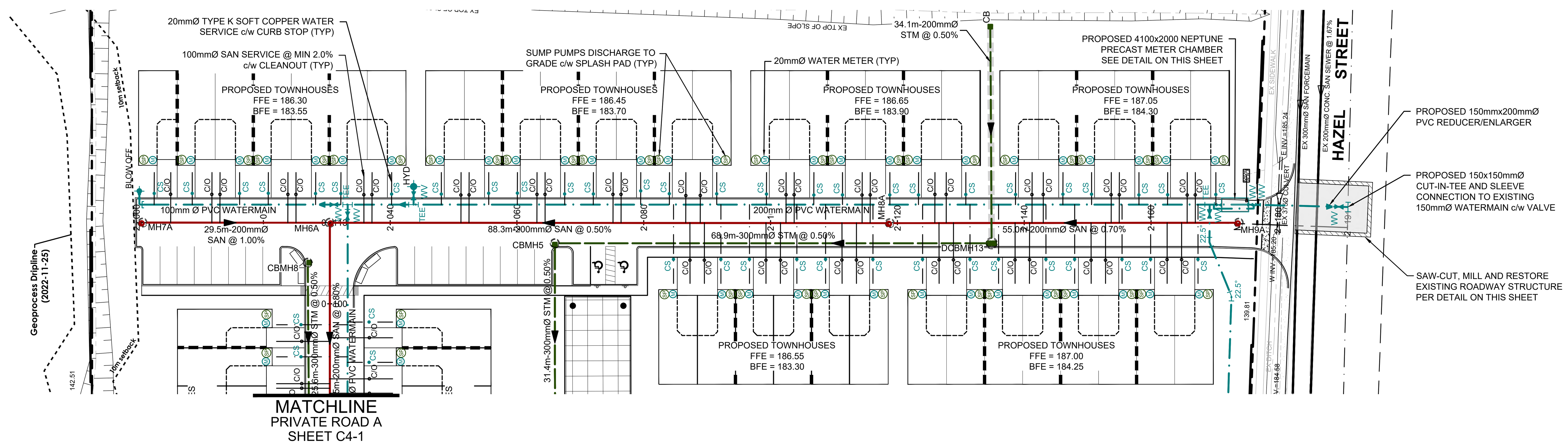


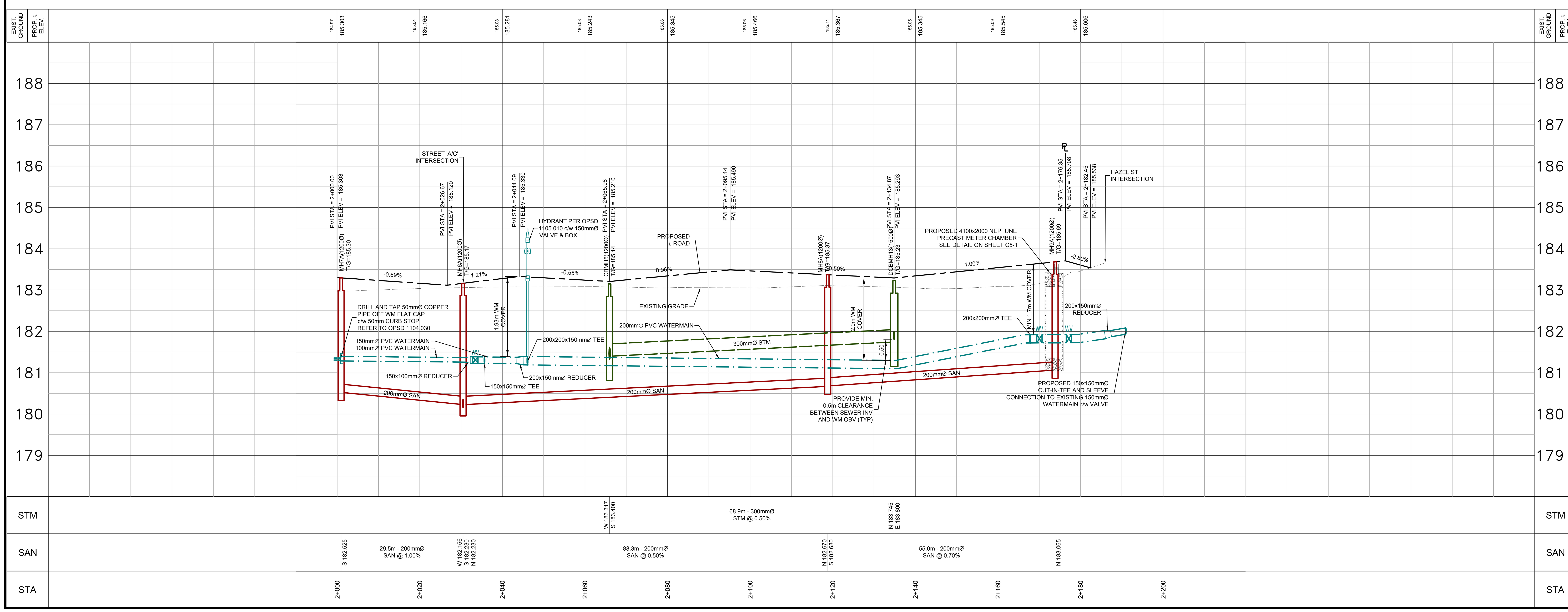
SCALE:	H1:500 V1:50
DATE:	2023-11-02
PROJECT NO:	2022.0365.10
DRAWN BY:	MPB
CHECKED BY:	JGO

SHEET NO.: C4-2

H1:500 V1:50



PRIVATE ROAD C



KEY PLAN

SITE

North

DATE	ISSUANCE	NO.
2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
2023.10.19	ISSUED FOR REZONING RESUBMISSION	2

LEGEND

- PROPOSED SANITARY SEWER/SERVICE
- PROPOSED STORM SEWER/SERVICE
- PROPOSED INSULATED STORM SEWER
- PROPOSED WATERMAIN/SERVICE
- EXISTING SANITARY SERVICE
- EXISTING STORM SERVICE
- EXISTING WATERMAIN
- WV PROPOSED WATERMAIN VALVE
- M PROPOSED WATER METER
- MH PROPOSED STORM MANHOLE
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45 REINHART PLACE, PETERSBURG, ON

PROJECT
3770 HAZEL STREET
TOWN OF FORT ERIE

TITLE
PLAN AND PROFILE
PRIVATE ROAD C
STA 2+000 TO 2+191

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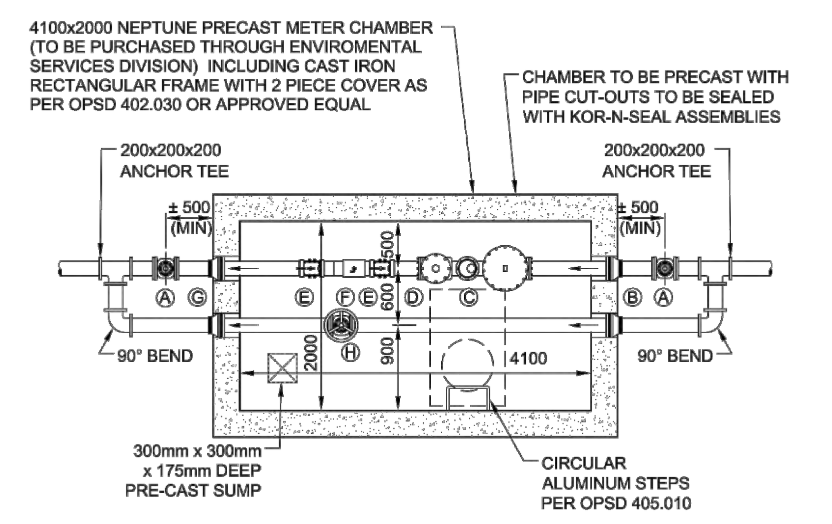
LICENSED PROFESSIONAL ENGINEER 03-Nov-2023 J. G. ORESKOVIC PROVINCE OF ONTARIO

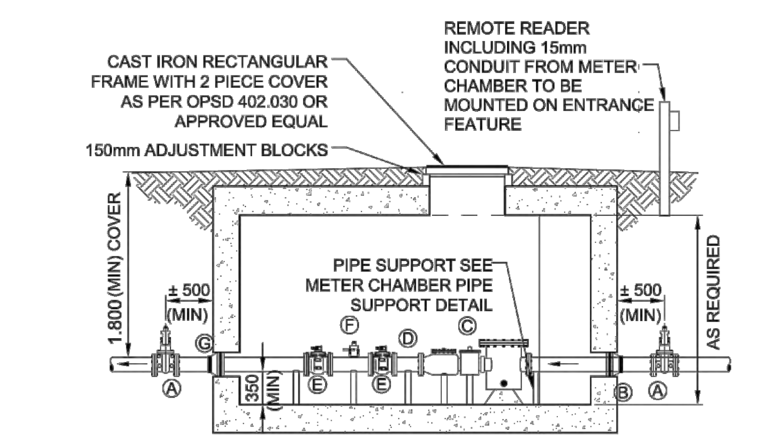
SCALE: H1:500 V1:50
DATE: 2023-11-03
PROJECT NO: 2022.0365.10
DRAWN BY: MPB
CHECKED BY: JGO
SHEET NO.: C4-3

H1:500 V1:50



METER CHAMBER PLAN

SCALE: N.T.S.



METER CHAMBER SECTION

SCALE: N.T.S.

ITEMS:

A. 200mmØ GATE VALVE (MJ TO MJ) AND VALVE BOX.

B. ±0.8m -200mmØ CAST IRON W/M. (MJ TO FE)

C. NEPTUNE MACH 10 ULTRASONIC COMPOUND METER

D. ±0.3m -200mmØ CAST IRON W/M FITTING (FE TO VICTAULIC END).

E. 200mmØ VICTAULIC MODEL 107 QUICKVIC RIGID COUPLING OR APPROVED EQUAL.

F. 200mm (10") WATTS SERIES 757a DOUBLE CHECK VALVE ASSEMBLY, INCLUDING SHUT-OFF VALVES.

G. ±0.8m -200mmØ CAST IRON W/M. (VICTAULIC TO VICTAULIC)

H. 200mmØ GATE VALVE (MJ TO MJ) INCLUDING WHEEL OPERATOR AND TOP NUT TO VALVE BOX EXTENSION IN CHAMBER LID.

METER CHAMBER TO BE MUNRO PRECAST 4100 X2000, OR APPROVED EQUAL, FOR 200mm METER SIZE. COMPLETE WITH SUMP PUMP OPERATED BY LEVEL SWITCH AND DISCHARGING TO GRADE. INTERNAL PIPING TO OPSD 1107.020 FOR 200mm PIPE SIZE.

NOTES:

1. THIS DETAIL IS INTENDED TO BE DIAGRAMMATIC, AND IS NOT INTENDED TO SHOW EVERY ITEM IN IT'S EXACT LOCATION, NOR THE EXACT DIMENSIONS, OR ALL EQUIPMENT DETAILS. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY ALL ACTUAL DIMENSIONS OF ALL PROPOSED EQUIPMENT TO ENSURE THAT ALL EQUIPMENT SHALL FIT. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES IMMEDIATELY.

2. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS FROM THIS DETAIL MAY BE MADE TO ACCOMPLISH THIS, BUT CHANGES WHICH INVOLVE EXTRA COSTS SHALL NOT BE MADE WITHOUT APPROVAL.

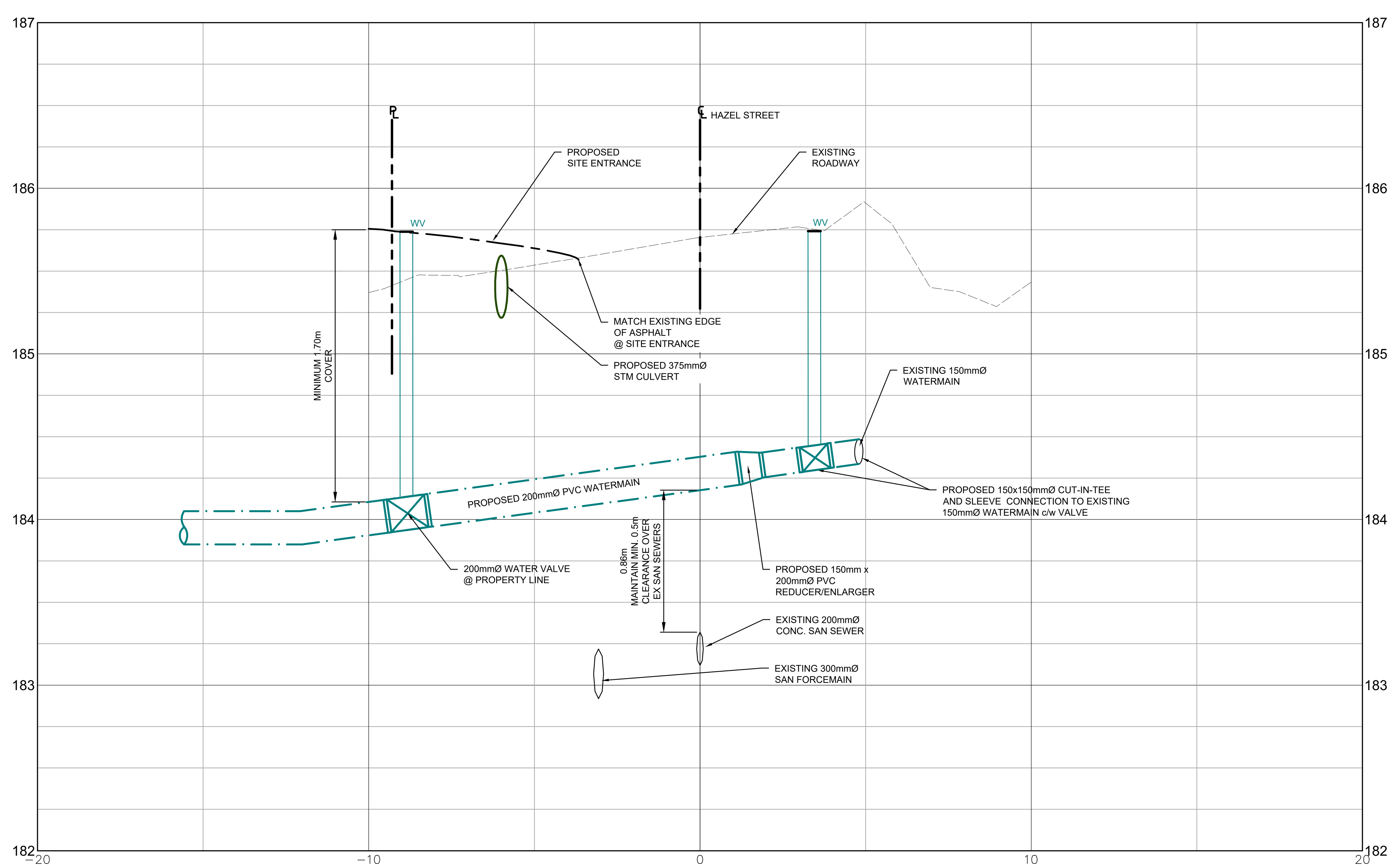
3. THE CONTRACTOR SHALL PROVIDE DETAILED SHOP DRAWINGS TO THE ENGINEER DETAILING ALL ITEMS AND DIMENSIONS IN DETAIL PRIOR TO PLACING ORDERS FOR ANY EQUIPMENT.

4. ALL WORKS ARE TO BE CARRIED OUT IN COMPLIANCE WITH ALL MUNICIPAL STANDARDS, AND ALL PROVINCIAL AND FEDERAL STATUTES.

5. PIPE SUPPORTS TO BE CONCRETE BLOCKS WITH BOND BREAKER APPLIED TO THE WATERMAIN OR APPURTENANCES PRIOR TO FINAL MORTAR PLACEMENT.

6. BY-PASS WITHIN CHAMBER IS PERMITTED, HOWER CITY WILL COME AND LOCK THAT OUT DURING THE FINAL METER INSPECTION. THAT VALVE SHOULD BE EXERCISED ANNUALLY AT A MINIMUM OTHERWAISE IT WILL NOT HOLD WATER AND RENDER THE BY-PASS USELESS. CITY MUST BE CALLED TO REMOVE THE LOCK.

METER CHAMBER DETAIL

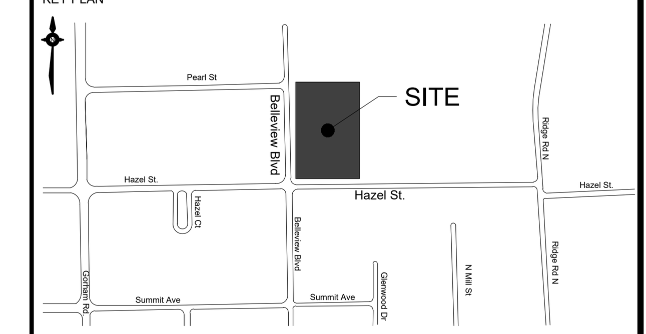


CROSS SECTION 'A-A'

H1:100 V1:20

1:100 (m)

KEY PLAN



DATE	ISSUANCE	NO.
2023.02.10	ISSUED FOR DRAFT CONDO PLAN SUBMISSION	1
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CLIENT

SCHOUT COMMUNITIES INC.

45 REINHART PLACE, PETERSBURG, ON

PROJECT

3770 HAZEL STREET
TOWN OF FORT ERIE

TITLE

NOTES AND DETAILS

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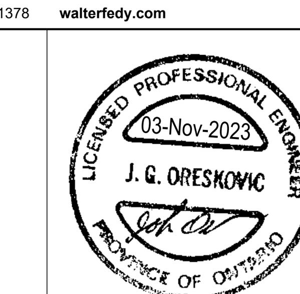

SCALE:	AS NOTED
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PROJECT NO.:	2022.0365.10
DRAWN BY:	MPB
CHECKED BY:	JGO

SHEET NO.:

C5-1