S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Functional Servicing & Stormwater Management Report

8885 – 8911 LUNDY'S LANE

CITY OF NIAGARA FALLS

M5V DEVELOPMENT INC.

JUNE 2023

SLA File: 22098

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1.0 INTRODUCTION AND BACKGROUND

1.1 Overview

S. Llewellyn & Associates Limited has been retained by M5V Inc. to provide Consulting Engineering services for the proposed development at 8885-8911 Lundy's Lane in the City of Niagara Falls (see Figure 1.0 for location plan).

The 0.90 ha site is bound by Lundy's Lane to the south, Garner Road to the west, and existing commercial lands to the east and north. The proponent proposes to construct a 10-storey mixed-use building with 1,462 m^2 of commercial space and 184 residential units including associated asphalt driveways, concrete curbing and landscaped areas.

This Functional Servicing and Stormwater Management Report will provide detailed information of the proposed stormwater management and functional servicing scheme for this development. Please refer to the Site Engineering Plans prepared by S. Llewellyn & Associates Limited and the Site Plan prepared by API Development Consultants Inc. for additional information.

1.2 Background Information

The following documents were referenced in the preparation of this report:

Ref. 1: *The City of Niagara Falls Engineering Design Guidelines Manual* (April 2016)

Ref. 2: *City Standards for Site Planning* (April 1992).

Ref. 3: *MOE Stormwater Management Practices Planning and Design Manual*, Ministry of Environment (March 2003).

Ref. 4: *Erosion & Sediment Control Guidelines for Urban Construction* (December 2006).

Figure 1.0 – Location Plan

2.0 STORMWATER MANAGEMENT

The following stormwater management (SWM) criteria will be applied to the site, in accordance with the City of Niagara Falls requirements:

Quantity Control
The stormwater discharge rate from the proposed site shall be controlled to the pre-development condition discharge rate for the 5-year storm event.

Quality Control
The stormwater runoff from the proposed condition site must meet Level 2 (Normal) stormwater quality control (70% TSS removal, 80% average annual runoff treatment).

Erosion Control
Erosion and sediment control measures will be implemented in accordance with the standards of the City of Niagara Falls and NPCA.

2.1 Pre-Development Conditions

In the pre-development condition, the 0.90ha site consists entirely of grassed area. The site sheet drains north-west towards Garner Road where runoff is captured by the

existing 450mmø storm sewer along Garner Road. This storm sewer flows south and outlets to the existing 1350mmø storm sewer along Lundy's Lane.

One catchment area, Catchment 101 has been identified in the existing condition. Catchment 101 represents the drainage area from the site, which is captured by the existing 450mmø storm sewer along Garner Road. As noted above, this sewer outlets to the existing 1350mmø storm sewer along Lundy's Lane. See Table 2.1 and the Existing Condition Storm Drainage Area Plan in Appendix A for details.

Table 2.1: Pre-Development Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious	Run-off Coefficient
101	To Lundy's Lane	0.901	0%	0.25

The existing conditions discharge from the site was calculated for Catchment 101 using the Rational Method based on the above runoff coefficient (C) and the City of Niagara Falls storm intensities at a time of concentration of 10 minutes (Tc=10min). An example of the 5-year calculation for Catchment 101 is shown below and a summary can be found in Table 2.2.

$Q_{5\text{-yr (Catchment 101)}}$ = 2.78CiA=2.78(0.25)(84.02 mm/hr)(0.901ha)
= **52.6 *l/s (0.0526 m^3/s)***

Table 2.2: Pre-Development Condition Site Discharge

Storm Event	Catchment 101 Runoff (m^3/s)
5-Yr Event	0.0526

2.2 Post-Development Conditions

The proposed development consists of constructing a 10-storey mixed-use with 1,462 m^2 of commercial space and 184 residential units including associated asphalt driveways, concrete curbing and landscaped areas. It is proposed to service the site with a private storm sewer system, designed and constructed in according to the City of Niagara Falls standards.

Two (2) catchment areas, Catchment 201 and 202 have been identified in the proposed condition. Catchments 201 represents the drainage area which is captured from the roof of the proposed building, asphalt surface, concrete walkways and landscaped areas and will outlet via the proposed storm sewer and discharge to the existing 450mmø storm sewer at the intersection of Garner Road and Lundy's Lane.

Catchment 202 represents the uncontrolled drainage area, which sheet drains to the municipal right of way and is captured by the existing 1350mmø storm sewer on Lundy's Lane. See Table 2.3 and the Proposed Condition Storm Drainage Area Plan in Appendix A for details.

Table 2.3: Post-Development Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious	Runoff Coefficient
201	Controlled to Lundy's Lane	0.71	94%	0.86
202	Uncontrolled to Lundy's Lane	0.19	31%	0.45

2.2.1 Water Quantity Control

It is required to restrict the 5-year post-development discharge rate from the subject site to the 5-year pre-development discharges rate. Stormwater quantity control for Catchment 201 will function through an 110mmø orifice plate located within MH2. The orifice plate will restrict discharge from the site to the allowable discharge rate. Details of this design can be found on the Preliminary Site Servicing Plan, prepared by S. Llewellyn and Associates Limited. A summary of the stage-storage-discharge characteristics and proposed discharge rates for the proposed condition can be seen in Table 2.4 and Appendix A.

Table 2.4: Proposed Condition Stage-Storage-Discharge for Catchment 201

Elevation (m)	Storage (m^3)	Discharge (m^3/s)
185.28 (Orifice Invert)	0	0.0000
186.65 (Top of Grade)	0	0.0290
186.70	2	0.0295
186.75	15	0.0300
186.80	50	0.0306
186.85	117	0.0311
186.90	234	0.0316

The maximum discharge rates for Catchment 202 were calculated using the Rational Method based on the proposed condition runoff coefficients for the 5-year storm event. Additionally, the 5-year storage volume for Catchment 201 was calculated using the Modified Rational Method (MRM). The proposed discharge rate and required storage volume is summarized in Table 2.5 below and in Appendix A for details.

Table 2.5: Proposed Condition Stormwater Discharge (To Garner Rd)

Storm Event	Catchment 201 Controlled Discharge (m^3/s)	Catchment 202 Uncontrolled Discharge (m^3/s)	Total Discharge (m^3/s)	Allowable Discharge (m^3/s)	Required Storage (m^3)
5-Yr	0.0316	0.0197	0.0513	0.0526	107

This analysis determined the following:

- The post-development condition discharge rates to Lundy's Lane will not exceed the pre-development condition discharge rate during the 5-year storm event.

- Sufficient stormwater storage is provided on the surface of the asphalt parking lot. A total storage volume of 234 m^3 is provided while only 107m^3 of storage is required during the 5-year storm event.

2.2.2 Water Quality Control

The proposed development is required to achieve a "Normal" (70% TSS removal) level of water quality protection. To achieve this criteria, discharge from Catchment 201 will be subject to treatment from a HydroStorm oil/grit separator before ultimately discharging to the existing storm sewer system along Lundy's Lane. The HydroStorm sizing software was used to determine the required size of oil/grit separator unit for the site. It was determined that a HydroStorm HS6 will provide 72% TSS removal and 96% average annual runoff treatment. See HydroStorm unit sizing procedures in Appendix B for details.

As part of a treatment train approach, Flexstorm Inlet Filters have been proposed within the proposed area drains in the asphalt driveways. The installation of the Flexstorm Inlet Filters will contribute to the removal of TSS and the capture of floatables within the catchbasins. Technical information regarding the Flexstorm Inlet Filters can be found in Appendix B.

HydroStorm units and Flexstorm Inlet Filters require regular inspection and maintenance as per the manufacturer's specifications to ensure the units operate properly. See the Maintenance Manuals in Appendix B for details.

2.2.3 Sediment and Erosion Control

In order to minimize erosion during the grading and site servicing period of construction, the following measures will be implemented:

- Install silt fencing along the outer boundary of the site to ensure that sediment does not migrate to the adjacent properties;

- Install sediment control (silt sacks) in the proposed area drains as well as the nearby existing catchbasins to ensure that no untreated runoff enters the existing conveyance system;

- Stabilize all disturbed or landscaped areas with hydro seeding/sodding to minimize the opportunity for erosion.

To ensure and document the effectiveness of the erosion and sediment control structures, an appropriate inspection and maintenance program is necessary. The program will include the following activities:

- Inspection of the erosion and sediment controls (e.g. silt fences, sediment traps, outlets, vegetation, etc.) with follow up reports to the governing municipality; and

- The developer and/or their contractor shall be responsible for any costs incurred during the remediation of problem areas.

Details of the proposed erosion & sediment control measures are provided on the Preliminary Site Erosion and Sediment Control Plan.

3.0 SANITARY SEWER SERVICING

3.1 Existing Conditions

There is an existing 450mmø sanitary sewer, which flows north along Garner Road and outlets to the Lundy's Lane pumping station.

3.2 Sanitary Demand

Niagara Region requires that the Peak Dry Weather Flow (DWF) and Peak Wet Weather Flow (WWF) be provided for the site in accordance with Section C.1 of Niagara Region Water-Wastewater Project Design Manual. Table 3.1 summarizes the Peak DWF and WWF

Table 3.1: Post-Development Sanitary Sewer Discharge

RDII[1] (l/s)	DWF[2] (l/s)	**Peak DWF[3] (l/s)**	WWF[4] (l/s)	**Peak WWF[5] (l/s)**
0.257	3.19	**12.60**	3.44	**12.86**

Population = (184 units x 3 persons/unit + 1,462m^2 of commercial x 90 persons/ha) = 552 + 13 = 565 persons
Peaking Factor = (1+(14/(4+P$^{0.5}$))) with P expressed in thousands, Min. 2.0, Max. 4.0 = 3.95
Dry Weather Infiltration = Area x Infiltration Rate = 0.90 ha x 0.28 l/ha/s = 0.252 l/s
[1]RDII (Rain Derived Inflow and infiltration) = Area x 0.286 l/s/ha = 0.90 ha x 0.286 l/s = 0.257 l/s
[2]DWF (Dry Weather Flow) = Average Sanitary Flow + Dry Weather Infiltration = (average daily per capita flow x population) + Dry Weather Infiltration = (450 lcpd x 565 persons) + 0.252 l/s= 3.19 l/s
[3]Peak DWF = DWF x Peaking Factor = 3.19 x 3.95 = 12.60l/s
[4]WWF (Wet Weather Flow) = DWF + Inflow and All Infiltration (Dry Weather and Rain Derived) = 3.19 l/s + 0.252 l/s = 3.44 l/s
[5] Peak WWF = Peak DWF + RDII = 12.60 l/s + 0.257 l/s = 12.86 l/s

3.3 Proposed Sanitary Servicing

The proposed site will be serviced by a 200mmø sanitary sewer system, and will be designed and constructed in accordance with the City of Niagara Falls standards. Drainage from the proposed sanitary sewer system will discharge to the existing 450mmø sanitary sewer along Garner Road.

The minimum grade of the proposed 200mmø sanitary sewer will be 0.5%. At this minimum grade, the proposed sanitary sewer will have a capacity of 0.023 m^3/s (23 l/s). Therefore, the proposed 200mmø sanitary sewer at a minimum of 0.5% grade is adequately sized to service the proposed site.

4.0 DOMESTIC AND FIRE WATER SUPPLY SERVICING

4.1 Existing Conditions

The existing municipal water distribution system consists of a 300mmø watermain along Lundy's Lane and 200mmø watermain along Garner Road. There are existing fire hydrants fronting the site on Lundy's Lane and Garner Road.

4.2 Domestic Water Demand

Water demand for the site was estimated in accordance with the Ministry of the Environment Design Guidelines for Drinking-Water Systems. Table 4.1 summarizes the domestic water demand requirements for the Average Daily, Maximum Daily and Peaking Hourly demand scenarios.

Table 4.1: Post-Development Domestic Water Demand

Population [A]	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
565 persons	2.35	2.75	4.13	**6.5**	**9.7**

[A] Population = (184 units x 3 persons/unit + 1,462m^2 of commercial x 90 persons/ha) = 552 + 13 = 565 persons

[B] Average Daily Demand = (270 l/cap/day + 450 l/cap/day)/2 = 360 l/cap/day x population

[C] Max. Daily Peaking Factor = 2.75 (refer to Table 3-1 from MOE Manual)

[D] Max. Hourly Peaking Factor = 4.13 (refer to Table 3-1 from MOE Manual)

[E] Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor

[F] Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

4.3 Fire Flow Demand

Fire flow demands for development are governed by a number of guidelines and criteria, such as the Water Supply for Public Fire Protection (Fire Underwriters Survey, 1999), Ontario Building Code (OBC), and various codes and standards published by the National Fire Protection Association (NFPA). The Fire Underwriters Survey - 2020 was used to determine the required flow rate for the proposed development.

There are two existing fire hydrants fronting the site on Lundy's Lane and Garner Road which meet the required 90m separation to the building face of the proposed buildings (as per Sentence 3.2.5.7 of the 2020 Ontario Building Code). Therefore, no additional private hydrant is proposed for the development.

The multi-use building is a non-combustible construction building (C=0.8), with limited combustible occupancy (-15% correction) and a sprinkler system (-50% correction). Exposure components are based on the following:

North Face: 0% correction (30m+)
South Face: 0% correction (30m+)
East Face: 0% correction (30m+)
West Face: 0% correction (30m+)
Total: 5%

An estimate of the required flow rate for the proposed building can be found in Appendix C. The flow rate was determined in accordance with the Fire Underwriters Survey – 2020 Water Supply for Public Fire Protection. It has been determined that the required fire flow for the site is **8000 l/min (133 l/s)**.

Hydrants flow tests were completed for the existing hydrants adjacent to the site and the data is shown in Table 4.2 and can be found in Appendix C. The hydrants flow tests result indicate that the water distribution system can supply **144 l/s and 197 l/s** at the minimum allowable pressure of 20 psi. Therefore, the water distribution system has adequate pressure and capacity to service the subject site.

Table 4.2: Hydrant Flow Test Data	
Location	On Lundy's Lane
Test Date (mm/dd/yyyy)	6/23/2023 @ 8:00 am.
Static Pressure	77 psi
Residual Pressure During Test #1	65 psi
Test #1 Flow Rate	992.7 USGPM (62.6 l/s)
Residual Pressure During Test #2	57 psi
Test #2 Flow Rate	1299.7 USGPM (82.0 l/s)
Theoretical Flow @ 20 psi	**2288 USGPM (144.4 l/s)**
Location	On Garner
Test Date (mm/dd/yyyy)	6/23/2023 @ 8:30 am.
Static Pressure	80 psi
Residual Pressure During Test #1	68 psi
Test #1 Flow Rate	1021 USGPM (64.4 l/s)
Residual Pressure During Test #2	61 psi
Test #2 Flow Rate	1977.9 USGPM (124.8 l/s)
Theoretical Flow @ 20 psi	**3122 USGPM (197.0 l/s)**

4.4 Proposed Water Servicing and Analysis

The proposed development will be serviced with a 200mmø watermain feeding off the existing 300mmø watermain along Lundy's Lane. The municipal watermain and fire hydrants will supply firefighting water for the development.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that:

- The development be graded and serviced in accordance with the Preliminary Grading Plan, Preliminary Site Servicing Plan, and Preliminary Erosion & Sediment Control Plan prepared by S. Llewellyn & Associates Limited;
- A 110mmø orifice plate be installed as per the Preliminary Site Servicing Plan and this report to provide adequate control to the Lundy's Lane storm sewer,
- The development be graded in accordance with the Preliminary Grading Plan and this report to provide adequate stormwater storage;
- A Hydrostorm HS6 oil/grit separator, or approved equivalent, and Flexstorm Inlet filters be installed as per the Preliminary Site Servicing Plan and this report to provide effective stormwater quality control;
- The proposed sanitary and water servicing system be installed as per the Preliminary Site Servicing Plan and this report to adequately service the proposed development;
- Erosion and sediment controls be installed as described in this report, and as per the standards and specifications of the City of Niagara Falls;

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.
Prepared by:

S. LLEWELLYN & ASSOCIATES LIMITED

F. Ghazal, EIT.

S. Nelson, P. Eng.

APPENDIX A
STORMWATER QUANTITY INFORMATION

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LUNDY'S LANE PUMPING STATION

EXISTING COMMERCIAL LAND

EXISTING COMMERCIAL LAND

GARNER ROAD

LUNDY'S LANE

101
0.90
0.0%
0.25

LEGEND

101
1.67
15%
0.35

DRAINAGE AREA I.D.

DRAINAGE AREA (ha)

PERCENT IMPERVIOUS

RUNOFF COEFFICIENT

DRAINAGE AREA BOUNDARY

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:600

PROJECT: 8885-8911 LUNDY'S LANE, NIAGARA FALLS
PROJECT No.: 22098

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LUNDY'S LANE PUMPING STATION

EXISTING COMMERCIAL LAND

EXISTING COMMERCIAL LAND

GARNER ROAD

LUNDY'S LANE

202
0.19
31%
0.45

201
0.71
94%
0.86

101
1.67
15%
0.35

LEGEND

DRAINAGE AREA I.D.

DRAINAGE AREA (ha)

PERCENT IMPERVIOUS

RUNOFF COEFFICIENT

DRAINAGE AREA BOUNDARY

STORMWATER MANAGEMENT
MAX PONDING VOLUME=234m³
MAX PONDING ELEVATION=186.90m
MAX PONDING DEPTH=0.25m
100-YEAR REQUIRED VOLUME=107m³
100-YEAR PONDING ELEVATION=186.84m
100-YEAR PONDING DEPTH=0.19m

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:600

PROJECT: 8885-8911 LUNDY'S LANE, NIAGARA FALLS
PROJECT No.: 22098

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8885 - 8911 Lundy's Lane
Niagara Falls, ON

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

STAGE-STORAGE-DISCHARGE CALCULATIONS

Catchment 201
Outlet Device No. 1 (Quantity)

Type:	Orifice Plate
Diameter (mm)	**110**
Area (m^2)	0.00950
Invert Elev. (m)	185.28
C/L Elev. (m)	185.34
Disch. Coeff. (C_d)	0.6
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1

		SWM Pond Volumes					Outlet No. 1	
	Elevation m	Area m^2	Additional Incremental Underground	Additional Incremental Surface m^3	Cumulative Volume m^3	Active Storage Volume m^3	H m	Discharge m^3/s
Top of Grade	186.65	0	0.0	0	0	0	1.315	0.0290
0.05m Ponding	186.70	98	0.0	2	2	2	1.365	0.0295
0.10m Ponding	186.75	423	0.0	13	15	15	1.415	0.0300
0.15m Ponding	186.80	956	0.0	34	50	50	1.465	0.0306
0.20m Ponding	186.85	1746	0.0	68	117	117	1.515	0.0311
0.25m Ponding	186.90	2933	0.0	117	234	234	1.565	0.0316

5-Year Storm - Modified Rational Method

Stormwater Storage Volume

Determination of required storage volume under proposed conditions to control the 100-year proposed conditions runoff to the allowable release rate. Storage volume calculated using the Modified Rational Method.

Storm Rainfall Information		
City/Town/Region:	**Niagara Falls**	
Return Period:	**5**	Years
A =	**719.500**	
B =	**6.340**	
C=	**0.7687**	
Tc =	**10**	minutes
	600	seconds

Area of site being investigated (ha) =	**0.71**	(Lot Area)
Composite Runoff Coeff. (C) =	**0.86**	(Post-development "C")
Release Rate - Q_{ALLOW} (m^3/s) =	**0.0324**	(Allowable discharge)

Flows from Lot area calculated from area indicated above

Roof flows (Q_{ROOF}) added in as a constant flow rate into the orifice controlled system (if applicable)

Duration (T_D)		Rainfall Intensity		Post-Development Runoff			Runoff Volume	Release Volume	Storage Volume
				Site	Roof	Total "Q_{POST}"			
(min)	(sec)	(mm/hr)	(m/s)	(m^3/s)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3)
5	300	111.263	0.0000309	0.189	0.0	0.1887	56.61	14.58	42.03
10	600	84.024	0.0000233	0.143	0.0	0.1425	85.51	19.44	66.07
15	900	68.435	0.0000190	0.116	0.0	0.1161	104.47	24.30	80.17
20	1200	58.211	0.0000162	0.099	0.0	0.0987	118.48	29.16	89.32
25	1500	50.931	0.0000141	0.086	0.0	0.0864	129.58	34.02	95.56
30	1800	45.453	0.0000126	0.077	0.0	0.0771	138.77	38.88	99.89
35	2100	41.165	0.0000114	0.070	0.0	0.0698	146.62	43.74	102.88
40	2400	37.706	0.0000105	0.064	0.0	0.0640	153.49	48.60	104.89
45	2700	34.850	0.0000097	0.059	0.0	0.0591	159.60	53.46	106.14
50	3000	32.447	0.0000090	0.055	0.0	0.0550	165.10	58.32	106.78
55	3300	30.394	0.0000084	0.052	0.0	0.0516	170.12	63.18	106.94
60	3600	28.618	0.0000079	0.049	0.0	0.0485	174.74	68.04	106.70
65	3900	27.063	0.0000075	0.046	0.0	0.0459	179.02	72.90	106.12
70	4200	25.690	0.0000071	0.044	0.0	0.0436	183.00	77.76	105.24
75	4500	24.467	0.0000068	0.041	0.0	0.0415	186.74	82.62	104.12
80	4800	23.370	0.0000065	0.040	0.0	0.0396	190.27	87.48	102.79
85	5100	22.381	0.0000062	0.038	0.0	0.0380	193.60	92.34	101.26
90	5400	21.482	0.0000060	0.036	0.0	0.0364	196.76	97.20	99.56
95	5700	20.663	0.0000057	0.035	0.0	0.0350	199.76	102.06	97.70
100	6000	19.912	0.0000055	0.034	0.0	0.0338	202.64	106.92	95.72
105	6300	19.221	0.0000053	0.033	0.0	0.0326	205.38	111.78	93.60
110	6600	18.583	0.0000052	0.032	0.0	0.0315	208.02	116.64	91.38
115	6900	17.991	0.0000050	0.031	0.0	0.0305	210.55	121.50	89.05
120	7200	17.441	0.0000048	0.030	0.0	0.0296	212.99	126.36	86.63

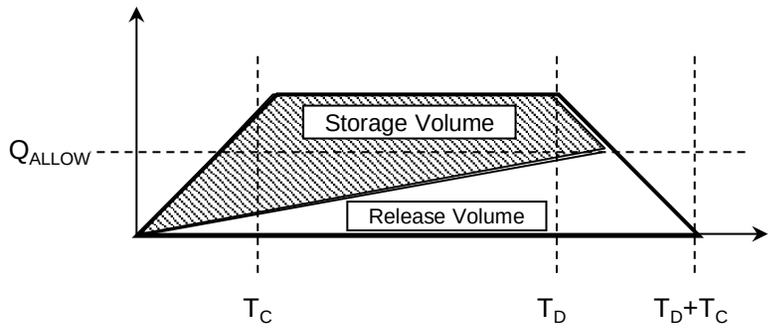
Max. required storage volume = 106.94 m^3

Q_{POST} = (C i A) x 10000 m^2/ha (Rational Method)

Runoff Volume = Area under trapezoidal hydrograph
= $(T_D - T_C)Q_{POST} + (T_C\, Q_{POST})$

Release Volume = Area under triangular outflow hydrograph
= ½ $(T_D + T_C)\, Q_{ALLOW}$

Storage Volume = Runoff Volume - Release Volume



APPENDIX B
STORMWATER QUALITY INFORMATION

Hydroworks Sizing Summary

8885 - 8911 Lundy's Lane, Niagra Falls

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06-15-2023

Recommended Size: HS 6

A HydroStorm HS 6 is recommended to provide 70 % annual TSS removal based on a drainage area of .71 (ha) with an imperviousness of 94 % and St. Catherines A, Ontario rainfall for the ETV Canada particle size distribution.

The recommended HydroStorm HS 6 treats 96 % of the annual runoff and provides 72 % annual TSS removal for the St. Catherines A rainfall records and ETV Canada particle size distribution.

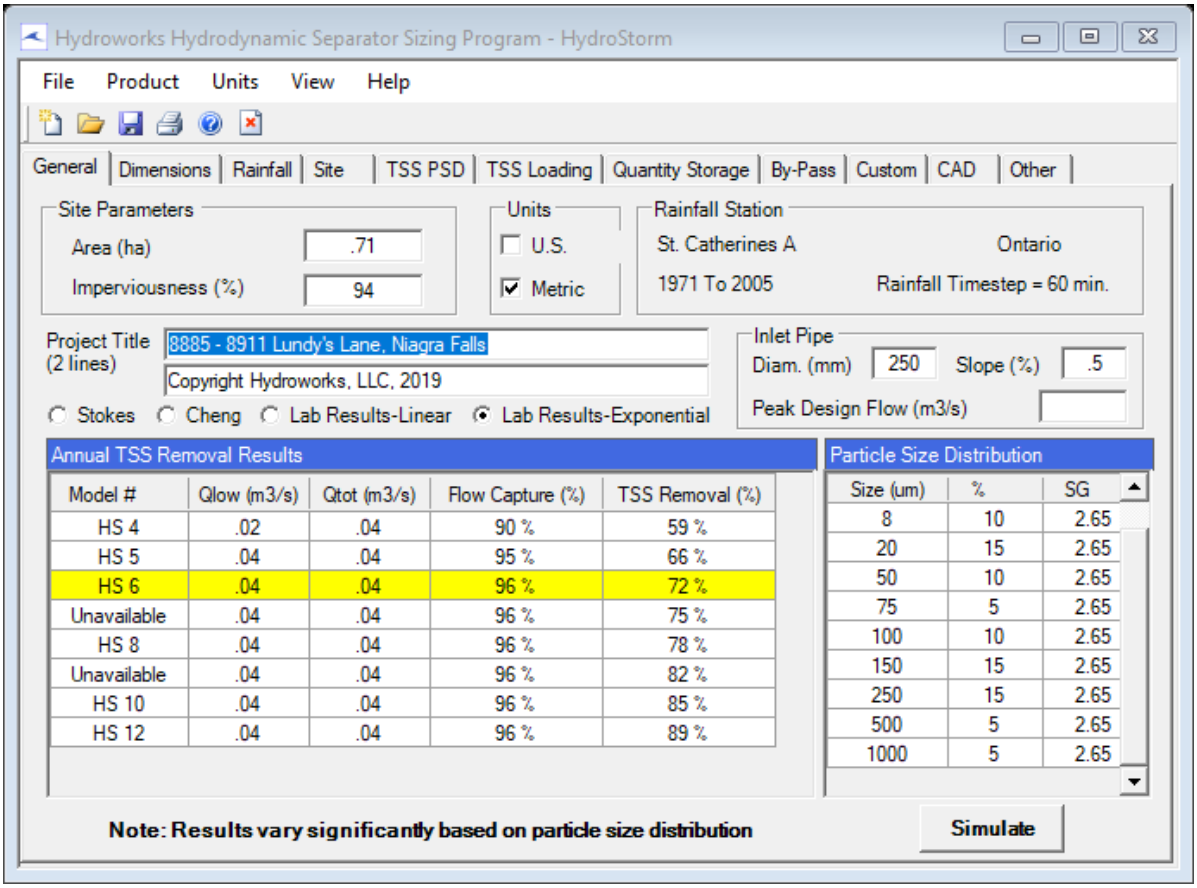
The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .04 (m3/s) for the given 250 (mm) pipe diameter at .5% slope. The headloss was calculated to be 39 (mm) based on a flow depth of 250 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

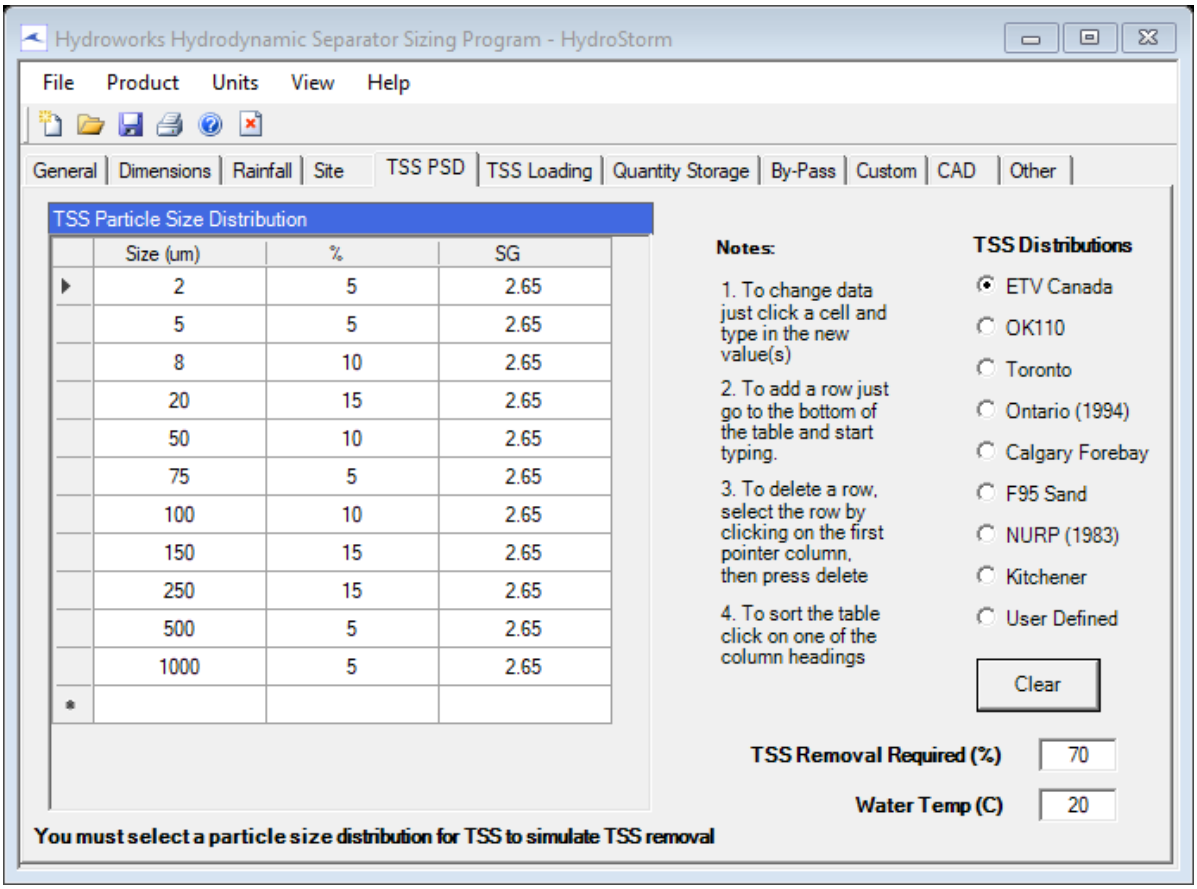
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm . Design liability is only valid for lawsuits brought within the United States where Hydroworks has its corporate headquarters.

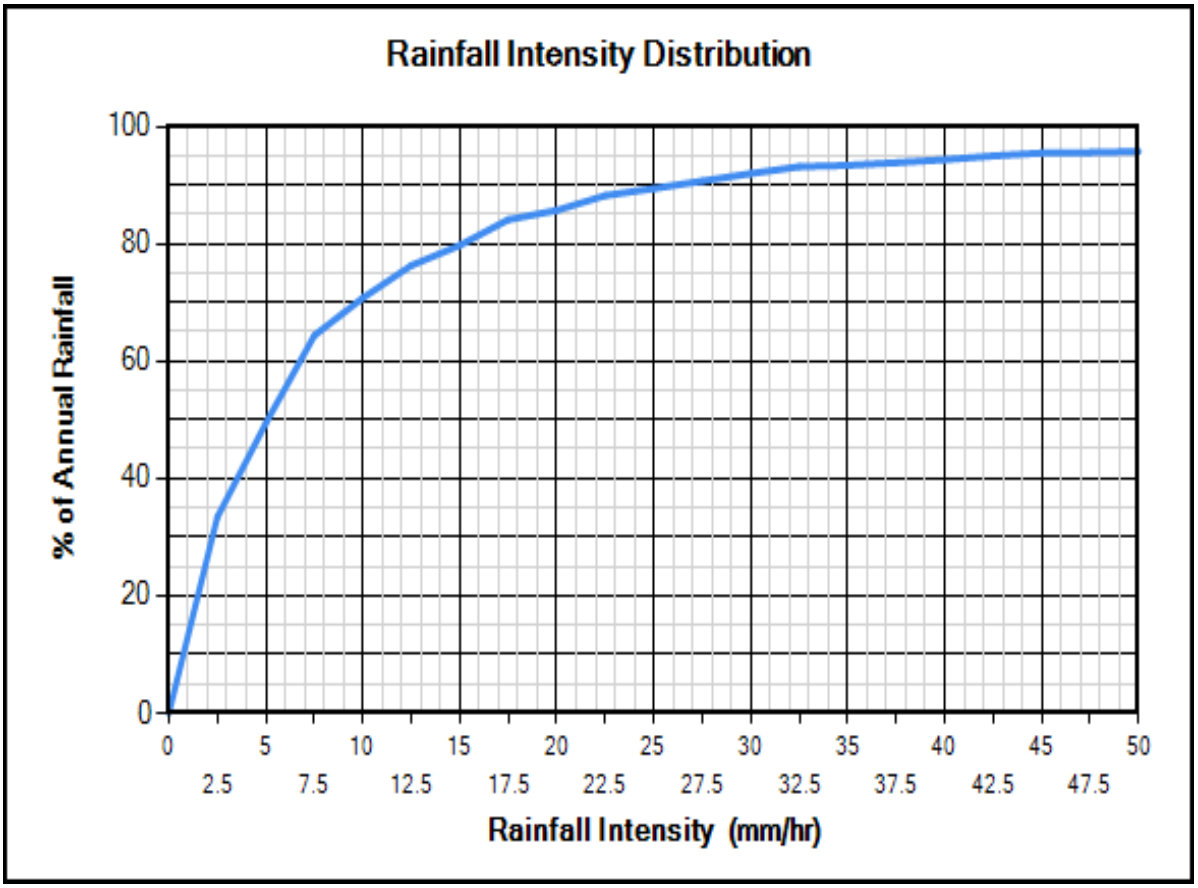
TSS Removal Sizing Summary



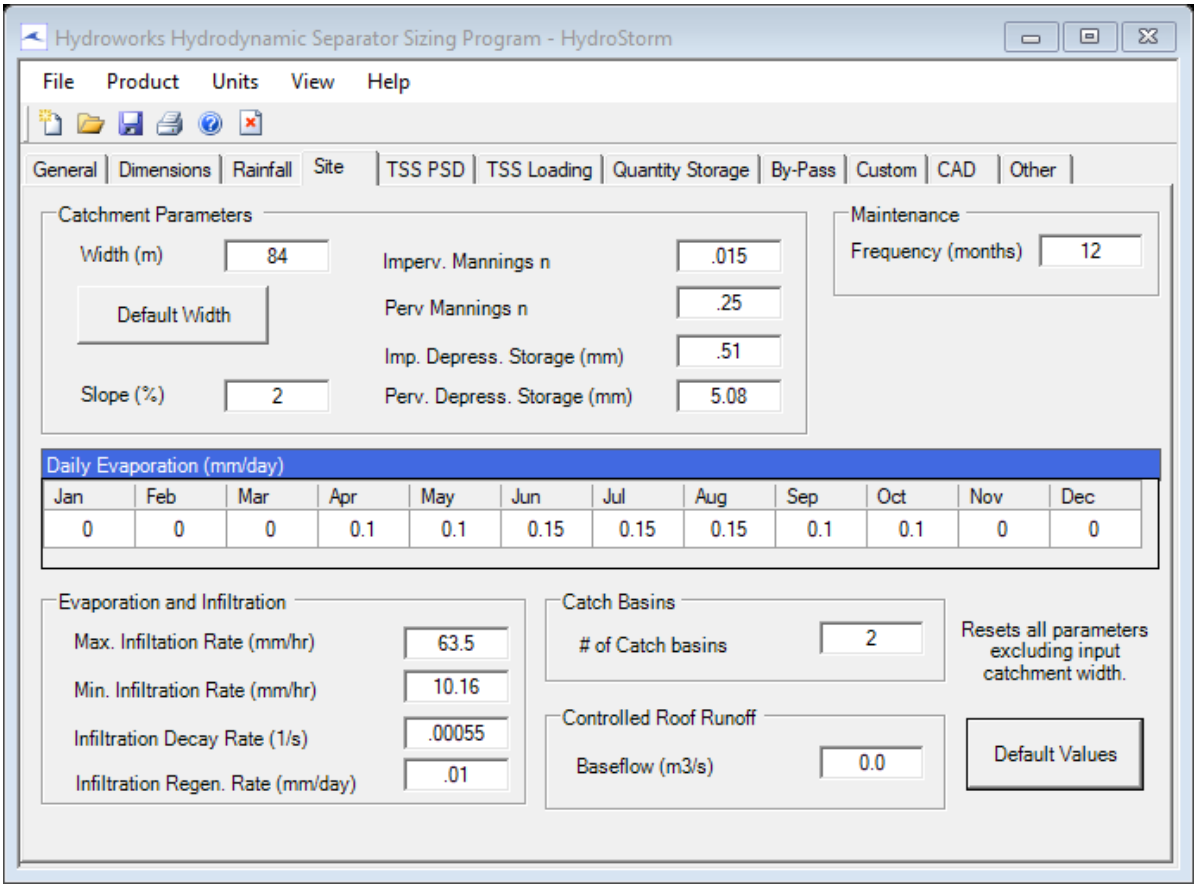
TSS Particle Size Distribution



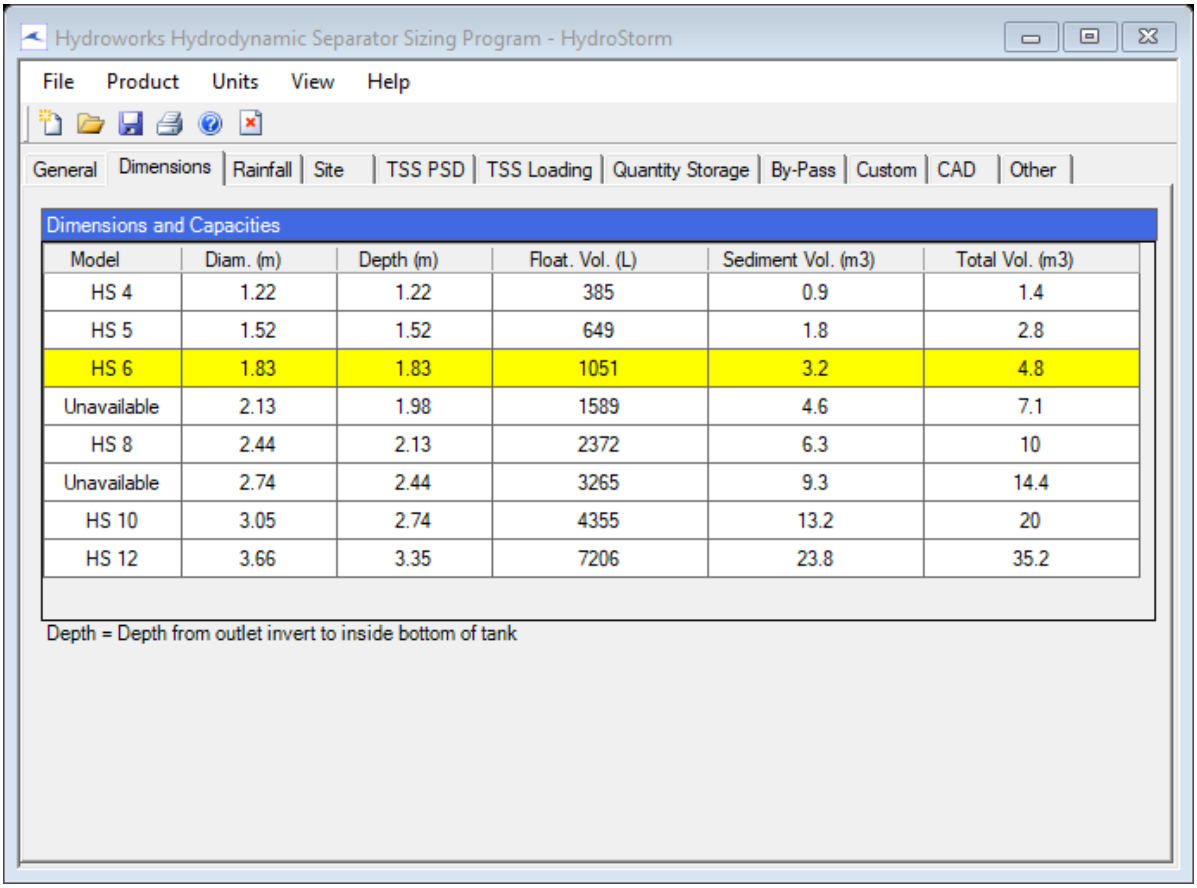
Rainfall Station - St. Catherines A, Ontario(1971 To 2005)



Site Physical Characteristics



Dimensions And Capacities

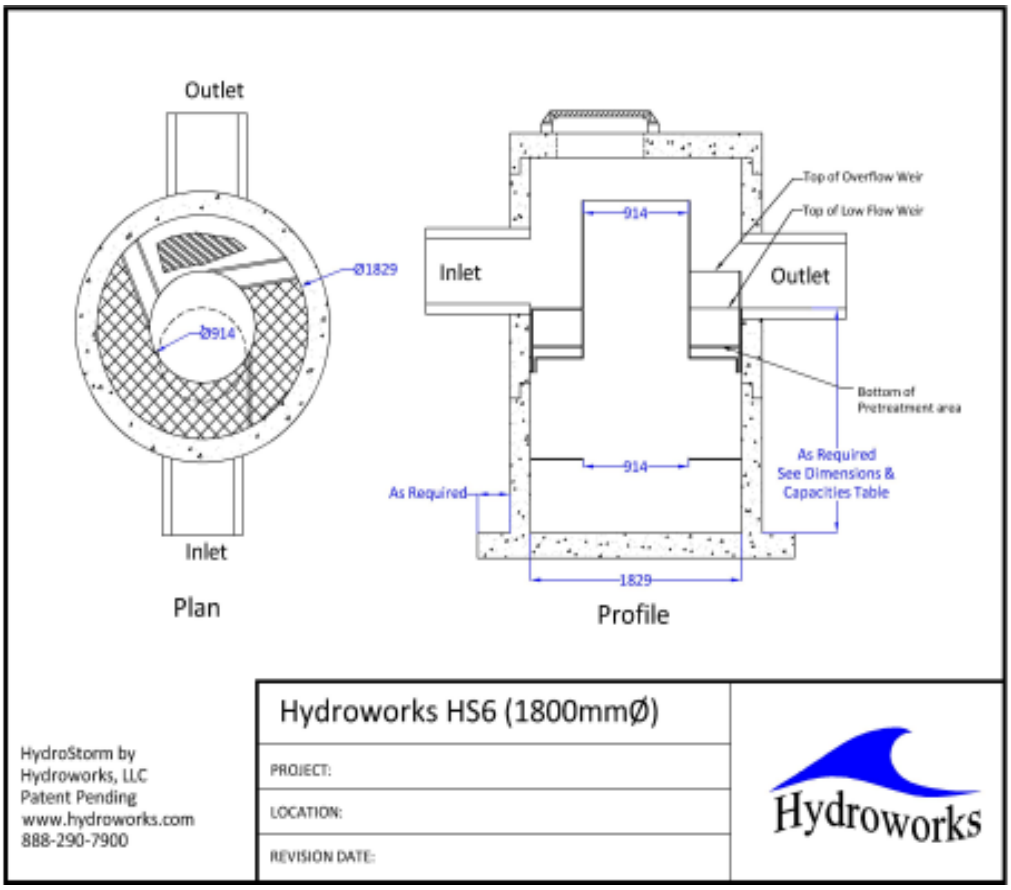


Dimensions and Capacities

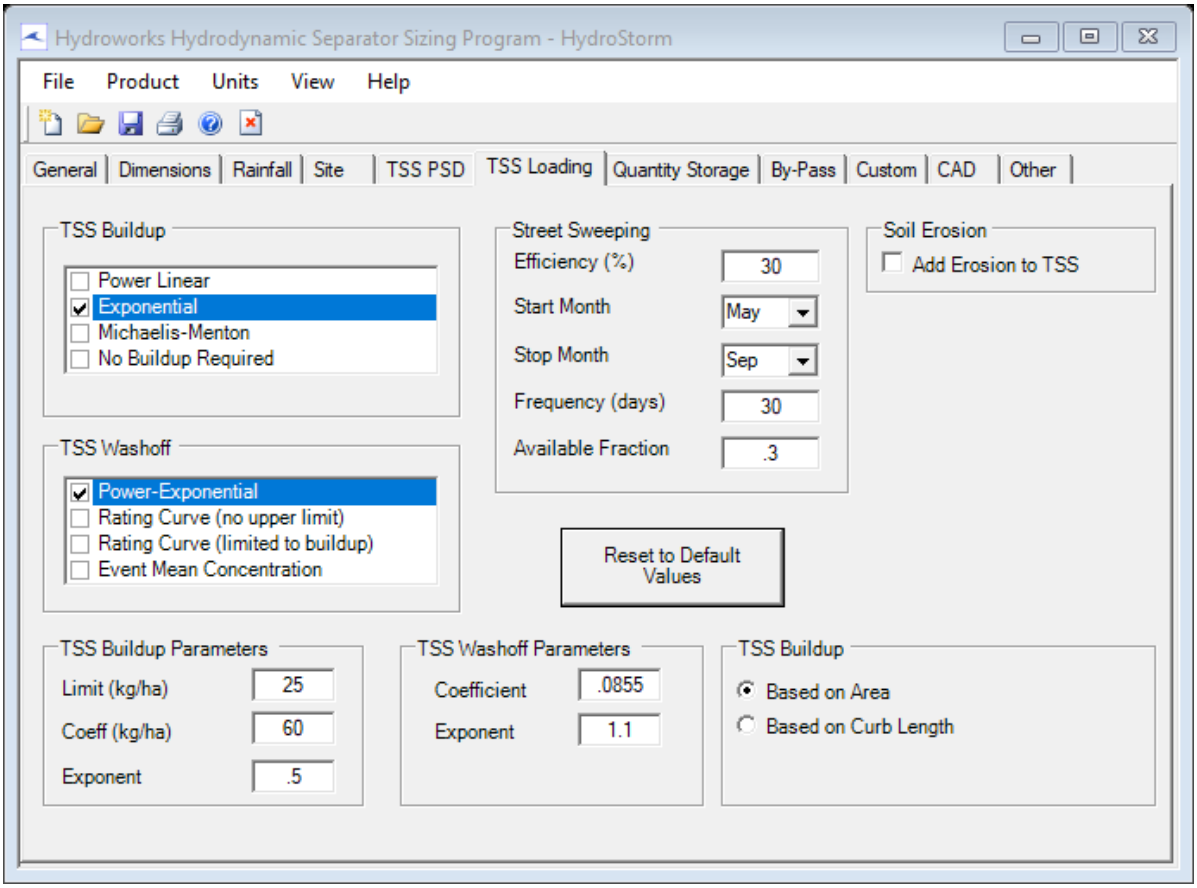
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 4	1.22	1.22	385	0.9	1.4
HS 5	1.52	1.52	649	1.8	2.8
HS 6	1.83	1.83	1051	3.2	4.8
Unavailable	2.13	1.98	1589	4.6	7.1
HS 8	2.44	2.13	2372	6.3	10
Unavailable	2.74	2.44	3265	9.3	14.4
HS 10	3.05	2.74	4355	13.2	20
HS 12	3.66	3.35	7206	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

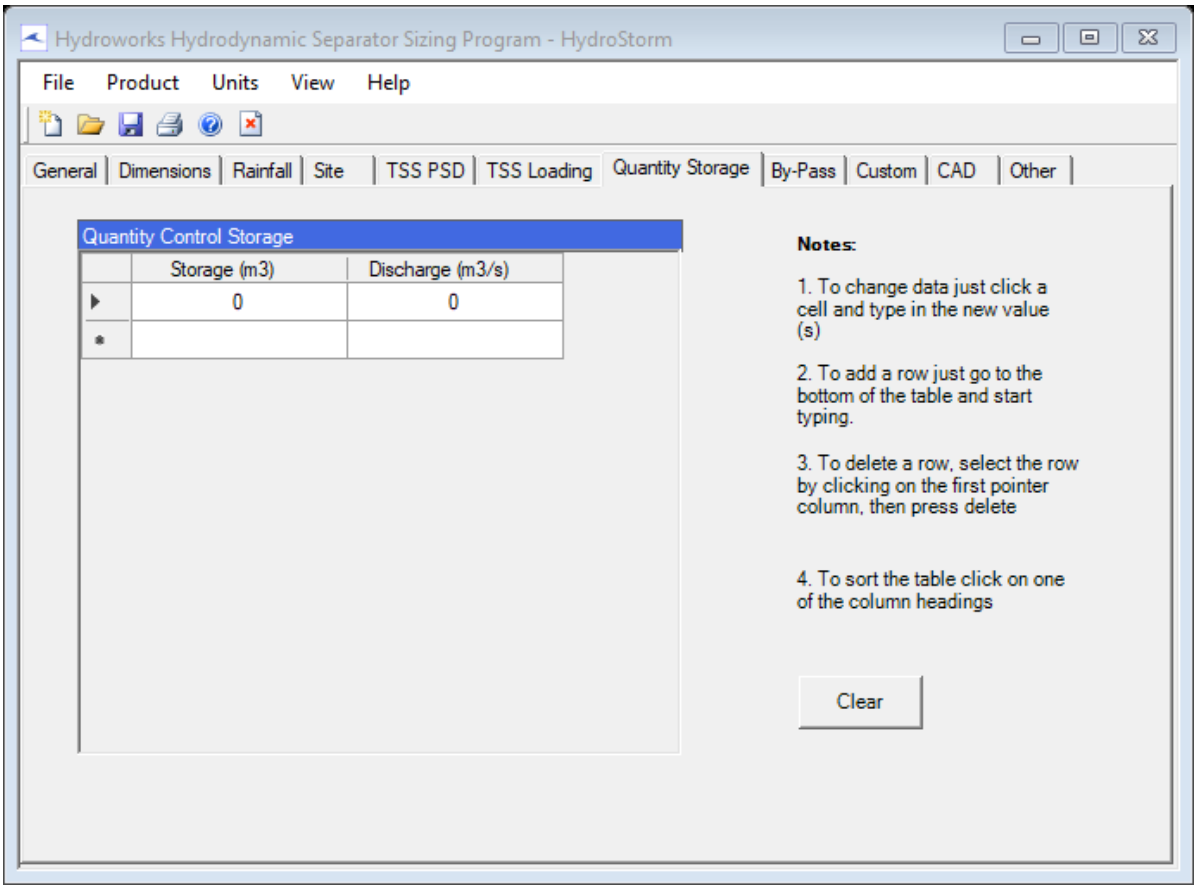
Generic HS 6 CAD Drawing



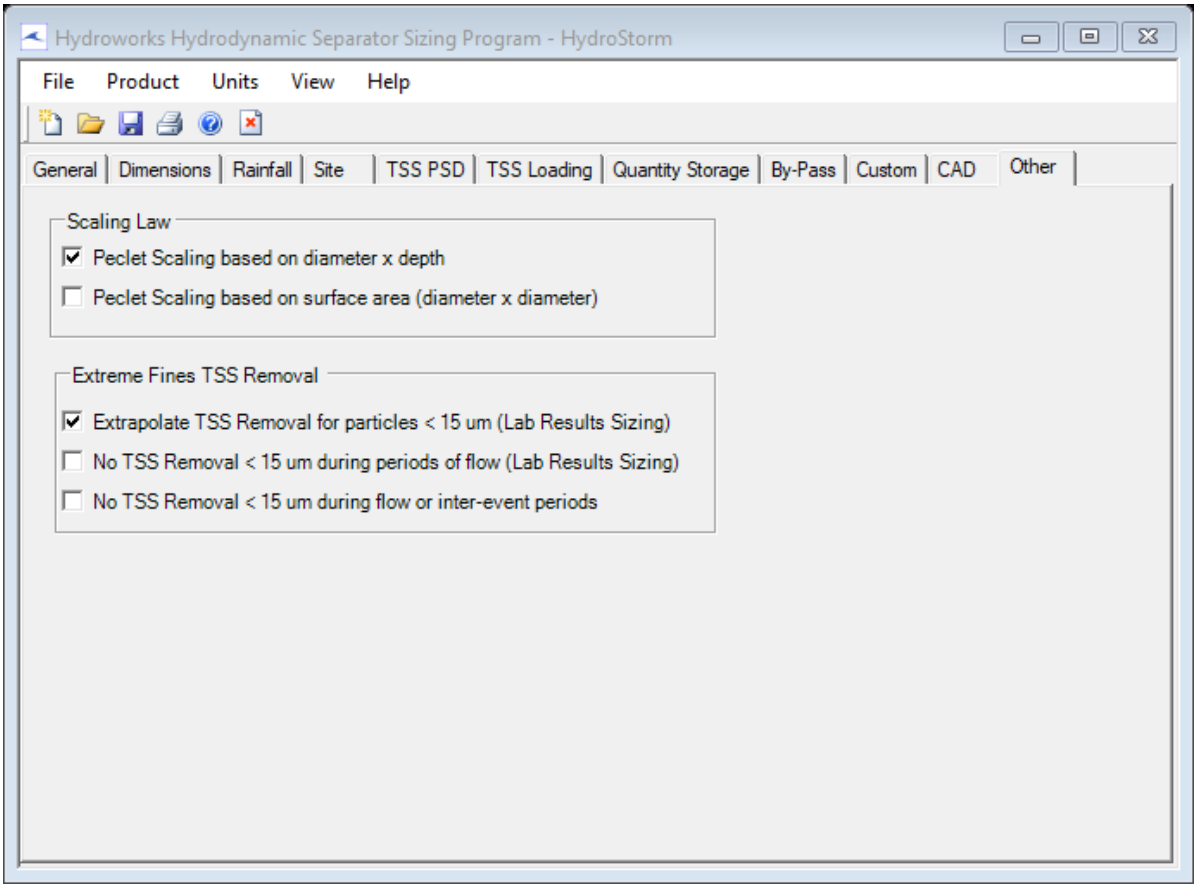
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Hydroworks Sizing Program - Version 4.9
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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.

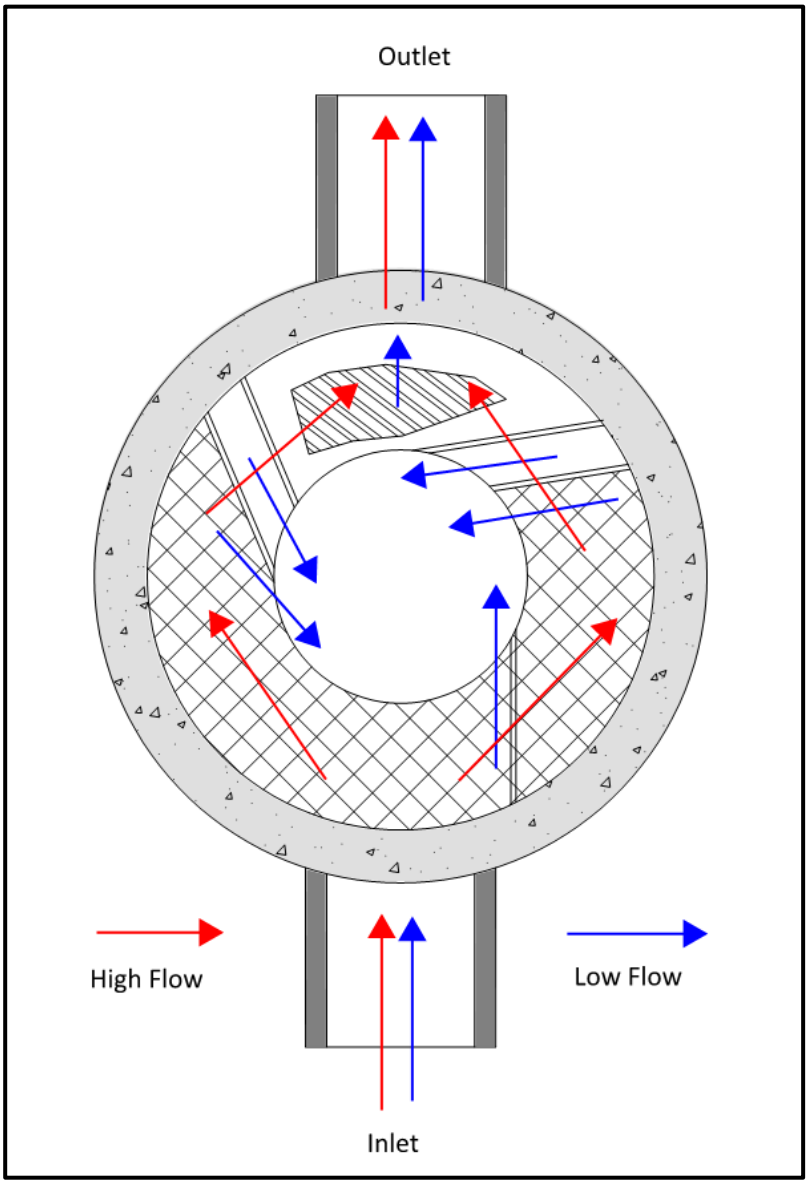


Figure 1. Hydroworks HydroStorm Operation – Plan View

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

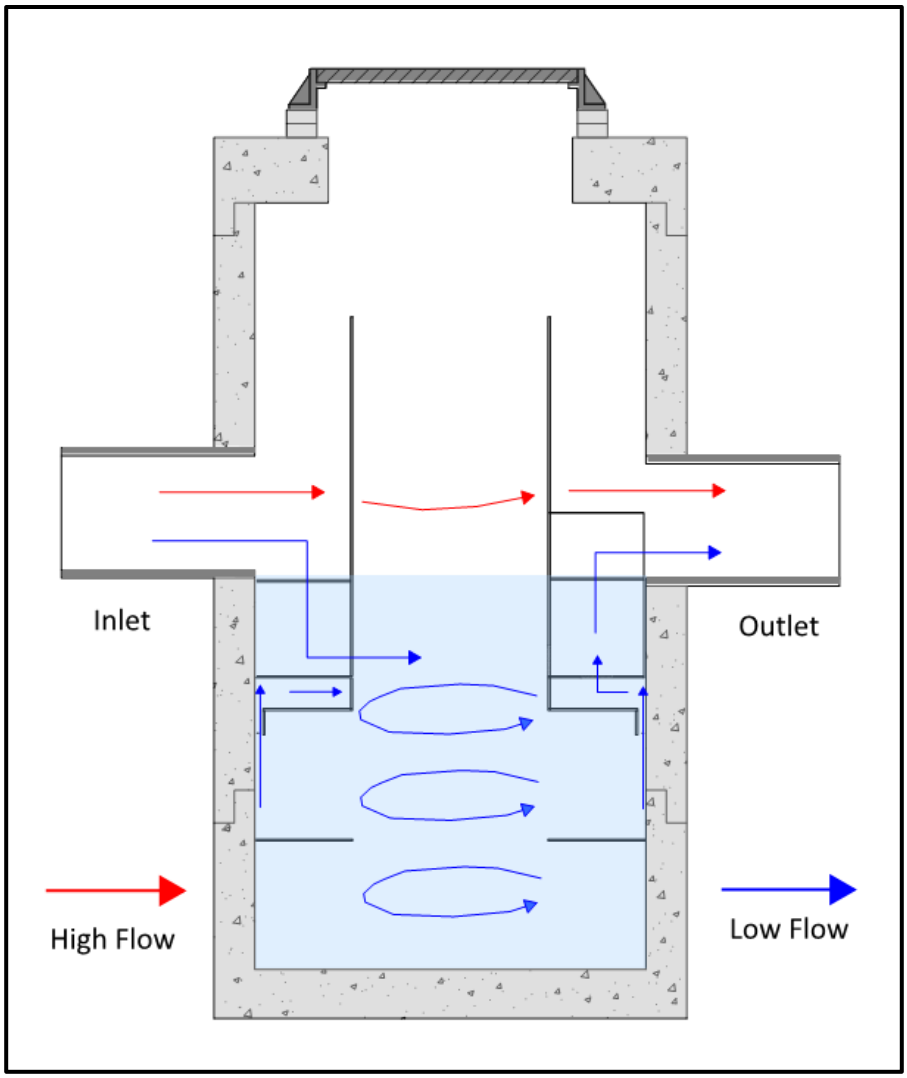


Figure 2. Hydroworks HydroStorm Operation – Profile View

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.

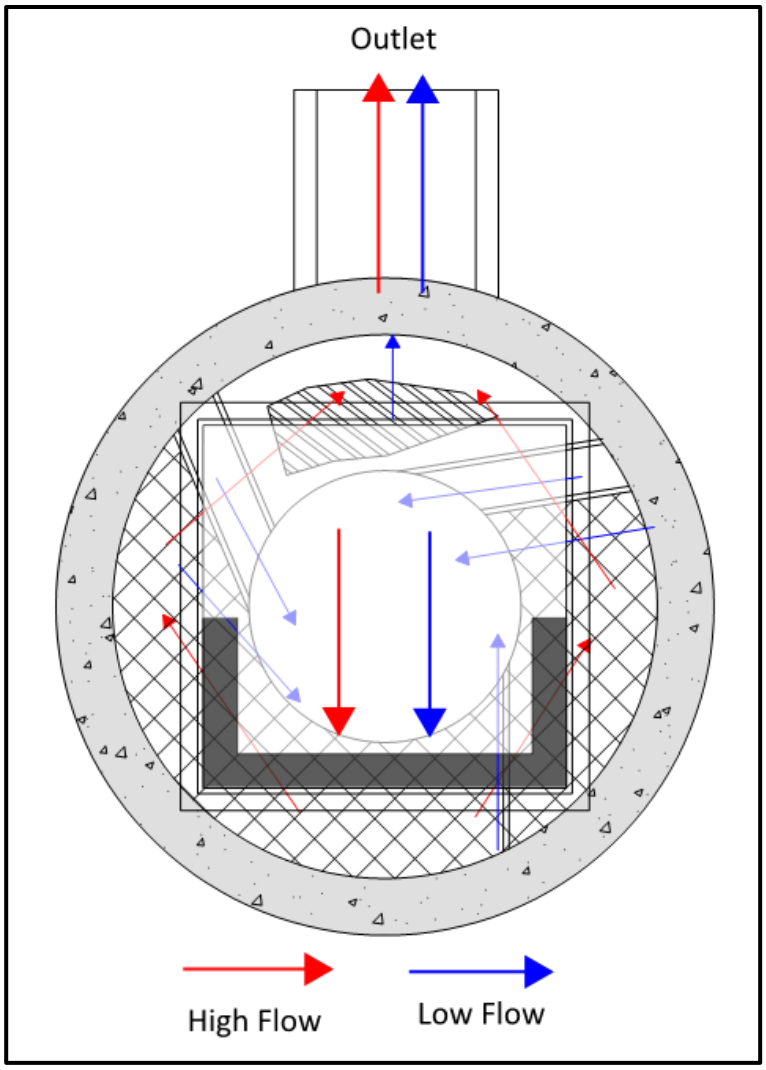


Figure 3. Hydroworks HS 4i Funnel

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.

Hydroworks

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).

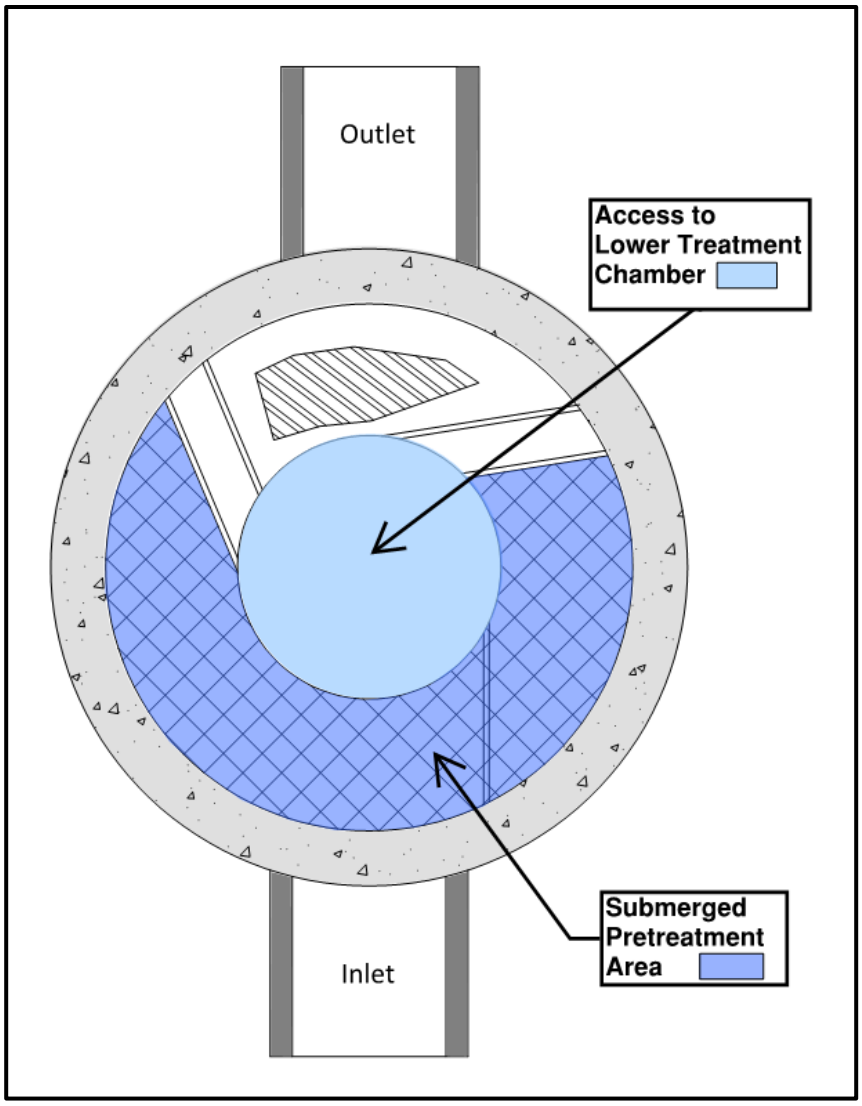


Figure 3. Maintenance Access

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

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 C
FIRE FLOW CALCULATIONS

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Project Number: **22098**
Project Name: **8885-8911 Lundy's Lane**
Date: **Jun-23**

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 2020).

An estimate of the fire flow required is given by the following formula:

$$F = 220\,C\sqrt{A} \qquad \textbf{(1)}$$

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for Type V wood frame construction (structure essentially all combustible)
= 0.8 for Type IV-A mass timber construction (encapsulated mass timber)
= 0.9 for Type IV-B mass timber construction (rated mass timber)
= 1.0 for Type IV-C mass timber construction (ordinary mass timber)
= 1.5 for Type IV-D mass timber construction (un-rated mass timber)
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = Total floor area in square metres

Building / Location	Building Area: Footprint Area (m^2)	Building Area: # of Storeys	Building Area: **Total GFA (m^2)**	Type of Construction	(1) ***Fire Flow "F"***: (l/min)	(1) ***Fire Flow "F"***: (l/s)	(2) ***Occupancy***: %	(2) ***Occupancy***: Adjustment (l/min)	(2) ***Occupancy***: **Adjusted Fire Flow (l/min)**	(3) ***Sprinkler***: %	(3) ***Sprinkler***: Adjustment (l/min)	(4) ***Exposure***: %	(4) ***Exposure***: Adjustment (l/min)	**Final Adjusted Fire Flow**: **(l/min)**	**Final Adjusted Fire Flow**: **(l/s)**
10-Storey Mixed-Use Building	**2273.1**	**10**	**10432.3**	**0.8**	18000	300.0	**-15**	-2700.0	**15300.0**	**-50**	-7650.0	0	0.0	**8000**	**133**

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

Minimum credit for systems designed to NFPA 13 is 30%.

If the domestic and fire services are supplied by the same municipal water system, then take an additional 10%.

If the sprinkler system is fully supervised (ie. annunciator panel that alerts the Fire Dept., such as a school), then an additional 10% can be taken. Maximum credit = 50%.

(4) Exposure

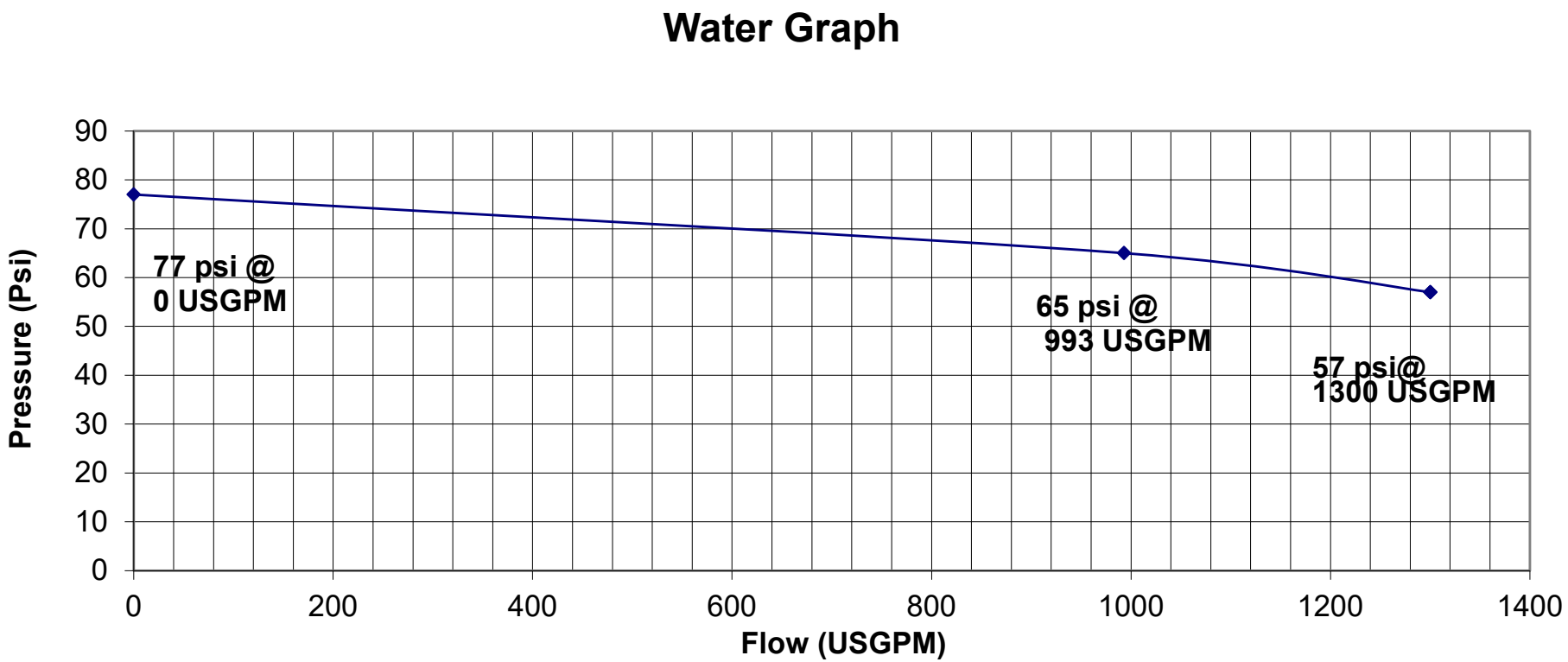
0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
> 30m	0%	exceed 75%

Side	Exposure (m)	Charge (%)
North =	**> 30m**	**0**
South =	**> 30m**	**0**
East =	**> 30m**	**0**
West =	**> 30m**	**0**
Total Exposure =		***0***

NIAGARA REGIONAL FIRE PROTECTION INC.

Flow Test Location: On Lundys Lane

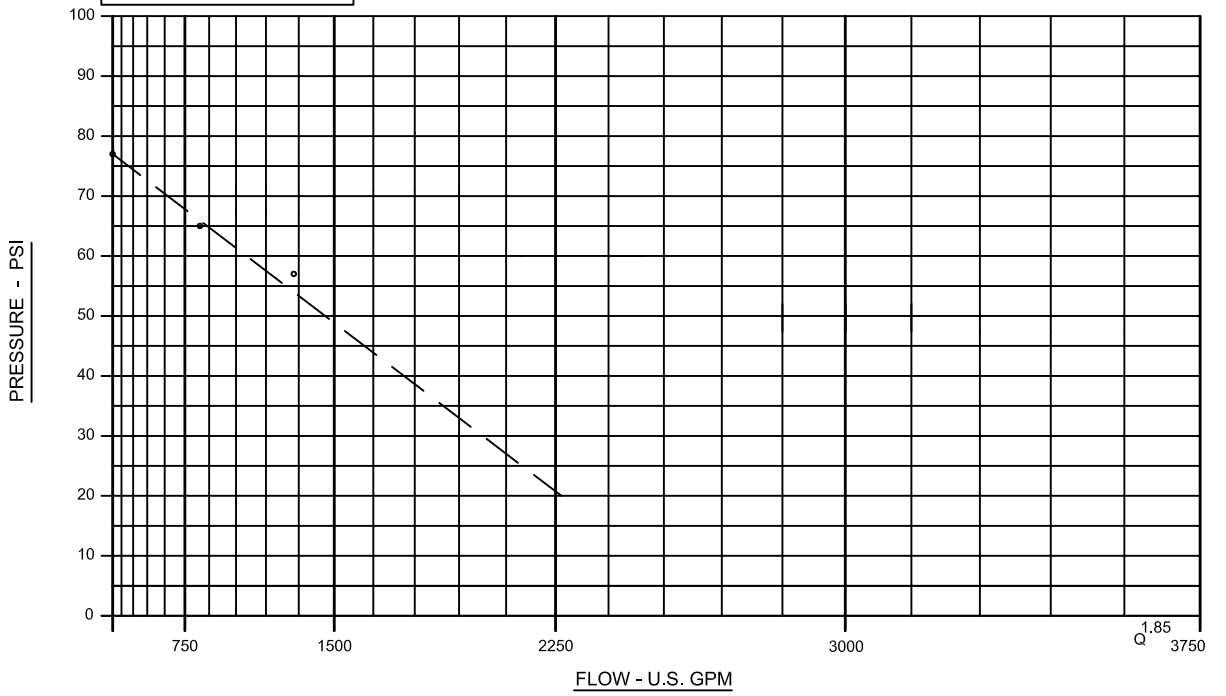
Static Pressure (Psi)		**Pitot Reading 1**	35	**# of Outlets Flowed 1**	1
	77	**Outlet Size 1**	2.5	**# of Outlets Flowed 2**	2
Residual Pressure 1 (Psi)		**Pitot Reading 2**	15	**# of Outlets Flowed 3**	2
	65	**Outlet Size 2**	2.5	**Graph Data:**	
Residual Pressure 2 (Psi)		**Pitot Reading 3**	15	**Pressure Values (y-axis)**	**Flow Values (x-axis)**
	57	**Outlet Size 3**	2.5	77	0
Residual Pressure 3 (Psi)		**Flow 1 Calculated**		65	993
	57		992.7	57	1300
		Flow 2 Calculated		57	1300
			1299.7	**Date & Time of Test :**	**June 23/2023**
Coefficient value		**Flow 3 Calculated**			**8:00am**
	0.9		1299.7	**Performed by:**	Derek & Cam



NIAGARA FIRE PROTECTION FLOW TEST	DATE: 2023-06-23	TIME: 8:00 AM
ON LUNDYS LANE	OFFICE : NRFP	
MUNICIPALITY: CITY OF NIAGARA	TEST BY : DEREK & CAM	
	HYDRANT COEFFICIENT: 0.9	

STATIC : 77 PSI
RES 1 : 65 PSI @ 992.7 GPM
RES 2 : 57 PSI @ 1299.7 GPM
RES 3 : 57 PSI @ 1299.7 GPM

WATER SUPPLY MAX PROVEN FLOW: 1299.7GPM
NOTE: GRAPH HAS BEEN EXTRAPOLATED
TO A RESIDUAL PRESSURE OF 20 PSI AT
2288 GPM AS PER NFPA 291 RECOMMENDATIONS

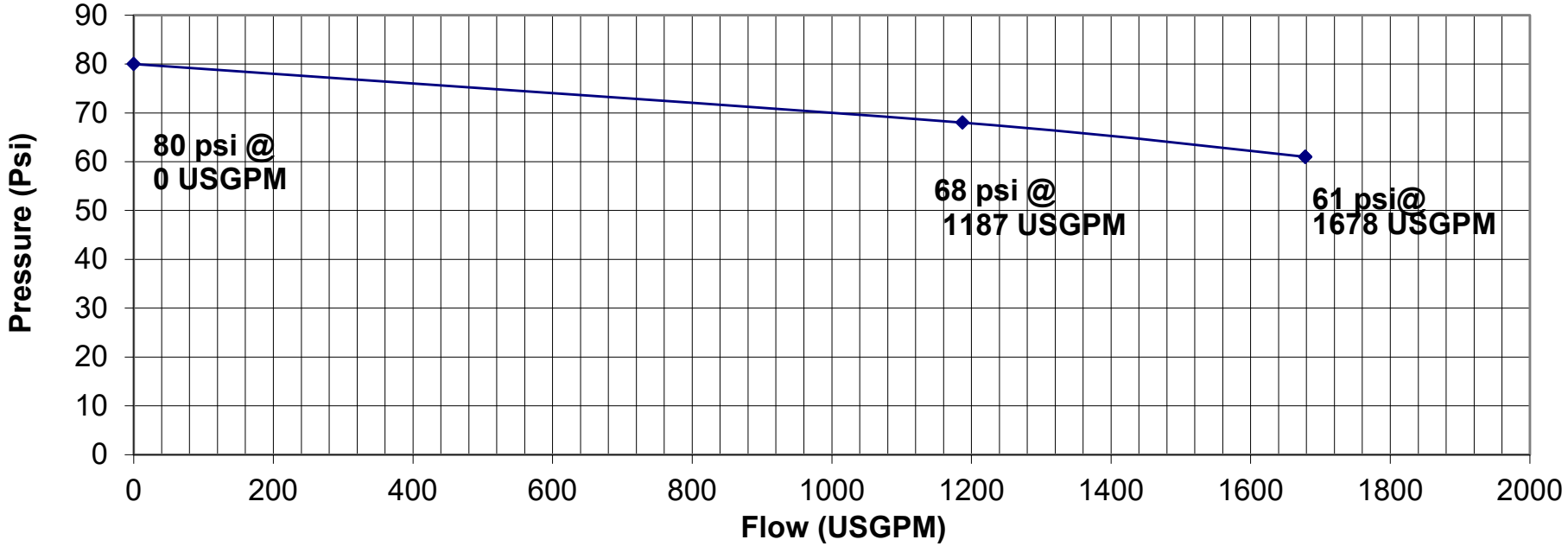


NIAGARA REGIONAL FIRE PROTECTION INC.

Flow Test Location: On Garner

Static Pressure (Psi)		**Pitot Reading 1**	50	**# of Outlets Flowed 1**	1
	80	**Outlet Size 1**	2.5	**# of Outlets Flowed 2**	2
Residual Pressure 1 (Psi)		**Pitot Reading 2**	25	**# of Outlets Flowed 3**	2
	68	**Outlet Size 2**	2.5	**Graph Data:**	
Residual Pressure 2 (Psi)		**Pitot Reading 3**	25	**Pressure Values (y-axis)**	**Flow Values (x-axis)**
	61	**Outlet Size 3**	2.5	80	0
Residual Pressure 3 (Psi)		**Flow 1 Calculated**		68	1187
	61		1186.5	61	1678
		Flow 2 Calculated		61	1678
			1677.9	**Date & Time of Test :**	**June 23/2023**
Coefficient value		**Flow 3 Calculated**			**8:30am**
	0.9		1677.9	**Performed by:**	Derek & Cam

Water Graph

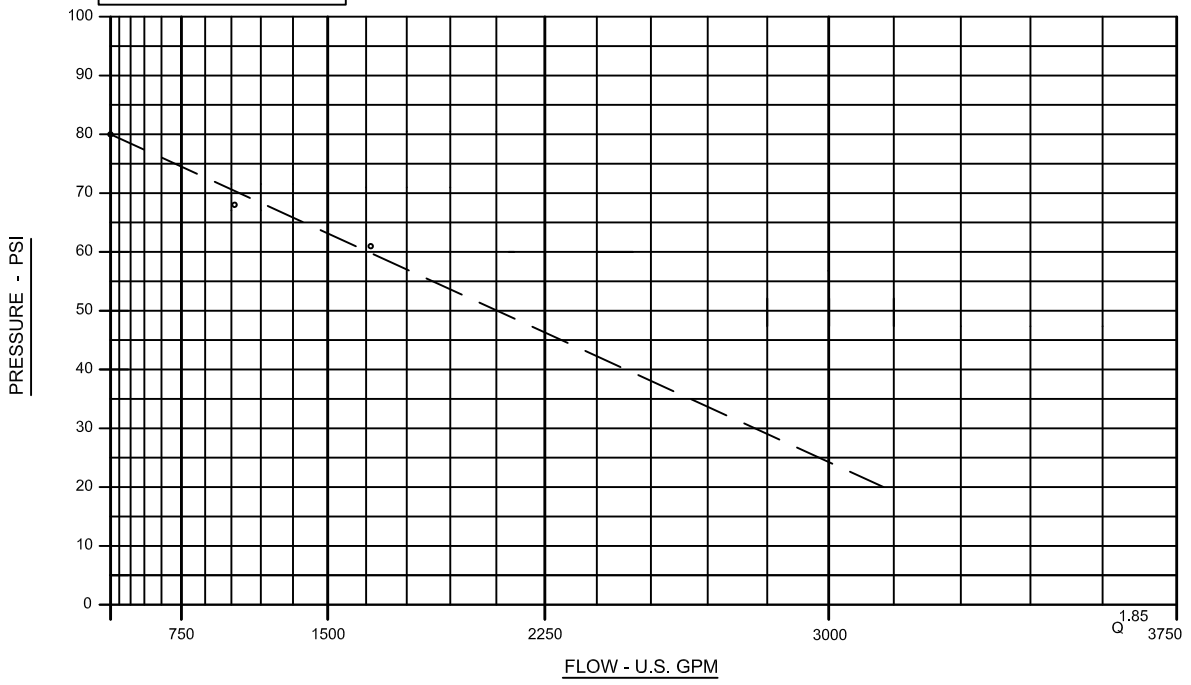


NRFP
Niagara Regional Fire Protection

NIAGARA FIRE PROTECTION FLOW TEST	DATE: 2023-06-23	TIME: 8:30 AM
ON GARNER	OFFICE : NRFP	
MUNICIPALITY: CITY OF NIAGARA	TEST BY : DEREK & CAM	
	HYDRANT COEFFICIENT: 0.9	

STATIC : 80 PSI
RES 1 : 68 PSI @ 1021 GPM
RES 2 : 61 PSI @ 1677.9 GPM
RES 3 : 61 PSI @ 1677.9 GPM

WATER SUPPLY MAX PROVEN FLOW: 1677.9GPM
NOTE: GRAPH HAS BEEN EXTRAPOLATED
TO A RESIDUAL PRESSURE OF 20 PSI AT
3122 GPM AS PER NFPA 291 RECOMMENDATIONS



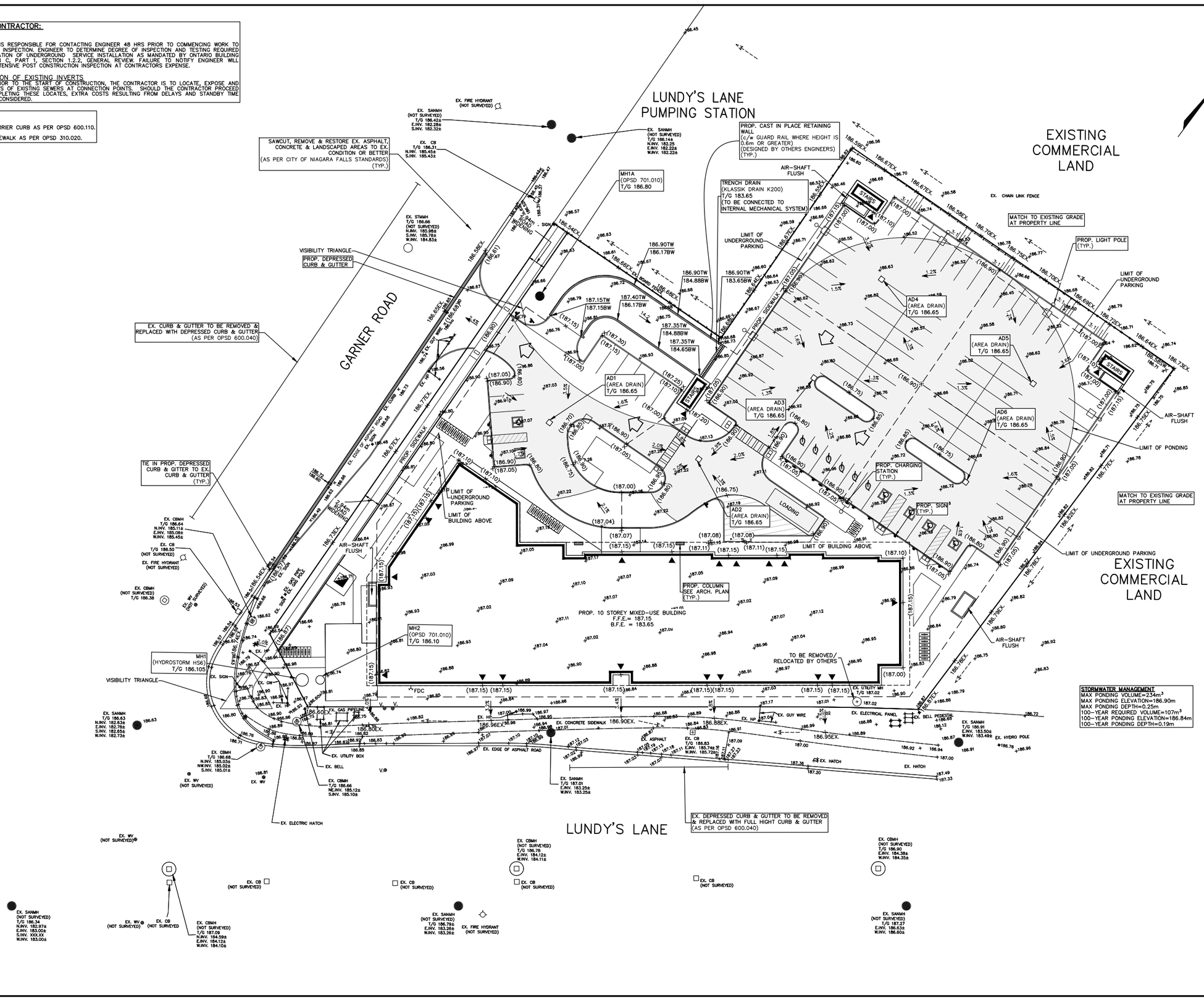
APPENDIX D
ENGINEERING PLANS

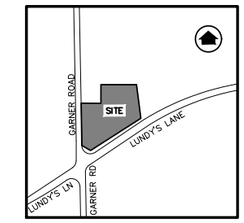
NOTES TO CONTRACTOR:

1. INSPECTION
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFIRMATION OF EXISTING INVERTS
   72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

NOTE:

1. CONCRETE BARRIER CURB AS PER OPSD 600.110.
2. CONCRETE SIDEWALK AS PER OPSD 310.020.





KEY MAP
N.T.S.

LEGEND:

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- PROPOSED ELEVATION TO MATCH EXISTING
- PROPOSED DIRECTION OF SHEET FLOW
- EXISTING CATCHBASIN MANHOLE/CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED CURB STOP/GATE VALVE
- EXISTING DIRECTION OF DRAINAGE
- PROPOSED EMERGENCY OVERLAND FLOW ROUTE
- MAXIMUM PONDING AREA
- PROPOSED DRAINAGE BREAK LINE

BENCH MARK NOTE:

748519: CONCRETE BRIDGE CARRYING LUNDY'S LANE (NIAGARA REGIONAL RD 51) OVER QEW, 4.7KM WEST OF CONCRETE AND STEEL BRIDGE CARRYING QEW OVER WELLAND RIVER IN THE CITY OF NIAGARA FALLS AND 2.8 KM EAST OF THOROLD STONE RD (NIAGARA REGIONAL RD 57). TABLET IS SET HORIZONTALLY IN EAST FACE OF SOUTH CONCRETE ABUTMENT, 37 CM SOUTH OF N.E. CORNER, 52 CM ABOVE GROUND LEVEL AND 8.2 M SOUTH OF CENTRELINE OF EASTBOUND LANE OF QEW.

NO.	DATE	BY	REVISIONS
.	.	.	.

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
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4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	FG	CHK'D	SN	DATE Jun. 29, 23
DRAWN	FG	CHK'D	SN	

SCALE 1:300 (0, 5, 10, 20, 30)

APPROVALS

STAMP

STORMWATER MANAGEMENT
MAX PONDING VOLUME=234m³
MAX PONDING ELEVATION=186.90m
MAX PONDING DEPTH=0.25m
100-YEAR REQUIRED VOLUME=107m³
100-YEAR PONDING ELEVATION=186.84m
100-YEAR PONDING DEPTH=0.19m

S. LLEWELLYN & ASSOCIATES LIMITED
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email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENT
M5V DEVELOPMENT INC.
56 – 10504 ISLINGTON AVENUE KLEINBURG ON L0J 1C0

PROJECT NAME
8885–8911 LUNDY'S LANE
NIAGARA FALLS, ON

TITLE
PRELIMINARY SITE GRADING PLAN

PROJECT No. 22098
DRAWING No. C101

S:\22098\Working\Current\22098 – Grading and Servicing Plan.dwg
Plotted: June 29, 2023 2:57:19 PM By: Fadi Ghazal

NOTES TO CONTRACTOR:

1. INSPECTION
CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

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NOTE:

1. CONCRETE BARRIER CURB AS PER OPSD 600.110.
2. CONCRETE SIDEWALK AS PER OPSD 310.020.

SEWER & WATER CROSSING CHART

#1
SAN. INV.=184.75
WTM. OBV.=184.25
SEPARATION=0.50m
*WTM LOWERING REQ'D

#2
WTM. INV.=184.25
SAN. OBV.=183.07
SEPARATION=1.18m

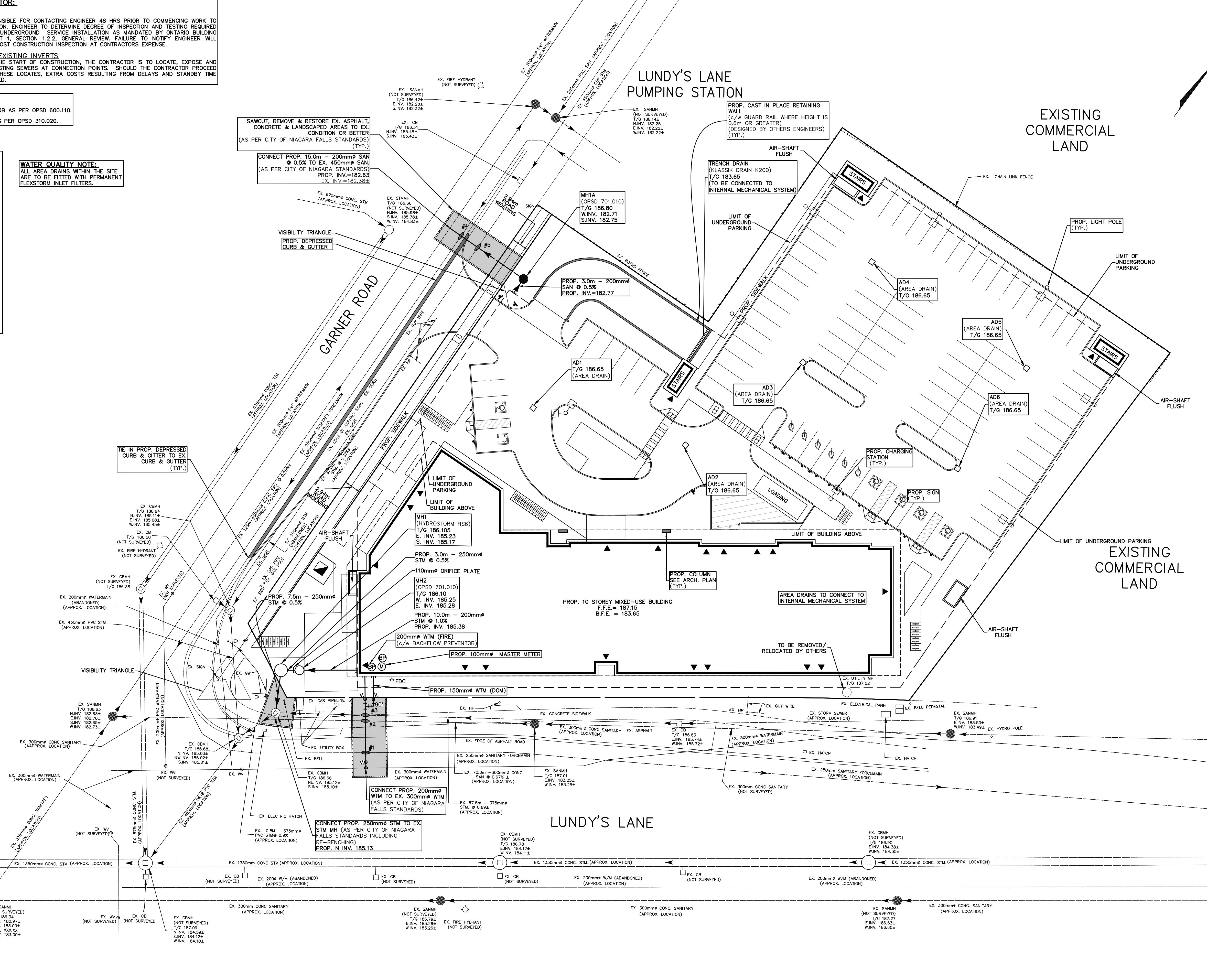
#3
STM. INV.=184.88
WTM. OBV.=184.38
SEPARATION=0.50m
*WTM LOWERING REQ'D

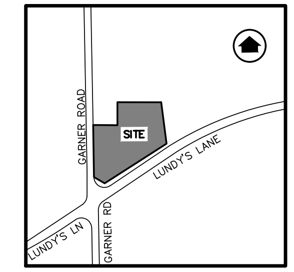
#4
EX. SAN.INV.=184.68
PROP. SAN.OBV.=182.64
SEPARATION=2.04m

#5
STM. INV.=185.38
SAN.OBV.=182.66
SEPARATION=2.72m

WATER QUALITY NOTE:

ALL AREA DRAINS WITHIN THE SITE ARE TO BE FITTED WITH PERMANENT FLEXSTORM INLET FILTERS.





KEY MAP
N.T.S.

LEGEND:

- EXISTING CATCHBASIN MANHOLE/CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED CURB STOP/GATE VALVE
- PROPOSED BACKFLOW PREVENTOR
- PROPOSED WATER METER
- SEWER CROSSING

BENCH MARK NOTE:

748519: CONCRETE BRIDGE CARRYING LUNDY'S LANE (NIAGARA REGIONAL RD 51) OVER QEW, 4.7KM WEST OF CONCRETE AND STEEL BRIDGE CARRYING QEW OVER WELLAND RIVER IN THE CITY OF NIAGARA FALLS AND 2.8 KM EAST OF THOROLD STONE RD (NIAGARA REGIONAL RD 57). TABLET IS SET HORIZONTALLY IN EAST FACE OF SOUTH CONCRETE ABUTMENT, 37 CM SOUTH OF N.E. CORNER, 52 CM ABOVE GROUND LEVEL AND 8.2 M SOUTH OF CENTRELINE OF EASTBOUND LANE OF QEW.

NO.	DATE	BY	REVISIONS
.	.	.	.

NOTES TO CONTRACTOR:

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DESIGN	FG	CHK'D	SN	DATE
DRAWN	FG	CHK'D	SN	Jun. 29, 23

SCALE 1:300 (0 5 10 20 30)

APPROVALS

STAMP

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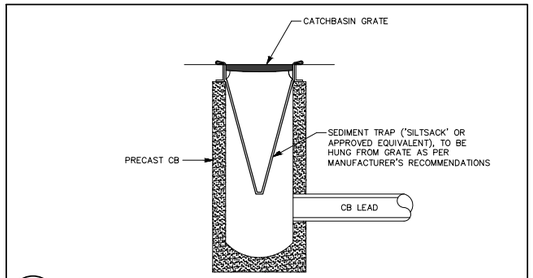
CONSULTING ENGINEERS
Tel. (905) 631-6978
Website: www.sla.on.ca
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENT
M5V DEVELOPMENT INC.
56 - 10504 ISLINGTON AVENUE KLEINBURG ON L0J 1C0

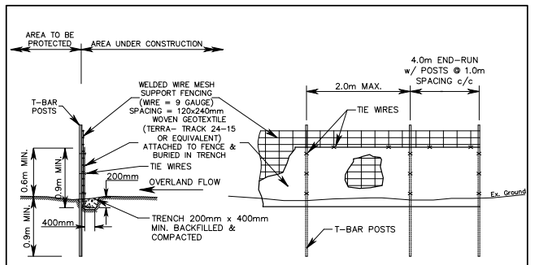
PROJECT NAME
8885-8911 LUNDY'S LANE
NIAGARA FALLS, ON

TITLE
PRELIMINARY SITE SERVICING PLAN

PROJECT No. 22098
DRAWING No. C102



DETAIL 1 — STREET CATCH BASIN/REAR LOT CATCHBASIN SEDIMENT TRAP
SCALE: N.T.S.



DETAIL 2 — HEAVY-DUTY SILT FENCE (PER OPSD 219.130)
SCALE: N.T.S.

NOTE:
1. CONCRETE BARRIER CURB AS PER OPSD 600.110.
2. CONCRETE SIDEWALK AS PER OPSD 310.020.

NOTES TO CONTRACTOR:

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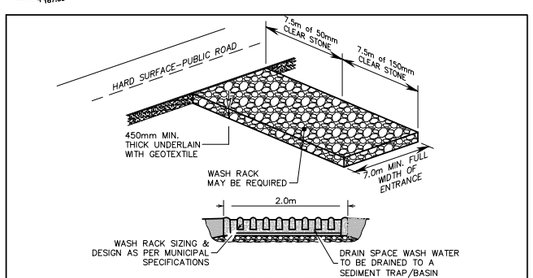
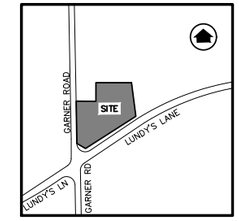


WASH RACK DETAIL

DETAIL 3 — MUD MAT CONSTRUCTION ENTRANCE
SCALE: N.T.S.



KEY MAP
N.T.S.

LEGEND:

- 209.00 — EXISTING GROUND ELEVATION
- ×(209.00) — PROPOSED GROUND ELEVATION
- 209.00EX — PROPOSED ELEVATION TO MATCH EXISTING
- EXISTING CATCHBASIN MANHOLE/CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED SILTATION CONTROL FENCE
- PROPOSED CATCHBASIN SILT SACK
- PROPOSED CURB STOP/GATE VALVE
- PROPOSED DEPRESSED CURB
- EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED DRAINAGE BREAK LINE

BENCH MARK NOTE:
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NO.	DATE	BY	REVISIONS

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DESIGN	FG	CHK'D	SN	DATE
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APPROVALS

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PROJECT NAME
8885–8911 LUNDY'S LANE
NIAGARA FALLS, ON

TITLE
PRELIMINARY SITE EROSION & SEDIMENT CONTROL PLAN

PROJECT No. 22098
DRAWING No. C103

S:\22098\Working\Current\22098 – Grading and Servicing Plan.dwg
Plotted: June 29, 2023 2:57:30 PM By: Fadi Ghazal