STORMWATER MANAGEMENT DESIGN BRIEF
VICTORIA STREET – PORT HOPE

November 6, 2023

Belleville
1 - 71 Millennium Pkwy
Belleville, ON
K8N 4Z5
Tel: 613-969-1111
info@jewelleng.ca

Kingston
208 - 4 Cataraqui St
Kingston, ON
K7K 1Z7
Tel: 613-389-7250
kingston@jewelleng.ca

Oakville
214-231 Oak Park Boulevard
Oakville, ON
L6H 7S8
Tel: 905-257-2880
oakville@jewelleng.ca

TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

TABLE OF APPENDICES

1 Background

Jewell Engineering Inc. (Jewell) was retained by Grey Jay Developments to prepare a preliminary stormwater management report in support of the proposed rezoning of the site. A conceptual site plan was provided by EcoVue Consulting and formed the basis for the preliminary stormwater management design. The objective of the design is to demonstrate that sufficient space is available to implement stormwater management remediation for the type and density of the proposed development.

The property is approximately 1.23ha. The municipality has requested that a municipal road be extended through the property from Klein Street and westerly to the property limit. The road will be an 18m ROW and will be situated on the north limit. Access to the development will be gained by the new road. Figure 1-1 illustrates the potential site layout.

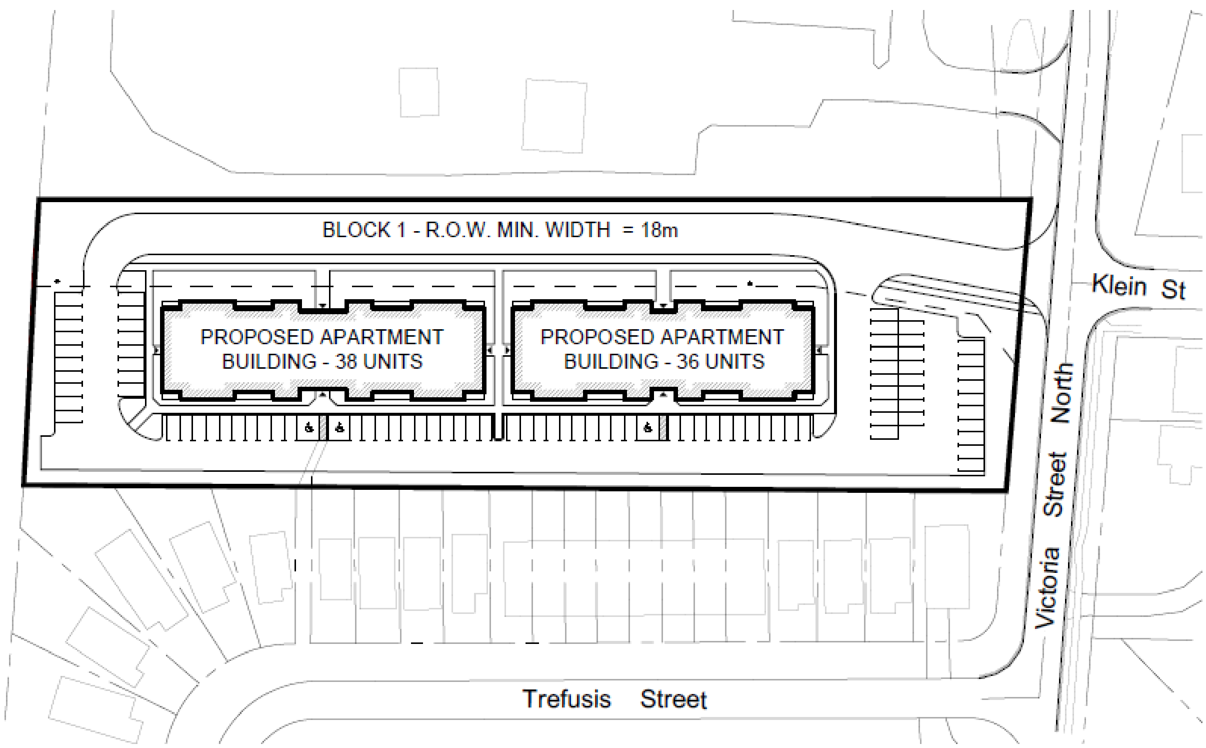


Figure 1-1: Site Location

2 Drainage

The site is gently sloped draining generally northwest to southeast. Site drainage is currently being received by a perimeter swale on the lands south of the site and by two municipal catch basins on Victoria Street.

Site drainage should contribute to the municipal system. Jewell reviewed the opportunity to drain to the Victoria Street storm sewer and identified this route as the preferred route. Both Victoria Street catch basins are connected to the 300mm storm sewer by 250mm laterals. A sewer extension servicing the new ROA should connect directly to the 300mm sewer.

Another drainage outlet is present within the storm sewer in the residential subdivision along the south limit. A rear yard catch basin abuts the subject property and may provide an alternate route. However, the municipality was unable to locate the engineering design for the storm sewer and it was not certain there was a right to drain or if any surplus capacity was available. Further review of this outlet would be required if a connection were to be proposed during detailed design.

3 Quantity Control

The purpose of the quantity control calculations is to determine the limits of discharge for the 5-yr to 100-yr events and the type and amount of storage required to achieve the limits.

Existing conditions peak flows were calculated using the Rational Method. The Rational Method is commonly used for design of storm sewers and for stormwater management at small sites. A limitation of the Rational Method is that it cannot directly be used in the estimate of storage. Instead, the Modified Rational Method is used to estimate storage volumes. The Rational Method equation is shown below.

Equation 1: Rational Method

$$Q = \frac{1}{360} CiA$$

Where:

Q = peak flow in cms
C = runoff coefficient (portion contributing to peak flow)
i = precipitation intensity in mm/hr
A = area in hectares

The existing conditions were estimated assuming the site is completely vegetated. Precipitation records were retrieved from the MTO IDF lookup tool.

Using the Rational Method, Jewell determined the 5-yr and 100-yr existing conditions (target) peak flows to be 20L/s and 33L/s respectively. Peak flows after development should not exceed the target values.

Table 3-1: Target Flows

Event	Coeff	Pre (l/s)
5-Yr	0.25	20
100-Yr	0.25	33

Quantity control measures may include parking lot storage, rooftop storage, infiltration, and underground storage. There is no central facility servicing the site.

Soils are identified on the Agricultural Information Atlas as Brighton Gravelly Loam, which are hydrologic soils group A. Group A soils have good potential for infiltration. Technologies that encourage infiltration can be incorporated into the stormwater management system.

3.1 Storage Opportunities

3.1.1 Rooftop Storage

The building concept does not lend itself to rooftop storage and therefore the roofs will not be used for storage of precipitation.

3.1.2 Ponds

The site is smaller that the recommended 5ha minimum site area for ponds or wetlands and as such these are not recommended.

3.1.3 Parking Lot Storage

Parking lot storage is possible, but not desirable for residential uses. Parking lot storage is not recommended.

3.1.4 Infiltration

Soils are amendable to infiltration, but at the time of writing, groundwater conditions are not fully understood. As seasonal high groundwater information becomes available, infiltration techniques may be added. The recommended solution should be compatible with infiltration techniques.

Infiltration is an important technique to assist with low impact development design. If site conditions allow infiltration of stormwater, this will be significant to implementation of low impact development design.

3.1.5 Underground Storage

In medium and high density residential sites and commercial sites underground storage is a preferred technology. In addition, some types are 'leaky' and will contribute to groundwater recharge through infiltration. This is recommended for the subject site.

3.2 Preferred Solution – Stormtech DC-780 units

Quantity storage may be provided in underground chambers using Stormtech DC-780 units. Using the Modified Rational Method, Jewell determined that 118 cubic metres of storage is required to reduce the 5-yr peak flows to 20L/s and 196 cubic metres is required to control the 100-yr to below pre-development peak flows.

Since a single orifice is proposed, the peak flows are matched to the 5-yr target of 20L/s using a 0.105m diameter orifice. During the 100-yr event, the storage chambers will fill and the resulting head on the orifice will increase the discharge to 26L/s. Thus, the storage volume provided is larger than required to match the 33L/s target.

The MRM calculation is adjusted to the 26L/s limit and storage volume provided is 222 cubic metres. The hydrologic calculations are contained within Appendix B.

Table 3-2: Event Summary

Event	Target	Provided	Storage (cubic metres)	Satisfied
5-Yr	20L/s	20L/s	130	**Yes**
100-Yr	33L/s	26L/s	246	**Yes**

The Stormtech sizing is included in Appendix C, and O&M information is in Appendix G.

4 Quality Control

Stormwater quality treatment should be provided to achieve *Enhanced* water quality objectives.

The underground storage chamber selected for the quantity control treatment have an isolator row for the quality event and is ETV certified to achieve *Enhanced* quality objectives. The manufacturer recommends pretreatment to extend the service interval. An oil grit separator (OGS) unit FD4 will capture 49% of incoming TSS and will treat in excess of 90% of incoming flows.

In a combination of technologies approach, the sediment removal efficiency of two technologies in series can be calculated as (*source: NCDENR Stormwater BMP Manual, p3-20*):

$$E = A + B - \left\lfloor \frac{AxB}{100} \right\rfloor$$

Where:

E = Total pollutant removal efficiency (%)
A = Removal efficiency of Technology 1 (upstream position)
B = Removal efficiency of Technology 2 (downstream position)

The calculation is:

$$E = 49\% + 80\% - \left\lfloor \frac{49\% * 80\%}{100} \right\rfloor = 90\%$$

The proposed quality treatment will exceed the target treatment of 80% removal (*Enhanced*).

The OGS unit sizing is in Appendix D.

5 Erosion and Sediment Controls – During Construction

Site development results in the loss of some vegetated cover. While it is the intention to limit vegetation removal for the construction of the site improvements, exposed soils from the work will be at risk of eroding into the receiving drainage system. Light duty silt fences and straw bale check dams are thus proposed for the site and will be placed in all areas downgradient from the worksite to control sediment runoff. These measures will be required to be put in place to reduce erosion during construction and for a period of up to one year after construction is completed. Controls should also be placed around stockpiles of any construction materials.

Typical sediment and erosion control measures will be applied as required and include:

- Siltation fencing
- Strawbale check dams
- Rip-rap check dams

Typical OPSDs provide good instruction on the correct placement and construction of the controls. The controls provide some protection if they are properly maintained, but they should be considered last resort measures. The most effective means of control are those which prevent or reduce erosion at the source. This would include diligent stabilization of exposed areas immediately after grading is completed. Stabilization measures include sod, erosion blankets or rip-rap and filter cloth on steep slopes as well as topsoil and hydroseed on gently sloped areas (<10%).

During site plan approval, a detailed erosion and sediment control plan will be prepared.

6 Maintenance

During detailed design, a detailed maintenance plan will be prepared identifying the routine and infrequent maintenance requirements for the stormwater management system.

Drainage will flow from parking lots into catch basins and conveyed by storm sewers to the underground treatment system. Maintenance activities should include:

1. Sweeping of the parking lot
2. Catchbasin cleanout
3. Sediment removal from the OGS unit
4. Sediment removal from the Isolator Row

Generic maintenance manuals are included in Appendices F and G.

7 Conclusion

Jewell studied the site and the proposed development and has prepared a stormwater management plan based on the conceptual site plan submitted in support of the rezoning application. Given that the development plan is presented as conceptual, the stormwater management plan is also presented as preliminary. The goal of a preliminary stormwater management plan is to demonstrate that stormwater management targets are achievable and to recommend the preferred technologies.

Stormwater peak flows will not exceed the predevelopment peaks if quantity controls are implemented (see summary table). The recommended measure is underground storage using Stormtech units.

Quality treatment will be provided by a combination of technologies approach with an OGS unit for pretreatment and an Isolator Row in the Stormtech units. Final water quality can be expected to exceed the *Enhanced* objectives.

Table 7-1: Quantity Control Summary

Event	Target	Provided	Storage (cubic metres)	Satisfied
5-Yr	20L/s	20L/s	130	Yes
100-Yr	33L/s	26L/s	246	Yes

Prepared by:

Bryon Keene, P. Eng
Jewell Engineering Inc.

GREY JAY VICTORIA STREET 2023 NOV 6

8 References

The information used to prepare this report is based on the following documents and information provided as noted below:

- Credit Valley Conservation Authority – Low Impact Development Stormwater Management Planning and Design Guide, 2010
- Oak Ridges Moraine Conservation Plan (OMRCP) Technical Paper #13
- Ontario Building Code O. Reg 332/12
- Ontario Ministry of Environment – Stormwater Management Planning and Design Manual, 2003
- Ontario Ministry of Transportation
    - Drainage Management Manual, 1997

APPENDIX A:
IDF CURVES – MTO

Ontario IDF CURVE LOOKUP

Active coordinate

43° 57' 45" N, 78° 18' 45" W (43.962500,-78.312500)

Retrieved: Wed, 04 Oct 2023 15:24:44 GMT

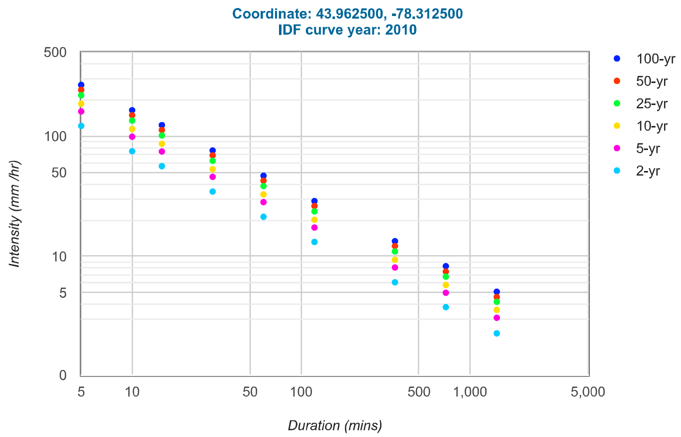
Location summary

These are the locations in the selection.

IDF Curve: 43° 57' 45" N, 78° 18' 45" W (43.962500,-78.312500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 43° 57' 45" N, 78° 18' 45" W (43.962500,-78.312500)

Retrieved: Wed, 04 Oct 2023 15:24:44 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	21.4	28.3	32.8	38.5	42.7	46.9
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	121.6	74.9	56.4	34.7	21.4	13.2	6.1	3.8	2.3
5-yr	160.7	99.0	74.6	45.9	28.3	17.4	8.1	5.0	3.1
10-yr	186.3	114.8	86.4	53.2	32.8	20.2	9.4	5.8	3.6
25-yr	218.7	134.7	101.5	62.5	38.5	23.7	11.0	6.8	4.2
50-yr	242.5	149.4	112.5	69.3	42.7	26.3	12.2	7.5	4.6
100-yr	266.4	164.1	123.6	76.1	46.9	28.9	13.4	8.3	5.1

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.1	12.5	14.1	17.4	21.4	26.4	36.7	45.2	55.7
5-yr	13.4	16.5	18.6	23.0	28.3	34.9	48.5	59.8	73.7
10-yr	15.5	19.1	21.6	26.6	32.8	40.4	56.2	69.3	85.4
25-yr	18.2	22.5	25.4	31.3	38.5	47.4	66.0	81.3	100.2
50-yr	20.2	24.9	28.1	34.7	42.7	52.6	73.2	90.2	111.1
100-yr	22.2	27.3	30.9	38.1	46.9	57.8	80.4	99.1	122.1

Terms of Use

You agree to the Terms of Use of this site by reviewing, using, or interpreting these data.

Ontario Ministry of Transportation | Terms and Conditions | About
Last Modified: September 2016

APPENDIX B:
HYDROLOGIC CALCULATIONS

Time of Concentration - predevelopment

Calculate Time of Concentration by Airport Method

$$Tc = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{S_w^{0.33}}$$

Where:		Slope Calculation	
T_c = Time of Concentration in min		85/10 Method	
L = Watershed length in metres =	210 m	Longest Flow Length =	210 m
C = Runoff Coefficient =	0.25	Elevation at 85% =	150.4 m
S_w = Watershed Slope in %	0.6 %	Elevation at 10% =	149.4 m
A = Watershed area in hectares	0.84 ha	Length at 85/10 =	157.5 m
T_c = 46.6 min		Slope =	0.0063 m/m

Pre-Development Peak Flows – 5Yr

$$i_5 = A(t_c)^B = 28.3 * \left(\frac{46.6}{60}\right)^{-0.699} = 33.8mm/h$$

$$Q_5 = \frac{CiA}{360} = \frac{0.25 * 33.8 * 0.84}{360} = 20L/s$$

Pre-Development Peak Flows – 100Yr

$$i_{100} = 46.9 * \left(\frac{46.6}{60}\right)^{-0.699} = 56.0mm/h$$

$$Q_{100} = \frac{0.25 * 56 * 0.84}{360} = 33L/s$$

Modified Rational Method – 5Yr

duration (min)	i (mm/h)	Flowrate, L/s			Storage, m^3
		Initial	Allowable	Difference	
5	160.7	300	20	280	84
10	99	185	20	165	99
15	74.6	139	20	119	107
30	**45.9**	**86**	**20**	**66**	**118**
60	28.3	53	20	33	118
120	17.4	32	20	12	90
360	8.1	15	20	-5	-
720	5.0	9	20	-11	-
1440	3.1	6	20	-14	-

Modified Rational Method – 100Yr

duration (min)	i (mm/h)	Flowrate, L/s			Storage, m^3
		Initial	Allowable*	Difference	
5	266.4	497	26	471	141
10	164.1	306	26	280	168
15	123.6	231	26	205	184
30	76.1	142	26	116	209
60	**46.9**	**88**	**26**	**62**	**222**
120	28.9	54	26	28	201
360	13.4	25	26	-1	-
720	8.3	15	26	-11	-
1440	5.1	10	26	-16	-

*Flowrate based on max allowable Q through 5Yr control orifice at maximum head.

APPENDIX C:
STORMTECH SIZING

Project: **276 Victoria Street North**

Chamber Model -	DC-780	
Units -	**Metric**	
	-	
Number of chambers -	110	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	148.54	m
Amount of Stone Above Chambers -	152	mm
Amount of Stone Below Chambers -	229	mm
	350.00	sq.meters

Min. Area - 345.4 sq.meters

StormTech DC-780 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Total Chamber *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Ch & St *(cubic meters)*	Cumulative Chamber *(cubic meters)*	Elevation *(meters)*
1143	0.00	0.00	3.56	3.56	246.476	149.68
1118	0.00	0.00	3.56	3.56	242.920	149.66
1092	0.00	0.00	3.56	3.56	239.364	149.63
1067	0.00	0.00	3.56	3.56	235.809	149.61
1041	0.00	0.00	3.56	3.56	232.253	149.58
1016	0.00	0.00	3.56	3.56	228.697	149.56
991	0.00	0.18	3.48	3.66	225.142	149.53
965	0.00	0.52	3.35	3.87	221.478	149.51
940	0.01	0.89	3.20	4.09	217.611	149.48
914	0.02	1.90	2.79	4.70	213.519	149.45
889	0.02	2.52	2.55	5.07	208.822	149.43
864	0.03	2.99	2.36	5.35	203.752	149.40
838	0.03	3.37	2.21	5.58	198.404	149.38
813	0.03	3.70	2.08	5.78	192.824	149.35
787	0.04	3.97	1.97	5.94	187.049	149.33
762	0.04	4.25	1.86	6.10	181.112	149.30
737	0.04	4.53	1.74	6.27	175.007	149.28
711	0.04	4.76	1.65	6.41	168.733	149.25
686	0.05	4.96	1.57	6.53	162.324	149.23
660	0.05	5.14	1.50	6.64	155.794	149.20
635	0.05	5.32	1.43	6.75	149.152	149.18
610	0.05	5.49	1.36	6.85	142.403	149.15
584	0.05	5.65	1.30	6.94	135.553	149.12
559	0.05	5.79	1.24	7.03	128.609	149.10
533	0.05	5.93	1.18	7.12	121.577	149.07
508	0.06	6.06	1.13	7.19	114.462	149.05
483	0.06	6.18	1.08	7.27	107.269	149.02
457	0.06	6.30	1.04	7.33	100.003	149.00
432	0.06	6.41	0.99	7.40	92.669	148.97
406	0.06	6.51	0.95	7.46	85.270	148.95
381	0.06	6.60	0.92	7.52	77.811	148.92
356	0.06	6.69	0.88	7.57	70.296	148.90
330	0.06	6.77	0.85	7.62	62.729	148.87
305	0.06	6.84	0.82	7.66	55.112	148.84
279	0.06	6.91	0.79	7.70	47.451	148.82
254	0.06	6.99	0.76	7.75	39.748	148.79
229	0.00	0.00	3.56	3.56	32.001	148.77
203	0.00	0.00	3.56	3.56	28.445	148.74
178	0.00	0.00	3.56	3.56	24.890	148.72
152	0.00	0.00	3.56	3.56	21.334	148.69
127	0.00	0.00	3.56	3.56	17.778	148.67
102	0.00	0.00	3.56	3.56	14.223	148.64
76	0.00	0.00	3.56	3.56	10.667	148.62
51	0.00	0.00	3.56	3.56	7.111	148.59
25	0.00	0.00	3.56	3.56	3.556	148.57

Stage:Discharge Relationship – Stormtech System

Elevation m	Weir (H) m	Head (h) m	Flow (Q) cms
148.54	0.190	0.138	0.009
148.55	0.200	0.148	0.009
148.56	0.210	0.158	0.009
148.57	0.220	0.168	0.009
148.58	0.230	0.178	0.010
148.59	0.240	0.188	0.010
148.60	0.250	0.198	0.010
148.61	0.260	0.208	0.010
148.62	0.270	0.218	0.011
148.63	0.280	0.228	0.011
148.64	0.290	0.238	0.011
148.65	0.300	0.248	0.011
148.66	0.310	0.258	0.012
148.67	0.320	0.268	0.012
148.68	0.330	0.278	0.012
148.69	0.340	0.288	0.012
148.70	0.350	0.298	0.013
148.71	0.360	0.308	0.013
148.72	0.370	0.318	0.013
148.73	0.380	0.328	0.013
148.74	0.390	0.338	0.013
148.75	0.400	0.348	0.014
148.76	0.410	0.358	0.014
148.77	0.420	0.368	0.014
148.78	0.430	0.378	0.014
148.79	0.440	0.388	0.014
148.80	0.450	0.398	0.015
148.81	0.460	0.408	0.015
148.82	0.470	0.418	0.015
148.83	0.480	0.428	0.015
148.84	0.490	0.438	0.015
148.85	0.500	0.448	0.015
148.86	0.510	0.458	0.016
148.87	0.520	0.468	0.016
148.88	0.530	0.478	0.016
148.89	0.540	0.488	0.016
148.90	0.550	0.498	0.016
148.91	0.560	0.508	0.016
148.92	0.570	0.518	0.017
148.93	0.580	0.528	0.017
148.94	0.590	0.538	0.017
148.95	0.600	0.548	0.017
148.96	0.610	0.558	0.017
148.97	0.620	0.568	0.017
148.98	0.630	0.578	0.017
148.99	0.640	0.588	0.018

149.00	0.650	0.598	0.018
149.01	0.660	0.608	0.018
149.02	0.670	0.618	0.018
149.03	0.680	0.628	0.018
149.04	0.690	0.638	0.018
149.05	0.700	0.648	0.019
149.06	0.710	0.658	0.019
149.07	0.720	0.668	0.019
149.08	0.730	0.678	0.019
149.09	0.740	0.688	0.019
149.10	0.750	0.698	0.019
149.11	0.760	0.708	0.019
149.12	0.770	0.718	0.019
149.13	0.780	0.728	0.020
149.14	0.790	0.738	0.020
149.15	0.800	0.748	0.020
149.16	0.810	0.758	0.020
149.17	0.820	0.768	0.020
149.18	0.830	0.778	0.020
149.19	0.840	0.788	0.020
149.20	0.850	0.798	0.021
149.21	0.860	0.808	0.021
149.22	0.870	0.818	0.021
149.23	0.880	0.828	0.021
149.24	0.890	0.838	0.021
149.25	0.900	0.848	0.021
149.26	0.910	0.858	0.021
149.27	0.920	0.868	0.021
149.28	0.930	0.878	0.022
149.29	0.940	0.888	0.022
149.30	0.950	0.898	0.022
149.31	0.960	0.908	0.022
149.32	0.970	0.918	0.022
149.33	0.980	0.928	0.022
149.34	0.990	0.938	0.022
149.35	1.000	0.948	0.022
149.36	1.010	0.958	0.023
149.37	1.020	0.968	0.023
149.38	1.030	0.978	0.023
149.39	1.040	0.988	0.023
149.40	1.050	0.998	0.023
149.41	1.060	1.008	0.023
149.42	1.070	1.018	0.023
149.43	1.080	1.028	0.023
149.44	1.090	1.038	0.023
149.45	1.100	1.048	0.024
149.46	1.110	1.058	0.024
149.47	1.120	1.068	0.024
149.48	1.130	1.078	0.024
149.49	1.140	1.088	0.024

149.50	1.150	1.098	0.024
149.51	1.160	1.108	0.024
149.52	1.170	1.118	0.024
149.53	1.180	1.128	0.024
149.54	1.190	1.138	0.025
149.55	1.200	1.148	0.025
149.56	1.210	1.158	0.025
149.57	1.220	1.168	0.025
149.58	1.230	1.178	0.025
149.59	1.240	1.188	0.025
149.60	1.250	1.198	0.025
149.61	1.260	1.208	0.025
149.62	1.270	1.218	0.025
149.63	1.280	1.228	0.025
149.64	1.290	1.238	0.026
149.65	1.300	1.248	0.026
149.66	1.310	1.258	0.026
149.67	1.320	1.268	0.026
149.68	1.330	1.278	0.026

APPENDIX D:
OGS UNIT SIZING

Hydro First Defense® - HC

Hydro International

Rev. 12.5

Project Name:	**276 Victoria St N**	*Report Date:*	
Street:	**Victoria St N**	*City:*	**Port Hope**
Province:	**ON**	*Country:*	**CAN**
Designer:	**A.Rosenthal, EIT**	*email:*	

Paste

Treatment Parameters:

Structure ID:	
TSS Goal:	% Removal
TSS Particle Size:	ETV
Area:	0.8 ha
Percent Impervious:	90%
Rational C value:	0.80 (Calc. Cn)
Rainfall Station:	Belleville, ONT (MAP)
Peak Storm Flow:	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	44.0%	>90%
FD-4HC	**49.0%**	**>90%**
FD-5HC	52.0%	>90%
FD-6HC	55.0%	>90%
FD-8HC	59.0%	>90%
FD-10HC	62.0%	>90%

Model Specification:

Model:	**FD-4HC**
Diameter:	1200 mm
Peak Flow Capacity:	510.00 L/s
Sediment Storage:	0.54 m^3
Oil Storage:	723.00 L

Installation Configuration:

Placement:	Online	
Outlet Pipe Size:	450 mm	*OK*
Inlet Pipe 1 Size:	450 mm	*OK*
Inlet Pipe 2 Size:	mm	*OK*
Inlet Pipe 3 Size:	mm	*OK*
Rim Level:	100.000 m	Calc Invs.
Outlet Pipe Invert:	m	*OK*
Invert Pipe 1:	m	*OK*
Invert Pipe 2:	m	
Invert Pipe 3:	m	

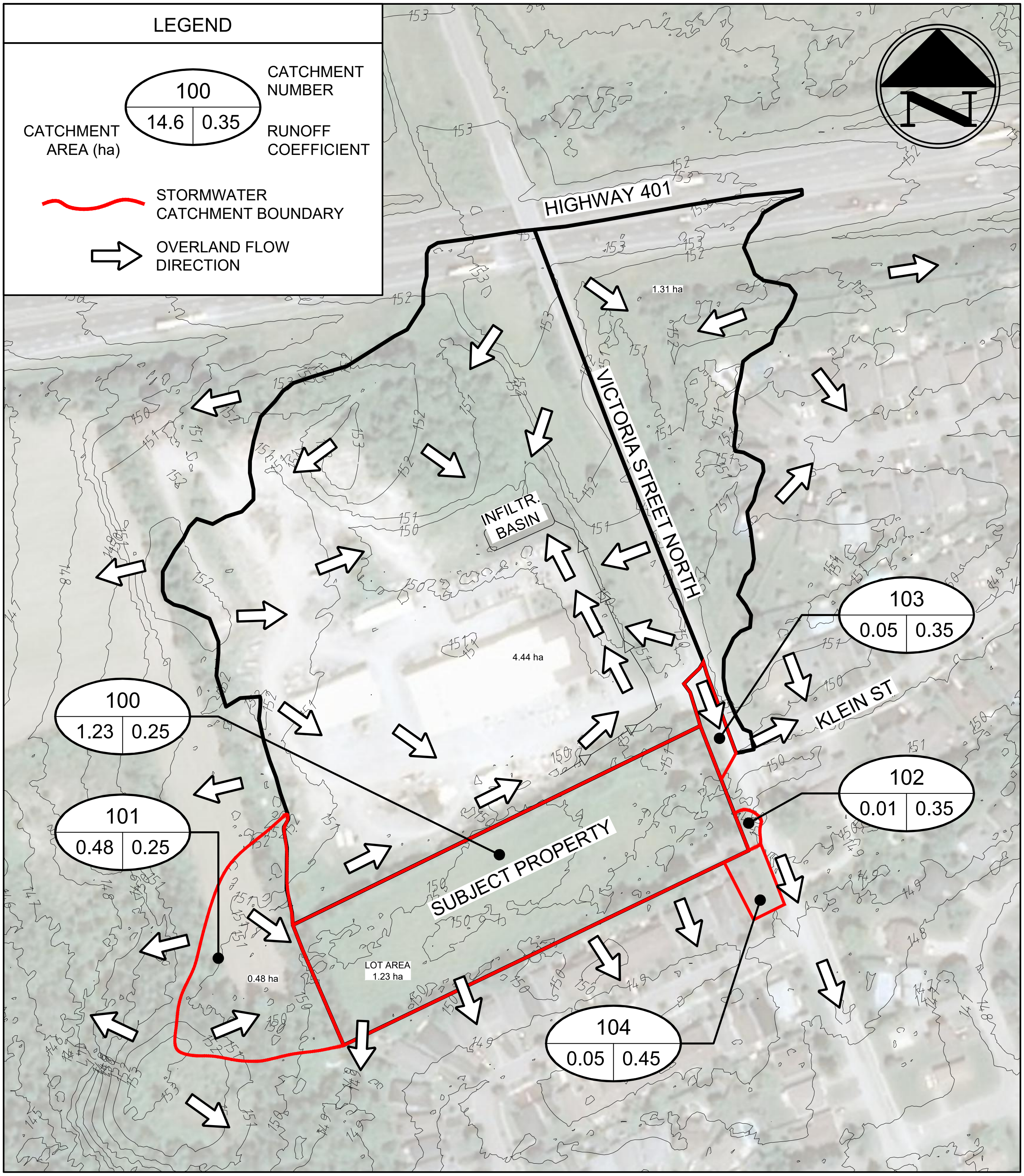
Net Annual Removal Model: FD-4HC

Intensity[1]	Fraction of Rainfall[1]	FD-4HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
0.50	0.4%	63.7%	0.3%
1.00	13.2%	58.7%	7.8%
1.50	14.0%	55.8%	7.8%
2.00	14.0%	53.7%	7.5%
2.50	3.6%	52.1%	1.8%
3.00	2.5%	50.8%	1.3%
3.50	8.4%	49.7%	4.2%
4.00	5.1%	48.7%	2.5%
4.50	1.6%	47.9%	0.8%
5.00	5.1%	47.1%	2.4%
6.00	4.8%	45.8%	2.2%
7.00	4.5%	44.7%	2.0%
8.00	3.5%	43.7%	1.5%
9.00	2.4%	42.9%	1.1%
10.00	2.5%	42.1%	1.1%
20.00	9.7%	37.1%	3.6%
30.00	2.8%	34.2%	0.9%
40.00	0.9%	32.1%	0.3%
50.00	0.4%	30.5%	0.1%
100.00	0.6%	0.0%	0.0%
150.00	0.1%	0.0%	0.0%
200.00	0.0%	0.0%	0.0%
Total Net Annual Removal Efficiency:			**49.0%**
Total Annual Runoff Volume Treated:			**>90%**

1. Rainfall Data: 1960:2007, HLY03, Belleville, ONT, 6150700 & 6150689.
2. Canada ETV PSD & Test Protocols - ISO14034 Certifed
3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Designer Notes:

APPENDIX E:
SITE DRAWINGS AND STORM SEWER SIZING



JEWELL ENGINEERING

PROPOSED APARTMENT BUILDINGS
276 Victoria Street North
Port Hope, Ontario

PRE-DEVELOPMENT STORMWATER
CATCHMENT AREAS

REVISIONS

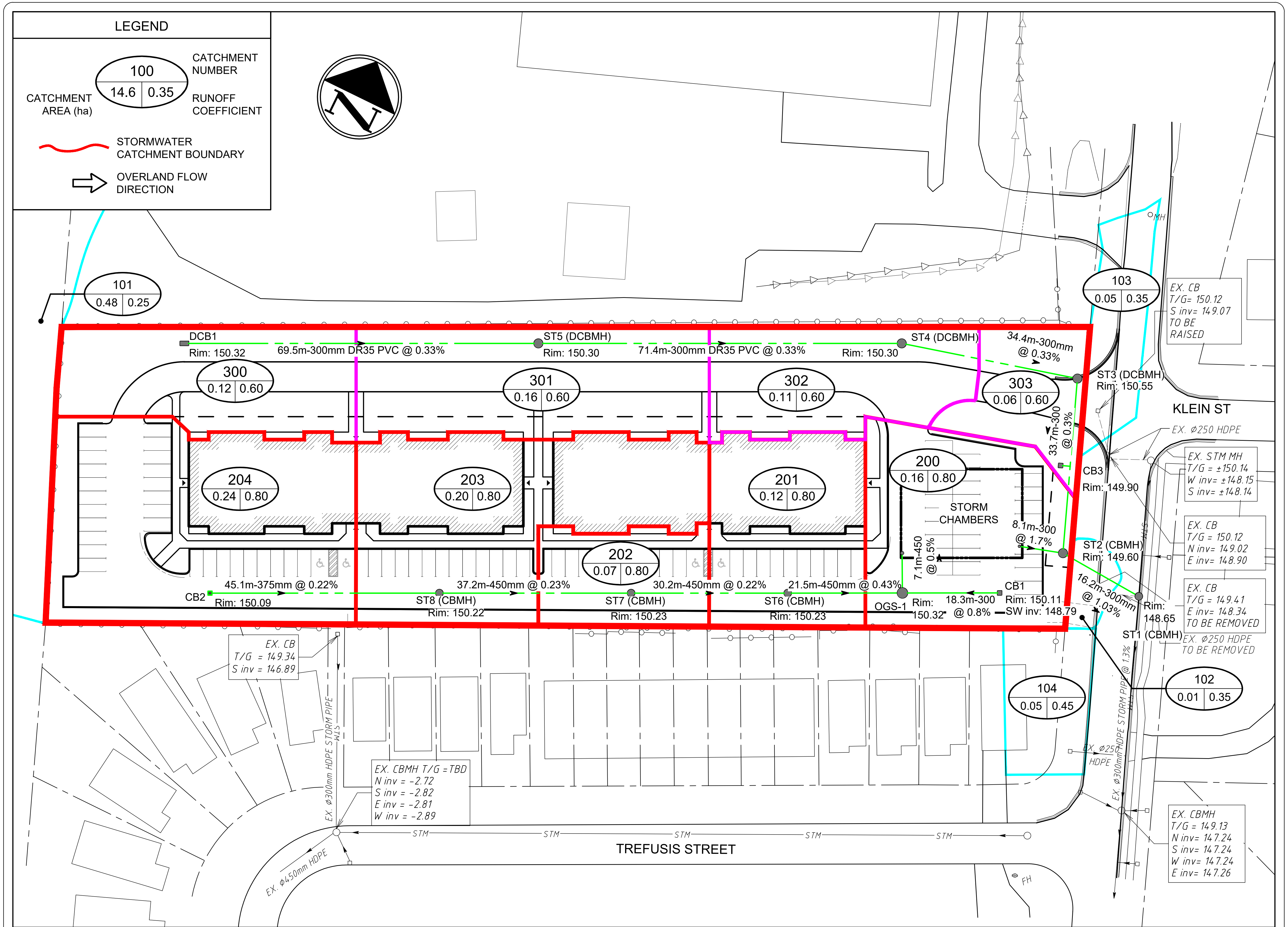
NO.	DATE	DESCRIPTION	BY

DRAWN BY: JO	PROJECT NO: 220-5186	
DESIGNED: BK	DATE: 12 June 2024	
CHECKED: BK	SCALE: 1:2500	DRAWING NO: CA-1

16/07/2024

F:\FTP\PROJECT FILES\1 CIVIL 3D PROJECT FILES\2205186 - LDB HOLDINGS - VICTORIA ST PORT HOPE\3 SHEETS\5186 - STM CA1

07/22/2024



REVISIONS

No.	DATE	DESCRIPTION	BY

JEWELL ENGINEERING

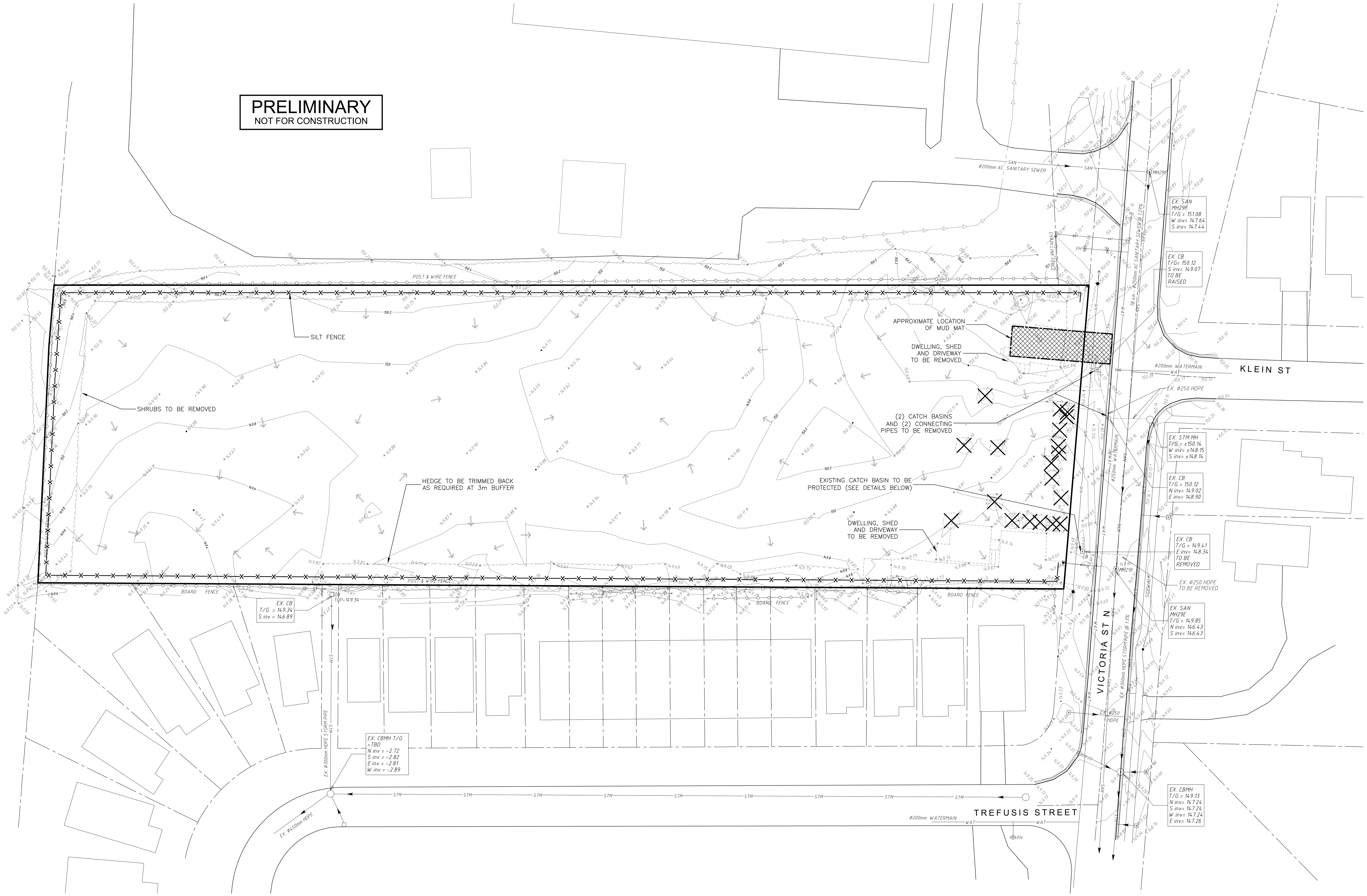
PROPOSED APARTMENT BUILDINGS

276 Victoria Street North
Port Hope, Ontario

POST-DEVELOPMENT STORMWATER CATCHMENT AREAS

DRAWN BY	PROJECT NO	
JO	220-5186	
DESIGNED	DATE	
PP	22 July 2024	
CHECKED	SCALE	DRAWING NO
BK	1:750	CA-2

F:\FTP\PROJECT FILES\1 CIVIL 3D PROJECT FILES\2205186 - LDB HOLDINGS - VICTORIA ST PORT HOPE\3 SHEETS\5186 - STM CA2



EROSION AND SEDIMENT CONTROL NOTES

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE THE PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE DURING CONSTRUCTION ACTIVITIES. THIS INCLUDES LIMITING THE AMOUNT OF EXPOSED SOIL AND INSTALLING SILT FENCES AND OTHER SEDIMENT TRAPS.

THE CONTRACTOR IS RESPONSIBLE FOR ENSURING EROSION AND SEDIMENT CONTROL MEASURES ARE INSTALLED CORRECTLY.

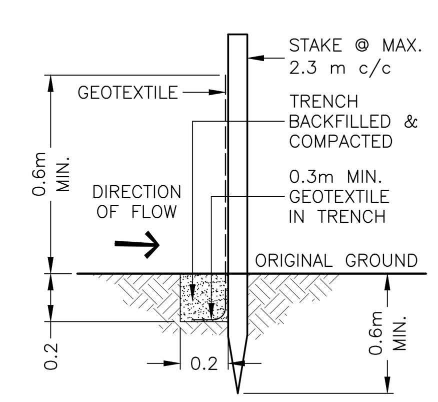
FOR LIGHT DUTY AND HEAVY DUTY SILT FENCE BARRIER, USE OPSD 219.110 AND 219.130 RESPECTIVELY. FOR STRAW BALE FLOW CHECK DAM, USE OPSD 219.180.

ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO DEVELOPMENT AND MAINTAINED THROUGHOUT THE CONSTRUCTION PROCESS, UNTIL ALL DISTURBED AREAS HAVE BEEN RE-VEGETATED.

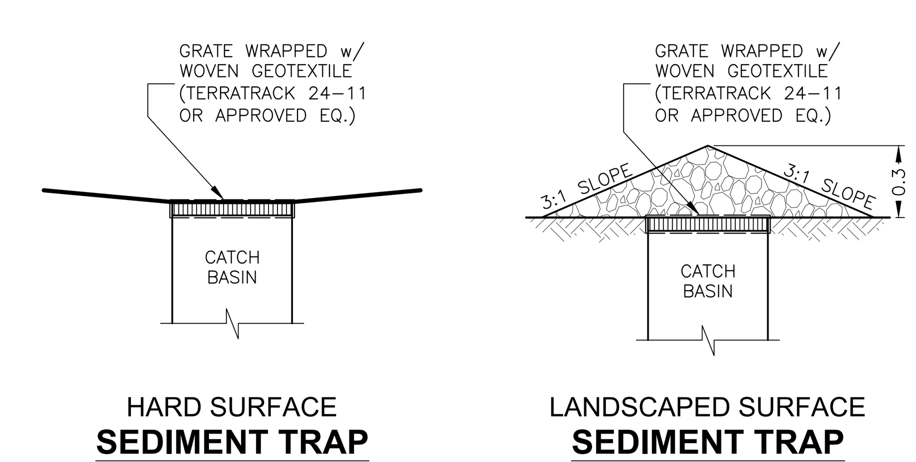
ANY DISTURBED AREA NOT SCHEDULED FOR FURTHER CONSTRUCTION WITHIN FORTY FIVE (45) DAYS WILL BE PROVIDED WITH A SUITABLE TEMPORARY MULCH AND SEED COVER WITHIN SEVEN (7) DAYS OF THE COMPLETION OF THAT PARTICULAR PHASE OF CONSTRUCTION.

ALL DISTURBED AREAS THAT WILL NOT BE FURTHER DISTURBED SHALL BE REVEGETATED WITH PERMANENT COVER IMMEDIATELY FOLLOWING COMPLETION OF CONSTRUCTION.

MUD MAT MUST BE A MINIMUM OF 20m IN LENGTH AND THE FULL WIDTH OF THE ENTRANCE (6m MINIMUM). THE PAD SHOULD BE A MINIMUM OF 300mm THICK, BUT 450mm THICKNESS IS RECOMMENDED. THE PAD SHOULD BE UNDERLAIN WITH A GEOTEXTILE (OR GRADED AGGREGATE FILTER) AND CONSIST OF 50mm DIAMETER CLEAR STONE FOR THE FIRST 10m AND THE REMAINDER OF THE LENGTH TO CONSIST OF 150mm DIAMETER CLEAR STONE.



SILT FENCE
Not to scale
REFER TO O.P.S.D. 219.110



CATCH BASIN PROTECTION
Not to scale

GENERAL NOTES

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM LOCATIONS ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.
- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	06NOV23	ISSUED FOR RE-ZONING	JO
2	17JUL23	DRIVEWAY AND SERVICES REVISED	JO
3	22JUL24	STORM SEWER MODIFIED	JO

LEGEND

- EXISTING GRADE (Elev. in m)
- DIRECTION OF EXISTING RUN-OFF
- TREE TO BE REMOVED
- REMOVALS
- LIGHT DUTY SILT FENCE AS PER OPSD 219.110
- FENCE
- TOP OF BANK
- BOTTOM OF SWALE
- EXISTING WATERMAIN
- VALVE
- HYDRANT
- EXISTING SANITARY SEWER
- MAINTENANCE HOLE
- EXISTING STORM SEWER
- CATCH BASIN
- GAS SERVICE
- OVERHEAD UTILITY
- UNDERGROUND UTILITY
- UTILITY POLE

LICENSED PROFESSIONAL ENGINEER
B. C. KEENE
PROVINCE OF ONTARIO

JEWELL ENGINEERING

PROPOSED
APARTMENT BUILDINGS

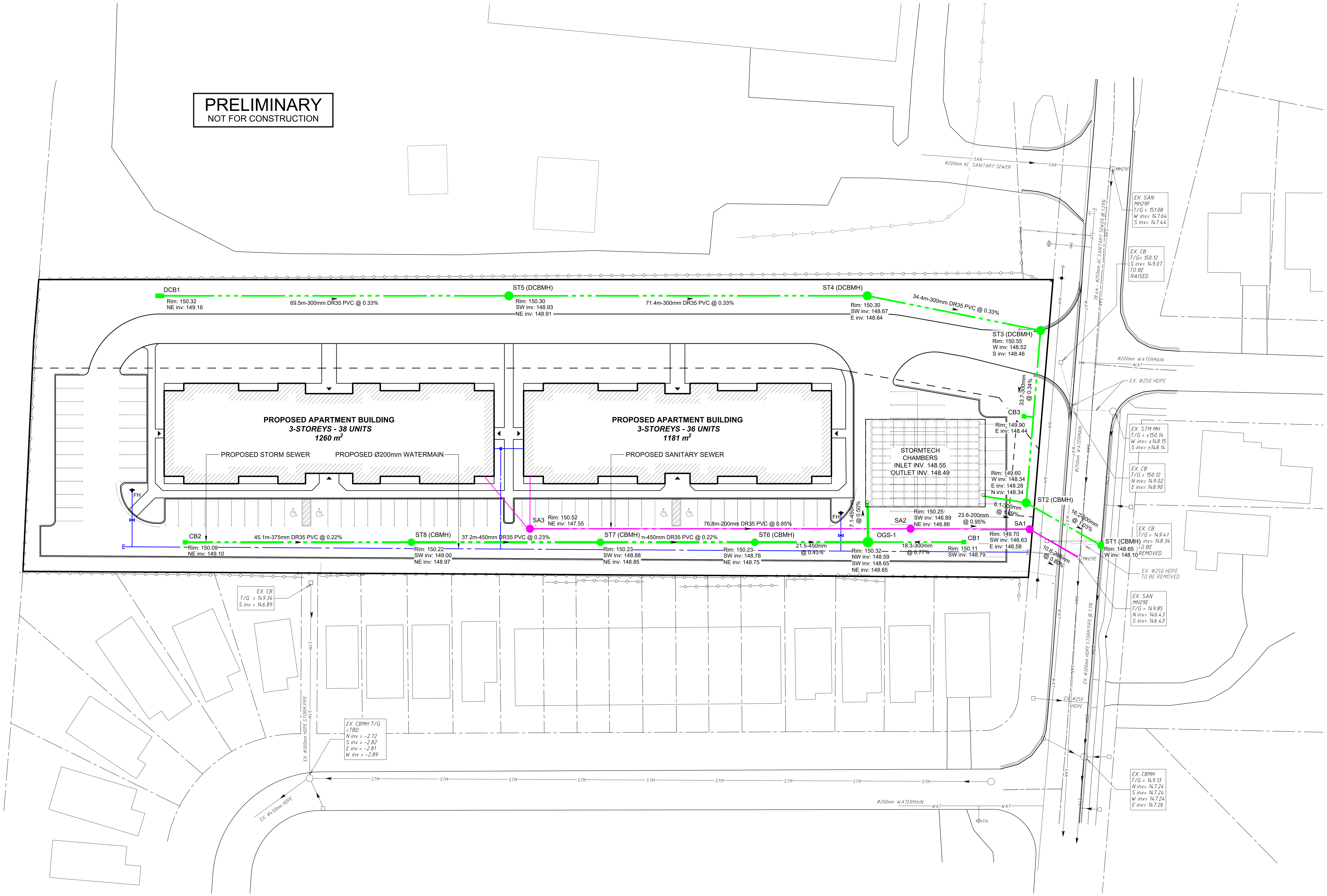
276 VICTORIA STREET NORTH
PORT HOPE, ONTARIO

EXISTING CONDITIONS
REMOVALS &
EROSION CONTROL

DRAWN BY: JO	PROJECT NO: 220-5186	
DESIGNED BY: JO	DATE: 16 July 2024	
CHECKED BY: BK	SCALE: 1:400	
APPROVED BY: BK	CONTRACT NO:	DRAWING NO: EC-1

07/22/2024

F:\FTP\PROJECT FILES\1 CIVIL 3D PROJECT FILES\2205186 - LDB HOLDINGS - VICTORIA ST PORT HOPE\3 SHEETS\5186 - GS1



GENERAL NOTES

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM LOCATIONS ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.
- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HT2_0, UNLESS DESCRIBED OTHERWISE.

* * DRAWINGS ARE NOT TO BE SCALED * *

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	06NOV23	ISSUED FOR RE-ZONING	JO
2	17JUL23	DRIVEWAY AND SERVICES REVISED	JO
3	22JUL24	STORM SEWER MODIFIED	JO

LEGEND

- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- VALVE
- HYDRANT
- EXISTING SANITARY SEWER
- PROPOSED SANIT. SEWER
- MAINTENANCE HOLE
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- CATCH BASIN
- GAS SERVICE
- OVERHEAD UTILITY
- UNDERGROUND UTILITY
- UTILITY POLE
- FENCE
- TOP OF BANK
- BOTTOM OF SWALE

LICENSED PROFESSIONAL ENGINEER
B. C. KEENE
July 22/24
PROVINCE OF ONTARIO

JEWELL ENGINEERING

PROPOSED
APARTMENT BUILDINGS

276 VICTORIA STREET NORTH
PORT HOPE, ONTARIO

GENERAL SERVICING PLAN

DRAWN BY: JO	PROJECT NO: 220-5186
DESIGNED BY: JO	DATE: 22 July 2024
CHECKED BY: BK	SCALE: 1:400
APPROVED BY: BK	CONTRACT NO:
	DRAWING NO: GS-1

STORM SEWER DESIGN SHEET - 276 Victoria Street North

Peak Runoff Estimate by Rational Method

$$Q = \frac{1}{360} C\, i\, A$$

Where:

- Q = Peak Flow in cms
- C = Runoff Coefficient
- i = Rainfall Intensity in mm/hr
- A = Area in hectares

Intensity for: **Trenton** **Station:** 6158875

$$i = A * T_c^{\,B}$$

Where:

- i = Rainfall Intensity in mm/hr
- T_c = Time of Concentration in hours

5-Year Parameters

- A = 25.2
- B = -0.664

Manning's Coef

- CSP 0.024
- RCP/PVC 0.013

Pipe Capacity by Manning's Equation

$$Q = \frac{1}{n} A\, R^{2/3}\, S^{1/2}$$

Where:

- A = area of pipe in m^2
- R = Hydraulic radius = A / P
- P = Wetted perimeter
- S = Slope (m/m)
- n = Manning's friction coef.

Check

$q \le Q$

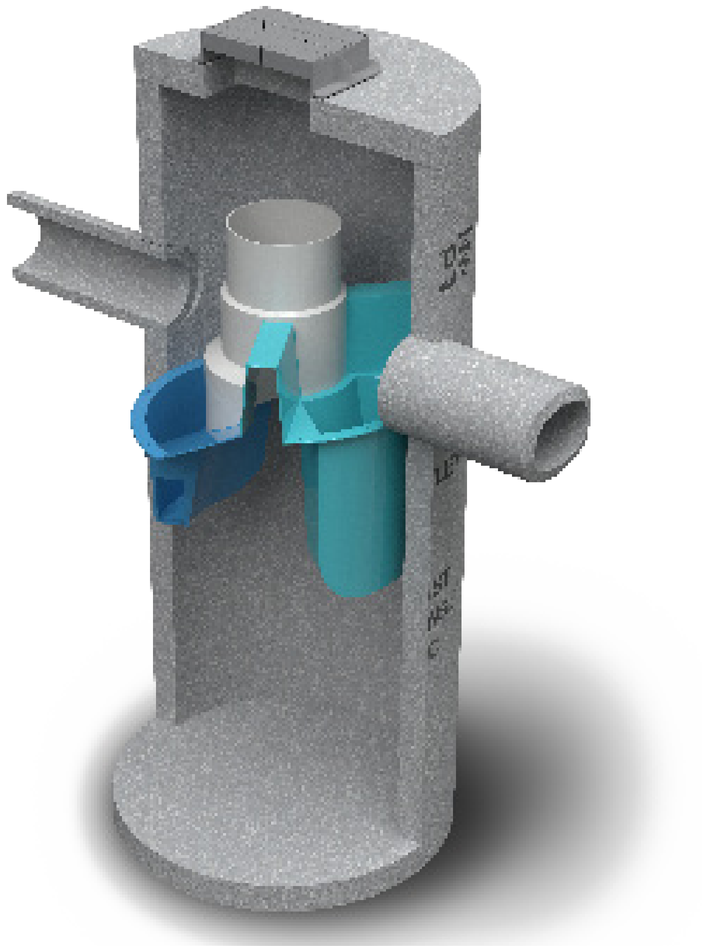
$V \le 6\, m/s$

LOCATION			PEAK FLOW CALCULATION									PROPOSED SEWER									
STREET / CATCHMENT AREA ID	FROM	TO	CATCHMENT AREAS / RUNOFF COEFFICIENT 0.35	0.45	0.6	0.8	R.C. x A (ha)	CUM. R.C x A (ha)	TIME OF CONCENTRATION (min)	INTENSITY (mm/hr)	PEAK FLOW (m^3/s)	Pipe Size (mm)	Length (m)	Type of Pipe	Grade *(use m/m)* (%)	Capacity, n = 0.013 (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min)	Actual Velocity at Q_d (m/s)	q/Q	Check Capacity
SITE																					
204	CB 2	ST 8				0.24	0.19	0.19	10.0	82.8	0.044	375	45.1	PVC	0.22%	0.08	0.74	1.01	0.76	0.54	OK
203	ST 8	ST 7				0.20	0.16	0.35	11.0	77.7	0.076	450	37.2	PVC	0.23%	0.14	0.86	0.72	0.88	0.56	OK
202	ST 7	ST 6				0.07	0.06	0.41	11.7	74.5	0.084	450	30.2	PVC	0.22%	0.13	0.84	0.60	0.89	0.63	OK
201	ST 6	OGS-1				0.12	0.10	0.50	12.3	72.1	0.101	450	21.5	PVC	0.43%	0.19	1.18	0.30	1.19	0.54	OK
200	CB 1	OGS-1				0.16	0.13	0.13	12.6	70.9	0.025	300	18.3	PVC	0.77%	0.08	1.20	0.25	1.05	0.30	OK
	OGS-1	STORM TECH				**Sum =**	**0.63**	**0.63**	12.9	70.0	0.123	450	7.1	PVC	0.50%	0.20	1.27	0.09	1.32	0.61	OK
	STORM TECH	ST 2									0.02	300	8.1	PVC	1.69%	0.13	1.78	0.08	1.30	0.16	OK
DRIVEWAY																					
300	DCB 1	ST 5			0.12		0.07	0.07	17.0	58.2	0.01	300	69.5	PVC	0.33%	0.06	0.79	1.47	0.62	0.21	OK
301	ST 5	ST 4			0.16		0.10	0.17	18.5	55.1	0.03	300	71.4	PVC	0.33%	0.06	0.79	1.51	0.77	0.46	OK
302	ST 4	ST 3			0.11		0.07	0.23	20.0	52.3	0.03	300	34.4	PVC	0.33%	0.06	0.79	0.73	0.82	0.61	OK
EASEMENT																					
303	ST 3	ST 2			0.06		0.04	0.27	20.7	51.1	0.038	300	33.7	PVC	0.34%	0.06	0.80	0.70	0.86	0.68	OK
	ST 2	ST 1						0.27	21.4	49.9	0.06	300	16.2	PVC	1.03%	0.10	1.39	0.19	1.44	0.59	OK
											(incl. Storm tech)										
VICTORIA STREET																					
102, 104	*Ex. STMH*	*Ex. CBMH*	0.06	0.05			0.04	0.31	21.6	49.6	0.04	300	70.00	PVC	1.30%	0.11	1.56	0.75	1.46	0.39	OK
											(incl. Storm tech)										
										MTO Chart 2.30 shows pipe capacity is 107% of Pipe Flowing Full Calculation											
		TOTAL AREA:			1.35																

Jewell Engineering Inc
1-71 Millennium Parkway
Belleville, ON, K8N 4Z5
Ph. 613-969-1111
Fx. 613-969-8988
www.jewelleng.ca

Designed:	Matthew Warner	**Project:**	
Checked:	Bryon Keene, P.Eng.		276 Victoria Street North, Port Hope
Date:	July 22, 2024		

APPENDIX F:
FD-HC O&M MANUAL



Operation and Maintenance Manual

First Defense® High Capacity and First Defense® Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

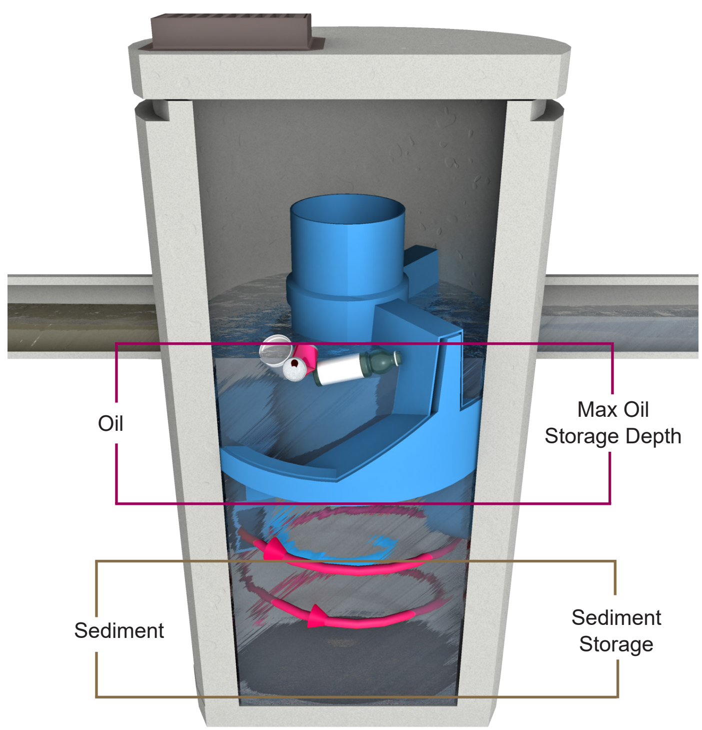


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

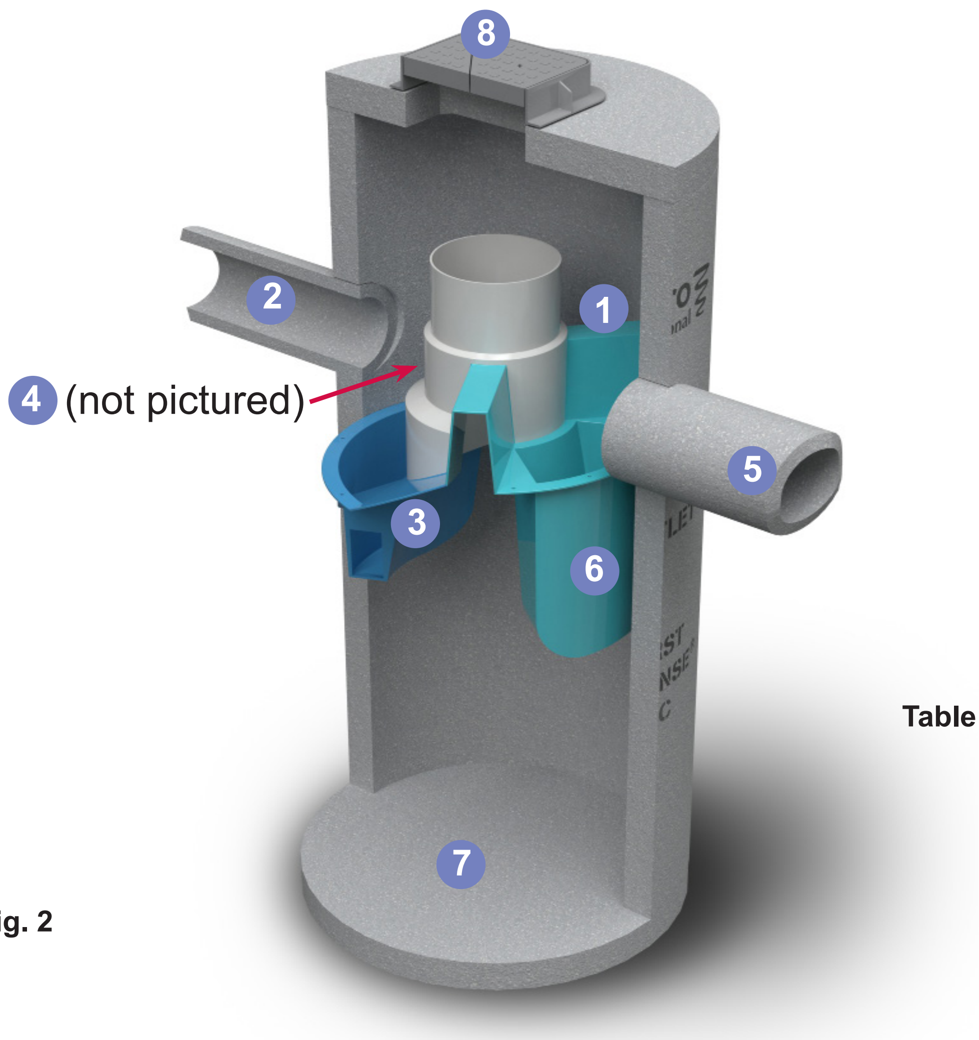


Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

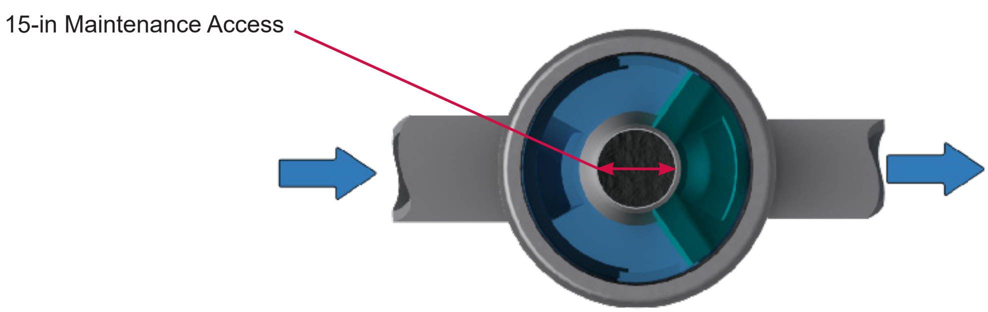


Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Fig.4 Floatables are removed with a vactor hose

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): [3-FT] [4-FT] [5-FT] [6-FT] [7-FT] [8-FT] [10-FT]

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

APPENDIX G:
STORMTECH ISOLATOR ROW O&M MANUAL

9.0 Inspection and Maintenance

9.1 ISOLATOR ROW PLUS PLUS INSPECTION

Regular inspection and maintenance are essential to assure a properly functioning stormwater system. Inspection is easily accomplished through the manhole or optional inspection ports of an Isolator Row PLUS. Please follow local and OSHA rules for a confined space entry.

Inspection ports can allow inspection to be accomplished completely from the surface without the need for a confined space entry. Inspection ports provide visual access to the system with the use of a flashlight. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding 3” (76 mm), cleanout is required.

A StormTech Isolator Row PLUS should initially be inspected immediately after completion of the site’s construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter any stormwater system. Inspection and maintenance, if necessary, should be performed prior to passing responsibility over to the site’s owner. Once in normal service, a StormTech Isolator Row PLUS should be inspected bi-annually until an understanding of the sites characteristics is developed. The site’s maintenance manager can then revise the inspection schedule based on experience or local requirements.

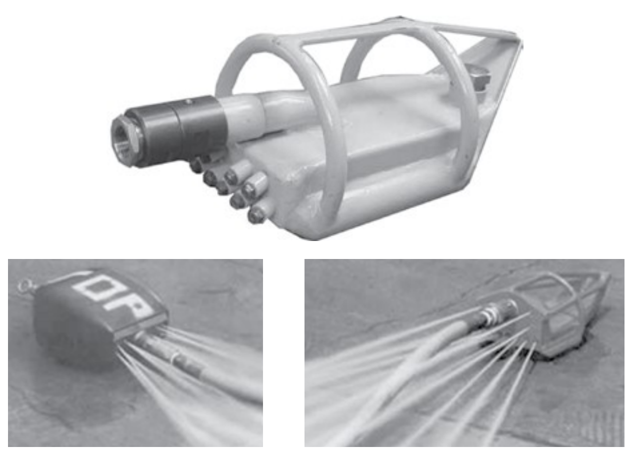
9.2 ISOLATOR ROW PLUS MAINTENANCE

JetVac maintenance is recommended if sediment has been collected to an average depth of 3” (76 mm) inside the Isolator Row PLUS. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row PLUS. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediments. As the nozzle is retrieved, a wave of suspended sediments is flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/ JetVac combi- nation vehicles. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” (1143 mm) are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. The JetVac process shall only be performed on StormTech Rows that have ADS PLUS fabric over the foundation stone.

A FLAMP (flared end ramp) is attached to the inlet pipe on the inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning, and to guide cleaning and inspection equipment back into the inlet pipe when complete.

FLAMP (Flared End Ramp)

A typical JetVac truck (This is not a StormTech product.)



Examples of culvert cleaning nozzles appropriate for Isolator Row PLUS maintenance. (These are not StormTech products).