design professionals INC
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS / PLANNERS / LANDSCAPE ARCHITECTS
Serving Connecticut, Massachusetts, & Rhode Island

P.O. BOX 1167
21 JEFFREY DRIVE
SOUTH WINDSOR, CT 06074
PHONE: 860.291.8755
FAX: 860.291.8757
www.designprofessionalsinc.com

Stormwater Management Report Addendum
The Gateway
Storm Sewer and Water Quality Flow Calculations
DPI No. 3530.M
June 12, 2020

This addendum provides results from our **Storm Sewer Collection System** analysis and replaces the **Water Quality** section the of previously submitted Stormwater Management Report for the The Gateway dated May 13th and revised on the 22nd. Supporting documents with analysis results are included as attachments at the end of this addendum.

Storm Sewer Collection System

The proposed subsurface stormwater collection and conveyance system was designed to adequately convey proposed runoff under 10- year storm event conditions. The design of the storm sewers followed the guidelines set forth in the Connecticut Department of Transportation's Drainage Manual. It is estimated that during a 10-year storm event, all proposed subsurface culverts will convey storm runoff without resulting in any unacceptable flooding conditions. The computations are included as **Attachment A**.

Water Quality

Cultec R-902HD isolation rows will be utilized to address water quality for all flows that will be detained in the multi-pond system. Based on the determined water quality flow and manufacturer specs for treated peak flow rates, the length of isolator rows provided will be more than adequate to treat the required water quality flow rate. Other flows from the site will be treated in an ADA Barracuda S6 unit. See **Attachment B** for water quality flow calculations, and ADS Barracuda manufacturer's sizing.

STATE OF CONNECTICUT
DANIEL H. JAMESON
33459
LICENSED PROFESSIONAL ENGINEER

06/12/2020

Attachment A

Subbasin Summary

Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
Sub-CB-01	0.13	0.8500	0.68	0.57	0.07	0.75	0 00:06:00
Sub-CB-02	0.27	0.7700	0.73	0.56	0.15	1.29	0 00:07:00
Sub-CB-03	0.24	0.6800	0.68	0.46	0.11	1.10	0 00:06:00
Sub-CB-04	0.32	0.8800	0.68	0.59	0.19	1.90	0 00:06:00
Sub-CB-05	0.38	0.8700	0.68	0.59	0.22	2.23	0 00:06:00
Sub-CB-06	0.38	0.8700	0.68	0.59	0.22	2.23	0 00:06:00
Sub-CB-07	0.33	0.8600	0.68	0.58	0.19	1.92	0 00:06:00
Sub-CB-08	0.14	0.8600	0.68	0.58	0.08	0.81	0 00:06:00
Sub-CB-09	0.31	0.8000	0.68	0.54	0.17	1.67	0 00:06:00
Sub-CB-10	0.30	0.8400	0.68	0.57	0.17	1.70	0 00:06:00
Sub-CB-11	0.11	0.7900	0.68	0.53	0.06	0.59	0 00:06:00
Sub-CB-12	0.03	0.7000	0.73	0.51	0.02	0.13	0 00:07:00
Sub-CB-13	0.18	0.7300	0.73	0.53	0.10	0.82	0 00:07:00
Sub-CB-14	0.04	0.6000	0.77	0.46	0.02	0.14	0 00:08:00
Sub-CB-15	0.14	0.8100	0.68	0.55	0.08	0.77	0 00:06:00
Sub-CB-16	0.03	0.9000	0.68	0.61	0.02	0.18	0 00:06:00
Sub-CB-17	0.11	0.7400	0.73	0.54	0.06	0.51	0 00:07:00
Sub-CB-18	0.34	0.8100	0.68	0.55	0.19	1.86	0 00:06:00
Sub-CB-19	0.17	0.8300	0.68	0.56	0.10	0.95	0 00:06:00
Sub-CB-20	0.27	0.7900	0.68	0.53	0.14	1.44	0 00:06:00
Sub-CB-21	0.07	0.8100	0.68	0.55	0.04	0.38	0 00:06:00
Sub-CB-22	0.16	0.8300	0.68	0.56	0.09	0.90	0 00:06:00
Sub-CB-23	0.23	0.8200	0.68	0.55	0.13	1.27	0 00:06:00
Sub-CB-24	0.27	0.7900	0.68	0.53	0.14	1.44	0 00:06:00
Sub-CB-25	0.07	0.8100	0.68	0.55	0.04	0.38	0 00:06:00
Sub-CB-26	0.08	0.9000	0.68	0.61	0.05	0.49	0 00:06:00
Sub-CB-27	0.13	0.7200	0.73	0.52	0.07	0.58	0 00:07:00
Sub-CB-28	0.21	0.8400	0.68	0.57	0.12	1.19	0 00:06:00
Sub-CB-29	0.21	0.8400	0.68	0.57	0.12	1.19	0 00:06:00
Sub-CB-30	0.10	0.7800	0.73	0.57	0.06	0.49	0 00:07:00
Sub-CB-31	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-CB-32	0.11	0.6300	0.77	0.49	0.05	0.40	0 00:08:00
Sub-CB-33	0.03	0.9000	0.68	0.61	0.02	0.18	0 00:06:00
Sub-CB-34	0.06	0.7000	0.73	0.51	0.03	0.26	0 00:07:00
Sub-CB-35	0.36	0.7500	0.73	0.54	0.20	1.68	0 00:07:00
Sub-CB-36	0.12	0.7000	0.73	0.51	0.06	0.52	0 00:07:00
Sub-CB-37	0.09	0.8300	0.68	0.56	0.05	0.50	0 00:06:00
Sub-CB-38	0.06	0.6000	0.77	0.46	0.03	0.21	0 00:08:00
Sub-CB-39	0.13	0.7600	0.73	0.55	0.07	0.61	0 00:07:00
Sub-CB-40	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-CB-41	0.01	0.9000	0.68	0.61	0.01	0.06	0 00:06:00
Sub-EXBD-01	0.45	0.7300	0.68	0.49	0.22	2.22	0 00:06:00
Sub-EXCB-02	0.37	0.7900	0.68	0.53	0.19	1.95	0 00:06:00
Sub-M-1A	0.13	0.9000	0.68	0.61	0.08	0.79	0 00:06:00
Sub-M-1B	0.33	0.9000	0.68	0.61	0.20	2.00	0 00:06:00
Sub-M-1C	0.12	0.9000	0.68	0.61	0.07	0.73	0 00:06:00
Sub-M-2A	0.13	0.9000	0.68	0.61	0.08	0.79	0 00:06:00
Sub-M-2B	0.33	0.9000	0.68	0.61	0.20	2.00	0 00:06:00
Sub-M-2C	0.12	0.9000	0.68	0.61	0.07	0.73	0 00:06:00
Sub-R-1A	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-1B	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-1C	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-R-1D	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-1E	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-2A	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-2B	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-2C	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-R-2D	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-2E	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-YD-01	0.05	0.4200	0.77	0.32	0.02	0.12	0 00:08:00
Sub-YD-02	0.07	0.3000	0.77	0.23	0.02	0.12	0 00:08:00
Sub-YD-03	0.23	0.2100	1.07	0.22	0.05	0.19	0 00:16:23
Sub-YD-04	1.51	0.2300	1.01	0.23	0.35	1.48	0 00:14:06
Sub-YD-05	0.49	0.2200	0.90	0.20	0.10	0.52	0 00:11:12
Sub-YD-06	4.58	0.3000	1.28	0.38	1.76	4.28	0 00:24:42
Sub-YD-07	1.82	0.2200	1.13	0.25	0.45	1.47	0 00:18:30
Sub-YD-08	0.57	0.2000	1.12	0.23	0.13	0.42	0 00:18:06
Sub-YD-09	1.72	0.1700	1.12	0.19	0.33	1.09	0 00:18:00
Sub-YD-10	0.01	0.3000	0.77	0.23	0.00	0.02	0 00:08:00
Sub-YD-11	0.05	0.3000	0.77	0.23	0.01	0.09	0 00:08:00
Sub-YD-12	0.05	0.7800	0.68	0.53	0.03	0.26	0 00:06:00
Sub-YD-13	0.04	0.7500	0.68	0.51	0.02	0.20	0 00:06:00
Sub-YD-14	0.01	0.3000	0.68	0.20	0.00	0.02	0 00:06:00

Link Summary

From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow Velocity	Peak Flow Depth	Total Time Surcharged
		(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)	(ft/sec)	(ft)	(min)
DMH-01	UGC-INLET-01	3.00	149.27	149.25	0.6700	36.000	0.0130	31.23	54.46	7.96	1.63	0.00
R2	CB-11	244.00	155.90	154.45	0.5900	12.000	0.0130	2.54	2.75	7.27	0.75	0.00
R1	YD-14	234.00	155.62	153.24	1.0200	12.000	0.0130	2.57	3.59	8.46	0.62	0.00
OCS	EXCB-01	29.00	144.60	144.30	1.0300	36.000	0.0130	19.32	67.84	8.27	1.10	0.00
EXCB-01	EXCB-02	58.00	143.72	142.97	1.2900	24.000	0.0130	19.31	25.72	8.99	1.29	0.00
EXCB-02	Out-04	15.00	142.97	142.78	1.2700	24.000	0.0130	19.31	25.46	8.91	1.30	0.00
CB-41(TYPEI)	CB-36	102.00	152.42	150.72	1.6700	15.000	0.0130	5.39	8.00	7.02	0.75	0.00
WQU-1	OCS	15.00	146.56	145.61	6.3300	30.000	0.0130	10.48	218.12	22.95	0.37	0.00
DMH-03	UGC-INLET-03	3.00	149.22	149.20	0.6700	15.000	0.0130	2.92	7.01	5.45	0.56	0.00
DMH-02	UGC-INLET-02	3.00	149.22	149.20	0.6700	15.000	0.0130	4.01	6.21	5.38	0.73	0.00
CB-03	CB-02	51.00	150.92	150.66	0.5100	12.000	0.0130	1.08	2.54	4.16	0.45	0.00
CB-31	CB-30	30.00	154.28	153.98	1.0000	18.000	0.0130	3.44	4.70	2.91	0.95	0.00
CB-30	CB-29	95.00	153.88	153.40	0.5100	18.000	0.0130	3.90	8.70	4.82	0.70	0.00
CB-29	DMH-04	44.00	153.30	153.07	0.5200	18.000	0.0130	4.82	9.07	5.22	0.78	0.00
DMH-04	CB-09	95.00	152.97	152.49	0.5100	18.000	0.0130	6.79	11.42	6.75	0.83	0.00
CB-09	YD-14	48.00	152.39	152.14	0.5200	30.000	0.0130	28.41	29.60	6.88	1.97	0.00
YD-14	YD-13	21.00	152.04	151.93	0.5200	36.000	0.0130	30.87	48.27	7.24	1.74	0.00
YD-13	YD-12	42.00	151.83	151.62	0.5000	36.000	0.0130	31.03	47.16	7.12	1.78	0.00
YD-12	DMH-01	75.00	151.52	151.14	0.5100	36.000	0.0130	31.24	47.48	7.17	1.78	0.00
CB-11	CB-41(TYPEI)	88.00	154.17	152.72	1.6500	15.000	0.0130	4.76	8.29	7.00	0.68	0.00
CB-10	CB-09	171.00	154.19	153.34	0.5000	15.000	0.0130	4.03	4.55	4.31	0.91	0.00
CB-13(TYPEI)	CB-12(TYPEI)	42.00	155.25	155.04	0.5000	12.000	0.0130	0.81	2.52	3.60	0.39	0.00
CB-12(TYPEI)	CB-11	36.00	154.94	154.45	1.3600	12.000	0.0130	1.70	4.16	5.04	0.45	0.00
CB-02	CB-01	41.00	150.56	150.35	0.5100	12.000	0.0130	2.25	2.55	3.69	0.73	0.00
CB-35	CB-34	7.00	155.99	155.96	0.4300	12.000	0.0130	2.29	2.48	3.58	0.76	0.00
CB-34	CB-33	33.00	155.86	155.54	0.9700	12.000	0.0130	2.54	3.54	4.92	0.63	0.00
CB-28	CB-27	7.00	157.29	156.94	5.0000	12.000	0.0130	1.19	14.13	10.94	0.20	0.00
CB-27	CB-26	21.00	156.84	156.73	0.5200	12.000	0.0130	1.68	3.62	4.53	0.48	0.00
CB-26	DMH-04	24.00	156.63	155.43	5.0000	12.000	0.0130	2.16	7.97	8.63	0.36	0.00
CB-37	CB-35	74.00	159.73	156.37	4.5400	12.000	0.0130	0.50	7.59	6.91	0.17	0.00
CB-23	CB-22	76.00	157.36	156.98	0.5000	24.000	0.0130	15.62	19.08	6.79	1.38	0.00
CB-22	CB-09	72.00	156.85	153.23	5.0300	24.000	0.0130	16.35	55.70	15.41	0.74	0.00
CB-18	CB-17	7.00	155.70	155.35	5.0000	12.000	0.0130	1.86	7.97	8.27	0.33	0.00
CB-17	CB-16	24.00	155.25	155.12	0.5400	12.000	0.0130	2.28	2.62	3.77	0.72	0.00
CB-16	CB-10	26.00	155.02	154.45	2.1900	12.000	0.0130	2.46	5.28	6.60	0.48	0.00
CB-15	CB-14	10.00	156.04	155.55	4.9000	12.000	0.0130	0.76	8.23	6.57	0.21	0.00
CB-14	CB-12(TYPEI)	33.00	155.45	155.29	0.4800	12.000	0.0130	0.86	2.48	2.88	0.41	0.00
CB-19	CB-20	54.00	159.92	159.65	0.5000	12.000	0.0130	1.47	2.52	3.36	0.55	0.00
CB-20	CB-21	36.00	159.55	159.37	0.5000	15.000	0.0130	2.87	4.57	3.94	0.72	0.00
CB-25	CB-24	36.00	158.90	158.72	0.5000	15.000	0.0130	3.59	4.57	4.14	0.83	0.00
CB-24	CB-23	54.00	157.73	157.46	0.5000	24.000	0.0130	14.57	18.85	6.63	1.32	0.00
YD-04	YD-05	101.00	160.44	159.93	0.5000	15.000	0.0130	3.51	4.59	4.15	0.82	0.00
CB-04	CB-05	102.00	152.19	151.68	0.5000	12.000	0.0130	1.85	2.52	5.39	0.64	0.00
YD-05	YD-06	89.00	159.83	159.38	0.5100	15.000	0.0130	4.46	4.59	4.31	0.99	0.00
YD-06	CB-24	134.00	158.51	157.83	0.5100	24.000	0.0130	10.07	17.15	5.70	1.10	0.00
YD-11	YD-10	53.00	161.18	160.91	0.5100	12.000	0.0130	0.09	2.96	2.43	0.12	0.00
YD-10	YD-09	54.00	160.81	160.53	0.5200	12.000	0.0130	0.79	2.96	3.21	0.35	0.00
YD-09	YD-08	101.00	160.43	159.92	0.5000	15.000	0.0130	3.10	5.02	4.34	0.71	0.00
YD-08	YD-07	89.00	159.82	159.38	0.4900	15.000	0.0130	3.97	5.07	4.61	0.83	0.00
YD-07	YD-06	132.00	159.28	158.61	0.5100	15.000	0.0130	4.47	6.55	5.78	0.76	0.00
YD-02	YD-03	52.00	161.18	160.91	0.5200	12.000	0.0130	0.12	2.57	2.39	0.15	0.00
YD-03	YD-04	54.00	160.81	160.54	0.5000	12.000	0.0130	0.93	2.52	2.99	0.42	0.00
CB-38	CB-35	38.00	157.36	156.09	3.3400	12.000	0.0130	0.21	6.51	4.05	0.12	0.00
CB-05	DMH-02	17.00	151.58	151.48	0.5900	15.000	0.0130	4.01	4.43	4.09	0.93	0.00
CB-33	CB-31	17.00	155.44	154.76	4.0000	12.000	0.0130	2.69	7.13	8.44	0.42	0.00
CB-01	DMH-03	18.00	150.25	150.15	0.5600	15.000	0.0130	2.92	4.81	4.11	0.70	0.00
CB-06	CB-07	102.00	152.19	151.68	0.5000	12.000	0.0130	2.18	2.47	5.52	0.73	0.00
CB-07	CB-36	131.00	151.31	150.65	0.5000	15.000	0.0130	3.98	4.72	4.40	0.88	0.00
CB-21	CB-25	55.00	159.27	159.00	0.4900	15.000	0.0130	3.23	4.53	4.04	0.78	0.00
CB-36	CB-08	31.00	150.55	149.87	2.1900	15.000	0.0130	9.80	11.80	10.75	0.87	0.00
CB-39(TYPEI)	CB-41(TYPEI)	16.00	152.60	152.52	0.5000	12.000	0.0130	0.61	1.69	2.14	0.41	0.00
CB-40	CB-19	29.00	160.46	160.02	1.5200	12.000	0.0130	0.54	4.39	4.21	0.24	0.00
CB-08	WQU-1	63.00	148.95	146.56	3.7900	30.000	0.0130	10.48	18.34	3.88	1.35	0.00
YD-01	CB-31	44.00	154.75	154.52	0.5200	12.000	0.0130	0.12	2.52	2.28	0.15	0.00
CB-32	CB-31	22.00	154.95	154.84	0.5000	12.000	0.0130	0.40	2.52	2.55	0.27	0.00

Junction Input

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)
CB-01	150.22	154.40
CB-02	150.52	153.53
CB-03	150.89	153.09
CB-04	152.18	154.40
CB-05	151.57	154.40
CB-06	151.09	154.40
CB-07	151.70	153.90
CB-08	149.96	152.26
CB-09	149.42	156.77
CB-10	150.37	156.68
CB-11	151.99	156.68
CB-12(TYPEI)	151.72	157.67
CB-13(TYPEI)	155.20	157.37
CB-14	151.45	158.14
CB-15	156.08	160.90
CB-16	150.59	157.90
CB-17	150.83	157.50
CB-18	155.66	160.17
CB-19	159.91	162.23
CB-20	159.53	162.70
CB-21	159.26	163.66
CB-22	157.59	161.90
CB-23	158.14	162.23
CB-24	158.51	162.70
CB-25	158.89	163.66
CB-26	156.61	159.37
CB-27	156.95	159.37
CB-28	158.05	161.75
CB-29	153.94	156.84
CB-30	154.59	156.77
CB-31	154.65	157.09
CB-32	154.92	157.13
CB-33	155.38	157.70
CB-34	155.87	158.49
CB-35	155.99	160.37
CB-36	151.00	153.31
CB-37	159.67	163.11
CB-38	157.34	159.46
CB-39(TYPEI)	152.56	154.77
CB-40	160.45	162.73
CB-41(TYPEI)	152.56	155.29
DMH-01	148.10	154.10
DMH-02	151.50	157.50
DMH-03	150.10	156.10
DMH-04	153.61	157.86
EXCB-01	143.72	148.58
EXCB-02	142.97	148.12
OCS	144.60	150.62
R1	155.62	158.40
R2	155.90	158.40
WQU-1	149.85	155.85
YD-01	154.87	157.10
YD-02	161.18	163.50
YD-03	160.81	170.20
YD-04	160.44	169.00
YD-05	159.83	169.00
YD-06	159.28	164.40
YD-07	160.64	164.40
YD-08	161.19	169.00
YD-09	161.80	169.00
YD-10	162.17	170.20
YD-11	162.53	163.50
YD-12	148.61	158.00
YD-13	148.90	157.98
YD-14	149.08	157.41

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Min Freeboard Attained	Time of Max HGL Occurrence
	(cfs)	(cfs)	(ft)	(ft)	(days hh:mm)
CB-01	2.92	0.75	151.08	3.32	0 00:07
CB-02	2.25	1.29	151.29	2.24	0 00:07
CB-03	1.10	1.10	151.38	1.71	0 00:06
CB-04	1.90	1.90	152.84	1.56	0 00:06
CB-05	4.01	2.23	152.51	1.89	0 00:06
CB-06	2.23	2.23	152.93	1.47	0 00:06
CB-07	4.03	1.91	152.59	1.31	0 00:06
CB-08	10.50	0.81	151.32	1.14	0 00:06
CB-09	28.42	1.67	154.36	2.41	0 00:07
CB-10	4.12	1.70	155.12	1.56	0 00:06
CB-11	4.76	0.59	155.21	1.47	0 00:06
CB-12(TYPEI)	1.70	0.13	155.70	1.97	0 00:06
CB-13(TYPEI)	0.82	0.82	155.64	1.73	0 00:07
CB-14	0.87	0.14	155.86	2.28	0 00:06
CB-15	0.77	0.77	156.29	4.61	0 00:06
CB-16	2.46	0.18	155.84	2.06	0 00:06
CB-17	2.29	0.51	155.97	1.53	0 00:06
CB-18	1.86	1.86	156.03	4.14	0 00:06
CB-19	1.49	0.95	160.47	1.76	0 00:06
CB-20	2.88	1.44	160.27	2.43	0 00:06
CB-21	3.24	0.38	160.09	3.57	0 00:06
CB-22	16.35	0.90	158.97	2.93	0 00:07
CB-23	15.63	1.27	159.51	2.72	0 00:07
CB-24	14.58	1.44	159.83	2.87	0 00:07
CB-25	3.59	0.38	159.78	3.88	0 00:06
CB-26	2.16	0.49	157.21	2.16	0 00:06
CB-27	1.69	0.58	157.43	1.94	0 00:06
CB-28	1.19	1.19	158.24	3.51	0 00:06
CB-29	4.83	1.19	154.72	2.12	0 00:07
CB-30	3.91	0.48	155.55	1.22	0 00:07
CB-31	3.44	0.36	155.60	1.49	0 00:07
CB-32	0.40	0.40	155.22	1.91	0 00:08
CB-33	2.69	0.18	156.17	1.53	0 00:07
CB-34	2.55	0.26	156.72	1.77	0 00:07
CB-35	2.29	1.68	156.75	3.62	0 00:07
CB-36	9.80	0.52	151.88	1.43	0 00:06
CB-37	0.50	0.50	159.91	3.20	0 00:06
CB-38	0.21	0.21	157.48	1.98	0 00:08
CB-39(TYPEI)	0.61	0.61	153.02	1.75	0 00:07
CB-40	0.55	0.55	160.70	2.03	0 00:06
CB-41(TYPEI)	5.40	0.06	153.40	1.89	0 00:06
DMH-01	31.24	0.00	152.92	1.22	0 00:07
DMH-02	4.01	0.00	152.43	5.07	0 00:06
DMH-03	2.92	0.00	150.85	5.25	0 00:06
DMH-04	6.79	0.00	155.79	2.08	0 00:06
EXCB-01	19.32	2.22	145.40	3.18	0 12:46
EXCB-02	19.31	1.95	144.27	3.85	0 12:46
OCS	19.32	19.32	145.98	4.64	0 00:07
R1	2.67	2.67	156.26	2.14	0 00:06
R2	2.67	2.67	156.70	1.70	0 00:06
WQU-1	10.48	0.00	151.21	4.65	0 00:07
YD-01	0.12	0.12	155.02	2.08	0 00:08
YD-02	0.12	0.12	161.33	2.17	0 00:08
YD-03	0.94	0.86	161.23	8.97	0 00:06
YD-04	3.54	2.63	161.26	7.74	0 00:06
YD-05	4.49	1.01	160.83	8.17	0 00:06
YD-06	10.10	4.28	160.39	4.01	0 00:07
YD-07	4.50	1.47	161.47	2.93	0 00:06
YD-08	3.99	0.93	162.02	6.98	0 00:06
YD-09	3.14	2.37	162.51	6.49	0 00:06
YD-10	0.80	0.74	162.52	7.68	0 00:06
YD-11	0.09	0.09	162.65	0.88	0 00:08
YD-12	31.25	0.26	153.40	4.60	0 00:07
YD-13	31.04	0.20	153.67	4.31	0 00:07
YD-14	30.87	0.02	154.11	3.30	0 00:07

Attachment B

The Gateway -DPI No.3530
May 28, 2020

Water Quality Flow Calculations
Per 2004 Connecticut Stormwater Quality Manual
Per Appendix B page B-3:
Water Quality Flow (WQF) = (qu)(A)(Q), where:
qu = unit peak discharge (cfs/mi^2/inch) per Exhibit 4-III
A = drainage area (mi^2)
Q = runoff depth (in watershed inches)
= [Water Quality Volume (WQV) (in acre-feet)] x [12 inches/foot] / drainage area (acres)

Isolation Row 1 (CB-1, 2, &3)
To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:
Time of Concentration (Tc):
6 mins = 0.10 hours
Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:
Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)
CN = 92
Ia = 0.174 inches
Design Precipitation (P) = 1" for water quality storms per Appendix B
Ia/P = 0.174
Unit Peak Discharge qu = 650 cfs/mi^2/inch

Drainage Area A = 27,878 sf = 0.64 acres = 0.001 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:
R = volumetric runoff coefficient
= 0.05 + 0.009(I), where I = percent impervious cover = 75.0%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(75.0)
R = 0.725

A = drainage area in acres = 0.64 acres

WQV = (1")(R)(A)/12
WQV = (1")(0.725)(0.64 acres) / 12 in/ft
WQV = 0.039 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area
Q = (0.039 acre-feet x 12 in/ft) / 0.64 acres
Q = 0.731 in

WQF = qu x A x Q
WQF = 650 cfs/mi^2/inch x 0.001 mi^2 x 0.733 in
WQF = **0.476 cfs required**

Proposed
As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **4 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **0.476 cfs** water quality flow. The current design plan proposes **14** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Isolation Row 2 (CB-4 & 5)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

6 mins = 0.43 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 97

Ia = 0.062 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.062

Unit Peak Discharge qu = 700 cfs/mi^2/inch

Drainage Area A = 30,492 sf = 0.70 acres = 0.0011 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 95.71%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(95.71)

R = 0.911

A = drainage area in acres = 0.70 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.911)(0.70 acres) / 12 in/ft

WQV = 0.053 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.053 acre-feet x 12 in/ft) / 0.70 acres

Q = 0.91 in

WQF = qu x A x Q

WQF = 700 cfs/mi^2/inch x 0.0011 mi^2 x 0.91 in

WQF = **0.70 cfs required**

Proposed

As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **6 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **0.70 cfs** water quality flow. The current design plan proposes **14** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Isolation Row 3 (Main Site)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

26 mins = 0.43 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 75

Ia = 0.667 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.667

Unit Peak Discharge qu = 280 cfs/mi^2/inch

Drainage Area A = 761,123 sf = 17.47 acres = 0.0273 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 31.02%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(31.02)

R = 0.329

A = drainage area in acres = 17.47 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.329)(17.47 acres) / 12 in/ft

WQV = 0.479 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.479 acre-feet x 12 in/ft) / 17.47 acres

Q = 0.33 in

WQF = qu x A x Q

WQF = 280 cfs/mi^2/inch x 0.0273 mi^2 x 0.33 in

WQF = **2.52 cfs required**

Proposed

As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **19 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **2.52 cfs** water quality flow. The current design plan proposes **20** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Water Quality Unit 1 (P5)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

6 mins = 0.10 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 95

Ia = 0.105 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.105

Unit Peak Discharge qu = 650 cfs/mi^2/inch

Drainage Area A = 89,298 sf = 2.05 acres = 0.003 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 88.29%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(88.29)

R = 0.845

A = drainage area in acres = 2.05 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.845)(2.05 acres) / 12 in/ft

WQV = 0.144 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.144 acre-feet x 12 in/ft) / 2.05 acres

Q = 0.843 in

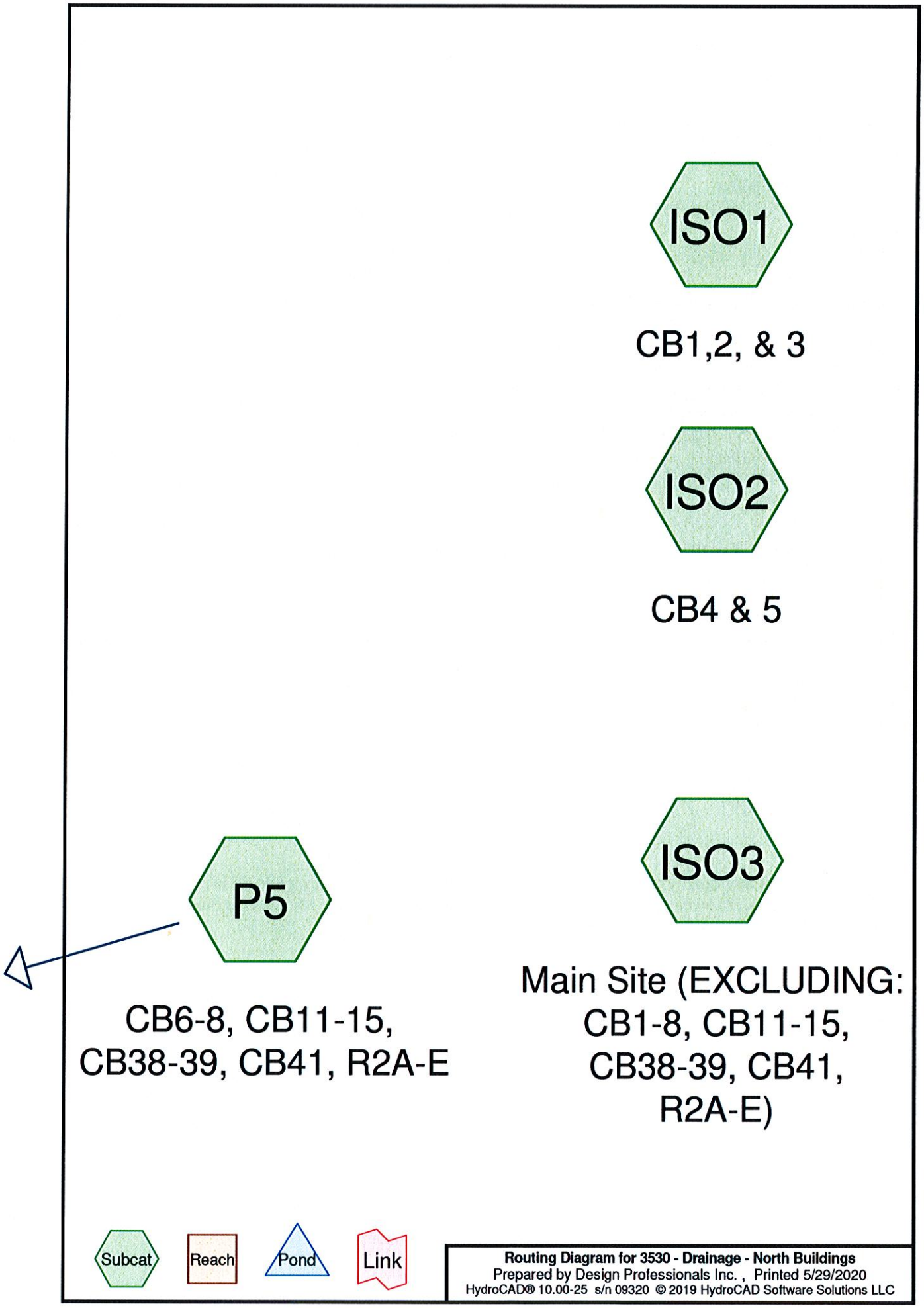
WQF = qu x A x Q

WQF = 650 cfs/mi^2/inch x 0.003 mi^2 x 0.843 in

WQF = **1.64 cfs required**

Proposed

As shown on the enclosed water quality unit sizing report, the proposed BaySaver Barracuda S6 is rated for 80% TSS removal for the required **1.64 cfs** water quality flow and Bypass the expected during 10.48cfs for during the 10 yr storm. See Barracuda sizing chart included in Appendix.


ISO1
CB1,2, & 3
ISO2
CB4 & 5
ISO3
Main Site (EXCLUDING: CB1-8, CB11-15, CB38-39, CB41, R2A-E)
P5
CB6-8, CB11-15, CB38-39, CB41, R2A-E
Subcat
Reach
Pond
Link
Routing Diagram for 3530 - Drainage - North Buildings
Prepared by Design Professionals Inc. , Printed 5/29/2020
HydroCAD® 10.00-25 s/n 09320 © 2019 HydroCAD Software Solutions LLC

Summary for Subcatchment ISO1: CB1,2, & 3

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 5,263 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.120	74	>75% Grass cover, Good, HSG C
*	0.040	77	>75% Grass cover, Good, HSG C/D
*	0.480	98	IMPERVIOUS
	0.640	92	Weighted Average
	0.160		25.00% Pervious Area
	0.480		75.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment ISO2: CB4 & 5

Runoff = 2.08 cfs @ 12.08 hrs, Volume= 7,032 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.020	74	>75% Grass cover, Good, HSG C
*	0.010	77	>75% Grass cover, Good, HSG C/D
*	0.670	98	IMPERVIOUS
	0.700	97	Weighted Average
	0.030		4.29% Pervious Area
	0.670		95.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment ISO3: Main Site (EXCLUDING: CB1-8, CB11-15, CB38-39, CB41, R2A-E)

Runoff = 12.10 cfs @ 12.39 hrs, Volume= 65,548 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	166,617	55	Woods, Good, HSG B
	25,221	70	Woods, Good, HSG C
*	55,408	74	Woods, Good, HSG C/D
	133,206	61	>75% Grass cover, Good, HSG B
	58,632	74	>75% Grass cover, Good, HSG C
*	43,081	77	>75% Grass cover, Good, HSG C/D
	3,659	58	Meadow, non-grazed, HSG B
	35,240	71	Meadow, non-grazed, HSG C
*	3,964	75	Meadow, non-grazed, HSG C/D
*	236,095	98	IMPERVIOUS
	761,123	75	Weighted Average
	525,028		68.98% Pervious Area
	236,095		31.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0500	0.17		**Sheet Flow, Grass Sheet Flow** Grass: Dense n= 0.240 P2= 3.09"
2.0	106	0.0310	0.88		**Shallow Concentrated Flow, Wodland SCF** Woodland Kv= 5.0 fps
1.3	100	0.0330	1.27		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
3.5	208	0.0400	1.00		**Shallow Concentrated Flow, Woods SCF** Woodland Kv= 5.0 fps
3.2	260	0.0380	1.36		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
4.2	439	0.1200	1.73		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
0.4	72	0.1800	2.97		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
1.3	580	0.0100	7.20	22.62	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.0	1,865	Total			

Summary for Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E

Runoff = 5.81 cfs @ 12.08 hrs, Volume= 19,027 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.040	74	>75% Grass cover, Good, HSG C
*	0.200	77	>75% Grass cover, Good, HSG C/D
*	1.810	98	IMPERVIOUS
	2.050	95	Weighted Average
	0.240		11.71% Pervious Area
	1.810		88.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

CULTEC Separator Row Sizing Tables (Imperial)

Maine DEP / ADS Equivalent Sizing (OK 110 Particle Distribution)

	80% TSS Flow Rate (Maine DEP)	Chamber Width	Installed Chamber Length	Bottom Area	Treatment Rate / Chamber
CONTACTOR 100HD	2.5 gpm/sf	3.00′	7.5′	22.50 s.f.	0.125 cfs
RECHARGER 150XLHD	2.5 gpm/sf	2.75′	10.25′	28.18 s.f.	0.157 cfs
RECHARGER 180HD	2.5 gpm/sf	3.00′	6.33′	18.99 s.f.	0.106 cfs
RECHARGER 280HD	2.5 gpm/sf	3.91′	7.00′	27.37 s.f.	0.152 cfs
RECHARGER 330XLHD	2.5 gpm/sf	4.33′	7.00′	31.31 s.f.	0.174 cfs
RECHARGER 360HD	2.5 gpm/sf	5.00′	3.67′	18.35 s.f.	0.102 cfs
RECHARGER 902HD	2.5 gpm/sf	6.50′	3.67′	23.86 s.f.	0.133 cfs

ETV (ETV / NJDEP Particle Distribution)

	80% TSS Flow Rate (ETV)	Chamber Width	Installed Chamber Length	Bottom Area	Treatment Rate / Chamber
CONTACTOR 100HD	1.0 gpm/sf	3.00′	7.5′	22.50 s.f.	0.050 cfs
RECHARGER 150XLHD	1.0 gpm/sf	2.75′	10.25′	28.18 s.f.	0.063 cfs
RECHARGER 180HD	1.0 gpm/sf	3.00′	6.33′	18.99 s.f.	0.042 cfs
RECHARGER 280HD	1.0 gpm/sf	3.91′	7.00′	27.37 s.f.	0.061 cfs
RECHARGER 330XLHD	1.0 gpm/sf	4.33′	7.00′	31.31 s.f.	0.070 cfs
RECHARGER 360HD	1.0 gpm/sf	5.00′	3.67′	18.35 s.f.	0.041 cfs
RECHARGER 902HD	1.0 gpm/sf	6.50′	3.67′	23.86 s.f.	0.053 cfs

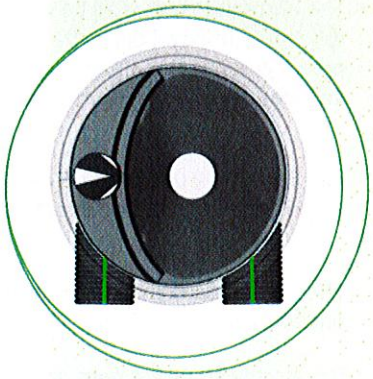
BAYSAVER TECHNOLOGIES

ADS

Barracuda S4

The Barracuda S4 is a market-changing stormwater quality technology. This high performance vortex hydrodynamic separator is designed to remove total suspended solids in order to protect our precious receiving waters. The Barracuda is also an outstanding value that offers multiple pipe configurations, and quick installation.

Inline Configuration



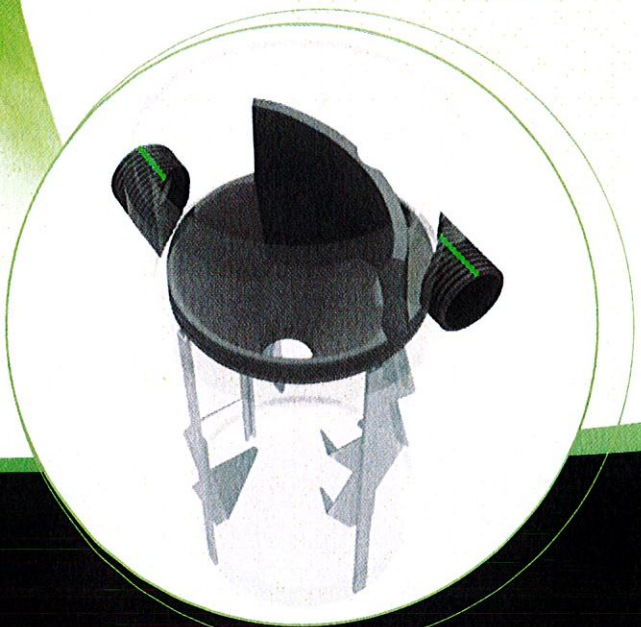
Offline Configuration

FEATURES:

- Single manhole design
- No elevation loss between the inlet and outlet
- Flexible inlet/outlet positions (not just 180 degree orientation)
- Internal bypass for inline installation (where applicable)
- Revolutionary, patent pending "teeth" mitigate turbulence in the sump area to prevent resuspension of captured contaminants.

BENEFITS:

- Internal components are in stock for quick delivery.
- The S4 can be provided within a 48" ADS HP Manhole, to be factory fabricated and delivered complete to the jobsite.
- The S4 can also be installed in a standard 48" precast manhole. The Barracuda "teeth" apparatus is fabricated and designed for quick and easy field assembly.
- Designed for easy maintenance using a vacuum truck or similar equipment.
- Inspection and maintenance are performed from the surface with no confined space entry.



ADS Service: **ADS representatives are committed to providing you with the answers to all your questions, including specifications, installation and more.**

BARRACUDA S4 SPECIFICATION

MATERIALS AND DESIGN

- Concrete Structures: Designed for H-20 traffic loading and applicable soil loads or as otherwise determined by a Licensed Professional Engineer. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.
- 48" HP Manhole Structures: Made from an impact modified copolymer polypropylene meeting the material requirements of ASTM F2764. The eccentric cone reducer shall be manufactured from polyethylene material meeting ASTM D3350 cell class 213320C. Gaskets shall be made of material meeting the requirements of ASTM F477.
- Separator internals shall be substantially constructed of stainless steel, polyethylene or other thermoplastic material approved by the manufacturer.

PERFORMANCE

- The stormwater treatment unit shall be an inline unit capable of conveying 100% of the design peak flow. If peak flow rates exceed maximum hydraulic rate, the unit shall be installed offline.

- The Barracuda unit shall be designed to remove at least 80% of the suspended solids on an annual aggregate removal basis. Said removal shall be based on full-scale third party testing using OK-110 media gradation or equivalent and 300 mg/L influent concentration. Said full scale testing shall have included sediment capture based on actual total mass collected by the stormwater treatment unit.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS using a media mix with d_{50}=75 micron and 200 mg/L influent concentration.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS per current NJDEP/NJCAT HDS protocol .

- The stormwater treatment unit internals shall consist of (1) separator cone assembly, and (1) sump assembly which includes (4) legs with "teeth".

	Manhole Diameter	80% Removal OK-110	50% TSS per NJCAT	Max Hydraulic Rate
Barracuda S4	48"	1.08 CFS	1.25 CFS	6.25 CFS

INSTALLATION

Installation of the stormwater treatment unit(s) shall be performed per manufacturer's installation instructions. Such instructions can be obtained by calling Advanced Drainage Systems at (800) 821-6710 or by logging on to www.ads-pipe.com or www.baysaver.com.

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

BOGGS ENVIRONMENTAL CONSULTANTS

Middletown, MD & Morgantown, WV

Administrative Office:
200 W Main Street
Middletown, Maryland 21769

Office (301) 694-5687
Fax (301) 694-9799

BaySaver Technologies, LLC
1030 Deer Hollow Drive
Mount Airy, MD 21771
(301) 679-0640; dfigola@ads-pipe.com

November 1, 2017

ATTENTION: Daniel Figola, General Manager
REFERENCE: Third Party Review of Testing Procedures for Barracuda™ Separator at the Mid Atlantic Storm Water Research Center, 1207 Park Ridge Drive, Mount Airy, MD 21771

SUMMARY

Boggs Environmental Consultants, Inc. (BEC) was hired by Advanced Drainage Systems (ADS) in August of 2017, to serve as independent third-party oversight of the BaySaver Barracuda S4 Separator test unit for removal of sediment with equivalent particle size distribution to the industry standard OK-110. The BaySaver Barracuda S4 is a storm water treatment device with a Maximum Treatment Flow Rate (MTFR) of approximately 1.08 cubic feet per second (cfs) that removes suspended solids from storm water runoff, with an average removal efficiency of 80% at the MTFR and a feed concentration of 300 mg/L. The device is an insert that can be installed in either Polypropylene plastic pipe or concrete vault, and consists of a cone (vortex separator) and baffles ("teeth").

SCALED RESULTS

Testing flow rates ranged from 0.31 to 1.61 cfs, with a feed OK-110 concentration of 300 mg/L. Based upon New Jersey scaling methodology, the table below represents treatment and device information for the S4, S6, and S8 units.

Table 1: MTFR's and Sizing for BaySaver Barracuda Models

Model[1]	Man-hole Diam-eter[1] (ft)	OK110 80% TSS Maximum Treatment Flow Rate (cfs)	Treat-ment Area (ft^2)	Hydraulic Loading rate (gpm/ft^2)	Chamber Depth (ft)	Wet Volume (ft^3)	50% Maximum Sediment Storage[2] (ft^3)
Barracuda S4	4	1.08	12.57	38.6	6.83	75.4	10.47
Barracuda S6	6	2.43	28.27	38.6	6.83	169.7	23.56
Barracuda S8	8	4.32	50.27	38.6	11.03	512.7	41.89

Notes:
1. In some areas, Barracuda units are available in additional diameters. Units not listed here are sized not to exceed 38.6 gpm/ft^2 of effective treatment during the peak water quality flow.
2. 50% Sediment Storage Capacity is equal to manhole diameter x 10 inches of sediment depth. Each Barracuda unit has a 20 inches deep sediment sump.

Should you have any questions, contact our office at your earliest convenience.

Sincerely,
BOGGS ENVIRONMENTAL CONSULTANTS, INC.

William R. Warfel
Principal Environmental Scientist

Robin J. Maliszewskyj
Chemical Engineer