

Stormwater Management Report

for:

The Easton at Rutgers Plaza

**Block 385, Lot 2.07
Township of Franklin
Somerset County, New Jersey**

Prepared By:

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Under the Immediate Supervision of:



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ST/MAD/hc
MEA # 2021.019.01
Dated: October 26, 2023



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INTRODUCTION

The following Stormwater Management Report details the design of the stormwater management plan for a proposed development located in the Township of Franklin, Somerset County, New Jersey and has been prepared by Menlo Engineering Associates, Inc. in accordance with the standards of the Township of Franklin, the County of Somerset, the New Jersey Soil Conservation Service, and the New Jersey Department of Environmental Protection. This report supplements, and should be reviewed in conjunction with, the project development plans prepared by Menlo Engineering Associates, Inc.

The purpose of this report is to demonstrate that the proposed stormwater management system adequately convey stormwater runoff, and to assist Engineers at the Municipal, County, and State levels in evaluating the drainage calculations and considerations incorporated in the design as shown on the plans submitted. The report supplements, and should be reviewed in conjunction with, the project development plans prepared by Menlo Engineering Associates, Inc. This office will readily respond to questions and requests for additional calculations or verification of the proposed design by Municipal, County, or State Engineers, and will be responsive to their suggestions and modifications to the design in conformance to the applicable codes in the interest of land use control consistent with environmental protection.

STORMWATER MANAGEMENT PLAN & DESIGN

The guidelines for hydraulic design, as prepared by the Soil Conservation District, the Township of Franklin, Somerset County, and the New Jersey Department of Environmental Protection have been utilized for the drainage design of this project. The purpose of the drainage design is to safely convey the stormwater runoff and attenuate the discharges in accordance with regulations promulgated by the above cited agencies.

The stormwater management plan for the site is to provide for conveyance of stormwater runoff from the proposed 4-story apartment building and parking lot retrofit to the existing stormwater collection system. The stormwater collection system will consist of inlets and pipe networks. The stormwater conveyance system has been designed for the 25-year storm and the inlet grates have been designed to comply with the most current regulations.

The proposed redevelopment results in a net decrease in impervious coverage of 1.46 acres. Moreover, the proposed redevelopment does not increase the peak runoff rates for the pre-construction condition leaving the site for the two-, ten-, and 100-year storm events, on the contrary, it decreases the peak runoff rates for the post construction conditions.

Summary Tables:

The following tables summarize the reduction of runoff for the 2, 10, 25, and 100-year storm events as analyzed utilizing the Rational method:

STORM	EXISTING RUNOFF FROM SITE (CFS)	PROPOSED RUNOFF FROM SITE (CFS)	FLOW REDUCTION (CFS)
100	201.8	197.4	4.4
25	169.0	165.3	3.7
10	146.3	143.1	3.2
2	106.0	103.6	2.4

Environmental Site Analysis.

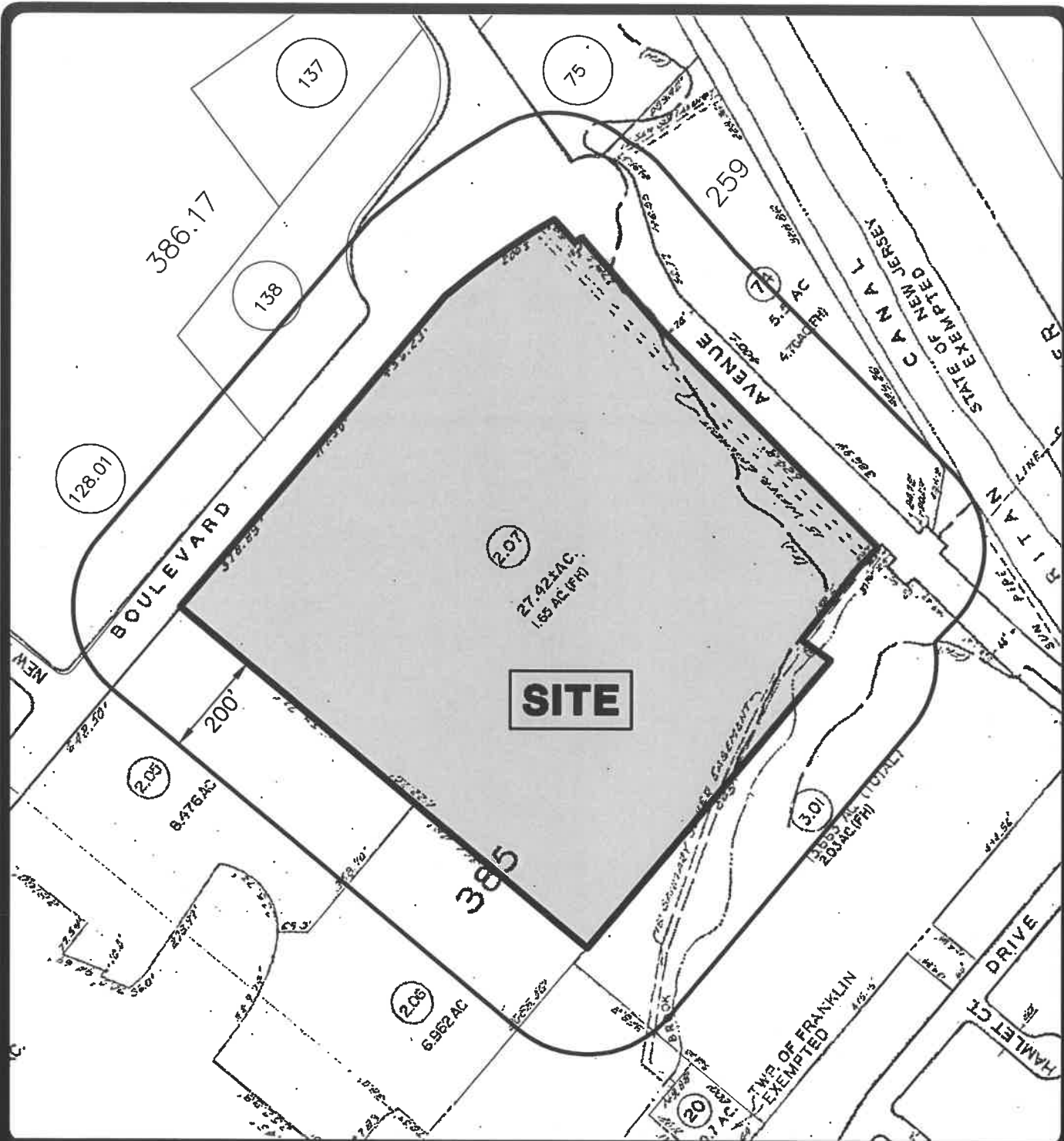
In accordance with the township ordinance 330-27.A(2), the 27.42 acres parcel is currently developed and consists of 21.60 acres of impervious coverage. Most of the site is classified as Klinesville soil which belongs to the hydraulic group D. The existing runoff is collected by an underground pipe network that discharges into Seeley's Brook which is maintained in the proposed conditions. Also, the existing drainage patterns are maintained in the proposed condition. Moreover, in the proposed conditions the impervious coverage is decreased to 20.14 acres which will generate lower peak runoff flows than in the existing condition. The site does not contain any environmentally sensitive features nor any unique conditions.

Land Use Planning and Source Control Plan.

In accordance with the township ordinance 330-27.A(4), as mentioned in this report the proposed redevelopment proposes a 1.46 acres of impervious reduction from the existing conditions. Therefore, water quality, quantity and ground water recharge are met by increasing the pervious areas. The existing peak runoff flows for the two-, ten- and 100-year storm are decreased in the proposed conditions. Since there is no increase in volume for the two-year storm the groundwater recharge standards are met. By providing two Water Quality Structures with a Removal TSS rate of 50% the stormwater runoff quality standards are met (see Appendix D for Water Quality Structure Sizing Calculations).

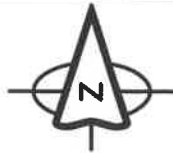
CONCLUSION

The proposed stormwater management system for the proposed redevelopment has been designed with provisions for safe and efficient control of stormwater runoff in a manner which will not adversely affect the existing drainage patterns found in the surrounding areas. It is the opinion of this office that the proposed development will not have any negative impacts on the drainage characteristics of the site, or the immediately surrounding areas. Further, it is the opinion of this office, that the proposed development will be in compliance with all applicable stormwater management regulations as established by the NJDEP and the Township of Franklin Standards.



TAX MAP

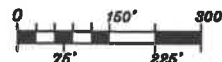
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 Franklin Township
 Somerset County



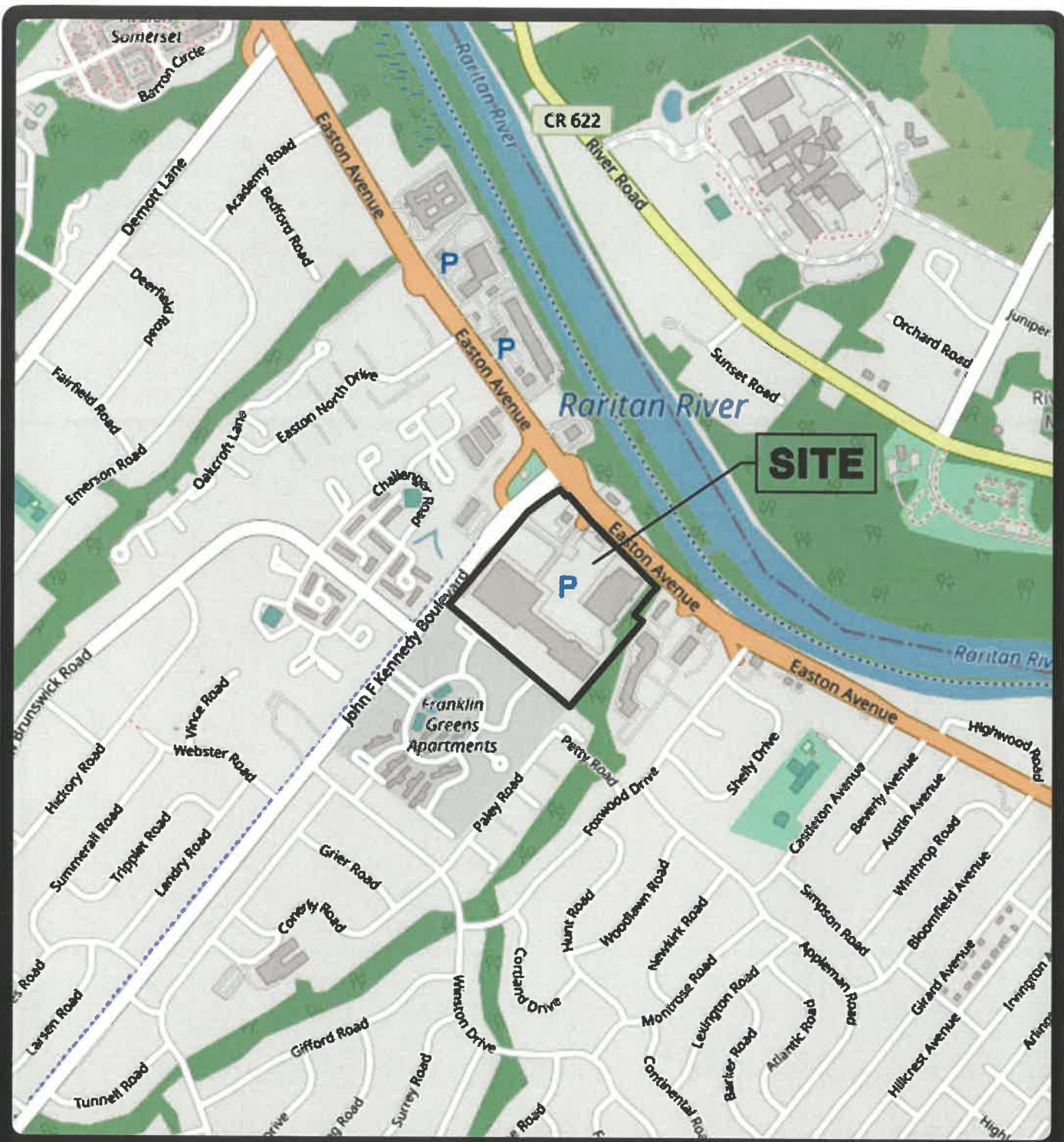
BLOCK
 385

LOT
 2.07

MENLO ENGINEERING ASSOCIATES, INC.
 261 CLEVELAND AVENUE
 HIGHLAND PARK, NJ 08904
 (732) 846-8585



Scale: 1" = 300 ± ft Job # 2021.019



ROAD MAP

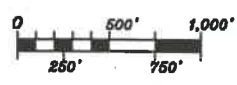
Franklin Township
Somerset County



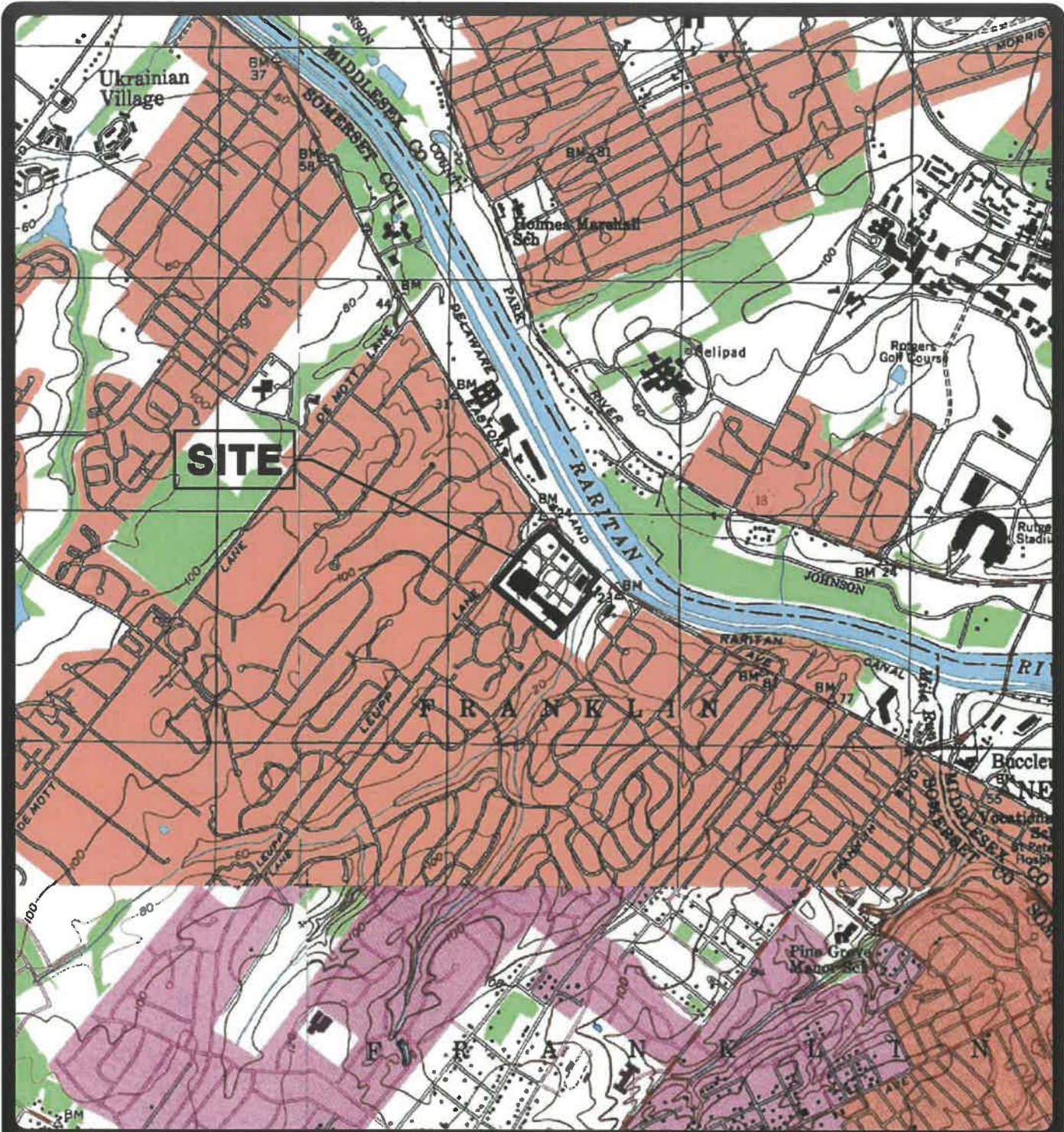
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Scale: 1" = 1,000 ± ft Job # 2021.019



U.S.G.S. MAP

Quad Name: Plainfield
 Franklin Township
 Somerset County

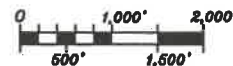


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State Plane Coordinates:
 N: 611,406.76 ft.
 E: 495,678.94 ft.



Scale: 1"=2,000±ft Job # 2021.019

APPENDIX A: PRE-DEVELOPMENT CONDITION

APPENDIX A: PRE-DEVELOPMENT CONDITION

PRE-DEVELOPMENT DRAINAGE CONDITION

I. Total Drainage Area: 27.42 Acres

		<u>Type</u>
II. Soil Groups/Types:	KkoC -Klinesville	D

III. Time of Concentration: 10 Minutes

IV Rainfall Intensity:

<u>Storm</u>	<u>Rainfall(in/hr)</u>
100-YR	8.00
25-YR	6.70
10-YR	5.80
2-YR	4.20
1-YR	3.20

V. Weighted 'c' Calculation:

<u>Land Use</u>	<u>Area</u>	<u>% of Cover</u>	<u>C Value</u>	<u>Total</u>
Impervious	21.60 Acres	0.79	0.99	0.78
Gravel	0.00 Acres	0.00	0.84	0.00
Grass	5.82 Acres	0.21	0.65	0.14
Woods	0.00 Acres	0.00	0.59	0.00
			Weighted 'c':	0.92

VI. $Q=ciA$

<u>Q=</u>	<u>c</u>	<u>I</u>	<u>A</u>	<u>=</u>	<u>Q</u>
$Q_{100} =$	0.92	8.00	27.42	=	201.8
$Q_{25} =$	0.92	6.70	27.42	=	169.0
$Q_{10} =$	0.92	5.80	27.42	=	146.3
$Q_2 =$	0.92	4.20	27.42	=	106.0

APPENDIX B: POST-DEVELOPMENT CONDITION

POST DEVELOPMENT RUNOFF CONDITION

I. Total Drainage Area: 27.42 Acres

II. Soil Groups/Types:	KkoC -Klinesville	<u>Type</u> D
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III. Time of Concentration: 10 Minutes

IV Rainfall Intensity:

<u>Storm</u>	<u>Rainfall(in/hr)</u>
100-YR	8.00
25-YR	6.70
10-YR	5.80
2-YR	4.20
1-YR	3.20

V. Weighted 'c' Calculation:

<u>Land Use</u>	<u>Area</u>	<u>% of Cover</u>	<u>C Value</u>	<u>Total</u>
Impervious	20.14 Acres	0.73	0.99	0.73
Gravel	0.00 Acres	0.00	0.84	0.00
Grass	7.28 Acres	0.27	0.65	0.17
Woods	0.00 Acres	0.00	0.59	0.00
Weighted 'c':				0.90

VI. $Q=ciA$

<u>Q=</u>	<u>c</u>	<u>I</u>	<u>A</u>	<u>=</u>	<u>Q</u>
$Q_{100} =$	0.90	8.00	27.42	=	197.4
$Q_{25} =$	0.90	6.70	27.42	=	165.3
$Q_{10} =$	0.90	5.80	27.42	=	143.1
$Q_2 =$	0.90	4.20	27.42	=	103.6

APPENDIX C: PIPE CALCULATIONS

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLINEVILLE (TYPE 'D')

STRUCTURE	TOTAL AREA (acres)		IMPERVIOUS		'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTED 'C' (F+J+N)
	AREA (acres)	%	AREA (acres)	%	AREA (acres)	%	AREA (acres)	%	AREA (acres)	%	AREA (acres)	%	WOODS 'C'	WOODS 'C'	
A2	0.41	80%	0.33	80%	0.08	20%	0.08	20%	0.65	0.13	0.00	0%	0.59	0.00	0.92
TOTALS	0.41	80%	0.33	80%	0.08	20%	0.08	20%	0.65	0.13	0.00	0%	0.59	0.00	

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	A2	P7	47.00	103.471	0.41	0.92	10.0	6.73	2.54	0.41	10.0	6.73	2.54	0.00	2.54	4.01	15	0.39	3.57	44.50	44.10	0.013

Project File: 2021.019-LINE A.stm

Number of lines: 1

Date: 8/12/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLINEVILLE (TYPE 'D')

STRUCTURE	TOTAL AREA (acres)		IMPERVIOUS		'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTED 'C' (F+J+N)
	TOTAL AREA (acres)	%	AREA (acres)	%	'C'	IMPERV 'C'	AREA (acres)	%	'C'	GRASS 'C'	AREA (acres)	%	'C'	WOODS 'C'	
B2	0.05	100%	0.05	100%	0.99	0.99	0.00	0%	0.65	0.00	0.00	0%	0.59	0.00	0.99
B3	0.38	79%	0.30	79%	0.99	0.78	0.08	21%	0.65	0.14	0.00	0%	0.59	0.00	0.92
TOTALS	0.43	81%	0.35	81%	0.99	0.81	0.08	19%	0.65	0.12	0.00	0%	0.59	0.00	

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Dmg Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	B2	P27	47.10	140.777	0.05	0.99	10.0	6.73	0.33	0.43	10.5	6.58	2.63	0.00	2.63	6.44	15	0.99	4.08	43.00	41.60	0.013
2	B3	P26	47.20	58.245	0.38	0.92	10.0	6.73	2.35	0.38	10.0	6.73	2.35	0.00	2.35	3.78	15	0.34	3.25	44.70	44.50	0.013

Project File: 2021.019-LINE B.sim

Number of lines: 2

Date: 8/12/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLINEVILLE (TYPE 'D')

STRUCTUR	TOTAL AREA (acres)		IMPERVIOUS		'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTE D 'C'
	AREA (acres)	%	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	
C2.1	0.22	100%	0.22	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C2.2	0.23	100%	0.23	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C2.3	0.04	100%	0.04	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C2.4	0.07	100%	0.07	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C2.5	0.05	100%	0.05	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C2.6	0.05	100%	0.05	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C4	0.26	100%	0.26	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C4.1	0.26	100%	0.26	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C5	0.03	100%	0.03	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C6	0.02	100%	0.02	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C7	0.03	100%	0.03	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C8	0.05	100%	0.05	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C9	0.05	100%	0.05	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C10	0.04	100%	0.04	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
C11	0.06	100%	0.06	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
TOTALS	1.46	100%	1.46	100%	0.99	0.99	0.00	0%	0.65	0.00	0.00	0%	0.59	0.00	0.99

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	C2	P30	47.50	150.973	0.00	0.00	0.0	0.00	0.00	1.46	12.4	6.08	8.79	0.00	8.79	15.94	24	0.50	5.20	39.75	39.00	0.013
2	C3	P39	48.10	89.646	0.00	0.00	0.0	0.00	0.00	0.80	11.7	6.26	4.96	0.00	4.96	6.47	15	1.00	5.52	41.90	41.00	0.013
3	C4	P38	48.25	73.686	0.26	0.99	10.0	6.73	1.73	0.80	11.4	6.34	5.02	0.00	5.02	6.51	15	1.02	5.56	42.75	42.00	0.013
4	C5	P37	48.70	49.168	0.03	0.99	10.0	6.73	0.20	0.28	11.1	6.43	1.78	0.00	1.78	4.67	12	1.02	3.25	43.35	42.85	0.010
5	C6	P36	48.70	20.813	0.02	0.99	10.0	6.73	0.13	0.25	11.0	6.45	1.60	0.00	1.60	1.72	8	1.20	5.25	43.70	43.45	0.010
6	C7	P35	48.70	20.813	0.03	0.99	10.0	6.73	0.20	0.23	10.9	6.47	1.47	0.00	1.47	1.72	8	1.20	5.03	44.05	43.80	0.010
7	C8	P34	48.80	35.128	0.05	0.99	10.0	6.73	0.33	0.20	10.7	6.52	1.29	0.00	1.29	1.57	8	1.00	4.61	44.50	44.15	0.010
8	C9	P33	48.80	26.000	0.05	0.99	10.0	6.73	0.33	0.15	10.6	6.56	0.97	0.00	0.97	1.69	8	1.15	3.87	44.90	44.60	0.010
9	C10	P32	48.70	32.170	0.04	0.99	10.0	6.73	0.27	0.10	10.3	6.64	0.66	0.00	0.66	1.64	8	1.09	3.26	45.35	45.00	0.010
10	C11	P31	48.70	20.813	0.06	0.99	10.0	6.73	0.40	0.06	10.0	6.73	0.40	0.00	0.40	1.72	8	1.20	2.77	45.70	45.45	0.010
11	C4.1	P40	48.25	41.625	0.26	0.99	10.0	6.73	1.73	0.26	10.0	6.73	1.73	0.00	1.73	6.71	15	1.08	4.08	45.25	44.80	0.013
12	C2.1	P24	48.25	48.742	0.22	0.99	10.0	6.73	1.47	0.66	12.2	6.14	4.01	0.00	4.01	6.54	15	1.03	5.18	42.70	42.20	0.013
13	C2.2	P23	48.25	26.513	0.23	0.99	10.0	6.73	1.53	0.44	12.0	6.18	2.69	0.00	2.69	6.87	15	1.13	3.93	43.10	42.80	0.013
14	C2.3	P22	48.25	53.000	0.04	0.99	10.0	6.73	0.27	0.21	11.2	6.39	1.33	0.00	1.33	6.58	15	1.04	2.90	43.75	43.20	0.013
15	C2.4	P21	48.25	33.697	0.07	0.99	10.0	6.73	0.47	0.17	11.0	6.43	1.08	0.00	1.08	1.60	8	1.04	4.42	44.20	43.85	0.010
16	C2.5	P20	48.25	42.725	0.05	0.99	10.0	6.73	0.33	0.10	10.7	6.54	0.65	0.00	0.65	1.61	8	1.05	3.09	44.75	44.30	0.010
17	C2.6	P19	48.25	37.882	0.05	0.99	10.0	6.73	0.33	0.05	10.0	6.73	0.33	0.00	0.33	1.61	8	1.06	2.48	45.25	44.85	0.010

Project File: 2021.019-LINE C.stm

Number of lines: 17

Date: 8/12/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLINEVILLE (TYPE 'D')

STRUCTURE	TOTAL AREA (acres)		IMPERVIOUS		'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTED 'C' (F+J+N)
	AREA (acres)	%	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	
D4	0.08	100%	0.08	100%	0.08	0.99	0.00	0%	0.00	0.65	0.00	0%	0.00	0.59	0.99
TOTALS	0.08	100%	0.08	100%	0.08	0.99	0.00	0%	0.00	0.65	0.00	0%	0.00	0.59	0.99

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	D1	P43	47.30	19.876	0.00	0.00	0.0	0.00	0.00	0.08	15.6	5.44	0.43	0.00	0.43	16.04	24	0.50	2.20	38.90	38.80	0.013
2	D2	P42	47.00	15.704	0.00	0.00	0.0	0.00	0.00	0.08	14.0	5.73	0.45	0.00	0.45	22.11	24	0.96	2.51	39.15	39.00	0.013
3	D3	P41	45.54	16.272	0.00	0.00	0.0	0.00	0.00	0.08	12.4	6.09	0.48	0.00	0.48	21.72	24	0.92	2.34	39.30	39.15	0.013
4	D4	P25	47.70	62.663	0.08	0.99	10.0	6.73	0.53	0.08	10.0	6.73	0.53	0.00	0.53	10.32	15	2.55	3.48	43.70	42.10	0.013

Project File: 2021.019-LINE D.stm

Number of lines: 4

Date: 8/12/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLINEVILLE (TYPE 'D')

STRUCTUR	TOTAL AREA (acres)		IMPERVIOUS 'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTE D 'C'
	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	WOODS 'C'	WOODS 'C'	
E1	0.19	47%	0.09	0.99	0.10	53%	0.65	0.34	0.00	0%	0.59	0.00	0.81
TOTALS	0.19	47%	0.09	0.99	0.10	53%	0.65	0.34	0.00	0%	0.59	0.00	

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr. Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	E2	P1	43.10	32.822	0.19	0.81	10.0	6.73	1.04	0.19	10.0	6.73	1.04	0.00	1.04	6.17	15	0.91	3.06	39.50	39.20	0.013

Project File: 2021.019-LINE E.stm

Number of lines: 1

Date: 8/5/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

2021.019-RUTGERS PLAZA - WEIGHTED 'C' VALUES

SOIL TYPE(S) : (KkoC) KLVNESVILLE (TYPE 'D')

STRUCTUR	TOTAL AREA (acres)		IMPERVIOUS		'C' = 0.99		GRASS		'C' = 0.65		WOODS		'C' = 0.59		TOTAL WEIGHTE D 'C'
	AREA (acres)	%	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	AREA (acres)	%	AREA (acres)	'C'	
F2.1	0.63	100%	0.63	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
F2.1	0.39	100%	0.39	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
F3	0.74	100%	0.74	100%	0.99	0.99		0%	0.65	0.00		0%	0.59	0.00	0.99
TOTALS	1.76	100%	1.76	100%	0.99	0.99	0.00	0%	0.65	0.00	0.00	0%	0.59	0.00	0.99

Pipe Calc

Line No.	Inlet ID	Line ID	Gnd/Rim El Up (ft)	Line Length (ft)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	i Inlet (in/hr)	Incr Q (cfs)	Total Area (ac)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Line Size (in)	Line Slope (%)	Vel Ave (ft/s)	Invert Up (ft)	Invert Dn (ft)	n-val Pipe
1	F2	P3	39.50	12.811	0.39	0.99	10.0	6.73	2.60	1.76	10.4	6.62	11.54	0.00	11.54	14.67	18	1.95	7.12	35.65	35.40	0.013
2	F2.1	P5	39.50	31.807	0.63	0.99	10.0	6.73	4.20	0.63	10.0	6.73	4.20	0.00	4.20	6.27	15	0.94	3.56	35.95	35.65	0.013
3	F3	P2	40.75	90.193	0.74	0.99	10.0	6.73	4.93	0.74	10.0	6.73	4.93	0.00	4.93	6.45	15	1.00	4.62	36.55	35.65	0.013

Project File: 2021.019-LINE F.stm

Number of lines: 3

Date: 8/5/2021

NOTES: Intensity = 42.39 / (Inlet time + 5.10) ^ 0.68 -- Return period = 25 Yrs. ; ** Critical depth

APPENDIX D: WATER QUALITY CALCULATIONS



WQ DEVICE #1



WQ DEVICE #2



Routing Diagram for 2021.019-Rutgers Plaza-WQ
Prepared by Menlo Engineering Associates, Inc, Printed 8/13/2021
HydroCAD® 10.10-4b s/n 01129 © 2020 HydroCAD Software Solutions LLC

2021.019-Rutgers Plaza-WQ

Prepared by Menlo Engineering Associates, Inc
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WQ STORM
NJ DEP 2-hr Rainfall=1.25"
Printed 8/13/2021
Page 6

Summary for Subcatchment 1S: WQ DEVICE #1

Runoff = 2.14 cfs @ 1.16 hrs, Volume= 0.076 af, Depth= 0.49"

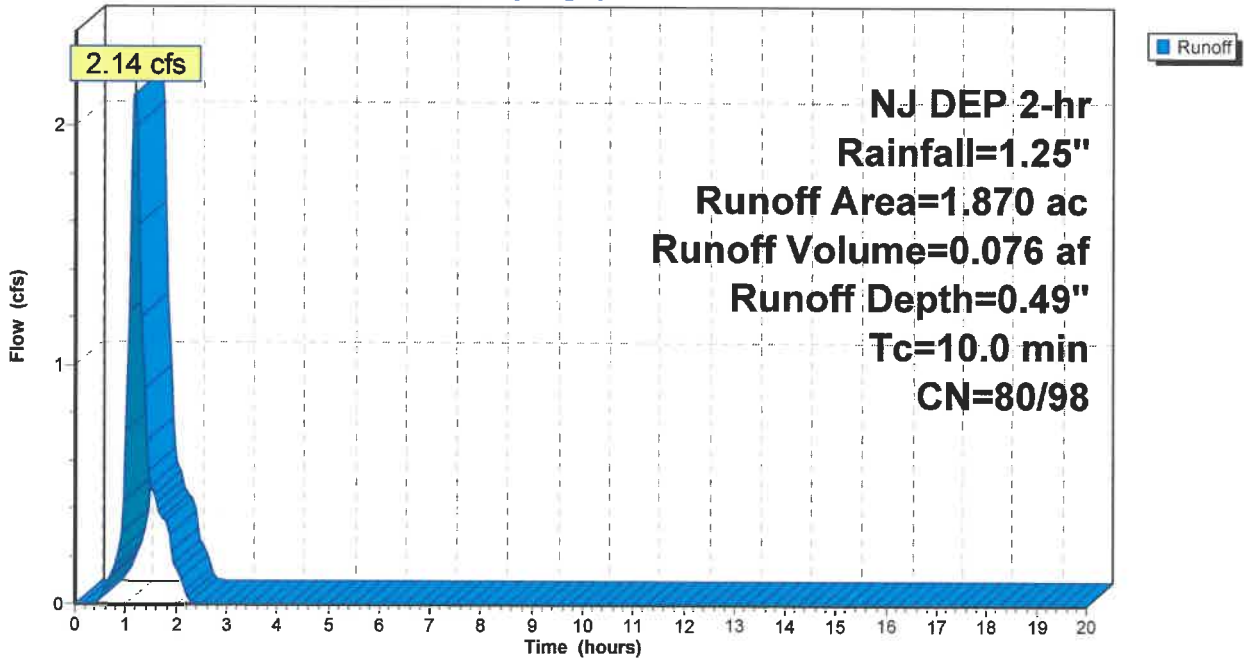
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr Rainfall=1.25"

Area (ac)	CN	Description
0.600	98	Paved parking, HSG D
1.190	80	>75% Grass cover, Good, HSG D
* 0.080	98	Concrete
1.870	87	Weighted Average
1.190	80	63.64% Pervious Area
0.680	98	36.36% Impervious Area

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

Subcatchment 1S: WQ DEVICE #1

Hydrograph



2021.019-Rutgers Plaza-WQ

Prepared by Menlo Engineering Associates, Inc
 HydroCAD® 10.10-4b s/n 01129 © 2020 HydroCAD Software Solutions LLC

WQ STORM
 NJ DEP 2-hr Rainfall=1.25"
 Printed 8/13/2021
 Page 7

Summary for Subcatchment 2S: WQ DEVICE #2

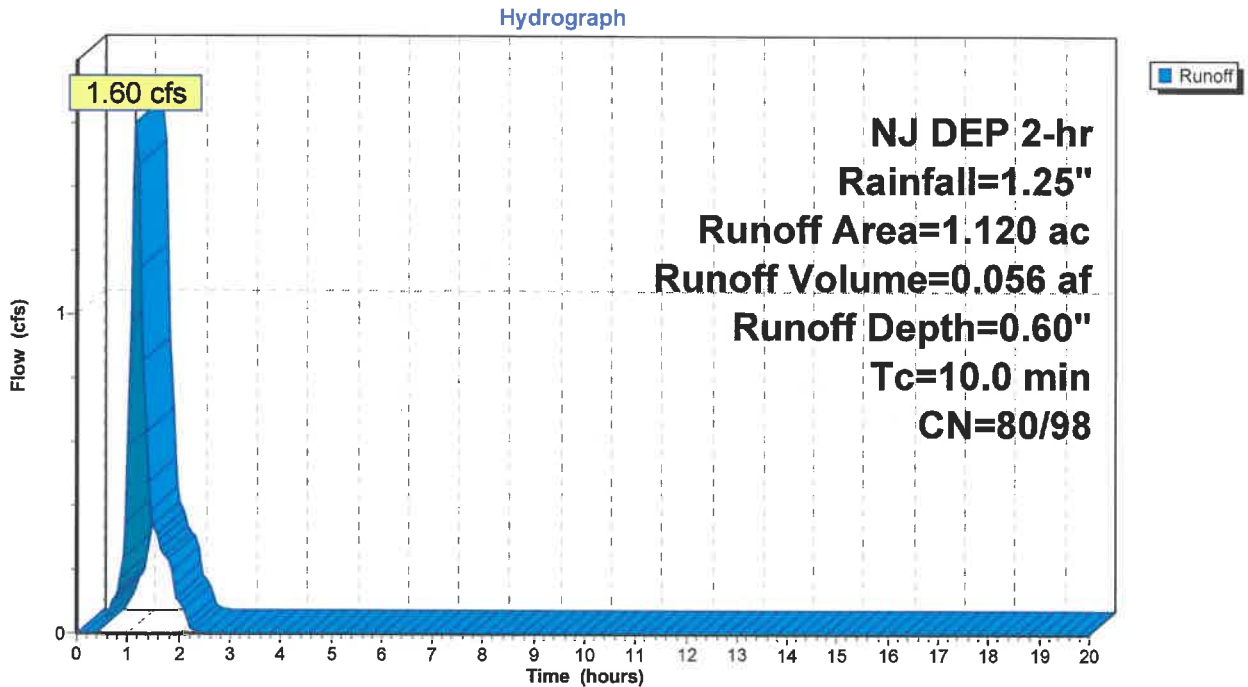
Runoff = 1.60 cfs @ 1.16 hrs, Volume= 0.056 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
 NJ DEP 2-hr Rainfall=1.25"

Area (ac)	CN	Description
0.500	98	Paved parking, HSG D
0.570	80	>75% Grass cover, Good, HSG D
* 0.050	98	Concrete
1.120	89	Weighted Average
0.570	80	50.89% Pervious Area
0.550	98	49.11% Impervious Area

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

Subcatchment 2S: WQ DEVICE #2





State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control

Division of Water Quality

401-02B

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Trenton, New Jersey 08625-0420

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http://www.state.nj.us/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. MCCABE
Commissioner

May 18, 2020

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Cascade Separator™
On-line Installation

TSS Removal Rate 50%

Dear Mr. Berg:

This revised certification letter supersedes the Department's prior certification dated October 1, 2019. This revision was completed to reflect Contech's enhanced fabrication capability to manufacture a smaller-size unit of its the Cascade Separator™ Manufactured Treatment Device (MTD), while still meeting the scaling methodology as agreed upon by the manufacturers' working group on September 19, 2016. Based on this modification, Table A-1 of the New Jersey Corporation for Advanced Technology (NJCAT) Verification report located at <http://www.njcat.org/uploads/newDocs/NJCATTechnologyVerificationFinal.pdf> has been revised to specify this smaller unit and associated maximum treatment flow rate. Table 1 below has been revised to reflect this same updated model size and flow rate.

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions, LLC (Contech) has requested an MTD Laboratory Certification for the Cascade Separator™ stormwater treatment system.

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25,

2013. The applicable protocol is the “New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device” dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated September 2019) for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

The NJDEP certifies the use of the Cascade Separator™ stormwater treatment system at a TSS removal rate of 50% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.
2. The Cascade Separator™ shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.
3. This Cascade Separator™ cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.
5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Cascade Separator™. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at <https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Cascade-Maintenance%20Guide.pdf?ver=2018-11-05-093254-300> for any changes to the maintenance requirements.
6. Sizing Requirement:

The example below demonstrates the sizing procedure for the Cascade Separator™:

Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using a Cascade Separator™. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
 $i = 3.2$ in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
 $c = 0.99$ (runoff coefficient for impervious)
 $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

Given the site runoff is 0.79 cfs and based on Table A-1 below, the Cascade Separator™ Model CS-3 with an MTFR of 1.02 cfs would be the smallest model approved that could be used for this site to remove 50% of the TSS from the impervious area without exceeding the MTFR.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Table A-1.

Table A-1 Cascade Separator™ Models and Associated MTFRs

Model	Manhole Diameter (ft)	MTFR (cfs)	50% Maximum Sediment Storage Area Volume (ft ³)
CS-3	3	1.02	5.3
CS-4	4	1.80	9.4
CS-5	5	2.81	14.7
CS-6	6	4.05	21.2
CS-8	8	7.20	37.7
CS-10	10	11.3	58.9
CS-12	12	16.2	84.8

A detailed maintenance plan is mandatory for any project with a stormwater BMP subject to the Stormwater Management rules under N.J.A.C. 7:8. The plan must include all of the items identified in the Maintenance requirements section of the Stormwater Management rules under N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Brian Salvo of my office at (609) 633-7021.

Sincerely,



Gabriel Mahon, Chief
 Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Jim Murphy, NJDEP-BNPC
Vince Mazzei, NJDEP-DLUR
Brian Salvo, NJDEP-BNPC

APPENDIX E: DRAINAGE AREA MAPS