

DRAINAGE REPORT

**SITEPLAN
20-32 SYLVAN AVENUE
Block 201 Lots 10-14 & Block 205 Lots 1,2, & 4
Borough of Englewood Cliffs
BERGEN COUNTY, NJ**

**November 22, 2024
Revised July 16, 2025**

**COLLAZUOL ENGINEERING & SURVEYING ASSOCIATES, LLC
PROFESSIONAL ENGINEERS - LAND SURVEYORS - PLANNERS**

**1610 CENTER AVENUE
FORT LEE, NJ 07024
201-944-7774**

**120 1/2 NO. BROADWAY
NYACK, NY 10960
845-358-1510**

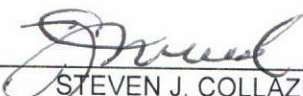

STEVEN J. COLLAZUOL
**PROFESSIONAL ENGINEER & LAND SURVEYOR
N.J. P.E. LICENSE NO. 31,265**

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INTRODUCTION

THE FOLLOWING CALCULATIONS UTILIZE THE NRCS METHOD TO DETERMINE THE EXISTING RATE OF STORM-WATER RUNOFF AND THE PROPOSED INCREASE IN RUNOFF DUE TO THE REDEVELOPMENT OF THE SITE. STORMWATER MANAGEMENT MEASURES WERE DESIGNED SO THAT THE POST CONSTRUCTION PEAK RUNOFF RATES FOR THE 2, 10, & 100 YEAR STORM EVENTS. GROUNDWATER RECHARGE REQUIREMENTS DO NOT APPLY SINCE THE SUBJECT PROPERTY IS LOCATED WITHIN THE URBAN REDEVELOPMENT AREA.

EXISTING CONDITIONS

THE EXISTING SITE KNOWN AS LOTS 10-14 BLOCK 201 & LOTS 1,2, & 4 BLOCK 205, IS LOCATED ON THE EASTERLY SIDE OF SYLVAN AVENUE & SOUTHERLY SIDE OF BAYVIEW AVENUE IN THE BOROUGH OF ENGLEWOOD CLIFFS, BERGEN COUNTY, NJ. THE SITE CURRENTLY CONTAINS OFFICE(S), DWELLING(S), GARAGE (S, PAVEMENT AREAS, STONE/GRAVEL AREAS AND WOODED AREAS.

PROPOSED DEVELOPMENT

THE PROPOSED DEVELOPMENT OF THE SITE WILL INCLUDE THE REMOVAL OF THE EXISTING BUILDING(S), DWELLING(S), GARAGE(S), PAVEMENT AREAS, STONE/GRAVEL AREAS AND WOODED AREAS FOR THE CONSTRUCTION OF A PROPOSED 3 STORY COMMERCIAL/ MULTI -FAMILY RESIDENTIAL BUILDING WITH A PARKING AREA IN THE REAR OF THE PROPOSED BUILDING. VEHICLE ACCESS WILL BE FROM BAYVIEW AVENUE.

PROPOSED STORMWATER

THE PROPOSED BUILDING AND PARKING AREA WILL INCREASE THE AMOUNT OF STORMWATER RUNOFF. A PROPOSED DETENTION BASIN HAS BEEN PROVIDED TO DETAIN THE STORMWATER FLOWS. THE PROPOSED DETENTION BASIN WILL SERVE TO STORE THE RUNOFF AND DISCHARGE INTO (2) PROPOSED STORMFILTER VAULTS AND THEN DISCHARGE TO A PROPOSED CATCH BASIN IN BAYVIEW AVENUE.

STORMWATER QUALITY

STORMWATER QUALITY MUST BE ADDRESSED IN ACCORDANCE WITH THE STORMWATER MANAGEMENT RULES N.J.A.C. 7:8. STORMFILTER VAULTS HAVE BEEN CHOSEN TO TREAT THE RUNOFF FROM THE PROPOSED BUILDING, PARKING AREA, AND LANDSCAPED AREAS.

STORMWATER MANAGEMENT SUMMARY DETENTION BASIN

<u>Design Storm</u>	<u>Existing Runoff</u>	<u>Post Developed Runoff</u>
	<u>CFS</u>	<u>CFS</u>
Basin A		
2-year	2.86	1.99
10-year	5.16	4.28
100-year	9.77	7.87

SECTION 1

BASIN 'A'

30365 Existing

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Page 1

Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 1162 NJ Bergen-D
Rainfall events imported from "NRCS2-Rain.txt" for 1162 NJ Bergen-D
Rainfall events imported from "NRCS2-Rain.txt" for 1162 NJ Bergen-D

30365 Existing

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.34	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.07	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.47	2

Summary for Reach 2R: North east corner

overland to wooded area

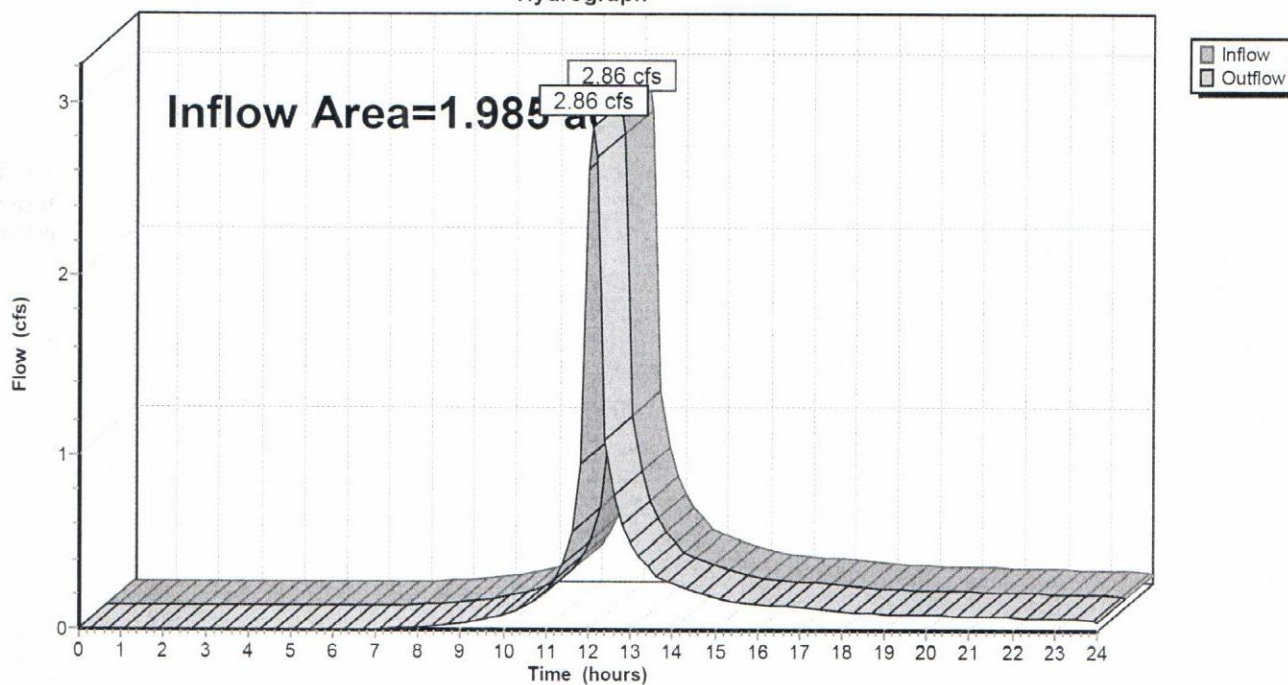
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.985 ac, 32.84% Impervious, Inflow Depth > 1.88" for 2-Year event
Inflow = 2.86 cfs @ 12.11 hrs, Volume= 0.311 af
Outflow = 2.86 cfs @ 12.11 hrs, Volume= 0.311 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.20 hrs

Reach 2R: North east corner

Hydrograph



30365 Existing

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NOAA 24-hr D 10-Year Rainfall=5.07"

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Summary for Reach 2R: North east corner

overland to wooded area

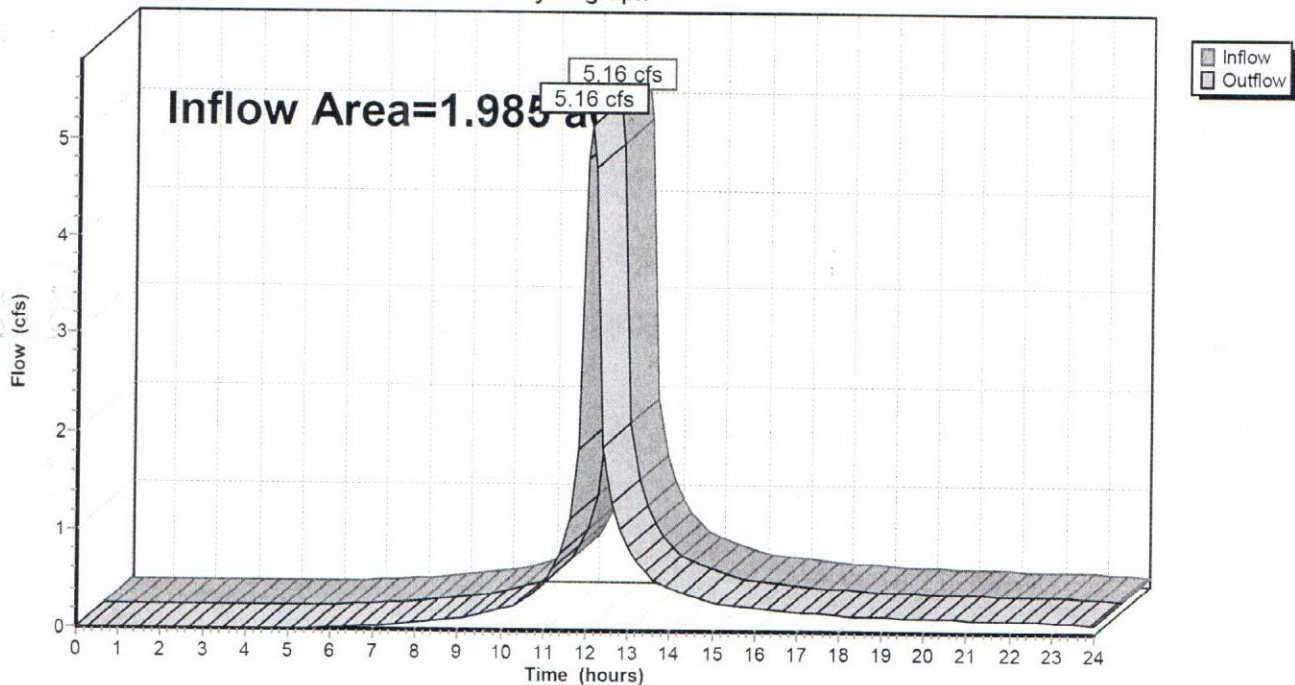
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.985 ac, 32.84% Impervious, Inflow Depth > 3.43" for 10-Year event
Inflow = 5.16 cfs @ 12.09 hrs, Volume= 0.568 af
Outflow = 5.16 cfs @ 12.09 hrs, Volume= 0.568 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.20 hrs

Reach 2R: North east corner

Hydrograph



30365 Existing

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NOAA 24-hr D 100-Year Rainfall=8.47"

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Summary for Reach 2R: North east corner

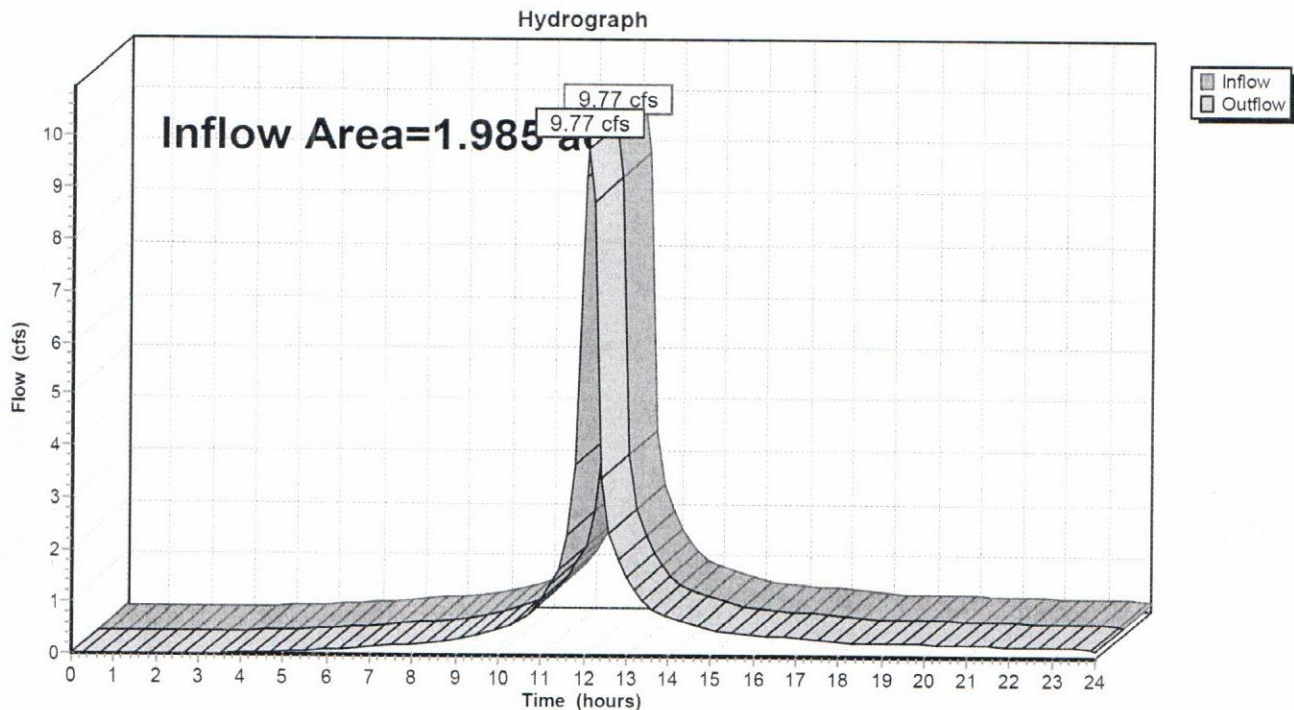
overland to wooded area

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.985 ac, 32.84% Impervious, Inflow Depth > 6.67" for 100-Year event
Inflow = 9.77 cfs @ 12.08 hrs, Volume= 1.103 af
Outflow = 9.77 cfs @ 12.08 hrs, Volume= 1.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.20 hrs

Reach 2R: North east corner



30365 Prop Basin East 2

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Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 1162 NJ Bergen-D

Rainfall events imported from "NRCS2-Rain.txt" for 1162 NJ Bergen-D

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.34	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.07	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.47	2

30365 Prop Basin East 2

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NOAA 24-hr D 2-Year Rainfall=3.34"

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Summary for Pond 2P: Basin A

Outlet Control

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 86,456 sf, 84.45% Impervious, Inflow Depth > 2.80" for 2-Year event
 Inflow = 3.97 cfs @ 12.01 hrs, Volume= 20,171 cf
 Outflow = 1.99 cfs @ 12.34 hrs, Volume= 20,164 cf, Atten= 50%, Lag= 19.8 min
 Primary = 1.99 cfs @ 12.34 hrs, Volume= 20,164 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.30 hrs
 Peak Elev= 357.54' @ 12.34 hrs Surf.Area= 4,837 sf Storage= 4,067 cf

Plug-Flow detention time= 22.5 min calculated for 20,164 cf (100% of inflow)
 Center-of-Mass det. time= 22.3 min (782.5 - 760.3)

Volume	Invert	Avail.Storage	Storage Description
#1	356.50'	7,182 cf	24.0" Round Pipe Storage x 9 L= 254.0'
#2	356.50'	702 cf	Concrete Galley 4x4x3 @ 30.00' L x 3 Inside= 42.0"W x 30.0"H => 8.91 sf x 26.25'L = 233.9 cf Outside= 48.0"W x 36.0"H => 10.81 sf x 30.00'L = 324.3 cf
		7,883 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	356.40'	2.5" Vert. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	356.90'	4.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	357.60'	6.0" Vert. Orifice/Grate X 6.00 C= 0.600 Limited to weir flow at low heads
#4	Primary	358.40'	0.7' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.96 cfs @ 12.34 hrs HW=357.52' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.83 cfs @ 4.85 fps)
- 2=Orifice/Grate (Orifice Controls 1.13 cfs @ 3.24 fps)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

30365 Prop Basin East 2

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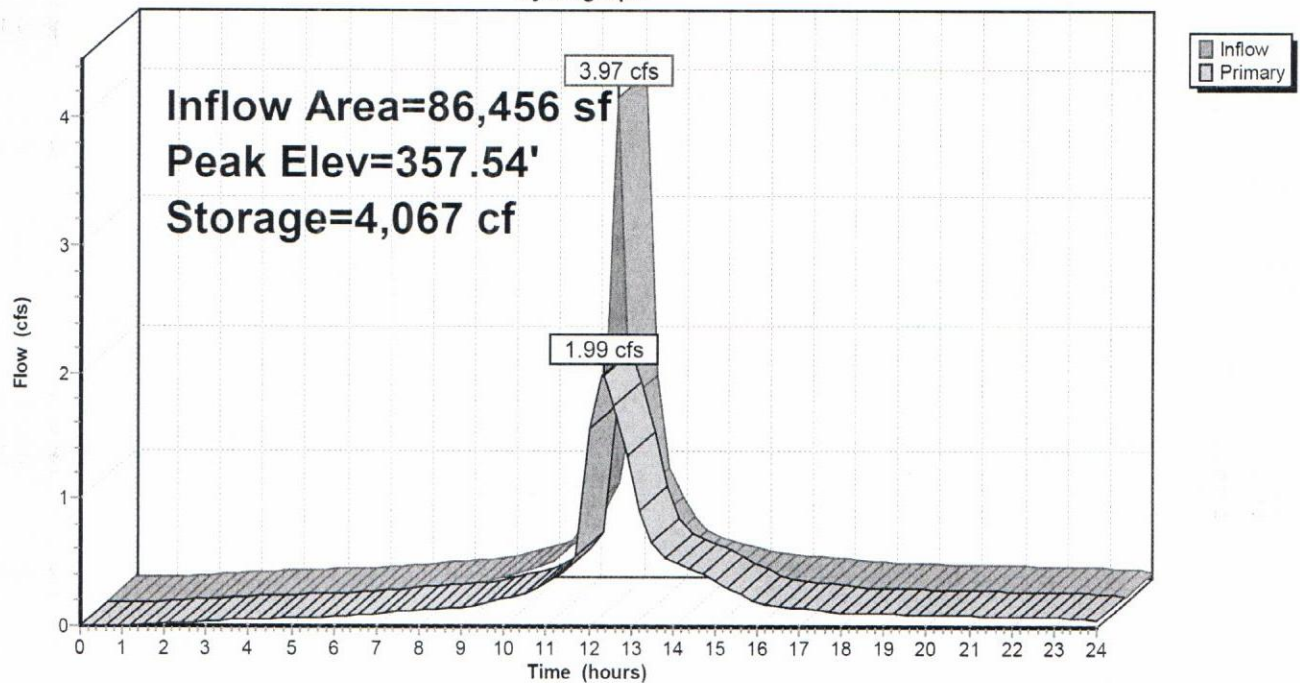
NOAA 24-hr D 2-Year Rainfall=3.34"

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Pond 2P: Basin A

Hydrograph



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NOAA 24-hr D 10-Year Rainfall=5.07"

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Summary for Pond 2P: Basin A

Outlet Control

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 86,456 sf, 84.45% Impervious, Inflow Depth > 4.46" for 10-Year event
Inflow = 6.24 cfs @ 12.01 hrs, Volume= 32,118 cf
Outflow = 4.28 cfs @ 12.29 hrs, Volume= 32,107 cf, Atten= 31%, Lag= 17.0 min
Primary = 4.28 cfs @ 12.29 hrs, Volume= 32,107 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.30 hrs
Peak Elev= 357.94' @ 12.29 hrs Surf.Area= 4,363 sf Storage= 5,961 cf

Plug-Flow detention time= 24.1 min calculated for 31,711 cf (99% of inflow)
Center-of-Mass det. time= 23.6 min (776.7 - 753.1)

Volume	Invert	Avail.Storage	Storage Description
#1	356.50'	7,182 cf	24.0" Round Pipe Storage x 9 L= 254.0'
#2	356.50'	702 cf	Concrete Galley 4x4x3 @ 30.00' L x 3 Inside= 42.0"W x 30.0"H => 8.91 sf x 26.25'L = 233.9 cf Outside= 48.0"W x 36.0"H => 10.81 sf x 30.00'L = 324.3 cf
		7,883 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	356.40'	2.5" Vert. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	356.90'	4.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	357.60'	6.0" Vert. Orifice/Grate X 6.00 C= 0.600 Limited to weir flow at low heads
#4	Primary	358.40'	0.7' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=4.22 cfs @ 12.29 hrs HW=357.94' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 0.98 cfs @ 5.76 fps)
- 2=Orifice/Grate (Orifice Controls 1.57 cfs @ 4.49 fps)
- 3=Orifice/Grate (Orifice Controls 1.67 cfs @ 1.98 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

30365 Prop Basin East 2

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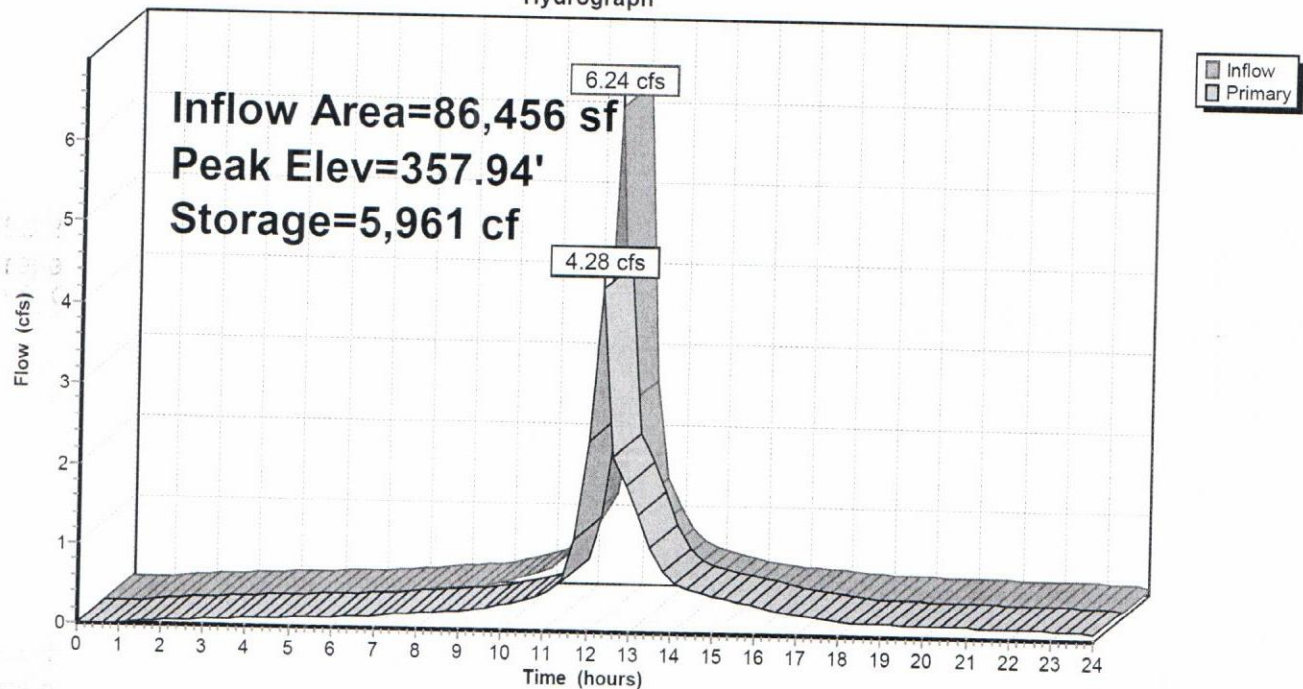
NOAA 24-hr D 10-Year Rainfall=5.07"

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Pond 2P: Basin A

Hydrograph



30365 Prop Basin East 2

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NOAA 24-hr D 100-Year Rainfall=8.47"

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Summary for Pond 2P: Basin A**Outlet Control**

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 86,456 sf, 84.45% Impervious, Inflow Depth > 7.78" for 100-Year event
 Inflow = 10.75 cfs @ 12.01 hrs, Volume= 56,065 cf
 Outflow = 7.87 cfs @ 12.21 hrs, Volume= 56,040 cf, Atten= 27%, Lag= 12.3 min
 Primary = 7.87 cfs @ 12.21 hrs, Volume= 56,040 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.30 hrs
 Peak Elev= 358.49' @ 12.23 hrs Surf.Area= 721 sf Storage= 7,744 cf

Plug-Flow detention time= 24.3 min calculated for 55,349 cf (99% of inflow)
 Center-of-Mass det. time= 23.8 min (769.6 - 745.8)

Volume	Invert	Avail.Storage	Storage Description
#1	356.50'	7,182 cf	24.0" Round Pipe Storage x 9 L= 254.0'
#2	356.50'	702 cf	Concrete Galley 4x4x3 @ 30.00' L x 3 Inside= 42.0"W x 30.0"H => 8.91 sf x 26.25'L = 233.9 cf Outside= 48.0"W x 36.0"H => 10.81 sf x 30.00'L = 324.3 cf
		7,883 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	356.40'	2.5" Vert. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	356.90'	4.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	357.60'	6.0" Vert. Orifice/Grate X 6.00 C= 0.600 Limited to weir flow at low heads
#4	Primary	358.40'	0.7' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=7.31 cfs @ 12.21 hrs HW=358.41' (Free Discharge)

- 1=Orifice/Grate (Orifice Controls 1.13 cfs @ 6.64 fps)
- 2=Orifice/Grate (Orifice Controls 1.94 cfs @ 5.57 fps)
- 3=Orifice/Grate (Orifice Controls 4.23 cfs @ 3.59 fps)
- 4=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.18 fps)

30365 Prop Basin East 2

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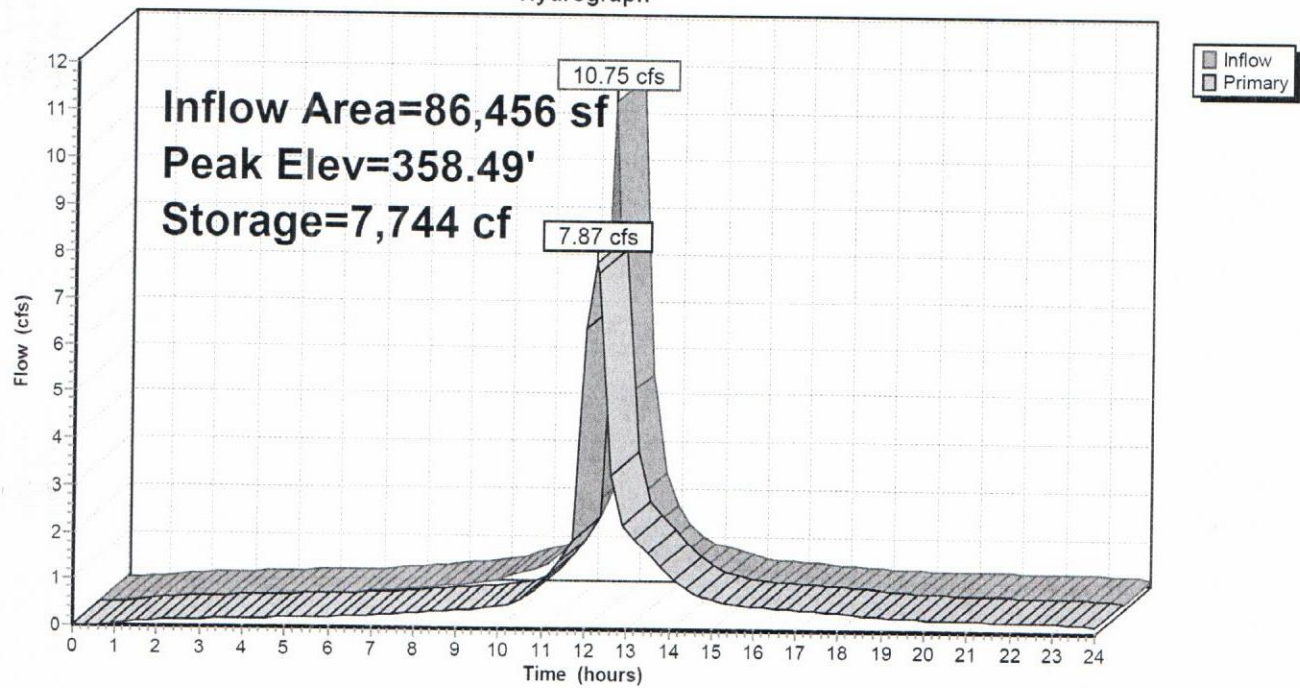
NOAA 24-hr D 100-Year Rainfall=8.47"

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Pond 2P: Basin A

Hydrograph



SECTION 2

STORMFILTER SIZING

20-32 SYLVAN AVE.
Englewood Cliffs, NJ

Stormfilter Sizing Detention Basin
NJDEP Modified Rational Method

$$Q = CIA$$

$$\begin{aligned} C &= 0.9 \\ I &= 3.2 \text{ inches/hr (from Fig. 5.3 } T_c=10\text{min.)} \\ A &= 1.711 \text{ Acres (pavement area \& landscaped area)} \end{aligned}$$

$$Q = 0.9 * 3.2 * 1.711$$

$$Q = 4.93 \text{ cfs}$$

For 80% TSS removal, cartridge flowrate = 22.5 gpm

$$Q = \boxed{2212} \text{ gpm}$$

$$2212 / 22.5 = \boxed{98} \text{ cartridges}$$

98 cartridges needed for 80% TSS removal

Use (2) 10.5' x 24' Stormfilter Vault
Each Vault to contain 50 Cartridges for a Total of 100 Cartridges

SECTION 3

OFFSITE DOWNSTREAM PIPE ANALYSIS

COLLAZUOL ENGINEERING SURVEYING ASSOCIATES

July 16,2025

EXISTING OFFSITE DOWNSTREAM PIPE TABULATION

STRUCTURE TO STRUCTURE	IMPERV. AREA (C=0.99) (S.F.)	PERV. AREA (C=0.41) (S.F.)	WEIGHTED C	25 YR. Q (C.F.S.)	25 YR CUM. Q (C.F.S.)	INVERT UP (FT.)	INVERT DOWN (FT.)	LENGTH (FT.)	SLOPE	PIPE SIZE	Q(CAPACITY) (C.F.S.)	DESIGN CHECK
CB#1 TO CB#2	27,757	6,939	0.87	4.43	4.43	363.94	360.24	75	0.049	18" RCP	23.31	OK
CB#2 TO CB#3	15,330	2,750	0.90	2.39	6.82	360.24	339.26	330	0.064	18" CLAY	26.48	OK
CB#3 TO CB#4	66,638	81,447	0.67	14.58	21.4	339.26	337.4	102	0.0182	15" CLAY	8.73	NOT OK
CB#4 TO CB#5	53,945	58,440	0.69	11.39	32.79	337.4	335.04	43	0.055	18" CLAY	24.6	NOT OK
CB#5 TO CB#6	53,337	51,246	0.71	10.85	43.64	335.04	332.04	128	0.023	18" CLAY	16.06	NOT OK
CB#6 TO MH#1	36,634	29,973	0.73	7.14	50.78	332.04	330.17	78	0.024	18" CLAY	16.27	NOT OK
MH#1 TO CB#7					50.78	330.17	327.86	35	0.066	18" CLAY	26.97	NOT OK

I 25 YEAR= 6.4 IN/HR.

SECTION 4

PIPE CAPACITY CALCULATIONS

TO BE PROVIDED

APPENDIX

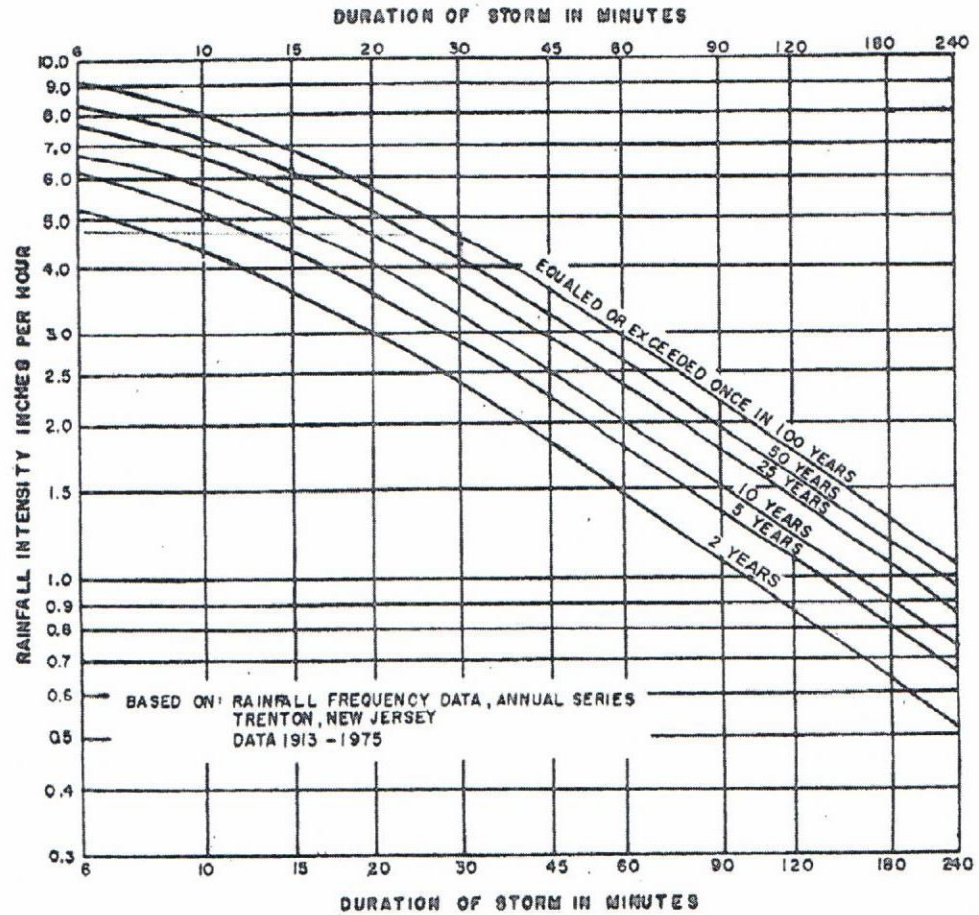
Recommended Coefficient of Runoff Values
for Various Selected Land Uses

Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	without conservation treatment	0.49	0.67	0.81	0.88
	with conservation treatment	0.27	0.43	0.67	0.67
Pasture or Range Land Meadow	poor condition	0.38	0.63	0.78	0.84
	good condition	---	0.25	0.51	0.65
	good condition	---	---	0.41	0.61
Wood or Forest Land	thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	good cover	---	---	0.45	0.59
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries	Good Condition				
	Fair Condition				
	grass cover on 75% or more	---	0.25	0.51	0.65
	grass cover on 50% to 75%	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial Districts	72% impervious	0.67	0.81	0.88	0.92
Residential	average % impervious				
Average Lot Size (acres)					
1/8	65	0.59	0.76	0.86	0.90
1/4	38	0.29	0.55	0.70	0.80
1/3	30	---	0.49	0.67	0.78
1/2	25	---	0.45	0.65	0.76
1	20	---	0.41	0.63	0.74
Paved Areas	parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.99
Streets and Roads	paved with curbs & storm sewers	0.99	0.99	0.99	0.99
	gravel	0.57	0.76	0.84	0.88
	dirt	0.49	0.69	0.80	0.84

NOTE: Values are based on NRCS (formerly the SCS) definitions and are average values.

Source: Technical Manual for Land Use Regulation Program, Bureau of Inland and Coastal Regulations, Stream Encroachment Permits, New Jersey Department of Environmental Protection

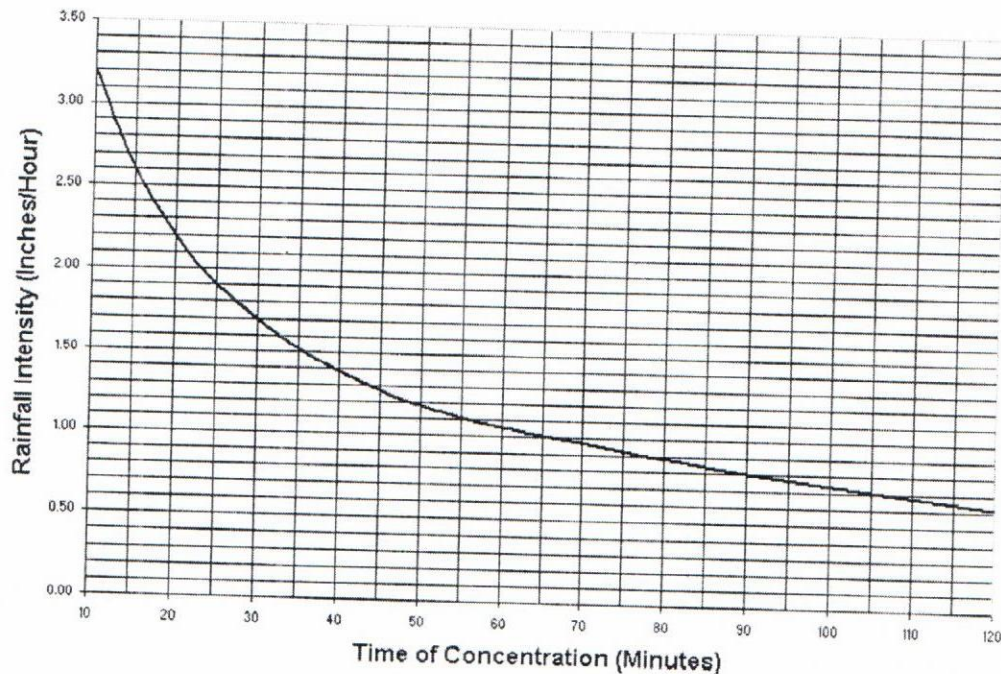
FIGURE 7.2 RAINFALL INTENSITY CURVES



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits*.

Figure 5-3 was prepared for those using the Rational Method to compute stormwater quality design storm runoff peaks. It presents the stormwater quality design storm as a rainfall intensity-duration curve that allows the user to determine the appropriate rainfall intensity for the selected time of concentration.

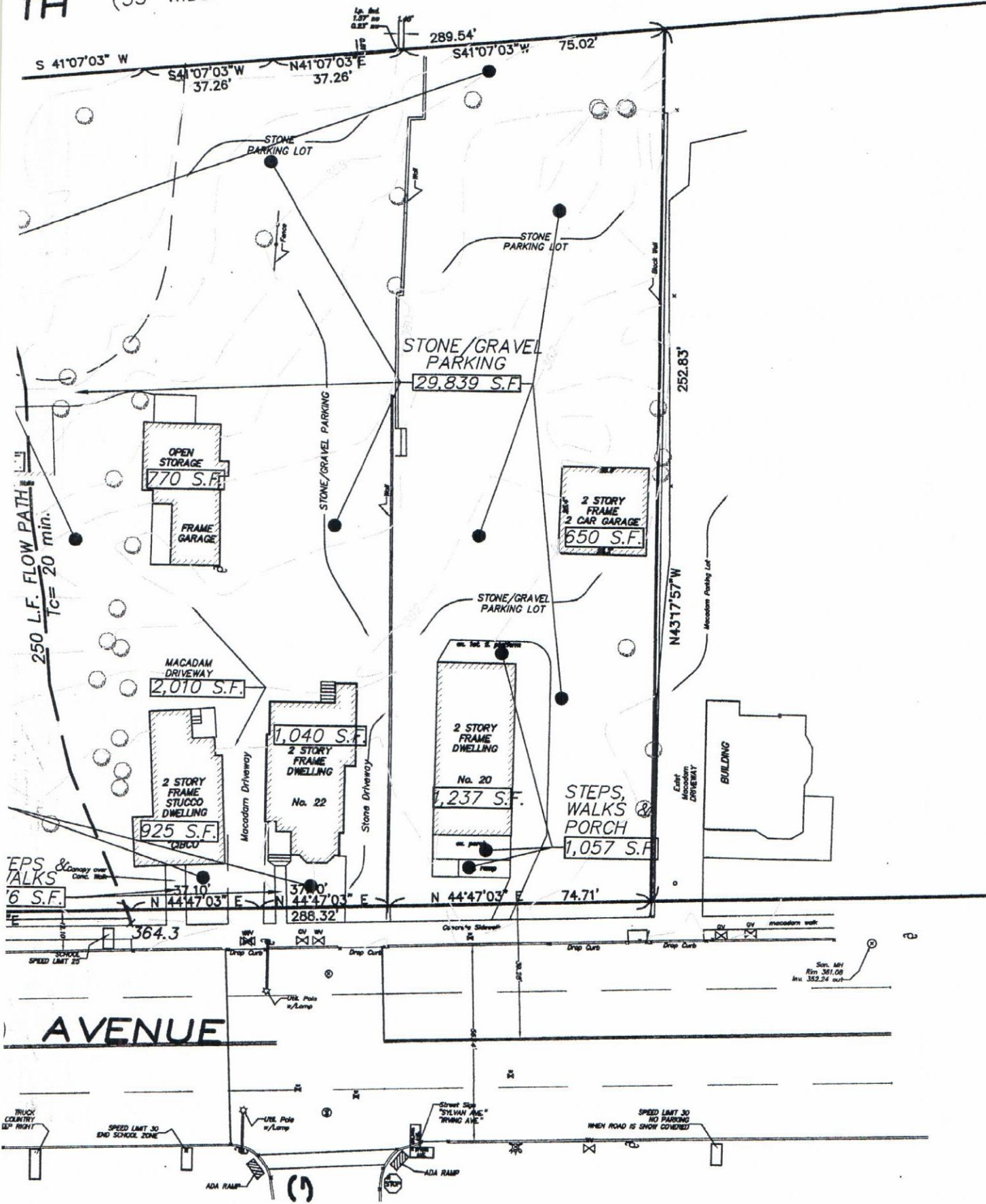
**Figure 5-3: NJDEP 1.25-Inch/2-Hour Stormwater Quality Design Storm
Rainfall Intensity-Duration Curve**

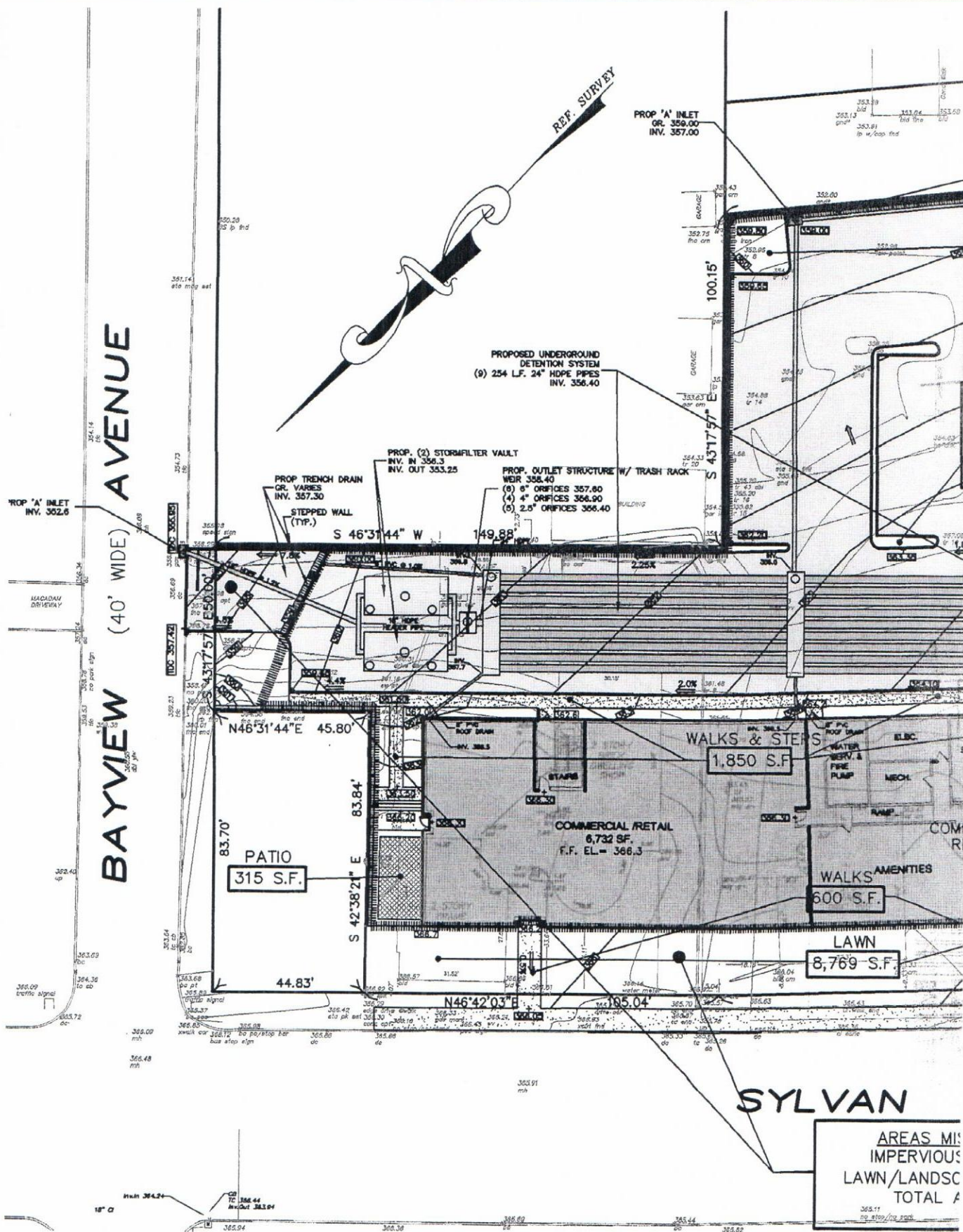


Finally, when using the Modified Rational Method to compute a stormwater quality design storm hydrograph, the entire 2-hour storm duration at an average intensity of 0.625-inches/hour can be used. Example 5-1 below demonstrates this procedure.

Important Note: While the stormwater quality design storm actually falls in a variable pattern, use of the 2-hour average rate described above and demonstrated in Example 5-1 is consistent with the assumptions of the Modified Rational Method. In addition, analysis and experience has shown that the structural BMPs that store and slowly release the stormwater quality design storm hydrograph (such as extended detention basins, wet ponds, bioretention facilities, constructed wetlands, and sand filters) are not particularly sensitive to rainfall pattern. If such sensitivity does exist for a particular BMP, the designer should use the NRCS methodology, which allows for consideration of the stormwater quality design storm's variable rainfall pattern.

TH (33' WIDE - UNIMPROVED) STREET





PROPOSED CONDITIONS MAP

SCALE 1" = 40'

