STORMWATER MANAGEMENT REPORT

for

AMENDED PRELIMINARY & FINAL MAJOR SITE PLAN

Prepared for:

LINDEN DEVELOPMENT, LLC.
PROPOSED FREDDY'S FROZEN CUSTARD & STEAKBURGERS WITH DRIVE-THRU

Block 469, Lot 38.05
Pleasant Street and Edgar Road (N.J.S.H. Route 1 & 9)
Union County
City of Linden, New Jersey

Prepared by:

BOHLER

N.J. Certificate of Authorization 24GA28161700

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BENJ File No. JS200709

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July 2020

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Appendices

A. Pre- vs. Post-Development Hydrographs

- Drainage Diagram
- 2-Year Storm Event
- 10-Year Storm Event
- 25-Year Storm Event
- 100-Year Storm Event

B. Design Calculations

- Pipe Sizing Calculations

C. Maps

- Tax Map
- Aerial Map
- Soil Map
- Depth to Water Table Map
- State Planning Area Map
- USGS
- HUC-14 Map
- FEMA Firm Map
- Drainage Area Maps
    - Proposed Drainage Areas Map
    - Proposed Inlet Areas Map

Memorandum

The purpose of this study is to analyze the stormwater drainage conditions that will occur as a result of the proposed Freddy's Frozen Custard & Steakburgers (Freddy's). The Freddy's will include one restaurant building with drive-thru, parking areas, stormwater conveyance and utility systems, landscaping, lighting and other ancillary improvements. The subject site is situated along the intersection of Pleasant Street and Route 1 & 9, within the City of Linden, in the County of Union, New Jersey. The subject site is part of an overall development more specifically defined as Block 469, Lots 38.05 and 38.06 and has a total area of 42.54 Acres.

This report is prepared as an amendment to the Stormwater Management Report for the Proposed Retail Development dated March 2014 and revised through January 2018 previously approved as part of Planning Board Application No. SP-1034-14 and the Stormwater Management Report Amended Preliminary & Final Major Site Plan for Phase 2 and Amended Preliminary Major Site Plan for Phase 3 dated March 2019 previously approved as part of Planning Board Application No. SP-1099-19. Applications No. SP-1034-14 and No. SP-1099-19 achieved compliance with applicable stormwater regulations by reducing the impervious cover from 100% to 90% which is the maximum impervious coverage allowed in the PCD Zone. Lot 38.05, involved in the current application, is part of Proposed Drainage Areas #1 and #2 in the referenced applications. Please refer to Proposed Drainage Areas Map in the appendix for more information.

Proposed Drainage Area #1:

Proposed Drainage Area 1 consists of 1,192,380 SF of impervious surfaces and 90,272 SF of grassed and landscaped areas. This area is tributary to Pleasant Street right-of-way and ultimately is conveyed to the Linden Avenue drainage system, similar to EDA-1. Runoff from this area will sheet-flow to and be collected in the proposed inlets within the parking areas of the site and conveyed into the existing stormwater system within Pleasant Street. A time of concentration of 13.4 minutes was utilized for this area per the maximum time of concentration calculated in the pipe calculations included in the previously approved Planning Board Application No. SP-1099-19. The additional grassed and landscaped areas provide for natural and non-structural means of water quality as well as an overall reduction in flow to the existing drainage system.

Proposed Drainage Area #2:

Proposed Drainage Area 2 consists of 475,563 SF of impervious surfaces and 95,055 SF of grass and landscaped areas. This area is tributary to the Route 1 & 9 right-of-way. A portion of the runoff from this area will sheet-flow directly to the Route 1 & 9 right-of-way, and the other portion will sheet-flow to, and be collected in the proposed inlets within the parking areas of the site and conveyed into the existing stormwater system within Route 1 & 9. A time of concentration of 13.4 minutes was utilized for this area per the maximum time of concentration calculated in the pipe calculations included in the previously approved Planning Board Application No. SP-1099-19. The additional grassed and landscaped areas provide for natural and non-structural means of water quality as well as an overall reduction in flow to the existing drainage system.

Conclusion:

The current application proposes 1,667,943 SF of impervious coverage which equates to 90.00% of Block 468, Lots 38.05& 38.06, therefore, the proposed improvements conform with the conditions approved under Applications No. SP-1034-14 and No. SP-1099-19. The stormwater design calculations have been updated accordingly and are attached along with stormwater conveyance calculations, the Proposed Drainage Areas Map and the Proposed Inlet Areas Map in the Appendices.

The following tables summarize the total peak discharge rates for existing and proposed conditions:

Pre vs Post Runoff Rates (**EDA VS PDA**)
(For Reference-Previously Approved Under App No. SP 1034-14)

Design Storm	**(A) Pre-Development Runoff Rate (cfs)**	**(B) Post-Development Runoff Rate (cfs)**	**Reduction in Peak Rate (cfs)**
2-year	121.28	113.89	7.39
10-year	186.23	178.29	7.49
25-year	231.71	223.74	7.79

100-year	314.16	306.48	7.68

Pre vs Post Runoff Rates (**EDA VS PDA**)

(For Reference-Previously Approved Under App No. SP 1099-19)

Design Storm	**(A) Pre-Development Runoff Rate (cfs)**	**(B) Post-Development Runoff Rate (cfs)**	**Reduction in Peak Rate (cfs)**
2-year	121.28	103.72	17.56
10-year	186.23	162.39	23.84
25-year	231.71	203.82	27.89
100-year	314.16	279.21	34.95

Pre vs Post Runoff Rates (**EDA VS PDA**)

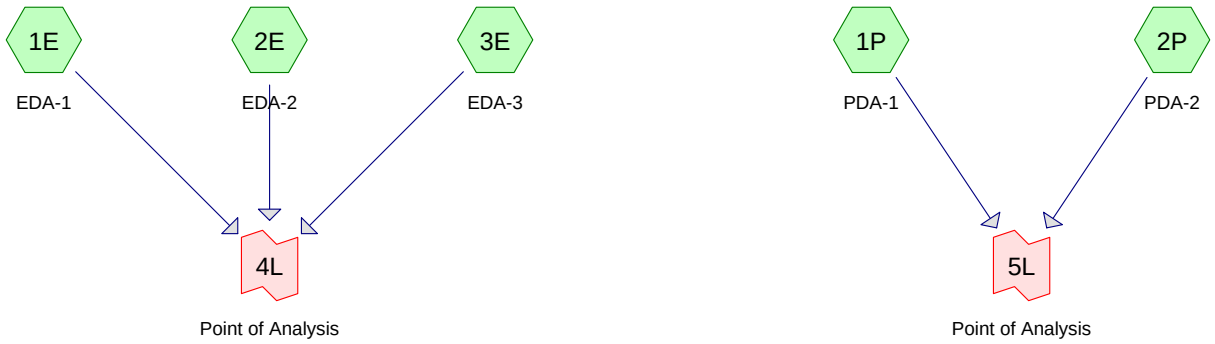
(Revised per this Amended Preliminary & Final Major Site Plan - September 2019)

Design Storm	**(A) Pre-Development Runoff Rate (cfs)**	**(B) Post-Development Runoff Rate (cfs)**	**Reduction in Peak Rate (cfs)**
2-year	121.28	103.72	17.56
10-year	186.23	162.39	23.84
25-year	231.71	203.82	27.89
100-year	314.16	279.22	34.94

A. PRE- vs. POST-DEVELOPMENT HYDROGRAPHS

- **Drainage Diagram**
- **2-Year Storm Event**
- **10-Year Storm Event**
- **25-Year Storm Event**
- **100-Year Storm Event**

DRAINAGE DIAGRAM



Subcat Reach Pond Link

Routing Diagram for Pre vs. Post
Prepared by Bohler Engineering, Printed 9/6/2019

2-YEAR STORM EVENT

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,521,213	98	Impervious (1E, 1P, 2E, 2P, 3E)
185,327	74	Pervious (1P, 2P)
3,706,540	**97**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
3,706,540	Other	1E, 1P, 2E, 2P, 3E
3,706,540		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	0	0	3,521,213	3,521,213	Impervious	1E, 1P, 2E, 2P, 3E
0	0	0	0	185,327	185,327	Pervious	1P, 2P
0	**0**	**0**	**0**	**3,706,540**	**3,706,540**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EDA-1 Runoff Area=884,738 sf 100.00% Impervious Runoff Depth=3.16"
Tc=0.167 hrs CN=0/98 Runoff=57.90 cfs 232,747 cf

Subcatchment 1P: PDA-1 Runoff Area=1,282,652 sf 92.96% Impervious Runoff Depth=3.02"
Tc=0.223 hrs CN=74/98 Runoff=73.17 cfs 322,439 cf

Subcatchment 2E: EDA-2 Runoff Area=710,936 sf 100.00% Impervious Runoff Depth=3.16"
Tc=0.167 hrs CN=0/98 Runoff=46.52 cfs 187,025 cf

Subcatchment 2P: PDA-2 Runoff Area=570,618 sf 83.34% Impervious Runoff Depth=2.82"
Tc=0.223 hrs CN=74/98 Runoff=30.55 cfs 134,331 cf

Subcatchment 3E: EDA-3 Runoff Area=257,596 sf 100.00% Impervious Runoff Depth=3.16"
Tc=0.167 hrs CN=0/98 Runoff=16.86 cfs 67,765 cf

Link 4L: Point of Analysis Inflow=121.28 cfs 487,537 cf
Primary=121.28 cfs 487,537 cf

Link 5L: Point of Analysis Inflow=103.72 cfs 456,770 cf
Primary=103.72 cfs 456,770 cf

Total Runoff Area = 3,706,540 sf Runoff Volume = 944,307 cf Average Runoff Depth = 3.06"
5.00% Pervious = 185,327 sf 95.00% Impervious = 3,521,213 sf

Summary for Subcatchment 1E: EDA-1

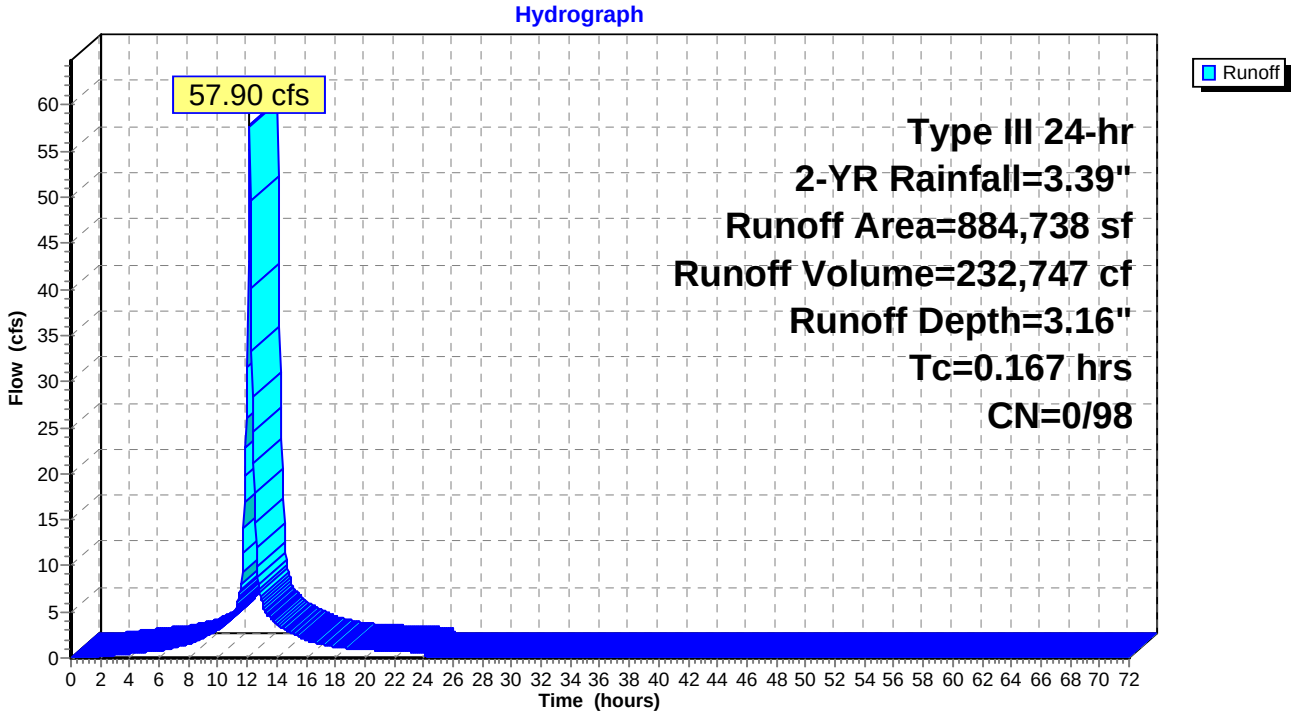
Runoff = 57.90 cfs @ 12.14 hrs, Volume= 232,747 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

	Area (sf)	CN	Description
*	884,738	98	Impervious
	884,738		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 1E: EDA-1



Summary for Subcatchment 1P: PDA-1

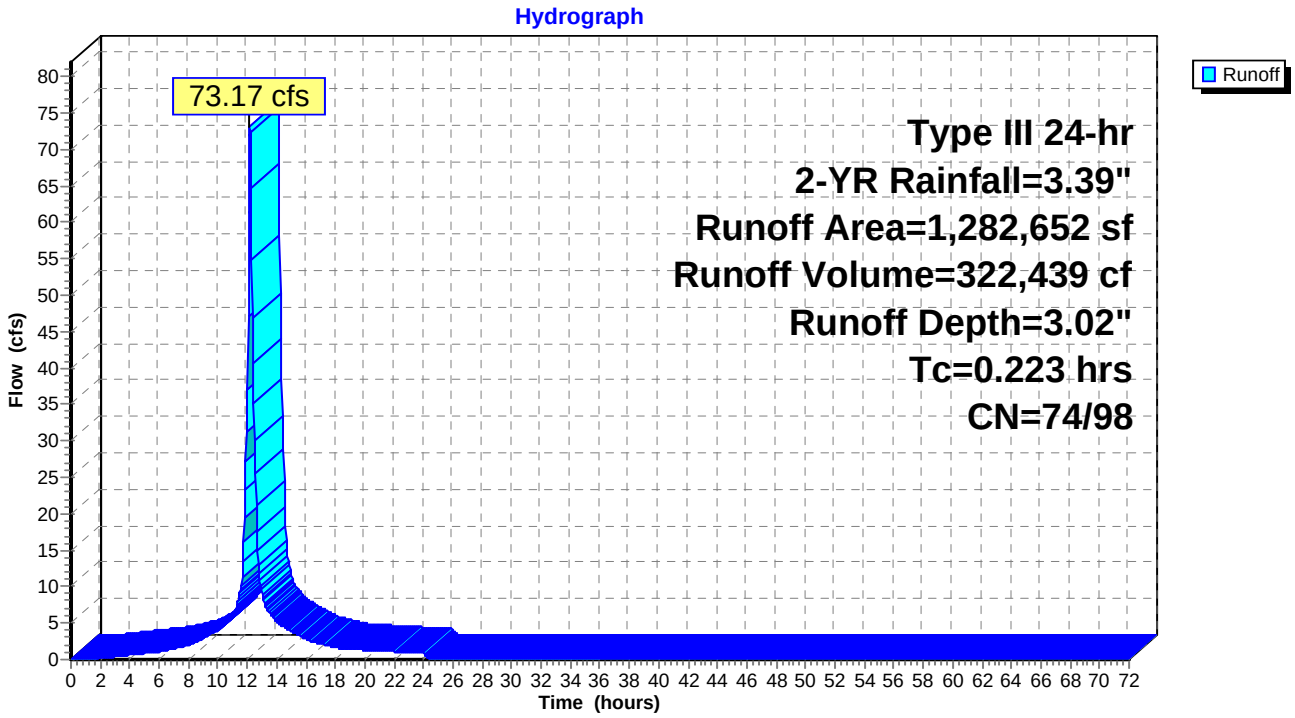
Runoff = 73.17 cfs @ 12.18 hrs, Volume= 322,439 cf, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

	Area (sf)	CN	Description
*	1,192,380	98	Impervious
*	90,272	74	Pervious
	1,282,652	96	Weighted Average
	90,272		7.04% Pervious Area
	1,192,380		92.96% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 1P: PDA-1



Summary for Subcatchment 2E: EDA-2

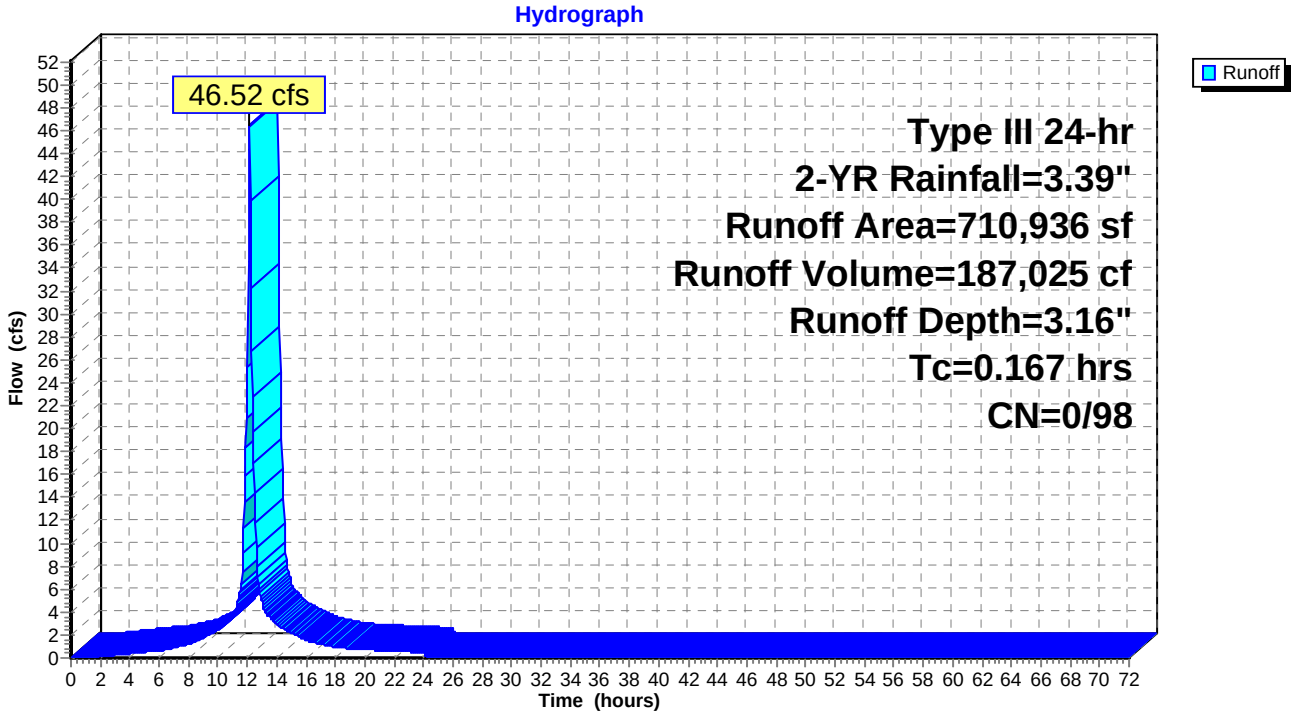
Runoff = 46.52 cfs @ 12.14 hrs, Volume= 187,025 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

	Area (sf)	CN	Description
*	710,936	98	Impervious
	710,936		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 2E: EDA-2



Summary for Subcatchment 2P: PDA-2

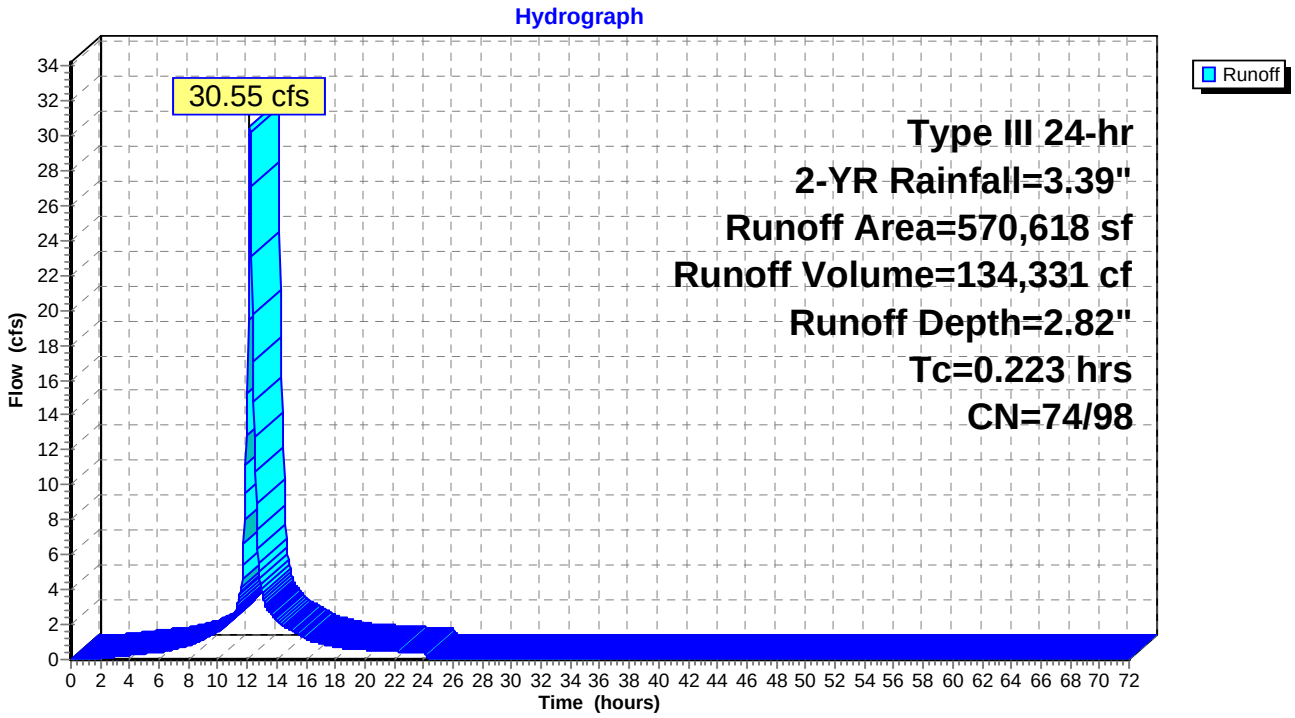
Runoff = 30.55 cfs @ 12.18 hrs, Volume= 134,331 cf, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

	Area (sf)	CN	Description
*	475,563	98	Impervious
*	95,055	74	Pervious
	570,618	94	Weighted Average
	95,055		16.66% Pervious Area
	475,563		83.34% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 2P: PDA-2



Summary for Subcatchment 3E: EDA-3

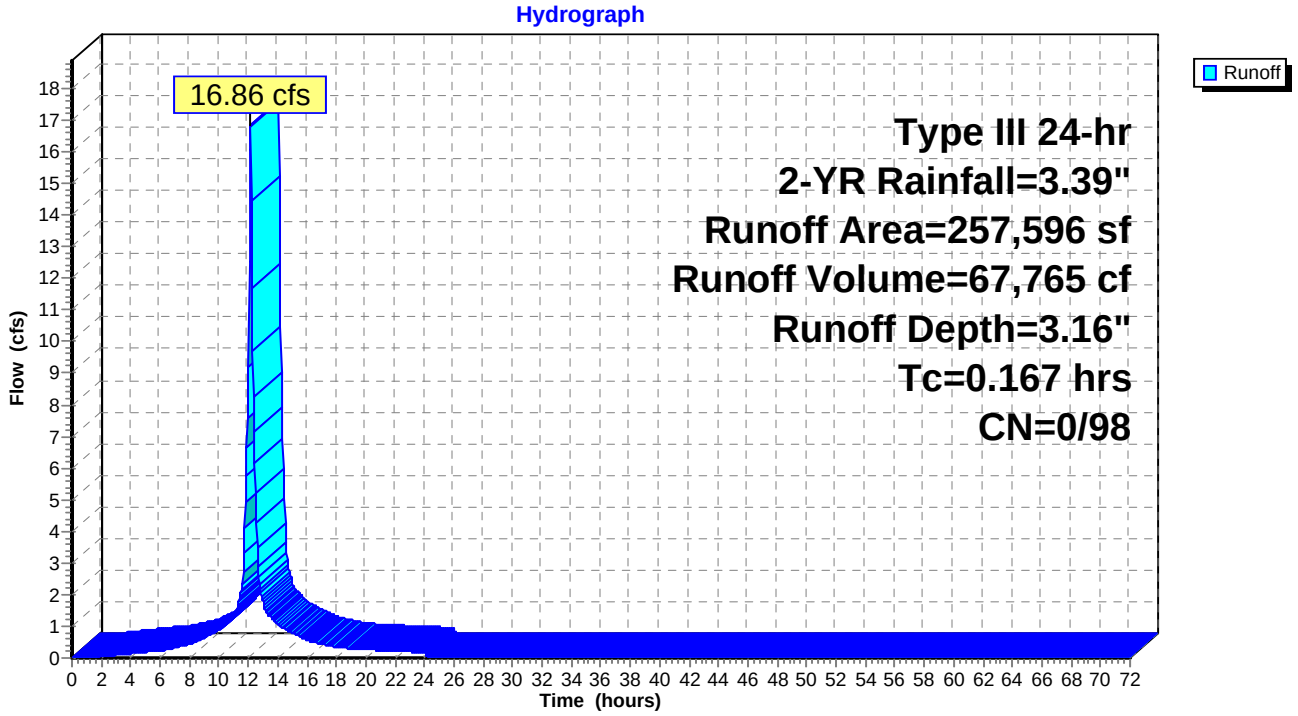
Runoff = 16.86 cfs @ 12.14 hrs, Volume= 67,765 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

	Area (sf)	CN	Description
*	257,596	98	Impervious
	257,596		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 3E: EDA-3

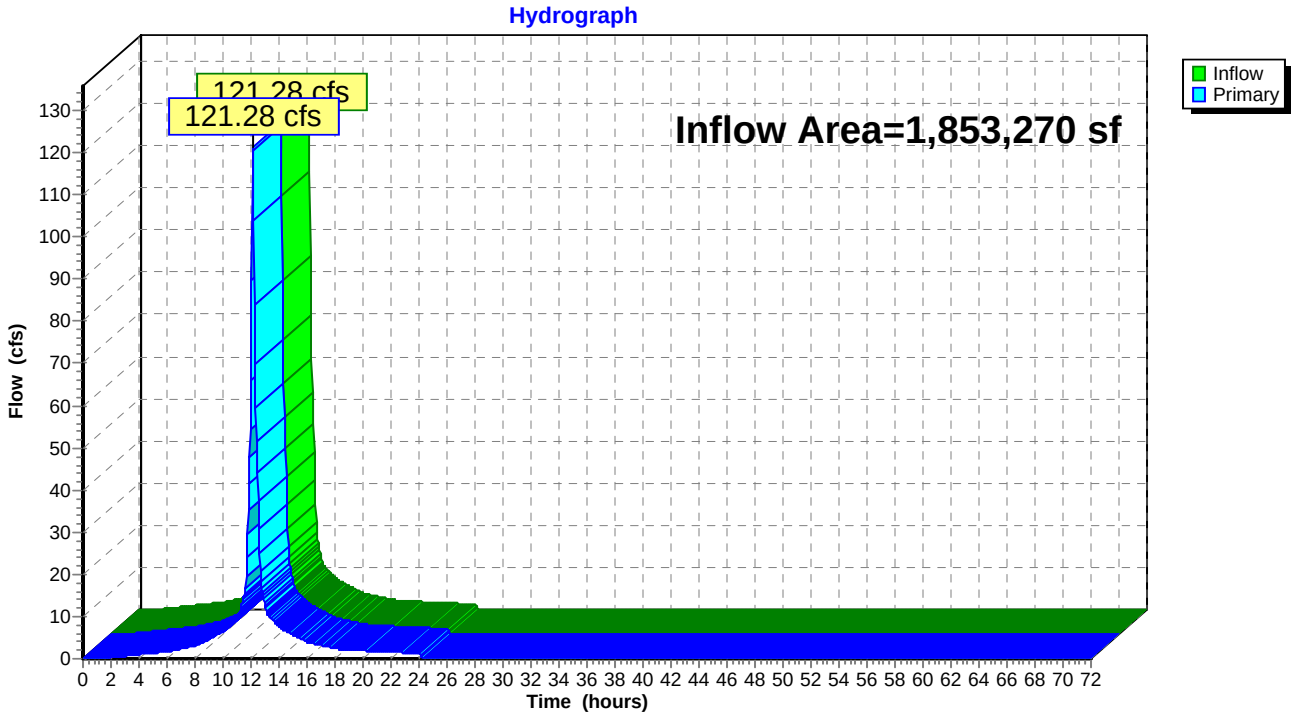


Summary for Link 4L: Point of Analysis

Inflow Area = 1,853,270 sf,100.00% Impervious, Inflow Depth = 3.16" for 2-YR event
Inflow = 121.28 cfs @ 12.14 hrs, Volume= 487,537 cf
Primary = 121.28 cfs @ 12.14 hrs, Volume= 487,537 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Point of Analysis

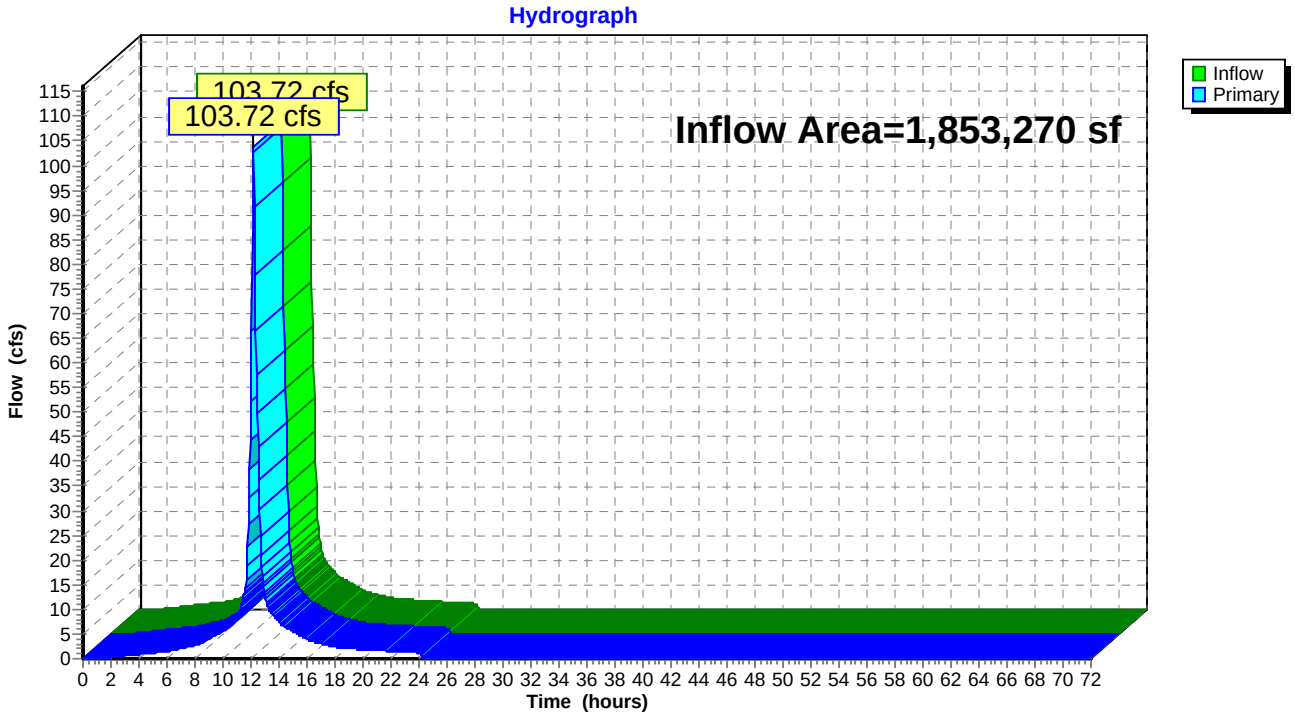


Summary for Link 5L: Point of Analysis

Inflow Area = 1,853,270 sf, 90.00% Impervious, Inflow Depth = 2.96" for 2-YR event
Inflow = 103.72 cfs @ 12.18 hrs, Volume= 456,770 cf
Primary = 103.72 cfs @ 12.18 hrs, Volume= 456,770 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 5L: Point of Analysis



10-YEAR STORM EVENT

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EDA-1 Runoff Area=884,738 sf 100.00% Impervious Runoff Depth=4.93"
Tc=0.167 hrs CN=0/98 Runoff=88.91 cfs 363,695 cf

Subcatchment 1P: PDA-1 Runoff Area=1,282,652 sf 92.96% Impervious Runoff Depth=4.76"
Tc=0.223 hrs CN=74/98 Runoff=113.89 cfs 508,970 cf

Subcatchment 2E: EDA-2 Runoff Area=710,936 sf 100.00% Impervious Runoff Depth=4.93"
Tc=0.167 hrs CN=0/98 Runoff=71.44 cfs 292,249 cf

Subcatchment 2P: PDA-2 Runoff Area=570,618 sf 83.34% Impervious Runoff Depth=4.53"
Tc=0.223 hrs CN=74/98 Runoff=48.50 cfs 215,300 cf

Subcatchment 3E: EDA-3 Runoff Area=257,596 sf 100.00% Impervious Runoff Depth=4.93"
Tc=0.167 hrs CN=0/98 Runoff=25.89 cfs 105,892 cf

Link 4L: Point of Analysis Inflow=186.23 cfs 761,835 cf
Primary=186.23 cfs 761,835 cf

Link 5L: Point of Analysis Inflow=162.39 cfs 724,270 cf
Primary=162.39 cfs 724,270 cf

Total Runoff Area = 3,706,540 sf Runoff Volume = 1,486,105 cf Average Runoff Depth = 4.81"
5.00% Pervious = 185,327 sf 95.00% Impervious = 3,521,213 sf

Summary for Subcatchment 1E: EDA-1

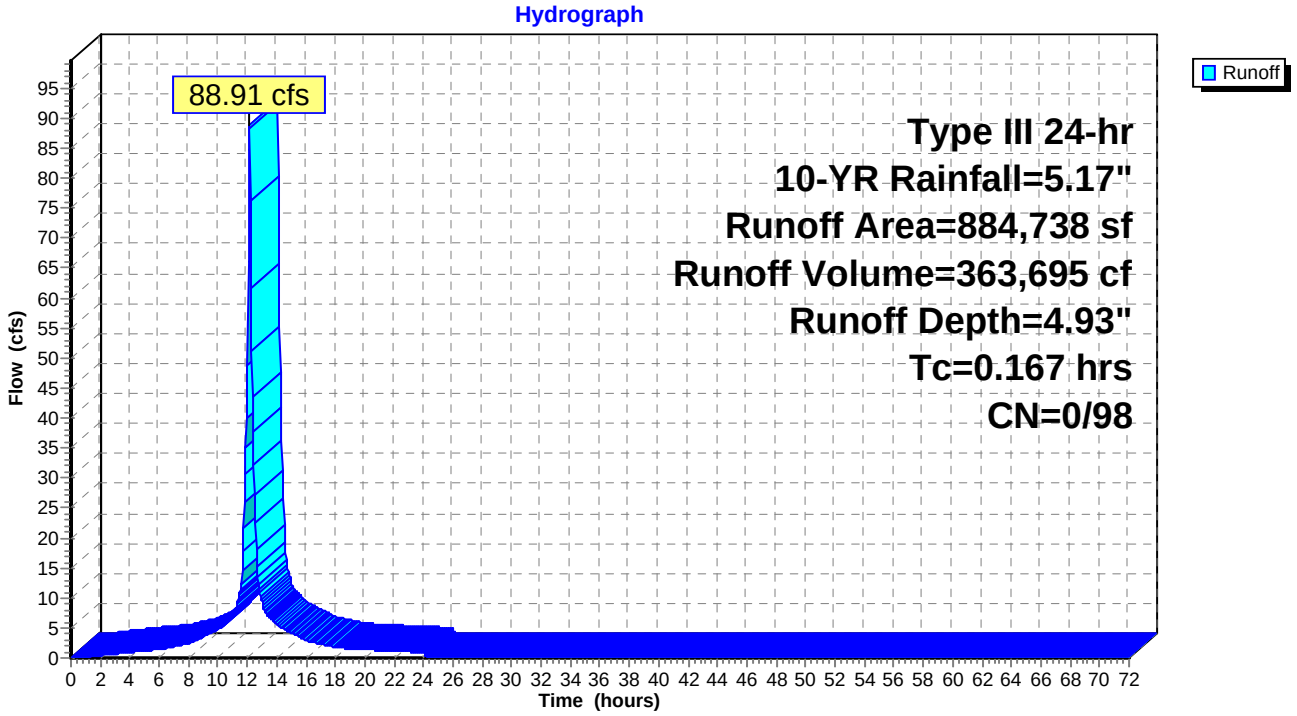
Runoff = 88.91 cfs @ 12.14 hrs, Volume= 363,695 cf, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.17"

	Area (sf)	CN	Description
*	884,738	98	Impervious
	884,738		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 1E: EDA-1



Summary for Subcatchment 1P: PDA-1

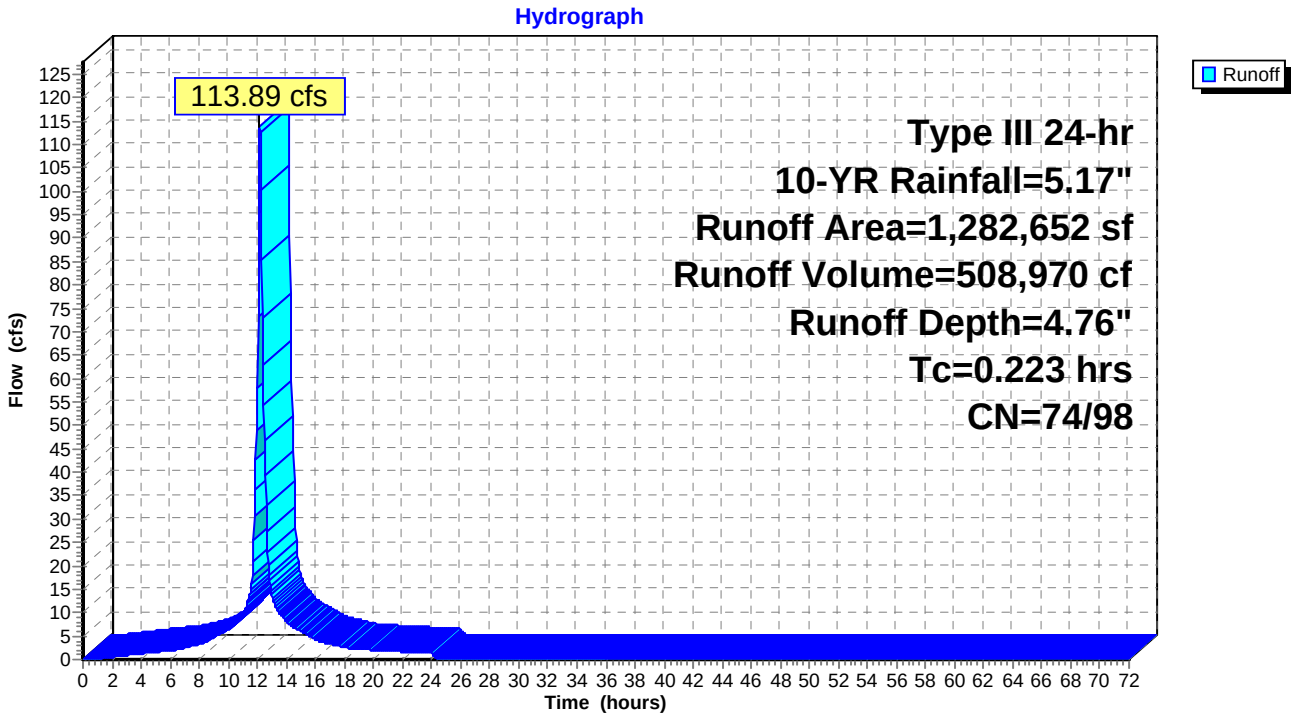
Runoff = 113.89 cfs @ 12.18 hrs, Volume= 508,970 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.17"

	Area (sf)	CN	Description
*	1,192,380	98	Impervious
*	90,272	74	Pervious
	1,282,652	96	Weighted Average
	90,272		7.04% Pervious Area
	1,192,380		92.96% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 1P: PDA-1



Summary for Subcatchment 2E: EDA-2

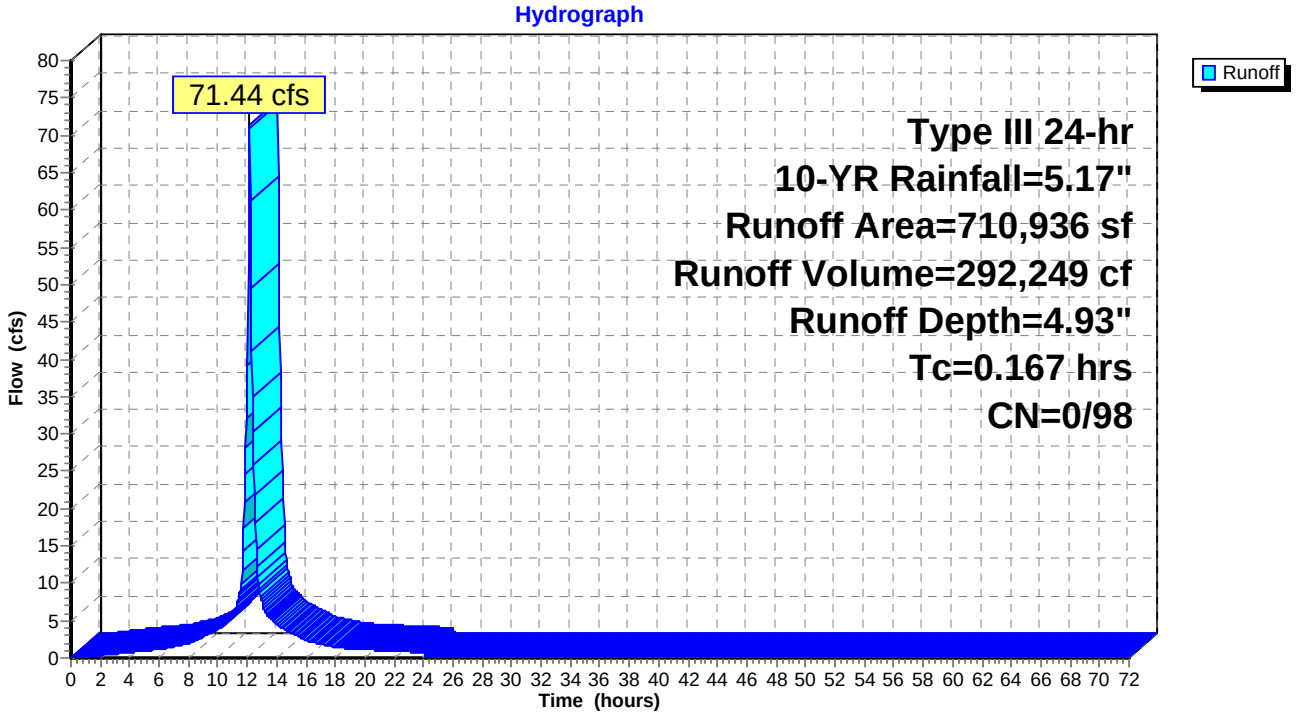
Runoff = 71.44 cfs @ 12.14 hrs, Volume= 292,249 cf, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.17"

	Area (sf)	CN	Description
*	710,936	98	Impervious
	710,936		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 2E: EDA-2



Summary for Subcatchment 2P: PDA-2

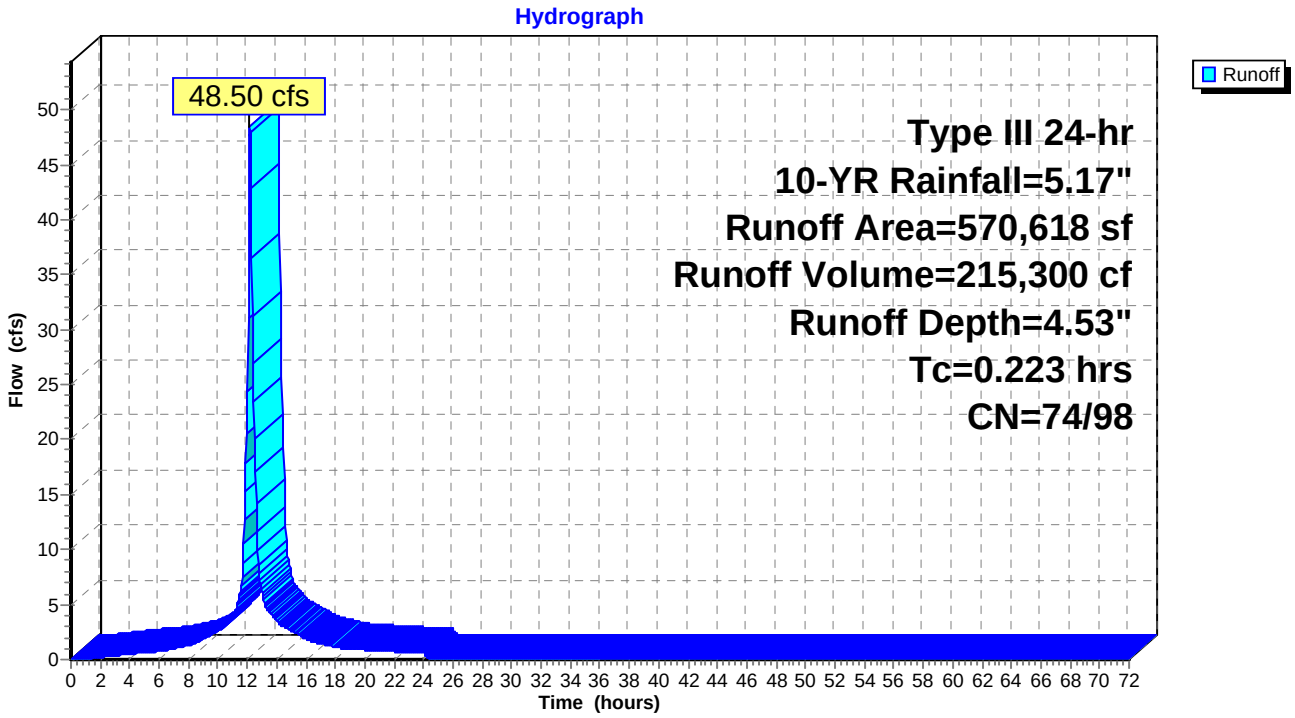
Runoff = 48.50 cfs @ 12.18 hrs, Volume= 215,300 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.17"

	Area (sf)	CN	Description
*	475,563	98	Impervious
*	95,055	74	Pervious
	570,618	94	Weighted Average
	95,055		16.66% Pervious Area
	475,563		83.34% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 2P: PDA-2



Summary for Subcatchment 3E: EDA-3

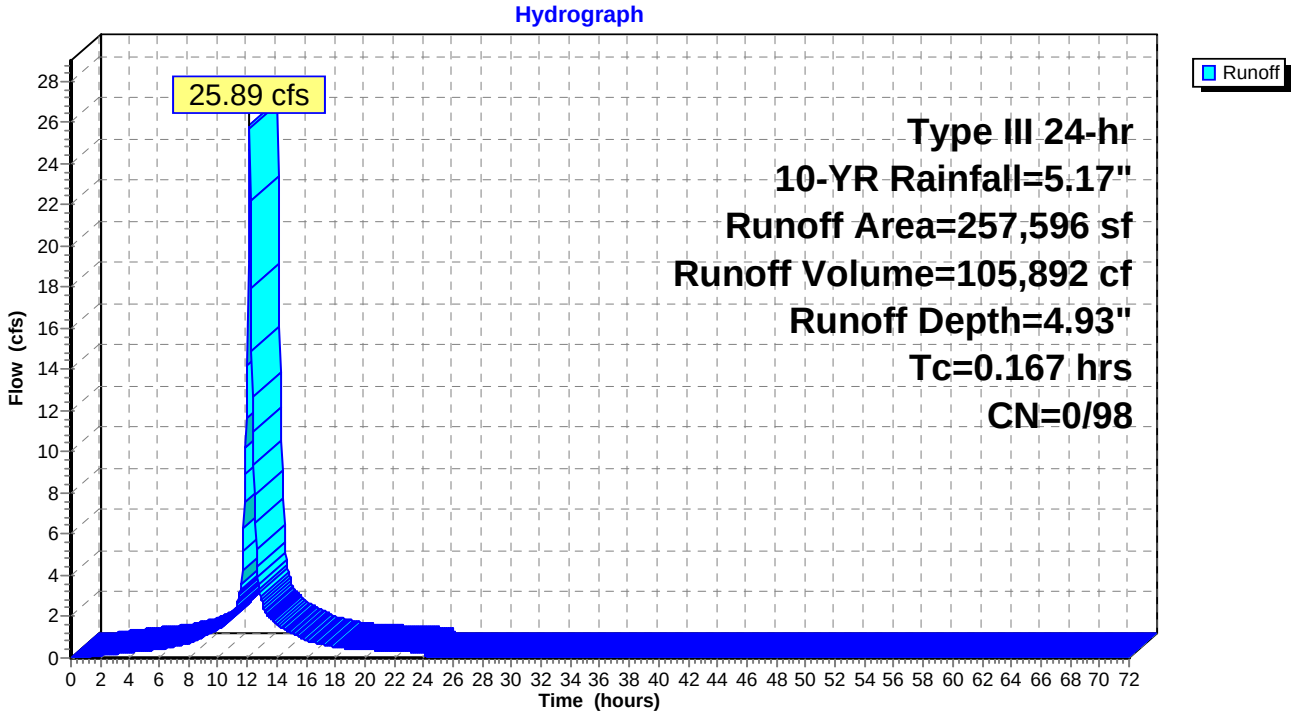
Runoff = 25.89 cfs @ 12.14 hrs, Volume= 105,892 cf, Depth= 4.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.17"

	Area (sf)	CN	Description
*	257,596	98	Impervious
	257,596		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 3E: EDA-3

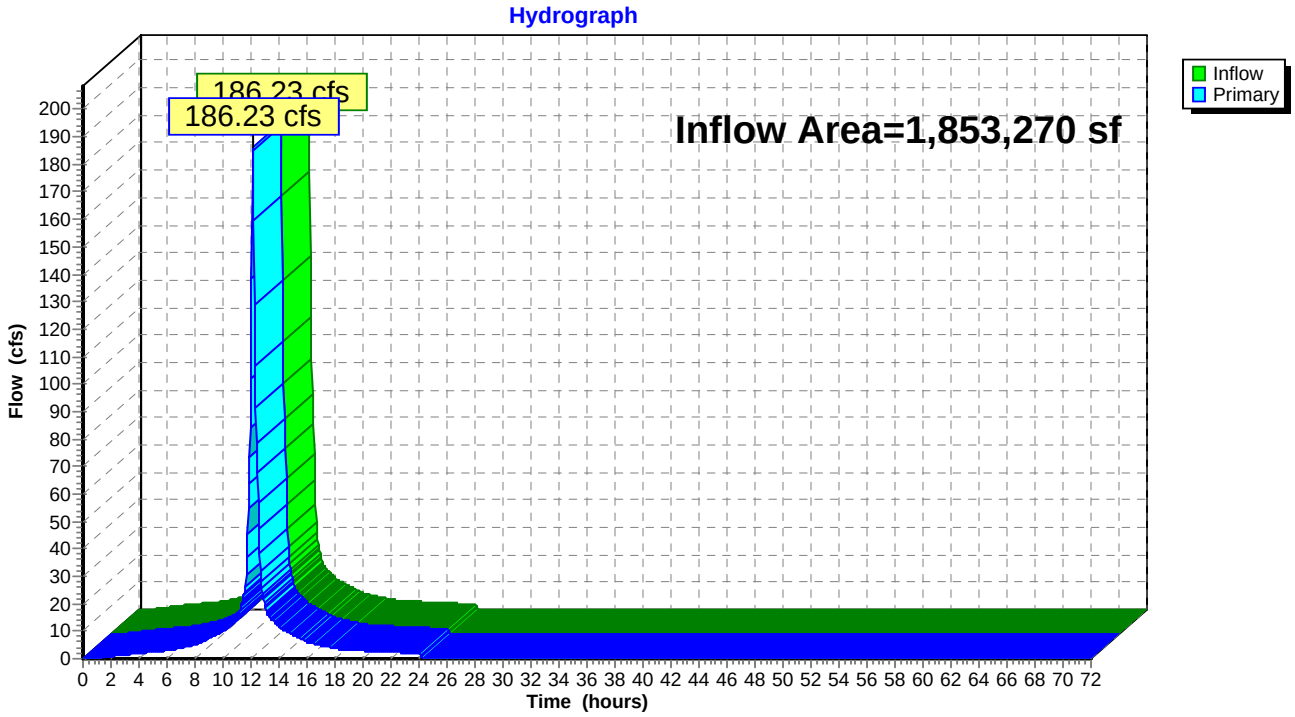


Summary for Link 4L: Point of Analysis

Inflow Area = 1,853,270 sf,100.00% Impervious, Inflow Depth = 4.93" for 10-YR event
Inflow = 186.23 cfs @ 12.14 hrs, Volume= 761,835 cf
Primary = 186.23 cfs @ 12.14 hrs, Volume= 761,835 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Point of Analysis

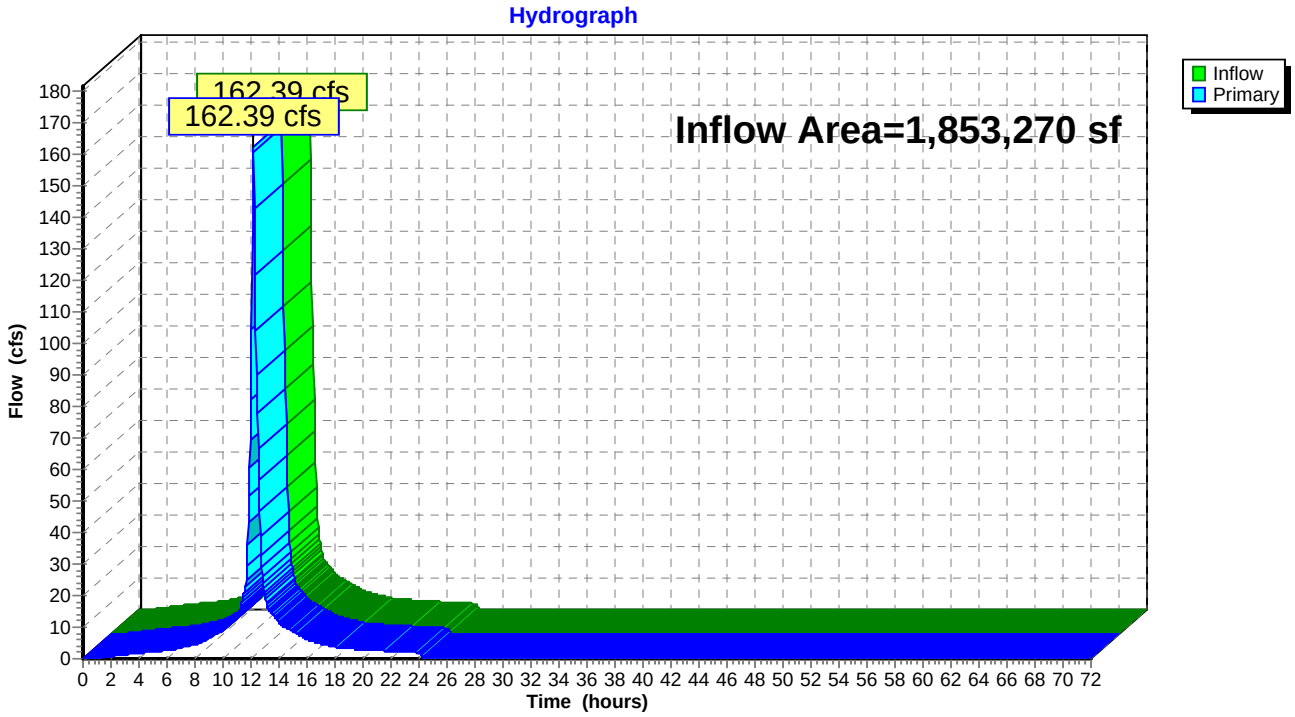


Summary for Link 5L: Point of Analysis

Inflow Area = 1,853,270 sf, 90.00% Impervious, Inflow Depth = 4.69" for 10-YR event
Inflow = 162.39 cfs @ 12.18 hrs, Volume= 724,270 cf
Primary = 162.39 cfs @ 12.18 hrs, Volume= 724,270 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 5L: Point of Analysis



25-YEAR STORM EVENT

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EDA-1 Runoff Area=884,738 sf 100.00% Impervious Runoff Depth=6.18"
Tc=0.167 hrs CN=0/98 Runoff=110.62 cfs 455,745 cf

Subcatchment 1P: PDA-1 Runoff Area=1,282,652 sf 92.96% Impervious Runoff Depth=6.00"
Tc=0.223 hrs CN=74/98 Runoff=142.56 cfs 640,856 cf

Subcatchment 2E: EDA-2 Runoff Area=710,936 sf 100.00% Impervious Runoff Depth=6.18"
Tc=0.167 hrs CN=0/98 Runoff=88.89 cfs 366,217 cf

Subcatchment 2P: PDA-2 Runoff Area=570,618 sf 83.34% Impervious Runoff Depth=5.74"
Tc=0.223 hrs CN=74/98 Runoff=61.25 cfs 273,022 cf

Subcatchment 3E: EDA-3 Runoff Area=257,596 sf 100.00% Impervious Runoff Depth=6.18"
Tc=0.167 hrs CN=0/98 Runoff=32.21 cfs 132,693 cf

Link 4L: Point of Analysis Inflow=231.71 cfs 954,655 cf
Primary=231.71 cfs 954,655 cf

Link 5L: Point of Analysis Inflow=203.82 cfs 913,878 cf
Primary=203.82 cfs 913,878 cf

Total Runoff Area = 3,706,540 sf Runoff Volume = 1,868,533 cf Average Runoff Depth = 6.05"
5.00% Pervious = 185,327 sf 95.00% Impervious = 3,521,213 sf

Summary for Subcatchment 1E: EDA-1

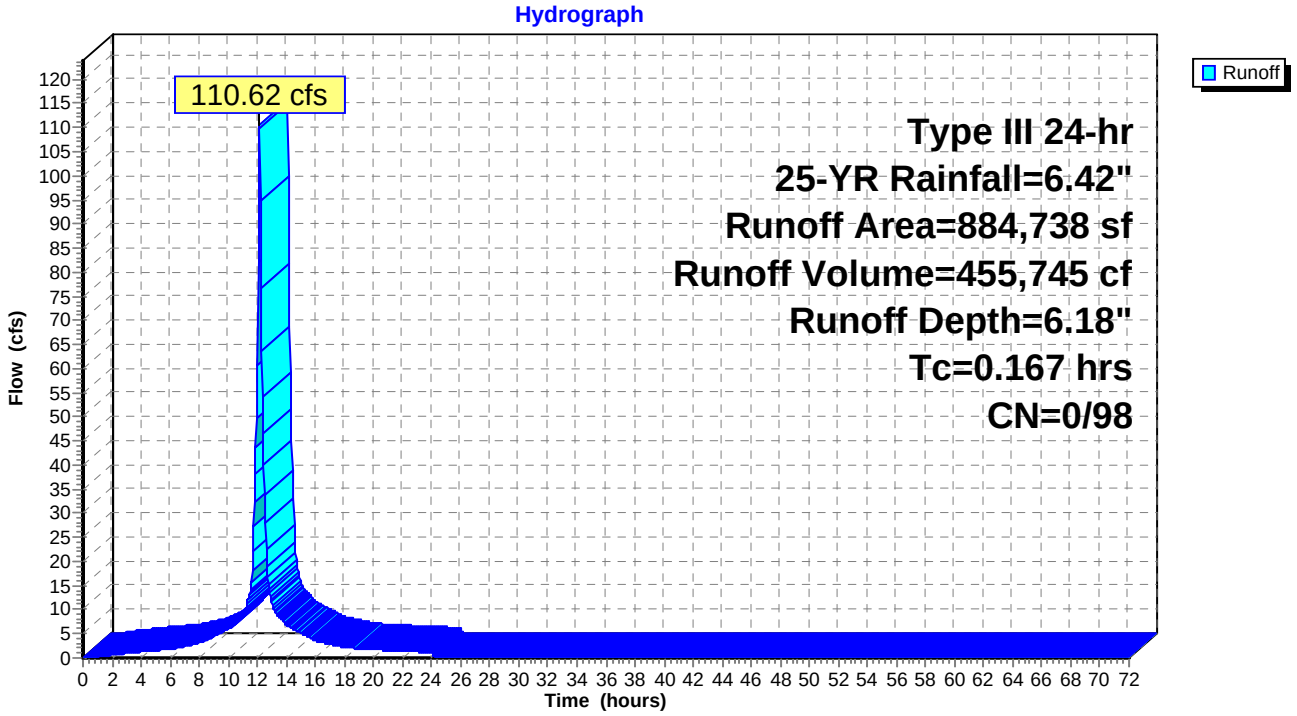
Runoff = 110.62 cfs @ 12.14 hrs, Volume= 455,745 cf, Depth= 6.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.42"

	Area (sf)	CN	Description
*	884,738	98	Impervious
	884,738		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 1E: EDA-1



Summary for Subcatchment 1P: PDA-1

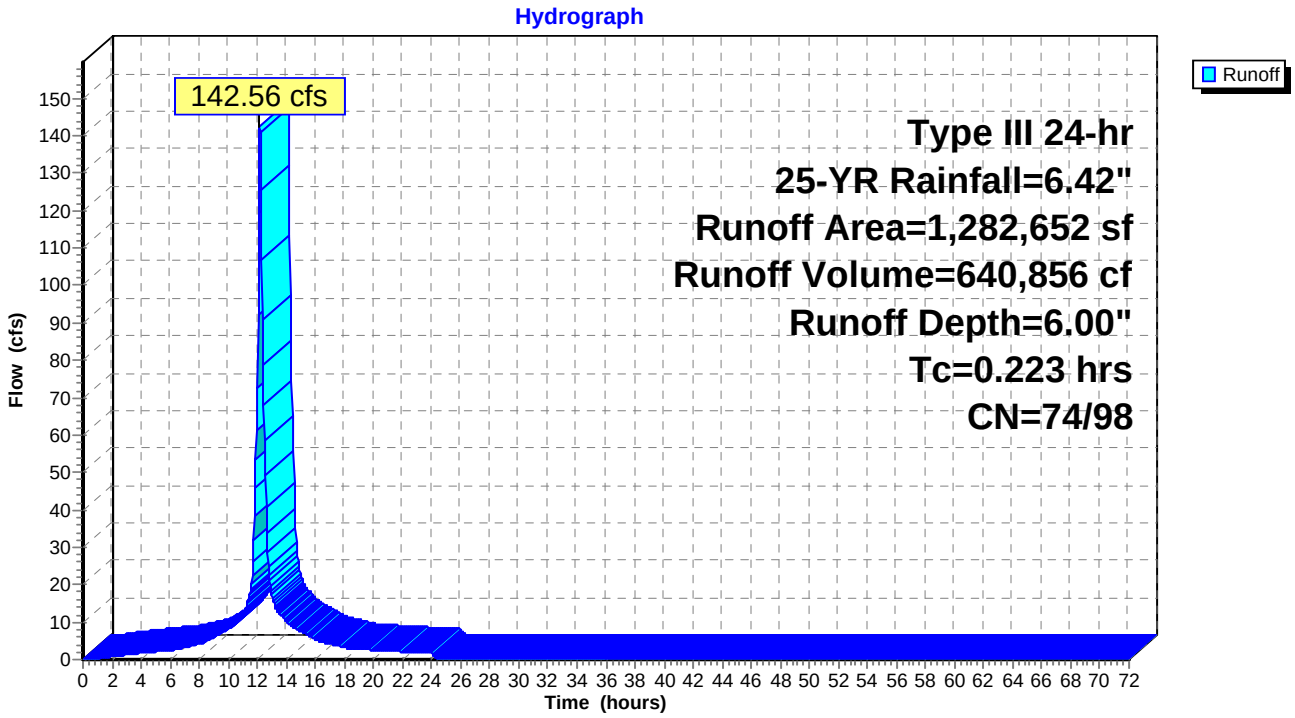
Runoff = 142.56 cfs @ 12.18 hrs, Volume= 640,856 cf, Depth= 6.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.42"

	Area (sf)	CN	Description
*	1,192,380	98	Impervious
*	90,272	74	Pervious
	1,282,652	96	Weighted Average
	90,272		7.04% Pervious Area
	1,192,380		92.96% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 1P: PDA-1



Summary for Subcatchment 2E: EDA-2

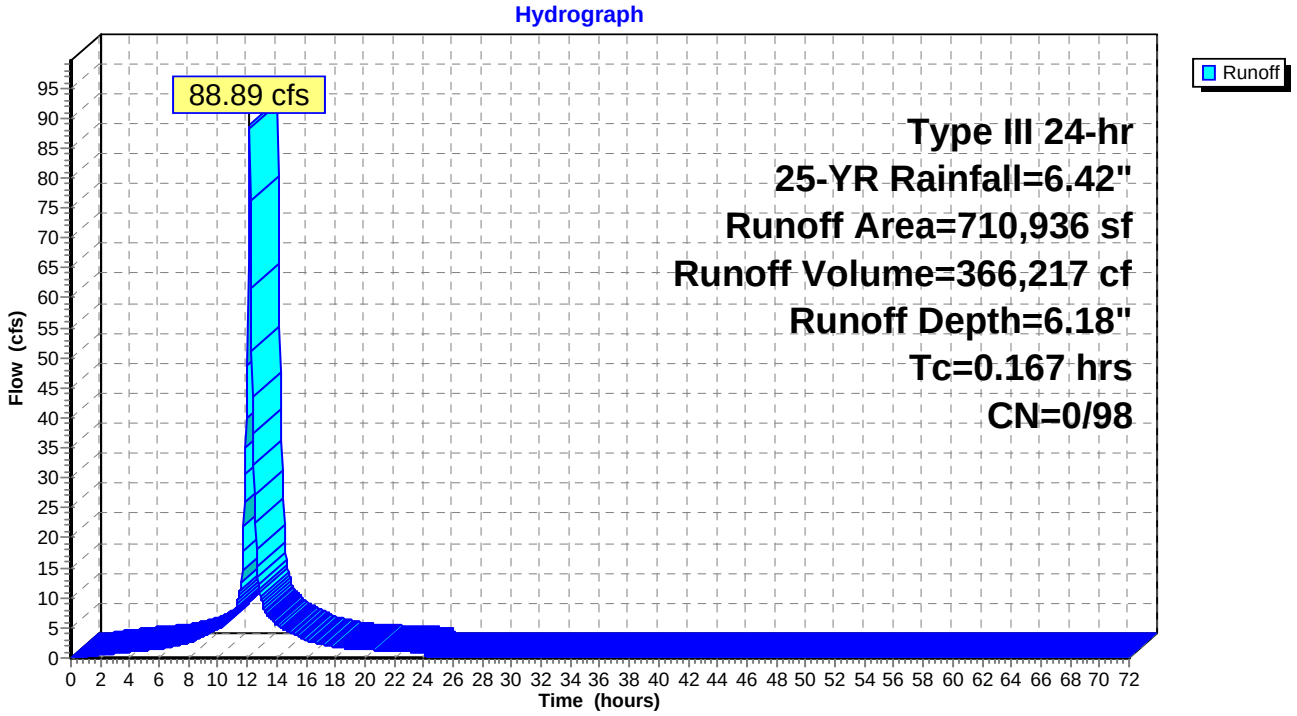
Runoff = 88.89 cfs @ 12.14 hrs, Volume= 366,217 cf, Depth= 6.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.42"

	Area (sf)	CN	Description
*	710,936	98	Impervious
	710,936		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 2E: EDA-2



Summary for Subcatchment 2P: PDA-2

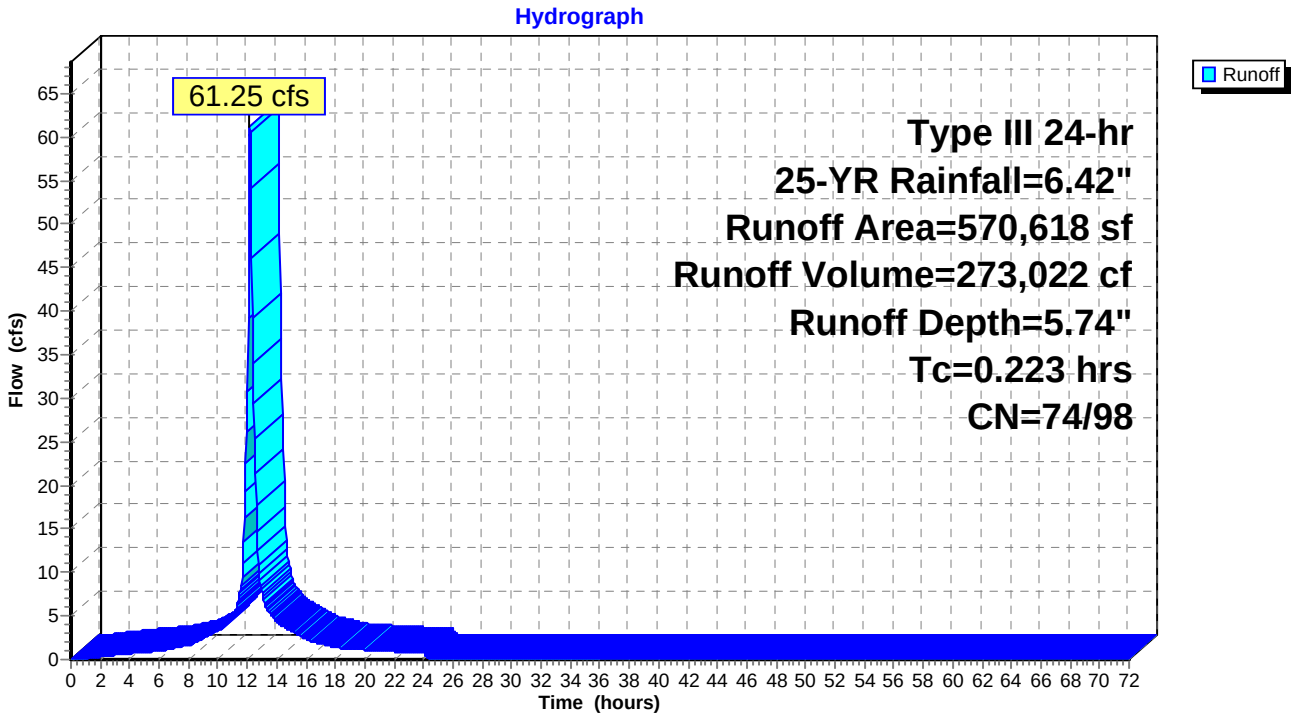
Runoff = 61.25 cfs @ 12.18 hrs, Volume= 273,022 cf, Depth= 5.74"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.42"

	Area (sf)	CN	Description
*	475,563	98	Impervious
*	95,055	74	Pervious
	570,618	94	Weighted Average
	95,055		16.66% Pervious Area
	475,563		83.34% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 2P: PDA-2



Summary for Subcatchment 3E: EDA-3

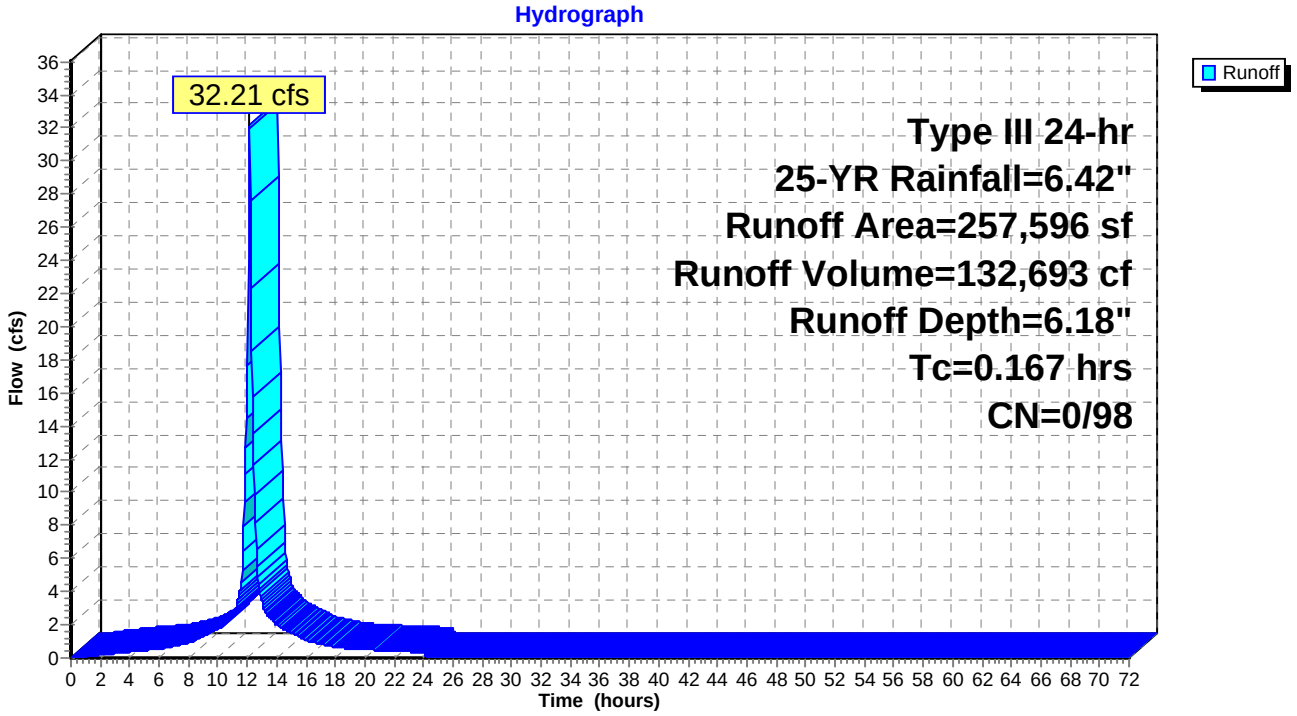
Runoff = 32.21 cfs @ 12.14 hrs, Volume= 132,693 cf, Depth= 6.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.42"

	Area (sf)	CN	Description
*	257,596	98	Impervious
	257,596		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 3E: EDA-3

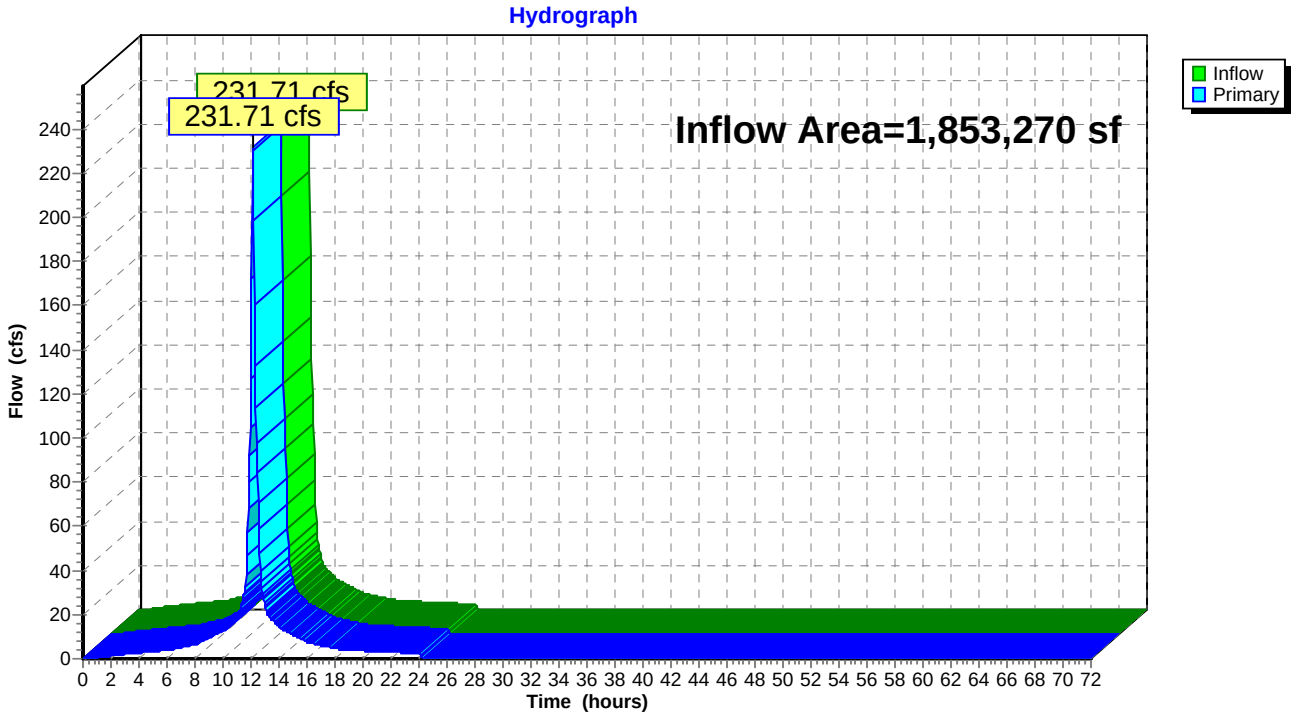


Summary for Link 4L: Point of Analysis

Inflow Area = 1,853,270 sf,100.00% Impervious, Inflow Depth = 6.18" for 25-YR event
Inflow = 231.71 cfs @ 12.14 hrs, Volume= 954,655 cf
Primary = 231.71 cfs @ 12.14 hrs, Volume= 954,655 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Point of Analysis

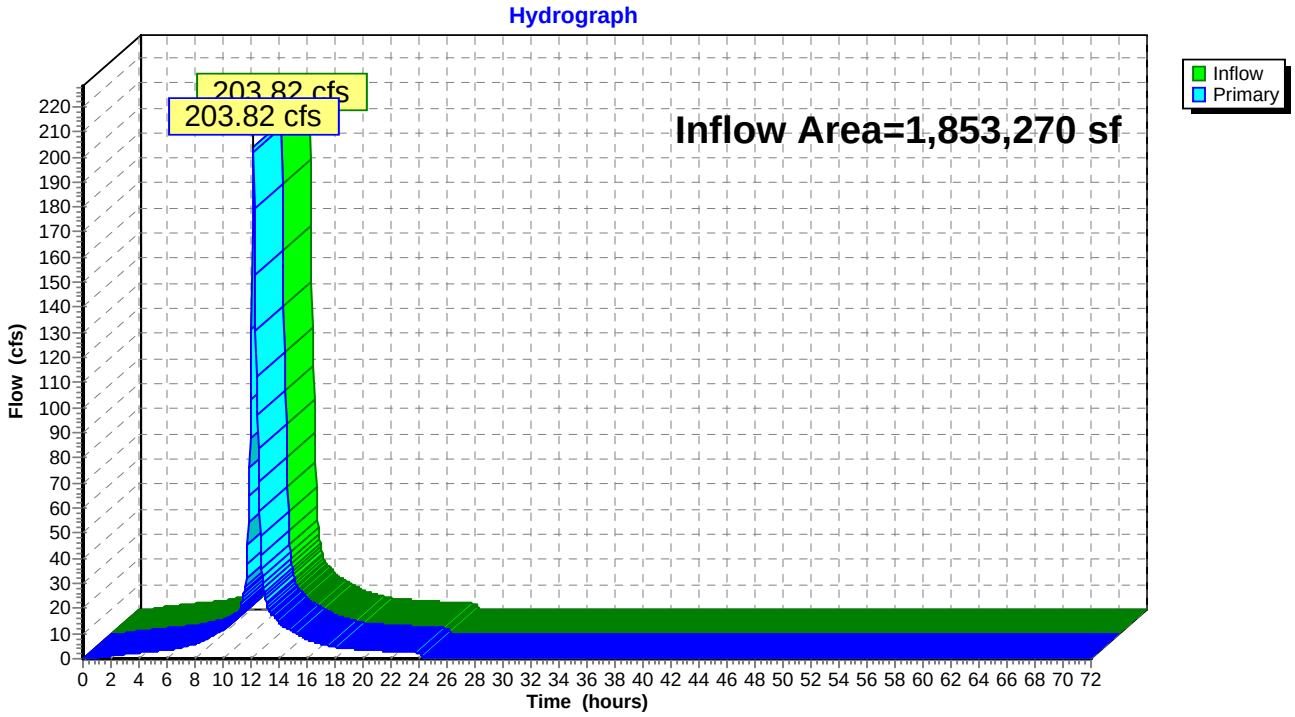


Summary for Link 5L: Point of Analysis

Inflow Area = 1,853,270 sf, 90.00% Impervious, Inflow Depth = 5.92" for 25-YR event
Inflow = 203.82 cfs @ 12.18 hrs, Volume= 913,878 cf
Primary = 203.82 cfs @ 12.18 hrs, Volume= 913,878 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 5L: Point of Analysis



100-YEAR STORM EVENT

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1E: EDA-1 Runoff Area=884,738 sf 100.00% Impervious Runoff Depth=8.45"
Tc=0.167 hrs CN=0/98 Runoff=149.98 cfs 622,989 cf

Subcatchment 1P: PDA-1 Runoff Area=1,282,652 sf 92.96% Impervious Runoff Depth=8.25"
Tc=0.223 hrs CN=74/98 Runoff=194.70 cfs 881,345 cf

Subcatchment 2E: EDA-2 Runoff Area=710,936 sf 100.00% Impervious Runoff Depth=8.45"
Tc=0.167 hrs CN=0/98 Runoff=120.52 cfs 500,606 cf

Subcatchment 2P: PDA-2 Runoff Area=570,618 sf 83.34% Impervious Runoff Depth=7.97"
Tc=0.223 hrs CN=74/98 Runoff=84.52 cfs 378,808 cf

Subcatchment 3E: EDA-3 Runoff Area=257,596 sf 100.00% Impervious Runoff Depth=8.45"
Tc=0.167 hrs CN=0/98 Runoff=43.67 cfs 181,386 cf

Link 4L: Point of Analysis Inflow=314.16 cfs 1,304,981 cf
Primary=314.16 cfs 1,304,981 cf

Link 5L: Point of Analysis Inflow=279.22 cfs 1,260,153 cf
Primary=279.22 cfs 1,260,153 cf

Total Runoff Area = 3,706,540 sf Runoff Volume = 2,565,134 cf Average Runoff Depth = 8.30"
5.00% Pervious = 185,327 sf 95.00% Impervious = 3,521,213 sf

Summary for Subcatchment 1E: EDA-1

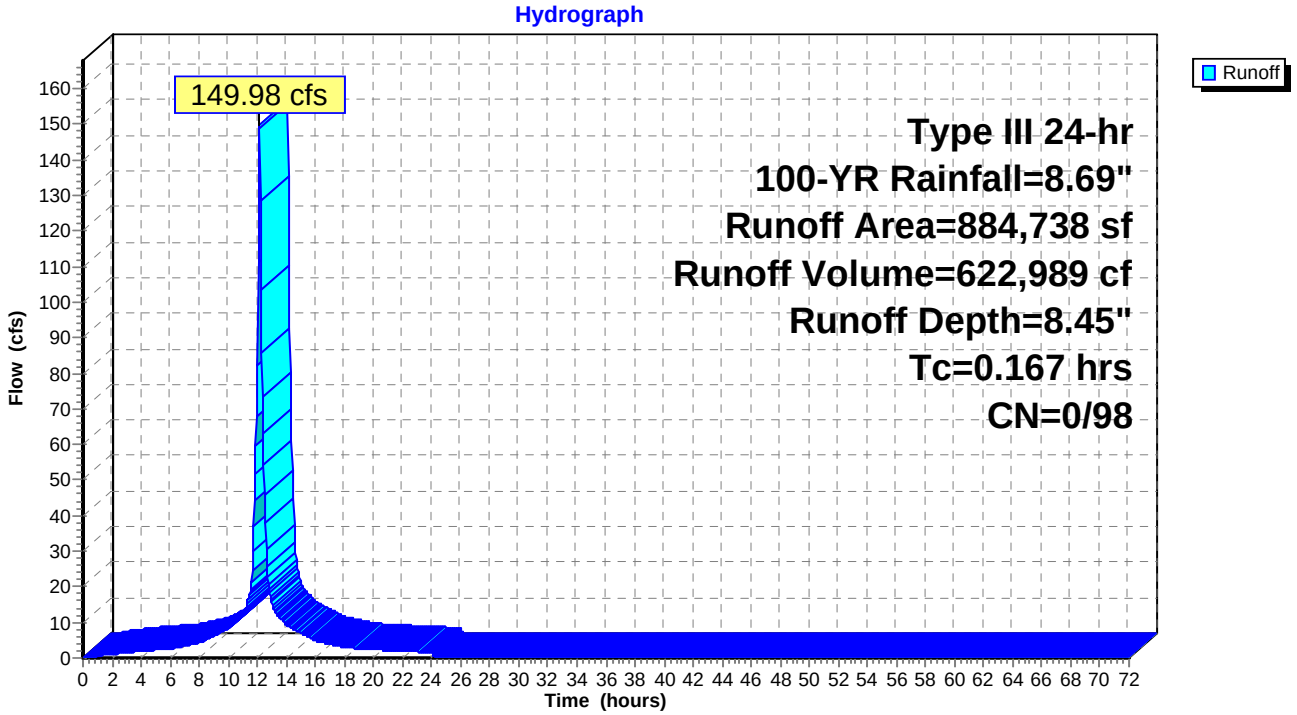
Runoff = 149.98 cfs @ 12.14 hrs, Volume= 622,989 cf, Depth= 8.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.69"

	Area (sf)	CN	Description
*	884,738	98	Impervious
	884,738		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 1E: EDA-1



Summary for Subcatchment 1P: PDA-1

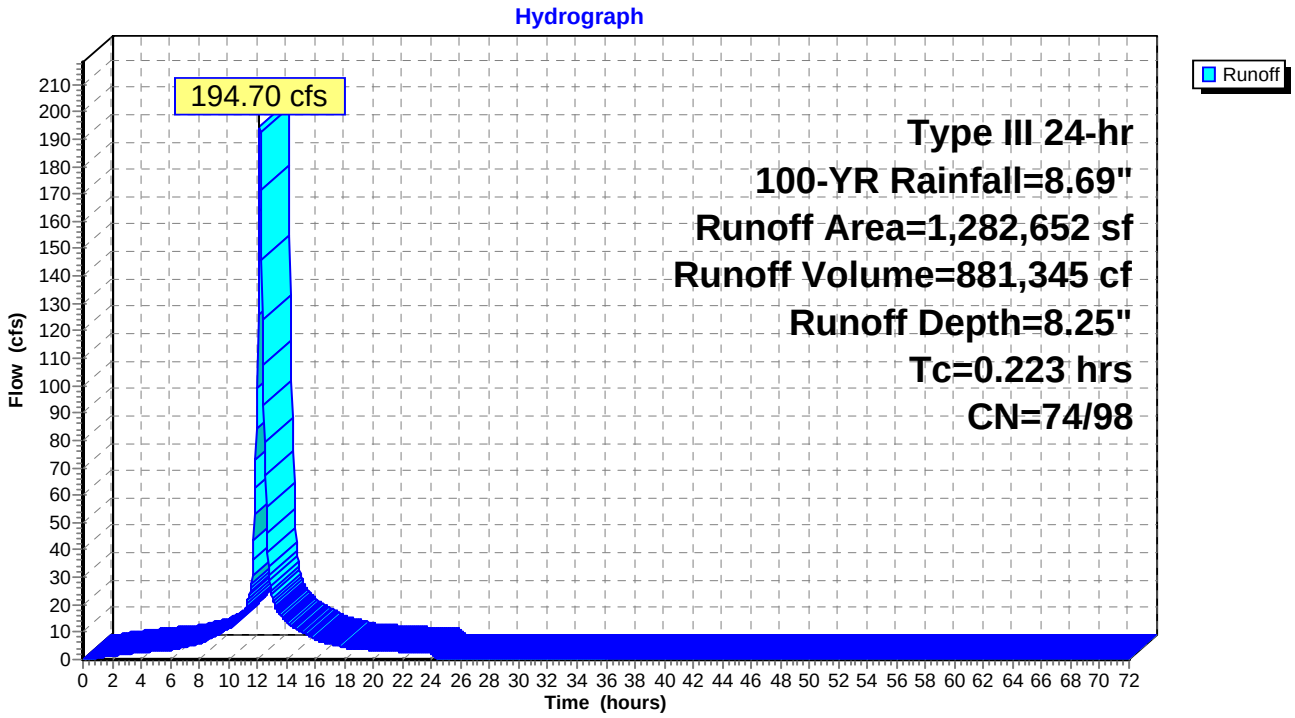
Runoff = 194.70 cfs @ 12.18 hrs, Volume= 881,345 cf, Depth= 8.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.69"

	Area (sf)	CN	Description
*	1,192,380	98	Impervious
*	90,272	74	Pervious
	1,282,652	96	Weighted Average
	90,272		7.04% Pervious Area
	1,192,380		92.96% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 1P: PDA-1



Summary for Subcatchment 2E: EDA-2

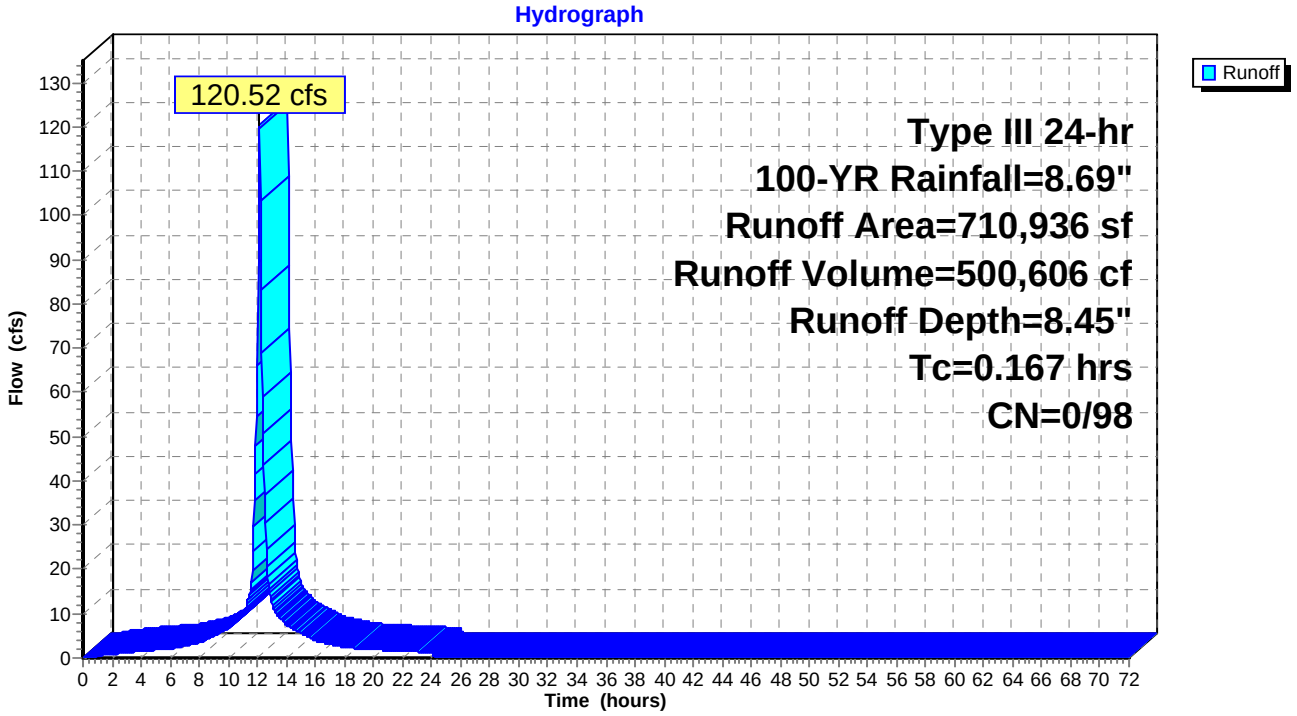
Runoff = 120.52 cfs @ 12.14 hrs, Volume= 500,606 cf, Depth= 8.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.69"

	Area (sf)	CN	Description
*	710,936	98	Impervious
	710,936		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 2E: EDA-2



Summary for Subcatchment 2P: PDA-2

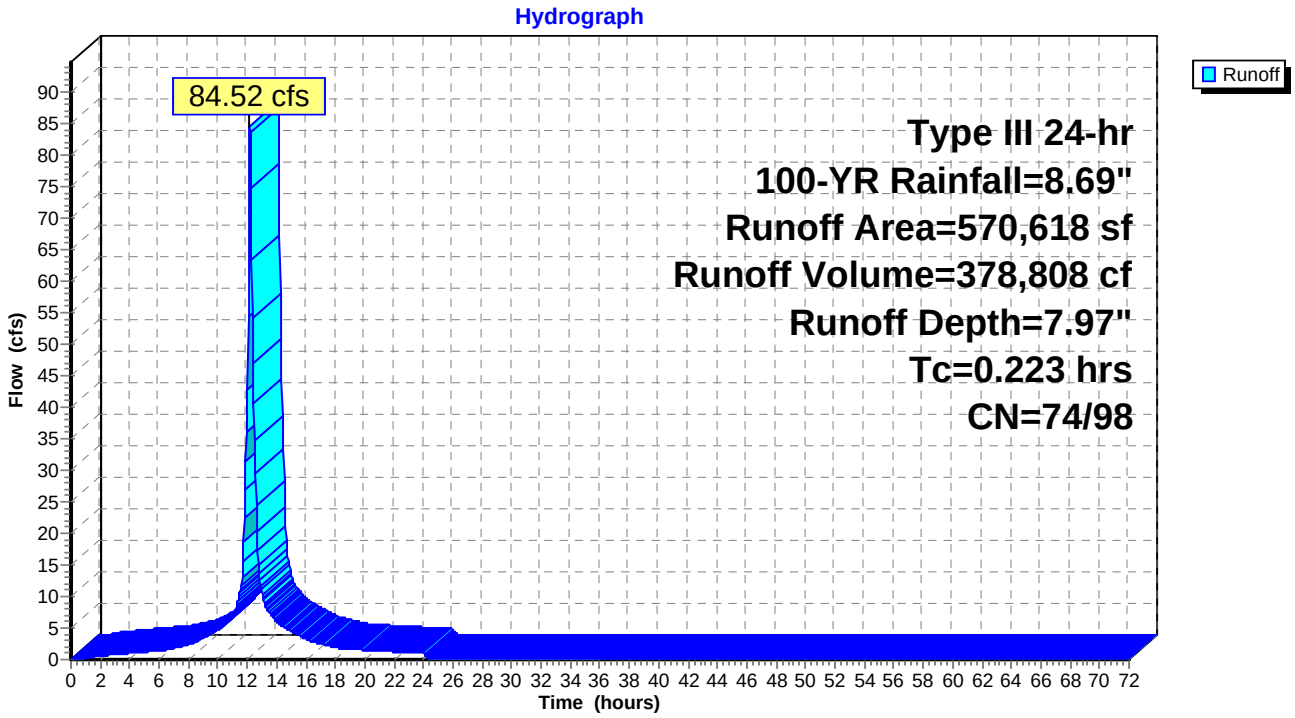
Runoff = 84.52 cfs @ 12.18 hrs, Volume= 378,808 cf, Depth= 7.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.69"

	Area (sf)	CN	Description
*	475,563	98	Impervious
*	95,055	74	Pervious
	570,618	94	Weighted Average
	95,055		16.66% Pervious Area
	475,563		83.34% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.223					**Direct Entry, 13.4**

Subcatchment 2P: PDA-2



Summary for Subcatchment 3E: EDA-3

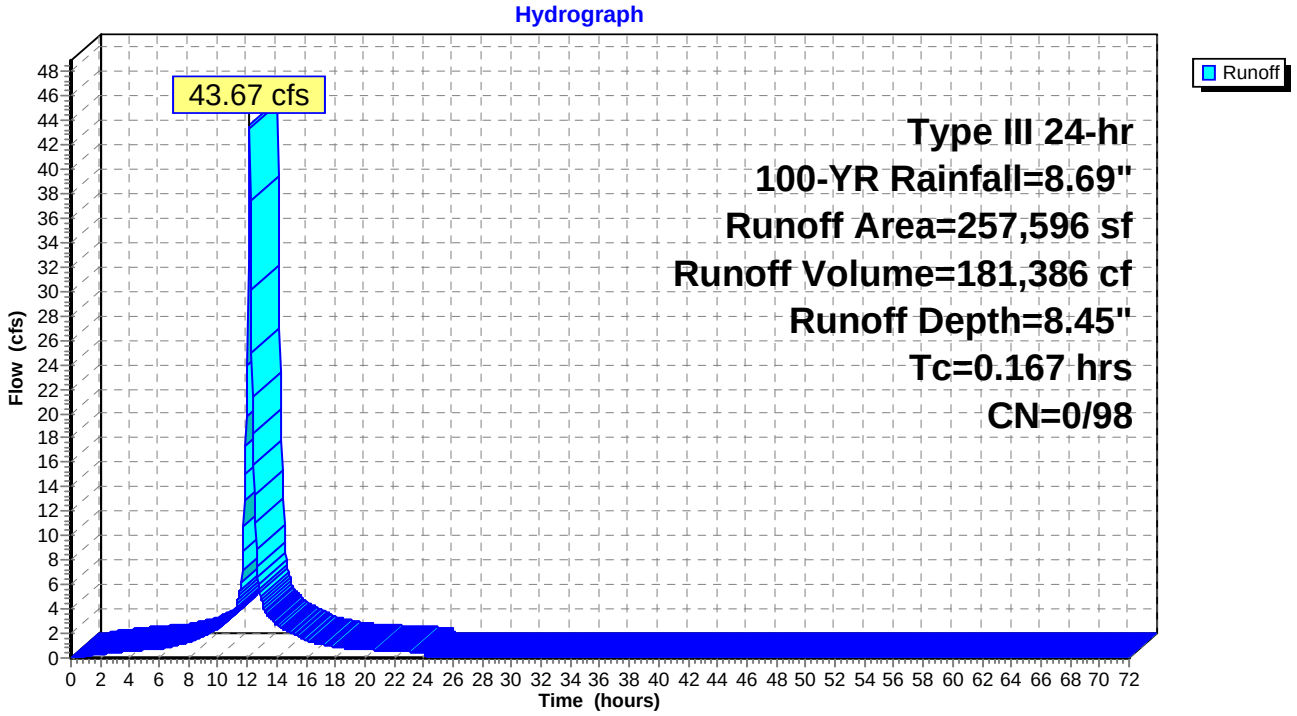
Runoff = 43.67 cfs @ 12.14 hrs, Volume= 181,386 cf, Depth= 8.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.69"

	Area (sf)	CN	Description
*	257,596	98	Impervious
	257,596		100.00% Impervious Area

Tc (hours)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.167					**Direct Entry, 10 Min**

Subcatchment 3E: EDA-3

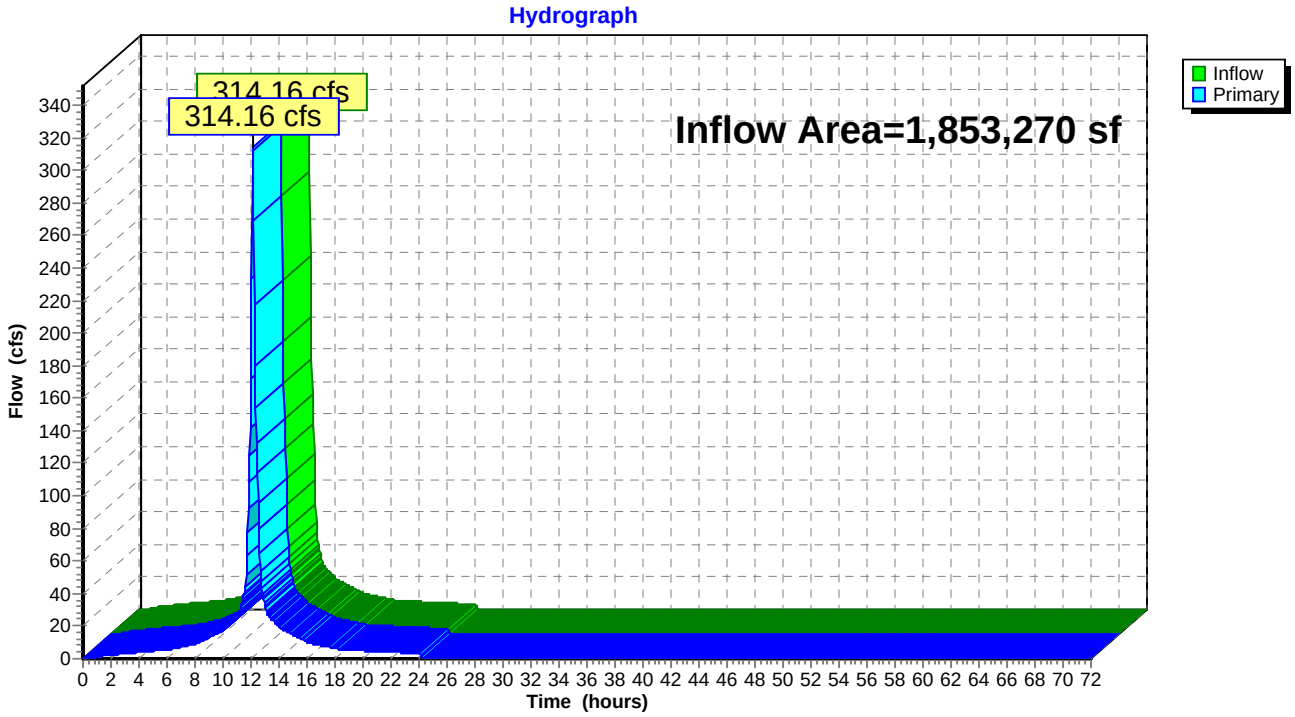


Summary for Link 4L: Point of Analysis

Inflow Area = 1,853,270 sf,100.00% Impervious, Inflow Depth = 8.45" for 100-YR event
Inflow = 314.16 cfs @ 12.14 hrs, Volume= 1,304,981 cf
Primary = 314.16 cfs @ 12.14 hrs, Volume= 1,304,981 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 4L: Point of Analysis

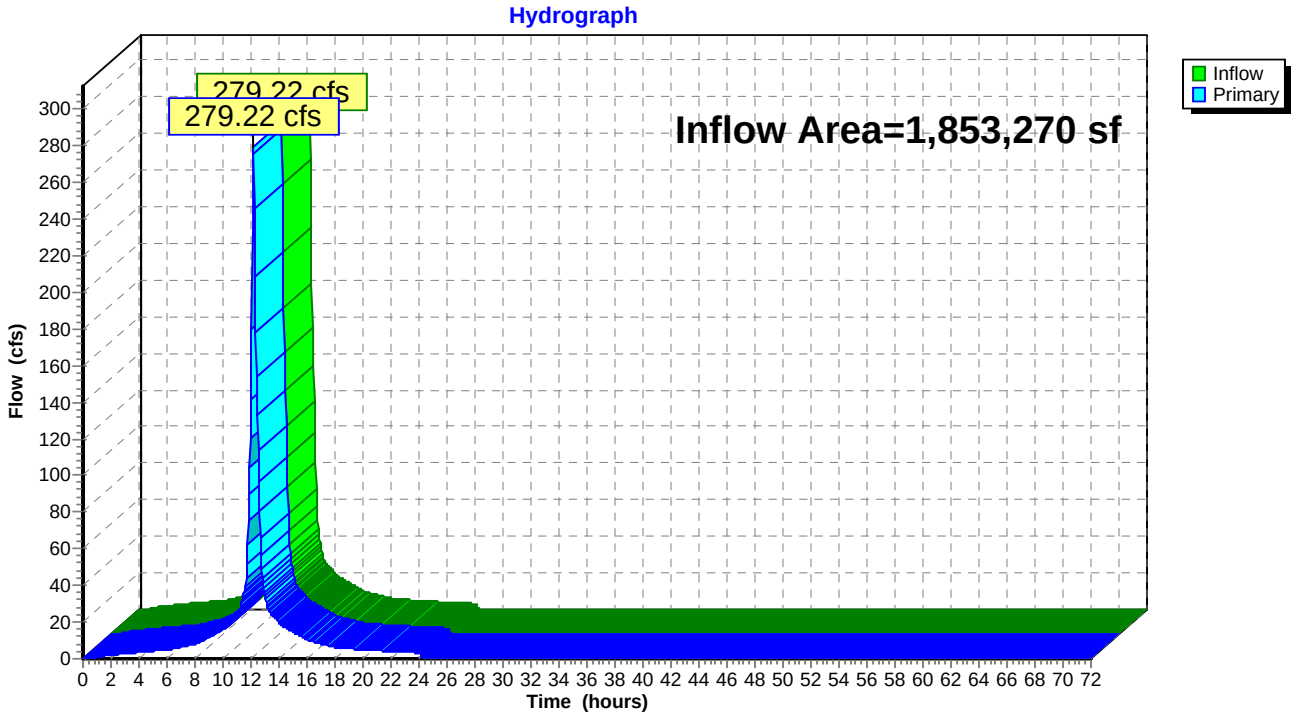


Summary for Link 5L: Point of Analysis

Inflow Area = 1,853,270 sf, 90.00% Impervious, Inflow Depth = 8.16" for 100-YR event
Inflow = 279.22 cfs @ 12.18 hrs, Volume= 1,260,153 cf
Primary = 279.22 cfs @ 12.18 hrs, Volume= 1,260,153 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

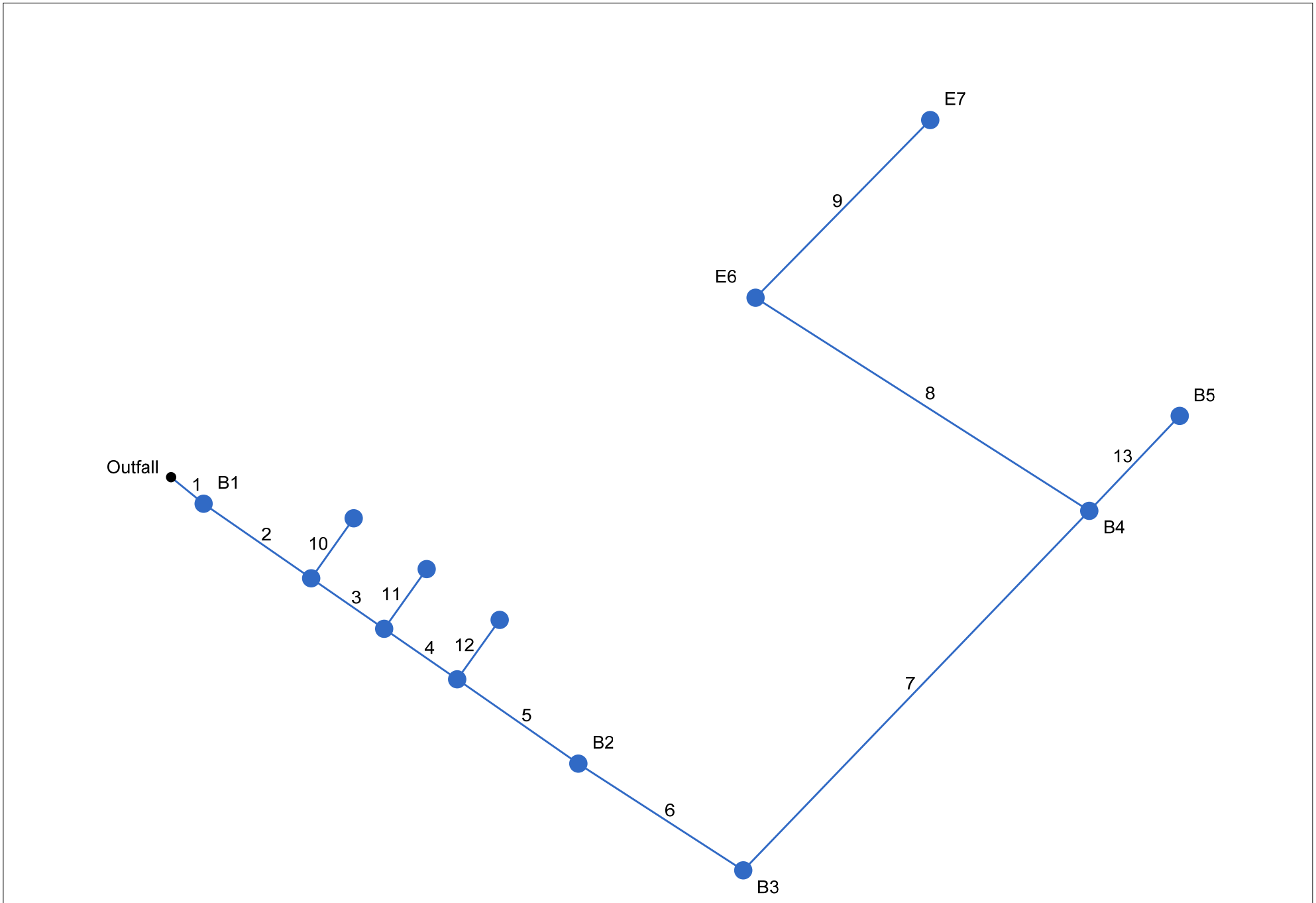
Link 5L: Point of Analysis



B. DESIGN CALCULATIONS

- **Pipe Sizing**

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Freddy's Pipe Calculations.stm	Number of lines: 13	Date: 7/16/2020

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.259	0.07	0.76	0.90	0.06	0.67	0.1	3.0	7.8	5.19	5.52	3.54	x 24 e	0.29	22.87	22.90	23.79	23.79	0.00	27.81	
2	1	31.971	0.00	0.69	0.00	0.00	0.60	0.1	2.9	7.8	4.70	5.71	3.47	x 24 e	0.31	22.90	23.00	23.98	23.84	27.81	28.25	
3	2	21.689	0.00	0.67	0.00	0.00	0.58	0.1	2.8	7.8	4.56	5.80	3.36	x 24 e	0.32	23.00	23.07	24.02	23.91	28.25	28.54	
4	3	21.689	0.00	0.65	0.00	0.00	0.57	0.1	2.7	7.8	4.42	5.37	3.35	x 24 e	0.28	23.07	23.13	24.08	23.92	28.54	28.34	
5	4	36.046	0.02	0.63	0.90	0.02	0.55	0.1	2.5	7.8	4.28	5.38	3.25	x 24 e	0.28	23.13	23.23	24.10	24.02	28.34	27.56	
6	5	48.000	0.08	0.61	0.87	0.07	0.53	0.1	2.2	7.8	4.14	5.70	3.25	x 24 e	0.31	23.23	23.38	24.19	24.17	27.56	26.75	
7	6	122.000	0.11	0.53	0.84	0.09	0.46	0.1	1.6	7.8	3.59	5.62	3.05	x 24 e	0.30	23.38	23.75	24.33	24.50	26.75	26.68	
8	7	96.693	0.22	0.37	0.89	0.20	0.33	0.1	1.0	7.8	2.57	3.54	3.14	15	0.30	23.75	24.04	24.54	24.83	26.68	27.40	
9	8	60.885	0.15	0.15	0.89	0.13	0.13	0.1	0.1	7.8	1.04	3.51	1.07	15	0.30	24.04	24.22	25.06	25.07	27.40	27.75	
10	2	17.982	0.02	0.02	0.90	0.02	0.02	0.1	0.1	7.8	0.14	0.27	2.79	4	1.00	24.50	24.68	24.67	24.89	28.25	28.42	
11	3	17.931	0.02	0.02	0.90	0.02	0.02	0.1	0.1	7.8	0.14	0.28	2.79	4	1.00	24.57	24.75	24.74	24.96	28.54	28.42	
12	4	17.880	0.02	0.02	0.90	0.02	0.02	0.1	0.1	7.8	0.14	0.28	2.79	4	1.01	24.63	24.81	24.80	25.02	28.34	28.42	
13	7	32.000	0.05	0.05	0.79	0.04	0.04	0.1	0.1	7.8	0.31	3.61	0.44	15	0.31	23.75	23.85	24.50	24.50	26.68	26.68	

Project File: Freddy's Pipe Calculations.stm

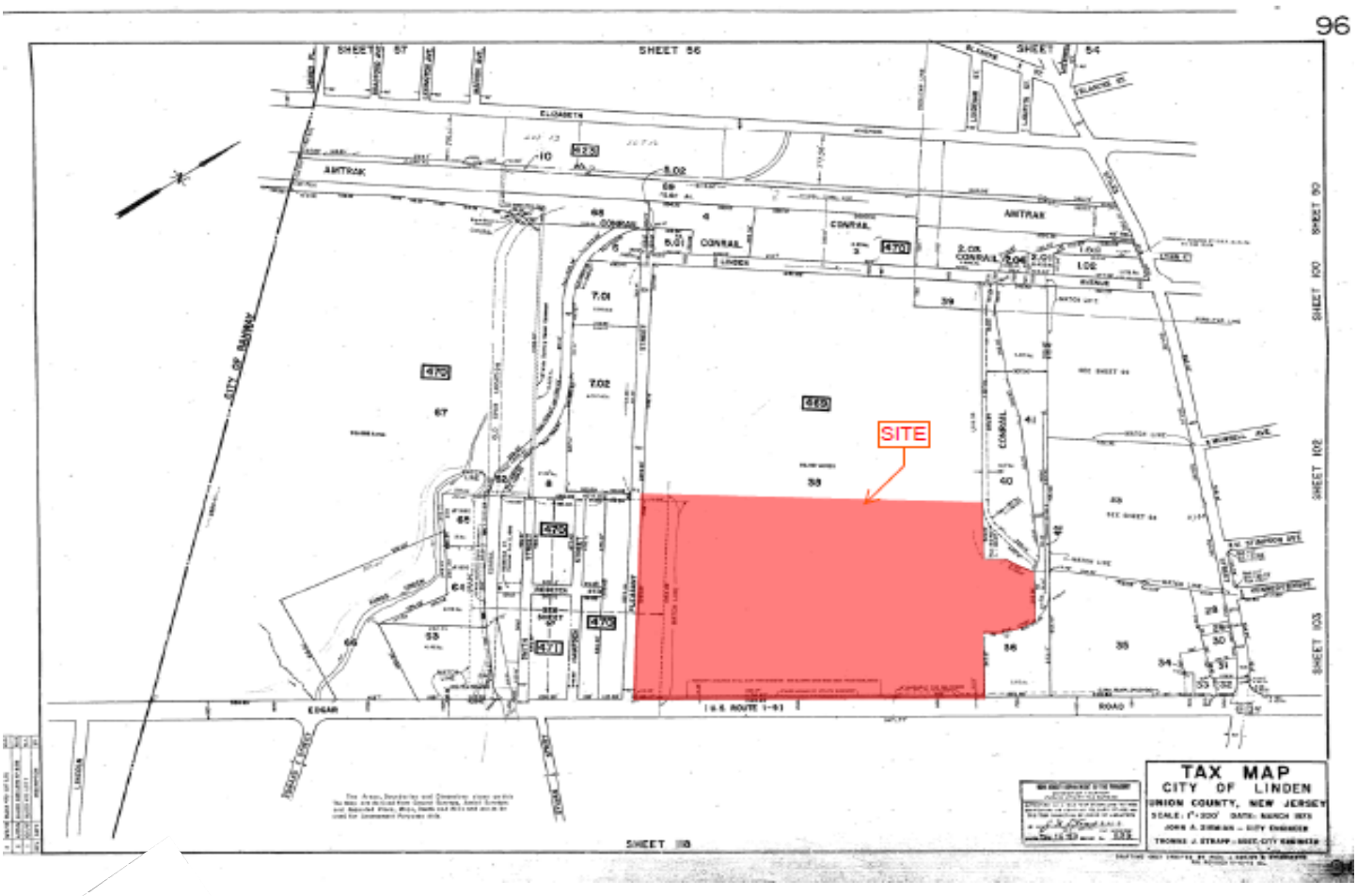
Number of lines: 13

Run Date: 7/16/2020

NOTES:Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period =Yrs. 25 ; c = cir e = ellip b = box

C. MAPS

- **Tax Map**
- **Aerial Map**
- **Soil Map**
- **Depth to Water Table Map**
- **State Planning Area Map**
- **USGS Map**
- **HUC14 Map**
- **FEMA FIRM Map**
- **Drainage Area Maps**
  - **Proposed Drainage Area Map**
  - **Proposed Inlet Area Map**



Tax Map

Source: Linden City Tax Map, Sheet #96

Date Access: 07/10/2020

Linden Development, LLC	
810 W. Edgar Road **Block 469; Lot 38.05**	**City of Linden, Union County, NJ**
BENJ #JS200709	BOHLER
Prepared by: AC / Date: 7/13/2020	
Checked by: JH / Scale: nts	

Aerial Map

Source: Bing

Date Access: 07/10/2020

Linden Development, LLC	
810 W. Edgar Road **Block 469; Lot 38.05**	**City of Linden, Union County, NJ**
BENJ #JS200709	
Prepared by: AC	Date: 7/13/2020
Checked by: JH	Scale: nts

Hydrologic Soil Group— Summary by Map Unit — Union County, New Jersey (NJ039)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BovB	Boonton-Urban land-Haledon complex, 0 to 8 percent slopes	C	1.4	1.7%
HctAr	Hasbrouck silt loam, 0 to 3 percent slopes, rarely flooded	C/D	0.1	0.2%
UdkttB	Udorthents, loamy substratum, 0 to 8 percent slopes	D	3.1	3.7%
UR	Urban land		80.1	94.5%
Totals for Area of Interest			84.7	100.0%

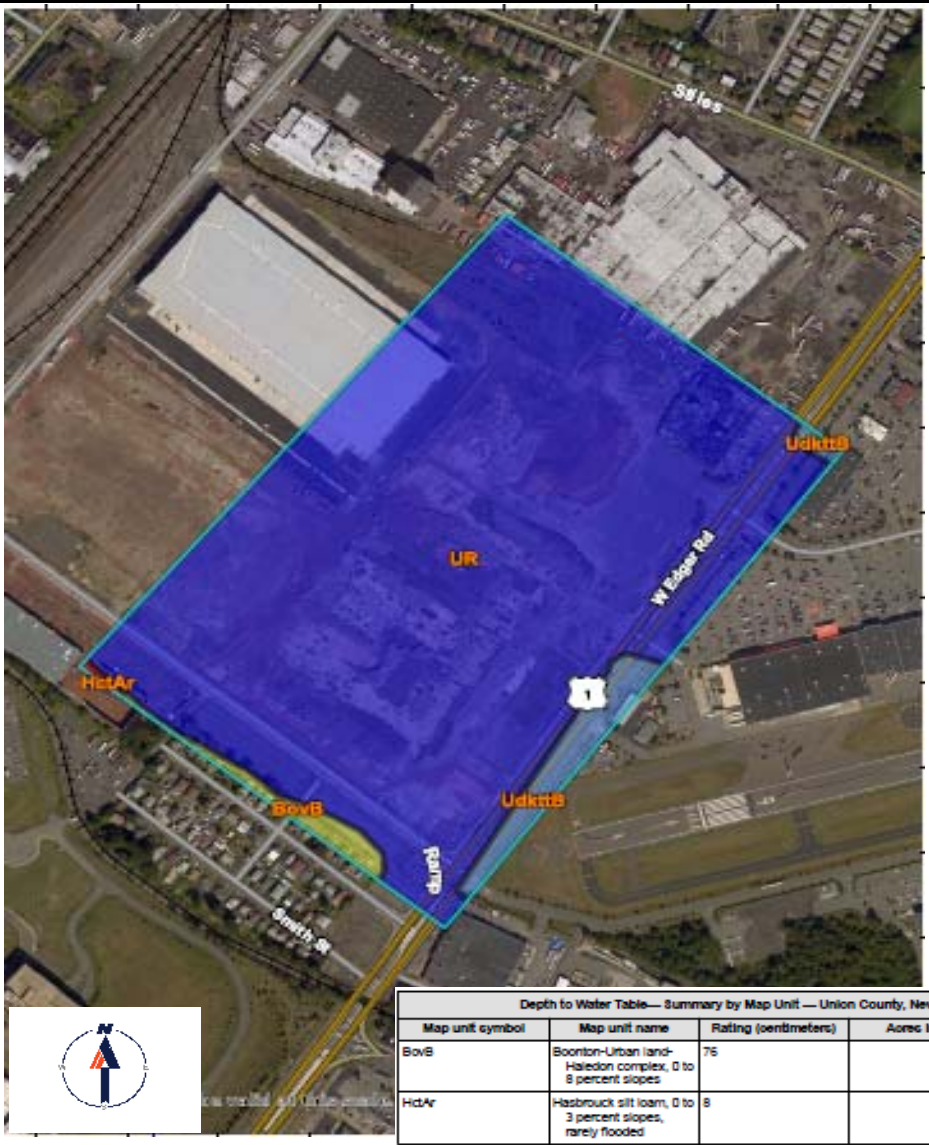
Hydrologic Soils Map

Source: NRCS Web Soil Survey, 2012

Date Access: 07/10/2020

Linden Development, LLC

810 W. Edgar Road **Block 469; Lot 38.05**	**City of Linden, Union County, NJ**
BENJ #JS200709	
Prepared by: AC — Date: 7/13/2020	
Checked by: JH — Scale: nts	BOHLER



Depth to Water Table— Summary by Map Unit — Union County, New Jersey (NJ038)				
Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
BovB	Boonton-Urban land-Haledon complex, 0 to 8 percent slopes	76	1.4	1.7%
HctAr	Hasbrouck silt loam, 0 to 3 percent slopes, rarely flooded	8	0.1	0.2%
UdkttB	Udorthents, loamy substratum, 0 to 8 percent slopes	183	3.1	3.7%
UR	Urban land	>200	80.1	94.5%
Totals for Area of Interest			84.7	100.0%

Depth to Seasonal High Water Table

Source: NRCS Web Soil Survey, 2012

Date Access: 07/10/2020

Linden Development, LLC

810 W. Edga. Edgar Road **Block 469; Lot 38.05**	**City of Linden, Union County, NJ**
BENJ #JS200709	
Prepared by: AC — Date: 7/13/2020	BOHLER
Checked by: JH — Scale: nts	

State Planning Area Map

Source: NJ GeoWeb

Date Access: 07/10/2020

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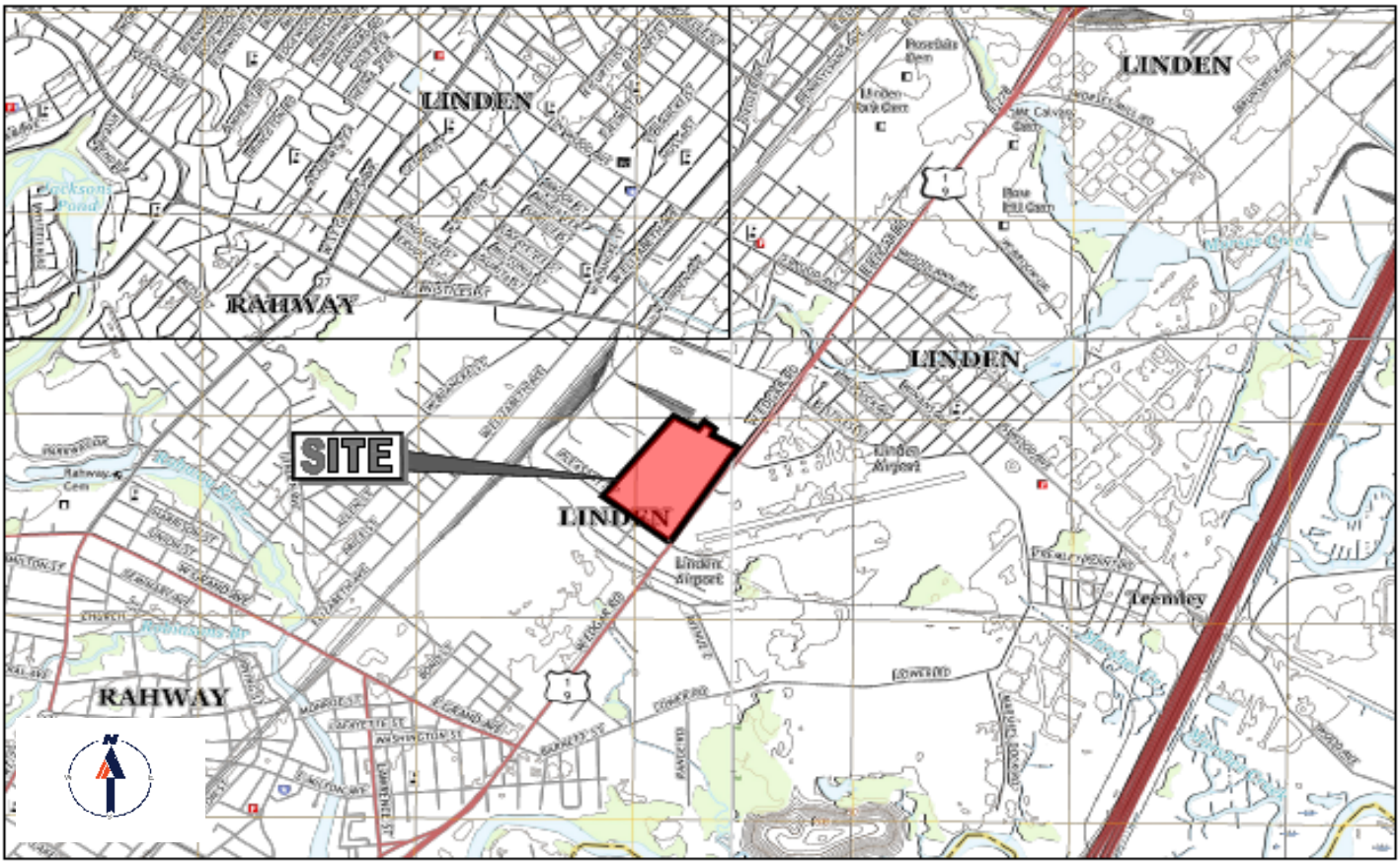

USGS Map
560,665-ft. E; 649,781-ft. N
Perth Amboy Quadrangle

Source: USGS, 1986

Date Access: 07/10/2020

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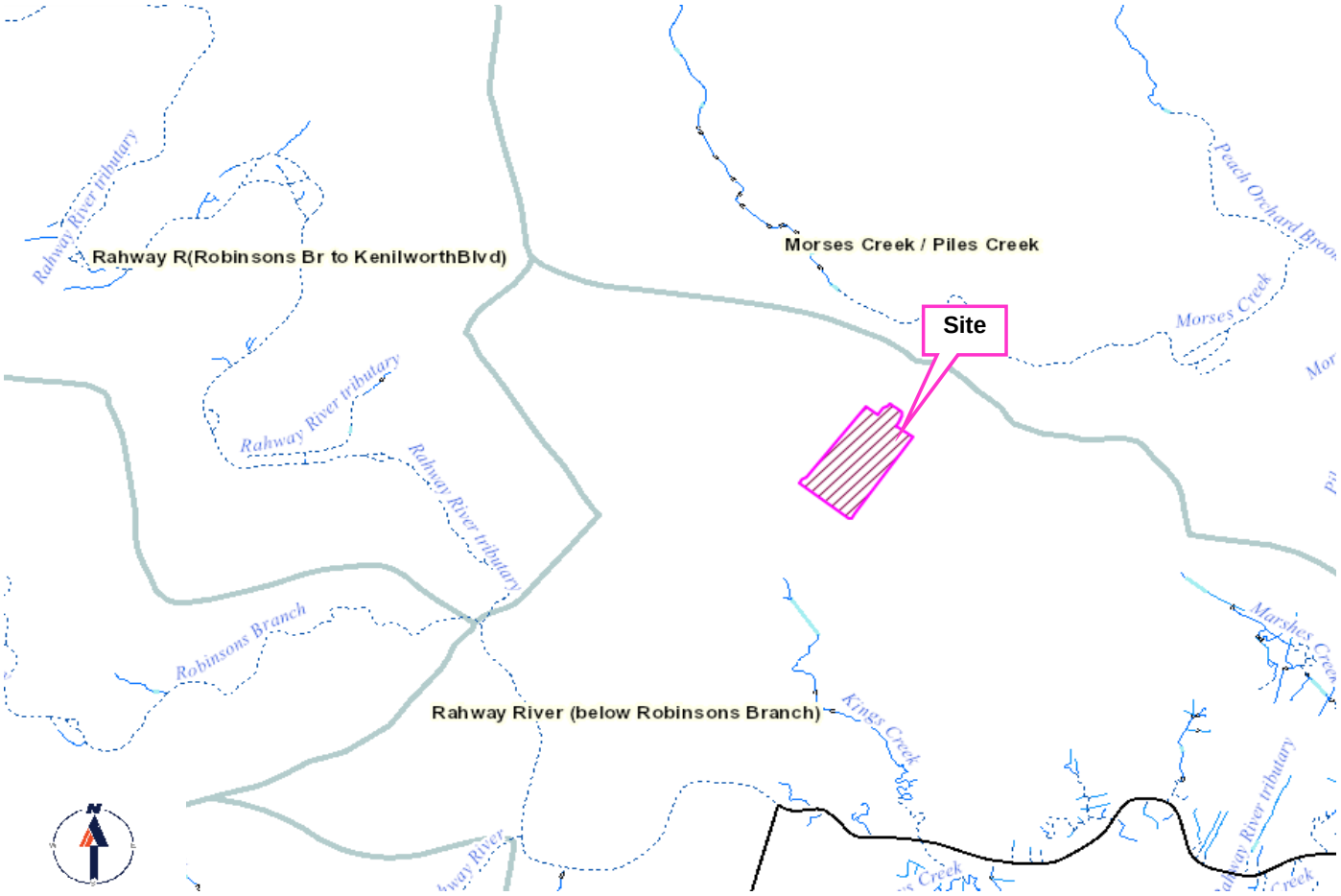

HUC-14 Sub-Watershed Map

Source: NJ GeoWeb

Date Access: 07/10/2020

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FEMA Flood Map

Source:FEMA Preliminary FIRM Map #34039C0044GG, Date 02/03/2015

Date Access: 07/10/2020

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PDA #1
TOTAL AREA = 1,282,652 SF (29.44 AC)
TOTAL PERVIOUS AREA = 90,272 SF (2.07 AC)
TOTAL IMPERVIOUS AREA = 1,192,380 SF (27.37 AC)

PDA #2
TOTAL AREA = 570,618 SF (13.10 AC)
TOTAL PERVIOUS AREA = 95,055 SF (2.18 AC)
TOTAL IMPERVIOUS AREA = 475,563 SF (10.92 AC)

(66' WIDE, PUBLIC RIGHT OF WAY)
(CONCRETE ROADWAY) (2-WAY TRAFFIC)
(25 MPH SPEED LIMIT)

PLEASANT STREET

(50' WIDE, PUBLIC RIGHT OF WAY)
(ASPHALT ROADWAY)
(TWO-WAY TRAFFIC)

REBECCA STREET

HAMPDEN STREET

EDGAR ROAD
(A.K.A US ROUTE 1 & 9)
(VARIABLE WIDTH)
(ASPHALT PAVEMENT ROADWAY)
(2-WAY TRAFFIC)
(40MPH SPEED LIMIT)

EXISTING WALMART
STORE #3469-01
C-182-90(L-NO
178,882 SF)

PROPOSED FITNESS GYM
41,195 SF
FFE: 30.00

BLDG A

BLDG B
FFE: 29.00

HOTEL

BLDG C

BLDG D
FFE: 29.30

BLDG E
FFE: 30.00

RUNWAY PROFILE
ROUTE 1 & 9

80 0 40 80 160 320
GRAPHIC SCALE
1 INCH = 80 FEET

G:\2020\JS200709\DRAWINGS\CURRENT DRAWINGS\SUPPLEMENT DRAWINGS\DRAINAGE MAPS\JS200709-PDA-0B---LAYOUT 01 PDAM

JH

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SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
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REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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PROJECT No.: JS200709
DRAWN BY: OU
CHECKED BY: JWH
DATE: 07/13/2020
CAD I.D.: JS200709-PDA-0B

PROJECT:

AMENDED PRELIMINARY & FINAL MAJOR SITE PLAN

FOR

LINDEN DEVELOPMENT, LLC

PROPOSED FREDDY'S FROZEN CUSTARD & STEAKBURGERS WITH DRIVE-THRU

BLOCK 469; LOT 38.05
PLEASANT STREET AND EDGAR ROAD (N.J.S.H. ROUTE 1 & 9)
CITY OF LINDEN
UNION COUNTY, NEW JERSEY

BOHLER
BOHLER ENGINEERING NJ, LLC
30 INDEPENDENCE BLVD., SUITE 200
WARREN, NJ 07059
Phone: (908) 668-8300
Fax: (908) 754-4401
www.BohlerEngineering.com
NJ CERT. OF AUTHORIZATION NO. 24GA28161700 & NH000122

D.F. WISOTSKY
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 42951
CONNECTICUT LICENSE No. 22098
NEW YORK LICENSE No. 073745

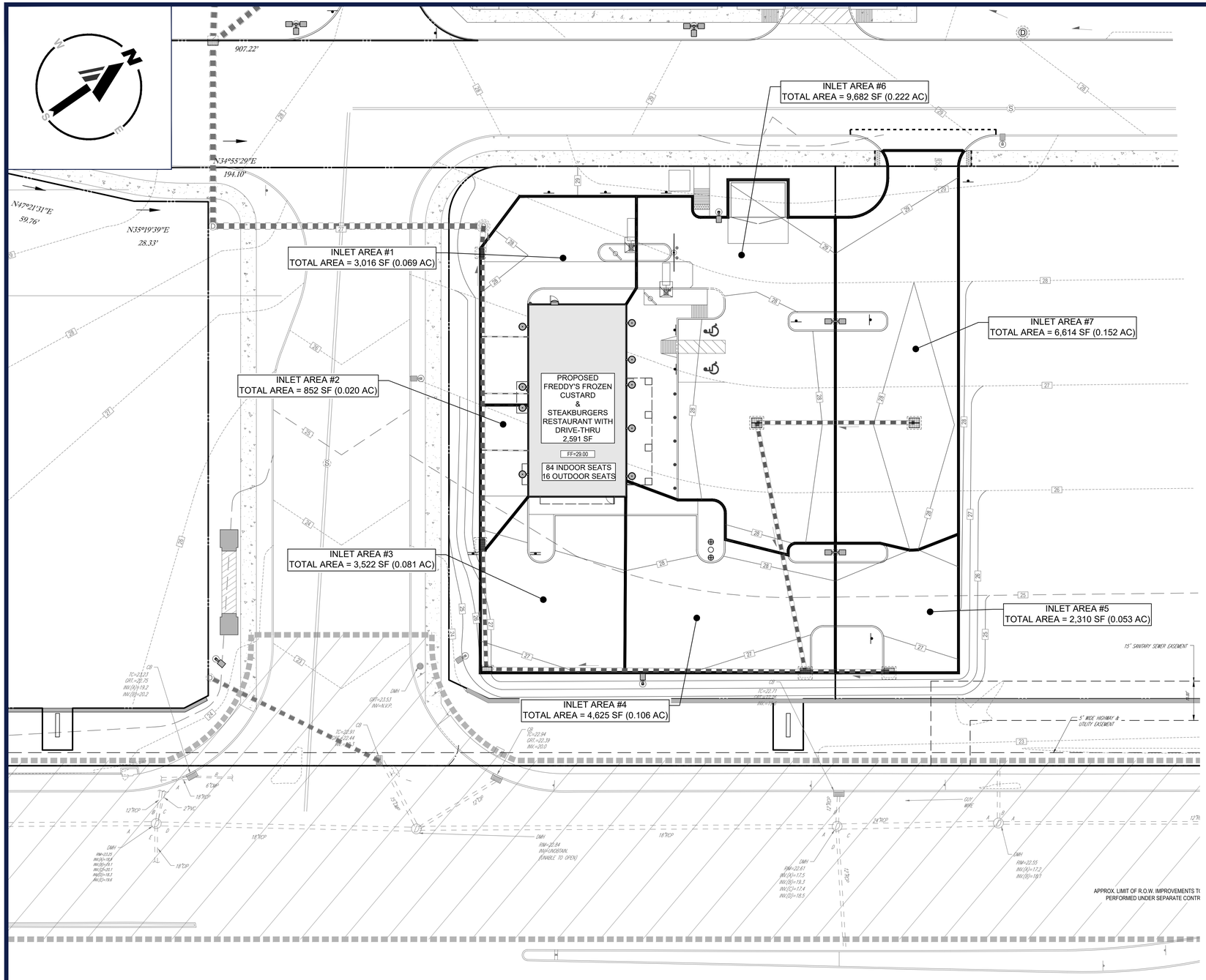
SHEET TITLE:

PROPOSED DRAINAGE AREAS MAP

SHEET NUMBER:

1
OF 1

ORG. DATE - 07/13/2020



EDGAR ROAD

(A.K.A US ROUTE 1 & 9)
(VARIABLE WIDTH)
(ASPHALT PAVEMENT ROADWAY)
(2-WAY TRAFFIC)
(40MPH SPEED LIMIT)

GRAPHIC LEGEND

(U010102 - 03/12/12)

- PROPERTY LINE
- EXIST. CONTOUR & ELEVATION
- PROP. FINISH GRADE CONTOUR & ELEVATION
- EXIST. WATER
- PROP. WATER
- EXIST. GAS
- PROP. GAS
- EXIST. ELECTRIC/TELEPHONE
- PROP. ELECTRIC/TELEPHONE
- EXIST. ELECTRIC/TELEPHONE/CABLE
- PROP. ELECTRIC/TELEPHONE/CABLE
- EXIST. OVERHEAD WIRES
- PROP. OVERHEAD WIRES
- EXIST. STORM PIPE
- PROP. STORM PIPE
- EXIST. SANITARY PIPE
- PROP. SANITARY PIPE
- PROP. DIRECTION OF DRAINAGE FLOW ARROW
- EXIST. ELEVATION
- EXIST. TOP OF CURB ELEVATION
- EXIST. GRADE ELEVATION
- PROP. TOP OF WALL ELEVATION; PROP. GRADE ON HIGH SIDE OF WALL; PROP. GRADE ON LOW SIDE OF WALL
- PROP. TOP OF CURB & FINISHED GRADE ELEV.
- EXIST. AREA/YARD LIGHT
- PROP. AREA/YARD LIGHT
- PROP. CLEAN OUT
- EXIST. INLET
- PROP. INLET
- EXIST. MANHOLE
- PROP. STORM MANHOLE
- PROP. SANITARY MANHOLE
- EXIST. HYDRANT
- PROP. HYDRANT
- EXIST. UTILITY VALVE
- PROP. UTILITY VALVE
- EXIST. UTILITY POLE
- PROP. UTILITY POLE
- EXIST. TRAFFIC SIGNAL
- PROP. TRAFFIC SIGNAL

REFER TO NOTES AND REFERENCES SHEET FOR ADDITIONAL NOTES, REFERENCES AND SPECIFICATIONS.

THIS PLAN TO BE UTILIZED FOR DRAINAGE AND UTILITIES PURPOSES ONLY

20 0 10 20 40 80

GRAPHIC SCALE **1 INCH = 20 FEET**

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SHEET TITLE:

PROPOSED INLET AREAS MAP

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ORG. DATE - 07/13/2020