Stormwater Management Report
For
Epic Church

Block 257, Lot 3.06
Borough of Sayreville, Middlesex County, New Jersey

January 2021
Revised April 2021

Prepared For

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MC Project No. 05000500F

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INTRODUCTION

This stormwater management report is being submitted as part of the Use Variance and Preliminary and Final Major Site Plan development application known as Epic Church located on Lot 3.06, Block 257, as shown on Sheet 91 of the Official Tax Map of the Borough of Sayreville, Middlesex County, New Jersey. The property is bounded by future Riverton Boulevard (current Chevalier Avenue) to the north, Main Street Extension to the east, future Peter Fisher Boulevard (current vacant land) to the south, and a future development known as Riverton (current vacant land) to the west. The site is presently developed with a church and associated site improvements including, but not limited to, parking areas, storm sewer and stormwater management facilities, utility services, lighting, and landscaping.

The proposed development maintains the existing use with modifications to the existing parking areas, including modifications to the storm sewer and stormwater management facilities.

This report and corresponding plans were prepared in accordance with the Borough of Sayreville Ordinance, Standards for Soil Erosion and Sediment Control in New Jersey, New Jersey of Environmental Protection (NJDEP) Stormwater Management Regulations at N.J.A.C. 7:8 and current industry standards for stormwater management. The purpose of this report is to summarize the stormwater management design as it pertains to the stormwater rules and to provide calculations to support the design.

This report should be reviewed concurrently with plans entitled, "Use Variance and Preliminary and Final Major Site Plan for Epic Church", prepared by Maser Consulting, dated January 13, 2021, latest revision. Location maps of the overall property are provided in the Appendix.

RELATIONSHIP TO RIVERTON REDEVELOPMENT PROJECT

The Riverton redevelopment project site is located along the southerly banks of the Raritan River, adjacent to the Garden State Parkway, Route 9, Route 35, Chevalier Avenue, and Main Street Extension in the Borough of Sayreville. The project site is defined as three Parcels: A, B

and C. Parcel A, located east of Route 35, has been designated as Open Space and will not be developed, except to provide access to Parcel B. Parcel B, which is located between the Garden State Parkway / Route 9 and Route 35, will contain mixed-use development including retail, office and hotel uses. Parcel C, located west of the Garden State Parkway, will contain mixed-use development including village style commercial space, retail space, office space, restaurants, townhomes, apartments, hotels and other ancillary land uses. Epic Church is bounded to the south and west by Parcel C of Riverton. Improvements to Chevalier Avenue (bounding Epic Church to the north) are also included in the proposed scope of the Riverton redevelopment project.

Riverton received Preliminary & Final Major Site Plan Approval and Preliminary Final Major Subdivision Approval from the Borough of Sayreville Planning Board per Resolution dated January 8, 2020. Approval is for a portion (Phase I) of the development within Parcel C and included a wet pond to address stormwater management. The Phase I wet pond is designed to provide stormwater management for full build-out of Phase I, future phases of Parcel C, and off-development areas including, but not limited to, a portion of the Epic Church property. Approval of the Riverton Phase I wet pond is also currently pending with the New Jersey Department of Environmental Protection (NJDEP) as part of a modification to NJDEP Permit Number 1219-04-0005.4.

Currently, 6.82 acres of the Epic Church property drains towards Parcel C (including Chevalier Avenue). This area is identified as drainage area E-1 on the Existing Drainage Area Map included in the Appendix of this report. An existing surface detention basin provides stormwater management for a portion of the 6.82 acres. The subject development application for Epic Church proposes to remove the existing detention basin and increase the drainage area towards Parcel C to 6.95 acres (drainage area P-1 on the Proposed Drainage Area Map), including an increase in impervious coverage. Removal of the existing basin and the increase in impervious coverage and drainage area toward Parcel C is fully accounted for from a water quantity and water quality perspective by the Riverton Phase I wet pond and associated storm sewer tributary to the wet pond. As water quantity and water quality stormwater management compliance for

drainage area P-1 is addressed as part of the Riverton development, the scope of this report is limited to documenting compliance with groundwater recharge requirements for the subject development, providing onsite storm sewer calculations within drainage area P-1, and documenting compliance with applicable stormwater management regulations for the remainder of the Epic Church property.

Further information regarding the Riverton Phase I wet pond and associated stormwater management regulation compliance can be found in the following documents:

1. "Preliminary/Final Major Site and Subdivision Plan for Riverton Village Phase I, Parcel C: Block 257, Lots 3.04 & 3.052, Block 257.01, Lots 1, 1.01, 4, 5, 6, 20, 1.10 & 30.12, Block 257.02, Lots 1, 1.01 & 22, Borough of Sayreville, Monmouth County, New Jersey", prepared by Maser Consulting, dated May 15, 2019, latest revision.
2. "Stormwater Management Report for Riverton Village – Phase I, Parcel C: Block 257, Lots 3.04 & 3.052, Block 257.01, Lots 1, 1.01, 4, 5, 6, 20, 1.10 & 30.12, Block 257.02, Lots 1, 1.01 & 22, Borough of Sayreville, Monmouth County, New Jersey", prepared by Maser Consulting, dated July 2019, latest revision.

STORMWATER COMPLIANCE STATEMENT

The proposed development complies with the water quantity regulations at Borough ordinance section 26-99.6D.f.1(c)(1) and N.J.A.C. 7:8-5.4(a)3.i. by demonstrating the post-construction runoff hydrographs for the two, 10 and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events at Point of Analysis #2 (Garden State Parkway Ramp) and #3 (Main Street Extension).

The proposed development complies with the groundwater recharge regulations at Borough ordinance section 26-99.6D.f.1(b)(1)(i) and N.J.A.C. 7:8-5.4.(a).2.i.(1) by maintaining 100 percent of the average annual pre-construction groundwater recharge volume for the site under post-construction conditions.

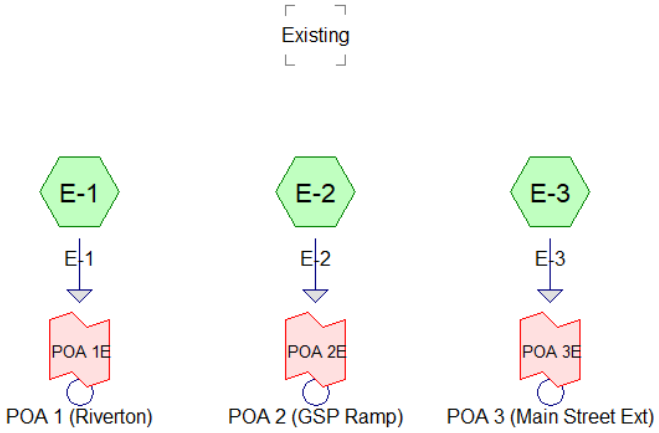
In accordance with Borough ordinance section 26-99.6D.g.1. and N.J.A.C. 7:8-5.5(a)., water quality standards are applicable to the proposed development due to a net increase of greater than 0.25 acres of impervious coverage. Water quality is addressed in Drainage Area P-1 through connection to the approved Riverton stormwater management system. As the entire increase in impervious coverage (i.e. the regulated impervious coverage) is contained in Drainage Area P-1, water quality for the proposed development is fully addressed through connection to the approved Riverton system.

As detailed in the "Relationship to Riverton Redevelopment Project" section of the report, compliance with water quantity and water quality stormwater management regulations at Point of Analysis #1 (Riverton Development) is addressed as part of the Riverton development and not included in this report.

STUDY AREAS

The drainage areas utilized to analyze and calculate the stormwater attenuation requirements for this development were established based on the proposed hydrologic limits of disturbance and the existing and proposed topography. The following is a listing of the drainage areas used in this report and a description of their location.

EXISTING CONDITIONS ANALYSIS

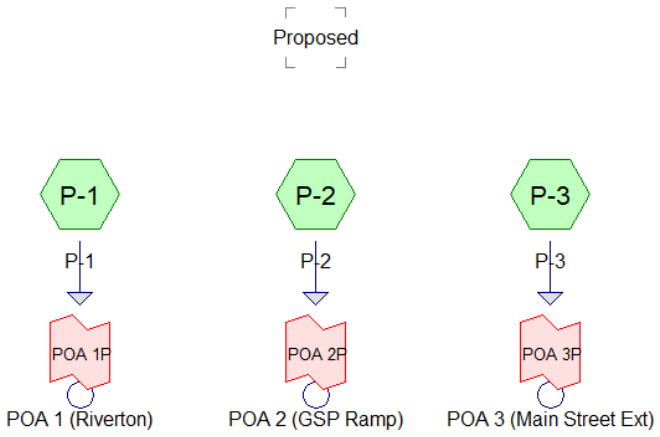


E-1: Consists of 6.82 acres within the western portion of the property, including impervious coverage (roof, pavement, sidewalk), grass, and a wooded area. A portion of this area is controlled by an existing surface detention basin. Runoff, including discharge from the existing basin, is tributary to Point of Analysis #1 (Riverton Development) by way of overland flow. Runoff calculations are not provided for this area in this report as the same is addressed as part of the Riverton development.

E-2: Consists of 6.49 acres within the eastern portion of the property, including impervious coverage (roof, pavement, sidewalk) and grass. This area does not contain existing stormwater management facilities beyond storm sewer piping. Runoff is tributary to Point of Analysis #2 (Garden State Parkway Ramp) by way of a storm sewer pipe connection to the GSP drainage system.

E-3: Consists of 0.68 acres at the eastern edge of the property along the Main Street Extension frontage of the site. Land cover includes impervious coverage (pavement) and grass. This area does not contain existing stormwater management facilities or storm sewer piping. Runoff is tributary to Point of Analysis #3 (Main Street Extension) by way of overland flow.

PROPOSED CONDITIONS ANALYSIS



P-1: Consists of 6.95 acres within the western portion of the property, including impervious coverage (roof, pavement, sidewalk), grass, and a wooded area. Runoff is tributary to Point of Analysis #1 (Riverton Development) by way of storm sewer piping connections to future Riverton Boulevard (existing Chevalier Avenue) and future Peter Fisher Boulevard. Runoff calculations are not provided for this area in this report as the same is addressed as part of the Riverton development.

P-2: Consists of 6.42 acres within the eastern portion of the property, including impervious coverage (roof, pavement, sidewalk) and grass. Runoff is tributary to Point of Analysis #2 (Garden State Parkway Ramp) by way of an existing storm sewer pipe connection to the GSP drainage system.

P-3: Consists of 0.63 acres at the eastern edge of the property along the Main Street Extension frontage of the site. Land cover includes impervious coverage (pavement) and grass. Runoff is tributary to Point of Analysis #3 (Main Street Extension) by way of overland flow.

STORMWATER MANAGEMENT METHODOLOGY

Modeling and analysis of existing and proposed conditions tributary to Point of Analysis #2 and #3 is performed utilizing HydroCAD v10.10-3a Software by HydroCAD Software Solutions. The Soil Conservation Service's Unit Hydrograph method and Standard Unit Hydrograph are utilized in conjunction with rainfall data based on the National Engineering Handbook, Part 650, Chapter 2, New Jersey Supplement, and a NOAA 24-hr Type D storm distribution. Time of concentration (Tc) is 6 minutes under both existing and proposed conditions.

STORMWATER RUNOFF QUANTITY

The proposed development complies with the water quantity regulations at Borough ordinance section 26-99.6D.f.1(c)(1) and N.J.A.C. 7:8-5.4(a)3.i. by demonstrating the post-construction runoff hydrographs for the two, 10 and 100-year storm events do not exceed, at any point in

time, the pre-construction runoff hydrographs for the same storm events at Point of Analysis #2 (Garden State Parkway Ramp) and #3 (Main Street Extension). The following tables summarize existing and proposed conditions tributary to Point of Analysis #2 and #3. Full hydrograph data, including a tabular comparison of existing and proposed conditions, is provided in the Appendix of this report.

SUMMARY OF OUTFLOW TO POA #2

Storm (Year)	Existing Peak Flow (cfs)	Proposed Peak Flow (cfs)	Existing Runoff Volume (ac-ft)	Proposed Runoff Volume (ac-ft)
2	19.60	19.38	1.588	1.570
10	30.71	30.36	2.525	2.497
100	52.76	52.18	4.404	4.355

SUMMARY OF OUTFLOW TO POA #3

Storm (Year)	Existing Peak Flow (cfs)	Proposed Peak Flow (cfs)	Existing Runoff Volume (ac-ft)	Proposed Runoff Volume (ac-ft)
2	1.56	1.38	0.119	0.104
10	2.72	2.46	0.209	0.186
100	5.10	4.66	0.397	0.359

STORMWATER RUNOFF QUALITY

In accordance with Borough ordinance section 26-99.6D.g.1. and N.J.A.C. 7:8-5.5(a)., water quality standards are applicable to the proposed development due to a net increase of greater than 0.25 acres of impervious coverage. The net increase in impervious coverage for the entire project site is 0.49 acres. Individually, net impervious coverage change in each drainage area is as follows:

- Drainage Area P-1: Net increase of 0.63 acres of impervious coverage.
- Drainage Area P-2: Net decrease of 0.07 acres of impervious coverage.
- Drainage Area P-3: Net decrease of 0.07 acres of impervious coverage.

Water quality is addressed in Drainage Area P-1 through connection to the approved Riverton stormwater management system. As the entire increase in impervious coverage (i.e. the regulated

impervious coverage) is contained in Drainage Area P-1, water quality for the proposed development is fully addressed through connection to the approved Riverton system.

Drainage Areas P-2 and P-3 have no regulated impervious coverage because there is no net increase of impervious coverage nor are there any modifications to the existing stormwater conveyance system which would adversely affect the quality characteristics of the runoff.

GROUNDWATER RECHARGE

The proposed development complies with the groundwater recharge regulations at Borough ordinance section 26-99.6D.f.1(b)(1)(i) and N.J.A.C. 7:8-5.4.(a).2.i.(1) by maintaining 100 percent of the average annual pre-construction groundwater recharge volume for the site under post-construction conditions.

Based on the New Jersey Groundwater Recharge Spreadsheet, Version 2.0, November 2003, the post-construction annual recharge deficit for this development is 23,442 cubic feet. Porous asphalt pavement is proposed in a portion of the parking lot expansion near the northwest corner of the subject site to address the deficit. Based on the proposed 8,748 square foot surface area and 6-inch stone depth (effective depth of 2.4-inches based on 40% void ratio), the porous pavement provides an annual BMP recharge volume of 39,658 cubic feet, which is greater than the 23,442 cubic foot deficit. The Annual Recharge Volume Deficit and Annual BMP Recharge Volume calculation spreadsheets are provided in the Appendix.

STORM SEWER DESIGN

Proposed storm sewer is designed in accordance with current engineering standards and the Borough ordinance, particularly section 26-99.3.c.2.(e). This section of the ordinance requires the pipe size determined to be adequate for the runoff computed shall be increased by at least one standard pipe size in order to provide adequate allowance for normal accumulation of sediment and debris. The minimum proposed pipe size is 15 inches.

Hydraflow Storm Sewer Extension for Autodesk AutoCAD Civil 3D v12 Software by Autodesk and StormCAD CONNECT Edition Update 3 Software by Bentley Systems were utilized in the design of the storm sewer. The proposed storm sewer was designed using the Rational Method with a minimum time of concentration of 10 minutes and the Trenton Intensity-Duration-Frequency Curve. A 'C' coefficient of 0.98 was used for all areas except for P1A-10C, which is modeled based on actual land cover. The storm sewer was designed to convey the 25-year storm frequency. Tailwater elevations at the connection points to the future Riverton stormwater system (i.e. Inlets S-P1A-113 and S-P1A-200) are based on the hydraulic grade line in the Riverton stormwater system during the 25-year storm event with the 25-year water surface elevation in the Riverton Phase I wet pond.

The pipes were initially designed in Hydraflow to provide a full flow pipe capacity equal to or greater than the peak flow discharging through the pipe. Once this design was completed, each pipe section was upsized one standard pipe diameter. The upsized pipes were then modeled in StormCAD using the tailwater elevation from the future Riverton stormwater system to evaluate the hydraulic grade line. The pipe diameters shown on the Plans are based on the upsized design.

Proposed pipes P-C-1 through P-C-3 are not included in the storm sewer calculations presented in this report. These pipes merely replace existing pipes removed in association with removal of the existing parking stall row along Chevalier Avenue. The proposed pipes match existing pipe size (24-inch) and meet or exceed existing pipe slopes. Due to removal of the parking row, the proposed pipes also receive less drainage area compared to existing conditions.

SOIL EROSION AND SEDIMENT CONTROL

In accordance with the Soil Erosion and Sediment Control Act and the Borough of Sayreville requirements, soil erosion measures were incorporated into the site design and graphically

depicted on the Soil Erosion and Sediment Control Plan sheets. These measures include, but are not limited to:

- Sediment Barriers and Silt Fences
- Stabilized Construction Access
- Topsoil Stockpile
- Temporary and Permanent Stabilization
- Storm Sewer Inlet Protection

CONCLUSION

The proposed development complies with applicable stormwater management regulations as specified by the Borough of Sayreville Ordinance, Standards for Soil Erosion and Sediment Control in New Jersey (SCD), and New Jersey of Environmental Protection (NJDEP) Stormwater Management Regulations at N.J.A.C. 7:8.

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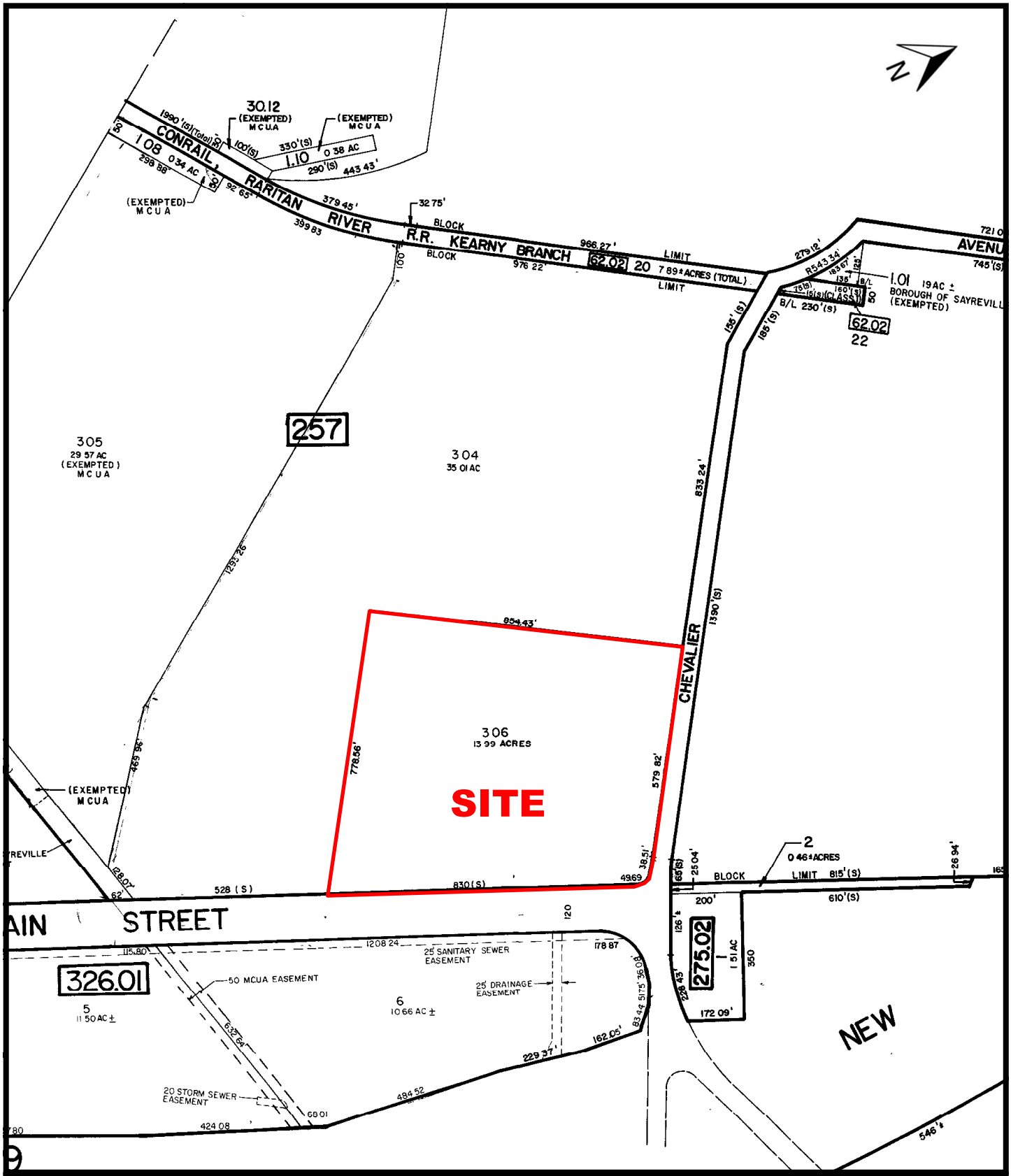
APPENDIX A

MAPS



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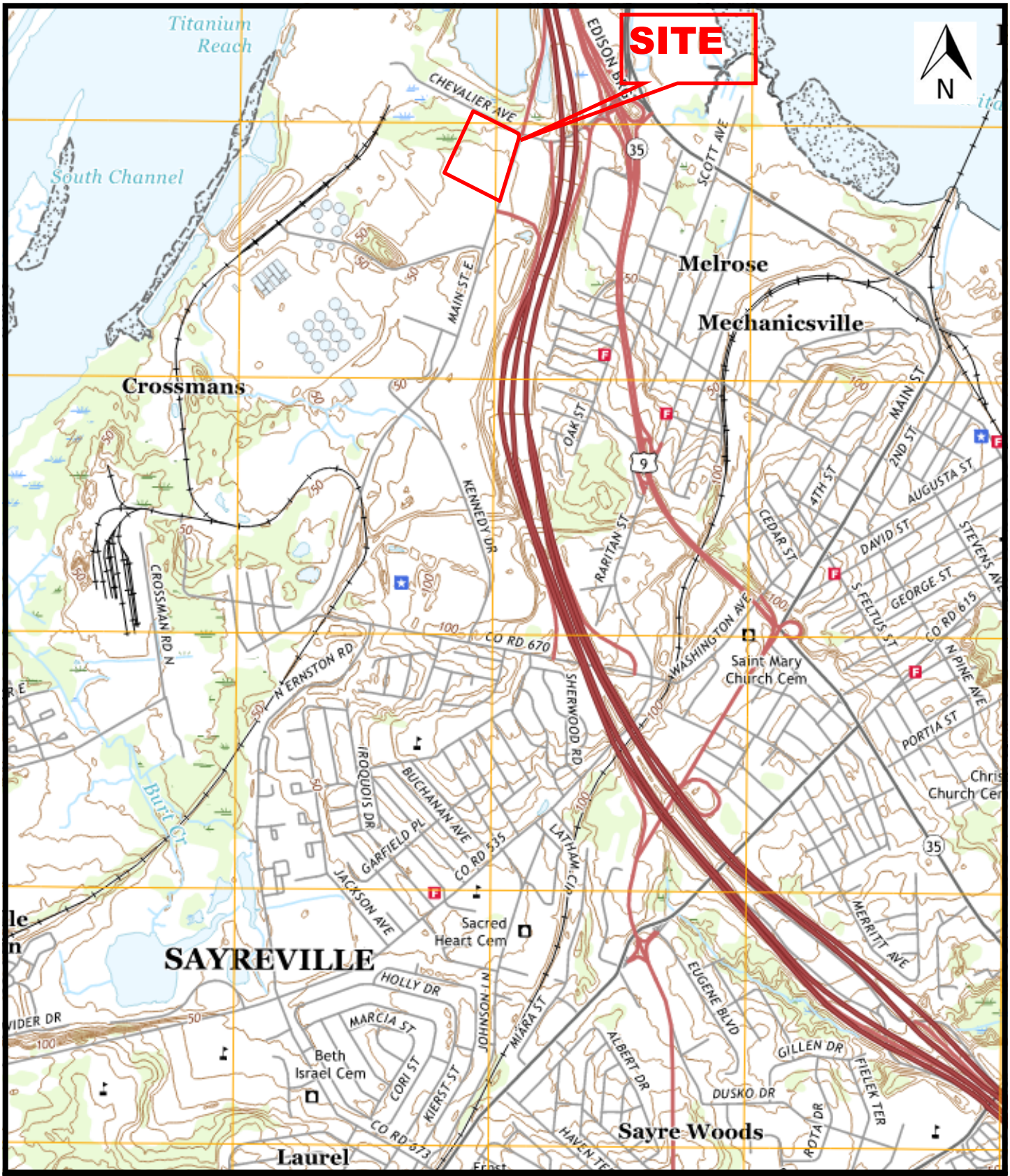
Tax Map
Block 257, Lot 3.06
Image source:
Borough of Sayreville Tax Map

Scale: NTS

Date: January 2021

MC Project No. 05000500F



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USGS Map
South Amboy Quadrangle
Image source:
http://www.usgs.gov

Scale: NTS

Date: January 2021

MC Project No. 05000500F

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
KemB	Keyport sandy loam, 2 to 5 percent slopes	D	4.9	34.7%
PHG	Pits, sand and gravel		9.0	64.2%
UR	Urban land		0.2	1.1%
Totals for Area of Interest			**14.0**	**100.0%**

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Soils Map
Image source:
http://www.websoilsurvey.nrcs.usda.gov

Scale: NTS

Date: January 2021

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Location Map
Image source:
Google Earth Pro

Scale: NTS

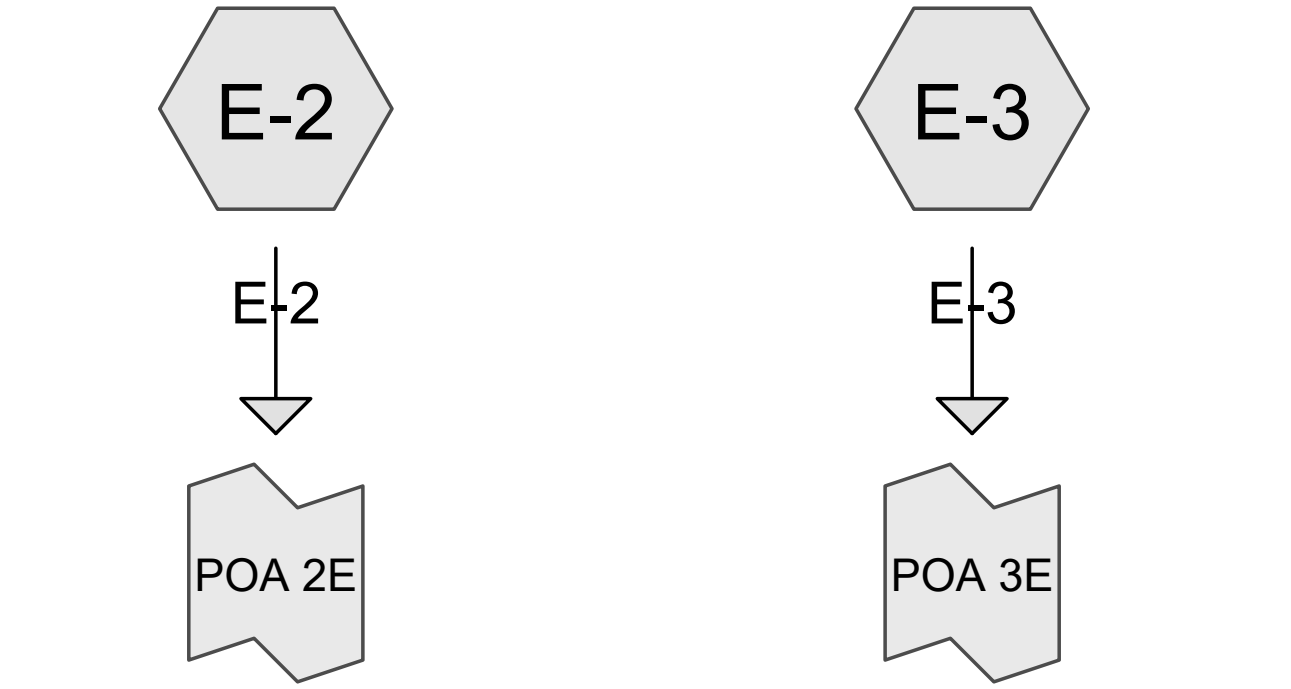
Date: January 2021

MC Project No. 05000500F

APPENDIX B

EXISTING CONDITIONS ROUTINGS

Existing



POA 2 (GSP Ramp)

POA 3 (Main Street Ext)

Subcat Reach Pond Link

Routing Diagram for 210127 - Epic Church Stormwater Model
Prepared by Maser Consulting PA, Printed 1/28/2021

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.170	80	>75% Grass cover, Good, HSG D (E-2, E-3)
6.000	98	Paved parking, HSG D (E-2, E-3)
7.170	**95**	**TOTAL AREA**

Summary for Subcatchment E-2: E-2

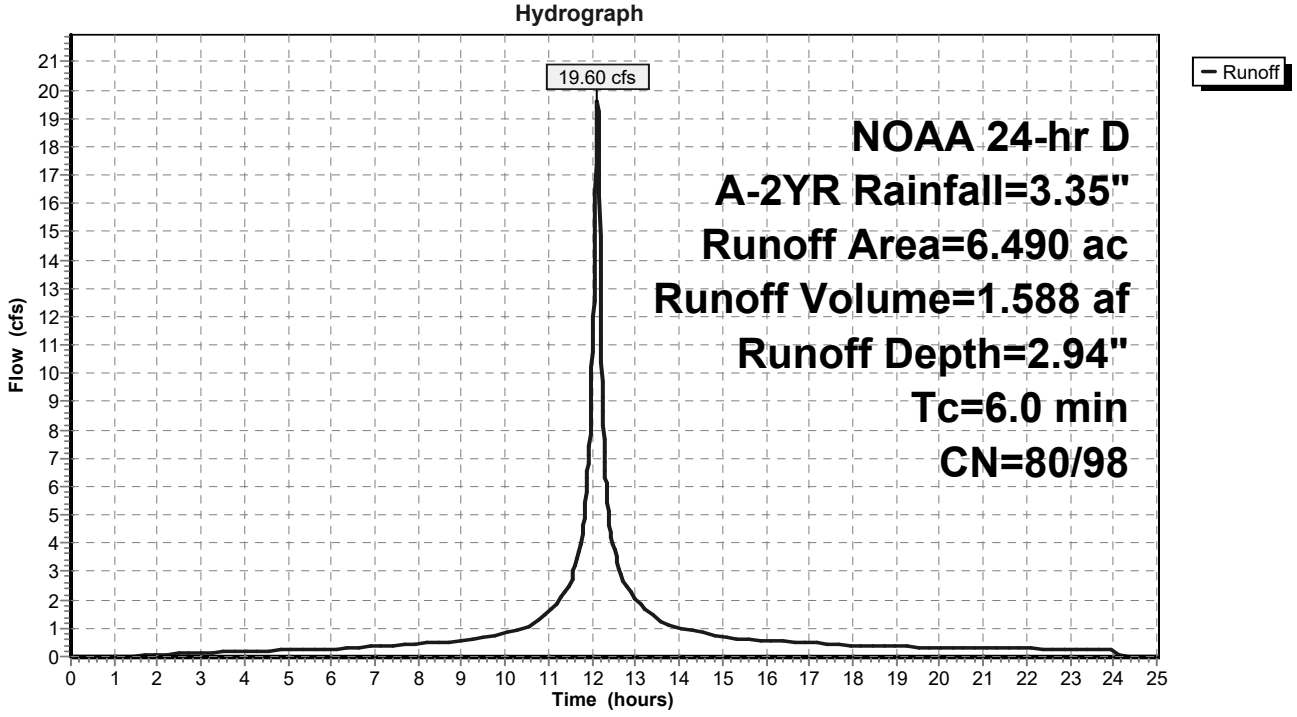
Runoff = 19.60 cfs @ 12.13 hrs, Volume= 1.588 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D A-2YR Rainfall=3.35"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.754	98	Paved parking, HSG D
6.490	96	Weighted Average
0.736	80	11.34% Pervious Area
5.754	98	88.66% Impervious Area

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

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

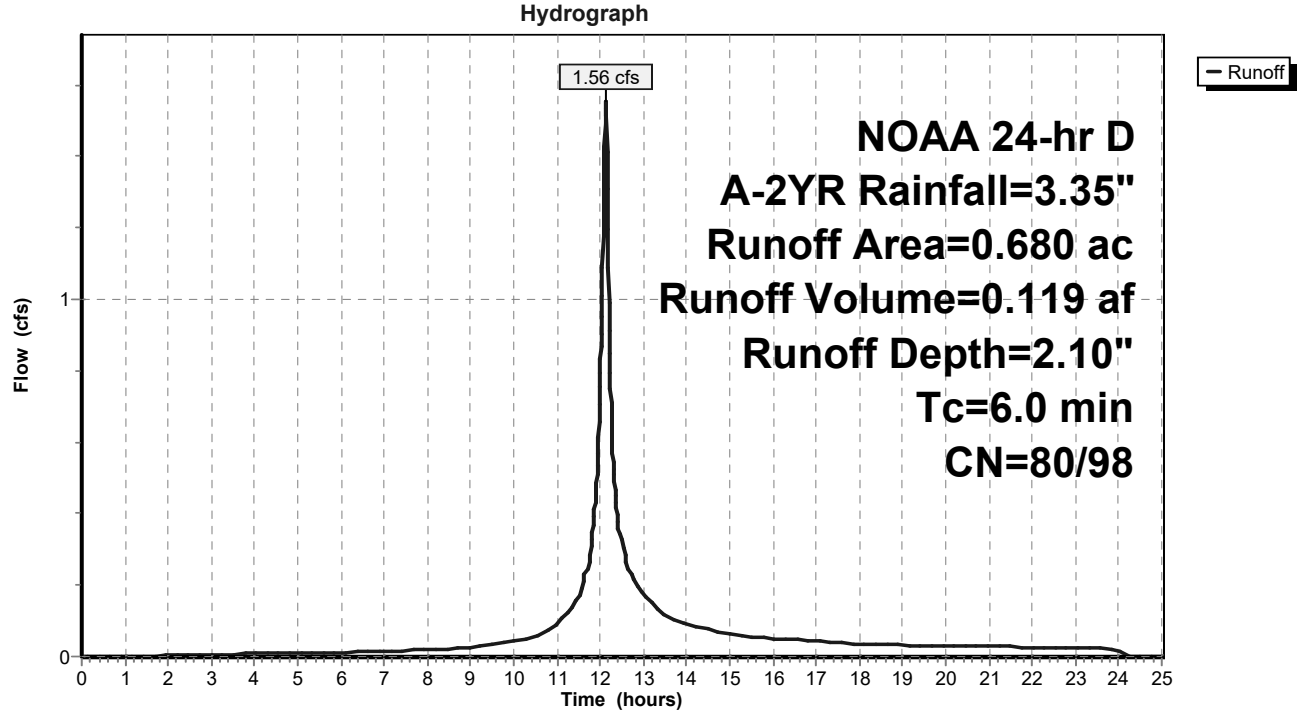
Runoff = 1.56 cfs @ 12.13 hrs, Volume= 0.119 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D A-2YR Rainfall=3.35"

Area (ac)	CN	Description
0.434	80	>75% Grass cover, Good, HSG D
0.246	98	Paved parking, HSG D
0.680	87	Weighted Average
0.434	80	63.82% Pervious Area
0.246	98	36.18% Impervious Area

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

Subcatchment E-3: E-3

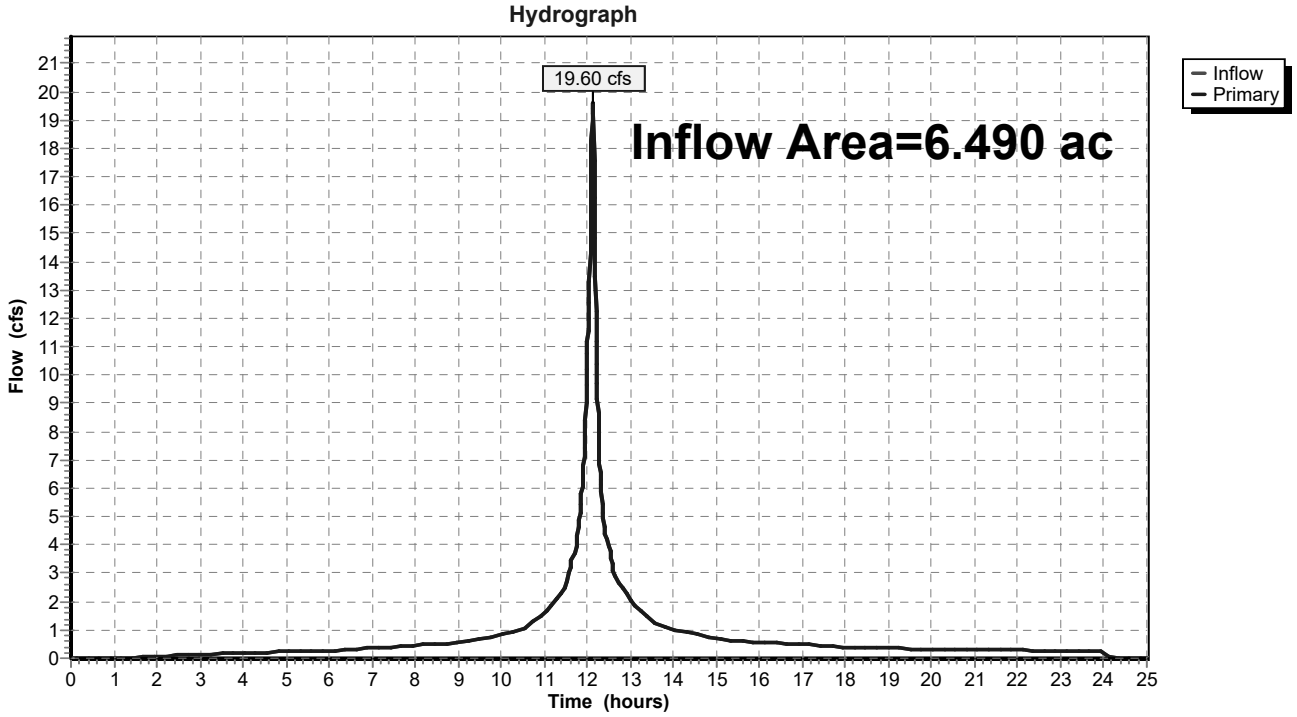


Summary for Link POA 2E: POA 2 (GSP Ramp)

Inflow Area = 6.490 ac, 88.66% Impervious, Inflow Depth = 2.94" for A-2YR event
Inflow = 19.60 cfs @ 12.13 hrs, Volume= 1.588 af
Primary = 19.60 cfs @ 12.13 hrs, Volume= 1.588 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2E: POA 2 (GSP Ramp)

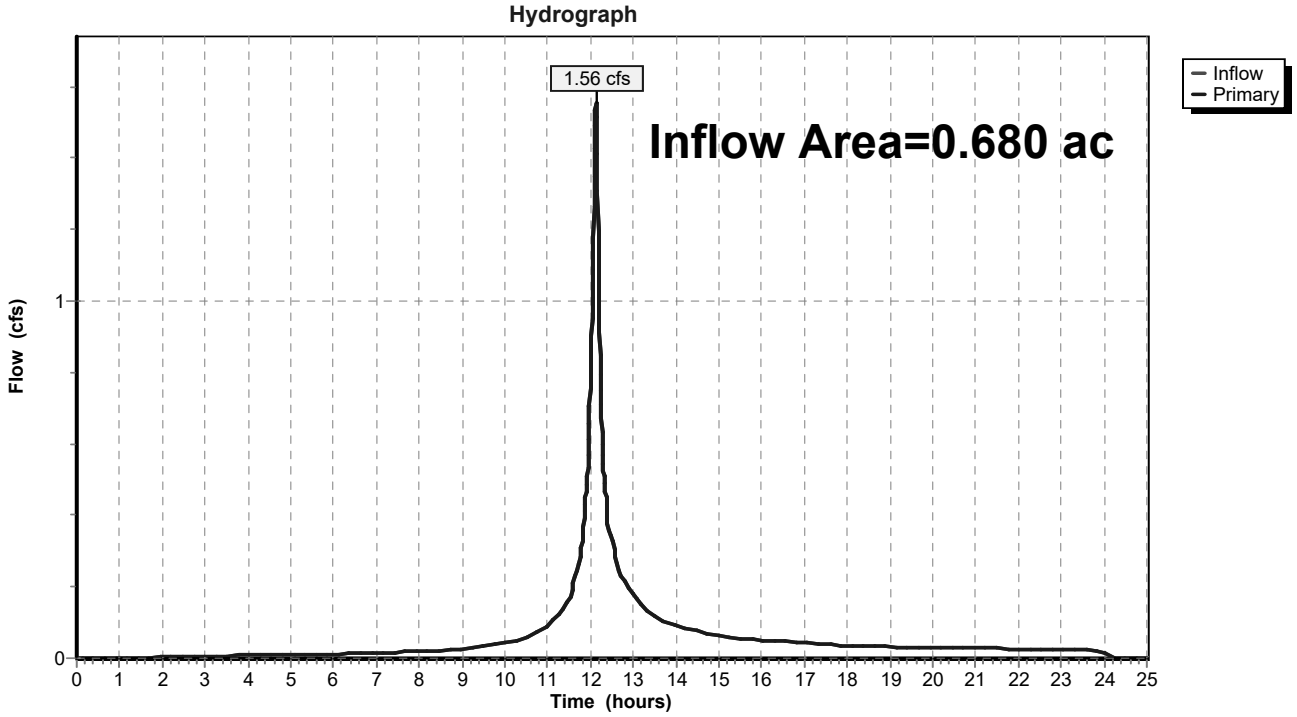


Summary for Link POA 3E: POA 3 (Main Street Ext)

Inflow Area = 0.680 ac, 36.18% Impervious, Inflow Depth = 2.10" for A-2YR event
Inflow = 1.56 cfs @ 12.13 hrs, Volume= 0.119 af
Primary = 1.56 cfs @ 12.13 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 3E: POA 3 (Main Street Ext)



Summary for Subcatchment E-2: E-2

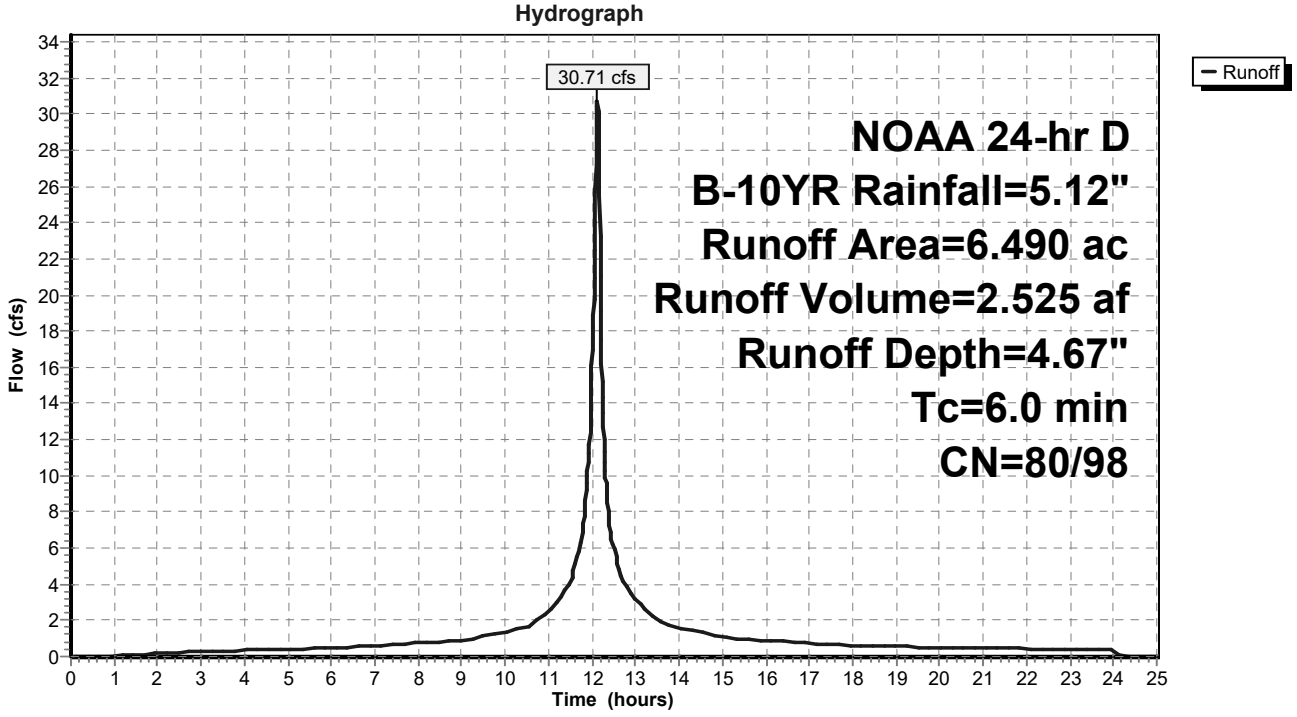
Runoff = 30.71 cfs @ 12.13 hrs, Volume= 2.525 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D B-10YR Rainfall=5.12"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.754	98	Paved parking, HSG D
6.490	96	Weighted Average
0.736	80	11.34% Pervious Area
5.754	98	88.66% Impervious Area

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

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

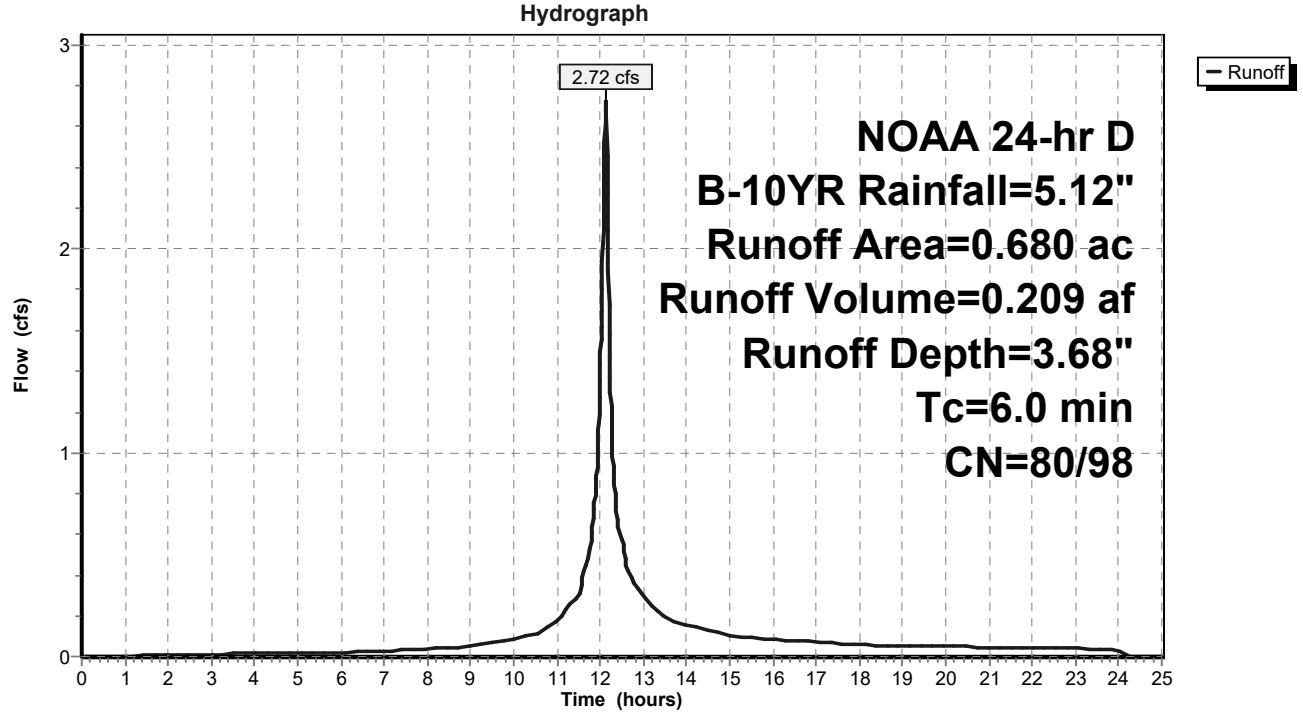
Runoff = 2.72 cfs @ 12.13 hrs, Volume= 0.209 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D B-10YR Rainfall=5.12"

Area (ac)	CN	Description
0.434	80	>75% Grass cover, Good, HSG D
0.246	98	Paved parking, HSG D
0.680	87	Weighted Average
0.434	80	63.82% Pervious Area
0.246	98	36.18% Impervious Area

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

Subcatchment E-3: E-3

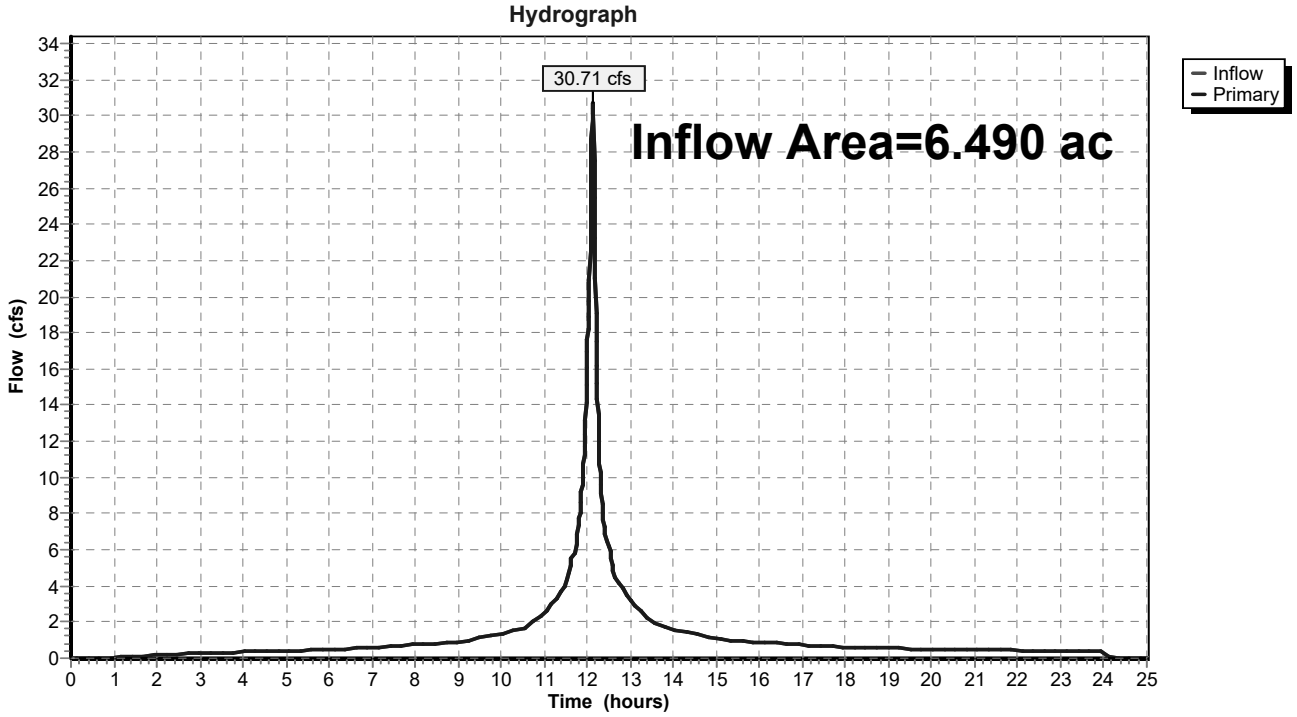


Summary for Link POA 2E: POA 2 (GSP Ramp)

Inflow Area = 6.490 ac, 88.66% Impervious, Inflow Depth = 4.67" for B-10YR event
Inflow = 30.71 cfs @ 12.13 hrs, Volume= 2.525 af
Primary = 30.71 cfs @ 12.13 hrs, Volume= 2.525 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2E: POA 2 (GSP Ramp)

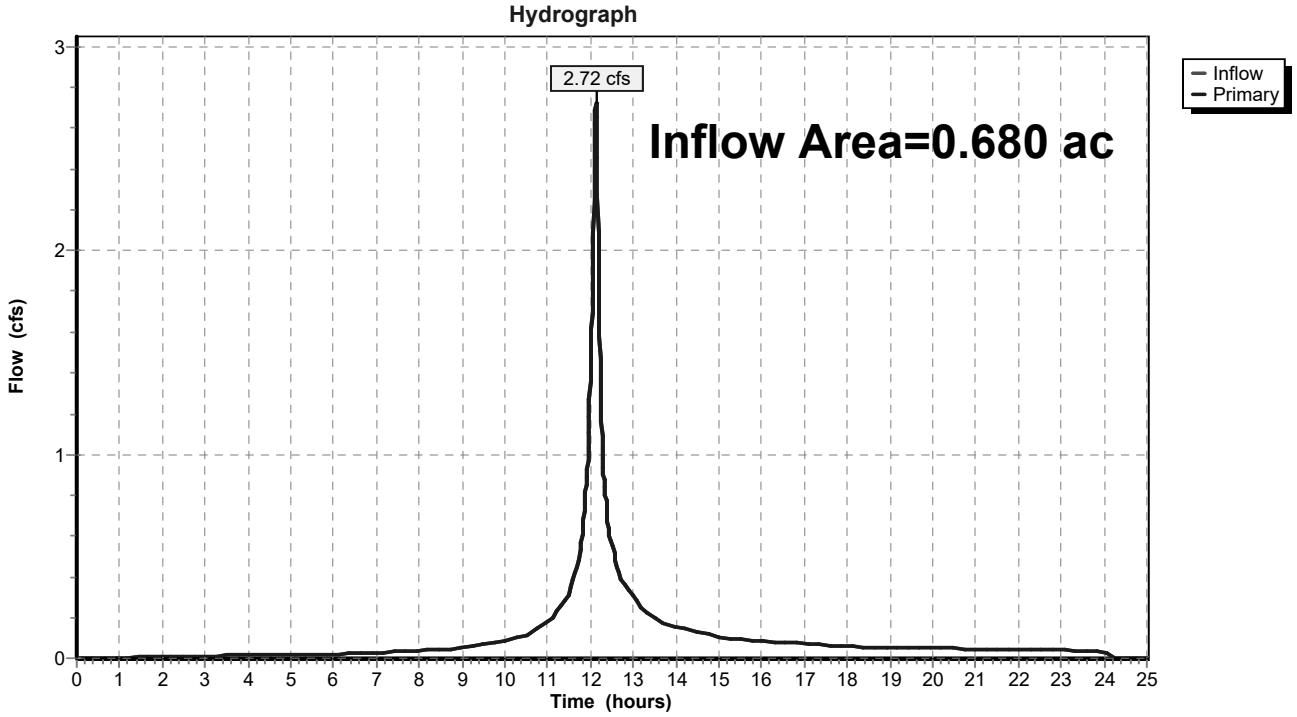


Summary for Link POA 3E: POA 3 (Main Street Ext)

Inflow Area = 0.680 ac, 36.18% Impervious, Inflow Depth = 3.68" for B-10YR event
Inflow = 2.72 cfs @ 12.13 hrs, Volume= 0.209 af
Primary = 2.72 cfs @ 12.13 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 3E: POA 3 (Main Street Ext)



Summary for Subcatchment E-2: E-2

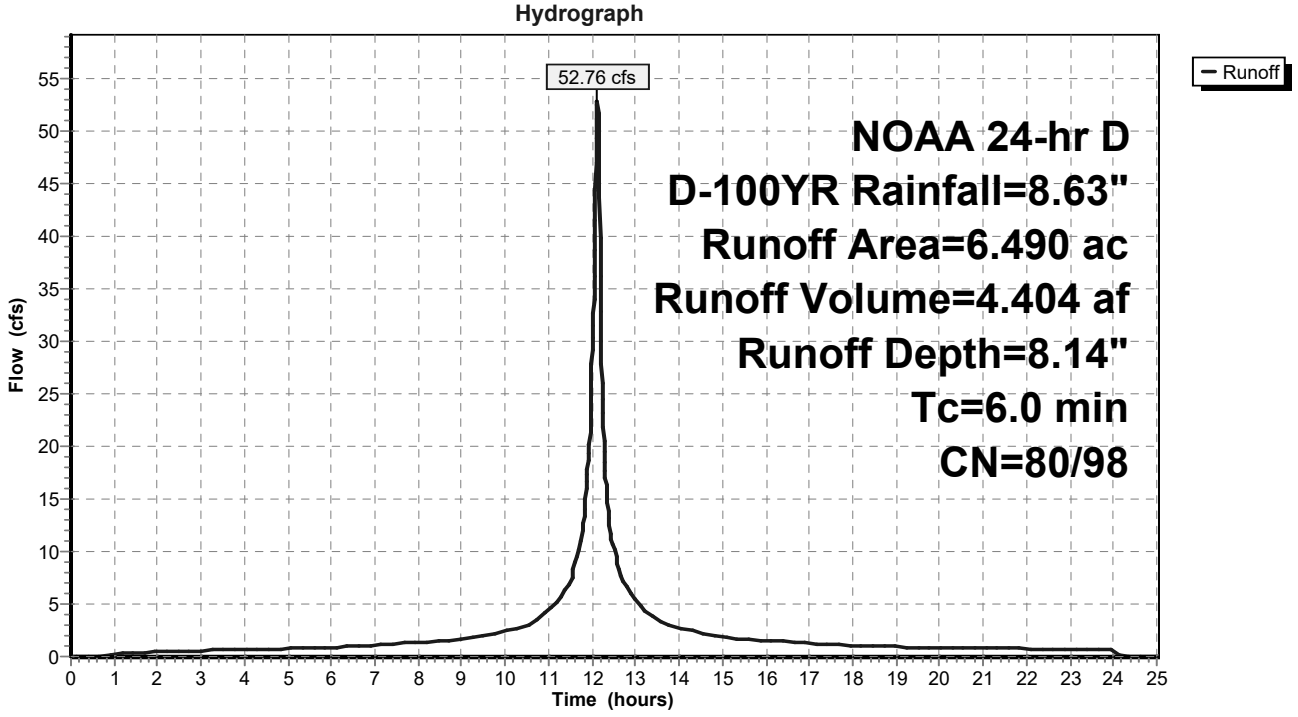
Runoff = 52.76 cfs @ 12.13 hrs, Volume= 4.404 af, Depth= 8.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D D-100YR Rainfall=8.63"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.754	98	Paved parking, HSG D
6.490	96	Weighted Average
0.736	80	11.34% Pervious Area
5.754	98	88.66% Impervious Area

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

Subcatchment E-2: E-2



Summary for Subcatchment E-3: E-3

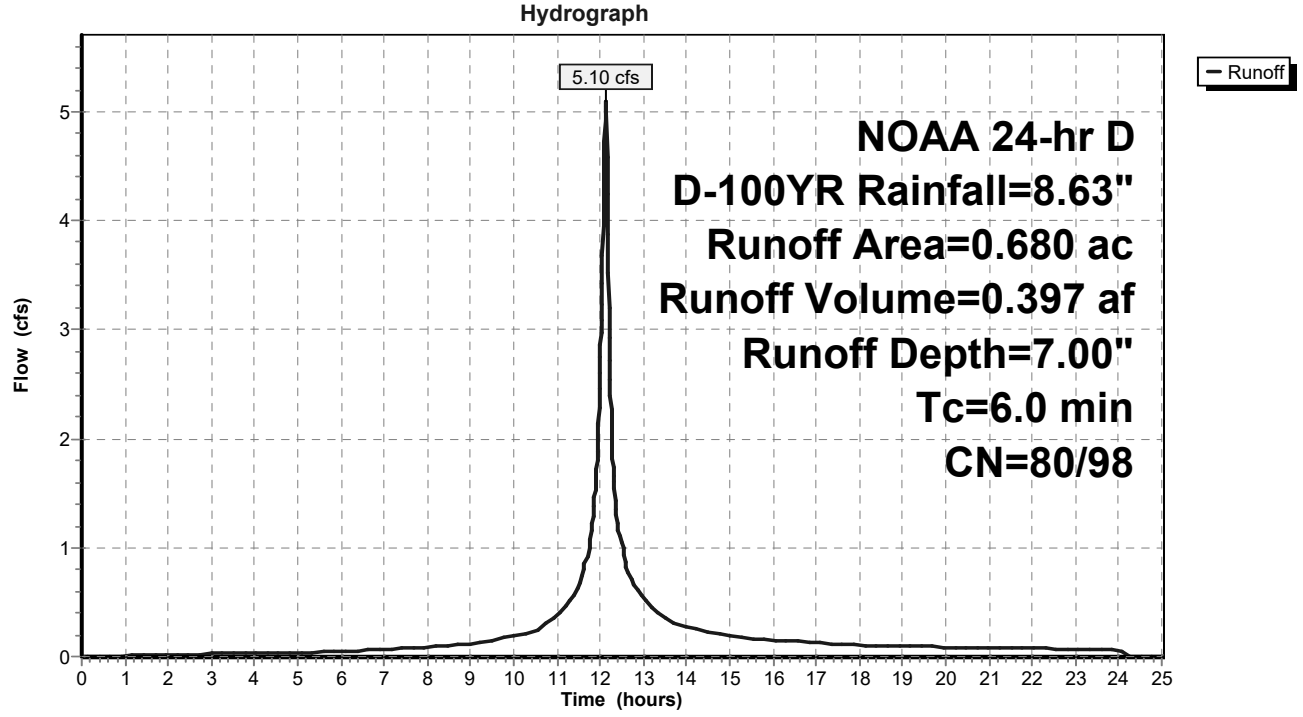
Runoff = 5.10 cfs @ 12.13 hrs, Volume= 0.397 af, Depth= 7.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D D-100YR Rainfall=8.63"

Area (ac)	CN	Description
0.434	80	>75% Grass cover, Good, HSG D
0.246	98	Paved parking, HSG D
0.680	87	Weighted Average
0.434	80	63.82% Pervious Area
0.246	98	36.18% Impervious Area

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

Subcatchment E-3: E-3

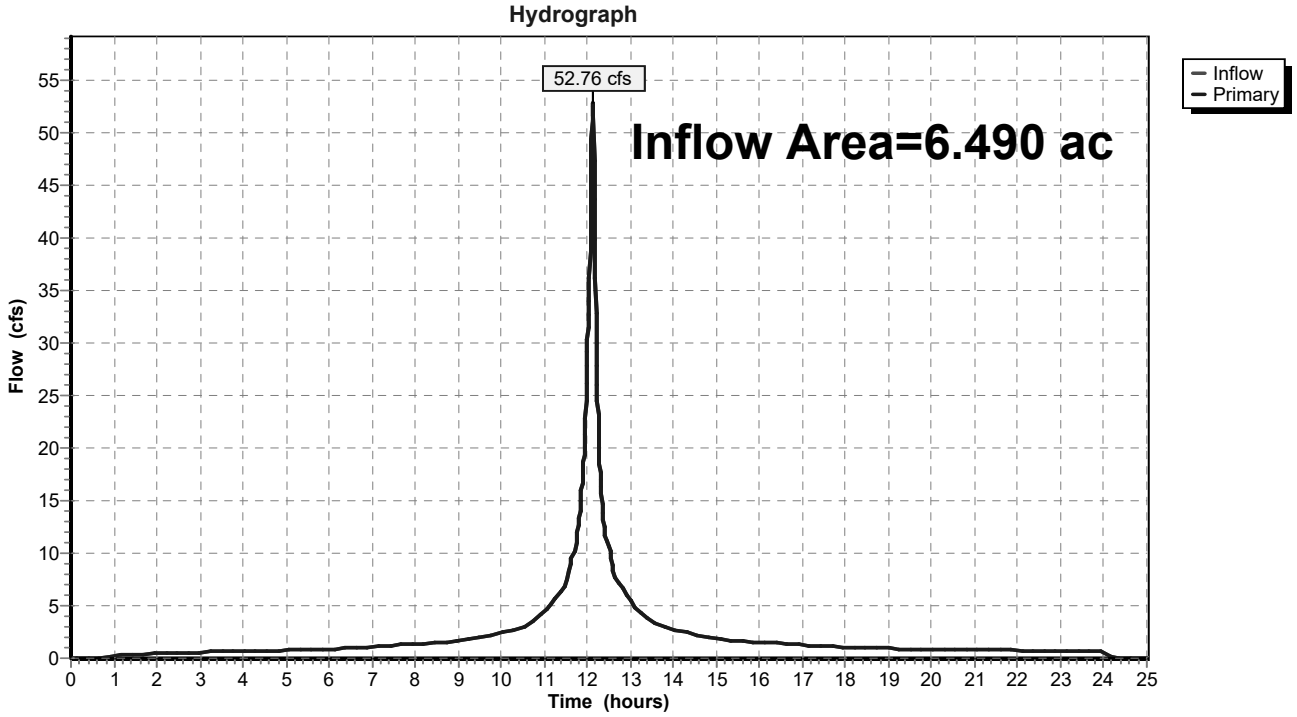


Summary for Link POA 2E: POA 2 (GSP Ramp)

Inflow Area = 6.490 ac, 88.66% Impervious, Inflow Depth = 8.14" for D-100YR event
Inflow = 52.76 cfs @ 12.13 hrs, Volume= 4.404 af
Primary = 52.76 cfs @ 12.13 hrs, Volume= 4.404 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2E: POA 2 (GSP Ramp)

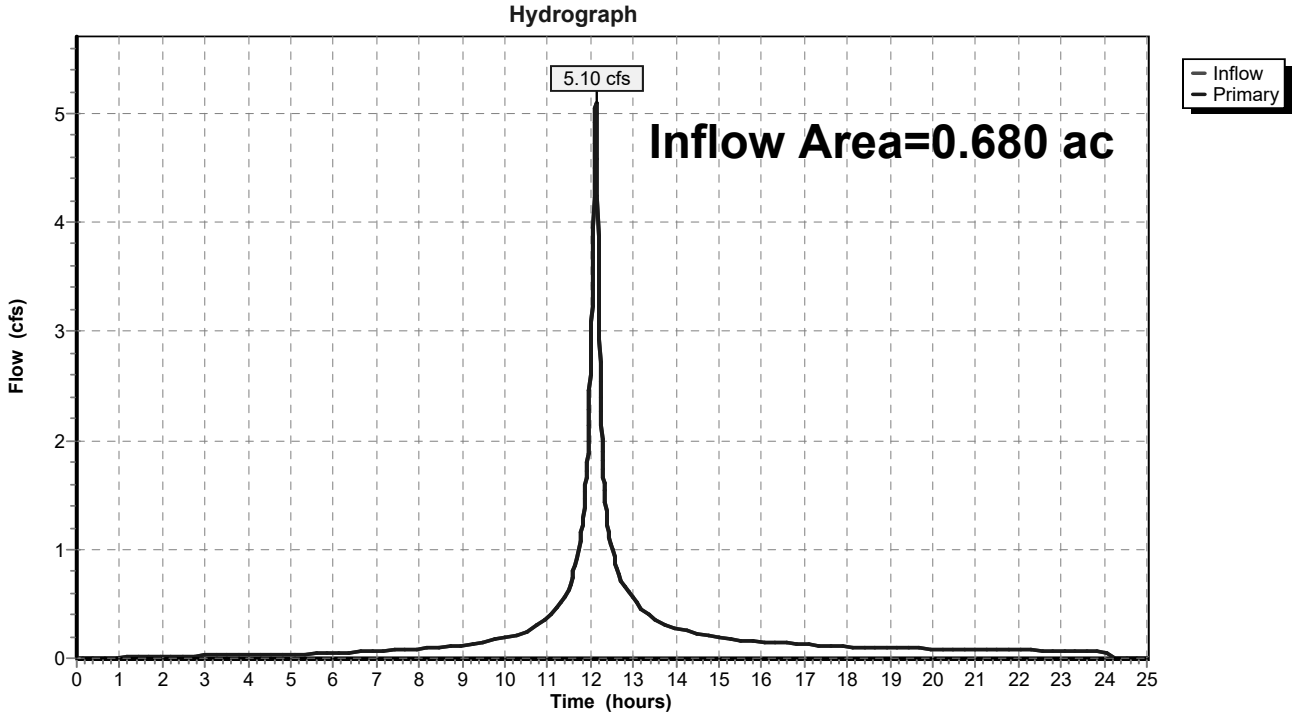


Summary for Link POA 3E: POA 3 (Main Street Ext)

Inflow Area = 0.680 ac, 36.18% Impervious, Inflow Depth = 7.00" for D-100YR event
Inflow = 5.10 cfs @ 12.13 hrs, Volume= 0.397 af
Primary = 5.10 cfs @ 12.13 hrs, Volume= 0.397 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

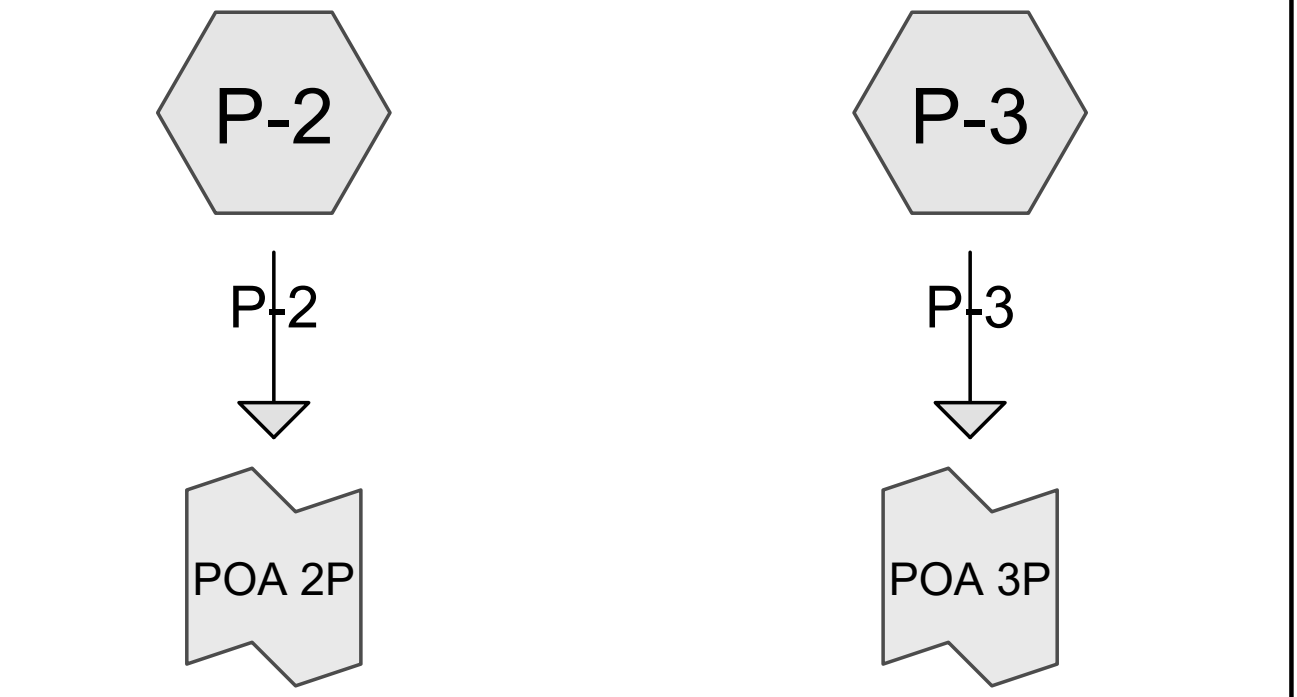
Link POA 3E: POA 3 (Main Street Ext)



APPENDIX C

PROPOSED CONDITIONS ROUTINGS

Proposed



POA 2 (GSP Ramp)

POA 3 (Main Street Ext)

Subcat Reach Pond Link

Routing Diagram for 210127 - Epic Church Stormwater Model
Prepared by Maser Consulting PA, Printed 1/28/2021

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.187	80	>75% Grass cover, Good, HSG D (P-2, P-3)
5.863	98	Paved parking, HSG D (P-2, P-3)
7.050	**95**	**TOTAL AREA**

Summary for Subcatchment P-2: P-2

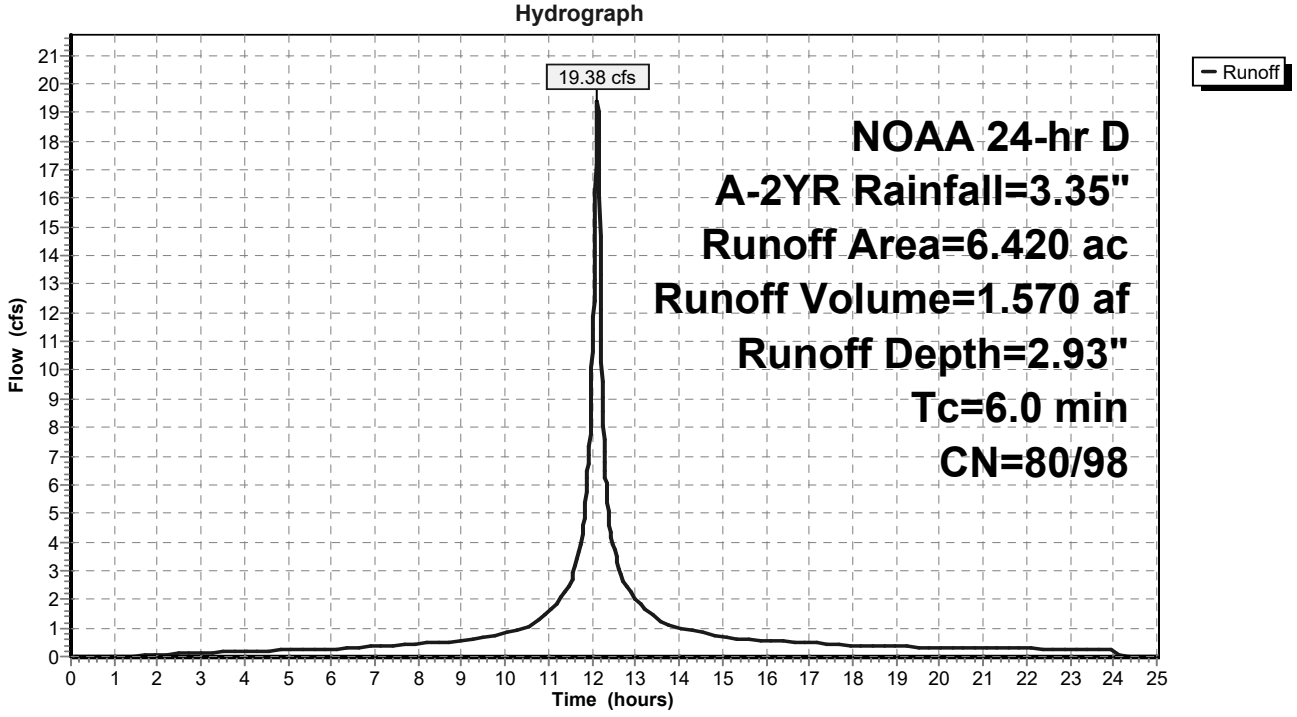
Runoff = 19.38 cfs @ 12.13 hrs, Volume= 1.570 af, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D A-2YR Rainfall=3.35"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.684	98	Paved parking, HSG D
6.420	96	Weighted Average
0.736	80	11.46% Pervious Area
5.684	98	88.54% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-3: P-3

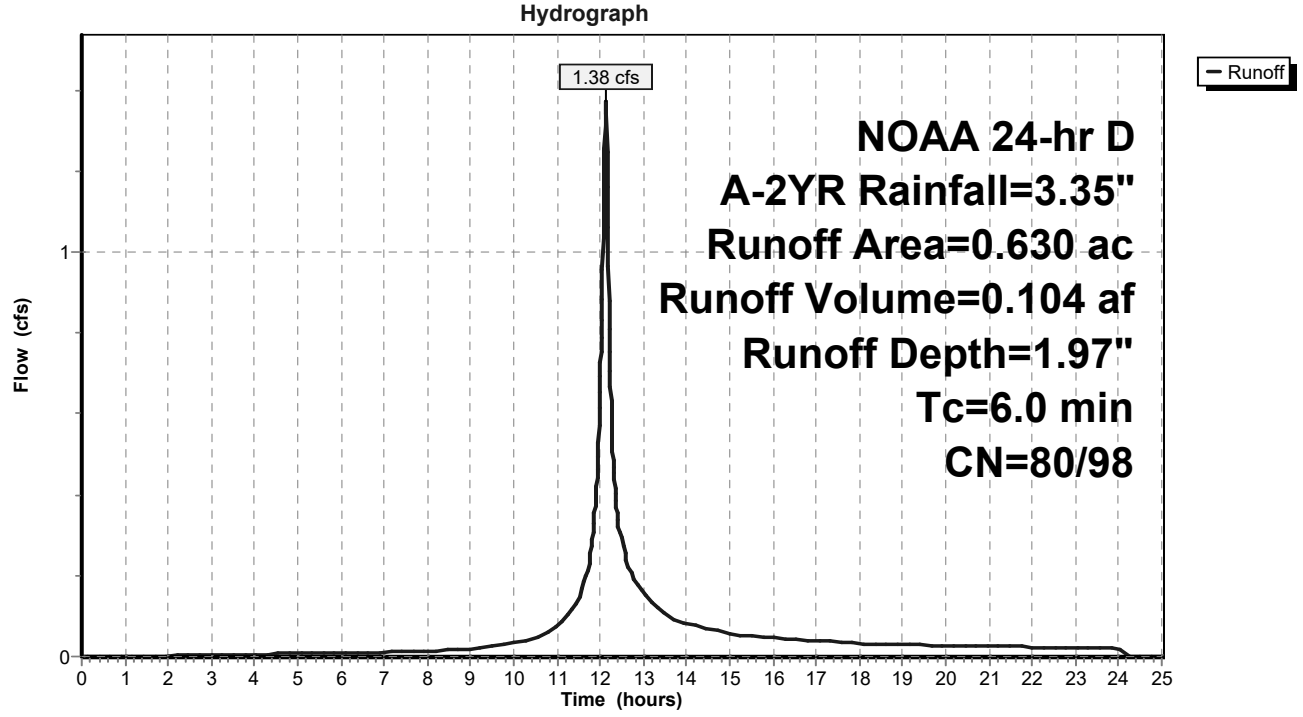
Runoff = 1.38 cfs @ 12.13 hrs, Volume= 0.104 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D A-2YR Rainfall=3.35"

Area (ac)	CN	Description
0.451	80	>75% Grass cover, Good, HSG D
0.179	98	Paved parking, HSG D
0.630	85	Weighted Average
0.451	80	71.59% Pervious Area
0.179	98	28.41% Impervious Area

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

Subcatchment P-3: P-3

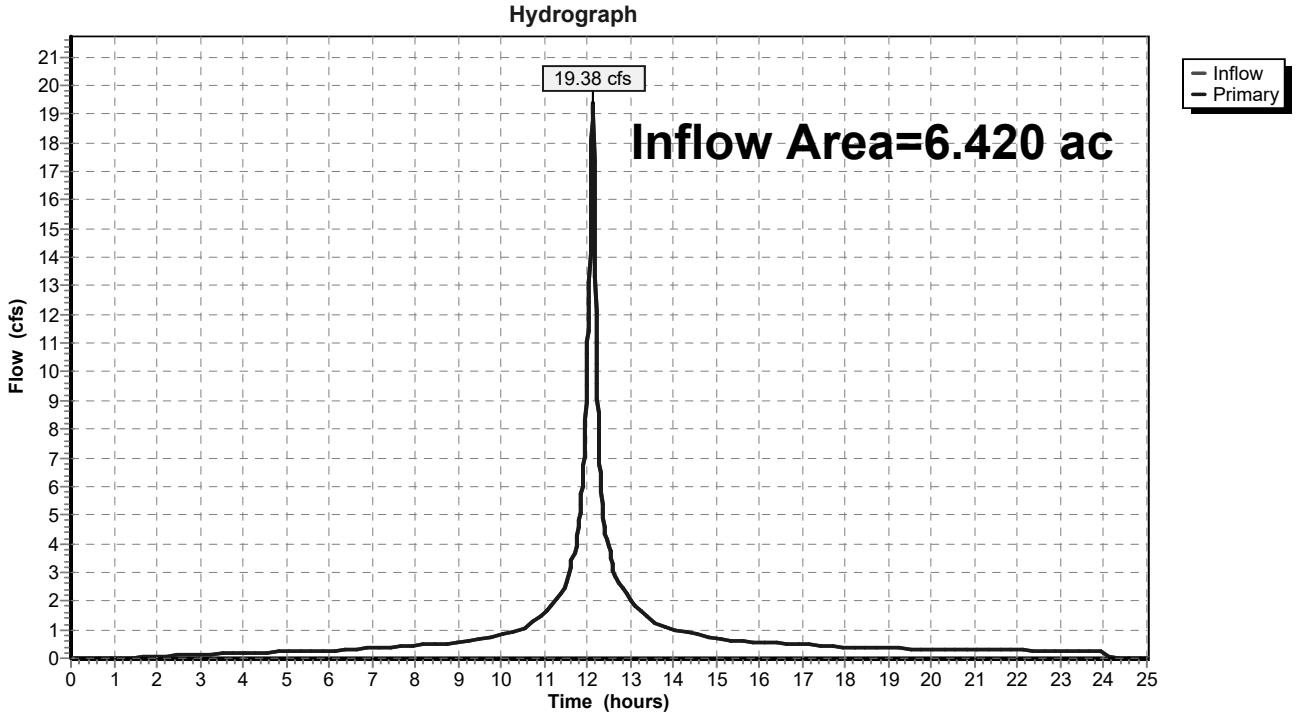


Summary for Link POA 2P: POA 2 (GSP Ramp)

Inflow Area = 6.420 ac, 88.54% Impervious, Inflow Depth = 2.93" for A-2YR event
Inflow = 19.38 cfs @ 12.13 hrs, Volume= 1.570 af
Primary = 19.38 cfs @ 12.13 hrs, Volume= 1.570 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2P: POA 2 (GSP Ramp)

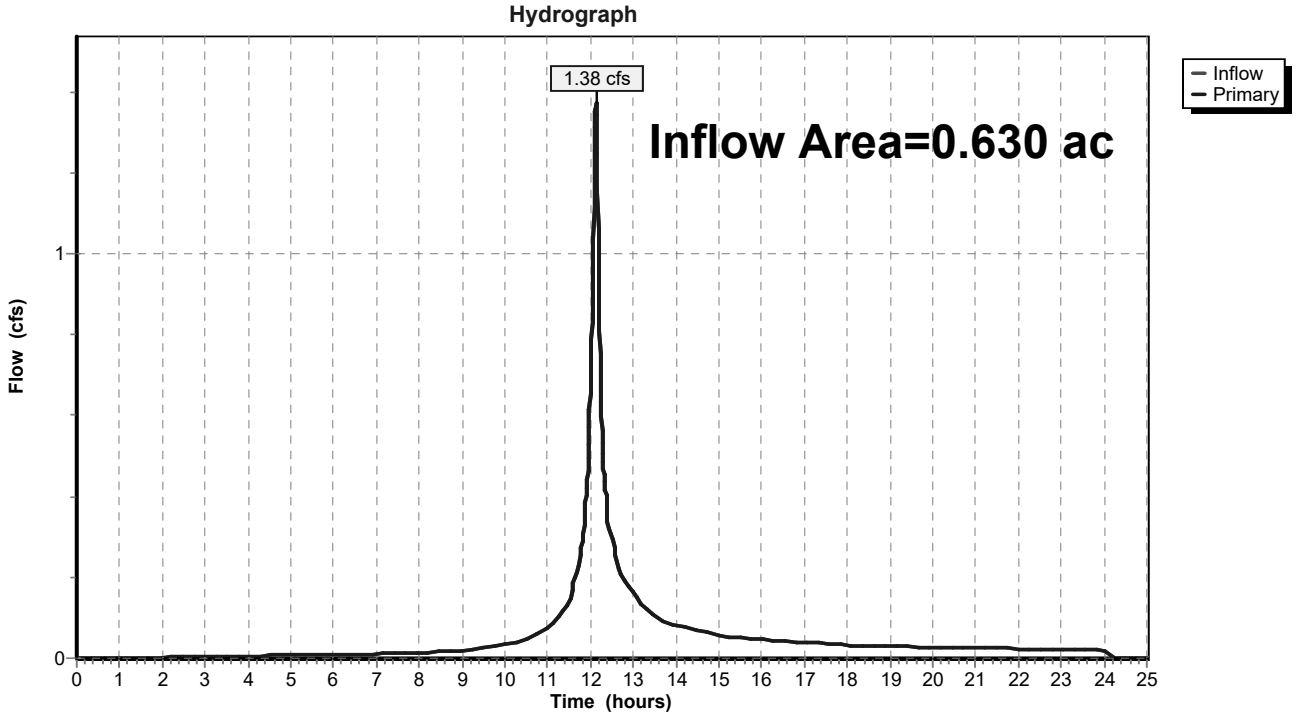


Summary for Link POA 3P: POA 3 (Main Street Ext)

Inflow Area = 0.630 ac, 28.41% Impervious, Inflow Depth = 1.97" for A-2YR event
Inflow = 1.38 cfs @ 12.13 hrs, Volume= 0.104 af
Primary = 1.38 cfs @ 12.13 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 3P: POA 3 (Main Street Ext)



Summary for Subcatchment P-2: P-2

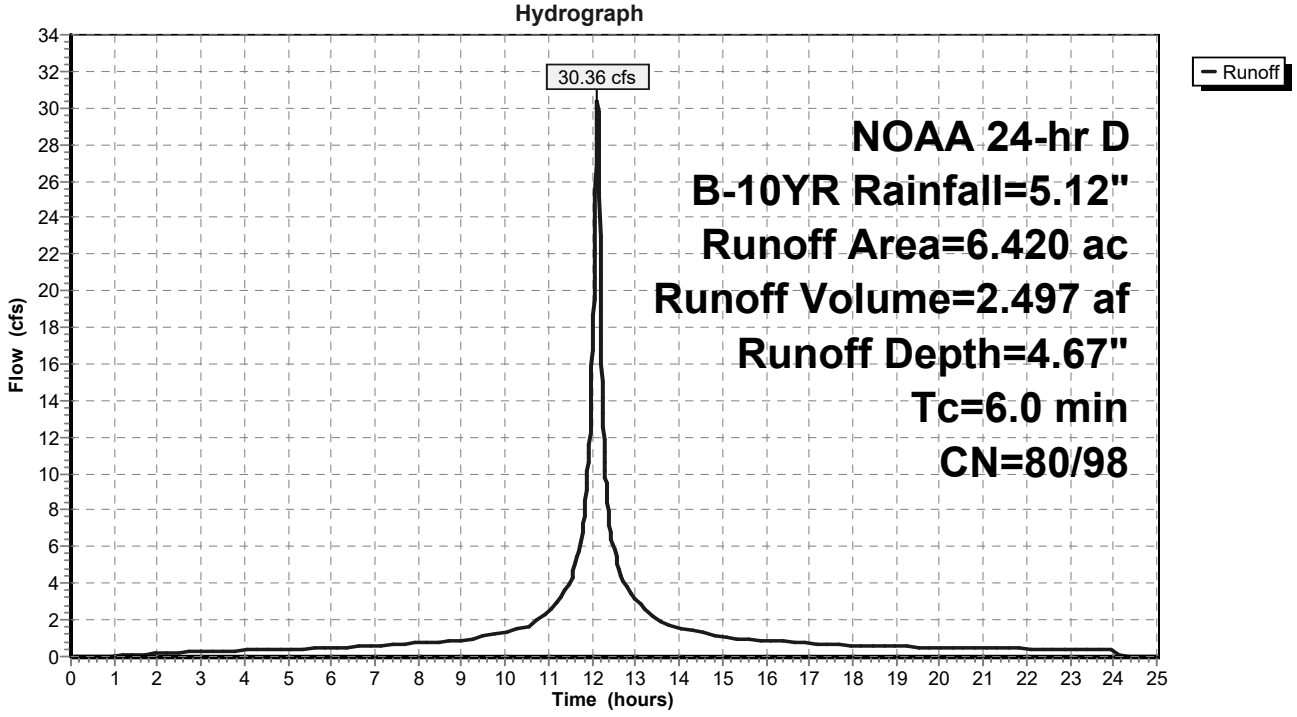
Runoff = 30.36 cfs @ 12.13 hrs, Volume= 2.497 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D B-10YR Rainfall=5.12"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.684	98	Paved parking, HSG D
6.420	96	Weighted Average
0.736	80	11.46% Pervious Area
5.684	98	88.54% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-3: P-3

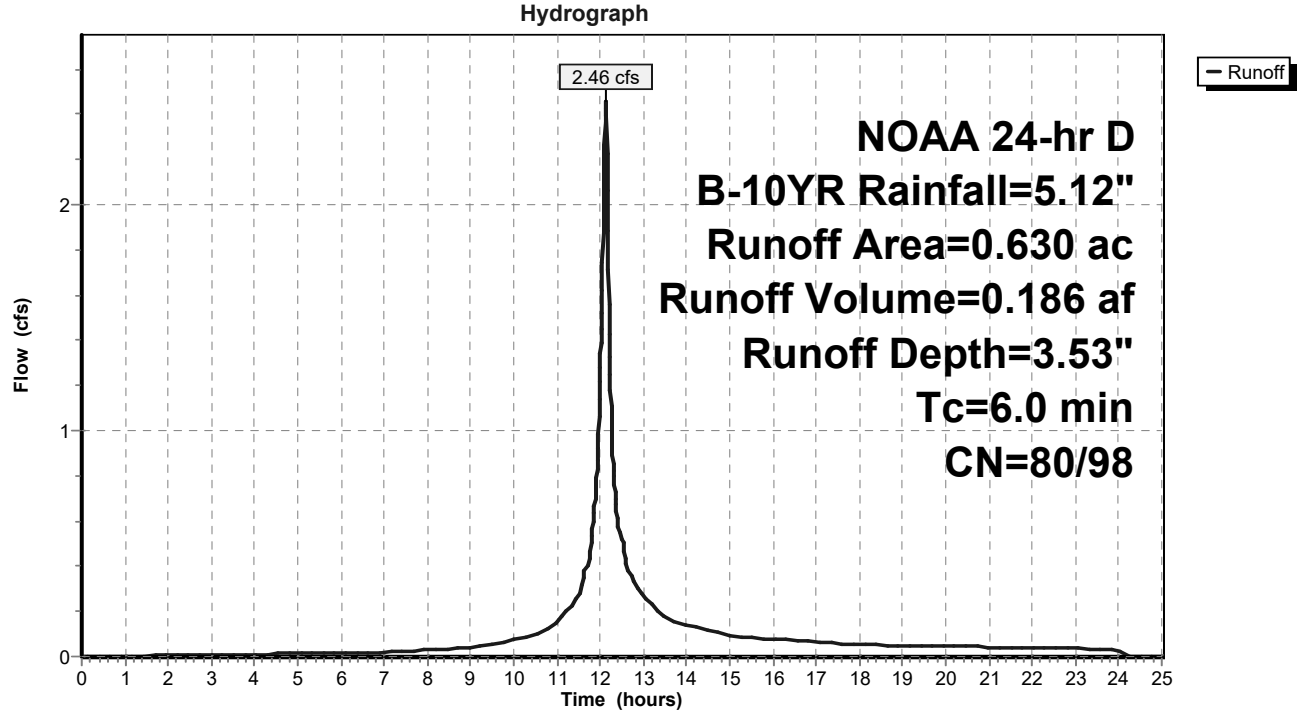
Runoff = 2.46 cfs @ 12.13 hrs, Volume= 0.186 af, Depth= 3.53"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D B-10YR Rainfall=5.12"

Area (ac)	CN	Description
0.451	80	>75% Grass cover, Good, HSG D
0.179	98	Paved parking, HSG D
0.630	85	Weighted Average
0.451	80	71.59% Pervious Area
0.179	98	28.41% Impervious Area

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

Subcatchment P-3: P-3

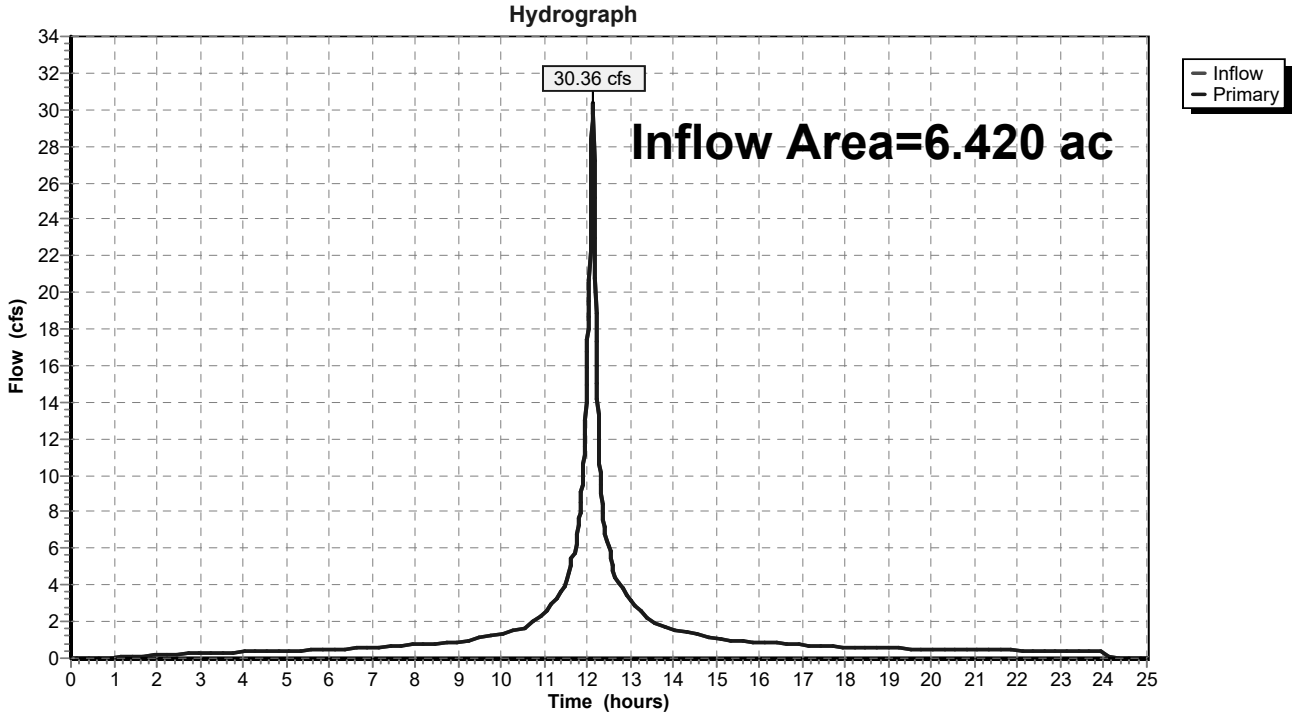


Summary for Link POA 2P: POA 2 (GSP Ramp)

Inflow Area = 6.420 ac, 88.54% Impervious, Inflow Depth = 4.67" for B-10YR event
Inflow = 30.36 cfs @ 12.13 hrs, Volume= 2.497 af
Primary = 30.36 cfs @ 12.13 hrs, Volume= 2.497 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2P: POA 2 (GSP Ramp)

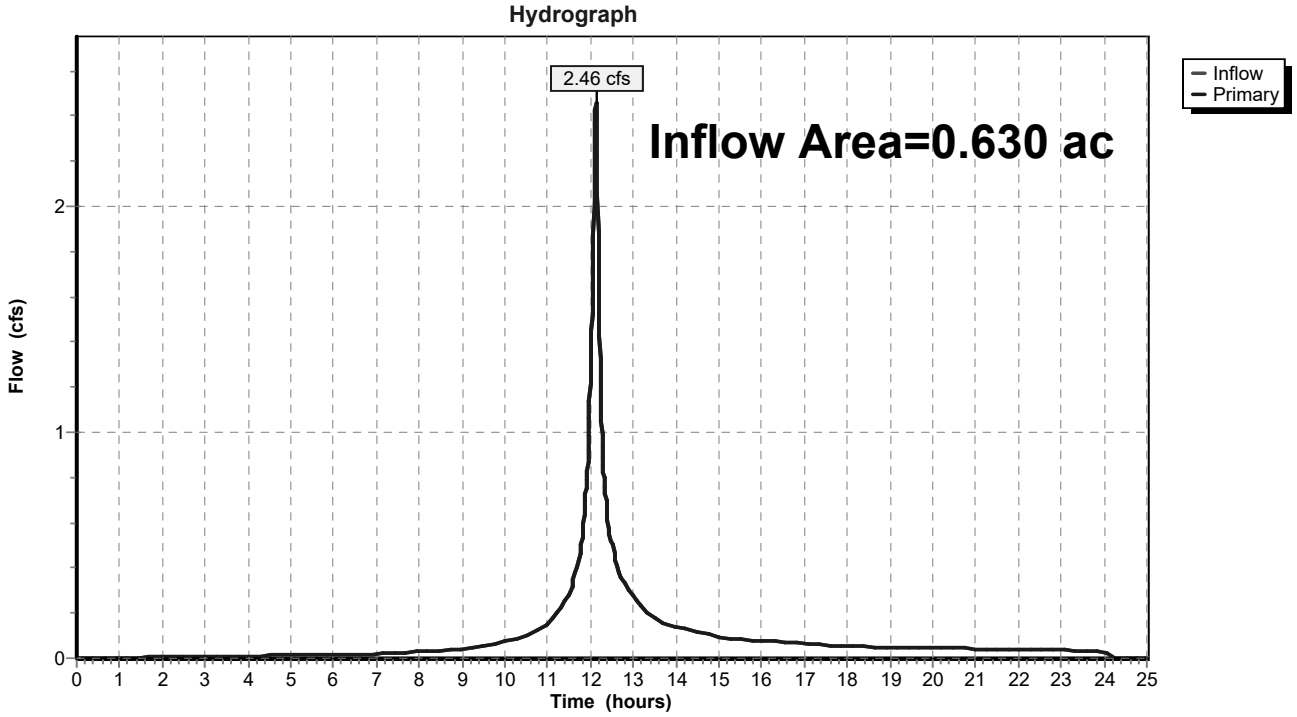


Summary for Link POA 3P: POA 3 (Main Street Ext)

Inflow Area = 0.630 ac, 28.41% Impervious, Inflow Depth = 3.53" for B-10YR event
Inflow = 2.46 cfs @ 12.13 hrs, Volume= 0.186 af
Primary = 2.46 cfs @ 12.13 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 3P: POA 3 (Main Street Ext)



Summary for Subcatchment P-2: P-2

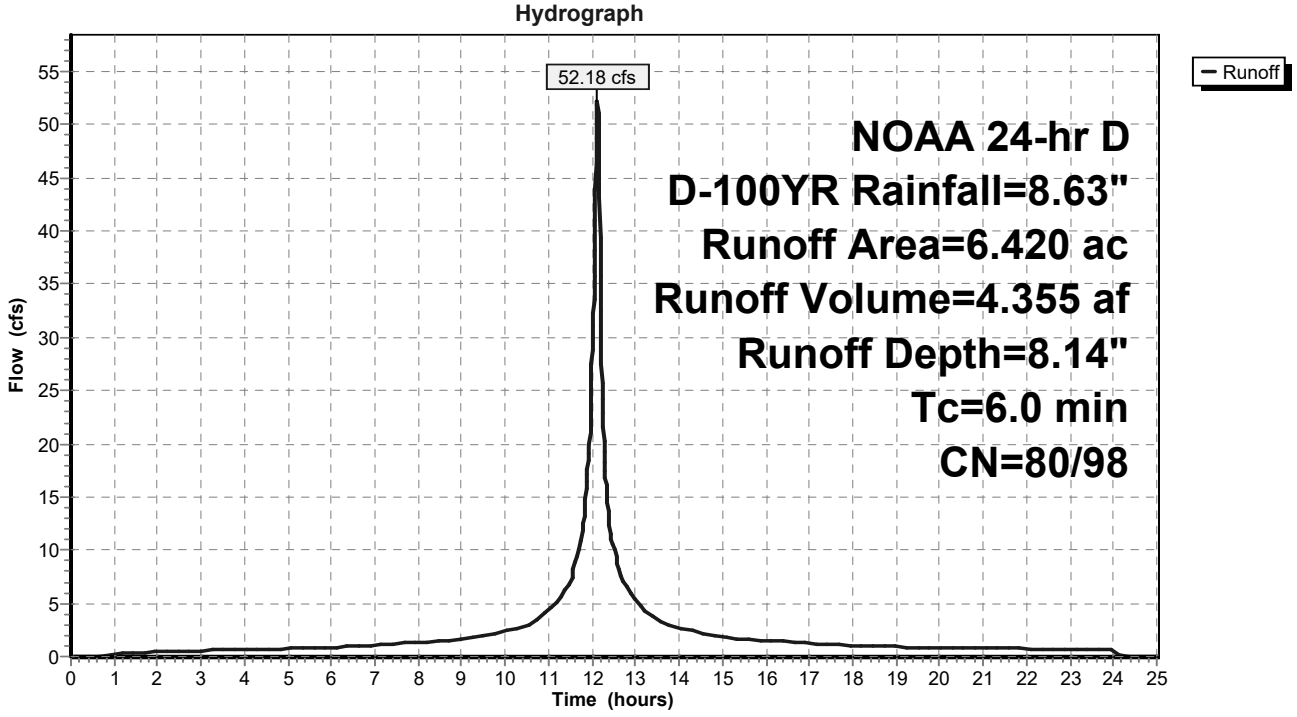
Runoff = 52.18 cfs @ 12.13 hrs, Volume= 4.355 af, Depth= 8.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D D-100YR Rainfall=8.63"

Area (ac)	CN	Description
0.736	80	>75% Grass cover, Good, HSG D
5.684	98	Paved parking, HSG D
6.420	96	Weighted Average
0.736	80	11.46% Pervious Area
5.684	98	88.54% Impervious Area

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

Subcatchment P-2: P-2



Summary for Subcatchment P-3: P-3

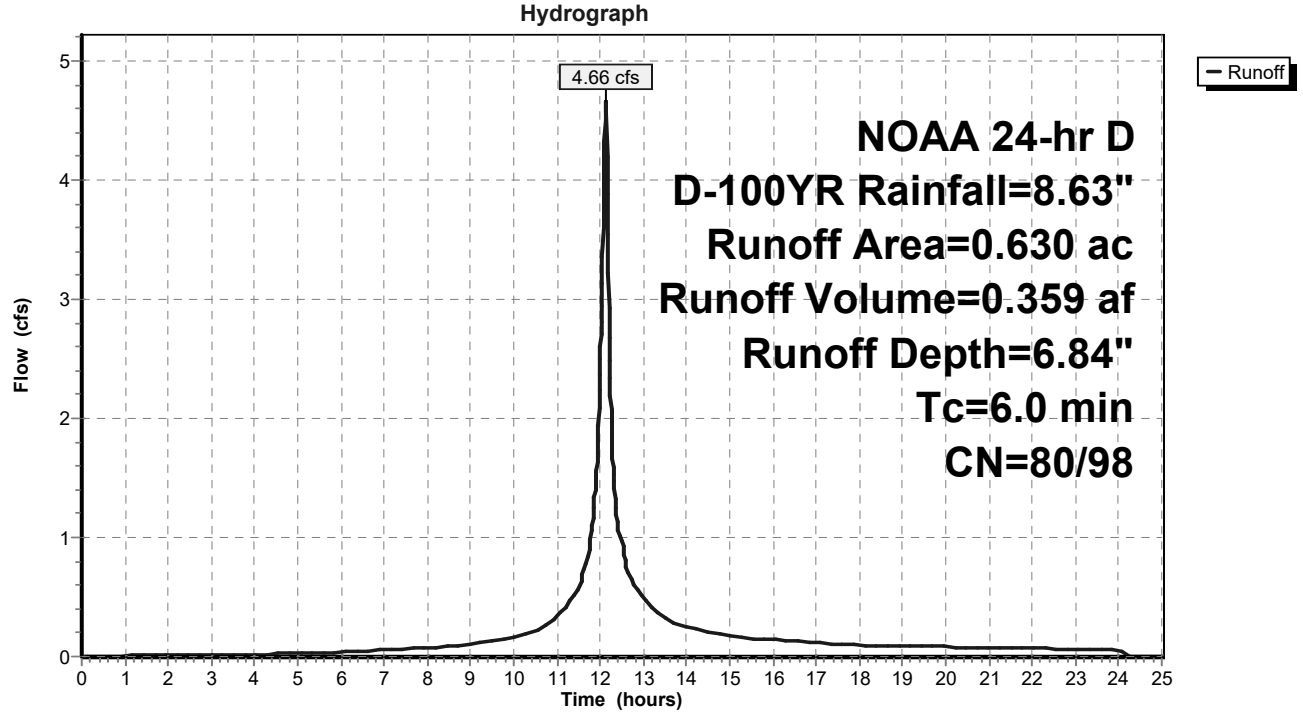
Runoff = 4.66 cfs @ 12.13 hrs, Volume= 0.359 af, Depth= 6.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-25.00 hrs, dt= 0.01
NOAA 24-hr D D-100YR Rainfall=8.63"

Area (ac)	CN	Description
0.451	80	>75% Grass cover, Good, HSG D
0.179	98	Paved parking, HSG D
0.630	85	Weighted Average
0.451	80	71.59% Pervious Area
0.179	98	28.41% Impervious Area

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

Subcatchment P-3: P-3

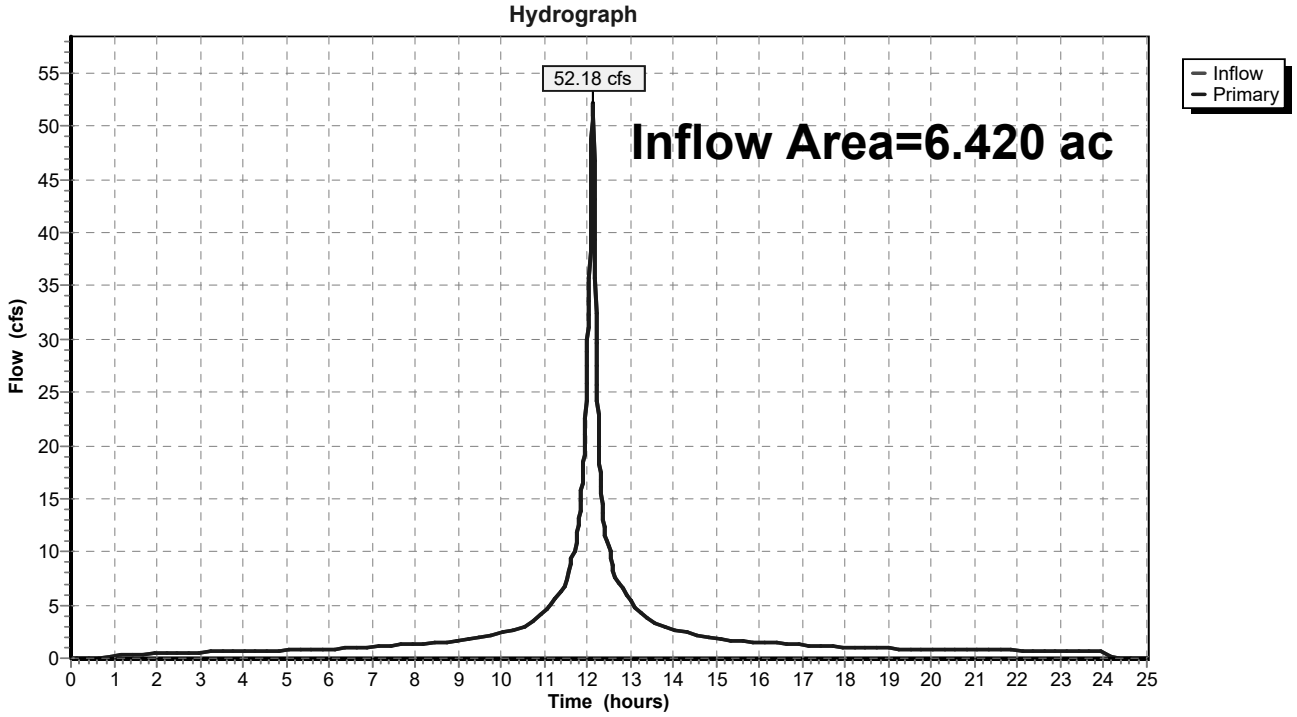


Summary for Link POA 2P: POA 2 (GSP Ramp)

Inflow Area = 6.420 ac, 88.54% Impervious, Inflow Depth = 8.14" for D-100YR event
Inflow = 52.18 cfs @ 12.13 hrs, Volume= 4.355 af
Primary = 52.18 cfs @ 12.13 hrs, Volume= 4.355 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 2P: POA 2 (GSP Ramp)

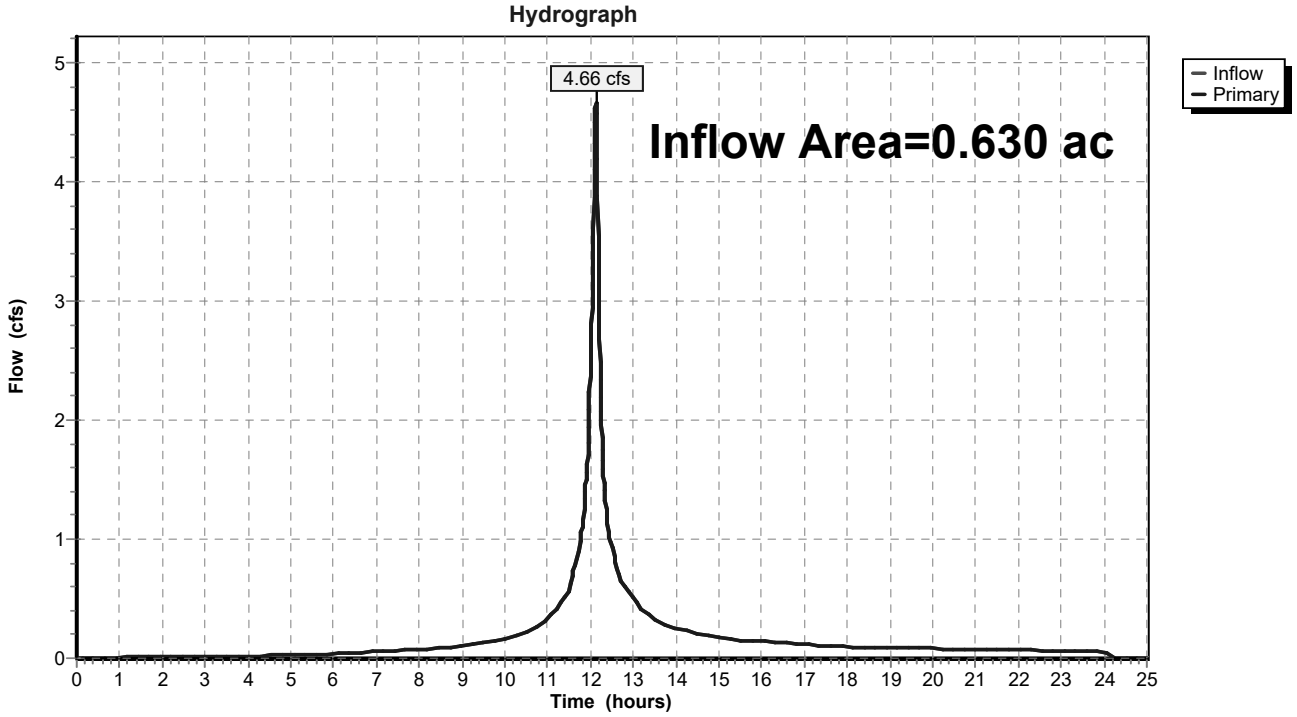


Summary for Link POA 3P: POA 3 (Main Street Ext)

Inflow Area = 0.630 ac, 28.41% Impervious, Inflow Depth = 6.84" for D-100YR event
Inflow = 4.66 cfs @ 12.13 hrs, Volume= 0.359 af
Primary = 4.66 cfs @ 12.13 hrs, Volume= 0.359 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Link POA 3P: POA 3 (Main Street Ext)



APPENDIX D

TABULAR HYDROGRAPH COMPARISONS

Hydrograph
Comparisons

Existing

Proposed

POA 2 (GSP Ramp)

POA 2 (GSP Ramp)

Subcat Reach Pond Link

Routing Diagram for 210127 - Epic Church Stormwater Model
Prepared by Maser Consulting PA, Printed 1/28/2021

Primary Comparison

Time (hours)	Link POA 2E (cfs)	Link POA 2P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.00	0.00
1.50	0.03	0.03
2.00	0.07	0.07
2.50	0.10	0.10
3.00	0.13	0.13
3.50	0.16	0.16
4.00	0.19	0.18
4.50	0.21	0.21
5.00	0.23	0.23
5.50	0.25	0.25
6.00	0.27	0.26
6.50	0.31	0.31
7.00	0.36	0.35
7.50	0.40	0.40
8.00	0.45	0.44
8.50	0.50	0.49
9.00	0.55	0.54
9.50	0.69	0.68
10.00	0.85	0.84
10.50	1.02	1.01
11.00	1.56	1.54
11.50	2.56	2.54
12.00	**10.74**	**10.62**
12.50	**3.90**	**3.86**
13.00	2.05	2.03
13.50	1.32	1.30
14.00	1.03	1.02
14.50	0.87	0.86
15.00	0.70	0.69
15.50	0.62	0.61
16.00	0.57	0.57
16.50	0.53	0.52
17.00	0.48	0.47
17.50	0.43	0.43
18.00	0.39	0.38
18.50	0.36	0.36
19.00	0.35	0.35
19.50	0.34	0.34
20.00	0.33	0.32
20.50	0.32	0.31
21.00	0.31	0.30
21.50	0.29	0.29
22.00	0.28	0.28
22.50	0.27	0.27
23.00	0.26	0.25
23.50	0.25	0.24
24.00	0.24	0.23
24.50	0.00	0.00
25.00	0.00	0.00

Primary Comparison

Time (hours)	Link POA 2E (cfs)	Link POA 2P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.04	0.04
1.50	0.12	0.12
2.00	0.18	0.18
2.50	0.23	0.23
3.00	0.28	0.27
3.50	0.32	0.31
4.00	0.35	0.34
4.50	0.38	0.37
5.00	0.41	0.40
5.50	0.43	0.43
6.00	0.46	0.45
6.50	0.52	0.52
7.00	0.59	0.59
7.50	0.67	0.66
8.00	0.74	0.73
8.50	0.82	0.81
9.00	0.89	0.88
9.50	1.13	1.11
10.00	1.38	1.36
10.50	1.64	1.62
11.00	2.50	2.47
11.50	4.08	4.03
12.00	**16.91**	**16.72**
12.50	**6.08**	**6.01**
13.00	3.19	3.16
13.50	2.05	2.03
14.00	1.60	1.59
14.50	1.35	1.33
15.00	1.09	1.07
15.50	0.96	0.95
16.00	0.89	0.88
16.50	0.82	0.81
17.00	0.74	0.73
17.50	0.67	0.66
18.00	0.60	0.59
18.50	0.56	0.56
19.00	0.54	0.54
19.50	0.53	0.52
20.00	0.51	0.50
20.50	0.49	0.48
21.00	0.47	0.47
21.50	0.45	0.45
22.00	0.44	0.43
22.50	0.42	0.41
23.00	0.40	0.39
23.50	0.38	0.38
24.00	0.36	0.36
24.50	0.00	0.00
25.00	0.00	0.00

Primary Comparison

Time (hours)	Link POA 2E (cfs)	Link POA 2P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.21	0.20
1.50	0.34	0.34
2.00	0.44	0.44
2.50	0.52	0.51
3.00	0.58	0.57
3.50	0.63	0.62
4.00	0.68	0.67
4.50	0.72	0.71
5.00	0.76	0.75
5.50	0.81	0.80
6.00	0.85	0.84
6.50	0.96	0.95
7.00	1.09	1.07
7.50	1.21	1.20
8.00	1.34	1.32
8.50	1.47	1.45
9.00	1.60	1.58
9.50	2.00	1.98
10.00	2.44	2.41
10.50	2.88	2.85
11.00	4.37	4.32
11.50	7.10	7.02
12.00	**29.17**	**28.85**
12.50	**10.40**	**10.29**
13.00	5.45	5.39
13.50	3.50	3.46
14.00	2.73	2.70
14.50	2.29	2.27
15.00	1.85	1.83
15.50	1.64	1.62
16.00	1.51	1.50
16.50	1.39	1.37
17.00	1.27	1.25
17.50	1.14	1.13
18.00	1.02	1.01
18.50	0.96	0.95
19.00	0.93	0.92
19.50	0.90	0.89
20.00	0.87	0.86
20.50	0.83	0.82
21.00	0.80	0.80
21.50	0.77	0.76
22.00	0.74	0.73
22.50	0.71	0.70
23.00	0.68	0.67
23.50	0.65	0.64
24.00	0.62	0.61
24.50	0.00	0.00
25.00	0.00	0.00

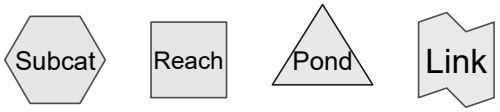
Hydrograph
Comparisons

Existing

POA 3 (Main Street Ext)

Proposed

POA 3 (Main Street Ext)



Routing Diagram for 210127 - Epic Church Stormwater Model
Prepared by Maser Consulting PA, Printed 1/28/2021

Primary Comparison

Time (hours)	Link POA 3E (cfs)	Link POA 3P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.00	0.00
1.50	0.00	0.00
2.00	0.00	0.00
2.50	0.00	0.00
3.00	0.01	0.00
3.50	0.01	0.01
4.00	0.01	0.01
4.50	0.01	0.01
5.00	0.01	0.01
5.50	0.01	0.01
6.00	0.01	0.01
6.50	0.01	0.01
7.00	0.02	0.01
7.50	0.02	0.01
8.00	0.02	0.01
8.50	0.02	0.02
9.00	0.02	0.02
9.50	0.03	0.02
10.00	0.04	0.03
10.50	0.06	0.04
11.00	0.09	0.08
11.50	0.17	0.14
12.00	**0.80**	**0.69**
12.50	**0.33**	**0.30**
13.00	0.18	0.16
13.50	0.12	0.10
14.00	0.09	0.08
14.50	0.08	0.07
15.00	0.06	0.06
15.50	0.06	0.05
16.00	0.05	0.05
16.50	0.05	0.04
17.00	0.04	0.04
17.50	0.04	0.04
18.00	0.04	0.03
18.50	0.03	0.03
19.00	0.03	0.03
19.50	0.03	0.03
20.00	0.03	0.03
20.50	0.03	0.03
21.00	0.03	0.03
21.50	0.03	0.02
22.00	0.03	0.02
22.50	0.02	0.02
23.00	0.02	0.02
23.50	0.02	0.02
24.00	0.02	0.02
24.50	0.00	0.00
25.00	0.00	0.00

Primary Comparison

Time (hours)	Link POA 3E (cfs)	Link POA 3P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.00	0.00
1.50	0.01	0.00
2.00	0.01	0.01
2.50	0.01	0.01
3.00	0.01	0.01
3.50	0.01	0.01
4.00	0.01	0.01
4.50	0.02	0.01
5.00	0.02	0.01
5.50	0.02	0.01
6.00	0.02	0.01
6.50	0.02	0.02
7.00	0.03	0.02
7.50	0.03	0.02
8.00	0.04	0.03
8.50	0.04	0.04
9.00	0.05	0.04
9.50	0.07	0.06
10.00	0.09	0.07
10.50	0.11	0.09
11.00	0.18	0.15
11.50	0.31	0.27
12.00	**1.43**	**1.28**
12.50	**0.56**	**0.51**
13.00	0.30	0.27
13.50	0.19	0.18
14.00	0.15	0.14
14.50	0.13	0.12
15.00	0.10	0.10
15.50	0.09	0.08
16.00	0.09	0.08
16.50	0.08	0.07
17.00	0.07	0.07
17.50	0.06	0.06
18.00	0.06	0.05
18.50	0.05	0.05
19.00	0.05	0.05
19.50	0.05	0.05
20.00	0.05	0.05
20.50	0.05	0.04
21.00	0.05	0.04
21.50	0.04	0.04
22.00	0.04	0.04
22.50	0.04	0.04
23.00	0.04	0.04
23.50	0.04	0.03
24.00	0.04	0.03
24.50	0.00	0.00
25.00	0.00	0.00

Primary Comparison

Time (hours)	Link POA 3E (cfs)	Link POA 3P (cfs)
0.00	0.00	0.00
0.50	0.00	0.00
1.00	0.01	0.01
1.50	0.01	0.01
2.00	0.02	0.01
2.50	0.02	0.02
3.00	0.02	0.02
3.50	0.03	0.02
4.00	0.03	0.02
4.50	0.03	0.02
5.00	0.04	0.03
5.50	0.04	0.03
6.00	0.05	0.04
6.50	0.06	0.04
7.00	0.07	0.05
7.50	0.08	0.06
8.00	0.09	0.08
8.50	0.10	0.09
9.00	0.12	0.10
9.50	0.15	0.13
10.00	0.19	0.17
10.50	0.23	0.21
11.00	0.37	0.33
11.50	0.63	0.57
12.00	**2.74**	**2.50**
12.50	**1.03**	**0.95**
13.00	0.54	0.50
13.50	0.35	0.32
14.00	0.27	0.25
14.50	0.23	0.21
15.00	0.19	0.17
15.50	0.17	0.15
16.00	0.15	0.14
16.50	0.14	0.13
17.00	0.13	0.12
17.50	0.12	0.11
18.00	0.10	0.09
18.50	0.10	0.09
19.00	0.09	0.09
19.50	0.09	0.08
20.00	0.09	0.08
20.50	0.08	0.08
21.00	0.08	0.08
21.50	0.08	0.07
22.00	0.08	0.07
22.50	0.07	0.07
23.00	0.07	0.06
23.50	0.07	0.06
24.00	0.06	0.06
24.50	0.00	0.00
25.00	0.00	0.00

APPENDIX E

GROUNDWATER RECHARGE SPREADSHEET

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MIDDLESEX CO., SAYREVILLE BORO	45.9	1.48

Project Name:	Epic Church
Description:	
Analysis Date:	04/01/21

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.831	Open space	Keyport	12.7	130,705
2	1.581	Woods	Keyport	12.5	71,947
3	9.578	Impervious areas	Keyport	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	14.0			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				4.0	202,652

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.548	Open space	Keyport	12.7	117,639
2	1.353	Woods	Keyport	12.5	61,571
3	10.089	Impervious areas	Keyport	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	14.0			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				3.5	179,210

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft) 439,477
Post-Development Annual Recharge Deficit=	*23,442*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	3.51	(in)	DRWC=	1.94	(in)
ERWC =	0.91	(in)	EDRWC=	0.50	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Epic Church	0	04/01/21	Porous Pavement

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	8748.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	2.4	in
Upper level of the BMP surface (negative if above ground)	dBMPu	7.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	13.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.91	in
ERWC Modified to consider dEXC	EDRWC	0.50	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.41	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.89	in
Inches of Rainfall to capture	Pdesign	1.08	in
Recharge Provided Avg. over Imp. Area		19.3	in
Runoff Captured Avg. over imp. Area		29.5	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.35	unitless
BMP Volume	VBMP	1,750	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> Solve Problem to satisfy Annual Recharge
dBMP Check---> OK
dEXC Check---> OK

BMP Location---> Location is selected as distributed or undetermined

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	23,442	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	24,661	sq.ft
Root Zone Water Capacity	RWC	3.51	in
RWC Modified to consider dEXC	DRWC	1.94	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.9	in
Recharge Requirement over Imp. Area	dr	0.6	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		39,658	cu.ft
Avg BMP Recharge Efficiency		65.4%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		82.5%	%
%Runoff Recharged		3.0%	%
%Rainfall Recharged		2.4%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

APPENDIX F

STORM SEWER CALCULATIONS (INITIAL ANALYSIS)

MASER

Line No.	Line ID	DnStm Ln No	Inlet ID	Drng Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	i Inlet (in/hr)	Incr Q (cfs)	Flow Rate (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Line Type	n-val Pipe	Line Length (ft)	Line Slope (%)	Invert Up (ft)	Invert Dn (ft)	
1	P-P1A-1C	Outfall	S-P1A-1C	0.07	0.98	0.07	3.60	6.47	0.44	22.29	22.31	7.99	24	Cir	0.012	37.381	0.83	32.55	32.24	
2	P-P1A-2C	1	S-P1A-2C	0.24	0.98	0.24	3.53	6.47	1.52	22.01	22.34	7.01	24	Cir	0.012	86.621	0.83	33.27	32.55	
3	P-P1A-5C	2	S-P1A-5C	0.36	0.98	0.35	2.59	6.47	2.28	16.51	16.90	9.34	18	Cir	0.012	22.203	2.21	35.65	35.16	
4	P-P1A-6C	3	S-P1A-6C	1.20	0.98	1.18	2.23	6.47	7.60	14.32	14.43	8.10	18	Cir	0.012	59.058	1.61	36.60	35.65	
5	P-P1A-7C	4	S-P1A-7C	1.08	0.98	1.06	1.06	6.47	6.84	6.84	6.99	5.58	15	Cir	0.012	90.235	1.00	37.75	36.85	
6	P-P1A-3C	2	S-P1A-3C	0.35	0.98	0.34	0.71	6.47	2.22	4.55	7.00	3.71	15	Cir	0.012	219.928	1.00	36.22	34.02	
7	P-P1A-4C	6	S-P1A-4C	0.37	0.98	0.36	0.36	6.47	2.34	2.34	3.81	2.99	12	Cir	0.012	14.350	0.98	36.61	36.47	
8	P-P1A-8C	Outfall	S-P1A-8C	0.13	0.98	0.13	1.77	6.47	0.82	11.16	11.41	6.35	18	Cir	0.012	38.740	1.01	20.69	20.30	
9	P-P1A-9C	8	S-P1A-9C	0.50	0.98	0.49	1.64	6.47	3.17	10.44	10.79	5.91	18	Cir	0.012	84.475	0.90	21.45	20.69	
10	P-P1A-10C	9	S-P1A-10C	1.83	0.63	1.15	1.15	6.47	7.45	7.45	8.06	4.22	18	Cir	0.012	133.496	0.50	22.12	21.45	

Project File: 210129 - Epic Church Storm Sewer - Capacity.stm | Number of lines: 10 | Date: 1/28/2021

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99 -- Return period = 25 Yrs. ; i Inlet control; ** Critical depth

APPENDIX G

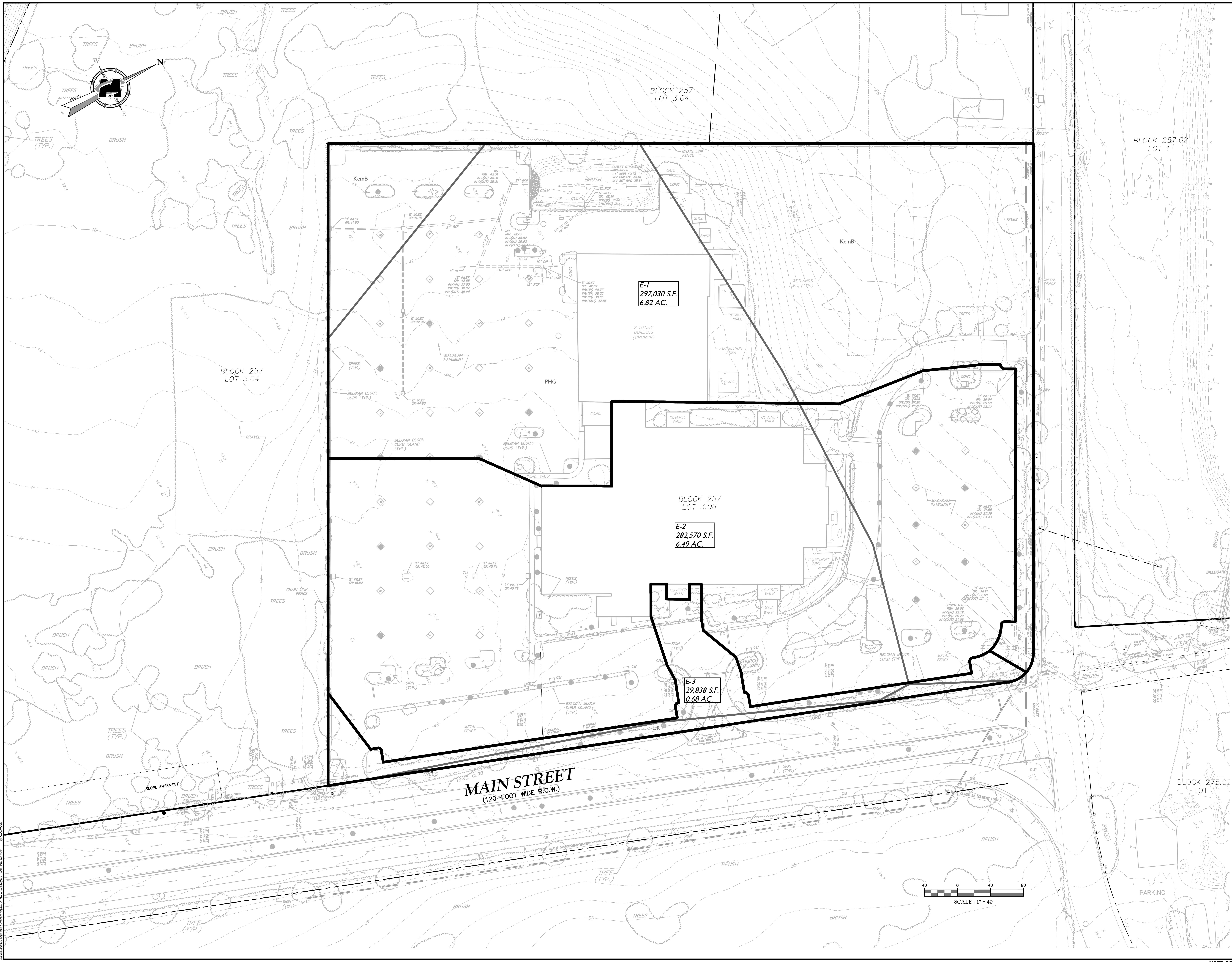
STORM SEWER CALCULATIONS (UPSIZED ANALYSIS)

Maser - Epic Church Storm Sewer Upsized Analysis

Label	Start Node	Stop Node	Upstream Inlet Area (acres)	Upstrea m Inlet C	System CA (acres)	Upstream Inlet Tc (hours)	Upstream Structure Flow (Total Surface) (cfs)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Diameter (in)	Section Type	Darcy-Weisbach e (ft)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Elevation Ground (Start) (ft)	Hydraulic Grade Line (In) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (Out) (ft)
P-P1A-10C	S-P1A-10C	S-P1A-9C	1.830	0.630	1.153	0.167	7.67	7.67	23.96	2.44	24.0	Circle	0.0000	133.0	0.005	21.62	20.95	25.00	24.14	24.90	24.05
P-P1A-1C	S-P1A-1C	S-P1A-113 (Proposed Storm P1-A)	0.070	0.980	3.597	0.167	0.46	23.15	56.96	4.72	30.0	Circle	0.0000	37.0	0.008	32.05	31.74	41.16	34.55	37.96	34.50
P-P1A-2C	S-P1A-2C	S-P1A-1C	0.240	0.980	3.528	0.167	1.56	22.92	56.26	4.84	30.0	Circle	0.0000	87.0	0.008	32.77	32.05	41.45	34.78	41.16	34.77
P-P1A-3C	S-P1A-3C	S-P1A-2C	0.350	0.980	0.706	0.167	2.28	4.68	16.28	5.66	18.0	Circle	0.0000	220.0	0.010	35.97	33.77	41.64	36.80	41.45	35.50
P-P1A-4C	S-P1A-4C	S-P1A-3C	0.370	0.980	0.363	0.167	2.41	2.41	10.07	2.12	15.0	Circle	0.0000	14.0	0.010	36.36	36.22	42.28	37.38	41.64	37.39
P-P1A-5C	S-P1A-5C	S-P1A-2C	0.360	0.980	2.587	0.167	2.35	16.93	53.28	8.67	24.0	Circle	0.0000	22.0	0.022	35.15	34.66	41.00	36.63	41.45	35.74
P-P1A-6C	S-P1A-6C	S-P1A-5C	1.200	0.980	2.234	0.167	7.82	14.69	44.78	5.78	24.0	Circle	0.0000	59.0	0.016	36.10	35.15	41.52	37.48	41.00	37.40
P-P1A-7C	S-P1A-7C	S-P1A-6C	1.080	0.980	1.058	0.167	7.04	7.04	16.28	4.17	18.0	Circle	0.0000	90.0	0.010	37.50	36.60	42.83	38.53	41.52	38.53
P-P1A-8C	S-P1A-8C	S-P1A-200 (Proposed Storm P1-A)	0.130	0.980	1.770	0.167	0.85	11.30	34.68	3.60	24.0	Circle	0.0000	39.0	0.010	20.19	19.80	25.90	23.50	23.97	23.45
P-P1A-9C	S-P1A-9C	S-P1A-8C	0.500	0.980	1.643	0.167	3.26	10.62	32.86	3.38	24.0	Circle	0.0000	84.0	0.009	20.95	20.19	24.90	23.83	25.90	23.74

APPENDIX H

DRAINAGE AREA MAPS



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REV	DATE	DRAWN BY	DESCRIPTION
1	4/9/21	AJC	REVISED PER CME LETTER DATED MARCH 18, 2021

DRAINAGE AREA MAPS

FOR

EPIC CHURCH

BLOCK 257
LOT 3.06

BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

RED BANK OFFICE
Corporate Headquarters
331 Newman Springs Road
Suite 203
Red Bank, NJ 07701

Phone: 732.383.1950
Fax: 732.383.1984

SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	1/27/2021	AJC	DB

PROJECT NUMBER:	DRAWING NAME:
05000500F	C-DRNG-CRCH

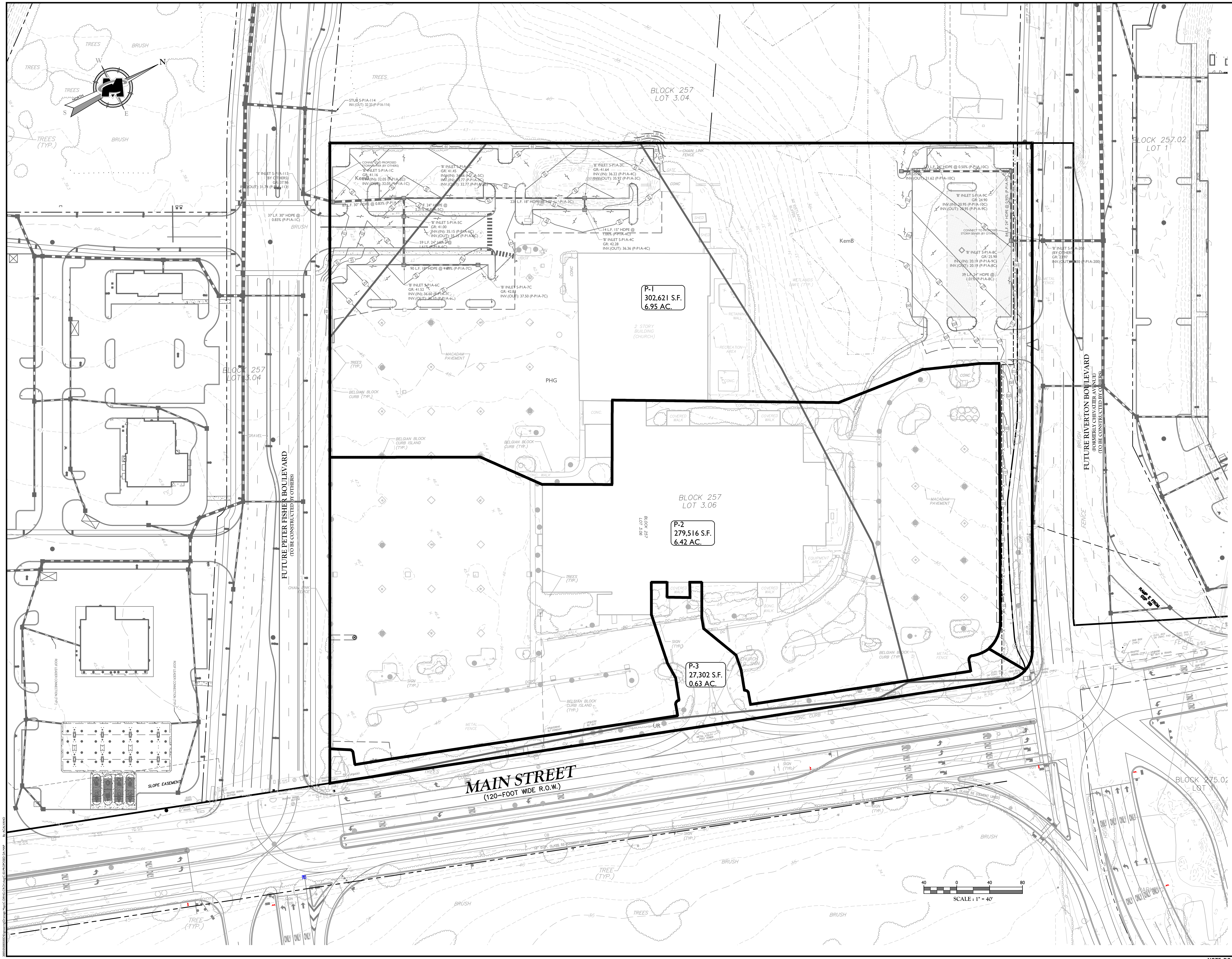
SHEET TITLE:

EXISTING DRAINAGE AREA MAP

SHEET NUMBER:

1 of 3

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.



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1	4/9/21	AJC	REVISED PER CME LETTER DATED MARCH 18, 2021

DRAINAGE AREA MAPS

FOR

EPIC CHURCH

BLOCK 257
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Fax: 732.383.1984

SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	1/27/2021	AJC	DB

PROJECT NUMBER:	DRAWING NAME:
05000500F	C-DRNG-CRCH

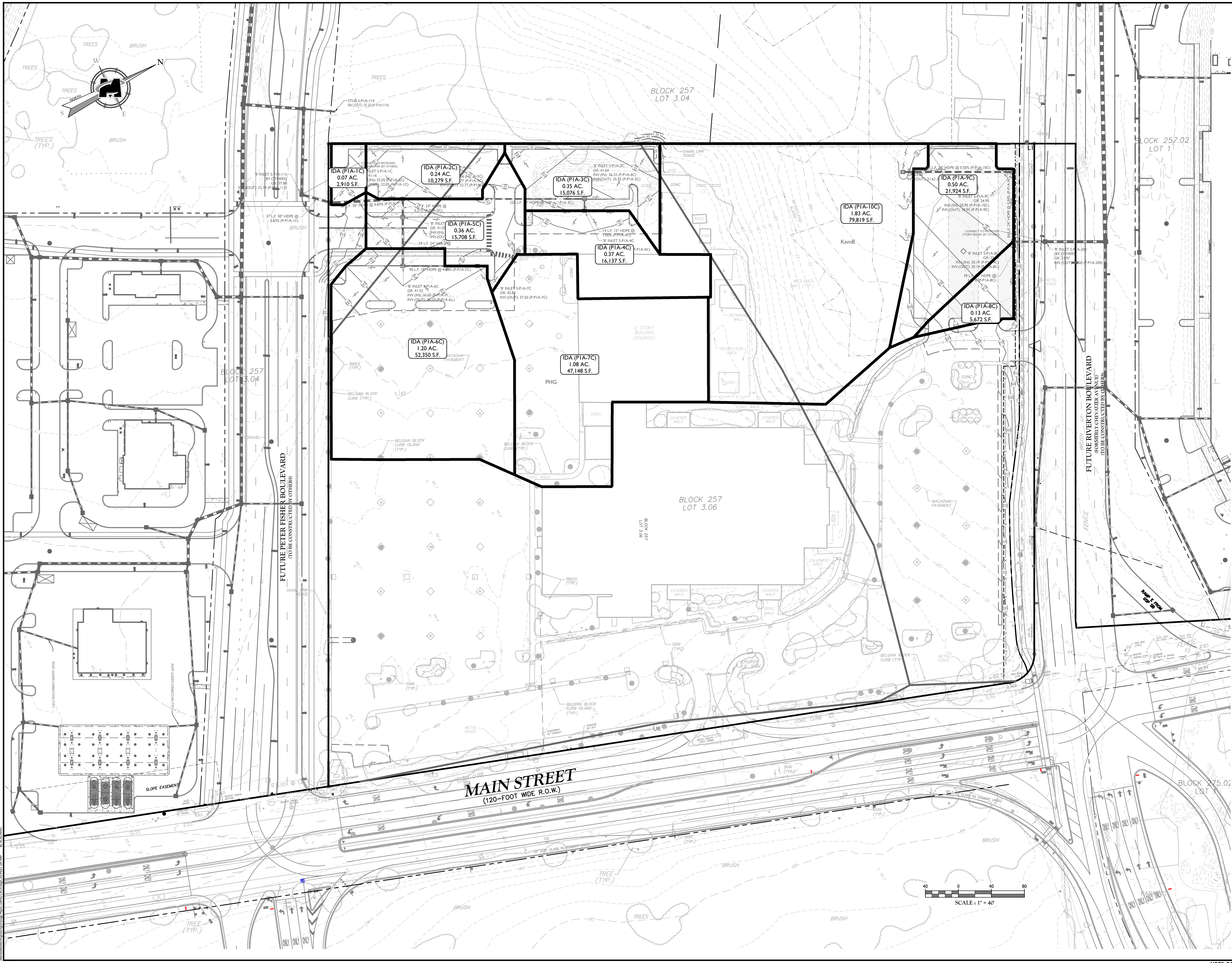
SHEET TITLE:

PROPOSED DRAINAGE AREA MAP

SHEET NUMBER:

2 of 3

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.



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DRAINAGE AREA MAPS

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Fax: 732.383.1984

SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	1/27/2021	AJC	DB

PROJECT NUMBER:	DRAWING NAME:
05000500F	C-DRNG-CRCH

SHEET TITLE: INLET DRAINAGE AREA MAP

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.