

AMERICAN ENGINEERING, INC.

CIVIL ENGINEERING / LAND SURVEYING / LAND PLANNING

*Stormwater Management Plan
For
Keystone, LLC.*

MIXED USE DEVELOPMENT

LOCATED AT

82 Main Street (Route 1A)
South Kingstown, Rhode Island

Prepared By:
American Engineering, Inc.
400 South County Trail, Suite A201
Exeter, Rhode Island 02822

September 9, 2025

INTRODUCTION

This report was prepared to document the proposed storm water collection and conveyance system for the proposed conditions at 82 Main Street in the Town of South Kingstown, Rhode Island.

The site is currently undeveloped and has an existing ground cover of grass with a few trees. The site is located on the south side of Main Street, the westerly side of Hazard Avenue, and is abutted to the south and west by residential properties.

We are proposing to construct a mixed use building which will have a commercial component with 3 residential units on the upper floors. The proposed building would be accessed from a proposed paved driveway and parking area that enters from Hazard Avenue. The building will be serviced by available public utilities including municipal sewer and water supply

The sites generally slopes from south to north towards Main Street with a portion of the runoff flowing east onto Hazard Avenue. Runoff that flows onto Hazard Avenue then flows north to Main Street. The runoff then enters the State drainage system in Main Street.

We are proposing to collect the roof leaders for the proposed mixed use building and collect the runoff from the proposed parking area with two catch basins which will feed a proposed underground infiltration system. The proposed underground infiltration system will provide peak runoff and runoff volume mitigation for the proposed project. A crushed stone infiltration trench has also been provided to capture a portion of the required storage volume. The stormwater management system has been designed to provide water quality treatment, reduce peak runoff rates, and capture the increase in volume for the 1, 10, and 100-year, 24-hour, Type III storm event.

METHODOLOGY

The drainage analysis was performed by using the computer model "HydroCAD" which uses the Soil Conservation Service's "TR-55 & TR-20" methodology for determining peak runoff rates and total volumes.

The proposed drainage system was designed to:

1. Have no increase in peak runoff rates from the 1, 10, and 100-year frequency storm events when compared to pre- project conditions and to pass the 100-year storm event without damage to property from flooding.
2. Treat stormwater to meet the State's requirements for water quality.

SOIL CATEGORIES

There is one dominant soil type on site for this project and its name and description as determined by The Soil Survey of Rhode Island is as follows:

MU - Merrimac-Urban land complex.

This complex consists of well drained Merrimac soils and areas of Urban land. The complex is on terraces and outwash plains in densely populated areas of the State, mainly in the areas of Providence

and Warwick. Areas are irregular in shape and mostly range from 10 to 400 acres. Slopes are mainly about 1 percent but range from 0 to 15 percent. The complex is about 40 percent Merrimac soils, 40 percent Urban land, and 20 percent other soils. The soils and urban land are so intermingled that it was not practical to map them separately. Typically the Merrimac soils have a surface layer of dark brown sandy loam 8 inches thick. The subsoil is yellowish brown and dark yellowish brown sandy loam 17 inches thick. The substratum is light yellowish brown gravelly sand to a depth of 60 inches or more. Urban land consists of areas covered by streets, parking lots, buildings, and other urban structures. Included with this complex in mapping are areas, up to 10 acres in size, of Udorthents, excessively drained Hinckley and Windsor soils, well drained Agawam and Enfield soils, and moderately well drained Sudbury and Ninigret soils. Also included are areas of darker colored soils. The permeability of the Merrimac soils is moderately rapid in the surface layer and upper part of the subsoil, moderately rapid to rapid in the lower part of the subsoil, and rapid in the substratum. The available water capacity is moderate. Runoff is slow to medium on the Merrimac soils. The soil is extremely acid through medium acid. This complex is mainly used for home sites, shopping centers, industrial parks, and other urban purposes. The home sites mostly range from 5,000 to 50,000 square feet. Onsite septic systems in this complex need careful design and installation to prevent pollution of ground water. Slopes of excavated areas are commonly unstable. Lawn grasses, shallow-rooted trees, and shrubs require watering in the summer. The use of straw bale sediment barriers and quickly establishing plant cover help to control erosion during construction. Areas of this complex require onsite investigation and evaluation for most uses. Capability subclass and wood land group not assigned.

FLOOD ZONES

The subject property is not situated in the 100-year flood zone as identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM Map Number's = 44009C0203 K, Effective Date = April 3, 2020

SUBCATCHMENT AREAS USED IN ANALYSIS

The subcatchment areas used in the pre/post project comparisons have the following characteristics:

Subcatchment Areas (Pre project) - have the following characteristics:

| | | |
|----------------|------------------|---------------|
| Watershed '1': | 10,107 sf, CN=43 | Tc= 18.4 min. |
|----------------|------------------|---------------|

Subcatchment Areas (Post project) - have the following characteristics:

| | | |
|-------------------|------------------|----------------|
| Watershed '1': | 4,226 sf, CN=55, | Tc = 17.8 min. |
| Watershed '2': | 5,881 sf, CN=91, | Tc = 5.0 min. |
| <hr/> | | |
| Totals/Composite: | 10,107 sf | |

RUNOFF RATES/VOLUMES

Pre Project (Existing) Runoff: Peak stormwater runoff rates and total volume were analyzed for the 1, 10, and 100-year storm events. The point of analysis is the northeasterly corner of the intersection of Main Street and Hazard Avenue where the entire site contributes it's runoff. RIDEM's Washington

County, Rhode Island 24-hour rainfall amounts for this area were used in the analysis. A summary of the pre-project peak runoff rates and total volumes are summarized below. Supporting calculations are provided in the Appendix.

| Pre-Project Drainage Analysis Summary | | |
|--|---|--|
| Storm | Peak Runoff Rate, CFS and Time of Peak | Total Runoff Volume, Cubic Feet |
| 1-yr | 0.00 @ 24.00 hrs | 1 |
| 10-yr | 0.02 @ 12.55 hrs | 275 |
| 100-yr | 0.28 @ 12.31 hrs | 1,508 |

Post-Project Runoff: Peak stormwater runoff rates were analyzed for the 1, 2, 10, 25, and 100-year storm events and routed through the proposed drainage system (as required by the Rhode Island Stormwater Design and Installation Standards Manual, Amended November 2018). RIDEM's Washington County, Rhode Island 24 hour rainfall amounts for this area were used in the analysis.

A summary of the results are summarized below. Supporting calculations are provided in the Appendix.

| Post-Project Drainage Analysis Summary | | |
|---|---|--|
| Storm | Peak Runoff Rate, CFS and Time of Peak | Total Runoff Volume, Cubic Feet |
| 1-yr | 0.00 @ 12.60 hrs* | 51* |
| 10-yr | 0.06 @ 12.31 hrs* | 328* |
| 100-yr | 0.24 @ 12.26 hrs | 1,103 |

*The proposed underground infiltration practice has been designed to capture as much runoff from the developed site as feasible. The proposed underground infiltration does not discharge any stormwater for the 1, 10 , and 100-year storm event. Watershed 1, which consists of runoff that could not be captured, while much smaller than the existing watershed, has a higher CN and a shorter time of concentration, which shows an increase in runoff rate and volume for the 1 and 10-year storm event. The site is located in an area with HSG 'A' soils which are receptive to stormwater infiltration, so the runoff rates and volumes for these storms are relatively low. In order to mitigate this small increase, we have provided a crushed stone infiltration trench with a volume designed to capture the increase in runoff volume for the 10 year storm and, therefore, the 1-year storm.

Summary/Conclusion:

Peak Runoff Rates: Post-project peak runoff rates approximate pre-project peak runoff rates.

Water Quality: Water quality BMPs have been incorporated into the design to meet the November 2018, stormwater standards.

Additional Discussion: Post-project peak runoff rates approximate pre-project rates for the 1, 10, and 100-year storm events for the point of analysis.

Post-project 100-year flood plain elevations are approximately equal to pre-project 100-year flood plain elevations since pre-project peak runoff rates approximate pre-project rates. The proposed project will not impact life and/or property from flooding and or flood flows, and no adverse impacts to water levels on property not owned by the applicant.

The proposed design does not create any restriction or significant modification of the path or velocities of flood flows for the 1, 10, or 100-year frequency, 24-hour, Type III storm events so as to cause harm to life and/or property since the flow paths will remain essentially the same and post-project peak runoff rates will approximate pre-project conditions.



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program



Site Evaluation Form
Part A - Soil Profile Description Application Number Drainage

Property Owner: Keystone LLC
Property Location: 82 Main Street (A.P. 57-1, Lot 73), South Kingstown, Rhode Island
Date of Test Hole: May 20, 2025
Soil Evaluator: Amber K. Hardy, M.S. License Number: D4098
Weather: Partly cloudy, 70° F, recent rain Shaded: Yes No Time: 9:00 am

Table with 11 columns: TH 1 Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab. S. Contr.), Texture, Structure, Consistence, Soil Category. Rows include horizons ^C, Apb, Bwb, 2C, TH 2 Bw, 2C.

TH 2 Soil Class G/C Total Depth 120 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 48 (og)

TH 1 Soil Class G/C Total Depth 120 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 72 (og)

Comments: Top couple feet of soil including most of the class G material has been removed from front half of lot (TH2). Between 6 and 12 inches of this material remains. Elevation of this area is lower than the existing steps/curb as well as the back half of the lot (TH1), where some fill is placed. During digging of TH1, several abandoned drainpipes and a brick structure were struck. The outwash consisted of alternating layers 8 to 16 inches thick of sands and medium gravels.

Part B





Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer

Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*

***OFFSETS MUST BE SHOWN**

Key:

-  Approximate location of test holes
-  Approximate location of bedrock test holes
-  Estimated gradient and direction of slope
-  Approximate direction of due north



| Bedrock THs | |
|-------------|-------|
| TH | Depth |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

1. Relief and Slope: 0 - 3% on each of the two parts with a steep scarp between
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO YES
8. Site's potential for flooding or ponding: NONE SLIGHT MODERATE SEVERE
9. Landscape position: Shoulder
10. Vegetation: Cleared unvegetated lot in developed downtown area
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site: _____

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: *Subwarsky* Signature License #D4098 Part B prepared by: *Subwarsky* Signature License # D4098

DO NOT WRITE IN THIS SPACE

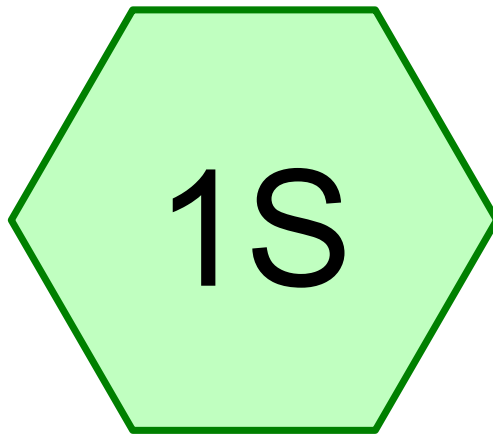
Witnessed Soil Evaluation Decision: Concur Inconclusive Disclaim
Unwitnessed Soil Evaluations Decision: Accept Inconclusive Disclaim

Wet Season Determination required Additional Field Review Required

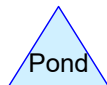
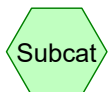
Explanation: _____

Signature Authorized Agent _____ Date _____

Appendix 1
Supporting Drainage Calculations – Existing Conditions



Watershed 1



Summary for Subcatchment 1S: Watershed 1

Runoff = 0.02 cfs @ 12.55 hrs, Volume= 275 cf, Depth= 0.33"

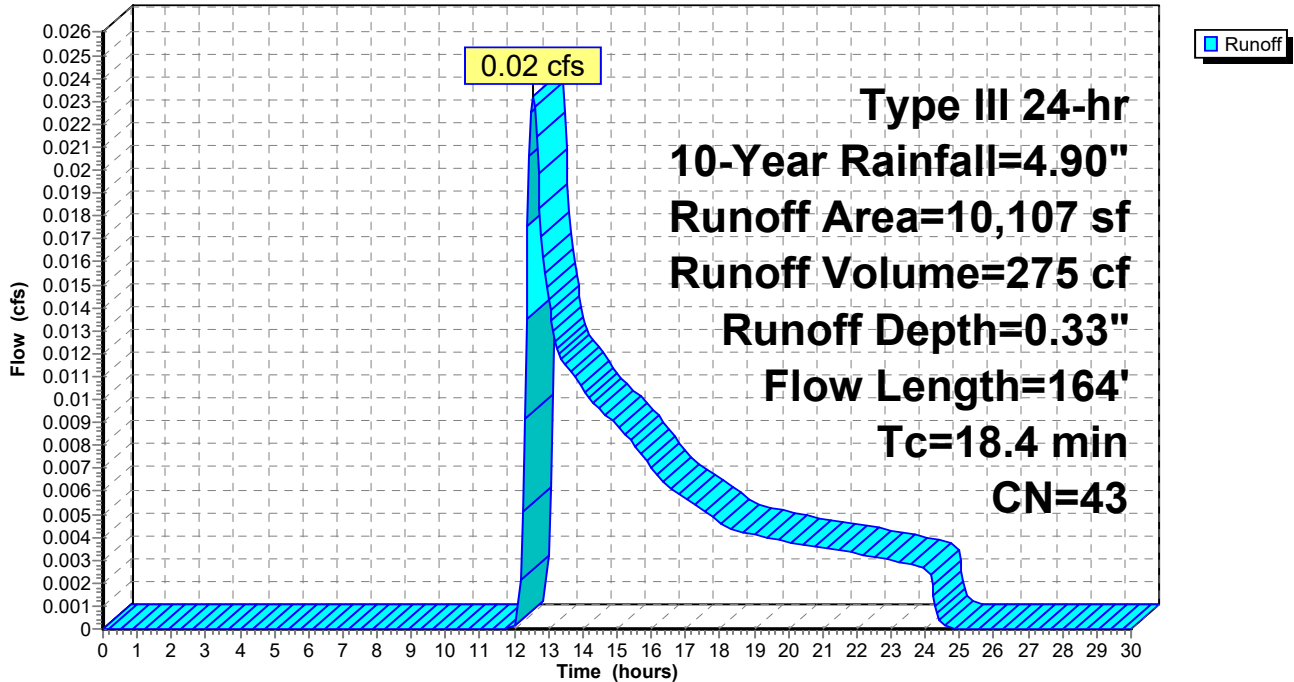
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,406 | 39 | >75% Grass cover, Good, HSG A |
| 701 | 98 | Paved parking, HSG A |
| 10,107 | 43 | Weighted Average |
| 9,406 | | 93.06% Pervious Area |
| 701 | | 6.94% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|--|
| 15.8 | 100 | 0.0150 | 0.11 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 2.3 | 24 | 0.1040 | 0.17 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 0.3 | 40 | 0.0125 | 2.27 | | Shallow Concentrated Flow, Paved Kv= 20.3 fps |
| 18.4 | 164 | Total | | | |

Subcatchment 1S: Watershed 1

Hydrograph



125222_EXISTING

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Type III 24-hr 100-Year Rainfall=8.50"

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Page 4

Summary for Subcatchment 1S: Watershed 1

Runoff = 0.28 cfs @ 12.31 hrs, Volume= 1,508 cf, Depth= 1.79"

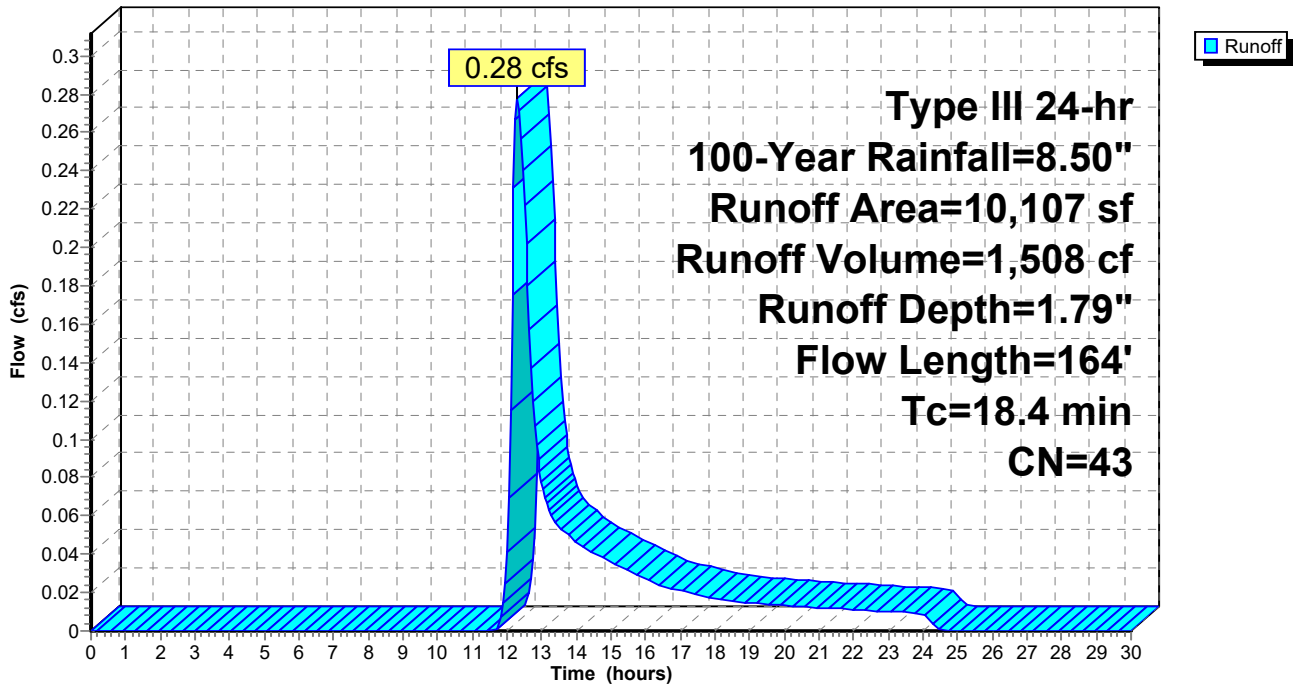
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 9,406 | 39 | >75% Grass cover, Good, HSG A |
| 701 | 98 | Paved parking, HSG A |
| 10,107 | 43 | Weighted Average |
| 9,406 | | 93.06% Pervious Area |
| 701 | | 6.94% Impervious Area |

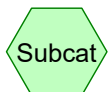
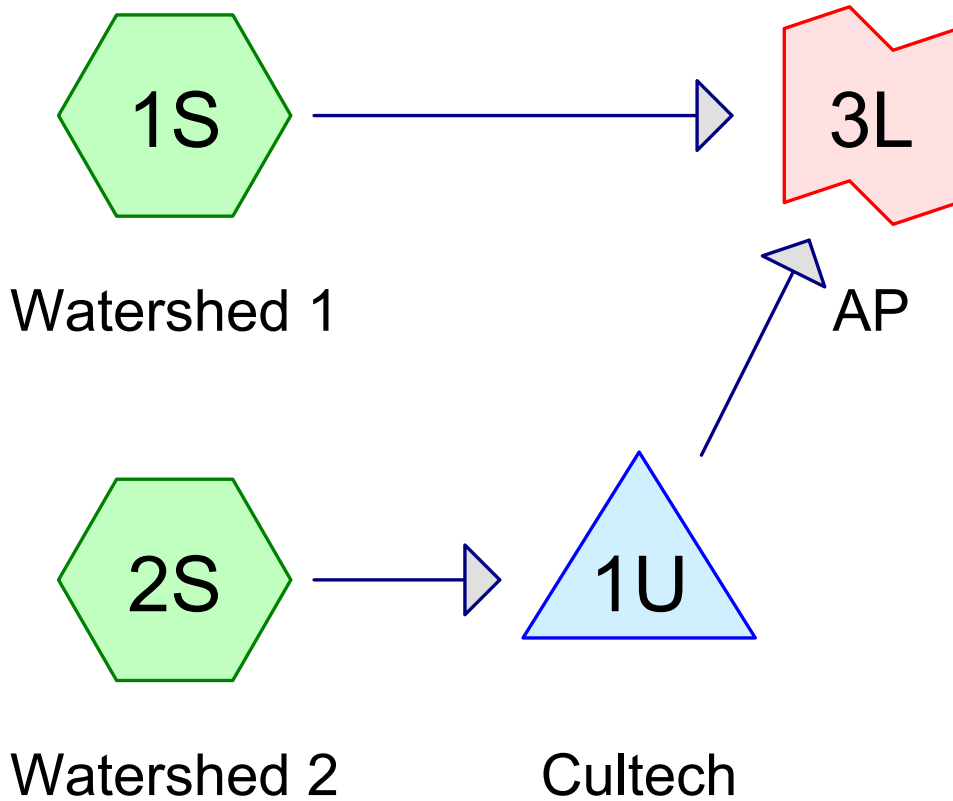
| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 15.8 | 100 | 0.0150 | 0.11 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 2.3 | 24 | 0.1040 | 0.17 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 0.3 | 40 | 0.0125 | 2.27 | | Shallow Concentrated Flow, Paved Kv= 20.3 fps |
| 18.4 | 164 | Total | | | |

Subcatchment 1S: Watershed 1

Hydrograph



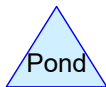
Appendix 2
Supporting Drainage Calculations – Developed Conditions



Subcat



Reach



Pond



Link

125222_PROPOSED

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Type III 24-hr 1-Year Rainfall=2.80"

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Page 2

Summary for Subcatchment 1S: Watershed 1

Runoff = 0.00 cfs @ 12.60 hrs, Volume= 51 cf, Depth= 0.14"

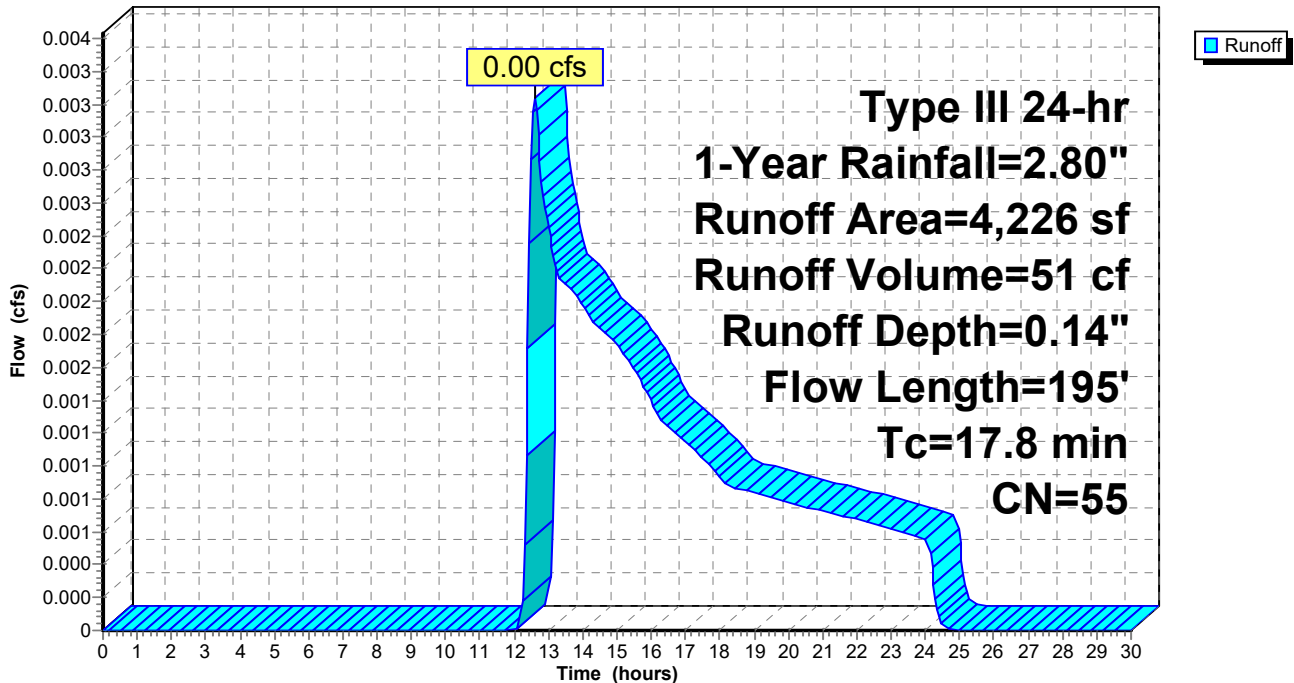
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

| Area (sf) | CN | Description |
|-----------|----|--|
| 3,108 | 39 | >75% Grass cover, Good, HSG A |
| * 694 | 98 | Existing Paved parking, HSG A |
| * 424 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 4,226 | 55 | Weighted Average |
| 3,108 | 39 | 73.54% Pervious Area |
| 1,118 | 98 | 26.46% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 15.8 | 100 | 0.0150 | 0.11 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 1.4 | 13 | 0.1154 | 0.16 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 0.6 | 82 | 0.0125 | 2.27 | | Shallow Concentrated Flow, Paved Kv= 20.3 fps |
| 17.8 | 195 | Total | | | |

Subcatchment 1S: Watershed 1

Hydrograph



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Type III 24-hr 1-Year Rainfall=2.80"

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Page 3

Summary for Subcatchment 2S: Watershed 2

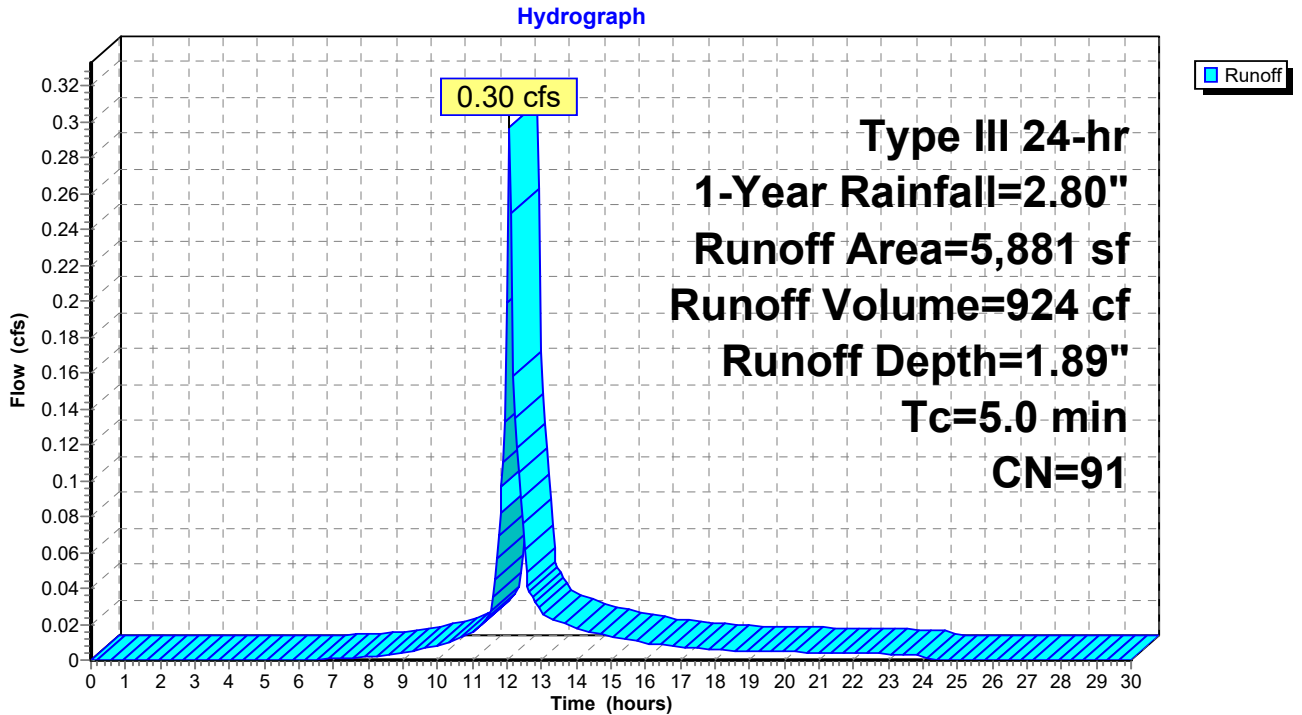
Runoff = 0.30 cfs @ 12.07 hrs, Volume= 924 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

| Area (sf) | CN | Description |
|-----------|----|--|
| 722 | 39 | >75% Grass cover, Good, HSG A |
| * 2,488 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 2,671 | 98 | Roofs, HSG A |
| 5,881 | 91 | Weighted Average |
| 722 | 39 | 12.28% Pervious Area |
| 5,159 | 98 | 87.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 5.0 | | | | | Direct Entry, |

Subcatchment 2S: Watershed 2



Summary for Pond 1U: Cultech

Inflow Area = 5,881 sf, 87.72% Impervious, Inflow Depth = 1.89" for 1-Year event
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 924 cf
 Outflow = 0.18 cfs @ 12.05 hrs, Volume= 924 cf, Atten= 41%, Lag= 0.0 min
 Discarded = 0.18 cfs @ 12.05 hrs, Volume= 924 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 49.17' @ 12.19 hrs Surf.Area= 917 sf Storage= 52 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 1.1 min (807.7 - 806.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 49.00' | 549 cf | Custom Stage Data (Prismatic) Listed below (Recalc) 2,137 cf Overall - 472 cf Embedded = 1,665 cf x 33.0% Voids |
| #2 | 49.50' | 472 cf | ADS_StormTech SC-310 +Cap x 32 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 8 Rows of 4 Chambers |
| #3 | 52.50' | 58 cf | Custom Stage Data (Prismatic) Listed below (Recalc) |
| | | 1,079 cf | Total Available Storage |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 49.00 | 917 | 0 | 0 |
| 51.33 | 917 | 2,137 | 2,137 |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 52.50 | 28 | 0 | 0 |
| 54.00 | 28 | 42 | 42 |
| 54.25 | 100 | 16 | 58 |

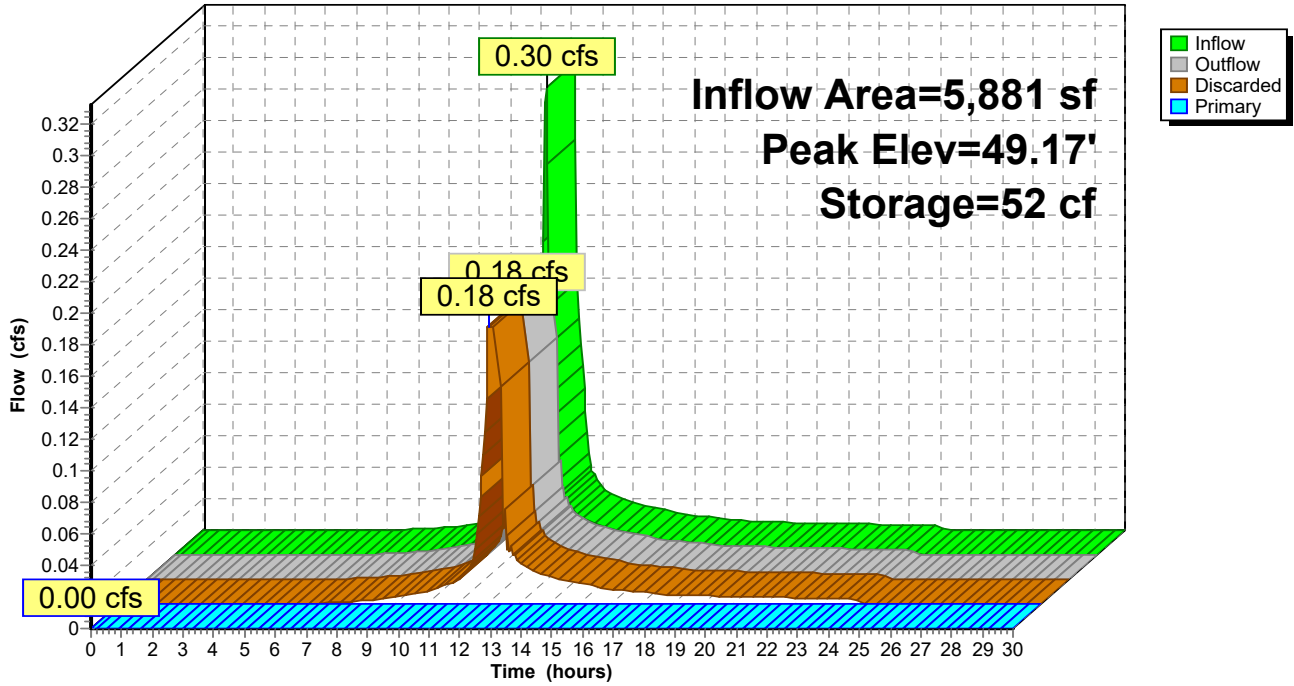
| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 52.50' | Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.25 Width (feet) 2.00 10.00 |
| #2 | Discarded | 49.00' | 8.270 in/hr Exfiltration over Surface area Phase-In= 0.01' |

Discarded OutFlow Max=0.18 cfs @ 12.05 hrs HW=49.06' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=49.00' TW=0.00' (Dynamic Tailwater)
 ↑1=Custom Weir/Orifice (Controls 0.00 cfs)

Pond 1U: Cultech

Hydrograph



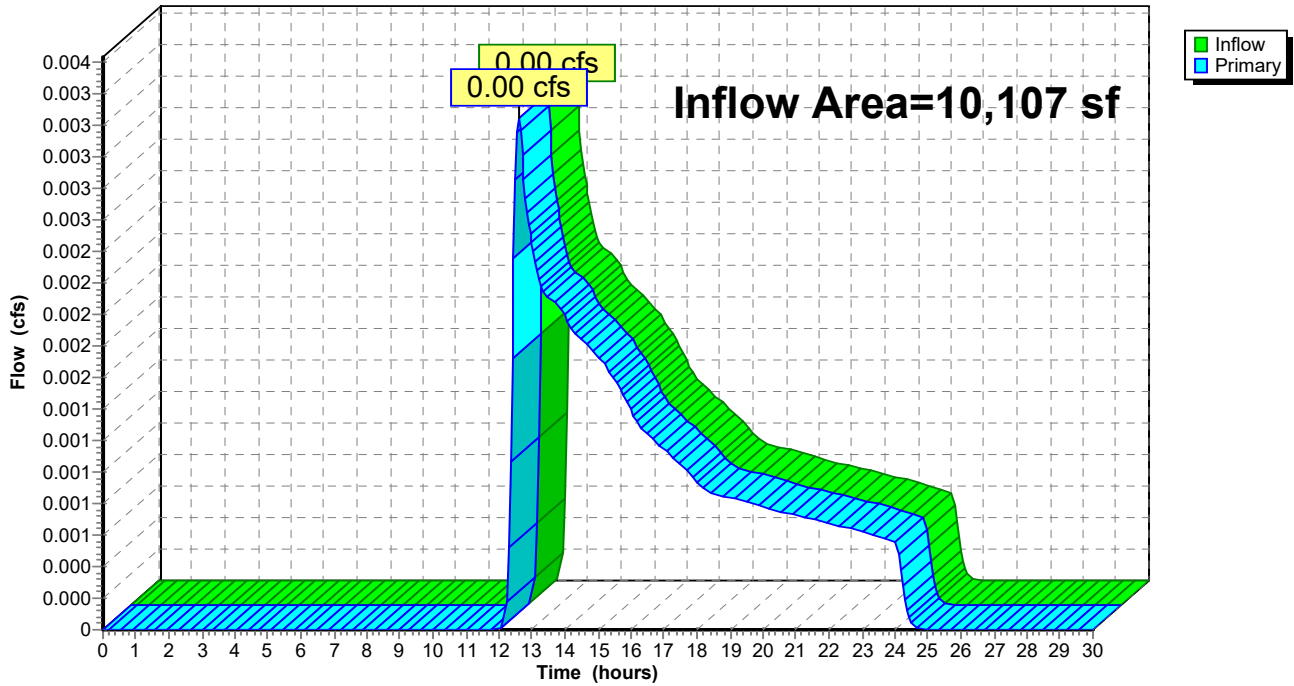
Summary for Link 3L: AP

Inflow Area = 10,107 sf, 62.11% Impervious, Inflow Depth = 0.06" for 1-Year event
Inflow = 0.00 cfs @ 12.60 hrs, Volume= 51 cf
Primary = 0.00 cfs @ 12.60 hrs, Volume= 51 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 3L: AP

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.90"

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Page 7

Summary for Subcatchment 1S: Watershed 1

Runoff = 0.06 cfs @ 12.31 hrs, Volume= 328 cf, Depth= 0.93"

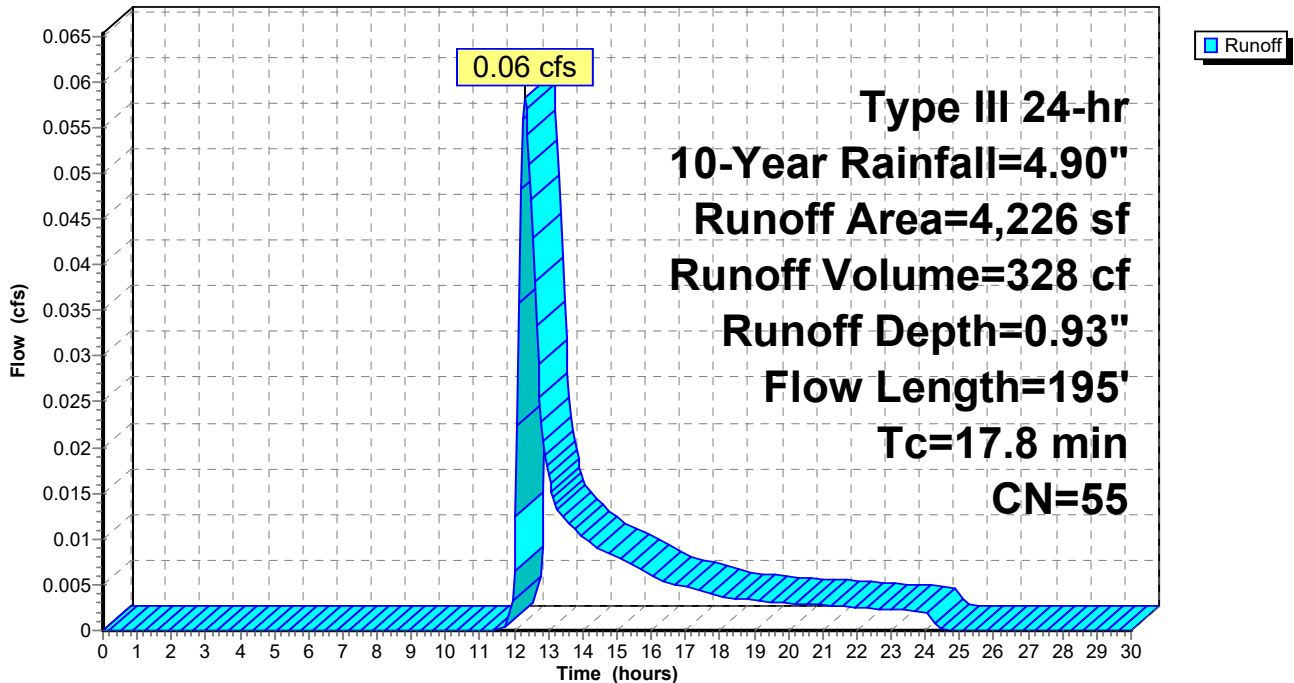
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

| Area (sf) | CN | Description |
|-----------|----|--|
| 3,108 | 39 | >75% Grass cover, Good, HSG A |
| * 694 | 98 | Existing Paved parking, HSG A |
| * 424 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 4,226 | 55 | Weighted Average |
| 3,108 | 39 | 73.54% Pervious Area |
| 1,118 | 98 | 26.46% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 15.8 | 100 | 0.0150 | 0.11 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 1.4 | 13 | 0.1154 | 0.16 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 0.6 | 82 | 0.0125 | 2.27 | | Shallow Concentrated Flow, Paved Kv= 20.3 fps |
| 17.8 | 195 | Total | | | |

Subcatchment 1S: Watershed 1

Hydrograph



Summary for Subcatchment 2S: Watershed 2

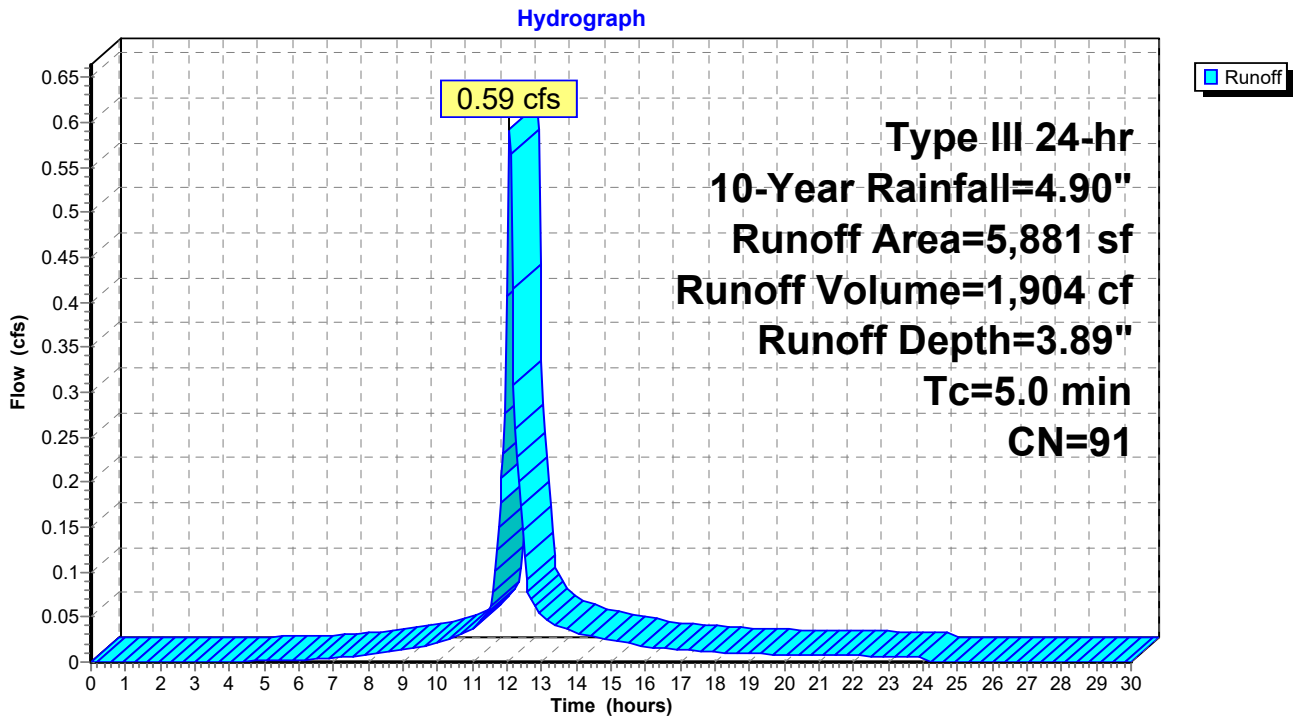
Runoff = 0.59 cfs @ 12.07 hrs, Volume= 1,904 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.90"

| Area (sf) | CN | Description |
|-----------|----|--|
| 722 | 39 | >75% Grass cover, Good, HSG A |
| * 2,488 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 2,671 | 98 | Roofs, HSG A |
| 5,881 | 91 | Weighted Average |
| 722 | 39 | 12.28% Pervious Area |
| 5,159 | 98 | 87.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 5.0 | | | | | Direct Entry, |

Subcatchment 2S: Watershed 2



Summary for Pond 1U: Cultech

Inflow Area = 5,881 sf, 87.72% Impervious, Inflow Depth = 3.89" for 10-Year event
 Inflow = 0.59 cfs @ 12.07 hrs, Volume= 1,904 cf
 Outflow = 0.18 cfs @ 11.95 hrs, Volume= 1,905 cf, Atten= 70%, Lag= 0.0 min
 Discarded = 0.18 cfs @ 11.95 hrs, Volume= 1,905 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 49.75' @ 12.39 hrs Surf.Area= 917 sf Storage= 316 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 8.1 min (794.7 - 786.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 49.00' | 549 cf | Custom Stage Data (Prismatic) Listed below (Recalc) 2,137 cf Overall - 472 cf Embedded = 1,665 cf x 33.0% Voids |
| #2 | 49.50' | 472 cf | ADS_StormTech SC-310 +Cap x 32 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 8 Rows of 4 Chambers |
| #3 | 52.50' | 58 cf | Custom Stage Data (Prismatic) Listed below (Recalc) |
| | | 1,079 cf | Total Available Storage |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 49.00 | 917 | 0 | 0 |
| 51.33 | 917 | 2,137 | 2,137 |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 52.50 | 28 | 0 | 0 |
| 54.00 | 28 | 42 | 42 |
| 54.25 | 100 | 16 | 58 |

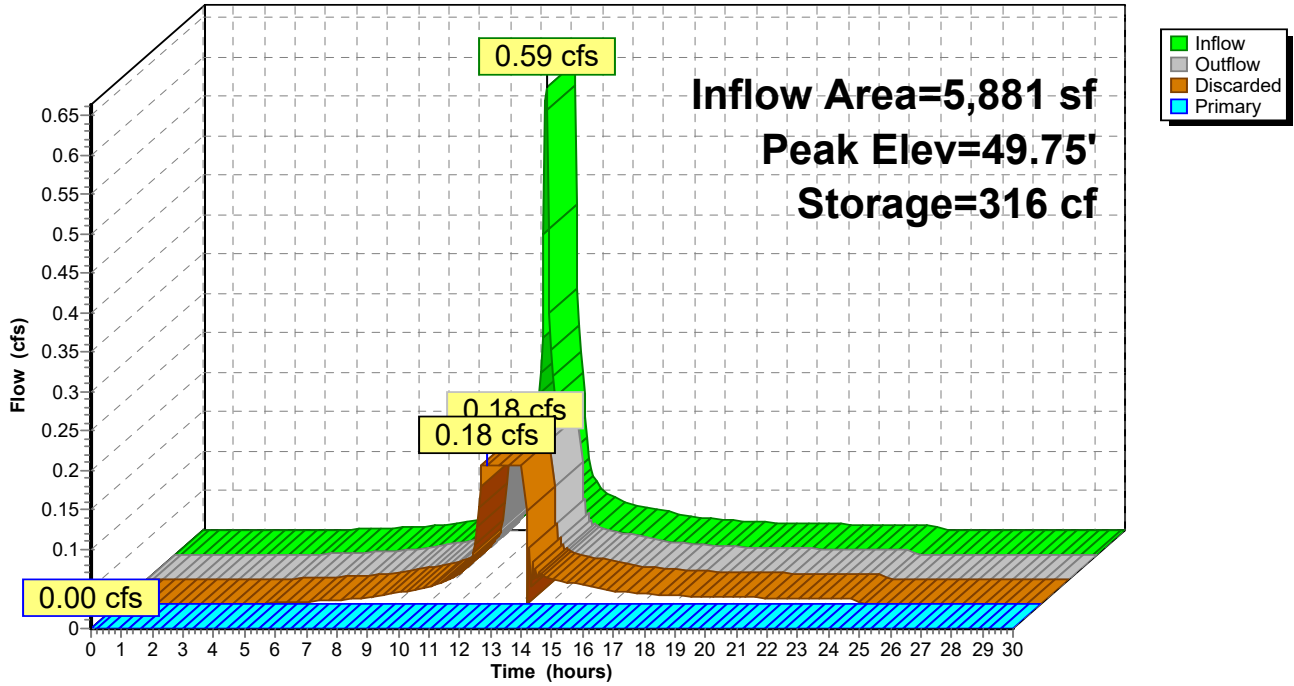
| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 52.50' | Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.25 Width (feet) 2.00 10.00 |
| #2 | Discarded | 49.00' | 8.270 in/hr Exfiltration over Surface area Phase-In= 0.01' |

Discarded OutFlow Max=0.18 cfs @ 11.95 hrs HW=49.09' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=49.00' TW=0.00' (Dynamic Tailwater)
 ↑1=Custom Weir/Orifice (Controls 0.00 cfs)

Pond 1U: Cultech

Hydrograph



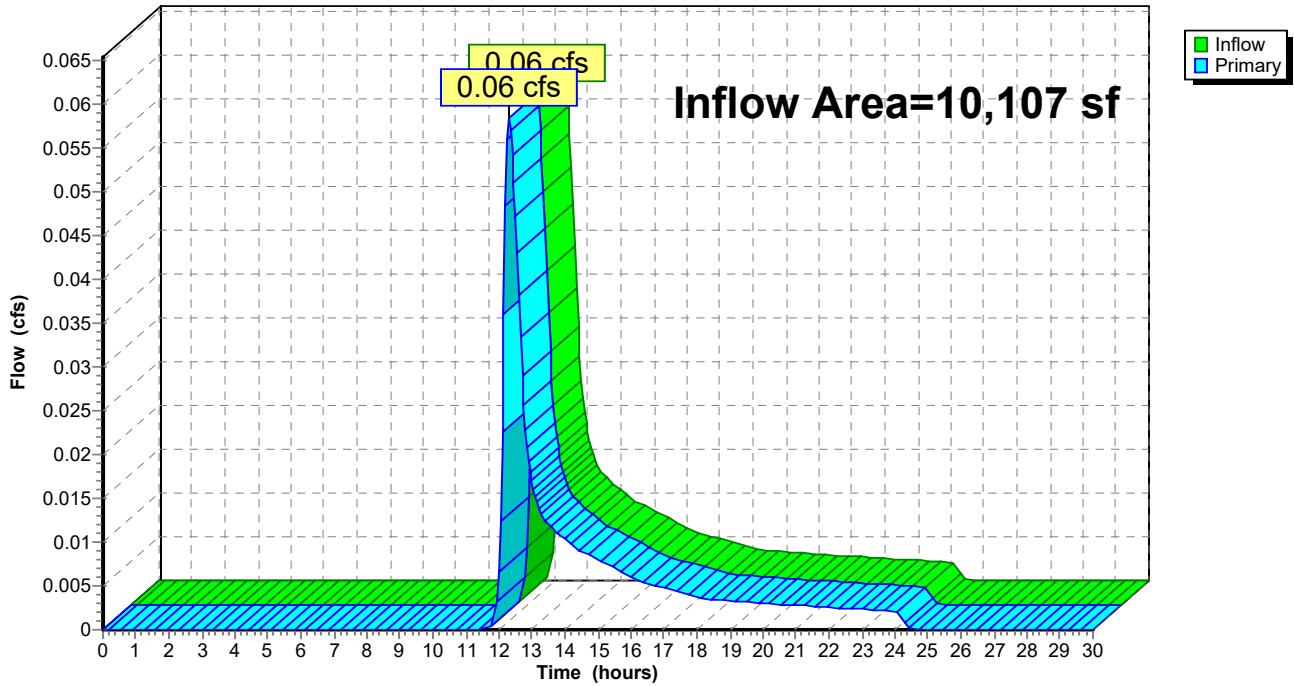
Summary for Link 3L: AP

Inflow Area = 10,107 sf, 62.11% Impervious, Inflow Depth = 0.39" for 10-Year event
Inflow = 0.06 cfs @ 12.31 hrs, Volume= 328 cf
Primary = 0.06 cfs @ 12.31 hrs, Volume= 328 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link 3L: AP

Hydrograph



125222_PROPOSED

Prepared by American Engineering, Inc.

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Type III 24-hr 100-Year Rainfall=8.50"

Printed 9/9/2025

Page 12

Summary for Subcatchment 1S: Watershed 1

Runoff = 0.24 cfs @ 12.26 hrs, Volume= 1,103 cf, Depth= 3.13"

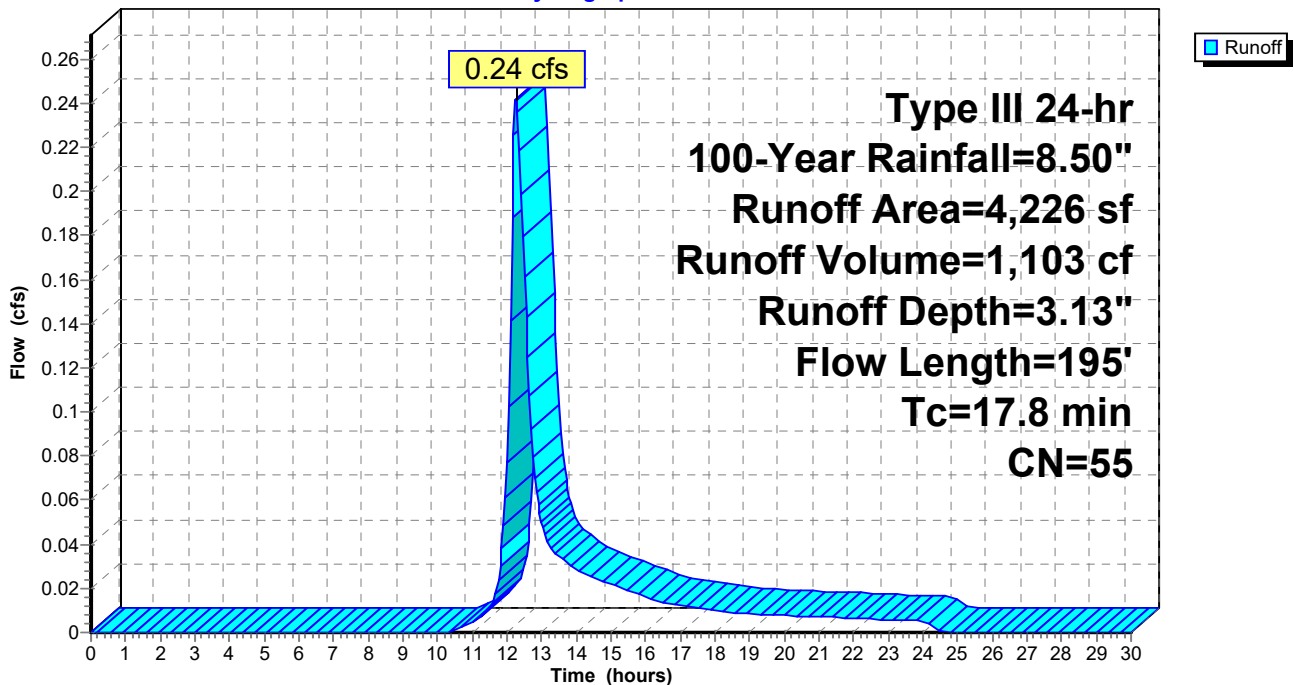
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.50"

| Area (sf) | CN | Description |
|-----------|----|--|
| 3,108 | 39 | >75% Grass cover, Good, HSG A |
| * 694 | 98 | Existing Paved parking, HSG A |
| * 424 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 4,226 | 55 | Weighted Average |
| 3,108 | 39 | 73.54% Pervious Area |
| 1,118 | 98 | 26.46% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---|
| 15.8 | 100 | 0.0150 | 0.11 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 1.4 | 13 | 0.1154 | 0.16 | | Sheet Flow, Grass: Dense n= 0.240 P2= 3.30" |
| 0.6 | 82 | 0.0125 | 2.27 | | Shallow Concentrated Flow, Paved Kv= 20.3 fps |
| 17.8 | 195 | Total | | | |

Subcatchment 1S: Watershed 1

Hydrograph



Summary for Subcatchment 2S: Watershed 2

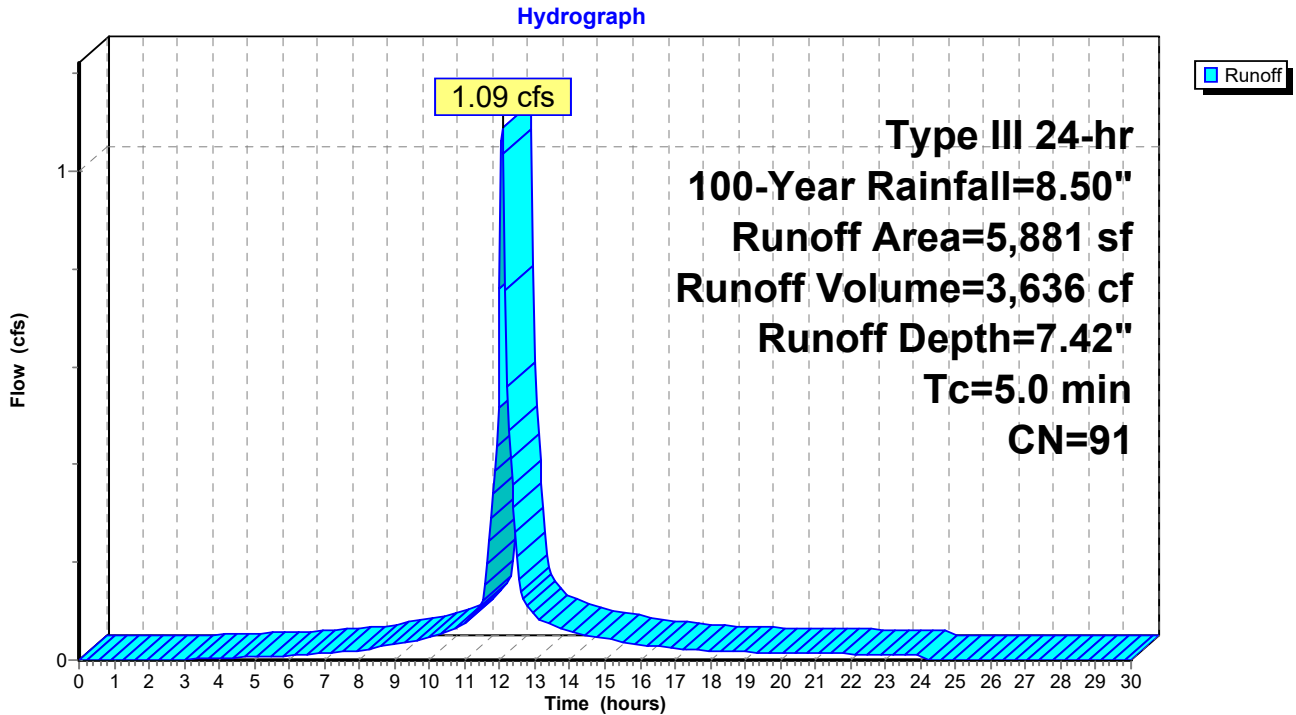
Runoff = 1.09 cfs @ 12.07 hrs, Volume= 3,636 cf, Depth= 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.50"

| Area (sf) | CN | Description |
|-----------|----|--|
| 722 | 39 | >75% Grass cover, Good, HSG A |
| * 2,488 | 98 | Proposed Paved parking/walkway/conc pad, HSG A |
| 2,671 | 98 | Roofs, HSG A |
| 5,881 | 91 | Weighted Average |
| 722 | 39 | 12.28% Pervious Area |
| 5,159 | 98 | 87.72% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 5.0 | | | | | Direct Entry, |

Subcatchment 2S: Watershed 2



Summary for Pond 1U: Cultech

Inflow Area = 5,881 sf, 87.72% Impervious, Inflow Depth = 7.42" for 100-Year event
 Inflow = 1.09 cfs @ 12.07 hrs, Volume= 3,636 cf
 Outflow = 0.18 cfs @ 11.75 hrs, Volume= 3,636 cf, Atten= 84%, Lag= 0.0 min
 Discarded = 0.18 cfs @ 11.75 hrs, Volume= 3,636 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 51.20' @ 12.54 hrs Surf.Area= 917 sf Storage= 983 cf

Plug-Flow detention time= 31.4 min calculated for 3,630 cf (100% of inflow)
 Center-of-Mass det. time= 31.3 min (801.3 - 770.0)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 49.00' | 549 cf | Custom Stage Data (Prismatic) Listed below (Recalc) 2,137 cf Overall - 472 cf Embedded = 1,665 cf x 33.0% Voids |
| #2 | 49.50' | 472 cf | ADS_StormTech SC-310 +Cap x 32 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 8 Rows of 4 Chambers |
| #3 | 52.50' | 58 cf | Custom Stage Data (Prismatic) Listed below (Recalc) |
| | | 1,079 cf | Total Available Storage |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 49.00 | 917 | 0 | 0 |
| 51.33 | 917 | 2,137 | 2,137 |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 52.50 | 28 | 0 | 0 |
| 54.00 | 28 | 42 | 42 |
| 54.25 | 100 | 16 | 58 |

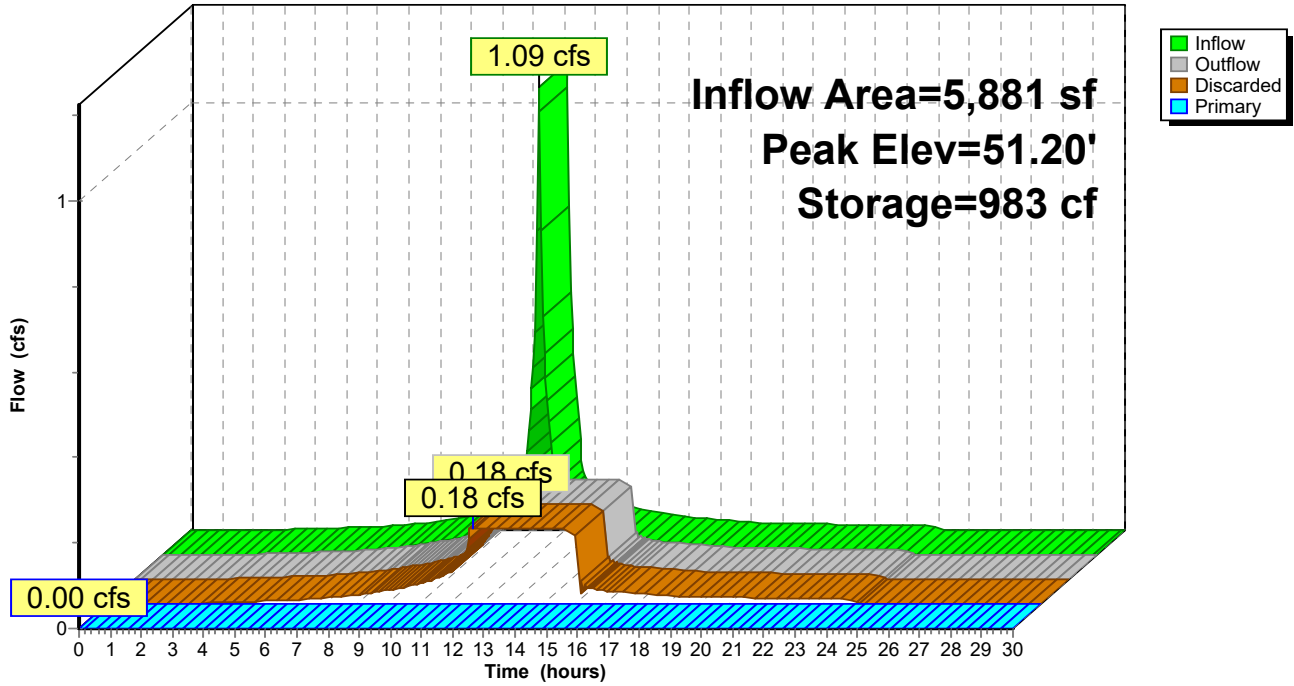
| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Primary | 52.50' | Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.25 Width (feet) 2.00 10.00 |
| #2 | Discarded | 49.00' | 8.270 in/hr Exfiltration over Surface area Phase-In= 0.01' |

Discarded OutFlow Max=0.18 cfs @ 11.75 hrs HW=49.10' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=49.00' TW=0.00' (Dynamic Tailwater)
 ↑1=Custom Weir/Orifice (Controls 0.00 cfs)

Pond 1U: Cultech

Hydrograph



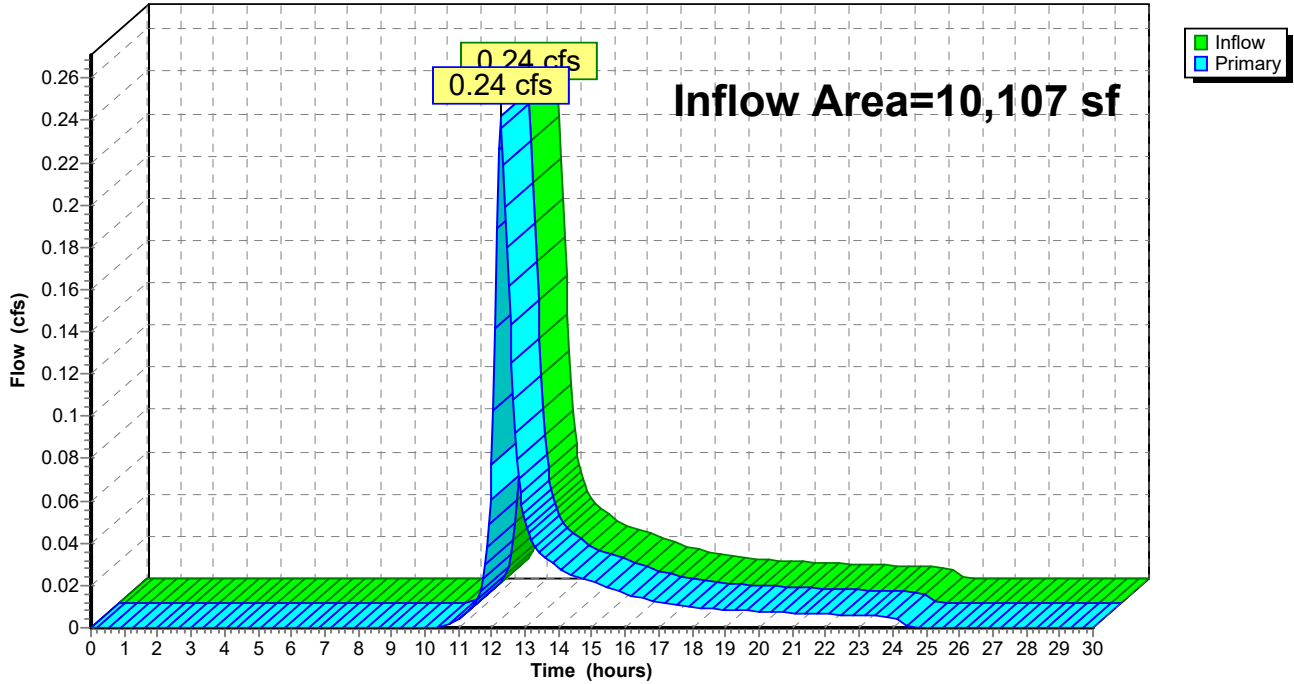
Summary for Link 3L: AP

Inflow Area = 10,107 sf, 62.11% Impervious, Inflow Depth = 1.31" for 100-Year event
Inflow = 0.24 cfs @ 12.26 hrs, Volume= 1,103 cf
Primary = 0.24 cfs @ 12.26 hrs, Volume= 1,103 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

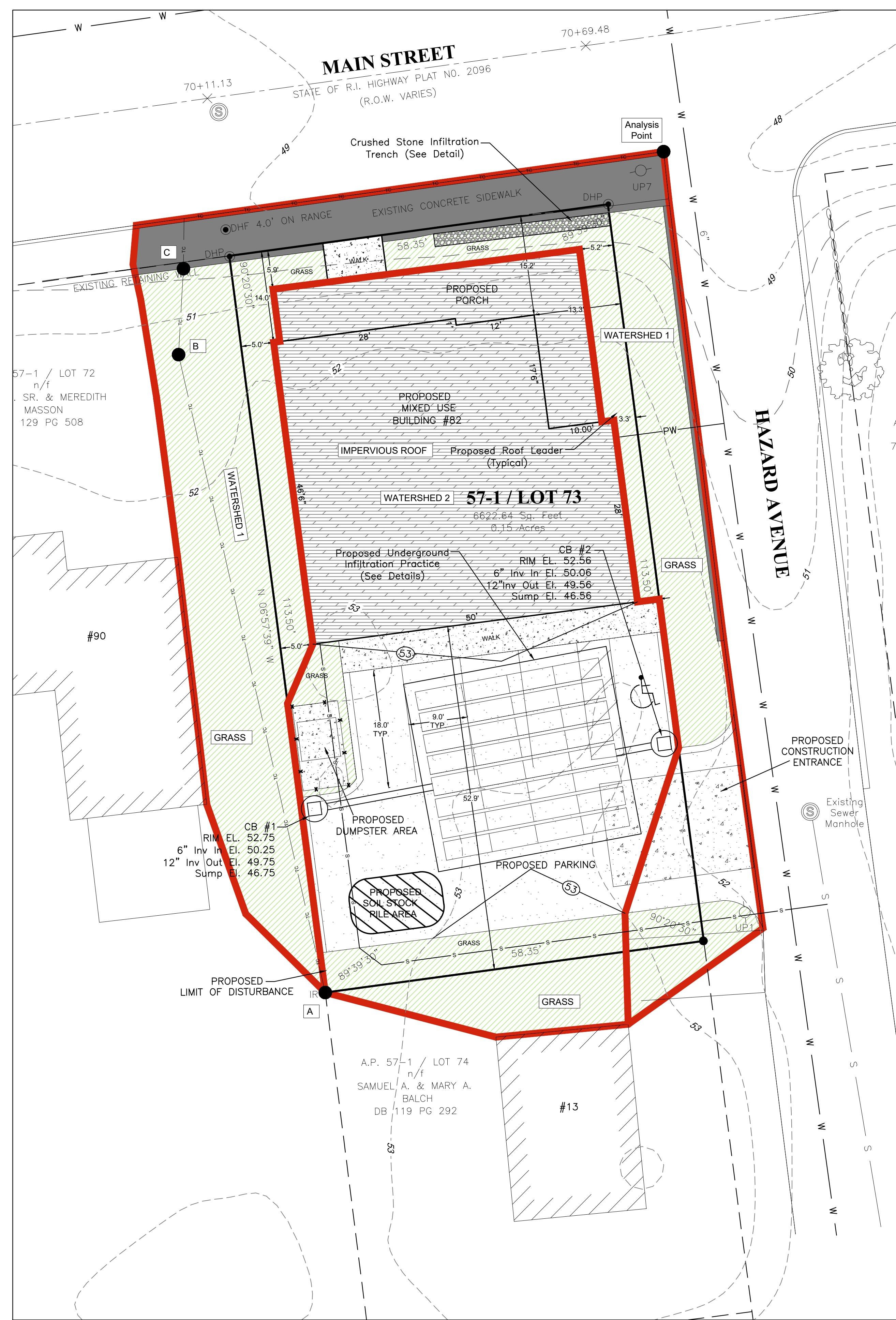
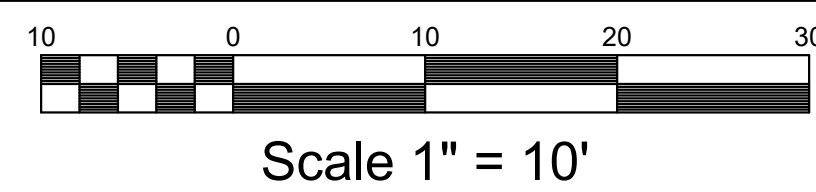
Link 3L: AP

Hydrograph



Appendix 3

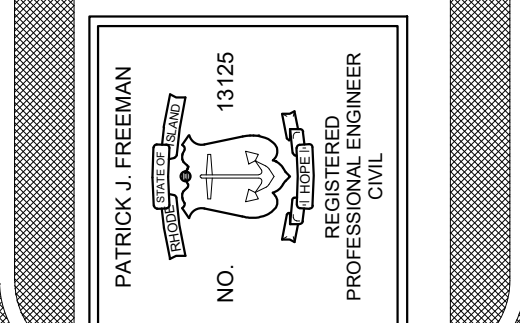
Watershed Maps



WATERSHED MAPS
FOR
KEYSTONE, LLC.
LOCATED AT
A.P. 57-1, LOT 73
82 MAIN STREET
SOUTH KINGSTOWN, R.I.

Drawn By: MJC
Checked By: PJF
Scale: AS SHOWN
Date: 09/09/2025

| NO. | REVISION | BY | DATE |
|-----|----------|----|------|
| | | | |



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