

October 21, 2025

Town of Reading  
 Conservation Commission  
 16 Lowell Street  
 Reading, MA 01867

**Re: Modified House Footprint, 0 Annette Lane, Reading, MA (Map 38, Lot 139)  
 Stormwater Memorandum**

Dear Commissioners:

Civil Design Group, LLC has been retained by Dale and Jessica Harvey to evaluate the previously approved drainage narrative entitled, ‘Drainage Narrative, Definitive Subdivision’, prepared by Somerville Engineering, dated August 11, 2023. Specifically, it was requested that our office review the watersheds contributing to Leaching Field 1 (D-1) and to determine whether any modifications to D-1 are required due to the increase in the proposed house footprint.

The previously approved watersheds contributing to D-1 include the house footprint (1,680 square feet) (Watershed R-1) and yard areas (Watershed P-1B) proximate to the house that are conveyed to D-1 via the stone trench. The modification will substantially maintain the yard areas and its contributing watershed factors; however, the house footprint is proposed to increase to 3,009± square feet. Our office re-created the D-1 leaching field in HydroCAD and modelled the same P-1B watershed and the revised R-1 watershed. The results yielded an increase of the 4’x4’ concrete structures from 6 units to 12 units in order to maintain the same peak flow rates. Below is a comparison between the previously approved and the proposed non-discarded rates for the D-1 node.

**TABLE 1: NON-DISCARDED PEAK FLOW RATE COMPARISON**

| POINT OF ANALYSIS | 2-YEAR STORM EVENT (3.22"/24-HR) |             | 10-YEAR STORM EVENT (4.89"/24-HR) |             | 25-YEAR STORM EVENT (6.22"/24-HR) |             | 100-YEAR STORM EVENT (8.94"/24-HR) |             |
|-------------------|----------------------------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|------------------------------------|-------------|
|                   | PRE-APP (CFS)                    | PROP (CFS)  | PRE-APP (CFS)                     | PROP (CFS)  | PRE-APP (CFS)                     | PROP (CFS)  | PRE-APP (CFS)                      | PROP (CFS)  |
| <b>D-1</b>        | <i>0.00</i>                      | <b>0.00</b> | <i>0.00</i>                       | <b>0.00</b> | <i>0.00</i>                       | <b>0.00</b> | <i>0.00</i>                        | <b>0.00</b> |

Enclosed, please find the HydroCad outputs from the previously approved and the proposed D-1 leaching field node.

Sincerely,

**CIVIL DESIGN GROUP, LLC**



Philip R. Henry, P.E.  
 Principal

cc. Mr. Dale Harvey

# PREVIOUSLY APPROVED

## 220304-01 - Proposed HCAD

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0 Annette Lane  
 Multi-Event Tables  
 Printed 8/7/2023  
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### Events for Pond D-1: Leaching Field

| Event  | Inflow<br>(cfs) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) | Volume<br>(cubic-feet) | Elevation<br>(feet) | Storage<br>(cubic-feet) |
|--------|-----------------|------------------|--------------------|------------------|------------------------|---------------------|-------------------------|
| 2-YR   | 0.14            | 0.01             | 0.01               | 0.00             | 0                      | 92.50               | 194                     |
| 10-YR  | 0.21            | 0.02             | 0.02               | 0.00             | 0                      | 95.61               | 319                     |
| 25-YR  | 0.27            | 0.02             | 0.02               | 0.00             | 0                      | 97.67               | 527                     |
| 100-YR | <b>0.59</b>     | <b>0.03</b>      | <b>0.03</b>        | 0.00             | 0                      | <b>99.34</b>        | <b>1,018</b>            |

## 220304-01 - Proposed HCAD

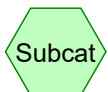
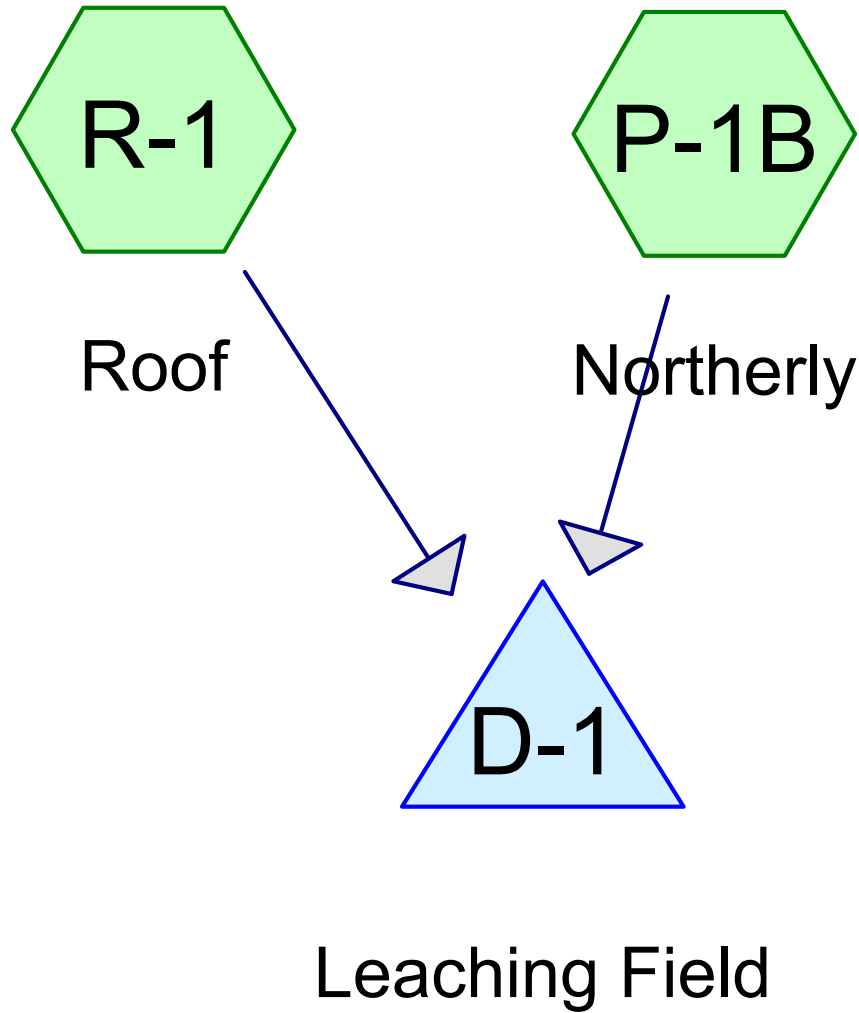
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0 Annette Lane  
 Multi-Event Tables  
 Printed 8/7/2023  
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### Events for Pond D-2: Leaching Field

| Event  | Inflow<br>(cfs) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) | Volume<br>(cubic-feet) | Elevation<br>(feet) | Storage<br>(cubic-feet) |
|--------|-----------------|------------------|--------------------|------------------|------------------------|---------------------|-------------------------|
| 2-YR   | 0.17            | <b>0.02</b>      | <b>0.02</b>        | <b>0.00</b>      | 0                      | 96.45               | 203                     |
| 10-YR  | 0.26            | 0.02             | 0.02               | 0.00             | 0                      | 96.97               | 367                     |
| 25-YR  | 0.33            | 0.02             | 0.02               | 0.00             | 0                      | 97.46               | 520                     |
| 100-YR | <b>0.47</b>     | 0.02             | 0.02               | 0.00             | 0                      | <b>100.87</b>       | <b>882</b>              |

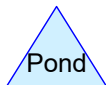
# PROPOSED



Subcat



Reach



Pond



Link

## Routing Diagram for 0 Annette Lane

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## 0 Annette Lane

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### Area Listing (all nodes)

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 0.129           | 39        | >75% Grass cover, Good, HSG A (P-1B)  |
| 0.069           | 98        | Unconnected roofs, HSG A (R-1)        |
| 0.042           | 30        | Woods, Good, HSG A (P-1B)             |
| <b>0.240</b>    | <b>54</b> | <b>TOTAL AREA</b>                     |

**0 Annette Lane**

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**Soil Listing (all nodes)**

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 0.240           | HSG A         | P-1B, R-1               |
| 0.000           | HSG B         |                         |
| 0.000           | HSG C         |                         |
| 0.000           | HSG D         |                         |
| 0.000           | Other         |                         |
| <b>0.240</b>    |               | <b>TOTAL AREA</b>       |

# 0 Annette Lane

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## Ground Covers (all nodes)

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover        | Subcatchment<br>Numbers |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|-------------------------|
| 0.129            | 0.000            | 0.000            | 0.000            | 0.000            | 0.129            | >75% Grass cover, Good | P-1B                    |
| 0.069            | 0.000            | 0.000            | 0.000            | 0.000            | 0.069            | Unconnected roofs      | R-1                     |
| 0.042            | 0.000            | 0.000            | 0.000            | 0.000            | 0.042            | Woods, Good            | P-1B                    |
| <b>0.240</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>0.240</b>     | <b>TOTAL AREA</b>      |                         |

**0 Annette Lane**

Type III 24-hr 2-YR Rainfall=3.22"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P-1B: Northerly**

Runoff Area=7,457 sf 0.00% Impervious Runoff Depth=0.00"  
Tc=6.0 min CN=37 Runoff=0.00 cfs 0.000 af

**Subcatchment R-1: Roof**

Runoff Area=3,009 sf 100.00% Impervious Runoff Depth=2.99"  
Tc=6.0 min CN=98 Runoff=0.21 cfs 0.017 af

**Pond D-1: Leaching Field**

Peak Elev=95.14' Storage=379 cf Inflow=0.21 cfs 0.017 af  
Discarded=0.02 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.017 af

**Total Runoff Area = 0.240 ac Runoff Volume = 0.017 af Average Runoff Depth = 0.86"**  
**71.25% Pervious = 0.171 ac 28.75% Impervious = 0.069 ac**

**Summary for Subcatchment P-1B: Northerly**

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

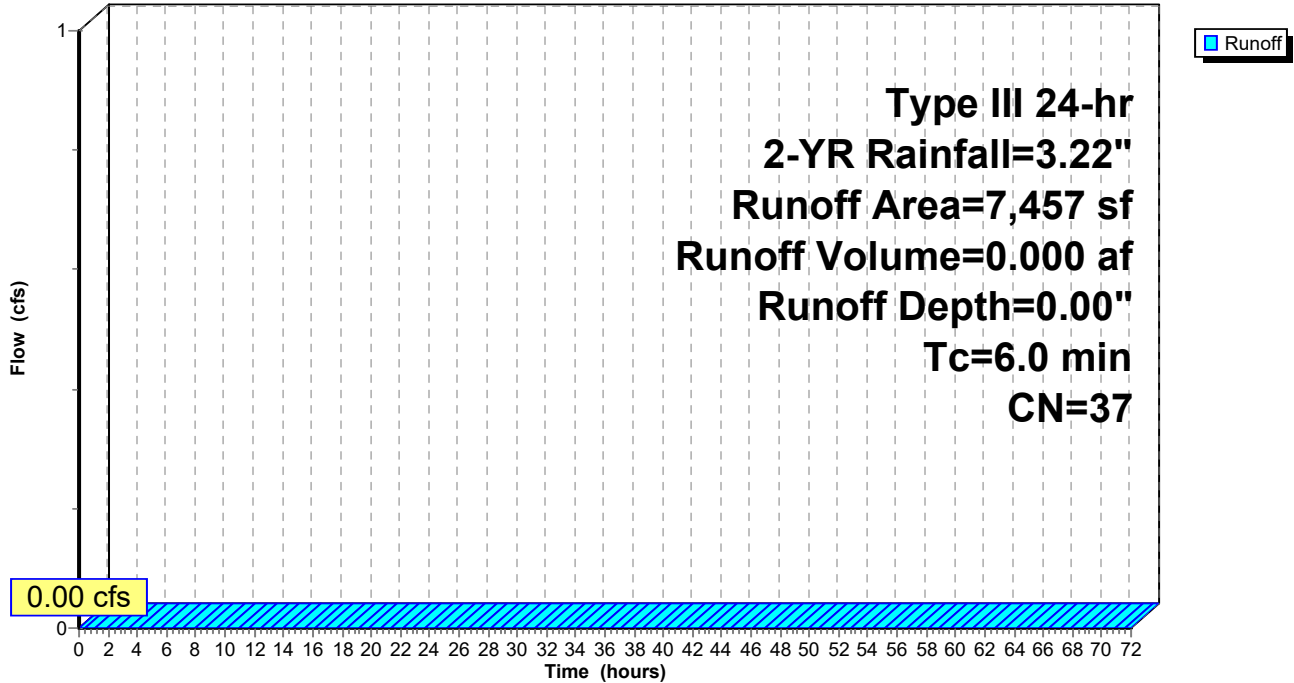
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2-YR Rainfall=3.22"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,842     | 30 | Woods, Good, HSG A            |
| 5,615     | 39 | >75% Grass cover, Good, HSG A |
| 7,457     | 37 | Weighted Average              |
| 7,457     |    | 100.00% Pervious Area         |

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

**Subcatchment P-1B: Northerly**

Hydrograph



### Summary for Subcatchment R-1: Roof

Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 2.99"

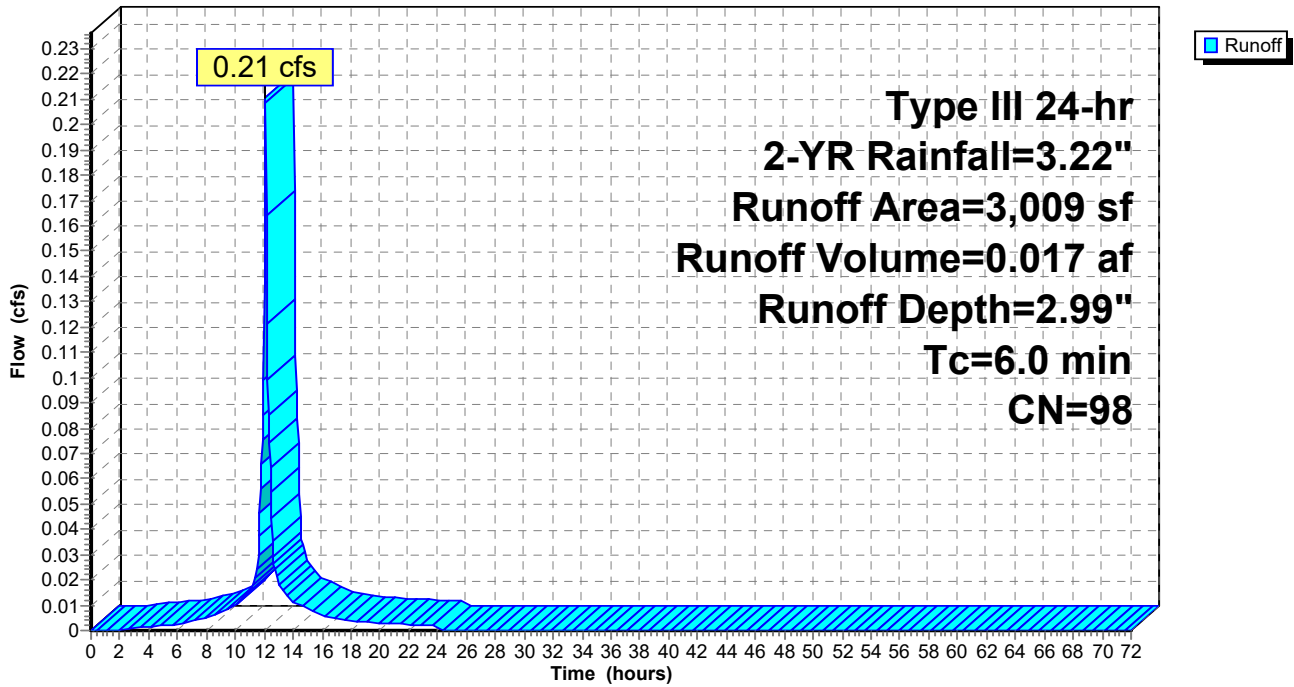
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-YR Rainfall=3.22"

| Area (sf) | CN | Description              |
|-----------|----|--------------------------|
| 3,009     | 98 | Unconnected roofs, HSG A |
| 3,009     |    | 100.00% Impervious Area  |
| 3,009     |    | 100.00% Unconnected      |

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

### Subcatchment R-1: Roof

Hydrograph



**Summary for Pond D-1: Leaching Field**

[42] Hint: Gap in defined storage above volume #4 at 92.50'

[92] Warning: Device #3 is above defined storage

Inflow Area = 0.240 ac, 28.75% Impervious, Inflow Depth = 0.86" for 2-YR event  
 Inflow = 0.21 cfs @ 12.09 hrs, Volume= 0.017 af  
 Outflow = 0.02 cfs @ 12.05 hrs, Volume= 0.017 af, Atten= 91%, Lag= 0.0 min  
 Discarded = 0.02 cfs @ 12.05 hrs, Volume= 0.017 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 95.14' @ 12.92 hrs Surf.Area= 841 sf Storage= 379 cf

Plug-Flow detention time= 253.7 min calculated for 0.017 af (100% of inflow)  
 Center-of-Mass det. time= 254.3 min ( 1,010.5 - 756.3 )

| Volume | Invert | Avail.Storage | Storage Description  |
|--------|--------|---------------|--|
| #1     | 94.20' | 349 cf        | <b>31.00'W x 11.00'L x 4.75'H Field A</b><br>1,620 cf Overall - 748 cf Embedded = 872 cf x 40.0% Voids   |
| #2     | 94.70' | 557 cf        | <b>Shea Leaching Chamber 4x4x4 x 12 Inside #1</b><br>Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf<br>Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf |
| #3     | 98.95' | 3 cf          | <b>2.00'D x 1.00'H Frame &amp; Grate</b>   |
| #4     | 91.50' | 218 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below  |
| #5     | 98.00' | 590 cf        | <b>2.00'W x 370.00'L x 2.00'H Stone Trench</b><br>1,480 cf Overall - 4 cf Embedded = 1,476 cf x 40.0% Voids  |
| #6     | 98.50' | 4 cf          | <b>6.0" Round Pipe Storage Inside #5</b><br>L= 20.0'   |
|        |        | 1,720 cf      | Total Available Storage  |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 91.50            | 0                 | 0                      | 0                      |
| 92.00            | 185               | 46                     | 46                     |
| 92.50            | 500               | 171                    | 218                    |

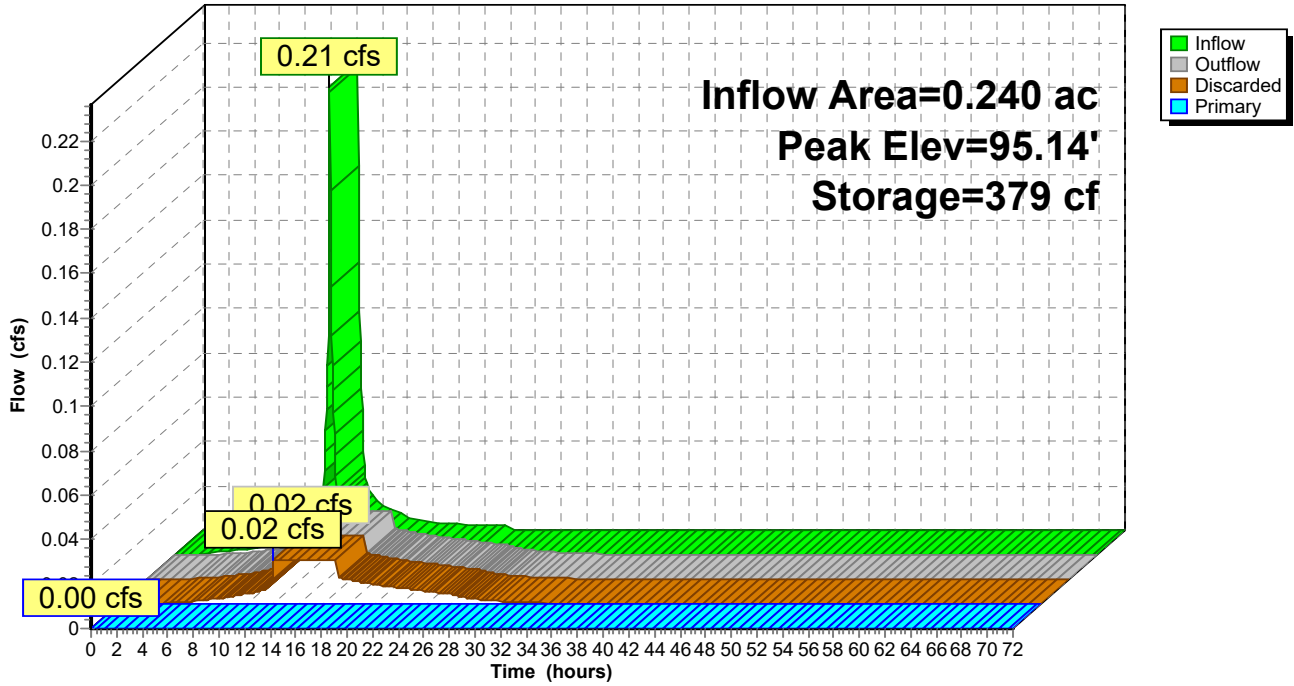
| Device | Routing   | Invert  | Outlet Devices  |
|--------|-----------|---------|---|
| #1     | Discarded | 91.50'  | <b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'   |
| #2     | Primary   | 99.94'  | <b>20.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3     | Primary   | 100.00' | <b>24.0" x 24.0" Horiz. Automatic Storage Overflow</b> C= 0.600<br>Limited to weir flow at low heads  |

**Discarded OutFlow** Max=0.02 cfs @ 12.05 hrs HW=94.24' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=91.50' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)  
 ↑3=Automatic Storage Overflow ( Controls 0.00 cfs)

### Pond D-1: Leaching Field

Hydrograph



**0 Annette Lane**

Type III 24-hr 10-YR Rainfall=4.89"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P-1B: Northerly**

Runoff Area=7,457 sf 0.00% Impervious Runoff Depth=0.12"  
Tc=6.0 min CN=37 Runoff=0.00 cfs 0.002 af

**Subcatchment R-1: Roof**

Runoff Area=3,009 sf 100.00% Impervious Runoff Depth=4.65"  
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.027 af

**Pond D-1: Leaching Field**

Peak Elev=96.38' Storage=647 cf Inflow=0.32 cfs 0.028 af  
Discarded=0.02 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.028 af

**Total Runoff Area = 0.240 ac Runoff Volume = 0.028 af Average Runoff Depth = 1.42"**  
**71.25% Pervious = 0.171 ac 28.75% Impervious = 0.069 ac**

**Summary for Subcatchment P-1B: Northerly**

Runoff = 0.00 cfs @ 14.72 hrs, Volume= 0.002 af, Depth= 0.12"

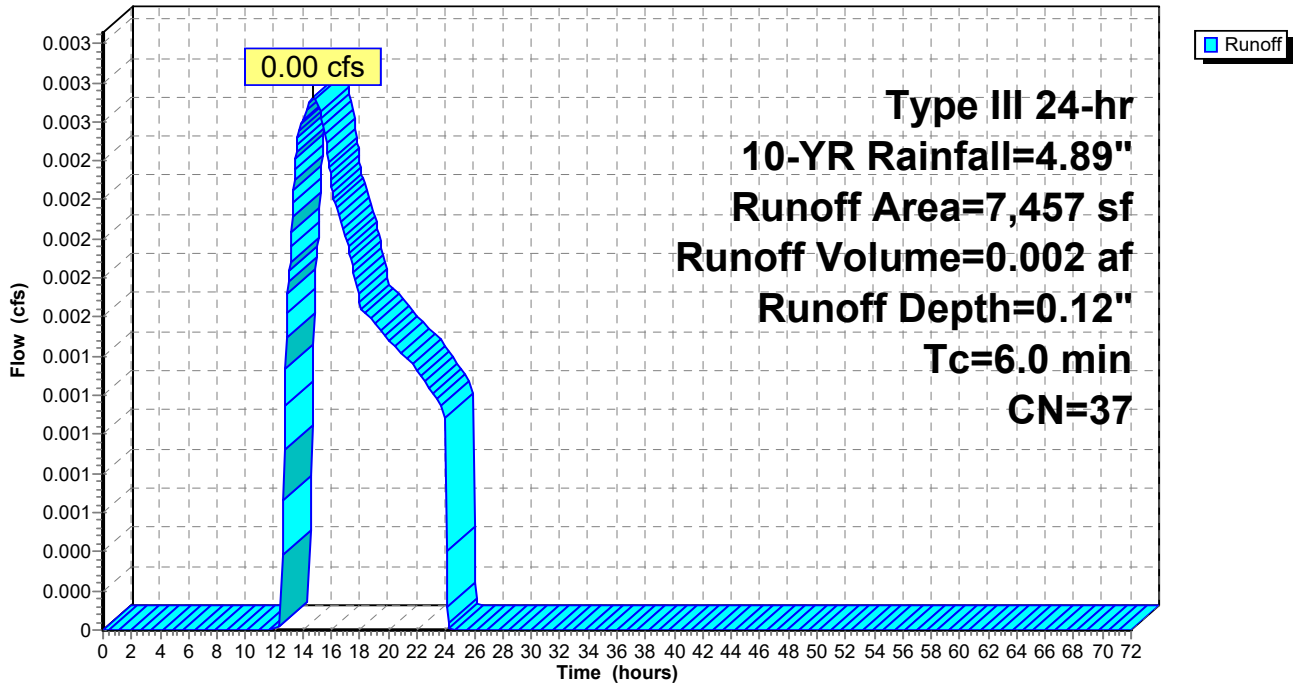
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10-YR Rainfall=4.89"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,842     | 30 | Woods, Good, HSG A            |
| 5,615     | 39 | >75% Grass cover, Good, HSG A |
| 7,457     | 37 | Weighted Average              |
| 7,457     |    | 100.00% Pervious Area         |

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

**Subcatchment P-1B: Northerly**

Hydrograph



**Summary for Subcatchment R-1: Roof**

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 4.65"

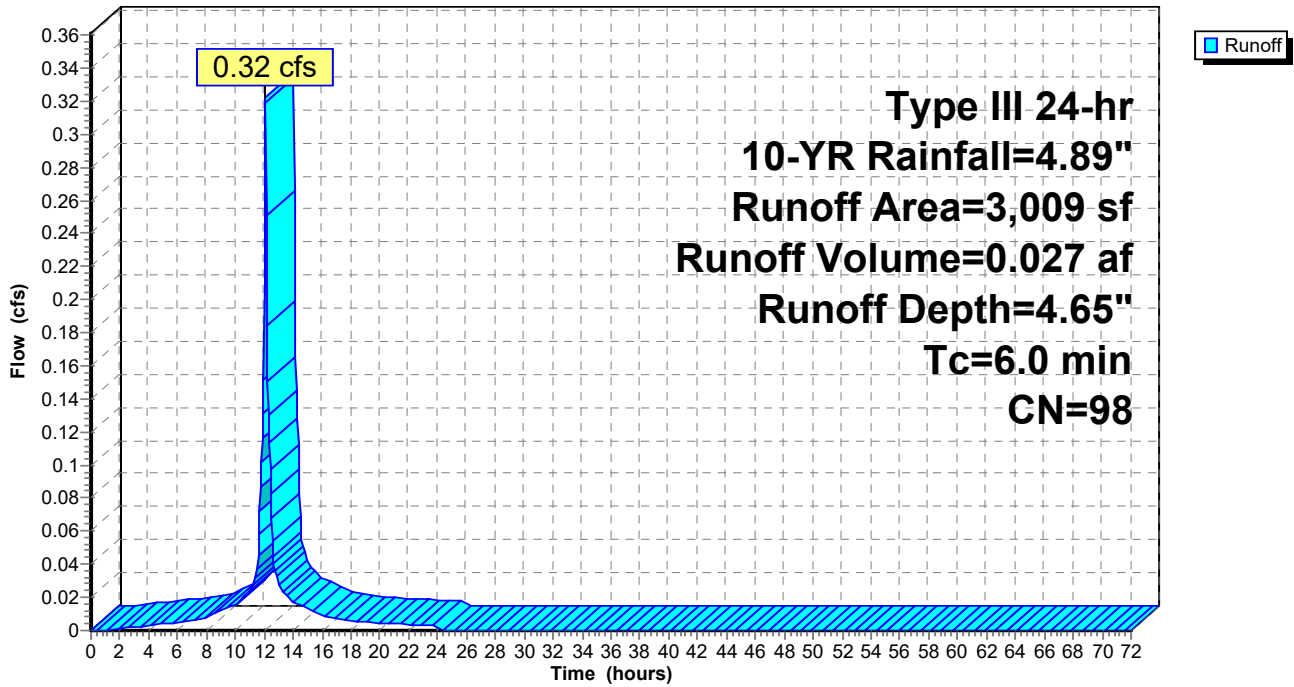
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10-YR Rainfall=4.89"

| Area (sf) | CN | Description              |
|-----------|----|--------------------------|
| 3,009     | 98 | Unconnected roofs, HSG A |
| 3,009     |    | 100.00% Impervious Area  |
| 3,009     |    | 100.00% Unconnected      |

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

**Subcatchment R-1: Roof**

Hydrograph



**Summary for Pond D-1: Leaching Field**

[42] Hint: Gap in defined storage above volume #4 at 92.50'

[92] Warning: Device #3 is above defined storage

Inflow Area = 0.240 ac, 28.75% Impervious, Inflow Depth = 1.42" for 10-YR event  
 Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.028 af  
 Outflow = 0.02 cfs @ 11.80 hrs, Volume= 0.028 af, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.02 cfs @ 11.80 hrs, Volume= 0.028 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 96.38' @ 14.02 hrs Surf.Area= 841 sf Storage= 647 cf

Plug-Flow detention time= 362.2 min calculated for 0.028 af (100% of inflow)  
 Center-of-Mass det. time= 361.7 min ( 1,128.3 - 766.7 )

| Volume | Invert | Avail.Storage | Storage Description  |
|--------|--------|---------------|--|
| #1     | 94.20' | 349 cf        | <b>31.00'W x 11.00'L x 4.75'H Field A</b><br>1,620 cf Overall - 748 cf Embedded = 872 cf x 40.0% Voids   |
| #2     | 94.70' | 557 cf        | <b>Shea Leaching Chamber 4x4x4 x 12 Inside #1</b><br>Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf<br>Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf |
| #3     | 98.95' | 3 cf          | <b>2.00'D x 1.00'H Frame &amp; Grate</b>   |
| #4     | 91.50' | 218 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below  |
| #5     | 98.00' | 590 cf        | <b>2.00'W x 370.00'L x 2.00'H Stone Trench</b><br>1,480 cf Overall - 4 cf Embedded = 1,476 cf x 40.0% Voids  |
| #6     | 98.50' | 4 cf          | <b>6.0" Round Pipe Storage Inside #5</b><br>L= 20.0'   |
|        |        | 1,720 cf      | Total Available Storage  |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 91.50            | 0                 | 0                      | 0                      |
| 92.00            | 185               | 46                     | 46                     |
| 92.50            | 500               | 171                    | 218                    |

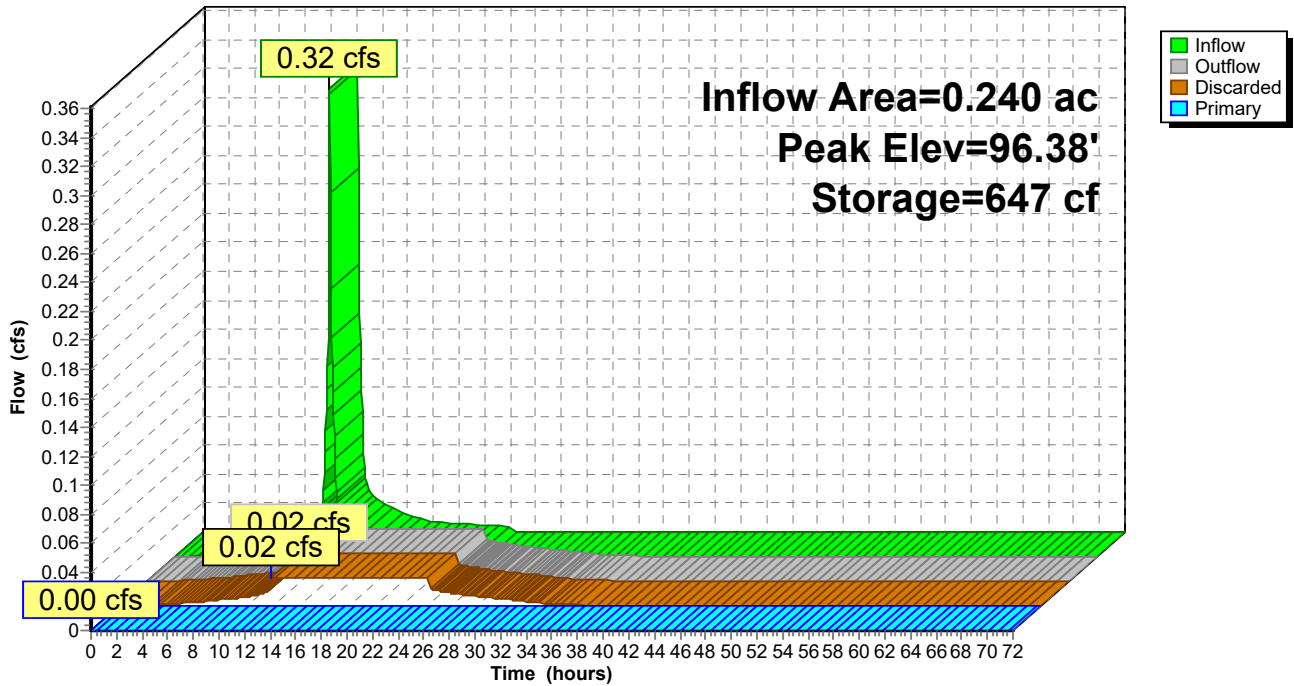
| Device | Routing   | Invert  | Outlet Devices  |
|--------|-----------|---------|---|
| #1     | Discarded | 91.50'  | <b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'   |
| #2     | Primary   | 99.94'  | <b>20.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3     | Primary   | 100.00' | <b>24.0" x 24.0" Horiz. Automatic Storage Overflow</b> C= 0.600<br>Limited to weir flow at low heads  |

**Discarded OutFlow** Max=0.02 cfs @ 11.80 hrs HW=94.28' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=91.50' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)  
 ↑3=Automatic Storage Overflow ( Controls 0.00 cfs)

### Pond D-1: Leaching Field

Hydrograph



**0 Annette Lane**

Type III 24-hr 25-YR Rainfall=6.22"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P-1B: Northerly**

Runoff Area=7,457 sf 0.00% Impervious Runoff Depth=0.40"  
Tc=6.0 min CN=37 Runoff=0.02 cfs 0.006 af

**Subcatchment R-1: Roof**

Runoff Area=3,009 sf 100.00% Impervious Runoff Depth=5.98"  
Tc=6.0 min CN=98 Runoff=0.41 cfs 0.034 af

**Pond D-1: Leaching Field**

Peak Elev=97.93' Storage=977 cf Inflow=0.41 cfs 0.040 af  
Discarded=0.02 cfs 0.040 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.040 af

**Total Runoff Area = 0.240 ac Runoff Volume = 0.040 af Average Runoff Depth = 2.00"**  
**71.25% Pervious = 0.171 ac 28.75% Impervious = 0.069 ac**

**Summary for Subcatchment P-1B: Northerly**

Runoff = 0.02 cfs @ 12.37 hrs, Volume= 0.006 af, Depth= 0.40"

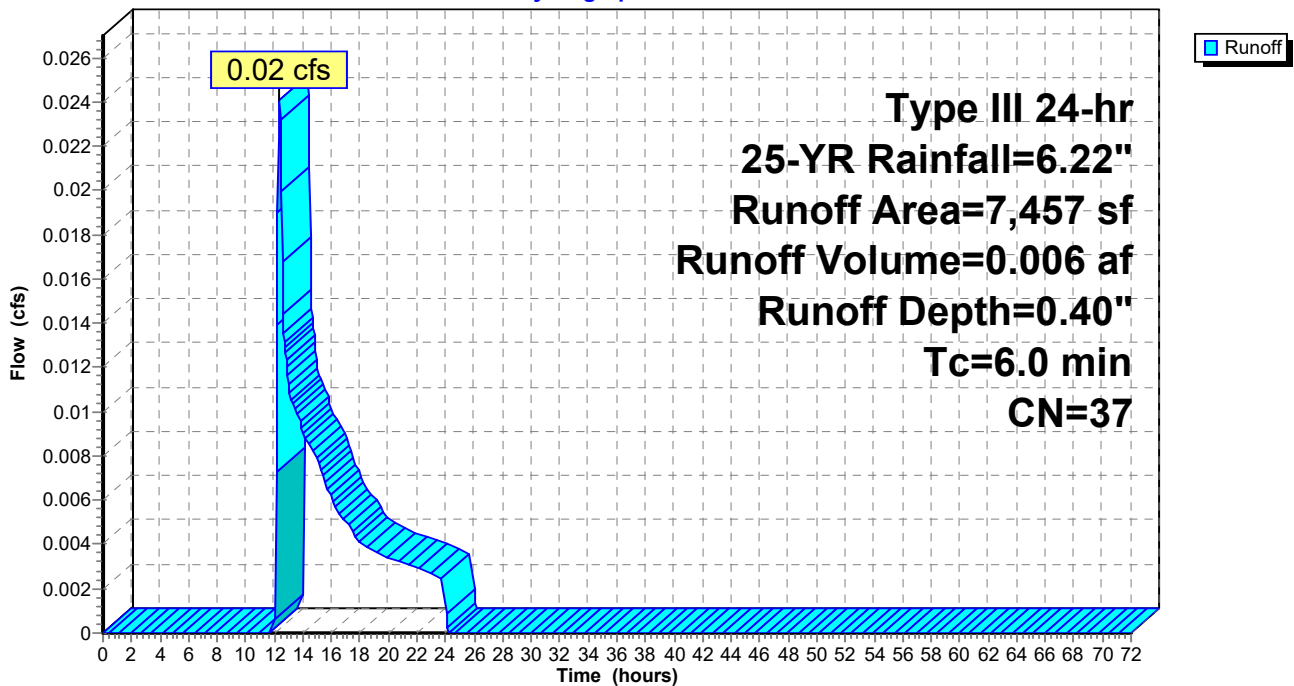
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 25-YR Rainfall=6.22"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
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| 5,615     | 39 | >75% Grass cover, Good, HSG A |
| 7,457     | 37 | Weighted Average              |
| 7,457     |    | 100.00% Pervious Area         |

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

**Subcatchment P-1B: Northerly**

Hydrograph



**Summary for Subcatchment R-1: Roof**

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 5.98"

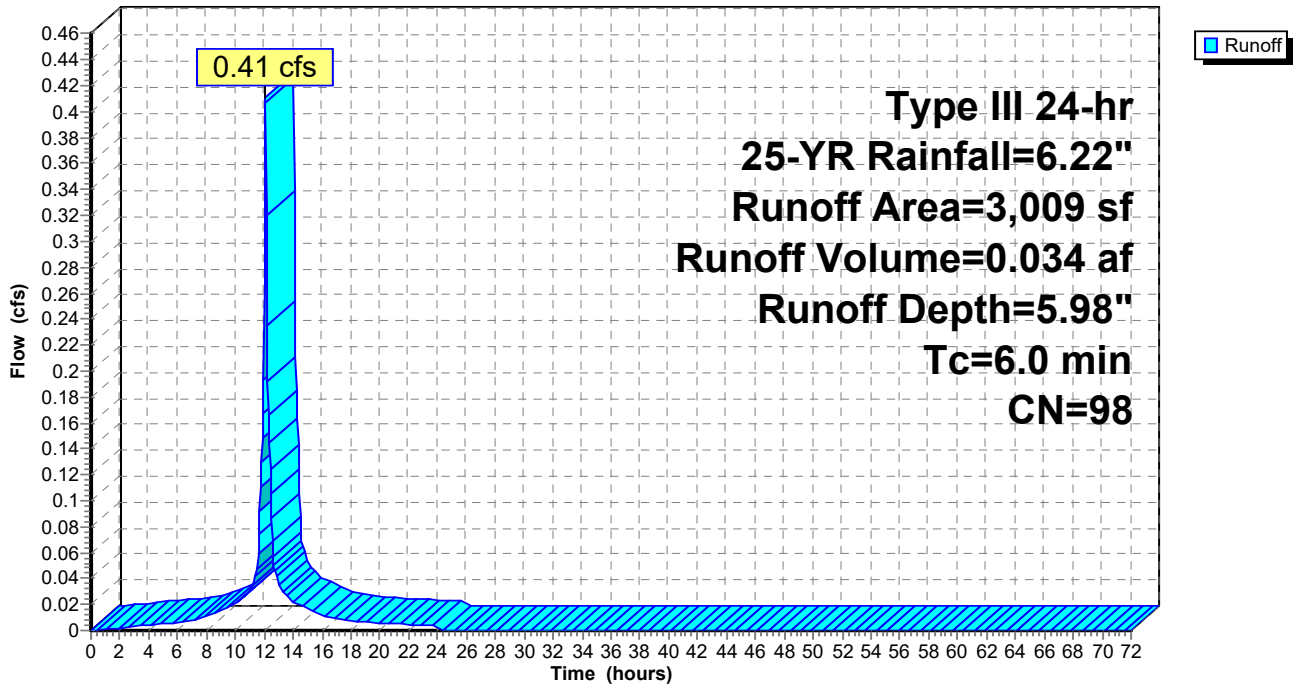
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 25-YR Rainfall=6.22"

| Area (sf) | CN | Description              |
|-----------|----|--------------------------|
| 3,009     | 98 | Unconnected roofs, HSG A |
| 3,009     |    | 100.00% Impervious Area  |
| 3,009     |    | 100.00% Unconnected      |

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

**Subcatchment R-1: Roof**

Hydrograph



**Summary for Pond D-1: Leaching Field**

[42] Hint: Gap in defined storage above volume #4 at 92.50'

[92] Warning: Device #3 is above defined storage

Inflow Area = 0.240 ac, 28.75% Impervious, Inflow Depth = 2.00" for 25-YR event  
 Inflow = 0.41 cfs @ 12.09 hrs, Volume= 0.040 af  
 Outflow = 0.02 cfs @ 11.40 hrs, Volume= 0.040 af, Atten= 95%, Lag= 0.0 min  
 Discarded = 0.02 cfs @ 11.40 hrs, Volume= 0.040 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 97.93' @ 15.70 hrs Surf.Area= 841 sf Storage= 977 cf

Plug-Flow detention time= 518.4 min calculated for 0.040 af (100% of inflow)  
 Center-of-Mass det. time= 519.2 min ( 1,295.9 - 776.7 )

| Volume | Invert | Avail.Storage | Storage Description  |
|--------|--------|---------------|--|
| #1     | 94.20' | 349 cf        | <b>31.00'W x 11.00'L x 4.75'H Field A</b><br>1,620 cf Overall - 748 cf Embedded = 872 cf x 40.0% Voids   |
| #2     | 94.70' | 557 cf        | <b>Shea Leaching Chamber 4x4x4 x 12 Inside #1</b><br>Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf<br>Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf |
| #3     | 98.95' | 3 cf          | <b>2.00'D x 1.00'H Frame &amp; Grate</b>   |
| #4     | 91.50' | 218 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below  |
| #5     | 98.00' | 590 cf        | <b>2.00'W x 370.00'L x 2.00'H Stone Trench</b><br>1,480 cf Overall - 4 cf Embedded = 1,476 cf x 40.0% Voids  |
| #6     | 98.50' | 4 cf          | <b>6.0" Round Pipe Storage Inside #5</b><br>L= 20.0'   |
|        |        | 1,720 cf      | Total Available Storage  |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 91.50            | 0                 | 0                      | 0                      |
| 92.00            | 185               | 46                     | 46                     |
| 92.50            | 500               | 171                    | 218                    |

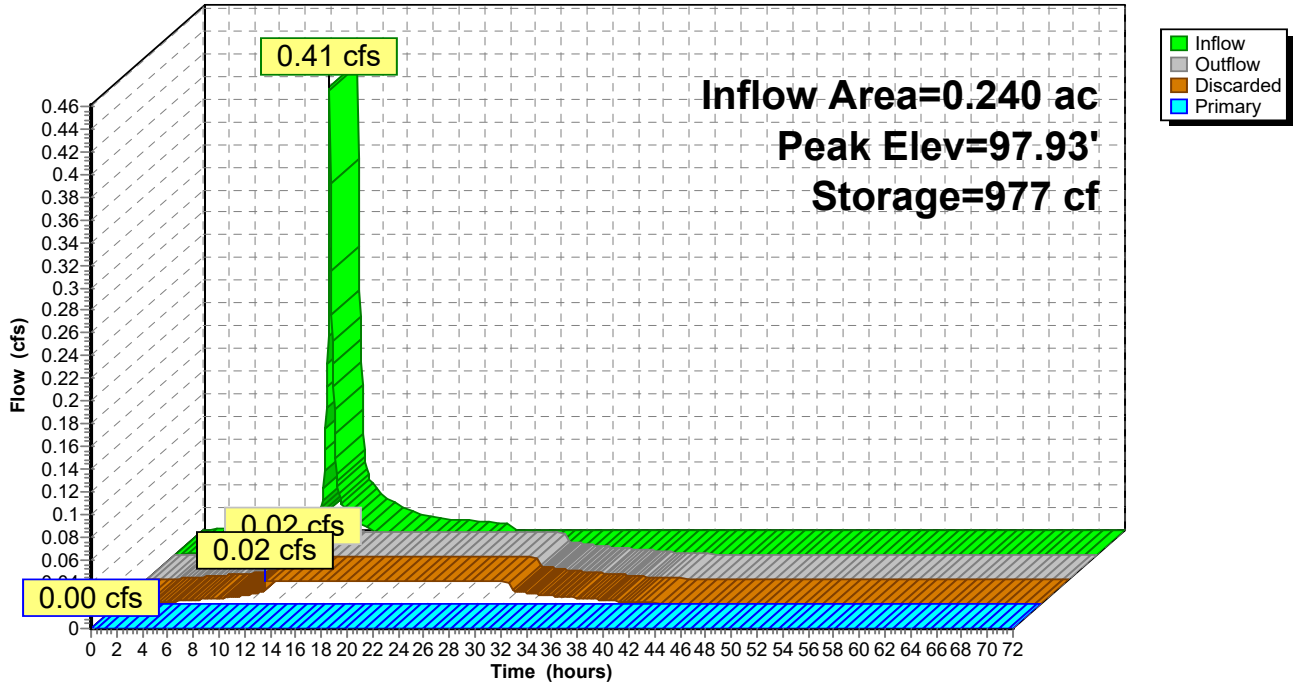
| Device | Routing   | Invert  | Outlet Devices  |
|--------|-----------|---------|---|
| #1     | Discarded | 91.50'  | <b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'   |
| #2     | Primary   | 99.94'  | <b>20.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3     | Primary   | 100.00' | <b>24.0" x 24.0" Horiz. Automatic Storage Overflow</b> C= 0.600<br>Limited to weir flow at low heads  |

**Discarded OutFlow** Max=0.02 cfs @ 11.40 hrs HW=94.22' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=91.50' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)  
 ↑3=Automatic Storage Overflow ( Controls 0.00 cfs)

### Pond D-1: Leaching Field

Hydrograph



**0 Annette Lane**

Type III 24-hr 100-YR Rainfall=8.94"

Prepared by {enter your company name here}

Printed 10/21/2025

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment P-1B: Northerly**

Runoff Area=7,457 sf 0.00% Impervious Runoff Depth=1.36"  
Tc=6.0 min CN=37 Runoff=0.18 cfs 0.019 af

**Subcatchment R-1: Roof**

Runoff Area=3,009 sf 100.00% Impervious Runoff Depth=8.70"  
Tc=6.0 min CN=98 Runoff=0.59 cfs 0.050 af

**Pond D-1: Leaching Field**

Peak Elev=99.89' Storage=1,689 cf Inflow=0.76 cfs 0.069 af  
Discarded=0.04 cfs 0.069 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.069 af

**Total Runoff Area = 0.240 ac Runoff Volume = 0.069 af Average Runoff Depth = 3.47"**  
**71.25% Pervious = 0.171 ac 28.75% Impervious = 0.069 ac**

**Summary for Subcatchment P-1B: Northerly**

Runoff = 0.18 cfs @ 12.12 hrs, Volume= 0.019 af, Depth= 1.36"

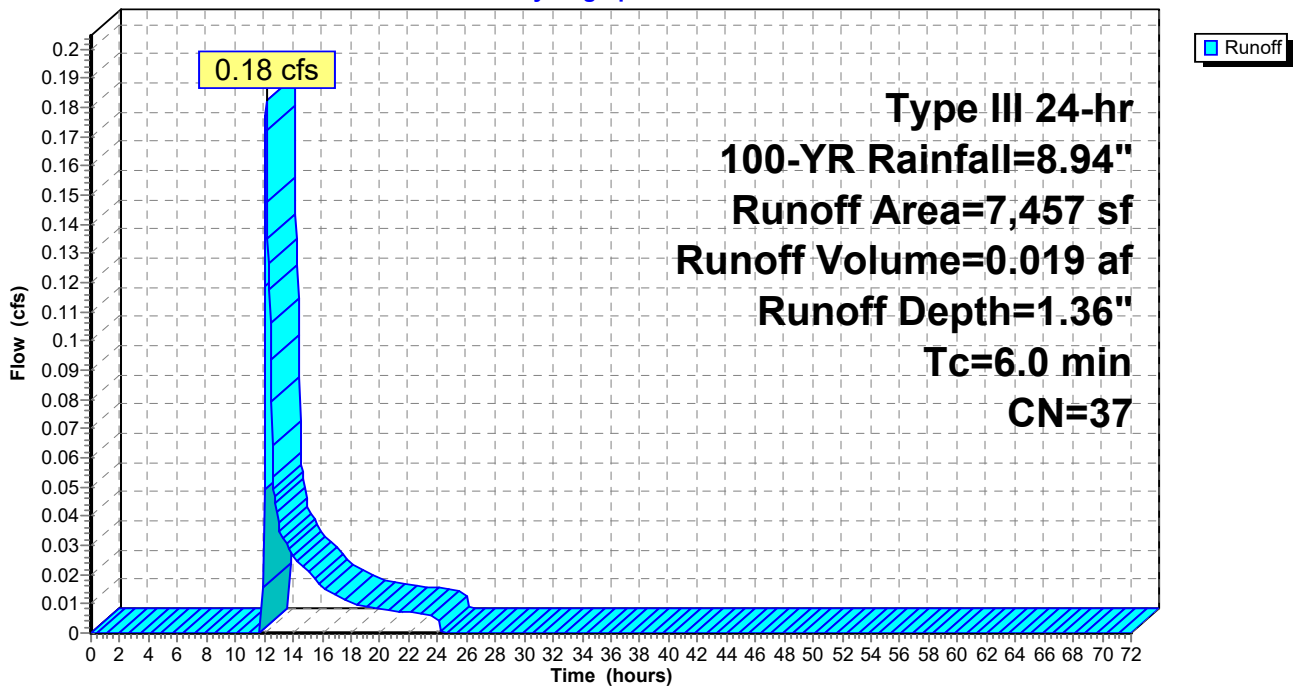
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,842     | 30 | Woods, Good, HSG A            |
| 5,615     | 39 | >75% Grass cover, Good, HSG A |
| 7,457     | 37 | Weighted Average              |
| 7,457     |    | 100.00% Pervious Area         |

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

**Subcatchment P-1B: Northerly**

Hydrograph



**Summary for Subcatchment R-1: Roof**

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 8.70"

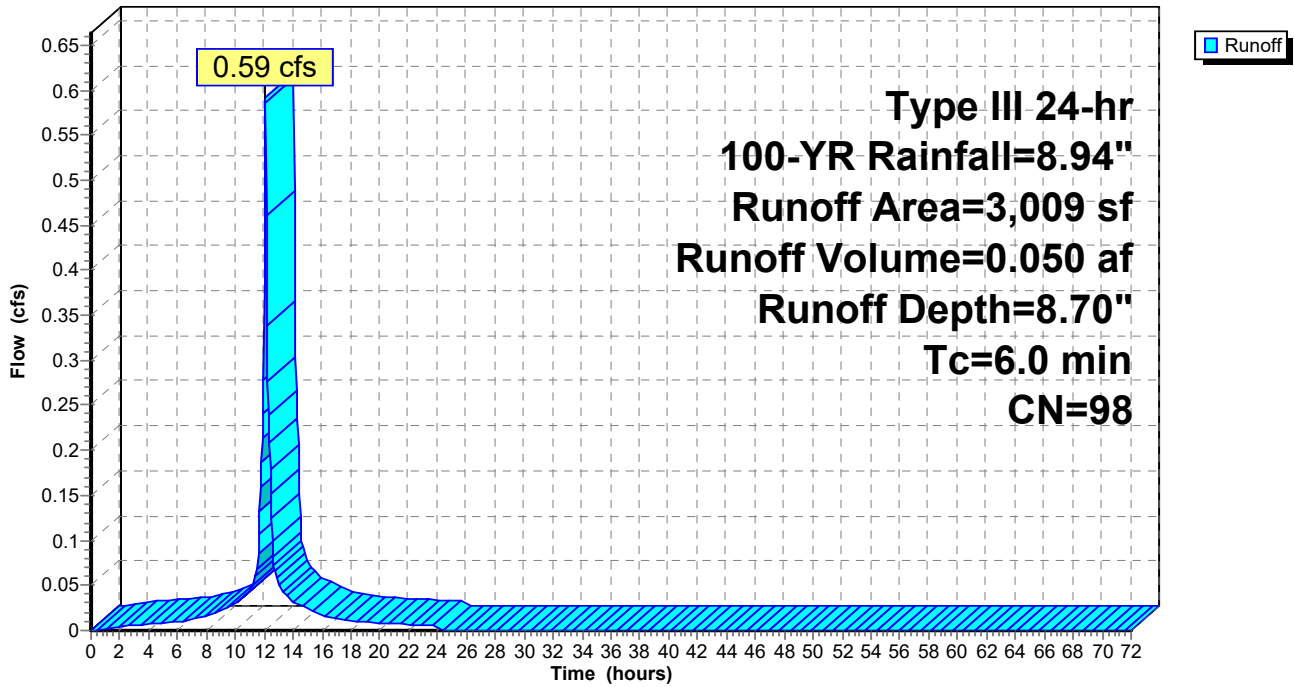
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description              |
|-----------|----|--------------------------|
| 3,009     | 98 | Unconnected roofs, HSG A |
| 3,009     |    | 100.00% Impervious Area  |
| 3,009     |    | 100.00% Unconnected      |

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

**Subcatchment R-1: Roof**

Hydrograph



**Summary for Pond D-1: Leaching Field**

[42] Hint: Gap in defined storage above volume #4 at 92.50'

[92] Warning: Device #3 is above defined storage

Inflow Area = 0.240 ac, 28.75% Impervious, Inflow Depth = 3.47" for 100-YR event  
 Inflow = 0.76 cfs @ 12.10 hrs, Volume= 0.069 af  
 Outflow = 0.04 cfs @ 12.60 hrs, Volume= 0.069 af, Atten= 95%, Lag= 30.2 min  
 Discarded = 0.04 cfs @ 12.60 hrs, Volume= 0.069 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 99.89' @ 15.62 hrs Surf.Area= 1,584 sf Storage= 1,689 cf

Plug-Flow detention time= 544.4 min calculated for 0.069 af (100% of inflow)  
 Center-of-Mass det. time= 545.2 min ( 1,332.2 - 787.0 )

| Volume | Invert | Avail.Storage | Storage Description  |
|--------|--------|---------------|--|
| #1     | 94.20' | 349 cf        | <b>31.00'W x 11.00'L x 4.75'H Field A</b><br>1,620 cf Overall - 748 cf Embedded = 872 cf x 40.0% Voids   |
| #2     | 94.70' | 557 cf        | <b>Shea Leaching Chamber 4x4x4 x 12</b> Inside #1<br>Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf<br>Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf |
| #3     | 98.95' | 3 cf          | <b>2.00'D x 1.00'H Frame &amp; Grate</b>   |
| #4     | 91.50' | 218 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below  |
| #5     | 98.00' | 590 cf        | <b>2.00'W x 370.00'L x 2.00'H Stone Trench</b><br>1,480 cf Overall - 4 cf Embedded = 1,476 cf x 40.0% Voids  |
| #6     | 98.50' | 4 cf          | <b>6.0" Round Pipe Storage</b> Inside #5<br>L= 20.0'   |
|        |        | 1,720 cf      | Total Available Storage  |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 91.50            | 0                 | 0                      | 0                      |
| 92.00            | 185               | 46                     | 46                     |
| 92.50            | 500               | 171                    | 218                    |

| Device | Routing   | Invert  | Outlet Devices  |
|--------|-----------|---------|---|
| #1     | Discarded | 91.50'  | <b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'   |
| #2     | Primary   | 99.94'  | <b>20.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #3     | Primary   | 100.00' | <b>24.0" x 24.0" Horiz. Automatic Storage Overflow</b> C= 0.600<br>Limited to weir flow at low heads  |

**Discarded OutFlow** Max=0.04 cfs @ 12.60 hrs HW=98.97' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=91.50' (Free Discharge)

↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

↑3=Automatic Storage Overflow ( Controls 0.00 cfs)

### Pond D-1: Leaching Field

Hydrograph

