

PRELIMINARY STORMWATER MANAGEMENT PLAN

S Garfield St 8-Lot Subdivision (SUB322-0001)

Submitted: January 2023

Owner: Scott Holden
Scottholden2007@outlook.com
(503) 502-8006

Engineer: Firwood Design Group
Contact: Kelli Grover
kg@firwooddesign.com
359 E. Historic Columbia River Highway
Troutdale, OR 97060
(503) 668 - 3788

Site Location: 100 S Garfield St
Newberg, OR 97132

Table of Contents

1. Site Information
2. Stormwater Management Strategy
3. Design Methodology
4. Facility Selection & Design Results
5. Conveyance

Appendices

| | |
|------------|-----------------------------|
| APPENDIX A | Basin Plan |
| APPENDIX B | HydroCAD Report |
| APPENDIX C | Infiltration Testing Report |

SITE INFORMATION

The project is located at 100 S Garfield St in Newberg, OR. The property is a split tax lot that totals 1.5 acres. The larger portion of the tax lot is at the north end of the Garfield St ROW and is encumbered by over 20,000 sf of un-developable area that contains wetlands and the City's Stream Corridor Overlay district. The smaller portion of the tax lot is to the south and is 11,400 sf. There is an existing duplex on the lot that will remain. The vicinity map in Figure 1 illustrates the location of the subject site.

The site is generally flat with grades of ~5% that slope down to the northwest to the existing stream. There is no existing stormwater infrastructure on S Garfield St in the vicinity of the project.

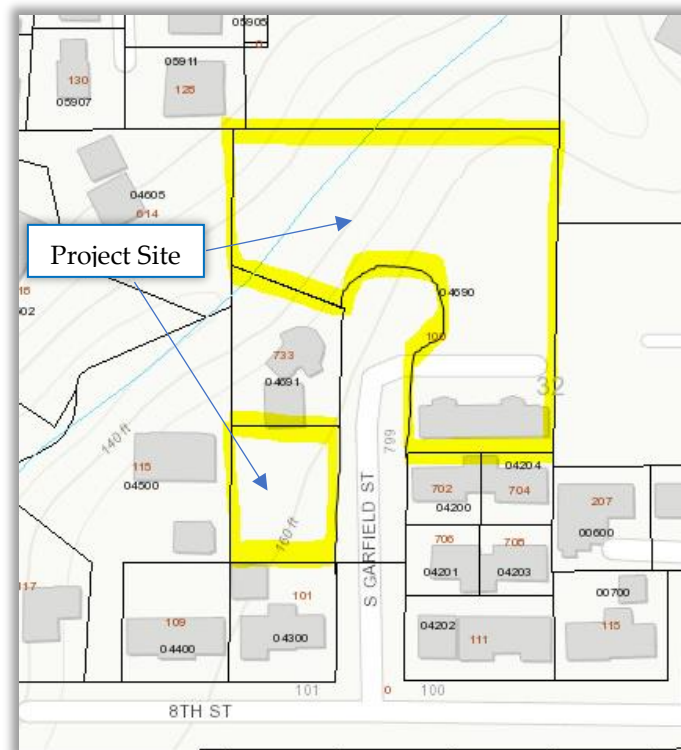


Figure 1 – Vicinity Map

The project proposes to subdivide the property into 8 lots ranging from 3,785 sf to 7,071 sf in size. Lots 1-7 will be for future residential development, and Lot 8 will retain the existing residential structures. Two tracts will be created in the subdivision; Tract A (1,847 sf) will be dedicated for

stormwater management while tract B (23,865 sf) will contain the wetlands and Stream Corridor Overlay area on site and is to be un-developed and remain as an environmental tract. Additionally, the project proposes to extend S Garfield St to the East with full street improvements. Public utilities will be extended into the shared private driveway to service the future residential developments.

Proposed stormwater improvements as a part of this project will treat and detain areas from both newly created public improvements and private roofs and driveways. New impervious areas associated with these areas are shown in Table 1 below. Due to the proposed grading plan and existing site constraints, Lot 7 impervious area will drain to the south, away from the proposed stormwater improvements, to be collected in the existing catch basins at the intersection of 8th St and S Garfield St. Therefore, Lot 7 area is not accounted for in this design.

Table 1 – Proposed Impervious Areas

| | Description | Impervious Area Created |
|------------------------------|--|--------------------------------|
| S Garfield St | 32' wide AC, 5' wide sidewalk (both sides), 12' wide driveway approaches | 14,860 sf |
| Lots 1-7 (Lot 8 Existing) | Impervious area assumption of 50% of lot coverage | 13,198 sf |
| TOTAL | | 28,058 sf |

A geotechnical study and infiltration test was done for the site on August 31st, 2022 by Rapid Soil Solutions (See Appendix B). Infiltration testing was performed at three locations and found the field infiltration rates to be 0.5, 1.0, & 2.0 in/hr. The study did not encounter groundwater at the infiltration test pit locations. The tested area #2 that produced a infiltration rate of 2.0 in/hr will be the locations for the proposed vegetated infiltration facilities. The 36" underground detention facility will be located in Tract A. Infiltration is not proposed in this area. As mentioned previously, the site contains wetlands and the City's Stream Corridor Overlay boundary. The proposed stormwater management facilities will be located outside of both restricted areas. However, the outfall for the detention facility will be located within the Stream Corridor Overlay and will be mitigated for and re-planted in accordance with City standards.

STORMWATER MANAGEMENT STRATEGY

Publicly owned

This project will utilize a combination of infiltration and detention to treat and detain all net new impervious area created, in accordance with the design flow chart in section 4.6 of the City's Stormwater Design Manual. All stormwater from impervious areas within the right-of-way (i.e. roads, sidewalks, and driveways) will be directed to three publicly owned vegetated roadside planters or rain garden #1 for treatment. Overflow from the three public roadside planters will also be directed to the public 18" detention facility and associated flow-control manhole within the right-of-way. The only exception to this is the small area (Basin 7) draining to the proposed catch basin at the curb return due to grading issues. However, this small area will receive residual treatment via natural vegetated filtration as it passes through existing vegetation after the outfall.

Privately owned

Lots 1-4 will have private stormwater laterals from the proposed private stormwater main for connection of roof drains of the residential developments. This stormwater main will convey stormwater to a private underground 36" detention facility for detention of stormwater for the applicable design storms. A concrete channel will collect runoff from the proposed shared driveway for Lots 1-4 and direct it to rain garden #2. The overflow from rain garden #2 will be directed to the private 36" detention facility.

Peak flows from the post-developed site will match peak flows from the existing site for the design storms for both public and private systems.

DSEIGN METHODOLOGY

The Santa Barbara Urban Hydrograph Method (calculated with HydroCAD with SCS Type 1A rainfall distribution) was used to create the hydrographs and to estimate the peak flows for the design storms. A curve number (CN) value of 98 was assigned to all impervious areas (road, driveway, sidewalk and roofs). A curve number value of 84 was assigned to the existing pervious basin area corresponding to grass cover in fair condition with HSG D soils.

The assumed void space in the growing medium and drain rock of the planters and rain gardens was assumed at 25% and 40%, respectively. The assumed exfiltration from the top of the growing medium through the facility was assumed at 1.0 in/hr, which accounts for a safety factor of 2 applied to the field infiltration rate of 2.0 in/hr.

Drainage conditions for impervious areas, when calculated, are generally less than the acceptable minimum 6-minute time of concentration. Therefore, the 6-minute minimum is applied.

Precipitation depths used for the design correlate to City of Newberg design storms and can be seen in Table 2 below.

Table 2 – Design Storm Volumes

| <i>Recurrence Interval (yr.)</i> | <i>Total Precipitation Depth (In)</i> |
|----------------------------------|---------------------------------------|
| 2 | 2.50 |
| Half - 2 | 1.25 |
| 10 | 3.50 |
| 25 | 4.00 |

FACILITY SELECTION & DESIGN RESULTS

The post-developed site is divided into seven smaller sub-basins for stormwater management and are delineated in Table 3. Please reference the preliminary utility and grading plan submitted in this land use application for more detail.

Table 3 – Sub-Basin Areas. See Basin Plan in Appendix.

| | Area Description | Facility | Impervious Area (sf) | Outflow |
|---------|---|--------------------|-----------------------------|---------------------------|
| Basin 1 | Public road and sidewalk, east | Planter 1, 18.5 LF | 2,178 sf | To 18" Detention Facility |
| Basin 2 | Public road and sidewalk and Lots 5 & 6, west | Planter 2, 18.5 LF | 5,524 sf | To 18" Detention Facility |
| Basin 3 | Public road and sidewalk, southeast | Planter 3, 25.5 LF | 1,774 sf | To 18" Detention Facility |

| | | | | |
|---------|----------------------------------|---------------------------|----------|---------------------------|
| Basin 4 | Lots 1-4 Roof drains | 36" Detention Pipe, 75 LF | 9,394 sf | To 36" Detention Facility |
| Basin 5 | Public road eyebrow and sidewalk | Rain garden #1, 250 SF | 6,214 sf | Outfall at Stream |
| Basin 6 | Shared Driveway | Rain garden #2, 84 SF | 2,584 sf | To 36" Detention Facility |
| Basin 7 | Curb Return | NA | 1,476 sf | To 18" Detention Facility |

Planters 1-3 will be constructed with a 1.5' gravel layer, 1.5' soil medium, and 0.5' ponding depth and will all have an open bottom to allow for exfiltration. Planters 1-3 will have beehive overflow structures set at the design ponding depth. Outflows from Planters 1-3 will be conveyed into the 18" detention pipe.

Rain Gardens 1 & 2 will be constructed with a 1.5' gravel layer, 1.5' soil medium, and 0.5' ponding depth and will all have an open bottom to allow for exfiltration. Rain Gardens 1 will have a beehive overflow structure set at the design ponding depth to direct overflow to a stream outfall. Rain Gardens 2 will have a beehive overflow structure set at the design ponding depth to direct overflow to the 36" detention pipe.

The 18" diameter underground detention pipe will be constructed with a flow control manhole with a 2.0" flow control orifice at the invert, a 2.0" upper orifice located 2.2' above the invert, and a 12" overflow orifice located 2.8' above the invert.

The 36" diameter underground detention pipe will be constructed with a flow control manhole with a 0.7" flow control orifice at the invert and a 1.8" upper orifice located 1.5' above the invert.

Collectively, all facilities will detain stormwater such that peak flows exiting the site in the post-development condition or less than or equal to peak flows in the existing condition for the 2-, 5-, 10-, and 25-year design storms. Table 4 below shows the results of the design.

Table 4 – Site Peak Flows

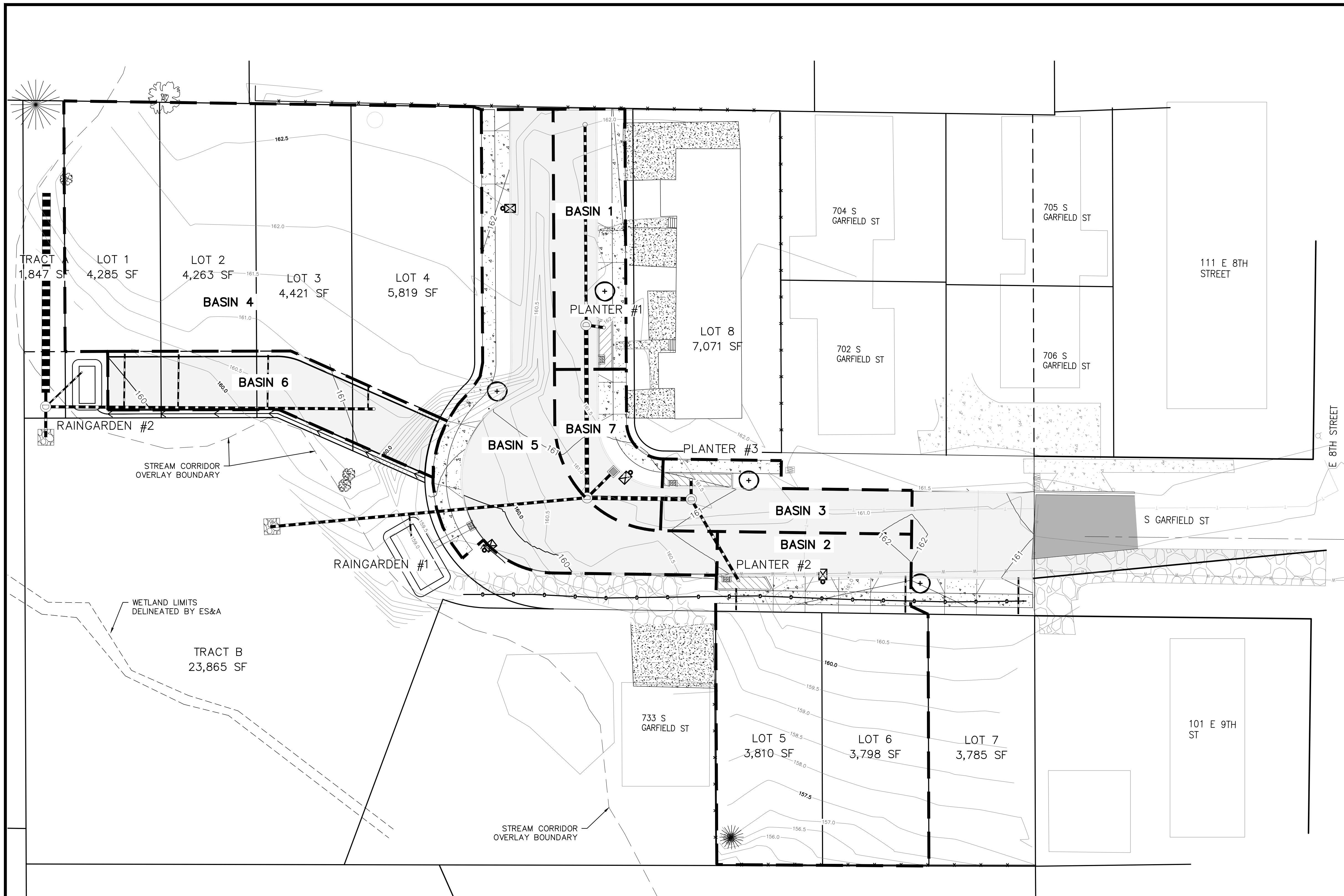
| | Pre-Existing Peak Flows (cfs) | Post-Development Peak Flows (cfs) |
|----------|--|--|
| 2-Year | 0.17 | 0.15 |
| ½ 2-Year | 0.26 | 0.20 |
| 10-Year | 0.31 | 0.30 |
| 25-Year | 0.39 | 0.38 |

To meet water quality and treatment standards, the three planters are designed to retain and infiltrate stormwater from surface impervious areas during the 1-inch water quality storm. The method of treatment is filtration through the vegetation and engineered soil medium.

See Appendix A for the Basin Plan and Appendix B for the HydroCAD report for more detail on the stormwater design.

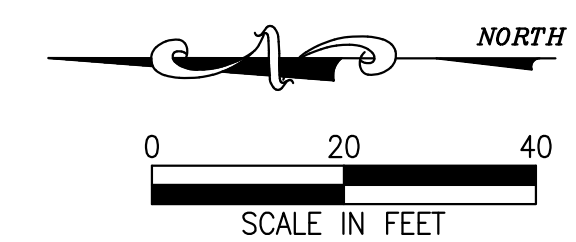
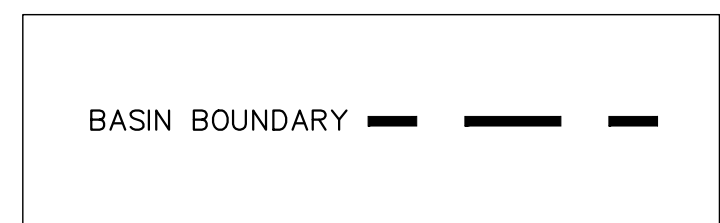
CONVEYANCE

All on-site stormwater mains will be minimum 12" diameter HDPE at a minimum slope of 0.5%. The capacity of this pipe when flowing full is 2.93 cfs, per Manning's equation. As demonstrated above, the peak flows exiting the site during the 25-year design storm is 0.38 cfs. Therefore, all proposed stormwater pipe is of adequate capacity for the proposed design. Additionally, all roadside planters will be constructed with grated overflow inlets to allow for the safe conveyance of stormwater if the facilities were to be inundated, and to prevent negative impacts to public roads and downstream neighboring properties.



BASIN AREAS

| | Area Description | Facility | Impervious Area (sf) | Outflow |
|---------|---|---------------------------|----------------------|---------------------------|
| Basin 1 | Public road and sidewalk, east | Planter 1, 18.5 LF | 2,178 sf | To 18" Detention Facility |
| Basin 2 | Public road and sidewalk and Lots 5 & 6, west | Planter 2, 18.5 LF | 5,524 sf | To 18" Detention Facility |
| Basin 3 | Public road and sidewalk, southeast | Planter 3, 25.5 LF | 1,774 sf | To 18" Detention Facility |
| Basin 4 | Lots 1-4 Roof drains | 36" Detention Pipe, 75 LF | 9,394 sf | To 36" Detention Facility |
| Basin 5 | Public road eyebrow and sidewalk | Rain garden #1, 250 SF | 6,214 sf | Outfall at Stream |
| Basin 6 | Shared Driveway | Rain garden #2, 84 SF | 2,584 sf | To 36" Detention Facility |
| Basin 7 | Curb Return | NA | 1,476 sf | To 18" Detention Facility |



EXPIRES: 06/30/23
SIGNATURE DATE: 01/31/23

| | | | | | |
|-------|-----|----------|---------------------|--------------------|----------|
| DATE: | NO. | REVISION | DRAWN: | DESIGNED: | CHECKED: |
| | | | SCALE: AS SHOWN | DATE: JANUARY 2023 | |
| | | | PROJECT NO. E21-049 | | |

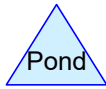
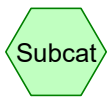
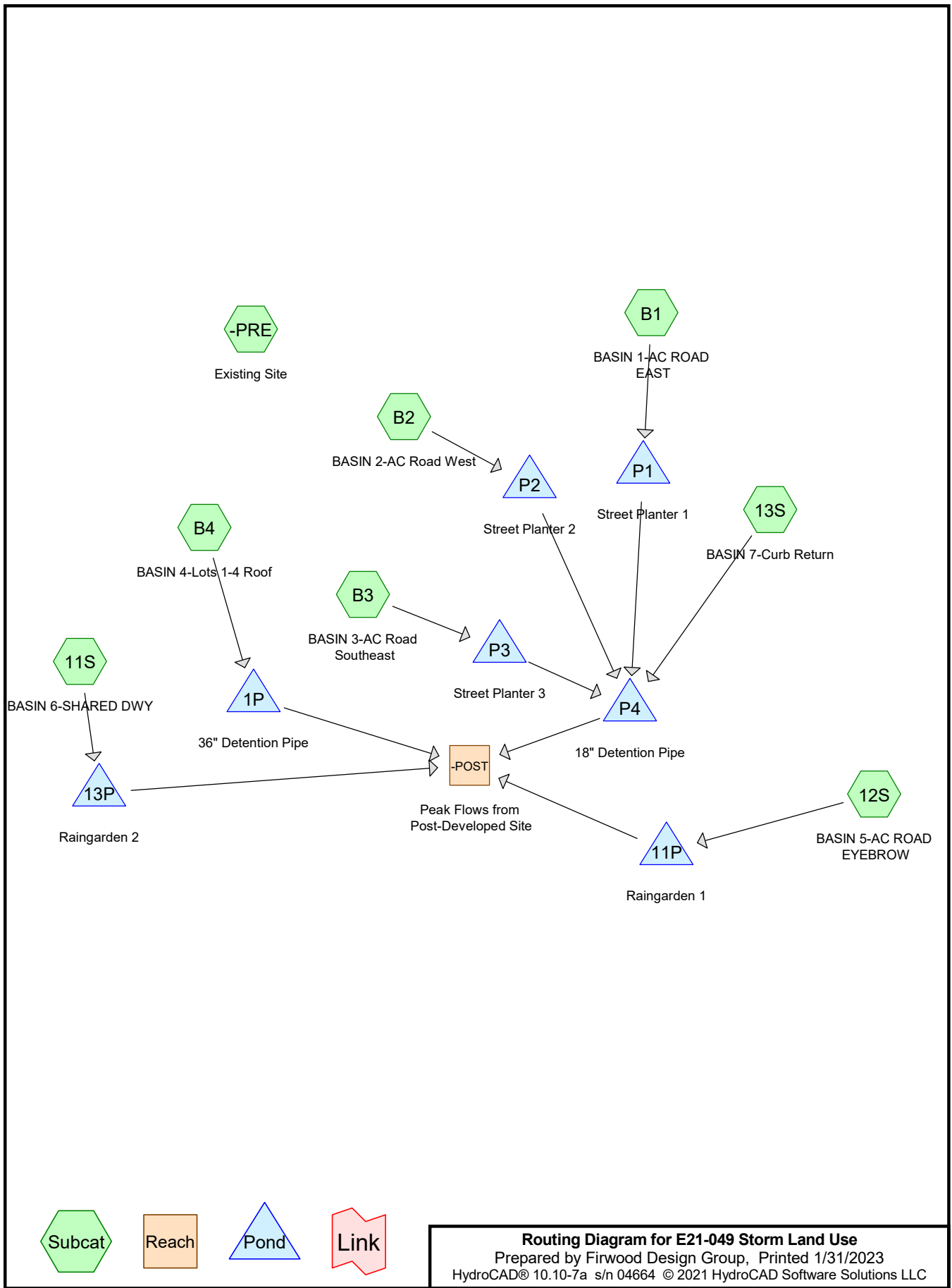


359 EAST HISTORIC COLUMBIA RIVER HIGHWAY
TROUTDALE, OREGON 97060
BUS: (503) 668-3737 ♦ FAX: (503) 668-3788

SCOTT HOLDEN
100 S GARFIELD ST
NEWBERG, OR 97132

BASIN PLAN
8-LOT SUBDIVISION

1
1



Routing Diagram for E21-049 Storm Land Use
 Prepared by Firwood Design Group, Printed 1/31/2023
 HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Printed 1/31/2023

Page 2

Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|---------------|-------|---------|------------------|-----|----------------|-----|
| 1 | 2-YR | Type IA 24-hr | | Default | 24.00 | 1 | 2.50 | 2 |
| 2 | 10-YR | Type IA 24-hr | | Default | 24.00 | 1 | 3.50 | 2 |
| 3 | 25-YR | Type IA 24-hr | | Default | 24.00 | 1 | 4.00 | 2 |
| 4 | Half 2yr | Type IA 24-hr | | Default | 24.00 | 1 | 1.25 | 2 |
| 5 | WQ | Type IA 24-hr | | Default | 24.00 | 1 | 1.00 | 2 |

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Printed 1/31/2023

Page 3

Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|-----------------|-----------|--|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D (-PRE) |
| 6,227 | 98 | AC (12S, B1) |
| 2,584 | 98 | Paved parking, HSG D (11S) |
| 3,650 | 98 | Paved roads w/curbs & sewers, HSG D (12S, 13S) |
| 7,298 | 98 | Public Impervious (B2, B3) |
| 9,394 | 98 | Roof Area (B4) |
| 58,306 | 91 | TOTAL AREA |

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Printed 1/31/2023

Page 4

Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|-----------------|---------------|-------------------------|
| 0 | HSG A | |
| 0 | HSG B | |
| 0 | HSG C | |
| 35,387 | HSG D | -PRE, 11S, 12S, 13S |
| 22,919 | Other | 12S, B1, B2, B3, B4 |
| 58,306 | | TOTAL AREA |

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Printed 1/31/2023

Page 5

Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
| 0 | 0 | 0 | 29,153 | 0 | 29,153 | 50-75% Grass cover, Fair |
| 0 | 0 | 0 | 0 | 6,227 | 6,227 | AC |
| 0 | 0 | 0 | 2,584 | 0 | 2,584 | Paved parking |
| 0 | 0 | 0 | 3,650 | 0 | 3,650 | Paved roads w/curbs & sewers |
| 0 | 0 | 0 | 0 | 7,298 | 7,298 | Public Impervious |
| 0 | 0 | 0 | 0 | 9,394 | 9,394 | Roof Area |
| 0 | 0 | 0 | 35,387 | 22,919 | 58,306 | TOTAL AREA |

E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment -PRE: Existing Site Runoff Area=29,153 sf 0.00% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=84/0 Runoff=0.17 cfs 2,711 cf

Subcatchment 11S: BASIN 6-SHARED DWY Runoff Area=2,584 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 489 cf

Subcatchment 12S: BASIN 5-AC ROAD Runoff Area=6,214 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.08 cfs 1,176 cf

Subcatchment 13S: BASIN 7-Curb Return Runoff Area=1,476 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.02 cfs 279 cf

Subcatchment B1: BASIN 1-AC ROAD Runoff Area=2,187 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 414 cf

Subcatchment B2: BASIN 2-AC Road West Runoff Area=5,524 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.07 cfs 1,045 cf

Subcatchment B3: BASIN 3-AC Road Runoff Area=1,774 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.02 cfs 336 cf

Subcatchment B4: BASIN 4-Lots 1-4 Roof Runoff Area=9,394 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=0/98 Runoff=0.12 cfs 1,778 cf

Reach -POST: Peak Flows from Post-Developed Site Inflow=0.15 cfs 2,580 cf
Outflow=0.15 cfs 2,580 cf

Pond 1P: 36" Detention Pipe Peak Elev=1.94' Storage=363 cf Inflow=0.12 cfs 1,778 cf
Outflow=0.07 cfs 1,778 cf

Pond 11P: Raingarden 1 Peak Elev=3.44' Storage=354 cf Inflow=0.08 cfs 1,176 cf
Discarded=0.02 cfs 1,176 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,176 cf

Pond 13P: Raingarden 2 Peak Elev=3.56' Storage=129 cf Inflow=0.03 cfs 489 cf
Discarded=0.01 cfs 447 cf Primary=0.01 cfs 42 cf Outflow=0.02 cfs 489 cf

Pond P1: Street Planter 1 Peak Elev=3.45' Storage=125 cf Inflow=0.03 cfs 414 cf
Discarded=0.01 cfs 414 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 414 cf

Pond P2: Street Planter 2 Peak Elev=3.55' Storage=131 cf Inflow=0.07 cfs 1,045 cf
Discarded=0.01 cfs 565 cf Primary=0.07 cfs 481 cf Outflow=0.07 cfs 1,045 cf

Pond P3: Street Planter 3 Peak Elev=1.86' Storage=84 cf Inflow=0.02 cfs 336 cf
Discarded=0.01 cfs 336 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 336 cf

Pond P4: 18" Detention Pipe Peak Elev=0.44' Storage=43 cf Inflow=0.09 cfs 760 cf
Outflow=0.07 cfs 760 cf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 7

Total Runoff Area = 58,306 sf Runoff Volume = 8,228 cf Average Runoff Depth = 1.69"
50.00% Pervious = 29,153 sf 50.00% Impervious = 29,153 sf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 8

Summary for Subcatchment -PRE: Existing Site

Runoff = 0.17 cfs @ 8.00 hrs, Volume= 2,711 cf, Depth= 1.12"

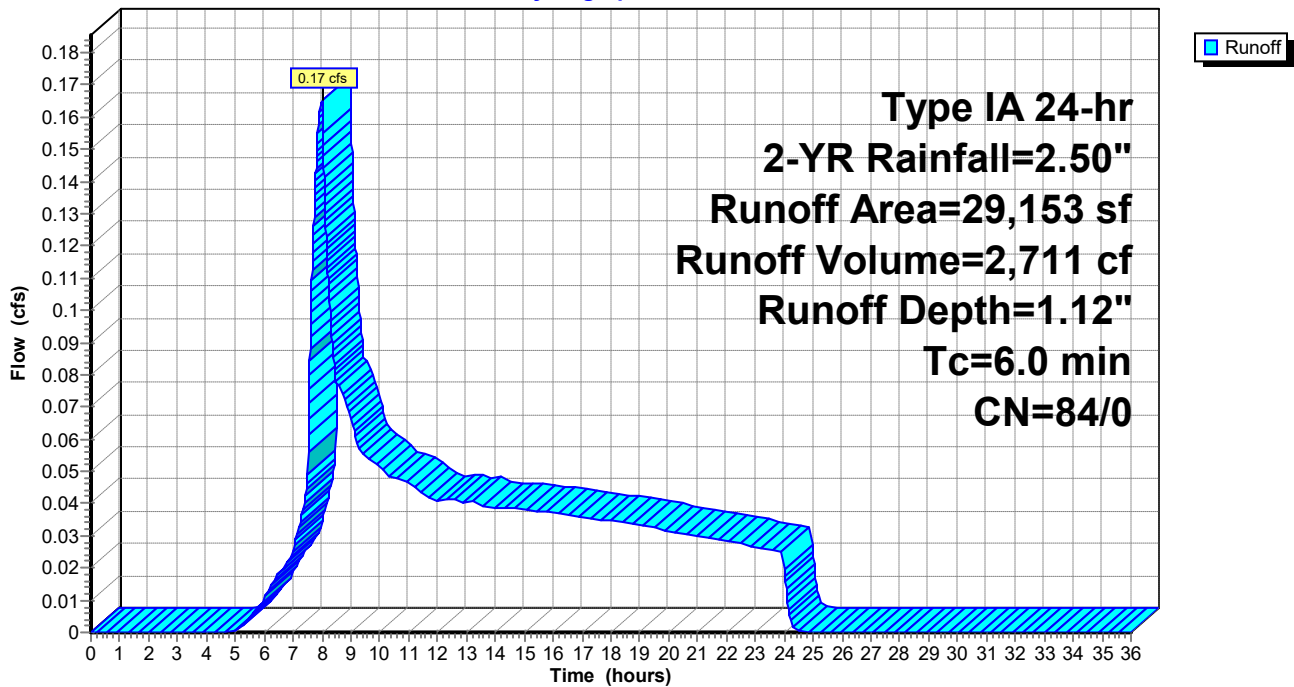
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|---------------------------------|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D |
| 29,153 | 84 | 100.00% Pervious Area |

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

Subcatchment -PRE: Existing Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 9

Summary for Subcatchment 11S: BASIN 6-SHARED DWY

Runoff = 0.03 cfs @ 7.90 hrs, Volume= 489 cf, Depth= 2.27"

Routed to Pond 13P : Raingarden 2

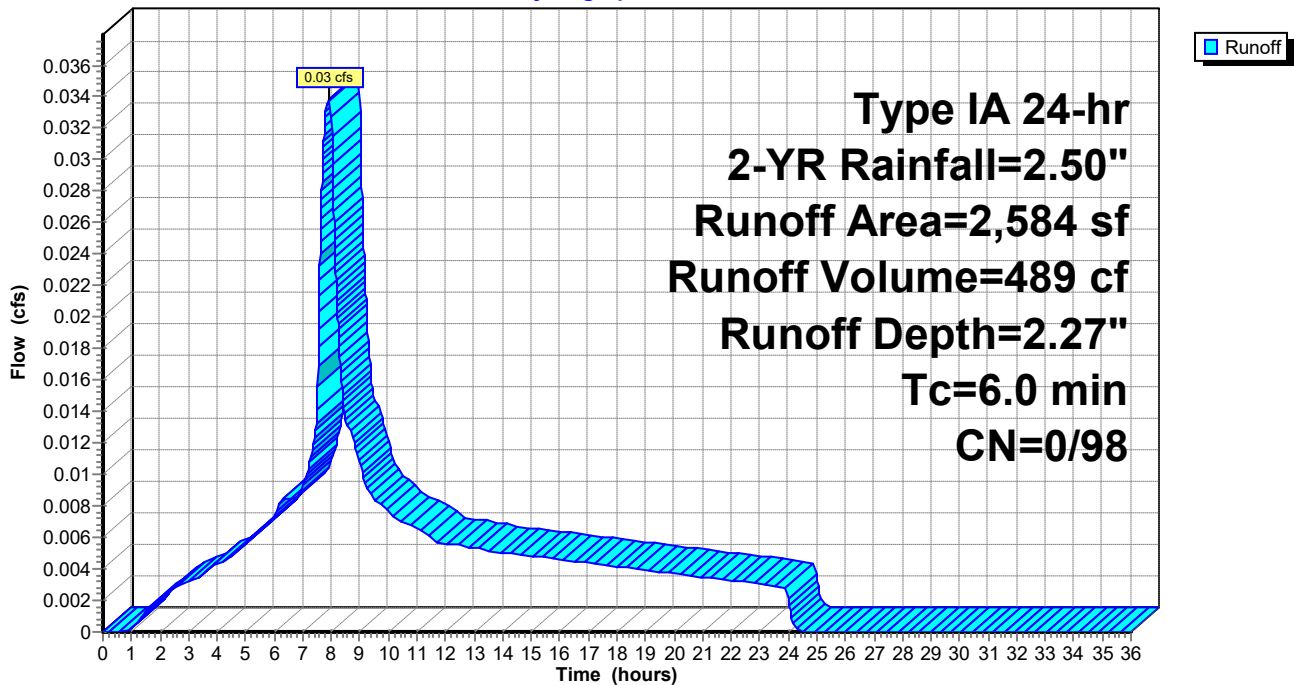
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 2,584 | 98 | Paved parking, HSG D |
| 2,584 | 98 | 100.00% Impervious Area |

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

Subcatchment 11S: BASIN 6-SHARED DWY

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 10

Summary for Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Runoff = 0.08 cfs @ 7.90 hrs, Volume= 1,176 cf, Depth= 2.27"

Routed to Pond 11P : Raingarden 1

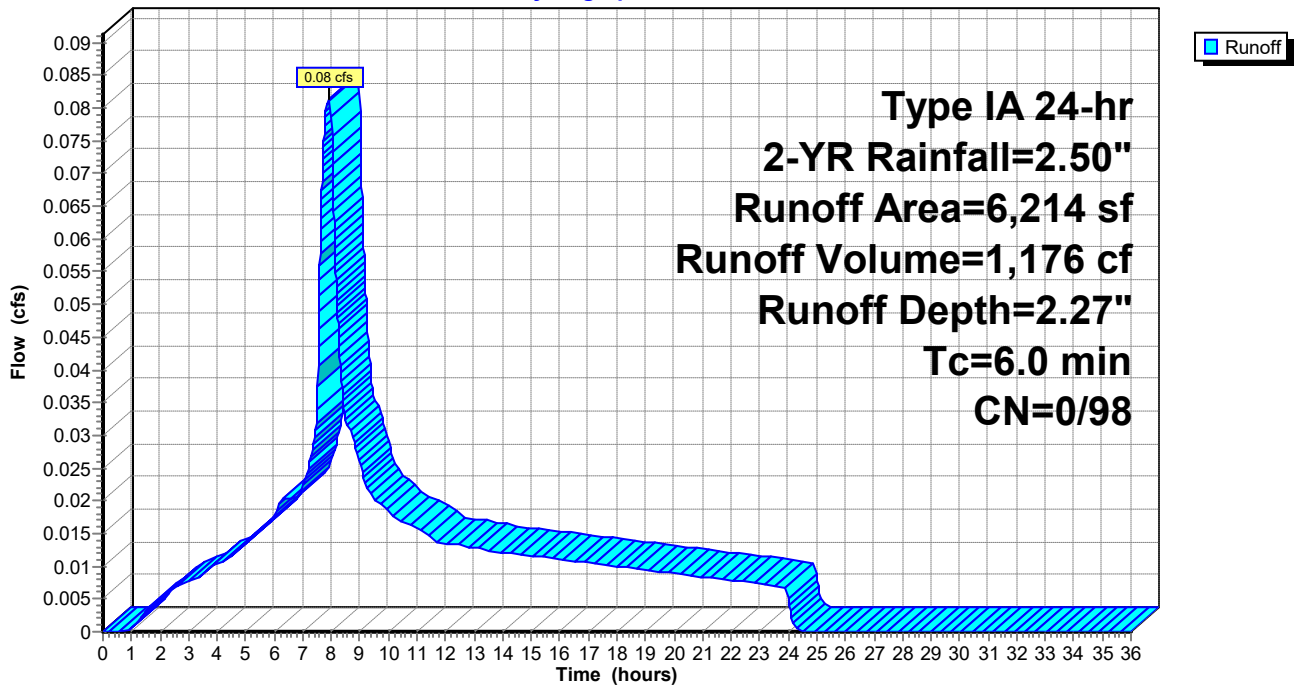
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------------------|
| * | 4,040 | 98 | AC |
| | 2,174 | 98 | Paved roads w/curbs & sewers, HSG D |
| | 6,214 | 98 | Weighted Average |
| | 6,214 | 98 | 100.00% Impervious Area |

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

Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 11

Summary for Subcatchment 13S: BASIN 7-Curb Return

Runoff = 0.02 cfs @ 7.90 hrs, Volume= 279 cf, Depth= 2.27"

Routed to Pond P4 : 18" Detention Pipe

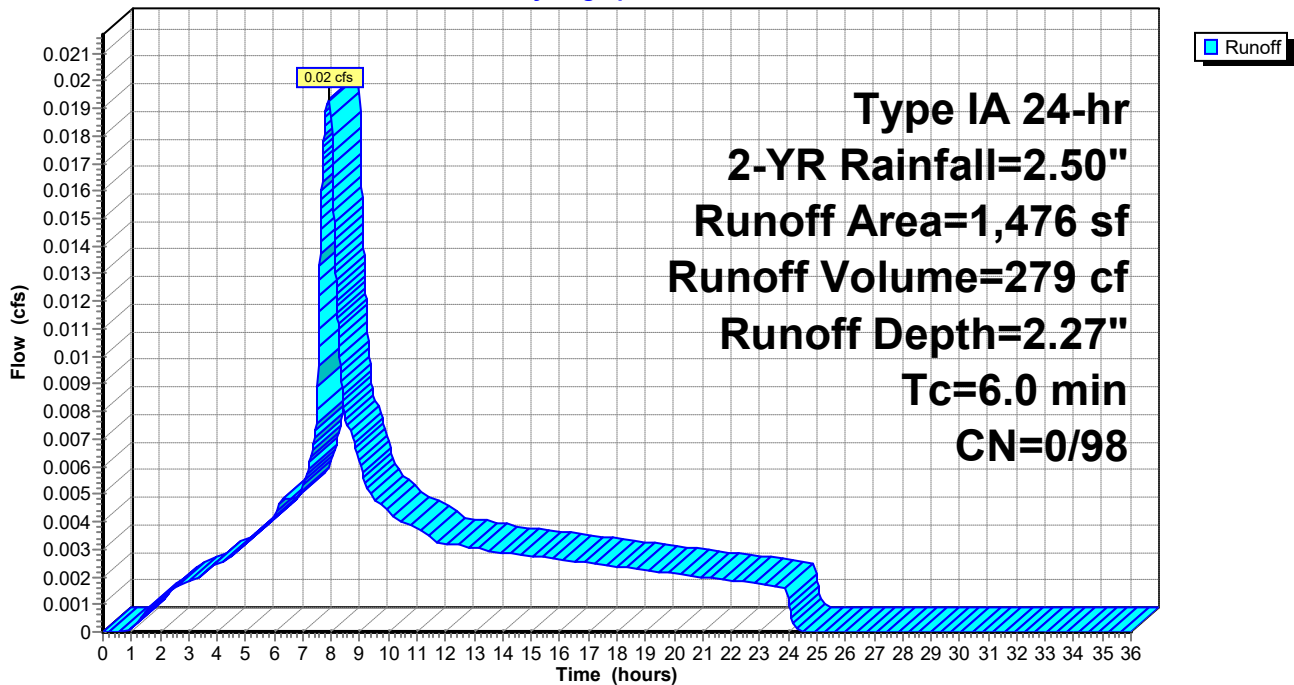
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------------|
| 1,476 | 98 | Paved roads w/curbs & sewers, HSG D |
| 1,476 | 98 | 100.00% Impervious Area |

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

Subcatchment 13S: BASIN 7-Curb Return

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 12

Summary for Subcatchment B1: BASIN 1-AC ROAD EAST

Runoff = 0.03 cfs @ 7.90 hrs, Volume= 414 cf, Depth= 2.27"
Routed to Pond P1 : Street Planter 1

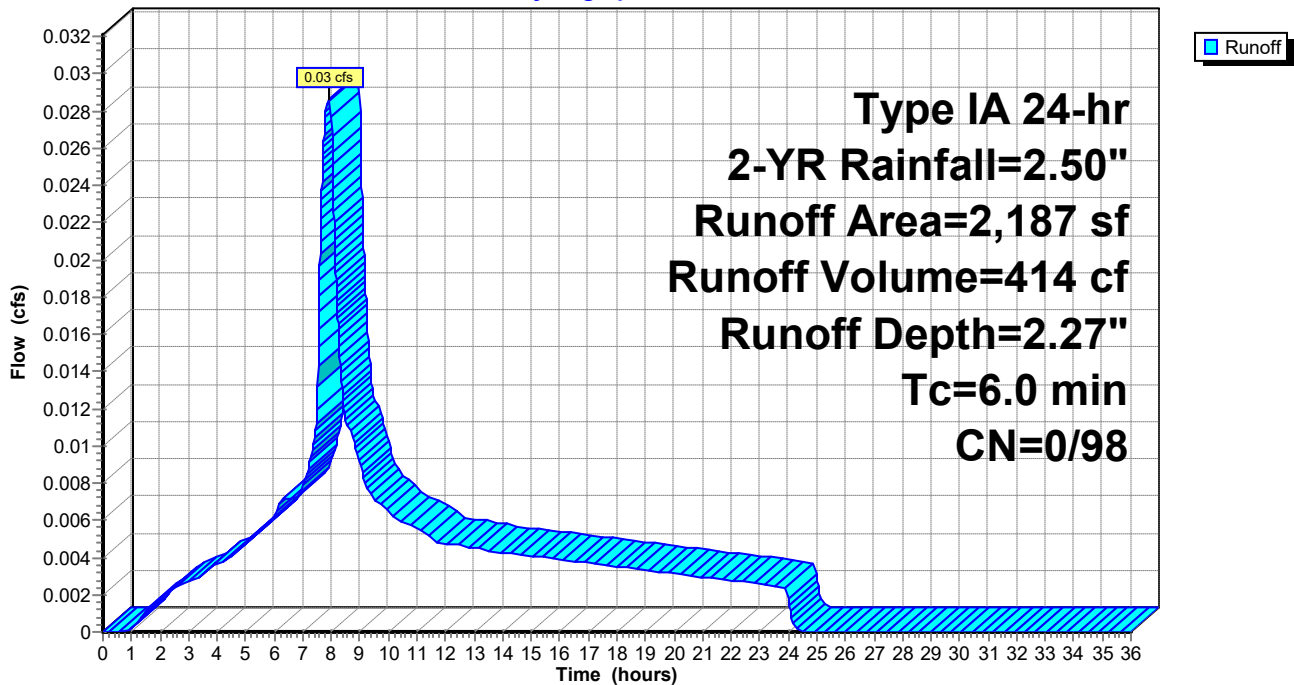
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 2,187 | 98 | AC |
| 2,187 | 98 | 100.00% Impervious Area |

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

Subcatchment B1: BASIN 1-AC ROAD EAST

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 13

Summary for Subcatchment B2: BASIN 2-AC Road West

Runoff = 0.07 cfs @ 7.90 hrs, Volume= 1,045 cf, Depth= 2.27"
 Routed to Pond P2 : Street Planter 2

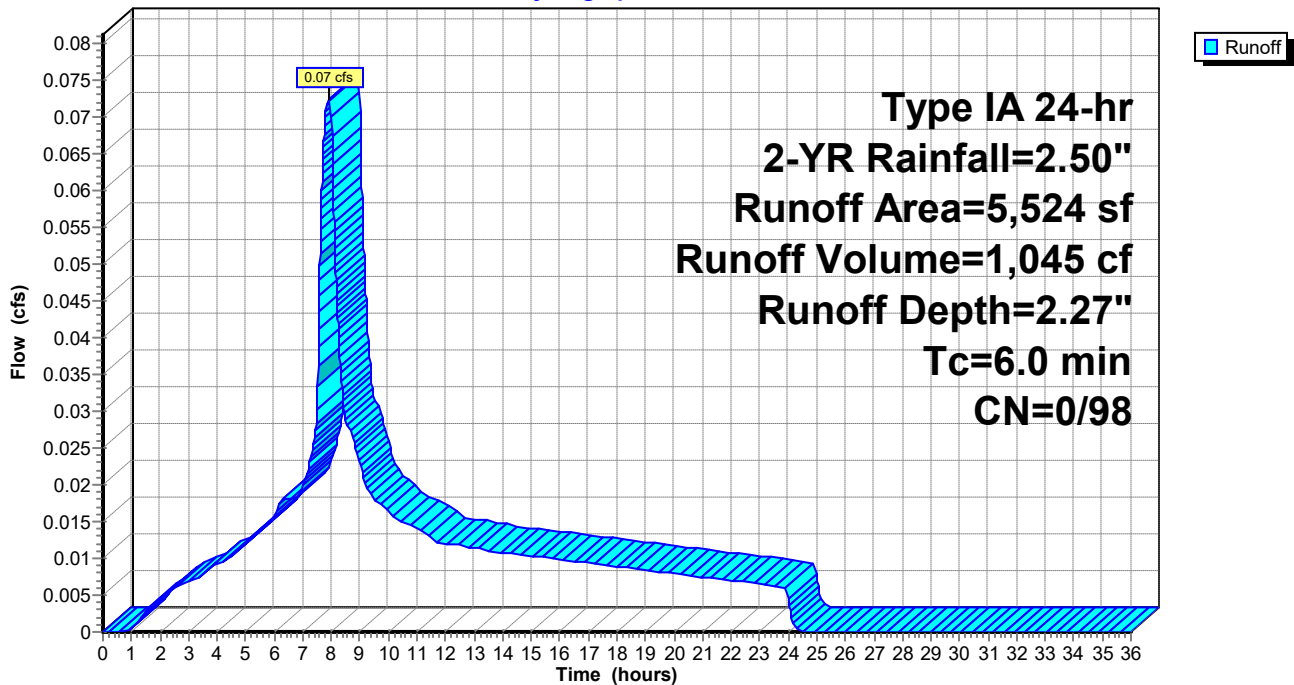
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 5,524 | 98 | Public Impervious |
| 5,524 | 98 | 100.00% Impervious Area |

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

Subcatchment B2: BASIN 2-AC Road West

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 14

Summary for Subcatchment B3: BASIN 3-AC Road Southeast

Runoff = 0.02 cfs @ 7.90 hrs, Volume= 336 cf, Depth= 2.27"
 Routed to Pond P3 : Street Planter 3

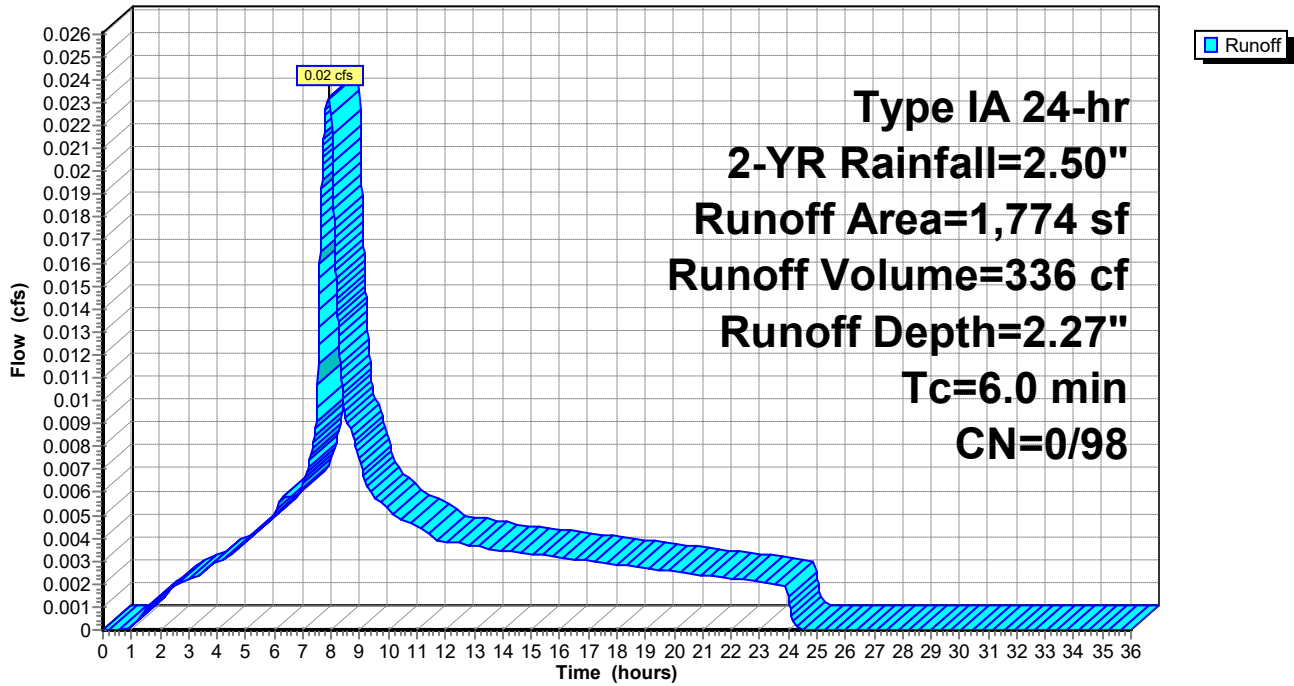
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 1,774 | 98 | Public Impervious |
| 1,774 | 98 | 100.00% Impervious Area |

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

Subcatchment B3: BASIN 3-AC Road Southeast

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 15

Summary for Subcatchment B4: BASIN 4-Lots 1-4 Roof

Runoff = 0.12 cfs @ 7.90 hrs, Volume= 1,778 cf, Depth= 2.27"

Routed to Pond 1P : 36" Detention Pipe

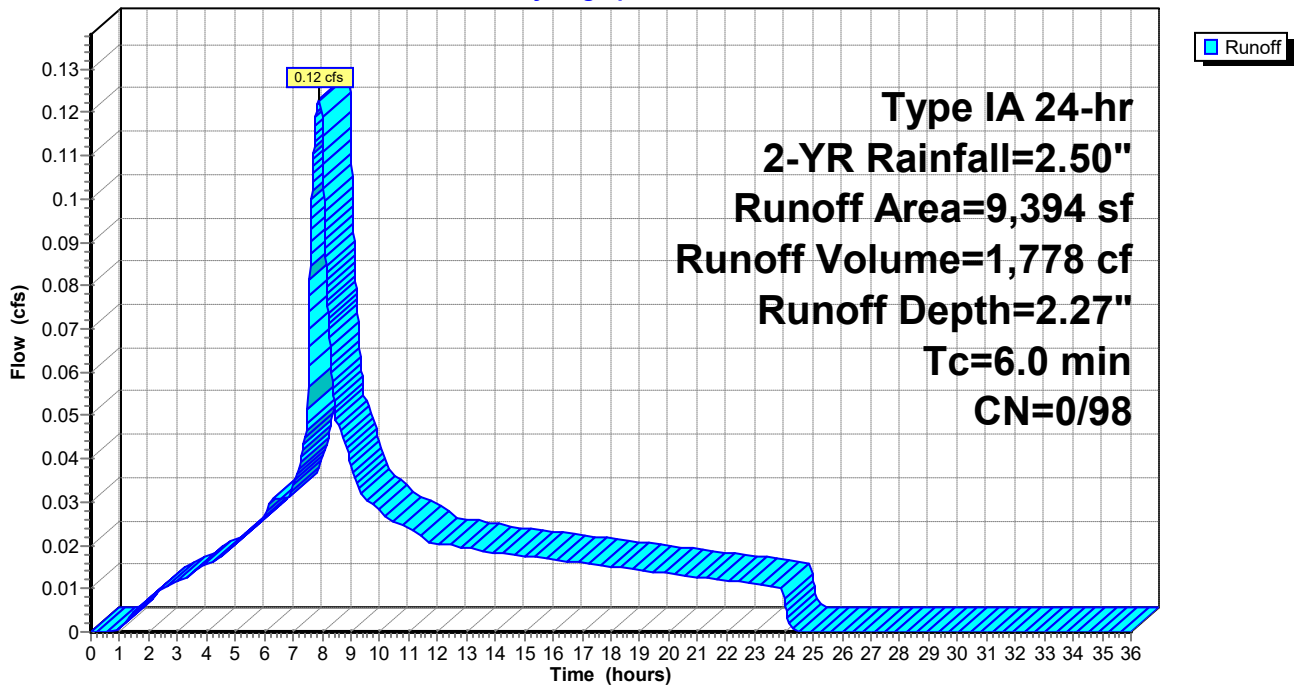
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 2-YR Rainfall=2.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 9,394 | 98 | Roof Area |
| 9,394 | 98 | 100.00% Impervious Area |

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

Subcatchment B4: BASIN 4-Lots 1-4 Roof

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 16

Summary for Reach -POST: Peak Flows from Post-Developed Site

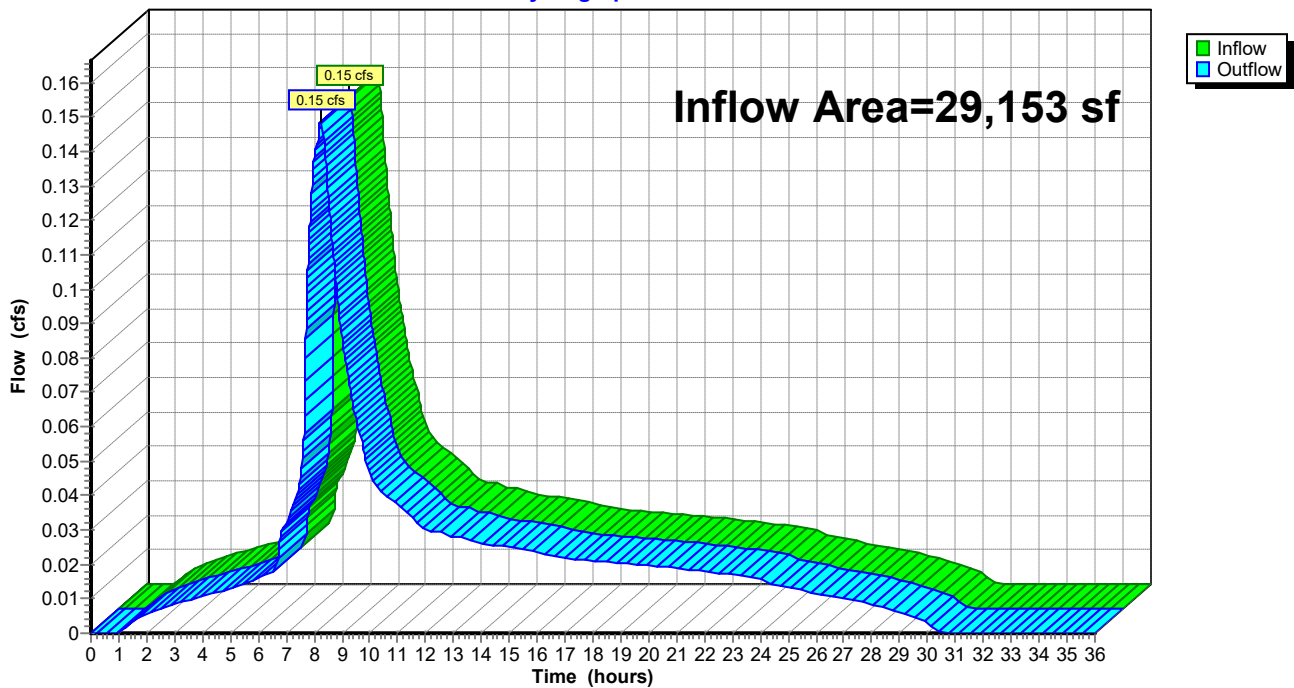
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 29,153 sf, 100.00% Impervious, Inflow Depth = 1.06" for 2-YR event
Inflow = 0.15 cfs @ 8.24 hrs, Volume= 2,580 cf
Outflow = 0.15 cfs @ 8.24 hrs, Volume= 2,580 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach -POST: Peak Flows from Post-Developed Site

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 17

Summary for Pond 1P: 36" Detention Pipe

Inflow Area = 9,394 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
 Inflow = 0.12 cfs @ 7.90 hrs, Volume= 1,778 cf
 Outflow = 0.07 cfs @ 8.20 hrs, Volume= 1,778 cf, Atten= 40%, Lag= 18.3 min
 Primary = 0.07 cfs @ 8.20 hrs, Volume= 1,778 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.94' @ 8.20 hrs Surf.Area= 215 sf Storage= 363 cf

Plug-Flow detention time= 181.4 min calculated for 1,777 cf (100% of inflow)
 Center-of-Mass det. time= 181.5 min (855.1 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 530 cf | 36.0" Round Pipe Storage L= 75.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 0.7" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 1.50' | 1.8" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.07 cfs @ 8.20 hrs HW=1.94' (Free Discharge)

- 1=Control Orifice (Orifice Controls 0.02 cfs @ 6.71 fps)
- 2=Upper Orifice (Orifice Controls 0.06 cfs @ 3.20 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

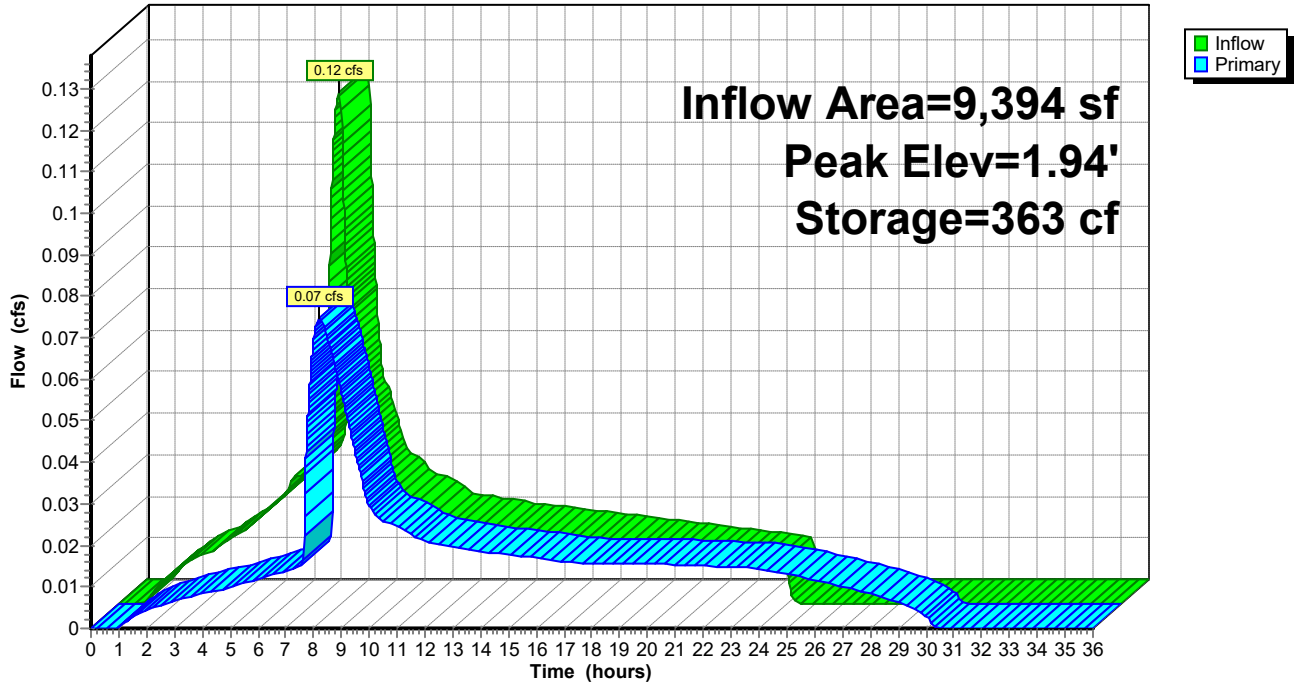
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 18

Pond 1P: 36" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 19

Summary for Pond 11P: Raingarden 1

Inflow Area = 6,214 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
 Inflow = 0.08 cfs @ 7.90 hrs, Volume= 1,176 cf
 Outflow = 0.02 cfs @ 7.92 hrs, Volume= 1,176 cf, Atten= 79%, Lag= 1.2 min
 Discarded = 0.02 cfs @ 7.92 hrs, Volume= 1,176 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.44' @ 10.23 hrs Surf.Area= 750 sf Storage= 354 cf

Plug-Flow detention time= 272.8 min calculated for 1,176 cf (100% of inflow)
 Center-of-Mass det. time= 272.8 min (946.4 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 150 cf | 10.00'W x 25.00'L x 1.50'H Rock 375 cf Overall x 40.0% Voids |
| #2 | 1.50' | 94 cf | 10.00'W x 25.00'L x 1.50'H Growing Medium 375 cf Overall x 25.0% Voids |
| #3 | 3.00' | 250 cf | 10.00'W x 25.00'L x 1.00'H Ponding |
| | | 494 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.02 cfs @ 7.92 hrs HW=3.01' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.02 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

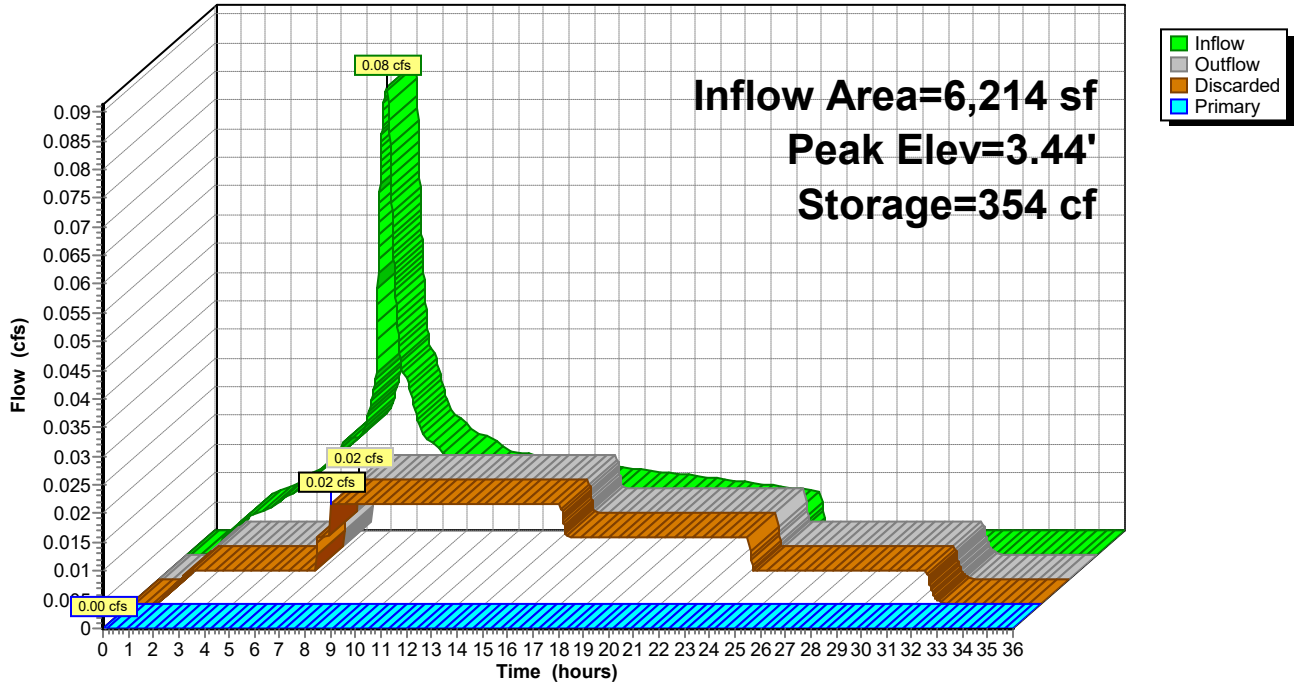
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 20

Pond 11P: Raingarden 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 21

Summary for Pond 13P: Raingarden 2

Inflow Area = 2,584 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
 Inflow = 0.03 cfs @ 7.90 hrs, Volume= 489 cf
 Outflow = 0.02 cfs @ 8.33 hrs, Volume= 489 cf, Atten= 51%, Lag= 26.1 min
 Discarded = 0.01 cfs @ 7.68 hrs, Volume= 447 cf
 Primary = 0.01 cfs @ 8.33 hrs, Volume= 42 cf

Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.56' @ 8.33 hrs Surf.Area= 252 sf Storage= 129 cf

Plug-Flow detention time= 267.1 min calculated for 489 cf (100% of inflow)
 Center-of-Mass det. time= 267.1 min (940.7 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 50 cf | 6.00'W x 14.00'L x 1.50'H Rock 126 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 6.00'W x 14.00'L x 1.50'H Growing Medium 126 cf Overall x 25.0% Voids |
| #3 | 3.00' | 84 cf | 6.00'W x 14.00'L x 1.00'H Ponding |
| | | 166 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 7.68 hrs HW=3.00' (Free Discharge)↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.01 cfs @ 8.33 hrs HW=3.56' (Free Discharge)↑2=**Overflow Orifice** (Orifice Controls 0.01 cfs @ 0.82 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

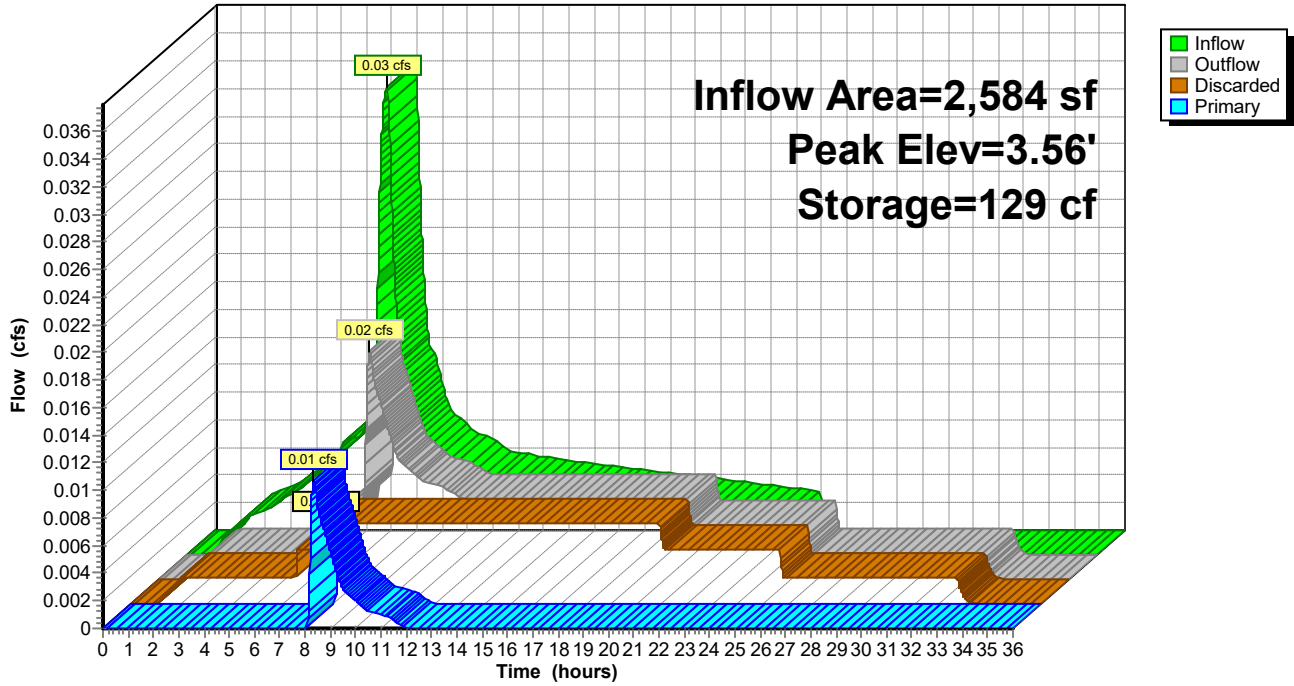
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 22

Pond 13P: Raingarden 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 23

Summary for Pond P1: Street Planter 1

Inflow Area = 2,187 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
 Inflow = 0.03 cfs @ 7.90 hrs, Volume= 414 cf
 Outflow = 0.01 cfs @ 7.91 hrs, Volume= 414 cf, Atten= 79%, Lag= 0.6 min
 Discarded = 0.01 cfs @ 7.91 hrs, Volume= 414 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.45' @ 10.26 hrs Surf.Area= 263 sf Storage= 125 cf

Plug-Flow detention time= 274.0 min calculated for 414 cf (100% of inflow)
 Center-of-Mass det. time= 274.0 min (947.6 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 53 cf | 5.00'W x 17.50'L x 1.50'H Rock 131 cf Overall x 40.0% Voids |
| #2 | 1.50' | 33 cf | 5.00'W x 17.50'L x 1.50'H Growing Medium 131 cf Overall x 25.0% Voids |
| #3 | 3.00' | 88 cf | 5.00'W x 17.50'L x 1.00'H Ponding |
| | | 173 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 7.91 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

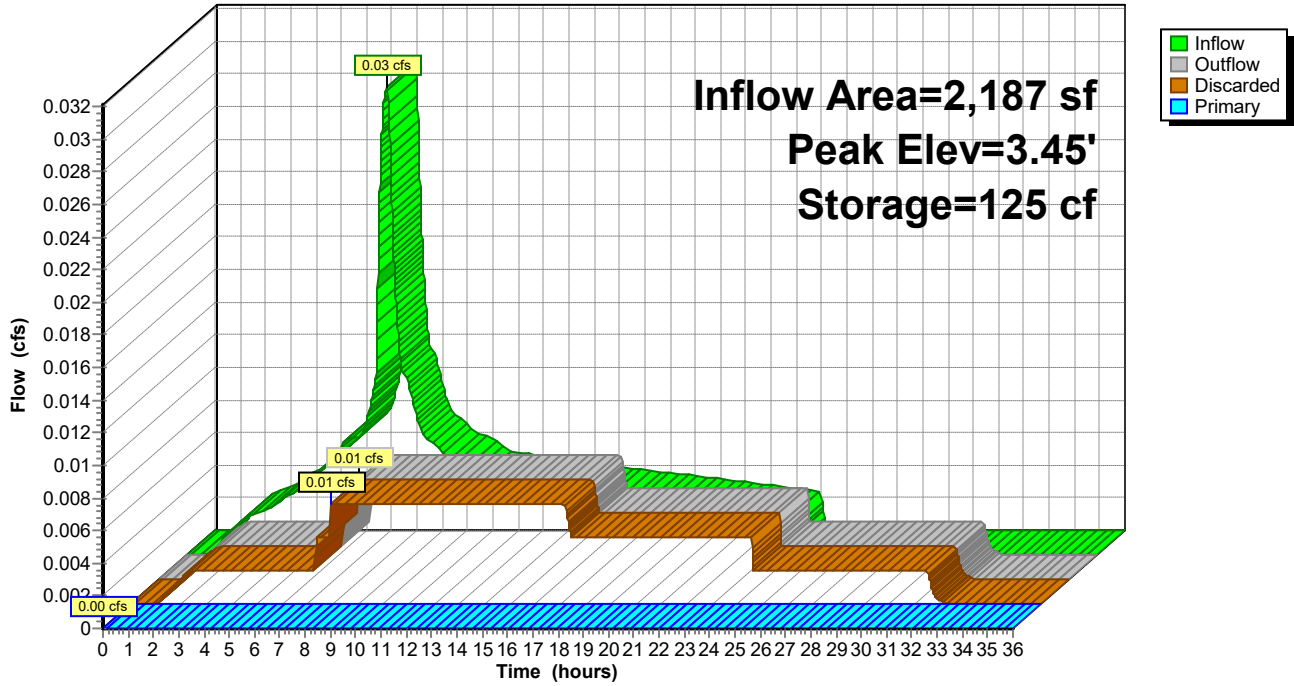
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 24

Pond P1: Street Planter 1

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 25

Summary for Pond P2: Street Planter 2

Inflow Area = 5,524 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
Inflow = 0.07 cfs @ 7.90 hrs, Volume= 1,045 cf
Outflow = 0.07 cfs @ 7.92 hrs, Volume= 1,045 cf, Atten= 0%, Lag= 0.9 min
Discarded = 0.01 cfs @ 5.55 hrs, Volume= 565 cf
Primary = 0.07 cfs @ 7.92 hrs, Volume= 481 cf
Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 3.55' @ 7.92 hrs Surf.Area= 258 sf Storage= 131 cf

Plug-Flow detention time= 173.4 min calculated for 1,045 cf (100% of inflow)
Center-of-Mass det. time= 173.5 min (847.1 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 52 cf | 5.00'W x 17.20'L x 1.50'H Rock 129 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 5.00'W x 17.20'L x 1.50'H Growing Medium 129 cf Overall x 25.0% Voids |
| #3 | 3.00' | 86 cf | 5.00'W x 17.20'L x 1.00'H Ponding |
| | | 170 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 5.55 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.06 cfs @ 7.92 hrs HW=3.55' (Free Discharge)

↑2=**Overflow Orifice** (Weir Controls 0.06 cfs @ 0.76 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

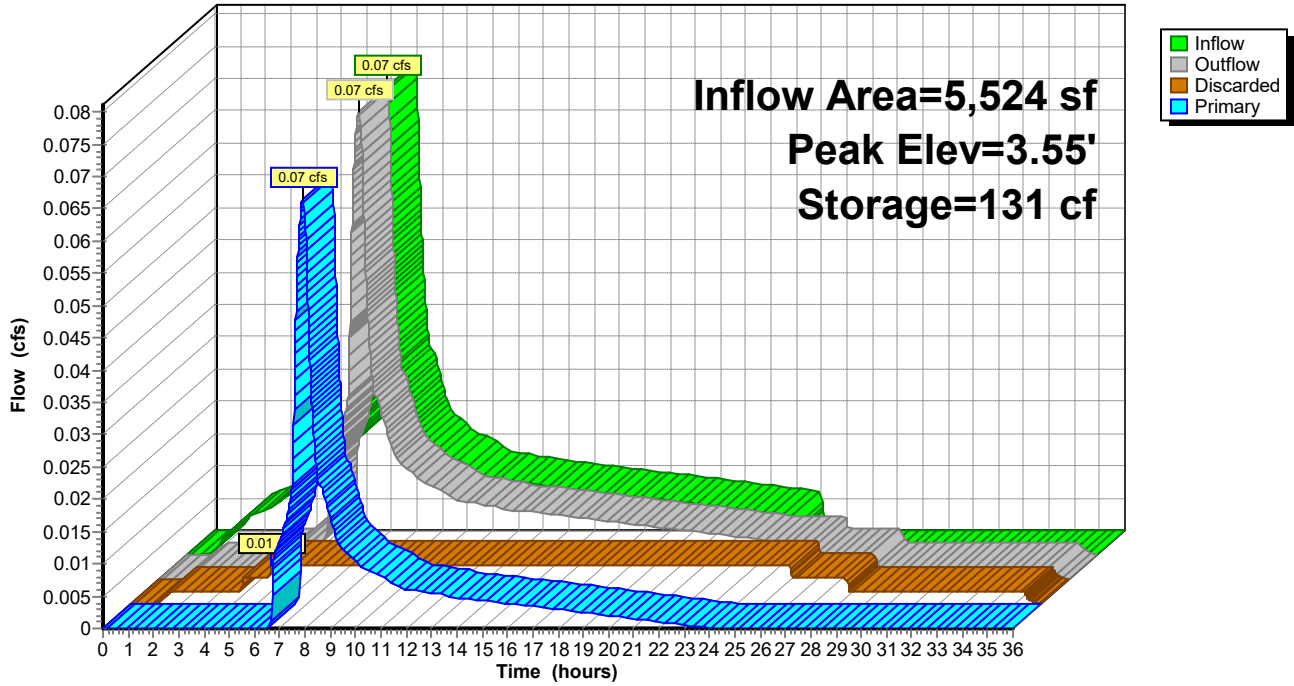
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 26

Pond P2: Street Planter 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 27

Summary for Pond P3: Street Planter 3

Inflow Area = 1,774 sf, 100.00% Impervious, Inflow Depth = 2.27" for 2-YR event
 Inflow = 0.02 cfs @ 7.90 hrs, Volume= 336 cf
 Outflow = 0.01 cfs @ 8.26 hrs, Volume= 336 cf, Atten= 76%, Lag= 21.6 min
 Discarded = 0.01 cfs @ 8.26 hrs, Volume= 336 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.86' @ 9.71 hrs Surf.Area= 242 sf Storage= 84 cf

Plug-Flow detention time= 254.9 min calculated for 336 cf (100% of inflow)
 Center-of-Mass det. time= 254.9 min (928.5 - 673.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 73 cf | 5.00'W x 24.20'L x 1.50'H Rock 182 cf Overall x 40.0% Voids |
| #2 | 1.50' | 45 cf | 5.00'W x 24.20'L x 1.50'H Growing Medium 182 cf Overall x 25.0% Voids |
| #3 | 3.00' | 121 cf | 5.00'W x 24.20'L x 1.00'H Ponding |
| | | 239 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 8.26 hrs HW=1.50' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

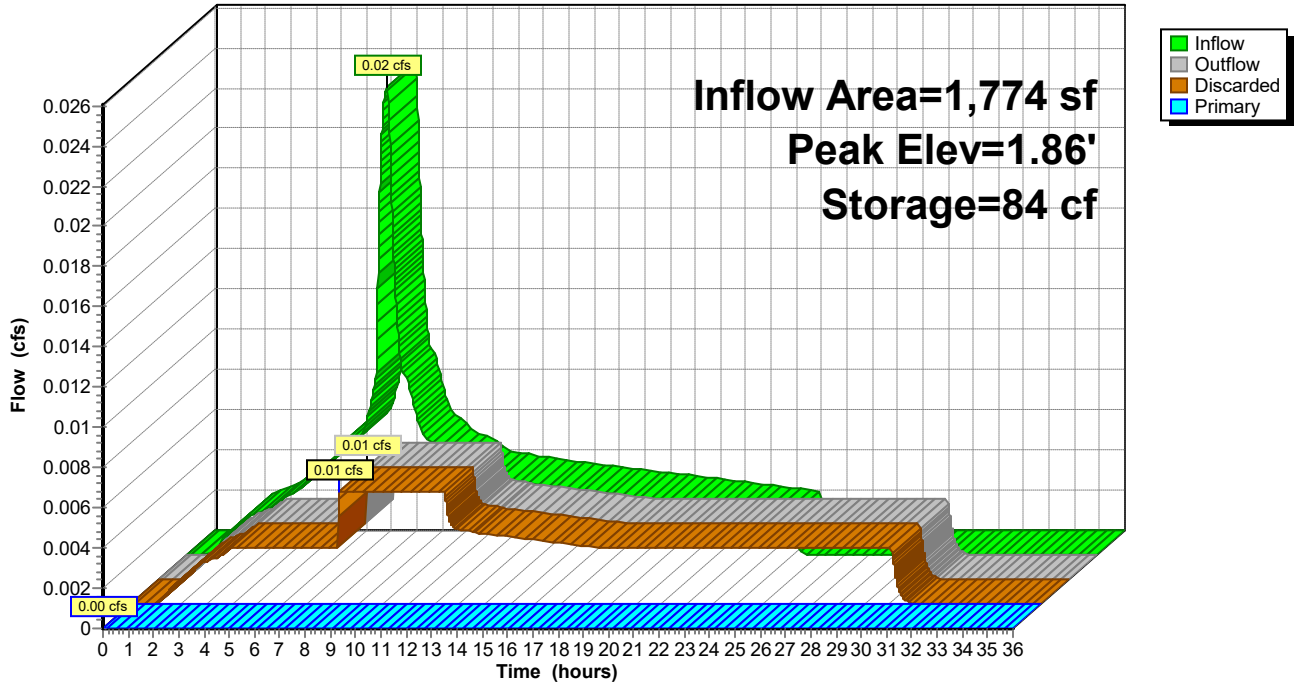
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 28

Pond P3: Street Planter 3

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 2-YR Rainfall=2.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 29

Summary for Pond P4: 18" Detention Pipe

[92] Warning: Device #2 is above defined storage

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

Inflow Area = 10,961 sf, 100.00% Impervious, Inflow Depth = 0.83" for 2-YR event
 Inflow = 0.09 cfs @ 7.91 hrs, Volume= 760 cf
 Outflow = 0.07 cfs @ 8.08 hrs, Volume= 760 cf, Atten= 19%, Lag= 9.9 min
 Primary = 0.07 cfs @ 8.08 hrs, Volume= 760 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.44' @ 8.08 hrs Surf.Area= 136 sf Storage= 43 cf

Plug-Flow detention time= 3.5 min calculated for 760 cf (100% of inflow)
 Center-of-Mass det. time= 3.5 min (653.1 - 649.7)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 177 cf | 18.0" Round Pipe Storage L= 100.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 2.0" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 2.20' | 2.0" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |
| #3 | Primary | 2.80' | 12.0" Vert. Overflow C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.07 cfs @ 8.08 hrs HW=0.44' (Free Discharge)

- 1=Control Orifice (Orifice Controls 0.07 cfs @ 3.18 fps)
- 2=Upper Orifice (Controls 0.00 cfs)
- 3=Overflow (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

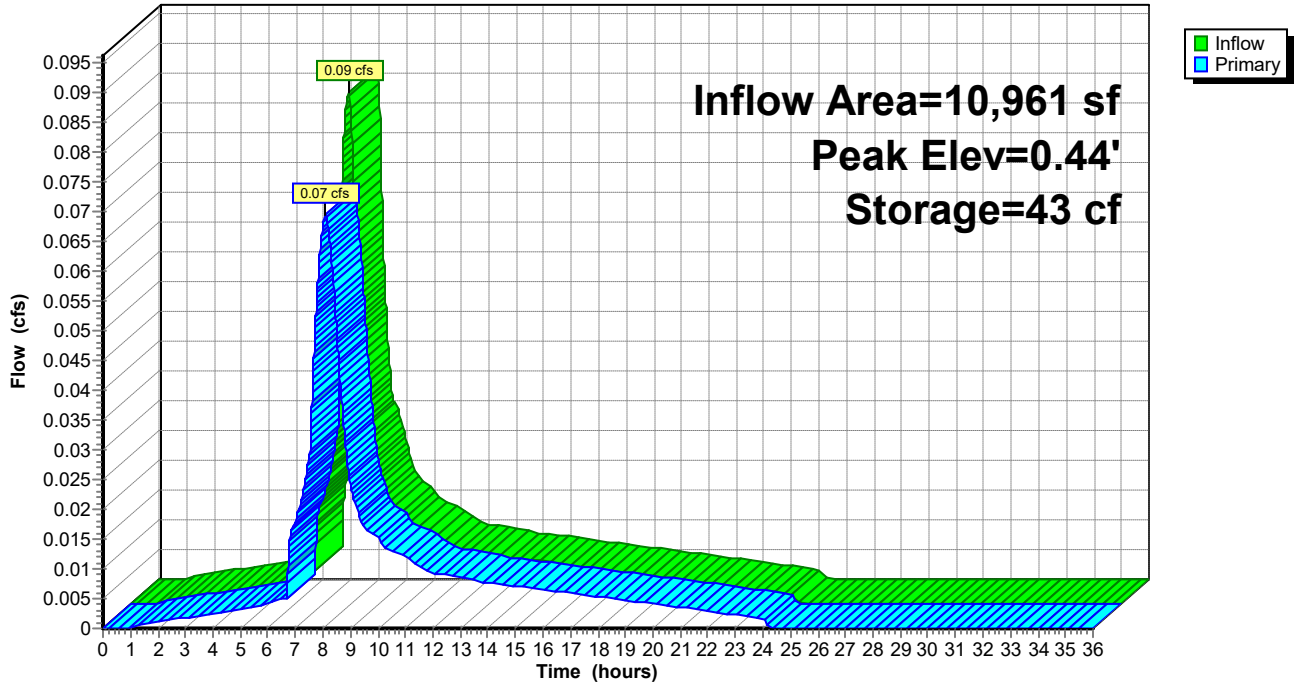
Type IA 24-hr 2-YR Rainfall=2.50"

Printed 1/31/2023

Page 30

Pond P4: 18" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 31

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment -PRE: Existing Site Runoff Area=29,153 sf 0.00% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=84/0 Runoff=0.31 cfs 4,704 cf

Subcatchment 11S: BASIN 6-SHARED DWY Runoff Area=2,584 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.05 cfs 703 cf

Subcatchment 12S: BASIN 5-AC ROAD Runoff Area=6,214 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.12 cfs 1,691 cf

Subcatchment 13S: BASIN 7-Curb Return Runoff Area=1,476 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 402 cf

Subcatchment B1: BASIN 1-AC ROAD Runoff Area=2,187 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.04 cfs 595 cf

Subcatchment B2: BASIN 2-AC Road West Runoff Area=5,524 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.10 cfs 1,504 cf

Subcatchment B3: BASIN 3-AC Road Runoff Area=1,774 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 483 cf

Subcatchment B4: BASIN 4-Lots 1-4 Roof Runoff Area=9,394 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=0/98 Runoff=0.18 cfs 2,557 cf

Reach -POST: Peak Flows from Post-Developed Site Inflow=0.30 cfs 4,415 cf
Outflow=0.30 cfs 4,415 cf

Pond 1P: 36" Detention Pipe Peak Elev=2.46' Storage=465 cf Inflow=0.18 cfs 2,557 cf
Outflow=0.10 cfs 2,557 cf

Pond 11P: Raingarden 1 Peak Elev=3.66' Storage=408 cf Inflow=0.12 cfs 1,691 cf
Discarded=0.02 cfs 1,430 cf Primary=0.07 cfs 261 cf Outflow=0.09 cfs 1,691 cf

Pond 13P: Raingarden 2 Peak Elev=3.62' Storage=134 cf Inflow=0.05 cfs 703 cf
Discarded=0.01 cfs 520 cf Primary=0.04 cfs 183 cf Outflow=0.05 cfs 703 cf

Pond P1: Street Planter 1 Peak Elev=3.60' Storage=138 cf Inflow=0.04 cfs 595 cf
Discarded=0.01 cfs 501 cf Primary=0.03 cfs 94 cf Outflow=0.04 cfs 595 cf

Pond P2: Street Planter 2 Peak Elev=3.57' Storage=133 cf Inflow=0.10 cfs 1,504 cf
Discarded=0.01 cfs 585 cf Primary=0.10 cfs 918 cf Outflow=0.10 cfs 1,504 cf

Pond P3: Street Planter 3 Peak Elev=3.14' Storage=135 cf Inflow=0.03 cfs 483 cf
Discarded=0.01 cfs 483 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 483 cf

Pond P4: 18" Detention Pipe Peak Elev=0.87' Storage=106 cf Inflow=0.15 cfs 1,414 cf
Outflow=0.10 cfs 1,414 cf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 32

Total Runoff Area = 58,306 sf Runoff Volume = 12,640 cf Average Runoff Depth = 2.60"
50.00% Pervious = 29,153 sf 50.00% Impervious = 29,153 sf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 33

Summary for Subcatchment -PRE: Existing Site

Runoff = 0.31 cfs @ 7.97 hrs, Volume= 4,704 cf, Depth= 1.94"

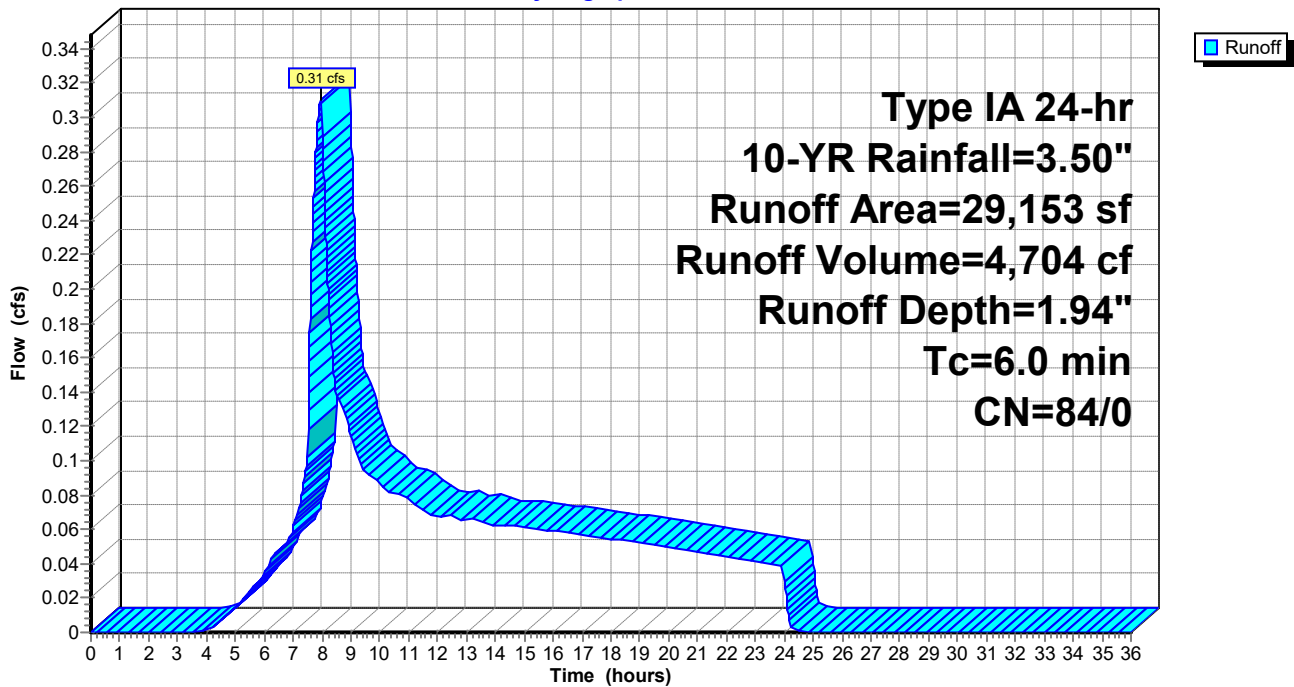
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|---------------------------------|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D |
| 29,153 | 84 | 100.00% Pervious Area |

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

Subcatchment -PRE: Existing Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 34

Summary for Subcatchment 11S: BASIN 6-SHARED DWY

Runoff = 0.05 cfs @ 7.90 hrs, Volume= 703 cf, Depth= 3.27"

Routed to Pond 13P : Raingarden 2

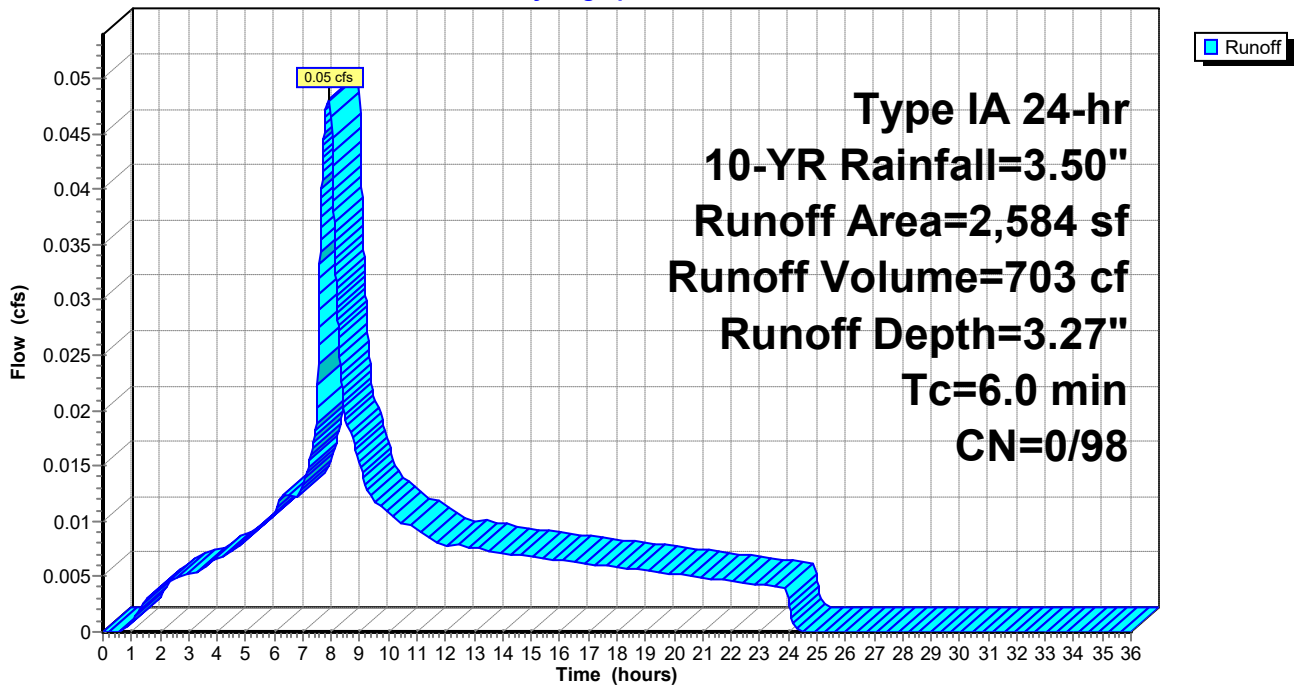
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 2,584 | 98 | Paved parking, HSG D |
| 2,584 | 98 | 100.00% Impervious Area |

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

Subcatchment 11S: BASIN 6-SHARED DWY

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 35

Summary for Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Runoff = 0.12 cfs @ 7.90 hrs, Volume= 1,691 cf, Depth= 3.27"

Routed to Pond 11P : Raingarden 1

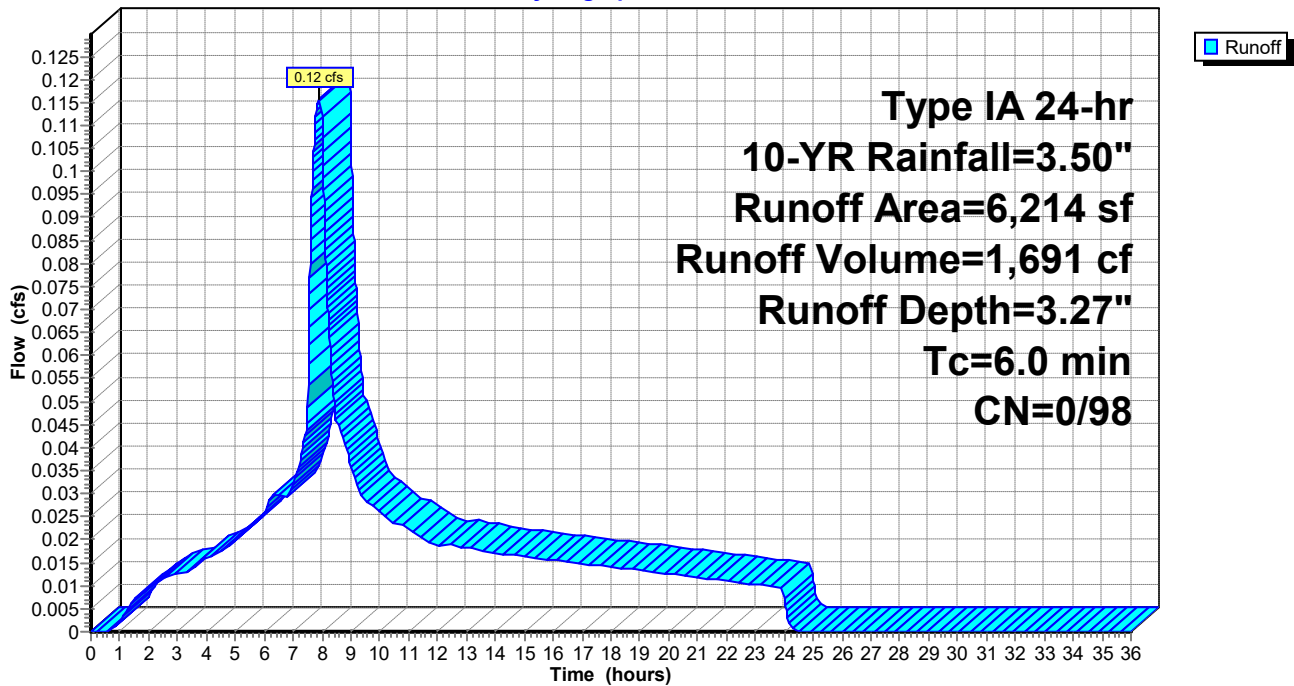
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 10-YR Rainfall=3.50"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------------------|
| * | 4,040 | 98 | AC |
| | 2,174 | 98 | Paved roads w/curbs & sewers, HSG D |
| | 6,214 | 98 | Weighted Average |
| | 6,214 | 98 | 100.00% Impervious Area |

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

Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 36

Summary for Subcatchment 13S: BASIN 7-Curb Return

Runoff = 0.03 cfs @ 7.90 hrs, Volume= 402 cf, Depth= 3.27"

Routed to Pond P4 : 18" Detention Pipe

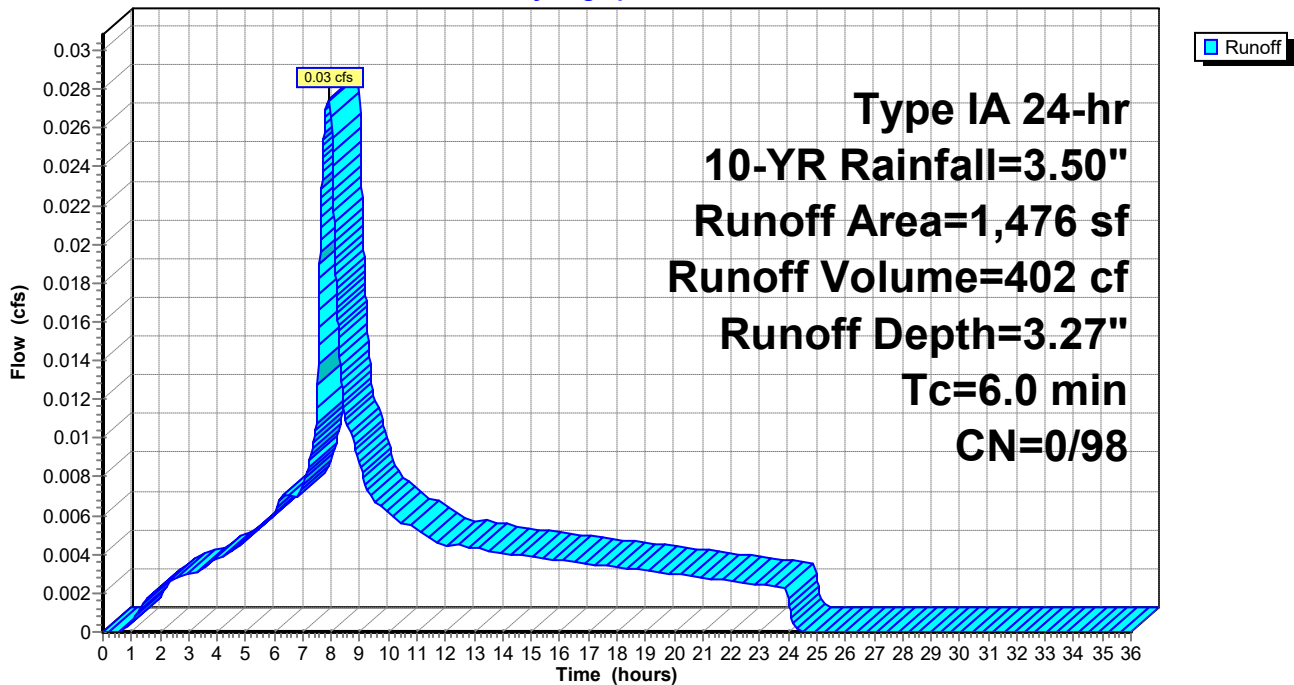
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------------|
| 1,476 | 98 | Paved roads w/curbs & sewers, HSG D |
| 1,476 | 98 | 100.00% Impervious Area |

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

Subcatchment 13S: BASIN 7-Curb Return

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 37

Summary for Subcatchment B1: BASIN 1-AC ROAD EAST

Runoff = 0.04 cfs @ 7.90 hrs, Volume= 595 cf, Depth= 3.27"
Routed to Pond P1 : Street Planter 1

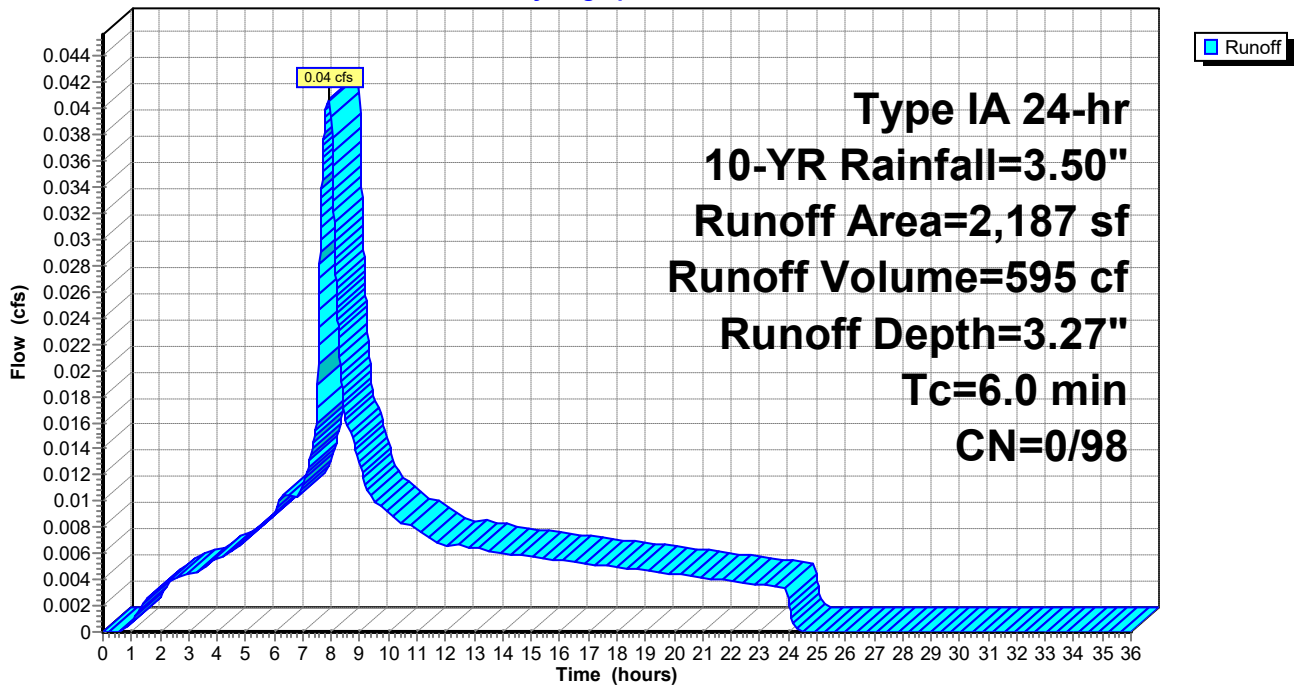
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 2,187 | 98 | AC |
| 2,187 | 98 | 100.00% Impervious Area |

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

Subcatchment B1: BASIN 1-AC ROAD EAST

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 38

Summary for Subcatchment B2: BASIN 2-AC Road West

Runoff = 0.10 cfs @ 7.90 hrs, Volume= 1,504 cf, Depth= 3.27"
Routed to Pond P2 : Street Planter 2

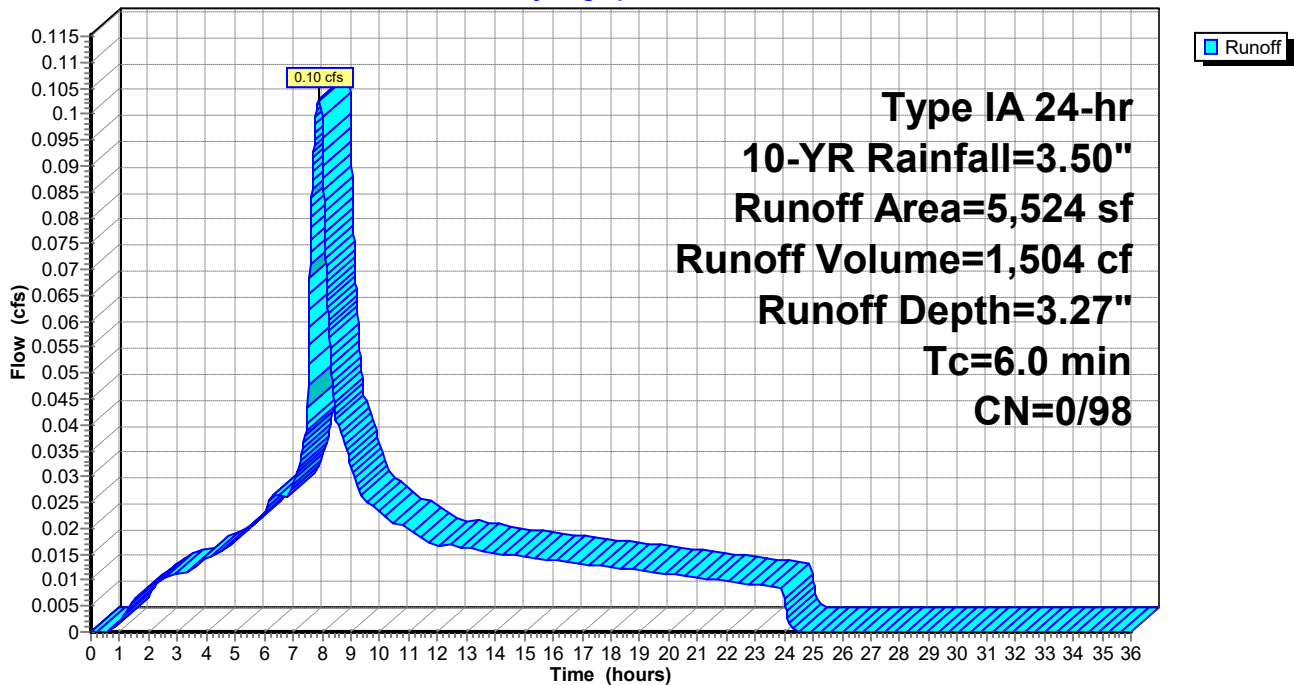
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 5,524 | 98 | Public Impervious |
| 5,524 | 98 | 100.00% Impervious Area |

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

Subcatchment B2: BASIN 2-AC Road West

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 39

Summary for Subcatchment B3: BASIN 3-AC Road Southeast

Runoff = 0.03 cfs @ 7.90 hrs, Volume= 483 cf, Depth= 3.27"
Routed to Pond P3 : Street Planter 3

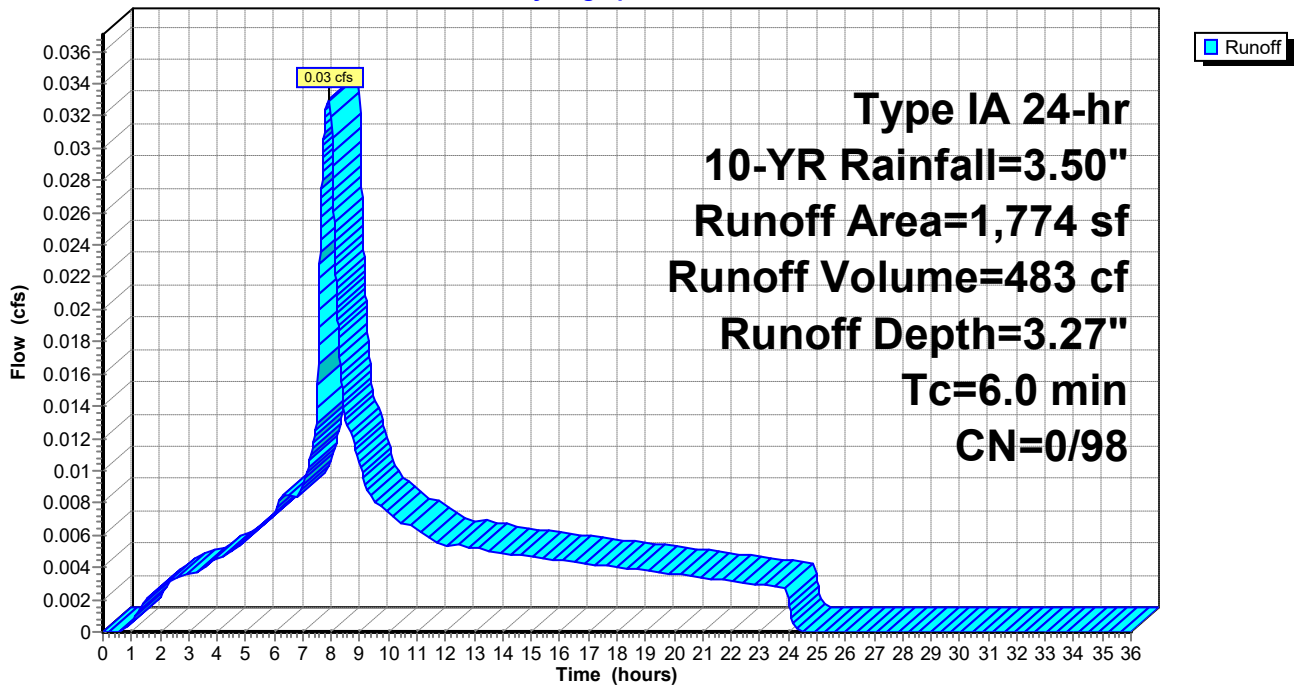
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 1,774 | 98 | Public Impervious |
| 1,774 | 98 | 100.00% Impervious Area |

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

Subcatchment B3: BASIN 3-AC Road Southeast

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 40

Summary for Subcatchment B4: BASIN 4-Lots 1-4 Roof

Runoff = 0.18 cfs @ 7.90 hrs, Volume= 2,557 cf, Depth= 3.27"

Routed to Pond 1P : 36" Detention Pipe

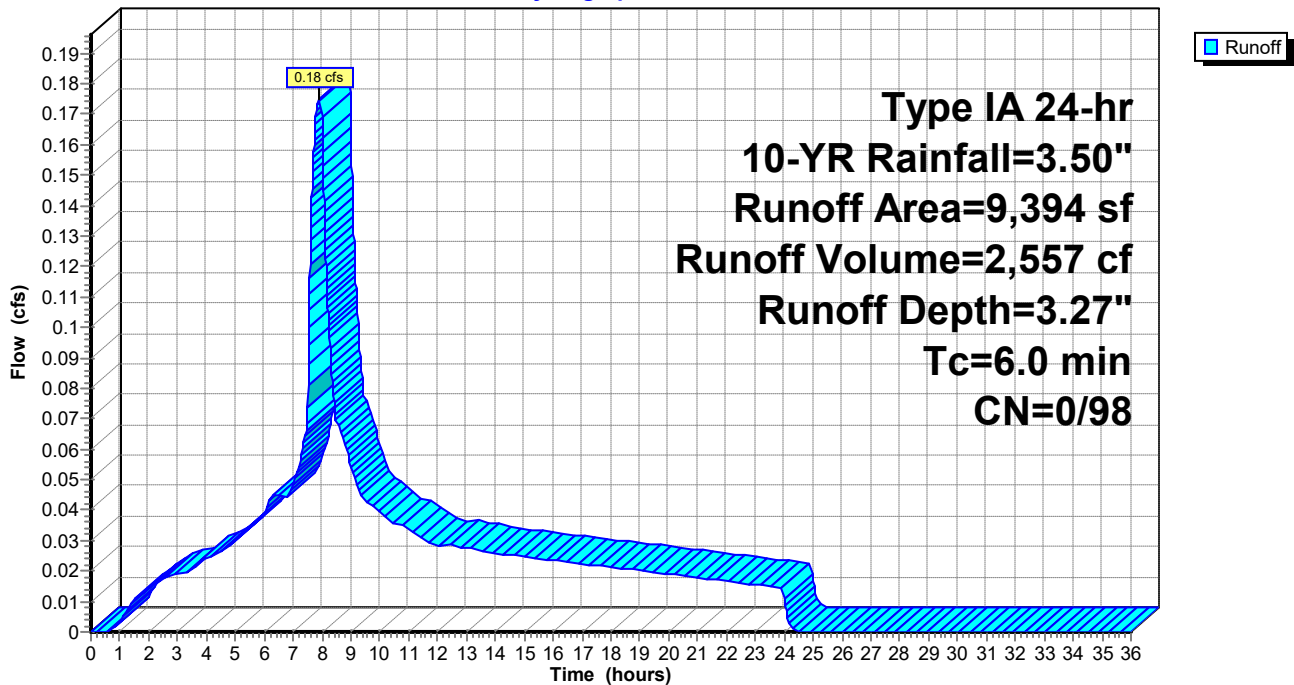
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-YR Rainfall=3.50"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------|
| * | 9,394 | 98 | Roof Area |
| | 9,394 | 98 | 100.00% Impervious Area |

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

Subcatchment B4: BASIN 4-Lots 1-4 Roof

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 41

Summary for Reach -POST: Peak Flows from Post-Developed Site

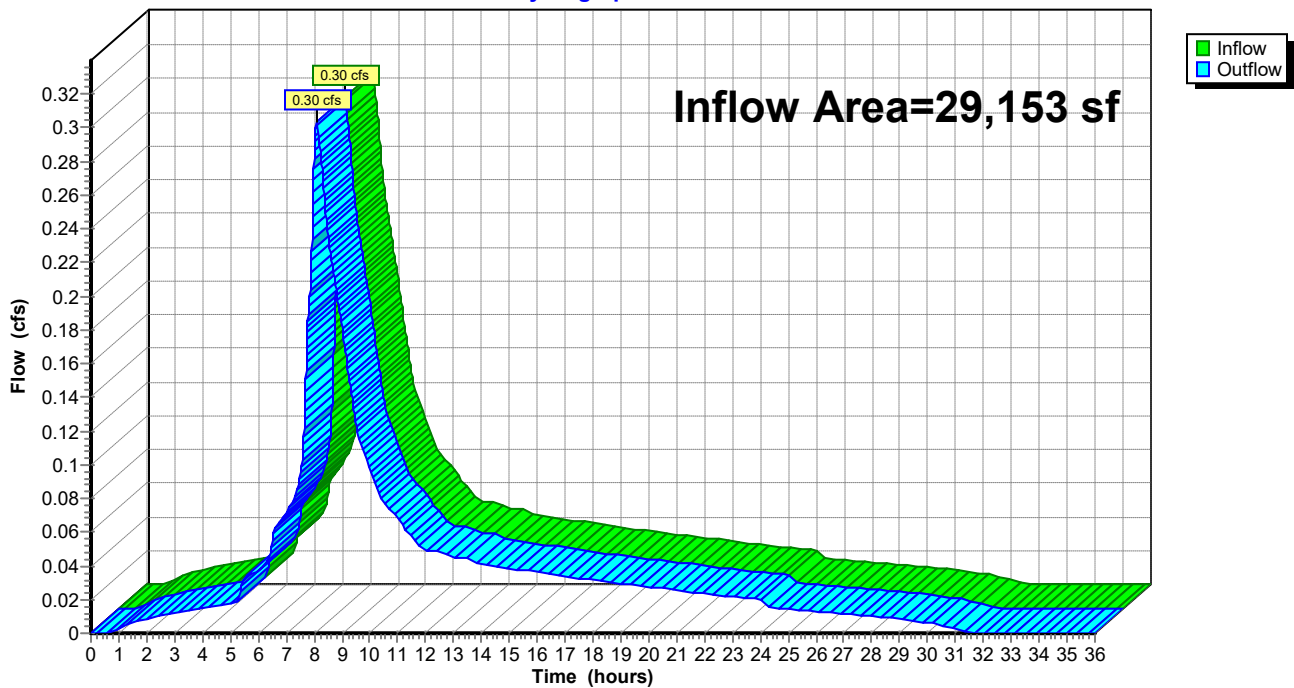
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 29,153 sf, 100.00% Impervious, Inflow Depth = 1.82" for 10-YR event
Inflow = 0.30 cfs @ 8.08 hrs, Volume= 4,415 cf
Outflow = 0.30 cfs @ 8.08 hrs, Volume= 4,415 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach -POST: Peak Flows from Post-Developed Site

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 42

Summary for Pond 1P: 36" Detention Pipe

Inflow Area = 9,394 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.18 cfs @ 7.90 hrs, Volume= 2,557 cf
 Outflow = 0.10 cfs @ 8.21 hrs, Volume= 2,557 cf, Atten= 41%, Lag= 19.1 min
 Primary = 0.10 cfs @ 8.21 hrs, Volume= 2,557 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 2.46' @ 8.21 hrs Surf.Area= 173 sf Storage= 465 cf

Plug-Flow detention time= 149.5 min calculated for 2,556 cf (100% of inflow)
 Center-of-Mass det. time= 149.6 min (813.4 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 530 cf | 36.0" Round Pipe Storage L= 75.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 0.7" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 1.50' | 1.8" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.10 cfs @ 8.21 hrs HW=2.46' (Free Discharge)

- 1=Control Orifice (Orifice Controls 0.02 cfs @ 7.55 fps)
- 2=Upper Orifice (Orifice Controls 0.08 cfs @ 4.72 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

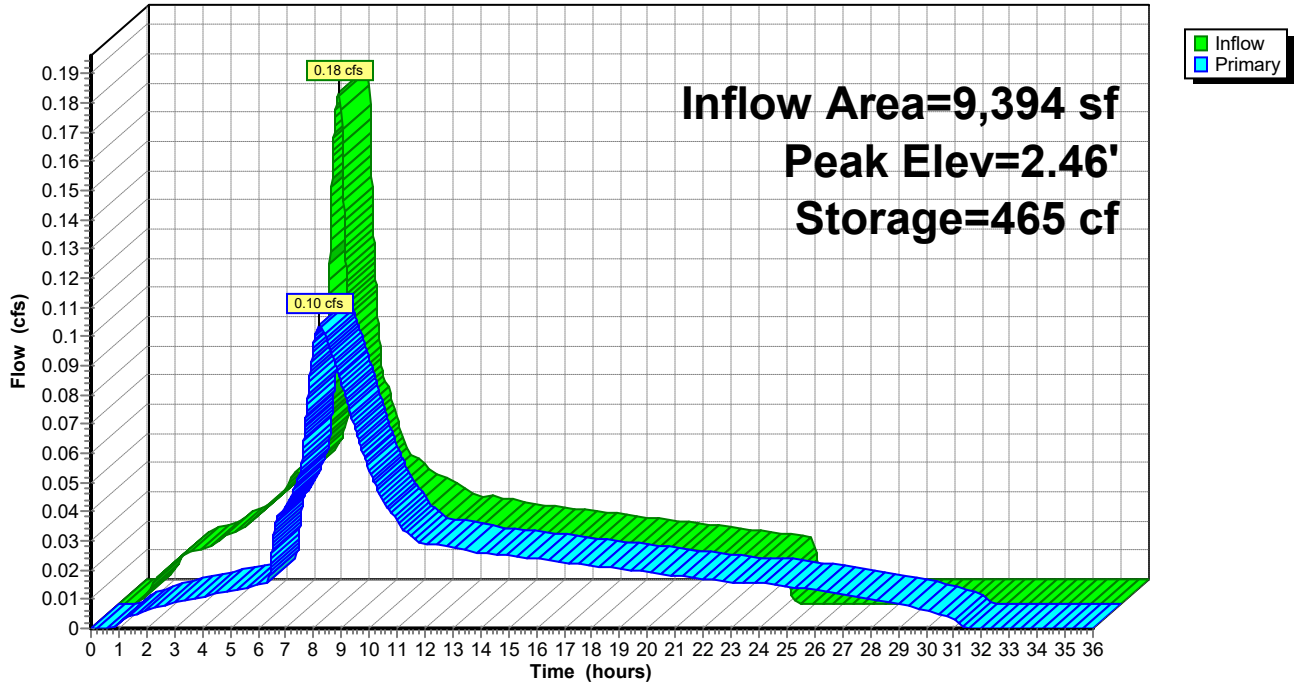
Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 43

Pond 1P: 36" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 44

Summary for Pond 11P: Raingarden 1

Inflow Area = 6,214 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.12 cfs @ 7.90 hrs, Volume= 1,691 cf
 Outflow = 0.09 cfs @ 8.09 hrs, Volume= 1,691 cf, Atten= 24%, Lag= 11.7 min
 Discarded = 0.02 cfs @ 7.28 hrs, Volume= 1,430 cf
 Primary = 0.07 cfs @ 8.09 hrs, Volume= 261 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.66' @ 8.09 hrs Surf.Area= 750 sf Storage= 408 cf

Plug-Flow detention time= 255.3 min calculated for 1,691 cf (100% of inflow)
 Center-of-Mass det. time= 255.3 min (919.2 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 150 cf | 10.00'W x 25.00'L x 1.50'H Rock 375 cf Overall x 40.0% Voids |
| #2 | 1.50' | 94 cf | 10.00'W x 25.00'L x 1.50'H Growing Medium 375 cf Overall x 25.0% Voids |
| #3 | 3.00' | 250 cf | 10.00'W x 25.00'L x 1.00'H Ponding |
| | | 494 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.02 cfs @ 7.28 hrs HW=3.00' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.07 cfs @ 8.09 hrs HW=3.66' (Free Discharge)

↑2=Overflow Orifice (Orifice Controls 0.07 cfs @ 1.34 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

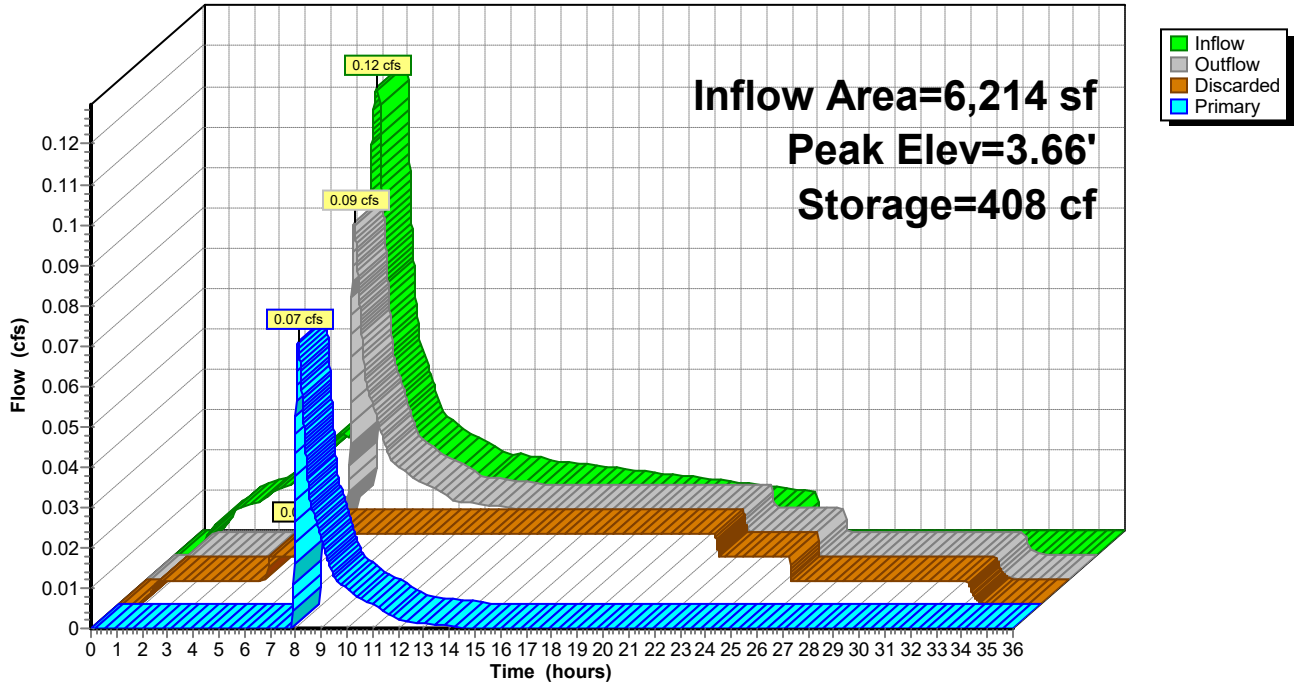
Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 45

Pond 11P: Raingarden 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 46

Summary for Pond 13P: Raingarden 2

Inflow Area = 2,584 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.05 cfs @ 7.90 hrs, Volume= 703 cf
 Outflow = 0.05 cfs @ 7.93 hrs, Volume= 703 cf, Atten= 0%, Lag= 2.3 min
 Discarded = 0.01 cfs @ 6.47 hrs, Volume= 520 cf
 Primary = 0.04 cfs @ 7.93 hrs, Volume= 183 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.62' @ 7.93 hrs Surf.Area= 252 sf Storage= 134 cf

Plug-Flow detention time= 232.2 min calculated for 703 cf (100% of inflow)
 Center-of-Mass det. time= 232.2 min (896.0 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 50 cf | 6.00'W x 14.00'L x 1.50'H Rock 126 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 6.00'W x 14.00'L x 1.50'H Growing Medium 126 cf Overall x 25.0% Voids |
| #3 | 3.00' | 84 cf | 6.00'W x 14.00'L x 1.00'H Ponding |
| | | 166 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 6.47 hrs HW=3.00' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.04 cfs @ 7.93 hrs HW=3.62' (Free Discharge)

↑**2=Overflow Orifice** (Orifice Controls 0.04 cfs @ 1.17 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

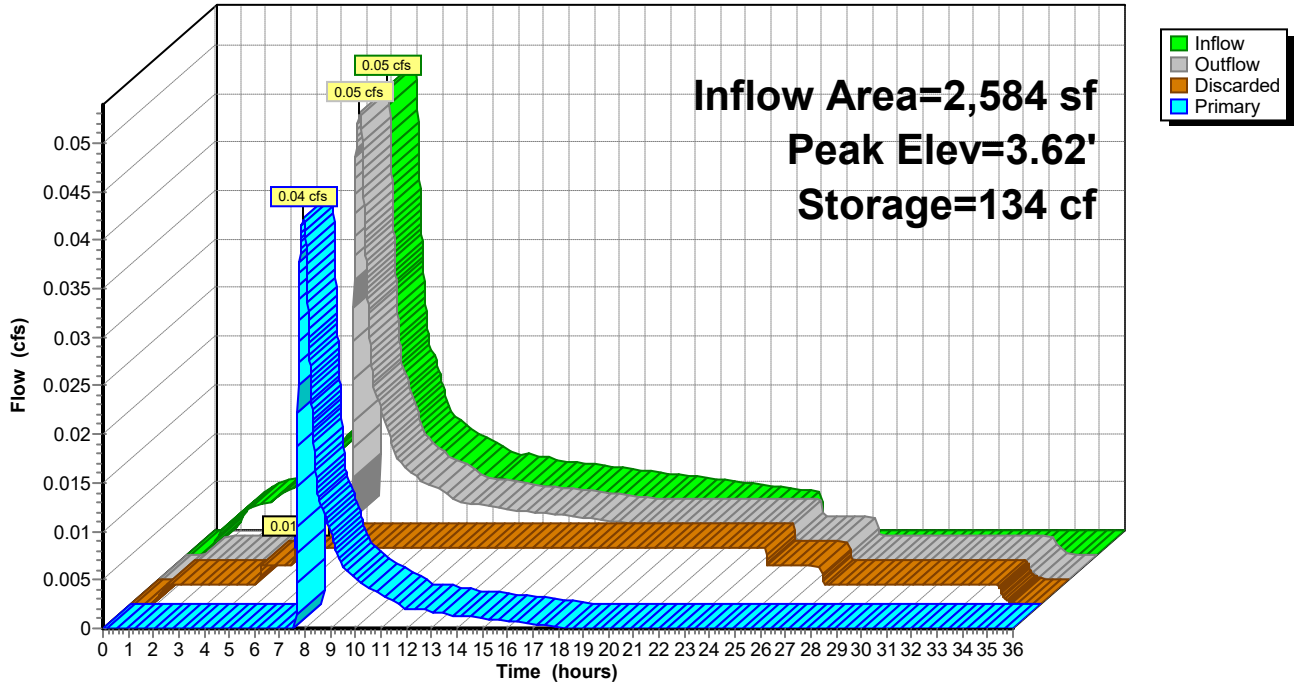
Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 47

Pond 13P: Raingarden 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 48

Summary for Pond P1: Street Planter 1

Inflow Area = 2,187 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.04 cfs @ 7.90 hrs, Volume= 595 cf
 Outflow = 0.04 cfs @ 8.03 hrs, Volume= 595 cf, Atten= 10%, Lag= 8.0 min
 Discarded = 0.01 cfs @ 7.26 hrs, Volume= 501 cf
 Primary = 0.03 cfs @ 8.03 hrs, Volume= 94 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.60' @ 8.03 hrs Surf.Area= 263 sf Storage= 138 cf

Plug-Flow detention time= 252.9 min calculated for 595 cf (100% of inflow)
 Center-of-Mass det. time= 253.0 min (916.8 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 53 cf | 5.00'W x 17.50'L x 1.50'H Rock 131 cf Overall x 40.0% Voids |
| #2 | 1.50' | 33 cf | 5.00'W x 17.50'L x 1.50'H Growing Medium 131 cf Overall x 25.0% Voids |
| #3 | 3.00' | 88 cf | 5.00'W x 17.50'L x 1.00'H Ponding |
| | | 173 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 7.26 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.03 cfs @ 8.03 hrs HW=3.60' (Free Discharge)

↑2=**Overflow Orifice** (Orifice Controls 0.03 cfs @ 1.08 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

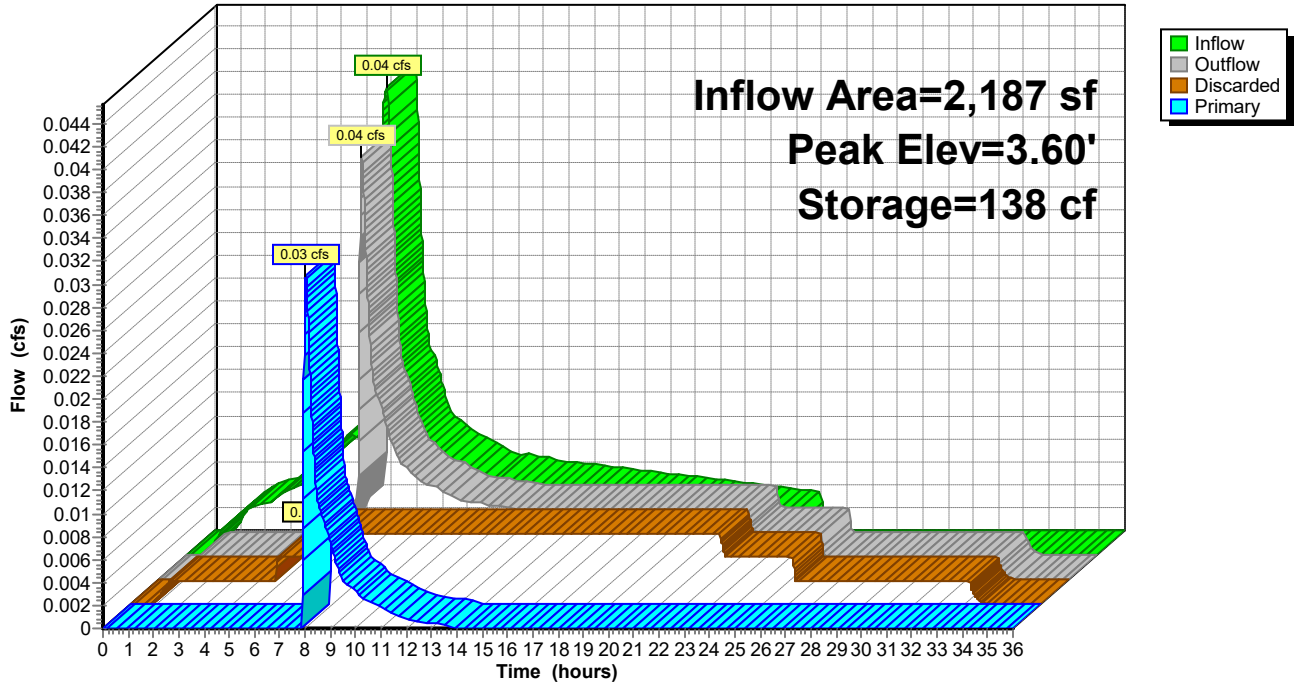
Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 49

Pond P1: Street Planter 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 50

Summary for Pond P2: Street Planter 2

Inflow Area = 5,524 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.10 cfs @ 7.90 hrs, Volume= 1,504 cf
 Outflow = 0.10 cfs @ 7.91 hrs, Volume= 1,504 cf, Atten= 0%, Lag= 0.7 min
 Discarded = 0.01 cfs @ 4.23 hrs, Volume= 585 cf
 Primary = 0.10 cfs @ 7.91 hrs, Volume= 918 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.57' @ 7.91 hrs Surf.Area= 258 sf Storage= 133 cf

Plug-Flow detention time= 127.0 min calculated for 1,504 cf (100% of inflow)
 Center-of-Mass det. time= 127.0 min (790.8 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 52 cf | 5.00'W x 17.20'L x 1.50'H Rock 129 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 5.00'W x 17.20'L x 1.50'H Growing Medium 129 cf Overall x 25.0% Voids |
| #3 | 3.00' | 86 cf | 5.00'W x 17.20'L x 1.00'H Ponding |
| | | 170 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 4.23 hrs HW=3.00' (Free Discharge)

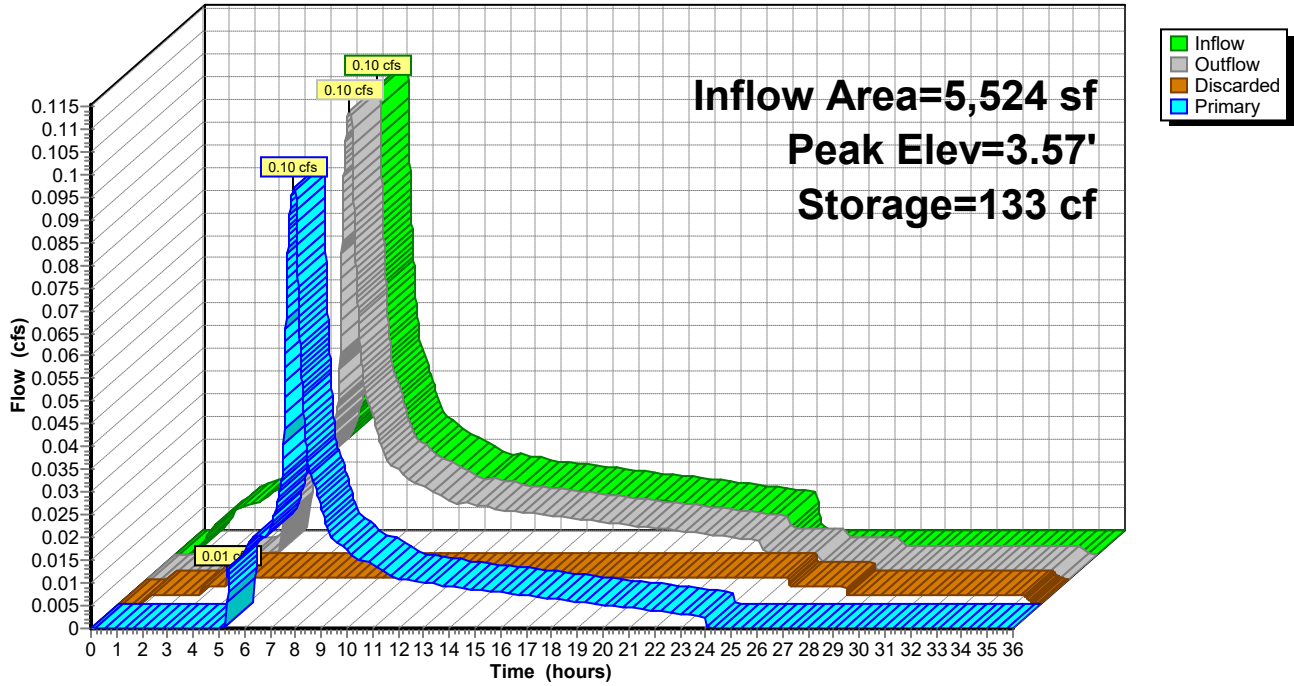
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.09 cfs @ 7.91 hrs HW=3.57' (Free Discharge)

↑**2=Overflow Orifice** (Weir Controls 0.09 cfs @ 0.86 fps)

Pond P2: Street Planter 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 10-YR Rainfall=3.50"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 52

Summary for Pond P3: Street Planter 3

Inflow Area = 1,774 sf, 100.00% Impervious, Inflow Depth = 3.27" for 10-YR event
 Inflow = 0.03 cfs @ 7.90 hrs, Volume= 483 cf
 Outflow = 0.01 cfs @ 8.17 hrs, Volume= 483 cf, Atten= 75%, Lag= 16.4 min
 Discarded = 0.01 cfs @ 8.17 hrs, Volume= 483 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.14' @ 9.38 hrs Surf.Area= 363 sf Storage= 135 cf

Plug-Flow detention time= 256.8 min calculated for 483 cf (100% of inflow)
 Center-of-Mass det. time= 256.8 min (920.7 - 663.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 73 cf | 5.00'W x 24.20'L x 1.50'H Rock 182 cf Overall x 40.0% Voids |
| #2 | 1.50' | 45 cf | 5.00'W x 24.20'L x 1.50'H Growing Medium 182 cf Overall x 25.0% Voids |
| #3 | 3.00' | 121 cf | 5.00'W x 24.20'L x 1.00'H Ponding |
| | | 239 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 8.17 hrs HW=3.00' (Free Discharge)

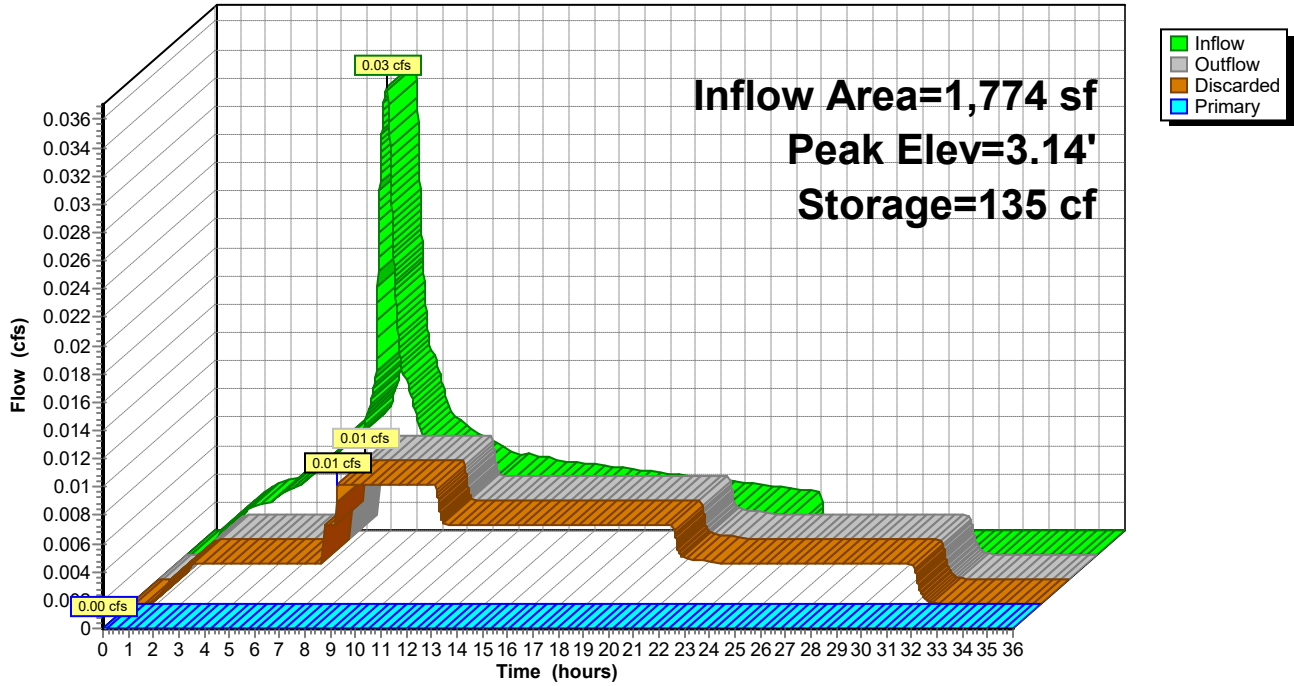
↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

Pond P3: Street Planter 3

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 10-YR Rainfall=3.50"

Printed 1/31/2023

Page 54

Summary for Pond P4: 18" Detention Pipe

[92] Warning: Device #2 is above defined storage

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

Inflow Area = 10,961 sf, 100.00% Impervious, Inflow Depth = 1.55" for 10-YR event
Inflow = 0.15 cfs @ 8.00 hrs, Volume= 1,414 cf
Outflow = 0.10 cfs @ 8.20 hrs, Volume= 1,414 cf, Atten= 35%, Lag= 11.8 min
Primary = 0.10 cfs @ 8.20 hrs, Volume= 1,414 cf
Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 0.87' @ 8.20 hrs Surf.Area= 148 sf Storage= 106 cf

Plug-Flow detention time= 5.7 min calculated for 1,414 cf (100% of inflow)
Center-of-Mass det. time= 5.7 min (656.8 - 651.0)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 177 cf | 18.0" Round Pipe Storage L= 100.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 2.0" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 2.20' | 2.0" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |
| #3 | Primary | 2.80' | 12.0" Vert. Overflow C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.10 cfs @ 8.20 hrs HW=0.87' (Free Discharge)

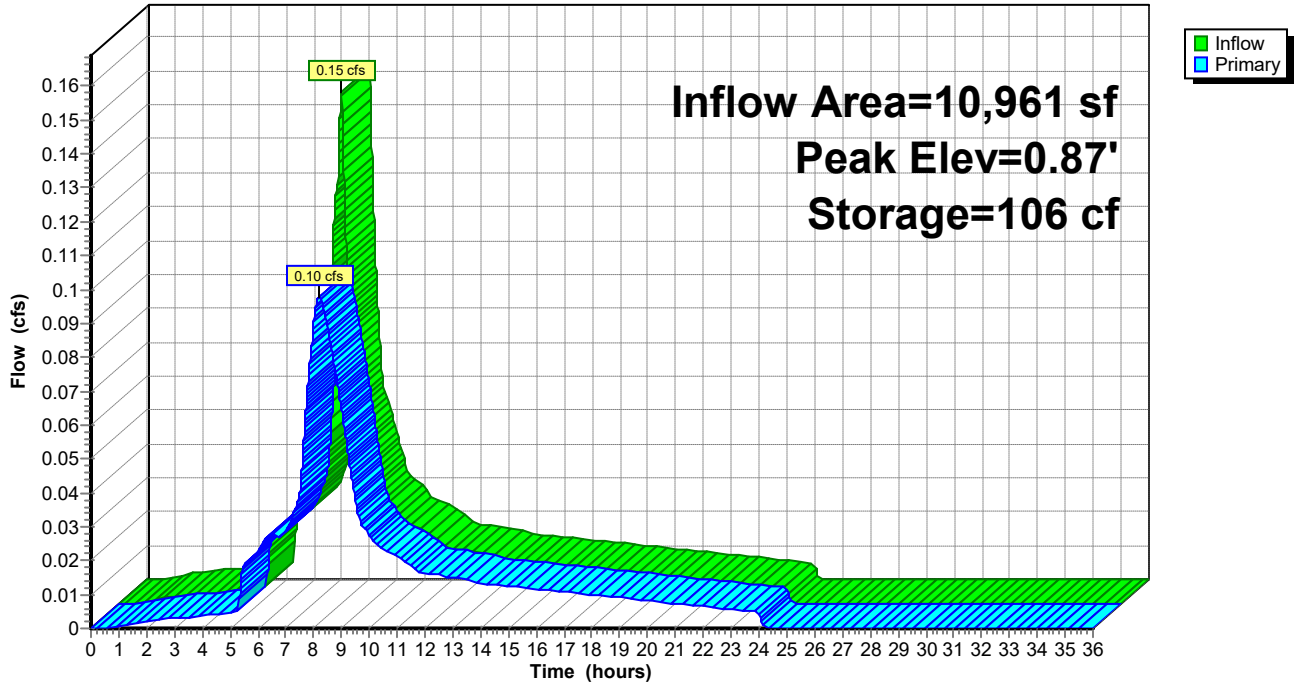
1=Control Orifice (Orifice Controls 0.10 cfs @ 4.49 fps)

2=Upper Orifice (Controls 0.00 cfs)

3=Overflow (Controls 0.00 cfs)

Pond P4: 18" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 56

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment -PRE: Existing Site Runoff Area=29,153 sf 0.00% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=84/0 Runoff=0.39 cfs 5,760 cf

Subcatchment 11S: BASIN 6-SHARED DWY Runoff Area=2,584 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.06 cfs 811 cf

Subcatchment 12S: BASIN 5-AC ROAD Runoff Area=6,214 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.13 cfs 1,950 cf

Subcatchment 13S: BASIN 7-Curb Return Runoff Area=1,476 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 463 cf

Subcatchment B1: BASIN 1-AC ROAD Runoff Area=2,187 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.05 cfs 686 cf

Subcatchment B2: BASIN 2-AC Road West Runoff Area=5,524 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.12 cfs 1,733 cf

Subcatchment B3: BASIN 3-AC Road Runoff Area=1,774 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.04 cfs 557 cf

Subcatchment B4: BASIN 4-Lots 1-4 Roof Runoff Area=9,394 sf 100.00% Impervious Runoff Depth=3.77"
Tc=6.0 min CN=0/98 Runoff=0.20 cfs 2,947 cf

Reach -POST: Peak Flows from Post-Developed Site Inflow=0.38 cfs 5,408 cf
Outflow=0.38 cfs 5,408 cf

Pond 1P: 36" Detention Pipe Peak Elev=2.77' Storage=511 cf Inflow=0.20 cfs 2,947 cf
Outflow=0.12 cfs 2,947 cf

Pond 11P: Raingarden 1 Peak Elev=3.70' Storage=418 cf Inflow=0.13 cfs 1,950 cf
Discarded=0.02 cfs 1,517 cf Primary=0.11 cfs 432 cf Outflow=0.13 cfs 1,950 cf

Pond 13P: Raingarden 2 Peak Elev=3.63' Storage=135 cf Inflow=0.06 cfs 811 cf
Discarded=0.01 cfs 541 cf Primary=0.05 cfs 270 cf Outflow=0.06 cfs 811 cf

Pond P1: Street Planter 1 Peak Elev=3.62' Storage=139 cf Inflow=0.05 cfs 686 cf
Discarded=0.01 cfs 532 cf Primary=0.04 cfs 155 cf Outflow=0.05 cfs 686 cf

Pond P2: Street Planter 2 Peak Elev=3.58' Storage=133 cf Inflow=0.12 cfs 1,733 cf
Discarded=0.01 cfs 592 cf Primary=0.11 cfs 1,141 cf Outflow=0.12 cfs 1,733 cf

Pond P3: Street Planter 3 Peak Elev=3.41' Storage=167 cf Inflow=0.04 cfs 557 cf
Discarded=0.01 cfs 557 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 557 cf

Pond P4: 18" Detention Pipe Peak Elev=1.19' Storage=151 cf Inflow=0.18 cfs 1,758 cf
Outflow=0.11 cfs 1,758 cf

E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 57

Total Runoff Area = 58,306 sf Runoff Volume = 14,907 cf Average Runoff Depth = 3.07"
50.00% Pervious = 29,153 sf 50.00% Impervious = 29,153 sf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 58

Summary for Subcatchment -PRE: Existing Site

Runoff = 0.39 cfs @ 7.96 hrs, Volume= 5,760 cf, Depth= 2.37"

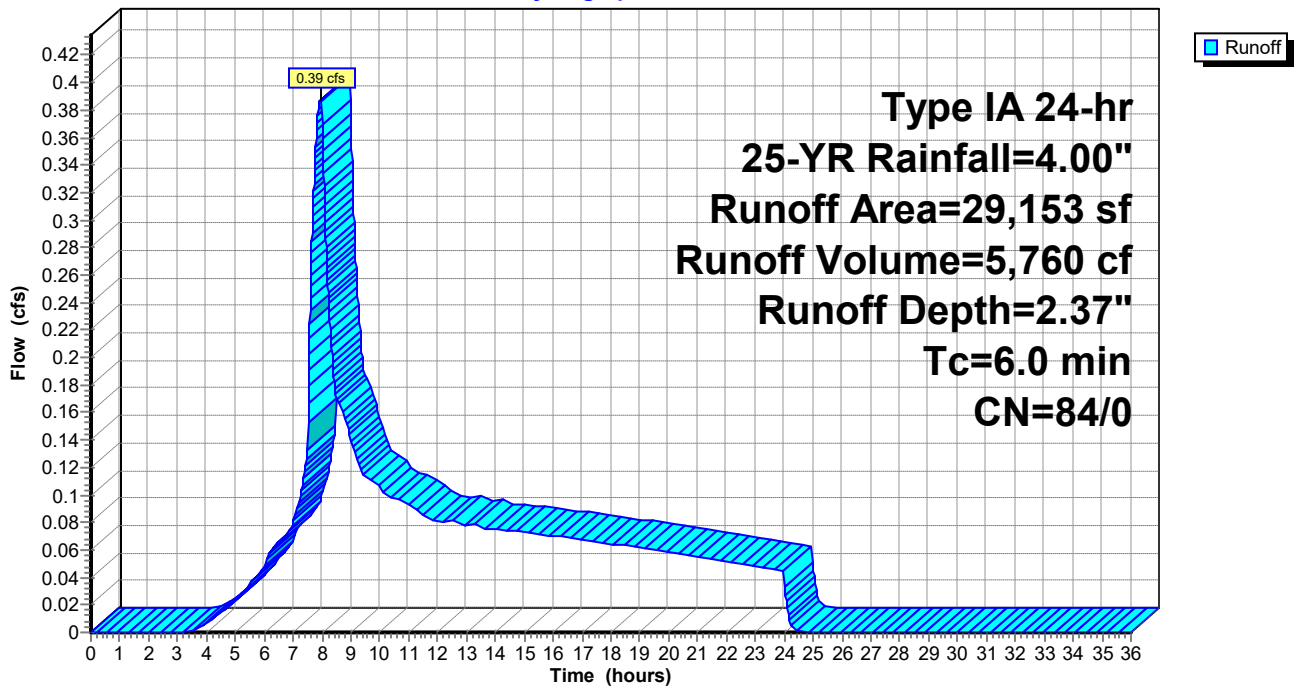
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|---------------------------------|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D |
| 29,153 | 84 | 100.00% Pervious Area |

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

Subcatchment -PRE: Existing Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 59

Summary for Subcatchment 11S: BASIN 6-SHARED DWY

Runoff = 0.06 cfs @ 7.90 hrs, Volume= 811 cf, Depth= 3.77"
Routed to Pond 13P : Raingarden 2

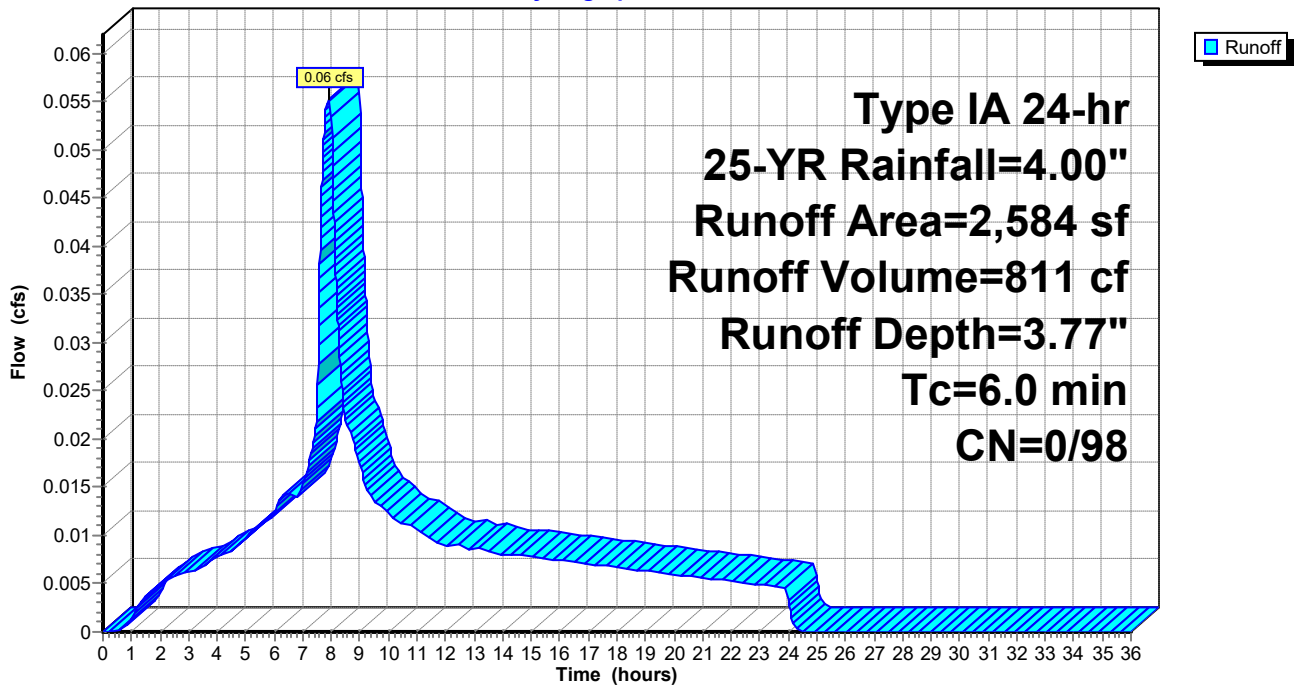
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 2,584 | 98 | Paved parking, HSG D |
| 2,584 | 98 | 100.00% Impervious Area |

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

Subcatchment 11S: BASIN 6-SHARED DWY

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 60

Summary for Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Runoff = 0.13 cfs @ 7.90 hrs, Volume= 1,950 cf, Depth= 3.77"

Routed to Pond 11P : Raingarden 1

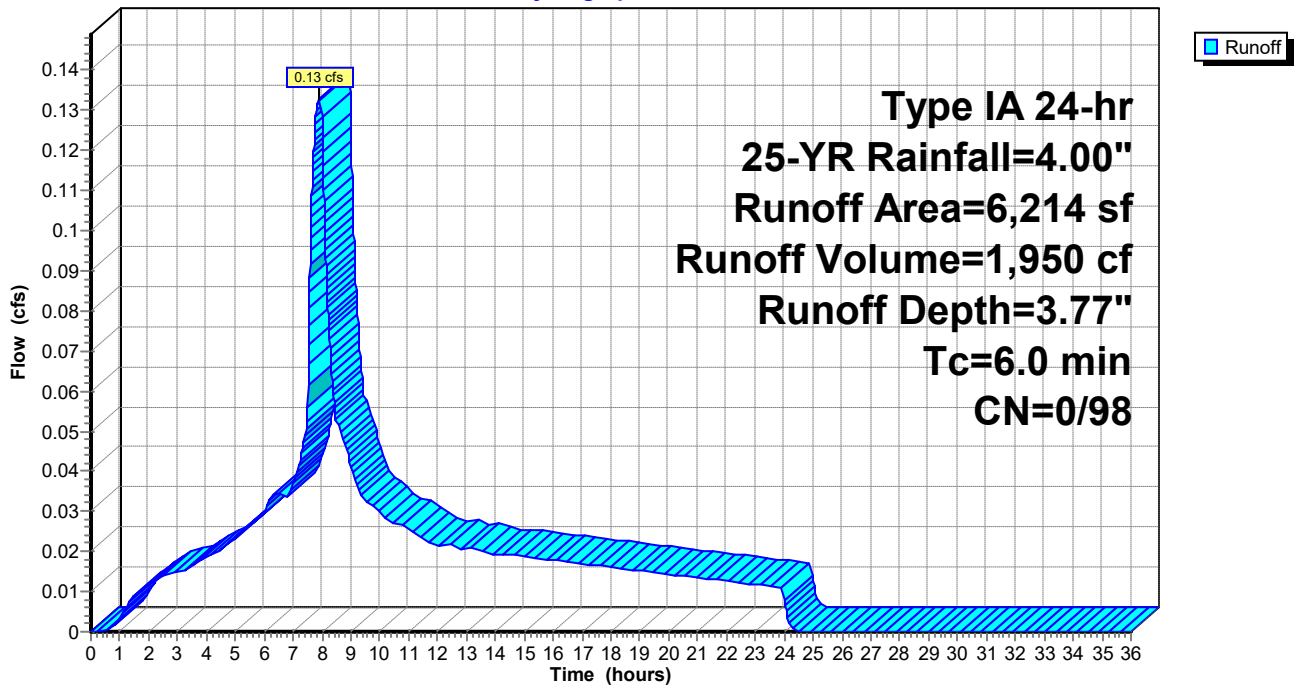
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 25-YR Rainfall=4.00"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------------------|
| * | 4,040 | 98 | AC |
| | 2,174 | 98 | Paved roads w/curbs & sewers, HSG D |
| | 6,214 | 98 | Weighted Average |
| | 6,214 | 98 | 100.00% Impervious Area |

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

Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 61

Summary for Subcatchment 13S: BASIN 7-Curb Return

Runoff = 0.03 cfs @ 7.90 hrs, Volume= 463 cf, Depth= 3.77"

Routed to Pond P4 : 18" Detention Pipe

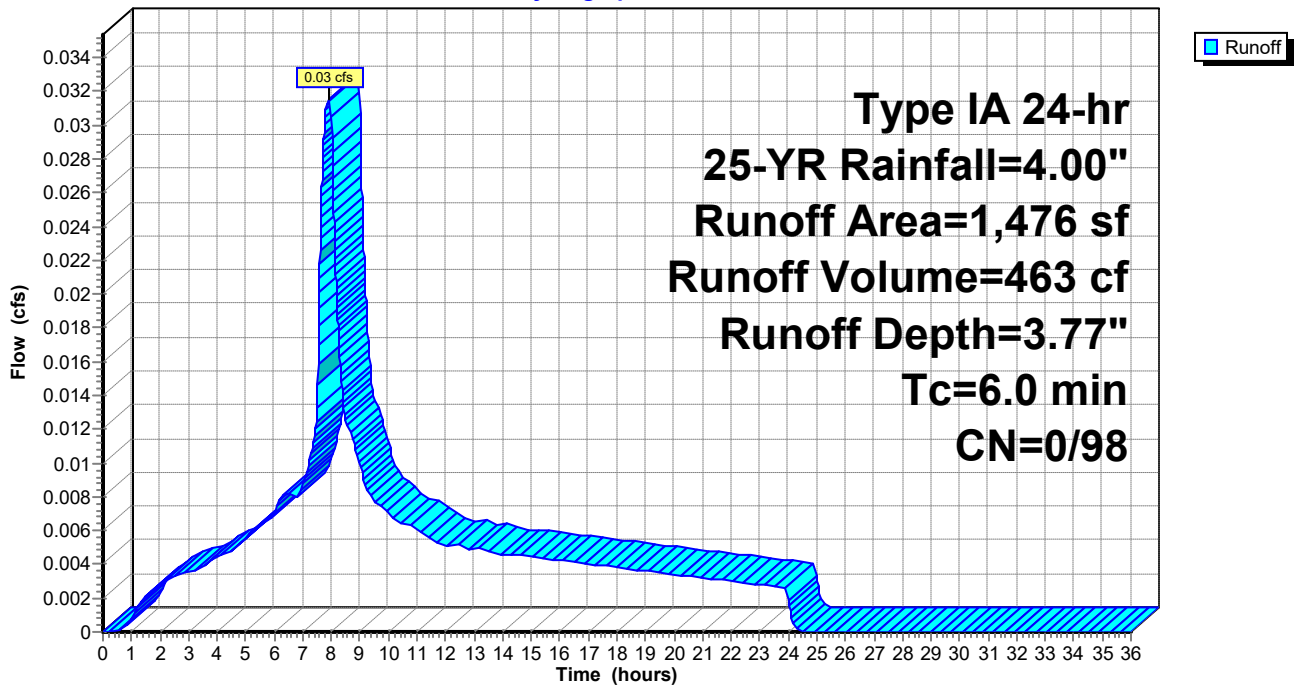
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------------|
| 1,476 | 98 | Paved roads w/curbs & sewers, HSG D |
| 1,476 | 98 | 100.00% Impervious Area |

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

Subcatchment 13S: BASIN 7-Curb Return

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 62

Summary for Subcatchment B1: BASIN 1-AC ROAD EAST

Runoff = 0.05 cfs @ 7.90 hrs, Volume= 686 cf, Depth= 3.77"
Routed to Pond P1 : Street Planter 1

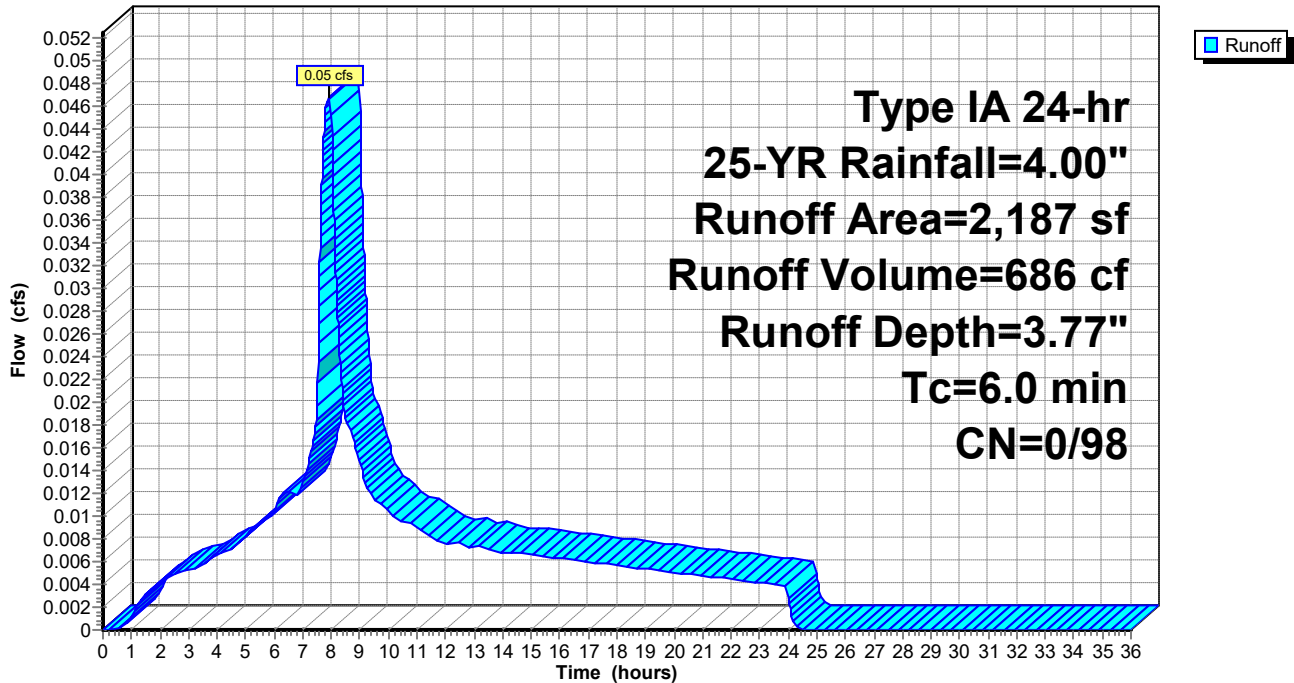
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------|
| * | 2,187 | 98 | AC |
| | 2,187 | 98 | 100.00% Impervious Area |

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

Subcatchment B1: BASIN 1-AC ROAD EAST

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 63

Summary for Subcatchment B2: BASIN 2-AC Road West

Runoff = 0.12 cfs @ 7.90 hrs, Volume= 1,733 cf, Depth= 3.77"
Routed to Pond P2 : Street Planter 2

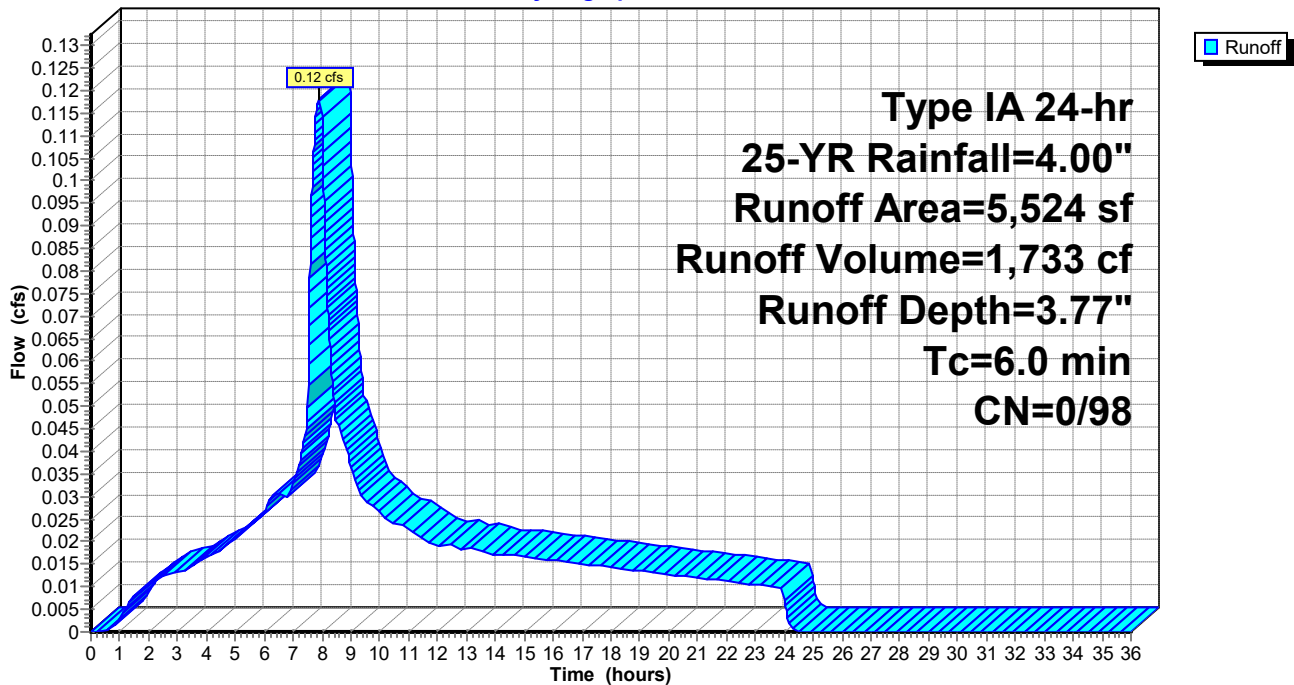
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 5,524 | 98 | Public Impervious |
| 5,524 | 98 | 100.00% Impervious Area |

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

Subcatchment B2: BASIN 2-AC Road West

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 64

Summary for Subcatchment B3: BASIN 3-AC Road Southeast

Runoff = 0.04 cfs @ 7.90 hrs, Volume= 557 cf, Depth= 3.77"
Routed to Pond P3 : Street Planter 3

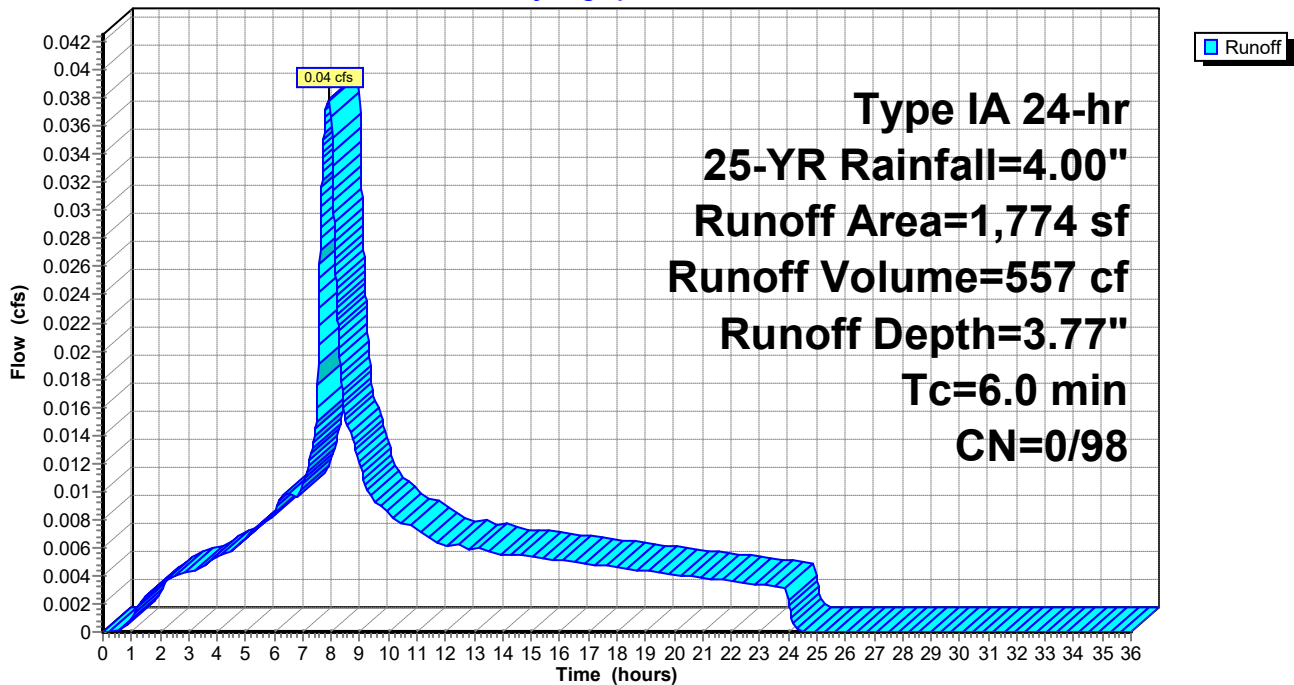
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 1,774 | 98 | Public Impervious |
| 1,774 | 98 | 100.00% Impervious Area |

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

Subcatchment B3: BASIN 3-AC Road Southeast

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 65

Summary for Subcatchment B4: BASIN 4-Lots 1-4 Roof

Runoff = 0.20 cfs @ 7.90 hrs, Volume= 2,947 cf, Depth= 3.77"
 Routed to Pond 1P : 36" Detention Pipe

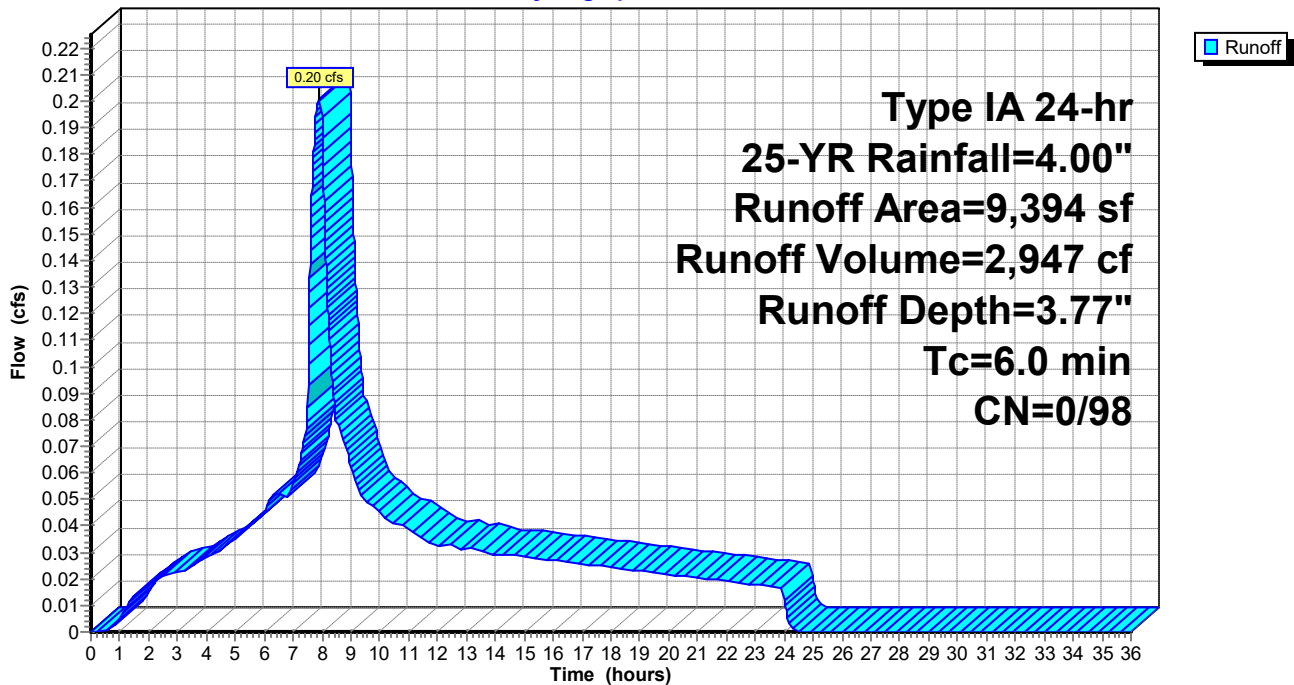
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr 25-YR Rainfall=4.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 9,394 | 98 | Roof Area |
| 9,394 | 98 | 100.00% Impervious Area |

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

Subcatchment B4: BASIN 4-Lots 1-4 Roof

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 66

Summary for Reach -POST: Peak Flows from Post-Developed Site

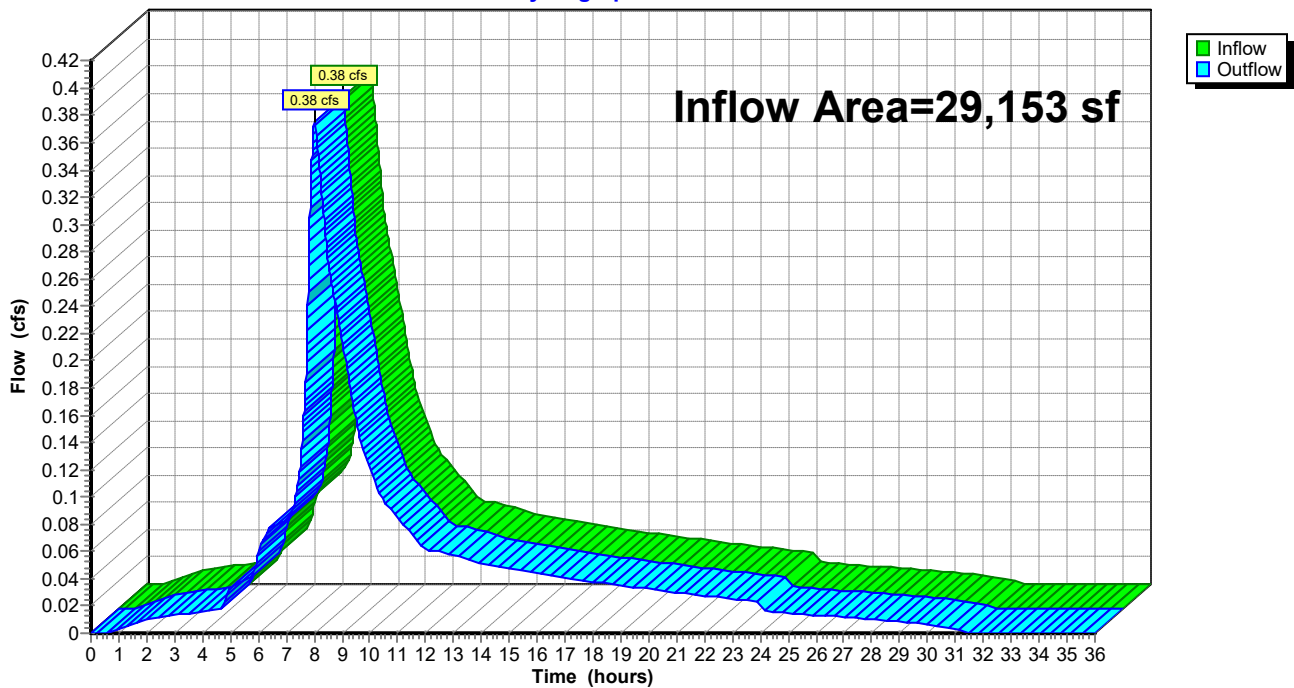
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 29,153 sf, 100.00% Impervious, Inflow Depth = 2.23" for 25-YR event
Inflow = 0.38 cfs @ 8.03 hrs, Volume= 5,408 cf
Outflow = 0.38 cfs @ 8.03 hrs, Volume= 5,408 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach -POST: Peak Flows from Post-Developed Site

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 67

Summary for Pond 1P: 36" Detention Pipe

Inflow Area = 9,394 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
 Inflow = 0.20 cfs @ 7.90 hrs, Volume= 2,947 cf
 Outflow = 0.12 cfs @ 8.22 hrs, Volume= 2,947 cf, Atten= 42%, Lag= 19.6 min
 Primary = 0.12 cfs @ 8.22 hrs, Volume= 2,947 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 2.77' @ 8.22 hrs Surf.Area= 120 sf Storage= 511 cf

Plug-Flow detention time= 136.1 min calculated for 2,947 cf (100% of inflow)
 Center-of-Mass det. time= 136.2 min (796.7 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 530 cf | 36.0" Round Pipe Storage L= 75.0' |

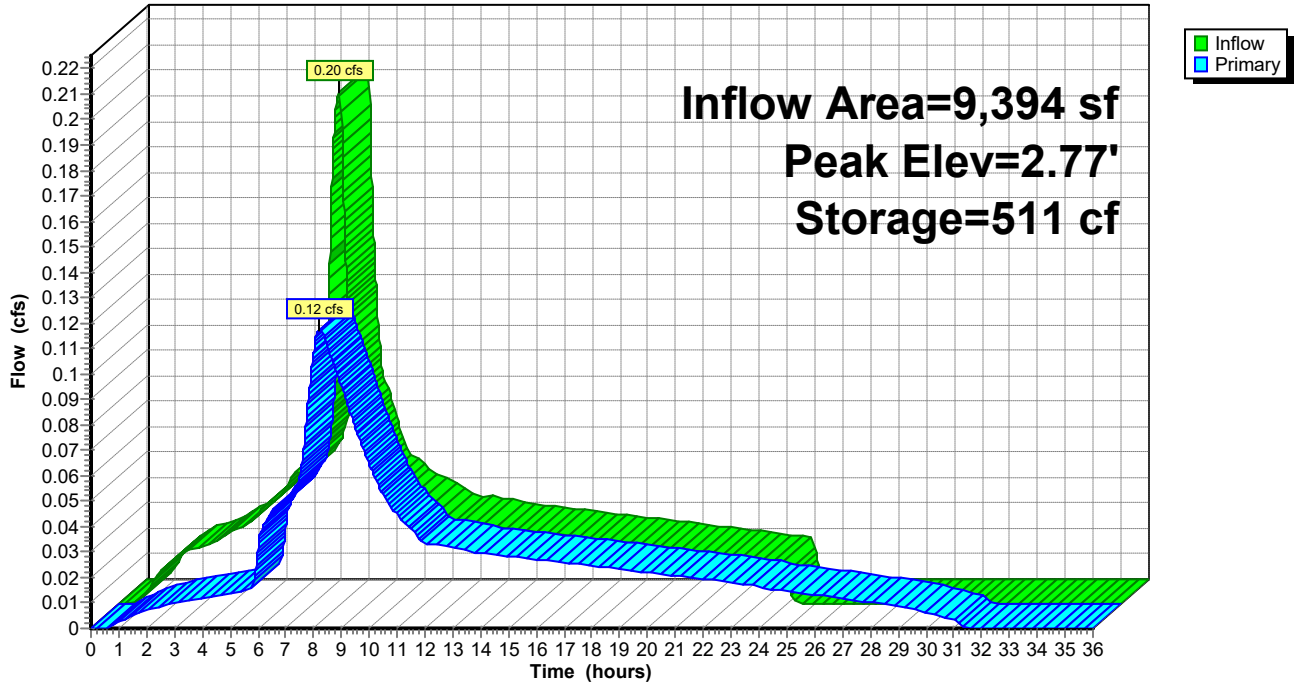
| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 0.7" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 1.50' | 1.8" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.12 cfs @ 8.22 hrs HW=2.77' (Free Discharge)

- 1=Control Orifice (Orifice Controls 0.02 cfs @ 8.01 fps)
- 2=Upper Orifice (Orifice Controls 0.10 cfs @ 5.42 fps)

Pond 1P: 36" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 69

Summary for Pond 11P: Raingarden 1

Inflow Area = 6,214 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
 Inflow = 0.13 cfs @ 7.90 hrs, Volume= 1,950 cf
 Outflow = 0.13 cfs @ 8.01 hrs, Volume= 1,950 cf, Atten= 5%, Lag= 6.9 min
 Discarded = 0.02 cfs @ 6.66 hrs, Volume= 1,517 cf
 Primary = 0.11 cfs @ 8.01 hrs, Volume= 432 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.70' @ 8.01 hrs Surf.Area= 750 sf Storage= 418 cf

Plug-Flow detention time= 242.5 min calculated for 1,949 cf (100% of inflow)
 Center-of-Mass det. time= 242.6 min (903.2 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 150 cf | 10.00'W x 25.00'L x 1.50'H Rock 375 cf Overall x 40.0% Voids |
| #2 | 1.50' | 94 cf | 10.00'W x 25.00'L x 1.50'H Growing Medium 375 cf Overall x 25.0% Voids |
| #3 | 3.00' | 250 cf | 10.00'W x 25.00'L x 1.00'H Ponding |
| | | 494 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.02 cfs @ 6.66 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.11 cfs @ 8.01 hrs HW=3.70' (Free Discharge)

↑2=**Overflow Orifice** (Orifice Controls 0.11 cfs @ 1.51 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

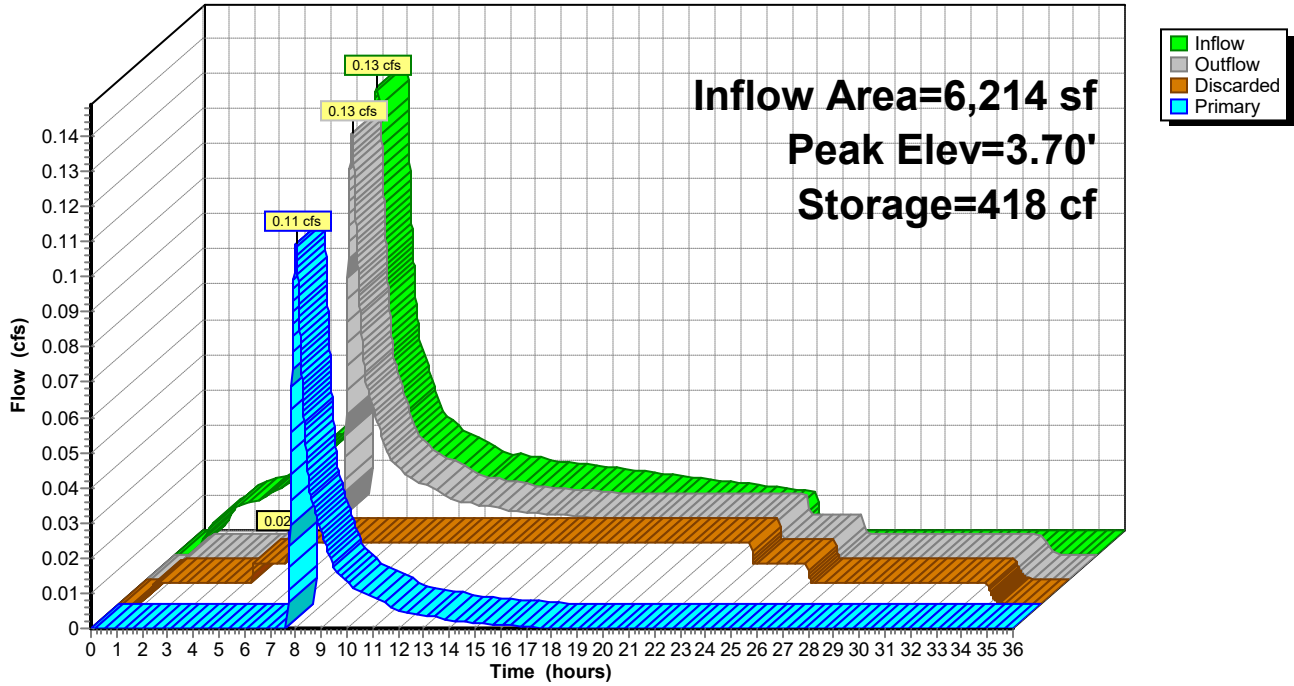
Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 70

Pond 11P: Raingarden 1

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 71

Summary for Pond 13P: Raingarden 2

Inflow Area = 2,584 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
Inflow = 0.06 cfs @ 7.90 hrs, Volume= 811 cf
Outflow = 0.06 cfs @ 7.93 hrs, Volume= 811 cf, Atten= 0%, Lag= 2.1 min
Discarded = 0.01 cfs @ 5.93 hrs, Volume= 541 cf
Primary = 0.05 cfs @ 7.93 hrs, Volume= 270 cf
Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 3.63' @ 7.93 hrs Surf.Area= 252 sf Storage= 135 cf

Plug-Flow detention time= 213.6 min calculated for 811 cf (100% of inflow)
Center-of-Mass det. time= 213.6 min (874.2 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 50 cf | 6.00'W x 14.00'L x 1.50'H Rock 126 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 6.00'W x 14.00'L x 1.50'H Growing Medium 126 cf Overall x 25.0% Voids |
| #3 | 3.00' | 84 cf | 6.00'W x 14.00'L x 1.00'H Ponding |
| | | 166 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 5.93 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.05 cfs @ 7.93 hrs HW=3.63' (Free Discharge)

↑2=**Overflow Orifice** (Orifice Controls 0.05 cfs @ 1.22 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

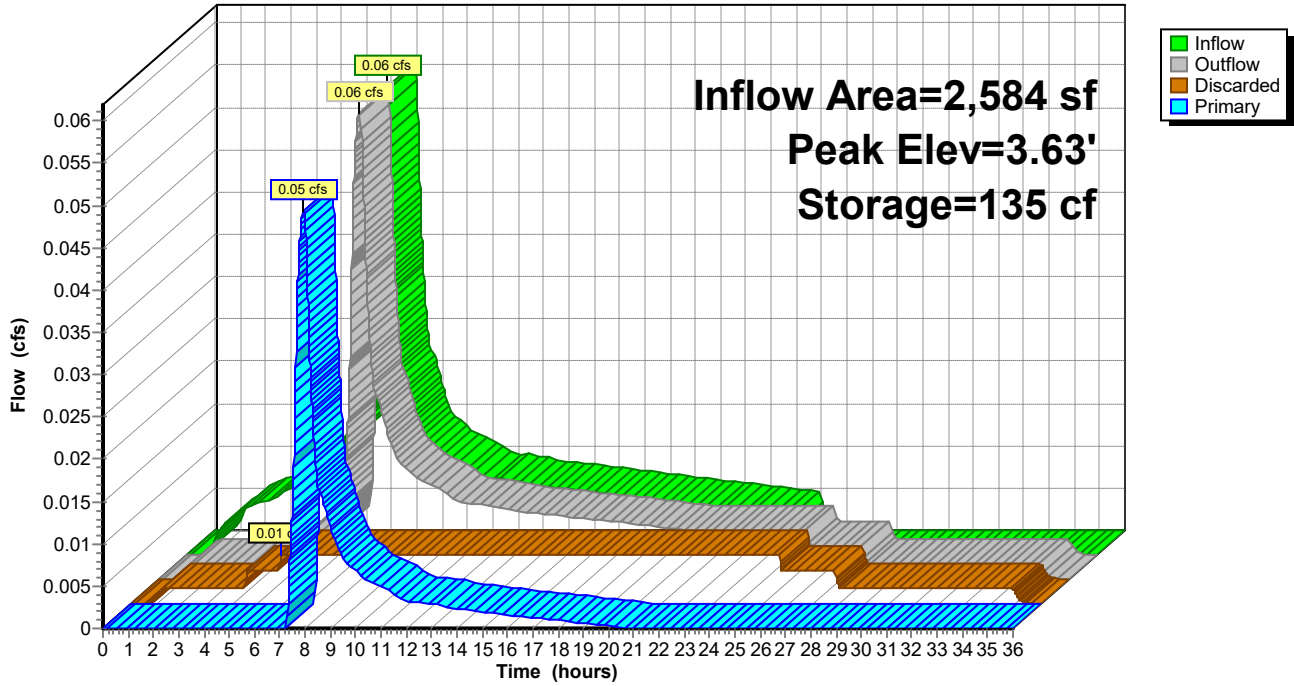
Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 72

Pond 13P: Raingarden 2

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 73

Summary for Pond P1: Street Planter 1

Inflow Area = 2,187 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
Inflow = 0.05 cfs @ 7.90 hrs, Volume= 686 cf
Outflow = 0.05 cfs @ 7.95 hrs, Volume= 686 cf, Atten= 1%, Lag= 3.2 min
Discarded = 0.01 cfs @ 6.64 hrs, Volume= 532 cf
Primary = 0.04 cfs @ 7.95 hrs, Volume= 155 cf
Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 3.62' @ 7.95 hrs Surf.Area= 263 sf Storage= 139 cf

Plug-Flow detention time= 240.0 min calculated for 686 cf (100% of inflow)
Center-of-Mass det. time= 240.0 min (900.5 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 53 cf | 5.00'W x 17.50'L x 1.50'H Rock 131 cf Overall x 40.0% Voids |
| #2 | 1.50' | 33 cf | 5.00'W x 17.50'L x 1.50'H Growing Medium 131 cf Overall x 25.0% Voids |
| #3 | 3.00' | 88 cf | 5.00'W x 17.50'L x 1.00'H Ponding |
| | | 173 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 6.64 hrs HW=3.00' (Free Discharge)
↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.04 cfs @ 7.95 hrs HW=3.62' (Free Discharge)
↑2=**Overflow Orifice** (Orifice Controls 0.04 cfs @ 1.16 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

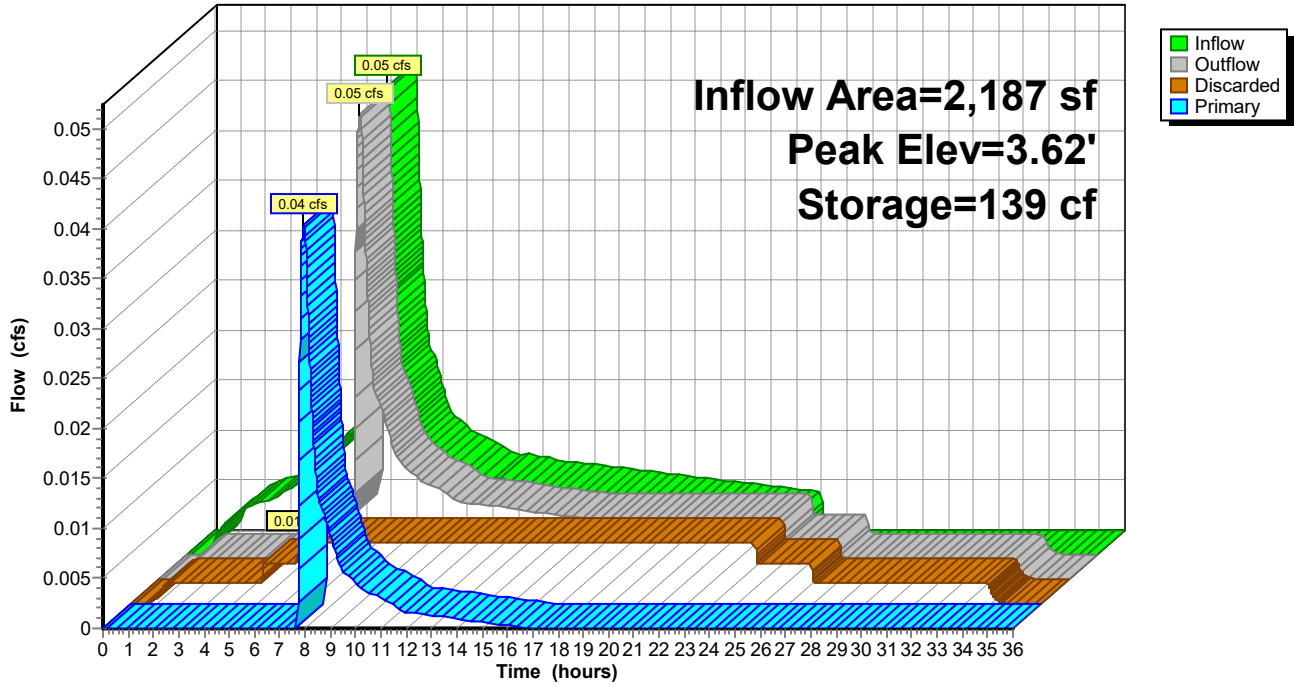
Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 74

Pond P1: Street Planter 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 75

Summary for Pond P2: Street Planter 2

Inflow Area = 5,524 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
 Inflow = 0.12 cfs @ 7.90 hrs, Volume= 1,733 cf
 Outflow = 0.12 cfs @ 7.91 hrs, Volume= 1,733 cf, Atten= 0%, Lag= 0.7 min
 Discarded = 0.01 cfs @ 3.76 hrs, Volume= 592 cf
 Primary = 0.11 cfs @ 7.91 hrs, Volume= 1,141 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.58' @ 7.91 hrs Surf.Area= 258 sf Storage= 133 cf

Plug-Flow detention time= 112.1 min calculated for 1,733 cf (100% of inflow)
 Center-of-Mass det. time= 112.1 min (772.7 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 52 cf | 5.00'W x 17.20'L x 1.50'H Rock 129 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 5.00'W x 17.20'L x 1.50'H Growing Medium 129 cf Overall x 25.0% Voids |
| #3 | 3.00' | 86 cf | 5.00'W x 17.20'L x 1.00'H Ponding |
| | | 170 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 3.76 hrs HW=3.00' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.11 cfs @ 7.91 hrs HW=3.58' (Free Discharge)
 ↑2=Overflow Orifice (Weir Controls 0.11 cfs @ 0.91 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

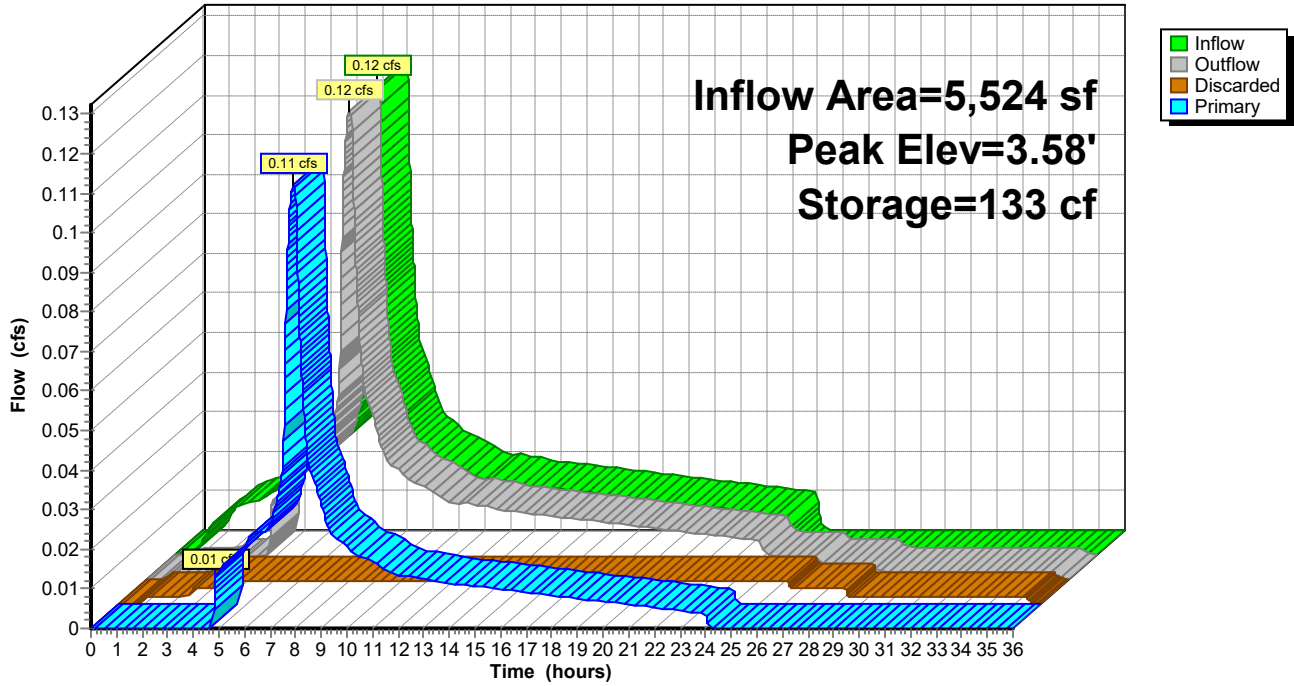
Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 76

Pond P2: Street Planter 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 77

Summary for Pond P3: Street Planter 3

Inflow Area = 1,774 sf, 100.00% Impervious, Inflow Depth = 3.77" for 25-YR event
 Inflow = 0.04 cfs @ 7.90 hrs, Volume= 557 cf
 Outflow = 0.01 cfs @ 7.91 hrs, Volume= 557 cf, Atten= 78%, Lag= 0.9 min
 Discarded = 0.01 cfs @ 7.91 hrs, Volume= 557 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.41' @ 10.04 hrs Surf.Area= 363 sf Storage= 167 cf

Plug-Flow detention time= 268.0 min calculated for 556 cf (100% of inflow)
 Center-of-Mass det. time= 268.0 min (928.6 - 660.5)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 73 cf | 5.00'W x 24.20'L x 1.50'H Rock 182 cf Overall x 40.0% Voids |
| #2 | 1.50' | 45 cf | 5.00'W x 24.20'L x 1.50'H Growing Medium 182 cf Overall x 25.0% Voids |
| #3 | 3.00' | 121 cf | 5.00'W x 24.20'L x 1.00'H Ponding |
| | | 239 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 7.91 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

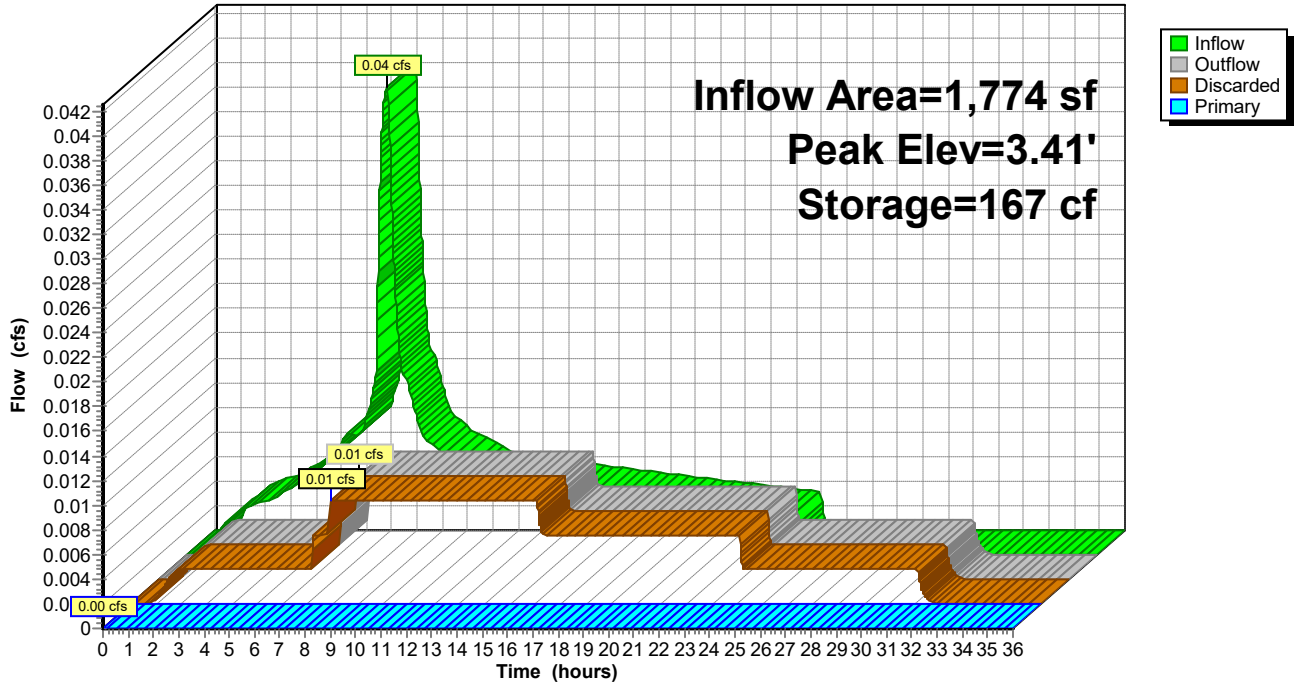
Type IA 24-hr 25-YR Rainfall=4.00"

Printed 1/31/2023

Page 78

Pond P3: Street Planter 3

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr 25-YR Rainfall=4.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 79

Summary for Pond P4: 18" Detention Pipe

[92] Warning: Device #2 is above defined storage

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

Inflow Area = 10,961 sf, 100.00% Impervious, Inflow Depth = 1.92" for 25-YR event
 Inflow = 0.18 cfs @ 7.92 hrs, Volume= 1,758 cf
 Outflow = 0.11 cfs @ 8.19 hrs, Volume= 1,758 cf, Atten= 38%, Lag= 16.2 min
 Primary = 0.11 cfs @ 8.19 hrs, Volume= 1,758 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.19' @ 8.19 hrs Surf.Area= 121 sf Storage= 151 cf

Plug-Flow detention time= 7.0 min calculated for 1,758 cf (100% of inflow)
 Center-of-Mass det. time= 7.0 min (657.0 - 650.0)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 177 cf | 18.0" Round Pipe Storage L= 100.0' |

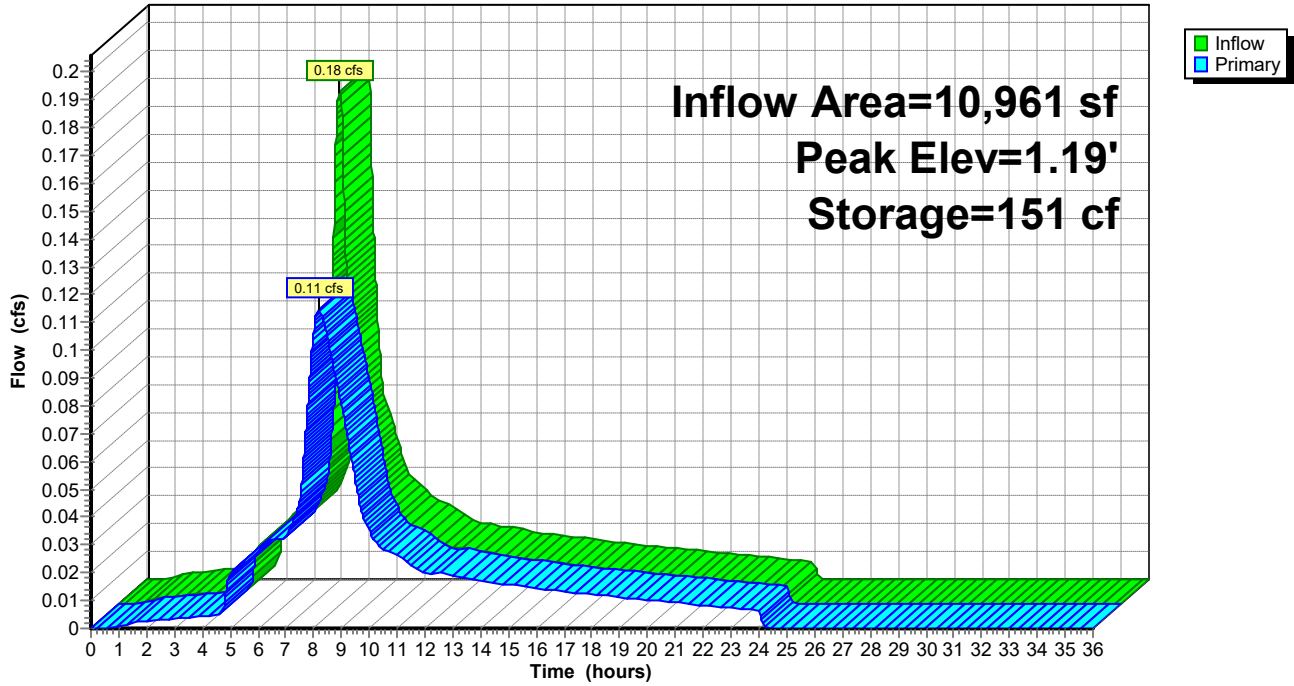
| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 2.0" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 2.20' | 2.0" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |
| #3 | Primary | 2.80' | 12.0" Vert. Overflow C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.11 cfs @ 8.19 hrs HW=1.19' (Free Discharge)

- 1=Control Orifice (Orifice Controls 0.11 cfs @ 5.26 fps)
- 2=Upper Orifice (Controls 0.00 cfs)
- 3=Overflow (Controls 0.00 cfs)

Pond P4: 18" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 81

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment -PRE: Existing Site Runoff Area=29,153 sf 0.00% Impervious Runoff Depth=0.27"
Tc=6.0 min CN=84/0 Runoff=0.02 cfs 661 cf

Subcatchment 11S: BASIN 6-SHARED DWY Runoff Area=2,584 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.02 cfs 223 cf

Subcatchment 12S: BASIN 5-AC ROAD Runoff Area=6,214 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.04 cfs 536 cf

Subcatchment 13S: BASIN 7-Curb Return Runoff Area=1,476 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 127 cf

Subcatchment B1: BASIN 1-AC ROAD Runoff Area=2,187 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 189 cf

Subcatchment B2: BASIN 2-AC Road West Runoff Area=5,524 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 476 cf

Subcatchment B3: BASIN 3-AC Road Runoff Area=1,774 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 153 cf

Subcatchment B4: BASIN 4-Lots 1-4 Roof Runoff Area=9,394 sf 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=0/98 Runoff=0.06 cfs 810 cf

Reach -POST: Peak Flows from Post-Developed Site Inflow=0.02 cfs 964 cf
Outflow=0.02 cfs 964 cf

Pond 1P: 36" Detention Pipe Peak Elev=1.15' Storage=187 cf Inflow=0.06 cfs 810 cf
Outflow=0.01 cfs 810 cf

Pond 11P: Raingarden 1 Peak Elev=1.48' Storage=148 cf Inflow=0.04 cfs 536 cf
Discarded=0.01 cfs 536 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 536 cf

Pond 13P: Raingarden 2 Peak Elev=1.68' Storage=54 cf Inflow=0.02 cfs 223 cf
Discarded=0.00 cfs 223 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 223 cf

Pond P1: Street Planter 1 Peak Elev=1.48' Storage=52 cf Inflow=0.01 cfs 189 cf
Discarded=0.00 cfs 189 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 189 cf

Pond P2: Street Planter 2 Peak Elev=3.51' Storage=128 cf Inflow=0.03 cfs 476 cf
Discarded=0.01 cfs 449 cf Primary=0.01 cfs 27 cf Outflow=0.01 cfs 476 cf

Pond P3: Street Planter 3 Peak Elev=0.49' Storage=24 cf Inflow=0.01 cfs 153 cf
Discarded=0.00 cfs 153 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 153 cf

Pond P4: 18" Detention Pipe Peak Elev=0.03' Storage=1 cf Inflow=0.01 cfs 154 cf
Outflow=0.01 cfs 154 cf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 82

Total Runoff Area = 58,306 sf Runoff Volume = 3,175 cf Average Runoff Depth = 0.65"
50.00% Pervious = 29,153 sf 50.00% Impervious = 29,153 sf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 83

Summary for Subcatchment -PRE: Existing Site

Runoff = 0.02 cfs @ 8.00 hrs, Volume= 661 cf, Depth= 0.27"

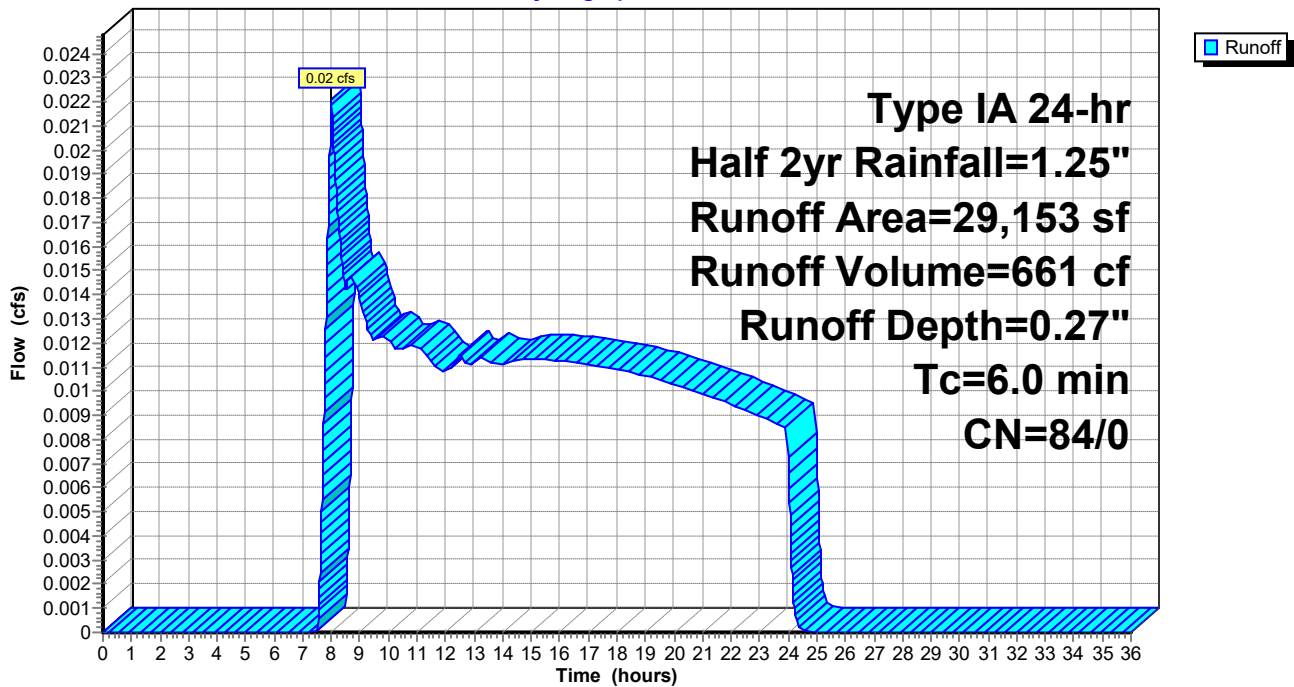
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|---------------------------------|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D |
| 29,153 | 84 | 100.00% Pervious Area |

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

Subcatchment -PRE: Existing Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 84

Summary for Subcatchment 11S: BASIN 6-SHARED DWY

Runoff = 0.02 cfs @ 7.91 hrs, Volume= 223 cf, Depth= 1.03"
Routed to Pond 13P : Raingarden 2

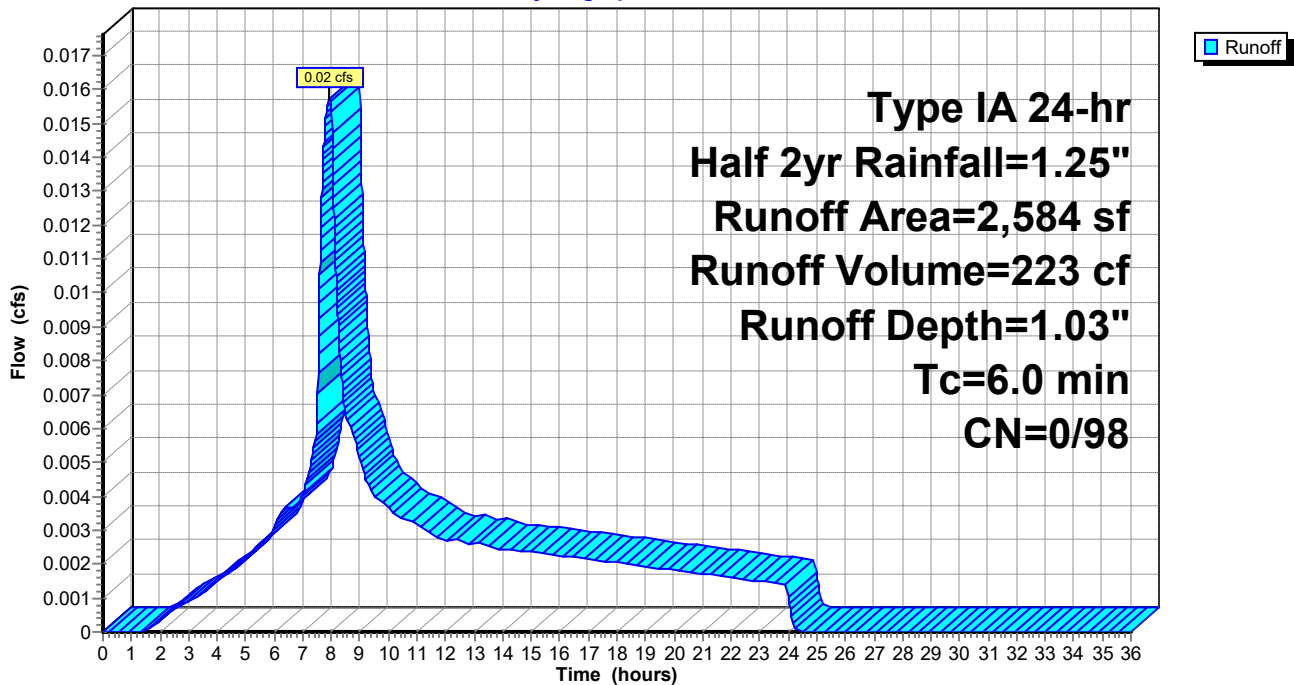
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 2,584 | 98 | Paved parking, HSG D |
| 2,584 | 98 | 100.00% Impervious Area |

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

Subcatchment 11S: BASIN 6-SHARED DWY

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 85

Summary for Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Runoff = 0.04 cfs @ 7.91 hrs, Volume= 536 cf, Depth= 1.03"

Routed to Pond 11P : Raingarden 1

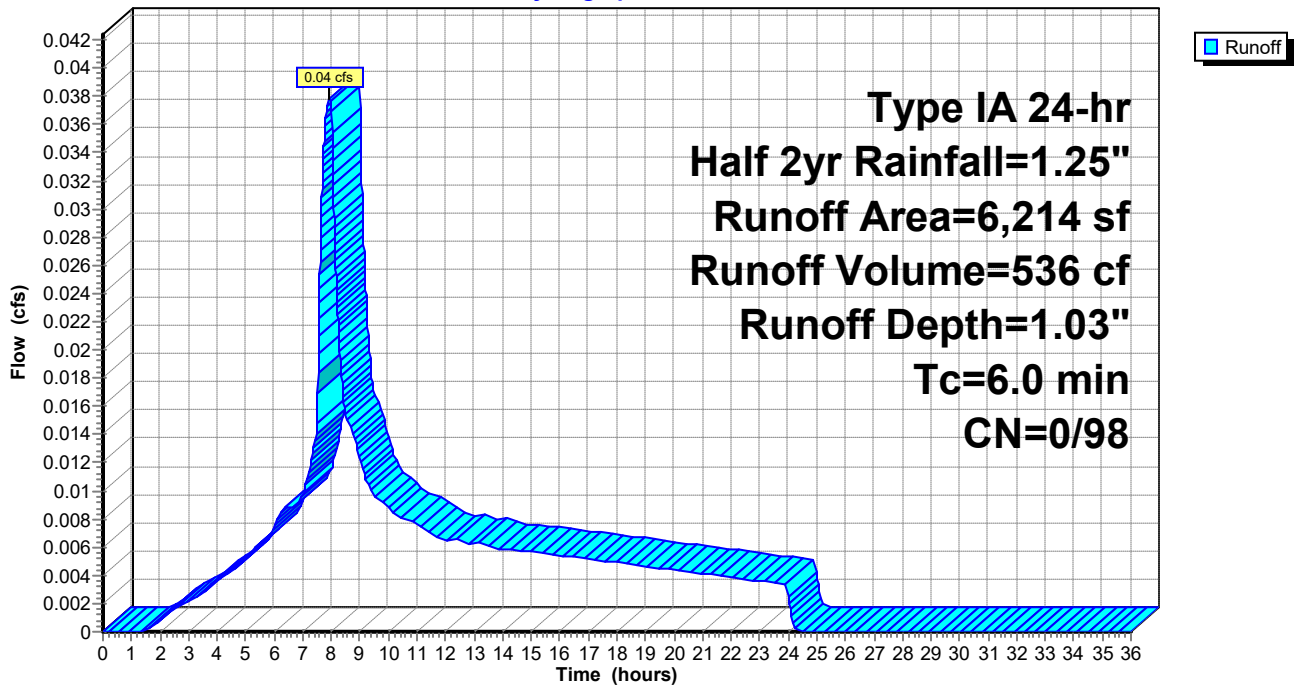
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr Half 2yr Rainfall=1.25"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------------------|
| * | 4,040 | 98 | AC |
| | 2,174 | 98 | Paved roads w/curbs & sewers, HSG D |
| | 6,214 | 98 | Weighted Average |
| | 6,214 | 98 | 100.00% Impervious Area |

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

Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 86

Summary for Subcatchment 13S: BASIN 7-Curb Return

Runoff = 0.01 cfs @ 7.91 hrs, Volume= 127 cf, Depth= 1.03"

Routed to Pond P4 : 18" Detention Pipe

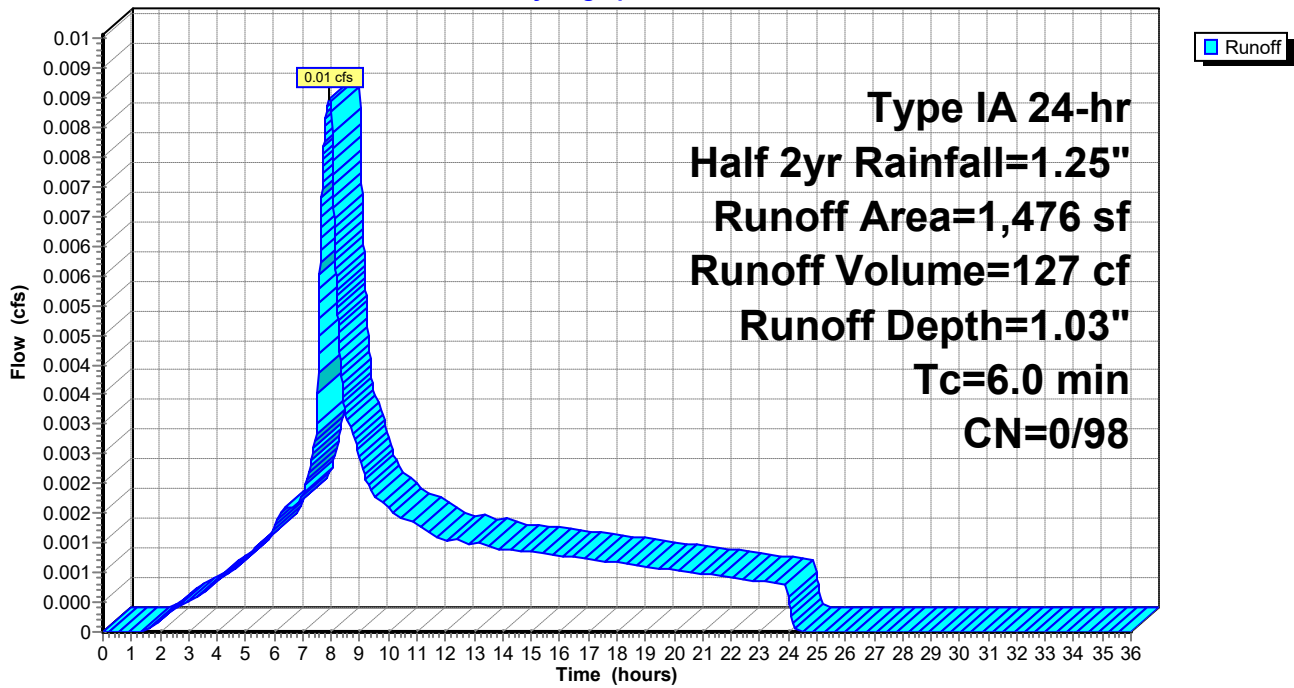
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------------|
| 1,476 | 98 | Paved roads w/curbs & sewers, HSG D |
| 1,476 | 98 | 100.00% Impervious Area |

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

Subcatchment 13S: BASIN 7-Curb Return

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 87

Summary for Subcatchment B1: BASIN 1-AC ROAD EAST

Runoff = 0.01 cfs @ 7.91 hrs, Volume= 189 cf, Depth= 1.03"
Routed to Pond P1 : Street Planter 1

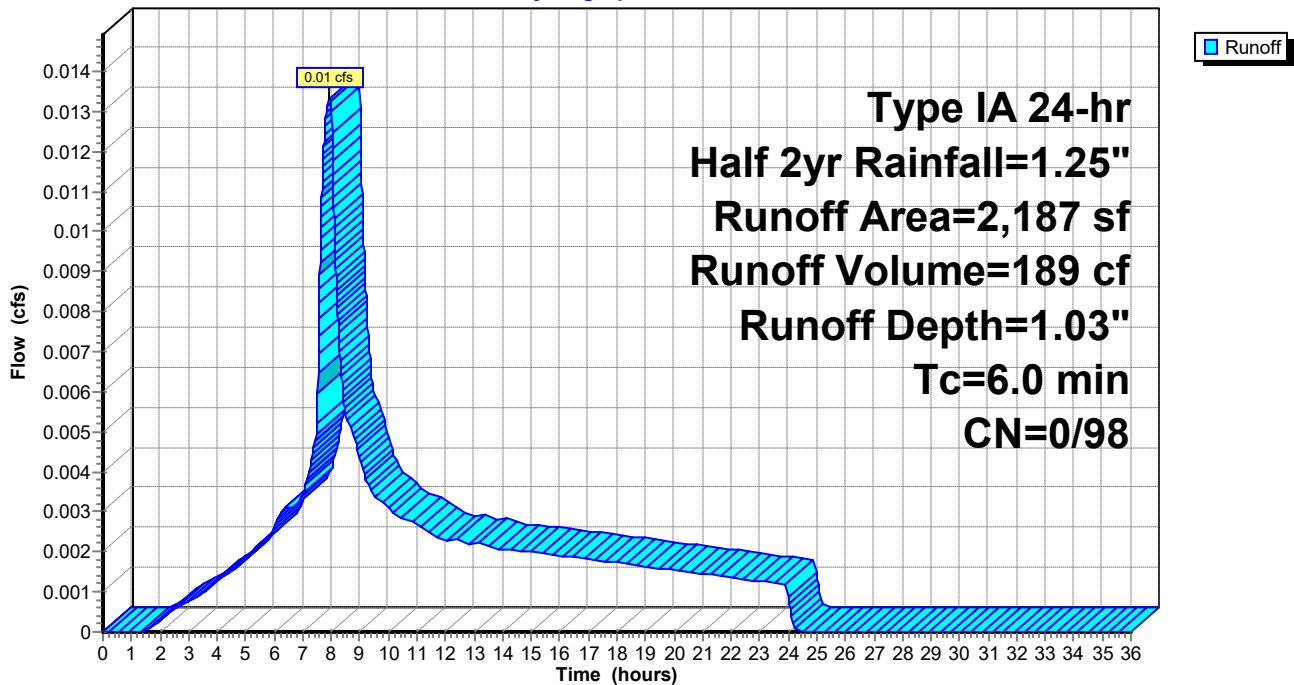
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 2,187 | 98 | AC |
| 2,187 | 98 | 100.00% Impervious Area |

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

Subcatchment B1: BASIN 1-AC ROAD EAST

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 88

Summary for Subcatchment B2: BASIN 2-AC Road West

Runoff = 0.03 cfs @ 7.91 hrs, Volume= 476 cf, Depth= 1.03"
 Routed to Pond P2 : Street Planter 2

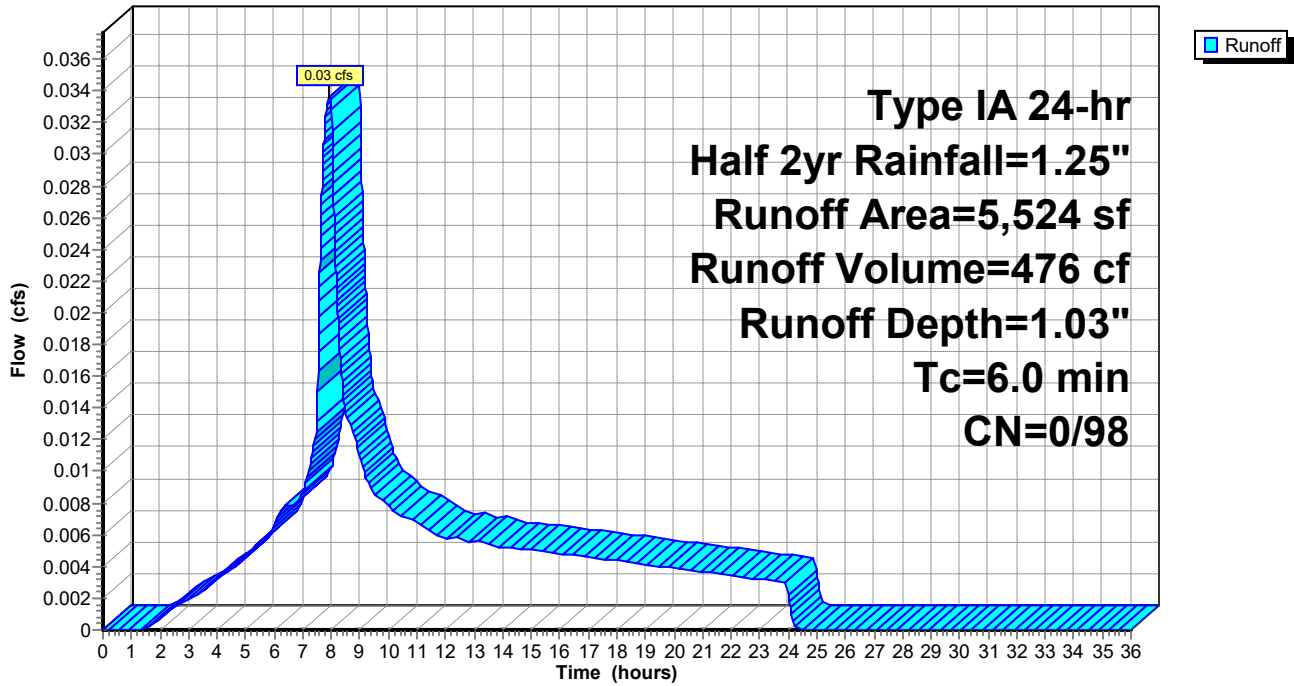
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 5,524 | 98 | Public Impervious |
| 5,524 | 98 | 100.00% Impervious Area |

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

Subcatchment B2: BASIN 2-AC Road West

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 89

Summary for Subcatchment B3: BASIN 3-AC Road Southeast

Runoff = 0.01 cfs @ 7.91 hrs, Volume= 153 cf, Depth= 1.03"
Routed to Pond P3 : Street Planter 3

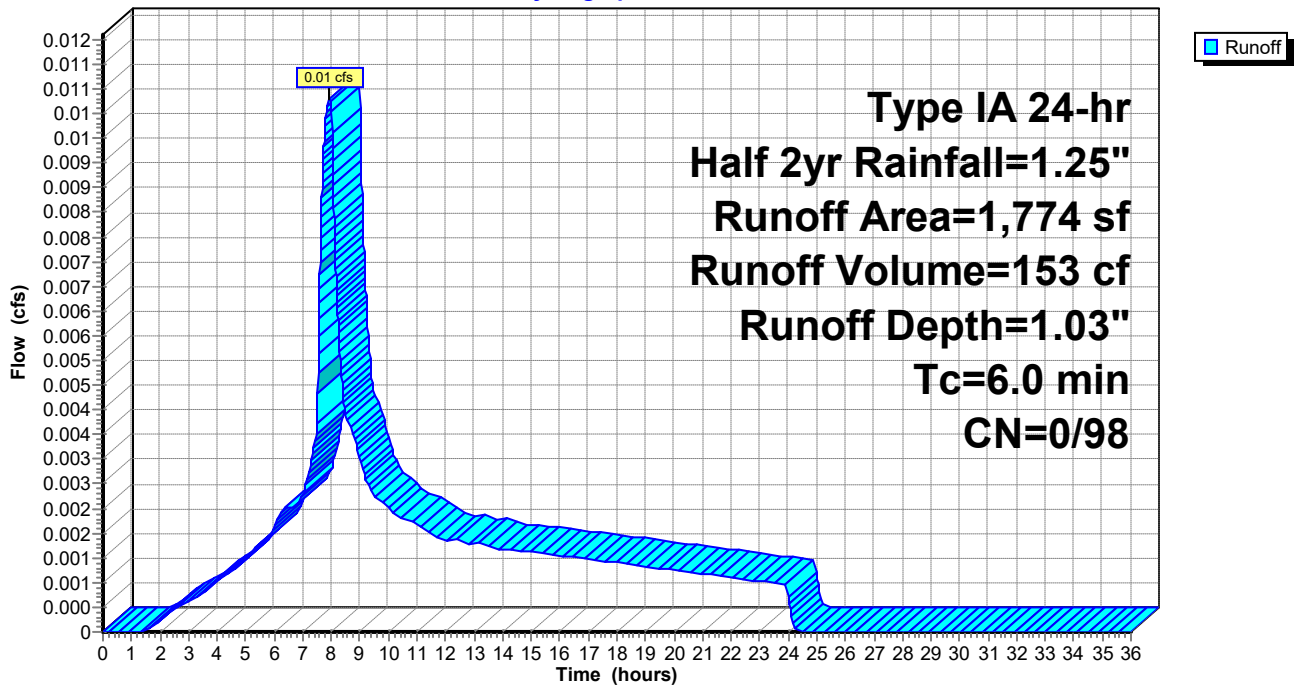
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 1,774 | 98 | Public Impervious |
| 1,774 | 98 | 100.00% Impervious Area |

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

Subcatchment B3: BASIN 3-AC Road Southeast

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 90

Summary for Subcatchment B4: BASIN 4-Lots 1-4 Roof

Runoff = 0.06 cfs @ 7.91 hrs, Volume= 810 cf, Depth= 1.03"

Routed to Pond 1P : 36" Detention Pipe

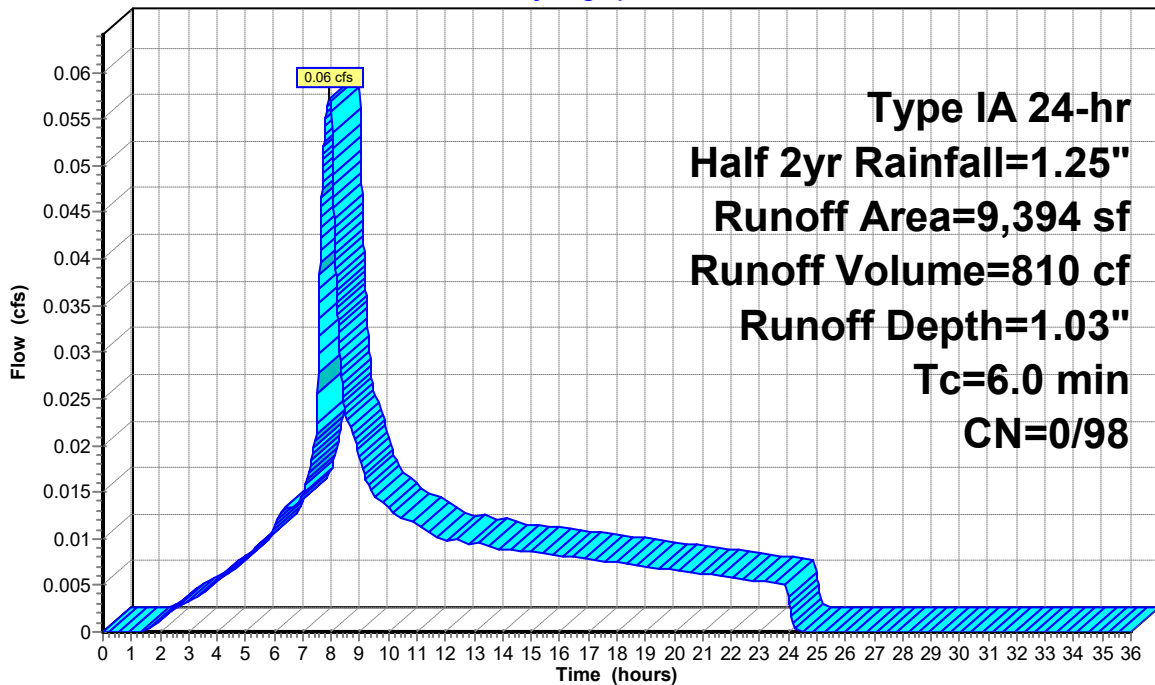
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Type IA 24-hr Half 2yr Rainfall=1.25"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 9,394 | 98 | Roof Area |
| 9,394 | 98 | 100.00% Impervious Area |

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

Subcatchment B4: BASIN 4-Lots 1-4 Roof

Hydrograph



Runoff

**Type IA 24-hr
 Half 2yr Rainfall=1.25"
 Runoff Area=9,394 sf
 Runoff Volume=810 cf
 Runoff Depth=1.03"
 Tc=6.0 min
 CN=0/98**

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 91

Summary for Reach -POST: Peak Flows from Post-Developed Site

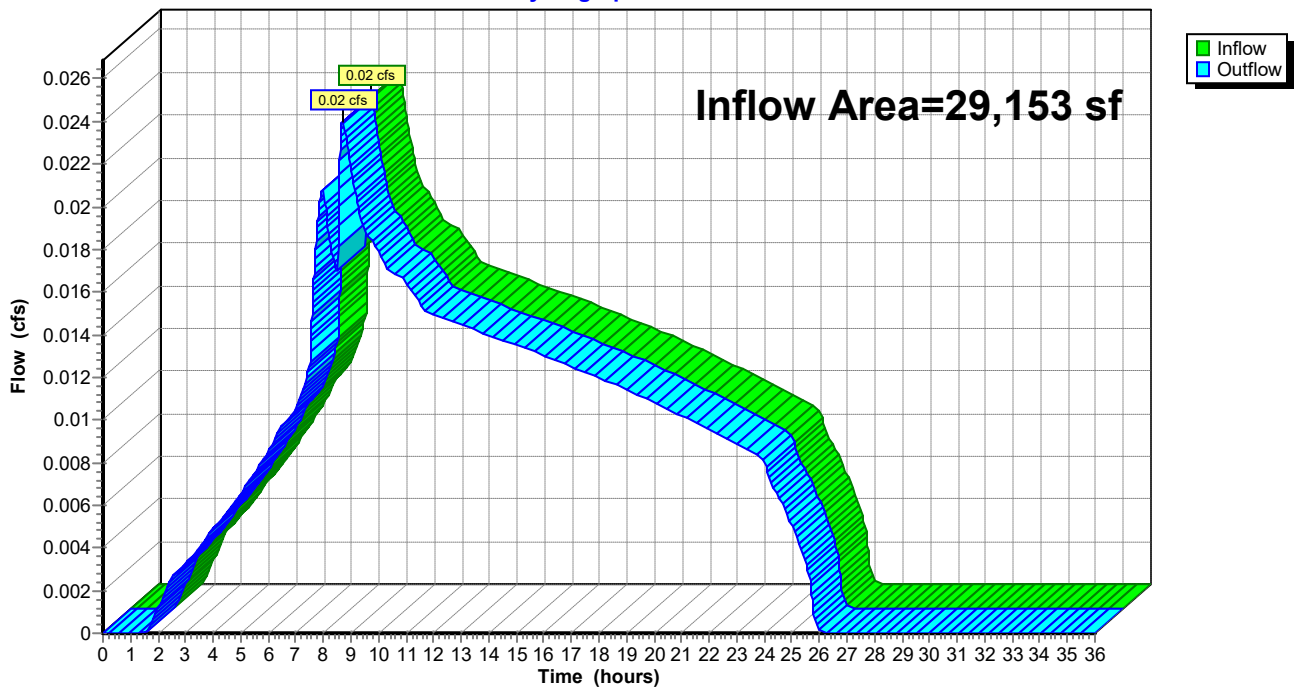
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 29,153 sf, 100.00% Impervious, Inflow Depth = 0.40" for Half 2yr event
Inflow = 0.02 cfs @ 8.70 hrs, Volume= 964 cf
Outflow = 0.02 cfs @ 8.70 hrs, Volume= 964 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach -POST: Peak Flows from Post-Developed Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 92

Summary for Pond 1P: 36" Detention Pipe

Inflow Area = 9,394 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
Inflow = 0.06 cfs @ 7.91 hrs, Volume= 810 cf
Outflow = 0.01 cfs @ 9.87 hrs, Volume= 810 cf, Atten= 76%, Lag= 117.7 min
Primary = 0.01 cfs @ 9.87 hrs, Volume= 810 cf
Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 1.15' @ 9.87 hrs Surf.Area= 219 sf Storage= 187 cf

Plug-Flow detention time= 151.2 min calculated for 810 cf (100% of inflow)
Center-of-Mass det. time= 151.1 min (853.0 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 530 cf | 36.0" Round Pipe Storage L= 75.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 0.7" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 1.50' | 1.8" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.01 cfs @ 9.87 hrs HW=1.15' (Free Discharge)

↑ **1=Control Orifice** (Orifice Controls 0.01 cfs @ 5.16 fps)

└ **2=Upper Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

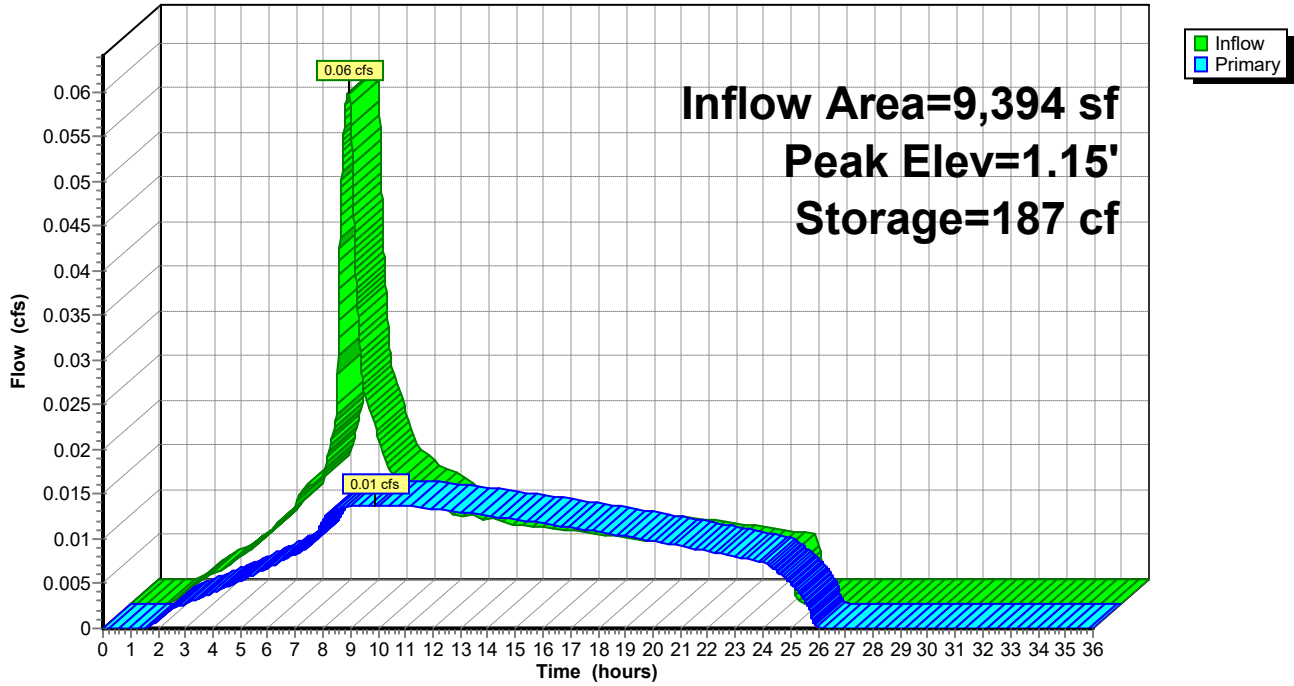
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 93

Pond 1P: 36" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 94

Summary for Pond 11P: Raingarden 1

Inflow Area = 6,214 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
 Inflow = 0.04 cfs @ 7.91 hrs, Volume= 536 cf
 Outflow = 0.01 cfs @ 12.53 hrs, Volume= 536 cf, Atten= 83%, Lag= 277.2 min
 Discarded = 0.01 cfs @ 12.53 hrs, Volume= 536 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.48' @ 12.53 hrs Surf.Area= 250 sf Storage= 148 cf

Plug-Flow detention time= 280.0 min calculated for 536 cf (100% of inflow)
 Center-of-Mass det. time= 280.0 min (981.8 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 150 cf | 10.00'W x 25.00'L x 1.50'H Rock 375 cf Overall x 40.0% Voids |
| #2 | 1.50' | 94 cf | 10.00'W x 25.00'L x 1.50'H Growing Medium 375 cf Overall x 25.0% Voids |
| #3 | 3.00' | 250 cf | 10.00'W x 25.00'L x 1.00'H Ponding |
| | | 494 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 12.53 hrs HW=1.48' (Free Discharge)↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

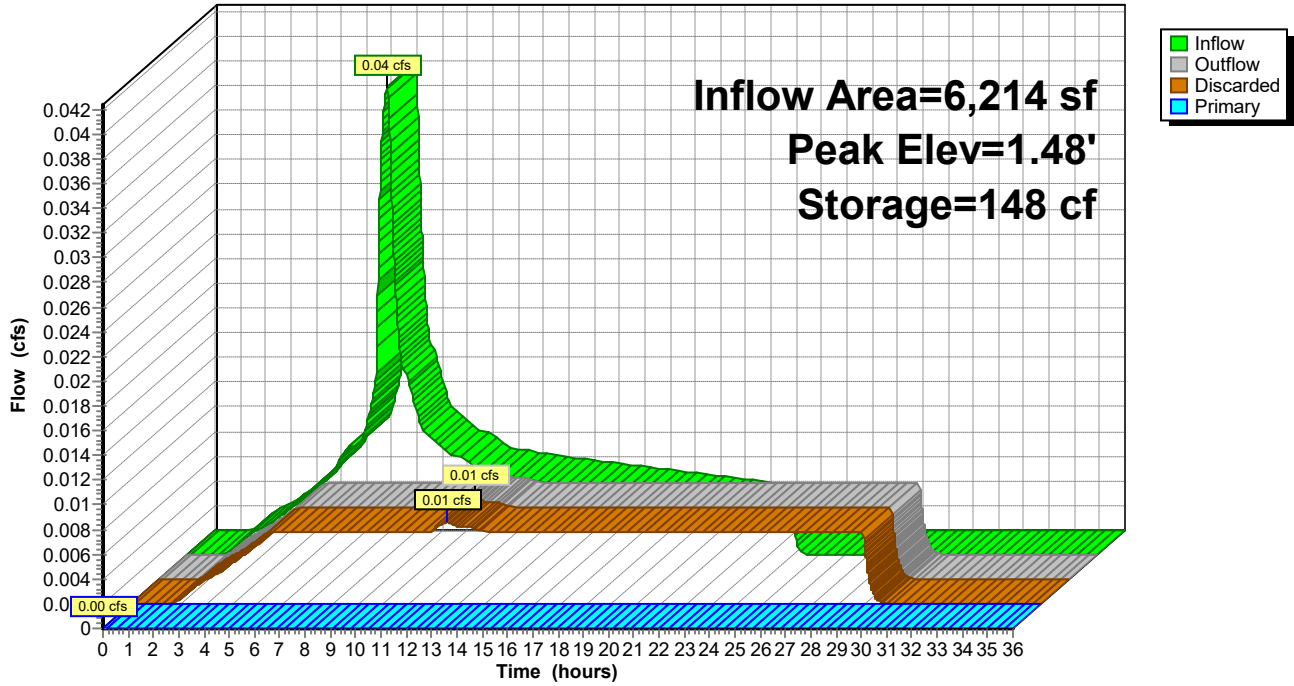
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 95

Pond 11P: Raingarden 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 96

Summary for Pond 13P: Raingarden 2

Inflow Area = 2,584 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
 Inflow = 0.02 cfs @ 7.91 hrs, Volume= 223 cf
 Outflow = 0.00 cfs @ 8.59 hrs, Volume= 223 cf, Atten= 75%, Lag= 40.7 min
 Discarded = 0.00 cfs @ 8.59 hrs, Volume= 223 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.68' @ 9.75 hrs Surf.Area= 168 sf Storage= 54 cf

Plug-Flow detention time= 261.3 min calculated for 223 cf (100% of inflow)
 Center-of-Mass det. time= 261.3 min (963.1 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 50 cf | 6.00'W x 14.00'L x 1.50'H Rock 126 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 6.00'W x 14.00'L x 1.50'H Growing Medium 126 cf Overall x 25.0% Voids |
| #3 | 3.00' | 84 cf | 6.00'W x 14.00'L x 1.00'H Ponding |
| | | 166 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 8.59 hrs HW=1.50' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.00 cfs)

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

↑2=Overflow Orifice (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

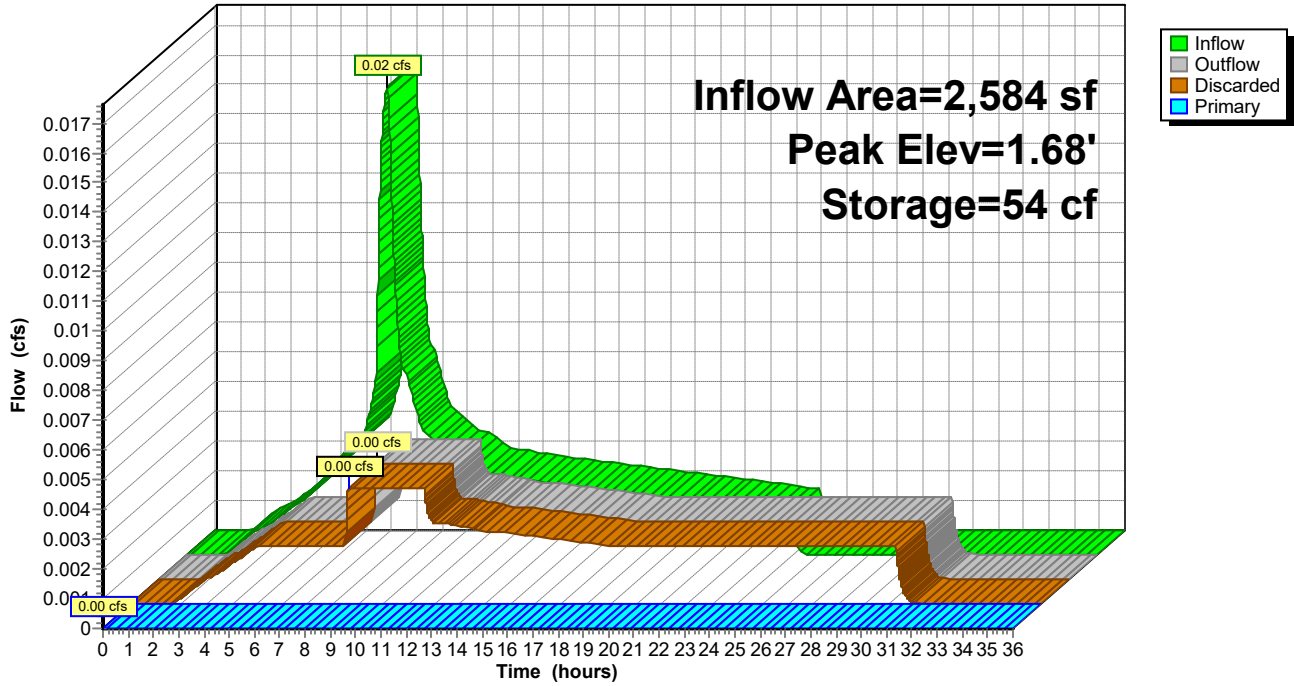
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 97

Pond 13P: Raingarden 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 98

Summary for Pond P1: Street Planter 1

Inflow Area = 2,187 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
 Inflow = 0.01 cfs @ 7.91 hrs, Volume= 189 cf
 Outflow = 0.00 cfs @ 11.70 hrs, Volume= 189 cf, Atten= 82%, Lag= 227.4 min
 Discarded = 0.00 cfs @ 11.70 hrs, Volume= 189 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.48' @ 11.70 hrs Surf.Area= 88 sf Storage= 52 cf

Plug-Flow detention time= 280.0 min calculated for 189 cf (100% of inflow)
 Center-of-Mass det. time= 280.0 min (981.9 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 53 cf | 5.00'W x 17.50'L x 1.50'H Rock 131 cf Overall x 40.0% Voids |
| #2 | 1.50' | 33 cf | 5.00'W x 17.50'L x 1.50'H Growing Medium 131 cf Overall x 25.0% Voids |
| #3 | 3.00' | 88 cf | 5.00'W x 17.50'L x 1.00'H Ponding |
| | | 173 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 11.70 hrs HW=1.48' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.00 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

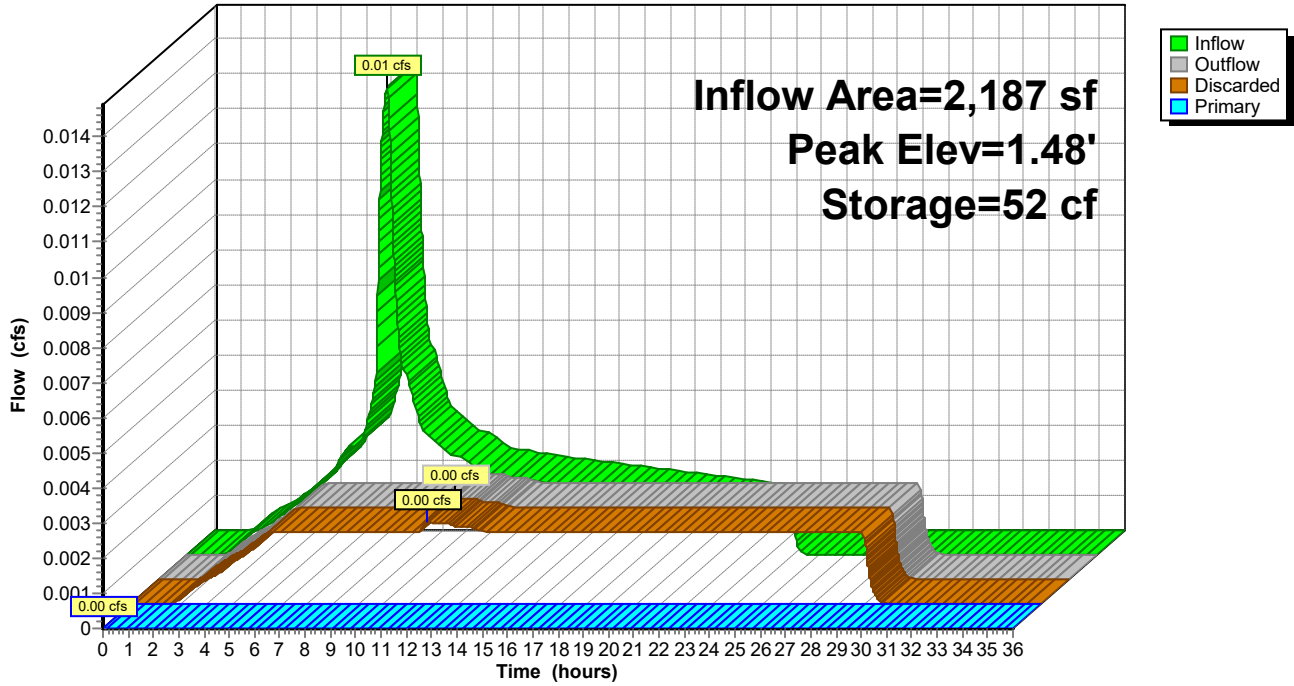
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 99

Pond P1: Street Planter 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 100

Summary for Pond P2: Street Planter 2

Inflow Area = 5,524 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
 Inflow = 0.03 cfs @ 7.91 hrs, Volume= 476 cf
 Outflow = 0.01 cfs @ 8.66 hrs, Volume= 476 cf, Atten= 61%, Lag= 44.9 min
 Discarded = 0.01 cfs @ 7.84 hrs, Volume= 449 cf
 Primary = 0.01 cfs @ 8.66 hrs, Volume= 27 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.51' @ 8.66 hrs Surf.Area= 258 sf Storage= 128 cf

Plug-Flow detention time= 274.1 min calculated for 476 cf (100% of inflow)
 Center-of-Mass det. time= 274.1 min (976.0 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 52 cf | 5.00'W x 17.20'L x 1.50'H Rock 129 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 5.00'W x 17.20'L x 1.50'H Growing Medium 129 cf Overall x 25.0% Voids |
| #3 | 3.00' | 86 cf | 5.00'W x 17.20'L x 1.00'H Ponding |
| | | 170 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 7.84 hrs HW=3.01' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 8.66 hrs HW=3.51' (Free Discharge)

↑2=Overflow Orifice (Weir Controls 0.00 cfs @ 0.32 fps)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

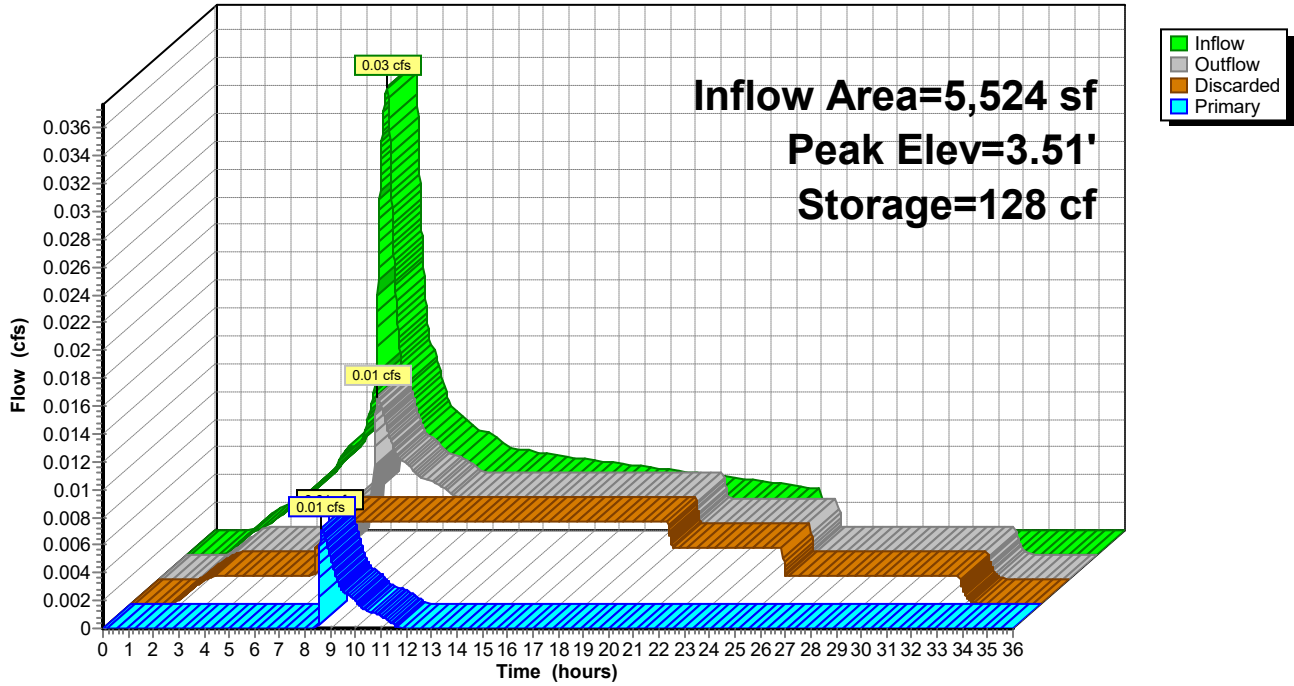
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 101

Pond P2: Street Planter 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr Half 2yr Rainfall=1.25"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 102

Summary for Pond P3: Street Planter 3

Inflow Area = 1,774 sf, 100.00% Impervious, Inflow Depth = 1.03" for Half 2yr event
 Inflow = 0.01 cfs @ 7.91 hrs, Volume= 153 cf
 Outflow = 0.00 cfs @ 7.16 hrs, Volume= 153 cf, Atten= 74%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 7.16 hrs, Volume= 153 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.49' @ 9.43 hrs Surf.Area= 121 sf Storage= 24 cf

Plug-Flow detention time= 58.6 min calculated for 153 cf (100% of inflow)
 Center-of-Mass det. time= 58.6 min (760.4 - 701.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 73 cf | 5.00'W x 24.20'L x 1.50'H Rock 182 cf Overall x 40.0% Voids |
| #2 | 1.50' | 45 cf | 5.00'W x 24.20'L x 1.50'H Growing Medium 182 cf Overall x 25.0% Voids |
| #3 | 3.00' | 121 cf | 5.00'W x 24.20'L x 1.00'H Ponding |
| | | 239 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 7.16 hrs HW=0.04' (Free Discharge)

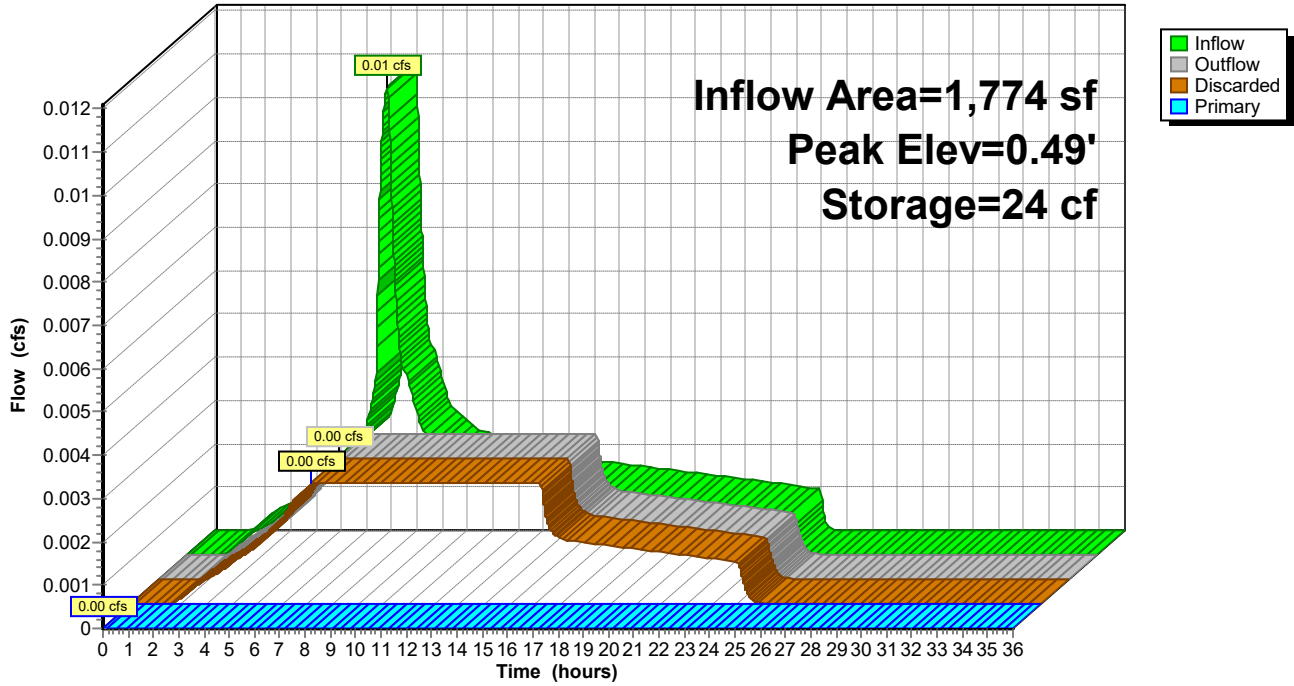
↑1=**Exfiltration** (Exfiltration Controls 0.00 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

Pond P3: Street Planter 3

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 104

Summary for Pond P4: 18" Detention Pipe

[92] Warning: Device #2 is above defined storage

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

Inflow Area = 10,961 sf, 100.00% Impervious, Inflow Depth = 0.17" for Half 2yr event
Inflow = 0.01 cfs @ 8.65 hrs, Volume= 154 cf
Outflow = 0.01 cfs @ 8.69 hrs, Volume= 154 cf, Atten= 1%, Lag= 2.3 min
Primary = 0.01 cfs @ 8.69 hrs, Volume= 154 cf
Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 0.03' @ 8.69 hrs Surf.Area= 43 sf Storage= 1 cf

Plug-Flow detention time= 1.6 min calculated for 154 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (679.5 - 677.9)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 177 cf | 18.0" Round Pipe Storage L= 100.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 2.0" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 2.20' | 2.0" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |
| #3 | Primary | 2.80' | 12.0" Vert. Overflow C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.01 cfs @ 8.69 hrs HW=0.03' (Free Discharge)

1=Control Orifice (Weir Controls 0.01 cfs @ 0.58 fps)

2=Upper Orifice (Controls 0.00 cfs)

3=Overflow (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

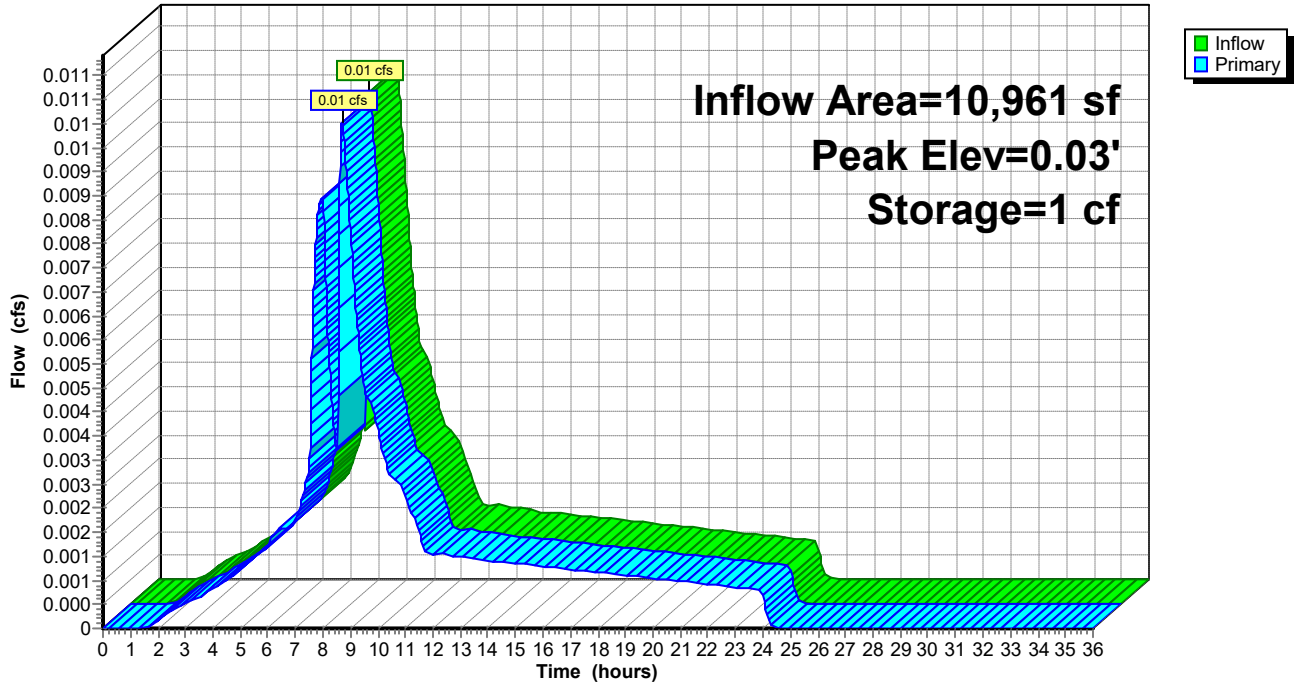
Type IA 24-hr Half 2yr Rainfall=1.25"

Printed 1/31/2023

Page 105

Pond P4: 18" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 106

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points

Runoff by SBUH method, Split Pervious/Imperv.

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment -PRE: Existing Site Runoff Area=29,153 sf 0.00% Impervious Runoff Depth=0.15"
Tc=6.0 min CN=84/0 Runoff=0.01 cfs 369 cf

Subcatchment 11S: BASIN 6-SHARED DWY Runoff Area=2,584 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 170 cf

Subcatchment 12S: BASIN 5-AC ROAD Runoff Area=6,214 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 410 cf

Subcatchment 13S: BASIN 7-Curb Return Runoff Area=1,476 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 97 cf

Subcatchment B1: BASIN 1-AC ROAD Runoff Area=2,187 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 144 cf

Subcatchment B2: BASIN 2-AC Road West Runoff Area=5,524 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.03 cfs 364 cf

Subcatchment B3: BASIN 3-AC Road Runoff Area=1,774 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.01 cfs 117 cf

Subcatchment B4: BASIN 4-Lots 1-4 Roof Runoff Area=9,394 sf 100.00% Impervious Runoff Depth=0.79"
Tc=6.0 min CN=0/98 Runoff=0.04 cfs 619 cf

Reach -POST: Peak Flows from Post-Developed Site Inflow=0.02 cfs 716 cf
Outflow=0.02 cfs 716 cf

Pond 1P: 36" Detention Pipe Peak Elev=0.85' Storage=124 cf Inflow=0.04 cfs 619 cf
Outflow=0.01 cfs 619 cf

Pond 11P: Raingarden 1 Peak Elev=0.85' Storage=85 cf Inflow=0.03 cfs 410 cf
Discarded=0.01 cfs 410 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 410 cf

Pond 13P: Raingarden 2 Peak Elev=1.35' Storage=45 cf Inflow=0.01 cfs 170 cf
Discarded=0.00 cfs 170 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 170 cf

Pond P1: Street Planter 1 Peak Elev=0.86' Storage=30 cf Inflow=0.01 cfs 144 cf
Discarded=0.00 cfs 144 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 144 cf

Pond P2: Street Planter 2 Peak Elev=3.17' Storage=98 cf Inflow=0.03 cfs 364 cf
Discarded=0.01 cfs 364 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 364 cf

Pond P3: Street Planter 3 Peak Elev=0.29' Storage=14 cf Inflow=0.01 cfs 117 cf
Discarded=0.00 cfs 117 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 117 cf

Pond P4: 18" Detention Pipe Peak Elev=0.02' Storage=0 cf Inflow=0.01 cfs 97 cf
Outflow=0.01 cfs 97 cf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 107

Total Runoff Area = 58,306 sf Runoff Volume = 2,290 cf Average Runoff Depth = 0.47"
50.00% Pervious = 29,153 sf 50.00% Impervious = 29,153 sf

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 108

Summary for Subcatchment -PRE: Existing Site

Runoff = 0.01 cfs @ 16.64 hrs, Volume= 369 cf, Depth= 0.15"

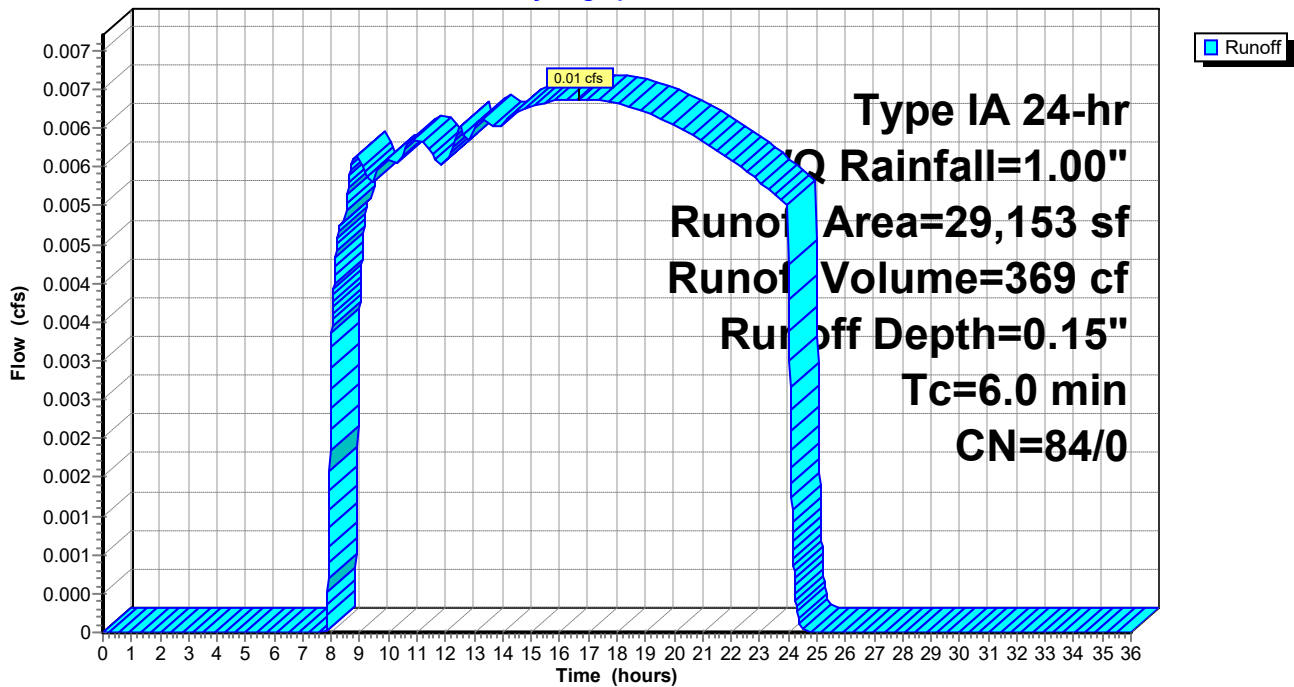
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|---------------------------------|
| 29,153 | 84 | 50-75% Grass cover, Fair, HSG D |
| 29,153 | 84 | 100.00% Pervious Area |

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

Subcatchment -PRE: Existing Site

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 109

Summary for Subcatchment 11S: BASIN 6-SHARED DWY

Runoff = 0.01 cfs @ 7.92 hrs, Volume= 170 cf, Depth= 0.79"
Routed to Pond 13P : Raingarden 2

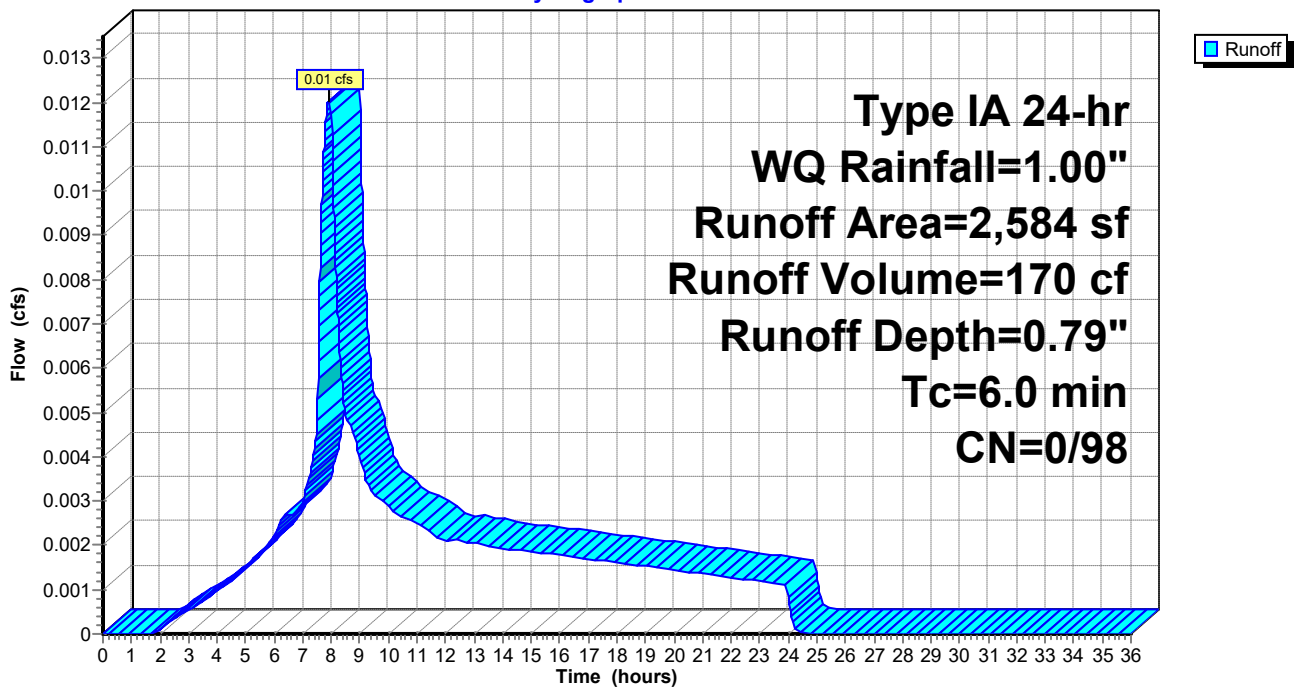
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 2,584 | 98 | Paved parking, HSG D |
| 2,584 | 98 | 100.00% Impervious Area |

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

Subcatchment 11S: BASIN 6-SHARED DWY

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 110

Summary for Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Runoff = 0.03 cfs @ 7.92 hrs, Volume= 410 cf, Depth= 0.79"

Routed to Pond 11P : Raingarden 1

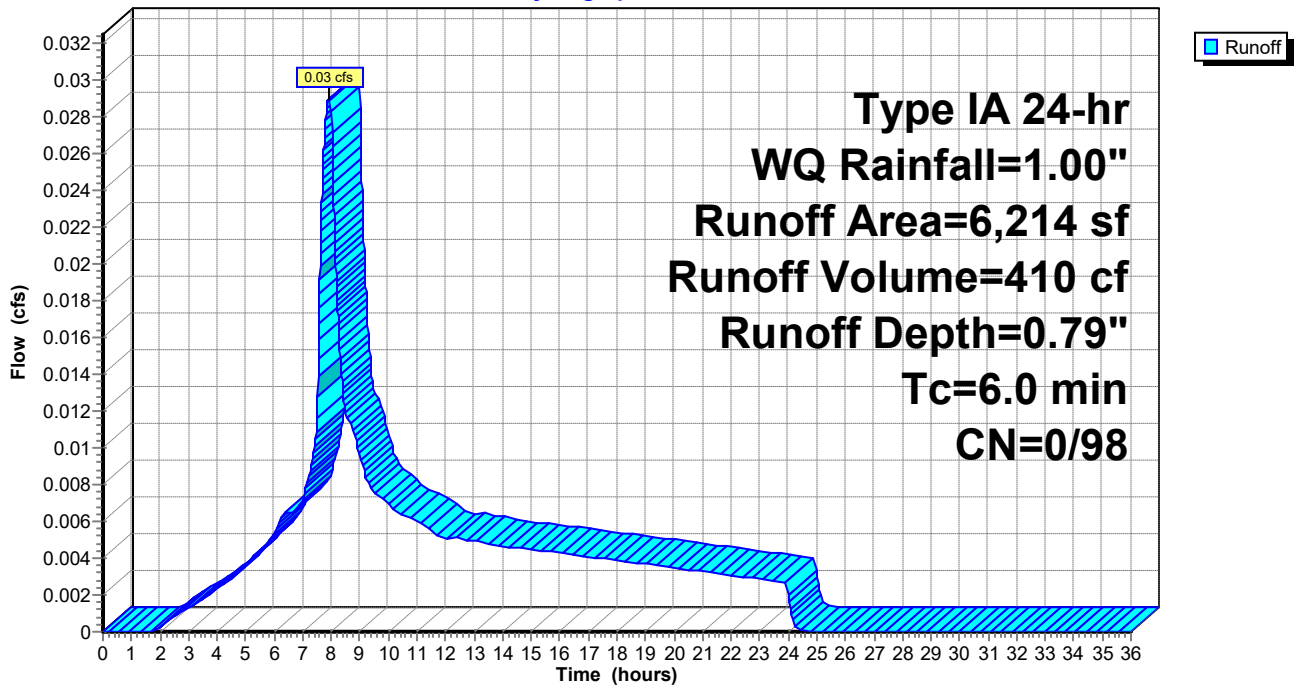
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------------------|
| * | 4,040 | 98 | AC |
| | 2,174 | 98 | Paved roads w/curbs & sewers, HSG D |
| | 6,214 | 98 | Weighted Average |
| | 6,214 | 98 | 100.00% Impervious Area |

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

Subcatchment 12S: BASIN 5-AC ROAD EYEBROW

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 111

Summary for Subcatchment 13S: BASIN 7-Curb Return

Runoff = 0.01 cfs @ 7.92 hrs, Volume= 97 cf, Depth= 0.79"

Routed to Pond P4 : 18" Detention Pipe

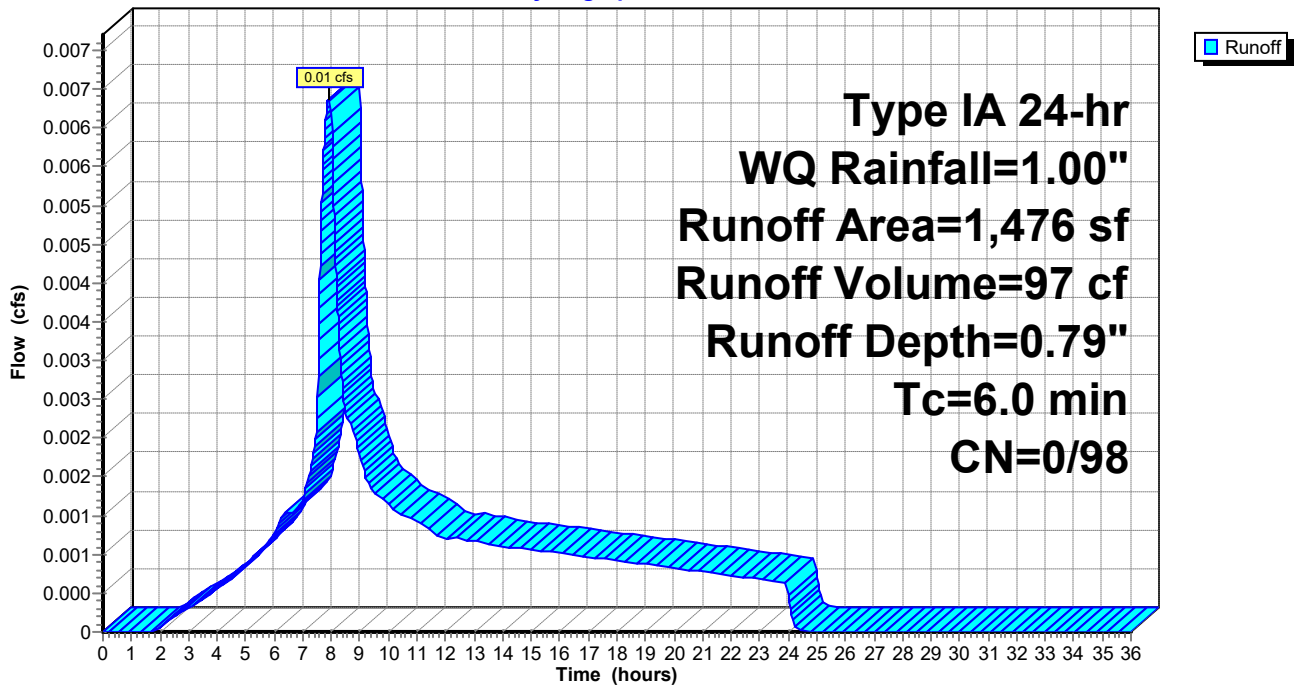
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------------|
| 1,476 | 98 | Paved roads w/curbs & sewers, HSG D |
| 1,476 | 98 | 100.00% Impervious Area |

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

Subcatchment 13S: BASIN 7-Curb Return

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 112

Summary for Subcatchment B1: BASIN 1-AC ROAD EAST

Runoff = 0.01 cfs @ 7.92 hrs, Volume= 144 cf, Depth= 0.79"
Routed to Pond P1 : Street Planter 1

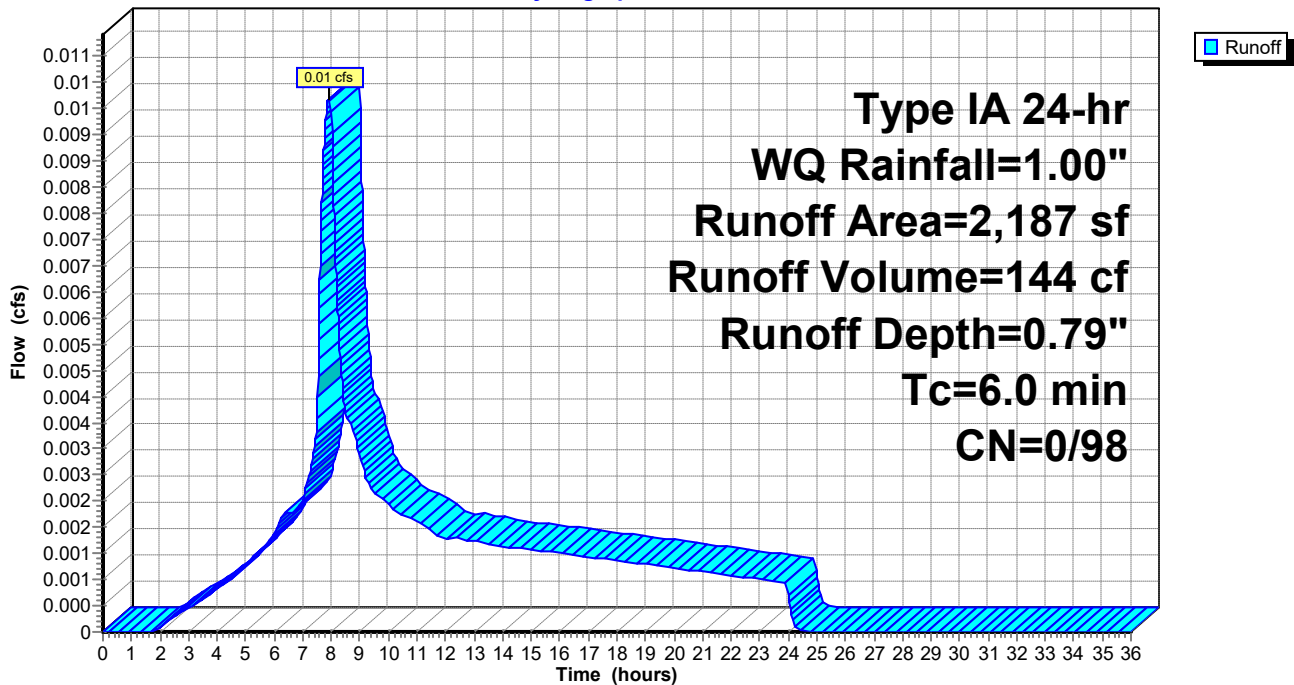
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 2,187 | 98 | AC |
| 2,187 | 98 | 100.00% Impervious Area |

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

Subcatchment B1: BASIN 1-AC ROAD EAST

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 113

Summary for Subcatchment B2: BASIN 2-AC Road West

Runoff = 0.03 cfs @ 7.92 hrs, Volume= 364 cf, Depth= 0.79"
Routed to Pond P2 : Street Planter 2

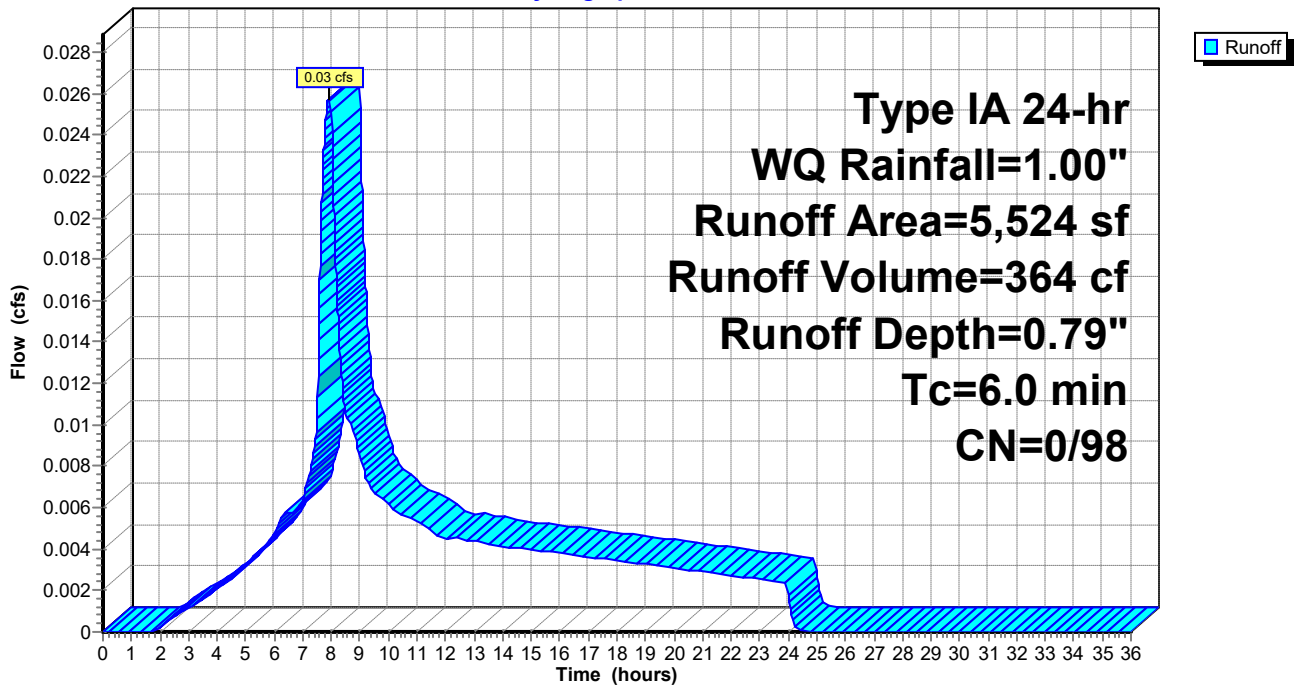
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 5,524 | 98 | Public Impervious |
| 5,524 | 98 | 100.00% Impervious Area |

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

Subcatchment B2: BASIN 2-AC Road West

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 114

Summary for Subcatchment B3: BASIN 3-AC Road Southeast

Runoff = 0.01 cfs @ 7.92 hrs, Volume= 117 cf, Depth= 0.79"
Routed to Pond P3 : Street Planter 3

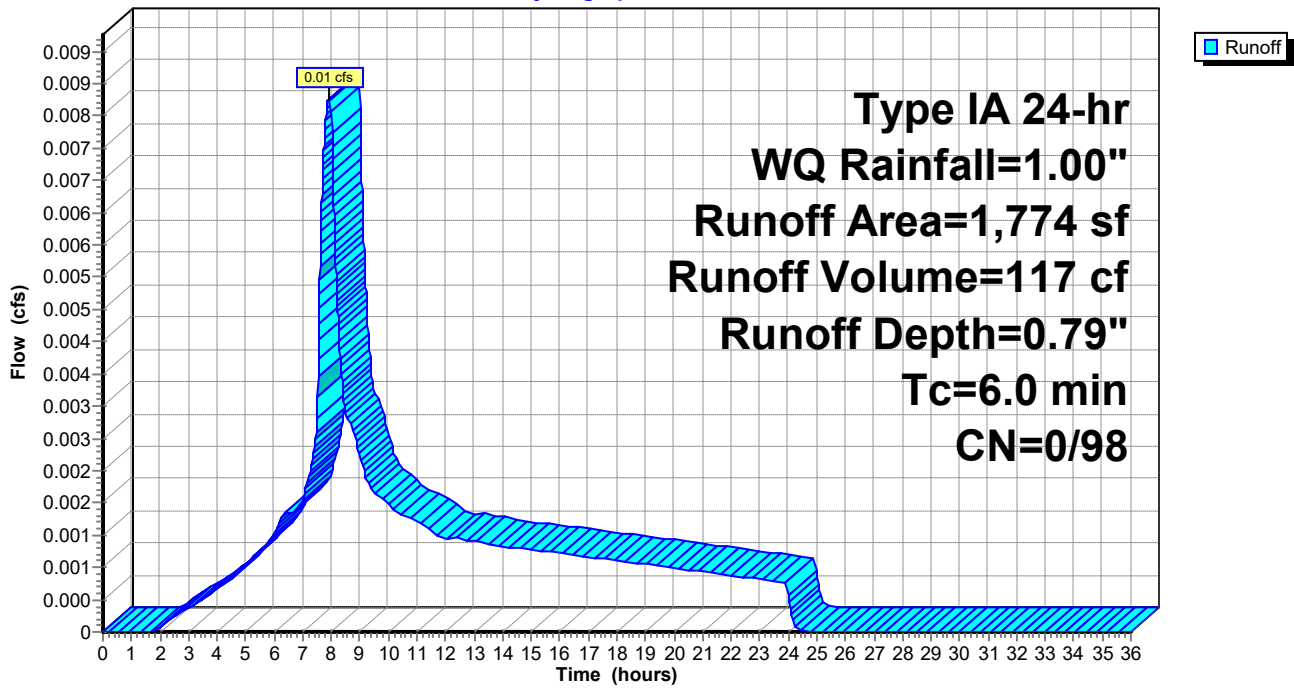
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| * 1,774 | 98 | Public Impervious |
| 1,774 | 98 | 100.00% Impervious Area |

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

Subcatchment B3: BASIN 3-AC Road Southeast

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 115

Summary for Subcatchment B4: BASIN 4-Lots 1-4 Roof

Runoff = 0.04 cfs @ 7.92 hrs, Volume= 619 cf, Depth= 0.79"
Routed to Pond 1P : 36" Detention Pipe

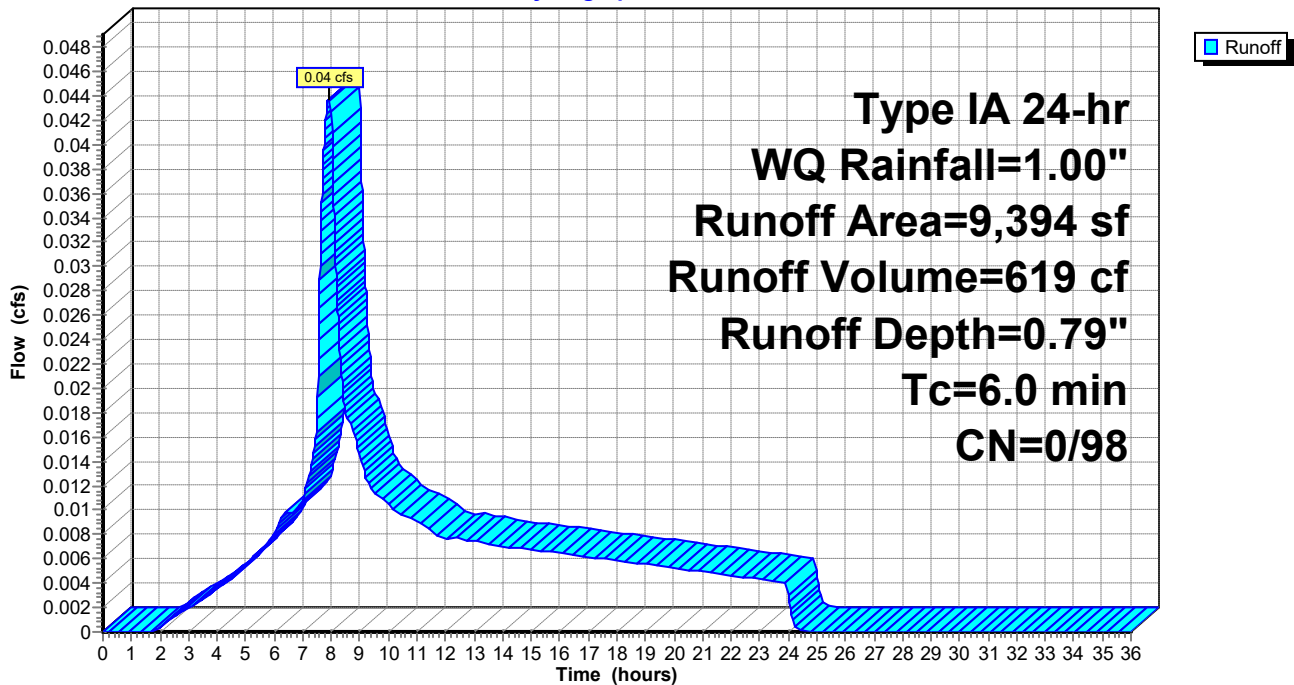
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.00"

| | Area (sf) | CN | Description |
|---|-----------|----|-------------------------|
| * | 9,394 | 98 | Roof Area |
| | 9,394 | 98 | 100.00% Impervious Area |

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

Subcatchment B4: BASIN 4-Lots 1-4 Roof

Hydrograph



E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 116

Summary for Reach -POST: Peak Flows from Post-Developed Site

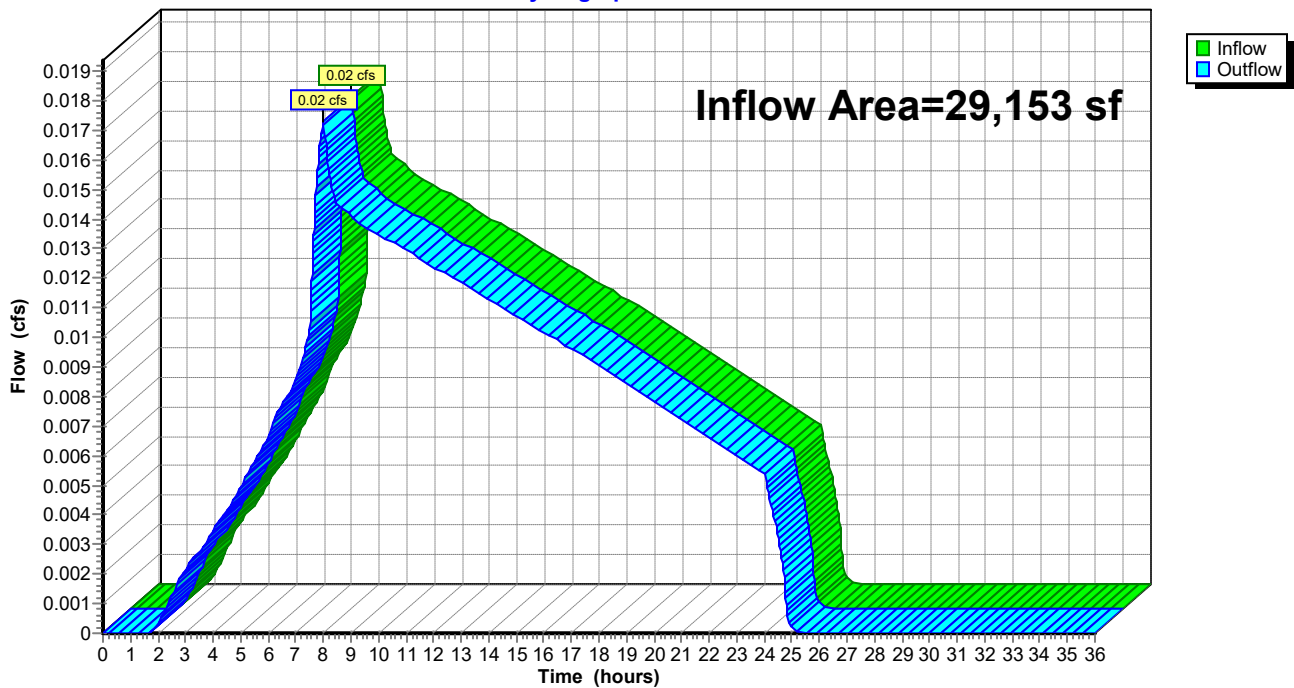
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 29,153 sf, 100.00% Impervious, Inflow Depth = 0.29" for WQ event
Inflow = 0.02 cfs @ 8.01 hrs, Volume= 716 cf
Outflow = 0.02 cfs @ 8.01 hrs, Volume= 716 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach -POST: Peak Flows from Post-Developed Site

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 117

Summary for Pond 1P: 36" Detention Pipe

Inflow Area = 9,394 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.04 cfs @ 7.92 hrs, Volume= 619 cf
 Outflow = 0.01 cfs @ 9.35 hrs, Volume= 619 cf, Atten= 73%, Lag= 86.0 min
 Primary = 0.01 cfs @ 9.35 hrs, Volume= 619 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.85' @ 9.35 hrs Surf.Area= 203 sf Storage= 124 cf

Plug-Flow detention time= 107.1 min calculated for 619 cf (100% of inflow)
 Center-of-Mass det. time= 107.1 min (820.7 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 530 cf | 36.0" Round Pipe Storage L= 75.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 0.7" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 1.50' | 1.8" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.01 cfs @ 9.35 hrs HW=0.85' (Free Discharge)
 1=Control Orifice (Orifice Controls 0.01 cfs @ 4.45 fps)
 2=Upper Orifice (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

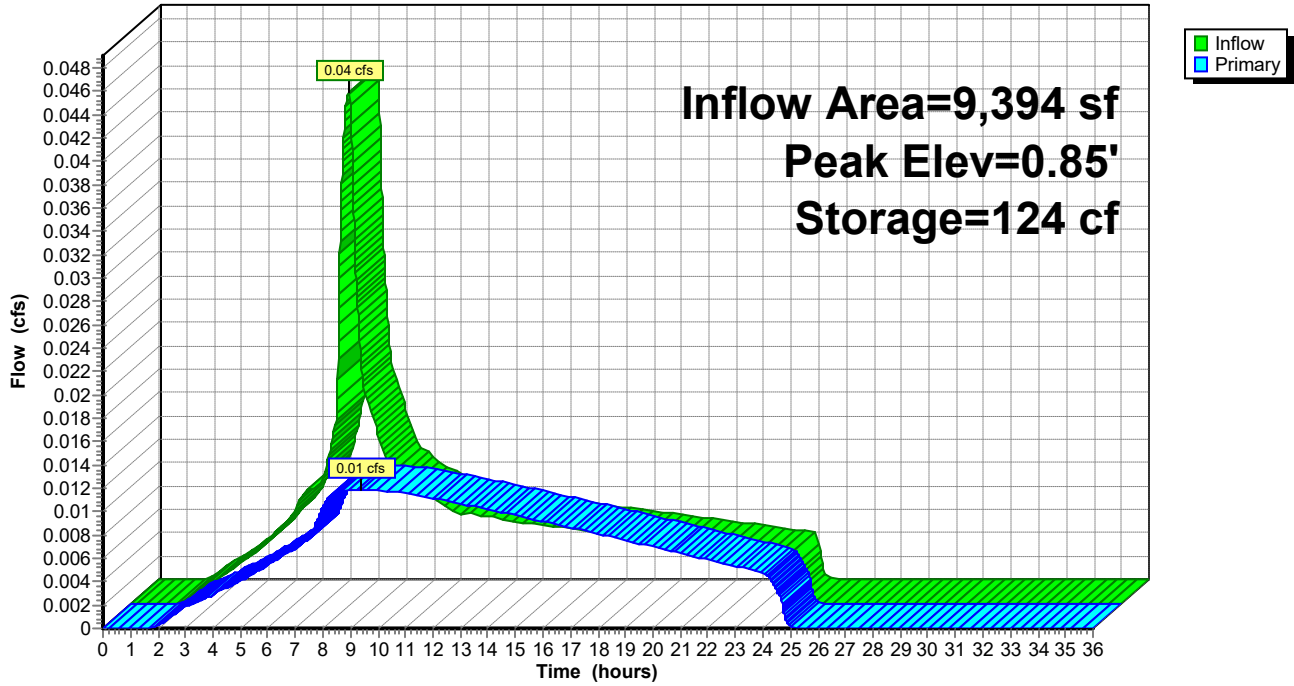
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 118

Pond 1P: 36" Detention Pipe

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 119

Summary for Pond 11P: Raingarden 1

Inflow Area = 6,214 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.03 cfs @ 7.92 hrs, Volume= 410 cf
 Outflow = 0.01 cfs @ 6.31 hrs, Volume= 410 cf, Atten= 80%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 6.31 hrs, Volume= 410 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.85' @ 11.22 hrs Surf.Area= 250 sf Storage= 85 cf

Plug-Flow detention time= 140.4 min calculated for 410 cf (100% of inflow)
 Center-of-Mass det. time= 140.4 min (854.1 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 150 cf | 10.00'W x 25.00'L x 1.50'H Rock 375 cf Overall x 40.0% Voids |
| #2 | 1.50' | 94 cf | 10.00'W x 25.00'L x 1.50'H Growing Medium 375 cf Overall x 25.0% Voids |
| #3 | 3.00' | 250 cf | 10.00'W x 25.00'L x 1.00'H Ponding |
| | | 494 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 6.31 hrs HW=0.04' (Free Discharge)↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

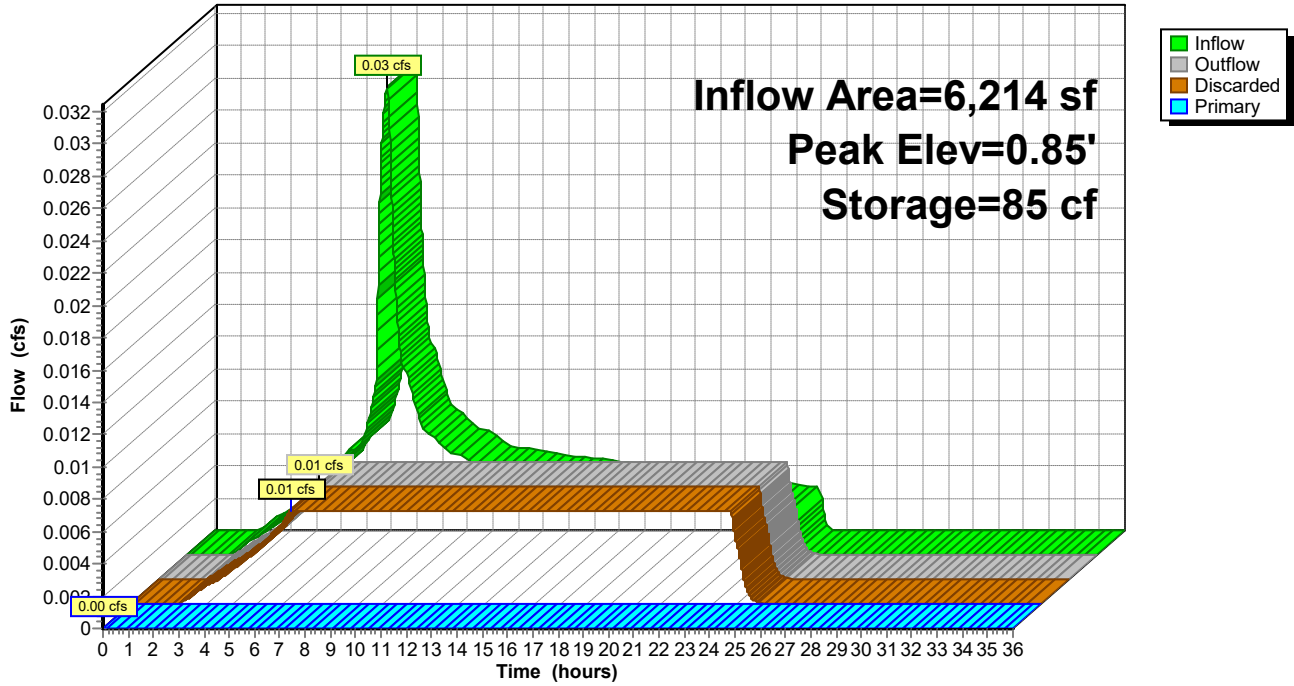
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 120

Pond 11P: Raingarden 1

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 121

Summary for Pond 13P: Raingarden 2

Inflow Area = 2,584 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.01 cfs @ 7.92 hrs, Volume= 170 cf
 Outflow = 0.00 cfs @ 5.85 hrs, Volume= 170 cf, Atten= 84%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 5.85 hrs, Volume= 170 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 1.35' @ 13.71 hrs Surf.Area= 84 sf Storage= 45 cf

Plug-Flow detention time= 257.9 min calculated for 170 cf (100% of inflow)
 Center-of-Mass det. time= 257.9 min (971.6 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 50 cf | 6.00'W x 14.00'L x 1.50'H Rock 126 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 6.00'W x 14.00'L x 1.50'H Growing Medium 126 cf Overall x 25.0% Voids |
| #3 | 3.00' | 84 cf | 6.00'W x 14.00'L x 1.00'H Ponding |
| | | 166 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 5.85 hrs HW=0.04' (Free Discharge)↑1=**Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

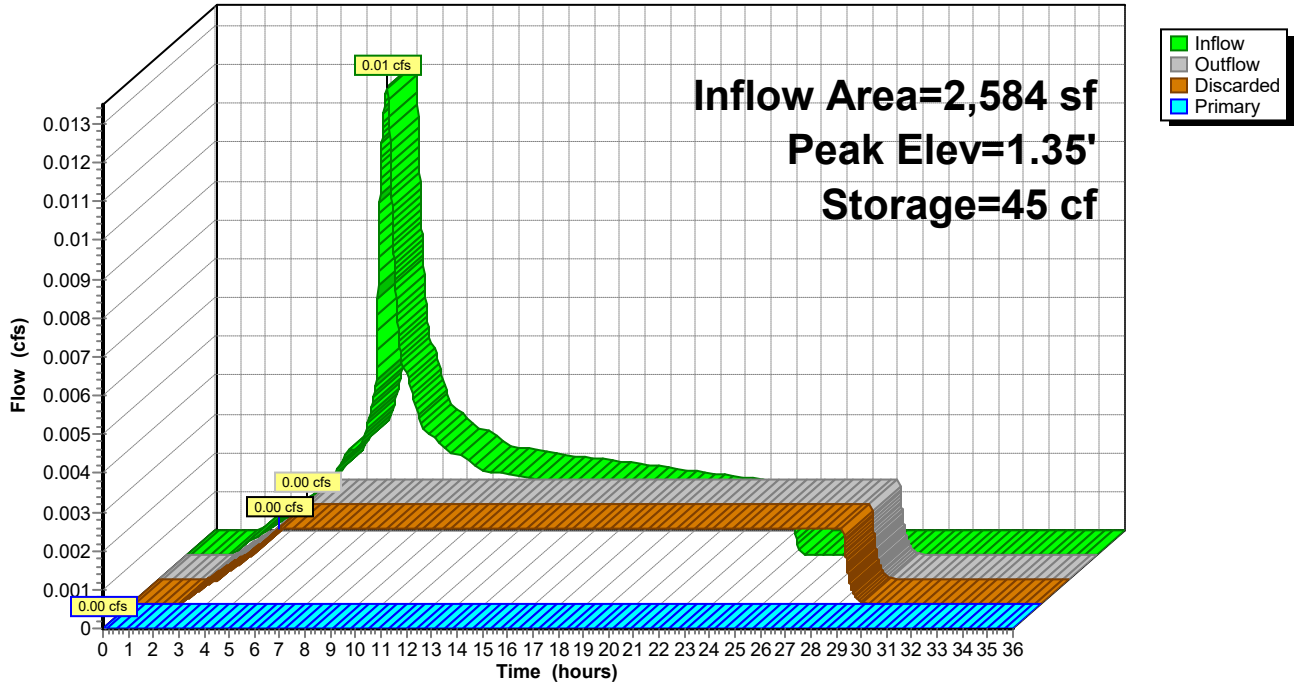
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 122

Pond 13P: Raingarden 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 123

Summary for Pond P1: Street Planter 1

Inflow Area = 2,187 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.01 cfs @ 7.92 hrs, Volume= 144 cf
 Outflow = 0.00 cfs @ 6.29 hrs, Volume= 144 cf, Atten= 80%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 6.29 hrs, Volume= 144 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.86' @ 11.25 hrs Surf.Area= 88 sf Storage= 30 cf

Plug-Flow detention time= 143.1 min calculated for 144 cf (100% of inflow)
 Center-of-Mass det. time= 143.1 min (856.7 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 53 cf | 5.00'W x 17.50'L x 1.50'H Rock 131 cf Overall x 40.0% Voids |
| #2 | 1.50' | 33 cf | 5.00'W x 17.50'L x 1.50'H Growing Medium 131 cf Overall x 25.0% Voids |
| #3 | 3.00' | 88 cf | 5.00'W x 17.50'L x 1.00'H Ponding |
| | | 173 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|--|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Vert. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 6.29 hrs HW=0.04' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.00 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 125

Summary for Pond P2: Street Planter 2

Inflow Area = 5,524 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.03 cfs @ 7.92 hrs, Volume= 364 cf
 Outflow = 0.01 cfs @ 8.31 hrs, Volume= 364 cf, Atten= 77%, Lag= 23.5 min
 Discarded = 0.01 cfs @ 8.31 hrs, Volume= 364 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 3.17' @ 10.11 hrs Surf.Area= 258 sf Storage= 98 cf

Plug-Flow detention time= 259.8 min calculated for 364 cf (100% of inflow)
 Center-of-Mass det. time= 259.8 min (973.5 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 52 cf | 5.00'W x 17.20'L x 1.50'H Rock 129 cf Overall x 40.0% Voids |
| #2 | 1.50' | 32 cf | 5.00'W x 17.20'L x 1.50'H Growing Medium 129 cf Overall x 25.0% Voids |
| #3 | 3.00' | 86 cf | 5.00'W x 17.20'L x 1.00'H Ponding |
| | | 170 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.01 cfs @ 8.31 hrs HW=3.00' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.01 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

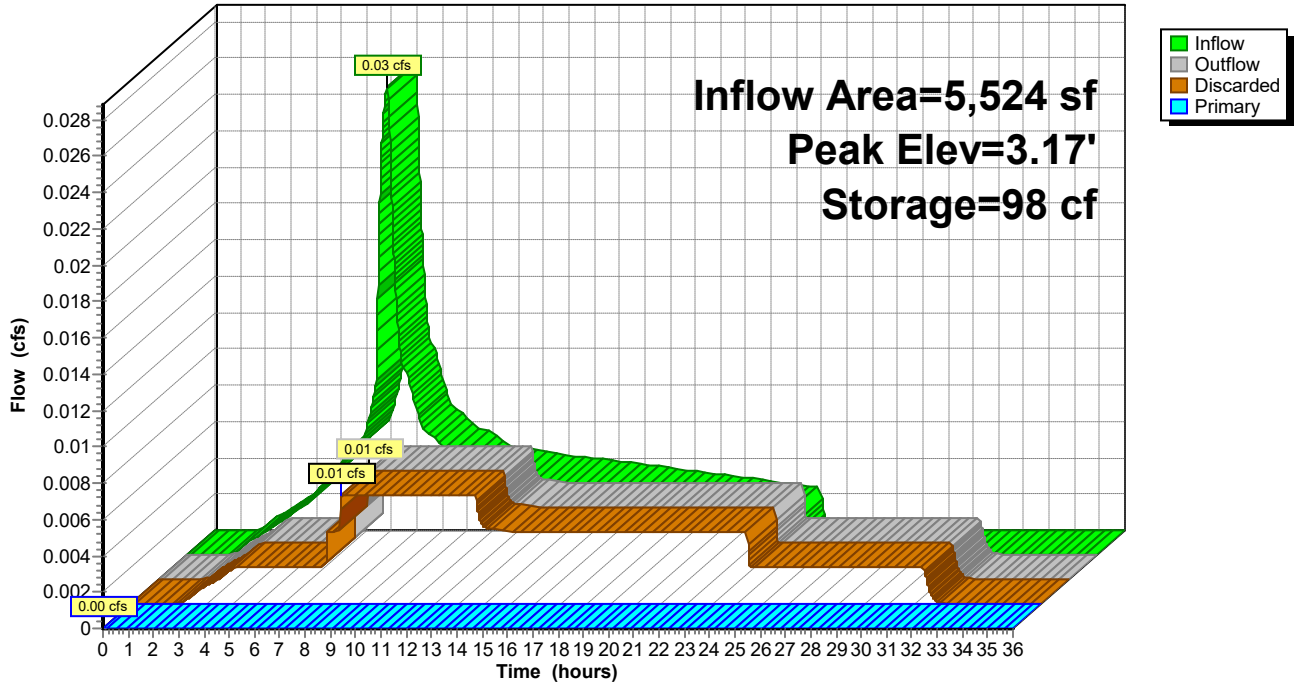
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 126

Pond P2: Street Planter 2

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 127

Summary for Pond P3: Street Planter 3

Inflow Area = 1,774 sf, 100.00% Impervious, Inflow Depth = 0.79" for WQ event
 Inflow = 0.01 cfs @ 7.92 hrs, Volume= 117 cf
 Outflow = 0.00 cfs @ 7.54 hrs, Volume= 117 cf, Atten= 66%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 7.54 hrs, Volume= 117 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond P4 : 18" Detention Pipe

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.29' @ 8.95 hrs Surf.Area= 121 sf Storage= 14 cf

Plug-Flow detention time= 30.3 min calculated for 117 cf (100% of inflow)
 Center-of-Mass det. time= 30.3 min (743.9 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---|
| #1 | 0.00' | 73 cf | 5.00'W x 24.20'L x 1.50'H Rock 182 cf Overall x 40.0% Voids |
| #2 | 1.50' | 45 cf | 5.00'W x 24.20'L x 1.50'H Growing Medium 182 cf Overall x 25.0% Voids |
| #3 | 3.00' | 121 cf | 5.00'W x 24.20'L x 1.00'H Ponding |
| | | 239 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|--------|---|
| #1 | Discarded | 0.00' | 1.000 in/hr Exfiltration over Horizontal area |
| #2 | Primary | 3.50' | 6.0" Horiz. Overflow Orifice C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.00 cfs @ 7.54 hrs HW=0.04' (Free Discharge)

↑1=**Exfiltration** (Exfiltration Controls 0.00 cfs)

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

↑2=**Overflow Orifice** (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

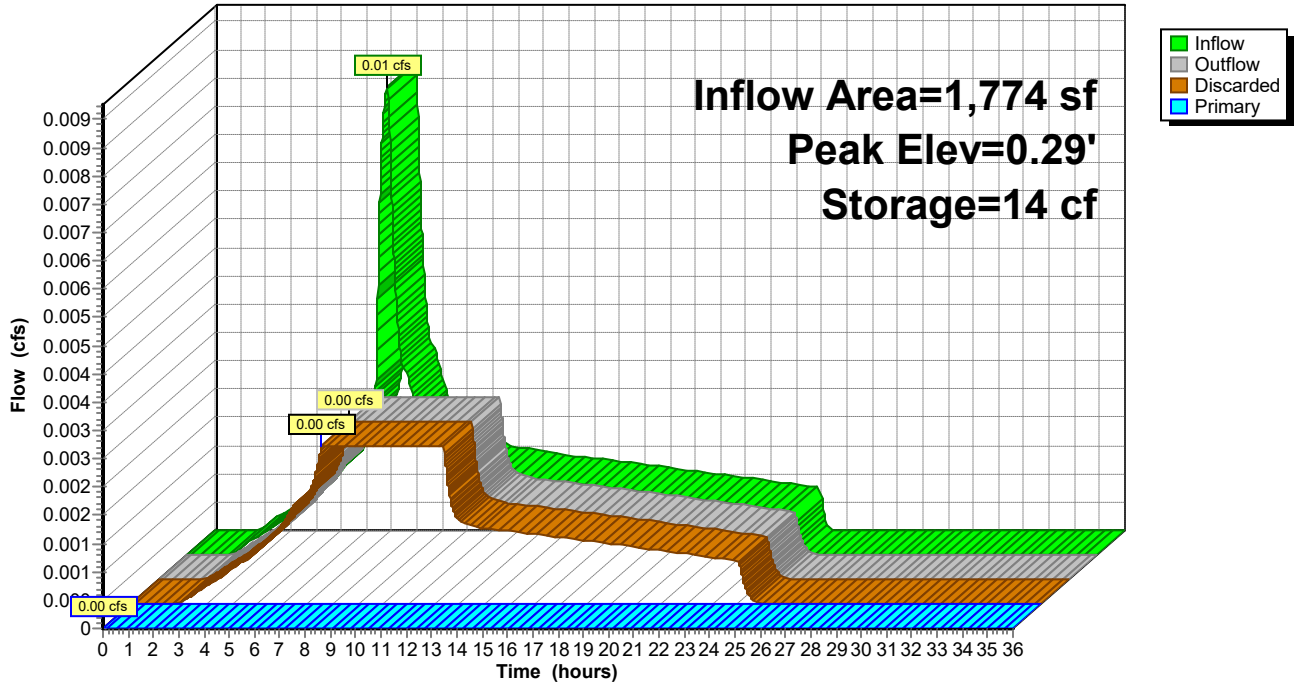
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 128

Pond P3: Street Planter 3

Hydrograph



E21-049 Storm Land Use

Type IA 24-hr WQ Rainfall=1.00"

Prepared by Firwood Design Group

Printed 1/31/2023

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

Page 129

Summary for Pond P4: 18" Detention Pipe

[92] Warning: Device #2 is above defined storage

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

Inflow Area = 10,961 sf, 100.00% Impervious, Inflow Depth = 0.11" for WQ event
 Inflow = 0.01 cfs @ 7.92 hrs, Volume= 97 cf
 Outflow = 0.01 cfs @ 7.95 hrs, Volume= 97 cf, Atten= 0%, Lag= 1.6 min
 Primary = 0.01 cfs @ 7.95 hrs, Volume= 97 cf
 Routed to Reach -POST : Peak Flows from Post-Developed Site

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 0.02' @ 7.95 hrs Surf.Area= 35 sf Storage= 0 cf

Plug-Flow detention time= 1.6 min calculated for 97 cf (100% of inflow)
 Center-of-Mass det. time= 1.6 min (715.2 - 713.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|--|
| #1 | 0.00' | 177 cf | 18.0" Round Pipe Storage L= 100.0' |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|--|
| #1 | Primary | 0.00' | 2.0" Horiz. Control Orifice C= 0.600 Limited to weir flow at low heads |
| #2 | Primary | 2.20' | 2.0" Horiz. Upper Orifice C= 0.600 Limited to weir flow at low heads |
| #3 | Primary | 2.80' | 12.0" Vert. Overflow C= 0.600 Limited to weir flow at low heads |

Primary OutFlow Max=0.01 cfs @ 7.95 hrs HW=0.02' (Free Discharge)

- 1=Control Orifice (Weir Controls 0.01 cfs @ 0.47 fps)
- 2=Upper Orifice (Controls 0.00 cfs)
- 3=Overflow (Controls 0.00 cfs)

E21-049 Storm Land Use

Prepared by Firwood Design Group

HydroCAD® 10.10-7a s/n 04664 © 2021 HydroCAD Software Solutions LLC

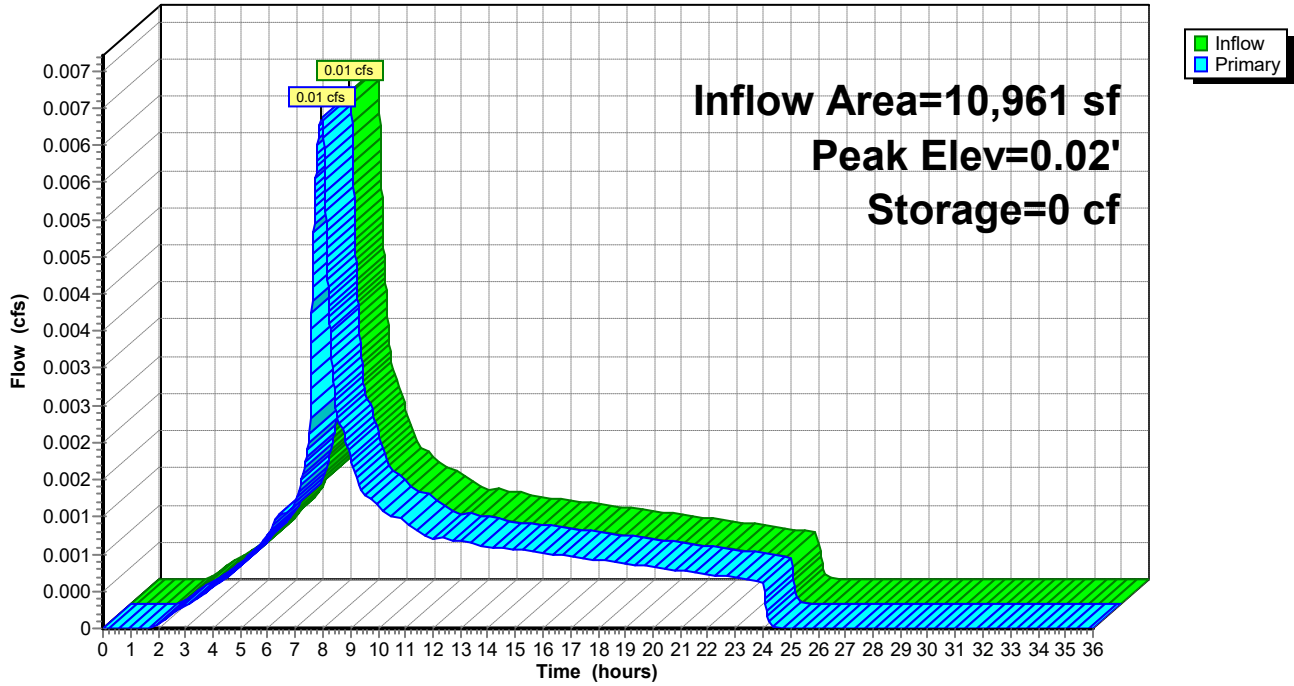
Type IA 24-hr WQ Rainfall=1.00"

Printed 1/31/2023

Page 130

Pond P4: 18" Detention Pipe

Hydrograph



Scott Holden
503-502-8006
scottholden2007@outlook.com

31 August 2022

Re: Infiltration testing for 100 S Garfield Street, Newberg, OR

Dear Mr. Holden,

Field Investigation:

Rapid Soil Solutions (RSS) has attempted to performed one (1) infiltration tests. Figure 1 below shows the project site location. Soils found on site match those in by DOGMI. RSS found stiff fine grained flood deposits.

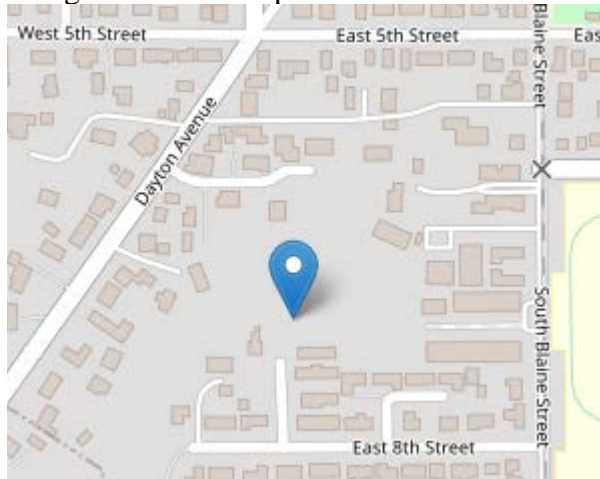


Figure 1

Infiltration Testing:

RSS perform an infiltration test per the Clean Water Services for Washington County. RSS excavated a 6ft deep holes into and started a pre-soak for four (4) hours then testing took place for three hours. The below table summarized the rates and depths. For soil details and locations please see the following infiltration testing sheets.

| Location | rate (in/hr.) | Depth (ft) |
|----------|---------------|------------|
| HA#1 | 0.5 | 6 |
| HA#2 | 2.0 | 6 |
| HA#3 | 1.0 | 6 |

Groundwater

Based upon the three (3) well logs at are the closest to the site and of similar elevation ground water is 180-200 below the sites elevations.

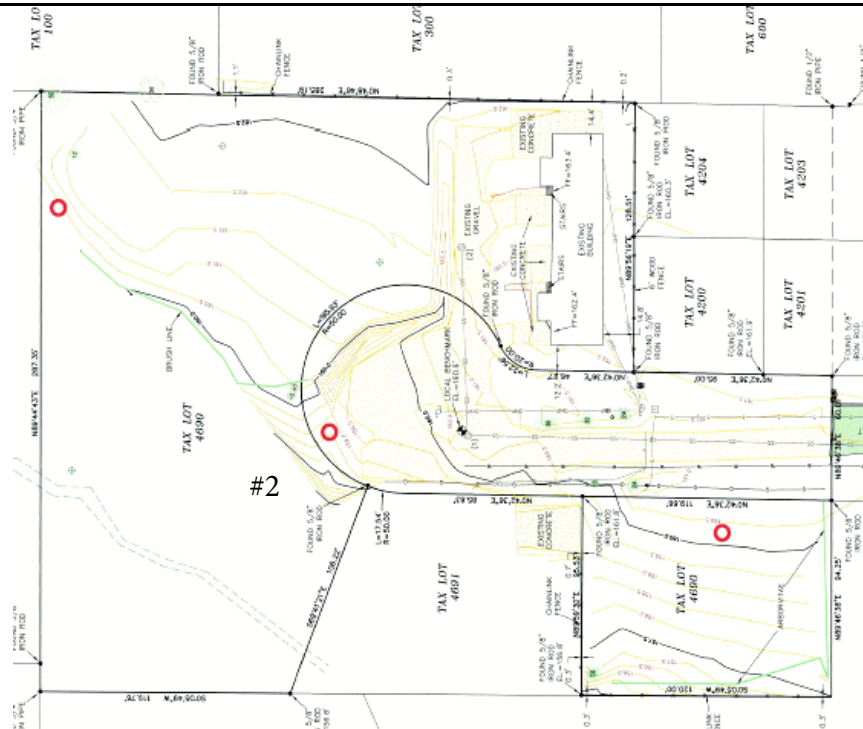
The analysis, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of explorations. Any questions regarding this report please contact me at the below number or email.

Sincerely,



Mia Mahedy, PE GE.

Rapid Soil Solutions Infiltration Test Results



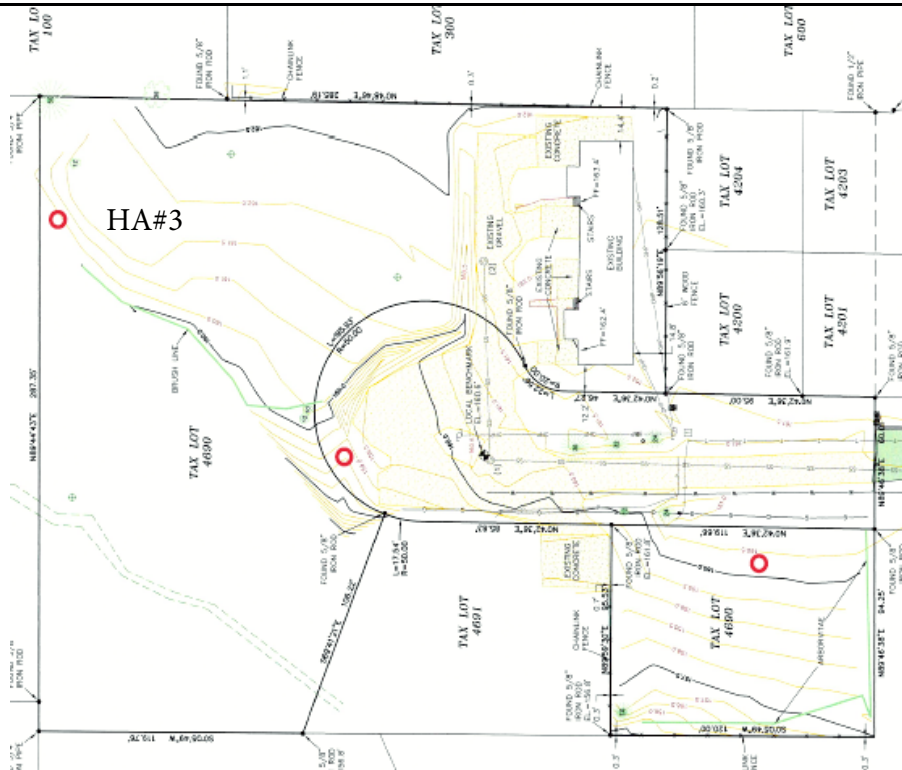
Preliminary Information

| | | | |
|-------------------------|-----------------------------------|---|-------------------|
| Location: | 100 S Garfield St, Newberg OR. | Performed By: (Supervised by Mia Mahedy, PE, GE) | Rick Sands |
| Date & Time: | 8-29-22, 8:45 am | Instrument Used: | 3-inch hand auger |
| Weather: | Sunny, 65 | Depth: | 6 ft |

HA # 2

| | | | |
|---|--|-----------------------------------|---------------------------|
| Soil | 2-4 ft, medium stiffness damp silty clay, brown , 4-6 ft, medium stiffness damp silty clay , brown | | |
| Presoak | 9:00, 15.25, 10:00, 12:25, fill 18.25, 11:00, 17, fill 18.50, 12:00, 16.50, fill 19, 1:00, 17, fill 19 | | |
| Time | Measurement (inches) | Level Refilled To (inches) | Rate (inches/hour) |
| 1:20 | 18.25 | | |
| 1:40 | 17.75 | | |
| 2:00 | 17.25 | 19 | |
| 2:20 | 18.25 | | |
| 2:40 | 17.25 | | |
| 3:00 | 17 | 19.50 | |
| 3:20 | 18.50 | | |
| 3:40 | 18 | | |
| 4:00 | 17.50 | | |
| Site Infiltration Rate (inches/hour) | | | 2in/hr. |

Rapid Soil Solutions Infiltration Test Results



Preliminary Information

| | | | |
|-------------------------|-----------------------------------|--|-------------------|
| Location: | 100 S Garfield St, Newberg OR. | Performed By: (Supervised by Mia Mahedy, PE, GE) | Rick Sands |
| Date & Time: | 8-29-22, 8:45 am | Instrument Used: | 3 inch hand auger |
| Weather: | Sunny, 65 | Depth: | 6 ft |

HA # 3

| | | | |
|---|--|-----------------------------------|---------------------------|
| Soil | 2-4 ft light brown silty clay medium stiffness damp, 4-6 ft, damp, brown , medium stiffness, silty clay | | |
| Presoak | 9:00, 19.50, 10:00, 18.25, fill 20, 11:00, 18.50, fill 20.75, 12:00, 20.25, fill 22, 1:00, 20.50, fill 22.25 | | |
| Time | Measurement (inches) | Level Refilled To (inches) | Rate (inches/hour) |
| 1:20 | 22 | | |
| 1:40 | 21.25 | | |
| 2:00 | 21.25 | 23.75 | |
| 2:20 | 23.25 | | |
| 2:40 | 23 | | |
| 3:00 | 22.75 | 24.25 | |
| 3:20 | 24 | | |
| 3:40 | 23.50 | | |
| 4:00 | 23.25' | | |
| Site Infiltration Rate (inches/hour) | | | 1in/hr. |

16

RECEIVED

3s/2w/19cb

STATE OF OREGON WATER WELL REPORT (as required by ORS 537.765)

JUL 13 1993

WATER RESOURCES DEPT. SALEM, OREGON

(START CARD) # 50236

YAMH 2837

(1) OWNER:

Name Tim & Robin Vachter
Address 24285 7ard Ln.
City Newberg State OR Zip 97132

(2) TYPE OF WORK:

New Well Deepen Recondition Abandon

(3) DRILL METHOD:

Rotary Air Rotary Mud Cable Other

(4) PROPOSED USE:

Domestic Community Industrial Irrigation
Thermal Injection Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes No Depth of Completed Well 200 ft.
Explosives used Yes No Type Amount

Table with columns: HOLE Diameter, From, To, SEAL Material, From, To, Amount sacks or pounds. Row 1: 10, 0, 39, Cement, 0, 39, 68 sk. Row 2: 6, 39, 200.

How was seal placed: Method A B C D E Other

Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

Table with columns: Diameter, From, To, Gauge, Steel, Plastic, Welded, Threaded. Rows for Casing and Liner.

Final location of shoe(s) 84.5

(7) PERFORATIONS/SCREENS:

Perforations Method skil saw
Screens Type Material

Table with columns: From, To, Slot size, Number, Diameter, Tele/pipe size, Casing, Liner. Row 1: 160, 200, 6", 30, 1/8"

(8) WELL TESTS: Minimum testing time is 1 hour

Pump Bailer Air Flowing Artesian
Yield gal/min Drawdown Drill stem at Time

Table with columns: Yield gal/min, Drawdown, Drill stem at, Time. Rows for bailer and pump.

Temperature of Water 51 Depth Artesian Flow Found
Was a water analysis done? Yes By whom WFR
Did any strata contain water not suitable for intended use? Too little
Salty Muddy Odor Colored Other
Depth of strata:

(9) LOCATION OF WELL by legal description:

County YAMHILL Latitude Longitude
Township 3S N or S. Range 2W E or W. WM.
Section 19 NW 1/4 SW 1/4
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address) SAME

(10) STATIC WATER LEVEL:

69 ft. below land surface. Date 6/23/93
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 132'

Table with columns: From, To, Estimated Flow Rate, SWL. Row 1: 132, 199, 20, 69

(12) WELL LOG:

Ground elevation 200

Table with columns: Material, From, To, SWL. Rows: Topsoil, Clay Brwn, clay & decomposed rockGR, Clay Gray, Rock decomposed w/clay brwn, Rock decomposed, Rock fractured/decomposed, Rock fractured.

Date started 6/4/93 Completed 6/24/93

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Signed Date WWC Number

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed Tom Bryant Date 6/24/93 WWC Number 703