



Drainage Report
West Essex Highlands
Block 179, Lot 32
West Orange NJ

March 12, 2023
Rev 1 April 27, 2023
Rev Sept 7, 2023
Rev Oct 3, 2023
Rev October 24, 2023
Rev 10-30-23

Digitally signed by Paul W.

Anderson
Date: 2023.10.29
16:15:05-04'00'

Paul W. Anderson PE PP CME
NJ PE Lic. No. 33410

Table of Contents

Location Map.....	1
Introduction.....	2
Methodology.....	2
Discussion.....	2
Detention area 1	3
Detention area 2.....	5
Detention area 3.....	7
Detention area 4.....	8
Detention area 5.....	9
Canoe Brook Watershed Analysis.....	12
Canoe Brook Tributary Analysis.....	13
Basin Infiltration calculations.....	13
Groundwater Recharge Spreadsheet.....	15
Water Quality Calculation.....	38
Culvert Design.....	39
Conclusion.....	39
Appendix	
Drainage area maps	
Hydrocad calculations Full Hydrology	
Basin 1 without exfiltration	
Basin 2-1 without exfiltration	
Basin 2-2 without exfiltration	
Basin 2-3 without exfiltration	
Basin 2-4 without exfiltration	
Basin 2-5 without exfiltration	
Basin 2-6 without exfiltration	
Basin 3 without exfiltration	
Basin 4 without exfiltration	
Basin 5 without exfiltration	
Groundwater recharge routings	
Basin 1 2yr with exfiltration	
Basin 2-1 2yr with exfiltration	
Basin 2-2 2yr with exfiltration	
Basin 2-3 2yr with exfiltration	

Basin 2-4 2yr with exfiltration
Basin 2-5 2yr with exfiltration
Basin 2-6 2yr with exfiltration
Basin 3 2yr with exfiltration
Basin 4 2yr with exfiltration
Basin 5 2yr with exfiltration
Culvert
Groundwater Mounding Analysis
Contech water quality device sizing



Figure 1.1: U.S.G.S. Map
(from 1995 U.S.G.S. 7.5" Quadrangle: Caldwell, NJ).

1-2

Location Map



Introduction

The West Essex Highlands property has been designated as the location for multifamily housing to help meet the affordable housing requirements of the Township of West Orange NJ. As part of the court approved development plan for this property the limit of disturbance on the 120-acre parcel is limited to 30 acres leaving the remainder as open space to be utilized as passive recreation in its natural condition.

The project design includes a stormwater management design that meets state stormwater standards for water quality, groundwater recharge and discharge rate. The drainage design has small scale infiltration basins with pre-treatment devices to provide green technology solutions for quantity, quality and recharge. One large scale infiltration basin with NJDEP approved green technology device for water quality throughout the drainage area and two porous pavement systems to provide green technology solutions for quality, quantity and recharge.

The stormwater control systems have been routed with exfiltration for the quantity calculation to demonstrate compliance without reliance on exfiltration. The groundwater recharge calculations use exfiltration based on field soil testing with the appropriate factor of safety to demonstrate compliance with the recharge requirement and a calculation is included to demonstrate the basins completely evacuate within 72 hours.

The calculations utilize Hydrocad, version 9.10, NJDEP approved intensity curves, and the SCS TR-20 methodology to calculate the pre-and post-development runoff volumes.

Methodology

The drainage for the development area of the property is calculated for the existing and proposed conditions for the areas going to each of the 6 detention systems. Overland flow areas that will not drain to the detention system are calculated individually in each of the areas.

The existing conditions for the site are considered wooded in good conditions per the ordinance standards. Discharge rates for the existing conditions under the 2, 10 and 100-year storm events are calculated with The Hydrocad drainage program and the SCS TR-20 method. Hydrographs for the proposed conditions for areas detained and un-detained are developed. Allowable discharge rates for the detention system are calculated and the proposed hydrograph is routed through a proposed detention system until the desired discharge rate is achieved for each storm.

Discussion

Soil Conditions & Groundwater Recharge

An extensive geotechnical investigation has been performed on the subject property to establish existing conditions. 15 borings and 27 test pits were performed in the development area in 2021 during the January to April testing window and testing was previously performed with a past development application. The results indicated a fairly uniform soil conditions. The percolation rates onsite indicate primarily a type D soil however due to the published maps indicating C soils onsite the stormwater calculations utilize C soils when selecting curve numbers.



The geotechnical investigation found that significant area of the site proposed for development have limitations to groundwater recharge in the form of shallow bedrock. Approximately 7 acres of the site where proposed building B and C are located has bedrock located on average 4 ft below grade. This site specific limiting factor make the estimation groundwater recharge of existing conditions with the standard analysis grossly conservative. It also limits the project's ability to provide small scale green infrastructure in proximity to the area of disturbance.

The proposed design with green technology solutions at the lower section of the site adjacent to the wetlands area then mimics the natural conditions of the site by taking stormwater that does not recharge into bedrock and recharging it into the deeper running permeable soils at the base of the hill. We believe that modeling the natural conditions as proposed meets the intent of the regulations.

Additional soil tests we recently performed in the proposed basin areas to verify the soil conditions in the exact location of the stormwater management systems. These tests were found to be very similar to the adjacent ones previously performed. The older tests are within the standards to locate the seasonal high groundwater table and the new testing provided more permeability data within the basin area.

Water Quality

The project proposes 8 small scale infiltration basins which take the discharge for the proposed developed area of the property. These small scale infiltration basins will have mechanical pretreatment in the form of a Cascade separator which removed 50% of the suspended solid prior to discharge to the small scale infiltration basin. The combination of the two devices in series results in the removal of 90% of the suspended solids from the stormwater.

The project also proposes one large scale infiltration basin which has filterra stormwater treatment devices before each inlet in a vehicle surface area. Filterra is approved as green technology for the removal of 80% of the suspended solids from stormwater

Two porous pavement systems are proposed to provide a green technology solution for water quality quantity and recharge making all aspects of the stormwater system green technology.

Water Quantity

The stormwater system proposed has been designed to reduce the discharge from the site for the 2-, 10- and 100-year storms as required by the stormwater regulations. Each of the drainage/detention areas has been designed to control stormwater to below its current discharge rate. The routing of the basins do not include exfiltration in the quantity analysis. The results of the stormwater analysis for existing and proposed discharge are provided in the tables below. Detailed Hydrocad output is also included in this report.

Detention Basin 1 Area

Tc Computations.

The existing conditions of the drainage area that is routed to Basin 1 a forested area with very light underbrush due to deer over browsing. The path of the existing conditions Tc is shown on the Existing Conditions Drainage Area Map. The Tc is calculated in the Hydrocad program with the factors shown on the map and is as follows.



The Basin 1 contributing area is 368392 sf of Woods in good condition.
 The initial 100 LF is sheet flow with a slope of 5% in woods with light underbrush. Tc= 14.4 min
 The next segment is shallow concentrated flow 1260 lf with a slope of 5.7% through woods with light underbrush. There is no discernable channel in the field along this path that would change the categorization of the flow type. Tc = 17.6 min.

Total pre-development Tc= 32 min

The proposed Tc for the area flowing to Detention 1 uses the following input
 Sheet flow 100 lf @0.5% over grass Tc= 24 min

Shallow concentrated flow 144 lf over grass @ 6.9% Tc = 0.6 min
 Shallow concentrated flow 642 lf over pavement @ 2.6% Tc= 3.7 min
 Pipe flow 873 lf of 18 inch pipe N= 0.13, Tc = 1.9 min
 Total Tc = 30.2 min

Un-detained Area associated with Basin 1.

These are small area at the perimeter of the drainage area that have minimal distance to travel before exiting the area of analysis. The longest path is
 Sheet flow 70 lf @ 8% over grass Tc= 5.9 min

Detention basin 1 collects water from the east side of the site that drains to the Canoe Brook. The existing conditions have been modeled with a coverage as woods is good condition as required by the standards with NOAA type D rainfall curves. The table below outlines the results of the routing for this area.

Filtrerra Treatment devices have been added prior to each paved surface inlet providing approved green technology water quality treatment for the basin

Large scale Infiltration basins are listed as green technology for quantity in Table 5-2. The basin has been routed without exfiltration for the quantity

Without Exfiltrations

	EXISTING (CFS)	Permitted (CFS)	DETENTION (CFS)	OVERLAND (CFS)	TOTAL (CFS)
2YR	4.51	2.26	0	1.36	1.36
10 YR	11.02	7.71	.75	2.97	3.72
100 YR	25.26	20.21	2.09	6.40	8.49

Water Quality

Water Quality is attained with Filterra treatment devices which are approved as green technology for 80% suspended solids removal.

Groundwater Recharge

Because green technology has been provide for 80% suspended solid removal the groundwater recharge has been calculated and included in the recharge spreadsheet.

Detention Basin 2 Area

The existing conditions of the drainage area that is routed to Basin 2 a forested area with very light underbrush due to deer over browsing. The path of the existing conditions Tc is shown on the Existing Conditions Drainage Area Map. The Tc is calculated in the Hydrocad program with the factors shown on the map and is as follows.

The Basin 2 contributing area is 465453 sf of Woods in good condition.

The initial 100 LF is sheet flow with a slope of 0.5% in woods with light underbrush. Tc=14.4 min

The next segment is shallow concentrated flow 1260 lf with a slope of 5.7% through woods with light underbrush. There is no discernable channel in the field along this path that would change the categorization of the flow type. Tc = 17.6 min.

Total pre-development Tc= 32 min

Basin 2-1 Tc. Basin 2-1 collects runoff by overland flow from the area down hill of the dog park. The 17,946 sf area will be grass cover and the Tc was computed with the flowing factors

Sheet flow 100 LF @ 6% Tc= 6.1 Min

Shallow concentrated flow 90 lf @ 3.4% Tc= .5 min

Total Tc = 6.6 min

Basin 2-2 Tc. Basin 2-2 collects runoff from the parking area behind Building A. The area of 61,497 sf is mostly paved coverage with grass area outside and the Tc was computed with the following factors.

Sheet Flow 60 LF @13 % grass cover Tc= 3min

Shallow concentrated flow 120 lf @ 4.5% Tc = .5 min, grass cover

Pipe Flow 426 lf of 12 inch pipe @ 3.5% N=0.01 Tc 1.1 min

Total Tc = 4.6 min

Basin 2-3 Tc. Basin 2-3 collect runoff from the area around the clubhouse and a portion of Kusik Drive. The Tc was computed with the following factors.

Sheet Flow 100 LF @3% grass cover Tc= 8 min

Shallow concentrated flow 60 lf @ 3.3% Tc = .4 min, grass cover

Shallow Concentrated Flow 72 LF@ 8% Tc =.2 min, Pavement Cover

Pipe Flow 1326 lf of 15 inch pipe @ 3% N=0.01 Tc 1.9 min

Total Tc= 10.5 min

Basin 2-4 Tc basin 2-4 collects runoff from behind Building C and the clubhouse parking lot. The Tc was computed with the following factors.

Sheet Flow 100 LF @8% grass cover Tc= 5.4 min

Shallow concentrated flow 120 lf @ 2% Tc = .9 min, grass cover

Pipe Flow 1692 lf of 15 inch pipe @ 3.7% N=0.01 Tc 3.7 min

Total Tc= 10 min

Basin 2-5 Tc

Basin 2-5 collects runoff from the roof of building A. The Tc was computed with the following factors.
 Sheet Flow 100 LF @ 1% on roof Tc = 1 min
 Pipe Flow 920 lf of 12 inch pipe @ 4.1% N=0.01 Tc 3 min
 Total Tc= 4.5 min

Basin 2-6 Tc

Basin 2-6 collects water from the roof and patio of building C. The Tc was computed with the following factors.

Sheet Flow 100 lf on roof s=1%, Tc= 1.5 min
 Shallow concentrated flow 40 LF @ 1% Tc =.3 min
 Pipe flow 1622 LF s=3.7 % n= 0.01, 12 inch pipe tc= 4.8 min
 Total Tc = 6.6 min

Un-detained Area associated with Basin 2.

These are small areas at the perimeter of the drainage area that have minimal distance to travel before exiting the area of analysis. The longest path is

Sheet flow 36 lf @ 16% over grass Tc= 4 min

Detention basins 2-1 though 2-6 collects water from the east of drainage area 1 that drains to the Canoe Brook Tributary. The existing conditions have been modeled with a coverage as wood is good condition as required by the standards with NOAA type D rainfall curves.

This area previously designed as one large scale infiltration basin has been redesigned to be 6 small scale infiltration basins with distinct drainage areas smaller than the 2.5-acre limit as required by the definition of a small scale infiltration basin.

The table below outlines the results of the routing for this area without exfiltration.

Small scale Infiltration basins are listed as green technology for quality, quantity and recharge in Table 5-2

	EXISTING	Permitted	OL	2-1	2-2	2-3	2-4	2-5	2-6	TOTAL
2yr	5.69	2.85	.91	0.4	.11	.15	.11	.19	.18	1.69
10 yr	13.90	9.73	1.98	.44	.61	.75	.62	.64	.68	5.72
100 yr	32.35	25.88	4.26	2.50	2.02	2.26	2.06	1.16	1.27	15.53

Water Quality

Water quality in drainage area 2 is provided with a pre-treatment cascade separator prior to flowing into the small-scale infiltration basins. Table 5-1 lists small-scale infiltration basins as green technology for water quality, quantity, and groundwater recharge. Total removal from the separator and small scale infiltration basin is 90%

Groundwater Recharge

Groundwater recharge is achieved through the sand bottom in the small-scale infiltration basins. The 2 year storm volume routed to the basin is recharged. A separate routing has been performed for the 2 year storm to determine the volume of recharge for this drainage area.

Test pits B1 & B2 were excavated to a depth of 13ft and 15 ft with groundwater located at 8 and 9 feet below grade. Based on the surface grade at the test locations the groundwater elevation is elevation 538. The basin bottom is set at elevation 540.0 making any groundwater in this area in excess of 2 ft below the bottom of the basin.

The permeability of B2 was determined to be .89 in/hr. With a factor of safety of 2 the exfiltration rate from the basin used in the hydrocad calculation was .45 in/hr.

A summary spreadsheet for the groundwater recharge on the project is provided on sheet 14

Infiltration basin is listed as a green technology solution for groundwater recharge with pre-treatment provided.

Detention Basin 3 Area

Detention basin 3 collects water from the clubhouse and building A along Warner Road.

The Existing Area of Basin 3 contributing area is 113995 sf of Woods in good condition. The initial 100 LF is sheet flow with a slope of 4% in woods with light underbrush. $T_c = 15.7$ min. The next segment is shallow concentrated flow 204 lf with a slope of 3.7% through woods with light underbrush. There is no discernable channel in the field along this path that would change the categorization of the flow type. $T_c = 19.4$ min.

Proposed T_c - Sheet Flow 100 LF @ 8% grass cover $T_c = 7.9$ min
Shallow concentrated flow 20 lf @ 8% $T_c = .1$ min, grass cover
Shallow Concentrated Flow 100 LF @ 5% $T_c = .4$ min, Pavement Cover
Pipe Flow 450 lf of 15 inch pipe @ 6% $N = 0.01$ $T_c = .8$ min
Total $T_c = 9.2$ min

Un-detained Area associated with Basin 3.

These are small areas at the perimeter of the drainage area that have minimal distance to travel before exiting the area of analysis. The longest path is

Sheet flow 45 lf @ 10% over grass $T_c = 3.8$ min

Detention basin 3 collects water from the center of the site from the clubhouse down proposed Warner Rd. that drains to the Canoe Brook Tributary. The existing conditions have been modeled with a coverage as wood is good condition as required by the standards with NOAA type D rainfall curves. The table below outlines the results of the routing for this area.

Small scale Infiltration basins are listed as green technology for quantity in Table 5-2 with pre-treatment.

Quantity without exfiltration

	EXISTING (CFS)	Permitted (CFS)	DETENTION (CFS)	OVERLAND (CFS)	TOTAL (CFS)
2YR	1.79	.90	0.9	.74	.83
10 YR	4.35	3.05	.87	1.34	2.21
100 YR	10.09	8.07	4.35	2.65	7.0

Water Quality

Small scale infiltration basins are listed as green technology for water quality when provided with pre-treatment. Basin 3 has a pre-treatment of a Cascade separator which provides 50% removal and the small-scale infiltration basin in series with it provides a total suspended solid removal of 90%

Groundwater Recharge

Groundwater recharge is achieved through the sand bottom in the small-scale infiltration basins. The 2 year storm volume routed to the basin is recharged. A spreadsheet showing the total compliance to the standard for groundwater recharge is included on page 14

Test pit G1 & G2 was excavated to a depth of 15 and 16 ft with no evidence of groundwater. The surface grade of this test pit is 538.0 making the bottom of the excavation 522.0. The basin bottom is set at elevation 528 making any groundwater in this area in excess of 6 ft below the bottom of the basin.

Small-scale Infiltration basins with pre-treatment are listed as a green technology solution for groundwater recharge in table 5-2. Separate routing of the 2 year storm with exfiltration is provided to allow calculation of the total recharge in the recharge spreadsheet.

Detention Basin 4 Area Tc Computations

The Existing Area of Basin 4 contributing area is 96981 sf of Woods in good condition. The initial 100 LF is sheet flow with a slope of .5% in woods with light underbrush. The next segment is shallow concentrated flow 90 lf with a slope of 4% through woods with light underbrush. There is no discernable channel in the field along this path that would change the categorization of the flow type. $T_c = 15.9$ min.

Proposed T_c - Sheet Flow 100 LF @ 5.2% grass cover $T_c = 6.4$ min

Shallow concentrated flow 100 lf @ 3% $T_c = .6$ min, grass cover

Pipe Flow 309 lf of 15 inch pipe @ 2.61% $N=0.01$ $T_c = 1$ min

Total $T_c = 8$ min

Un-detained Area associated with Basin 4.

These are small areas at the perimeter of the drainage area that have minimal distance to travel before exiting the area of analysis. The longest path is
Sheet flow 96 lf @ 5.73% over grass Tc= 8.7 min

Detention basin 4 collects water from the roof of Building D1, the disturbed grass area behind D1 and the roadway on the east side of the site in front of Building D. The drainage in this area drains to the Canoe Brook Tributary. The existing conditions have been modeled with a coverage as woods in good condition as required by the standards with NOAA type D rainfall curves. The table below outlines the results of the routing for this area.

Water Quantity without exfiltration

	EXISTING	Permitted	Undet.	BASIN	TOTAL
2 YR	1.67	.84	.33	0.16	.41
10 YR	4.06	2.84	.70	.70	1.40
100 YR	9.38	7.50	1.50	5.25	6.75

Water Quality

Small scale infiltration basins are listed as green technology for water quality when provided with pre-treatment. Basin 4 has a pre-treatment of a Cascade separator which provides 50% removal and the small-scale infiltration basin in series with it provides a total suspended solid removal of 90%

Groundwater Recharge

Test pit E1 and E2 were excavated to a depth of 12 and 14 ft with groundwater at 7 and 9 ft below grade respectively. The surface grade of E1 minus the 7 ft to groundwater is the limiting factor establishing the groundwater level at elevation 583. The basin bottom is set at elevation 585 making any groundwater in this area 2 ft below the bottom of the basin. The porous pavement reservoir is in fill over the existing grade for most of this system.

The permeability of E1 was determined to be 0.61 in/hr. With a factor of safety of 2 the exfiltration rate from the basin used in the hydrocad calculation was .305 in/hr.

See the spreadsheet on page 14 for the summary of groundwater recharge for this basin area and the project.

Detention Basin 5

Area

The Existing Area of Basin 5 contributing area is 167719 sf of Woods in good condition.
The initial 100 LF is sheet flow with a slope of 12% in woods with light underbrush. Tc=10.1 min



The next segment is shallow concentrated flow 174 lf with a slope of 16.7% through woods with light underbrush. There is no discernable channel in the field along this path that would change the categorization of the flow type. $T_c = 11.5$ min.

Proposed T_c - Sheet Flow 100 LF @ 1.7% grass cover $T_c = 10.1$ min
Shallow concentrated flow 164lf @ 3.05% $T_c = 1.0$ min, grass cover
Shallow Concentrated Flow 50LF@ 5% $T_c = .1$ min, Pavement Cover
Total $T_c = 11.2$ min

Un-detained Area associated with Basin 5 in this analysis.

This is a large area from the clubhouse down Road D and up to the limit of Basin 5. It is disturbance beyond basin 5 and counts to the overall disturbance and discharge to the Canoe Brook tributary but not precisely to basin 5. The longest path is

Sheet flow 100 lf @ 12% over grass $T_c = 6.7$ min
Shallow concentrated flow 20 lf @ 5% grass cover $T_c = .1$
Shallow concentrated flow 118 lf @ 5.5% pavement cover .4 min
Pipe flow 156 lf, 15 in, $n = 0.01$, $s = 3.49\%$

Detention basin 5 collects water from the roof of building D2, the roadway on the east side of the site in front D2 and the grass area behind D2. The drainage in this area drains to the Canoe Brook Tributary. The table below outlines the results of the routing for this area.

The small scale infiltration basin is listed as green technology for water quality, quantity and recharge in table 5.1

Quantity

	EXISTING	REDUCED	OL **	BASIN	TOTAL **
2 YR	3.33	1.67	2.94	0	2.94
10 YR	8.02	5.61	5.38	0.35	5.73
100 YR	18.05	14.44	10.39	2.86	13.25

** The un-detained area included in this basin is an internal point of analysis and includes all area downstream of basin 5. The point of analysis of the areas that discharge to the Canoe Brook Tributary as it leaves the property comply with the required discharge rates. See table on page 13 for the overall quantity compliance for the Canoe Brook Tributary

Water Quality

Small scale infiltration basins are listed as green technology for water quality when provided with pre-treatment. Basin 3 has a pre-treatment of a Cascade separator which provides 50% removal and the small-scale infiltration basin in series with it provides a total suspended solid removal of 90% for the detained portion of Basin 5.

The overland flow area of basin 5 has vehicle surface area which is treated with a Filterra device. The Filterra's will provide 80% suspended solid removal. Filterra is listed as green technology.

Groundwater Recharge

The system will recharge to groundwater and help maintain the water supply for the adjacent downhill wetlands. Small scale infiltration basins are listed as green technology in table 5.1 for groundwater recharge

Test pit D1 and D2 were excavated to a depth of 16 and 9 ft respectively with groundwater 10 ft and 6 ft down from the surface elevation. Using the existing grade and depth to groundwater for each the groundwater elevation is at elevation 568 at both test pits

Test pit D1 has a permeability rate of .64 inches/hr and D2 has a permeability rate of 2.64 in/hr. With a factor of safety of 2 the exfiltration rate from the basin used in the hydrocad calculation was .31 in/hr based on the most restrictive test.

See the spreadsheet for the recharge from this basin and the overall project on page 15

Canoe Brook Watershed Summary

The proposed area draining to the Canoe Brook has been analyzed under existing conditions for the proposed disturbed area and under proposed conditions. The proposed conditions include the un-detained flow of areas not routed to Infiltration Basin 1 and the flow from infiltration basin 1. The results are summarized here with Hydrocad calculations in the back of this report.

	EXISTING (CFS)	PERMITTED (CFS)	DETENTION (CFS)	OVERLAND (CFS)	TOTAL (CFS)
2YR	4.51	2.26	0	1.36	1.36
10 YR	11.02	7.71	.75	2.97	3.75
100 YR	25.26	20.21	2.09	6.40	8.49

The total discharge from infiltration basin 1 and the un-detained flow meet the volume discharge requirements in the stormwater standard and the discharge to the canoe brook will reduce the flow to the neighboring properties.

Canoe Brook Tributary Summary

A second stream onsite is a tributary to the Canoe Brook connecting to the main stream about ½ mile downstream. The project has been analyzed to determine if the stormwater standards have been met on a watershed basis as well as the individual area outlined above. The results are summarized here with detailed hydrocad calculation in the back of this report.

The contributing flows to the Canoe Brook Tributary are Infiltration Basin 2, Infiltration Basin 3, Porous pavement system 4, Infiltration Basin 5 and overland flow.

	2 yr	10 yr	100 yr
EXISTING	12.48	30.33	69.87
PERMITTED	6.24	21.23	55.90
BASIN 2-1	.04	.44	2.50
BASIN 2-2	.11	.61	2.02
BASIN 2-3	.15	.75	2.26
BASIN 2-4	.11	.62	2.06
BASIN 2-5	.19	.64	1.16
BASIN 2-6	.18	.68	1.27
BASIN 3	.09	.87	4.35
BASIN 4	.08	.70	5.25
BASIN 5	0	.35	2.86
BASIN 6	0	0	0
OVERLAND BASIN 2	.91	4.41	6.78
OVERLAND BASIN 3	.74	1.96	3.23
OVERLAND BASIN 4	.33	.70	1.50
OVERLAND BASIN 5	2.94	5.38	10.39
TOTAL	5.94	18.11	45.63

The total discharge from infiltration basins and the un-detained flow meets the volume discharge requirements in the stormwater standard and the discharge to the Canoe Brook Tributary will reduce the flow to the neighboring properties.

Basin Infiltration period Calculations

Basin #1

Infiltrated Volume (cf): 63,106 Infiltration Area (sf): 38188 Permeability Rate (in/hr): 0.32

$$\text{Duration of Infiltration Period (hrs.)} = \frac{63,106 \text{ cf} \cdot 12 \text{ in/ft}}{38,188 \text{ sf} \cdot 0.32 \text{ in/hr}} = 62.71 \text{ hrs.}$$

Basin # 2-1

Infiltrated Volume (cf): 2,955 Infiltration Area (sf): 2,020 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{2,955 \text{ cf} * 12 \text{ in/ft}}{2,020 \text{ sf} * 0.45 \text{ in/hr}} = 39.01 \text{ hrs.}$$

Basin # 2-2

Infiltrated Volume (cf): 12,863 Infiltration Area (sf): 7,112 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{12,863 \text{ cf} * 12 \text{ in/ft}}{7,112 \text{ sf} * 0.45 \text{ in/hr}} = 48.23 \text{ hrs.}$$

Basin # 2-3

Infiltrated Volume (cf): 18,890 Infiltration Area (sf): 10,412 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{18,890 \text{ cf} * 12 \text{ in/ft}}{10,412 \text{ sf} * 0.45 \text{ in/hr}} = 48.38 \text{ hrs.}$$

Basin # 2-4

Infiltrated Volume (cf): 15,422 Infiltration Area (sf): 11,090 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{15,422 \text{ cf} * 12 \text{ in/ft}}{11,090 \text{ sf} * 0.45 \text{ in/hr}} = 37.08 \text{ hrs.}$$

Basin # 2-5

Infiltrated Volume (cf): 19,207 Infiltration Area (sf): 11,558 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{19,207 \text{ cf} * 12 \text{ in/ft}}{11,558 \text{ sf} * 0.45 \text{ in/hr}} = 44.31 \text{ hrs.}$$

Basin # 2-6

Infiltrated Volume (cf): 21,437 Infiltration Area (sf): 10,782 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{21,437 \text{ cf} * 12 \text{ in/ft}}{10,782 \text{ sf} * 0.45 \text{ in/hr}} = 53.02 \text{ hrs.}$$

Basin # 2-Overall

Infiltrated Volume (cf): 74,856 Infiltration Area (sf): 33,991 Permeability Rate (in/hr): 0.45

$$\text{Duration of Infiltration Period (hrs.)} = \frac{74,856 \text{ cf} * 12 \text{ in/ft}}{33,991 \text{ sf} * 0.45 \text{ in/hr}} = 58.73 \text{ hrs.}$$

Basin #3

Infiltrated Volume (cf): 14,956 Infiltration Area (sf): 10,178 Permeability Rate (in/hr): 0.37

$$\text{Duration of Infiltration Period (hrs.)} = \frac{14,956 \text{ cf} * 12 \text{ in/ft}}{10,178 \text{ sf} * 0.37 \text{ in/hr}} = 47.66 \text{ hrs.}$$

Basin #4

Infiltrated Volume (cf): 18,823 Infiltration Area (sf): 10,178 Permeability Rate (in/hr): 0.31

$$\text{Duration of Infiltration Period (hrs.)} = \frac{18,823 \text{ cf} * 12 \text{ in/ft}}{10,178 \text{ sf} * 0.31 \text{ in/hr}} = 71.59 \text{ hrs.}$$

Basin #5

Infiltrated Volume (cf): 20,319 Infiltration Area (sf): 12,410 Permeability Rate (in/hr): 0.32

$$\text{Duration of Infiltration Period (hrs.)} = \frac{20,319 \text{ cf} * 12 \text{ in/ft}}{12,410 \text{ sf} * 0.32 \text{ in/hr}} = 61.40 \text{ hrs.}$$

Basin #6

Infiltrated Volume (cf): 1,346 Infiltration Area (sf): 1,000 Permeability Rate (in/hr): 0.31

$$\text{Duration of Infiltration Period (hrs.)} = \frac{1,346 \text{ cf} * 12 \text{ in/ft}}{1,000 \text{ sf} * 0.31 \text{ in/hr}} = 52.10 \text{ hrs.}$$

Recharge Spreadsheet (See Recharge spreadsheet included after this table)

**As note on page 3 of this report a minimum of 7 acres of the disturbed area of this project has shallow bedrock based on the geotechnical studies performed. This area is largely in the drainage area to basin 1. If 7 acres of groundwater recharge is eliminated for this area. The existing recharge for the basin 1 area becomes .3 AF

Existing Conditions	Total Rainfall (1)	Total Runoff	Area Recharge (2)	Basin Recharge	Total Recharge
Basin 1 Area	2.43	.69	1.74	-	1.74 **/.3 AF
Basin 2 Area	3.06	.87	2.19	-	2.19
Basin 3 Area	.75	.21	.54	-	.54
Basin 4 Area	.64	.18	.46	-	.46
Basin 5 Area	1.10	.31	.79	-	.79
Basin 6 Area	.06	.02	.04	-	.04
Total Existing Recharge (AF)	8.04	3.36	5.76		5.76/ 4.32**
Proposed Conditions					
Basin 1	2.07	1.47	.60	1.37	1.97
Basin 2-1	.17	.07	.1	.07 (4)	.17
Basin 2-2	.41	.12	.29	.30(4)	.59

Basin 2-3	.65	.43	.22	.43(4)	.65
Basin 2-4	.57	.35	.22	.35(4)	.57
Basin 2-5	.47	.44	.03	.44(4)	.47
Basin 2-6	.53	.49	.04	.49(4)	.53
Basin 3	.63	.34	.29	.30(4)	.59
Basin 4	.56	.43	.13	.35(4)	.48
Basin 5	.65	.47	.18	.24(4)	.42
Basin 6	.06	.03	.03	.03(4)	.06
OL Basin 1	.34	.12	.22	-	.22
OL Basin 2	.23	.08	.15	-	.15
OL Basin 3	.12	.07	.05	-	.05
OL Basin 4	.07	.03	.04	-	.04
OL Basin 5	.45	.24	.21	-	.21
OL Basin 6	0	0	0	0	0
Total proposed Recharge (AF)	7.98	5.18	2.80	4.37	7.17

- 1) All Runoff is in Acre-Feet
- 2) Area recharge is the difference between total rainfall volume and total runoff volume for the 2-year storm based on Hydrocad calculations. The runoff volume is routed to the detention basin where additional recharge may occur calculated in this table for Green Technologies approved for Groundwater Recharge
- 3) Total rainfall is basin area x rainfall intensity.
- 4) The entire 2-year storm recharged.

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓
ESSEX CO., WEST ORANGE TOWN

Average Annual P (in) 49.0

Climatic Factor 1.67

Project Name: West Essex Highlands

Description: DA-1

Analysis Date: 10/27/23

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	5.324	Woods	Boonton	15.7	302,603
2	1.77	Woods	Haledon	15.5	99,421
3	0.1	Woods	Hasbrouck	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	7.2			15.4	402,023

Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.878	Impervious areas	Boonton	0.0	-
2	2.78	Open space	Boonton	14.9	150,847
3	1.5	Open space	Haledon	14.7	80,246
4	0.05	Open space	Hasbrouck	0.0	-
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	7.2	Warning: make total area equal to Pre-Developed Conditions		8.8	231,093

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Annual Recharge (cu.ft)	125,366
Post-Development Annual Recharge Deficit=		170,930	(cubic feet)
Recharge Efficiency Parameters Calculations (area averages)			
RWC=	3.71 (in)	DRWC=	0.00 (in)
ERWC =	0.61 (in)	EDRWC=	0.00 (in)

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

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

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name:	West Essex Highlands
Description:	DA-1
Analysis Date:	10/27/23

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	5.324	Woods	Boonton	15.7	302,603
2	1.77	Woods	Haledon	15.5	99,421
3	0.1	Woods	Hasbrouck	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total = 7.2				Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				15.4	402,023

Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.878	Impervious areas	Boonton	0.0	-
2	2.78	Open space	Boonton	14.9	150,847
3	1.5	Open space	Haledon	14.7	80,246
4	0.05	Open space	Hasbrouck	0.0	-
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	7.2	Warning: make total area equal to Pre-Developed Conditions		Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
Annual Recharge Requirements Calculation					

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

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

% of Pre-Developed Annual Recharge to Preserve =	100%
Post-Development Annual Recharge Deficit=	170,930
Recharge Efficiency Parameters Calculations (area averages)	
RWC= 3.71 (in)	DRWC= 0.00 (in)
ERWC= 0.61 (in)	EDRWC= 0.00 (in)
Total Impervious Area (sq.ft)	125,366

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name: West Essex Highlands

Description: DA 2-1

Analysis Date: 10/27/23

Pre-Developed Conditions						Post-Developed Conditions						
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)	Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)	
1	0.547	Woods	Boonton	15.7	31,090	1			Boonton			
2	0.012	Woods	Haledon	15.5	674	2	0.5335	Open space	Boonton	14.9	28,949	
3	0					3	0.012	Open space	Haledon	14.7	642	
4	0					4	0					
5	0					5	0					
6	0					6	0					
7	0					7	0					
8	0					8	0					
9	0					9	0					
10	0					10	0					
11	0					11	0					
12	0					12	0					
13	0					13	0					
14	0					14	0					
15	0					15	0					
Total =	0.6			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)	Total =	0.5	Warning: make total area equal to Pre-Developed Conditions		Total Annual Recharge (in)	Total Annual Recharge (cu.ft)	
				15.7	31,764			Annual Recharge Requirements Calculation ↓		14.6	29,591	
								% of Pre-Developed Annual Recharge to Preserve =				
								100%				
								Post-Development Annual Recharge Deficit=				
								2,174				(cubic feet)
Recharge Efficiency Parameters Calculations (area averages)												
RWC=		3.71	(in)	DRWC=		1.45	(in)		(in)			
ERWC =		0.61	(in)	EDRWC=		0.24	(in)		(in)			

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

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

Project Name
West Essex Highlands

Description
DA 2-1

Analysis Date
10/27/23

BMP or LID Type

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	2020.0	sq. ft
BMP Effective Depth, this is the design variable	dBMP	-335544.3	in
Upper level of the BMP surface (negative if above ground)	dBMPu	12.6	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	24.0	in
Post-development Land Segment Location of BMP	SegBMP		unitless
Input Zero if Location is distributed or undetermined			

Root Zone Water Capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.61	in
ERWC Modified to consider dEXC	EDRWC	0.24	in
Empty Portion of RWC under Infiltr. BMP	RERWC	#DIV/0!	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	#DIV/0!	in
Inches of Rainfall to capture	Pdesign	#DIV/0!	in
Recharge Provided Avg. over Imp. Area		#DIV/0!	in
Runoff Captured Avg. over imp. Area		#DIV/0!	in

BMP Calculated Size Parameters

ABMP/Aimp	#DIV/0!	unitless
BMP Volume	#####	cu. ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	2,174	cu. ft
Post-D Impervious Area (or target Impervious Area)	Aimp	0	sq. ft
Root Zone Water Capacity	RWC	3.71	in
RWC Modified to consider dEXC	DRWC	1.45	in
Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	49.0	in
Recharge Requirement over Imp. Area	dr	#DIV/0!	in

CALCULATION CHECK MESSAGES

Volume Balance--> #DIV/0!
dBMP Check--> OK
dEXC Check--> OK
BMP Location--> Location is selected as distributed or undetermined

OTHER NOTES

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

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

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name:	West Essex Highlands
Description:	DA 2-2
Analysis Date:	10/27/23

Pre-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.4	Woods	Boonton	15.7
2	0.078	Woods	Haledon	15.5
3	0			
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	1.5			15.6
				Total Annual Recharge (in)
				83,954

Post-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	0.513	Impervious areas	Boonton	0.0
2	0.49	Open space	Boonton	14.9
3	0.025	Open space	Haledon	14.7
4	0.13	Brush	Boonton	17.1
5	0.32	brush	Haledon	16.9
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	1.5			10.4
				Total Annual Recharge (in)
				55,639

Annual Recharge Requirements Calculation ↓

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

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

% of Pre-Developed Annual Recharge to Preserve =

100%

Post-Development Annual Recharge Deficit=

28,314

Recharge Efficiency Parameters Calculations (area averages)

RWC= 3.78 (in)

DRWC= 0.00 (in)

ERWC= 0.62 (in)

EDRW= 0.00 (in)

EDRW= 0.00 (in)

Total Annual Recharge (cu.ft)

22,346

Project Name		Description		Analysis Date		BMP or LID Type	
West Essex Highlands		DA 2-2		10/27/23			
Recharge BMP Input Parameters				Root Zone Water capacity Calculated Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	5721.3	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.62	in
BMP Effective Depth, this is the design variable Upper level of the BMP surface (negative if above ground)	dBMP	0.9	in	ERWC Modified to consider dEXC	EDRWC	0.00	in
	dBMPu	33.6	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	48.0	in				
Post-development Land Segment Location of BMP	SegBMP	0	unitless				
Input Zero if Location is distributed or undetermined							
				Recharge Design Parameters			
				Parameter	Symbol	Value	Unit
				Inches of Runoff to capture	Qdesign	0.25	in
				Inches of Rainfall to capture	Pdesign	0.33	in
				Recharge Provided Avg. over Imp. Area		15.2	in
				Runoff Captured			
				Avg. over imp. Area		15.2	in
				CALCULATION CHECK MESSAGES			
				Volume Balance--> OK			
				dBMP Check--> OK			
				dEXC Check--> OK			
				BMP Location--> Location is selected as distributed or undetermined			
				OTHER NOTES			
				Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.			
				How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.			
Parameters from Annual Recharge Worksheet				BMP Calculated Size Parameters			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	28,314	cu.ft	ABMP/Aimp	Aratio	0.28	unitless
Post-D Impervious Area (or target Impervious Area)	Aimp	22,346	sq.ft	BMP Volume	VBMP	445	cu.ft
Root Zone Water Capacity	RWC	3.78	in	System Performance Calculated Parameters			
RWC Modified to consider dEXC	DRWC	0.00	in	Annual BMP Recharge Volume		28,314	cu.ft
Climatic Factor	C-factor	1.67	no units	Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
Average Annual P	Pavg	49.0	in	%Rainfall became Runoff		78.5%	%
Recharge Requirement over Imp. Area	dr	15.2	in	%Runoff Infiltrated		39.5%	%
				%Recharge Recharged		39.5%	%
				%Rainfall Recharged		31.0%	%

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name: West Essex Highlands					
Description: DA 2-3					
Analysis Date: 10/27/23					
Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.077	Impervious areas	Boonton	0.0	-
2	0.945	Open space	Boonton	14.9	51,277
3	0.237	Open space	Haledon	14.7	12,679
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	2.3				
Annual Recharge Requirements Calculation ↓					
% of Pre-Developed Annual Recharge to Preserve = 100%					
Post-Development Annual Recharge Deficit= 64,277 (cubic feet)					
Recharge Efficiency Parameters Calculations (area averages)					
RWC= 3.62 (in)	DRWC= 0.00		(in)		
ERWC = 0.60 (in)	EDRWEC= 0.00		(in)		

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.016	Woods	Boonton	15.7	114,584
2	0.243	Woods	Haledon	15.5	13,649
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total = 2.3				Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				15.6	128,234

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

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

Project Name		Description		Analysis Date		BMP or LID Type	
West Essex Highlands		DA 2-3		10/27/23			
Recharge BMP Input Parameters				Root Zone Water Capacity Calculated Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	10411.7	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.60	in
BMP Effective Depth, this is the design variable	dBMP	1.2	in	ERWC Modified to consider dEXC	EDRWC	0.00	in
Upper level of the BMP surface (negative if above ground)	dBMPu	33.6	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	48.0	in				
Post-development Land Segment Location of BMP	SegBMP	0	unitless				
Input Zero if Location is distributed or undetermined							
Recharge Design Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
Inches of Runoff to capture				Inches of Runoff to capture	Qdesign	0.27	in
Inches of Rainfall to capture				Inches of Rainfall to capture	Pdesign	0.35	in
Recharge Provided Avg. over Imp. Area				Recharge Provided Avg. over Imp. Area		16.4	in
Runoff Captured Avg. over imp. Area				Runoff Captured Avg. over imp. Area		16.4	in
BMP Calculated Size Parameters				BMP Calculated Size Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
ABMP/Aimp	Aratio	0.22	unitless	ABMP/Aimp	Aratio	0.22	unitless
BMP Volume	VBMP	1,041	cu.ft	BMP Volume	VBMP	1,041	cu.ft
System Performance Calculated Parameters				System Performance Calculated Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
Annual BMP Recharge Volume		64,277	cu.ft	Annual BMP Recharge Volume		64,277	cu.ft
Avg BMP Recharge Efficiency		100.0%		Avg BMP Recharge Efficiency		100.0%	
%Rainfall became Runoff		78.5%	%	%Rainfall became Runoff		78.5%	%
%Runoff Infiltrated		42.7%	%	%Runoff Infiltrated		42.7%	%
%Recharged		42.7%	%	%Recharged		42.7%	%
%Rainfall Recharged		33.6%	%	%Rainfall Recharged		33.6%	%
Parameters from Annual Recharge Worksheet				Parameters from Annual Recharge Worksheet			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
Post-D Deficit Recharge (or desired recharge volume)	Vdef	64,277	cu.ft	Post-D Deficit Recharge (or desired recharge volume)	Vdef	64,277	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	46,914	sq.ft	Post-D Impervious Area (or target Impervious Area)	Aimp	46,914	sq.ft
Root Zone Water Capacity	RWC	3.62	in	Root Zone Water Capacity	RWC	3.62	in
RWC Modified to consider dEXC	DRWC	0.00	in	RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.67	no units	Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	49.0	in	Average Annual P	Pavg	49.0	in
Recharge Requirement over Imp. Area	dr	16.4	in	Recharge Requirement over Imp. Area	dr	16.4	in
How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.							
Calculation Check Messages				Calculation Check Messages			
Volume Balance--> OK				Volume Balance--> OK			
dBMP Check--> OK				dBMP Check--> OK			
dEXC Check--> OK				dEXC Check--> OK			
BMP Location--> Location is selected as distributed or undetermined				BMP Location--> Location is selected as distributed or undetermined			
Other Notes				Other Notes			
Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.							

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.87

Project Name:	West Essex Highlands
Description:	DA - 2-4
Analysis Date:	10/27/23

Pre-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.947	Woods	Boonton	15.7
2	0.2546	Woods	Haledon	15.5
3	0			
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.2			15.6
				Total Annual Recharge (cu-ft)
				124,963

Post-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	0.599	Impervious areas	Boonton	0.0
2	1.348	Open space	Boonton	14.9
3	0.2546	Open space	Haledon	14.7
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.2			10.9
				Total Annual Recharge (cu-ft)
				86,765

Annual Recharge Requirements Calculation ↓	
--	--

% of Pre-Developed Annual Recharge to Preserve =	100%
--	------

Post-Development Annual Recharge Deficit=	38,198
---	--------

Recharge Efficiency Parameters Calculations (area averages)			
RWC=	3.70	(in)	DRWC= 0.00
ERWC=	0.61	(in)	EDRWC= 0.00

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

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

Project Name		Description		Analysis Date		BMP or LID Type	
West Essex Highlands		DA - 2-4		10/27/23			
Recharge BMP Input Parameters				Root Zone Water Capacity Calculated Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	11090.4	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.61	in
BMP Effective Depth, this is the design variable	dBMP	0.7	in	ERWC Modified to consider dEXC	EDRWC	0.00	in
Upper level of the BMP surface (negative if above ground)	dBMPu	37.2	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	48.0	in				
Post-development Land Segment Location of BMP	SegBMP	0	unitless				
1. Input Zero if Location is distributed or undetermined							
Parameters from Annual Recharge Worksheet				BMP Calculated Size Parameters			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	38,198	cu.ft	ABMP/Aimp	Aratio	0.43	unitless
Post-D Impervious Area (or target Impervious Area)	Aimp	26,092	sq.ft	BMP Volume	VBMP	637	cu.ft
Root Zone Water Capacity	RWC	3.70	in	System Performance Calculated Parameters			
RWC Modified to consider dEXC	DRWC	0.00	in	Annual BMP Recharge Volume		38,198	cu.ft
Climatic Factor	C-factor	1.67	no units	Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
Average Annual P	Pavg	49.0	in	%Rainfall became Runoff		78.5%	%
Recharge Requirement over Imp. Area	dr	17.6	in	%Runoff		45.7%	%
				%Infiltrated		45.7%	%
				%Runoff Recharged		35.9%	%
				%Rainfall Recharged			%
How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.							
Recharge Design Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.30	in	Inches of Rainfall to capture	Pdesign	0.39	in
Recharge Provided Avg. over Imp. Area		17.6	in	Runoff Captured Avg. over imp. Area		17.6	in
CALCULATION CHECK MESSAGES Volume Balance-> OK dBMP Check----> OK dEXC Check----> OK BMP Location----> Location is selected as distributed or undetermined OTHER NOTES Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.							

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Annual Groundwater Recharge Analysis (based on GSR-32)						Project Name: West Essex Highlands							
Select Township ↓				Average Annual P (in)	Climatic Factor	Description: DA 2-5							
ESSEX CO., WEST ORANGE TOWN				49.0	1.67	Analysis Date: 10/27/23							
Pre-Developed Conditions						Post-Developed Conditions							
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)	Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)		
1	1.361	Woods	Boonton	15.7	77,356	1	1.385	Impervious areas	Boonton	0.0			
2	0.289	Woods	Haledon	15.5	16,233	2	0.265	Open space	Haledon	14.7	14,177		
3	0					3	0						
4	0					4	0						
5	0					5	0						
6	0					6	0						
7	0					7	0						
8	0					8	0						
9	0					9	0						
10	0					10	0						
11	0					11	0						
12	0					12	0						
13	0					13	0						
14	0					14	0						
15	0					15	0						
Total =		1.7		Total Annual Recharge (in)	15.6	Total Annual Recharge (cu.ft)				Total Annual Recharge (in)	Total Annual Recharge (cu.ft)		
				15.6	93,589					2.4	14,177		
				Annual Recharge Requirements Calculation ↓				Total Impervious Area (sq.ft)					
								100%					
				% of Pre-Developed Annual Recharge to Preserve =				(cubic feet)					
				79,412									
				Post-Development Annual Recharge Deficit=									
				Recharge Efficiency Parameters Calculations (area averages)									
				RWC= 3.54 (in)	DRWC= 0.00 (in)								
				ERWC = 0.58 (in)	EDRWC= 0.00 (in)								

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

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

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.361	Woods	Boonton	15.7	77,356
2	0.289	Woods	Haledon	15.5	16,233
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.7			15.6	93,589

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

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

Project Name		Description		Analysis Date		BMP or LID Type	
West Essex Highlands		DA 2-5		10/27/23			
Recharge BMP Input Parameters							
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	11558.0	sq. ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.58	in
BMP Effective Depth, this is the design variable Upper level of the BMP surface (negative if above ground)	dBMP	1.3	in	ERWC Modified to consider dEXC	EDRWC	0.00	in
	dBMPu	30.0	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in
Depth of lower surface of BMP, must be > dBMPu	dEXC	42.0	in				
Post-development Land Segment Location of BMP	SegBMP	0	unitless				
Recharge Design Parameters							
				Inches of Runoff to capture	Qdesign	0.26	in
				Inches of Rainfall to capture	Pdesign	0.34	in
				Recharge Provided Avg. over Imp. Area		15.8	in
				Runoff Captured Avg. over imp. Area		15.8	in
Root Zone Water Capacity Calculated Parameters							
BMP Calculated Size Parameters							
ABMP/Aimp			0.19	unitless			
BMP Volume			1,265	cu. ft			
System Performance Calculated Parameters							
Annual BMP Recharge Volume			79,412	cu. ft			
Avg BMP Recharge Efficiency			100.0%	Represents % Infiltration Recharged			
%Rainfall became Runoff			78.5%	%			
%Runoff Infiltrated			41.1%	%			
%Runoff Recharged			41.1%	%			
%Rainfall Recharged			32.2%	%			
Parameters from Annual Recharge Worksheet							
Post-D Deficit Recharge (or desired recharge volume)	Vdef	79,412	cu. ft				
Post-D Impervious Area (or target Impervious Area)	Aimp	60,331	sq. ft				
Root Zone Water Capacity	RWC	3.54	in				
RWC Modified to consider dEXC	DRWC	0.00	in				
Climatic Factor	C-factor	1.67	no units				
Average Annual P	Pavg	49.0	in				
Recharge Requirement over Imp. Area	dr	15.8	in				
How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.							
Calculation Check Messages Volume Balance -> OK dBMP Check -> OK dEXC Check -> OK BMP Location -> Location is selected as distributed or undetermined Other Notes Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.							

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name:	West Essex Highlands
Description:	DA - 2-6
Analysis Date:	10/27/23

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.5941	Woods	Boonton	15.7	90,605
2	0.247	Woods	Haledon	15.5	13,874
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.8			15.6	104,479

Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.5941	Impervious areas	Boonton	0.0	-
2	0.247	Brush	Boonton	17.1	15,306
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	1.8			2.3	15,306

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

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

Annual Recharge Requirements Calculation ↓			
% of Pre-Developed Annual Recharge to Preserve =	100%	Total Annual Recharge (in)	2.3
Post-Development Annual Recharge Deficit= 89,173 (cubic feet)			
Recharge Efficiency Parameters Calculations (area averages)			
RWC= 3.38 (in)	DRWC= 0.00		
ERWC = 0.56 (in)	EDRW= 0.00		

Project Name
West Essex Highlands

Description
DA - 2-6

Analysis Date
10/27/23

BMP or LID Type

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	10782.1	sq. ft
BMP Effective Depth, this is the design variable Upper level of the BMP surface (negative if above ground)	dBMP	1.6	in
Depth of lower surface of BMP, must be >= dBMPu	dBMPu	26.4	in
Post-development Land Segment Location of BMP	dEXC	42.0	in
Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water Capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.56	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.25	in
Inches of Rainfall to capture	Pdesign	0.33	in
Recharge Provided Avg. over Imp. Area		15.4	in
Runoff Captured Avg. over imp. Area		15.4	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.16	unitless
BMP Volume	VBMP	1,407	cu. ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	89,173	cu. ft
Post-D Impervious Area (or target Impervious Area)	Aimp	69,439	sq. ft
Root Zone Water Capacity	RWC	3.38	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	49.0	in
Recharge Requirement over Imp. Area	dr	15.4	in

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

CALCULATION CHECK MESSAGES

Volume Balance-->	OK
dBMP Check-->	OK
dEXC Check-->	OK
BMP Location-->	Location is selected as distributed or undetermined

OTHER NOTES

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

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓
ESSEX CO., WEST ORANGE TOWN

Average Annual P (in) 49.0

Climatic Factor 1.67

Project Name: West Essex Highlands

Description: DA-3

Analysis Date: 10/27/23

Pre-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.805	Woods	Boonton	15.7
2	0.382	Woods	Haledon	15.5
3	0			
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.2			15.6
				Total Annual Recharge (cu.ft)
				124,048

Post-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	0.679	Impervious areas	Boonton	0.0
2	1.333	Open space	Boonton	14.9
3	0.178	Open space	Haledon	14.7
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.2			
				Total Annual Recharge (cu.ft)
				81,853

Warning: make total area equal to Pre-Developed Conditions

Annual Recharge Requirements Calculation ↓				
% of Pre-Developed Annual Recharge to Preserve =			100%	
Post-Development Annual Recharge Deficit=			42,195	
Recharge Efficiency Parameters Calculations (area averages)				
RWC= 3.65	(in)	DRWC= 0.00	(in)	
ERWC = 0.60	(in)	EDRWC= 0.00	(in)	

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

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

Project Name
West Essex Highlands

Description
DA-3

Analysis Date
10/27/23

BMP or LID Type

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	9871.6	sq.ft
BMP Effective Depth, this is the design variable	dBMP	0.8	in
Upper level of the BMP surface (negative if above ground)	dBMPu	21.6	in
Depth of lower surface of BMP, must be > dBMPu	dEXC	48.0	in
Post-development Land Segment Location of BMP	SegBMP	0	unitless

Root Zone Water Capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.60	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.29	in
Inches of Rainfall to capture	Pdesign	0.38	in
Recharge Provided Avg. over Imp. Area		17.1	in
Runoff Captured Avg. over imp. Area		17.1	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.33	unitless
BMP Volume	VBMP	695	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-->	OK
dBMP Check-->	OK
dEXC Check-->	OK
BMP Location-->	Location is selected as distributed or undetermined

System Performance Calculated Parameters

Annual BMP Recharge Volume	42,195	cu.ft
Avg BMP Recharge Efficiency	100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff	78.5%	%
%Runoff Infiltrated	44.5%	%
%Runoff Recharged	44.5%	%
%Rainfall Recharged	34.9%	%

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	42,195	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	29,577	sq.ft
Root Zone Water Capacity	RWC	3.65	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	49.0	in
Recharge Requirement over Imp. Area	dr	17.1	in

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

OTHER NOTES

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

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name: West Essex Highlands

Description:	DA - 4
Analysis Date:	10/27/23

Pre-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.91	Woods	Boonton	15.7
2	0			
3	0			
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	1.9			15.7
				Total Annual Recharge (cu.ft)
				108,560

Post-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.13	Impervious areas	Boonton	0.0
2	0.57	Open space	Boonton	14.9
3	0.2	Open space	Boonton	14.9
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	1.9			
				Total Annual Recharge (cu.ft)
				41,781

Warning: make total area equal to Pre-Developed Conditions

Annual Recharge Requirements Calculation ↓	Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
	6.0	41,781
% of Pre-Developed Annual Recharge to Preserve =	100%	49,223

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

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

Post-Development Annual Recharge Deficit= 66,778

Recharge Efficiency Parameters Calculations (area averages)

RWC= 3.48 (in)	DRWC= 0.00 (in)
ERWC = 0.57 (in)	EDRWC= 0.00 (in)

Project Name
West Essex Highlands

Description
DA - 4

Analysis Date
10/27/23

BMP or LID Type

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	8678.4	sq. ft
BMP Effective Depth, this is the design variable	dBMP	1.5	in
Upper level of the BMP surface (negative if above ground)	dBMPu	24.0	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	47.4	in
Post-development Land Segment Location of BMP	SegBMP	0	unitless

Root Zone Water Capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.57	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.27	in
Inches of Rainfall to capture	Pdesign	0.35	in
Recharge Provided Avg. over Imp. Area		16.3	in
Runoff Captured Avg. over imp. Area		16.3	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.18	unitless
BMP Volume	VBMP	1,077	cu. ft

CALCULATION CHECK MESSAGES

Volume Balance -> OK
dBMP Check -> OK
dEXC Check -> OK

BMP Location -> Location is selected as distributed or undetermined

OTHER NOTES

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

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	66,778	cu. ft
Post-D Impervious Area (or target impervious Area)	Aimp	49,223	sq. ft
Root Zone Water Capacity	RWC	3.48	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.67	no units
Average Annual P	Pavg	49.0	in
Recharge Requirement over Imp. Area	dr	16.3	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		66,778	cu. ft
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		78.5%	%
%Runoff Infiltrated		42.3%	%
%Runoff Recharged		42.3%	%
%Rainfall Recharged		33.2%	%

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

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name:	West Essex Highlands
Description:	DA-5
Analysis Date:	10/27/23

Pre-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	2.26	Woods	Boonton	15.7
2				
3				
4	0			
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.3			15.7
				Total Annual Recharge (cu.ft)
				128,453

Post-Developed Conditions				
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)
1	1.44	Impervious areas	Boonton	0.0
2	0.82	Open space	Boonton	14.9
3				
4				
5	0			
6	0			
7	0			
8	0			
9	0			
10	0			
11	0			
12	0			
13	0			
14	0			
15	0			
Total =	2.3			5.4
				Total Annual Recharge (cu.ft)
				44,495

Annual Recharge Requirements Calculation ↓		
% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq ft)
Post-Development Annual Recharge Deficit= 83,958 (cubic feet)		
Recharge Efficiency Parameters Calculations (area averages)		
RWC= 3.46 (in)	DRWC= 0.00	(in)
ERWC = 0.57 (in)	EDRWC= 0.00	(in)

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

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

Project Name		Description		Analysis Date		BMP or LID Type	
West Essex Highlands		DA-5		10/27/23			
Recharge BMP Input Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	12412.4	sq.ft	Inches of Runoff to capture	Qdesign	0.27	in
BMP Effective Depth, this is the design variable Upper level of the BMP surface (negative if above ground)	dBMP	1.3	in	Inches of Rainfall to capture	Pdesign	0.35	in
Depth of lower surface of BMP, must be >= dBMPu	dBMPu	19.2	in	Recharge Provided Avg. over Imp. Area		16.1	in
Post-development Land Segment Location of BMP	dEXC	42.0	in	Runoff Captured Avg. over imp. Area		16.1	in
Input Zero if Location is distributed or undetermined	SegBMP	0	unitless				
BMP Calculated Size Parameters				CALCULATION CHECK MESSAGES			
ABMP/Aimp	Aratio	0.20	unitless	Volume Balance-->	OK		
BMP Volume	VBMP	1,346	cu.ft	dBMP Check-->	OK		
System Performance Calculated Parameters				dEXC Check-->	OK		
Annual BMP Recharge Volume		83,958	cu.ft	BMP Location-->	Location is selected as distributed or undetermined		
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged	OTHER NOTES			
%Rainfall became Runoff		78.5%	%	Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "Impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.			
%Runoff Infiltrated		41.8%	%				
%Runoff Recharged		41.8%	%				
%Rainfall Recharged		32.8%	%				
Parameters from Annual Recharge Worksheet				How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	83,958	cu.ft				
Post-D Impervious Area (or target Impervious Area)	Aimp	62,726	sq.ft				
Root Zone Water Capacity	RWC	3.46	in				
RWC Modified to consider dEXC	DRWC	0.00	in				
Climatic Factor	C-factor	1.67	no units				
Average Annual P	Pavg	49.0	in				
Recharge Requirement over Imp. Area	dr	16.1	in				

Water Quality Calculation

The project has been designed with green technology solutions for water quality improvements. In all areas of the project site. Solutions include both manufactured devices like the filterra which is approved as green technology for 80% removal, small scale infiltration basins, large scale infiltration basins, porous pavement and mechanical devices including the Cascade separator and the Kracken filter system. The table below outlines the vehicle surface area for each basin and the water quality device designed to achieve the required water quality. The table calculates the average for the entire site.

Vehicle Surface Areas

Area	Vehicle Area (sf)	Device	% removal	Area X %
Basin 1	88791	Filterra	80%	71033
Basin 2-1	0	Cascade & Small scale infiltration	50% & 80% total 90%	0
Basin 2-2	29657	Cascade & Small scale infiltration	50% & 80% total 90%	26691
Basin 2-3	9495	Cascade & Small scale infiltration	50% & 80% total 90%	8546
Basin 2-4	23633	Cascade & Small scale infiltration	50% & 80% total 90%	21270
Basin 2-5	0, Roof and basin surface only	Cascade & Small scale infiltration	50% & 80% total 90%	0
Basin 2-6	0, roof and basin surface only	Cascade & Small scale infiltration	50% & 80% total 90%	0
Basin 3	25084	Cascade & Small scale infiltration	50% & 80% total 90%	22576
Basin 4	24519	Porous pavement	80%	19615
Basin 5	22407	Cascade & Small scale infiltration	50% & 80% total 90%	20166
Basin 6	2683	Porous Pavement	80%	2146
Un-detained basin 5	17864	Kracken	80%	14291
Un-detained basin 3	5633	Filterra	80%	4506
Un-detained basin 1	7246	None	0%	0
Totals	257012 sf			210,840 sf

% removal of suspended solids from Vehicle surface areas for the site equals (area x % total)/ total area= 210,840/ 257,012 = 82 %

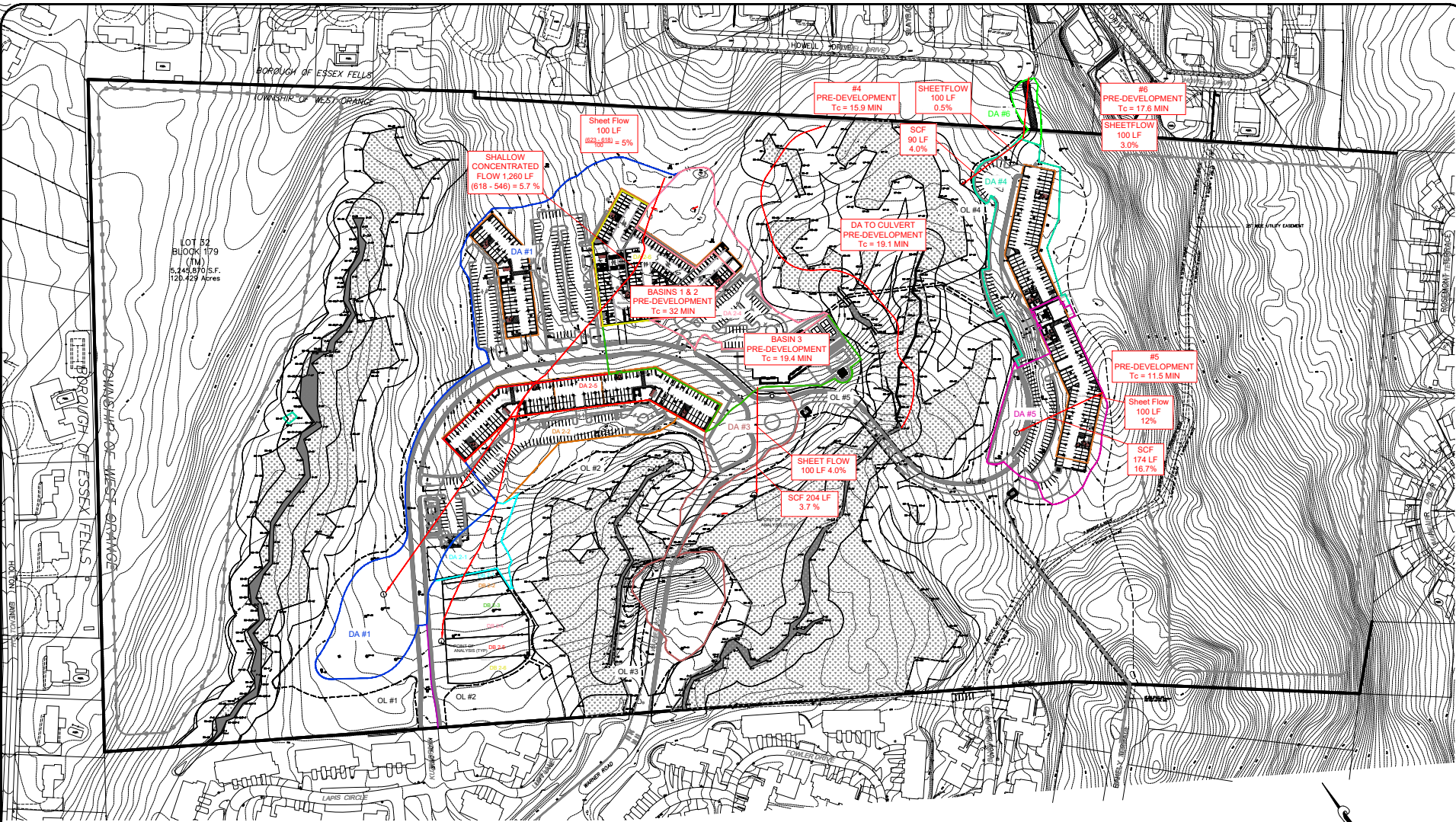
Culvert Design

The roadway to Building D crosses a small stream, and the roadway design includes a culvert designed to convey the runoff from the drainage area upstream of the culvert. The stream has a drainage area of 18 acres, so no FHA permit is required by NJDEP. The crossing does have to meet the standards for riparian zone disturbance, and this is the subject of our NJDEP application. The culvert capacity has been designed to convey the flow through the culvert with 1 foot of freeboard for the 100-year storm. Hydrographs and a routing of the flow through the culvert are included in this report.

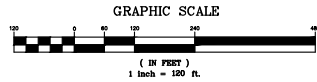
Conclusion

The design of the West Essex Highlands Project has been completed in accordance with the court approved resolution with the limiting of the area of disturbance below 30 acres and the inclusion of environmentally friendly designs that are sensitive to the existing environmental constraints.

The stormwater design includes green technology for water quantity, quality and seeks to optimize the volume groundwater recharge with green technology. The overall discharge has been conservatively calculated for each drainage basin and overall and meet the discharge standards as required in the state standards and municipal ordinance.



PRE-DEVELOPMENT	
DA TO BASIN 1:	32.0 MIN
DA TO BASIN 2:	32.0 MIN
DA TO BASIN 3:	19.4 MIN
DA TO 4:	15.9 MIN
DA TO 5:	11.5 MIN
DA TO 6:	17.6 MIN
DA TO CULVERT :	19.1 MIN



LOD: 1,234,888.2 SF
28.35 Acres

○ - POINT OF ANALYSIS

- MAP REFERENCE:
- TOPOGRAPHIC INFORMATION BASED ON SURVEY ENTITLED "TOPOGRAPHIC SURVEY OF PROPERTY" TAX LOTS 1, 2, 04, & 3 - BLOCK 161 TAX LOT 3.01 - BLOCK 161, 1701-1711 ROUTE 10, TOWNSHIP OF MORRIS PLAINS, MORRIS COUNTY, NEW JERSEY DATED 1/15/16 AND LAST REVISED 1-20-20 PREPARED BY LAKEVIEW SURVEYING, ROCKAWAY NJ. SIGNED BY MARC J. CIFONE, PLS
 - VERTICAL DATUM IS NAVD 1988
 - NGVD29 TO NGVD1988 = + 1.03 FT
 - FRESHWATERS WETLANDS/BOUNDARY LINE AS VERIFIED BY NJDEP FILE No. 1423-07-0001.1, FWW190001



NEW JERSEY STATE LAW REQUIRES NOTIFICATION 3 BUSINESS DAYS PRIOR TO ANY LAND DISTURBANCE. CONTRACTOR IS RESPONSIBLE FOR CALLING 811 OR 1-800-272-1000 FOR UTILITY MARKOUTS. UTILITY INFORMATION SHOWN IS PROVIDED BY THE SURVEYOR AND IS CURRENT AT THE TIME OF THE SURVEY. ANDERSON CONSULTING SERVICES IS NOT RESPONSIBLE FOR THE ACCURACY OF THE DATA.

PAUL W. ANDERSON
N.J. PROFESSIONAL ENGINEER
LICENSE NO. 12043



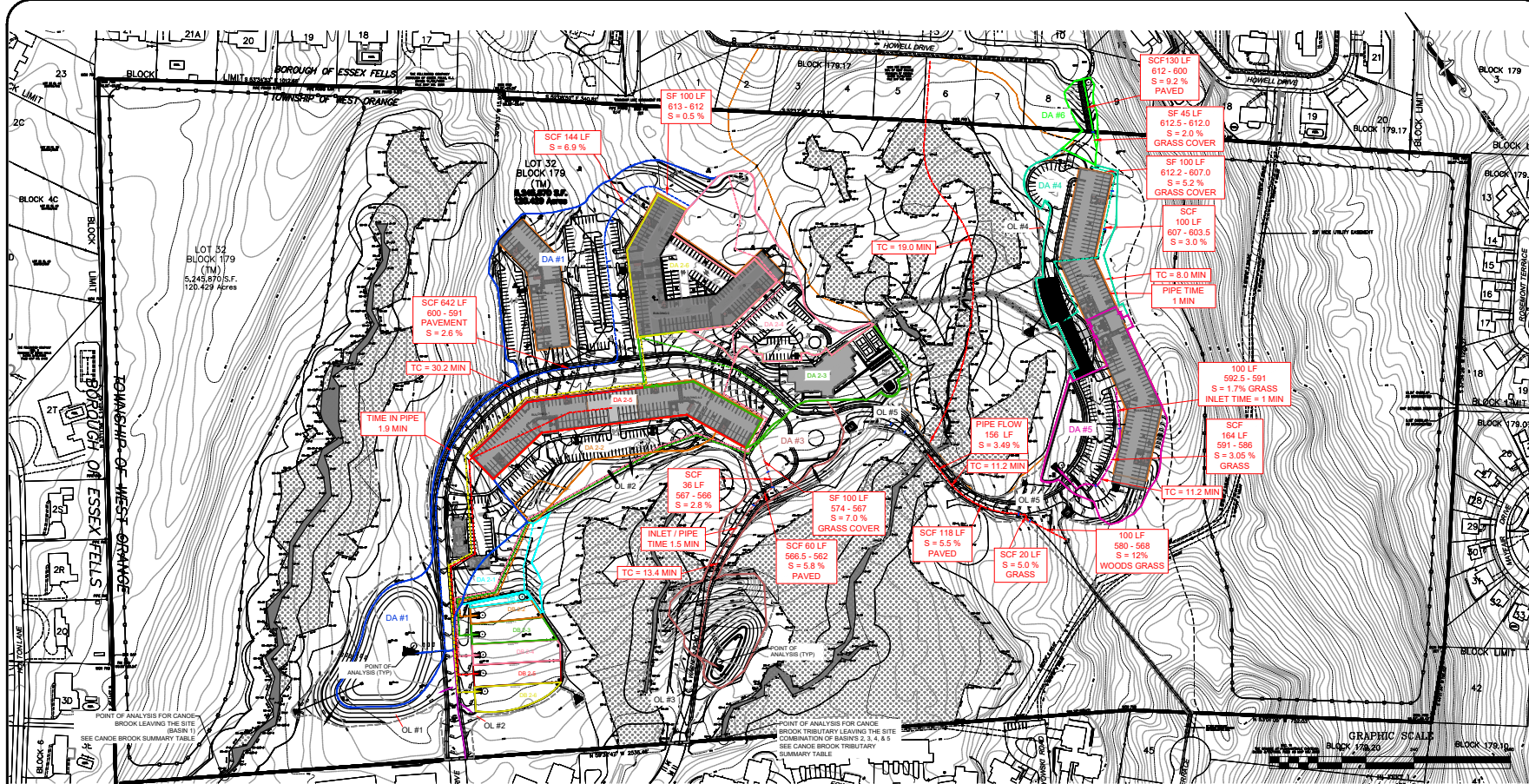
10/26/23	PER NJDEP COMMENTS
10/26/23	PER NJDEP COMMENTS
10/26/23	PER NJDEP COMMENTS
7/17/23	PER NJDEP COMMENTS
2/9/23	PER NJDEP COMMENTS

ACB
40 Miller Drive
Bloomington, NJ 07005
Tel: 973.975.0703
Fax: 973.975.0703
www.pwanderson-cs.com

Project No.	12-24-23
Date	12-24-23
Drawn By	RCA
Checked By	PWA
Scale	AS SHOWN

PRELIMINARY AND FINAL SITE PLAN
WEST ESSEX HIGHLANDS
BLOCK 179 LOT 32
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY
PRE-DEVELOPMENT DRAINAGE AREA
DA-1

SHEET 1 OF 3



DA-1

TOTAL:	314,926.1 SF
IMPERVIOUS:	121,300.8 SF
PERVIOUS:	203,625.3 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 144 LF GRASS COVER S = 6.9%	
1c. S.C.F. 642 LF PAVEMENT S = 2.6%	
TIME IN PIPE: 2.35 MIN	
Tc: 30.2 MIN	

DA-2

TOTAL:	64,315.3 SF
IMPERVIOUS:	34,005.0 SF
PERVIOUS:	30,310.3 SF
POND AREA:	7,112.4 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 120 LF GRASS COVER S = 6.9%	
1c. S.C.F. 120 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 426 LF 15" PIPE	
S _{avg} = 3.3%	
Tc: 4.6 MIN	

DA-3

TOTAL:	98,636.1 SF
IMPERVIOUS:	26,461.0 SF
PERVIOUS:	72,175.1 SF
POND AREA:	11,090.0 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 120 LF GRASS COVER S = 6.9%	
1c. S.C.F. 120 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,892 LF 15" PIPE	
S _{avg} = 3.3%	
Tc: 10 MIN	

DA-4

TOTAL:	80,222.6 SF
IMPERVIOUS:	69,441.0 SF
PERVIOUS:	10,781.6 SF
POND AREA:	10,782.1 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 60 LF GRASS COVER S = 6.9%	
1c. S.C.F. 60 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 600 LF 15" PIPE	
S _{avg} = 4.1%	
Tc: 4.5 MIN	

DA-5

TOTAL:	83,083.0 SF
IMPERVIOUS:	61,223.7 SF
PERVIOUS:	21,759.3 SF
POND AREA:	10,178.0 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 100 LF GRASS COVER S = 6.9%	
1c. S.C.F. 100 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,000 LF 15" PIPE	
S _{avg} = 4.1%	
Tc: 8.0 MIN	

DA-6

TOTAL:	11,773.6 SF
IMPERVIOUS:	3,000.0 SF (25.5%)
PERVIOUS:	8,773.6 SF (74.5%)
Tc:	10.0 MIN

UNDETAILED AREAS

TOTAL:	194,686.7 SF
OL1:	56,038.8 SF
OL2:	39,625.3 SF
OL3:	18,616.3 SF
OL4:	11,273.2 SF
OL5:	69,133.1 SF

DA TO CULVERT

TOTAL:	573,106 SF
PERVIOUS:	13,156 Acres
Tc:	19.0 MIN

DA-2-1

TOTAL:	24,371.6 SF
IMPERVIOUS:	607.2 SF
PERVIOUS:	23,764.4 SF
POND AREA:	2,000.0 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 100 LF GRASS COVER S = 6.9%	
1c. S.C.F. 100 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,000 LF 15" PIPE	
S _{avg} = 3.3%	
Tc: 4.6 MIN	

DA-2-2

TOTAL:	98,393.8 SF
IMPERVIOUS:	41,793.0 SF
PERVIOUS:	56,600.8 SF
POND AREA:	10,411.7 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 120 LF GRASS COVER S = 6.9%	
1c. S.C.F. 120 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,200 LF 15" PIPE	
S _{avg} = 3.3%	
Tc: 10.5 MIN	

DA-2-3

TOTAL:	71,875.3 SF
IMPERVIOUS:	60,317.0 SF
PERVIOUS:	11,558.3 SF
POND AREA:	11,558.0 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 120 LF GRASS COVER S = 6.9%	
1c. S.C.F. 120 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,200 LF 15" PIPE	
S _{avg} = 4.1%	
Tc: 4.5 MIN	

DA-3

TOTAL:	95,425.1 SF
IMPERVIOUS:	32,411.7 SF
PERVIOUS:	63,013.4 SF
POND AREA:	10,178.0 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 100 LF GRASS COVER S = 6.9%	
1c. S.C.F. 100 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,000 LF 15" PIPE	
S _{avg} = 4.1%	
Tc: 9.2 MIN	

DA-5

TOTAL:	99,084.0 SF
IMPERVIOUS:	62,281.0 SF
PERVIOUS:	36,803.0 SF
POND AREA:	12,412.4 SF
1a. SHEETFLOW 100 LF GRASS COVER S = 0.5%	
1b. S.C.F. 100 LF GRASS COVER S = 6.9%	
1c. S.C.F. 100 LF PAVEMENT S = 4.5%	
PIPE FLOW TIME: 1,000 LF 15" PIPE	
S _{avg} = 4.1%	
Tc: 11.3 MIN	

OL 1

TOTAL:	56,038.8 SF
IMPERVIOUS:	3,552.3 SF
PERVIOUS:	52,486.5 SF
Tc:	5.9 MIN

OL 2

TOTAL:	39,625.3 SF
IMPERVIOUS:	1,295.3 SF
PERVIOUS:	38,330.0 SF
Tc:	4.0 MIN

OL 3

TOTAL:	18,616.3 SF
IMPERVIOUS:	6,736.8 SF
PERVIOUS:	11,879.5 SF
Tc:	4 MIN

OL 4

TOTAL:	11,273.2 SF
IMPERVIOUS:	301.0 SF
PERVIOUS:	10,972.2 SF
Tc:	8.7 MIN

OL 5

TOTAL:	69,133.1 SF
IMPERVIOUS:	22,200.0 SF
PERVIOUS:	46,933.1 SF
Tc:	7.6 MIN

- POINT OF ANALYSIS

DETAINED:	1,027,732.9 SF
UNDETAILED:	194,686.7 SF

TOTAL SITE LIMIT OF DISTURBANCE:

1,234,889.2 SF
28.35 Acres

NEW JERSEY STATE LAW REQUIRES NOTIFICATION 3 BUSINESS DAYS PRIOR TO ANY LAND DISTURBANCE. CONTRACTOR IS RESPONSIBLE FOR CALLING 811 OR 1-800-272-1000 FOR UTILITY MARKING. UTILITY INFORMATION SHOWN IS THE PROPERTY OF THE TOWNSHIP OF WEST ORANGE, NEW JERSEY. ANDERSON CONSULTING SERVICES IS NOT RESPONSIBLE FOR THE ACCURACY OF THE DATA.

PAUL W. ANDERSON
N.J. PROFESSIONAL ENGINEER
No. 120000001

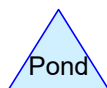
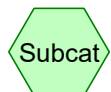
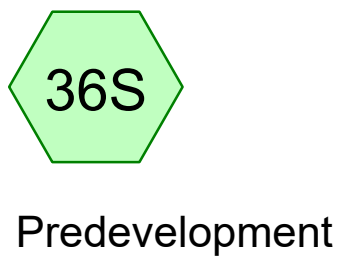
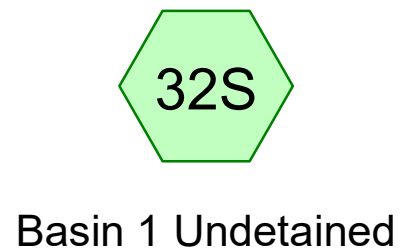
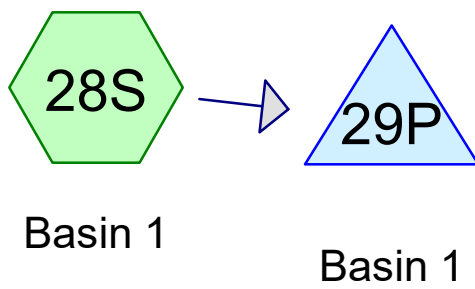
WEST ORANGE, NEW JERSEY
1000 WEST ORANGE AVENUE
SUITE 200
WEST ORANGE, NJ 07090
TEL: 973.975.0703
WWW.PWANDERSON-CA.COM

PRELIMINARY AND FINAL SITE PLAN
WEST ORANGE, NEW JERSEY
DA-2

OVERALL DRAINAGE AREA MAP

DATE: 1-24-23
BY: PWA
CHECKED BY: PWA
APPROVED BY: PWA
SCALE: AS SHOWN

10/26/23 PER NADP COMMENTS
10/23/23 PER NADP COMMENTS
10/23/23 PER NADP COMMENTS
10/23/23 PER NADP COMMENTS
10/23/23 PER NADP COMMENTS
10/23/23 PER NADP COMMENTS



Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.968	74	>75% Grass cover, Good, HSG C (28S, 32S)
4.445	98	Paved parking, HSG C (28S)
8.469	70	Woods, Good, HSG C (36S)
16.883	78	TOTAL AREA

Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
16.883	HSG C	28S, 32S, 36S
0.000	HSG D	
0.000	Other	
16.883		TOTAL AREA

Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	3.968	0.000	0.000	3.968	>75% Grass cover, Good	28S, 32S
0.000	0.000	4.445	0.000	0.000	4.445	Paved parking	28S
0.000	0.000	8.469	0.000	0.000	8.469	Woods, Good	36S
0.000	0.000	16.883	0.000	0.000	16.883	TOTAL AREA	

Proposed basin 1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	28S	0.00	0.00	873.0	0.0520	0.013	0.0	18.0	12.0	

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 28S: Basin 1

Runoff Area=314,926 sf Runoff Depth=2.43"

Flow Length=1,759' Tc=30.2 min CN=74/98 Runoff=9.88 cfs 1.466 af

Subcatchment 32S: Basin 1 Undetained

Runoff Area=51,560 sf Runoff Depth=1.20"

Flow Length=70' Slope=0.0800 '/' Tc=10.0 min CN=74/0 Runoff=1.36 cfs 0.118 af

Subcatchment 36S: Basin 1 Predevelopment

Runoff Area=368,926 sf Runoff Depth=0.97"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=4.51 cfs 0.685 af

Pond 29P: Basin 1

Peak Elev=542.84' Storage=63,856 cf Inflow=9.88 cfs 1.466 af

Outflow=0.00 cfs 0.000 af

Total Runoff Area = 16.883 ac Runoff Volume = 2.270 af Average Runoff Depth = 1.61"

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 28S: Basin 1

[47] Hint: Peak is 251% of capacity of segment #4

Runoff = 9.88 cfs @ 12.42 hrs, Volume= 1.466 af, Depth= 2.43"
Routed to Pond 29P : Basin 1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
193,625	98	Paved parking, HSG C
121,301	74	>75% Grass cover, Good, HSG C
314,926	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	100	0.0050	0.07		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.44"
0.6	144	0.0690	3.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	642	0.0206	2.91		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	873	0.0520	7.62	3.93	Pipe Channel, 18.0" Round w/ 12.0" inside fill Area= 0.5 sf Perim= 3.3' r= 0.16' n= 0.013 Corrugated PE, smooth interior
30.2	1,759	Total			

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

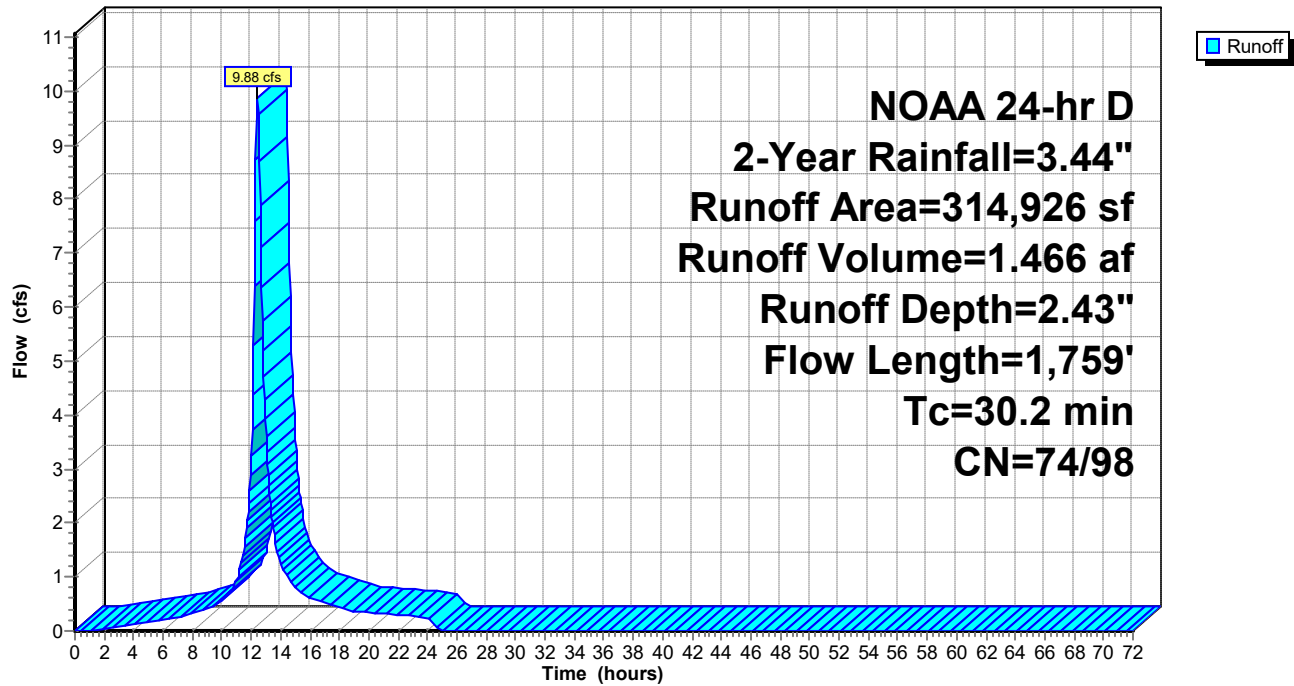
Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Subcatchment 28S: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Hydrograph for Subcatchment 28S: Basin 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.02	0.06
5.00	0.24	0.00	0.09	0.17
7.50	0.40	0.00	0.23	0.29
10.00	0.68	0.00	0.49	0.58
12.50	2.35	0.53	2.12	9.36
15.00	2.89	0.84	2.66	0.83
17.50	3.11	0.98	2.88	0.48
20.00	3.26	1.08	3.03	0.35
22.50	3.38	1.16	3.15	0.29
25.00	3.44	1.20	3.21	0.01
27.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
32.50	3.44	1.20	3.21	0.00
35.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
40.00	3.44	1.20	3.21	0.00
42.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
47.50	3.44	1.20	3.21	0.00
50.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
55.00	3.44	1.20	3.21	0.00
57.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
62.50	3.44	1.20	3.21	0.00
65.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
70.00	3.44	1.20	3.21	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Summary for Subcatchment 32S: Basin 1 Undetained

Runoff = 1.36 cfs @ 12.18 hrs, Volume= 0.118 af, Depth= 1.20"

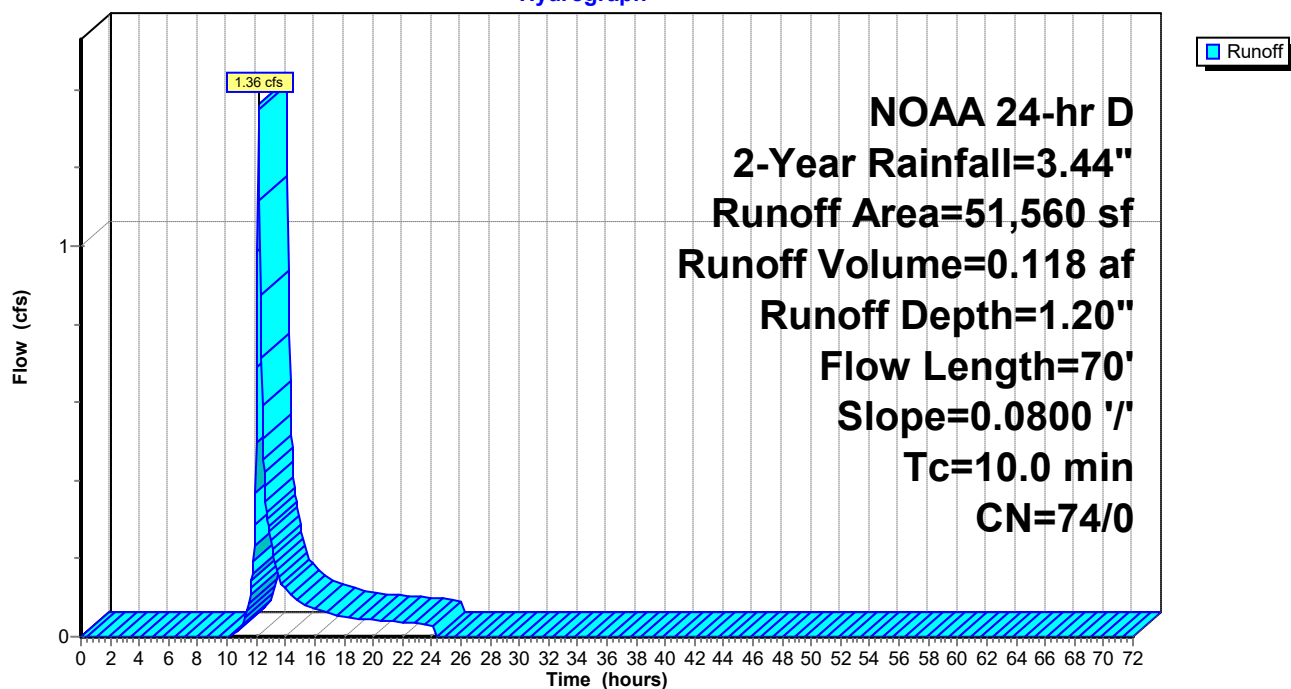
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
51,560	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	70	0.0800	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
5.9	70	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 32S: Basin 1 Undetained

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Hydrograph for Subcatchment 32S: Basin 1 Undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.53	0.00	0.45
15.00	2.89	0.84	0.00	0.09
17.50	3.11	0.98	0.00	0.05
20.00	3.26	1.08	0.00	0.04
22.50	3.38	1.16	0.00	0.04
25.00	3.44	1.20	0.00	0.00
27.50	3.44	1.20	0.00	0.00
30.00	3.44	1.20	0.00	0.00
32.50	3.44	1.20	0.00	0.00
35.00	3.44	1.20	0.00	0.00
37.50	3.44	1.20	0.00	0.00
40.00	3.44	1.20	0.00	0.00
42.50	3.44	1.20	0.00	0.00
45.00	3.44	1.20	0.00	0.00
47.50	3.44	1.20	0.00	0.00
50.00	3.44	1.20	0.00	0.00
52.50	3.44	1.20	0.00	0.00
55.00	3.44	1.20	0.00	0.00
57.50	3.44	1.20	0.00	0.00
60.00	3.44	1.20	0.00	0.00
62.50	3.44	1.20	0.00	0.00
65.00	3.44	1.20	0.00	0.00
67.50	3.44	1.20	0.00	0.00
70.00	3.44	1.20	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Summary for Subcatchment 36S: Basin 1 Predevelopment

Runoff = 4.51 cfs @ 12.49 hrs, Volume= 0.685 af, Depth= 0.97"

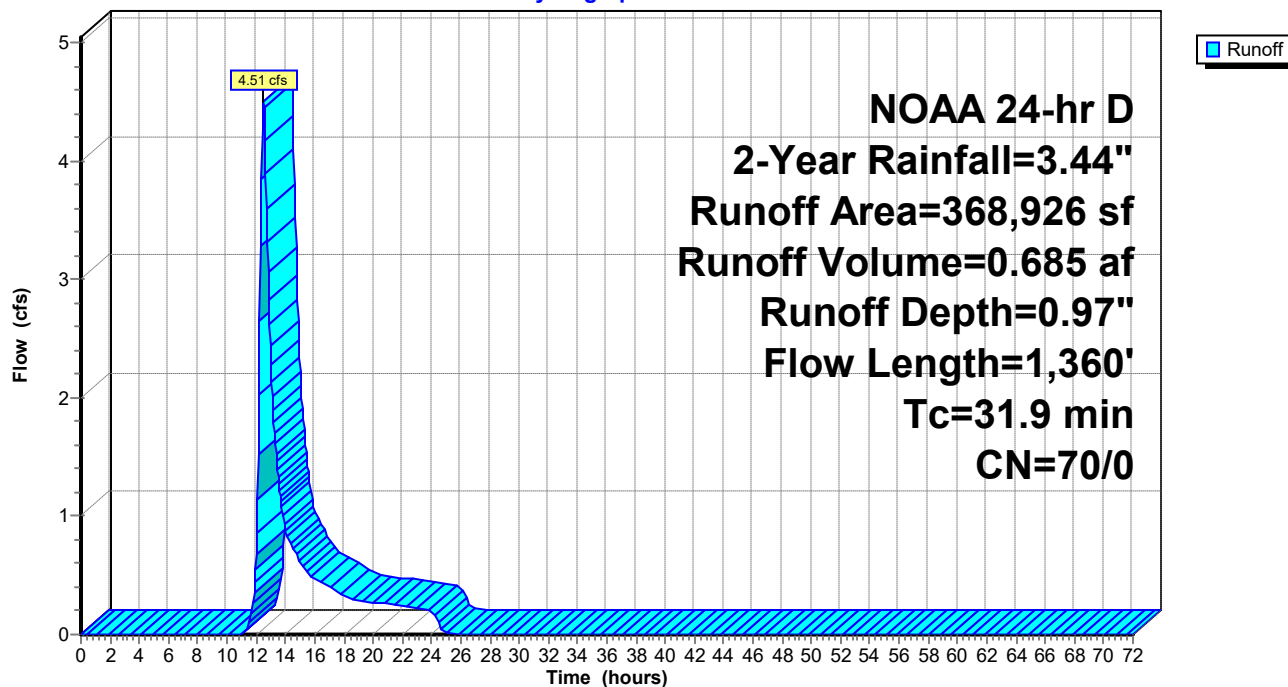
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
368,926	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 36S: Basin 1 Predevelopment

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Hydrograph for Subcatchment 36S: Basin 1 Predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	4.50
15.00	2.89	0.66	0.00	0.62
17.50	3.11	0.78	0.00	0.37
20.00	3.26	0.86	0.00	0.27
22.50	3.38	0.93	0.00	0.23
25.00	3.44	0.97	0.00	0.01
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Summary for Pond 29P: Basin 1

Inflow Area = 7.230 ac, Inflow Depth = 2.43" for 2-Year event
Inflow = 9.88 cfs @ 12.42 hrs, Volume= 1.466 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 542.84' @ 25.80 hrs Surf.Area= 32,964 sf Storage= 63,856 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	191,393 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	21,047	0	0
542.00	29,152	37,649	37,649
544.00	38,188	67,340	104,989
546.00	48,216	86,404	191,393

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=540.50' (Free Discharge)
↑ **1=Orifice/Grate** (Controls 0.00 cfs)

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

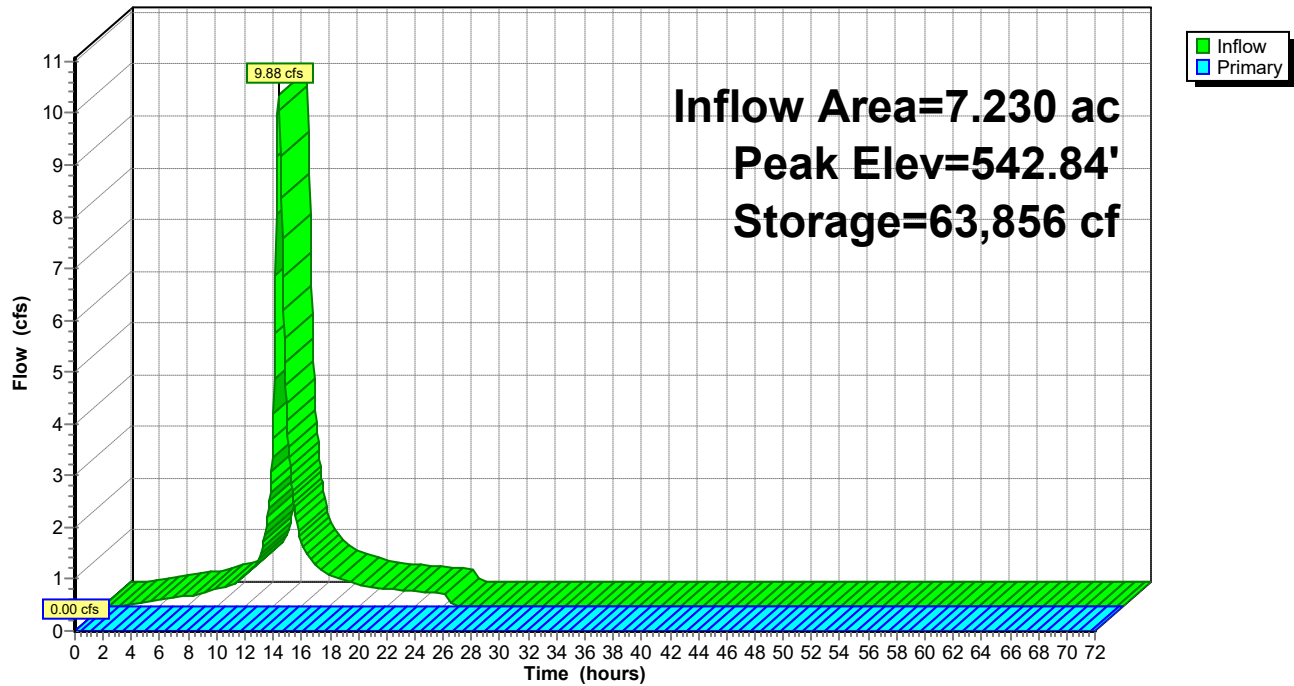
Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Pond 29P: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Hydrograph for Pond 29P: Basin 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.06	127	540.51	0.00
5.00	0.17	1,231	540.56	0.00
7.50	0.29	3,216	540.65	0.00
10.00	0.58	6,808	540.81	0.00
12.50	9.36	28,252	541.67	0.00
15.00	0.83	50,183	542.42	0.00
17.50	0.48	55,647	542.59	0.00
20.00	0.35	59,153	542.70	0.00
22.50	0.29	61,995	542.79	0.00
25.00	0.01	63,853	542.84	0.00
27.50	0.00	63,858	542.84	0.00
30.00	0.00	63,858	542.84	0.00
32.50	0.00	63,858	542.84	0.00
35.00	0.00	63,858	542.84	0.00
37.50	0.00	63,858	542.84	0.00
40.00	0.00	63,858	542.84	0.00
42.50	0.00	63,858	542.84	0.00
45.00	0.00	63,858	542.84	0.00
47.50	0.00	63,858	542.84	0.00
50.00	0.00	63,858	542.84	0.00
52.50	0.00	63,858	542.84	0.00
55.00	0.00	63,858	542.84	0.00
57.50	0.00	63,858	542.84	0.00
60.00	0.00	63,858	542.84	0.00
62.50	0.00	63,858	542.84	0.00
65.00	0.00	63,858	542.84	0.00
67.50	0.00	63,858	542.84	0.00
70.00	0.00	63,858	542.84	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 19

Stage-Discharge for Pond 29P: Basin 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	543.05	0.08	545.60	2.59
540.55	0.00	543.10	0.13	545.65	2.61
540.60	0.00	543.15	0.20	545.70	2.64
540.65	0.00	543.20	0.28	545.75	2.67
540.70	0.00	543.25	0.37	545.80	2.69
540.75	0.00	543.30	0.47	545.85	2.72
540.80	0.00	543.35	0.57	545.90	2.74
540.85	0.00	543.40	0.68	545.95	2.77
540.90	0.00	543.45	0.78	546.00	2.80
540.95	0.00	543.50	0.87		
541.00	0.00	543.55	0.95		
541.05	0.00	543.60	1.02		
541.10	0.00	543.65	1.08		
541.15	0.00	543.70	1.15		
541.20	0.00	543.75	1.21		
541.25	0.00	543.80	1.27		
541.30	0.00	543.85	1.32		
541.35	0.00	543.90	1.37		
541.40	0.00	543.95	1.42		
541.45	0.00	544.00	1.47		
541.50	0.00	544.05	1.52		
541.55	0.00	544.10	1.56		
541.60	0.00	544.15	1.61		
541.65	0.00	544.20	1.65		
541.70	0.00	544.25	1.69		
541.75	0.00	544.30	1.74		
541.80	0.00	544.35	1.78		
541.85	0.00	544.40	1.82		
541.90	0.00	544.45	1.85		
541.95	0.00	544.50	1.89		
542.00	0.00	544.55	1.93		
542.05	0.00	544.60	1.96		
542.10	0.00	544.65	2.00		
542.15	0.00	544.70	2.04		
542.20	0.00	544.75	2.07		
542.25	0.00	544.80	2.10		
542.30	0.00	544.85	2.14		
542.35	0.00	544.90	2.17		
542.40	0.00	544.95	2.20		
542.45	0.00	545.00	2.23		
542.50	0.00	545.05	2.27		
542.55	0.00	545.10	2.30		
542.60	0.00	545.15	2.33		
542.65	0.00	545.20	2.36		
542.70	0.00	545.25	2.39		
542.75	0.00	545.30	2.42		
542.80	0.00	545.35	2.45		
542.85	0.00	545.40	2.47		
542.90	0.00	545.45	2.50		
542.95	0.01	545.50	2.53		
543.00	0.04	545.55	2.56		

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 20

Stage-Area-Storage for Pond 29P: Basin 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	21,047	0	545.60	46,210	172,508
540.60	21,587	2,132	545.70	46,712	177,154
540.70	22,128	4,317	545.80	47,213	181,850
540.80	22,668	6,557	545.90	47,715	186,597
540.90	23,208	8,851	546.00	48,216	191,393
541.00	23,749	11,199			
541.10	24,289	13,601			
541.20	24,829	16,057			
541.30	25,370	18,567			
541.40	25,910	21,131			
541.50	26,450	23,749			
541.60	26,991	26,421			
541.70	27,531	29,147			
541.80	28,071	31,927			
541.90	28,612	34,761			
542.00	29,152	37,649			
542.10	29,604	40,587			
542.20	30,056	43,570			
542.30	30,507	46,598			
542.40	30,959	49,671			
542.50	31,411	52,790			
542.60	31,863	55,954			
542.70	32,315	59,163			
542.80	32,766	62,417			
542.90	33,218	65,716			
543.00	33,670	69,060			
543.10	34,122	72,450			
543.20	34,574	75,885			
543.30	35,025	79,365			
543.40	35,477	82,890			
543.50	35,929	86,460			
543.60	36,381	90,075			
543.70	36,833	93,736			
543.80	37,284	97,442			
543.90	37,736	101,193			
544.00	38,188	104,989			
544.10	38,689	108,833			
544.20	39,191	112,727			
544.30	39,692	116,671			
544.40	40,194	120,666			
544.50	40,695	124,710			
544.60	41,196	128,805			
544.70	41,698	132,949			
544.80	42,199	137,144			
544.90	42,701	141,389			
545.00	43,202	145,684			
545.10	43,703	150,030			
545.20	44,205	154,425			
545.30	44,706	158,870			
545.40	45,208	163,366			
545.50	45,709	167,912			

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 28S: Basin 1

Runoff Area=314,926 sf Runoff Depth=4.04"

Flow Length=1,759' Tc=30.2 min CN=74/98 Runoff=16.45 cfs 2.435 af

Subcatchment 32S: Basin 1 Undetained

Runoff Area=51,560 sf Runoff Depth=2.54"

Flow Length=70' Slope=0.0800 '/' Tc=10.0 min CN=74/0 Runoff=2.97 cfs 0.251 af

Subcatchment 36S: Basin 1 Predevelopment

Runoff Area=368,926 sf Runoff Depth=2.20"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=11.02 cfs 1.553 af

Pond 29P: Basin 1

Peak Elev=543.44' Storage=84,135 cf Inflow=16.45 cfs 2.435 af

Outflow=0.75 cfs 0.891 af

Total Runoff Area = 16.883 ac Runoff Volume = 4.239 af Average Runoff Depth = 3.01"

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Summary for Subcatchment 28S: Basin 1

[47] Hint: Peak is 418% of capacity of segment #4

Runoff = 16.45 cfs @ 12.41 hrs, Volume= 2.435 af, Depth= 4.04"
Routed to Pond 29P : Basin 1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
193,625	98	Paved parking, HSG C
121,301	74	>75% Grass cover, Good, HSG C
314,926	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	100	0.0050	0.07		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.44"
0.6	144	0.0690	3.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	642	0.0206	2.91		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	873	0.0520	7.62	3.93	Pipe Channel, 18.0" Round w/ 12.0" inside fill Area= 0.5 sf Perim= 3.3' r= 0.16' n= 0.013 Corrugated PE, smooth interior
30.2	1,759	Total			

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

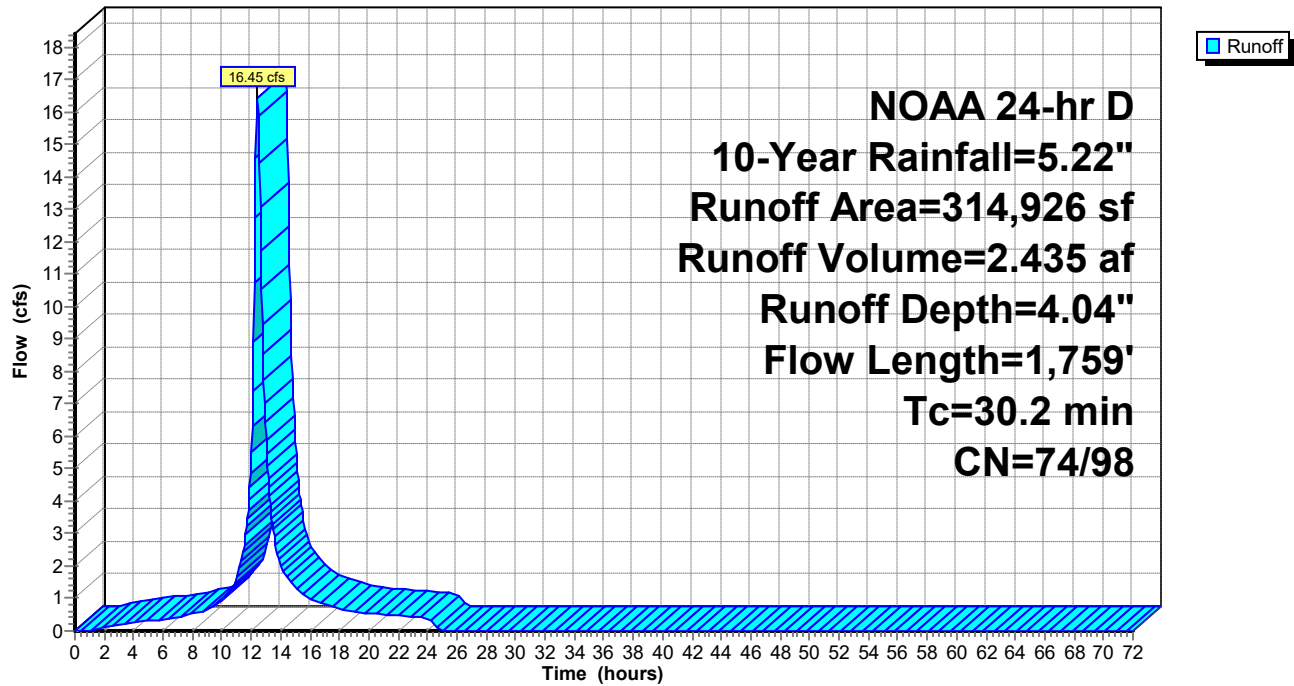
Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Subcatchment 28S: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Hydrograph for Subcatchment 28S: Basin 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.04	0.16
5.00	0.36	0.00	0.19	0.31
7.50	0.61	0.00	0.42	0.48
10.00	1.03	0.03	0.82	0.98
12.50	3.57	1.29	3.33	15.54
15.00	4.39	1.89	4.16	1.34
17.50	4.73	2.15	4.49	0.77
20.00	4.95	2.32	4.71	0.56
22.50	5.13	2.47	4.89	0.46
25.00	5.22	2.54	4.98	0.01
27.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
32.50	5.22	2.54	4.98	0.00
35.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
40.00	5.22	2.54	4.98	0.00
42.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
47.50	5.22	2.54	4.98	0.00
50.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
55.00	5.22	2.54	4.98	0.00
57.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
62.50	5.22	2.54	4.98	0.00
65.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
70.00	5.22	2.54	4.98	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Summary for Subcatchment 32S: Basin 1 Undetained

Runoff = 2.97 cfs @ 12.18 hrs, Volume= 0.251 af, Depth= 2.54"

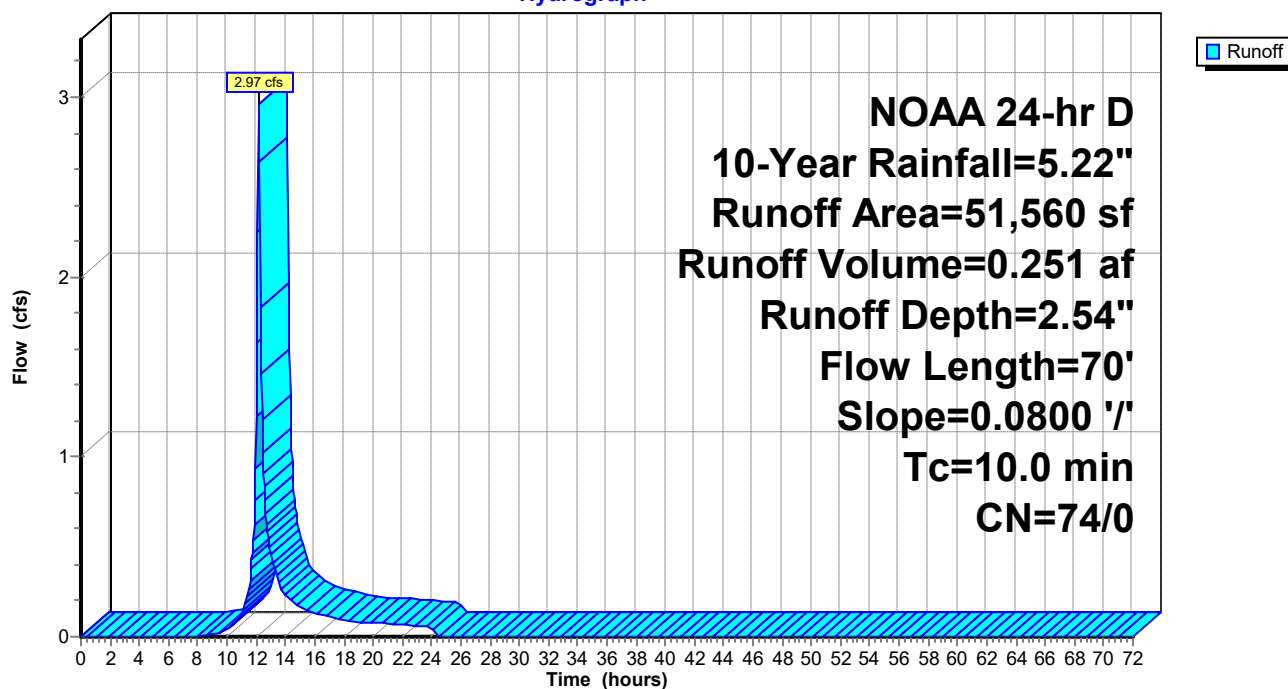
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
51,560	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	70	0.0800	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
5.9	70	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 32S: Basin 1 Undetained

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Hydrograph for Subcatchment 32S: Basin 1 Undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.03	0.00	0.04
12.50	3.57	1.29	0.00	0.91
15.00	4.39	1.89	0.00	0.16
17.50	4.73	2.15	0.00	0.10
20.00	4.95	2.32	0.00	0.08
22.50	5.13	2.47	0.00	0.06
25.00	5.22	2.54	0.00	0.00
27.50	5.22	2.54	0.00	0.00
30.00	5.22	2.54	0.00	0.00
32.50	5.22	2.54	0.00	0.00
35.00	5.22	2.54	0.00	0.00
37.50	5.22	2.54	0.00	0.00
40.00	5.22	2.54	0.00	0.00
42.50	5.22	2.54	0.00	0.00
45.00	5.22	2.54	0.00	0.00
47.50	5.22	2.54	0.00	0.00
50.00	5.22	2.54	0.00	0.00
52.50	5.22	2.54	0.00	0.00
55.00	5.22	2.54	0.00	0.00
57.50	5.22	2.54	0.00	0.00
60.00	5.22	2.54	0.00	0.00
62.50	5.22	2.54	0.00	0.00
65.00	5.22	2.54	0.00	0.00
67.50	5.22	2.54	0.00	0.00
70.00	5.22	2.54	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Summary for Subcatchment 36S: Basin 1 Predevelopment

Runoff = 11.02 cfs @ 12.46 hrs, Volume= 1.553 af, Depth= 2.20"

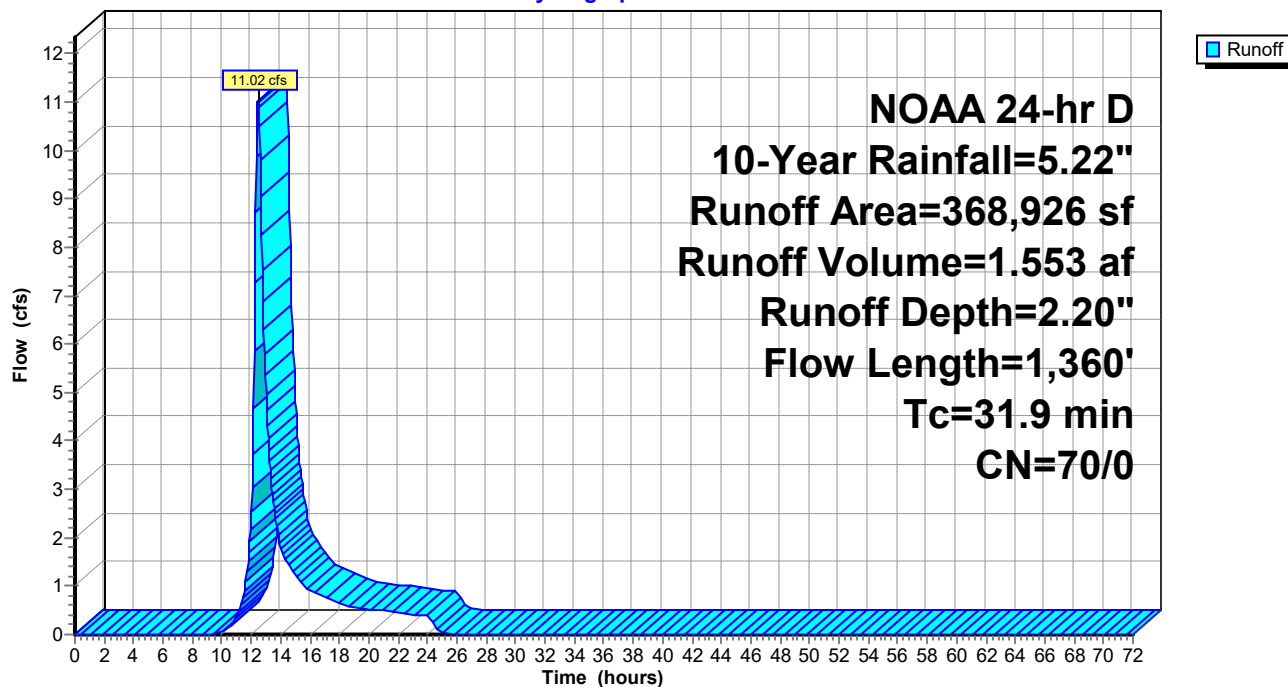
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
368,926	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 36S: Basin 1 Predevelopment

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Hydrograph for Subcatchment 36S: Basin 1 Predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.06
12.50	3.57	1.05	0.00	10.90
15.00	4.39	1.60	0.00	1.22
17.50	4.73	1.83	0.00	0.71
20.00	4.95	2.00	0.00	0.52
22.50	5.13	2.13	0.00	0.44
25.00	5.22	2.20	0.00	0.01
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Summary for Pond 29P: Basin 1

Inflow Area = 7.230 ac, Inflow Depth = 4.04" for 10-Year event
Inflow = 16.45 cfs @ 12.41 hrs, Volume= 2.435 af
Outflow = 0.75 cfs @ 17.63 hrs, Volume= 0.891 af, Atten= 95%, Lag= 312.9 min
Primary = 0.75 cfs @ 17.63 hrs, Volume= 0.891 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.44' @ 17.63 hrs Surf.Area= 35,635 sf Storage= 84,135 cf

Plug-Flow detention time= 838.1 min calculated for 0.891 af (37% of inflow)
Center-of-Mass det. time= 660.0 min (1,454.5 - 794.5)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	191,393 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	21,047	0	0
542.00	29,152	37,649	37,649
544.00	38,188	67,340	104,989
546.00	48,216	86,404	191,393

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.75 cfs @ 17.63 hrs HW=543.44' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 0.75 cfs @ 2.49 fps)

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

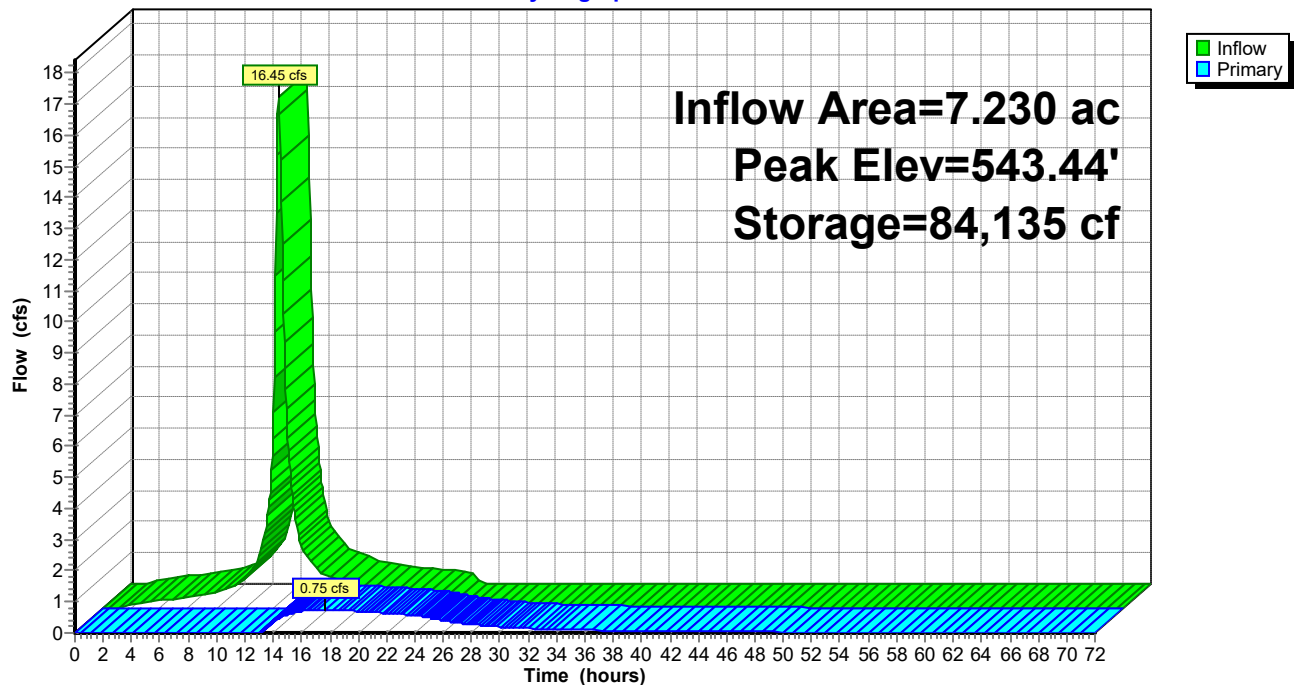
Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 30

Pond 29P: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 31

Hydrograph for Pond 29P: Basin 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.16	426	540.52	0.00
5.00	0.31	2,573	540.62	0.00
7.50	0.48	5,932	540.77	0.00
10.00	0.98	11,821	541.03	0.00
12.50	15.54	48,085	542.35	0.00
15.00	1.34	81,627	543.36	0.60
17.50	0.77	84,132	543.43	0.75
20.00	0.56	83,229	543.41	0.70
22.50	0.46	81,880	543.37	0.62
25.00	0.01	79,733	543.31	0.49
27.50	0.00	76,246	543.21	0.30
30.00	0.00	74,032	543.15	0.20
32.50	0.00	72,535	543.10	0.14
35.00	0.00	71,472	543.07	0.10
37.50	0.00	70,673	543.05	0.08
40.00	0.00	70,066	543.03	0.06
42.50	0.00	69,584	543.02	0.05
45.00	0.00	69,185	543.00	0.04
47.50	0.00	68,855	542.99	0.03
50.00	0.00	68,581	542.99	0.03
52.50	0.00	68,354	542.98	0.02
55.00	0.00	68,165	542.97	0.02
57.50	0.00	67,996	542.97	0.02
60.00	0.00	67,843	542.96	0.02
62.50	0.00	67,703	542.96	0.01
65.00	0.00	67,575	542.96	0.01
67.50	0.00	67,458	542.95	0.01
70.00	0.00	67,351	542.95	0.01

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 32

Stage-Discharge for Pond 29P: Basin 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	543.05	0.08	545.60	2.59
540.55	0.00	543.10	0.13	545.65	2.61
540.60	0.00	543.15	0.20	545.70	2.64
540.65	0.00	543.20	0.28	545.75	2.67
540.70	0.00	543.25	0.37	545.80	2.69
540.75	0.00	543.30	0.47	545.85	2.72
540.80	0.00	543.35	0.57	545.90	2.74
540.85	0.00	543.40	0.68	545.95	2.77
540.90	0.00	543.45	0.78	546.00	2.80
540.95	0.00	543.50	0.87		
541.00	0.00	543.55	0.95		
541.05	0.00	543.60	1.02		
541.10	0.00	543.65	1.08		
541.15	0.00	543.70	1.15		
541.20	0.00	543.75	1.21		
541.25	0.00	543.80	1.27		
541.30	0.00	543.85	1.32		
541.35	0.00	543.90	1.37		
541.40	0.00	543.95	1.42		
541.45	0.00	544.00	1.47		
541.50	0.00	544.05	1.52		
541.55	0.00	544.10	1.56		
541.60	0.00	544.15	1.61		
541.65	0.00	544.20	1.65		
541.70	0.00	544.25	1.69		
541.75	0.00	544.30	1.74		
541.80	0.00	544.35	1.78		
541.85	0.00	544.40	1.82		
541.90	0.00	544.45	1.85		
541.95	0.00	544.50	1.89		
542.00	0.00	544.55	1.93		
542.05	0.00	544.60	1.96		
542.10	0.00	544.65	2.00		
542.15	0.00	544.70	2.04		
542.20	0.00	544.75	2.07		
542.25	0.00	544.80	2.10		
542.30	0.00	544.85	2.14		
542.35	0.00	544.90	2.17		
542.40	0.00	544.95	2.20		
542.45	0.00	545.00	2.23		
542.50	0.00	545.05	2.27		
542.55	0.00	545.10	2.30		
542.60	0.00	545.15	2.33		
542.65	0.00	545.20	2.36		
542.70	0.00	545.25	2.39		
542.75	0.00	545.30	2.42		
542.80	0.00	545.35	2.45		
542.85	0.00	545.40	2.47		
542.90	0.00	545.45	2.50		
542.95	0.01	545.50	2.53		
543.00	0.04	545.55	2.56		

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 33

Stage-Area-Storage for Pond 29P: Basin 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	21,047	0	545.60	46,210	172,508
540.60	21,587	2,132	545.70	46,712	177,154
540.70	22,128	4,317	545.80	47,213	181,850
540.80	22,668	6,557	545.90	47,715	186,597
540.90	23,208	8,851	546.00	48,216	191,393
541.00	23,749	11,199			
541.10	24,289	13,601			
541.20	24,829	16,057			
541.30	25,370	18,567			
541.40	25,910	21,131			
541.50	26,450	23,749			
541.60	26,991	26,421			
541.70	27,531	29,147			
541.80	28,071	31,927			
541.90	28,612	34,761			
542.00	29,152	37,649			
542.10	29,604	40,587			
542.20	30,056	43,570			
542.30	30,507	46,598			
542.40	30,959	49,671			
542.50	31,411	52,790			
542.60	31,863	55,954			
542.70	32,315	59,163			
542.80	32,766	62,417			
542.90	33,218	65,716			
543.00	33,670	69,060			
543.10	34,122	72,450			
543.20	34,574	75,885			
543.30	35,025	79,365			
543.40	35,477	82,890			
543.50	35,929	86,460			
543.60	36,381	90,075			
543.70	36,833	93,736			
543.80	37,284	97,442			
543.90	37,736	101,193			
544.00	38,188	104,989			
544.10	38,689	108,833			
544.20	39,191	112,727			
544.30	39,692	116,671			
544.40	40,194	120,666			
544.50	40,695	124,710			
544.60	41,196	128,805			
544.70	41,698	132,949			
544.80	42,199	137,144			
544.90	42,701	141,389			
545.00	43,202	145,684			
545.10	43,703	150,030			
545.20	44,205	154,425			
545.30	44,706	158,870			
545.40	45,208	163,366			
545.50	45,709	167,912			

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 28S: Basin 1

Runoff Area=314,926 sf Runoff Depth=7.30"

Flow Length=1,759' Tc=30.2 min CN=74/98 Runoff=29.62 cfs 4.400 af

Subcatchment 32S: Basin 1 Undetained

Runoff Area=51,560 sf Runoff Depth=5.52"

Flow Length=70' Slope=0.0800 '/' Tc=10.0 min CN=74/0 Runoff=6.40 cfs 0.544 af

Subcatchment 36S: Basin 1 Predevelopment

Runoff Area=368,926 sf Runoff Depth=5.04"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=25.64 cfs 3.555 af

Pond 29P: Basin 1

Peak Elev=544.77' Storage=136,068 cf Inflow=29.62 cfs 4.400 af

Outflow=2.09 cfs 2.848 af

Total Runoff Area = 16.883 ac Runoff Volume = 8.499 af Average Runoff Depth = 6.04"

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Summary for Subcatchment 28S: Basin 1

[47] Hint: Peak is 754% of capacity of segment #4

Runoff = 29.62 cfs @ 12.41 hrs, Volume= 4.400 af, Depth= 7.30"
Routed to Pond 29P : Basin 1Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
193,625	98	Paved parking, HSG C
121,301	74	>75% Grass cover, Good, HSG C
314,926	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	100	0.0050	0.07		Sheet Flow, grass Grass: Dense n= 0.240 P2= 3.44"
0.6	144	0.0690	3.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	642	0.0206	2.91		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	873	0.0520	7.62	3.93	Pipe Channel, 18.0" Round w/ 12.0" inside fill Area= 0.5 sf Perim= 3.3' r= 0.16' n= 0.013 Corrugated PE, smooth interior
30.2	1,759	Total			

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

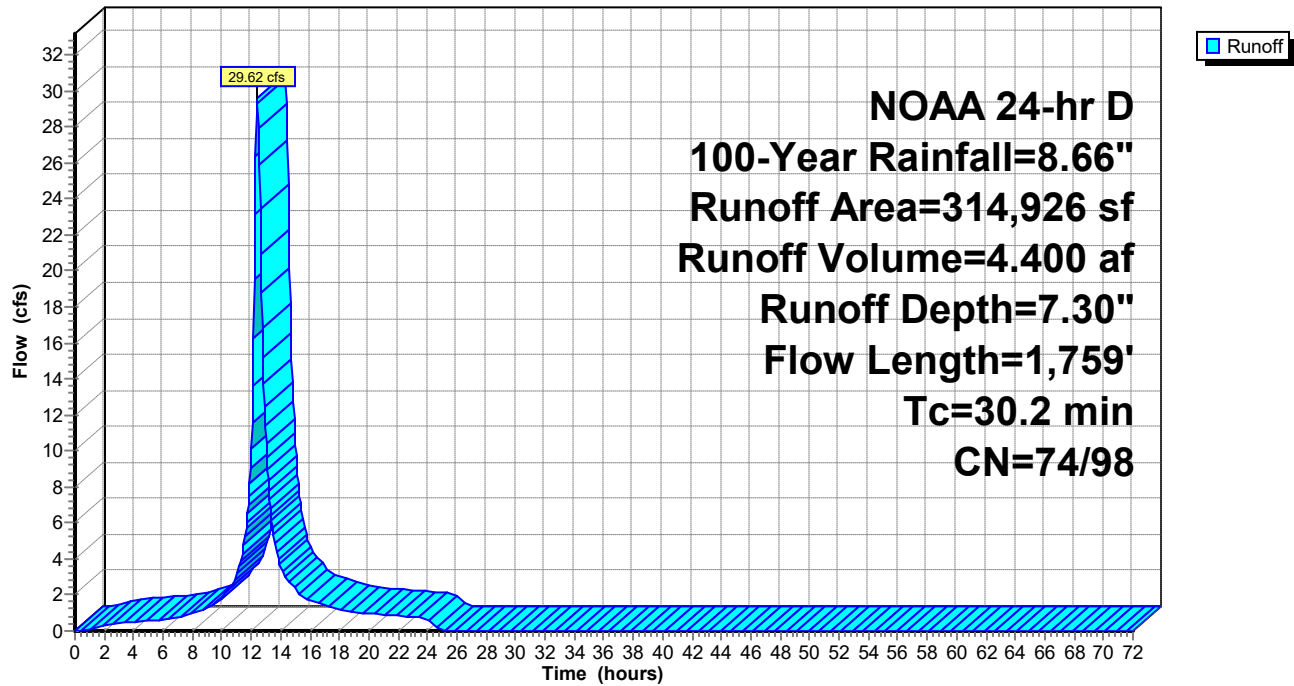
Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Subcatchment 28S: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Hydrograph for Subcatchment 28S: Basin 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.12	0.36
5.00	0.59	0.00	0.40	0.56
7.50	1.01	0.03	0.80	0.90
10.00	1.72	0.23	1.49	1.88
12.50	5.91	3.11	5.68	27.90
15.00	7.29	4.29	7.05	2.35
17.50	7.84	4.78	7.60	1.33
20.00	8.21	5.11	7.97	0.96
22.50	8.51	5.38	8.27	0.79
25.00	8.66	5.52	8.42	0.02
27.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
32.50	8.66	5.52	8.42	0.00
35.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
40.00	8.66	5.52	8.42	0.00
42.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
47.50	8.66	5.52	8.42	0.00
50.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
55.00	8.66	5.52	8.42	0.00
57.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
62.50	8.66	5.52	8.42	0.00
65.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
70.00	8.66	5.52	8.42	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Summary for Subcatchment 32S: Basin 1 Undetained

Runoff = 6.40 cfs @ 12.17 hrs, Volume= 0.544 af, Depth= 5.52"

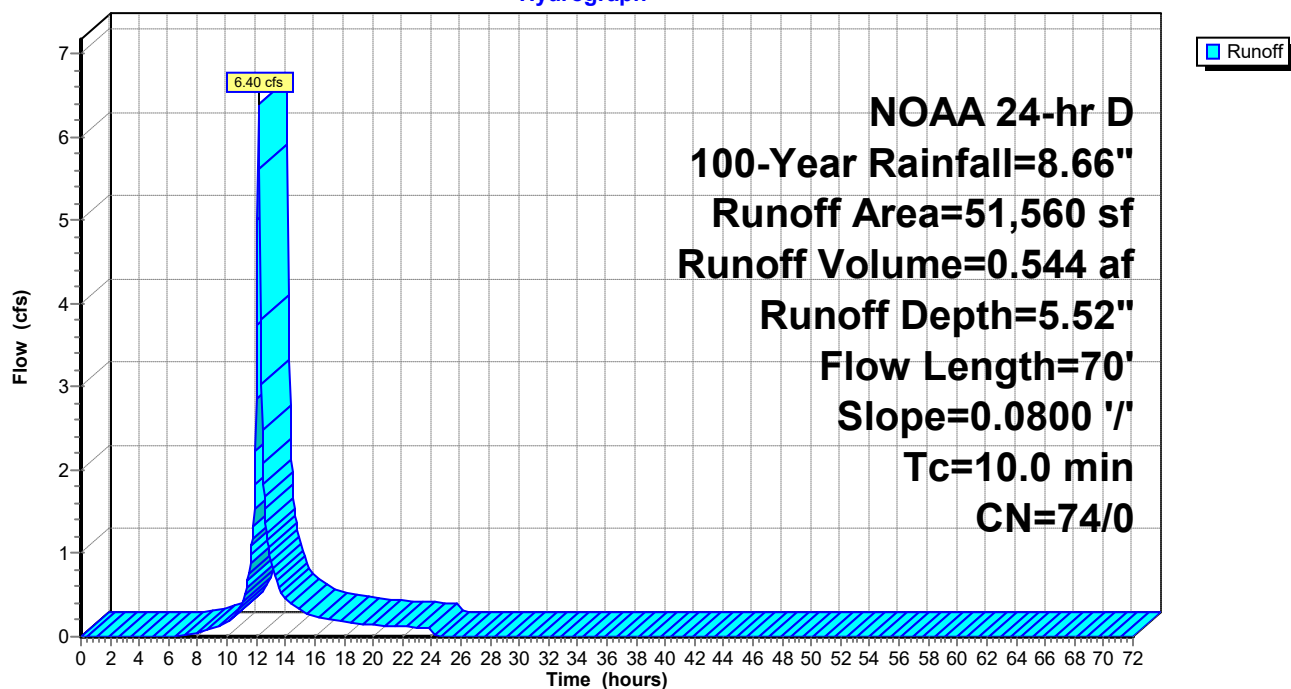
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
51,560	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	70	0.0800	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
5.9	70	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 32S: Basin 1 Undetained

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Hydrograph for Subcatchment 32S: Basin 1 Undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.03	0.00	0.03
10.00	1.72	0.23	0.00	0.18
12.50	5.91	3.11	0.00	1.83
15.00	7.29	4.29	0.00	0.31
17.50	7.84	4.78	0.00	0.19
20.00	8.21	5.11	0.00	0.14
22.50	8.51	5.38	0.00	0.12
25.00	8.66	5.52	0.00	0.00
27.50	8.66	5.52	0.00	0.00
30.00	8.66	5.52	0.00	0.00
32.50	8.66	5.52	0.00	0.00
35.00	8.66	5.52	0.00	0.00
37.50	8.66	5.52	0.00	0.00
40.00	8.66	5.52	0.00	0.00
42.50	8.66	5.52	0.00	0.00
45.00	8.66	5.52	0.00	0.00
47.50	8.66	5.52	0.00	0.00
50.00	8.66	5.52	0.00	0.00
52.50	8.66	5.52	0.00	0.00
55.00	8.66	5.52	0.00	0.00
57.50	8.66	5.52	0.00	0.00
60.00	8.66	5.52	0.00	0.00
62.50	8.66	5.52	0.00	0.00
65.00	8.66	5.52	0.00	0.00
67.50	8.66	5.52	0.00	0.00
70.00	8.66	5.52	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 40

Summary for Subcatchment 36S: Basin 1 Predevelopment

Runoff = 25.64 cfs @ 12.45 hrs, Volume= 3.555 af, Depth= 5.04"

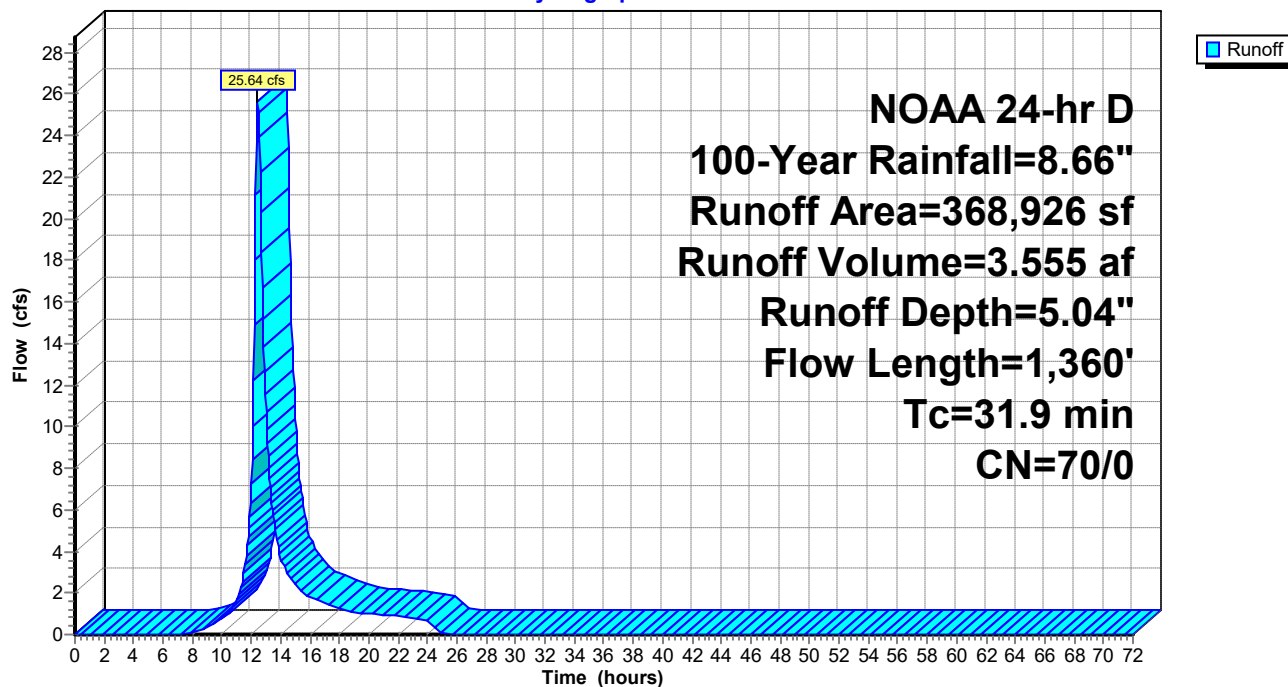
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
368,926	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 36S: Basin 1 Predevelopment

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 41

Hydrograph for Subcatchment 36S: Basin 1 Predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.05
10.00	1.72	0.14	0.00	0.75
12.50	5.91	2.74	0.00	25.13
15.00	7.29	3.86	0.00	2.44
17.50	7.84	4.33	0.00	1.40
20.00	8.21	4.64	0.00	1.01
22.50	8.51	4.90	0.00	0.84
25.00	8.66	5.04	0.00	0.03
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 42

Summary for Pond 29P: Basin 1

Inflow Area = 7.230 ac, Inflow Depth = 7.30" for 100-Year event
Inflow = 29.62 cfs @ 12.41 hrs, Volume= 4.400 af
Outflow = 2.09 cfs @ 15.28 hrs, Volume= 2.848 af, Atten= 93%, Lag= 172.1 min
Primary = 2.09 cfs @ 15.28 hrs, Volume= 2.848 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 544.77' @ 15.28 hrs Surf.Area= 42,071 sf Storage= 136,068 cf

Plug-Flow detention time= 699.4 min calculated for 2.848 af (65% of inflow)
Center-of-Mass det. time= 584.0 min (1,370.7 - 786.7)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	191,393 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	21,047	0	0
542.00	29,152	37,649	37,649
544.00	38,188	67,340	104,989
546.00	48,216	86,404	191,393

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.09 cfs @ 15.28 hrs HW=544.77' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 2.09 cfs @ 5.98 fps)

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

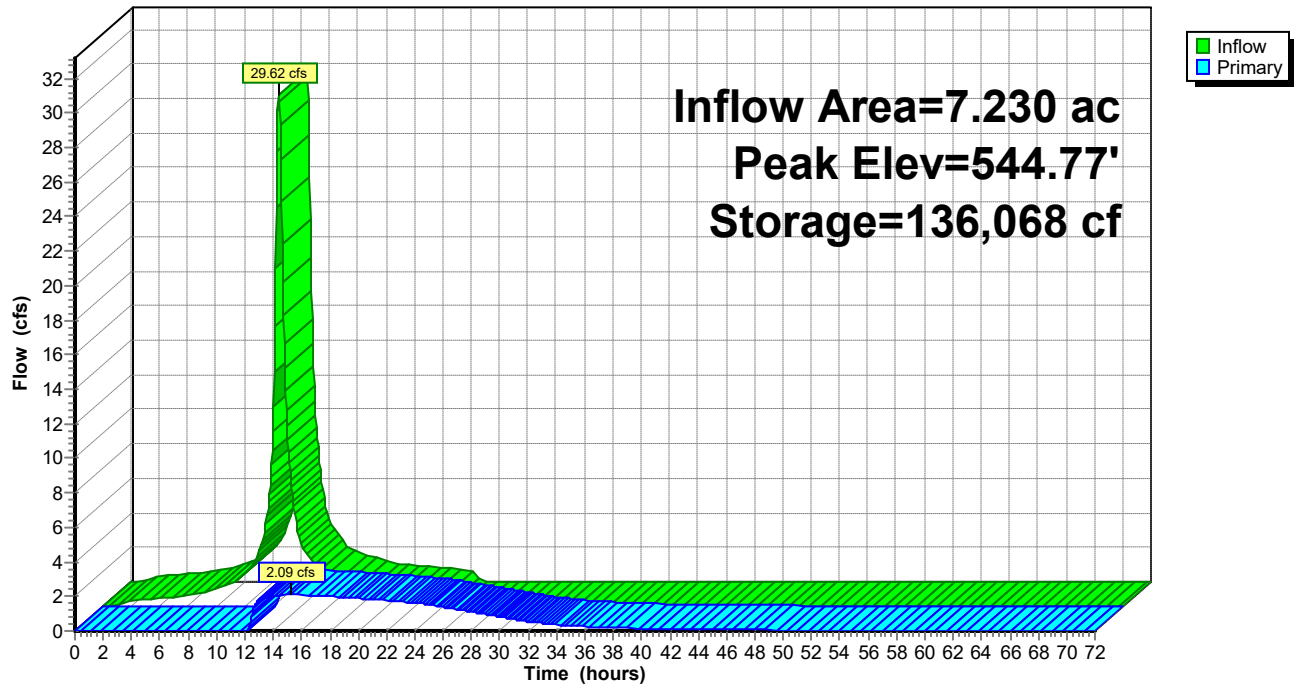
Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 43

Pond 29P: Basin 1

Hydrograph



Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 44

Hydrograph for Pond 29P: Basin 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.36	1,269	540.56	0.00
5.00	0.56	5,526	540.75	0.00
7.50	0.90	11,643	541.02	0.00
10.00	1.88	22,997	541.47	0.00
12.50	27.90	89,390	543.58	0.99
15.00	2.35	135,940	544.77	2.08
17.50	1.33	132,694	544.69	2.03
20.00	0.96	124,791	544.50	1.89
22.50	0.79	116,376	544.29	1.73
25.00	0.02	106,803	544.05	1.52
27.50	0.00	94,677	543.73	1.18
30.00	0.00	85,621	543.48	0.83
32.50	0.00	79,777	543.31	0.49
35.00	0.00	76,269	543.21	0.30
37.50	0.00	74,046	543.15	0.20
40.00	0.00	72,545	543.10	0.14
42.50	0.00	71,479	543.07	0.10
45.00	0.00	70,679	543.05	0.08
47.50	0.00	70,070	543.03	0.06
50.00	0.00	69,588	543.02	0.05
52.50	0.00	69,188	543.00	0.04
55.00	0.00	68,857	542.99	0.03
57.50	0.00	68,583	542.99	0.03
60.00	0.00	68,355	542.98	0.02
62.50	0.00	68,166	542.97	0.02
65.00	0.00	67,998	542.97	0.02
67.50	0.00	67,844	542.96	0.02
70.00	0.00	67,704	542.96	0.01

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 45

Stage-Discharge for Pond 29P: Basin 1

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	543.05	0.08	545.60	2.59
540.55	0.00	543.10	0.13	545.65	2.61
540.60	0.00	543.15	0.20	545.70	2.64
540.65	0.00	543.20	0.28	545.75	2.67
540.70	0.00	543.25	0.37	545.80	2.69
540.75	0.00	543.30	0.47	545.85	2.72
540.80	0.00	543.35	0.57	545.90	2.74
540.85	0.00	543.40	0.68	545.95	2.77
540.90	0.00	543.45	0.78	546.00	2.80
540.95	0.00	543.50	0.87		
541.00	0.00	543.55	0.95		
541.05	0.00	543.60	1.02		
541.10	0.00	543.65	1.08		
541.15	0.00	543.70	1.15		
541.20	0.00	543.75	1.21		
541.25	0.00	543.80	1.27		
541.30	0.00	543.85	1.32		
541.35	0.00	543.90	1.37		
541.40	0.00	543.95	1.42		
541.45	0.00	544.00	1.47		
541.50	0.00	544.05	1.52		
541.55	0.00	544.10	1.56		
541.60	0.00	544.15	1.61		
541.65	0.00	544.20	1.65		
541.70	0.00	544.25	1.69		
541.75	0.00	544.30	1.74		
541.80	0.00	544.35	1.78		
541.85	0.00	544.40	1.82		
541.90	0.00	544.45	1.85		
541.95	0.00	544.50	1.89		
542.00	0.00	544.55	1.93		
542.05	0.00	544.60	1.96		
542.10	0.00	544.65	2.00		
542.15	0.00	544.70	2.04		
542.20	0.00	544.75	2.07		
542.25	0.00	544.80	2.10		
542.30	0.00	544.85	2.14		
542.35	0.00	544.90	2.17		
542.40	0.00	544.95	2.20		
542.45	0.00	545.00	2.23		
542.50	0.00	545.05	2.27		
542.55	0.00	545.10	2.30		
542.60	0.00	545.15	2.33		
542.65	0.00	545.20	2.36		
542.70	0.00	545.25	2.39		
542.75	0.00	545.30	2.42		
542.80	0.00	545.35	2.45		
542.85	0.00	545.40	2.47		
542.90	0.00	545.45	2.50		
542.95	0.01	545.50	2.53		
543.00	0.04	545.55	2.56		

Proposed basin 1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 46

Stage-Area-Storage for Pond 29P: Basin 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	21,047	0	545.60	46,210	172,508
540.60	21,587	2,132	545.70	46,712	177,154
540.70	22,128	4,317	545.80	47,213	181,850
540.80	22,668	6,557	545.90	47,715	186,597
540.90	23,208	8,851	546.00	48,216	191,393
541.00	23,749	11,199			
541.10	24,289	13,601			
541.20	24,829	16,057			
541.30	25,370	18,567			
541.40	25,910	21,131			
541.50	26,450	23,749			
541.60	26,991	26,421			
541.70	27,531	29,147			
541.80	28,071	31,927			
541.90	28,612	34,761			
542.00	29,152	37,649			
542.10	29,604	40,587			
542.20	30,056	43,570			
542.30	30,507	46,598			
542.40	30,959	49,671			
542.50	31,411	52,790			
542.60	31,863	55,954			
542.70	32,315	59,163			
542.80	32,766	62,417			
542.90	33,218	65,716			
543.00	33,670	69,060			
543.10	34,122	72,450			
543.20	34,574	75,885			
543.30	35,025	79,365			
543.40	35,477	82,890			
543.50	35,929	86,460			
543.60	36,381	90,075			
543.70	36,833	93,736			
543.80	37,284	97,442			
543.90	37,736	101,193			
544.00	38,188	104,989			
544.10	38,689	108,833			
544.20	39,191	112,727			
544.30	39,692	116,671			
544.40	40,194	120,666			
544.50	40,695	124,710			
544.60	41,196	128,805			
544.70	41,698	132,949			
544.80	42,199	137,144			
544.90	42,701	141,389			
545.00	43,202	145,684			
545.10	43,703	150,030			
545.20	44,205	154,425			
545.30	44,706	158,870			
545.40	45,208	163,366			
545.50	45,709	167,912			



All basin's 2 undetained



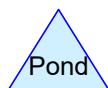
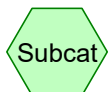
Pre-dev basin 2 All



Basin 2-1



Pond 2-1



Routing Diagram for Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.326	74	>75% Grass cover, Good, HSG C (33S, 40S)
0.014	98	Roofs, HSG C (40S)
0.046	98	Water Surface, 0% imp, HSG C (40S)
10.685	70	Woods, Good, HSG C (34S)
12.072	71	TOTAL AREA

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
12.072	HSG C	33S, 34S, 40S
0.000	HSG D	
0.000	Other	
12.072		TOTAL AREA

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.326	0.000	0.000	1.326	>75% Grass cover, Good	33S, 40S
0.000	0.000	0.014	0.000	0.000	0.014	Roofs	40S
0.000	0.000	0.046	0.000	0.000	0.046	Water Surface, 0% imp	40S
0.000	0.000	10.685	0.000	0.000	10.685	Woods, Good	34S
0.000	0.000	12.072	0.000	0.000	12.072	TOTAL AREA	

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 7

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 33S: All basin's 2 undetained

Runoff Area=34,308 sf Runoff Depth=1.20"

Flow Length=36' Slope=0.1600 '/' Tc=10.0 min CN=74/0 Runoff=0.91 cfs 0.079 af

Subcatchment 34S: Pre-dev basin 2 All

Runoff Area=465,453 sf Runoff Depth=0.97"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=5.69 cfs 0.865 af

Subcatchment 40S: Basin 2-1

Runoff Area=26,074 sf Runoff Depth=1.36"

Flow Length=190' Tc=10.0 min CN=76/98 Runoff=0.79 cfs 0.068 af

Pond 41P: Pond 2-1

Peak Elev=547.05' Storage=2,121 cf Inflow=0.79 cfs 0.068 af

Outflow=0.04 cfs 0.024 af

Total Runoff Area = 12.072 ac Runoff Volume = 1.011 af Average Runoff Depth = 1.01"

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Summary for Subcatchment 33S: All basin's 2 undetained

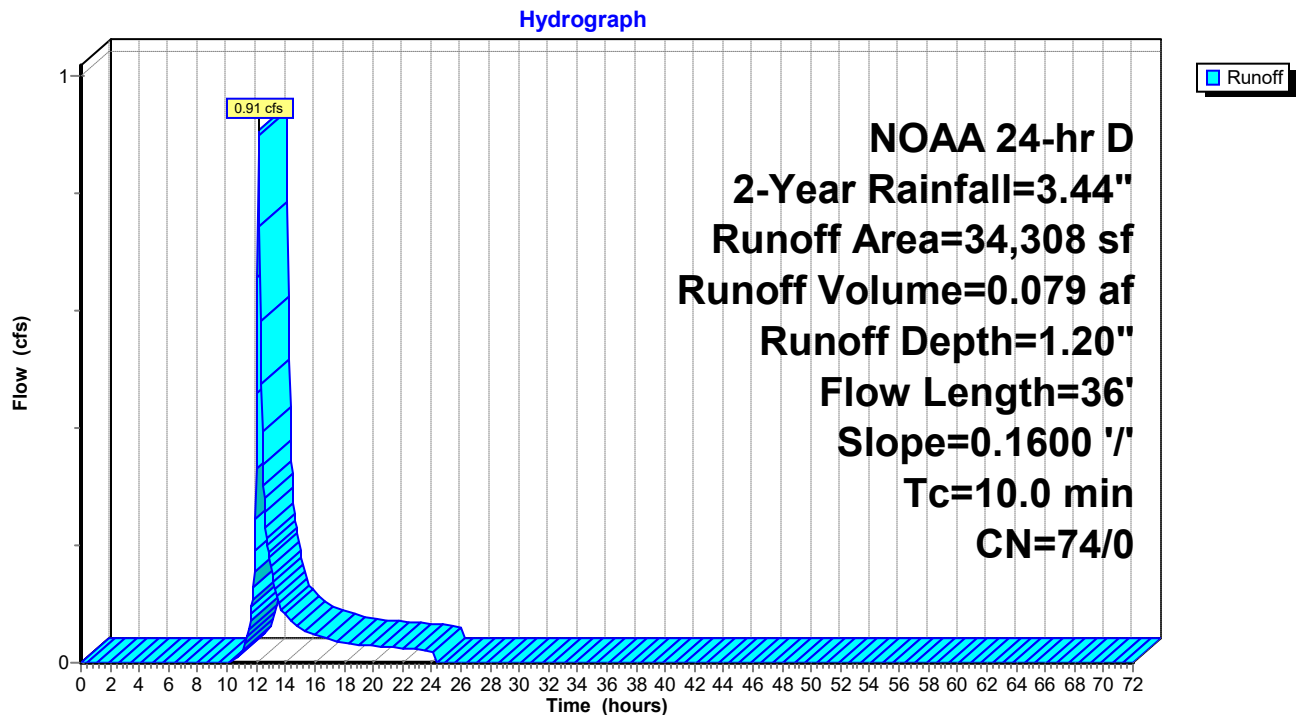
Runoff = 0.91 cfs @ 12.18 hrs, Volume= 0.079 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
34,308	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	36	0.1600	0.15		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
4.0	36	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 33S: All basin's 2 undetained



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 34S: Pre-dev basin 2 All

Runoff = 5.69 cfs @ 12.49 hrs, Volume= 0.865 af, Depth= 0.97"

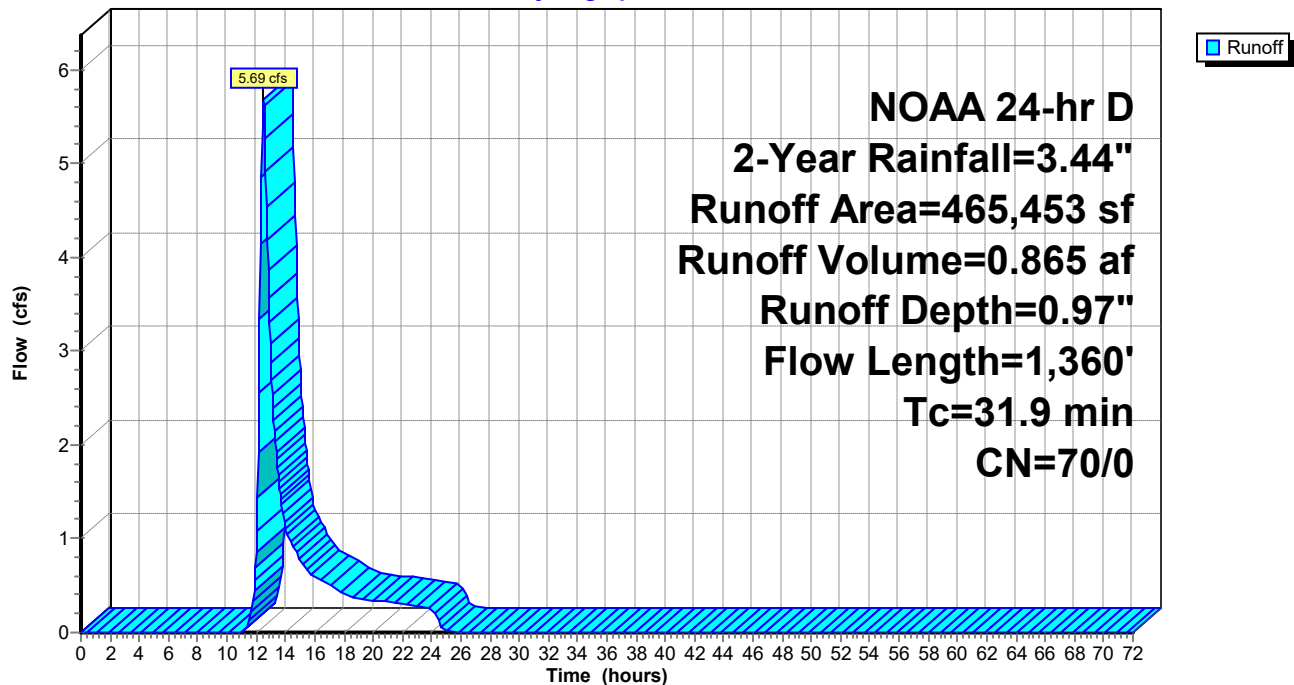
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
465,453	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 34S: Pre-dev basin 2 All

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Summary for Subcatchment 40S: Basin 2-1

Runoff = 0.79 cfs @ 12.18 hrs, Volume= 0.068 af, Depth= 1.36"
Routed to Pond 41P : Pond 2-1

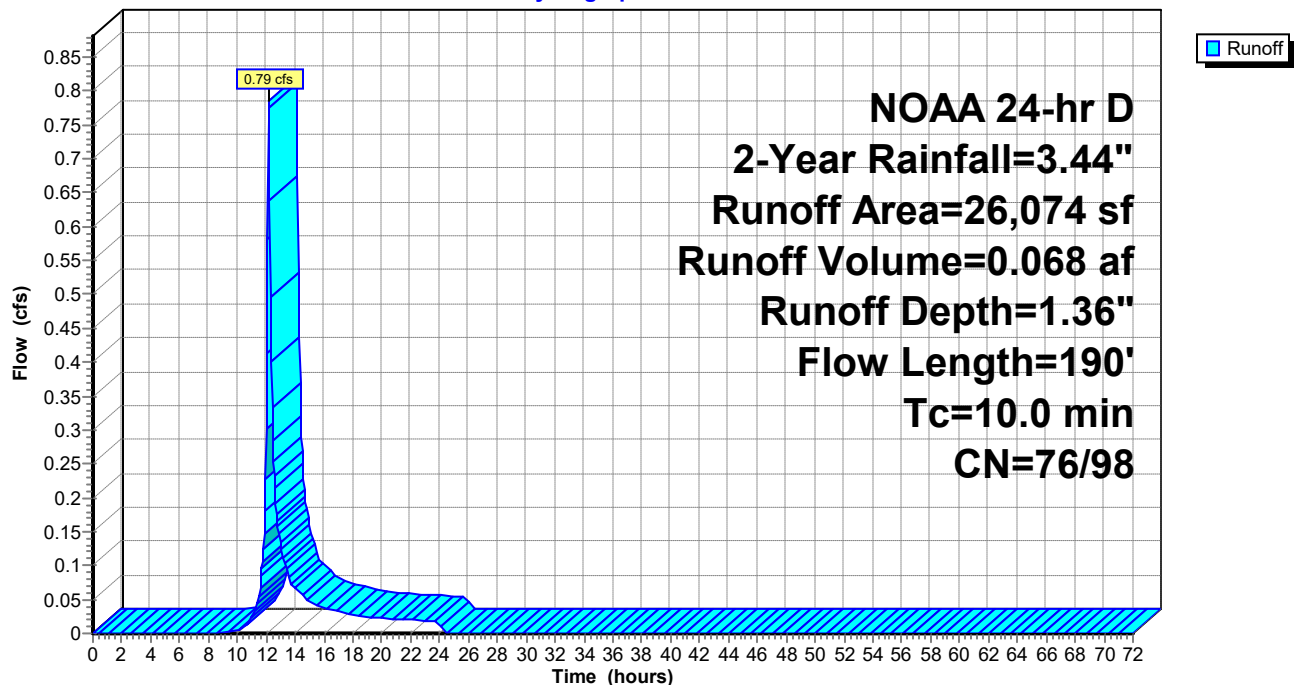
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
23,447	74	>75% Grass cover, Good, HSG C
607	98	Roofs, HSG C
2,020	98	Water Surface, 0% imp, HSG C
26,074	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0600	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	90	0.0340	2.77		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
6.6	190	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 40S: Basin 2-1

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Pond 41P: Pond 2-1

Inflow Area = 0.599 ac, Inflow Depth = 1.36" for 2-Year event
Inflow = 0.79 cfs @ 12.18 hrs, Volume= 0.068 af
Outflow = 0.04 cfs @ 16.51 hrs, Volume= 0.024 af, Atten= 95%, Lag= 259.5 min
Primary = 0.04 cfs @ 16.51 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 547.05' @ 16.51 hrs Surf.Area= 2,020 sf Storage= 2,121 cf

Plug-Flow detention time= 503.1 min calculated for 0.024 af (35% of inflow)
Center-of-Mass det. time= 355.4 min (1,217.1 - 861.6)

Volume	Invert	Avail.Storage	Storage Description
#1	546.00'	4,040 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
546.00	2,020	0	0
548.00	2,020	4,040	4,040

Device	Routing	Invert	Outlet Devices
#1	Primary	546.95'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	547.20'	10.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 16.51 hrs HW=547.05' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.08 fps)
└ **2=Orifice/Grate** (Controls 0.00 cfs)

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

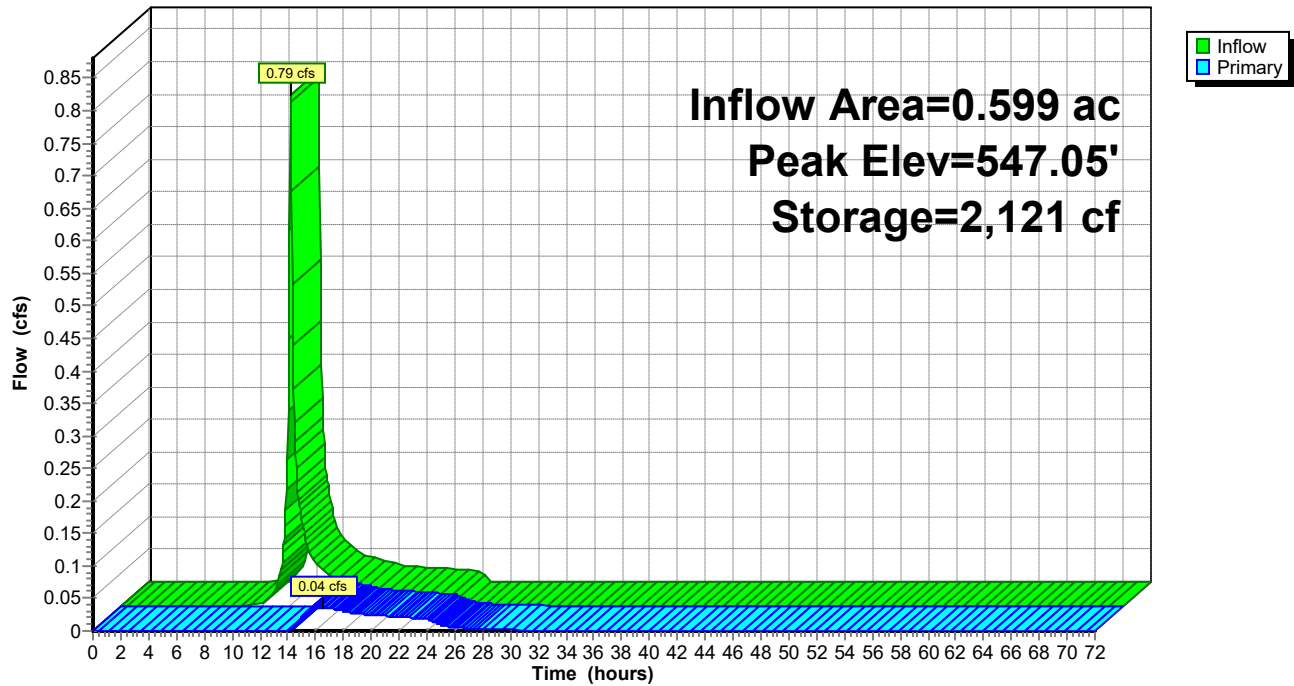
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Pond 41P: Pond 2-1

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 13

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 33S: All basin's 2 undetained

Runoff Area=34,308 sf Runoff Depth=2.54"

Flow Length=36' Slope=0.1600 '/' Tc=10.0 min CN=74/0 Runoff=1.98 cfs 0.167 af

Subcatchment 34S: Pre-dev basin 2 All

Runoff Area=465,453 sf Runoff Depth=2.20"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=13.90 cfs 1.960 af

Subcatchment 40S: Basin 2-1

Runoff Area=26,074 sf Runoff Depth=2.76"

Flow Length=190' Tc=10.0 min CN=76/98 Runoff=1.62 cfs 0.138 af

Pond 41P: Pond 2-1

Peak Elev=547.31' Storage=2,643 cf Inflow=1.62 cfs 0.138 af

Outflow=0.44 cfs 0.094 af

Total Runoff Area = 12.072 ac Runoff Volume = 2.264 af Average Runoff Depth = 2.25"

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 14

Summary for Subcatchment 33S: All basin's 2 undetained

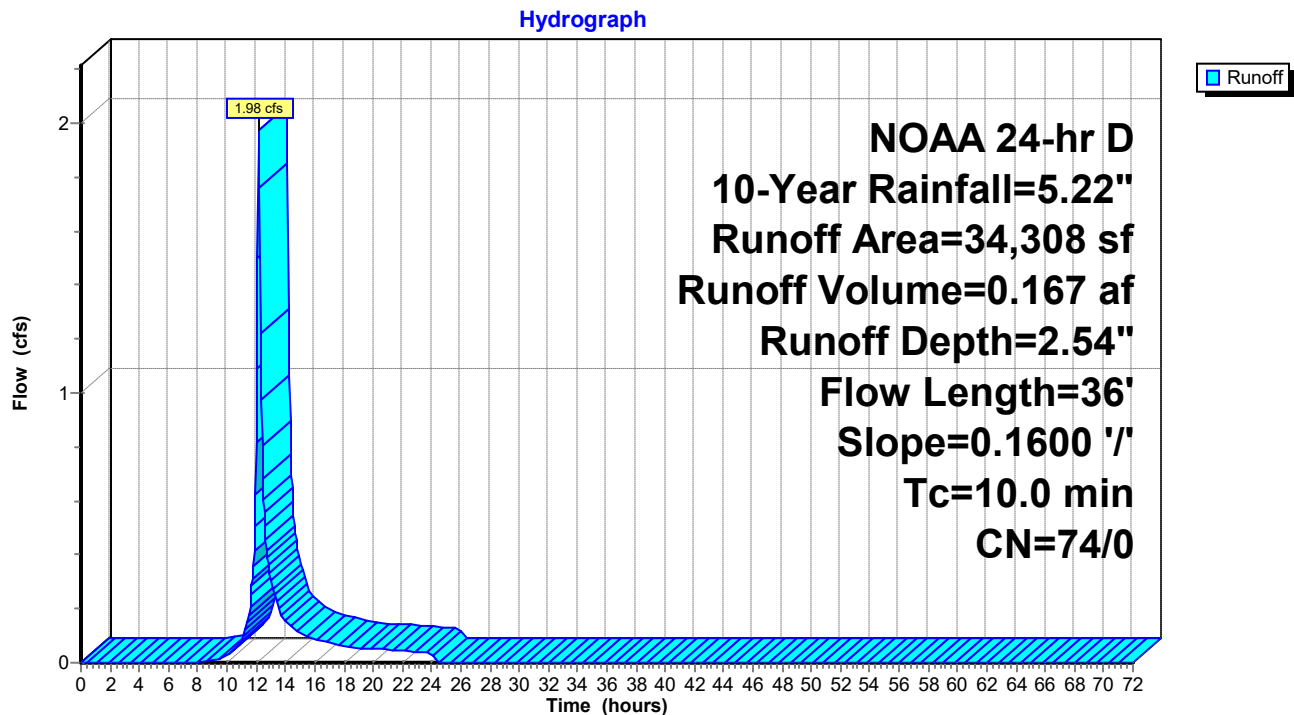
Runoff = 1.98 cfs @ 12.18 hrs, Volume= 0.167 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
34,308	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	36	0.1600	0.15		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
4.0	36	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 33S: All basin's 2 undetained



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 15

Summary for Subcatchment 34S: Pre-dev basin 2 All

Runoff = 13.90 cfs @ 12.46 hrs, Volume= 1.960 af, Depth= 2.20"

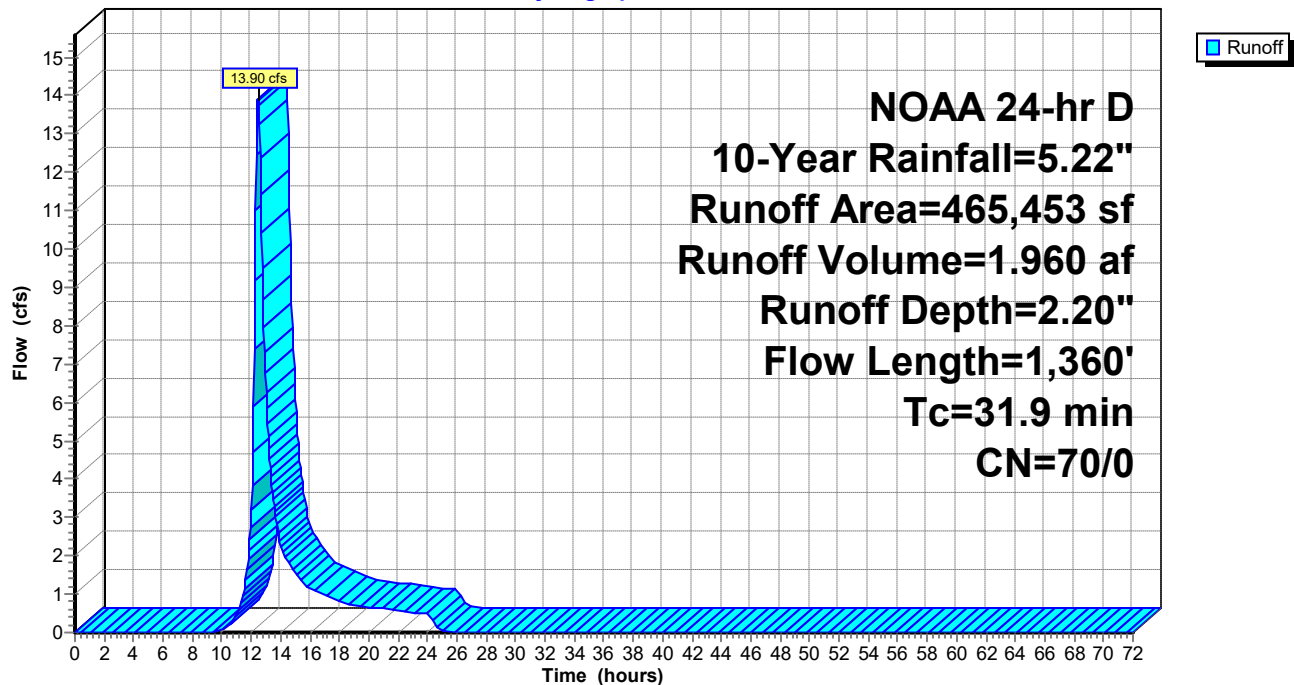
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
465,453	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 34S: Pre-dev basin 2 All

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 16

Summary for Subcatchment 40S: Basin 2-1

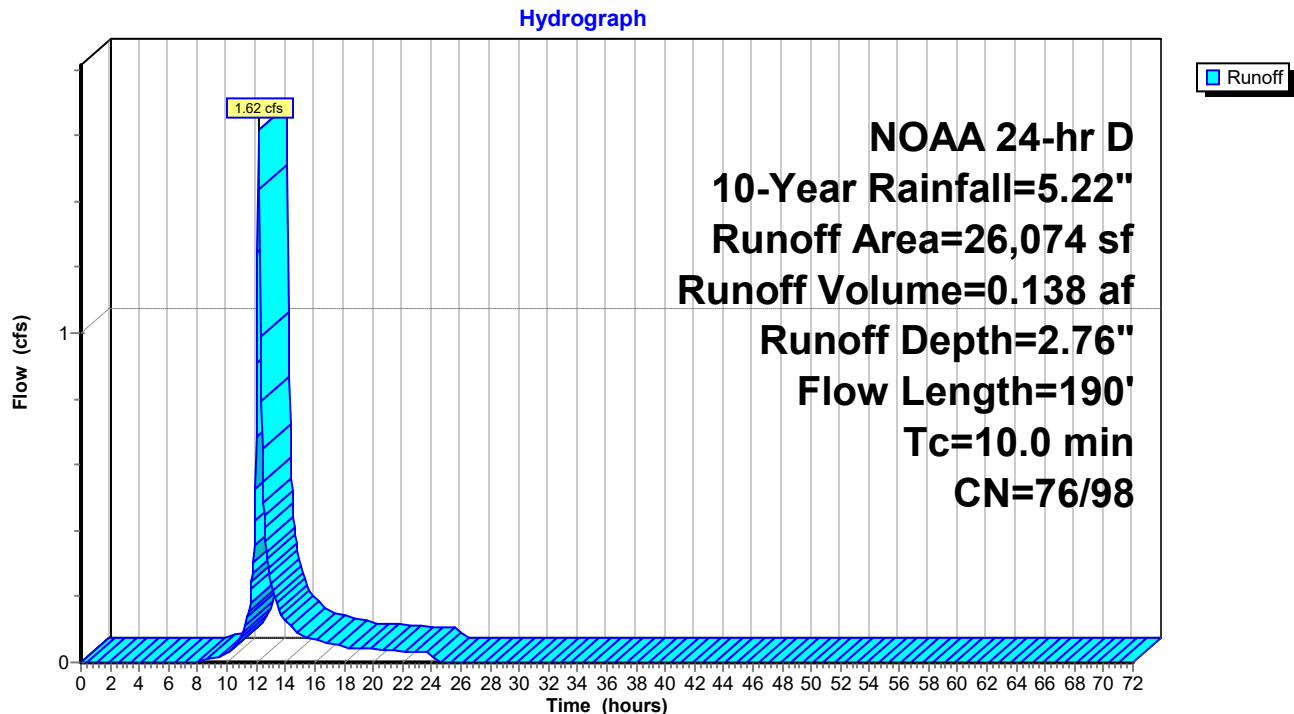
Runoff = 1.62 cfs @ 12.18 hrs, Volume= 0.138 af, Depth= 2.76"
Routed to Pond 41P : Pond 2-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
23,447	74	>75% Grass cover, Good, HSG C
607	98	Roofs, HSG C
2,020	98	Water Surface, 0% imp, HSG C
26,074	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0600	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	90	0.0340	2.77		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
6.6	190	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 40S: Basin 2-1



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 17

Summary for Pond 41P: Pond 2-1

Inflow Area = 0.599 ac, Inflow Depth = 2.76" for 10-Year event
Inflow = 1.62 cfs @ 12.18 hrs, Volume= 0.138 af
Outflow = 0.44 cfs @ 12.57 hrs, Volume= 0.094 af, Atten= 73%, Lag= 23.4 min
Primary = 0.44 cfs @ 12.57 hrs, Volume= 0.094 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 547.31' @ 12.57 hrs Surf.Area= 2,020 sf Storage= 2,643 cf

Plug-Flow detention time= 239.7 min calculated for 0.094 af (68% of inflow)
Center-of-Mass det. time= 132.1 min (972.5 - 840.4)

Volume	Invert	Avail.Storage	Storage Description
#1	546.00'	4,040 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
546.00	2,020	0	0
548.00	2,020	4,040	4,040

Device	Routing	Invert	Outlet Devices
#1	Primary	546.95'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	547.20'	10.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.44 cfs @ 12.57 hrs HW=547.31' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.39 cfs @ 2.04 fps)

2=Orifice/Grate (Orifice Controls 0.05 cfs @ 1.12 fps)

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

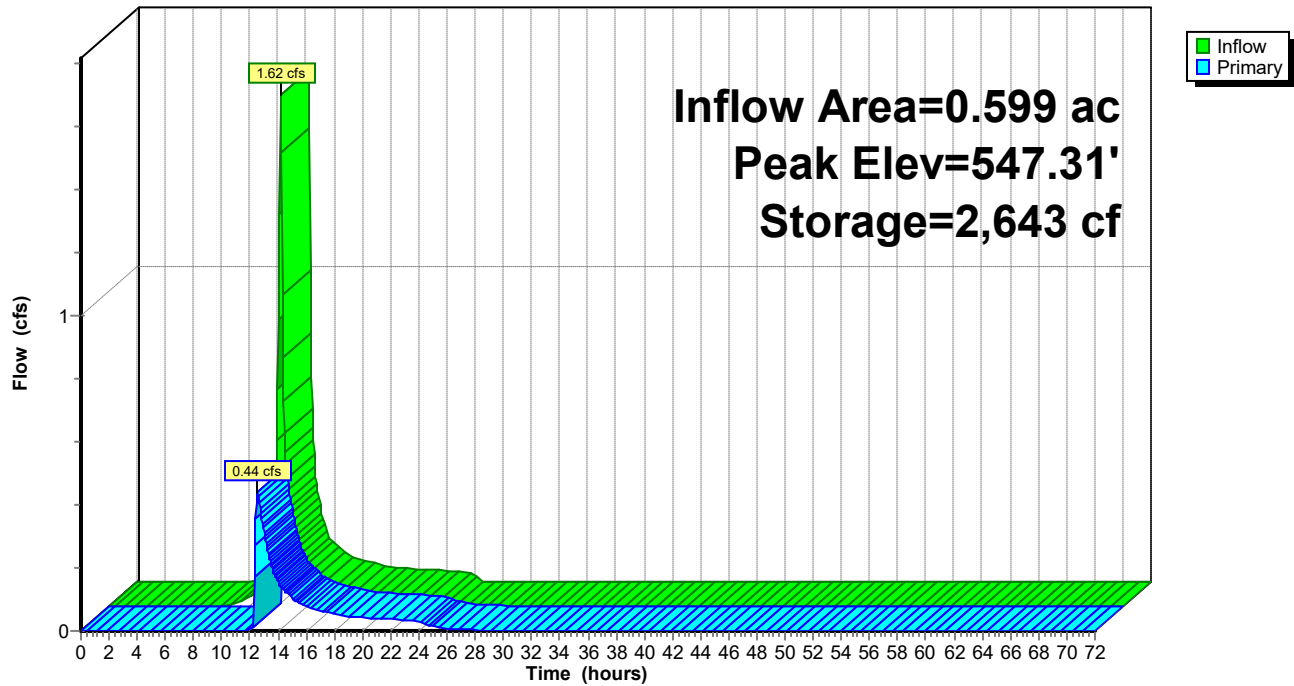
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 18

Pond 41P: Pond 2-1

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 19

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 33S: All basin's 2 undetained

Runoff Area=34,308 sf Runoff Depth=5.52"

Flow Length=36' Slope=0.1600 '/' Tc=10.0 min CN=74/0 Runoff=4.26 cfs 0.362 af

Subcatchment 34S: Pre-dev basin 2 All

Runoff Area=465,453 sf Runoff Depth=5.04"

Flow Length=1,360' Tc=31.9 min CN=70/0 Runoff=32.35 cfs 4.485 af

Subcatchment 40S: Basin 2-1

Runoff Area=26,074 sf Runoff Depth=5.81"

Flow Length=190' Tc=10.0 min CN=76/98 Runoff=3.38 cfs 0.290 af

Pond 41P: Pond 2-1

Peak Elev=547.85' Storage=3,730 cf Inflow=3.38 cfs 0.290 af

Outflow=2.50 cfs 0.246 af

Total Runoff Area = 12.072 ac Runoff Volume = 5.137 af Average Runoff Depth = 5.11"

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 20

Summary for Subcatchment 33S: All basin's 2 undetained

Runoff = 4.26 cfs @ 12.17 hrs, Volume= 0.362 af, Depth= 5.52"

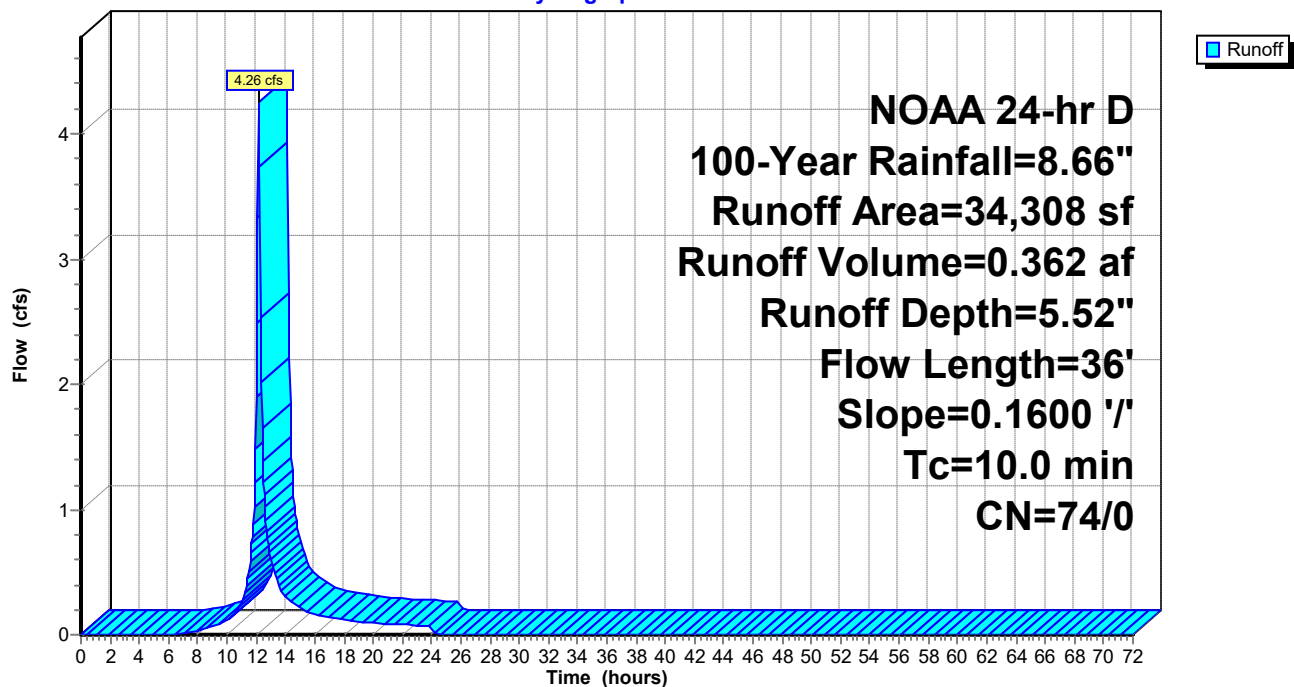
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
34,308	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	36	0.1600	0.15		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
4.0	36	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 33S: All basin's 2 undetained

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 21

Summary for Subcatchment 34S: Pre-dev basin 2 All

Runoff = 32.35 cfs @ 12.45 hrs, Volume= 4.485 af, Depth= 5.04"

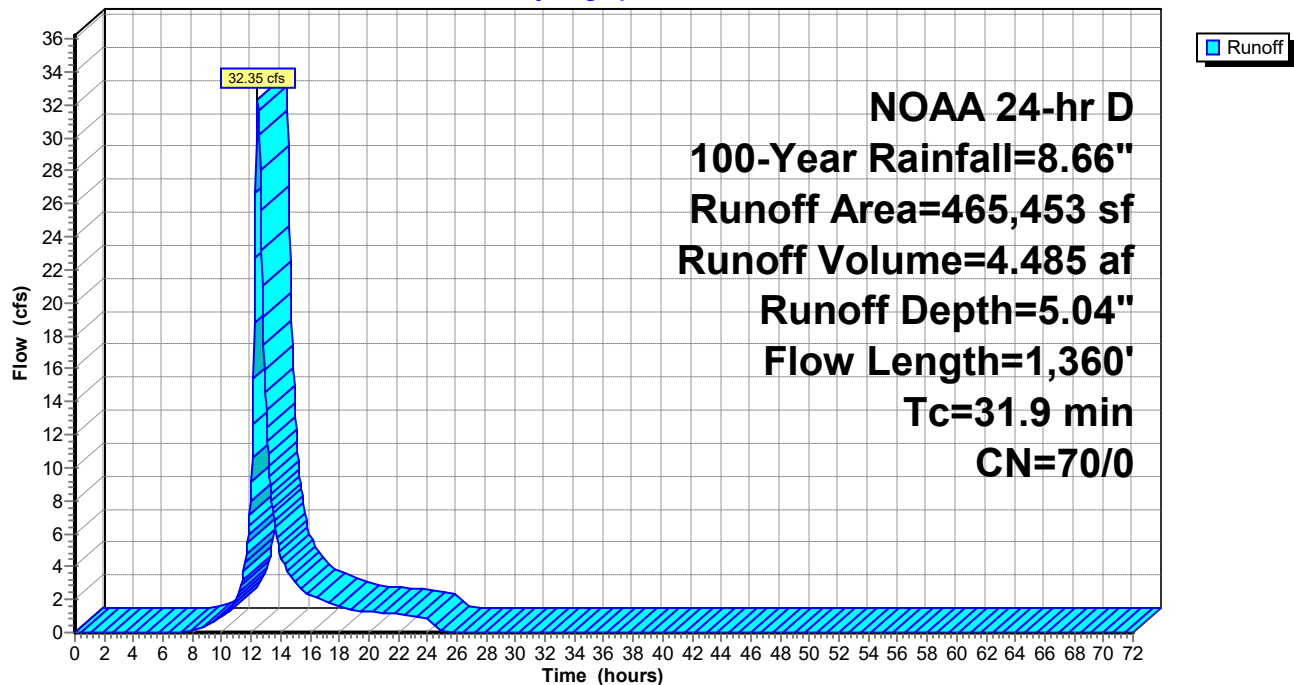
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
465,453	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
17.6	1,260	0.0570	1.19		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
31.9	1,360	Total			

Subcatchment 34S: Pre-dev basin 2 All

Hydrograph



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 22

Summary for Subcatchment 40S: Basin 2-1

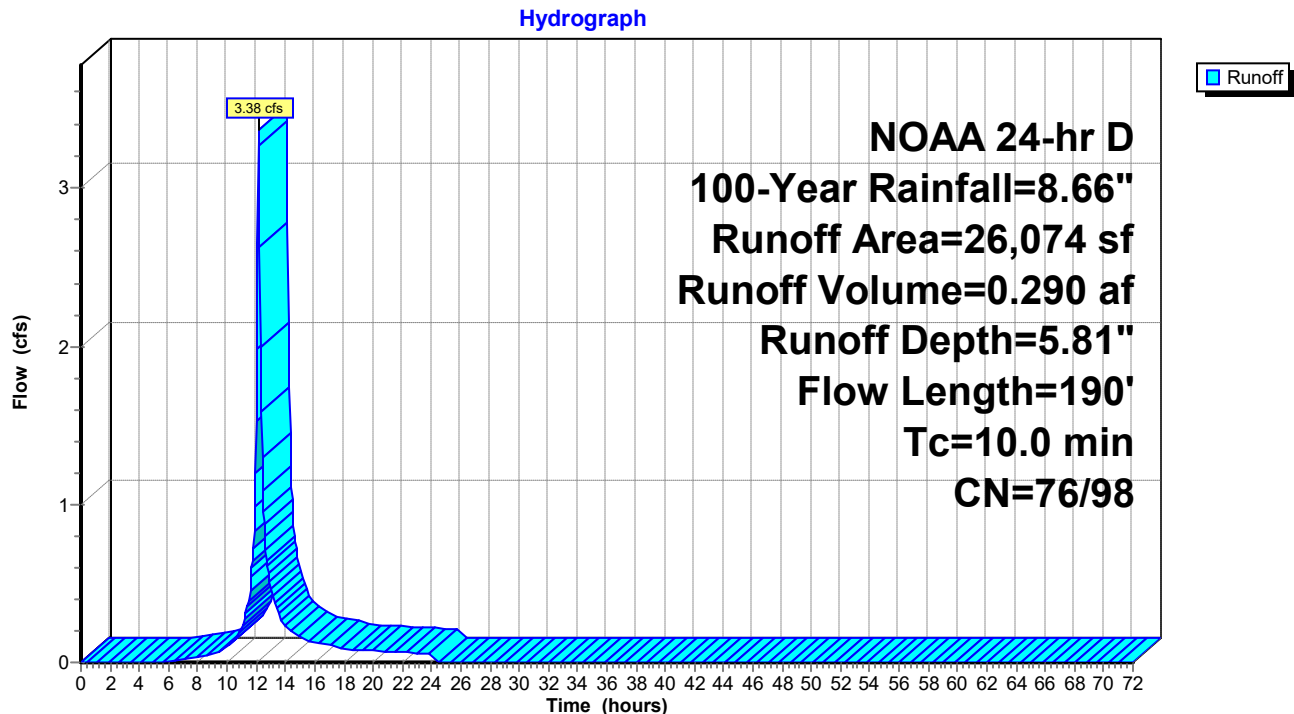
Runoff = 3.38 cfs @ 12.17 hrs, Volume= 0.290 af, Depth= 5.81"
Routed to Pond 41P : Pond 2-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
23,447	74	>75% Grass cover, Good, HSG C
607	98	Roofs, HSG C
2,020	98	Water Surface, 0% imp, HSG C
26,074	76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0600	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	90	0.0340	2.77		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
6.6	190	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 40S: Basin 2-1



Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 23

Summary for Pond 41P: Pond 2-1

Inflow Area = 0.599 ac, Inflow Depth = 5.81" for 100-Year event
Inflow = 3.38 cfs @ 12.17 hrs, Volume= 0.290 af
Outflow = 2.50 cfs @ 12.26 hrs, Volume= 0.246 af, Atten= 26%, Lag= 5.5 min
Primary = 2.50 cfs @ 12.26 hrs, Volume= 0.246 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 547.85' @ 12.26 hrs Surf.Area= 2,020 sf Storage= 3,730 cf

Plug-Flow detention time= 142.0 min calculated for 0.246 af (85% of inflow)
Center-of-Mass det. time= 72.1 min (889.9 - 817.8)

Volume	Invert	Avail.Storage	Storage Description
#1	546.00'	4,040 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
546.00	2,020	0	0
548.00	2,020	4,040	4,040

Device	Routing	Invert	Outlet Devices
#1	Primary	546.95'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	547.20'	10.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.48 cfs @ 12.26 hrs HW=547.84' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.25 cfs @ 3.59 fps)

└ **2=Orifice/Grate** (Orifice Controls 1.22 cfs @ 2.72 fps)

Proposed Basin 2-1 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-1

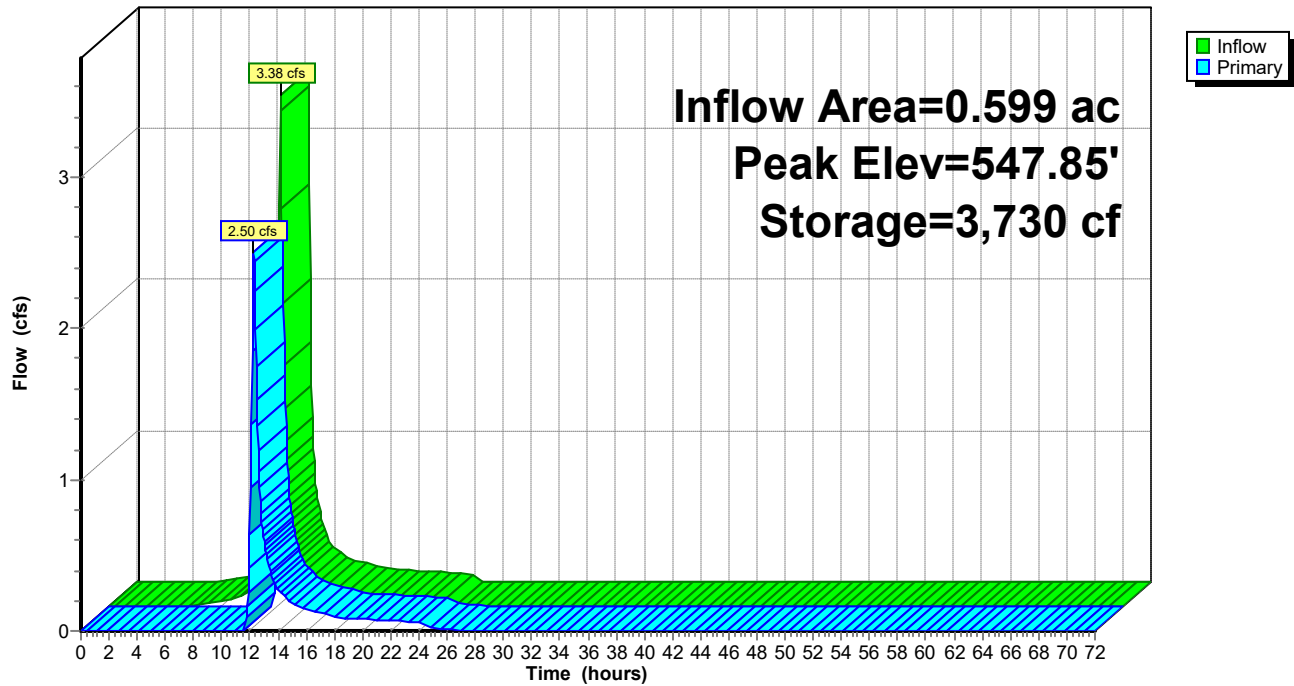
NOAA 24-hr D 100-Year Rainfall=8.66"

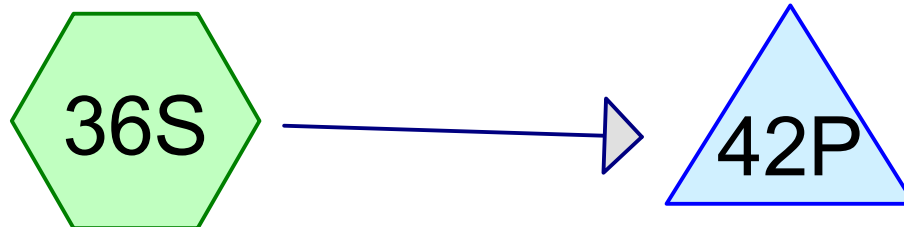
Printed 10/29/2023

Page 24

Pond 41P: Pond 2-1

Hydrograph



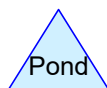
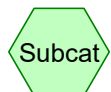


Basin 2-2

Pond 2-2



Basin 2-2
pre-development



Routing Diagram for Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.454	74	>75% Grass cover, Good, HSG C (36S)
0.794	98	Paved parking, HSG C (36S)
0.163	98	Water Surface, 0% imp, HSG C (36S)
1.430	70	Woods, Good, HSG C (45S)
2.842	80	TOTAL AREA

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.842	HSG C	36S, 45S
0.000	HSG D	
0.000	Other	
2.842		TOTAL AREA

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.454	0.000	0.000	0.454	>75% Grass cover, Good	36S
0.000	0.000	0.794	0.000	0.000	0.794	Paved parking	36S
0.000	0.000	0.163	0.000	0.000	0.163	Water Surface, 0% imp	36S
0.000	0.000	1.430	0.000	0.000	1.430	Woods, Good	45S
0.000	0.000	2.842	0.000	0.000	2.842	TOTAL AREA	

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	36S	0.00	0.00	426.0	0.0350	0.010	0.0	12.0	8.0	

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-2

Runoff Area=61,497 sf Runoff Depth=2.51"

Flow Length=606' Tc=10.0 min CN=80/98 Runoff=3.19 cfs 0.295 af

Subcatchment 45S: Basin 2-2 pre-development

Runoff Area=62,290 sf Runoff Depth=0.97"

Flow Length=130' Tc=13.3 min CN=70/0 Runoff=1.16 cfs 0.116 af

Pond 42P: Pond 2-2

Peak Elev=543.40' Storage=9,963 cf Inflow=3.19 cfs 0.295 af

Outflow=0.11 cfs 0.099 af

Total Runoff Area = 2.842 ac Runoff Volume = 0.411 af Average Runoff Depth = 1.74"

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 36S: Basin 2-2

[47] Hint: Peak is 225% of capacity of segment #3

Runoff = 3.19 cfs @ 12.17 hrs, Volume= 0.295 af, Depth= 2.51"
Routed to Pond 42P : Pond 2-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
34,605	98	Paved parking, HSG C
19,780	74	>75% Grass cover, Good, HSG C
7,112	98	Water Surface, 0% imp, HSG C
61,497	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1300	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	120	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	426	0.0350	6.20	1.42	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.010
4.6	606	Total, Increased to minimum Tc = 10.0 min			

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

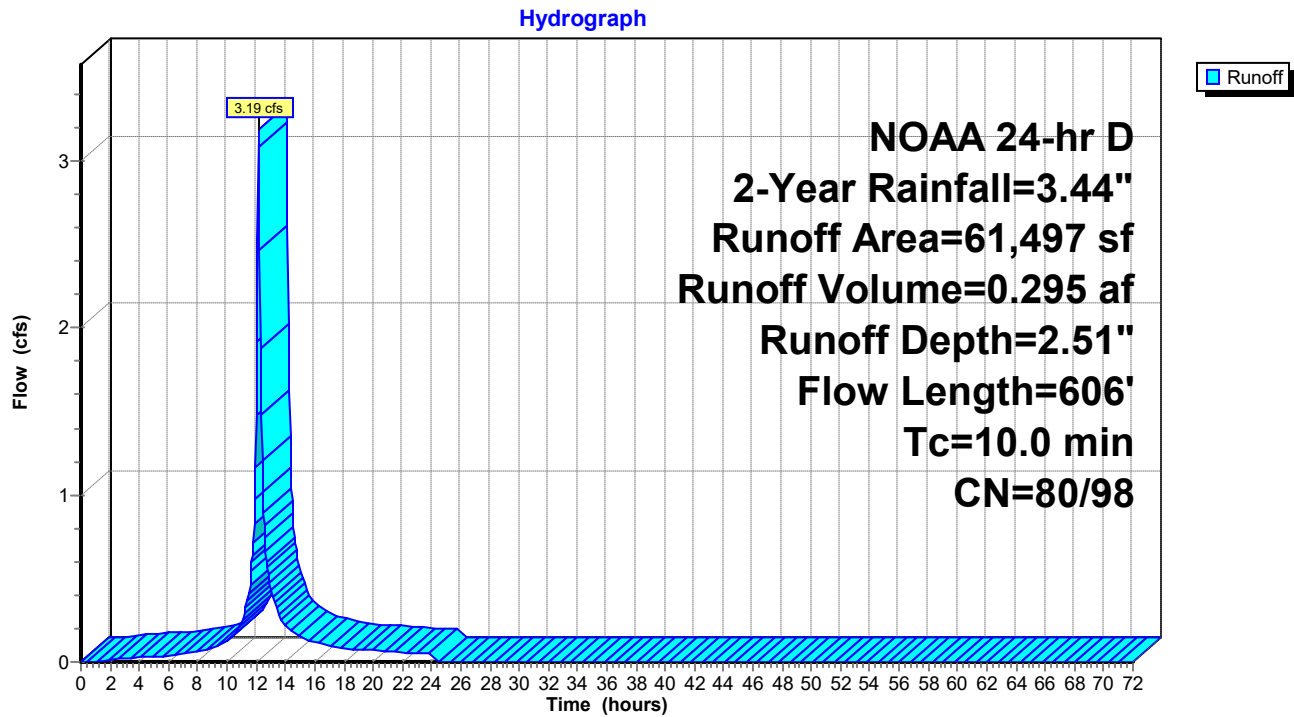
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Subcatchment 36S: Basin 2-2



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 45S: Basin 2-2 pre-development

Runoff = 1.16 cfs @ 12.22 hrs, Volume= 0.116 af, Depth= 0.97"

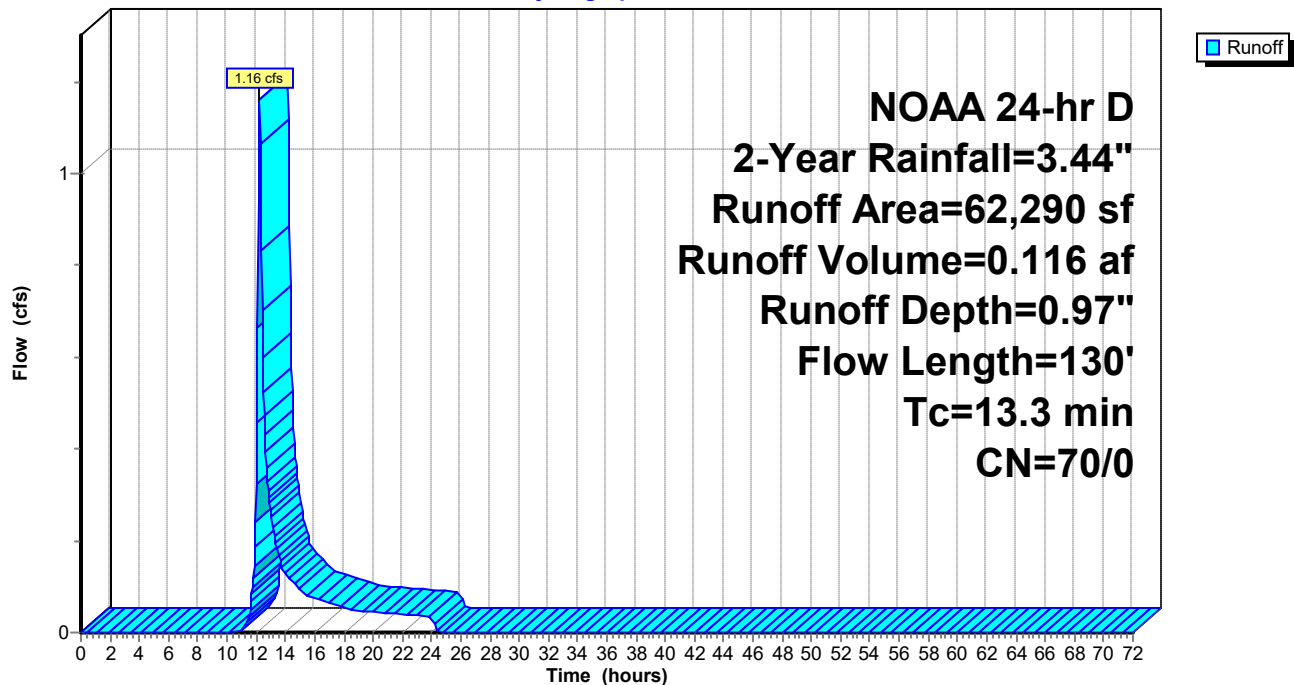
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
62,290	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0700	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	30	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.3	130	Total			

Subcatchment 45S: Basin 2-2 pre-development

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Summary for Pond 42P: Pond 2-2

Inflow Area = 1.412 ac, Inflow Depth = 2.51" for 2-Year event
Inflow = 3.19 cfs @ 12.17 hrs, Volume= 0.295 af
Outflow = 0.11 cfs @ 16.35 hrs, Volume= 0.099 af, Atten= 96%, Lag= 250.8 min
Primary = 0.11 cfs @ 16.35 hrs, Volume= 0.099 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.40' @ 16.35 hrs Surf.Area= 7,112 sf Storage= 9,963 cf

Plug-Flow detention time= 697.8 min calculated for 0.099 af (33% of inflow)
Center-of-Mass det. time= 519.2 min (1,305.5 - 786.3)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	28,448 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	7,112	0	0
546.00	7,112	28,448	28,448

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 16.35 hrs HW=543.40' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.11 cfs @ 1.53 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

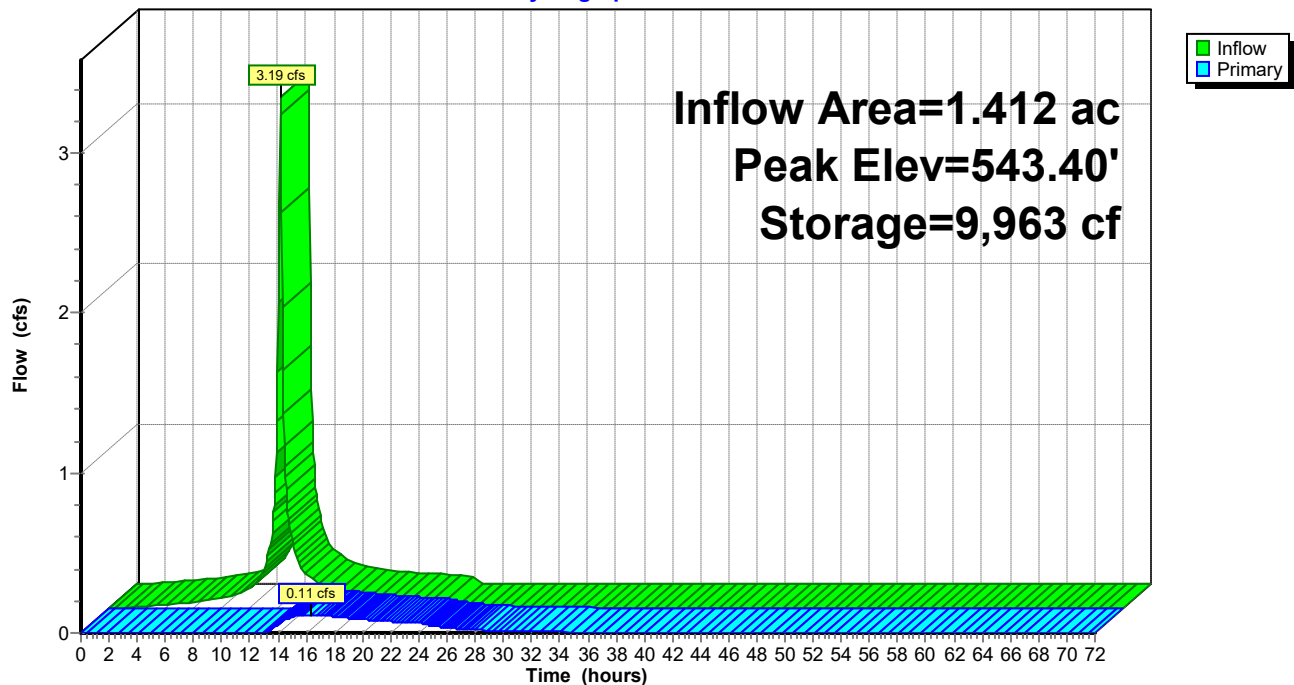
Basdin 2-2 without Exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Pond 42P: Pond 2-2

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 14

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-2

Runoff Area=61,497 sf Runoff Depth=4.17"

Flow Length=606' Tc=10.0 min CN=80/98 Runoff=5.27 cfs 0.490 af

Subcatchment 45S: Basin 2-2 pre-development

Runoff Area=62,290 sf Runoff Depth=2.20"

Flow Length=130' Tc=13.3 min CN=70/0 Runoff=2.80 cfs 0.262 af

Pond 42P: Pond 2-2

Peak Elev=543.84' Storage=13,078 cf Inflow=5.27 cfs 0.490 af

Outflow=0.61 cfs 0.294 af

Total Runoff Area = 2.842 ac Runoff Volume = 0.753 af Average Runoff Depth = 3.18"

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 15

Summary for Subcatchment 36S: Basin 2-2

[47] Hint: Peak is 371% of capacity of segment #3

Runoff = 5.27 cfs @ 12.17 hrs, Volume= 0.490 af, Depth= 4.17"
Routed to Pond 42P : Pond 2-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
34,605	98	Paved parking, HSG C
19,780	74	>75% Grass cover, Good, HSG C
7,112	98	Water Surface, 0% imp, HSG C
61,497	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1300	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	120	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	426	0.0350	6.20	1.42	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.010
4.6	606	Total, Increased to minimum Tc = 10.0 min			

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration

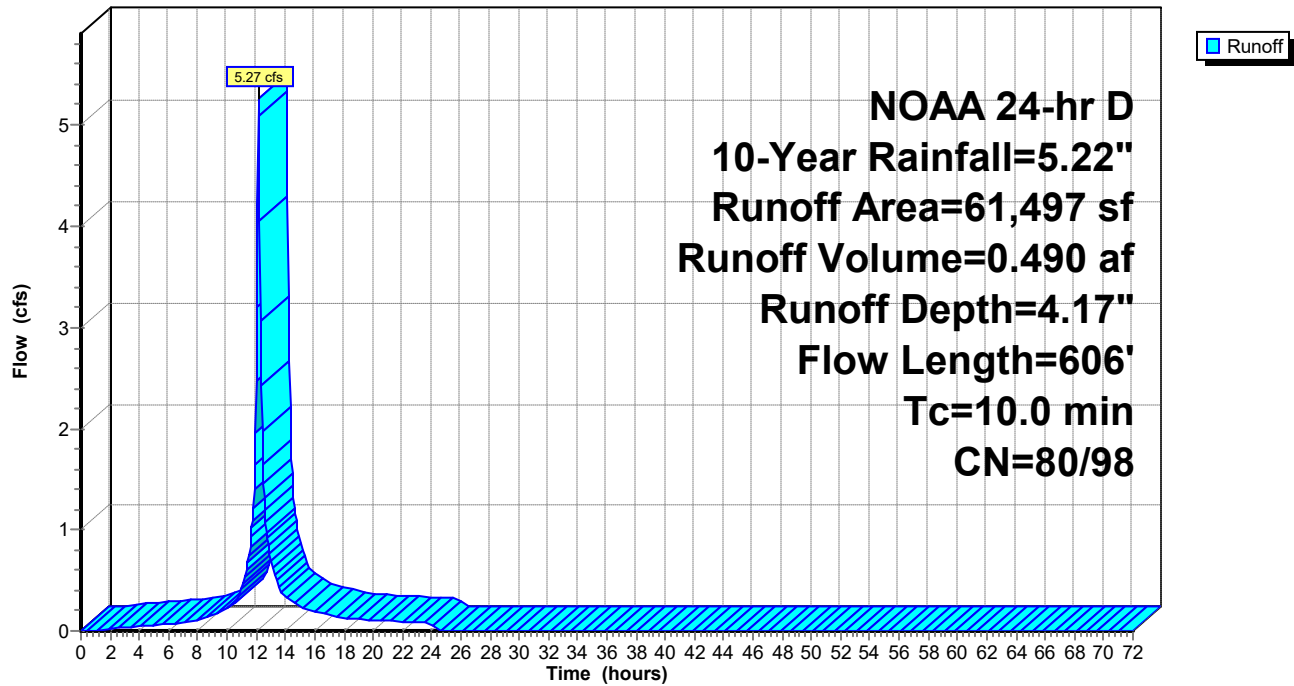
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 16

Subcatchment 36S: Basin 2-2

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 without Exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 17

Summary for Subcatchment 45S: Basin 2-2 pre-development

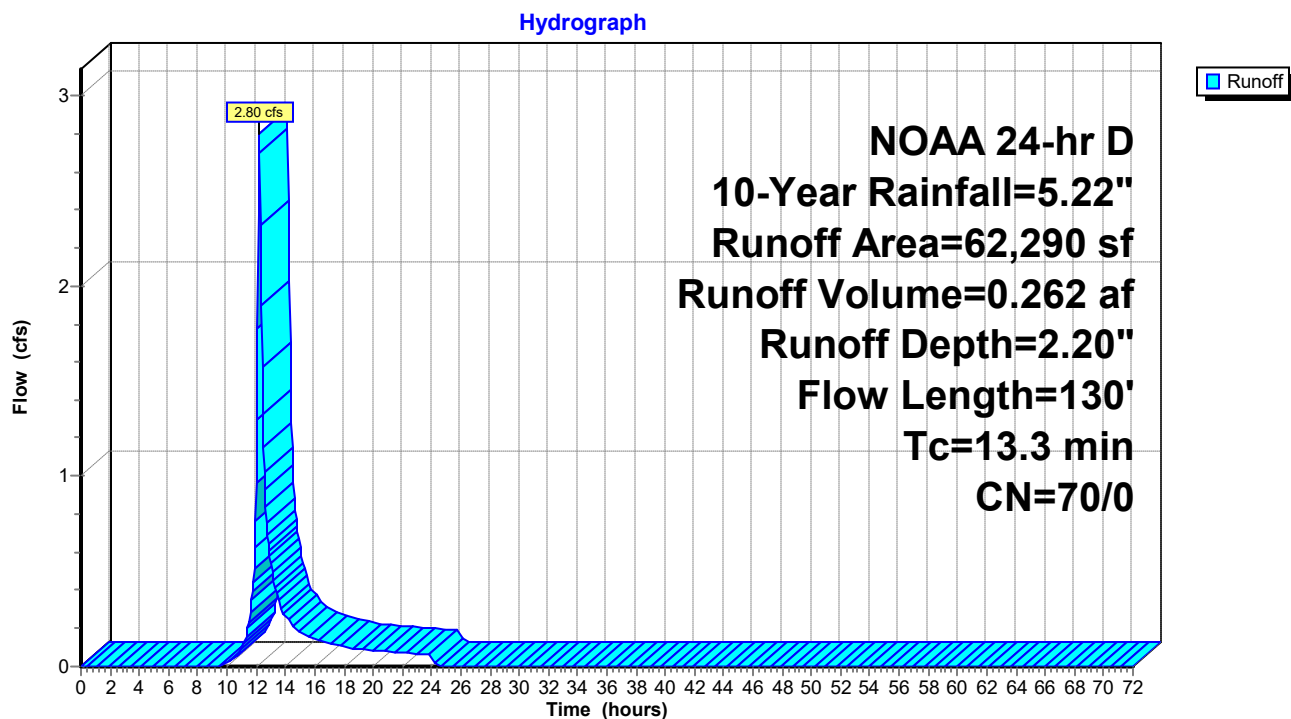
Runoff = 2.80 cfs @ 12.22 hrs, Volume= 0.262 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
62,290	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0700	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	30	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.3	130	Total			

Subcatchment 45S: Basin 2-2 pre-development



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 18

Summary for Pond 42P: Pond 2-2

Inflow Area = 1.412 ac, Inflow Depth = 4.17" for 10-Year event
Inflow = 5.27 cfs @ 12.17 hrs, Volume= 0.490 af
Outflow = 0.61 cfs @ 13.15 hrs, Volume= 0.294 af, Atten= 88%, Lag= 58.7 min
Primary = 0.61 cfs @ 13.15 hrs, Volume= 0.294 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.84' @ 13.15 hrs Surf.Area= 7,112 sf Storage= 13,078 cf

Plug-Flow detention time= 402.4 min calculated for 0.294 af (60% of inflow)
Center-of-Mass det. time= 283.0 min (1,061.2 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	28,448 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	7,112	0	0
546.00	7,112	28,448	28,448

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.61 cfs @ 13.15 hrs HW=543.84' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.59 cfs @ 3.00 fps)

└ **2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 1.01 fps)

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

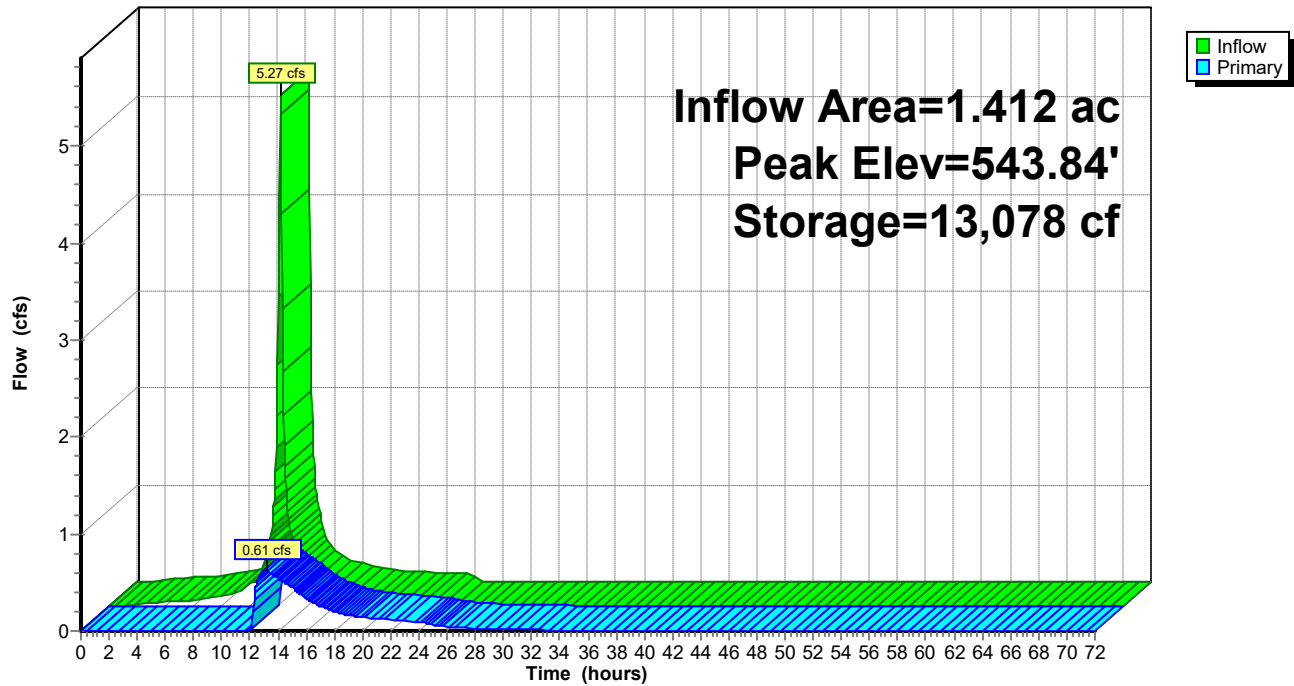
Basdin 2-2 without Exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 19

Pond 42P: Pond 2-2

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 20

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-2

Runoff Area=61,497 sf Runoff Depth=7.49"

Flow Length=606' Tc=10.0 min CN=80/98 Runoff=9.35 cfs 0.881 af

Subcatchment 45S: Basin 2-2 pre-development

Runoff Area=62,290 sf Runoff Depth=5.04"

Flow Length=130' Tc=13.3 min CN=70/0 Runoff=6.47 cfs 0.600 af

Pond 42P: Pond 2-2

Peak Elev=544.88' Storage=20,478 cf Inflow=9.35 cfs 0.881 af

Outflow=2.02 cfs 0.684 af

Total Runoff Area = 2.842 ac Runoff Volume = 1.481 af Average Runoff Depth = 6.25"

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 21

Summary for Subcatchment 36S: Basin 2-2

[47] Hint: Peak is 658% of capacity of segment #3

Runoff = 9.35 cfs @ 12.17 hrs, Volume= 0.881 af, Depth= 7.49"
Routed to Pond 42P : Pond 2-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
34,605	98	Paved parking, HSG C
19,780	74	>75% Grass cover, Good, HSG C
7,112	98	Water Surface, 0% imp, HSG C
61,497	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1300	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	120	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	426	0.0350	6.20	1.42	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.010
4.6	606	Total, Increased to minimum Tc = 10.0 min			

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration

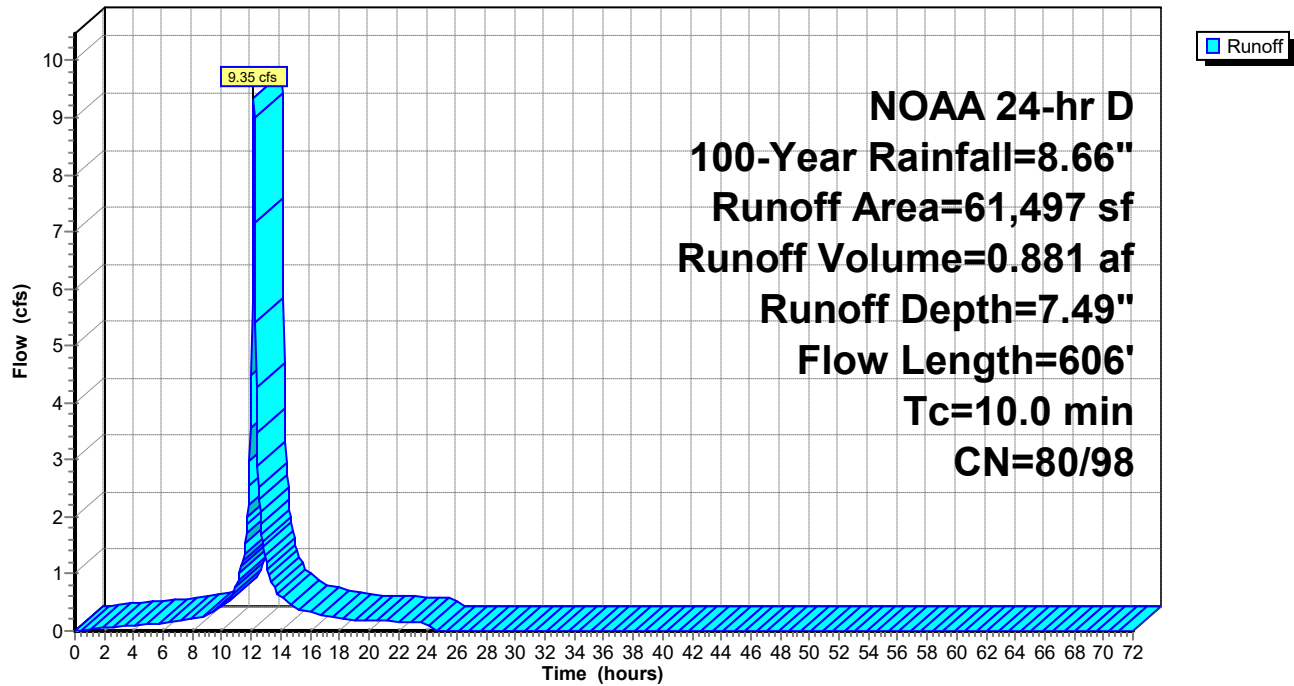
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 22

Subcatchment 36S: Basin 2-2

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 without Exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 23

Summary for Subcatchment 45S: Basin 2-2 pre-development

Runoff = 6.47 cfs @ 12.21 hrs, Volume= 0.600 af, Depth= 5.04"

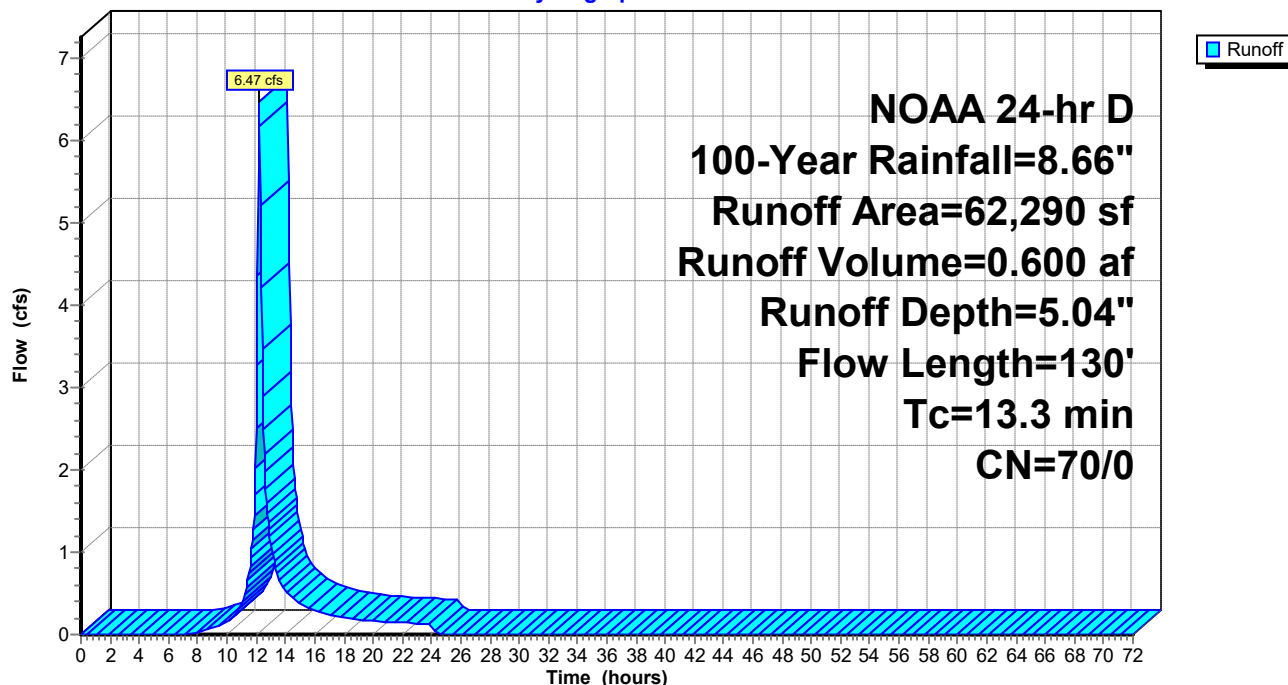
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
62,290	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0700	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
0.7	30	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.3	130	Total			

Subcatchment 45S: Basin 2-2 pre-development

Hydrograph



Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 24

Summary for Pond 42P: Pond 2-2

Inflow Area = 1.412 ac, Inflow Depth = 7.49" for 100-Year event
Inflow = 9.35 cfs @ 12.17 hrs, Volume= 0.881 af
Outflow = 2.02 cfs @ 12.62 hrs, Volume= 0.684 af, Atten= 78%, Lag= 26.8 min
Primary = 2.02 cfs @ 12.62 hrs, Volume= 0.684 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 544.88' @ 12.62 hrs Surf.Area= 7,112 sf Storage= 20,478 cf

Plug-Flow detention time= 288.3 min calculated for 0.684 af (78% of inflow)
Center-of-Mass det. time= 200.4 min (968.8 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	28,448 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	7,112	0	0
546.00	7,112	28,448	28,448

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.02 cfs @ 12.62 hrs HW=544.88' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.76 fps)

└ **2=Orifice/Grate** (Orifice Controls 0.89 cfs @ 4.51 fps)

Proposed Basin 2-2 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basdin 2-2 without Exfiltration

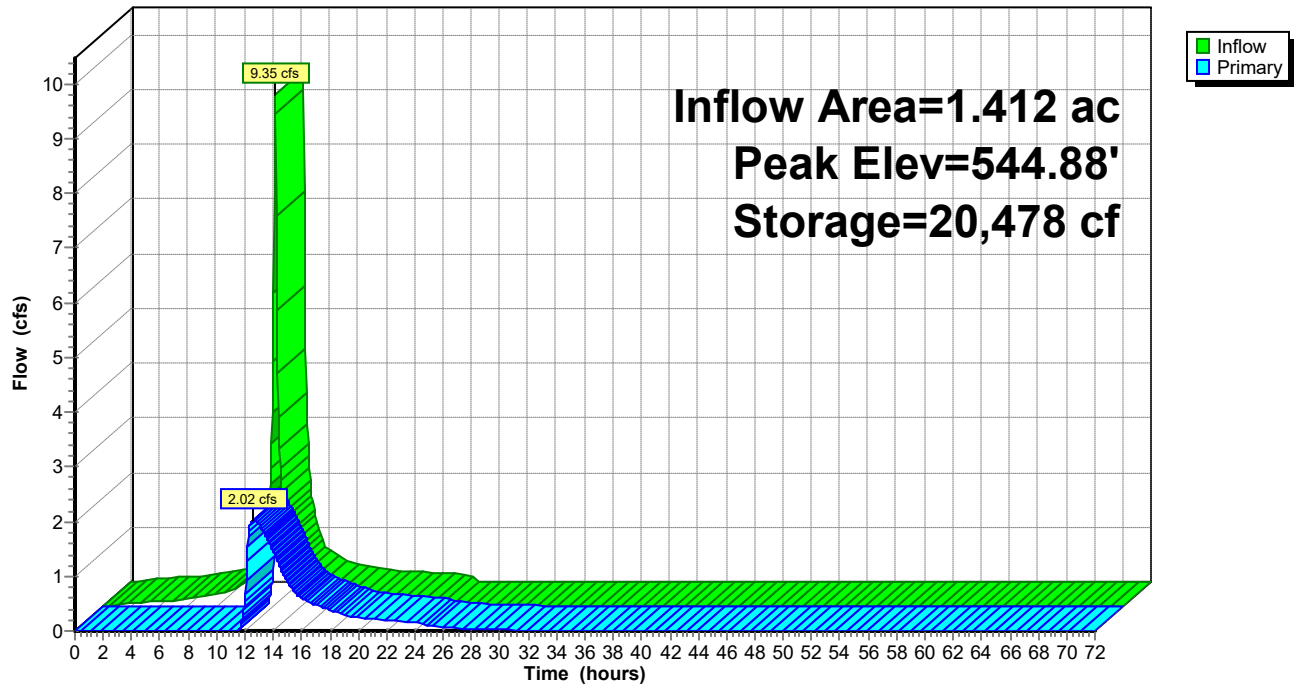
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 25

Pond 42P: Pond 2-2

Hydrograph





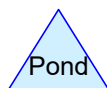
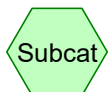
basin 2-3
pre-development



Basin 2-3



pond 2-3



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.959	74	>75% Grass cover, Good, HSG C (40S)
1.060	98	Roofs, HSG C (40S)
0.239	98	Water Surface, 0% imp, HSG C (40S)
2.282	70	Woods, Good, HSG C (45S)
4.541	79	TOTAL AREA

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.541	HSG C	40S, 45S
0.000	HSG D	
0.000	Other	
4.541		TOTAL AREA

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.959	0.000	0.000	0.959	>75% Grass cover, Good	40S
0.000	0.000	1.060	0.000	0.000	1.060	Roofs	40S
0.000	0.000	0.239	0.000	0.000	0.239	Water Surface, 0% imp	40S
0.000	0.000	2.282	0.000	0.000	2.282	Woods, Good	45S
0.000	0.000	4.541	0.000	0.000	4.541	TOTAL AREA	

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	40S	0.00	0.00	1,326.0	0.0300	0.010	0.0	15.0	0.0	

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 40S: Basin 2-3

Runoff Area=98,395 sf Runoff Depth=2.30"

Flow Length=1,558' Tc=10.5 min CN=79/98 Runoff=4.65 cfs 0.434 af

Subcatchment 45S: basin 2-3 pre-development

Runoff Area=99,393 sf Runoff Depth=0.97"

Flow Length=280' Tc=12.2 min CN=70/0 Runoff=1.92 cfs 0.185 af

Pond 44P: pond 2-3

Peak Elev=543.43' Storage=14,908 cf Inflow=4.65 cfs 0.434 af

Outflow=0.15 cfs 0.144 af

Total Runoff Area = 4.541 ac Runoff Volume = 0.618 af Average Runoff Depth = 1.63"

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 40S: Basin 2-3

Runoff = 4.65 cfs @ 12.18 hrs, Volume= 0.434 af, Depth= 2.30"
Routed to Pond 44P : pond 2-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
41,793	74	>75% Grass cover, Good, HSG C
46,190	98	Roofs, HSG C
10,412	98	Water Surface, 0% imp, HSG C
98,395	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.2	72	0.0800	5.74		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	1,326	0.0300	11.85	14.55	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
10.5	1,558	Total			

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

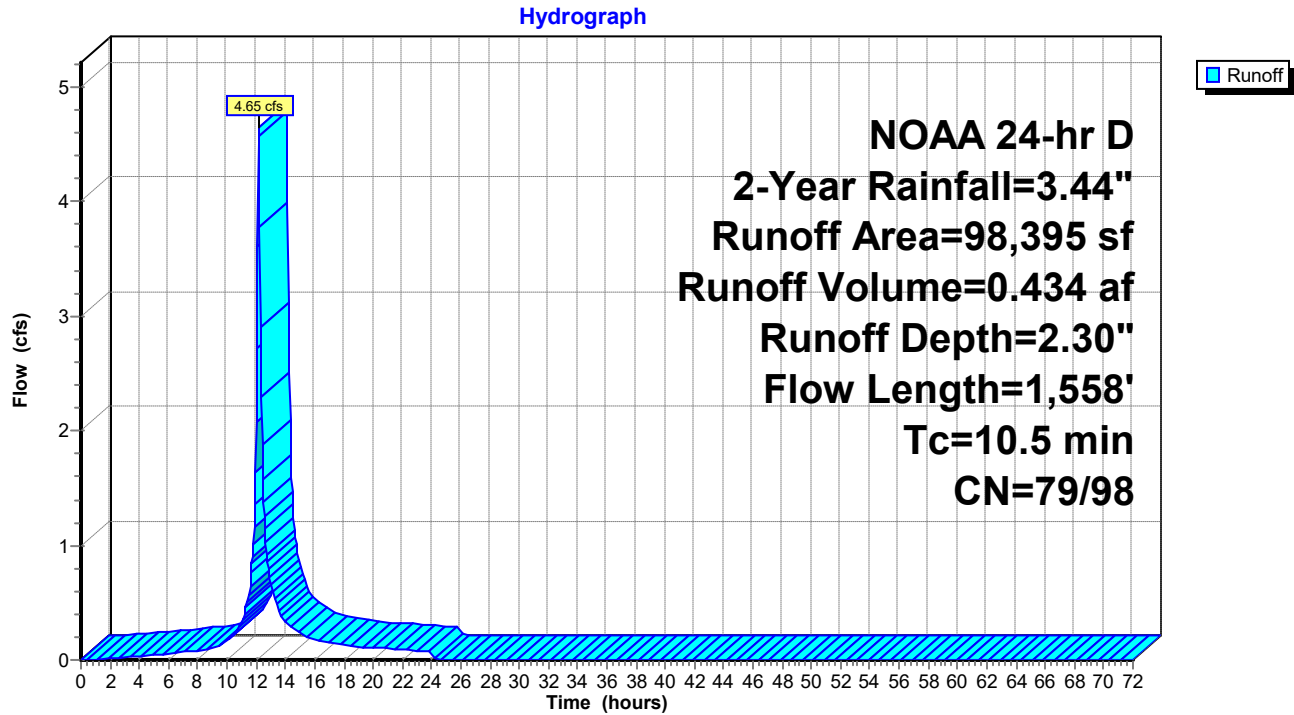
Basin 2-3 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Subcatchment 40S: Basin 2-3



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Hydrograph for Subcatchment 40S: Basin 2-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.02	0.02
5.00	0.24	0.00	0.09	0.04
7.50	0.40	0.00	0.23	0.08
10.00	0.68	0.01	0.49	0.17
12.50	2.35	0.73	2.12	1.37
15.00	2.89	1.10	2.66	0.23
17.50	3.11	1.26	2.88	0.14
20.00	3.26	1.37	3.03	0.11
22.50	3.38	1.46	3.15	0.09
25.00	3.44	1.50	3.21	0.00
27.50	3.44	1.50	3.21	0.00
30.00	3.44	1.50	3.21	0.00
32.50	3.44	1.50	3.21	0.00
35.00	3.44	1.50	3.21	0.00
37.50	3.44	1.50	3.21	0.00
40.00	3.44	1.50	3.21	0.00
42.50	3.44	1.50	3.21	0.00
45.00	3.44	1.50	3.21	0.00
47.50	3.44	1.50	3.21	0.00
50.00	3.44	1.50	3.21	0.00
52.50	3.44	1.50	3.21	0.00
55.00	3.44	1.50	3.21	0.00
57.50	3.44	1.50	3.21	0.00
60.00	3.44	1.50	3.21	0.00
62.50	3.44	1.50	3.21	0.00
65.00	3.44	1.50	3.21	0.00
67.50	3.44	1.50	3.21	0.00
70.00	3.44	1.50	3.21	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Summary for Subcatchment 45S: basin 2-3 pre-development

Runoff = 1.92 cfs @ 12.21 hrs, Volume= 0.185 af, Depth= 0.97"

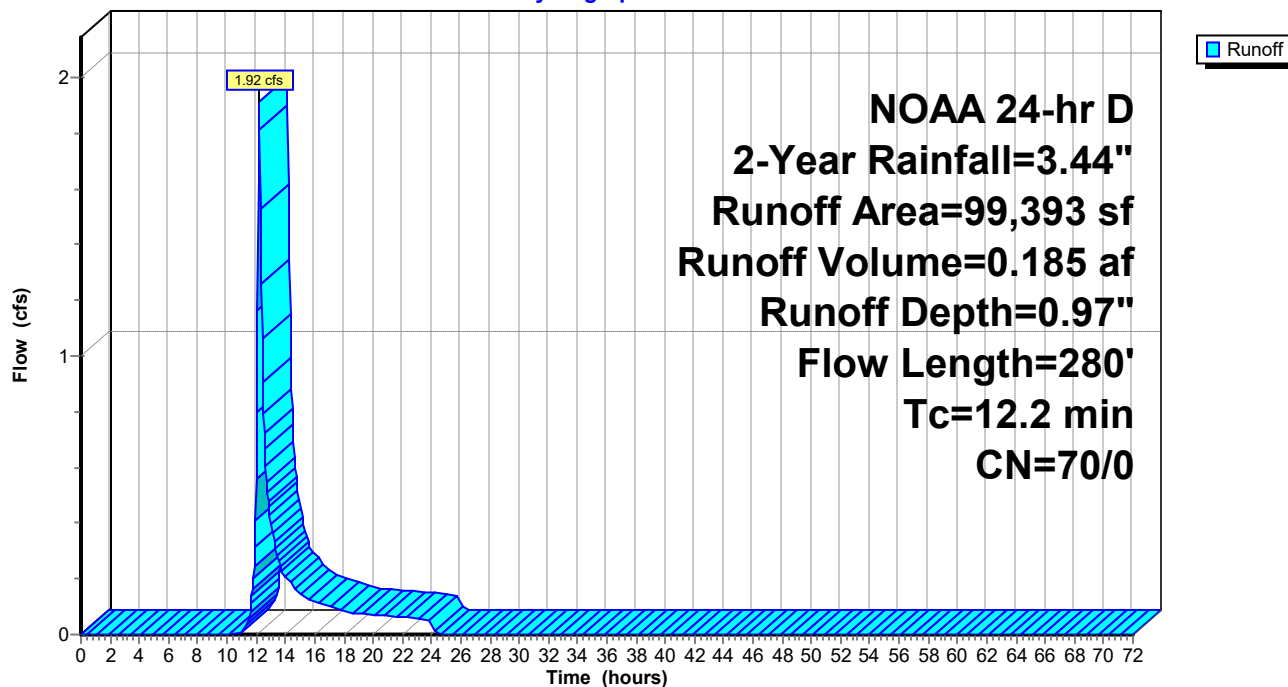
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
99,393	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
2.1	180	0.0830	1.44		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.2	280	Total			

Subcatchment 45S: basin 2-3 pre-development

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Hydrograph for Subcatchment 45S: basin 2-3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	0.80
15.00	2.89	0.66	0.00	0.15
17.50	3.11	0.78	0.00	0.09
20.00	3.26	0.86	0.00	0.07
22.50	3.38	0.93	0.00	0.06
25.00	3.44	0.97	0.00	0.00
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Summary for Pond 44P: pond 2-3

Inflow Area = 2.259 ac, Inflow Depth = 2.30" for 2-Year event
Inflow = 4.65 cfs @ 12.18 hrs, Volume= 0.434 af
Outflow = 0.15 cfs @ 17.25 hrs, Volume= 0.144 af, Atten= 97%, Lag= 304.5 min
Primary = 0.15 cfs @ 17.25 hrs, Volume= 0.144 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.43' @ 17.25 hrs Surf.Area= 10,412 sf Storage= 14,908 cf

Plug-Flow detention time= 761.1 min calculated for 0.144 af (33% of inflow)
Center-of-Mass det. time= 586.3 min (1,380.9 - 794.6)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	41,648 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	10,412	0	0
546.00	10,412	41,648	41,648

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 17.25 hrs HW=543.43' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.15 cfs @ 1.64 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

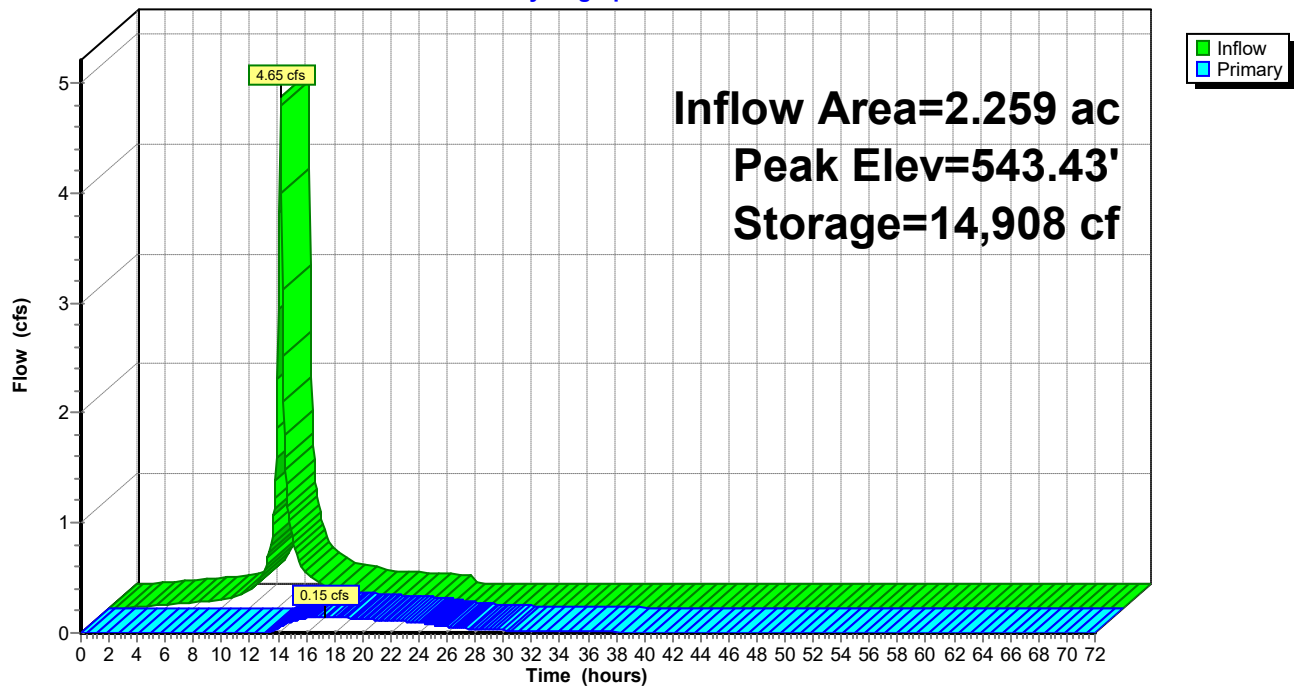
Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Pond 44P: pond 2-3

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Hydrograph for Pond 44P: pond 2-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.02	48	542.00	0.00
5.00	0.04	339	542.03	0.00
7.50	0.08	845	542.08	0.00
10.00	0.17	1,801	542.17	0.00
12.50	1.37	10,607	543.02	0.00
15.00	0.23	14,542	543.40	0.11
17.50	0.14	14,905	543.43	0.15
20.00	0.11	14,721	543.41	0.13
22.50	0.09	14,534	543.40	0.11
25.00	0.00	14,154	543.36	0.07
27.50	0.00	13,672	543.31	0.04
30.00	0.00	13,398	543.29	0.02
32.50	0.00	13,226	543.27	0.02
35.00	0.00	13,103	543.26	0.01
37.50	0.00	13,012	543.25	0.01
40.00	0.00	12,946	543.24	0.01
42.50	0.00	12,898	543.24	0.00
45.00	0.00	12,856	543.23	0.00
47.50	0.00	12,819	543.23	0.00
50.00	0.00	12,786	543.23	0.00
52.50	0.00	12,756	543.23	0.00
55.00	0.00	12,729	543.22	0.00
57.50	0.00	12,705	543.22	0.00
60.00	0.00	12,683	543.22	0.00
62.50	0.00	12,664	543.22	0.00
65.00	0.00	12,647	543.21	0.00
67.50	0.00	12,631	543.21	0.00
70.00	0.00	12,617	543.21	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Stage-Discharge for Pond 44P: pond 2-3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.00	544.04	0.94	545.06	2.17
542.02	0.00	543.04	0.00	544.06	0.98	545.08	2.19
542.04	0.00	543.06	0.00	544.08	1.02	545.10	2.21
542.06	0.00	543.08	0.00	544.10	1.06	545.12	2.22
542.08	0.00	543.10	0.00	544.12	1.10	545.14	2.24
542.10	0.00	543.12	0.00	544.14	1.13	545.16	2.25
542.12	0.00	543.14	0.00	544.16	1.17	545.18	2.27
542.14	0.00	543.16	0.00	544.18	1.21	545.20	2.29
542.16	0.00	543.18	0.00	544.20	1.24	545.22	2.30
542.18	0.00	543.20	0.00	544.22	1.28	545.24	2.32
542.20	0.00	543.22	0.00	544.24	1.31	545.26	2.33
542.22	0.00	543.24	0.01	544.26	1.33	545.28	2.35
542.24	0.00	543.26	0.01	544.28	1.36	545.30	2.36
542.26	0.00	543.28	0.02	544.30	1.39	545.32	2.38
542.28	0.00	543.30	0.03	544.32	1.42	545.34	2.39
542.30	0.00	543.32	0.04	544.34	1.44	545.36	2.41
542.32	0.00	543.34	0.06	544.36	1.47	545.38	2.42
542.34	0.00	543.36	0.07	544.38	1.49	545.40	2.44
542.36	0.00	543.38	0.09	544.40	1.52	545.42	2.45
542.38	0.00	543.40	0.11	544.42	1.54	545.44	2.47
542.40	0.00	543.42	0.13	544.44	1.57	545.46	2.48
542.42	0.00	543.44	0.16	544.46	1.59	545.48	2.50
542.44	0.00	543.46	0.18	544.48	1.61	545.50	2.51
542.46	0.00	543.48	0.20	544.50	1.64	545.52	2.53
542.48	0.00	543.50	0.23	544.52	1.66	545.54	2.54
542.50	0.00	543.52	0.26	544.54	1.68	545.56	2.55
542.52	0.00	543.54	0.28	544.56	1.70	545.58	2.57
542.54	0.00	543.56	0.31	544.58	1.73	545.60	2.58
542.56	0.00	543.58	0.34	544.60	1.75	545.62	2.60
542.58	0.00	543.60	0.36	544.62	1.77	545.64	2.61
542.60	0.00	543.62	0.39	544.64	1.79	545.66	2.62
542.62	0.00	543.64	0.41	544.66	1.81	545.68	2.64
542.64	0.00	543.66	0.44	544.68	1.83	545.70	2.65
542.66	0.00	543.68	0.46	544.70	1.85	545.72	2.66
542.68	0.00	543.70	0.47	544.72	1.87	545.74	2.68
542.70	0.00	543.72	0.49	544.74	1.89	545.76	2.69
542.72	0.00	543.74	0.51	544.76	1.91	545.78	2.70
542.74	0.00	543.76	0.53	544.78	1.93	545.80	2.72
542.76	0.00	543.78	0.55	544.80	1.94	545.82	2.73
542.78	0.00	543.80	0.57	544.82	1.96	545.84	2.74
542.80	0.00	543.82	0.59	544.84	1.98	545.86	2.76
542.82	0.00	543.84	0.61	544.86	2.00	545.88	2.77
542.84	0.00	543.86	0.64	544.88	2.02	545.90	2.78
542.86	0.00	543.88	0.67	544.90	2.04	545.92	2.80
542.88	0.00	543.90	0.70	544.92	2.05	545.94	2.81
542.90	0.00	543.92	0.73	544.94	2.07	545.96	2.82
542.92	0.00	543.94	0.76	544.96	2.09	545.98	2.83
542.94	0.00	543.96	0.80	544.98	2.11	546.00	2.85
542.96	0.00	543.98	0.83	545.00	2.12		
542.98	0.00	544.00	0.87	545.02	2.14		
543.00	0.00	544.02	0.91	545.04	2.16		

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Stage-Area-Storage for Pond 44P: pond 2-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	10,412	0	544.55	10,412	26,551
542.05	10,412	521	544.60	10,412	27,071
542.10	10,412	1,041	544.65	10,412	27,592
542.15	10,412	1,562	544.70	10,412	28,112
542.20	10,412	2,082	544.75	10,412	28,633
542.25	10,412	2,603	544.80	10,412	29,154
542.30	10,412	3,124	544.85	10,412	29,674
542.35	10,412	3,644	544.90	10,412	30,195
542.40	10,412	4,165	544.95	10,412	30,715
542.45	10,412	4,685	545.00	10,412	31,236
542.50	10,412	5,206	545.05	10,412	31,757
542.55	10,412	5,727	545.10	10,412	32,277
542.60	10,412	6,247	545.15	10,412	32,798
542.65	10,412	6,768	545.20	10,412	33,318
542.70	10,412	7,288	545.25	10,412	33,839
542.75	10,412	7,809	545.30	10,412	34,360
542.80	10,412	8,330	545.35	10,412	34,880
542.85	10,412	8,850	545.40	10,412	35,401
542.90	10,412	9,371	545.45	10,412	35,921
542.95	10,412	9,891	545.50	10,412	36,442
543.00	10,412	10,412	545.55	10,412	36,963
543.05	10,412	10,933	545.60	10,412	37,483
543.10	10,412	11,453	545.65	10,412	38,004
543.15	10,412	11,974	545.70	10,412	38,524
543.20	10,412	12,494	545.75	10,412	39,045
543.25	10,412	13,015	545.80	10,412	39,566
543.30	10,412	13,536	545.85	10,412	40,086
543.35	10,412	14,056	545.90	10,412	40,607
543.40	10,412	14,577	545.95	10,412	41,127
543.45	10,412	15,097	546.00	10,412	41,648
543.50	10,412	15,618			
543.55	10,412	16,139			
543.60	10,412	16,659			
543.65	10,412	17,180			
543.70	10,412	17,700			
543.75	10,412	18,221			
543.80	10,412	18,742			
543.85	10,412	19,262			
543.90	10,412	19,783			
543.95	10,412	20,303			
544.00	10,412	20,824			
544.05	10,412	21,345			
544.10	10,412	21,865			
544.15	10,412	22,386			
544.20	10,412	22,906			
544.25	10,412	23,427			
544.30	10,412	23,948			
544.35	10,412	24,468			
544.40	10,412	24,989			
544.45	10,412	25,509			
544.50	10,412	26,030			

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 19

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 40S: Basin 2-3

Runoff Area=98,395 sf Runoff Depth=3.92"

Flow Length=1,558' Tc=10.5 min CN=79/98 Runoff=7.90 cfs 0.737 af

Subcatchment 45S: basin 2-3 pre-development

Runoff Area=99,393 sf Runoff Depth=2.20"

Flow Length=280' Tc=12.2 min CN=70/0 Runoff=4.62 cfs 0.418 af

Pond 44P: pond 2-3

Peak Elev=543.93' Storage=20,108 cf Inflow=7.90 cfs 0.737 af

Outflow=0.75 cfs 0.448 af

Total Runoff Area = 4.541 ac Runoff Volume = 1.156 af Average Runoff Depth = 3.05"

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Summary for Subcatchment 40S: Basin 2-3

Runoff = 7.90 cfs @ 12.18 hrs, Volume= 0.737 af, Depth= 3.92"
Routed to Pond 44P : pond 2-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
41,793	74	>75% Grass cover, Good, HSG C
46,190	98	Roofs, HSG C
10,412	98	Water Surface, 0% imp, HSG C
98,395	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.2	72	0.0800	5.74		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	1,326	0.0300	11.85	14.55	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
10.5	1,558	Total			

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

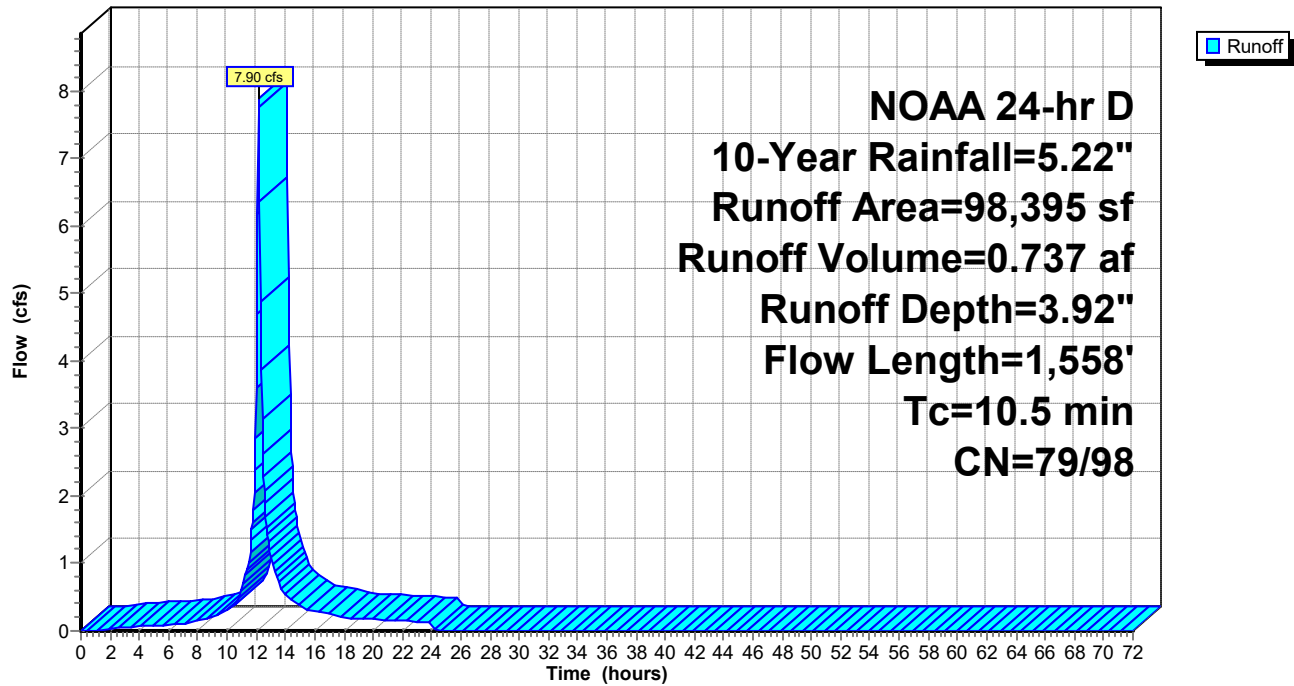
Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Subcatchment 40S: Basin 2-3

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 40S: Basin 2-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.04	0.04
5.00	0.36	0.00	0.19	0.08
7.50	0.61	0.00	0.42	0.13
10.00	1.03	0.08	0.82	0.32
12.50	3.57	1.60	3.33	2.29
15.00	4.39	2.27	4.16	0.37
17.50	4.73	2.55	4.49	0.23
20.00	4.95	2.74	4.71	0.17
22.50	5.13	2.89	4.89	0.14
25.00	5.22	2.97	4.98	0.00
27.50	5.22	2.97	4.98	0.00
30.00	5.22	2.97	4.98	0.00
32.50	5.22	2.97	4.98	0.00
35.00	5.22	2.97	4.98	0.00
37.50	5.22	2.97	4.98	0.00
40.00	5.22	2.97	4.98	0.00
42.50	5.22	2.97	4.98	0.00
45.00	5.22	2.97	4.98	0.00
47.50	5.22	2.97	4.98	0.00
50.00	5.22	2.97	4.98	0.00
52.50	5.22	2.97	4.98	0.00
55.00	5.22	2.97	4.98	0.00
57.50	5.22	2.97	4.98	0.00
60.00	5.22	2.97	4.98	0.00
62.50	5.22	2.97	4.98	0.00
65.00	5.22	2.97	4.98	0.00
67.50	5.22	2.97	4.98	0.00
70.00	5.22	2.97	4.98	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Subcatchment 45S: basin 2-3 pre-development

Runoff = 4.62 cfs @ 12.21 hrs, Volume= 0.418 af, Depth= 2.20"

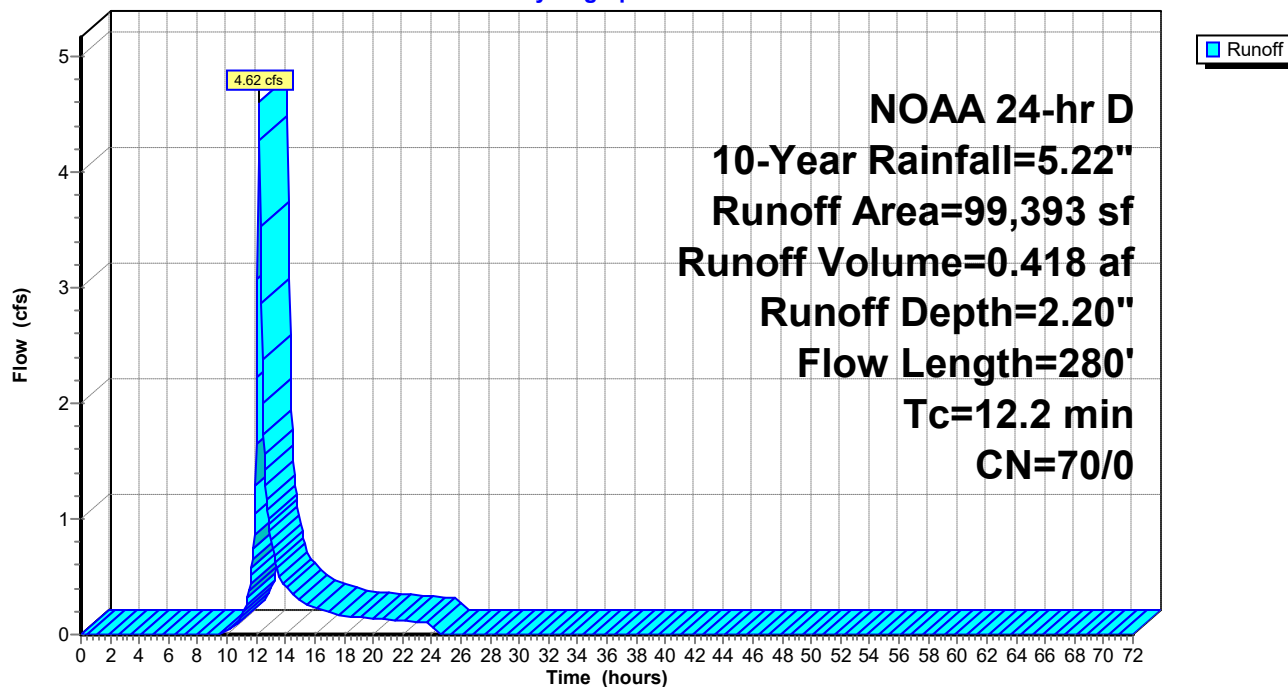
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
99,393	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
2.1	180	0.0830	1.44		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.2	280	Total			

Subcatchment 45S: basin 2-3 pre-development

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Hydrograph for Subcatchment 45S: basin 2-3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.03
12.50	3.57	1.05	0.00	1.73
15.00	4.39	1.60	0.00	0.29
17.50	4.73	1.83	0.00	0.18
20.00	4.95	2.00	0.00	0.14
22.50	5.13	2.13	0.00	0.11
25.00	5.22	2.20	0.00	0.00
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Summary for Pond 44P: pond 2-3

Inflow Area = 2.259 ac, Inflow Depth = 3.92" for 10-Year event
Inflow = 7.90 cfs @ 12.18 hrs, Volume= 0.737 af
Outflow = 0.75 cfs @ 13.44 hrs, Volume= 0.448 af, Atten= 91%, Lag= 75.8 min
Primary = 0.75 cfs @ 13.44 hrs, Volume= 0.448 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.93' @ 13.44 hrs Surf.Area= 10,412 sf Storage= 20,108 cf

Plug-Flow detention time= 446.8 min calculated for 0.448 af (61% of inflow)
Center-of-Mass det. time= 326.4 min (1,112.9 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	41,648 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	10,412	0	0
546.00	10,412	41,648	41,648

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.75 cfs @ 13.44 hrs HW=543.93' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.66 cfs @ 3.34 fps)

└ **2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.45 fps)

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

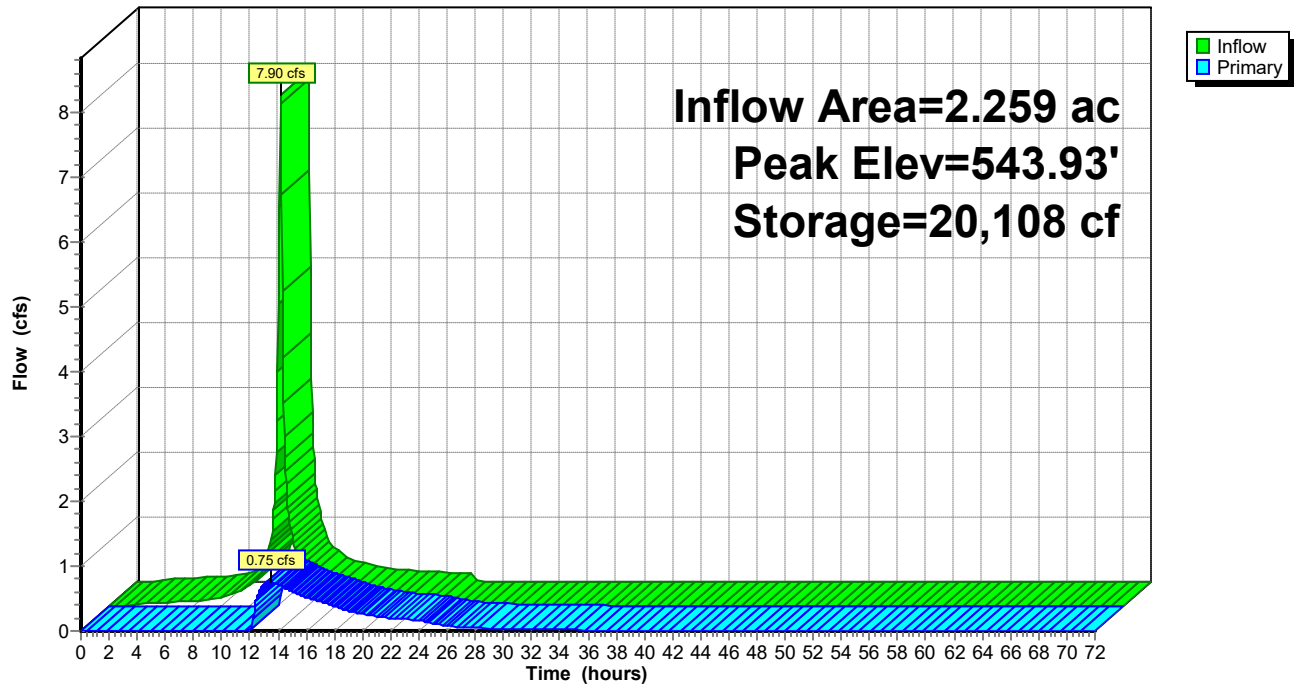
Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Pond 44P: pond 2-3

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Hydrograph for Pond 44P: pond 2-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.04	144	542.01	0.00
5.00	0.08	694	542.07	0.00
7.50	0.13	1,547	542.15	0.00
10.00	0.32	3,319	542.32	0.00
12.50	2.29	18,207	543.75	0.52
15.00	0.37	19,115	543.84	0.61
17.50	0.23	17,125	543.64	0.42
20.00	0.17	15,857	543.52	0.26
22.50	0.14	15,277	543.47	0.19
25.00	0.00	14,613	543.40	0.12
27.50	0.00	13,898	543.33	0.05
30.00	0.00	13,532	543.30	0.03
32.50	0.00	13,313	543.28	0.02
35.00	0.00	13,166	543.26	0.01
37.50	0.00	13,059	543.25	0.01
40.00	0.00	12,980	543.25	0.01
42.50	0.00	12,923	543.24	0.01
45.00	0.00	12,879	543.24	0.00
47.50	0.00	12,839	543.23	0.00
50.00	0.00	12,804	543.23	0.00
52.50	0.00	12,772	543.23	0.00
55.00	0.00	12,743	543.22	0.00
57.50	0.00	12,718	543.22	0.00
60.00	0.00	12,695	543.22	0.00
62.50	0.00	12,674	543.22	0.00
65.00	0.00	12,656	543.22	0.00
67.50	0.00	12,639	543.21	0.00
70.00	0.00	12,624	543.21	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Stage-Discharge for Pond 44P: pond 2-3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.00	544.04	0.94	545.06	2.17
542.02	0.00	543.04	0.00	544.06	0.98	545.08	2.19
542.04	0.00	543.06	0.00	544.08	1.02	545.10	2.21
542.06	0.00	543.08	0.00	544.10	1.06	545.12	2.22
542.08	0.00	543.10	0.00	544.12	1.10	545.14	2.24
542.10	0.00	543.12	0.00	544.14	1.13	545.16	2.25
542.12	0.00	543.14	0.00	544.16	1.17	545.18	2.27
542.14	0.00	543.16	0.00	544.18	1.21	545.20	2.29
542.16	0.00	543.18	0.00	544.20	1.24	545.22	2.30
542.18	0.00	543.20	0.00	544.22	1.28	545.24	2.32
542.20	0.00	543.22	0.00	544.24	1.31	545.26	2.33
542.22	0.00	543.24	0.01	544.26	1.33	545.28	2.35
542.24	0.00	543.26	0.01	544.28	1.36	545.30	2.36
542.26	0.00	543.28	0.02	544.30	1.39	545.32	2.38
542.28	0.00	543.30	0.03	544.32	1.42	545.34	2.39
542.30	0.00	543.32	0.04	544.34	1.44	545.36	2.41
542.32	0.00	543.34	0.06	544.36	1.47	545.38	2.42
542.34	0.00	543.36	0.07	544.38	1.49	545.40	2.44
542.36	0.00	543.38	0.09	544.40	1.52	545.42	2.45
542.38	0.00	543.40	0.11	544.42	1.54	545.44	2.47
542.40	0.00	543.42	0.13	544.44	1.57	545.46	2.48
542.42	0.00	543.44	0.16	544.46	1.59	545.48	2.50
542.44	0.00	543.46	0.18	544.48	1.61	545.50	2.51
542.46	0.00	543.48	0.20	544.50	1.64	545.52	2.53
542.48	0.00	543.50	0.23	544.52	1.66	545.54	2.54
542.50	0.00	543.52	0.26	544.54	1.68	545.56	2.55
542.52	0.00	543.54	0.28	544.56	1.70	545.58	2.57
542.54	0.00	543.56	0.31	544.58	1.73	545.60	2.58
542.56	0.00	543.58	0.34	544.60	1.75	545.62	2.60
542.58	0.00	543.60	0.36	544.62	1.77	545.64	2.61
542.60	0.00	543.62	0.39	544.64	1.79	545.66	2.62
542.62	0.00	543.64	0.41	544.66	1.81	545.68	2.64
542.64	0.00	543.66	0.44	544.68	1.83	545.70	2.65
542.66	0.00	543.68	0.46	544.70	1.85	545.72	2.66
542.68	0.00	543.70	0.47	544.72	1.87	545.74	2.68
542.70	0.00	543.72	0.49	544.74	1.89	545.76	2.69
542.72	0.00	543.74	0.51	544.76	1.91	545.78	2.70
542.74	0.00	543.76	0.53	544.78	1.93	545.80	2.72
542.76	0.00	543.78	0.55	544.80	1.94	545.82	2.73
542.78	0.00	543.80	0.57	544.82	1.96	545.84	2.74
542.80	0.00	543.82	0.59	544.84	1.98	545.86	2.76
542.82	0.00	543.84	0.61	544.86	2.00	545.88	2.77
542.84	0.00	543.86	0.64	544.88	2.02	545.90	2.78
542.86	0.00	543.88	0.67	544.90	2.04	545.92	2.80
542.88	0.00	543.90	0.70	544.92	2.05	545.94	2.81
542.90	0.00	543.92	0.73	544.94	2.07	545.96	2.82
542.92	0.00	543.94	0.76	544.96	2.09	545.98	2.83
542.94	0.00	543.96	0.80	544.98	2.11	546.00	2.85
542.96	0.00	543.98	0.83	545.00	2.12		
542.98	0.00	544.00	0.87	545.02	2.14		
543.00	0.00	544.02	0.91	545.04	2.16		

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Stage-Area-Storage for Pond 44P: pond 2-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	10,412	0	544.55	10,412	26,551
542.05	10,412	521	544.60	10,412	27,071
542.10	10,412	1,041	544.65	10,412	27,592
542.15	10,412	1,562	544.70	10,412	28,112
542.20	10,412	2,082	544.75	10,412	28,633
542.25	10,412	2,603	544.80	10,412	29,154
542.30	10,412	3,124	544.85	10,412	29,674
542.35	10,412	3,644	544.90	10,412	30,195
542.40	10,412	4,165	544.95	10,412	30,715
542.45	10,412	4,685	545.00	10,412	31,236
542.50	10,412	5,206	545.05	10,412	31,757
542.55	10,412	5,727	545.10	10,412	32,277
542.60	10,412	6,247	545.15	10,412	32,798
542.65	10,412	6,768	545.20	10,412	33,318
542.70	10,412	7,288	545.25	10,412	33,839
542.75	10,412	7,809	545.30	10,412	34,360
542.80	10,412	8,330	545.35	10,412	34,880
542.85	10,412	8,850	545.40	10,412	35,401
542.90	10,412	9,371	545.45	10,412	35,921
542.95	10,412	9,891	545.50	10,412	36,442
543.00	10,412	10,412	545.55	10,412	36,963
543.05	10,412	10,933	545.60	10,412	37,483
543.10	10,412	11,453	545.65	10,412	38,004
543.15	10,412	11,974	545.70	10,412	38,524
543.20	10,412	12,494	545.75	10,412	39,045
543.25	10,412	13,015	545.80	10,412	39,566
543.30	10,412	13,536	545.85	10,412	40,086
543.35	10,412	14,056	545.90	10,412	40,607
543.40	10,412	14,577	545.95	10,412	41,127
543.45	10,412	15,097	546.00	10,412	41,648
543.50	10,412	15,618			
543.55	10,412	16,139			
543.60	10,412	16,659			
543.65	10,412	17,180			
543.70	10,412	17,700			
543.75	10,412	18,221			
543.80	10,412	18,742			
543.85	10,412	19,262			
543.90	10,412	19,783			
543.95	10,412	20,303			
544.00	10,412	20,824			
544.05	10,412	21,345			
544.10	10,412	21,865			
544.15	10,412	22,386			
544.20	10,412	22,906			
544.25	10,412	23,427			
544.30	10,412	23,948			
544.35	10,412	24,468			
544.40	10,412	24,989			
544.45	10,412	25,509			
544.50	10,412	26,030			

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 30

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 40S: Basin 2-3

Runoff Area=98,395 sf Runoff Depth=7.19"

Flow Length=1,558' Tc=10.5 min CN=79/98 Runoff=14.34 cfs 1.353 af

Subcatchment 45S: basin 2-3 pre-development

Runoff Area=99,393 sf Runoff Depth=5.04"

Flow Length=280' Tc=12.2 min CN=70/0 Runoff=10.64 cfs 0.958 af

Pond 44P: pond 2-3

Peak Elev=545.17' Storage=32,959 cf Inflow=14.34 cfs 1.353 af

Outflow=2.26 cfs 1.063 af

Total Runoff Area = 4.541 ac Runoff Volume = 2.311 af Average Runoff Depth = 6.11"

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 31

Summary for Subcatchment 40S: Basin 2-3

Runoff = 14.34 cfs @ 12.18 hrs, Volume= 1.353 af, Depth= 7.19"
Routed to Pond 44P : pond 2-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
41,793	74	>75% Grass cover, Good, HSG C
46,190	98	Roofs, HSG C
10,412	98	Water Surface, 0% imp, HSG C
98,395	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.2	72	0.0800	5.74		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	1,326	0.0300	11.85	14.55	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
10.5	1,558	Total			

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

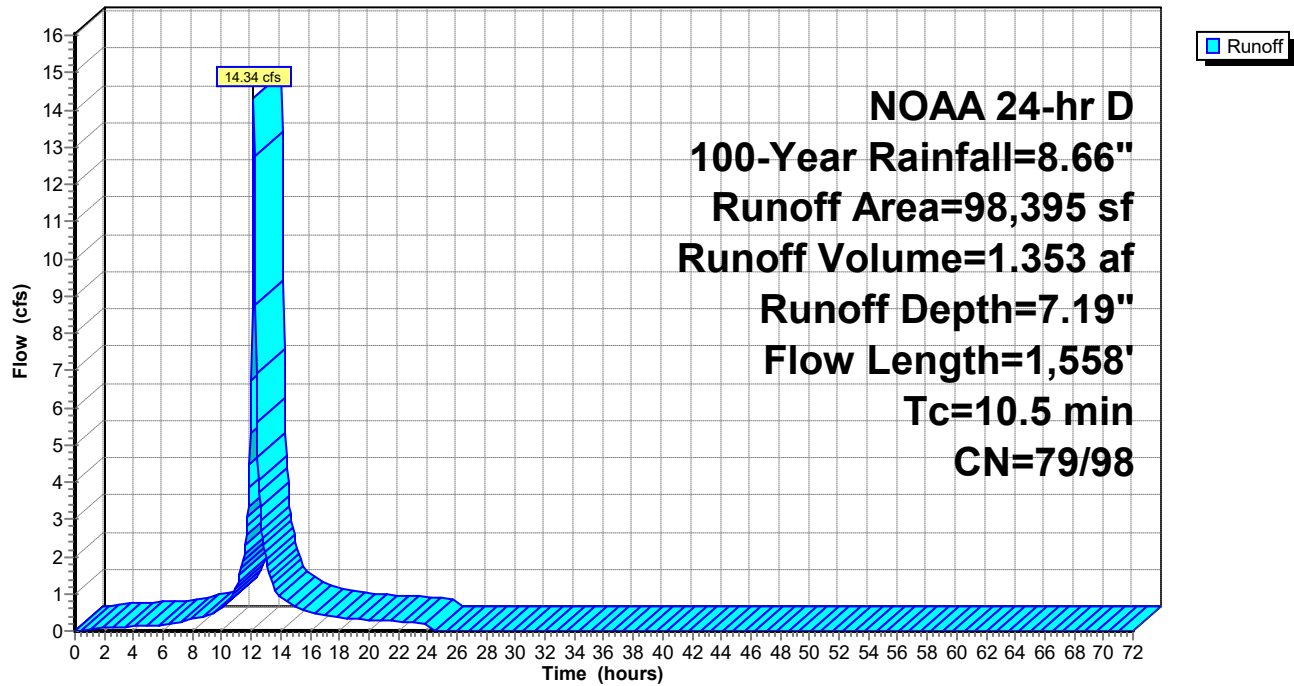
Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 32

Subcatchment 40S: Basin 2-3

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Hydrograph for Subcatchment 40S: Basin 2-3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.12	0.09
5.00	0.59	0.00	0.40	0.14
7.50	1.01	0.07	0.80	0.28
10.00	1.72	0.36	1.49	0.65
12.50	5.91	3.58	5.68	4.07
15.00	7.29	4.82	7.05	0.65
17.50	7.84	5.33	7.60	0.39
20.00	8.21	5.67	7.97	0.29
22.50	8.51	5.96	8.27	0.24
25.00	8.66	6.10	8.42	0.00
27.50	8.66	6.10	8.42	0.00
30.00	8.66	6.10	8.42	0.00
32.50	8.66	6.10	8.42	0.00
35.00	8.66	6.10	8.42	0.00
37.50	8.66	6.10	8.42	0.00
40.00	8.66	6.10	8.42	0.00
42.50	8.66	6.10	8.42	0.00
45.00	8.66	6.10	8.42	0.00
47.50	8.66	6.10	8.42	0.00
50.00	8.66	6.10	8.42	0.00
52.50	8.66	6.10	8.42	0.00
55.00	8.66	6.10	8.42	0.00
57.50	8.66	6.10	8.42	0.00
60.00	8.66	6.10	8.42	0.00
62.50	8.66	6.10	8.42	0.00
65.00	8.66	6.10	8.42	0.00
67.50	8.66	6.10	8.42	0.00
70.00	8.66	6.10	8.42	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Summary for Subcatchment 45S: basin 2-3 pre-development

Runoff = 10.64 cfs @ 12.20 hrs, Volume= 0.958 af, Depth= 5.04"

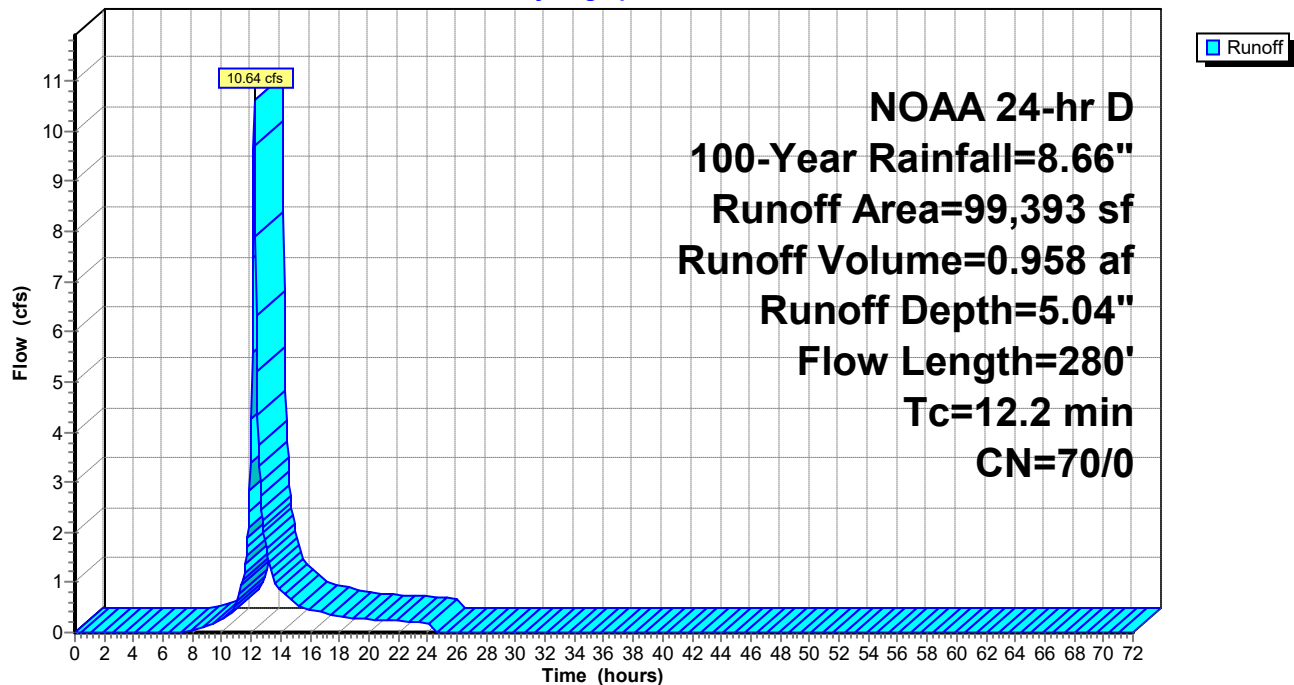
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
99,393	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
2.1	180	0.0830	1.44		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.2	280	Total			

Subcatchment 45S: basin 2-3 pre-development

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Hydrograph for Subcatchment 45S: basin 2-3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
10.00	1.72	0.14	0.00	0.25
12.50	5.91	2.74	0.00	3.73
15.00	7.29	3.86	0.00	0.58
17.50	7.84	4.33	0.00	0.35
20.00	8.21	4.64	0.00	0.27
22.50	8.51	4.90	0.00	0.22
25.00	8.66	5.04	0.00	0.00
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Summary for Pond 44P: pond 2-3

Inflow Area = 2.259 ac, Inflow Depth = 7.19" for 100-Year event
Inflow = 14.34 cfs @ 12.18 hrs, Volume= 1.353 af
Outflow = 2.26 cfs @ 12.85 hrs, Volume= 1.063 af, Atten= 84%, Lag= 40.5 min
Primary = 2.26 cfs @ 12.85 hrs, Volume= 1.063 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 545.17' @ 12.85 hrs Surf.Area= 10,412 sf Storage= 32,959 cf

Plug-Flow detention time= 325.2 min calculated for 1.063 af (79% of inflow)
Center-of-Mass det. time= 239.4 min (1,015.4 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	41,648 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	10,412	0	0
546.00	10,412	41,648	41,648

Device	Routing	Invert	Outlet Devices
#1	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.26 cfs @ 12.85 hrs HW=545.17' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.24 cfs @ 6.31 fps)

└ **2=Orifice/Grate** (Orifice Controls 1.02 cfs @ 5.20 fps)

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

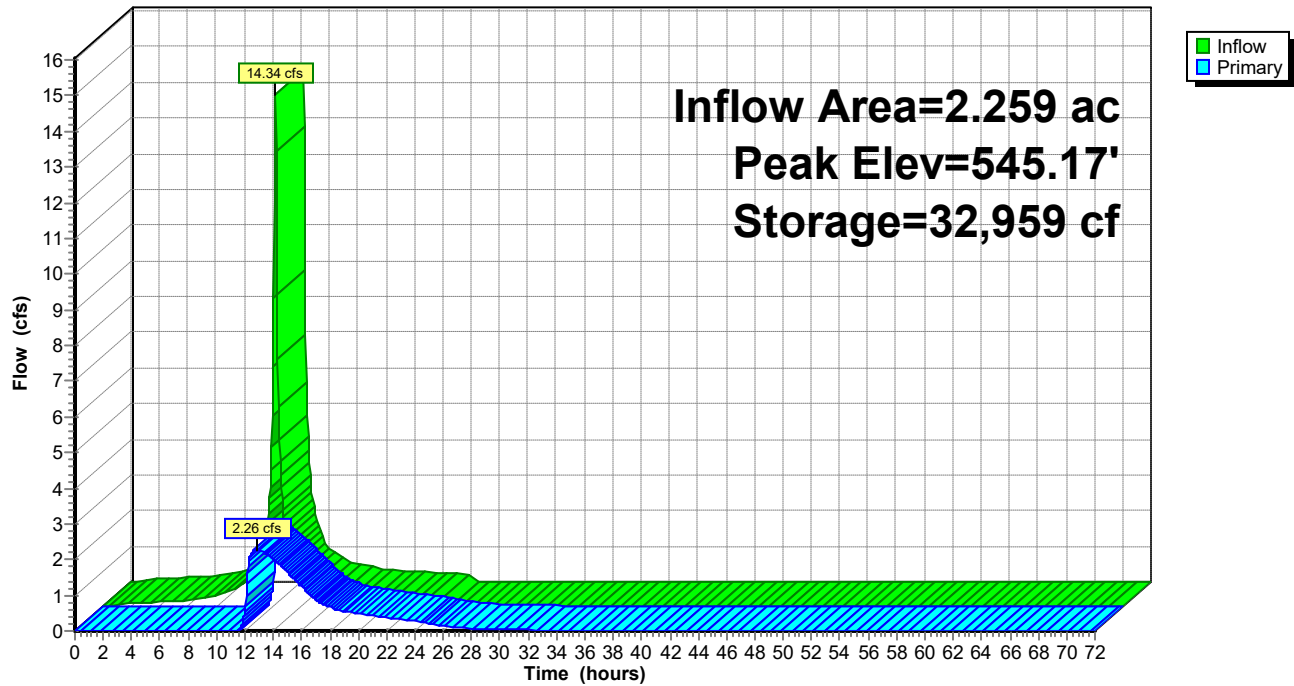
Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Pond 44P: pond 2-3

Hydrograph



Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Hydrograph for Pond 44P: pond 2-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.09	399	542.04	0.00
5.00	0.14	1,469	542.14	0.00
7.50	0.28	3,239	542.31	0.00
10.00	0.65	6,926	542.67	0.00
12.50	4.07	32,036	545.08	2.19
15.00	0.65	26,114	544.51	1.65
17.50	0.39	20,153	543.94	0.76
20.00	0.29	17,810	543.71	0.48
22.50	0.24	16,519	543.59	0.34
25.00	0.00	15,311	543.47	0.19
27.50	0.00	14,201	543.36	0.08
30.00	0.00	13,697	543.32	0.04
32.50	0.00	13,413	543.29	0.02
35.00	0.00	13,236	543.27	0.02
37.50	0.00	13,110	543.26	0.01
40.00	0.00	13,018	543.25	0.01
42.50	0.00	12,950	543.24	0.01
45.00	0.00	12,901	543.24	0.00
47.50	0.00	12,859	543.24	0.00
50.00	0.00	12,822	543.23	0.00
52.50	0.00	12,788	543.23	0.00
55.00	0.00	12,758	543.23	0.00
57.50	0.00	12,731	543.22	0.00
60.00	0.00	12,707	543.22	0.00
62.50	0.00	12,685	543.22	0.00
65.00	0.00	12,665	543.22	0.00
67.50	0.00	12,648	543.21	0.00
70.00	0.00	12,632	543.21	0.00

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Stage-Discharge for Pond 44P: pond 2-3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.00	544.04	0.94	545.06	2.17
542.02	0.00	543.04	0.00	544.06	0.98	545.08	2.19
542.04	0.00	543.06	0.00	544.08	1.02	545.10	2.21
542.06	0.00	543.08	0.00	544.10	1.06	545.12	2.22
542.08	0.00	543.10	0.00	544.12	1.10	545.14	2.24
542.10	0.00	543.12	0.00	544.14	1.13	545.16	2.25
542.12	0.00	543.14	0.00	544.16	1.17	545.18	2.27
542.14	0.00	543.16	0.00	544.18	1.21	545.20	2.29
542.16	0.00	543.18	0.00	544.20	1.24	545.22	2.30
542.18	0.00	543.20	0.00	544.22	1.28	545.24	2.32
542.20	0.00	543.22	0.00	544.24	1.31	545.26	2.33
542.22	0.00	543.24	0.01	544.26	1.33	545.28	2.35
542.24	0.00	543.26	0.01	544.28	1.36	545.30	2.36
542.26	0.00	543.28	0.02	544.30	1.39	545.32	2.38
542.28	0.00	543.30	0.03	544.32	1.42	545.34	2.39
542.30	0.00	543.32	0.04	544.34	1.44	545.36	2.41
542.32	0.00	543.34	0.06	544.36	1.47	545.38	2.42
542.34	0.00	543.36	0.07	544.38	1.49	545.40	2.44
542.36	0.00	543.38	0.09	544.40	1.52	545.42	2.45
542.38	0.00	543.40	0.11	544.42	1.54	545.44	2.47
542.40	0.00	543.42	0.13	544.44	1.57	545.46	2.48
542.42	0.00	543.44	0.16	544.46	1.59	545.48	2.50
542.44	0.00	543.46	0.18	544.48	1.61	545.50	2.51
542.46	0.00	543.48	0.20	544.50	1.64	545.52	2.53
542.48	0.00	543.50	0.23	544.52	1.66	545.54	2.54
542.50	0.00	543.52	0.26	544.54	1.68	545.56	2.55
542.52	0.00	543.54	0.28	544.56	1.70	545.58	2.57
542.54	0.00	543.56	0.31	544.58	1.73	545.60	2.58
542.56	0.00	543.58	0.34	544.60	1.75	545.62	2.60
542.58	0.00	543.60	0.36	544.62	1.77	545.64	2.61
542.60	0.00	543.62	0.39	544.64	1.79	545.66	2.62
542.62	0.00	543.64	0.41	544.66	1.81	545.68	2.64
542.64	0.00	543.66	0.44	544.68	1.83	545.70	2.65
542.66	0.00	543.68	0.46	544.70	1.85	545.72	2.66
542.68	0.00	543.70	0.47	544.72	1.87	545.74	2.68
542.70	0.00	543.72	0.49	544.74	1.89	545.76	2.69
542.72	0.00	543.74	0.51	544.76	1.91	545.78	2.70
542.74	0.00	543.76	0.53	544.78	1.93	545.80	2.72
542.76	0.00	543.78	0.55	544.80	1.94	545.82	2.73
542.78	0.00	543.80	0.57	544.82	1.96	545.84	2.74
542.80	0.00	543.82	0.59	544.84	1.98	545.86	2.76
542.82	0.00	543.84	0.61	544.86	2.00	545.88	2.77
542.84	0.00	543.86	0.64	544.88	2.02	545.90	2.78
542.86	0.00	543.88	0.67	544.90	2.04	545.92	2.80
542.88	0.00	543.90	0.70	544.92	2.05	545.94	2.81
542.90	0.00	543.92	0.73	544.94	2.07	545.96	2.82
542.92	0.00	543.94	0.76	544.96	2.09	545.98	2.83
542.94	0.00	543.96	0.80	544.98	2.11	546.00	2.85
542.96	0.00	543.98	0.83	545.00	2.12		
542.98	0.00	544.00	0.87	545.02	2.14		
543.00	0.00	544.02	0.91	545.04	2.16		

Proposed Basin 2-3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

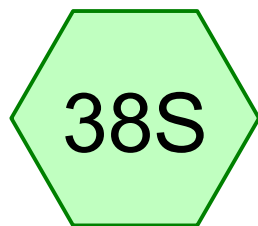
Page 40

Stage-Area-Storage for Pond 44P: pond 2-3

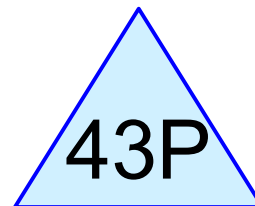
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	10,412	0	544.55	10,412	26,551
542.05	10,412	521	544.60	10,412	27,071
542.10	10,412	1,041	544.65	10,412	27,592
542.15	10,412	1,562	544.70	10,412	28,112
542.20	10,412	2,082	544.75	10,412	28,633
542.25	10,412	2,603	544.80	10,412	29,154
542.30	10,412	3,124	544.85	10,412	29,674
542.35	10,412	3,644	544.90	10,412	30,195
542.40	10,412	4,165	544.95	10,412	30,715
542.45	10,412	4,685	545.00	10,412	31,236
542.50	10,412	5,206	545.05	10,412	31,757
542.55	10,412	5,727	545.10	10,412	32,277
542.60	10,412	6,247	545.15	10,412	32,798
542.65	10,412	6,768	545.20	10,412	33,318
542.70	10,412	7,288	545.25	10,412	33,839
542.75	10,412	7,809	545.30	10,412	34,360
542.80	10,412	8,330	545.35	10,412	34,880
542.85	10,412	8,850	545.40	10,412	35,401
542.90	10,412	9,371	545.45	10,412	35,921
542.95	10,412	9,891	545.50	10,412	36,442
543.00	10,412	10,412	545.55	10,412	36,963
543.05	10,412	10,933	545.60	10,412	37,483
543.10	10,412	11,453	545.65	10,412	38,004
543.15	10,412	11,974	545.70	10,412	38,524
543.20	10,412	12,494	545.75	10,412	39,045
543.25	10,412	13,015	545.80	10,412	39,566
543.30	10,412	13,536	545.85	10,412	40,086
543.35	10,412	14,056	545.90	10,412	40,607
543.40	10,412	14,577	545.95	10,412	41,127
543.45	10,412	15,097	546.00	10,412	41,648
543.50	10,412	15,618			
543.55	10,412	16,139			
543.60	10,412	16,659			
543.65	10,412	17,180			
543.70	10,412	17,700			
543.75	10,412	18,221			
543.80	10,412	18,742			
543.85	10,412	19,262			
543.90	10,412	19,783			
543.95	10,412	20,303			
544.00	10,412	20,824			
544.05	10,412	21,345			
544.10	10,412	21,865			
544.15	10,412	22,386			
544.20	10,412	22,906			
544.25	10,412	23,427			
544.30	10,412	23,948			
544.35	10,412	24,468			
544.40	10,412	24,989			
544.45	10,412	25,509			
544.50	10,412	26,030			



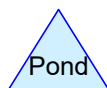
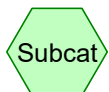
Basin 2-4
pe-development



Basin 2-4



pond 2-4



Routing Diagram for Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.343	74	>75% Grass cover, Good, HSG C (38S)
0.607	98	Roofs, HSG C (38S)
0.255	98	Water Surface, 0% imp, HSG C (38S)
2.205	70	Woods, Good, HSG C (45S)
4.409	77	TOTAL AREA

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.409	HSG C	38S, 45S
0.000	HSG D	
0.000	Other	
4.409		TOTAL AREA

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.343	0.000	0.000	1.343	>75% Grass cover, Good	38S
0.000	0.000	0.607	0.000	0.000	0.607	Roofs	38S
0.000	0.000	0.255	0.000	0.000	0.255	Water Surface, 0% imp	38S
0.000	0.000	2.205	0.000	0.000	2.205	Woods, Good	45S
0.000	0.000	4.409	0.000	0.000	4.409	TOTAL AREA	

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	38S	0.00	0.00	1,692.0	0.0390	0.010	0.0	15.0	10.0	

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-4

Runoff Area=96,037 sf Runoff Depth=1.93"

Flow Length=1,912' Tc=10.1 min CN=78/98 Runoff=3.93 cfs 0.354 af

Subcatchment 45S: Basin 2-4 pe-development

Runoff Area=96,036 sf Runoff Depth=0.97"

Flow Length=390' Tc=18.0 min CN=70/0 Runoff=1.56 cfs 0.178 af

Pond 43P: pond 2-4

Peak Elev=543.10' Storage=12,214 cf Inflow=3.93 cfs 0.354 af

Outflow=0.11 cfs 0.121 af

Total Runoff Area = 4.409 ac Runoff Volume = 0.532 af Average Runoff Depth = 1.45"

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 38S: Basin 2-4

[47] Hint: Peak is 144% of capacity of segment #3

Runoff = 3.93 cfs @ 12.18 hrs, Volume= 0.354 af, Depth= 1.93"
Routed to Pond 43P : pond 2-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
26,461	98	Roofs, HSG C
11,090	98	Water Surface, 0% imp, HSG C
58,486	74	>75% Grass cover, Good, HSG C
96,037	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0800	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.9	120	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	1,692	0.0390	7.60	2.72	Pipe Channel, pipe to basin 15.0" Round w/ 10.0" inside fill Area= 0.4 sf Perim= 2.7' r= 0.13' n= 0.010
10.1	1,912	Total			

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

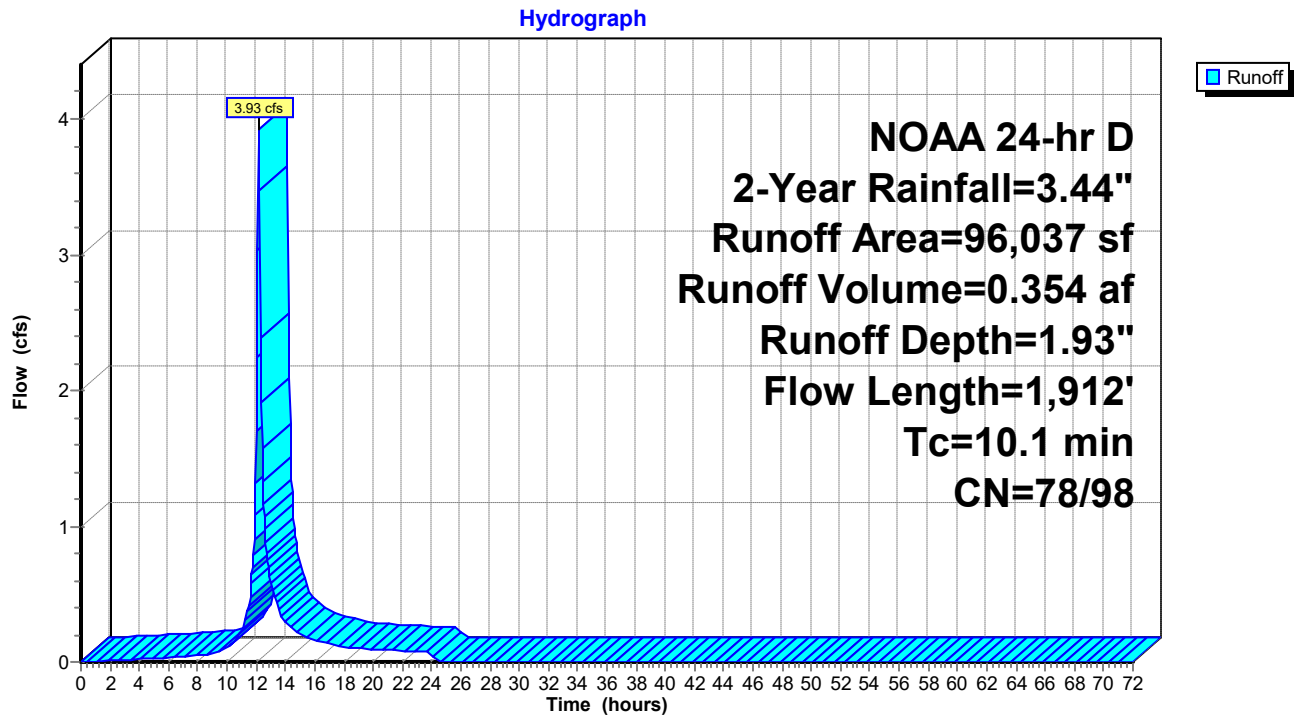
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Subcatchment 38S: Basin 2-4



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Hydrograph for Subcatchment 38S: Basin 2-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.02	0.01
5.00	0.24	0.00	0.09	0.02
7.50	0.40	0.00	0.23	0.04
10.00	0.68	0.00	0.49	0.10
12.50	2.35	0.68	2.12	1.17
15.00	2.89	1.04	2.66	0.20
17.50	3.11	1.20	2.88	0.13
20.00	3.26	1.31	3.03	0.10
22.50	3.38	1.39	3.15	0.08
25.00	3.44	1.44	3.21	0.00
27.50	3.44	1.44	3.21	0.00
30.00	3.44	1.44	3.21	0.00
32.50	3.44	1.44	3.21	0.00
35.00	3.44	1.44	3.21	0.00
37.50	3.44	1.44	3.21	0.00
40.00	3.44	1.44	3.21	0.00
42.50	3.44	1.44	3.21	0.00
45.00	3.44	1.44	3.21	0.00
47.50	3.44	1.44	3.21	0.00
50.00	3.44	1.44	3.21	0.00
52.50	3.44	1.44	3.21	0.00
55.00	3.44	1.44	3.21	0.00
57.50	3.44	1.44	3.21	0.00
60.00	3.44	1.44	3.21	0.00
62.50	3.44	1.44	3.21	0.00
65.00	3.44	1.44	3.21	0.00
67.50	3.44	1.44	3.21	0.00
70.00	3.44	1.44	3.21	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Summary for Subcatchment 45S: Basin 2-4 pe-development

Runoff = 1.56 cfs @ 12.29 hrs, Volume= 0.178 af, Depth= 0.97"

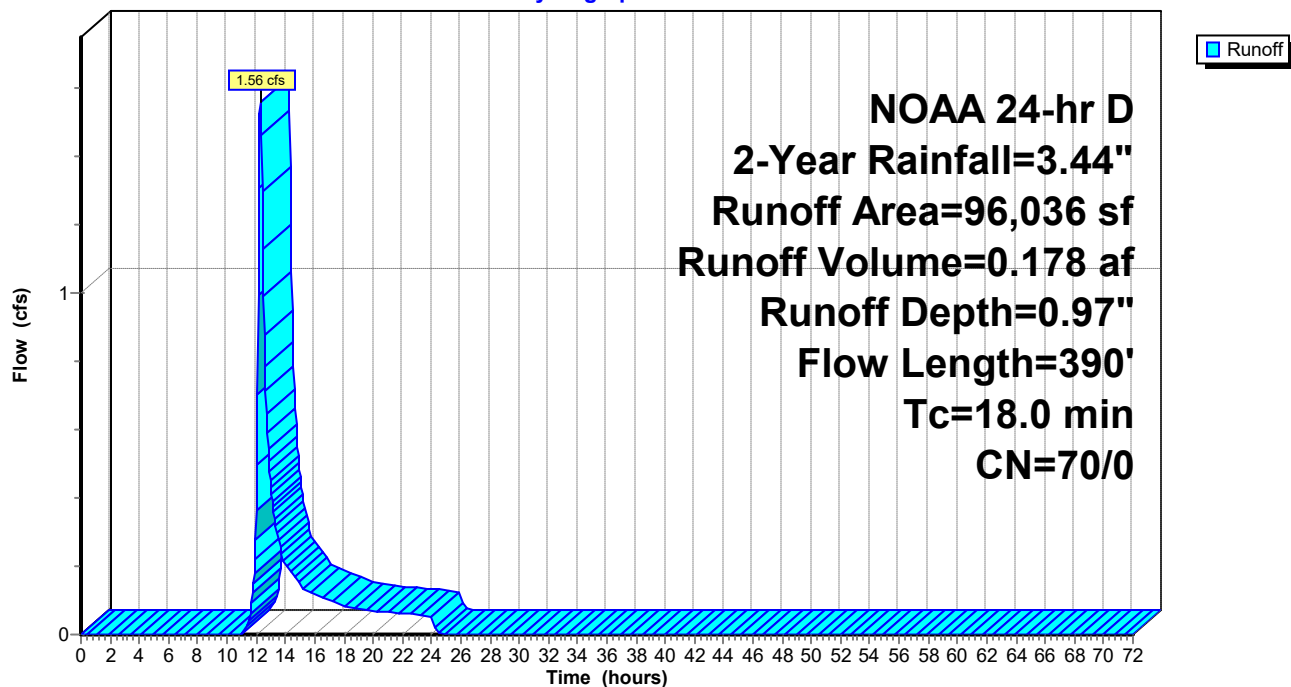
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
96,036	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.6	290	0.0720	1.34		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
18.0	390	Total			

Subcatchment 45S: Basin 2-4 pe-development

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Hydrograph for Subcatchment 45S: Basin 2-4 pe-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	0.99
15.00	2.89	0.66	0.00	0.15
17.50	3.11	0.78	0.00	0.09
20.00	3.26	0.86	0.00	0.07
22.50	3.38	0.93	0.00	0.06
25.00	3.44	0.97	0.00	0.00
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Summary for Pond 43P: pond 2-4

Inflow Area = 2.205 ac, Inflow Depth = 1.93" for 2-Year event
Inflow = 3.93 cfs @ 12.18 hrs, Volume= 0.354 af
Outflow = 0.11 cfs @ 17.96 hrs, Volume= 0.121 af, Atten= 97%, Lag= 347.0 min
Primary = 0.11 cfs @ 17.96 hrs, Volume= 0.121 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.10' @ 17.96 hrs Surf.Area= 11,090 sf Storage= 12,214 cf

Plug-Flow detention time= 777.8 min calculated for 0.121 af (34% of inflow)
Center-of-Mass det. time= 613.5 min (1,428.5 - 815.0)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	44,360 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	11,090	0	0
546.00	11,090	44,360	44,360

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.40'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 17.96 hrs HW=543.10' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.11 cfs @ 1.53 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

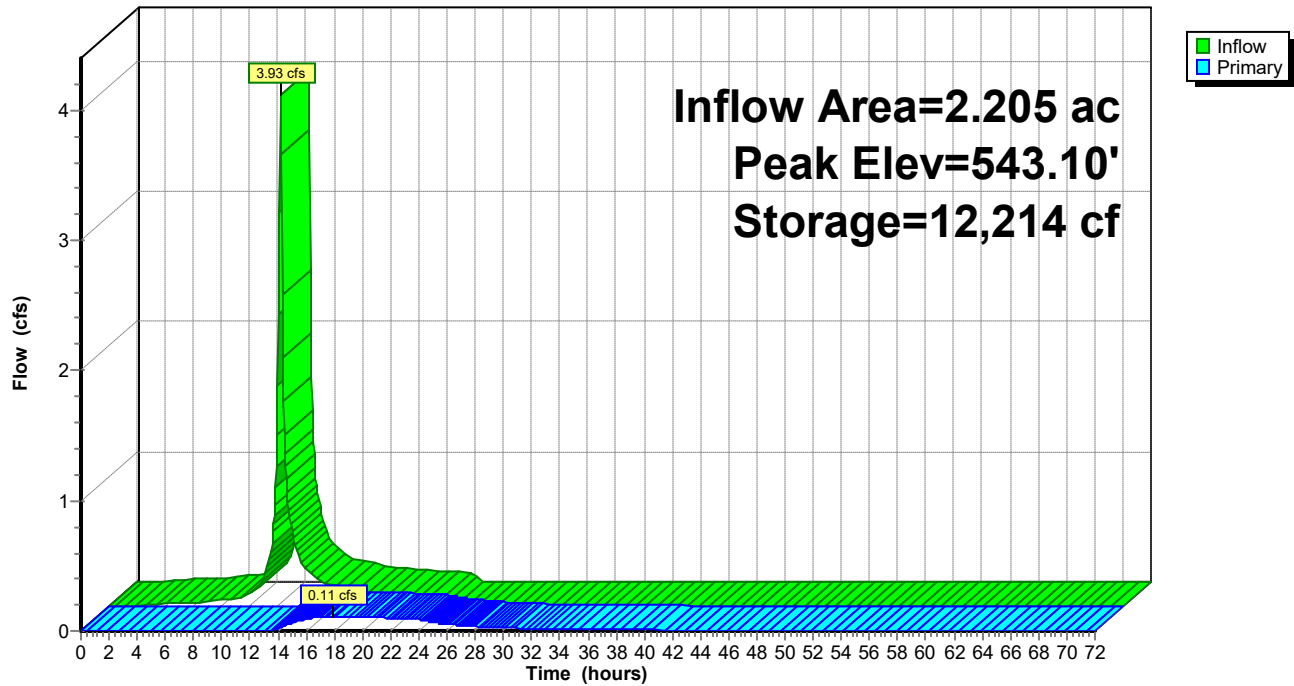
Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Pond 43P: pond 2-4

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Hydrograph for Pond 43P: pond 2-4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.01	28	542.00	0.00
5.00	0.02	195	542.02	0.00
7.50	0.04	485	542.04	0.00
10.00	0.10	1,037	542.09	0.00
12.50	1.17	8,043	542.73	0.00
15.00	0.20	11,634	543.05	0.07
17.50	0.13	12,203	543.10	0.11
20.00	0.10	12,149	543.10	0.11
22.50	0.08	12,019	543.08	0.10
25.00	0.00	11,679	543.05	0.07
27.50	0.00	11,219	543.01	0.04
30.00	0.00	10,950	542.99	0.02
32.50	0.00	10,770	542.97	0.02
35.00	0.00	10,647	542.96	0.01
37.50	0.00	10,556	542.95	0.01
40.00	0.00	10,482	542.95	0.01
42.50	0.00	10,421	542.94	0.01
45.00	0.00	10,371	542.94	0.01
47.50	0.00	10,330	542.93	0.00
50.00	0.00	10,297	542.93	0.00
52.50	0.00	10,269	542.93	0.00
55.00	0.00	10,247	542.92	0.00
57.50	0.00	10,229	542.92	0.00
60.00	0.00	10,214	542.92	0.00
62.50	0.00	10,201	542.92	0.00
65.00	0.00	10,190	542.92	0.00
67.50	0.00	10,180	542.92	0.00
70.00	0.00	10,170	542.92	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Stage-Discharge for Pond 43P: pond 2-4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.04	544.04	1.48	545.06	2.43
542.02	0.00	543.04	0.06	544.06	1.51	545.08	2.44
542.04	0.00	543.06	0.07	544.08	1.53	545.10	2.46
542.06	0.00	543.08	0.09	544.10	1.56	545.12	2.47
542.08	0.00	543.10	0.11	544.12	1.58	545.14	2.49
542.10	0.00	543.12	0.13	544.14	1.60	545.16	2.50
542.12	0.00	543.14	0.16	544.16	1.63	545.18	2.52
542.14	0.00	543.16	0.18	544.18	1.65	545.20	2.53
542.16	0.00	543.18	0.20	544.20	1.67	545.22	2.54
542.18	0.00	543.20	0.23	544.22	1.69	545.24	2.56
542.20	0.00	543.22	0.26	544.24	1.71	545.26	2.57
542.22	0.00	543.24	0.28	544.26	1.73	545.28	2.59
542.24	0.00	543.26	0.31	544.28	1.76	545.30	2.60
542.26	0.00	543.28	0.34	544.30	1.78	545.32	2.61
542.28	0.00	543.30	0.36	544.32	1.80	545.34	2.63
542.30	0.00	543.32	0.39	544.34	1.82	545.36	2.64
542.32	0.00	543.34	0.41	544.36	1.84	545.38	2.66
542.34	0.00	543.36	0.44	544.38	1.86	545.40	2.67
542.36	0.00	543.38	0.46	544.40	1.88	545.42	2.68
542.38	0.00	543.40	0.47	544.42	1.90	545.44	2.70
542.40	0.00	543.42	0.49	544.44	1.91	545.46	2.71
542.42	0.00	543.44	0.51	544.46	1.93	545.48	2.72
542.44	0.00	543.46	0.54	544.48	1.95	545.50	2.74
542.46	0.00	543.48	0.56	544.50	1.97	545.52	2.75
542.48	0.00	543.50	0.59	544.52	1.99	545.54	2.76
542.50	0.00	543.52	0.62	544.54	2.01	545.56	2.77
542.52	0.00	543.54	0.65	544.56	2.02	545.58	2.79
542.54	0.00	543.56	0.68	544.58	2.04	545.60	2.80
542.56	0.00	543.58	0.71	544.60	2.06	545.62	2.81
542.58	0.00	543.60	0.75	544.62	2.08	545.64	2.83
542.60	0.00	543.62	0.78	544.64	2.09	545.66	2.84
542.62	0.00	543.64	0.82	544.66	2.11	545.68	2.85
542.64	0.00	543.66	0.85	544.68	2.13	545.70	2.86
542.66	0.00	543.68	0.89	544.70	2.15	545.72	2.88
542.68	0.00	543.70	0.93	544.72	2.16	545.74	2.89
542.70	0.00	543.72	0.97	544.74	2.18	545.76	2.90
542.72	0.00	543.74	1.01	544.76	2.20	545.78	2.91
542.74	0.00	543.76	1.05	544.78	2.21	545.80	2.93
542.76	0.00	543.78	1.09	544.80	2.23	545.82	2.94
542.78	0.00	543.80	1.12	544.82	2.24	545.84	2.95
542.80	0.00	543.82	1.16	544.84	2.26	545.86	2.96
542.82	0.00	543.84	1.20	544.86	2.28	545.88	2.97
542.84	0.00	543.86	1.23	544.88	2.29	545.90	2.99
542.86	0.00	543.88	1.26	544.90	2.31	545.92	3.00
542.88	0.00	543.90	1.29	544.92	2.32	545.94	3.01
542.90	0.00	543.92	1.32	544.94	2.34	545.96	3.02
542.92	0.00	543.94	1.35	544.96	2.35	545.98	3.03
542.94	0.01	543.96	1.38	544.98	2.37	546.00	3.05
542.96	0.01	543.98	1.40	545.00	2.38		
542.98	0.02	544.00	1.43	545.02	2.40		
543.00	0.03	544.02	1.46	545.04	2.41		

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Stage-Area-Storage for Pond 43P: pond 2-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	11,090	0	544.55	11,090	28,279
542.05	11,090	554	544.60	11,090	28,834
542.10	11,090	1,109	544.65	11,090	29,388
542.15	11,090	1,663	544.70	11,090	29,943
542.20	11,090	2,218	544.75	11,090	30,498
542.25	11,090	2,773	544.80	11,090	31,052
542.30	11,090	3,327	544.85	11,090	31,607
542.35	11,090	3,882	544.90	11,090	32,161
542.40	11,090	4,436	544.95	11,090	32,716
542.45	11,090	4,991	545.00	11,090	33,270
542.50	11,090	5,545	545.05	11,090	33,824
542.55	11,090	6,099	545.10	11,090	34,379
542.60	11,090	6,654	545.15	11,090	34,933
542.65	11,090	7,208	545.20	11,090	35,488
542.70	11,090	7,763	545.25	11,090	36,043
542.75	11,090	8,318	545.30	11,090	36,597
542.80	11,090	8,872	545.35	11,090	37,152
542.85	11,090	9,427	545.40	11,090	37,706
542.90	11,090	9,981	545.45	11,090	38,261
542.95	11,090	10,536	545.50	11,090	38,815
543.00	11,090	11,090	545.55	11,090	39,369
543.05	11,090	11,644	545.60	11,090	39,924
543.10	11,090	12,199	545.65	11,090	40,478
543.15	11,090	12,753	545.70	11,090	41,033
543.20	11,090	13,308	545.75	11,090	41,588
543.25	11,090	13,863	545.80	11,090	42,142
543.30	11,090	14,417	545.85	11,090	42,697
543.35	11,090	14,972	545.90	11,090	43,251
543.40	11,090	15,526	545.95	11,090	43,806
543.45	11,090	16,081	546.00	11,090	44,360
543.50	11,090	16,635			
543.55	11,090	17,189			
543.60	11,090	17,744			
543.65	11,090	18,298			
543.70	11,090	18,853			
543.75	11,090	19,408			
543.80	11,090	19,962			
543.85	11,090	20,517			
543.90	11,090	21,071			
543.95	11,090	21,626			
544.00	11,090	22,180			
544.05	11,090	22,734			
544.10	11,090	23,289			
544.15	11,090	23,843			
544.20	11,090	24,398			
544.25	11,090	24,953			
544.30	11,090	25,507			
544.35	11,090	26,062			
544.40	11,090	26,616			
544.45	11,090	27,171			
544.50	11,090	27,725			

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 19

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-4

Runoff Area=96,037 sf Runoff Depth=3.46"

Flow Length=1,912' Tc=10.1 min CN=78/98 Runoff=7.12 cfs 0.636 af

Subcatchment 45S: Basin 2-4 pe-development

Runoff Area=96,036 sf Runoff Depth=2.20"

Flow Length=390' Tc=18.0 min CN=70/0 Runoff=3.80 cfs 0.404 af

Pond 43P: pond 2-4

Peak Elev=543.52' Storage=16,883 cf Inflow=7.12 cfs 0.636 af

Outflow=0.62 cfs 0.403 af

Total Runoff Area = 4.409 ac Runoff Volume = 1.040 af Average Runoff Depth = 2.83"

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Summary for Subcatchment 38S: Basin 2-4

[47] Hint: Peak is 262% of capacity of segment #3

Runoff = 7.12 cfs @ 12.17 hrs, Volume= 0.636 af, Depth= 3.46"
Routed to Pond 43P : pond 2-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
26,461	98	Roofs, HSG C
11,090	98	Water Surface, 0% imp, HSG C
58,486	74	>75% Grass cover, Good, HSG C
96,037	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0800	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.9	120	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	1,692	0.0390	7.60	2.72	Pipe Channel, pipe to basin 15.0" Round w/ 10.0" inside fill Area= 0.4 sf Perim= 2.7' r= 0.13' n= 0.010
10.1	1,912	Total			

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

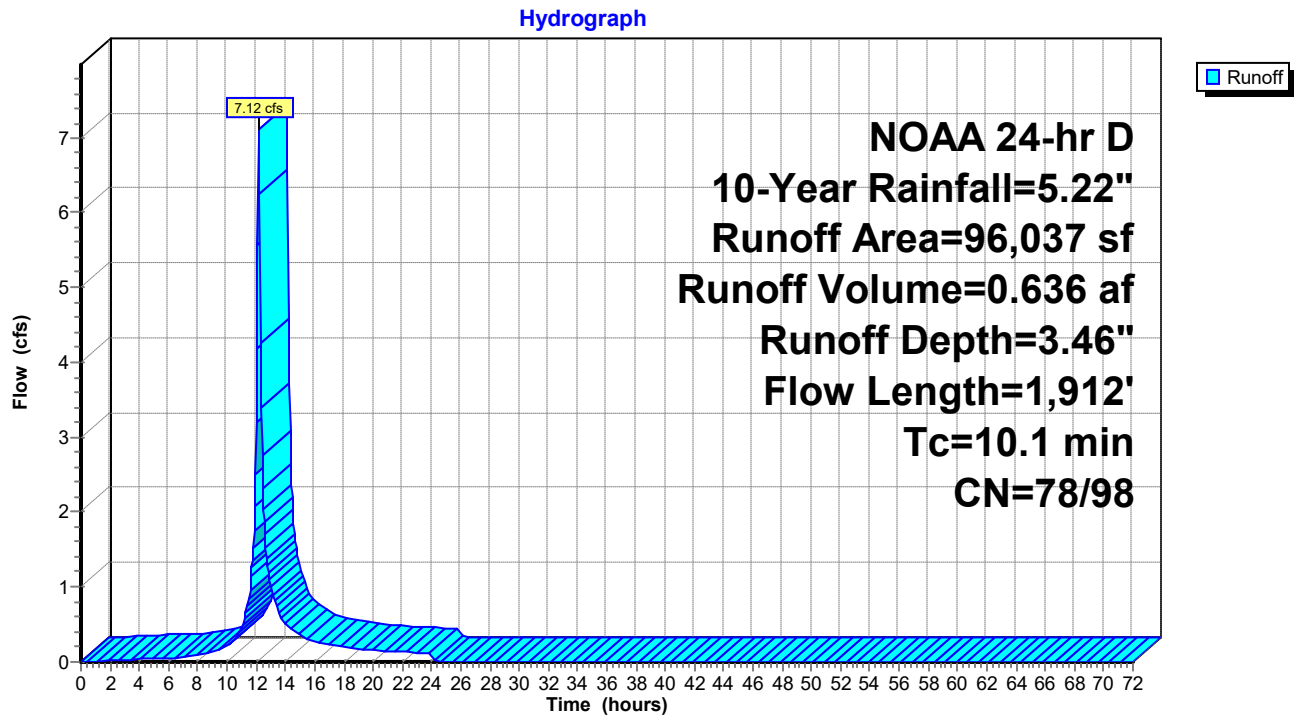
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Subcatchment 38S: Basin 2-4



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 38S: Basin 2-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.04	0.02
5.00	0.36	0.00	0.19	0.04
7.50	0.61	0.00	0.42	0.07
10.00	1.03	0.07	0.82	0.23
12.50	3.57	1.54	3.33	2.04
15.00	4.39	2.19	4.16	0.34
17.50	4.73	2.47	4.49	0.21
20.00	4.95	2.65	4.71	0.16
22.50	5.13	2.81	4.89	0.13
25.00	5.22	2.88	4.98	0.00
27.50	5.22	2.88	4.98	0.00
30.00	5.22	2.88	4.98	0.00
32.50	5.22	2.88	4.98	0.00
35.00	5.22	2.88	4.98	0.00
37.50	5.22	2.88	4.98	0.00
40.00	5.22	2.88	4.98	0.00
42.50	5.22	2.88	4.98	0.00
45.00	5.22	2.88	4.98	0.00
47.50	5.22	2.88	4.98	0.00
50.00	5.22	2.88	4.98	0.00
52.50	5.22	2.88	4.98	0.00
55.00	5.22	2.88	4.98	0.00
57.50	5.22	2.88	4.98	0.00
60.00	5.22	2.88	4.98	0.00
62.50	5.22	2.88	4.98	0.00
65.00	5.22	2.88	4.98	0.00
67.50	5.22	2.88	4.98	0.00
70.00	5.22	2.88	4.98	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Subcatchment 45S: Basin 2-4 pe-development

Runoff = 3.80 cfs @ 12.27 hrs, Volume= 0.404 af, Depth= 2.20"

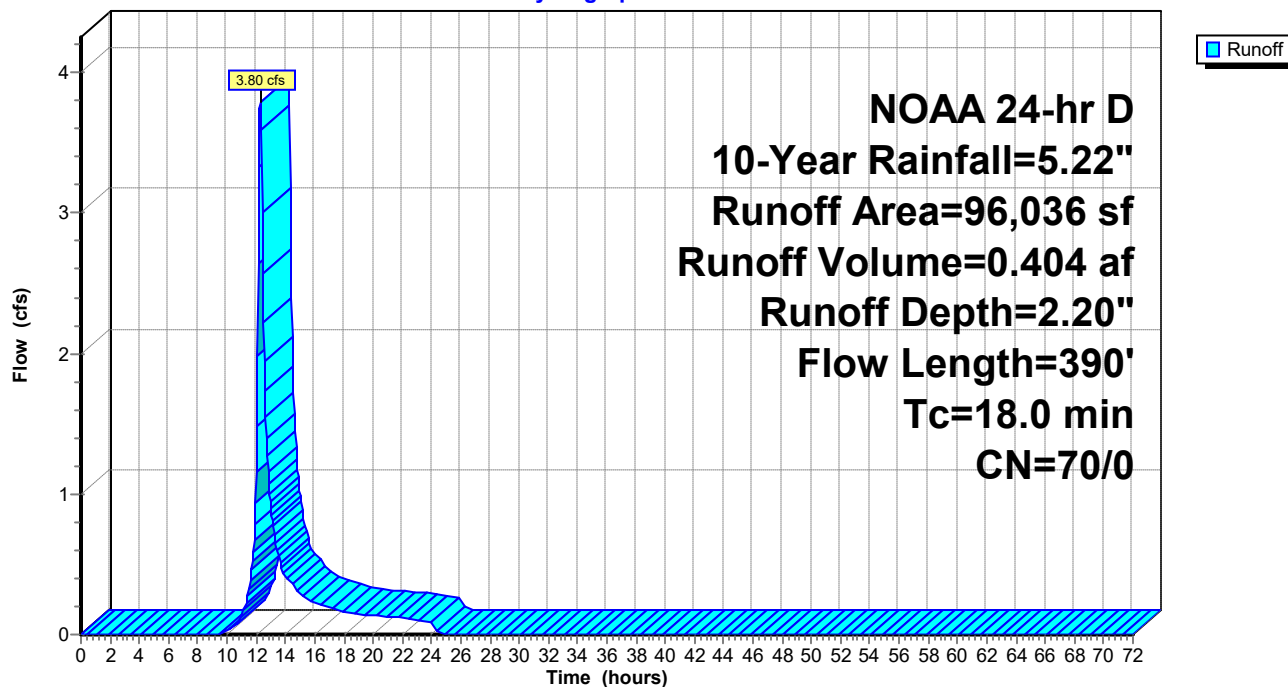
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
96,036	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.6	290	0.0720	1.34		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
18.0	390	Total			

Subcatchment 45S: Basin 2-4 pe-development

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Hydrograph for Subcatchment 45S: Basin 2-4 pe-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.03
12.50	3.57	1.05	0.00	2.22
15.00	4.39	1.60	0.00	0.29
17.50	4.73	1.83	0.00	0.18
20.00	4.95	2.00	0.00	0.13
22.50	5.13	2.13	0.00	0.11
25.00	5.22	2.20	0.00	0.00
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Summary for Pond 43P: pond 2-4

Inflow Area = 2.205 ac, Inflow Depth = 3.46" for 10-Year event
Inflow = 7.12 cfs @ 12.17 hrs, Volume= 0.636 af
Outflow = 0.62 cfs @ 13.56 hrs, Volume= 0.403 af, Atten= 91%, Lag= 83.3 min
Primary = 0.62 cfs @ 13.56 hrs, Volume= 0.403 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.52' @ 13.56 hrs Surf.Area= 11,090 sf Storage= 16,883 cf

Plug-Flow detention time= 442.1 min calculated for 0.402 af (63% of inflow)
Center-of-Mass det. time= 327.7 min (1,132.3 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	44,360 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	11,090	0	0
546.00	11,090	44,360	44,360

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.40'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.62 cfs @ 13.56 hrs HW=543.52' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.58 cfs @ 2.94 fps)

2=Orifice/Grate (Orifice Controls 0.04 cfs @ 1.19 fps)

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

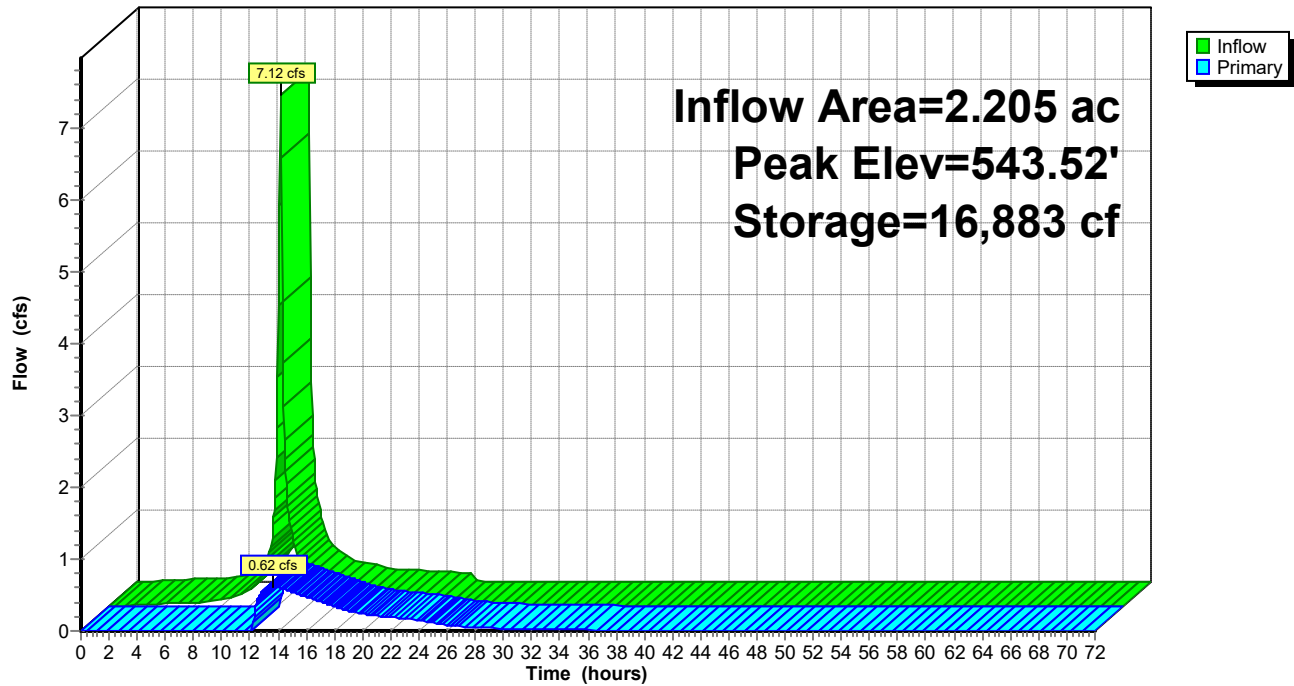
Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Pond 43P: pond 2-4

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Hydrograph for Pond 43P: pond 2-4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.02	83	542.01	0.00
5.00	0.04	399	542.04	0.00
7.50	0.07	887	542.08	0.00
10.00	0.23	2,063	542.19	0.00
12.50	2.04	14,919	543.35	0.42
15.00	0.34	16,208	543.46	0.54
17.50	0.21	14,512	543.31	0.37
20.00	0.16	13,407	543.21	0.24
22.50	0.13	12,859	543.16	0.18
25.00	0.00	12,208	543.10	0.11
27.50	0.00	11,495	543.04	0.05
30.00	0.00	11,115	543.00	0.03
32.50	0.00	10,882	542.98	0.02
35.00	0.00	10,724	542.97	0.01
37.50	0.00	10,615	542.96	0.01
40.00	0.00	10,530	542.95	0.01
42.50	0.00	10,460	542.94	0.01
45.00	0.00	10,403	542.94	0.01
47.50	0.00	10,356	542.93	0.00
50.00	0.00	10,318	542.93	0.00
52.50	0.00	10,287	542.93	0.00
55.00	0.00	10,261	542.93	0.00
57.50	0.00	10,240	542.92	0.00
60.00	0.00	10,223	542.92	0.00
62.50	0.00	10,209	542.92	0.00
65.00	0.00	10,197	542.92	0.00
67.50	0.00	10,187	542.92	0.00
70.00	0.00	10,176	542.92	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Stage-Discharge for Pond 43P: pond 2-4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.04	544.04	1.48	545.06	2.43
542.02	0.00	543.04	0.06	544.06	1.51	545.08	2.44
542.04	0.00	543.06	0.07	544.08	1.53	545.10	2.46
542.06	0.00	543.08	0.09	544.10	1.56	545.12	2.47
542.08	0.00	543.10	0.11	544.12	1.58	545.14	2.49
542.10	0.00	543.12	0.13	544.14	1.60	545.16	2.50
542.12	0.00	543.14	0.16	544.16	1.63	545.18	2.52
542.14	0.00	543.16	0.18	544.18	1.65	545.20	2.53
542.16	0.00	543.18	0.20	544.20	1.67	545.22	2.54
542.18	0.00	543.20	0.23	544.22	1.69	545.24	2.56
542.20	0.00	543.22	0.26	544.24	1.71	545.26	2.57
542.22	0.00	543.24	0.28	544.26	1.73	545.28	2.59
542.24	0.00	543.26	0.31	544.28	1.76	545.30	2.60
542.26	0.00	543.28	0.34	544.30	1.78	545.32	2.61
542.28	0.00	543.30	0.36	544.32	1.80	545.34	2.63
542.30	0.00	543.32	0.39	544.34	1.82	545.36	2.64
542.32	0.00	543.34	0.41	544.36	1.84	545.38	2.66
542.34	0.00	543.36	0.44	544.38	1.86	545.40	2.67
542.36	0.00	543.38	0.46	544.40	1.88	545.42	2.68
542.38	0.00	543.40	0.47	544.42	1.90	545.44	2.70
542.40	0.00	543.42	0.49	544.44	1.91	545.46	2.71
542.42	0.00	543.44	0.51	544.46	1.93	545.48	2.72
542.44	0.00	543.46	0.54	544.48	1.95	545.50	2.74
542.46	0.00	543.48	0.56	544.50	1.97	545.52	2.75
542.48	0.00	543.50	0.59	544.52	1.99	545.54	2.76
542.50	0.00	543.52	0.62	544.54	2.01	545.56	2.77
542.52	0.00	543.54	0.65	544.56	2.02	545.58	2.79
542.54	0.00	543.56	0.68	544.58	2.04	545.60	2.80
542.56	0.00	543.58	0.71	544.60	2.06	545.62	2.81
542.58	0.00	543.60	0.75	544.62	2.08	545.64	2.83
542.60	0.00	543.62	0.78	544.64	2.09	545.66	2.84
542.62	0.00	543.64	0.82	544.66	2.11	545.68	2.85
542.64	0.00	543.66	0.85	544.68	2.13	545.70	2.86
542.66	0.00	543.68	0.89	544.70	2.15	545.72	2.88
542.68	0.00	543.70	0.93	544.72	2.16	545.74	2.89
542.70	0.00	543.72	0.97	544.74	2.18	545.76	2.90
542.72	0.00	543.74	1.01	544.76	2.20	545.78	2.91
542.74	0.00	543.76	1.05	544.78	2.21	545.80	2.93
542.76	0.00	543.78	1.09	544.80	2.23	545.82	2.94
542.78	0.00	543.80	1.12	544.82	2.24	545.84	2.95
542.80	0.00	543.82	1.16	544.84	2.26	545.86	2.96
542.82	0.00	543.84	1.20	544.86	2.28	545.88	2.97
542.84	0.00	543.86	1.23	544.88	2.29	545.90	2.99
542.86	0.00	543.88	1.26	544.90	2.31	545.92	3.00
542.88	0.00	543.90	1.29	544.92	2.32	545.94	3.01
542.90	0.00	543.92	1.32	544.94	2.34	545.96	3.02
542.92	0.00	543.94	1.35	544.96	2.35	545.98	3.03
542.94	0.01	543.96	1.38	544.98	2.37	546.00	3.05
542.96	0.01	543.98	1.40	545.00	2.38		
542.98	0.02	544.00	1.43	545.02	2.40		
543.00	0.03	544.02	1.46	545.04	2.41		

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Stage-Area-Storage for Pond 43P: pond 2-4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	11,090	0	544.55	11,090	28,279
542.05	11,090	554	544.60	11,090	28,834
542.10	11,090	1,109	544.65	11,090	29,388
542.15	11,090	1,663	544.70	11,090	29,943
542.20	11,090	2,218	544.75	11,090	30,498
542.25	11,090	2,773	544.80	11,090	31,052
542.30	11,090	3,327	544.85	11,090	31,607
542.35	11,090	3,882	544.90	11,090	32,161
542.40	11,090	4,436	544.95	11,090	32,716
542.45	11,090	4,991	545.00	11,090	33,270
542.50	11,090	5,545	545.05	11,090	33,824
542.55	11,090	6,099	545.10	11,090	34,379
542.60	11,090	6,654	545.15	11,090	34,933
542.65	11,090	7,208	545.20	11,090	35,488
542.70	11,090	7,763	545.25	11,090	36,043
542.75	11,090	8,318	545.30	11,090	36,597
542.80	11,090	8,872	545.35	11,090	37,152
542.85	11,090	9,427	545.40	11,090	37,706
542.90	11,090	9,981	545.45	11,090	38,261
542.95	11,090	10,536	545.50	11,090	38,815
543.00	11,090	11,090	545.55	11,090	39,369
543.05	11,090	11,644	545.60	11,090	39,924
543.10	11,090	12,199	545.65	11,090	40,478
543.15	11,090	12,753	545.70	11,090	41,033
543.20	11,090	13,308	545.75	11,090	41,588
543.25	11,090	13,863	545.80	11,090	42,142
543.30	11,090	14,417	545.85	11,090	42,697
543.35	11,090	14,972	545.90	11,090	43,251
543.40	11,090	15,526	545.95	11,090	43,806
543.45	11,090	16,081	546.00	11,090	44,360
543.50	11,090	16,635			
543.55	11,090	17,189			
543.60	11,090	17,744			
543.65	11,090	18,298			
543.70	11,090	18,853			
543.75	11,090	19,408			
543.80	11,090	19,962			
543.85	11,090	20,517			
543.90	11,090	21,071			
543.95	11,090	21,626			
544.00	11,090	22,180			
544.05	11,090	22,734			
544.10	11,090	23,289			
544.15	11,090	23,843			
544.20	11,090	24,398			
544.25	11,090	24,953			
544.30	11,090	25,507			
544.35	11,090	26,062			
544.40	11,090	26,616			
544.45	11,090	27,171			
544.50	11,090	27,725			

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 30

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-4

Runoff Area=96,037 sf Runoff Depth=6.65"

Flow Length=1,912' Tc=10.1 min CN=78/98 Runoff=13.54 cfs 1.223 af

Subcatchment 45S: Basin 2-4 pe-development

Runoff Area=96,036 sf Runoff Depth=5.04"

Flow Length=390' Tc=18.0 min CN=70/0 Runoff=8.80 cfs 0.925 af

Pond 43P: pond 2-4

Peak Elev=544.61' Storage=28,898 cf Inflow=13.54 cfs 1.223 af

Outflow=2.06 cfs 0.989 af

Total Runoff Area = 4.409 ac Runoff Volume = 2.148 af Average Runoff Depth = 5.85"

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 31

Summary for Subcatchment 38S: Basin 2-4

[47] Hint: Peak is 497% of capacity of segment #3

Runoff = 13.54 cfs @ 12.17 hrs, Volume= 1.223 af, Depth= 6.65"
Routed to Pond 43P : pond 2-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
26,461	98	Roofs, HSG C
11,090	98	Water Surface, 0% imp, HSG C
58,486	74	>75% Grass cover, Good, HSG C
96,037	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0800	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.9	120	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	1,692	0.0390	7.60	2.72	Pipe Channel, pipe to basin 15.0" Round w/ 10.0" inside fill Area= 0.4 sf Perim= 2.7' r= 0.13' n= 0.010
10.1	1,912	Total			

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

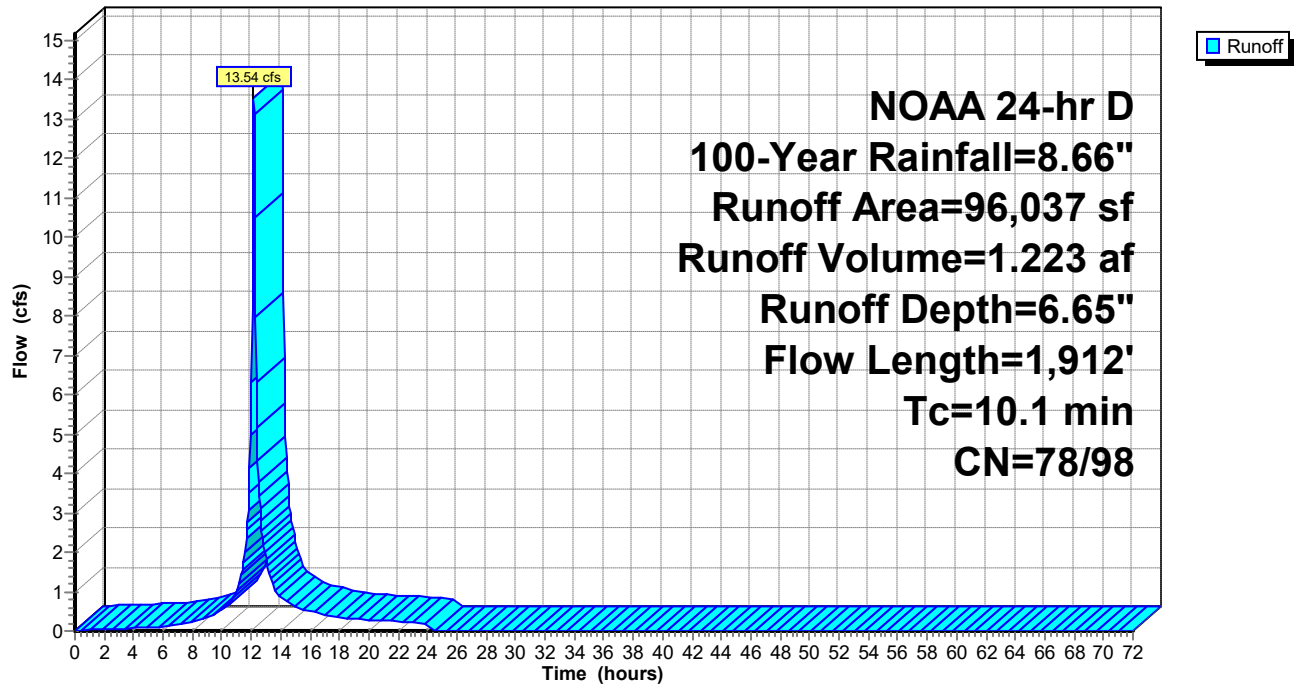
Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 32

Subcatchment 38S: Basin 2-4

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Hydrograph for Subcatchment 38S: Basin 2-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.12	0.05
5.00	0.59	0.00	0.40	0.08
7.50	1.01	0.06	0.80	0.20
10.00	1.72	0.33	1.49	0.53
12.50	5.91	3.49	5.68	3.76
15.00	7.29	4.72	7.05	0.61
17.50	7.84	5.22	7.60	0.37
20.00	8.21	5.56	7.97	0.28
22.50	8.51	5.84	8.27	0.23
25.00	8.66	5.98	8.42	0.00
27.50	8.66	5.98	8.42	0.00
30.00	8.66	5.98	8.42	0.00
32.50	8.66	5.98	8.42	0.00
35.00	8.66	5.98	8.42	0.00
37.50	8.66	5.98	8.42	0.00
40.00	8.66	5.98	8.42	0.00
42.50	8.66	5.98	8.42	0.00
45.00	8.66	5.98	8.42	0.00
47.50	8.66	5.98	8.42	0.00
50.00	8.66	5.98	8.42	0.00
52.50	8.66	5.98	8.42	0.00
55.00	8.66	5.98	8.42	0.00
57.50	8.66	5.98	8.42	0.00
60.00	8.66	5.98	8.42	0.00
62.50	8.66	5.98	8.42	0.00
65.00	8.66	5.98	8.42	0.00
67.50	8.66	5.98	8.42	0.00
70.00	8.66	5.98	8.42	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Summary for Subcatchment 45S: Basin 2-4 pe-development

Runoff = 8.80 cfs @ 12.27 hrs, Volume= 0.925 af, Depth= 5.04"

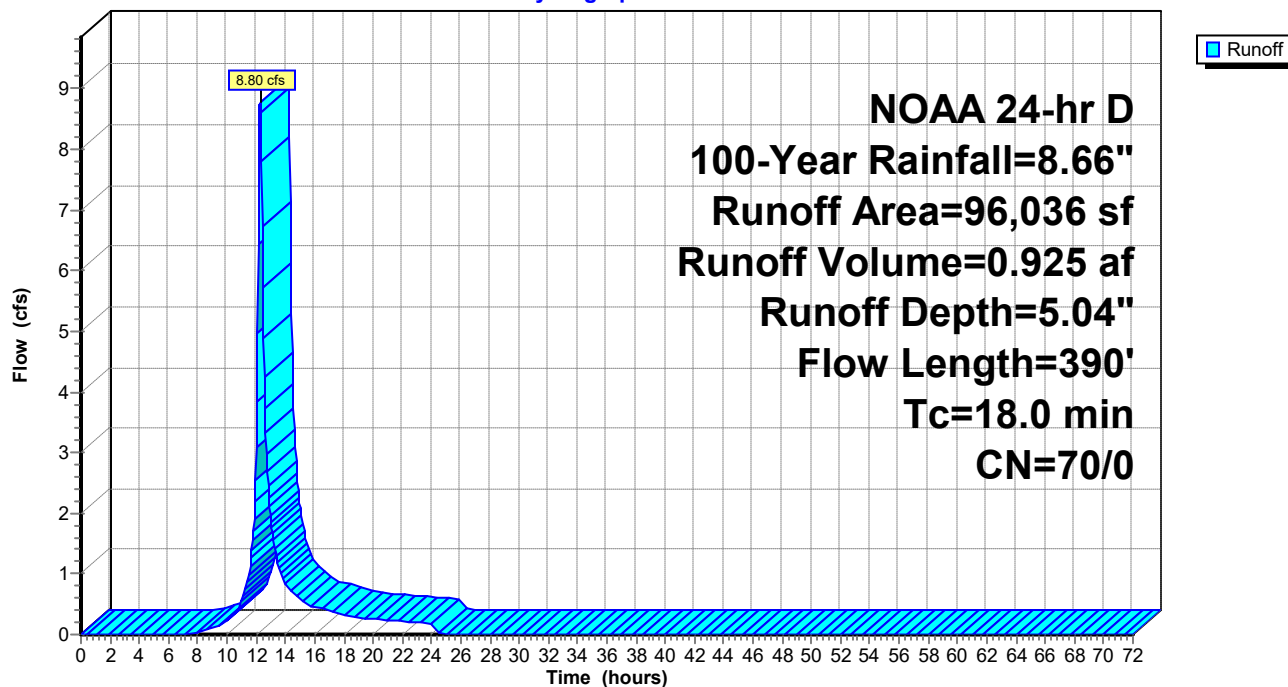
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
96,036	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.6	290	0.0720	1.34		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
18.0	390	Total			

Subcatchment 45S: Basin 2-4 pe-development

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Hydrograph for Subcatchment 45S: Basin 2-4 pe-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
10.00	1.72	0.14	0.00	0.23
12.50	5.91	2.74	0.00	4.89
15.00	7.29	3.86	0.00	0.58
17.50	7.84	4.33	0.00	0.35
20.00	8.21	4.64	0.00	0.26
22.50	8.51	4.90	0.00	0.22
25.00	8.66	5.04	0.00	0.00
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Summary for Pond 43P: pond 2-4

Inflow Area = 2.205 ac, Inflow Depth = 6.65" for 100-Year event
Inflow = 13.54 cfs @ 12.17 hrs, Volume= 1.223 af
Outflow = 2.06 cfs @ 12.88 hrs, Volume= 0.989 af, Atten= 85%, Lag= 42.7 min
Primary = 2.06 cfs @ 12.88 hrs, Volume= 0.989 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 544.61' @ 12.88 hrs Surf.Area= 11,090 sf Storage= 28,898 cf

Plug-Flow detention time= 315.5 min calculated for 0.989 af (81% of inflow)
Center-of-Mass det. time= 233.6 min (1,024.6 - 791.0)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	44,360 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	11,090	0	0
546.00	11,090	44,360	44,360

Device	Routing	Invert	Outlet Devices
#1	Primary	542.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	543.40'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.06 cfs @ 12.88 hrs HW=544.61' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.14 cfs @ 5.81 fps)

└ **2=Orifice/Grate** (Orifice Controls 0.92 cfs @ 4.71 fps)

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

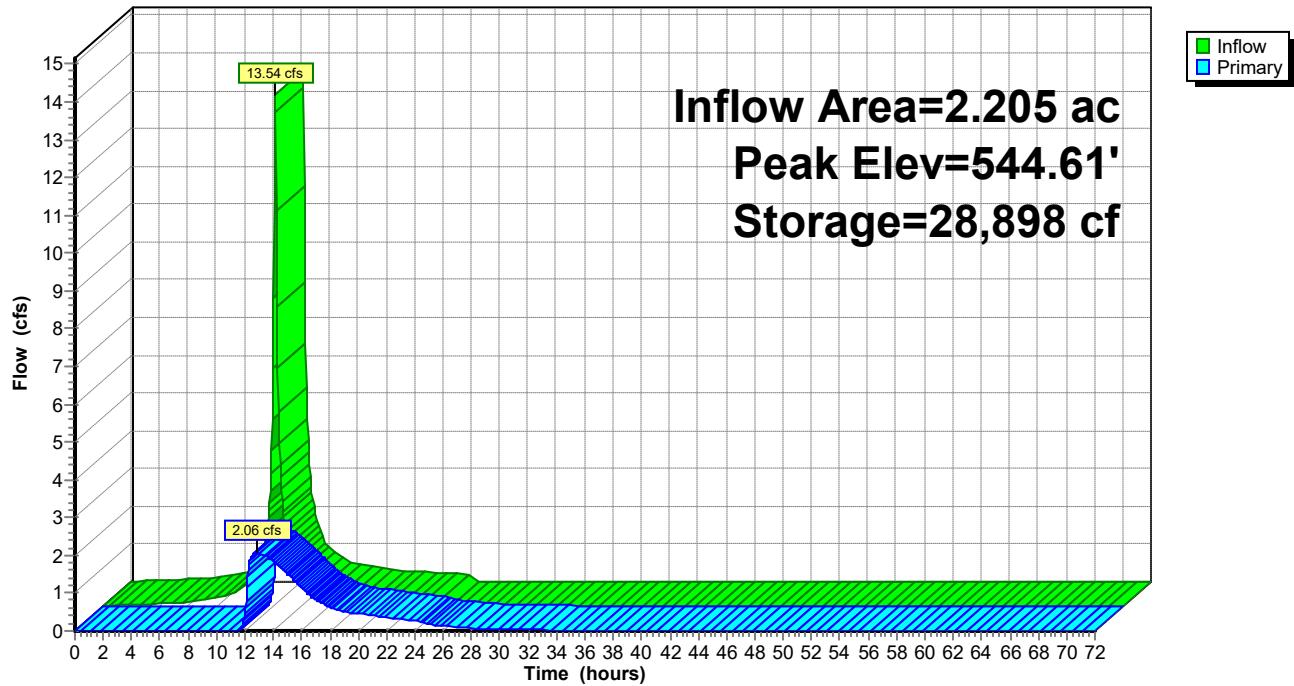
Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Pond 43P: pond 2-4

Hydrograph



Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Hydrograph for Pond 43P: pond 2-4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	542.00	0.00
2.50	0.05	230	542.02	0.00
5.00	0.08	842	542.08	0.00
7.50	0.20	2,004	542.18	0.00
10.00	0.53	4,895	542.44	0.00
12.50	3.76	27,974	544.52	1.99
15.00	0.61	22,882	544.06	1.51
17.50	0.37	17,535	543.58	0.71
20.00	0.28	15,336	543.38	0.46
22.50	0.23	14,139	543.27	0.33
25.00	0.00	12,960	543.17	0.19
27.50	0.00	11,837	543.07	0.08
30.00	0.00	11,305	543.02	0.04
32.50	0.00	11,003	542.99	0.03
35.00	0.00	10,806	542.97	0.02
37.50	0.00	10,672	542.96	0.01
40.00	0.00	10,576	542.95	0.01
42.50	0.00	10,498	542.95	0.01
45.00	0.00	10,434	542.94	0.01
47.50	0.00	10,382	542.94	0.01
50.00	0.00	10,339	542.93	0.00
52.50	0.00	10,304	542.93	0.00
55.00	0.00	10,275	542.93	0.00
57.50	0.00	10,252	542.92	0.00
60.00	0.00	10,233	542.92	0.00
62.50	0.00	10,217	542.92	0.00
65.00	0.00	10,204	542.92	0.00
67.50	0.00	10,193	542.92	0.00
70.00	0.00	10,182	542.92	0.00

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Stage-Discharge for Pond 43P: pond 2-4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
542.00	0.00	543.02	0.04	544.04	1.48	545.06	2.43
542.02	0.00	543.04	0.06	544.06	1.51	545.08	2.44
542.04	0.00	543.06	0.07	544.08	1.53	545.10	2.46
542.06	0.00	543.08	0.09	544.10	1.56	545.12	2.47
542.08	0.00	543.10	0.11	544.12	1.58	545.14	2.49
542.10	0.00	543.12	0.13	544.14	1.60	545.16	2.50
542.12	0.00	543.14	0.16	544.16	1.63	545.18	2.52
542.14	0.00	543.16	0.18	544.18	1.65	545.20	2.53
542.16	0.00	543.18	0.20	544.20	1.67	545.22	2.54
542.18	0.00	543.20	0.23	544.22	1.69	545.24	2.56
542.20	0.00	543.22	0.26	544.24	1.71	545.26	2.57
542.22	0.00	543.24	0.28	544.26	1.73	545.28	2.59
542.24	0.00	543.26	0.31	544.28	1.76	545.30	2.60
542.26	0.00	543.28	0.34	544.30	1.78	545.32	2.61
542.28	0.00	543.30	0.36	544.32	1.80	545.34	2.63
542.30	0.00	543.32	0.39	544.34	1.82	545.36	2.64
542.32	0.00	543.34	0.41	544.36	1.84	545.38	2.66
542.34	0.00	543.36	0.44	544.38	1.86	545.40	2.67
542.36	0.00	543.38	0.46	544.40	1.88	545.42	2.68
542.38	0.00	543.40	0.47	544.42	1.90	545.44	2.70
542.40	0.00	543.42	0.49	544.44	1.91	545.46	2.71
542.42	0.00	543.44	0.51	544.46	1.93	545.48	2.72
542.44	0.00	543.46	0.54	544.48	1.95	545.50	2.74
542.46	0.00	543.48	0.56	544.50	1.97	545.52	2.75
542.48	0.00	543.50	0.59	544.52	1.99	545.54	2.76
542.50	0.00	543.52	0.62	544.54	2.01	545.56	2.77
542.52	0.00	543.54	0.65	544.56	2.02	545.58	2.79
542.54	0.00	543.56	0.68	544.58	2.04	545.60	2.80
542.56	0.00	543.58	0.71	544.60	2.06	545.62	2.81
542.58	0.00	543.60	0.75	544.62	2.08	545.64	2.83
542.60	0.00	543.62	0.78	544.64	2.09	545.66	2.84
542.62	0.00	543.64	0.82	544.66	2.11	545.68	2.85
542.64	0.00	543.66	0.85	544.68	2.13	545.70	2.86
542.66	0.00	543.68	0.89	544.70	2.15	545.72	2.88
542.68	0.00	543.70	0.93	544.72	2.16	545.74	2.89
542.70	0.00	543.72	0.97	544.74	2.18	545.76	2.90
542.72	0.00	543.74	1.01	544.76	2.20	545.78	2.91
542.74	0.00	543.76	1.05	544.78	2.21	545.80	2.93
542.76	0.00	543.78	1.09	544.80	2.23	545.82	2.94
542.78	0.00	543.80	1.12	544.82	2.24	545.84	2.95
542.80	0.00	543.82	1.16	544.84	2.26	545.86	2.96
542.82	0.00	543.84	1.20	544.86	2.28	545.88	2.97
542.84	0.00	543.86	1.23	544.88	2.29	545.90	2.99
542.86	0.00	543.88	1.26	544.90	2.31	545.92	3.00
542.88	0.00	543.90	1.29	544.92	2.32	545.94	3.01
542.90	0.00	543.92	1.32	544.94	2.34	545.96	3.02
542.92	0.00	543.94	1.35	544.96	2.35	545.98	3.03
542.94	0.01	543.96	1.38	544.98	2.37	546.00	3.05
542.96	0.01	543.98	1.40	545.00	2.38		
542.98	0.02	544.00	1.43	545.02	2.40		
543.00	0.03	544.02	1.46	545.04	2.41		

Proposed Basin 2-4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

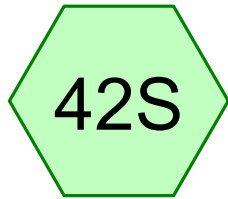
Basin 2-4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 40

Stage-Area-Storage for Pond 43P: pond 2-4

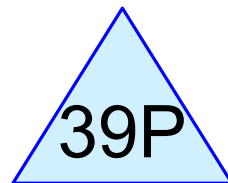
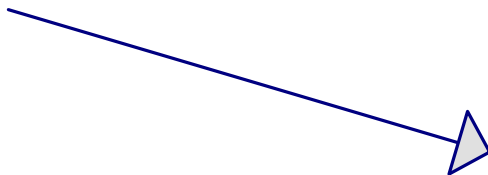
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
542.00	11,090	0	544.55	11,090	28,279
542.05	11,090	554	544.60	11,090	28,834
542.10	11,090	1,109	544.65	11,090	29,388
542.15	11,090	1,663	544.70	11,090	29,943
542.20	11,090	2,218	544.75	11,090	30,498
542.25	11,090	2,773	544.80	11,090	31,052
542.30	11,090	3,327	544.85	11,090	31,607
542.35	11,090	3,882	544.90	11,090	32,161
542.40	11,090	4,436	544.95	11,090	32,716
542.45	11,090	4,991	545.00	11,090	33,270
542.50	11,090	5,545	545.05	11,090	33,824
542.55	11,090	6,099	545.10	11,090	34,379
542.60	11,090	6,654	545.15	11,090	34,933
542.65	11,090	7,208	545.20	11,090	35,488
542.70	11,090	7,763	545.25	11,090	36,043
542.75	11,090	8,318	545.30	11,090	36,597
542.80	11,090	8,872	545.35	11,090	37,152
542.85	11,090	9,427	545.40	11,090	37,706
542.90	11,090	9,981	545.45	11,090	38,261
542.95	11,090	10,536	545.50	11,090	38,815
543.00	11,090	11,090	545.55	11,090	39,369
543.05	11,090	11,644	545.60	11,090	39,924
543.10	11,090	12,199	545.65	11,090	40,478
543.15	11,090	12,753	545.70	11,090	41,033
543.20	11,090	13,308	545.75	11,090	41,588
543.25	11,090	13,863	545.80	11,090	42,142
543.30	11,090	14,417	545.85	11,090	42,697
543.35	11,090	14,972	545.90	11,090	43,251
543.40	11,090	15,526	545.95	11,090	43,806
543.45	11,090	16,081	546.00	11,090	44,360
543.50	11,090	16,635			
543.55	11,090	17,189			
543.60	11,090	17,744			
543.65	11,090	18,298			
543.70	11,090	18,853			
543.75	11,090	19,408			
543.80	11,090	19,962			
543.85	11,090	20,517			
543.90	11,090	21,071			
543.95	11,090	21,626			
544.00	11,090	22,180			
544.05	11,090	22,734			
544.10	11,090	23,289			
544.15	11,090	23,843			
544.20	11,090	24,398			
544.25	11,090	24,953			
544.30	11,090	25,507			
544.35	11,090	26,062			
544.40	11,090	26,616			
544.45	11,090	27,171			
544.50	11,090	27,725			



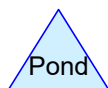
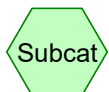
Basin 2-5
predevelopment



Basin 2-5



pond 2-5



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.385	98	Roofs, HSG C (38S)
0.265	98	Water Surface, 0% imp, HSG C (38S)
1.650	70	Woods, Good, HSG C (42S)
3.300	84	TOTAL AREA

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.300	HSG C	38S, 42S
0.000	HSG D	
0.000	Other	
3.300		TOTAL AREA

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.385	0.000	0.000	1.385	Roofs	38S
0.000	0.000	0.265	0.000	0.000	0.265	Water Surface, 0% imp	38S
0.000	0.000	1.650	0.000	0.000	1.650	Woods, Good	42S
0.000	0.000	3.300	0.000	0.000	3.300	TOTAL AREA	

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	38S	0.00	0.00	920.0	0.0410	0.013	0.0	12.0	8.0	

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-5

Runoff Area=71,875 sf Runoff Depth=3.21"

Flow Length=1,020' Tc=10.0 min CN=98/98 Runoff=4.60 cfs 0.441 af

Subcatchment 42S: Basin 2-5 predevelopment

Runoff Area=71,875 sf Runoff Depth=0.97"

Flow Length=220' Tc=13.2 min CN=70/0 Runoff=1.34 cfs 0.134 af

Pond 39P: pond 2-5

Peak Elev=541.77' Storage=14,645 cf Inflow=4.60 cfs 0.441 af

Outflow=0.19 cfs 0.171 af

Total Runoff Area = 3.300 ac Runoff Volume = 0.574 af Average Runoff Depth = 2.09"

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 38S: Basin 2-5

[47] Hint: Peak is 388% of capacity of segment #2

Runoff = 4.60 cfs @ 12.17 hrs, Volume= 0.441 af, Depth= 3.21"
Routed to Pond 39P : pond 2-5

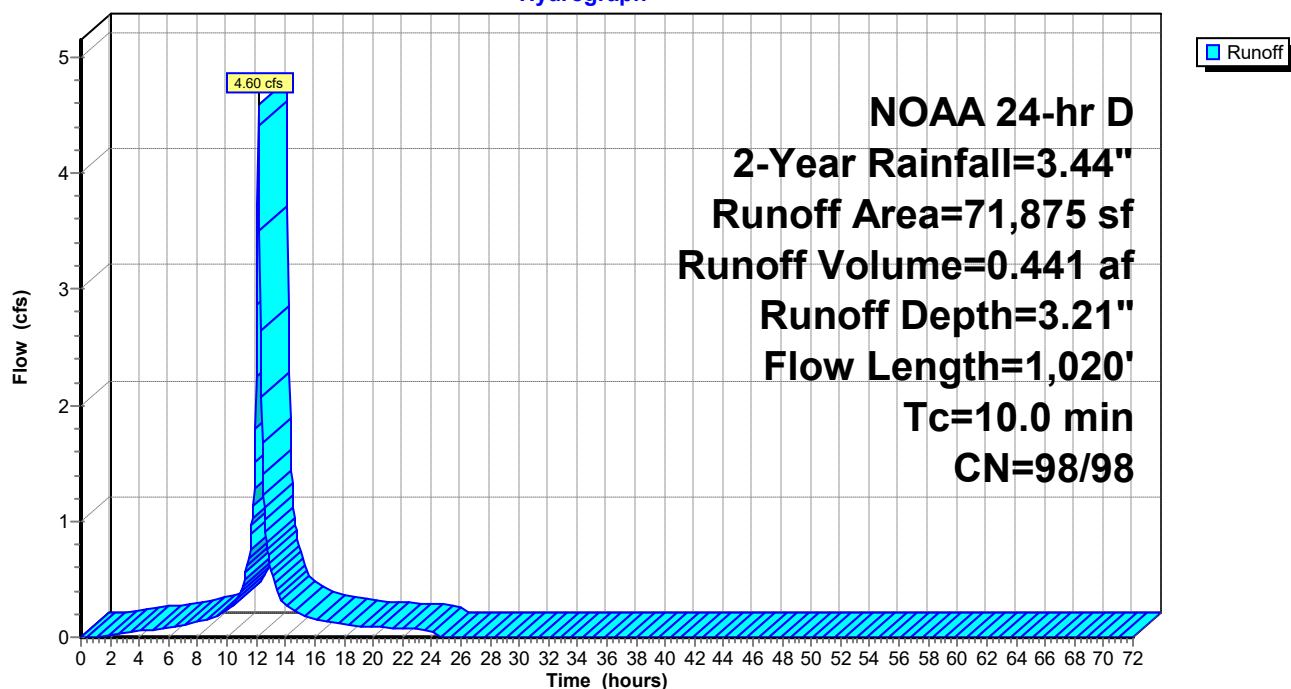
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
60,317	98	Roofs, HSG C
11,558	98	Water Surface, 0% imp, HSG C
71,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
3.0	920	0.0410	5.17	1.18	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.013
4.5	1,020	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 38S: Basin 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Hydrograph for Subcatchment 38S: Basin 2-5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.02	0.02	0.03
5.00	0.24	0.09	0.09	0.07
7.50	0.40	0.23	0.23	0.12
10.00	0.68	0.49	0.49	0.24
12.50	2.35	2.12	2.12	1.22
15.00	2.89	2.66	2.66	0.19
17.50	3.11	2.88	2.88	0.12
20.00	3.26	3.03	3.03	0.09
22.50	3.38	3.15	3.15	0.07
25.00	3.44	3.21	3.21	0.00
27.50	3.44	3.21	3.21	0.00
30.00	3.44	3.21	3.21	0.00
32.50	3.44	3.21	3.21	0.00
35.00	3.44	3.21	3.21	0.00
37.50	3.44	3.21	3.21	0.00
40.00	3.44	3.21	3.21	0.00
42.50	3.44	3.21	3.21	0.00
45.00	3.44	3.21	3.21	0.00
47.50	3.44	3.21	3.21	0.00
50.00	3.44	3.21	3.21	0.00
52.50	3.44	3.21	3.21	0.00
55.00	3.44	3.21	3.21	0.00
57.50	3.44	3.21	3.21	0.00
60.00	3.44	3.21	3.21	0.00
62.50	3.44	3.21	3.21	0.00
65.00	3.44	3.21	3.21	0.00
67.50	3.44	3.21	3.21	0.00
70.00	3.44	3.21	3.21	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 42S: Basin 2-5 predevelopment

Runoff = 1.34 cfs @ 12.22 hrs, Volume= 0.134 af, Depth= 0.97"

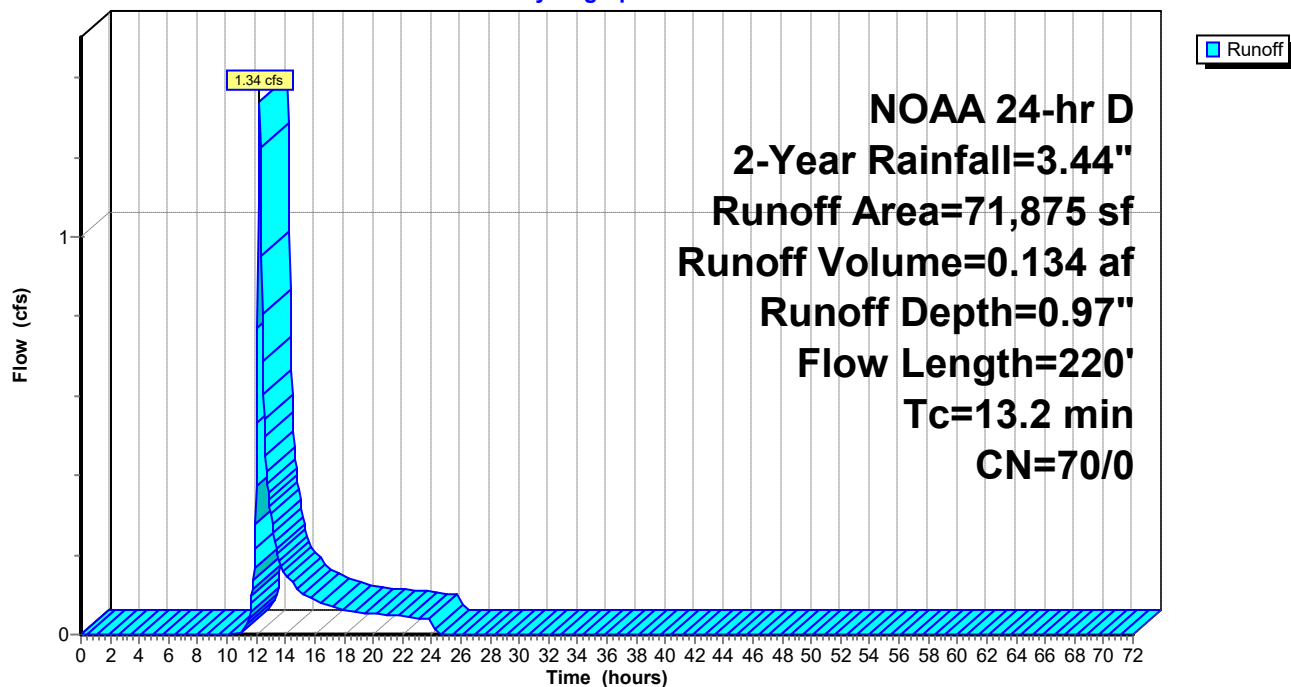
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
71,875	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0800	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.3	120	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.2	220	Total			

Subcatchment 42S: Basin 2-5 predevelopment

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Hydrograph for Subcatchment 42S: Basin 2-5 predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	0.60
15.00	2.89	0.66	0.00	0.11
17.50	3.11	0.78	0.00	0.07
20.00	3.26	0.86	0.00	0.05
22.50	3.38	0.93	0.00	0.04
25.00	3.44	0.97	0.00	0.00
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Summary for Pond 39P: pond 2-5

Inflow Area = 1.650 ac, Inflow Depth = 3.21" for 2-Year event
Inflow = 4.60 cfs @ 12.17 hrs, Volume= 0.441 af
Outflow = 0.19 cfs @ 15.07 hrs, Volume= 0.171 af, Atten= 96%, Lag= 174.2 min
Primary = 0.19 cfs @ 15.07 hrs, Volume= 0.171 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 541.77' @ 15.07 hrs Surf.Area= 11,558 sf Storage= 14,645 cf

Plug-Flow detention time= 707.2 min calculated for 0.171 af (39% of inflow)
Center-of-Mass det. time= 539.3 min (1,299.8 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	40,453 cf	540 (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	11,558	0	0
544.00	11,558	40,453	40,453

Device	Routing	Invert	Outlet Devices
#1	Primary	541.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 15.07 hrs HW=541.77' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 0.19 cfs @ 1.76 fps)

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

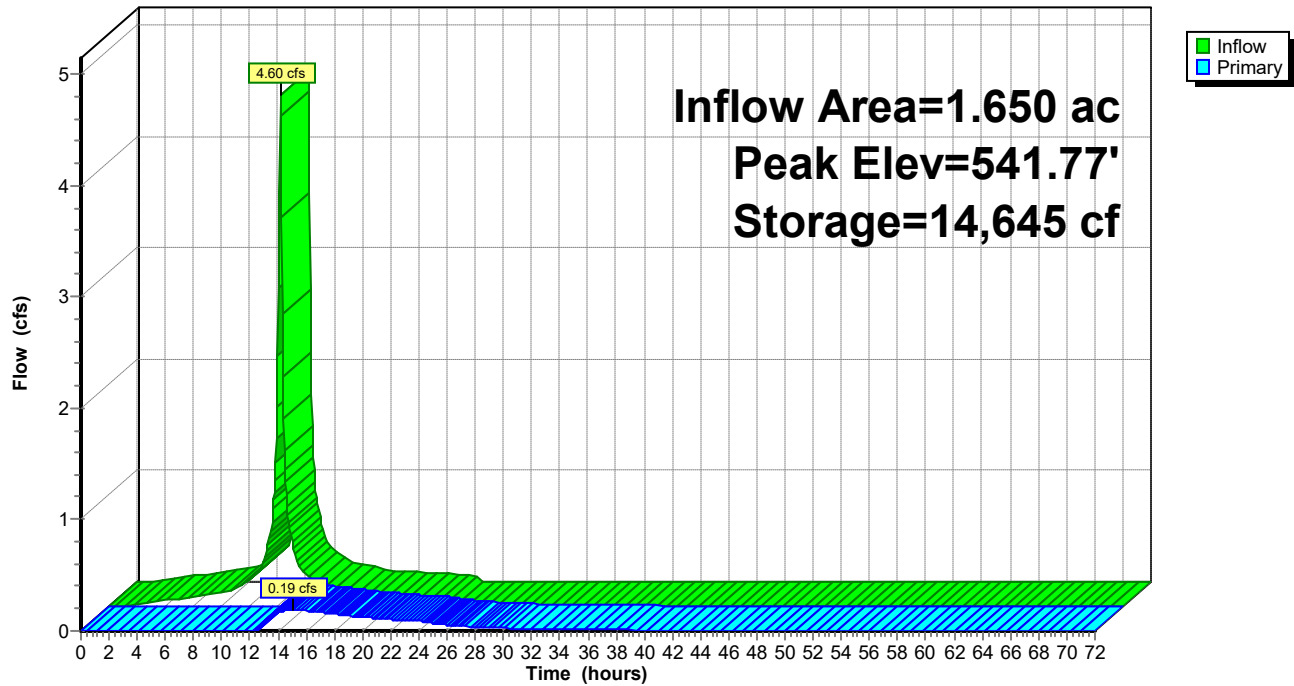
Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Pond 39P: pond 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Hydrograph for Pond 39P: pond 2-5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.03	76	540.51	0.00
5.00	0.07	530	540.55	0.00
7.50	0.12	1,319	540.61	0.00
10.00	0.24	2,776	540.74	0.00
12.50	1.22	12,084	541.55	0.01
15.00	0.19	14,644	541.77	0.19
17.50	0.12	14,394	541.75	0.16
20.00	0.09	14,003	541.71	0.12
22.50	0.07	13,728	541.69	0.10
25.00	0.00	13,337	541.65	0.07
27.50	0.00	12,871	541.61	0.04
30.00	0.00	12,590	541.59	0.02
32.50	0.00	12,406	541.57	0.02
35.00	0.00	12,273	541.56	0.01
37.50	0.00	12,176	541.55	0.01
40.00	0.00	12,104	541.55	0.01
42.50	0.00	12,044	541.54	0.01
45.00	0.00	11,992	541.54	0.01
47.50	0.00	11,948	541.53	0.00
50.00	0.00	11,911	541.53	0.00
52.50	0.00	11,879	541.53	0.00
55.00	0.00	11,851	541.53	0.00
57.50	0.00	11,828	541.52	0.00
60.00	0.00	11,808	541.52	0.00
62.50	0.00	11,791	541.52	0.00
65.00	0.00	11,776	541.52	0.00
67.50	0.00	11,764	541.52	0.00
70.00	0.00	11,753	541.52	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Stage-Discharge for Pond 39P: pond 2-5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.84	543.56	1.27
540.52	0.00	541.54	0.01	542.56	0.85	543.58	1.28
540.54	0.00	541.56	0.01	542.58	0.86	543.60	1.29
540.56	0.00	541.58	0.02	542.60	0.87	543.62	1.29
540.58	0.00	541.60	0.03	542.62	0.88	543.64	1.30
540.60	0.00	541.62	0.04	542.64	0.89	543.66	1.31
540.62	0.00	541.64	0.06	542.66	0.90	543.68	1.31
540.64	0.00	541.66	0.07	542.68	0.91	543.70	1.32
540.66	0.00	541.68	0.09	542.70	0.92	543.72	1.33
540.68	0.00	541.70	0.11	542.72	0.93	543.74	1.33
540.70	0.00	541.72	0.13	542.74	0.94	543.76	1.34
540.72	0.00	541.74	0.16	542.76	0.95	543.78	1.35
540.74	0.00	541.76	0.18	542.78	0.96	543.80	1.35
540.76	0.00	541.78	0.20	542.80	0.97	543.82	1.36
540.78	0.00	541.80	0.23	542.82	0.98	543.84	1.37
540.80	0.00	541.82	0.26	542.84	0.99	543.86	1.37
540.82	0.00	541.84	0.28	542.86	1.00	543.88	1.38
540.84	0.00	541.86	0.31	542.88	1.00	543.90	1.39
540.86	0.00	541.88	0.34	542.90	1.01	543.92	1.39
540.88	0.00	541.90	0.36	542.92	1.02	543.94	1.40
540.90	0.00	541.92	0.39	542.94	1.03	543.96	1.41
540.92	0.00	541.94	0.41	542.96	1.04	543.98	1.41
540.94	0.00	541.96	0.44	542.98	1.05	544.00	1.42
540.96	0.00	541.98	0.46	543.00	1.06		
540.98	0.00	542.00	0.47	543.02	1.07		
541.00	0.00	542.02	0.49	543.04	1.07		
541.02	0.00	542.04	0.51	543.06	1.08		
541.04	0.00	542.06	0.53	543.08	1.09		
541.06	0.00	542.08	0.54	543.10	1.10		
541.08	0.00	542.10	0.56	543.12	1.11		
541.10	0.00	542.12	0.58	543.14	1.11		
541.12	0.00	542.14	0.59	543.16	1.12		
541.14	0.00	542.16	0.61	543.18	1.13		
541.16	0.00	542.18	0.62	543.20	1.14		
541.18	0.00	542.20	0.63	543.22	1.15		
541.20	0.00	542.22	0.65	543.24	1.15		
541.22	0.00	542.24	0.66	543.26	1.16		
541.24	0.00	542.26	0.68	543.28	1.17		
541.26	0.00	542.28	0.69	543.30	1.18		
541.28	0.00	542.30	0.70	543.32	1.18		
541.30	0.00	542.32	0.71	543.34	1.19		
541.32	0.00	542.34	0.73	543.36	1.20		
541.34	0.00	542.36	0.74	543.38	1.21		
541.36	0.00	542.38	0.75	543.40	1.21		
541.38	0.00	542.40	0.76	543.42	1.22		
541.40	0.00	542.42	0.77	543.44	1.23		
541.42	0.00	542.44	0.79	543.46	1.24		
541.44	0.00	542.46	0.80	543.48	1.24		
541.46	0.00	542.48	0.81	543.50	1.25		
541.48	0.00	542.50	0.82	543.52	1.26		
541.50	0.00	542.52	0.83	543.54	1.26		

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Stage-Area-Storage for Pond 39P: pond 2-5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	11,558	0	543.05	11,558	29,473
540.55	11,558	578	543.10	11,558	30,051
540.60	11,558	1,156	543.15	11,558	30,629
540.65	11,558	1,734	543.20	11,558	31,207
540.70	11,558	2,312	543.25	11,558	31,785
540.75	11,558	2,890	543.30	11,558	32,362
540.80	11,558	3,467	543.35	11,558	32,940
540.85	11,558	4,045	543.40	11,558	33,518
540.90	11,558	4,623	543.45	11,558	34,096
540.95	11,558	5,201	543.50	11,558	34,674
541.00	11,558	5,779	543.55	11,558	35,252
541.05	11,558	6,357	543.60	11,558	35,830
541.10	11,558	6,935	543.65	11,558	36,408
541.15	11,558	7,513	543.70	11,558	36,986
541.20	11,558	8,091	543.75	11,558	37,564
541.25	11,558	8,669	543.80	11,558	38,141
541.30	11,558	9,246	543.85	11,558	38,719
541.35	11,558	9,824	543.90	11,558	39,297
541.40	11,558	10,402	543.95	11,558	39,875
541.45	11,558	10,980	544.00	11,558	40,453
541.50	11,558	11,558			
541.55	11,558	12,136			
541.60	11,558	12,714			
541.65	11,558	13,292			
541.70	11,558	13,870			
541.75	11,558	14,448			
541.80	11,558	15,025			
541.85	11,558	15,603			
541.90	11,558	16,181			
541.95	11,558	16,759			
542.00	11,558	17,337			
542.05	11,558	17,915			
542.10	11,558	18,493			
542.15	11,558	19,071			
542.20	11,558	19,649			
542.25	11,558	20,227			
542.30	11,558	20,804			
542.35	11,558	21,382			
542.40	11,558	21,960			
542.45	11,558	22,538			
542.50	11,558	23,116			
542.55	11,558	23,694			
542.60	11,558	24,272			
542.65	11,558	24,850			
542.70	11,558	25,428			
542.75	11,558	26,006			
542.80	11,558	26,583			
542.85	11,558	27,161			
542.90	11,558	27,739			
542.95	11,558	28,317			
543.00	11,558	28,895			

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 18

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-5

Runoff Area=71,875 sf Runoff Depth=4.98"

Flow Length=1,020' Tc=10.0 min CN=98/98 Runoff=7.02 cfs 0.685 af

Subcatchment 42S: Basin 2-5 predevelopment

Runoff Area=71,875 sf Runoff Depth=2.20"

Flow Length=220' Tc=13.2 min CN=70/0 Runoff=3.24 cfs 0.303 af

Pond 39P: pond 2-5

Peak Elev=542.21' Storage=19,784 cf Inflow=7.02 cfs 0.685 af

Outflow=0.64 cfs 0.415 af

Total Runoff Area = 3.300 ac Runoff Volume = 0.988 af Average Runoff Depth = 3.59"

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 19

Summary for Subcatchment 38S: Basin 2-5

[47] Hint: Peak is 593% of capacity of segment #2

Runoff = 7.02 cfs @ 12.17 hrs, Volume= 0.685 af, Depth= 4.98"
Routed to Pond 39P : pond 2-5

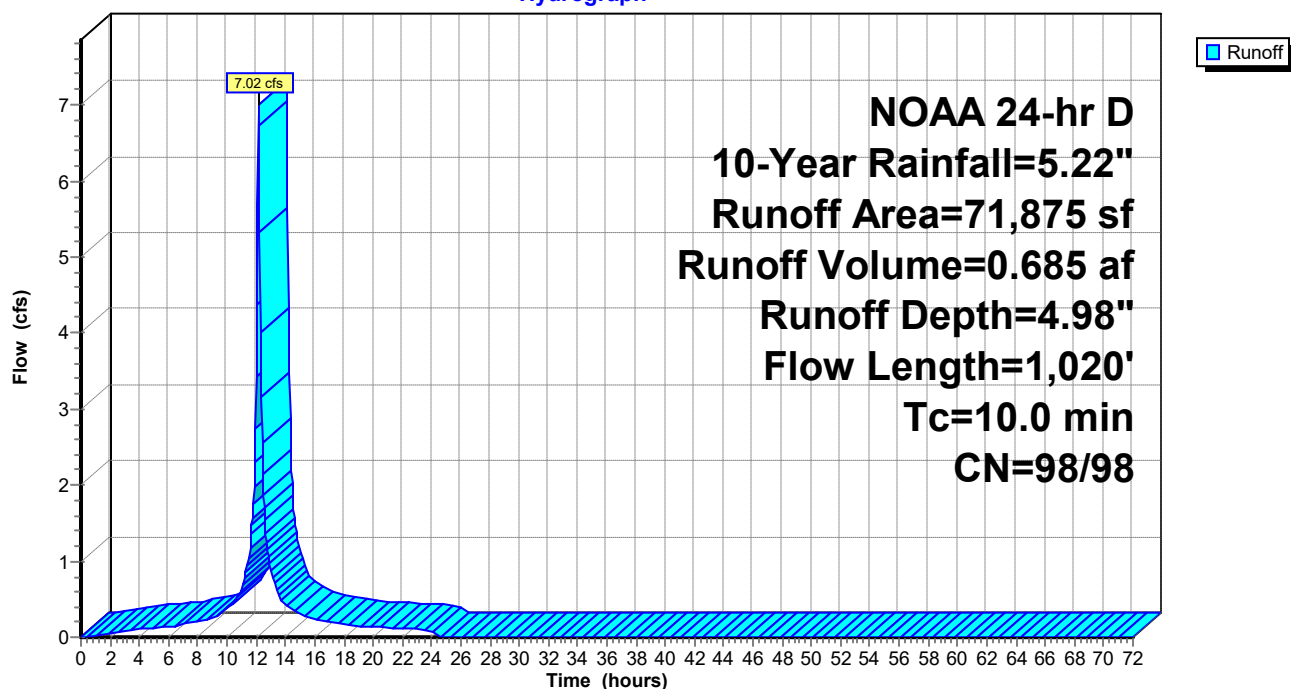
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
60,317	98	Roofs, HSG C
11,558	98	Water Surface, 0% imp, HSG C
71,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
3.0	920	0.0410	5.17	1.18	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.013
4.5	1,020	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 38S: Basin 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Hydrograph for Subcatchment 38S: Basin 2-5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.04	0.04	0.07
5.00	0.36	0.19	0.19	0.12
7.50	0.61	0.42	0.42	0.19
10.00	1.03	0.82	0.82	0.38
12.50	3.57	3.33	3.33	1.86
15.00	4.39	4.16	4.16	0.30
17.50	4.73	4.49	4.49	0.18
20.00	4.95	4.71	4.71	0.13
22.50	5.13	4.89	4.89	0.11
25.00	5.22	4.98	4.98	0.00
27.50	5.22	4.98	4.98	0.00
30.00	5.22	4.98	4.98	0.00
32.50	5.22	4.98	4.98	0.00
35.00	5.22	4.98	4.98	0.00
37.50	5.22	4.98	4.98	0.00
40.00	5.22	4.98	4.98	0.00
42.50	5.22	4.98	4.98	0.00
45.00	5.22	4.98	4.98	0.00
47.50	5.22	4.98	4.98	0.00
50.00	5.22	4.98	4.98	0.00
52.50	5.22	4.98	4.98	0.00
55.00	5.22	4.98	4.98	0.00
57.50	5.22	4.98	4.98	0.00
60.00	5.22	4.98	4.98	0.00
62.50	5.22	4.98	4.98	0.00
65.00	5.22	4.98	4.98	0.00
67.50	5.22	4.98	4.98	0.00
70.00	5.22	4.98	4.98	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Summary for Subcatchment 42S: Basin 2-5 predevelopment

Runoff = 3.24 cfs @ 12.22 hrs, Volume= 0.303 af, Depth= 2.20"

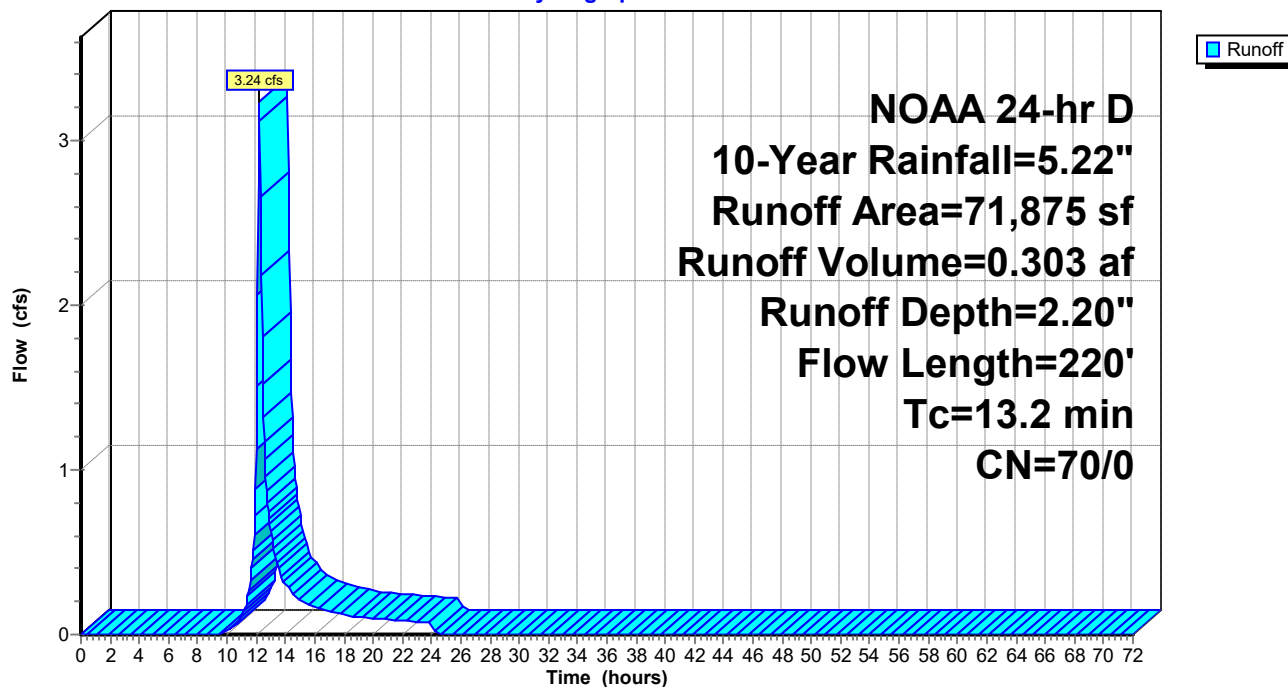
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
71,875	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0800	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.3	120	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.2	220	Total			

Subcatchment 42S: Basin 2-5 predevelopment

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 42S: Basin 2-5 predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.02
12.50	3.57	1.05	0.00	1.32
15.00	4.39	1.60	0.00	0.21
17.50	4.73	1.83	0.00	0.13
20.00	4.95	2.00	0.00	0.10
22.50	5.13	2.13	0.00	0.08
25.00	5.22	2.20	0.00	0.00
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Pond 39P: pond 2-5

Inflow Area = 1.650 ac, Inflow Depth = 4.98" for 10-Year event
Inflow = 7.02 cfs @ 12.17 hrs, Volume= 0.685 af
Outflow = 0.64 cfs @ 13.37 hrs, Volume= 0.415 af, Atten= 91%, Lag= 72.0 min
Primary = 0.64 cfs @ 13.37 hrs, Volume= 0.415 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 542.21' @ 13.37 hrs Surf.Area= 11,558 sf Storage= 19,784 cf

Plug-Flow detention time= 486.9 min calculated for 0.415 af (61% of inflow)
Center-of-Mass det. time= 365.6 min (1,117.8 - 752.2)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	40,453 cf	540 (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	11,558	0	0
544.00	11,558	40,453	40,453

Device	Routing	Invert	Outlet Devices
#1	Primary	541.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.64 cfs @ 13.37 hrs HW=542.21' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.64 cfs @ 3.27 fps)

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

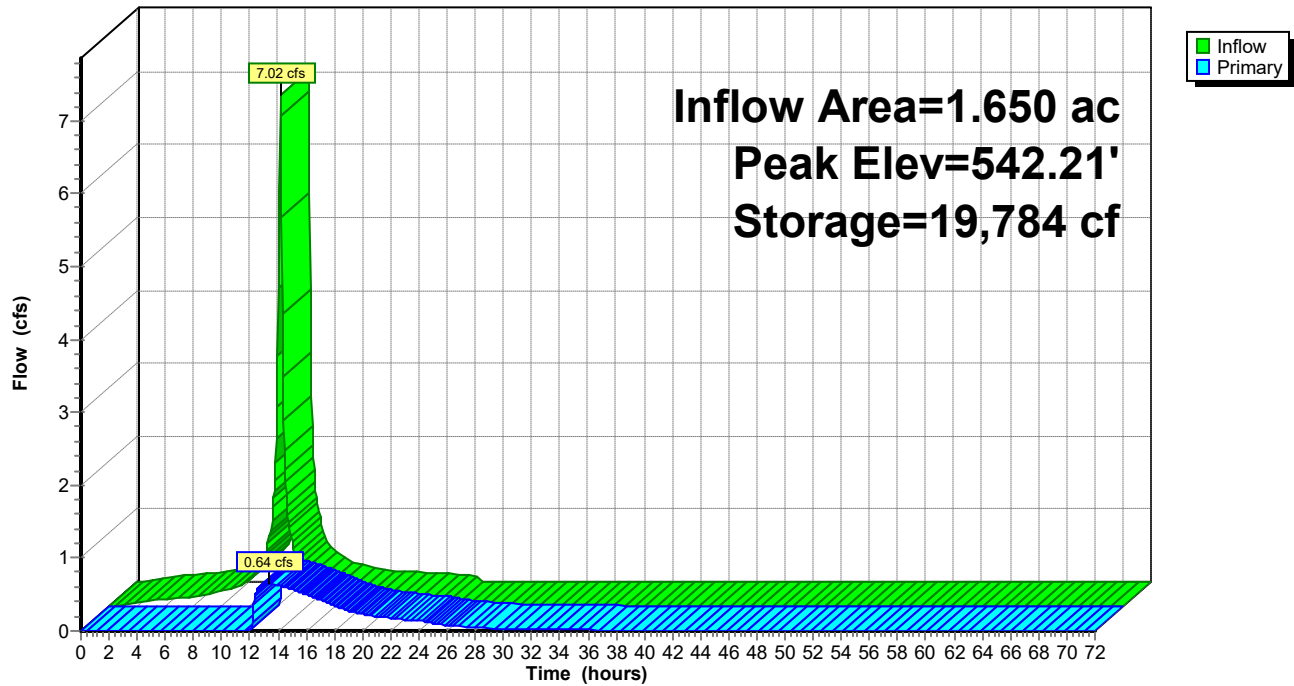
Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Pond 39P: pond 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Hydrograph for Pond 39P: pond 2-5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.07	226	540.52	0.00
5.00	0.12	1,084	540.59	0.00
7.50	0.19	2,406	540.71	0.00
10.00	0.38	4,725	540.91	0.00
12.50	1.86	18,470	542.10	0.56
15.00	0.30	18,651	542.11	0.57
17.50	0.18	16,385	541.92	0.39
20.00	0.13	15,044	541.80	0.23
22.50	0.11	14,406	541.75	0.16
25.00	0.00	13,769	541.69	0.10
27.50	0.00	13,102	541.63	0.05
30.00	0.00	12,733	541.60	0.03
32.50	0.00	12,503	541.58	0.02
35.00	0.00	12,344	541.57	0.02
37.50	0.00	12,227	541.56	0.01
40.00	0.00	12,143	541.55	0.01
42.50	0.00	12,077	541.54	0.01
45.00	0.00	12,021	541.54	0.01
47.50	0.00	11,973	541.54	0.00
50.00	0.00	11,931	541.53	0.00
52.50	0.00	11,896	541.53	0.00
55.00	0.00	11,866	541.53	0.00
57.50	0.00	11,841	541.52	0.00
60.00	0.00	11,819	541.52	0.00
62.50	0.00	11,800	541.52	0.00
65.00	0.00	11,784	541.52	0.00
67.50	0.00	11,771	541.52	0.00
70.00	0.00	11,759	541.52	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Stage-Discharge for Pond 39P: pond 2-5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.84	543.56	1.27
540.52	0.00	541.54	0.01	542.56	0.85	543.58	1.28
540.54	0.00	541.56	0.01	542.58	0.86	543.60	1.29
540.56	0.00	541.58	0.02	542.60	0.87	543.62	1.29
540.58	0.00	541.60	0.03	542.62	0.88	543.64	1.30
540.60	0.00	541.62	0.04	542.64	0.89	543.66	1.31
540.62	0.00	541.64	0.06	542.66	0.90	543.68	1.31
540.64	0.00	541.66	0.07	542.68	0.91	543.70	1.32
540.66	0.00	541.68	0.09	542.70	0.92	543.72	1.33
540.68	0.00	541.70	0.11	542.72	0.93	543.74	1.33
540.70	0.00	541.72	0.13	542.74	0.94	543.76	1.34
540.72	0.00	541.74	0.16	542.76	0.95	543.78	1.35
540.74	0.00	541.76	0.18	542.78	0.96	543.80	1.35
540.76	0.00	541.78	0.20	542.80	0.97	543.82	1.36
540.78	0.00	541.80	0.23	542.82	0.98	543.84	1.37
540.80	0.00	541.82	0.26	542.84	0.99	543.86	1.37
540.82	0.00	541.84	0.28	542.86	1.00	543.88	1.38
540.84	0.00	541.86	0.31	542.88	1.00	543.90	1.39
540.86	0.00	541.88	0.34	542.90	1.01	543.92	1.39
540.88	0.00	541.90	0.36	542.92	1.02	543.94	1.40
540.90	0.00	541.92	0.39	542.94	1.03	543.96	1.41
540.92	0.00	541.94	0.41	542.96	1.04	543.98	1.41
540.94	0.00	541.96	0.44	542.98	1.05	544.00	1.42
540.96	0.00	541.98	0.46	543.00	1.06		
540.98	0.00	542.00	0.47	543.02	1.07		
541.00	0.00	542.02	0.49	543.04	1.07		
541.02	0.00	542.04	0.51	543.06	1.08		
541.04	0.00	542.06	0.53	543.08	1.09		
541.06	0.00	542.08	0.54	543.10	1.10		
541.08	0.00	542.10	0.56	543.12	1.11		
541.10	0.00	542.12	0.58	543.14	1.11		
541.12	0.00	542.14	0.59	543.16	1.12		
541.14	0.00	542.16	0.61	543.18	1.13		
541.16	0.00	542.18	0.62	543.20	1.14		
541.18	0.00	542.20	0.63	543.22	1.15		
541.20	0.00	542.22	0.65	543.24	1.15		
541.22	0.00	542.24	0.66	543.26	1.16		
541.24	0.00	542.26	0.68	543.28	1.17		
541.26	0.00	542.28	0.69	543.30	1.18		
541.28	0.00	542.30	0.70	543.32	1.18		
541.30	0.00	542.32	0.71	543.34	1.19		
541.32	0.00	542.34	0.73	543.36	1.20		
541.34	0.00	542.36	0.74	543.38	1.21		
541.36	0.00	542.38	0.75	543.40	1.21		
541.38	0.00	542.40	0.76	543.42	1.22		
541.40	0.00	542.42	0.77	543.44	1.23		
541.42	0.00	542.44	0.79	543.46	1.24		
541.44	0.00	542.46	0.80	543.48	1.24		
541.46	0.00	542.48	0.81	543.50	1.25		
541.48	0.00	542.50	0.82	543.52	1.26		
541.50	0.00	542.52	0.83	543.54	1.26		

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Stage-Area-Storage for Pond 39P: pond 2-5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	11,558	0	543.05	11,558	29,473
540.55	11,558	578	543.10	11,558	30,051
540.60	11,558	1,156	543.15	11,558	30,629
540.65	11,558	1,734	543.20	11,558	31,207
540.70	11,558	2,312	543.25	11,558	31,785
540.75	11,558	2,890	543.30	11,558	32,362
540.80	11,558	3,467	543.35	11,558	32,940
540.85	11,558	4,045	543.40	11,558	33,518
540.90	11,558	4,623	543.45	11,558	34,096
540.95	11,558	5,201	543.50	11,558	34,674
541.00	11,558	5,779	543.55	11,558	35,252
541.05	11,558	6,357	543.60	11,558	35,830
541.10	11,558	6,935	543.65	11,558	36,408
541.15	11,558	7,513	543.70	11,558	36,986
541.20	11,558	8,091	543.75	11,558	37,564
541.25	11,558	8,669	543.80	11,558	38,141
541.30	11,558	9,246	543.85	11,558	38,719
541.35	11,558	9,824	543.90	11,558	39,297
541.40	11,558	10,402	543.95	11,558	39,875
541.45	11,558	10,980	544.00	11,558	40,453
541.50	11,558	11,558			
541.55	11,558	12,136			
541.60	11,558	12,714			
541.65	11,558	13,292			
541.70	11,558	13,870			
541.75	11,558	14,448			
541.80	11,558	15,025			
541.85	11,558	15,603			
541.90	11,558	16,181			
541.95	11,558	16,759			
542.00	11,558	17,337			
542.05	11,558	17,915			
542.10	11,558	18,493			
542.15	11,558	19,071			
542.20	11,558	19,649			
542.25	11,558	20,227			
542.30	11,558	20,804			
542.35	11,558	21,382			
542.40	11,558	21,960			
542.45	11,558	22,538			
542.50	11,558	23,116			
542.55	11,558	23,694			
542.60	11,558	24,272			
542.65	11,558	24,850			
542.70	11,558	25,428			
542.75	11,558	26,006			
542.80	11,558	26,583			
542.85	11,558	27,161			
542.90	11,558	27,739			
542.95	11,558	28,317			
543.00	11,558	28,895			

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 28

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-5

Runoff Area=71,875 sf Runoff Depth=8.42"

Flow Length=1,020' Tc=10.0 min CN=98/98 Runoff=11.68 cfs 1.158 af

Subcatchment 42S: Basin 2-5 predevelopment

Runoff Area=71,875 sf Runoff Depth=5.04"

Flow Length=220' Tc=13.2 min CN=70/0 Runoff=7.48 cfs 0.693 af

Pond 39P: pond 2-5

Peak Elev=543.27' Storage=31,977 cf Inflow=11.68 cfs 1.158 af

Outflow=1.16 cfs 0.888 af

Total Runoff Area = 3.300 ac Runoff Volume = 1.850 af Average Runoff Depth = 6.73"

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 29

Summary for Subcatchment 38S: Basin 2-5

[47] Hint: Peak is 987% of capacity of segment #2

Runoff = 11.68 cfs @ 12.17 hrs, Volume= 1.158 af, Depth= 8.42"
Routed to Pond 39P : pond 2-5

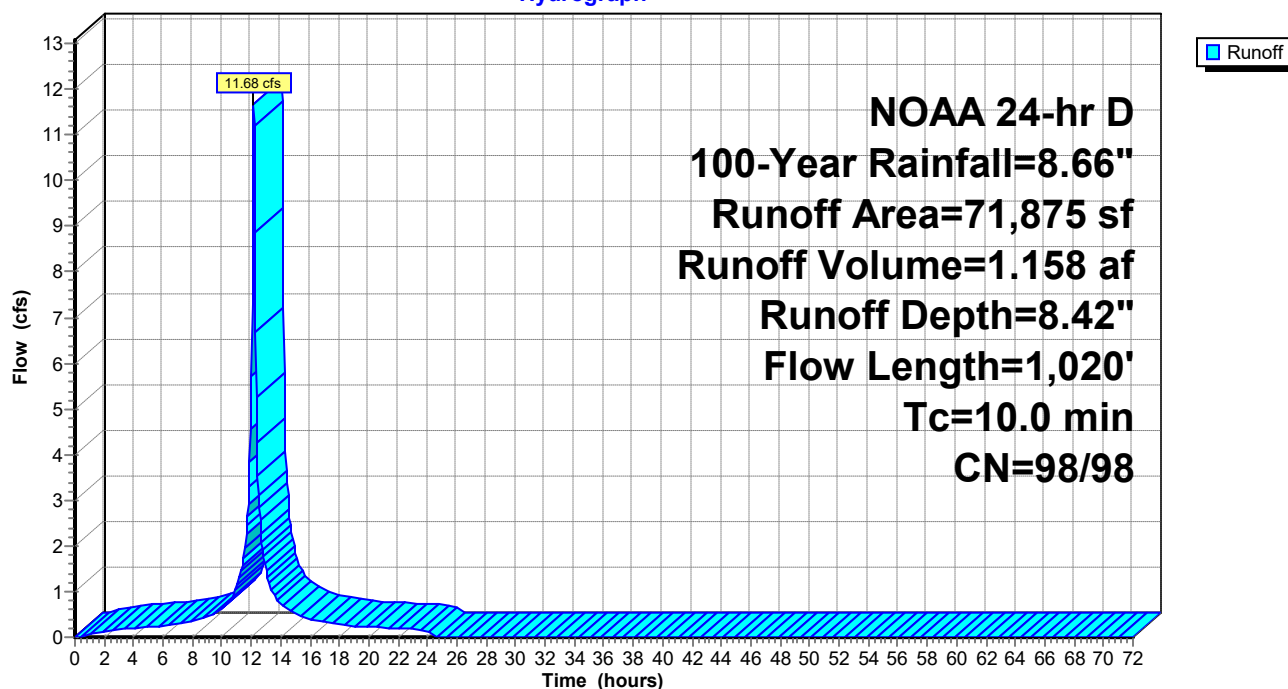
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
60,317	98	Roofs, HSG C
11,558	98	Water Surface, 0% imp, HSG C
71,875	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
3.0	920	0.0410	5.17	1.18	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.013
4.5	1,020	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 38S: Basin 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 30

Hydrograph for Subcatchment 38S: Basin 2-5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.12	0.12	0.15
5.00	0.59	0.40	0.40	0.22
7.50	1.01	0.80	0.80	0.33
10.00	1.72	1.49	1.49	0.64
12.50	5.91	5.68	5.68	3.10
15.00	7.29	7.05	7.05	0.49
17.50	7.84	7.60	7.60	0.30
20.00	8.21	7.97	7.97	0.22
22.50	8.51	8.27	8.27	0.18
25.00	8.66	8.42	8.42	0.00
27.50	8.66	8.42	8.42	0.00
30.00	8.66	8.42	8.42	0.00
32.50	8.66	8.42	8.42	0.00
35.00	8.66	8.42	8.42	0.00
37.50	8.66	8.42	8.42	0.00
40.00	8.66	8.42	8.42	0.00
42.50	8.66	8.42	8.42	0.00
45.00	8.66	8.42	8.42	0.00
47.50	8.66	8.42	8.42	0.00
50.00	8.66	8.42	8.42	0.00
52.50	8.66	8.42	8.42	0.00
55.00	8.66	8.42	8.42	0.00
57.50	8.66	8.42	8.42	0.00
60.00	8.66	8.42	8.42	0.00
62.50	8.66	8.42	8.42	0.00
65.00	8.66	8.42	8.42	0.00
67.50	8.66	8.42	8.42	0.00
70.00	8.66	8.42	8.42	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 31

Summary for Subcatchment 42S: Basin 2-5 predevelopment

Runoff = 7.48 cfs @ 12.21 hrs, Volume= 0.693 af, Depth= 5.04"

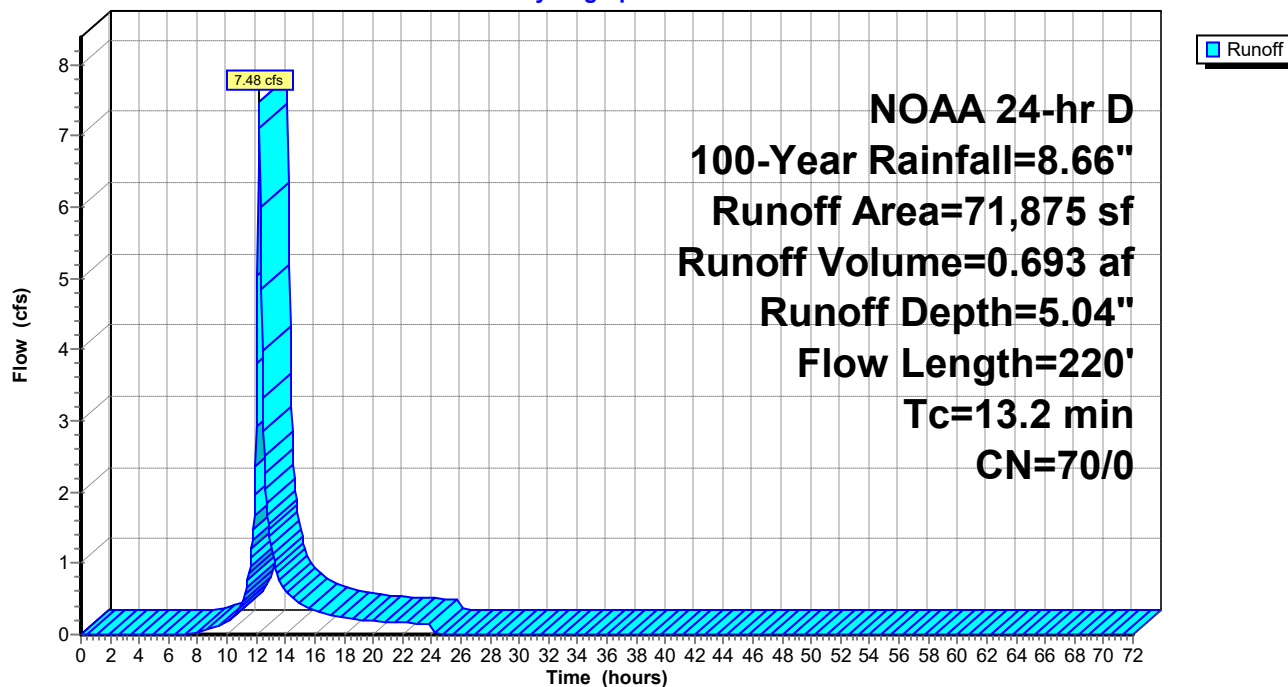
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
71,875	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0800	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.3	120	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.2	220	Total			

Subcatchment 42S: Basin 2-5 predevelopment

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 32

Hydrograph for Subcatchment 42S: Basin 2-5 predevelopment

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
10.00	1.72	0.14	0.00	0.18
12.50	5.91	2.74	0.00	2.84
15.00	7.29	3.86	0.00	0.42
17.50	7.84	4.33	0.00	0.26
20.00	8.21	4.64	0.00	0.19
22.50	8.51	4.90	0.00	0.16
25.00	8.66	5.04	0.00	0.00
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Summary for Pond 39P: pond 2-5

Inflow Area = 1.650 ac, Inflow Depth = 8.42" for 100-Year event
Inflow = 11.68 cfs @ 12.17 hrs, Volume= 1.158 af
Outflow = 1.16 cfs @ 13.26 hrs, Volume= 0.888 af, Atten= 90%, Lag= 65.6 min
Primary = 1.16 cfs @ 13.26 hrs, Volume= 0.888 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.27' @ 13.26 hrs Surf.Area= 11,558 sf Storage= 31,977 cf

Plug-Flow detention time= 438.9 min calculated for 0.888 af (77% of inflow)
Center-of-Mass det. time= 346.1 min (1,090.8 - 744.7)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	40,453 cf	540 (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	11,558	0	0
544.00	11,558	40,453	40,453

Device	Routing	Invert	Outlet Devices
#1	Primary	541.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.16 cfs @ 13.26 hrs HW=543.27' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 1.16 cfs @ 5.93 fps)

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

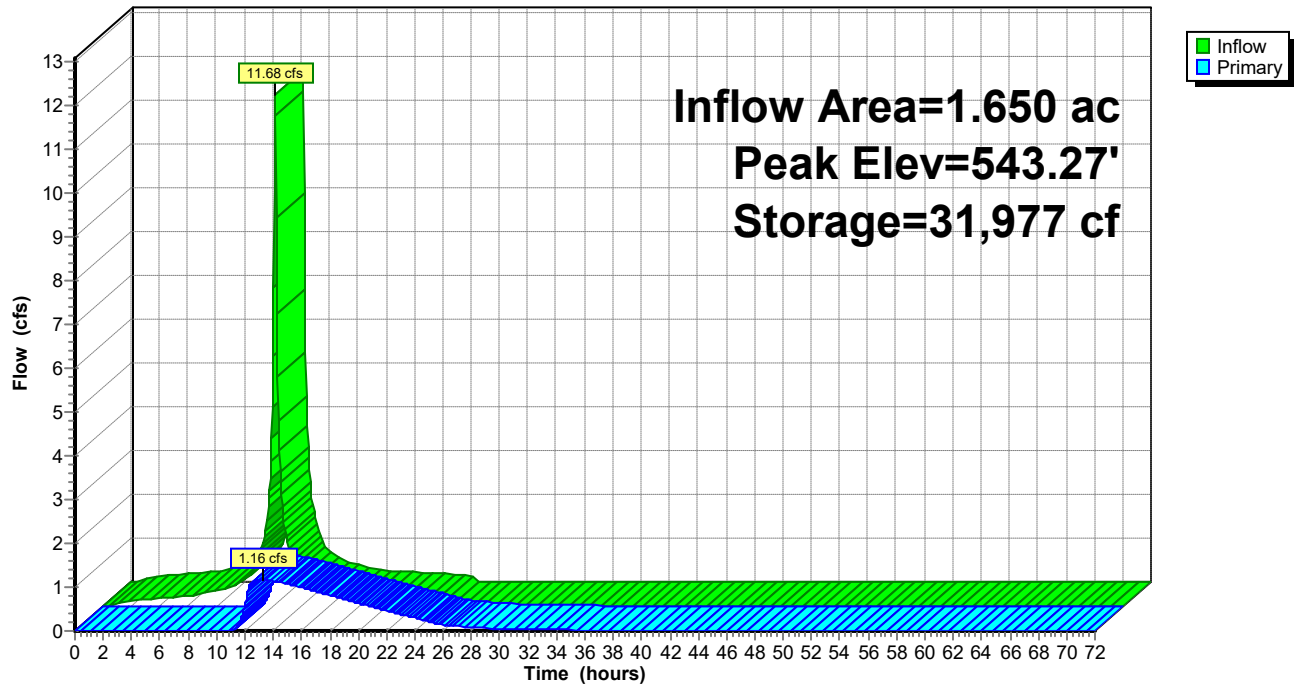
Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Pond 39P: pond 2-5

Hydrograph



Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Hydrograph for Pond 39P: pond 2-5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.15	624	540.55	0.00
5.00	0.22	2,288	540.70	0.00
7.50	0.33	4,628	540.90	0.00
10.00	0.64	8,585	541.24	0.00
12.50	3.10	30,146	543.11	1.10
15.00	0.49	29,442	543.05	1.08
17.50	0.30	24,098	542.58	0.86
20.00	0.22	19,608	542.20	0.63
22.50	0.18	16,724	541.95	0.42
25.00	0.00	14,856	541.79	0.21
27.50	0.00	13,607	541.68	0.09
30.00	0.00	13,017	541.63	0.05
32.50	0.00	12,682	541.60	0.03
35.00	0.00	12,469	541.58	0.02
37.50	0.00	12,319	541.57	0.01
40.00	0.00	12,209	541.56	0.01
42.50	0.00	12,129	541.55	0.01
45.00	0.00	12,066	541.54	0.01
47.50	0.00	12,011	541.54	0.01
50.00	0.00	11,964	541.54	0.00
52.50	0.00	11,925	541.53	0.00
55.00	0.00	11,890	541.53	0.00
57.50	0.00	11,861	541.53	0.00
60.00	0.00	11,836	541.52	0.00
62.50	0.00	11,815	541.52	0.00
65.00	0.00	11,797	541.52	0.00
67.50	0.00	11,782	541.52	0.00
70.00	0.00	11,768	541.52	0.00

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Stage-Discharge for Pond 39P: pond 2-5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.84	543.56	1.27
540.52	0.00	541.54	0.01	542.56	0.85	543.58	1.28
540.54	0.00	541.56	0.01	542.58	0.86	543.60	1.29
540.56	0.00	541.58	0.02	542.60	0.87	543.62	1.29
540.58	0.00	541.60	0.03	542.62	0.88	543.64	1.30
540.60	0.00	541.62	0.04	542.64	0.89	543.66	1.31
540.62	0.00	541.64	0.06	542.66	0.90	543.68	1.31
540.64	0.00	541.66	0.07	542.68	0.91	543.70	1.32
540.66	0.00	541.68	0.09	542.70	0.92	543.72	1.33
540.68	0.00	541.70	0.11	542.72	0.93	543.74	1.33
540.70	0.00	541.72	0.13	542.74	0.94	543.76	1.34
540.72	0.00	541.74	0.16	542.76	0.95	543.78	1.35
540.74	0.00	541.76	0.18	542.78	0.96	543.80	1.35
540.76	0.00	541.78	0.20	542.80	0.97	543.82	1.36
540.78	0.00	541.80	0.23	542.82	0.98	543.84	1.37
540.80	0.00	541.82	0.26	542.84	0.99	543.86	1.37
540.82	0.00	541.84	0.28	542.86	1.00	543.88	1.38
540.84	0.00	541.86	0.31	542.88	1.00	543.90	1.39
540.86	0.00	541.88	0.34	542.90	1.01	543.92	1.39
540.88	0.00	541.90	0.36	542.92	1.02	543.94	1.40
540.90	0.00	541.92	0.39	542.94	1.03	543.96	1.41
540.92	0.00	541.94	0.41	542.96	1.04	543.98	1.41
540.94	0.00	541.96	0.44	542.98	1.05	544.00	1.42
540.96	0.00	541.98	0.46	543.00	1.06		
540.98	0.00	542.00	0.47	543.02	1.07		
541.00	0.00	542.02	0.49	543.04	1.07		
541.02	0.00	542.04	0.51	543.06	1.08		
541.04	0.00	542.06	0.53	543.08	1.09		
541.06	0.00	542.08	0.54	543.10	1.10		
541.08	0.00	542.10	0.56	543.12	1.11		
541.10	0.00	542.12	0.58	543.14	1.11		
541.12	0.00	542.14	0.59	543.16	1.12		
541.14	0.00	542.16	0.61	543.18	1.13		
541.16	0.00	542.18	0.62	543.20	1.14		
541.18	0.00	542.20	0.63	543.22	1.15		
541.20	0.00	542.22	0.65	543.24	1.15		
541.22	0.00	542.24	0.66	543.26	1.16		
541.24	0.00	542.26	0.68	543.28	1.17		
541.26	0.00	542.28	0.69	543.30	1.18		
541.28	0.00	542.30	0.70	543.32	1.18		
541.30	0.00	542.32	0.71	543.34	1.19		
541.32	0.00	542.34	0.73	543.36	1.20		
541.34	0.00	542.36	0.74	543.38	1.21		
541.36	0.00	542.38	0.75	543.40	1.21		
541.38	0.00	542.40	0.76	543.42	1.22		
541.40	0.00	542.42	0.77	543.44	1.23		
541.42	0.00	542.44	0.79	543.46	1.24		
541.44	0.00	542.46	0.80	543.48	1.24		
541.46	0.00	542.48	0.81	543.50	1.25		
541.48	0.00	542.50	0.82	543.52	1.26		
541.50	0.00	542.52	0.83	543.54	1.26		

Proposed Basin 2-5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

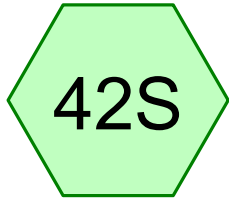
Basin 2-5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Stage-Area-Storage for Pond 39P: pond 2-5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	11,558	0	543.05	11,558	29,473
540.55	11,558	578	543.10	11,558	30,051
540.60	11,558	1,156	543.15	11,558	30,629
540.65	11,558	1,734	543.20	11,558	31,207
540.70	11,558	2,312	543.25	11,558	31,785
540.75	11,558	2,890	543.30	11,558	32,362
540.80	11,558	3,467	543.35	11,558	32,940
540.85	11,558	4,045	543.40	11,558	33,518
540.90	11,558	4,623	543.45	11,558	34,096
540.95	11,558	5,201	543.50	11,558	34,674
541.00	11,558	5,779	543.55	11,558	35,252
541.05	11,558	6,357	543.60	11,558	35,830
541.10	11,558	6,935	543.65	11,558	36,408
541.15	11,558	7,513	543.70	11,558	36,986
541.20	11,558	8,091	543.75	11,558	37,564
541.25	11,558	8,669	543.80	11,558	38,141
541.30	11,558	9,246	543.85	11,558	38,719
541.35	11,558	9,824	543.90	11,558	39,297
541.40	11,558	10,402	543.95	11,558	39,875
541.45	11,558	10,980	544.00	11,558	40,453
541.50	11,558	11,558			
541.55	11,558	12,136			
541.60	11,558	12,714			
541.65	11,558	13,292			
541.70	11,558	13,870			
541.75	11,558	14,448			
541.80	11,558	15,025			
541.85	11,558	15,603			
541.90	11,558	16,181			
541.95	11,558	16,759			
542.00	11,558	17,337			
542.05	11,558	17,915			
542.10	11,558	18,493			
542.15	11,558	19,071			
542.20	11,558	19,649			
542.25	11,558	20,227			
542.30	11,558	20,804			
542.35	11,558	21,382			
542.40	11,558	21,960			
542.45	11,558	22,538			
542.50	11,558	23,116			
542.55	11,558	23,694			
542.60	11,558	24,272			
542.65	11,558	24,850			
542.70	11,558	25,428			
542.75	11,558	26,006			
542.80	11,558	26,583			
542.85	11,558	27,161			
542.90	11,558	27,739			
542.95	11,558	28,317			
543.00	11,558	28,895			



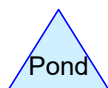
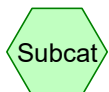
basin 2-6
pre-development



Basin 2-6



Pond 2-6



Routing Diagram for Proposed basin 2-6 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.594	98	Roofs, HSG C (36S)
0.248	98	Water Surface, 0% imp, HSG C (36S)
1.842	70	Woods, Good, HSG C (42S)
3.683	84	TOTAL AREA

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.683	HSG C	36S, 42S
0.000	HSG D	
0.000	Other	
3.683		TOTAL AREA

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.594	0.000	0.000	1.594	Roofs	36S
0.000	0.000	0.248	0.000	0.000	0.248	Water Surface, 0% imp	36S
0.000	0.000	1.842	0.000	0.000	1.842	Woods, Good	42S
0.000	0.000	3.683	0.000	0.000	3.683	TOTAL AREA	

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	36S	0.00	0.00	1,622.0	0.0370	0.013	0.0	12.0	7.0	

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-6

Runoff Area=80,223 sf Runoff Depth=3.21"

Flow Length=1,762' Tc=10.0 min CN=98/98 Runoff=5.13 cfs 0.492 af

Subcatchment 42S: basin 2-6 pre-development

Runoff Area=80,223 sf Runoff Depth=0.97"

Flow Length=230' Tc=17.3 min CN=70/0 Runoff=1.32 cfs 0.149 af

Pond 37P: Pond 2-6

Peak Elev=542.06' Storage=16,822 cf Inflow=5.13 cfs 0.492 af

Outflow=0.18 cfs 0.167 af

Total Runoff Area = 3.683 ac Runoff Volume = 0.641 af Average Runoff Depth = 2.09"

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 36S: Basin 2-6

[47] Hint: Peak is 294% of capacity of segment #3

Runoff = 5.13 cfs @ 12.17 hrs, Volume= 0.492 af, Depth= 3.21"
Routed to Pond 37P : Pond 2-6

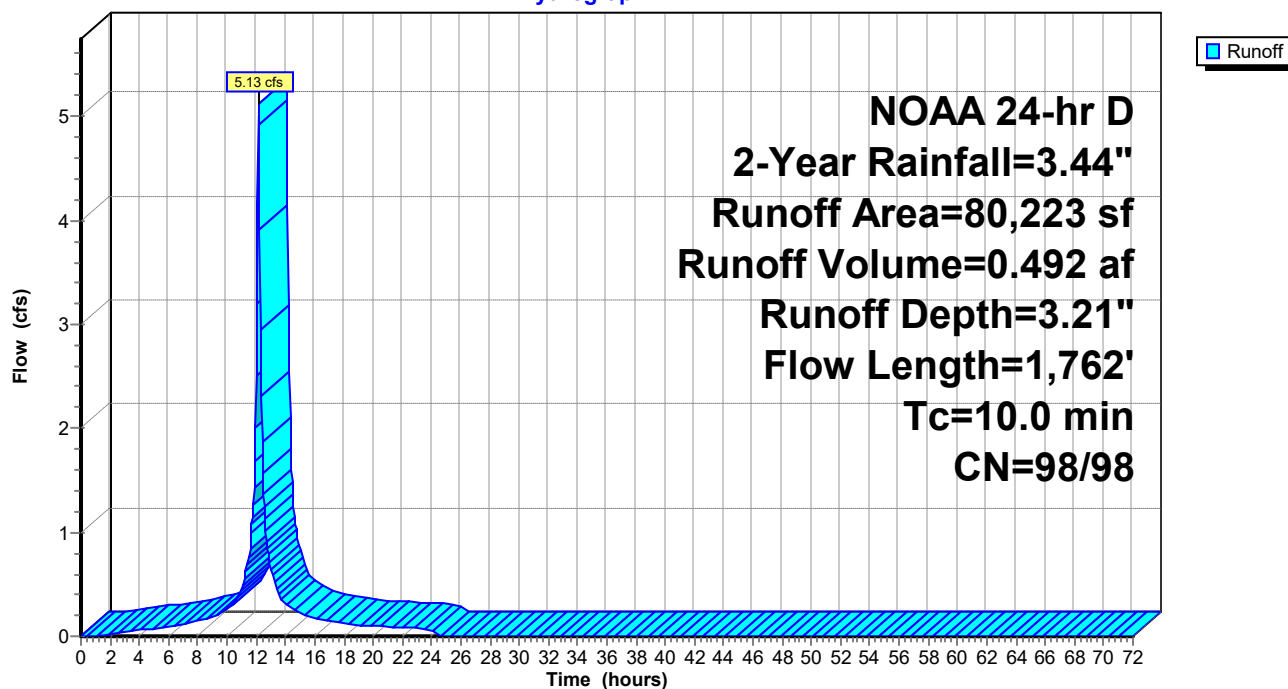
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
69,441	98	Roofs, HSG C
10,782	98	Water Surface, 0% imp, HSG C
80,223	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	40	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
4.8	1,622	0.0370	5.63	1.74	Pipe Channel, 12.0" Round w/ 7.0" inside fill Area= 0.3 sf Perim= 2.4' r= 0.13' n= 0.013
6.7	1,762	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Hydrograph for Subcatchment 36S: Basin 2-6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.02	0.02	0.03
5.00	0.24	0.09	0.09	0.08
7.50	0.40	0.23	0.23	0.13
10.00	0.68	0.49	0.49	0.27
12.50	2.35	2.12	2.12	1.37
15.00	2.89	2.66	2.66	0.22
17.50	3.11	2.88	2.88	0.13
20.00	3.26	3.03	3.03	0.10
22.50	3.38	3.15	3.15	0.08
25.00	3.44	3.21	3.21	0.00
27.50	3.44	3.21	3.21	0.00
30.00	3.44	3.21	3.21	0.00
32.50	3.44	3.21	3.21	0.00
35.00	3.44	3.21	3.21	0.00
37.50	3.44	3.21	3.21	0.00
40.00	3.44	3.21	3.21	0.00
42.50	3.44	3.21	3.21	0.00
45.00	3.44	3.21	3.21	0.00
47.50	3.44	3.21	3.21	0.00
50.00	3.44	3.21	3.21	0.00
52.50	3.44	3.21	3.21	0.00
55.00	3.44	3.21	3.21	0.00
57.50	3.44	3.21	3.21	0.00
60.00	3.44	3.21	3.21	0.00
62.50	3.44	3.21	3.21	0.00
65.00	3.44	3.21	3.21	0.00
67.50	3.44	3.21	3.21	0.00
70.00	3.44	3.21	3.21	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 42S: basin 2-6 pre-development

Runoff = 1.32 cfs @ 12.28 hrs, Volume= 0.149 af, Depth= 0.97"

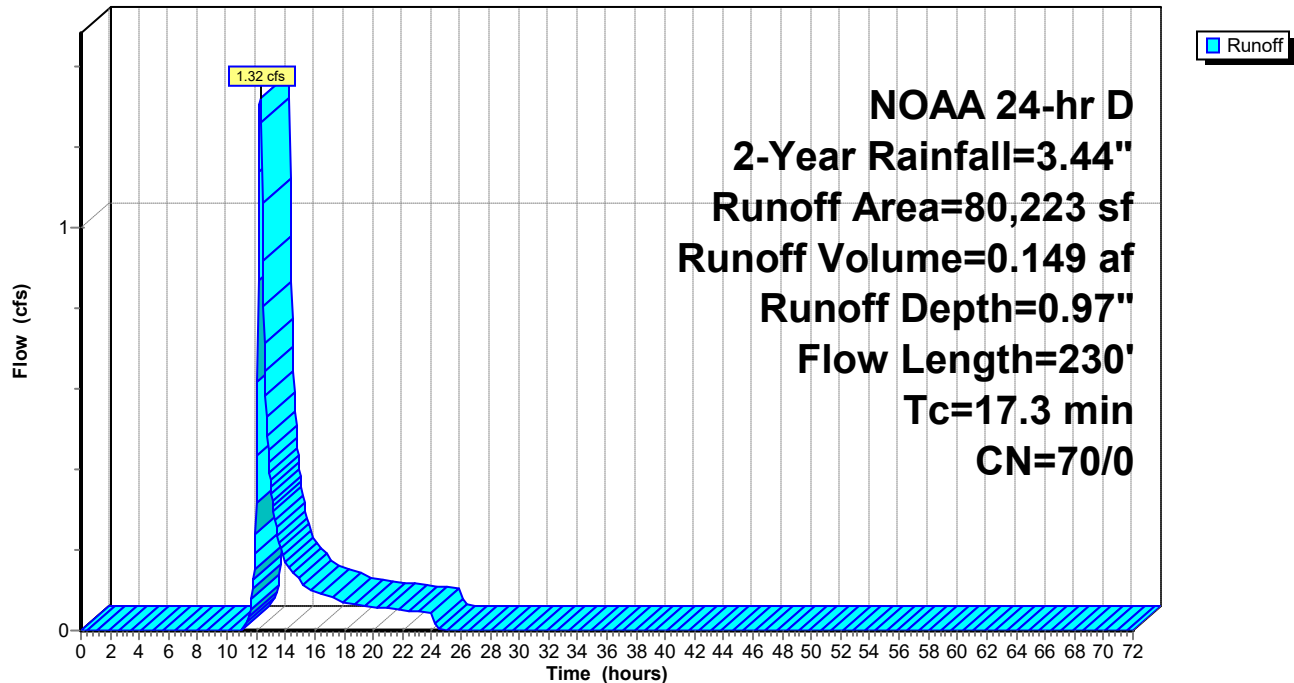
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
80,223	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.6	130	0.0700	1.32		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
17.3	230	Total			

Subcatchment 42S: basin 2-6 pre-development

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Hydrograph for Subcatchment 42S: basin 2-6 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	0.80
15.00	2.89	0.66	0.00	0.12
17.50	3.11	0.78	0.00	0.08
20.00	3.26	0.86	0.00	0.06
22.50	3.38	0.93	0.00	0.05
25.00	3.44	0.97	0.00	0.00
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Summary for Pond 37P: Pond 2-6

Inflow Area = 1.842 ac, Inflow Depth = 3.21" for 2-Year event
Inflow = 5.13 cfs @ 12.17 hrs, Volume= 0.492 af
Outflow = 0.18 cfs @ 15.80 hrs, Volume= 0.167 af, Atten= 96%, Lag= 217.8 min
Primary = 0.18 cfs @ 15.80 hrs, Volume= 0.167 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 542.06' @ 15.80 hrs Surf.Area= 10,782 sf Storage= 16,822 cf

Plug-Flow detention time= 738.3 min calculated for 0.167 af (34% of inflow)
Center-of-Mass det. time= 551.4 min (1,311.9 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	37,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	10,782	0	0
544.00	10,782	37,737	37,737

Device	Routing	Invert	Outlet Devices
#1	Primary	541.80'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 15.80 hrs HW=542.06' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 0.18 cfs @ 1.74 fps)

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

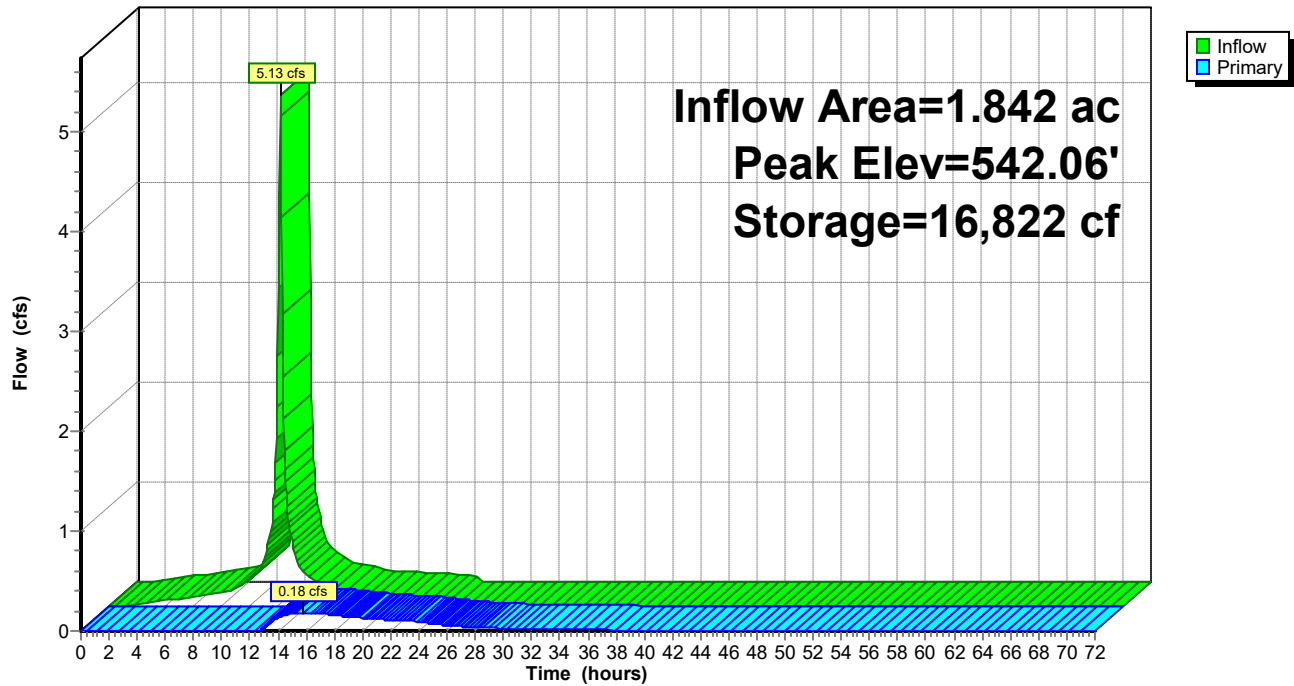
Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Pond 37P: Pond 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Hydrograph for Pond 37P: Pond 2-6

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.03	85	540.51	0.00
5.00	0.08	591	540.55	0.00
7.50	0.13	1,472	540.64	0.00
10.00	0.27	3,098	540.79	0.00
12.50	1.37	13,488	541.75	0.00
15.00	0.22	16,780	542.06	0.18
17.50	0.13	16,703	542.05	0.17
20.00	0.10	16,362	542.02	0.13
22.50	0.08	16,112	541.99	0.11
25.00	0.00	15,717	541.96	0.07
27.50	0.00	15,239	541.91	0.04
30.00	0.00	14,965	541.89	0.02
32.50	0.00	14,786	541.87	0.02
35.00	0.00	14,665	541.86	0.01
37.50	0.00	14,572	541.85	0.01
40.00	0.00	14,499	541.84	0.01
42.50	0.00	14,442	541.84	0.01
45.00	0.00	14,398	541.84	0.00
47.50	0.00	14,363	541.83	0.00
50.00	0.00	14,335	541.83	0.00
52.50	0.00	14,311	541.83	0.00
55.00	0.00	14,288	541.83	0.00
57.50	0.00	14,268	541.82	0.00
60.00	0.00	14,249	541.82	0.00
62.50	0.00	14,231	541.82	0.00
65.00	0.00	14,215	541.82	0.00
67.50	0.00	14,200	541.82	0.00
70.00	0.00	14,186	541.82	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Stage-Discharge for Pond 37P: Pond 2-6

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.66	543.56	1.16
540.52	0.00	541.54	0.00	542.56	0.68	543.58	1.17
540.54	0.00	541.56	0.00	542.58	0.69	543.60	1.18
540.56	0.00	541.58	0.00	542.60	0.70	543.62	1.18
540.58	0.00	541.60	0.00	542.62	0.71	543.64	1.19
540.60	0.00	541.62	0.00	542.64	0.73	543.66	1.20
540.62	0.00	541.64	0.00	542.66	0.74	543.68	1.21
540.64	0.00	541.66	0.00	542.68	0.75	543.70	1.21
540.66	0.00	541.68	0.00	542.70	0.76	543.72	1.22
540.68	0.00	541.70	0.00	542.72	0.77	543.74	1.23
540.70	0.00	541.72	0.00	542.74	0.79	543.76	1.24
540.72	0.00	541.74	0.00	542.76	0.80	543.78	1.24
540.74	0.00	541.76	0.00	542.78	0.81	543.80	1.25
540.76	0.00	541.78	0.00	542.80	0.82	543.82	1.26
540.78	0.00	541.80	0.00	542.82	0.83	543.84	1.26
540.80	0.00	541.82	0.00	542.84	0.84	543.86	1.27
540.82	0.00	541.84	0.01	542.86	0.85	543.88	1.28
540.84	0.00	541.86	0.01	542.88	0.86	543.90	1.29
540.86	0.00	541.88	0.02	542.90	0.87	543.92	1.29
540.88	0.00	541.90	0.03	542.92	0.88	543.94	1.30
540.90	0.00	541.92	0.04	542.94	0.89	543.96	1.31
540.92	0.00	541.94	0.06	542.96	0.90	543.98	1.31
540.94	0.00	541.96	0.07	542.98	0.91	544.00	1.32
540.96	0.00	541.98	0.09	543.00	0.92		
540.98	0.00	542.00	0.11	543.02	0.93		
541.00	0.00	542.02	0.13	543.04	0.94		
541.02	0.00	542.04	0.16	543.06	0.95		
541.04	0.00	542.06	0.18	543.08	0.96		
541.06	0.00	542.08	0.20	543.10	0.97		
541.08	0.00	542.10	0.23	543.12	0.98		
541.10	0.00	542.12	0.26	543.14	0.99		
541.12	0.00	542.14	0.28	543.16	1.00		
541.14	0.00	542.16	0.31	543.18	1.00		
541.16	0.00	542.18	0.34	543.20	1.01		
541.18	0.00	542.20	0.36	543.22	1.02		
541.20	0.00	542.22	0.39	543.24	1.03		
541.22	0.00	542.24	0.41	543.26	1.04		
541.24	0.00	542.26	0.44	543.28	1.05		
541.26	0.00	542.28	0.46	543.30	1.06		
541.28	0.00	542.30	0.47	543.32	1.07		
541.30	0.00	542.32	0.49	543.34	1.07		
541.32	0.00	542.34	0.51	543.36	1.08		
541.34	0.00	542.36	0.53	543.38	1.09		
541.36	0.00	542.38	0.54	543.40	1.10		
541.38	0.00	542.40	0.56	543.42	1.11		
541.40	0.00	542.42	0.58	543.44	1.11		
541.42	0.00	542.44	0.59	543.46	1.12		
541.44	0.00	542.46	0.61	543.48	1.13		
541.46	0.00	542.48	0.62	543.50	1.14		
541.48	0.00	542.50	0.63	543.52	1.15		
541.50	0.00	542.52	0.65	543.54	1.15		

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Stage-Area-Storage for Pond 37P: Pond 2-6

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	10,782	0	543.05	10,782	27,494
540.55	10,782	539	543.10	10,782	28,033
540.60	10,782	1,078	543.15	10,782	28,572
540.65	10,782	1,617	543.20	10,782	29,111
540.70	10,782	2,156	543.25	10,782	29,651
540.75	10,782	2,696	543.30	10,782	30,190
540.80	10,782	3,235	543.35	10,782	30,729
540.85	10,782	3,774	543.40	10,782	31,268
540.90	10,782	4,313	543.45	10,782	31,807
540.95	10,782	4,852	543.50	10,782	32,346
541.00	10,782	5,391	543.55	10,782	32,885
541.05	10,782	5,930	543.60	10,782	33,424
541.10	10,782	6,469	543.65	10,782	33,963
541.15	10,782	7,008	543.70	10,782	34,502
541.20	10,782	7,547	543.75	10,782	35,042
541.25	10,782	8,087	543.80	10,782	35,581
541.30	10,782	8,626	543.85	10,782	36,120
541.35	10,782	9,165	543.90	10,782	36,659
541.40	10,782	9,704	543.95	10,782	37,198
541.45	10,782	10,243	544.00	10,782	37,737
541.50	10,782	10,782			
541.55	10,782	11,321			
541.60	10,782	11,860			
541.65	10,782	12,399			
541.70	10,782	12,938			
541.75	10,782	13,478			
541.80	10,782	14,017			
541.85	10,782	14,556			
541.90	10,782	15,095			
541.95	10,782	15,634			
542.00	10,782	16,173			
542.05	10,782	16,712			
542.10	10,782	17,251			
542.15	10,782	17,790			
542.20	10,782	18,329			
542.25	10,782	18,869			
542.30	10,782	19,408			
542.35	10,782	19,947			
542.40	10,782	20,486			
542.45	10,782	21,025			
542.50	10,782	21,564			
542.55	10,782	22,103			
542.60	10,782	22,642			
542.65	10,782	23,181			
542.70	10,782	23,720			
542.75	10,782	24,260			
542.80	10,782	24,799			
542.85	10,782	25,338			
542.90	10,782	25,877			
542.95	10,782	26,416			
543.00	10,782	26,955			

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 18

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-6

Runoff Area=80,223 sf Runoff Depth=4.98"

Flow Length=1,762' Tc=10.0 min CN=98/98 Runoff=7.83 cfs 0.765 af

Subcatchment 42S: basin 2-6 pre-development

Runoff Area=80,223 sf Runoff Depth=2.20"

Flow Length=230' Tc=17.3 min CN=70/0 Runoff=3.23 cfs 0.338 af

Pond 37P: Pond 2-6

Peak Elev=542.57' Storage=22,303 cf Inflow=7.83 cfs 0.765 af

Outflow=0.68 cfs 0.439 af

Total Runoff Area = 3.683 ac Runoff Volume = 1.103 af Average Runoff Depth = 3.59"

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 19

Summary for Subcatchment 36S: Basin 2-6

[47] Hint: Peak is 449% of capacity of segment #3

Runoff = 7.83 cfs @ 12.17 hrs, Volume= 0.765 af, Depth= 4.98"
Routed to Pond 37P : Pond 2-6

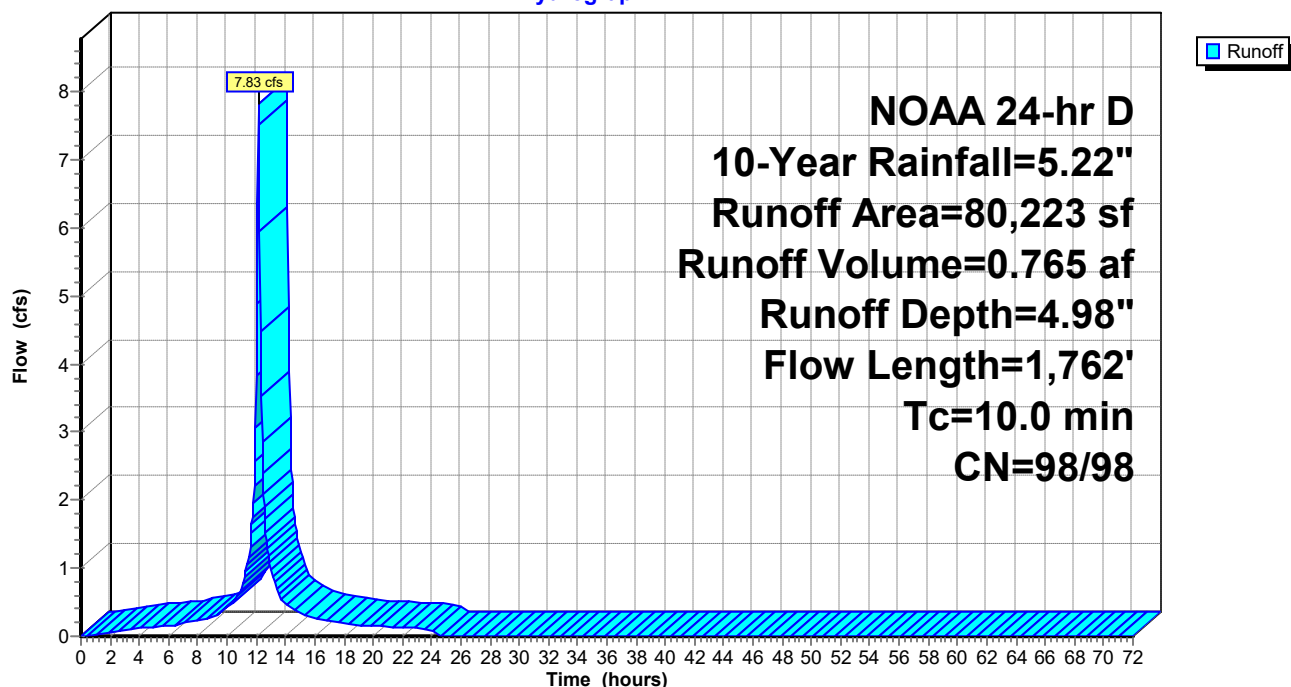
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
69,441	98	Roofs, HSG C
10,782	98	Water Surface, 0% imp, HSG C
80,223	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	40	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
4.8	1,622	0.0370	5.63	1.74	Pipe Channel, 12.0" Round w/ 7.0" inside fill Area= 0.3 sf Perim= 2.4' r= 0.13' n= 0.013
6.7	1,762	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Hydrograph for Subcatchment 36S: Basin 2-6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.04	0.04	0.08
5.00	0.36	0.19	0.19	0.13
7.50	0.61	0.42	0.42	0.21
10.00	1.03	0.82	0.82	0.42
12.50	3.57	3.33	3.33	2.08
15.00	4.39	4.16	4.16	0.33
17.50	4.73	4.49	4.49	0.20
20.00	4.95	4.71	4.71	0.15
22.50	5.13	4.89	4.89	0.12
25.00	5.22	4.98	4.98	0.00
27.50	5.22	4.98	4.98	0.00
30.00	5.22	4.98	4.98	0.00
32.50	5.22	4.98	4.98	0.00
35.00	5.22	4.98	4.98	0.00
37.50	5.22	4.98	4.98	0.00
40.00	5.22	4.98	4.98	0.00
42.50	5.22	4.98	4.98	0.00
45.00	5.22	4.98	4.98	0.00
47.50	5.22	4.98	4.98	0.00
50.00	5.22	4.98	4.98	0.00
52.50	5.22	4.98	4.98	0.00
55.00	5.22	4.98	4.98	0.00
57.50	5.22	4.98	4.98	0.00
60.00	5.22	4.98	4.98	0.00
62.50	5.22	4.98	4.98	0.00
65.00	5.22	4.98	4.98	0.00
67.50	5.22	4.98	4.98	0.00
70.00	5.22	4.98	4.98	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Summary for Subcatchment 42S: basin 2-6 pre-development

Runoff = 3.23 cfs @ 12.27 hrs, Volume= 0.338 af, Depth= 2.20"

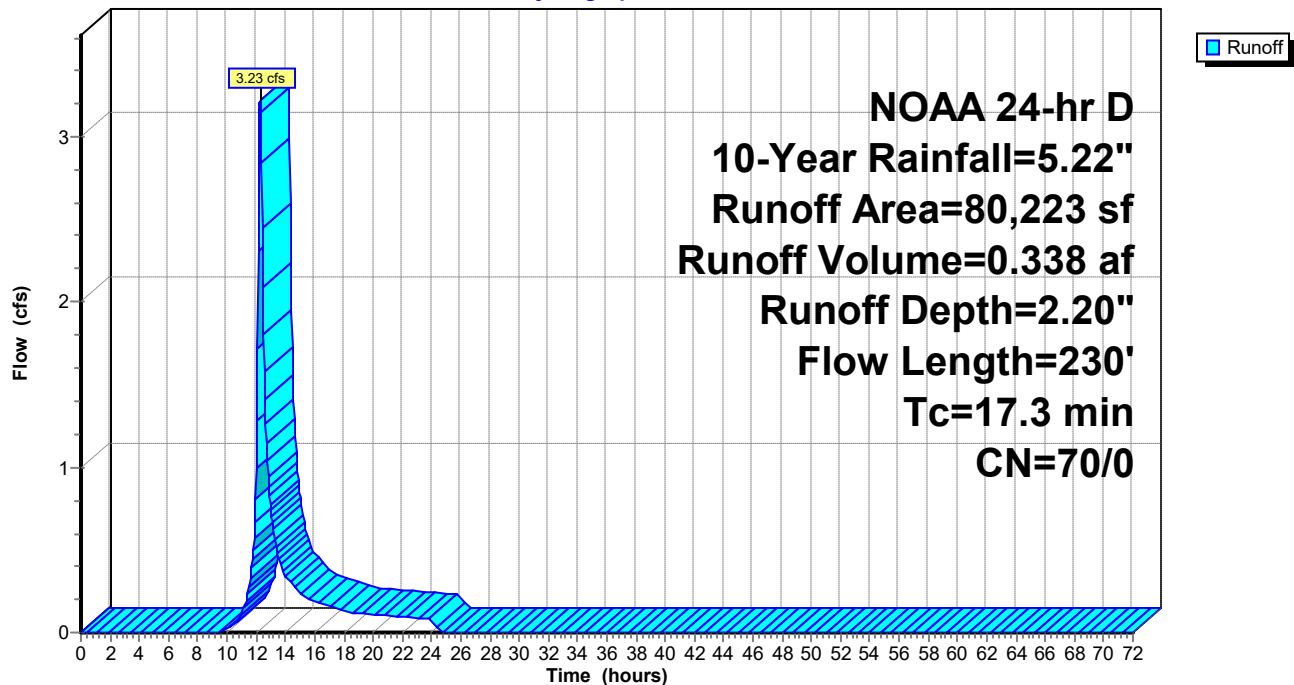
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
80,223	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.6	130	0.0700	1.32		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
17.3	230	Total			

Subcatchment 42S: basin 2-6 pre-development

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 42S: basin 2-6 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.02
12.50	3.57	1.05	0.00	1.81
15.00	4.39	1.60	0.00	0.24
17.50	4.73	1.83	0.00	0.15
20.00	4.95	2.00	0.00	0.11
22.50	5.13	2.13	0.00	0.09
25.00	5.22	2.20	0.00	0.00
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Pond 37P: Pond 2-6

Inflow Area = 1.842 ac, Inflow Depth = 4.98" for 10-Year event
Inflow = 7.83 cfs @ 12.17 hrs, Volume= 0.765 af
Outflow = 0.68 cfs @ 13.43 hrs, Volume= 0.439 af, Atten= 91%, Lag= 75.9 min
Primary = 0.68 cfs @ 13.43 hrs, Volume= 0.439 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 542.57' @ 13.43 hrs Surf.Area= 10,782 sf Storage= 22,303 cf

Plug-Flow detention time= 483.2 min calculated for 0.439 af (57% of inflow)
Center-of-Mass det. time= 355.7 min (1,108.0 - 752.2)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	37,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	10,782	0	0
544.00	10,782	37,737	37,737

Device	Routing	Invert	Outlet Devices
#1	Primary	541.80'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.68 cfs @ 13.43 hrs HW=542.57' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.68 cfs @ 3.47 fps)

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

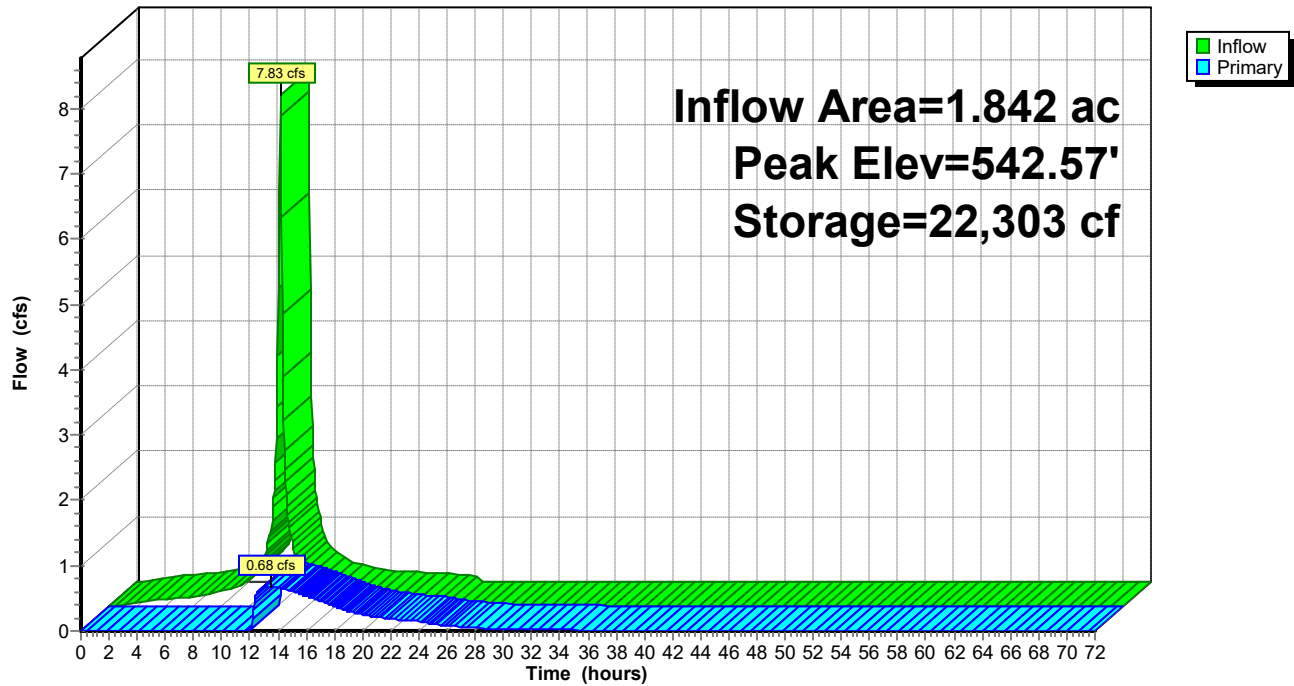
Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Pond 37P: Pond 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Hydrograph for Pond 37P: Pond 2-6

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.08	252	540.52	0.00
5.00	0.13	1,210	540.61	0.00
7.50	0.21	2,685	540.75	0.00
10.00	0.42	5,273	540.99	0.00
12.50	2.08	20,704	542.42	0.58
15.00	0.33	21,215	542.47	0.61
17.50	0.20	18,847	542.25	0.42
20.00	0.15	17,419	542.12	0.25
22.50	0.12	16,780	542.06	0.18
25.00	0.00	16,129	542.00	0.11
27.50	0.00	15,450	541.93	0.05
30.00	0.00	15,090	541.90	0.03
32.50	0.00	14,869	541.88	0.02
35.00	0.00	14,722	541.87	0.01
37.50	0.00	14,617	541.86	0.01
40.00	0.00	14,535	541.85	0.01
42.50	0.00	14,470	541.84	0.01
45.00	0.00	14,419	541.84	0.00
47.50	0.00	14,380	541.83	0.00
50.00	0.00	14,348	541.83	0.00
52.50	0.00	14,323	541.83	0.00
55.00	0.00	14,300	541.83	0.00
57.50	0.00	14,278	541.82	0.00
60.00	0.00	14,258	541.82	0.00
62.50	0.00	14,240	541.82	0.00
65.00	0.00	14,223	541.82	0.00
67.50	0.00	14,207	541.82	0.00
70.00	0.00	14,193	541.82	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Stage-Discharge for Pond 37P: Pond 2-6

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.66	543.56	1.16
540.52	0.00	541.54	0.00	542.56	0.68	543.58	1.17
540.54	0.00	541.56	0.00	542.58	0.69	543.60	1.18
540.56	0.00	541.58	0.00	542.60	0.70	543.62	1.18
540.58	0.00	541.60	0.00	542.62	0.71	543.64	1.19
540.60	0.00	541.62	0.00	542.64	0.73	543.66	1.20
540.62	0.00	541.64	0.00	542.66	0.74	543.68	1.21
540.64	0.00	541.66	0.00	542.68	0.75	543.70	1.21
540.66	0.00	541.68	0.00	542.70	0.76	543.72	1.22
540.68	0.00	541.70	0.00	542.72	0.77	543.74	1.23
540.70	0.00	541.72	0.00	542.74	0.79	543.76	1.24
540.72	0.00	541.74	0.00	542.76	0.80	543.78	1.24
540.74	0.00	541.76	0.00	542.78	0.81	543.80	1.25
540.76	0.00	541.78	0.00	542.80	0.82	543.82	1.26
540.78	0.00	541.80	0.00	542.82	0.83	543.84	1.26
540.80	0.00	541.82	0.00	542.84	0.84	543.86	1.27
540.82	0.00	541.84	0.01	542.86	0.85	543.88	1.28
540.84	0.00	541.86	0.01	542.88	0.86	543.90	1.29
540.86	0.00	541.88	0.02	542.90	0.87	543.92	1.29
540.88	0.00	541.90	0.03	542.92	0.88	543.94	1.30
540.90	0.00	541.92	0.04	542.94	0.89	543.96	1.31
540.92	0.00	541.94	0.06	542.96	0.90	543.98	1.31
540.94	0.00	541.96	0.07	542.98	0.91	544.00	1.32
540.96	0.00	541.98	0.09	543.00	0.92		
540.98	0.00	542.00	0.11	543.02	0.93		
541.00	0.00	542.02	0.13	543.04	0.94		
541.02	0.00	542.04	0.16	543.06	0.95		
541.04	0.00	542.06	0.18	543.08	0.96		
541.06	0.00	542.08	0.20	543.10	0.97		
541.08	0.00	542.10	0.23	543.12	0.98		
541.10	0.00	542.12	0.26	543.14	0.99		
541.12	0.00	542.14	0.28	543.16	1.00		
541.14	0.00	542.16	0.31	543.18	1.00		
541.16	0.00	542.18	0.34	543.20	1.01		
541.18	0.00	542.20	0.36	543.22	1.02		
541.20	0.00	542.22	0.39	543.24	1.03		
541.22	0.00	542.24	0.41	543.26	1.04		
541.24	0.00	542.26	0.44	543.28	1.05		
541.26	0.00	542.28	0.46	543.30	1.06		
541.28	0.00	542.30	0.47	543.32	1.07		
541.30	0.00	542.32	0.49	543.34	1.07		
541.32	0.00	542.34	0.51	543.36	1.08		
541.34	0.00	542.36	0.53	543.38	1.09		
541.36	0.00	542.38	0.54	543.40	1.10		
541.38	0.00	542.40	0.56	543.42	1.11		
541.40	0.00	542.42	0.58	543.44	1.11		
541.42	0.00	542.44	0.59	543.46	1.12		
541.44	0.00	542.46	0.61	543.48	1.13		
541.46	0.00	542.48	0.62	543.50	1.14		
541.48	0.00	542.50	0.63	543.52	1.15		
541.50	0.00	542.52	0.65	543.54	1.15		

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Stage-Area-Storage for Pond 37P: Pond 2-6

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	10,782	0	543.05	10,782	27,494
540.55	10,782	539	543.10	10,782	28,033
540.60	10,782	1,078	543.15	10,782	28,572
540.65	10,782	1,617	543.20	10,782	29,111
540.70	10,782	2,156	543.25	10,782	29,651
540.75	10,782	2,696	543.30	10,782	30,190
540.80	10,782	3,235	543.35	10,782	30,729
540.85	10,782	3,774	543.40	10,782	31,268
540.90	10,782	4,313	543.45	10,782	31,807
540.95	10,782	4,852	543.50	10,782	32,346
541.00	10,782	5,391	543.55	10,782	32,885
541.05	10,782	5,930	543.60	10,782	33,424
541.10	10,782	6,469	543.65	10,782	33,963
541.15	10,782	7,008	543.70	10,782	34,502
541.20	10,782	7,547	543.75	10,782	35,042
541.25	10,782	8,087	543.80	10,782	35,581
541.30	10,782	8,626	543.85	10,782	36,120
541.35	10,782	9,165	543.90	10,782	36,659
541.40	10,782	9,704	543.95	10,782	37,198
541.45	10,782	10,243	544.00	10,782	37,737
541.50	10,782	10,782			
541.55	10,782	11,321			
541.60	10,782	11,860			
541.65	10,782	12,399			
541.70	10,782	12,938			
541.75	10,782	13,478			
541.80	10,782	14,017			
541.85	10,782	14,556			
541.90	10,782	15,095			
541.95	10,782	15,634			
542.00	10,782	16,173			
542.05	10,782	16,712			
542.10	10,782	17,251			
542.15	10,782	17,790			
542.20	10,782	18,329			
542.25	10,782	18,869			
542.30	10,782	19,408			
542.35	10,782	19,947			
542.40	10,782	20,486			
542.45	10,782	21,025			
542.50	10,782	21,564			
542.55	10,782	22,103			
542.60	10,782	22,642			
542.65	10,782	23,181			
542.70	10,782	23,720			
542.75	10,782	24,260			
542.80	10,782	24,799			
542.85	10,782	25,338			
542.90	10,782	25,877			
542.95	10,782	26,416			
543.00	10,782	26,955			

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 28

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-6

Runoff Area=80,223 sf Runoff Depth=8.42"

Flow Length=1,762' Tc=10.0 min CN=98/98 Runoff=13.04 cfs 1.292 af

Subcatchment 42S: basin 2-6 pre-development

Runoff Area=80,223 sf Runoff Depth=5.04"

Flow Length=230' Tc=17.3 min CN=70/0 Runoff=7.47 cfs 0.773 af

Pond 37P: Pond 2-6

Peak Elev=543.84' Storage=36,022 cf Inflow=13.04 cfs 1.292 af

Outflow=1.27 cfs 0.966 af

Total Runoff Area = 3.683 ac Runoff Volume = 2.065 af Average Runoff Depth = 6.73"

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 29

Summary for Subcatchment 36S: Basin 2-6

[47] Hint: Peak is 747% of capacity of segment #3

Runoff = 13.04 cfs @ 12.17 hrs, Volume= 1.292 af, Depth= 8.42"
Routed to Pond 37P : Pond 2-6

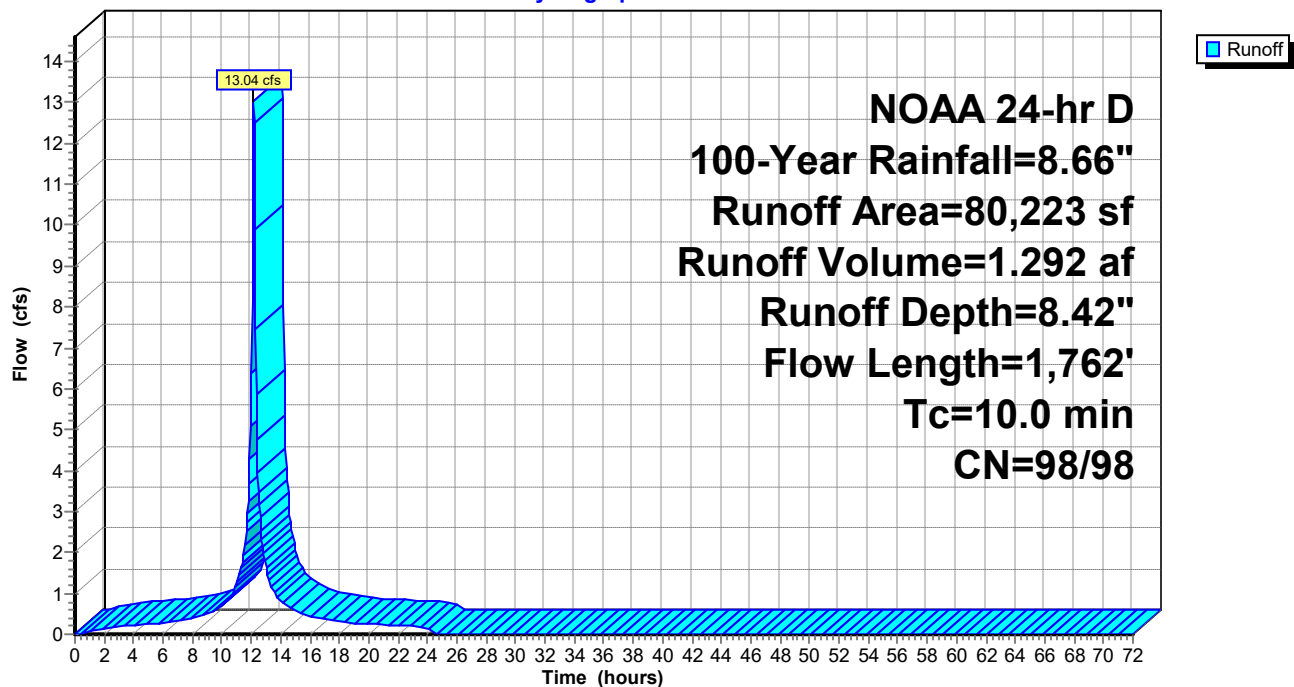
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
69,441	98	Roofs, HSG C
10,782	98	Water Surface, 0% imp, HSG C
80,223	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0100	1.08		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	40	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
4.8	1,622	0.0370	5.63	1.74	Pipe Channel, 12.0" Round w/ 7.0" inside fill Area= 0.3 sf Perim= 2.4' r= 0.13' n= 0.013
6.7	1,762	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 30

Hydrograph for Subcatchment 36S: Basin 2-6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.12	0.12	0.16
5.00	0.59	0.40	0.40	0.24
7.50	1.01	0.80	0.80	0.37
10.00	1.72	1.49	1.49	0.72
12.50	5.91	5.68	5.68	3.46
15.00	7.29	7.05	7.05	0.55
17.50	7.84	7.60	7.60	0.33
20.00	8.21	7.97	7.97	0.25
22.50	8.51	8.27	8.27	0.20
25.00	8.66	8.42	8.42	0.00
27.50	8.66	8.42	8.42	0.00
30.00	8.66	8.42	8.42	0.00
32.50	8.66	8.42	8.42	0.00
35.00	8.66	8.42	8.42	0.00
37.50	8.66	8.42	8.42	0.00
40.00	8.66	8.42	8.42	0.00
42.50	8.66	8.42	8.42	0.00
45.00	8.66	8.42	8.42	0.00
47.50	8.66	8.42	8.42	0.00
50.00	8.66	8.42	8.42	0.00
52.50	8.66	8.42	8.42	0.00
55.00	8.66	8.42	8.42	0.00
57.50	8.66	8.42	8.42	0.00
60.00	8.66	8.42	8.42	0.00
62.50	8.66	8.42	8.42	0.00
65.00	8.66	8.42	8.42	0.00
67.50	8.66	8.42	8.42	0.00
70.00	8.66	8.42	8.42	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 31

Summary for Subcatchment 42S: basin 2-6 pre-development

Runoff = 7.47 cfs @ 12.26 hrs, Volume= 0.773 af, Depth= 5.04"

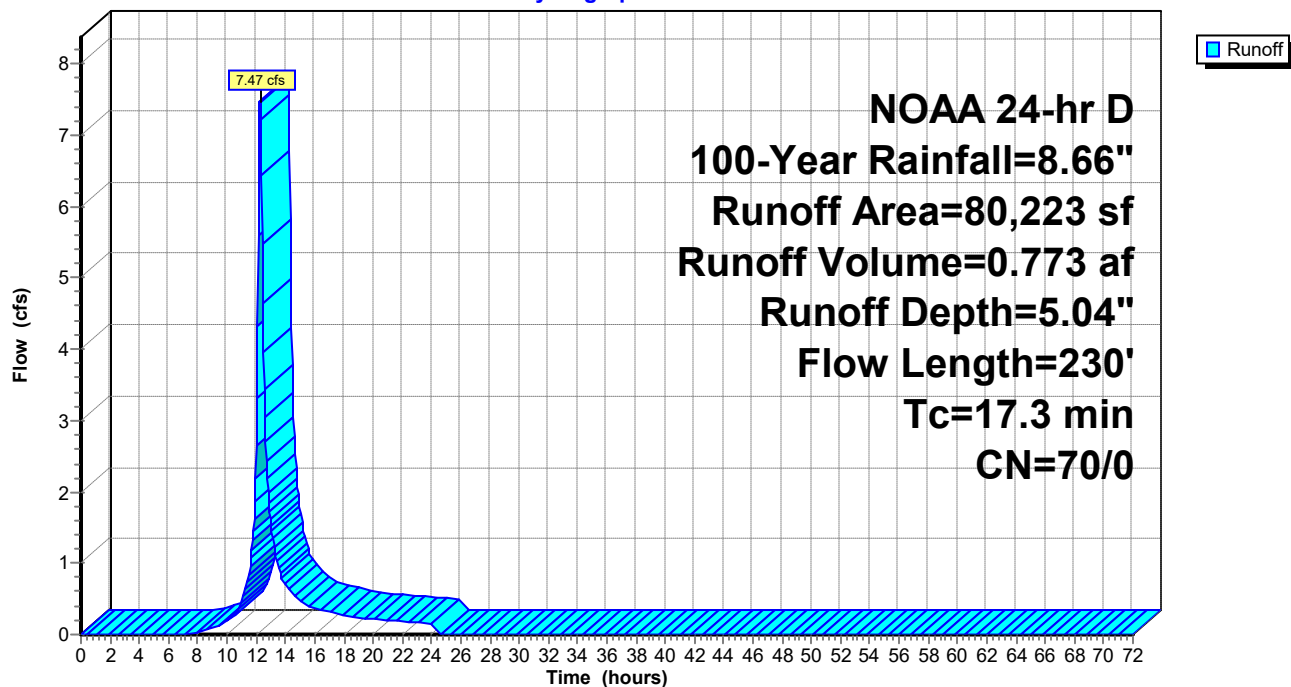
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
80,223	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.6	130	0.0700	1.32		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
17.3	230	Total			

Subcatchment 42S: basin 2-6 pre-development

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 32

Hydrograph for Subcatchment 42S: basin 2-6 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
10.00	1.72	0.14	0.00	0.19
12.50	5.91	2.74	0.00	3.96
15.00	7.29	3.86	0.00	0.48
17.50	7.84	4.33	0.00	0.29
20.00	8.21	4.64	0.00	0.22
22.50	8.51	4.90	0.00	0.18
25.00	8.66	5.04	0.00	0.00
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Summary for Pond 37P: Pond 2-6

Inflow Area = 1.842 ac, Inflow Depth = 8.42" for 100-Year event
Inflow = 13.04 cfs @ 12.17 hrs, Volume= 1.292 af
Outflow = 1.27 cfs @ 13.29 hrs, Volume= 0.966 af, Atten= 90%, Lag= 67.5 min
Primary = 1.27 cfs @ 13.29 hrs, Volume= 0.966 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.84' @ 13.29 hrs Surf.Area= 10,782 sf Storage= 36,022 cf

Plug-Flow detention time= 438.5 min calculated for 0.966 af (75% of inflow)
Center-of-Mass det. time= 341.7 min (1,086.4 - 744.7)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	37,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	10,782	0	0
544.00	10,782	37,737	37,737

Device	Routing	Invert	Outlet Devices
#1	Primary	541.80'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.27 cfs @ 13.29 hrs HW=543.84' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 1.27 cfs @ 6.44 fps)

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

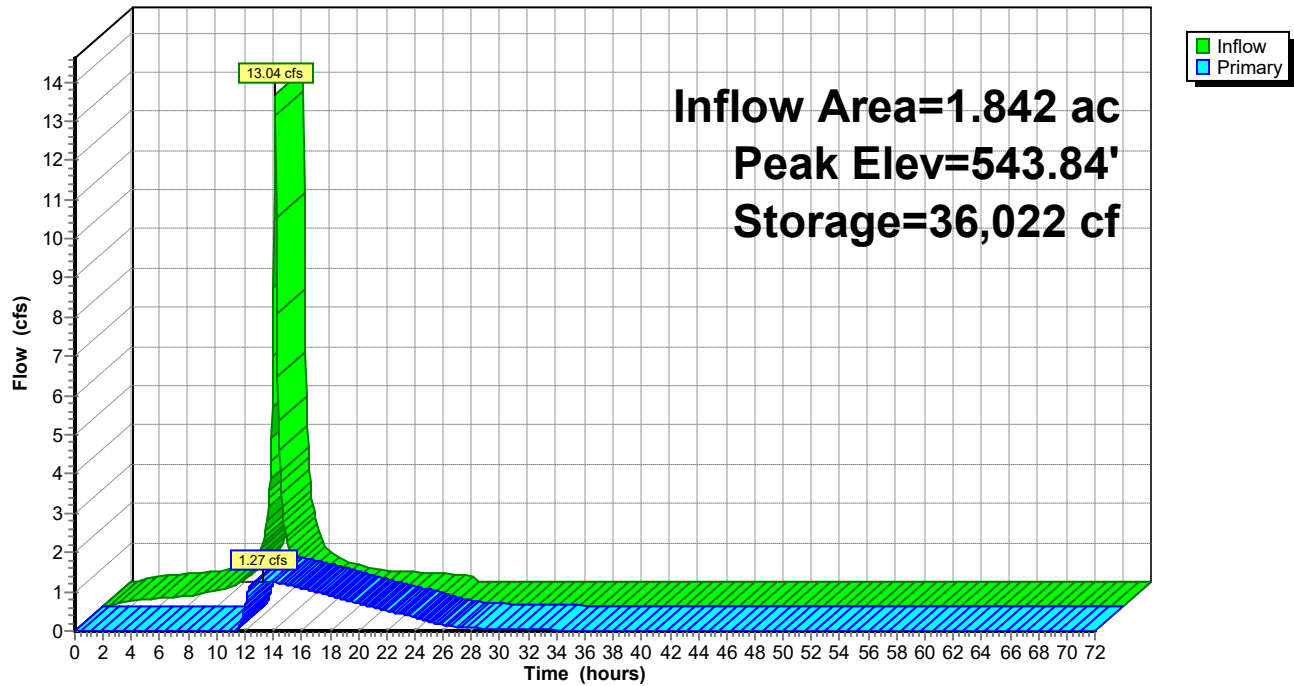
Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Pond 37P: Pond 2-6

Hydrograph



Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Hydrograph for Pond 37P: Pond 2-6

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	540.50	0.00
2.50	0.16	697	540.56	0.00
5.00	0.24	2,554	540.74	0.00
7.50	0.37	5,165	540.98	0.00
10.00	0.72	9,582	541.39	0.00
12.50	3.46	33,878	543.64	1.19
15.00	0.55	33,381	543.60	1.18
17.50	0.33	27,599	543.06	0.95
20.00	0.25	22,663	542.60	0.70
22.50	0.20	19,430	542.30	0.48
25.00	0.00	17,280	542.10	0.23
27.50	0.00	15,949	541.98	0.09
30.00	0.00	15,361	541.92	0.05
32.50	0.00	15,039	541.89	0.03
35.00	0.00	14,835	541.88	0.02
37.50	0.00	14,699	541.86	0.01
40.00	0.00	14,599	541.85	0.01
42.50	0.00	14,521	541.85	0.01
45.00	0.00	14,459	541.84	0.01
47.50	0.00	14,411	541.84	0.00
50.00	0.00	14,373	541.83	0.00
52.50	0.00	14,343	541.83	0.00
55.00	0.00	14,318	541.83	0.00
57.50	0.00	14,295	541.83	0.00
60.00	0.00	14,274	541.82	0.00
62.50	0.00	14,255	541.82	0.00
65.00	0.00	14,237	541.82	0.00
67.50	0.00	14,220	541.82	0.00
70.00	0.00	14,204	541.82	0.00

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Stage-Discharge for Pond 37P: Pond 2-6

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
540.50	0.00	541.52	0.00	542.54	0.66	543.56	1.16
540.52	0.00	541.54	0.00	542.56	0.68	543.58	1.17
540.54	0.00	541.56	0.00	542.58	0.69	543.60	1.18
540.56	0.00	541.58	0.00	542.60	0.70	543.62	1.18
540.58	0.00	541.60	0.00	542.62	0.71	543.64	1.19
540.60	0.00	541.62	0.00	542.64	0.73	543.66	1.20
540.62	0.00	541.64	0.00	542.66	0.74	543.68	1.21
540.64	0.00	541.66	0.00	542.68	0.75	543.70	1.21
540.66	0.00	541.68	0.00	542.70	0.76	543.72	1.22
540.68	0.00	541.70	0.00	542.72	0.77	543.74	1.23
540.70	0.00	541.72	0.00	542.74	0.79	543.76	1.24
540.72	0.00	541.74	0.00	542.76	0.80	543.78	1.24
540.74	0.00	541.76	0.00	542.78	0.81	543.80	1.25
540.76	0.00	541.78	0.00	542.80	0.82	543.82	1.26
540.78	0.00	541.80	0.00	542.82	0.83	543.84	1.26
540.80	0.00	541.82	0.00	542.84	0.84	543.86	1.27
540.82	0.00	541.84	0.01	542.86	0.85	543.88	1.28
540.84	0.00	541.86	0.01	542.88	0.86	543.90	1.29
540.86	0.00	541.88	0.02	542.90	0.87	543.92	1.29
540.88	0.00	541.90	0.03	542.92	0.88	543.94	1.30
540.90	0.00	541.92	0.04	542.94	0.89	543.96	1.31
540.92	0.00	541.94	0.06	542.96	0.90	543.98	1.31
540.94	0.00	541.96	0.07	542.98	0.91	544.00	1.32
540.96	0.00	541.98	0.09	543.00	0.92		
540.98	0.00	542.00	0.11	543.02	0.93		
541.00	0.00	542.02	0.13	543.04	0.94		
541.02	0.00	542.04	0.16	543.06	0.95		
541.04	0.00	542.06	0.18	543.08	0.96		
541.06	0.00	542.08	0.20	543.10	0.97		
541.08	0.00	542.10	0.23	543.12	0.98		
541.10	0.00	542.12	0.26	543.14	0.99		
541.12	0.00	542.14	0.28	543.16	1.00		
541.14	0.00	542.16	0.31	543.18	1.00		
541.16	0.00	542.18	0.34	543.20	1.01		
541.18	0.00	542.20	0.36	543.22	1.02		
541.20	0.00	542.22	0.39	543.24	1.03		
541.22	0.00	542.24	0.41	543.26	1.04		
541.24	0.00	542.26	0.44	543.28	1.05		
541.26	0.00	542.28	0.46	543.30	1.06		
541.28	0.00	542.30	0.47	543.32	1.07		
541.30	0.00	542.32	0.49	543.34	1.07		
541.32	0.00	542.34	0.51	543.36	1.08		
541.34	0.00	542.36	0.53	543.38	1.09		
541.36	0.00	542.38	0.54	543.40	1.10		
541.38	0.00	542.40	0.56	543.42	1.11		
541.40	0.00	542.42	0.58	543.44	1.11		
541.42	0.00	542.44	0.59	543.46	1.12		
541.44	0.00	542.46	0.61	543.48	1.13		
541.46	0.00	542.48	0.62	543.50	1.14		
541.48	0.00	542.50	0.63	543.52	1.15		
541.50	0.00	542.52	0.65	543.54	1.15		

Proposed basin 2-6 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

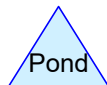
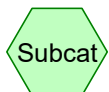
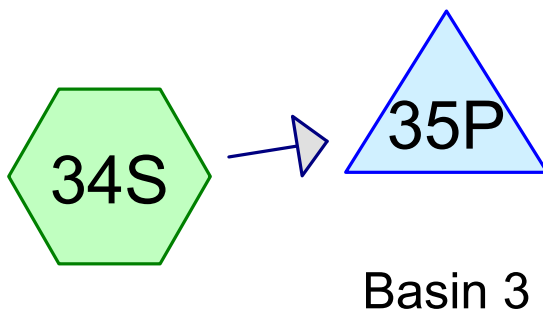
Basin 2-6 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Stage-Area-Storage for Pond 37P: Pond 2-6

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
540.50	10,782	0	543.05	10,782	27,494
540.55	10,782	539	543.10	10,782	28,033
540.60	10,782	1,078	543.15	10,782	28,572
540.65	10,782	1,617	543.20	10,782	29,111
540.70	10,782	2,156	543.25	10,782	29,651
540.75	10,782	2,696	543.30	10,782	30,190
540.80	10,782	3,235	543.35	10,782	30,729
540.85	10,782	3,774	543.40	10,782	31,268
540.90	10,782	4,313	543.45	10,782	31,807
540.95	10,782	4,852	543.50	10,782	32,346
541.00	10,782	5,391	543.55	10,782	32,885
541.05	10,782	5,930	543.60	10,782	33,424
541.10	10,782	6,469	543.65	10,782	33,963
541.15	10,782	7,008	543.70	10,782	34,502
541.20	10,782	7,547	543.75	10,782	35,042
541.25	10,782	8,087	543.80	10,782	35,581
541.30	10,782	8,626	543.85	10,782	36,120
541.35	10,782	9,165	543.90	10,782	36,659
541.40	10,782	9,704	543.95	10,782	37,198
541.45	10,782	10,243	544.00	10,782	37,737
541.50	10,782	10,782			
541.55	10,782	11,321			
541.60	10,782	11,860			
541.65	10,782	12,399			
541.70	10,782	12,938			
541.75	10,782	13,478			
541.80	10,782	14,017			
541.85	10,782	14,556			
541.90	10,782	15,095			
541.95	10,782	15,634			
542.00	10,782	16,173			
542.05	10,782	16,712			
542.10	10,782	17,251			
542.15	10,782	17,790			
542.20	10,782	18,329			
542.25	10,782	18,869			
542.30	10,782	19,408			
542.35	10,782	19,947			
542.40	10,782	20,486			
542.45	10,782	21,025			
542.50	10,782	21,564			
542.55	10,782	22,103			
542.60	10,782	22,642			
542.65	10,782	23,181			
542.70	10,782	23,720			
542.75	10,782	24,260			
542.80	10,782	24,799			
542.85	10,782	25,338			
542.90	10,782	25,877			
542.95	10,782	26,416			
543.00	10,782	26,955			



proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.718	74	>75% Grass cover, Good, HSG C (34S, 36S)
0.744	98	Paved parking, HSG C (34S)
0.155	98	Paved roads w/curbs & sewers, HSG C (36S)
2.617	70	Woods, Good, HSG C (37S)
5.234	76	TOTAL AREA

proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
5.234	HSG C	34S, 36S, 37S
0.000	HSG D	
0.000	Other	
5.234		TOTAL AREA

proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.718	0.000	0.000	1.718	>75% Grass cover, Good	34 S, 36 S
0.000	0.000	0.744	0.000	0.000	0.744	Paved parking	34 S
0.000	0.000	0.155	0.000	0.000	0.155	Paved roads w/curbs & sewers	36 S
0.000	0.000	2.617	0.000	0.000	2.617	Woods, Good	37 S
0.000	0.000	5.234	0.000	0.000	5.234	TOTAL AREA	

proposed basin 3 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	34S	0.00	0.00	450.0	0.0600	0.013	0.0	15.0	8.0	

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 34S: Basin 3

Runoff Area=95,425 sf Runoff Depth=1.88"

Flow Length=670' Tc=10.0 min CN=74/98 Runoff=3.73 cfs 0.343 af

Subcatchment 36S: Basin 3 undetained

Runoff Area=18,573 sf Runoff Depth=1.93"

Flow Length=45' Slope=0.1000 '/' Tc=10.0 min CN=74/98 Runoff=0.74 cfs 0.068 af

Subcatchment 37S: Basin 3 pre-development

Runoff Area=113,998 sf Runoff Depth=0.97"

Flow Length=304' Tc=19.4 min CN=70/0 Runoff=1.79 cfs 0.212 af

Pond 35P: Basin 3

Peak Elev=530.38' Storage=12,717 cf Inflow=3.73 cfs 0.343 af

Outflow=0.09 cfs 0.080 af

Total Runoff Area = 5.234 ac Runoff Volume = 0.624 af Average Runoff Depth = 1.43"

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 34S: Basin 3

Runoff = 3.73 cfs @ 12.17 hrs, Volume= 0.343 af, Depth= 1.88"
Routed to Pond 35P : Basin 3

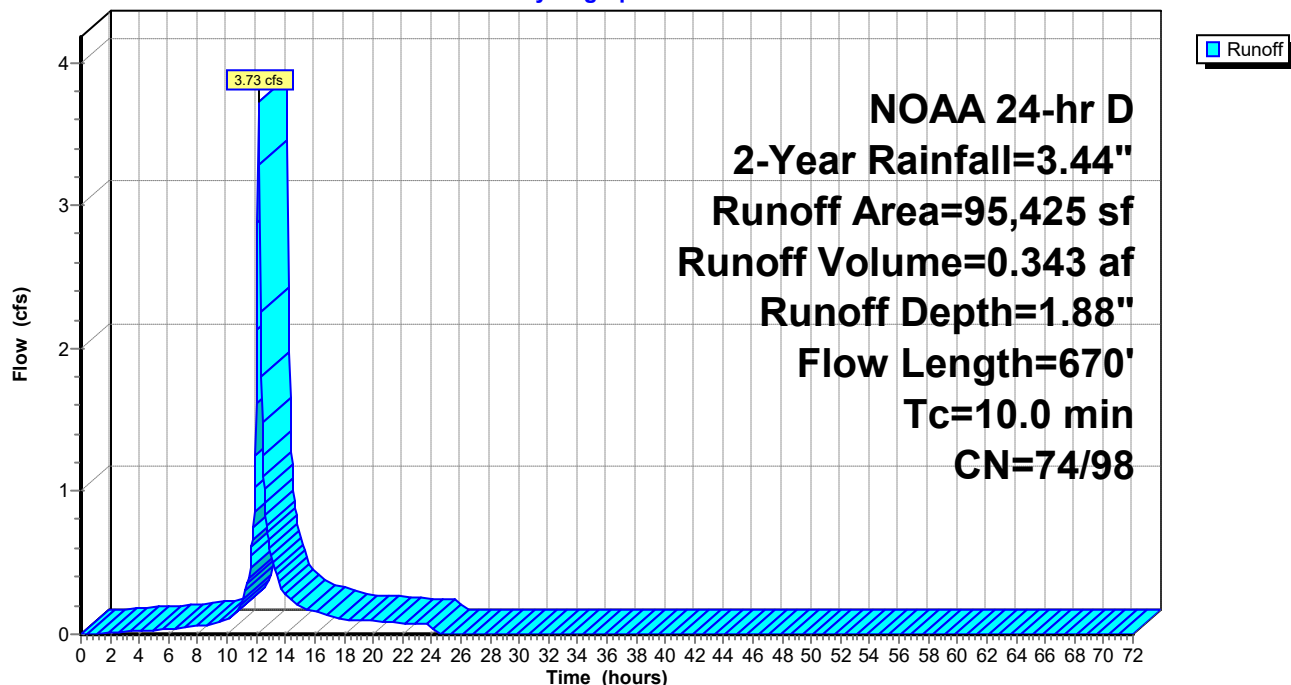
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
32,412	98	Paved parking, HSG C
63,013	74	>75% Grass cover, Good, HSG C
95,425	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0800	0.21		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0800	4.24		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	100	0.0500	4.54		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	450	0.0600	8.91	5.00	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Concrete sewer w/manholes & inlets
9.2	670	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 34S: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Hydrograph for Subcatchment 34S: Basin 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.02	0.01
5.00	0.24	0.00	0.09	0.03
7.50	0.40	0.00	0.23	0.05
10.00	0.68	0.00	0.49	0.11
12.50	2.35	0.53	2.12	1.10
15.00	2.89	0.84	2.66	0.19
17.50	3.11	0.98	2.88	0.12
20.00	3.26	1.08	3.03	0.09
22.50	3.38	1.16	3.15	0.08
25.00	3.44	1.20	3.21	0.00
27.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
32.50	3.44	1.20	3.21	0.00
35.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
40.00	3.44	1.20	3.21	0.00
42.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
47.50	3.44	1.20	3.21	0.00
50.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
55.00	3.44	1.20	3.21	0.00
57.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
62.50	3.44	1.20	3.21	0.00
65.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
70.00	3.44	1.20	3.21	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 36S: Basin 3 undetained

Runoff = 0.74 cfs @ 12.17 hrs, Volume= 0.068 af, Depth= 1.93"

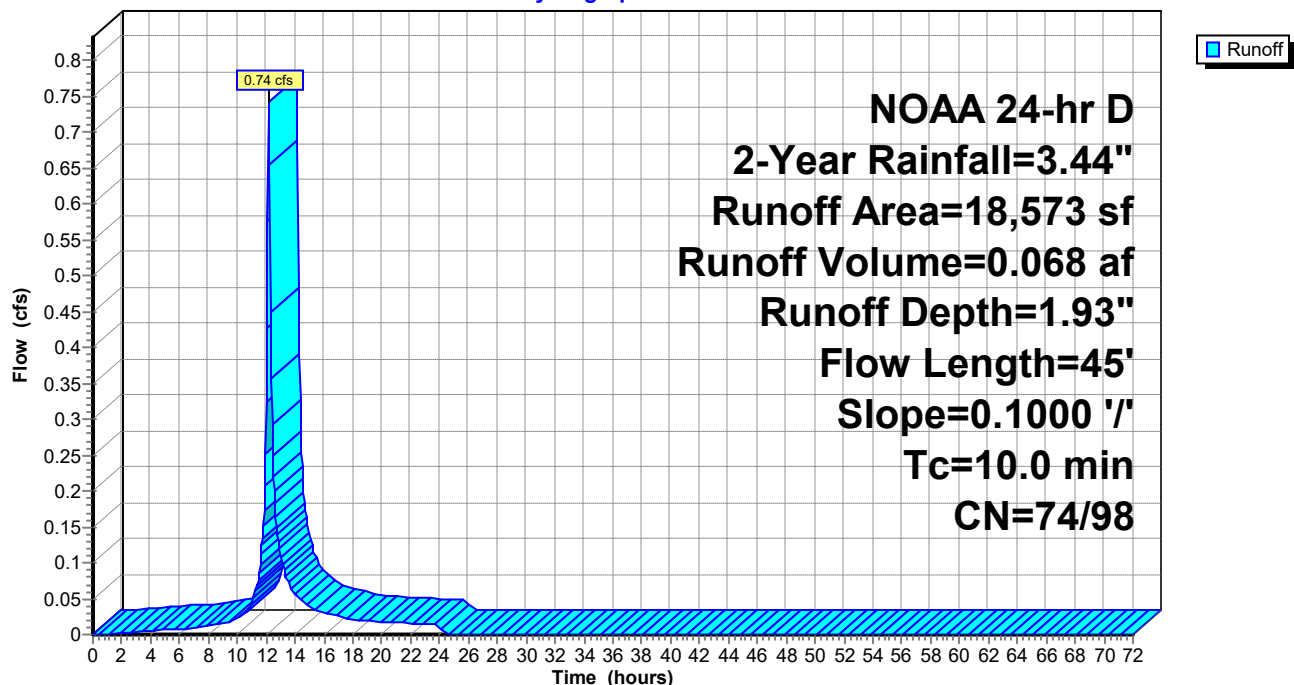
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
11,836	74	>75% Grass cover, Good, HSG C
6,737	98	Paved roads w/curbs & sewers, HSG C
18,573	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.1000	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
3.8	45	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 3 undetained

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Hydrograph for Subcatchment 36S: Basin 3 undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.02	0.00
5.00	0.24	0.00	0.09	0.01
7.50	0.40	0.00	0.23	0.01
10.00	0.68	0.00	0.49	0.02
12.50	2.35	0.53	2.12	0.22
15.00	2.89	0.84	2.66	0.04
17.50	3.11	0.98	2.88	0.02
20.00	3.26	1.08	3.03	0.02
22.50	3.38	1.16	3.15	0.01
25.00	3.44	1.20	3.21	0.00
27.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
32.50	3.44	1.20	3.21	0.00
35.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
40.00	3.44	1.20	3.21	0.00
42.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
47.50	3.44	1.20	3.21	0.00
50.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
55.00	3.44	1.20	3.21	0.00
57.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
62.50	3.44	1.20	3.21	0.00
65.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
70.00	3.44	1.20	3.21	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Summary for Subcatchment 37S: Basin 3 pre-development

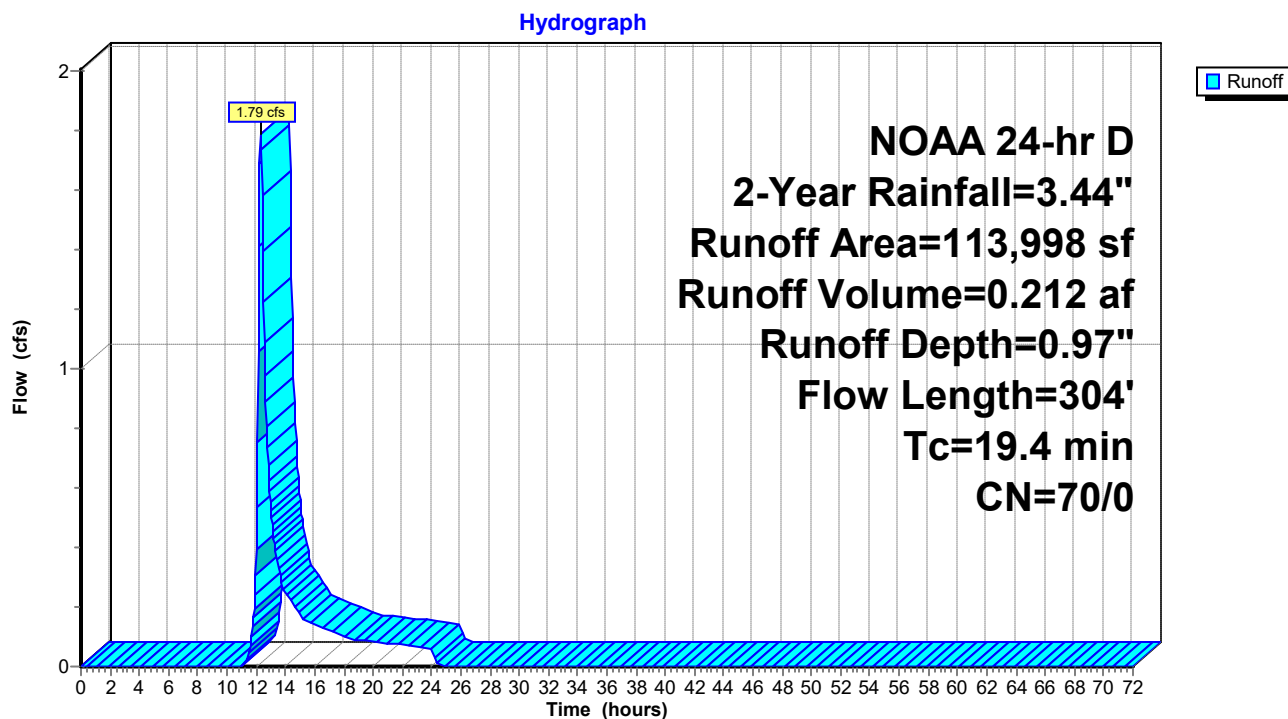
Runoff = 1.79 cfs @ 12.31 hrs, Volume= 0.212 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
113,998	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.7	204	0.0340	0.92		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.4	304	Total			

Subcatchment 37S: Basin 3 pre-development



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Hydrograph for Subcatchment 37S: Basin 3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.11	0.00	0.00	0.00
5.00	0.24	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
10.00	0.68	0.00	0.00	0.00
12.50	2.35	0.39	0.00	1.23
15.00	2.89	0.66	0.00	0.18
17.50	3.11	0.78	0.00	0.11
20.00	3.26	0.86	0.00	0.08
22.50	3.38	0.93	0.00	0.07
25.00	3.44	0.97	0.00	0.00
27.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
32.50	3.44	0.97	0.00	0.00
35.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
40.00	3.44	0.97	0.00	0.00
42.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
47.50	3.44	0.97	0.00	0.00
50.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
55.00	3.44	0.97	0.00	0.00
57.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
62.50	3.44	0.97	0.00	0.00
65.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
70.00	3.44	0.97	0.00	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Summary for Pond 35P: Basin 3

Inflow Area = 2.191 ac, Inflow Depth = 1.88" for 2-Year event
Inflow = 3.73 cfs @ 12.17 hrs, Volume= 0.343 af
Outflow = 0.09 cfs @ 20.28 hrs, Volume= 0.080 af, Atten= 98%, Lag= 486.3 min
Primary = 0.09 cfs @ 20.28 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 530.38' @ 20.28 hrs Surf.Area= 7,314 sf Storage= 12,717 cf

Plug-Flow detention time= 853.2 min calculated for 0.080 af (23% of inflow)
Center-of-Mass det. time= 638.4 min (1,446.6 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	528.00'	26,911 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
528.00	3,437	0	0
530.00	6,648	10,085	10,085
532.00	10,178	16,826	26,911

Device	Routing	Invert	Outlet Devices
#1	Primary	530.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	530.60'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.09 cfs @ 20.28 hrs HW=530.38' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.43 fps)
— **2=Orifice/Grate** (Controls 0.00 cfs)

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

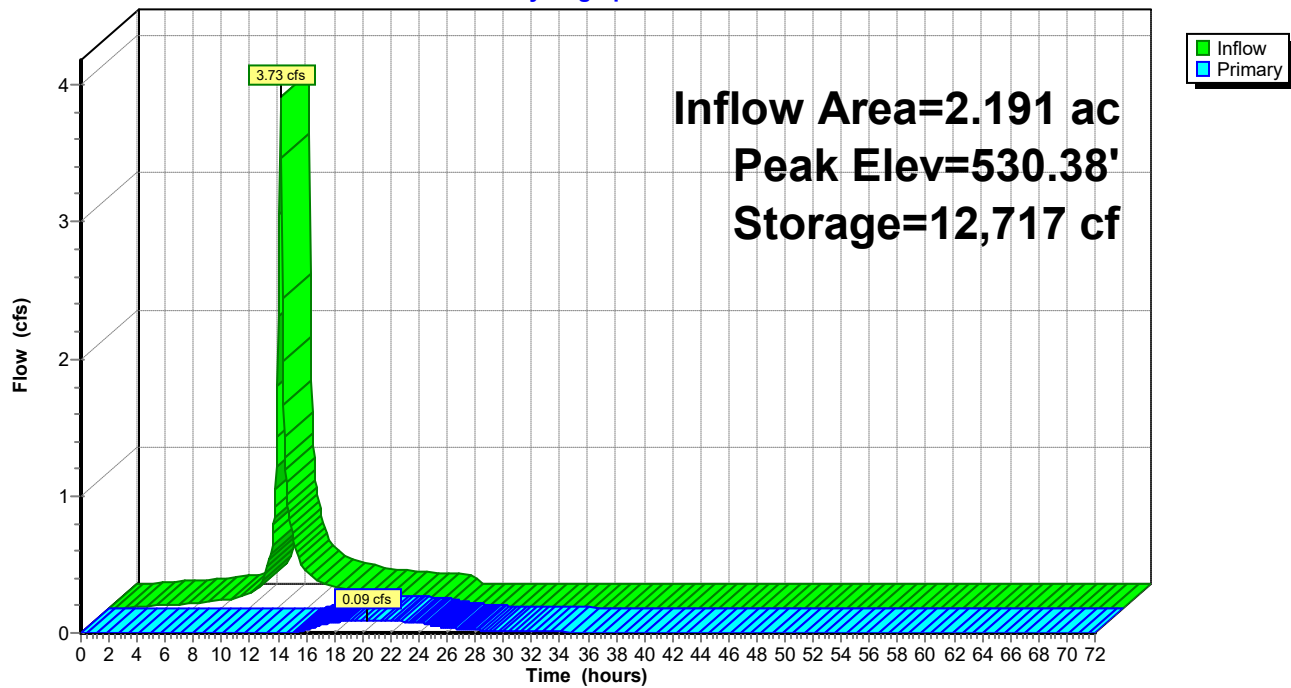
Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Pond 35P: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Hydrograph for Pond 35P: Basin 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	528.00	0.00
2.50	0.01	34	528.01	0.00
5.00	0.03	239	528.07	0.00
7.50	0.05	595	528.17	0.00
10.00	0.11	1,252	528.34	0.00
12.50	1.10	7,923	529.66	0.00
15.00	0.19	11,508	530.21	0.00
17.50	0.12	12,563	530.36	0.07
20.00	0.09	12,717	530.38	0.09
22.50	0.08	12,677	530.37	0.08
25.00	0.00	12,418	530.34	0.06
27.50	0.00	12,083	530.29	0.03
30.00	0.00	11,916	530.27	0.01
32.50	0.00	11,812	530.25	0.01
35.00	0.00	11,746	530.24	0.01
37.50	0.00	11,701	530.24	0.00
40.00	0.00	11,664	530.23	0.00
42.50	0.00	11,633	530.23	0.00
45.00	0.00	11,605	530.22	0.00
47.50	0.00	11,582	530.22	0.00
50.00	0.00	11,563	530.22	0.00
52.50	0.00	11,546	530.21	0.00
55.00	0.00	11,532	530.21	0.00
57.50	0.00	11,520	530.21	0.00
60.00	0.00	11,509	530.21	0.00
62.50	0.00	11,501	530.21	0.00
65.00	0.00	11,493	530.21	0.00
67.50	0.00	11,487	530.21	0.00
70.00	0.00	11,481	530.20	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Stage-Discharge for Pond 35P: Basin 3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
528.00	0.00	529.02	0.00	530.04	0.00	531.06	2.24
528.02	0.00	529.04	0.00	530.06	0.00	531.08	2.35
528.04	0.00	529.06	0.00	530.08	0.00	531.10	2.46
528.06	0.00	529.08	0.00	530.10	0.00	531.12	2.57
528.08	0.00	529.10	0.00	530.12	0.00	531.14	2.66
528.10	0.00	529.12	0.00	530.14	0.00	531.16	2.74
528.12	0.00	529.14	0.00	530.16	0.00	531.18	2.83
528.14	0.00	529.16	0.00	530.18	0.00	531.20	2.90
528.16	0.00	529.18	0.00	530.20	0.00	531.22	2.98
528.18	0.00	529.20	0.00	530.22	0.00	531.24	3.05
528.20	0.00	529.22	0.00	530.24	0.01	531.26	3.12
528.22	0.00	529.24	0.00	530.26	0.01	531.28	3.19
528.24	0.00	529.26	0.00	530.28	0.02	531.30	3.26
528.26	0.00	529.28	0.00	530.30	0.03	531.32	3.33
528.28	0.00	529.30	0.00	530.32	0.04	531.34	3.39
528.30	0.00	529.32	0.00	530.34	0.06	531.36	3.45
528.32	0.00	529.34	0.00	530.36	0.07	531.38	3.52
528.34	0.00	529.36	0.00	530.38	0.09	531.40	3.58
528.36	0.00	529.38	0.00	530.40	0.11	531.42	3.63
528.38	0.00	529.40	0.00	530.42	0.13	531.44	3.69
528.40	0.00	529.42	0.00	530.44	0.16	531.46	3.75
528.42	0.00	529.44	0.00	530.46	0.18	531.48	3.81
528.44	0.00	529.46	0.00	530.48	0.20	531.50	3.86
528.46	0.00	529.48	0.00	530.50	0.23	531.52	3.92
528.48	0.00	529.50	0.00	530.52	0.26	531.54	3.97
528.50	0.00	529.52	0.00	530.54	0.28	531.56	4.02
528.52	0.00	529.54	0.00	530.56	0.31	531.58	4.08
528.54	0.00	529.56	0.00	530.58	0.34	531.60	4.13
528.56	0.00	529.58	0.00	530.60	0.36	531.62	4.18
528.58	0.00	529.60	0.00	530.62	0.40	531.64	4.23
528.60	0.00	529.62	0.00	530.64	0.45	531.66	4.28
528.62	0.00	529.64	0.00	530.66	0.51	531.68	4.33
528.64	0.00	529.66	0.00	530.68	0.57	531.70	4.37
528.66	0.00	529.68	0.00	530.70	0.62	531.72	4.42
528.68	0.00	529.70	0.00	530.72	0.69	531.74	4.47
528.70	0.00	529.72	0.00	530.74	0.76	531.76	4.52
528.72	0.00	529.74	0.00	530.76	0.83	531.78	4.56
528.74	0.00	529.76	0.00	530.78	0.91	531.80	4.61
528.76	0.00	529.78	0.00	530.80	0.99	531.82	4.65
528.78	0.00	529.80	0.00	530.82	1.07	531.84	4.70
528.80	0.00	529.82	0.00	530.84	1.16	531.86	4.74
528.82	0.00	529.84	0.00	530.86	1.24	531.88	4.79
528.84	0.00	529.86	0.00	530.88	1.33	531.90	4.83
528.86	0.00	529.88	0.00	530.90	1.43	531.92	4.87
528.88	0.00	529.90	0.00	530.92	1.52	531.94	4.92
528.90	0.00	529.92	0.00	530.94	1.62	531.96	4.96
528.92	0.00	529.94	0.00	530.96	1.72	531.98	5.00
528.94	0.00	529.96	0.00	530.98	1.82	532.00	5.04
528.96	0.00	529.98	0.00	531.00	1.92		
528.98	0.00	530.00	0.00	531.02	2.02		
529.00	0.00	530.02	0.00	531.04	2.13		

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 19

Stage-Area-Storage for Pond 35P: Basin 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
528.00	3,437	0	530.55	7,619	14,008
528.05	3,517	174	530.60	7,707	14,392
528.10	3,598	352	530.65	7,795	14,779
528.15	3,678	534	530.70	7,884	15,171
528.20	3,758	720	530.75	7,972	15,567
528.25	3,838	909	530.80	8,060	15,968
528.30	3,919	1,103	530.85	8,148	16,373
528.35	3,999	1,301	530.90	8,236	16,783
528.40	4,079	1,503	530.95	8,325	17,197
528.45	4,159	1,709	531.00	8,413	17,616
528.50	4,240	1,919	531.05	8,501	18,038
528.55	4,320	2,133	531.10	8,590	18,466
528.60	4,400	2,351	531.15	8,678	18,897
528.65	4,481	2,573	531.20	8,766	19,333
528.70	4,561	2,799	531.25	8,854	19,774
528.75	4,641	3,029	531.30	8,942	20,219
528.80	4,721	3,263	531.35	9,031	20,668
528.85	4,802	3,501	531.40	9,119	21,122
528.90	4,882	3,744	531.45	9,207	21,580
528.95	4,962	3,990	531.50	9,296	22,043
529.00	5,043	4,240	531.55	9,384	22,510
529.05	5,123	4,494	531.60	9,472	22,981
529.10	5,203	4,752	531.65	9,560	23,457
529.15	5,283	5,014	531.70	9,649	23,937
529.20	5,364	5,280	531.75	9,737	24,422
529.25	5,444	5,551	531.80	9,825	24,911
529.30	5,524	5,825	531.85	9,913	25,404
529.35	5,604	6,103	531.90	10,001	25,902
529.40	5,685	6,385	531.95	10,090	26,404
529.45	5,765	6,671	532.00	10,178	26,911
529.50	5,845	6,962			
529.55	5,926	7,256			
529.60	6,006	7,554			
529.65	6,086	7,857			
529.70	6,166	8,163			
529.75	6,247	8,473			
529.80	6,327	8,788			
529.85	6,407	9,106			
529.90	6,487	9,428			
529.95	6,568	9,755			
530.00	6,648	10,085			
530.05	6,736	10,420			
530.10	6,825	10,759			
530.15	6,913	11,102			
530.20	7,001	11,450			
530.25	7,089	11,802			
530.30	7,177	12,159			
530.35	7,266	12,520			
530.40	7,354	12,885			
530.45	7,442	13,255			
530.50	7,531	13,630			

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 34S: Basin 3

Runoff Area=95,425 sf Runoff Depth=3.37"

Flow Length=670' Tc=10.0 min CN=74/98 Runoff=6.79 cfs 0.615 af

Subcatchment 36S: Basin 3 undetained

Runoff Area=18,573 sf Runoff Depth=3.43"

Flow Length=45' Slope=0.1000 '/' Tc=10.0 min CN=74/98 Runoff=1.34 cfs 0.122 af

Subcatchment 37S: Basin 3 pre-development

Runoff Area=113,998 sf Runoff Depth=2.20"

Flow Length=304' Tc=19.4 min CN=70/0 Runoff=4.35 cfs 0.480 af

Pond 35P: Basin 3

Peak Elev=530.77' Storage=15,712 cf Inflow=6.79 cfs 0.615 af

Outflow=0.87 cfs 0.352 af

Total Runoff Area = 5.234 ac Runoff Volume = 1.217 af Average Runoff Depth = 2.79"

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Summary for Subcatchment 34S: Basin 3

[47] Hint: Peak is 136% of capacity of segment #4

Runoff = 6.79 cfs @ 12.17 hrs, Volume= 0.615 af, Depth= 3.37"
 Routed to Pond 35P : Basin 3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
32,412	98	Paved parking, HSG C
63,013	74	>75% Grass cover, Good, HSG C
95,425	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0800	0.21		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0800	4.24		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	100	0.0500	4.54		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	450	0.0600	8.91	5.00	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Concrete sewer w/manholes & inlets
9.2	670	Total, Increased to minimum Tc = 10.0 min			

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

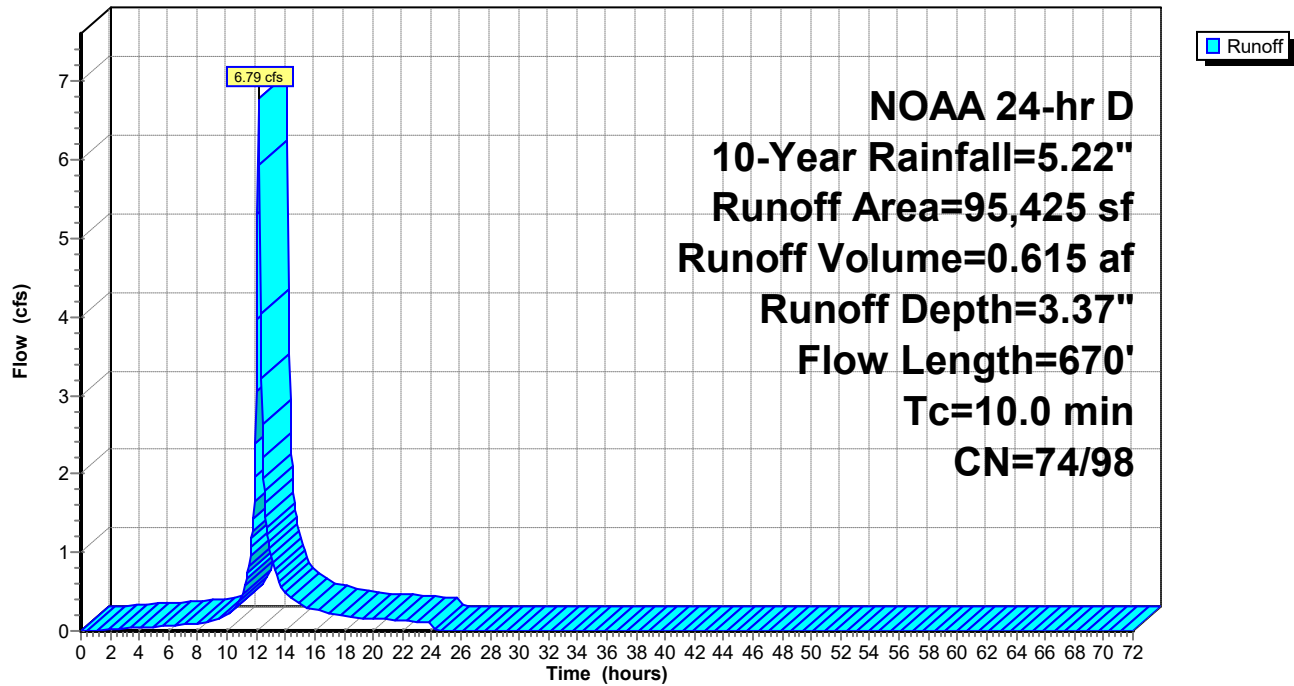
Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Subcatchment 34S: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Hydrograph for Subcatchment 34S: Basin 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.04	0.03
5.00	0.36	0.00	0.19	0.05
7.50	0.61	0.00	0.42	0.09
10.00	1.03	0.03	0.82	0.22
12.50	3.57	1.29	3.33	1.95
15.00	4.39	1.89	4.16	0.33
17.50	4.73	2.15	4.49	0.20
20.00	4.95	2.32	4.71	0.15
22.50	5.13	2.47	4.89	0.13
25.00	5.22	2.54	4.98	0.00
27.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
32.50	5.22	2.54	4.98	0.00
35.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
40.00	5.22	2.54	4.98	0.00
42.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
47.50	5.22	2.54	4.98	0.00
50.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
55.00	5.22	2.54	4.98	0.00
57.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
62.50	5.22	2.54	4.98	0.00
65.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
70.00	5.22	2.54	4.98	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Summary for Subcatchment 36S: Basin 3 undetained

Runoff = 1.34 cfs @ 12.17 hrs, Volume= 0.122 af, Depth= 3.43"

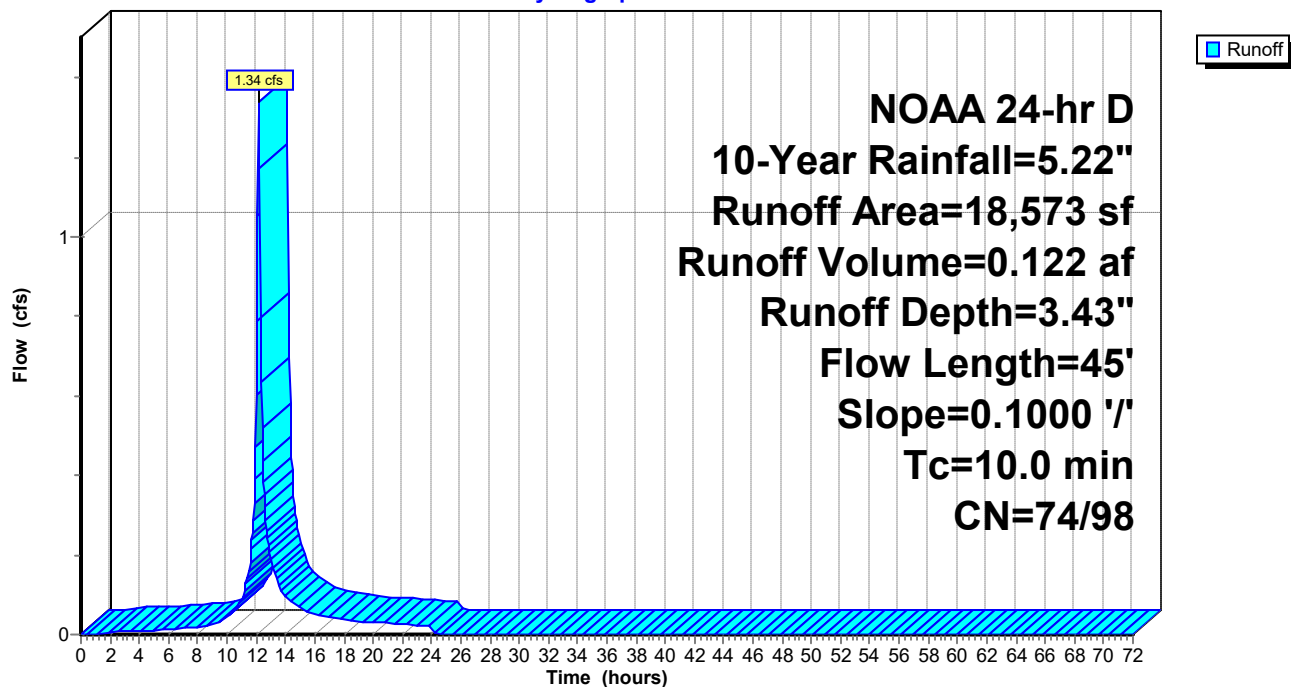
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
11,836	74	>75% Grass cover, Good, HSG C
6,737	98	Paved roads w/curbs & sewers, HSG C
18,573	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.1000	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
3.8	45	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 3 undetained

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Hydrograph for Subcatchment 36S: Basin 3 undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.04	0.01
5.00	0.36	0.00	0.19	0.01
7.50	0.61	0.00	0.42	0.02
10.00	1.03	0.03	0.82	0.05
12.50	3.57	1.29	3.33	0.38
15.00	4.39	1.89	4.16	0.06
17.50	4.73	2.15	4.49	0.04
20.00	4.95	2.32	4.71	0.03
22.50	5.13	2.47	4.89	0.02
25.00	5.22	2.54	4.98	0.00
27.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
32.50	5.22	2.54	4.98	0.00
35.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
40.00	5.22	2.54	4.98	0.00
42.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
47.50	5.22	2.54	4.98	0.00
50.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
55.00	5.22	2.54	4.98	0.00
57.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
62.50	5.22	2.54	4.98	0.00
65.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
70.00	5.22	2.54	4.98	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Summary for Subcatchment 37S: Basin 3 pre-development

Runoff = 4.35 cfs @ 12.29 hrs, Volume= 0.480 af, Depth= 2.20"

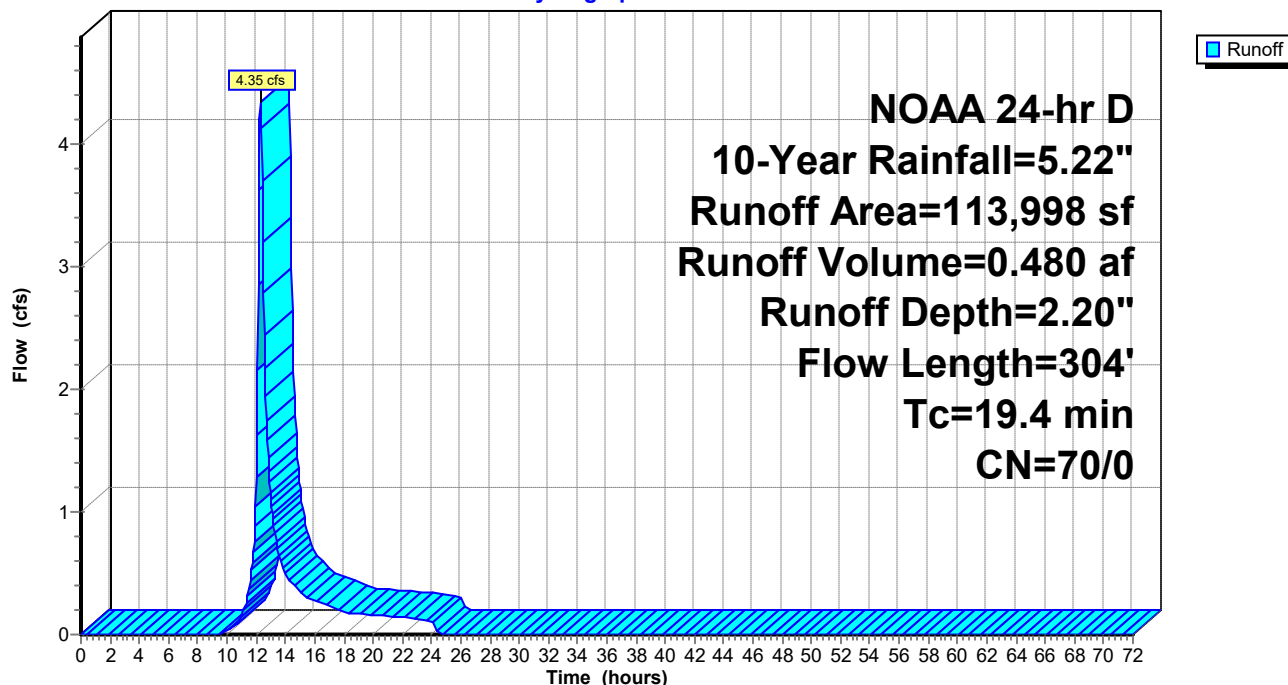
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
113,998	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.7	204	0.0340	0.92		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.4	304	Total			

Subcatchment 37S: Basin 3 pre-development

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Hydrograph for Subcatchment 37S: Basin 3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.16	0.00	0.00	0.00
5.00	0.36	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
10.00	1.03	0.01	0.00	0.03
12.50	3.57	1.05	0.00	2.78
15.00	4.39	1.60	0.00	0.35
17.50	4.73	1.83	0.00	0.21
20.00	4.95	2.00	0.00	0.16
22.50	5.13	2.13	0.00	0.13
25.00	5.22	2.20	0.00	0.00
27.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
32.50	5.22	2.20	0.00	0.00
35.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
40.00	5.22	2.20	0.00	0.00
42.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
47.50	5.22	2.20	0.00	0.00
50.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
55.00	5.22	2.20	0.00	0.00
57.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
62.50	5.22	2.20	0.00	0.00
65.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
70.00	5.22	2.20	0.00	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Summary for Pond 35P: Basin 3

Inflow Area = 2.191 ac, Inflow Depth = 3.37" for 10-Year event
Inflow = 6.79 cfs @ 12.17 hrs, Volume= 0.615 af
Outflow = 0.87 cfs @ 13.12 hrs, Volume= 0.352 af, Atten= 87%, Lag= 56.9 min
Primary = 0.87 cfs @ 13.12 hrs, Volume= 0.352 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 530.77' @ 13.12 hrs Surf.Area= 8,004 sf Storage= 15,712 cf

Plug-Flow detention time= 393.9 min calculated for 0.352 af (57% of inflow)
Center-of-Mass det. time= 268.4 min (1,069.1 - 800.7)

Volume	Invert	Avail.Storage	Storage Description
#1	528.00'	26,911 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
528.00	3,437	0	0
530.00	6,648	10,085	10,085
532.00	10,178	16,826	26,911

Device	Routing	Invert	Outlet Devices
#1	Primary	530.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	530.60'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.86 cfs @ 13.12 hrs HW=530.77' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.53 cfs @ 2.72 fps)
— **2=Orifice/Grate** (Orifice Controls 0.33 cfs @ 1.32 fps)

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

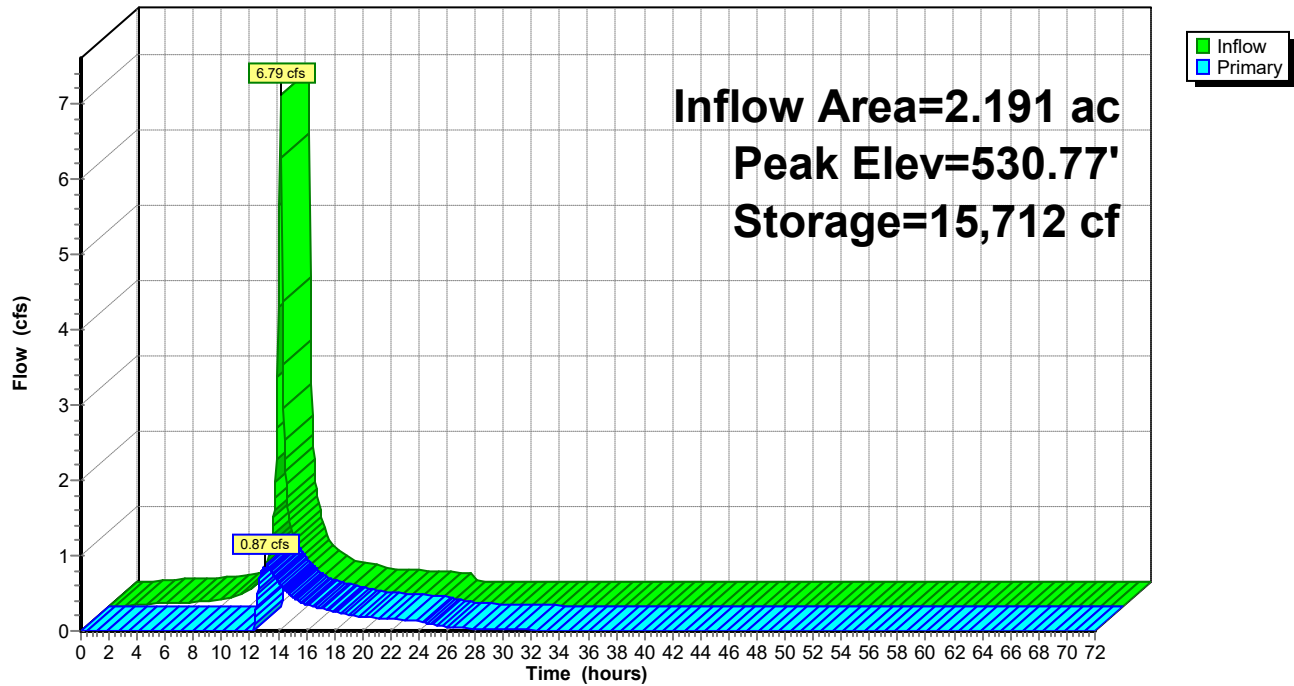
Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Pond 35P: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 30

Hydrograph for Pond 35P: Basin 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	528.00	0.00
2.50	0.03	102	528.03	0.00
5.00	0.05	489	528.14	0.00
7.50	0.09	1,085	528.30	0.00
10.00	0.22	2,251	528.58	0.00
12.50	1.95	14,552	530.62	0.41
15.00	0.33	14,716	530.64	0.46
17.50	0.20	13,907	530.54	0.28
20.00	0.15	13,396	530.47	0.19
22.50	0.13	13,148	530.44	0.15
25.00	0.00	12,693	530.37	0.09
27.50	0.00	12,201	530.31	0.03
30.00	0.00	11,979	530.27	0.02
32.50	0.00	11,852	530.26	0.01
35.00	0.00	11,771	530.25	0.01
37.50	0.00	11,720	530.24	0.00
40.00	0.00	11,680	530.23	0.00
42.50	0.00	11,646	530.23	0.00
45.00	0.00	11,617	530.22	0.00
47.50	0.00	11,592	530.22	0.00
50.00	0.00	11,571	530.22	0.00
52.50	0.00	11,553	530.21	0.00
55.00	0.00	11,538	530.21	0.00
57.50	0.00	11,525	530.21	0.00
60.00	0.00	11,514	530.21	0.00
62.50	0.00	11,504	530.21	0.00
65.00	0.00	11,496	530.21	0.00
67.50	0.00	11,489	530.21	0.00
70.00	0.00	11,484	530.20	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 31

Stage-Discharge for Pond 35P: Basin 3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
528.00	0.00	529.02	0.00	530.04	0.00	531.06	2.24
528.02	0.00	529.04	0.00	530.06	0.00	531.08	2.35
528.04	0.00	529.06	0.00	530.08	0.00	531.10	2.46
528.06	0.00	529.08	0.00	530.10	0.00	531.12	2.57
528.08	0.00	529.10	0.00	530.12	0.00	531.14	2.66
528.10	0.00	529.12	0.00	530.14	0.00	531.16	2.74
528.12	0.00	529.14	0.00	530.16	0.00	531.18	2.83
528.14	0.00	529.16	0.00	530.18	0.00	531.20	2.90
528.16	0.00	529.18	0.00	530.20	0.00	531.22	2.98
528.18	0.00	529.20	0.00	530.22	0.00	531.24	3.05
528.20	0.00	529.22	0.00	530.24	0.01	531.26	3.12
528.22	0.00	529.24	0.00	530.26	0.01	531.28	3.19
528.24	0.00	529.26	0.00	530.28	0.02	531.30	3.26
528.26	0.00	529.28	0.00	530.30	0.03	531.32	3.33
528.28	0.00	529.30	0.00	530.32	0.04	531.34	3.39
528.30	0.00	529.32	0.00	530.34	0.06	531.36	3.45
528.32	0.00	529.34	0.00	530.36	0.07	531.38	3.52
528.34	0.00	529.36	0.00	530.38	0.09	531.40	3.58
528.36	0.00	529.38	0.00	530.40	0.11	531.42	3.63
528.38	0.00	529.40	0.00	530.42	0.13	531.44	3.69
528.40	0.00	529.42	0.00	530.44	0.16	531.46	3.75
528.42	0.00	529.44	0.00	530.46	0.18	531.48	3.81
528.44	0.00	529.46	0.00	530.48	0.20	531.50	3.86
528.46	0.00	529.48	0.00	530.50	0.23	531.52	3.92
528.48	0.00	529.50	0.00	530.52	0.26	531.54	3.97
528.50	0.00	529.52	0.00	530.54	0.28	531.56	4.02
528.52	0.00	529.54	0.00	530.56	0.31	531.58	4.08
528.54	0.00	529.56	0.00	530.58	0.34	531.60	4.13
528.56	0.00	529.58	0.00	530.60	0.36	531.62	4.18
528.58	0.00	529.60	0.00	530.62	0.40	531.64	4.23
528.60	0.00	529.62	0.00	530.64	0.45	531.66	4.28
528.62	0.00	529.64	0.00	530.66	0.51	531.68	4.33
528.64	0.00	529.66	0.00	530.68	0.57	531.70	4.37
528.66	0.00	529.68	0.00	530.70	0.62	531.72	4.42
528.68	0.00	529.70	0.00	530.72	0.69	531.74	4.47
528.70	0.00	529.72	0.00	530.74	0.76	531.76	4.52
528.72	0.00	529.74	0.00	530.76	0.83	531.78	4.56
528.74	0.00	529.76	0.00	530.78	0.91	531.80	4.61
528.76	0.00	529.78	0.00	530.80	0.99	531.82	4.65
528.78	0.00	529.80	0.00	530.82	1.07	531.84	4.70
528.80	0.00	529.82	0.00	530.84	1.16	531.86	4.74
528.82	0.00	529.84	0.00	530.86	1.24	531.88	4.79
528.84	0.00	529.86	0.00	530.88	1.33	531.90	4.83
528.86	0.00	529.88	0.00	530.90	1.43	531.92	4.87
528.88	0.00	529.90	0.00	530.92	1.52	531.94	4.92
528.90	0.00	529.92	0.00	530.94	1.62	531.96	4.96
528.92	0.00	529.94	0.00	530.96	1.72	531.98	5.00
528.94	0.00	529.96	0.00	530.98	1.82	532.00	5.04
528.96	0.00	529.98	0.00	531.00	1.92		
528.98	0.00	530.00	0.00	531.02	2.02		
529.00	0.00	530.02	0.00	531.04	2.13		

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 32

Stage-Area-Storage for Pond 35P: Basin 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
528.00	3,437	0	530.55	7,619	14,008
528.05	3,517	174	530.60	7,707	14,392
528.10	3,598	352	530.65	7,795	14,779
528.15	3,678	534	530.70	7,884	15,171
528.20	3,758	720	530.75	7,972	15,567
528.25	3,838	909	530.80	8,060	15,968
528.30	3,919	1,103	530.85	8,148	16,373
528.35	3,999	1,301	530.90	8,236	16,783
528.40	4,079	1,503	530.95	8,325	17,197
528.45	4,159	1,709	531.00	8,413	17,616
528.50	4,240	1,919	531.05	8,501	18,038
528.55	4,320	2,133	531.10	8,590	18,466
528.60	4,400	2,351	531.15	8,678	18,897
528.65	4,481	2,573	531.20	8,766	19,333
528.70	4,561	2,799	531.25	8,854	19,774
528.75	4,641	3,029	531.30	8,942	20,219
528.80	4,721	3,263	531.35	9,031	20,668
528.85	4,802	3,501	531.40	9,119	21,122
528.90	4,882	3,744	531.45	9,207	21,580
528.95	4,962	3,990	531.50	9,296	22,043
529.00	5,043	4,240	531.55	9,384	22,510
529.05	5,123	4,494	531.60	9,472	22,981
529.10	5,203	4,752	531.65	9,560	23,457
529.15	5,283	5,014	531.70	9,649	23,937
529.20	5,364	5,280	531.75	9,737	24,422
529.25	5,444	5,551	531.80	9,825	24,911
529.30	5,524	5,825	531.85	9,913	25,404
529.35	5,604	6,103	531.90	10,001	25,902
529.40	5,685	6,385	531.95	10,090	26,404
529.45	5,765	6,671	532.00	10,178	26,911
529.50	5,845	6,962			
529.55	5,926	7,256			
529.60	6,006	7,554			
529.65	6,086	7,857			
529.70	6,166	8,163			
529.75	6,247	8,473			
529.80	6,327	8,788			
529.85	6,407	9,106			
529.90	6,487	9,428			
529.95	6,568	9,755			
530.00	6,648	10,085			
530.05	6,736	10,420			
530.10	6,825	10,759			
530.15	6,913	11,102			
530.20	7,001	11,450			
530.25	7,089	11,802			
530.30	7,177	12,159			
530.35	7,266	12,520			
530.40	7,354	12,885			
530.45	7,442	13,255			
530.50	7,531	13,630			

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 34S: Basin 3

Runoff Area=95,425 sf Runoff Depth=6.50"

Flow Length=670' Tc=10.0 min CN=74/98 Runoff=13.09 cfs 1.188 af

Subcatchment 36S: Basin 3 undetained

Runoff Area=18,573 sf Runoff Depth=6.57"

Flow Length=45' Slope=0.1000 '/' Tc=10.0 min CN=74/98 Runoff=2.56 cfs 0.234 af

Subcatchment 37S: Basin 3 pre-development

Runoff Area=113,998 sf Runoff Depth=5.04"

Flow Length=304' Tc=19.4 min CN=70/0 Runoff=10.09 cfs 1.098 af

Pond 35P: Basin 3

Peak Elev=531.69' Storage=23,858 cf Inflow=13.09 cfs 1.188 af

Outflow=4.35 cfs 0.924 af

Total Runoff Area = 5.234 ac Runoff Volume = 2.519 af Average Runoff Depth = 5.78"

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Summary for Subcatchment 34S: Basin 3

[47] Hint: Peak is 262% of capacity of segment #4

Runoff = 13.09 cfs @ 12.17 hrs, Volume= 1.188 af, Depth= 6.50"
 Routed to Pond 35P : Basin 3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
32,412	98	Paved parking, HSG C
63,013	74	>75% Grass cover, Good, HSG C
95,425	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0800	0.21		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0800	4.24		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	100	0.0500	4.54		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	450	0.0600	8.91	5.00	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Concrete sewer w/manholes & inlets
9.2	670	Total, Increased to minimum Tc = 10.0 min			

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

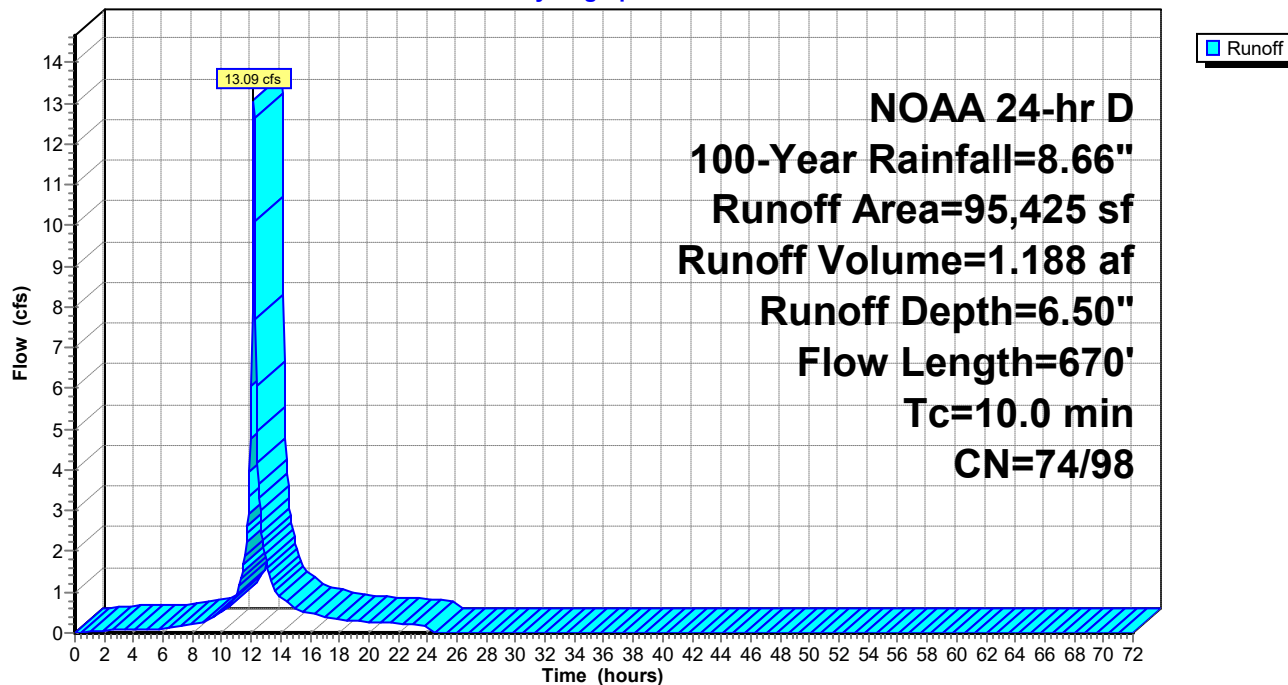
Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Subcatchment 34S: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Hydrograph for Subcatchment 34S: Basin 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.12	0.07
5.00	0.59	0.00	0.40	0.10
7.50	1.01	0.03	0.80	0.19
10.00	1.72	0.23	1.49	0.51
12.50	5.91	3.11	5.68	3.64
15.00	7.29	4.29	7.05	0.60
17.50	7.84	4.78	7.60	0.37
20.00	8.21	5.11	7.97	0.28
22.50	8.51	5.38	8.27	0.23
25.00	8.66	5.52	8.42	0.00
27.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
32.50	8.66	5.52	8.42	0.00
35.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
40.00	8.66	5.52	8.42	0.00
42.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
47.50	8.66	5.52	8.42	0.00
50.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
55.00	8.66	5.52	8.42	0.00
57.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
62.50	8.66	5.52	8.42	0.00
65.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
70.00	8.66	5.52	8.42	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Summary for Subcatchment 36S: Basin 3 undetained

Runoff = 2.56 cfs @ 12.17 hrs, Volume= 0.234 af, Depth= 6.57"

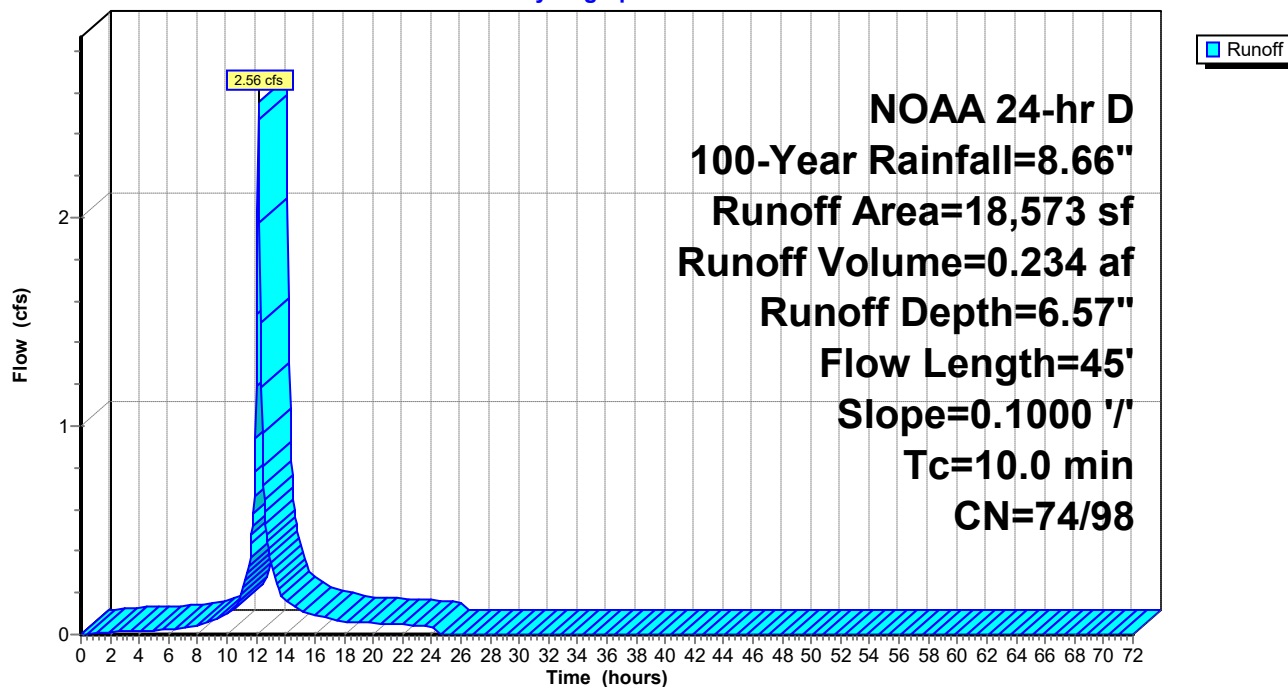
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
11,836	74	>75% Grass cover, Good, HSG C
6,737	98	Paved roads w/curbs & sewers, HSG C
18,573	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	45	0.1000	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
3.8	45	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 36S: Basin 3 undetained

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Hydrograph for Subcatchment 36S: Basin 3 undetained

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.12	0.01
5.00	0.59	0.00	0.40	0.02
7.50	1.01	0.03	0.80	0.04
10.00	1.72	0.23	1.49	0.10
12.50	5.91	3.11	5.68	0.71
15.00	7.29	4.29	7.05	0.12
17.50	7.84	4.78	7.60	0.07
20.00	8.21	5.11	7.97	0.05
22.50	8.51	5.38	8.27	0.04
25.00	8.66	5.52	8.42	0.00
27.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
32.50	8.66	5.52	8.42	0.00
35.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
40.00	8.66	5.52	8.42	0.00
42.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
47.50	8.66	5.52	8.42	0.00
50.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
55.00	8.66	5.52	8.42	0.00
57.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
62.50	8.66	5.52	8.42	0.00
65.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
70.00	8.66	5.52	8.42	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Summary for Subcatchment 37S: Basin 3 pre-development

Runoff = 10.09 cfs @ 12.29 hrs, Volume= 1.098 af, Depth= 5.04"

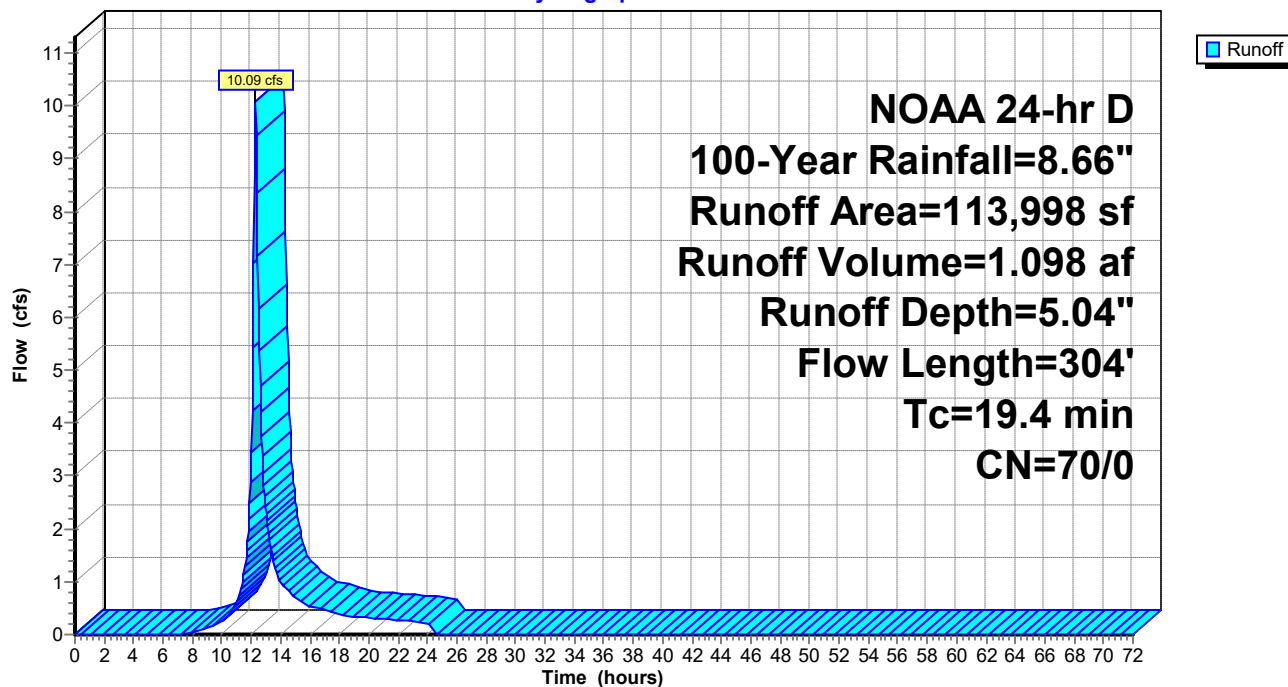
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
113,998	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0400	0.11		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
3.7	204	0.0340	0.92		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.4	304	Total			

Subcatchment 37S: Basin 3 pre-development

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 40

Hydrograph for Subcatchment 37S: Basin 3 pre-development

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
2.50	0.27	0.00	0.00	0.00
5.00	0.59	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
10.00	1.72	0.14	0.00	0.27
12.50	5.91	2.74	0.00	6.16
15.00	7.29	3.86	0.00	0.70
17.50	7.84	4.33	0.00	0.42
20.00	8.21	4.64	0.00	0.31
22.50	8.51	4.90	0.00	0.26
25.00	8.66	5.04	0.00	0.00
27.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
32.50	8.66	5.04	0.00	0.00
35.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
40.00	8.66	5.04	0.00	0.00
42.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
47.50	8.66	5.04	0.00	0.00
50.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
55.00	8.66	5.04	0.00	0.00
57.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
62.50	8.66	5.04	0.00	0.00
65.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
70.00	8.66	5.04	0.00	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 41

Summary for Pond 35P: Basin 3

Inflow Area = 2.191 ac, Inflow Depth = 6.50" for 100-Year event
 Inflow = 13.09 cfs @ 12.17 hrs, Volume= 1.188 af
 Outflow = 4.35 cfs @ 12.44 hrs, Volume= 0.924 af, Atten= 67%, Lag= 16.2 min
 Primary = 4.35 cfs @ 12.44 hrs, Volume= 0.924 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 531.69' @ 12.44 hrs Surf.Area= 9,634 sf Storage= 23,858 cf

Plug-Flow detention time= 242.0 min calculated for 0.923 af (78% of inflow)
 Center-of-Mass det. time= 154.0 min (943.6 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	528.00'	26,911 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
528.00	3,437	0	0
530.00	6,648	10,085	10,085
532.00	10,178	16,826	26,911

Device	Routing	Invert	Outlet Devices
#1	Primary	530.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	530.60'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.35 cfs @ 12.44 hrs HW=531.69' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.05 cfs @ 5.36 fps)
 — **2=Orifice/Grate** (Orifice Controls 3.30 cfs @ 4.40 fps)

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

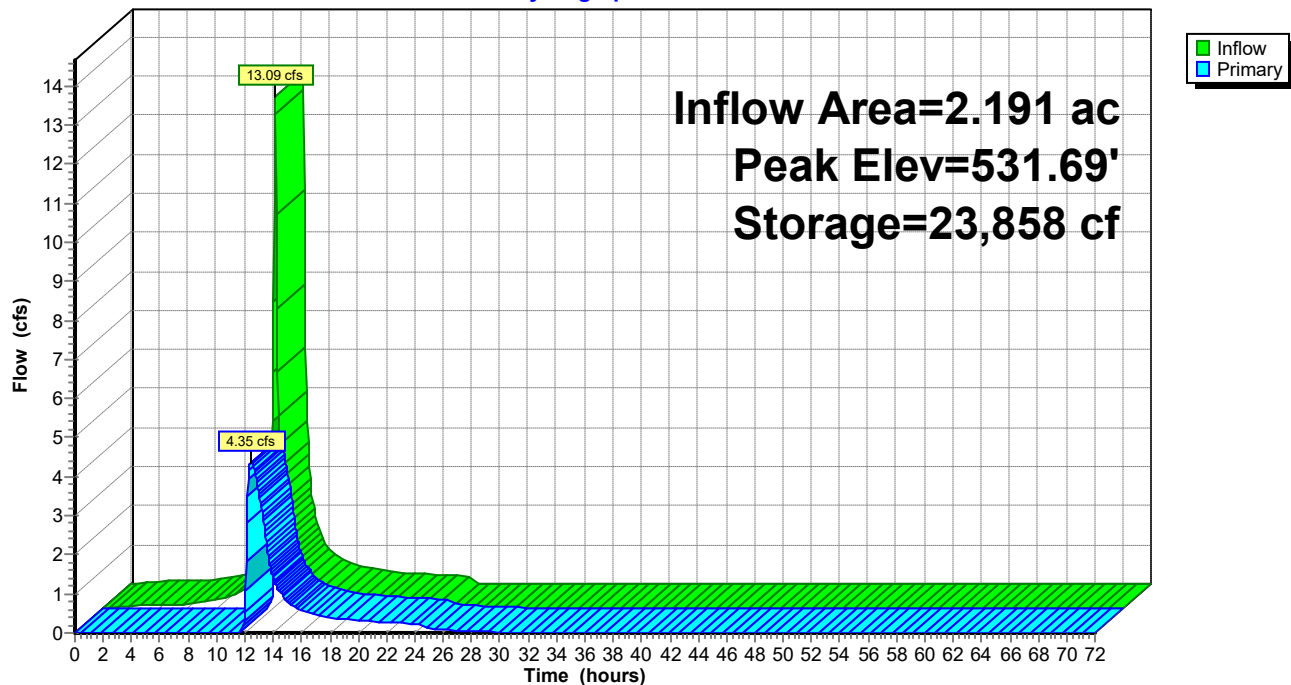
Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 42

Pond 35P: Basin 3

Hydrograph



proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 43

Hydrograph for Pond 35P: Basin 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	528.00	0.00
2.50	0.07	281	528.08	0.00
5.00	0.10	1,032	528.28	0.00
7.50	0.19	2,195	528.56	0.00
10.00	0.51	4,939	529.14	0.00
12.50	3.64	23,775	531.68	4.33
15.00	0.60	15,604	530.75	0.82
17.50	0.37	14,642	530.63	0.43
20.00	0.28	14,135	530.57	0.32
22.50	0.23	13,811	530.52	0.26
25.00	0.00	13,074	530.43	0.14
27.50	0.00	12,339	530.32	0.05
30.00	0.00	12,047	530.28	0.02
32.50	0.00	11,894	530.26	0.01
35.00	0.00	11,798	530.25	0.01
37.50	0.00	11,737	530.24	0.01
40.00	0.00	11,695	530.23	0.00
42.50	0.00	11,658	530.23	0.00
45.00	0.00	11,627	530.23	0.00
47.50	0.00	11,601	530.22	0.00
50.00	0.00	11,579	530.22	0.00
52.50	0.00	11,560	530.22	0.00
55.00	0.00	11,543	530.21	0.00
57.50	0.00	11,530	530.21	0.00
60.00	0.00	11,518	530.21	0.00
62.50	0.00	11,508	530.21	0.00
65.00	0.00	11,499	530.21	0.00
67.50	0.00	11,492	530.21	0.00
70.00	0.00	11,486	530.21	0.00

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 44

Stage-Discharge for Pond 35P: Basin 3

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
528.00	0.00	529.02	0.00	530.04	0.00	531.06	2.24
528.02	0.00	529.04	0.00	530.06	0.00	531.08	2.35
528.04	0.00	529.06	0.00	530.08	0.00	531.10	2.46
528.06	0.00	529.08	0.00	530.10	0.00	531.12	2.57
528.08	0.00	529.10	0.00	530.12	0.00	531.14	2.66
528.10	0.00	529.12	0.00	530.14	0.00	531.16	2.74
528.12	0.00	529.14	0.00	530.16	0.00	531.18	2.83
528.14	0.00	529.16	0.00	530.18	0.00	531.20	2.90
528.16	0.00	529.18	0.00	530.20	0.00	531.22	2.98
528.18	0.00	529.20	0.00	530.22	0.00	531.24	3.05
528.20	0.00	529.22	0.00	530.24	0.01	531.26	3.12
528.22	0.00	529.24	0.00	530.26	0.01	531.28	3.19
528.24	0.00	529.26	0.00	530.28	0.02	531.30	3.26
528.26	0.00	529.28	0.00	530.30	0.03	531.32	3.33
528.28	0.00	529.30	0.00	530.32	0.04	531.34	3.39
528.30	0.00	529.32	0.00	530.34	0.06	531.36	3.45
528.32	0.00	529.34	0.00	530.36	0.07	531.38	3.52
528.34	0.00	529.36	0.00	530.38	0.09	531.40	3.58
528.36	0.00	529.38	0.00	530.40	0.11	531.42	3.63
528.38	0.00	529.40	0.00	530.42	0.13	531.44	3.69
528.40	0.00	529.42	0.00	530.44	0.16	531.46	3.75
528.42	0.00	529.44	0.00	530.46	0.18	531.48	3.81
528.44	0.00	529.46	0.00	530.48	0.20	531.50	3.86
528.46	0.00	529.48	0.00	530.50	0.23	531.52	3.92
528.48	0.00	529.50	0.00	530.52	0.26	531.54	3.97
528.50	0.00	529.52	0.00	530.54	0.28	531.56	4.02
528.52	0.00	529.54	0.00	530.56	0.31	531.58	4.08
528.54	0.00	529.56	0.00	530.58	0.34	531.60	4.13
528.56	0.00	529.58	0.00	530.60	0.36	531.62	4.18
528.58	0.00	529.60	0.00	530.62	0.40	531.64	4.23
528.60	0.00	529.62	0.00	530.64	0.45	531.66	4.28
528.62	0.00	529.64	0.00	530.66	0.51	531.68	4.33
528.64	0.00	529.66	0.00	530.68	0.57	531.70	4.37
528.66	0.00	529.68	0.00	530.70	0.62	531.72	4.42
528.68	0.00	529.70	0.00	530.72	0.69	531.74	4.47
528.70	0.00	529.72	0.00	530.74	0.76	531.76	4.52
528.72	0.00	529.74	0.00	530.76	0.83	531.78	4.56
528.74	0.00	529.76	0.00	530.78	0.91	531.80	4.61
528.76	0.00	529.78	0.00	530.80	0.99	531.82	4.65
528.78	0.00	529.80	0.00	530.82	1.07	531.84	4.70
528.80	0.00	529.82	0.00	530.84	1.16	531.86	4.74
528.82	0.00	529.84	0.00	530.86	1.24	531.88	4.79
528.84	0.00	529.86	0.00	530.88	1.33	531.90	4.83
528.86	0.00	529.88	0.00	530.90	1.43	531.92	4.87
528.88	0.00	529.90	0.00	530.92	1.52	531.94	4.92
528.90	0.00	529.92	0.00	530.94	1.62	531.96	4.96
528.92	0.00	529.94	0.00	530.96	1.72	531.98	5.00
528.94	0.00	529.96	0.00	530.98	1.82	532.00	5.04
528.96	0.00	529.98	0.00	531.00	1.92		
528.98	0.00	530.00	0.00	531.02	2.02		
529.00	0.00	530.02	0.00	531.04	2.13		

proposed basin 3 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

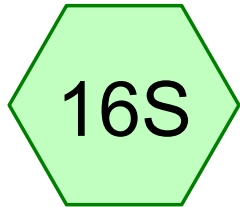
Basin 3 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

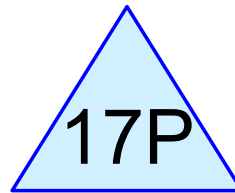
Page 45

Stage-Area-Storage for Pond 35P: Basin 3

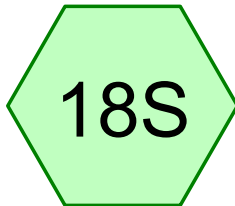
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
528.00	3,437	0	530.55	7,619	14,008
528.05	3,517	174	530.60	7,707	14,392
528.10	3,598	352	530.65	7,795	14,779
528.15	3,678	534	530.70	7,884	15,171
528.20	3,758	720	530.75	7,972	15,567
528.25	3,838	909	530.80	8,060	15,968
528.30	3,919	1,103	530.85	8,148	16,373
528.35	3,999	1,301	530.90	8,236	16,783
528.40	4,079	1,503	530.95	8,325	17,197
528.45	4,159	1,709	531.00	8,413	17,616
528.50	4,240	1,919	531.05	8,501	18,038
528.55	4,320	2,133	531.10	8,590	18,466
528.60	4,400	2,351	531.15	8,678	18,897
528.65	4,481	2,573	531.20	8,766	19,333
528.70	4,561	2,799	531.25	8,854	19,774
528.75	4,641	3,029	531.30	8,942	20,219
528.80	4,721	3,263	531.35	9,031	20,668
528.85	4,802	3,501	531.40	9,119	21,122
528.90	4,882	3,744	531.45	9,207	21,580
528.95	4,962	3,990	531.50	9,296	22,043
529.00	5,043	4,240	531.55	9,384	22,510
529.05	5,123	4,494	531.60	9,472	22,981
529.10	5,203	4,752	531.65	9,560	23,457
529.15	5,283	5,014	531.70	9,649	23,937
529.20	5,364	5,280	531.75	9,737	24,422
529.25	5,444	5,551	531.80	9,825	24,911
529.30	5,524	5,825	531.85	9,913	25,404
529.35	5,604	6,103	531.90	10,001	25,902
529.40	5,685	6,385	531.95	10,090	26,404
529.45	5,765	6,671	532.00	10,178	26,911
529.50	5,845	6,962			
529.55	5,926	7,256			
529.60	6,006	7,554			
529.65	6,086	7,857			
529.70	6,166	8,163			
529.75	6,247	8,473			
529.80	6,327	8,788			
529.85	6,407	9,106			
529.90	6,487	9,428			
529.95	6,568	9,755			
530.00	6,648	10,085			
530.05	6,736	10,420			
530.10	6,825	10,759			
530.15	6,913	11,102			
530.20	7,001	11,450			
530.25	7,089	11,802			
530.30	7,177	12,159			
530.35	7,266	12,520			
530.40	7,354	12,885			
530.45	7,442	13,255			
530.50	7,531	13,630			



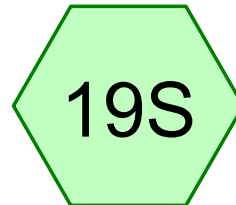
Basin 4 Porous pvmt



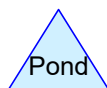
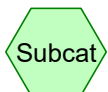
Porous pavement
system 4



OL-4



pre-dev basin 4



Routing Diagram for Proposed basin 4 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.812	74	>75% Grass cover, Good, HSG C (16S, 18S)
0.007	98	Paved roads w/curbs & sewers, HSG C (18S)
2.226	70	Woods, Good, HSG C (19S)
1.408	98	roof and parking (16S)
4.453	80	TOTAL AREA

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.045	HSG C	16S, 18S, 19S
0.000	HSG D	
1.408	Other	16S
4.453		TOTAL AREA

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.812	0.000	0.000	0.812	>75% Grass cover, Good	16 S, 18 S
0.000	0.000	0.007	0.000	0.000	0.007	Paved roads w/curbs & sewers	18 S
0.000	0.000	2.226	0.000	0.000	2.226	Woods, Good	19 S
0.000	0.000	0.000	0.000	1.408	1.408	roof and parking	16 S
0.000	0.000	3.045	0.000	1.408	4.453	TOTAL AREA	

Proposed basin 4 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	16S	0.00	0.00	309.0	0.0261	0.013	0.0	15.0	9.0	

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 16S: Basin 4 Porous pvmt

Runoff Area=85,708 sf Runoff Depth=2.64"

Flow Length=509' Tc=8.1 min CN=74/98 Runoff=4.96 cfs 0.432 af

Subcatchment 18S: OL-4

Runoff Area=11,273 sf Runoff Depth=1.25"

Flow Length=96' Slope=0.0573 '/' Tc=8.7 min CN=74/98 Runoff=0.33 cfs 0.027 af

Subcatchment 19S: pre-dev basin 4

Runoff Area=96,981 sf Runoff Depth=0.97"

Flow Length=190' Tc=15.9 min CN=70/0 Runoff=1.67 cfs 0.180 af

Pond 17P: Porous pavement system 4

Peak Elev=589.11' Storage=17,538 cf Inflow=4.96 cfs 0.432 af

Outflow=0.08 cfs 0.045 af

Total Runoff Area = 4.453 ac Runoff Volume = 0.639 af Average Runoff Depth = 1.72"

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 16S: Basin 4 Porous pvmt

[47] Hint: Peak is 202% of capacity of segment #3

Runoff = 4.96 cfs @ 12.15 hrs, Volume= 0.432 af, Depth= 2.64"
Routed to Pond 17P : Porous pavement system 4

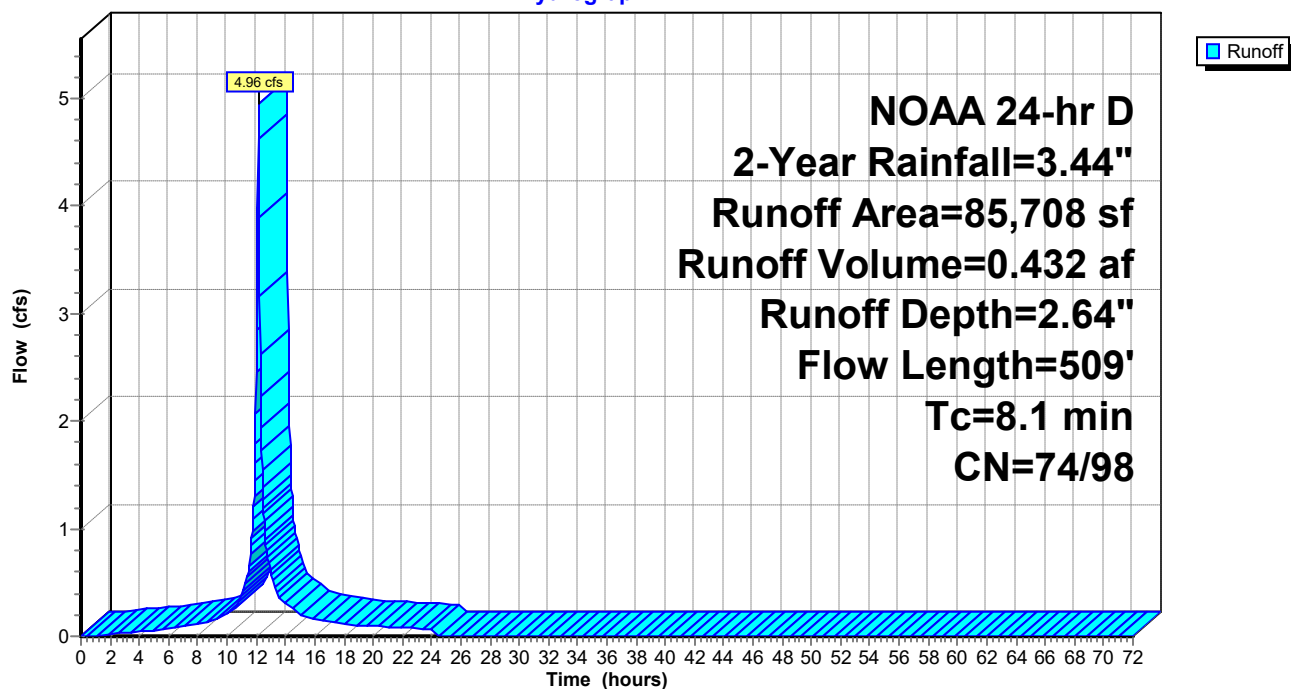
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	61,324	98	roof and parking
	24,384	74	>75% Grass cover, Good, HSG C
	85,708	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0520	0.26		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.44"
0.6	100	0.0300	2.60		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.0	309	0.0261	5.35	2.45	Pipe Channel, 15.0" Round w/ 9.0" inside fill Area= 0.5 sf Perim= 2.9' r= 0.16' n= 0.013 Corrugated PE, smooth interior
8.1	509	Total			

Subcatchment 16S: Basin 4 Porous pvmt

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Hydrograph for Subcatchment 16S: Basin 4 Porous pvmt

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.01
3.00	0.13	0.00	0.03	0.03
4.50	0.21	0.00	0.07	0.05
6.00	0.29	0.00	0.14	0.07
7.50	0.40	0.00	0.23	0.10
9.00	0.55	0.00	0.36	0.14
10.50	0.77	0.00	0.57	0.25
12.00	1.65	0.20	1.43	2.45
13.50	2.67	0.71	2.44	0.39
15.00	2.89	0.84	2.66	0.20
16.50	3.04	0.93	2.81	0.15
18.00	3.15	1.00	2.91	0.11
19.50	3.23	1.06	3.00	0.10
21.00	3.31	1.11	3.08	0.09
22.50	3.38	1.16	3.15	0.08
24.00	3.44	1.20	3.21	0.07
25.50	3.44	1.20	3.21	0.00
27.00	3.44	1.20	3.21	0.00
28.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
31.50	3.44	1.20	3.21	0.00
33.00	3.44	1.20	3.21	0.00
34.50	3.44	1.20	3.21	0.00
36.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
39.00	3.44	1.20	3.21	0.00
40.50	3.44	1.20	3.21	0.00
42.00	3.44	1.20	3.21	0.00
43.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
46.50	3.44	1.20	3.21	0.00
48.00	3.44	1.20	3.21	0.00
49.50	3.44	1.20	3.21	0.00
51.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
54.00	3.44	1.20	3.21	0.00
55.50	3.44	1.20	3.21	0.00
57.00	3.44	1.20	3.21	0.00
58.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
61.50	3.44	1.20	3.21	0.00
63.00	3.44	1.20	3.21	0.00
64.50	3.44	1.20	3.21	0.00
66.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
69.00	3.44	1.20	3.21	0.00
70.50	3.44	1.20	3.21	0.00
72.00	3.44	1.20	3.21	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 18S: OL-4

Runoff = 0.33 cfs @ 12.16 hrs, Volume= 0.027 af, Depth= 1.25"

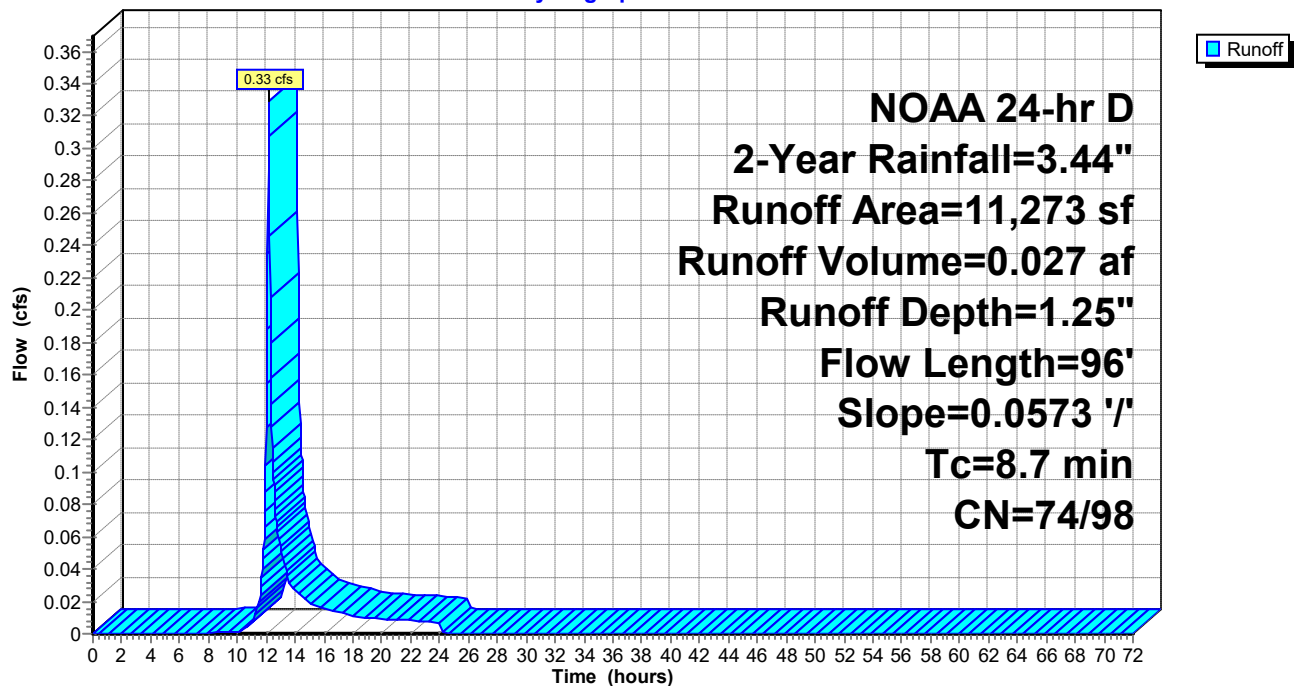
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
301	98	Paved roads w/curbs & sewers, HSG C
10,972	74	>75% Grass cover, Good, HSG C
11,273	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	96	0.0573	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 18S: OL-4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Hydrograph for Subcatchment 18S: OL-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.00
3.00	0.13	0.00	0.03	0.00
4.50	0.21	0.00	0.07	0.00
6.00	0.29	0.00	0.14	0.00
7.50	0.40	0.00	0.23	0.00
9.00	0.55	0.00	0.36	0.00
10.50	0.77	0.00	0.57	0.00
12.00	1.65	0.20	1.43	0.13
13.50	2.67	0.71	2.44	0.03
15.00	2.89	0.84	2.66	0.02
16.50	3.04	0.93	2.81	0.01
18.00	3.15	1.00	2.91	0.01
19.50	3.23	1.06	3.00	0.01
21.00	3.31	1.11	3.08	0.01
22.50	3.38	1.16	3.15	0.01
24.00	3.44	1.20	3.21	0.01
25.50	3.44	1.20	3.21	0.00
27.00	3.44	1.20	3.21	0.00
28.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
31.50	3.44	1.20	3.21	0.00
33.00	3.44	1.20	3.21	0.00
34.50	3.44	1.20	3.21	0.00
36.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
39.00	3.44	1.20	3.21	0.00
40.50	3.44	1.20	3.21	0.00
42.00	3.44	1.20	3.21	0.00
43.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
46.50	3.44	1.20	3.21	0.00
48.00	3.44	1.20	3.21	0.00
49.50	3.44	1.20	3.21	0.00
51.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
54.00	3.44	1.20	3.21	0.00
55.50	3.44	1.20	3.21	0.00
57.00	3.44	1.20	3.21	0.00
58.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
61.50	3.44	1.20	3.21	0.00
63.00	3.44	1.20	3.21	0.00
64.50	3.44	1.20	3.21	0.00
66.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
69.00	3.44	1.20	3.21	0.00
70.50	3.44	1.20	3.21	0.00
72.00	3.44	1.20	3.21	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Summary for Subcatchment 19S: pre-dev basin 4

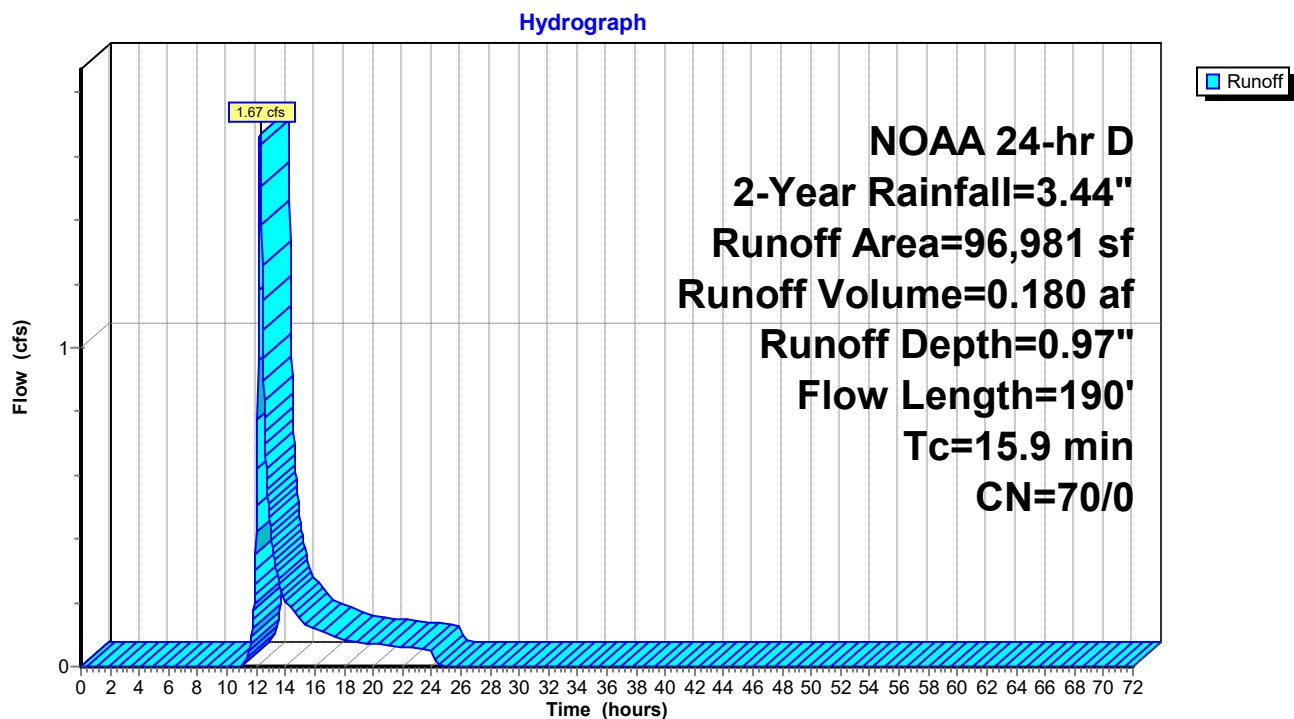
Runoff = 1.67 cfs @ 12.26 hrs, Volume= 0.180 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
96,981	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.5	90	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.9	190	Total			

Subcatchment 19S: pre-dev basin 4



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Hydrograph for Subcatchment 19S: pre-dev basin 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.00
3.00	0.13	0.00	0.00	0.00
4.50	0.21	0.00	0.00	0.00
6.00	0.29	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
9.00	0.55	0.00	0.00	0.00
10.50	0.77	0.00	0.00	0.00
12.00	1.65	0.12	0.00	0.42
13.50	2.67	0.54	0.00	0.28
15.00	2.89	0.66	0.00	0.15
16.50	3.04	0.74	0.00	0.11
18.00	3.15	0.80	0.00	0.08
19.50	3.23	0.85	0.00	0.07
21.00	3.31	0.89	0.00	0.07
22.50	3.38	0.93	0.00	0.06
24.00	3.44	0.97	0.00	0.05
25.50	3.44	0.97	0.00	0.00
27.00	3.44	0.97	0.00	0.00
28.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
31.50	3.44	0.97	0.00	0.00
33.00	3.44	0.97	0.00	0.00
34.50	3.44	0.97	0.00	0.00
36.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
39.00	3.44	0.97	0.00	0.00
40.50	3.44	0.97	0.00	0.00
42.00	3.44	0.97	0.00	0.00
43.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
46.50	3.44	0.97	0.00	0.00
48.00	3.44	0.97	0.00	0.00
49.50	3.44	0.97	0.00	0.00
51.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
54.00	3.44	0.97	0.00	0.00
55.50	3.44	0.97	0.00	0.00
57.00	3.44	0.97	0.00	0.00
58.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
61.50	3.44	0.97	0.00	0.00
63.00	3.44	0.97	0.00	0.00
64.50	3.44	0.97	0.00	0.00
66.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
69.00	3.44	0.97	0.00	0.00
70.50	3.44	0.97	0.00	0.00
72.00	3.44	0.97	0.00	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Summary for Pond 17P: Porous pavement system 4

Inflow Area = 1.968 ac, Inflow Depth = 2.64" for 2-Year event
Inflow = 4.96 cfs @ 12.15 hrs, Volume= 0.432 af
Outflow = 0.08 cfs @ 22.15 hrs, Volume= 0.045 af, Atten= 98%, Lag= 600.3 min
Primary = 0.08 cfs @ 22.15 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 589.11' @ 22.15 hrs Surf.Area= 10,178 sf Storage= 17,538 cf

Plug-Flow detention time= 1,046.9 min calculated for 0.045 af (10% of inflow)
Center-of-Mass det. time= 671.5 min (1,444.9 - 773.3)

Volume	Invert	Avail.Storage	Storage Description
#1	585.00'	32,044 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 81,424 cf Overall - 1,315 cf Embedded = 80,109 cf x 40.0% Voids
#2	586.00'	1,315 cf	36.0" Round Pipe Storage Inside #1 L= 186.0'
33,358 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.00	10,178	0	0
593.00	10,178	81,424	81,424

Device	Routing	Invert	Outlet Devices
#1	Primary	588.95'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	589.90'	24.0" W x 4.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 22.15 hrs HW=589.11' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.08 cfs @ 1.38 fps)

2=Orifice/Grate (Controls 0.00 cfs)

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

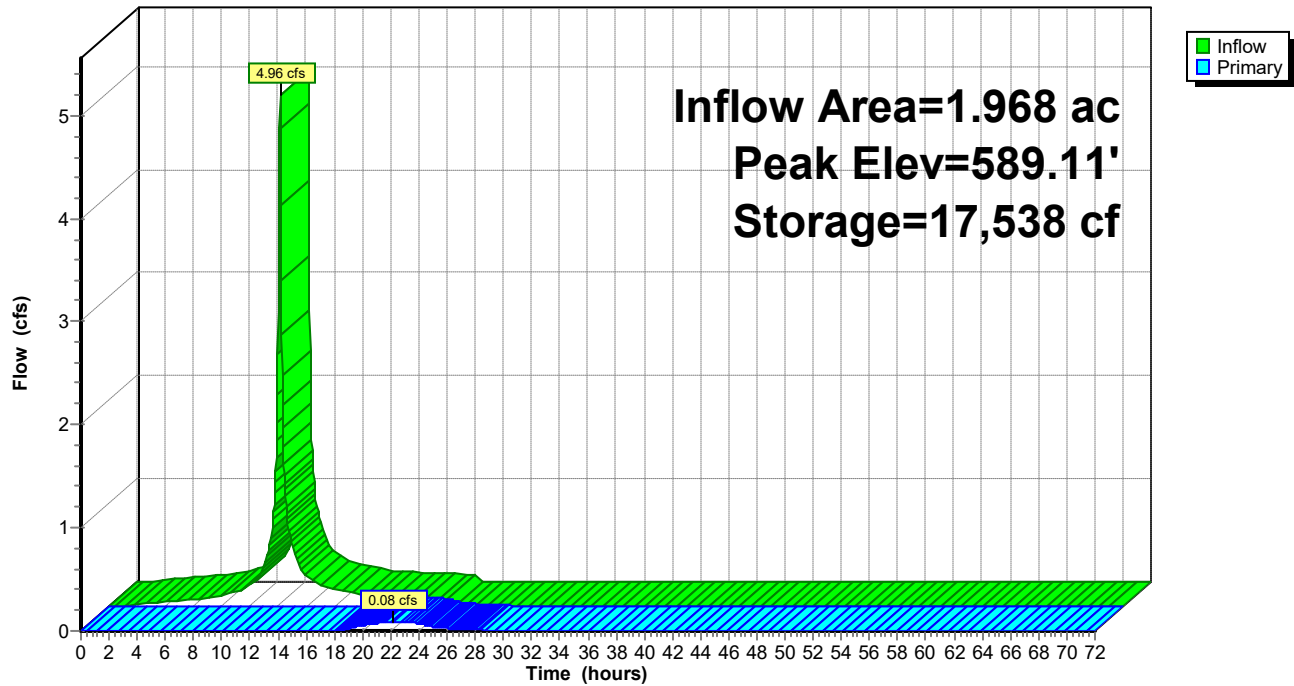
Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Pond 17P: Porous pavement system 4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Hydrograph for Pond 17P: Porous pavement system 4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	585.00	0.00
1.50	0.01	5	585.00	0.00
3.00	0.03	122	585.03	0.00
4.50	0.05	359	585.09	0.00
6.00	0.07	685	585.17	0.00
7.50	0.10	1,136	585.28	0.00
9.00	0.14	1,776	585.44	0.00
10.50	0.25	2,802	585.69	0.00
12.00	2.45	6,360	586.54	0.00
13.50	0.39	13,733	588.22	0.00
15.00	0.20	15,230	588.56	0.00
16.50	0.15	16,164	588.78	0.00
18.00	0.11	16,879	588.95	0.00
19.50	0.10	17,339	589.07	0.04
21.00	0.09	17,515	589.11	0.08
22.50	0.08	17,537	589.11	0.08
24.00	0.07	17,512	589.11	0.07
25.50	0.00	17,270	589.05	0.03
27.00	0.00	17,141	589.02	0.02
28.50	0.00	17,077	589.00	0.01
30.00	0.00	17,038	588.99	0.01
31.50	0.00	17,007	588.98	0.01
33.00	0.00	16,981	588.98	0.00
34.50	0.00	16,960	588.97	0.00
36.00	0.00	16,943	588.97	0.00
37.50	0.00	16,929	588.96	0.00
39.00	0.00	16,918	588.96	0.00
40.50	0.00	16,908	588.96	0.00
42.00	0.00	16,901	588.96	0.00
43.50	0.00	16,895	588.96	0.00
45.00	0.00	16,890	588.96	0.00
46.50	0.00	16,885	588.95	0.00
48.00	0.00	16,882	588.95	0.00
49.50	0.00	16,879	588.95	0.00
51.00	0.00	16,877	588.95	0.00
52.50	0.00	16,875	588.95	0.00
54.00	0.00	16,874	588.95	0.00
55.50	0.00	16,873	588.95	0.00
57.00	0.00	16,872	588.95	0.00
58.50	0.00	16,871	588.95	0.00
60.00	0.00	16,870	588.95	0.00
61.50	0.00	16,870	588.95	0.00
63.00	0.00	16,869	588.95	0.00
64.50	0.00	16,869	588.95	0.00
66.00	0.00	16,869	588.95	0.00
67.50	0.00	16,868	588.95	0.00
69.00	0.00	16,868	588.95	0.00
70.50	0.00	16,868	588.95	0.00
72.00	0.00	16,868	588.95	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Stage-Discharge for Pond 17P: Porous pavement system 4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
585.00	0.00	587.55	0.00	590.10	1.47	592.65	6.91
585.05	0.00	587.60	0.00	590.15	1.72	592.70	6.98
585.10	0.00	587.65	0.00	590.20	2.00	592.75	7.04
585.15	0.00	587.70	0.00	590.25	2.28	592.80	7.10
585.20	0.00	587.75	0.00	590.30	2.51	592.85	7.16
585.25	0.00	587.80	0.00	590.35	2.70	592.90	7.22
585.30	0.00	587.85	0.00	590.40	2.87	592.95	7.28
585.35	0.00	587.90	0.00	590.45	3.03	593.00	7.34
585.40	0.00	587.95	0.00	590.50	3.18		
585.45	0.00	588.00	0.00	590.55	3.32		
585.50	0.00	588.05	0.00	590.60	3.45		
585.55	0.00	588.10	0.00	590.65	3.58		
585.60	0.00	588.15	0.00	590.70	3.71		
585.65	0.00	588.20	0.00	590.75	3.82		
585.70	0.00	588.25	0.00	590.80	3.94		
585.75	0.00	588.30	0.00	590.85	4.05		
585.80	0.00	588.35	0.00	590.90	4.16		
585.85	0.00	588.40	0.00	590.95	4.26		
585.90	0.00	588.45	0.00	591.00	4.37		
585.95	0.00	588.50	0.00	591.05	4.47		
586.00	0.00	588.55	0.00	591.10	4.56		
586.05	0.00	588.60	0.00	591.15	4.66		
586.10	0.00	588.65	0.00	591.20	4.75		
586.15	0.00	588.70	0.00	591.25	4.84		
586.20	0.00	588.75	0.00	591.30	4.93		
586.25	0.00	588.80	0.00	591.35	5.02		
586.30	0.00	588.85	0.00	591.40	5.11		
586.35	0.00	588.90	0.00	591.45	5.19		
586.40	0.00	588.95	0.00	591.50	5.27		
586.45	0.00	589.00	0.01	591.55	5.36		
586.50	0.00	589.05	0.03	591.60	5.44		
586.55	0.00	589.10	0.07	591.65	5.52		
586.60	0.00	589.15	0.11	591.70	5.60		
586.65	0.00	589.20	0.17	591.75	5.67		
586.70	0.00	589.25	0.23	591.80	5.75		
586.75	0.00	589.30	0.30	591.85	5.82		
586.80	0.00	589.35	0.36	591.90	5.90		
586.85	0.00	589.40	0.43	591.95	5.97		
586.90	0.00	589.45	0.47	592.00	6.04		
586.95	0.00	589.50	0.52	592.05	6.12		
587.00	0.00	589.55	0.56	592.10	6.19		
587.05	0.00	589.60	0.60	592.15	6.26		
587.10	0.00	589.65	0.63	592.20	6.32		
587.15	0.00	589.70	0.67	592.25	6.39		
587.20	0.00	589.75	0.70	592.30	6.46		
587.25	0.00	589.80	0.73	592.35	6.53		
587.30	0.00	589.85	0.76	592.40	6.59		
587.35	0.00	589.90	0.79	592.45	6.66		
587.40	0.00	589.95	0.89	592.50	6.72		
587.45	0.00	590.00	1.05	592.55	6.79		
587.50	0.00	590.05	1.24	592.60	6.85		

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 19

Stage-Area-Storage for Pond 17P: Porous pavement system 4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
585.00	0	590.10	21,552
585.10	407	590.20	21,959
585.20	814	590.30	22,366
585.30	1,221	590.40	22,773
585.40	1,628	590.50	23,180
585.50	2,036	590.60	23,588
585.60	2,443	590.70	23,995
585.70	2,850	590.80	24,402
585.80	3,257	590.90	24,809
585.90	3,664	591.00	25,216
586.00	4,071	591.10	25,623
586.10	4,486	591.20	26,030
586.20	4,908	591.30	26,437
586.30	5,334	591.40	26,845
586.40	5,762	591.50	27,252
586.50	6,193	591.60	27,659
586.60	6,626	591.70	28,066
586.70	7,061	591.80	28,473
586.80	7,497	591.90	28,880
586.90	7,934	592.00	29,287
587.00	8,373	592.10	29,694
587.10	8,812	592.20	30,101
587.20	9,251	592.30	30,509
587.30	9,691	592.40	30,916
587.40	10,132	592.50	31,323
587.50	10,572	592.60	31,730
587.60	11,013	592.70	32,137
587.70	11,453	592.80	32,544
587.80	11,894	592.90	32,951
587.90	12,333	593.00	33,358
588.00	12,772		
588.10	13,211		
588.20	13,648		
588.30	14,084		
588.40	14,519		
588.50	14,952		
588.60	15,383		
588.70	15,811		
588.80	16,237		
588.90	16,658		
589.00	17,074		
589.10	17,481		
589.20	17,888		
589.30	18,295		
589.40	18,702		
589.50	19,109		
589.60	19,516		
589.70	19,923		
589.80	20,331		
589.90	20,738		
590.00	21,145		

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 16S: Basin 4 Porous pvmt

Runoff Area=85,708 sf Runoff Depth=4.29"

Flow Length=509' Tc=8.1 min CN=74/98 Runoff=8.03 cfs 0.703 af

Subcatchment 18S: OL-4

Runoff Area=11,273 sf Runoff Depth=2.61"

Flow Length=96' Slope=0.0573 '/' Tc=8.7 min CN=74/98 Runoff=0.70 cfs 0.056 af

Subcatchment 19S: pre-dev basin 4

Runoff Area=96,981 sf Runoff Depth=2.20"

Flow Length=190' Tc=15.9 min CN=70/0 Runoff=4.06 cfs 0.408 af

Pond 17P: Porous pavement system 4

Peak Elev=589.75' Storage=20,113 cf Inflow=8.03 cfs 0.703 af

Outflow=0.70 cfs 0.316 af

Total Runoff Area = 4.453 ac Runoff Volume = 1.168 af Average Runoff Depth = 3.15"

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Summary for Subcatchment 16S: Basin 4 Porous pvmt

[47] Hint: Peak is 327% of capacity of segment #3

Runoff = 8.03 cfs @ 12.15 hrs, Volume= 0.703 af, Depth= 4.29"
Routed to Pond 17P : Porous pavement system 4

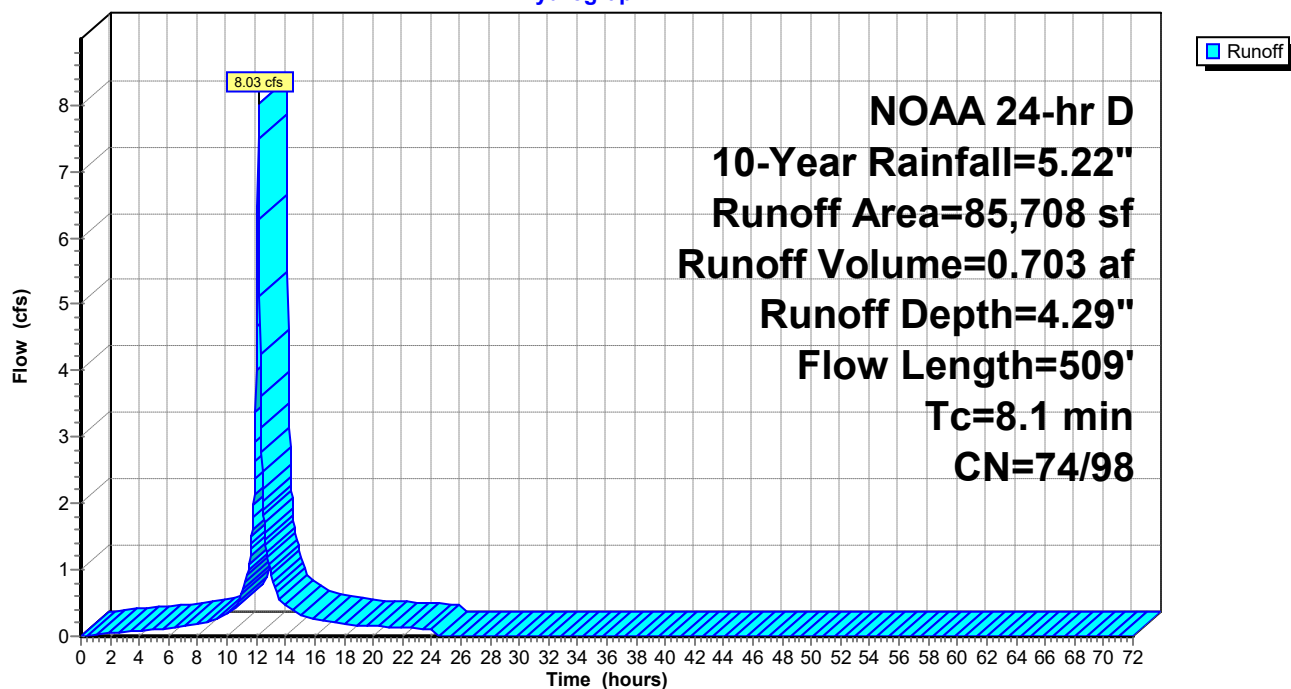
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	61,324	98	roof and parking
	24,384	74	>75% Grass cover, Good, HSG C
	85,708	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0520	0.26		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.44"
0.6	100	0.0300	2.60		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.0	309	0.0261	5.35	2.45	Pipe Channel, 15.0" Round w/ 9.0" inside fill Area= 0.5 sf Perim= 2.9' r= 0.16' n= 0.013 Corrugated PE, smooth interior
8.1	509	Total			

Subcatchment 16S: Basin 4 Porous pvmt

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 16S: Basin 4 Porous pvmt

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.01	0.03
3.00	0.20	0.00	0.07	0.07
4.50	0.31	0.00	0.16	0.09
6.00	0.45	0.00	0.27	0.11
7.50	0.61	0.00	0.42	0.16
9.00	0.83	0.00	0.63	0.22
10.50	1.17	0.05	0.96	0.42
12.00	2.50	0.61	2.27	4.00
13.50	4.05	1.63	3.82	0.62
15.00	4.39	1.89	4.16	0.32
16.50	4.61	2.06	4.37	0.24
18.00	4.77	2.19	4.54	0.18
19.50	4.91	2.29	4.67	0.16
21.00	5.02	2.38	4.79	0.14
22.50	5.13	2.47	4.89	0.12
24.00	5.22	2.54	4.98	0.11
25.50	5.22	2.54	4.98	0.00
27.00	5.22	2.54	4.98	0.00
28.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
31.50	5.22	2.54	4.98	0.00
33.00	5.22	2.54	4.98	0.00
34.50	5.22	2.54	4.98	0.00
36.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
39.00	5.22	2.54	4.98	0.00
40.50	5.22	2.54	4.98	0.00
42.00	5.22	2.54	4.98	0.00
43.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
46.50	5.22	2.54	4.98	0.00
48.00	5.22	2.54	4.98	0.00
49.50	5.22	2.54	4.98	0.00
51.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
54.00	5.22	2.54	4.98	0.00
55.50	5.22	2.54	4.98	0.00
57.00	5.22	2.54	4.98	0.00
58.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
61.50	5.22	2.54	4.98	0.00
63.00	5.22	2.54	4.98	0.00
64.50	5.22	2.54	4.98	0.00
66.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
69.00	5.22	2.54	4.98	0.00
70.50	5.22	2.54	4.98	0.00
72.00	5.22	2.54	4.98	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Subcatchment 18S: OL-4

Runoff = 0.70 cfs @ 12.16 hrs, Volume= 0.056 af, Depth= 2.61"

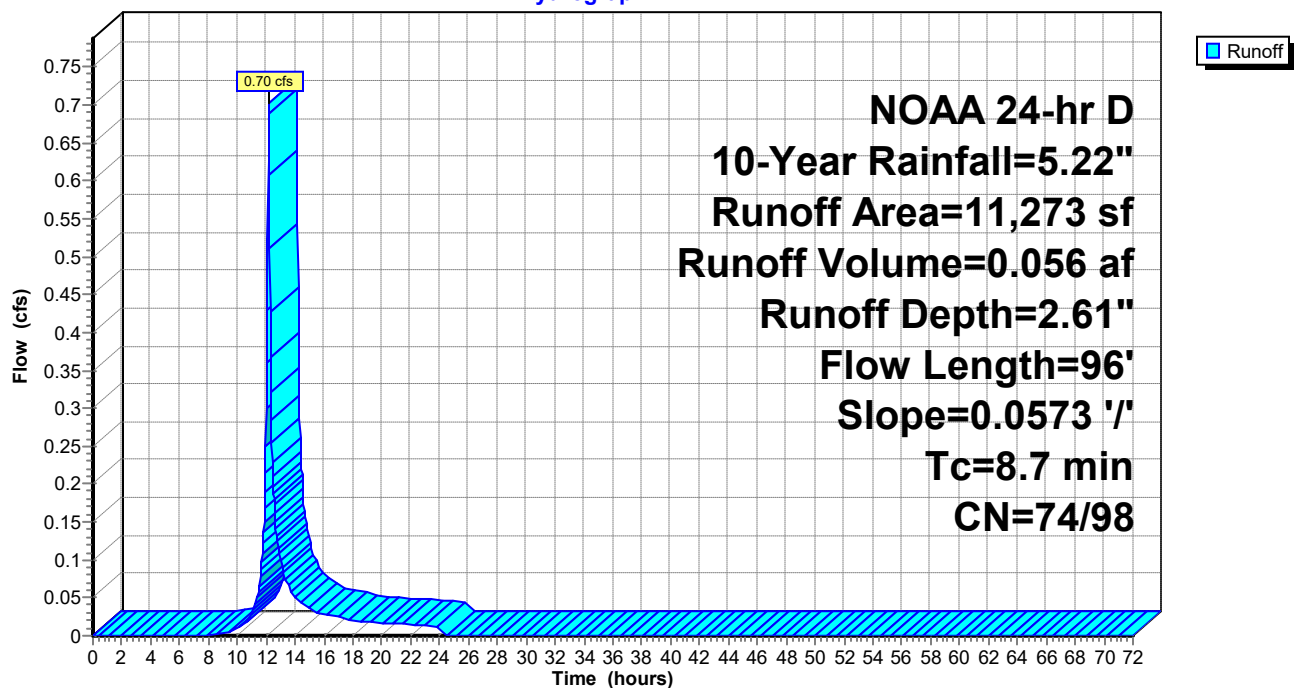
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
301	98	Paved roads w/curbs & sewers, HSG C
10,972	74	>75% Grass cover, Good, HSG C
11,273	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	96	0.0573	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 18S: OL-4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Hydrograph for Subcatchment 18S: OL-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.01	0.00
3.00	0.20	0.00	0.07	0.00
4.50	0.31	0.00	0.16	0.00
6.00	0.45	0.00	0.27	0.00
7.50	0.61	0.00	0.42	0.00
9.00	0.83	0.00	0.63	0.00
10.50	1.17	0.05	0.96	0.02
12.00	2.50	0.61	2.27	0.30
13.50	4.05	1.63	3.82	0.07
15.00	4.39	1.89	4.16	0.04
16.50	4.61	2.06	4.37	0.03
18.00	4.77	2.19	4.54	0.02
19.50	4.91	2.29	4.67	0.02
21.00	5.02	2.38	4.79	0.02
22.50	5.13	2.47	4.89	0.01
24.00	5.22	2.54	4.98	0.01
25.50	5.22	2.54	4.98	0.00
27.00	5.22	2.54	4.98	0.00
28.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
31.50	5.22	2.54	4.98	0.00
33.00	5.22	2.54	4.98	0.00
34.50	5.22	2.54	4.98	0.00
36.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
39.00	5.22	2.54	4.98	0.00
40.50	5.22	2.54	4.98	0.00
42.00	5.22	2.54	4.98	0.00
43.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
46.50	5.22	2.54	4.98	0.00
48.00	5.22	2.54	4.98	0.00
49.50	5.22	2.54	4.98	0.00
51.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
54.00	5.22	2.54	4.98	0.00
55.50	5.22	2.54	4.98	0.00
57.00	5.22	2.54	4.98	0.00
58.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
61.50	5.22	2.54	4.98	0.00
63.00	5.22	2.54	4.98	0.00
64.50	5.22	2.54	4.98	0.00
66.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
69.00	5.22	2.54	4.98	0.00
70.50	5.22	2.54	4.98	0.00
72.00	5.22	2.54	4.98	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Summary for Subcatchment 19S: pre-dev basin 4

Runoff = 4.06 cfs @ 12.25 hrs, Volume= 0.408 af, Depth= 2.20"

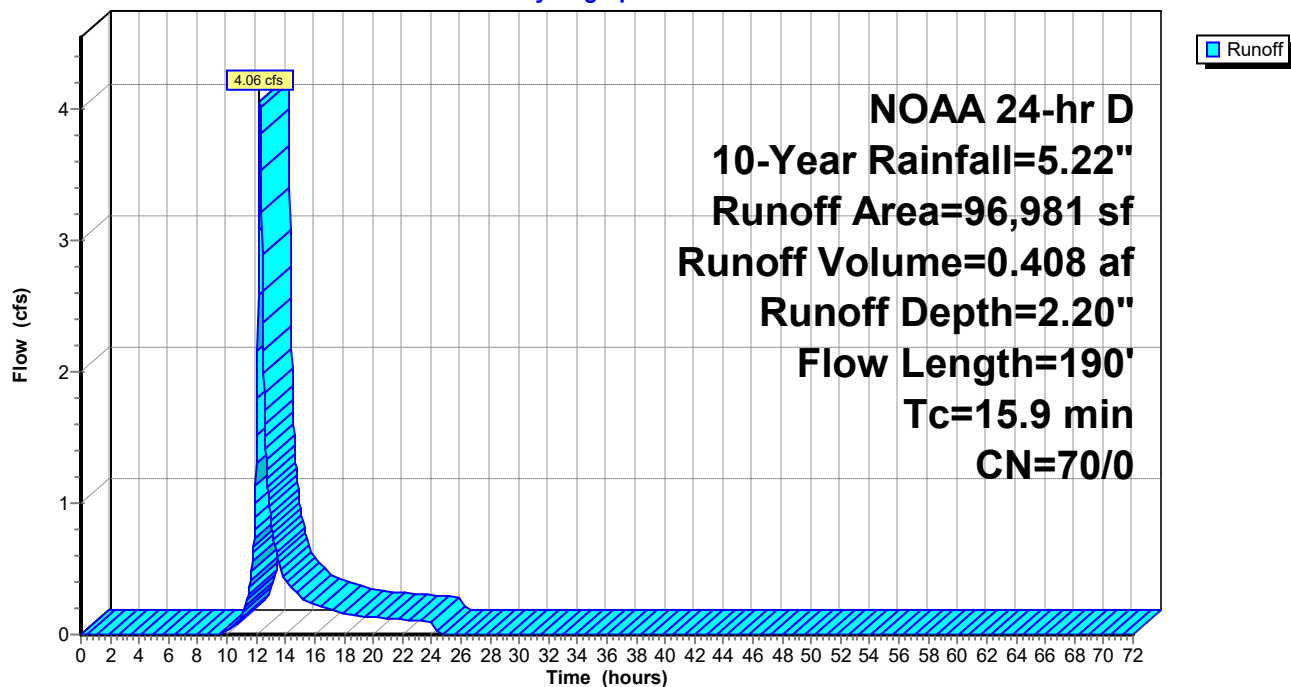
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
96,981	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.5	90	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.9	190	Total			

Subcatchment 19S: pre-dev basin 4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Hydrograph for Subcatchment 19S: pre-dev basin 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.00	0.00
3.00	0.20	0.00	0.00	0.00
4.50	0.31	0.00	0.00	0.00
6.00	0.45	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
9.00	0.83	0.00	0.00	0.00
10.50	1.17	0.02	0.00	0.06
12.00	2.50	0.46	0.00	1.30
13.50	4.05	1.36	0.00	0.56
15.00	4.39	1.60	0.00	0.29
16.50	4.61	1.75	0.00	0.21
18.00	4.77	1.87	0.00	0.16
19.50	4.91	1.97	0.00	0.14
21.00	5.02	2.05	0.00	0.13
22.50	5.13	2.13	0.00	0.11
24.00	5.22	2.20	0.00	0.10
25.50	5.22	2.20	0.00	0.00
27.00	5.22	2.20	0.00	0.00
28.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
31.50	5.22	2.20	0.00	0.00
33.00	5.22	2.20	0.00	0.00
34.50	5.22	2.20	0.00	0.00
36.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
39.00	5.22	2.20	0.00	0.00
40.50	5.22	2.20	0.00	0.00
42.00	5.22	2.20	0.00	0.00
43.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
46.50	5.22	2.20	0.00	0.00
48.00	5.22	2.20	0.00	0.00
49.50	5.22	2.20	0.00	0.00
51.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
54.00	5.22	2.20	0.00	0.00
55.50	5.22	2.20	0.00	0.00
57.00	5.22	2.20	0.00	0.00
58.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
61.50	5.22	2.20	0.00	0.00
63.00	5.22	2.20	0.00	0.00
64.50	5.22	2.20	0.00	0.00
66.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
69.00	5.22	2.20	0.00	0.00
70.50	5.22	2.20	0.00	0.00
72.00	5.22	2.20	0.00	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Summary for Pond 17P: Porous pavement system 4

Inflow Area = 1.968 ac, Inflow Depth = 4.29" for 10-Year event
Inflow = 8.03 cfs @ 12.15 hrs, Volume= 0.703 af
Outflow = 0.70 cfs @ 13.35 hrs, Volume= 0.316 af, Atten= 91%, Lag= 72.3 min
Primary = 0.70 cfs @ 13.35 hrs, Volume= 0.316 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 589.75' @ 13.35 hrs Surf.Area= 10,178 sf Storage= 20,113 cf

Plug-Flow detention time= 408.7 min calculated for 0.316 af (45% of inflow)
Center-of-Mass det. time= 255.7 min (1,022.5 - 766.8)

Volume	Invert	Avail.Storage	Storage Description
#1	585.00'	32,044 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 81,424 cf Overall - 1,315 cf Embedded = 80,109 cf x 40.0% Voids
#2	586.00'	1,315 cf	36.0" Round Pipe Storage Inside #1 L= 186.0'
33,358 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.00	10,178	0	0
593.00	10,178	81,424	81,424

Device	Routing	Invert	Outlet Devices
#1	Primary	588.95'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	589.90'	24.0" W x 4.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.70 cfs @ 13.35 hrs HW=589.75' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.70 cfs @ 3.56 fps)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

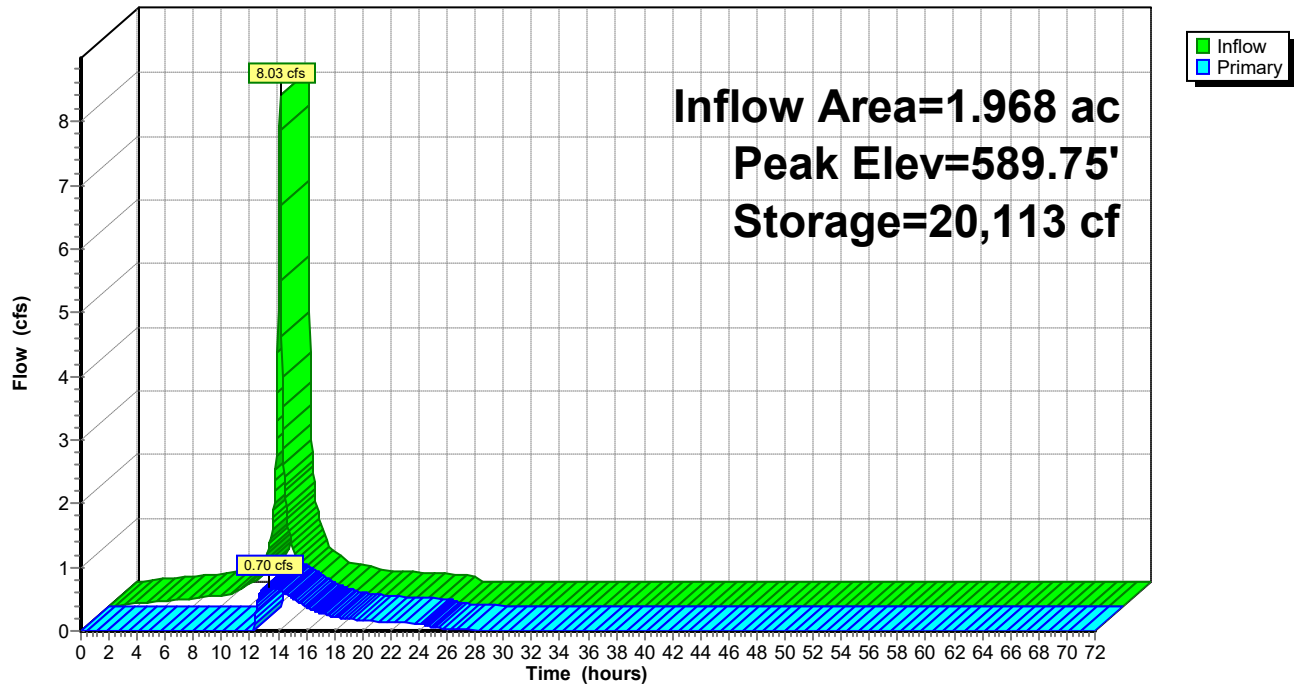
Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Pond 17P: Porous pavement system 4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Hydrograph for Pond 17P: Porous pavement system 4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	585.00	0.00
1.50	0.03	38	585.01	0.00
3.00	0.07	314	585.08	0.00
4.50	0.09	759	585.19	0.00
6.00	0.11	1,324	585.33	0.00
7.50	0.16	2,070	585.51	0.00
9.00	0.22	3,104	585.76	0.00
10.50	0.42	4,803	586.18	0.00
12.00	4.00	10,671	587.52	0.00
13.50	0.62	20,093	589.74	0.70
15.00	0.32	19,134	589.51	0.52
16.50	0.24	18,377	589.32	0.32
18.00	0.18	18,067	589.24	0.22
19.50	0.16	17,906	589.20	0.17
21.00	0.14	17,828	589.19	0.15
22.50	0.12	17,768	589.17	0.13
24.00	0.11	17,711	589.16	0.12
25.50	0.00	17,350	589.07	0.04
27.00	0.00	17,181	589.03	0.02
28.50	0.00	17,097	589.01	0.01
30.00	0.00	17,052	588.99	0.01
31.50	0.00	17,018	588.99	0.01
33.00	0.00	16,991	588.98	0.00
34.50	0.00	16,968	588.97	0.00
36.00	0.00	16,949	588.97	0.00
37.50	0.00	16,934	588.97	0.00
39.00	0.00	16,922	588.96	0.00
40.50	0.00	16,912	588.96	0.00
42.00	0.00	16,904	588.96	0.00
43.50	0.00	16,897	588.96	0.00
45.00	0.00	16,891	588.96	0.00
46.50	0.00	16,887	588.95	0.00
48.00	0.00	16,883	588.95	0.00
49.50	0.00	16,880	588.95	0.00
51.00	0.00	16,878	588.95	0.00
52.50	0.00	16,876	588.95	0.00
54.00	0.00	16,874	588.95	0.00
55.50	0.00	16,873	588.95	0.00
57.00	0.00	16,872	588.95	0.00
58.50	0.00	16,871	588.95	0.00
60.00	0.00	16,870	588.95	0.00
61.50	0.00	16,870	588.95	0.00
63.00	0.00	16,869	588.95	0.00
64.50	0.00	16,869	588.95	0.00
66.00	0.00	16,869	588.95	0.00
67.50	0.00	16,868	588.95	0.00
69.00	0.00	16,868	588.95	0.00
70.50	0.00	16,868	588.95	0.00
72.00	0.00	16,868	588.95	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 30

Stage-Discharge for Pond 17P: Porous pavement system 4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
585.00	0.00	587.55	0.00	590.10	1.47	592.65	6.91
585.05	0.00	587.60	0.00	590.15	1.72	592.70	6.98
585.10	0.00	587.65	0.00	590.20	2.00	592.75	7.04
585.15	0.00	587.70	0.00	590.25	2.28	592.80	7.10
585.20	0.00	587.75	0.00	590.30	2.51	592.85	7.16
585.25	0.00	587.80	0.00	590.35	2.70	592.90	7.22
585.30	0.00	587.85	0.00	590.40	2.87	592.95	7.28
585.35	0.00	587.90	0.00	590.45	3.03	593.00	7.34
585.40	0.00	587.95	0.00	590.50	3.18		
585.45	0.00	588.00	0.00	590.55	3.32		
585.50	0.00	588.05	0.00	590.60	3.45		
585.55	0.00	588.10	0.00	590.65	3.58		
585.60	0.00	588.15	0.00	590.70	3.71		
585.65	0.00	588.20	0.00	590.75	3.82		
585.70	0.00	588.25	0.00	590.80	3.94		
585.75	0.00	588.30	0.00	590.85	4.05		
585.80	0.00	588.35	0.00	590.90	4.16		
585.85	0.00	588.40	0.00	590.95	4.26		
585.90	0.00	588.45	0.00	591.00	4.37		
585.95	0.00	588.50	0.00	591.05	4.47		
586.00	0.00	588.55	0.00	591.10	4.56		
586.05	0.00	588.60	0.00	591.15	4.66		
586.10	0.00	588.65	0.00	591.20	4.75		
586.15	0.00	588.70	0.00	591.25	4.84		
586.20	0.00	588.75	0.00	591.30	4.93		
586.25	0.00	588.80	0.00	591.35	5.02		
586.30	0.00	588.85	0.00	591.40	5.11		
586.35	0.00	588.90	0.00	591.45	5.19		
586.40	0.00	588.95	0.00	591.50	5.27		
586.45	0.00	589.00	0.01	591.55	5.36		
586.50	0.00	589.05	0.03	591.60	5.44		
586.55	0.00	589.10	0.07	591.65	5.52		
586.60	0.00	589.15	0.11	591.70	5.60		
586.65	0.00	589.20	0.17	591.75	5.67		
586.70	0.00	589.25	0.23	591.80	5.75		
586.75	0.00	589.30	0.30	591.85	5.82		
586.80	0.00	589.35	0.36	591.90	5.90		
586.85	0.00	589.40	0.43	591.95	5.97		
586.90	0.00	589.45	0.47	592.00	6.04		
586.95	0.00	589.50	0.52	592.05	6.12		
587.00	0.00	589.55	0.56	592.10	6.19		
587.05	0.00	589.60	0.60	592.15	6.26		
587.10	0.00	589.65	0.63	592.20	6.32		
587.15	0.00	589.70	0.67	592.25	6.39		
587.20	0.00	589.75	0.70	592.30	6.46		
587.25	0.00	589.80	0.73	592.35	6.53		
587.30	0.00	589.85	0.76	592.40	6.59		
587.35	0.00	589.90	0.79	592.45	6.66		
587.40	0.00	589.95	0.89	592.50	6.72		
587.45	0.00	590.00	1.05	592.55	6.79		
587.50	0.00	590.05	1.24	592.60	6.85		

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 31

Stage-Area-Storage for Pond 17P: Porous pavement system 4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
585.00	0	590.10	21,552
585.10	407	590.20	21,959
585.20	814	590.30	22,366
585.30	1,221	590.40	22,773
585.40	1,628	590.50	23,180
585.50	2,036	590.60	23,588
585.60	2,443	590.70	23,995
585.70	2,850	590.80	24,402
585.80	3,257	590.90	24,809
585.90	3,664	591.00	25,216
586.00	4,071	591.10	25,623
586.10	4,486	591.20	26,030
586.20	4,908	591.30	26,437
586.30	5,334	591.40	26,845
586.40	5,762	591.50	27,252
586.50	6,193	591.60	27,659
586.60	6,626	591.70	28,066
586.70	7,061	591.80	28,473
586.80	7,497	591.90	28,880
586.90	7,934	592.00	29,287
587.00	8,373	592.10	29,694
587.10	8,812	592.20	30,101
587.20	9,251	592.30	30,509
587.30	9,691	592.40	30,916
587.40	10,132	592.50	31,323
587.50	10,572	592.60	31,730
587.60	11,013	592.70	32,137
587.70	11,453	592.80	32,544
587.80	11,894	592.90	32,951
587.90	12,333	593.00	33,358
588.00	12,772		
588.10	13,211		
588.20	13,648		
588.30	14,084		
588.40	14,519		
588.50	14,952		
588.60	15,383		
588.70	15,811		
588.80	16,237		
588.90	16,658		
589.00	17,074		
589.10	17,481		
589.20	17,888		
589.30	18,295		
589.40	18,702		
589.50	19,109		
589.60	19,516		
589.70	19,923		
589.80	20,331		
589.90	20,738		
590.00	21,145		

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 32

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 16S: Basin 4 Porous pvmt

Runoff Area=85,708 sf Runoff Depth=7.59"

Flow Length=509' Tc=8.1 min CN=74/98 Runoff=14.11 cfs 1.245 af

Subcatchment 18S: OL-4

Runoff Area=11,273 sf Runoff Depth=5.60"

Flow Length=96' Slope=0.0573 '/' Tc=8.7 min CN=74/98 Runoff=1.50 cfs 0.121 af

Subcatchment 19S: pre-dev basin 4

Runoff Area=96,981 sf Runoff Depth=5.04"

Flow Length=190' Tc=15.9 min CN=70/0 Runoff=9.38 cfs 0.934 af

Pond 17P: Porous pavement system 4

Peak Elev=591.49' Storage=27,199 cf Inflow=14.11 cfs 1.245 af

Outflow=5.25 cfs 0.858 af

Total Runoff Area = 4.453 ac Runoff Volume = 2.300 af Average Runoff Depth = 6.20"

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Summary for Subcatchment 16S: Basin 4 Porous pvmt

[47] Hint: Peak is 575% of capacity of segment #3

Runoff = 14.11 cfs @ 12.15 hrs, Volume= 1.245 af, Depth= 7.59"
Routed to Pond 17P : Porous pavement system 4

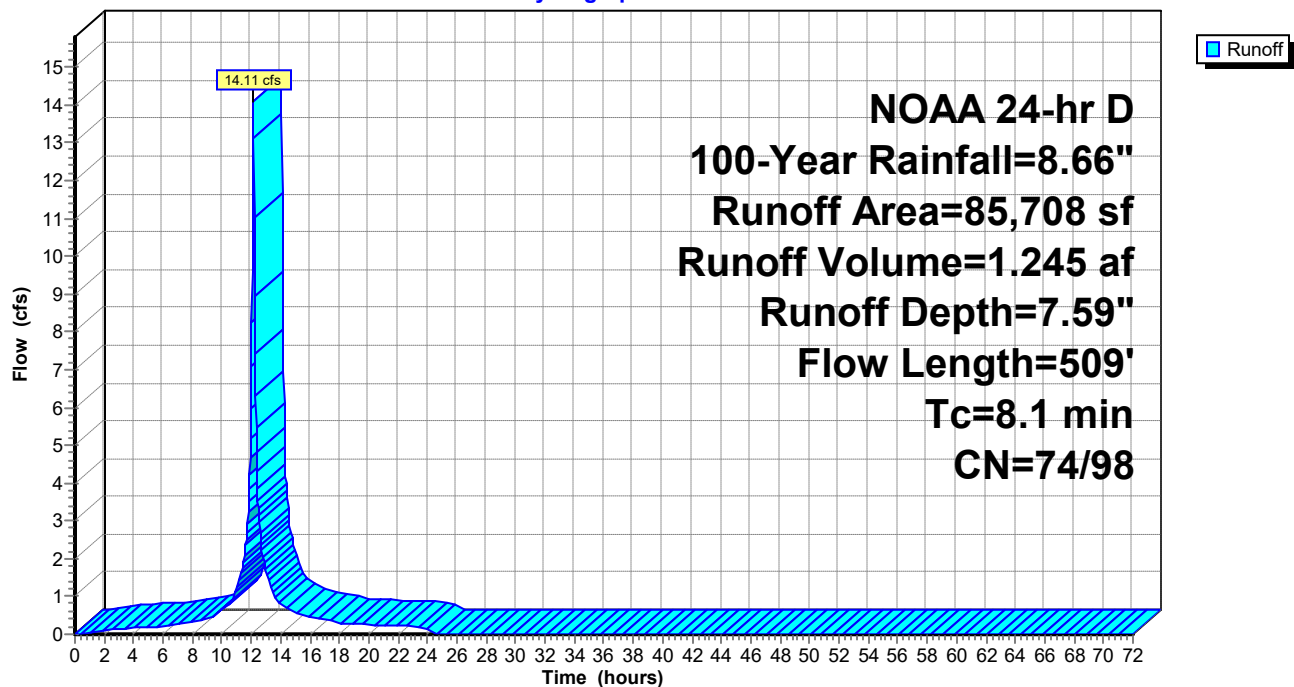
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

	Area (sf)	CN	Description
*	61,324	98	roof and parking
	24,384	74	>75% Grass cover, Good, HSG C
	85,708	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0520	0.26		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.44"
0.6	100	0.0300	2.60		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.0	309	0.0261	5.35	2.45	Pipe Channel, 15.0" Round w/ 9.0" inside fill Area= 0.5 sf Perim= 2.9' r= 0.16' n= 0.013 Corrugated PE, smooth interior
8.1	509	Total			

Subcatchment 16S: Basin 4 Porous pvmt

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Hydrograph for Subcatchment 16S: Basin 4 Porous pvmt

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.04	0.08
3.00	0.33	0.00	0.17	0.14
4.50	0.52	0.00	0.34	0.18
6.00	0.74	0.00	0.54	0.20
7.50	1.01	0.03	0.80	0.30
9.00	1.37	0.11	1.16	0.41
10.50	1.94	0.32	1.71	0.77
12.00	4.15	1.71	3.91	7.10
13.50	6.72	3.80	6.48	1.07
15.00	7.29	4.29	7.05	0.56
16.50	7.65	4.61	7.41	0.41
18.00	7.92	4.85	7.68	0.30
19.50	8.14	5.05	7.90	0.27
21.00	8.33	5.23	8.09	0.24
22.50	8.51	5.38	8.27	0.21
24.00	8.66	5.52	8.42	0.18
25.50	8.66	5.52	8.42	0.00
27.00	8.66	5.52	8.42	0.00
28.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
31.50	8.66	5.52	8.42	0.00
33.00	8.66	5.52	8.42	0.00
34.50	8.66	5.52	8.42	0.00
36.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
39.00	8.66	5.52	8.42	0.00
40.50	8.66	5.52	8.42	0.00
42.00	8.66	5.52	8.42	0.00
43.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
46.50	8.66	5.52	8.42	0.00
48.00	8.66	5.52	8.42	0.00
49.50	8.66	5.52	8.42	0.00
51.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
54.00	8.66	5.52	8.42	0.00
55.50	8.66	5.52	8.42	0.00
57.00	8.66	5.52	8.42	0.00
58.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
61.50	8.66	5.52	8.42	0.00
63.00	8.66	5.52	8.42	0.00
64.50	8.66	5.52	8.42	0.00
66.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
69.00	8.66	5.52	8.42	0.00
70.50	8.66	5.52	8.42	0.00
72.00	8.66	5.52	8.42	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Summary for Subcatchment 18S: OL-4

Runoff = 1.50 cfs @ 12.16 hrs, Volume= 0.121 af, Depth= 5.60"

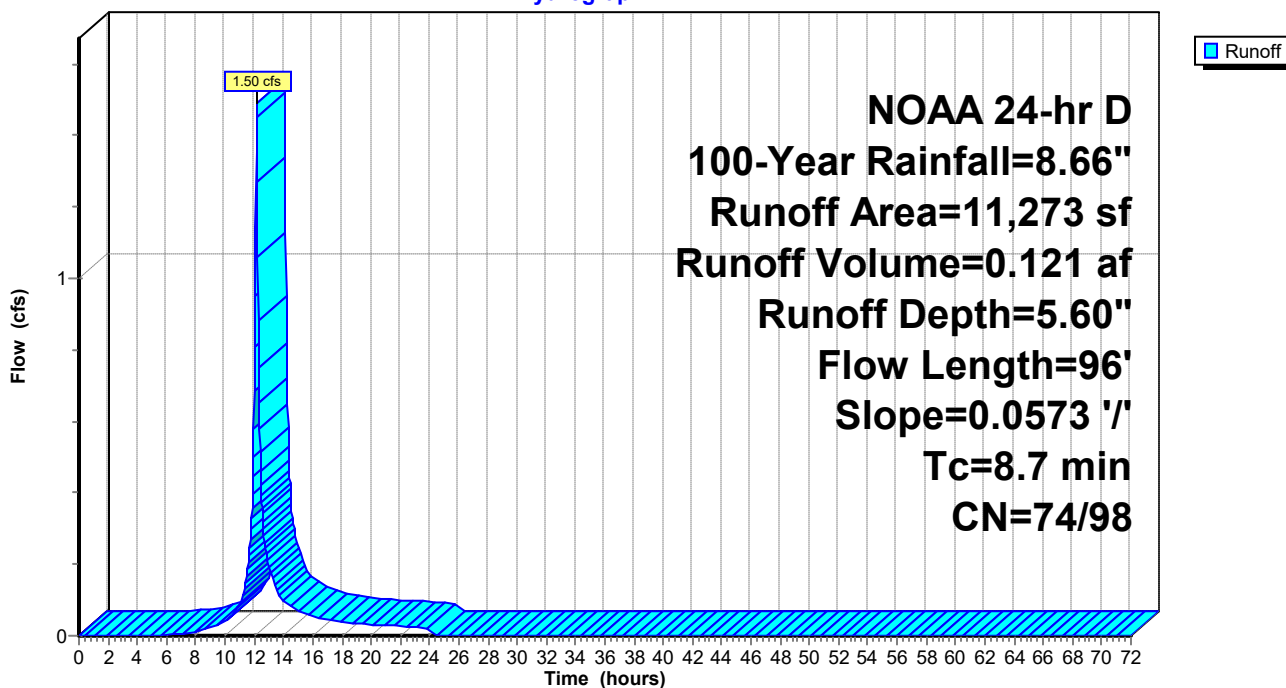
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
301	98	Paved roads w/curbs & sewers, HSG C
10,972	74	>75% Grass cover, Good, HSG C
11,273	75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	96	0.0573	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"

Subcatchment 18S: OL-4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Hydrograph for Subcatchment 18S: OL-4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.04	0.00
3.00	0.33	0.00	0.17	0.00
4.50	0.52	0.00	0.34	0.00
6.00	0.74	0.00	0.54	0.00
7.50	1.01	0.03	0.80	0.01
9.00	1.37	0.11	1.16	0.02
10.50	1.94	0.32	1.71	0.05
12.00	4.15	1.71	3.91	0.69
13.50	6.72	3.80	6.48	0.13
15.00	7.29	4.29	7.05	0.07
16.50	7.65	4.61	7.41	0.05
18.00	7.92	4.85	7.68	0.04
19.50	8.14	5.05	7.90	0.03
21.00	8.33	5.23	8.09	0.03
22.50	8.51	5.38	8.27	0.03
24.00	8.66	5.52	8.42	0.02
25.50	8.66	5.52	8.42	0.00
27.00	8.66	5.52	8.42	0.00
28.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
31.50	8.66	5.52	8.42	0.00
33.00	8.66	5.52	8.42	0.00
34.50	8.66	5.52	8.42	0.00
36.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
39.00	8.66	5.52	8.42	0.00
40.50	8.66	5.52	8.42	0.00
42.00	8.66	5.52	8.42	0.00
43.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
46.50	8.66	5.52	8.42	0.00
48.00	8.66	5.52	8.42	0.00
49.50	8.66	5.52	8.42	0.00
51.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
54.00	8.66	5.52	8.42	0.00
55.50	8.66	5.52	8.42	0.00
57.00	8.66	5.52	8.42	0.00
58.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
61.50	8.66	5.52	8.42	0.00
63.00	8.66	5.52	8.42	0.00
64.50	8.66	5.52	8.42	0.00
66.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
69.00	8.66	5.52	8.42	0.00
70.50	8.66	5.52	8.42	0.00
72.00	8.66	5.52	8.42	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Summary for Subcatchment 19S: pre-dev basin 4

Runoff = 9.38 cfs @ 12.24 hrs, Volume= 0.934 af, Depth= 5.04"

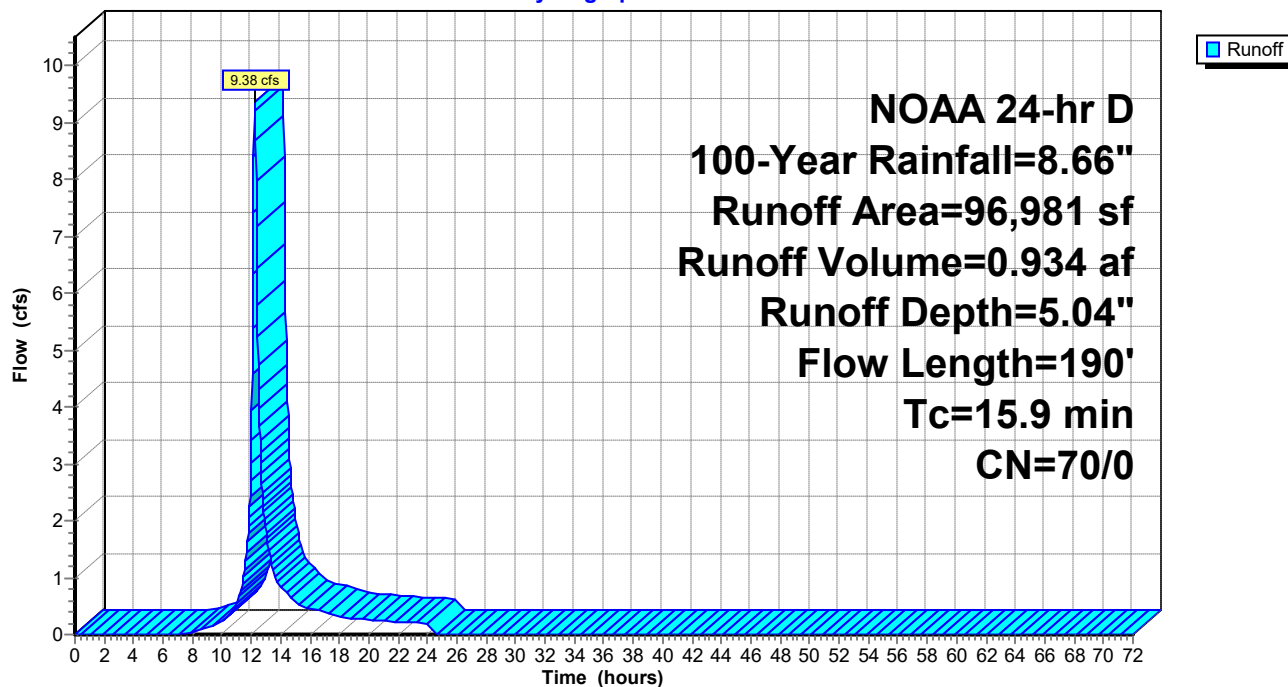
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
96,981	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0500	0.12		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.5	90	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.9	190	Total			

Subcatchment 19S: pre-dev basin 4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Hydrograph for Subcatchment 19S: pre-dev basin 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.00	0.00
3.00	0.33	0.00	0.00	0.00
4.50	0.52	0.00	0.00	0.00
6.00	0.74	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.02
9.00	1.37	0.06	0.00	0.11
10.50	1.94	0.22	0.00	0.34
12.00	4.15	1.43	0.00	3.43
13.50	6.72	3.39	0.00	1.14
15.00	7.29	3.86	0.00	0.58
16.50	7.65	4.16	0.00	0.42
18.00	7.92	4.40	0.00	0.31
19.50	8.14	4.58	0.00	0.27
21.00	8.33	4.75	0.00	0.24
22.50	8.51	4.90	0.00	0.22
24.00	8.66	5.04	0.00	0.19
25.50	8.66	5.04	0.00	0.00
27.00	8.66	5.04	0.00	0.00
28.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
31.50	8.66	5.04	0.00	0.00
33.00	8.66	5.04	0.00	0.00
34.50	8.66	5.04	0.00	0.00
36.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
39.00	8.66	5.04	0.00	0.00
40.50	8.66	5.04	0.00	0.00
42.00	8.66	5.04	0.00	0.00
43.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
46.50	8.66	5.04	0.00	0.00
48.00	8.66	5.04	0.00	0.00
49.50	8.66	5.04	0.00	0.00
51.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
54.00	8.66	5.04	0.00	0.00
55.50	8.66	5.04	0.00	0.00
57.00	8.66	5.04	0.00	0.00
58.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
61.50	8.66	5.04	0.00	0.00
63.00	8.66	5.04	0.00	0.00
64.50	8.66	5.04	0.00	0.00
66.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
69.00	8.66	5.04	0.00	0.00
70.50	8.66	5.04	0.00	0.00
72.00	8.66	5.04	0.00	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Summary for Pond 17P: Porous pavement system 4

Inflow Area = 1.968 ac, Inflow Depth = 7.59" for 100-Year event
Inflow = 14.11 cfs @ 12.15 hrs, Volume= 1.245 af
Outflow = 5.25 cfs @ 12.34 hrs, Volume= 0.858 af, Atten= 63%, Lag= 11.5 min
Primary = 5.25 cfs @ 12.34 hrs, Volume= 0.858 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 591.49' @ 12.34 hrs Surf.Area= 10,178 sf Storage= 27,199 cf

Plug-Flow detention time= 261.4 min calculated for 0.858 af (69% of inflow)
Center-of-Mass det. time= 154.3 min (913.8 - 759.5)

Volume	Invert	Avail.Storage	Storage Description
#1	585.00'	32,044 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 81,424 cf Overall - 1,315 cf Embedded = 80,109 cf x 40.0% Voids
#2	586.00'	1,315 cf	36.0" Round Pipe Storage Inside #1 L= 186.0'
33,358 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.00	10,178	0	0
593.00	10,178	81,424	81,424

Device	Routing	Invert	Outlet Devices
#1	Primary	588.95'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Primary	589.90'	24.0" W x 4.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.25 cfs @ 12.34 hrs HW=591.48' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.43 cfs @ 7.28 fps)

↑ **2=Orifice/Grate** (Orifice Controls 3.82 cfs @ 5.73 fps)

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

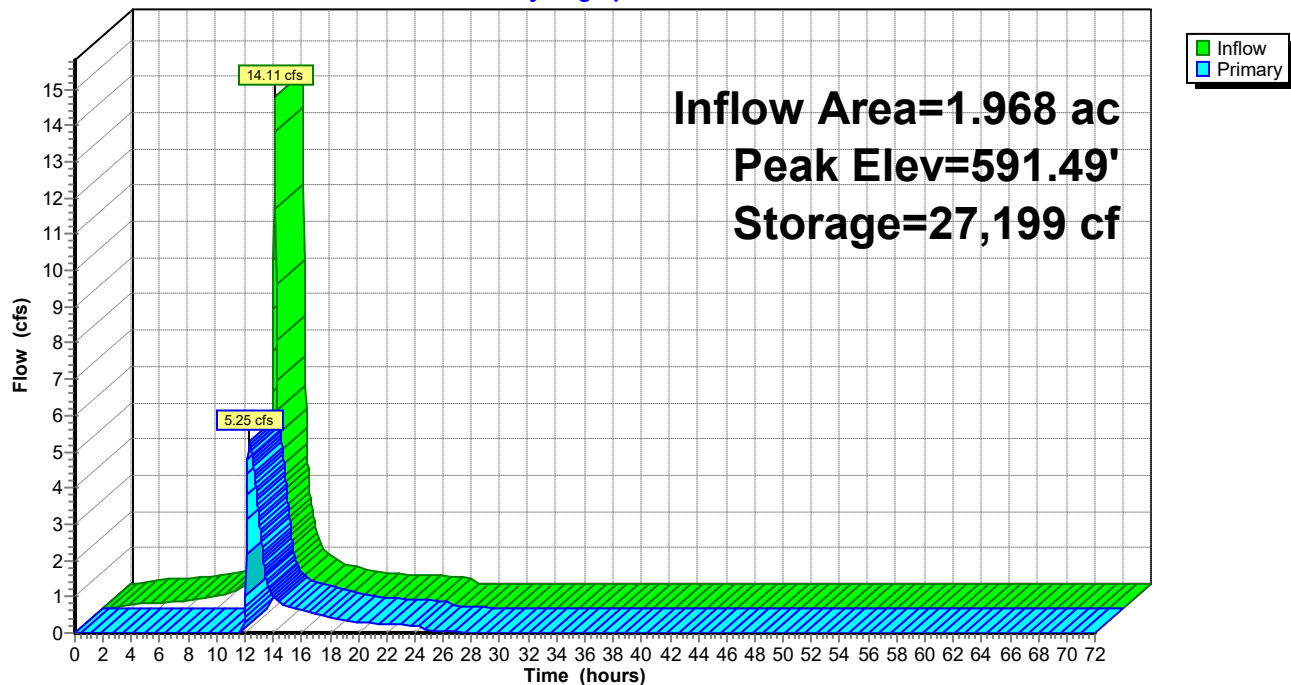
Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 40

Pond 17P: Porous pavement system 4

Hydrograph



Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 41

Hydrograph for Pond 17P: Porous pavement system 4

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	585.00	0.00
1.50	0.08	163	585.04	0.00
3.00	0.14	787	585.19	0.00
4.50	0.18	1,647	585.40	0.00
6.00	0.20	2,671	585.66	0.00
7.50	0.30	4,022	585.99	0.00
9.00	0.41	5,941	586.44	0.00
10.50	0.77	9,068	587.16	0.00
12.00	7.10	19,488	589.59	0.59
13.50	1.07	21,555	590.10	1.48
15.00	0.56	20,513	589.84	0.76
16.50	0.41	19,441	589.58	0.58
18.00	0.30	18,684	589.40	0.42
19.50	0.27	18,316	589.31	0.30
21.00	0.24	18,181	589.27	0.26
22.50	0.21	18,087	589.25	0.23
24.00	0.18	17,998	589.23	0.20
25.50	0.00	17,442	589.09	0.06
27.00	0.00	17,226	589.04	0.03
28.50	0.00	17,119	589.01	0.01
30.00	0.00	17,066	589.00	0.01
31.50	0.00	17,029	588.99	0.01
33.00	0.00	16,999	588.98	0.00
34.50	0.00	16,975	588.98	0.00
36.00	0.00	16,955	588.97	0.00
37.50	0.00	16,939	588.97	0.00
39.00	0.00	16,926	588.96	0.00
40.50	0.00	16,915	588.96	0.00
42.00	0.00	16,906	588.96	0.00
43.50	0.00	16,899	588.96	0.00
45.00	0.00	16,893	588.96	0.00
46.50	0.00	16,888	588.96	0.00
48.00	0.00	16,884	588.95	0.00
49.50	0.00	16,881	588.95	0.00
51.00	0.00	16,879	588.95	0.00
52.50	0.00	16,877	588.95	0.00
54.00	0.00	16,875	588.95	0.00
55.50	0.00	16,873	588.95	0.00
57.00	0.00	16,872	588.95	0.00
58.50	0.00	16,871	588.95	0.00
60.00	0.00	16,871	588.95	0.00
61.50	0.00	16,870	588.95	0.00
63.00	0.00	16,869	588.95	0.00
64.50	0.00	16,869	588.95	0.00
66.00	0.00	16,869	588.95	0.00
67.50	0.00	16,868	588.95	0.00
69.00	0.00	16,868	588.95	0.00
70.50	0.00	16,868	588.95	0.00
72.00	0.00	16,868	588.95	0.00

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 42

Stage-Discharge for Pond 17P: Porous pavement system 4

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
585.00	0.00	587.55	0.00	590.10	1.47	592.65	6.91
585.05	0.00	587.60	0.00	590.15	1.72	592.70	6.98
585.10	0.00	587.65	0.00	590.20	2.00	592.75	7.04
585.15	0.00	587.70	0.00	590.25	2.28	592.80	7.10
585.20	0.00	587.75	0.00	590.30	2.51	592.85	7.16
585.25	0.00	587.80	0.00	590.35	2.70	592.90	7.22
585.30	0.00	587.85	0.00	590.40	2.87	592.95	7.28
585.35	0.00	587.90	0.00	590.45	3.03	593.00	7.34
585.40	0.00	587.95	0.00	590.50	3.18		
585.45	0.00	588.00	0.00	590.55	3.32		
585.50	0.00	588.05	0.00	590.60	3.45		
585.55	0.00	588.10	0.00	590.65	3.58		
585.60	0.00	588.15	0.00	590.70	3.71		
585.65	0.00	588.20	0.00	590.75	3.82		
585.70	0.00	588.25	0.00	590.80	3.94		
585.75	0.00	588.30	0.00	590.85	4.05		
585.80	0.00	588.35	0.00	590.90	4.16		
585.85	0.00	588.40	0.00	590.95	4.26		
585.90	0.00	588.45	0.00	591.00	4.37		
585.95	0.00	588.50	0.00	591.05	4.47		
586.00	0.00	588.55	0.00	591.10	4.56		
586.05	0.00	588.60	0.00	591.15	4.66		
586.10	0.00	588.65	0.00	591.20	4.75		
586.15	0.00	588.70	0.00	591.25	4.84		
586.20	0.00	588.75	0.00	591.30	4.93		
586.25	0.00	588.80	0.00	591.35	5.02		
586.30	0.00	588.85	0.00	591.40	5.11		
586.35	0.00	588.90	0.00	591.45	5.19		
586.40	0.00	588.95	0.00	591.50	5.27		
586.45	0.00	589.00	0.01	591.55	5.36		
586.50	0.00	589.05	0.03	591.60	5.44		
586.55	0.00	589.10	0.07	591.65	5.52		
586.60	0.00	589.15	0.11	591.70	5.60		
586.65	0.00	589.20	0.17	591.75	5.67		
586.70	0.00	589.25	0.23	591.80	5.75		
586.75	0.00	589.30	0.30	591.85	5.82		
586.80	0.00	589.35	0.36	591.90	5.90		
586.85	0.00	589.40	0.43	591.95	5.97		
586.90	0.00	589.45	0.47	592.00	6.04		
586.95	0.00	589.50	0.52	592.05	6.12		
587.00	0.00	589.55	0.56	592.10	6.19		
587.05	0.00	589.60	0.60	592.15	6.26		
587.10	0.00	589.65	0.63	592.20	6.32		
587.15	0.00	589.70	0.67	592.25	6.39		
587.20	0.00	589.75	0.70	592.30	6.46		
587.25	0.00	589.80	0.73	592.35	6.53		
587.30	0.00	589.85	0.76	592.40	6.59		
587.35	0.00	589.90	0.79	592.45	6.66		
587.40	0.00	589.95	0.89	592.50	6.72		
587.45	0.00	590.00	1.05	592.55	6.79		
587.50	0.00	590.05	1.24	592.60	6.85		

Proposed basin 4 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 4 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 43

Stage-Area-Storage for Pond 17P: Porous pavement system 4

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
585.00	0	590.10	21,552
585.10	407	590.20	21,959
585.20	814	590.30	22,366
585.30	1,221	590.40	22,773
585.40	1,628	590.50	23,180
585.50	2,036	590.60	23,588
585.60	2,443	590.70	23,995
585.70	2,850	590.80	24,402
585.80	3,257	590.90	24,809
585.90	3,664	591.00	25,216
586.00	4,071	591.10	25,623
586.10	4,486	591.20	26,030
586.20	4,908	591.30	26,437
586.30	5,334	591.40	26,845
586.40	5,762	591.50	27,252
586.50	6,193	591.60	27,659
586.60	6,626	591.70	28,066
586.70	7,061	591.80	28,473
586.80	7,497	591.90	28,880
586.90	7,934	592.00	29,287
587.00	8,373	592.10	29,694
587.10	8,812	592.20	30,101
587.20	9,251	592.30	30,509
587.30	9,691	592.40	30,916
587.40	10,132	592.50	31,323
587.50	10,572	592.60	31,730
587.60	11,013	592.70	32,137
587.70	11,453	592.80	32,544
587.80	11,894	592.90	32,951
587.90	12,333	593.00	33,358
588.00	12,772		
588.10	13,211		
588.20	13,648		
588.30	14,084		
588.40	14,519		
588.50	14,952		
588.60	15,383		
588.70	15,811		
588.80	16,237		
588.90	16,658		
589.00	17,074		
589.10	17,481		
589.20	17,888		
589.30	18,295		
589.40	18,702		
589.50	19,109		
589.60	19,516		
589.70	19,923		
589.80	20,331		
589.90	20,738		
590.00	21,145		



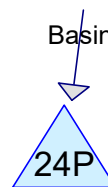
overland 5-A



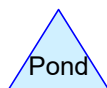
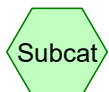
pre-dev basin 5



Basin 5



Infiltration basin 5



Routing Diagram for Proposed basin 5 R5

Prepared by Anderson Consulting Services, Printed 10/29/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.911	74	>75% Grass cover, Good, HSG C (23S, 25S)
0.510	98	Paved parking, HSG C (25S)
1.430	98	Roofs, HSG D (23S)
3.850	70	Woods, Good, HSG C (26S)
7.701	78	TOTAL AREA

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
6.271	HSG C	23S, 25S, 26S
1.430	HSG D	23S
0.000	Other	
7.701		TOTAL AREA

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.911	0.000	0.000	1.911	>75% Grass cover, Good	23S, 25S
0.000	0.000	0.510	0.000	0.000	0.510	Paved parking	25S
0.000	0.000	0.000	1.430	0.000	1.430	Roofs	23S
0.000	0.000	3.850	0.000	0.000	3.850	Woods, Good	26S
0.000	0.000	6.271	1.430	0.000	7.701	TOTAL AREA	

Proposed basin 5 R5

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	25S	0.00	0.00	156.0	0.0349	0.013	0.0	15.0	8.0	

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 8

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 23S: Basin 5

Runoff Area=99,084 sf Runoff Depth=2.46"

Flow Length=314' Tc=11.3 min CN=74/98 Runoff=4.83 cfs 0.466 af

Subcatchment 25S: overland 5-A

Runoff Area=68,635 sf Runoff Depth=1.85"

Flow Length=394' Tc=7.6 min CN=74/98 Runoff=2.94 cfs 0.243 af

Subcatchment 26S: pre-dev basin 5

Runoff Area=167,719 sf Runoff Depth=0.97"

Flow Length=274' Tc=11.5 min CN=70/0 Runoff=3.33 cfs 0.312 af

Pond 24P: Infiltration basin 5

Peak Elev=572.14' Storage=20,319 cf Inflow=4.83 cfs 0.466 af

Outflow=0.00 cfs 0.000 af

Total Runoff Area = 7.701 ac Runoff Volume = 1.021 af Average Runoff Depth = 1.59"

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 9

Summary for Subcatchment 23S: Basin 5

Runoff = 4.83 cfs @ 12.19 hrs, Volume= 0.466 af, Depth= 2.46"
Routed to Pond 24P : Infiltration basin 5

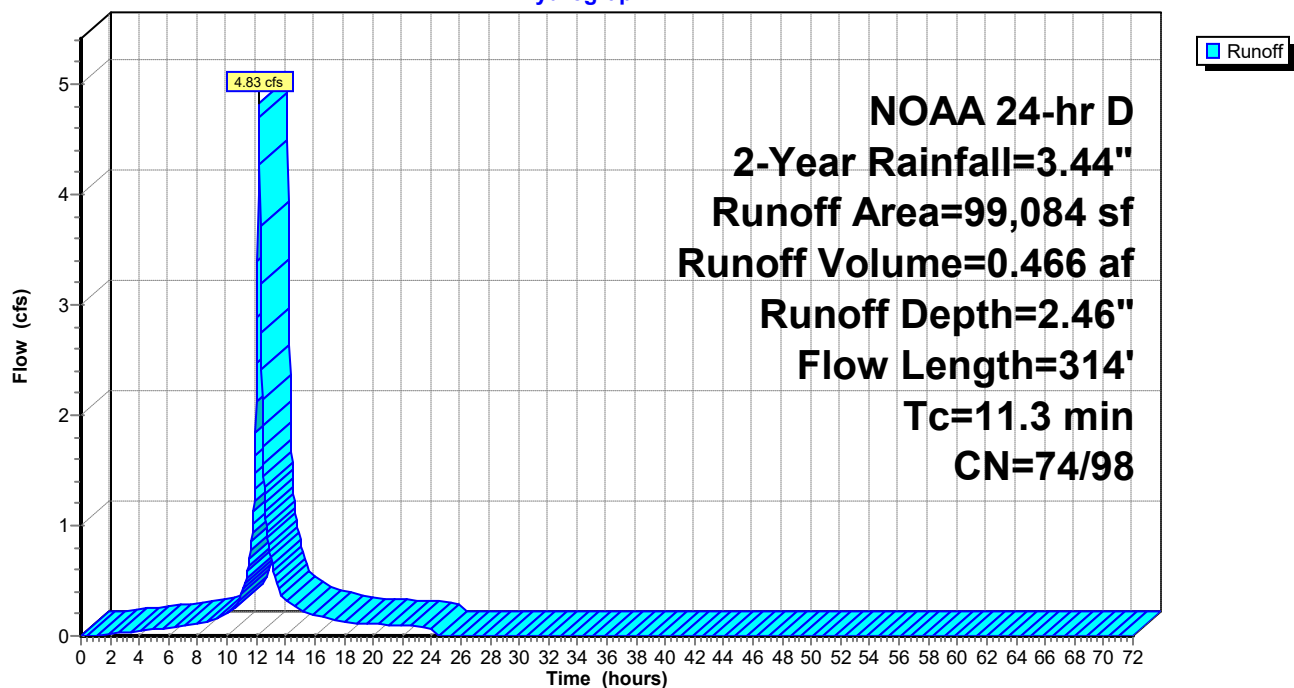
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
62,281	98	Roofs, HSG D
36,803	74	>75% Grass cover, Good, HSG C
99,084	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0170	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
1.0	164	0.0305	2.62		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	50	0.0760	5.60		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	314	Total			

Subcatchment 23S: Basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 10

Hydrograph for Subcatchment 23S: Basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.01
3.00	0.13	0.00	0.03	0.03
4.50	0.21	0.00	0.07	0.05
6.00	0.29	0.00	0.14	0.07
7.50	0.40	0.00	0.23	0.10
9.00	0.55	0.00	0.36	0.14
10.50	0.77	0.00	0.57	0.25
12.00	1.65	0.20	1.43	2.12
13.50	2.67	0.71	2.44	0.45
15.00	2.89	0.84	2.66	0.23
16.50	3.04	0.93	2.81	0.17
18.00	3.15	1.00	2.91	0.13
19.50	3.23	1.06	3.00	0.11
21.00	3.31	1.11	3.08	0.10
22.50	3.38	1.16	3.15	0.09
24.00	3.44	1.20	3.21	0.08
25.50	3.44	1.20	3.21	0.00
27.00	3.44	1.20	3.21	0.00
28.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
31.50	3.44	1.20	3.21	0.00
33.00	3.44	1.20	3.21	0.00
34.50	3.44	1.20	3.21	0.00
36.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
39.00	3.44	1.20	3.21	0.00
40.50	3.44	1.20	3.21	0.00
42.00	3.44	1.20	3.21	0.00
43.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
46.50	3.44	1.20	3.21	0.00
48.00	3.44	1.20	3.21	0.00
49.50	3.44	1.20	3.21	0.00
51.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
54.00	3.44	1.20	3.21	0.00
55.50	3.44	1.20	3.21	0.00
57.00	3.44	1.20	3.21	0.00
58.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
61.50	3.44	1.20	3.21	0.00
63.00	3.44	1.20	3.21	0.00
64.50	3.44	1.20	3.21	0.00
66.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
69.00	3.44	1.20	3.21	0.00
70.50	3.44	1.20	3.21	0.00
72.00	3.44	1.20	3.21	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 11

Summary for Subcatchment 25S: overland 5-A

Runoff = 2.94 cfs @ 12.15 hrs, Volume= 0.243 af, Depth= 1.85"

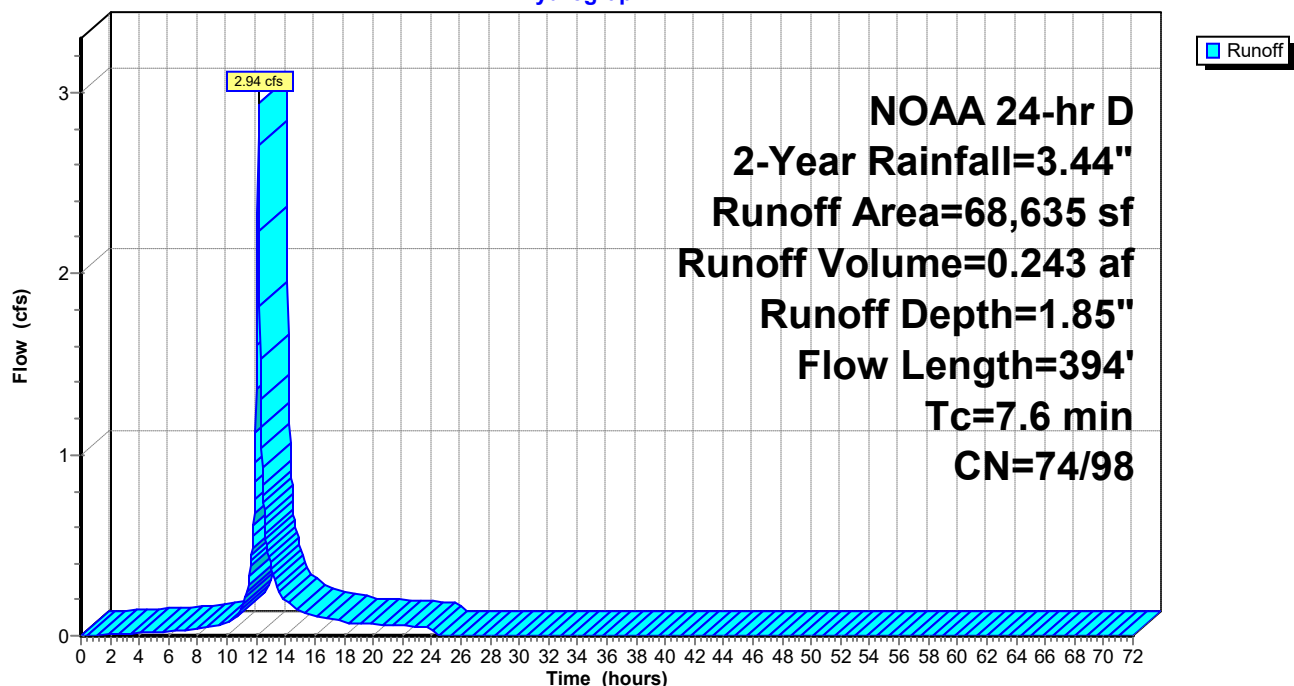
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
22,200	98	Paved parking, HSG C
46,435	74	>75% Grass cover, Good, HSG C
68,635	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1200	0.25		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0500	3.35		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	118	0.0550	4.76		Shallow Concentrated Flow, gutter flow Paved Kv= 20.3 fps
0.4	156	0.0349	6.80	3.82	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Corrugated PE, smooth interior
7.6	394	Total			

Subcatchment 25S: overland 5-A

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 12

Hydrograph for Subcatchment 25S: overland 5-A

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.00
3.00	0.13	0.00	0.03	0.01
4.50	0.21	0.00	0.07	0.02
6.00	0.29	0.00	0.14	0.02
7.50	0.40	0.00	0.23	0.04
9.00	0.55	0.00	0.36	0.05
10.50	0.77	0.00	0.57	0.09
12.00	1.65	0.20	1.43	1.36
13.50	2.67	0.71	2.44	0.25
15.00	2.89	0.84	2.66	0.14
16.50	3.04	0.93	2.81	0.10
18.00	3.15	1.00	2.91	0.08
19.50	3.23	1.06	3.00	0.07
21.00	3.31	1.11	3.08	0.06
22.50	3.38	1.16	3.15	0.05
24.00	3.44	1.20	3.21	0.05
25.50	3.44	1.20	3.21	0.00
27.00	3.44	1.20	3.21	0.00
28.50	3.44	1.20	3.21	0.00
30.00	3.44	1.20	3.21	0.00
31.50	3.44	1.20	3.21	0.00
33.00	3.44	1.20	3.21	0.00
34.50	3.44	1.20	3.21	0.00
36.00	3.44	1.20	3.21	0.00
37.50	3.44	1.20	3.21	0.00
39.00	3.44	1.20	3.21	0.00
40.50	3.44	1.20	3.21	0.00
42.00	3.44	1.20	3.21	0.00
43.50	3.44	1.20	3.21	0.00
45.00	3.44	1.20	3.21	0.00
46.50	3.44	1.20	3.21	0.00
48.00	3.44	1.20	3.21	0.00
49.50	3.44	1.20	3.21	0.00
51.00	3.44	1.20	3.21	0.00
52.50	3.44	1.20	3.21	0.00
54.00	3.44	1.20	3.21	0.00
55.50	3.44	1.20	3.21	0.00
57.00	3.44	1.20	3.21	0.00
58.50	3.44	1.20	3.21	0.00
60.00	3.44	1.20	3.21	0.00
61.50	3.44	1.20	3.21	0.00
63.00	3.44	1.20	3.21	0.00
64.50	3.44	1.20	3.21	0.00
66.00	3.44	1.20	3.21	0.00
67.50	3.44	1.20	3.21	0.00
69.00	3.44	1.20	3.21	0.00
70.50	3.44	1.20	3.21	0.00
72.00	3.44	1.20	3.21	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 13

Summary for Subcatchment 26S: pre-dev basin 5

Runoff = 3.33 cfs @ 12.20 hrs, Volume= 0.312 af, Depth= 0.97"

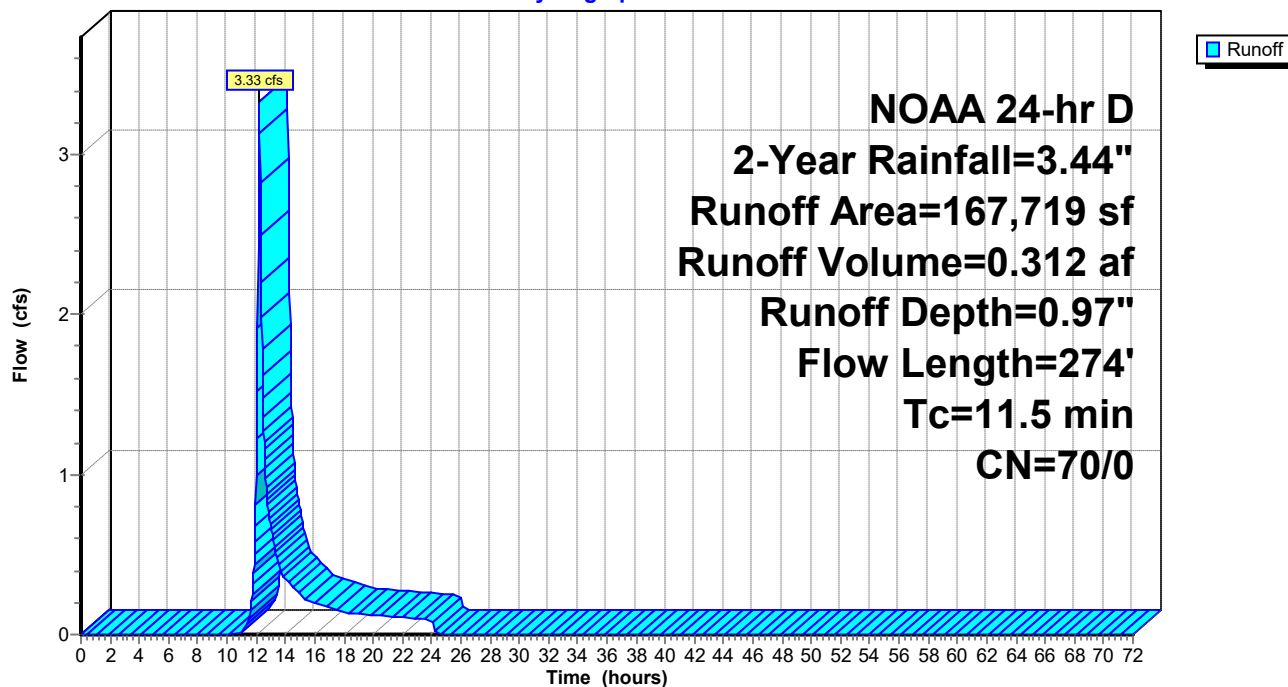
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
167,719	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.4	174	0.1670	2.04		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	274	Total			

Subcatchment 26S: pre-dev basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 14

Hydrograph for Subcatchment 26S: pre-dev basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.06	0.00	0.00	0.00
3.00	0.13	0.00	0.00	0.00
4.50	0.21	0.00	0.00	0.00
6.00	0.29	0.00	0.00	0.00
7.50	0.40	0.00	0.00	0.00
9.00	0.55	0.00	0.00	0.00
10.50	0.77	0.00	0.00	0.00
12.00	1.65	0.12	0.00	0.99
13.50	2.67	0.54	0.00	0.45
15.00	2.89	0.66	0.00	0.25
16.50	3.04	0.74	0.00	0.19
18.00	3.15	0.80	0.00	0.14
19.50	3.23	0.85	0.00	0.13
21.00	3.31	0.89	0.00	0.11
22.50	3.38	0.93	0.00	0.10
24.00	3.44	0.97	0.00	0.09
25.50	3.44	0.97	0.00	0.00
27.00	3.44	0.97	0.00	0.00
28.50	3.44	0.97	0.00	0.00
30.00	3.44	0.97	0.00	0.00
31.50	3.44	0.97	0.00	0.00
33.00	3.44	0.97	0.00	0.00
34.50	3.44	0.97	0.00	0.00
36.00	3.44	0.97	0.00	0.00
37.50	3.44	0.97	0.00	0.00
39.00	3.44	0.97	0.00	0.00
40.50	3.44	0.97	0.00	0.00
42.00	3.44	0.97	0.00	0.00
43.50	3.44	0.97	0.00	0.00
45.00	3.44	0.97	0.00	0.00
46.50	3.44	0.97	0.00	0.00
48.00	3.44	0.97	0.00	0.00
49.50	3.44	0.97	0.00	0.00
51.00	3.44	0.97	0.00	0.00
52.50	3.44	0.97	0.00	0.00
54.00	3.44	0.97	0.00	0.00
55.50	3.44	0.97	0.00	0.00
57.00	3.44	0.97	0.00	0.00
58.50	3.44	0.97	0.00	0.00
60.00	3.44	0.97	0.00	0.00
61.50	3.44	0.97	0.00	0.00
63.00	3.44	0.97	0.00	0.00
64.50	3.44	0.97	0.00	0.00
66.00	3.44	0.97	0.00	0.00
67.50	3.44	0.97	0.00	0.00
69.00	3.44	0.97	0.00	0.00
70.50	3.44	0.97	0.00	0.00
72.00	3.44	0.97	0.00	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 15

Summary for Pond 24P: Infiltration basin 5

Inflow Area = 2.275 ac, Inflow Depth = 2.46" for 2-Year event
Inflow = 4.83 cfs @ 12.19 hrs, Volume= 0.466 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 572.14' @ 24.66 hrs Surf.Area= 12,410 sf Storage= 20,319 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	570.50'	43,435 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
570.50	12,410	0	0	12,410
574.00	12,410	43,435	43,435	13,792

Device	Routing	Invert	Outlet Devices
#1	Primary	572.40'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=570.50' (Free Discharge)
↑1=Orifice/Grate (Controls 0.00 cfs)

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

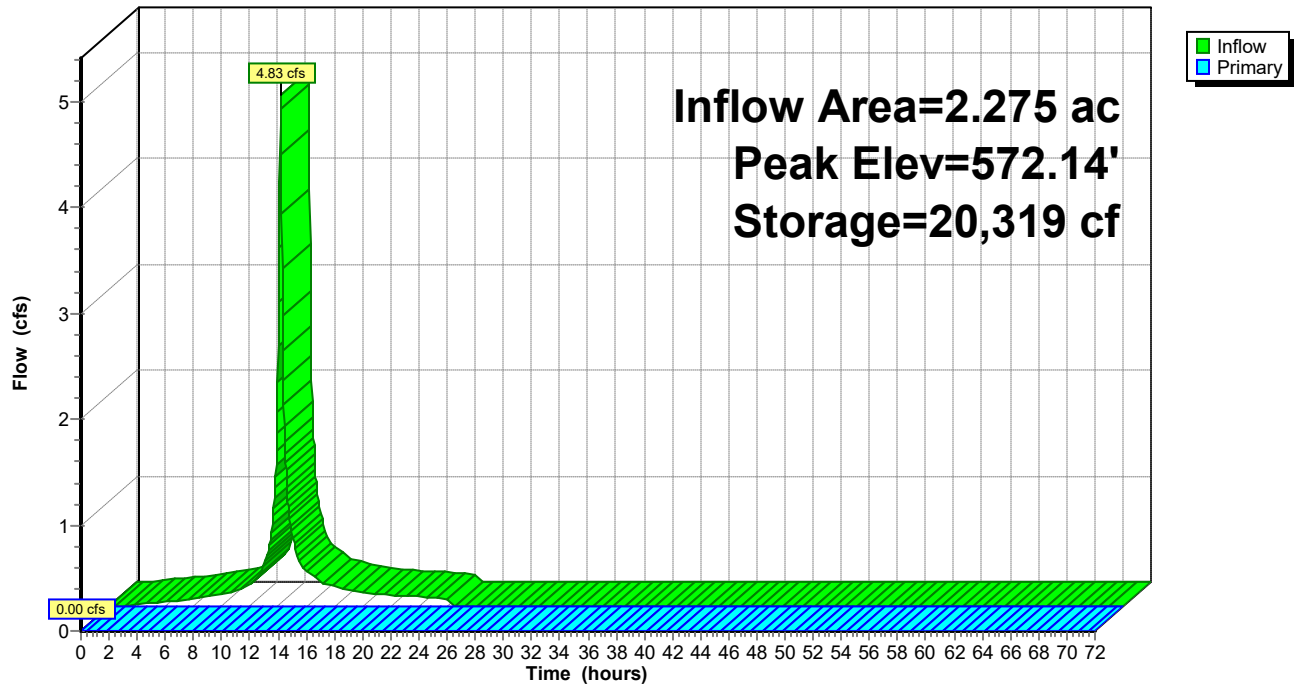
Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 16

Pond 24P: Infiltration basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 17

Hydrograph for Pond 24P: Infiltration basin 5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	570.50	0.00
1.50	0.01	4	570.50	0.00
3.00	0.03	118	570.51	0.00
4.50	0.05	355	570.53	0.00
6.00	0.07	683	570.56	0.00
7.50	0.10	1,135	570.59	0.00
9.00	0.14	1,779	570.64	0.00
10.50	0.25	2,802	570.73	0.00
12.00	2.12	6,214	571.00	0.00
13.50	0.45	14,558	571.67	0.00
15.00	0.23	16,261	571.81	0.00
16.50	0.17	17,314	571.90	0.00
18.00	0.13	18,120	571.96	0.00
19.50	0.11	18,749	572.01	0.00
21.00	0.10	19,317	572.06	0.00
22.50	0.09	19,825	572.10	0.00
24.00	0.08	20,271	572.13	0.00
25.50	0.00	20,319	572.14	0.00
27.00	0.00	20,319	572.14	0.00
28.50	0.00	20,319	572.14	0.00
30.00	0.00	20,319	572.14	0.00
31.50	0.00	20,319	572.14	0.00
33.00	0.00	20,319	572.14	0.00
34.50	0.00	20,319	572.14	0.00
36.00	0.00	20,319	572.14	0.00
37.50	0.00	20,319	572.14	0.00
39.00	0.00	20,319	572.14	0.00
40.50	0.00	20,319	572.14	0.00
42.00	0.00	20,319	572.14	0.00
43.50	0.00	20,319	572.14	0.00
45.00	0.00	20,319	572.14	0.00
46.50	0.00	20,319	572.14	0.00
48.00	0.00	20,319	572.14	0.00
49.50	0.00	20,319	572.14	0.00
51.00	0.00	20,319	572.14	0.00
52.50	0.00	20,319	572.14	0.00
54.00	0.00	20,319	572.14	0.00
55.50	0.00	20,319	572.14	0.00
57.00	0.00	20,319	572.14	0.00
58.50	0.00	20,319	572.14	0.00
60.00	0.00	20,319	572.14	0.00
61.50	0.00	20,319	572.14	0.00
63.00	0.00	20,319	572.14	0.00
64.50	0.00	20,319	572.14	0.00
66.00	0.00	20,319	572.14	0.00
67.50	0.00	20,319	572.14	0.00
69.00	0.00	20,319	572.14	0.00
70.50	0.00	20,319	572.14	0.00
72.00	0.00	20,319	572.14	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 18

Stage-Discharge for Pond 24P: Infiltration basin 5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
570.50	0.00	571.52	0.00	572.54	0.25	573.56	3.43
570.52	0.00	571.54	0.00	572.56	0.31	573.58	3.47
570.54	0.00	571.56	0.00	572.58	0.37	573.60	3.51
570.56	0.00	571.58	0.00	572.60	0.43	573.62	3.55
570.58	0.00	571.60	0.00	572.62	0.50	573.64	3.58
570.60	0.00	571.62	0.00	572.64	0.57	573.66	3.62
570.62	0.00	571.64	0.00	572.66	0.64	573.68	3.66
570.64	0.00	571.66	0.00	572.68	0.71	573.70	3.69
570.66	0.00	571.68	0.00	572.70	0.79	573.72	3.73
570.68	0.00	571.70	0.00	572.72	0.87	573.74	3.76
570.70	0.00	571.72	0.00	572.74	0.95	573.76	3.80
570.72	0.00	571.74	0.00	572.76	1.04	573.78	3.83
570.74	0.00	571.76	0.00	572.78	1.13	573.80	3.86
570.76	0.00	571.78	0.00	572.80	1.22	573.82	3.90
570.78	0.00	571.80	0.00	572.82	1.31	573.84	3.93
570.80	0.00	571.82	0.00	572.84	1.41	573.86	3.97
570.82	0.00	571.84	0.00	572.86	1.50	573.88	4.00
570.84	0.00	571.86	0.00	572.88	1.60	573.90	4.03
570.86	0.00	571.88	0.00	572.90	1.70	573.92	4.06
570.88	0.00	571.90	0.00	572.92	1.79	573.94	4.10
570.90	0.00	571.92	0.00	572.94	1.87	573.96	4.13
570.92	0.00	571.94	0.00	572.96	1.95	573.98	4.16
570.94	0.00	571.96	0.00	572.98	2.02	574.00	4.19
570.96	0.00	571.98	0.00	573.00	2.09		
570.98	0.00	572.00	0.00	573.02	2.15		
571.00	0.00	572.02	0.00	573.04	2.21		
571.02	0.00	572.04	0.00	573.06	2.27		
571.04	0.00	572.06	0.00	573.08	2.33		
571.06	0.00	572.08	0.00	573.10	2.39		
571.08	0.00	572.10	0.00	573.12	2.44		
571.10	0.00	572.12	0.00	573.14	2.50		
571.12	0.00	572.14	0.00	573.16	2.55		
571.14	0.00	572.16	0.00	573.18	2.60		
571.16	0.00	572.18	0.00	573.20	2.65		
571.18	0.00	572.20	0.00	573.22	2.70		
571.20	0.00	572.22	0.00	573.24	2.75		
571.22	0.00	572.24	0.00	573.26	2.80		
571.24	0.00	572.26	0.00	573.28	2.85		
571.26	0.00	572.28	0.00	573.30	2.89		
571.28	0.00	572.30	0.00	573.32	2.94		
571.30	0.00	572.32	0.00	573.34	2.98		
571.32	0.00	572.34	0.00	573.36	3.03		
571.34	0.00	572.36	0.00	573.38	3.07		
571.36	0.00	572.38	0.00	573.40	3.11		
571.38	0.00	572.40	0.00	573.42	3.15		
571.40	0.00	572.42	0.01	573.44	3.20		
571.42	0.00	572.44	0.04	573.46	3.24		
571.44	0.00	572.46	0.07	573.48	3.28		
571.46	0.00	572.48	0.11	573.50	3.32		
571.48	0.00	572.50	0.15	573.52	3.36		
571.50	0.00	572.52	0.20	573.54	3.40		

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 19

Stage-Area-Storage for Pond 24P: Infiltration basin 5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
570.50	12,410	0	573.05	12,410	31,645
570.55	12,410	620	573.10	12,410	32,266
570.60	12,410	1,241	573.15	12,410	32,886
570.65	12,410	1,861	573.20	12,410	33,507
570.70	12,410	2,482	573.25	12,410	34,128
570.75	12,410	3,103	573.30	12,410	34,748
570.80	12,410	3,723	573.35	12,410	35,369
570.85	12,410	4,344	573.40	12,410	35,989
570.90	12,410	4,964	573.45	12,410	36,610
570.95	12,410	5,585	573.50	12,410	37,230
571.00	12,410	6,205	573.55	12,410	37,850
571.05	12,410	6,825	573.60	12,410	38,471
571.10	12,410	7,446	573.65	12,410	39,091
571.15	12,410	8,066	573.70	12,410	39,712
571.20	12,410	8,687	573.75	12,410	40,333
571.25	12,410	9,308	573.80	12,410	40,953
571.30	12,410	9,928	573.85	12,410	41,574
571.35	12,410	10,549	573.90	12,410	42,194
571.40	12,410	11,169	573.95	12,410	42,815
571.45	12,410	11,790	574.00	12,410	43,435
571.50	12,410	12,410			
571.55	12,410	13,030			
571.60	12,410	13,651			
571.65	12,410	14,271			
571.70	12,410	14,892			
571.75	12,410	15,513			
571.80	12,410	16,133			
571.85	12,410	16,754			
571.90	12,410	17,374			
571.95	12,410	17,995			
572.00	12,410	18,615			
572.05	12,410	19,235			
572.10	12,410	19,856			
572.15	12,410	20,476			
572.20	12,410	21,097			
572.25	12,410	21,718			
572.30	12,410	22,338			
572.35	12,410	22,959			
572.40	12,410	23,579			
572.45	12,410	24,200			
572.50	12,410	24,820			
572.55	12,410	25,440			
572.60	12,410	26,061			
572.65	12,410	26,681			
572.70	12,410	27,302			
572.75	12,410	27,923			
572.80	12,410	28,543			
572.85	12,410	29,164			
572.90	12,410	29,784			
572.95	12,410	30,405			
573.00	12,410	31,025			

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 20

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 23S: Basin 5

Runoff Area=99,084 sf Runoff Depth=4.08"

Flow Length=314' Tc=11.3 min CN=74/98 Runoff=8.00 cfs 0.773 af

Subcatchment 25S: overland 5-A

Runoff Area=68,635 sf Runoff Depth=3.33"

Flow Length=394' Tc=7.6 min CN=74/98 Runoff=5.38 cfs 0.437 af

Subcatchment 26S: pre-dev basin 5

Runoff Area=167,719 sf Runoff Depth=2.20"

Flow Length=274' Tc=11.5 min CN=70/0 Runoff=8.02 cfs 0.706 af

Pond 24P: Infiltration basin 5

Peak Elev=572.57' Storage=25,739 cf Inflow=8.00 cfs 0.773 af

Outflow=0.35 cfs 0.231 af

Total Runoff Area = 7.701 ac Runoff Volume = 1.916 af Average Runoff Depth = 2.99"

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 21

Summary for Subcatchment 23S: Basin 5

Runoff = 8.00 cfs @ 12.19 hrs, Volume= 0.773 af, Depth= 4.08"
Routed to Pond 24P : Infiltration basin 5

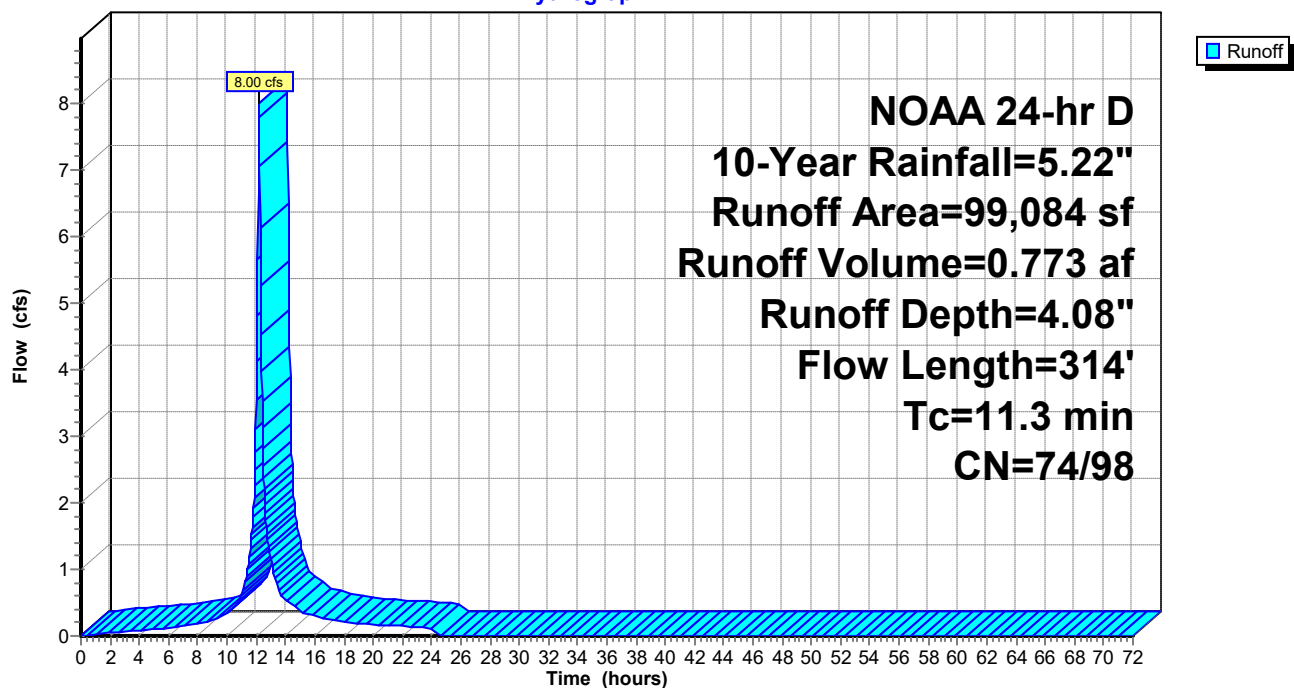
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
62,281	98	Roofs, HSG D
36,803	74	>75% Grass cover, Good, HSG C
99,084	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0170	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
1.0	164	0.0305	2.62		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	50	0.0760	5.60		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	314	Total			

Subcatchment 23S: Basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 22

Hydrograph for Subcatchment 23S: Basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.01	0.03
3.00	0.20	0.00	0.07	0.07
4.50	0.31	0.00	0.16	0.10
6.00	0.45	0.00	0.27	0.12
7.50	0.61	0.00	0.42	0.17
9.00	0.83	0.00	0.63	0.23
10.50	1.17	0.05	0.96	0.43
12.00	2.50	0.61	2.27	3.55
13.50	4.05	1.63	3.82	0.73
15.00	4.39	1.89	4.16	0.37
16.50	4.61	2.06	4.37	0.28
18.00	4.77	2.19	4.54	0.20
19.50	4.91	2.29	4.67	0.18
21.00	5.02	2.38	4.79	0.16
22.50	5.13	2.47	4.89	0.14
24.00	5.22	2.54	4.98	0.12
25.50	5.22	2.54	4.98	0.00
27.00	5.22	2.54	4.98	0.00
28.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
31.50	5.22	2.54	4.98	0.00
33.00	5.22	2.54	4.98	0.00
34.50	5.22	2.54	4.98	0.00
36.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
39.00	5.22	2.54	4.98	0.00
40.50	5.22	2.54	4.98	0.00
42.00	5.22	2.54	4.98	0.00
43.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
46.50	5.22	2.54	4.98	0.00
48.00	5.22	2.54	4.98	0.00
49.50	5.22	2.54	4.98	0.00
51.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
54.00	5.22	2.54	4.98	0.00
55.50	5.22	2.54	4.98	0.00
57.00	5.22	2.54	4.98	0.00
58.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
61.50	5.22	2.54	4.98	0.00
63.00	5.22	2.54	4.98	0.00
64.50	5.22	2.54	4.98	0.00
66.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
69.00	5.22	2.54	4.98	0.00
70.50	5.22	2.54	4.98	0.00
72.00	5.22	2.54	4.98	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 23

Summary for Subcatchment 25S: overland 5-A

[47] Hint: Peak is 141% of capacity of segment #4

Runoff = 5.38 cfs @ 12.15 hrs, Volume= 0.437 af, Depth= 3.33"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
22,200	98	Paved parking, HSG C
46,435	74	>75% Grass cover, Good, HSG C
68,635	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1200	0.25		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0500	3.35		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	118	0.0550	4.76		Shallow Concentrated Flow, gutter flow Paved Kv= 20.3 fps
0.4	156	0.0349	6.80	3.82	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Corrugated PE, smooth interior
7.6	394	Total			

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

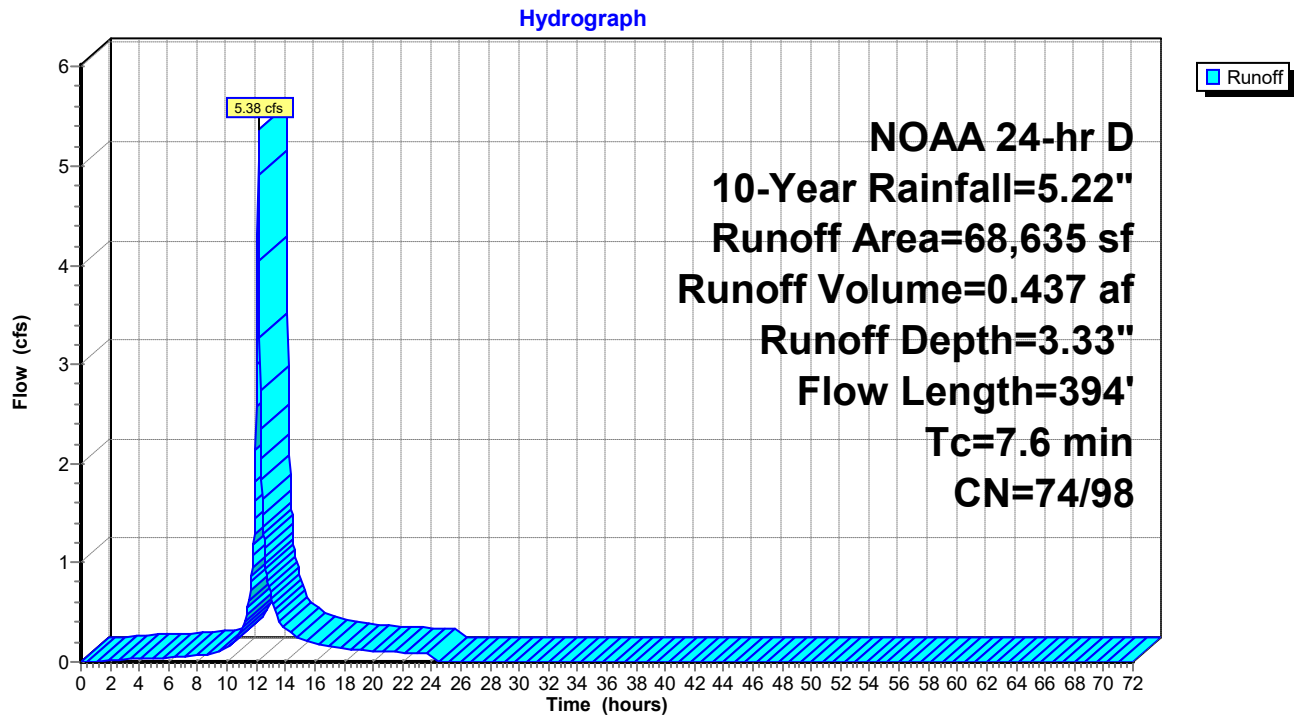
Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 24

Subcatchment 25S: overland 5-A



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 25

Hydrograph for Subcatchment 25S: overland 5-A

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.01	0.01
3.00	0.20	0.00	0.07	0.03
4.50	0.31	0.00	0.16	0.03
6.00	0.45	0.00	0.27	0.04
7.50	0.61	0.00	0.42	0.06
9.00	0.83	0.00	0.63	0.09
10.50	1.17	0.05	0.96	0.20
12.00	2.50	0.61	2.27	2.57
13.50	4.05	1.63	3.82	0.44
15.00	4.39	1.89	4.16	0.23
16.50	4.61	2.06	4.37	0.18
18.00	4.77	2.19	4.54	0.13
19.50	4.91	2.29	4.67	0.11
21.00	5.02	2.38	4.79	0.10
22.50	5.13	2.47	4.89	0.09
24.00	5.22	2.54	4.98	0.08
25.50	5.22	2.54	4.98	0.00
27.00	5.22	2.54	4.98	0.00
28.50	5.22	2.54	4.98	0.00
30.00	5.22	2.54	4.98	0.00
31.50	5.22	2.54	4.98	0.00
33.00	5.22	2.54	4.98	0.00
34.50	5.22	2.54	4.98	0.00
36.00	5.22	2.54	4.98	0.00
37.50	5.22	2.54	4.98	0.00
39.00	5.22	2.54	4.98	0.00
40.50	5.22	2.54	4.98	0.00
42.00	5.22	2.54	4.98	0.00
43.50	5.22	2.54	4.98	0.00
45.00	5.22	2.54	4.98	0.00
46.50	5.22	2.54	4.98	0.00
48.00	5.22	2.54	4.98	0.00
49.50	5.22	2.54	4.98	0.00
51.00	5.22	2.54	4.98	0.00
52.50	5.22	2.54	4.98	0.00
54.00	5.22	2.54	4.98	0.00
55.50	5.22	2.54	4.98	0.00
57.00	5.22	2.54	4.98	0.00
58.50	5.22	2.54	4.98	0.00
60.00	5.22	2.54	4.98	0.00
61.50	5.22	2.54	4.98	0.00
63.00	5.22	2.54	4.98	0.00
64.50	5.22	2.54	4.98	0.00
66.00	5.22	2.54	4.98	0.00
67.50	5.22	2.54	4.98	0.00
69.00	5.22	2.54	4.98	0.00
70.50	5.22	2.54	4.98	0.00
72.00	5.22	2.54	4.98	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 26

Summary for Subcatchment 26S: pre-dev basin 5

Runoff = 8.02 cfs @ 12.20 hrs, Volume= 0.706 af, Depth= 2.20"

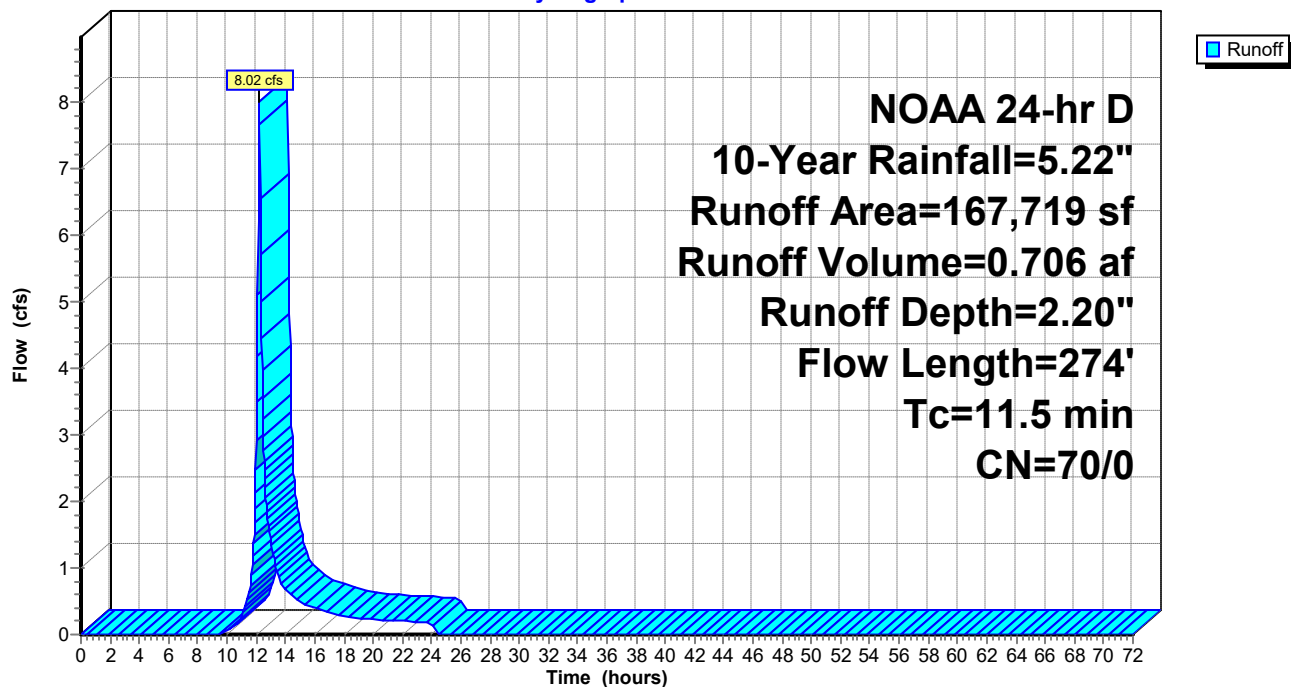
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
167,719	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.4	174	0.1670	2.04		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	274	Total			

Subcatchment 26S: pre-dev basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 27

Hydrograph for Subcatchment 26S: pre-dev basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.09	0.00	0.00	0.00
3.00	0.20	0.00	0.00	0.00
4.50	0.31	0.00	0.00	0.00
6.00	0.45	0.00	0.00	0.00
7.50	0.61	0.00	0.00	0.00
9.00	0.83	0.00	0.00	0.00
10.50	1.17	0.02	0.00	0.12
12.00	2.50	0.46	0.00	2.92
13.50	4.05	1.36	0.00	0.92
15.00	4.39	1.60	0.00	0.49
16.50	4.61	1.75	0.00	0.37
18.00	4.77	1.87	0.00	0.27
19.50	4.91	1.97	0.00	0.24
21.00	5.02	2.05	0.00	0.22
22.50	5.13	2.13	0.00	0.19
24.00	5.22	2.20	0.00	0.17
25.50	5.22	2.20	0.00	0.00
27.00	5.22	2.20	0.00	0.00
28.50	5.22	2.20	0.00	0.00
30.00	5.22	2.20	0.00	0.00
31.50	5.22	2.20	0.00	0.00
33.00	5.22	2.20	0.00	0.00
34.50	5.22	2.20	0.00	0.00
36.00	5.22	2.20	0.00	0.00
37.50	5.22	2.20	0.00	0.00
39.00	5.22	2.20	0.00	0.00
40.50	5.22	2.20	0.00	0.00
42.00	5.22	2.20	0.00	0.00
43.50	5.22	2.20	0.00	0.00
45.00	5.22	2.20	0.00	0.00
46.50	5.22	2.20	0.00	0.00
48.00	5.22	2.20	0.00	0.00
49.50	5.22	2.20	0.00	0.00
51.00	5.22	2.20	0.00	0.00
52.50	5.22	2.20	0.00	0.00
54.00	5.22	2.20	0.00	0.00
55.50	5.22	2.20	0.00	0.00
57.00	5.22	2.20	0.00	0.00
58.50	5.22	2.20	0.00	0.00
60.00	5.22	2.20	0.00	0.00
61.50	5.22	2.20	0.00	0.00
63.00	5.22	2.20	0.00	0.00
64.50	5.22	2.20	0.00	0.00
66.00	5.22	2.20	0.00	0.00
67.50	5.22	2.20	0.00	0.00
69.00	5.22	2.20	0.00	0.00
70.50	5.22	2.20	0.00	0.00
72.00	5.22	2.20	0.00	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 28

Summary for Pond 24P: Infiltration basin 5

Inflow Area = 2.275 ac, Inflow Depth = 4.08" for 10-Year event
Inflow = 8.00 cfs @ 12.19 hrs, Volume= 0.773 af
Outflow = 0.35 cfs @ 15.15 hrs, Volume= 0.231 af, Atten= 96%, Lag= 177.6 min
Primary = 0.35 cfs @ 15.15 hrs, Volume= 0.231 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 572.57' @ 15.15 hrs Surf.Area= 12,410 sf Storage= 25,739 cf

Plug-Flow detention time= 580.4 min calculated for 0.231 af (30% of inflow)
Center-of-Mass det. time= 376.7 min (1,152.6 - 775.9)

Volume	Invert	Avail.Storage	Storage Description
#1	570.50'	43,435 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
570.50	12,410	0	0	12,410
574.00	12,410	43,435	43,435	13,792

Device	Routing	Invert	Outlet Devices
#1	Primary	572.40'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.35 cfs @ 15.15 hrs HW=572.57' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 0.35 cfs @ 1.34 fps)

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

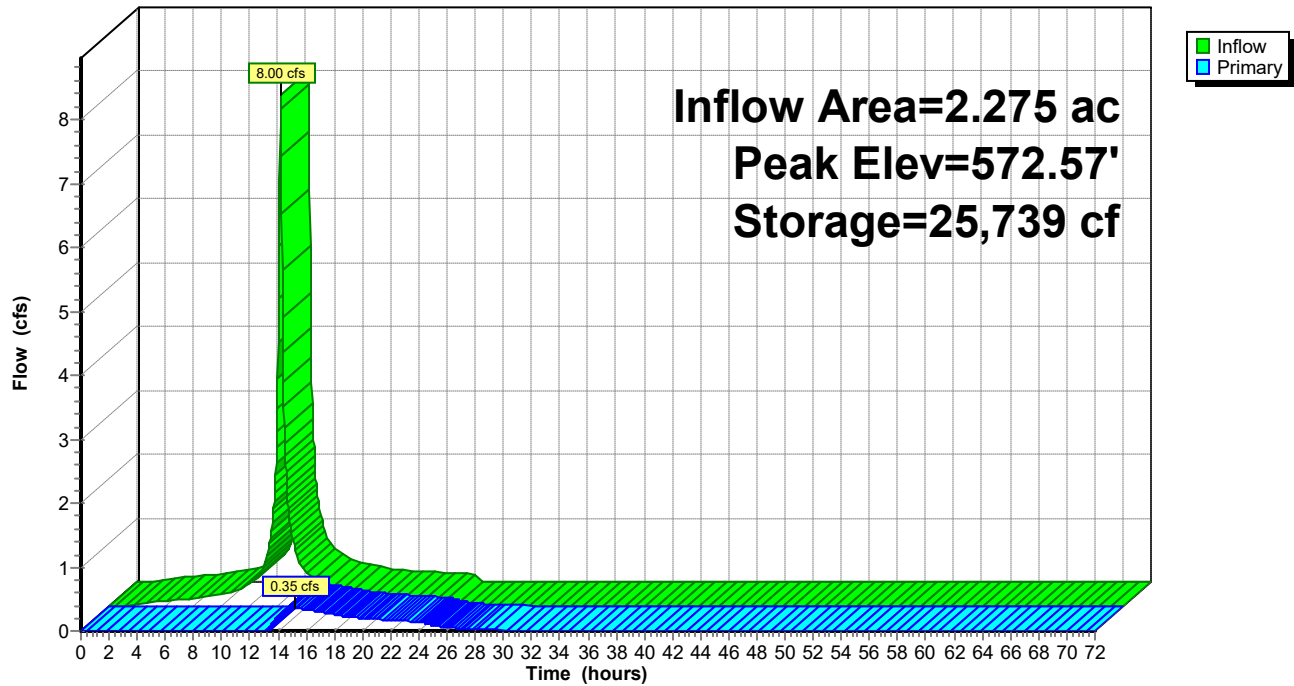
NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 29

Pond 24P: Infiltration basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 30

Hydrograph for Pond 24P: Infiltration basin 5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	570.50	0.00
1.50	0.03	34	570.50	0.00
3.00	0.07	306	570.52	0.00
4.50	0.10	754	570.56	0.00
6.00	0.12	1,324	570.61	0.00
7.50	0.17	2,073	570.67	0.00
9.00	0.23	3,115	570.75	0.00
10.50	0.43	4,848	570.89	0.00
12.00	3.55	10,646	571.36	0.00
13.50	0.73	24,349	572.46	0.07
15.00	0.37	25,732	572.57	0.35
16.50	0.28	25,602	572.56	0.32
18.00	0.20	25,338	572.54	0.26
19.50	0.18	25,106	572.52	0.21
21.00	0.16	24,966	572.51	0.18
22.50	0.14	24,857	572.50	0.16
24.00	0.12	24,758	572.50	0.14
25.50	0.00	24,284	572.46	0.07
27.00	0.00	24,021	572.44	0.03
28.50	0.00	23,883	572.42	0.02
30.00	0.00	23,797	572.42	0.01
31.50	0.00	23,736	572.41	0.01
33.00	0.00	23,691	572.41	0.01
34.50	0.00	23,660	572.41	0.00
36.00	0.00	23,637	572.40	0.00
37.50	0.00	23,621	572.40	0.00
39.00	0.00	23,609	572.40	0.00
40.50	0.00	23,600	572.40	0.00
42.00	0.00	23,594	572.40	0.00
43.50	0.00	23,590	572.40	0.00
45.00	0.00	23,587	572.40	0.00
46.50	0.00	23,585	572.40	0.00
48.00	0.00	23,583	572.40	0.00
49.50	0.00	23,582	572.40	0.00
51.00	0.00	23,581	572.40	0.00
52.50	0.00	23,581	572.40	0.00
54.00	0.00	23,580	572.40	0.00
55.50	0.00	23,580	572.40	0.00
57.00	0.00	23,580	572.40	0.00
58.50	0.00	23,579	572.40	0.00
60.00	0.00	23,579	572.40	0.00
61.50	0.00	23,579	572.40	0.00
63.00	0.00	23,579	572.40	0.00
64.50	0.00	23,579	572.40	0.00
66.00	0.00	23,579	572.40	0.00
67.50	0.00	23,579	572.40	0.00
69.00	0.00	23,579	572.40	0.00
70.50	0.00	23,579	572.40	0.00
72.00	0.00	23,579	572.40	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 31

Stage-Discharge for Pond 24P: Infiltration basin 5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
570.50	0.00	571.52	0.00	572.54	0.25	573.56	3.43
570.52	0.00	571.54	0.00	572.56	0.31	573.58	3.47
570.54	0.00	571.56	0.00	572.58	0.37	573.60	3.51
570.56	0.00	571.58	0.00	572.60	0.43	573.62	3.55
570.58	0.00	571.60	0.00	572.62	0.50	573.64	3.58
570.60	0.00	571.62	0.00	572.64	0.57	573.66	3.62
570.62	0.00	571.64	0.00	572.66	0.64	573.68	3.66
570.64	0.00	571.66	0.00	572.68	0.71	573.70	3.69
570.66	0.00	571.68	0.00	572.70	0.79	573.72	3.73
570.68	0.00	571.70	0.00	572.72	0.87	573.74	3.76
570.70	0.00	571.72	0.00	572.74	0.95	573.76	3.80
570.72	0.00	571.74	0.00	572.76	1.04	573.78	3.83
570.74	0.00	571.76	0.00	572.78	1.13	573.80	3.86
570.76	0.00	571.78	0.00	572.80	1.22	573.82	3.90
570.78	0.00	571.80	0.00	572.82	1.31	573.84	3.93
570.80	0.00	571.82	0.00	572.84	1.41	573.86	3.97
570.82	0.00	571.84	0.00	572.86	1.50	573.88	4.00
570.84	0.00	571.86	0.00	572.88	1.60	573.90	4.03
570.86	0.00	571.88	0.00	572.90	1.70	573.92	4.06
570.88	0.00	571.90	0.00	572.92	1.79	573.94	4.10
570.90	0.00	571.92	0.00	572.94	1.87	573.96	4.13
570.92	0.00	571.94	0.00	572.96	1.95	573.98	4.16
570.94	0.00	571.96	0.00	572.98	2.02	574.00	4.19
570.96	0.00	571.98	0.00	573.00	2.09		
570.98	0.00	572.00	0.00	573.02	2.15		
571.00	0.00	572.02	0.00	573.04	2.21		
571.02	0.00	572.04	0.00	573.06	2.27		
571.04	0.00	572.06	0.00	573.08	2.33		
571.06	0.00	572.08	0.00	573.10	2.39		
571.08	0.00	572.10	0.00	573.12	2.44		
571.10	0.00	572.12	0.00	573.14	2.50		
571.12	0.00	572.14	0.00	573.16	2.55		
571.14	0.00	572.16	0.00	573.18	2.60		
571.16	0.00	572.18	0.00	573.20	2.65		
571.18	0.00	572.20	0.00	573.22	2.70		
571.20	0.00	572.22	0.00	573.24	2.75		
571.22	0.00	572.24	0.00	573.26	2.80		
571.24	0.00	572.26	0.00	573.28	2.85		
571.26	0.00	572.28	0.00	573.30	2.89		
571.28	0.00	572.30	0.00	573.32	2.94		
571.30	0.00	572.32	0.00	573.34	2.98		
571.32	0.00	572.34	0.00	573.36	3.03		
571.34	0.00	572.36	0.00	573.38	3.07		
571.36	0.00	572.38	0.00	573.40	3.11		
571.38	0.00	572.40	0.00	573.42	3.15		
571.40	0.00	572.42	0.01	573.44	3.20		
571.42	0.00	572.44	0.04	573.46	3.24		
571.44	0.00	572.46	0.07	573.48	3.28		
571.46	0.00	572.48	0.11	573.50	3.32		
571.48	0.00	572.50	0.15	573.52	3.36		
571.50	0.00	572.52	0.20	573.54	3.40		

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 10-Year Rainfall=5.22"

Printed 10/29/2023

Page 32

Stage-Area-Storage for Pond 24P: Infiltration basin 5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
570.50	12,410	0	573.05	12,410	31,645
570.55	12,410	620	573.10	12,410	32,266
570.60	12,410	1,241	573.15	12,410	32,886
570.65	12,410	1,861	573.20	12,410	33,507
570.70	12,410	2,482	573.25	12,410	34,128
570.75	12,410	3,103	573.30	12,410	34,748
570.80	12,410	3,723	573.35	12,410	35,369
570.85	12,410	4,344	573.40	12,410	35,989
570.90	12,410	4,964	573.45	12,410	36,610
570.95	12,410	5,585	573.50	12,410	37,230
571.00	12,410	6,205	573.55	12,410	37,850
571.05	12,410	6,825	573.60	12,410	38,471
571.10	12,410	7,446	573.65	12,410	39,091
571.15	12,410	8,066	573.70	12,410	39,712
571.20	12,410	8,687	573.75	12,410	40,333
571.25	12,410	9,308	573.80	12,410	40,953
571.30	12,410	9,928	573.85	12,410	41,574
571.35	12,410	10,549	573.90	12,410	42,194
571.40	12,410	11,169	573.95	12,410	42,815
571.45	12,410	11,790	574.00	12,410	43,435
571.50	12,410	12,410			
571.55	12,410	13,030			
571.60	12,410	13,651			
571.65	12,410	14,271			
571.70	12,410	14,892			
571.75	12,410	15,513			
571.80	12,410	16,133			
571.85	12,410	16,754			
571.90	12,410	17,374			
571.95	12,410	17,995			
572.00	12,410	18,615			
572.05	12,410	19,235			
572.10	12,410	19,856			
572.15	12,410	20,476			
572.20	12,410	21,097			
572.25	12,410	21,718			
572.30	12,410	22,338			
572.35	12,410	22,959			
572.40	12,410	23,579			
572.45	12,410	24,200			
572.50	12,410	24,820			
572.55	12,410	25,440			
572.60	12,410	26,061			
572.65	12,410	26,681			
572.70	12,410	27,302			
572.75	12,410	27,923			
572.80	12,410	28,543			
572.85	12,410	29,164			
572.90	12,410	29,784			
572.95	12,410	30,405			
573.00	12,410	31,025			

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 33

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 23S: Basin 5

Runoff Area=99,084 sf Runoff Depth=7.34"
Flow Length=314' Tc=11.3 min CN=74/98 Runoff=14.33 cfs 1.392 af

Subcatchment 25S: overland 5-A

Runoff Area=68,635 sf Runoff Depth=6.46"
Flow Length=394' Tc=7.6 min CN=74/98 Runoff=10.39 cfs 0.848 af

Subcatchment 26S: pre-dev basin 5

Runoff Area=167,719 sf Runoff Depth=5.04"
Flow Length=274' Tc=11.5 min CN=70/0 Runoff=18.50 cfs 1.616 af

Pond 24P: Infiltration basin 5

Peak Elev=573.29' Storage=34,562 cf Inflow=14.33 cfs 1.392 af
Outflow=2.86 cfs 0.851 af

Total Runoff Area = 7.701 ac Runoff Volume = 3.856 af Average Runoff Depth = 6.01"

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 34

Summary for Subcatchment 23S: Basin 5

Runoff = 14.33 cfs @ 12.18 hrs, Volume= 1.392 af, Depth= 7.34"
Routed to Pond 24P : Infiltration basin 5

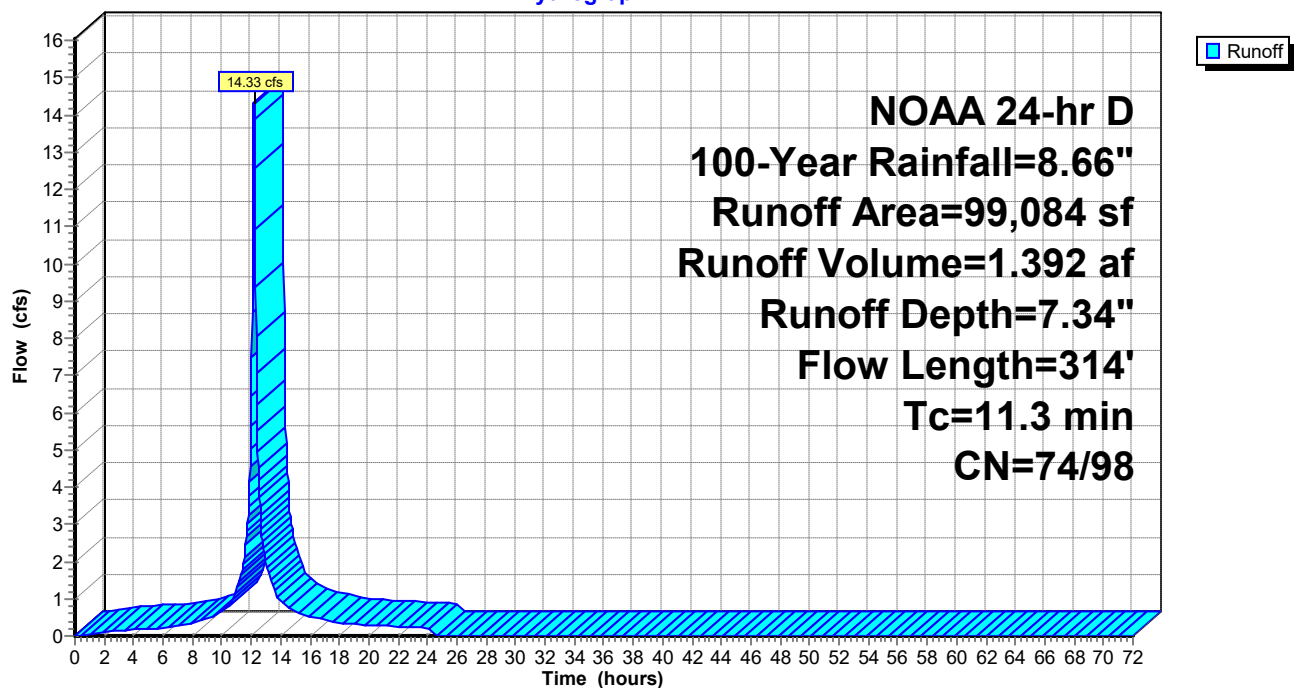
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
62,281	98	Roofs, HSG D
36,803	74	>75% Grass cover, Good, HSG C
99,084	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0170	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
1.0	164	0.0305	2.62		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	50	0.0760	5.60		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	314	Total			

Subcatchment 23S: Basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 35

Hydrograph for Subcatchment 23S: Basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.04	0.08
3.00	0.33	0.00	0.17	0.14
4.50	0.52	0.00	0.34	0.18
6.00	0.74	0.00	0.54	0.21
7.50	1.01	0.03	0.80	0.31
9.00	1.37	0.11	1.16	0.43
10.50	1.94	0.32	1.71	0.82
12.00	4.15	1.71	3.91	6.47
13.50	6.72	3.80	6.48	1.27
15.00	7.29	4.29	7.05	0.65
16.50	7.65	4.61	7.41	0.48
18.00	7.92	4.85	7.68	0.35
19.50	8.14	5.05	7.90	0.31
21.00	8.33	5.23	8.09	0.28
22.50	8.51	5.38	8.27	0.24
24.00	8.66	5.52	8.42	0.21
25.50	8.66	5.52	8.42	0.00
27.00	8.66	5.52	8.42	0.00
28.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
31.50	8.66	5.52	8.42	0.00
33.00	8.66	5.52	8.42	0.00
34.50	8.66	5.52	8.42	0.00
36.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
39.00	8.66	5.52	8.42	0.00
40.50	8.66	5.52	8.42	0.00
42.00	8.66	5.52	8.42	0.00
43.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
46.50	8.66	5.52	8.42	0.00
48.00	8.66	5.52	8.42	0.00
49.50	8.66	5.52	8.42	0.00
51.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
54.00	8.66	5.52	8.42	0.00
55.50	8.66	5.52	8.42	0.00
57.00	8.66	5.52	8.42	0.00
58.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
61.50	8.66	5.52	8.42	0.00
63.00	8.66	5.52	8.42	0.00
64.50	8.66	5.52	8.42	0.00
66.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
69.00	8.66	5.52	8.42	0.00
70.50	8.66	5.52	8.42	0.00
72.00	8.66	5.52	8.42	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 36

Summary for Subcatchment 25S: overland 5-A

[47] Hint: Peak is 272% of capacity of segment #4

Runoff = 10.39 cfs @ 12.15 hrs, Volume= 0.848 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
22,200	98	Paved parking, HSG C
46,435	74	>75% Grass cover, Good, HSG C
68,635	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.1200	0.25		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0500	3.35		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	118	0.0550	4.76		Shallow Concentrated Flow, gutter flow Paved Kv= 20.3 fps
0.4	156	0.0349	6.80	3.82	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Corrugated PE, smooth interior
7.6	394	Total			

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

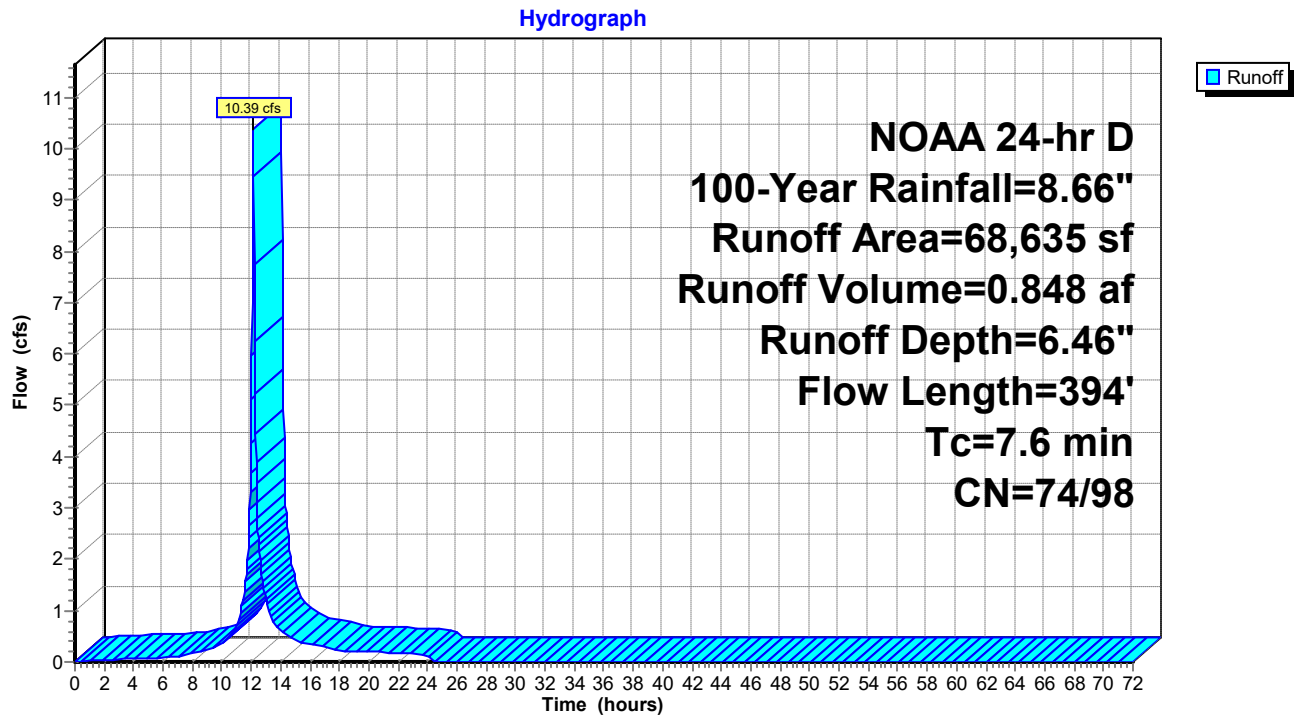
Basin 5 without exfiltration

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 37

Subcatchment 25S: overland 5-A



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 38

Hydrograph for Subcatchment 25S: overland 5-A

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.04	0.03
3.00	0.33	0.00	0.17	0.05
4.50	0.52	0.00	0.34	0.06
6.00	0.74	0.00	0.54	0.08
7.50	1.01	0.03	0.80	0.14
9.00	1.37	0.11	1.16	0.21
10.50	1.94	0.32	1.71	0.46
12.00	4.15	1.71	3.91	5.13
13.50	6.72	3.80	6.48	0.80
15.00	7.29	4.29	7.05	0.42
16.50	7.65	4.61	7.41	0.32
18.00	7.92	4.85	7.68	0.23
19.50	8.14	5.05	7.90	0.20
21.00	8.33	5.23	8.09	0.18
22.50	8.51	5.38	8.27	0.16
24.00	8.66	5.52	8.42	0.14
25.50	8.66	5.52	8.42	0.00
27.00	8.66	5.52	8.42	0.00
28.50	8.66	5.52	8.42	0.00
30.00	8.66	5.52	8.42	0.00
31.50	8.66	5.52	8.42	0.00
33.00	8.66	5.52	8.42	0.00
34.50	8.66	5.52	8.42	0.00
36.00	8.66	5.52	8.42	0.00
37.50	8.66	5.52	8.42	0.00
39.00	8.66	5.52	8.42	0.00
40.50	8.66	5.52	8.42	0.00
42.00	8.66	5.52	8.42	0.00
43.50	8.66	5.52	8.42	0.00
45.00	8.66	5.52	8.42	0.00
46.50	8.66	5.52	8.42	0.00
48.00	8.66	5.52	8.42	0.00
49.50	8.66	5.52	8.42	0.00
51.00	8.66	5.52	8.42	0.00
52.50	8.66	5.52	8.42	0.00
54.00	8.66	5.52	8.42	0.00
55.50	8.66	5.52	8.42	0.00
57.00	8.66	5.52	8.42	0.00
58.50	8.66	5.52	8.42	0.00
60.00	8.66	5.52	8.42	0.00
61.50	8.66	5.52	8.42	0.00
63.00	8.66	5.52	8.42	0.00
64.50	8.66	5.52	8.42	0.00
66.00	8.66	5.52	8.42	0.00
67.50	8.66	5.52	8.42	0.00
69.00	8.66	5.52	8.42	0.00
70.50	8.66	5.52	8.42	0.00
72.00	8.66	5.52	8.42	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 39

Summary for Subcatchment 26S: pre-dev basin 5

Runoff = 18.50 cfs @ 12.19 hrs, Volume= 1.616 af, Depth= 5.04"

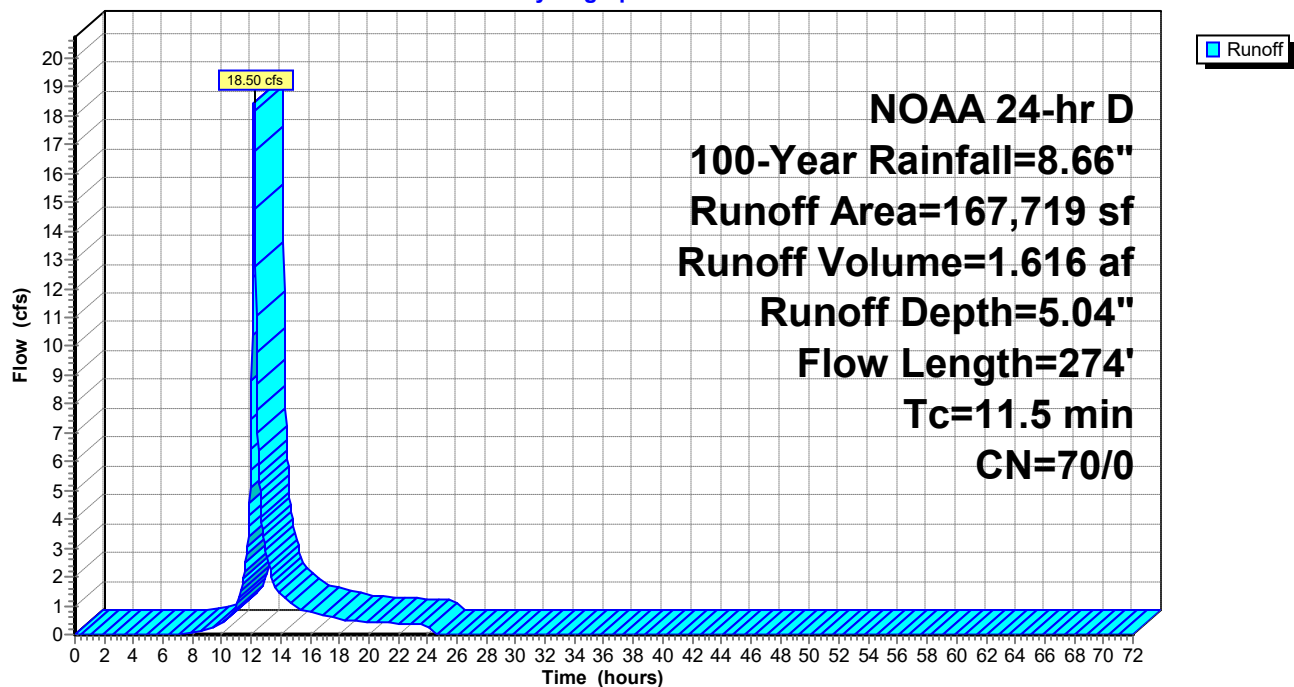
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
167,719	70	Woods, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.1200	0.16		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.44"
1.4	174	0.1670	2.04		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	274	Total			

Subcatchment 26S: pre-dev basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 40

Hydrograph for Subcatchment 26S: pre-dev basin 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
1.50	0.15	0.00	0.00	0.00
3.00	0.33	0.00	0.00	0.00
4.50	0.52	0.00	0.00	0.00
6.00	0.74	0.00	0.00	0.00
7.50	1.01	0.01	0.00	0.04
9.00	1.37	0.06	0.00	0.19
10.50	1.94	0.22	0.00	0.61
12.00	4.15	1.43	0.00	7.50
13.50	6.72	3.39	0.00	1.87
15.00	7.29	3.86	0.00	0.97
16.50	7.65	4.16	0.00	0.72
18.00	7.92	4.40	0.00	0.53
19.50	8.14	4.58	0.00	0.47
21.00	8.33	4.75	0.00	0.42
22.50	8.51	4.90	0.00	0.37
24.00	8.66	5.04	0.00	0.33
25.50	8.66	5.04	0.00	0.00
27.00	8.66	5.04	0.00	0.00
28.50	8.66	5.04	0.00	0.00
30.00	8.66	5.04	0.00	0.00
31.50	8.66	5.04	0.00	0.00
33.00	8.66	5.04	0.00	0.00
34.50	8.66	5.04	0.00	0.00
36.00	8.66	5.04	0.00	0.00
37.50	8.66	5.04	0.00	0.00
39.00	8.66	5.04	0.00	0.00
40.50	8.66	5.04	0.00	0.00
42.00	8.66	5.04	0.00	0.00
43.50	8.66	5.04	0.00	0.00
45.00	8.66	5.04	0.00	0.00
46.50	8.66	5.04	0.00	0.00
48.00	8.66	5.04	0.00	0.00
49.50	8.66	5.04	0.00	0.00
51.00	8.66	5.04	0.00	0.00
52.50	8.66	5.04	0.00	0.00
54.00	8.66	5.04	0.00	0.00
55.50	8.66	5.04	0.00	0.00
57.00	8.66	5.04	0.00	0.00
58.50	8.66	5.04	0.00	0.00
60.00	8.66	5.04	0.00	0.00
61.50	8.66	5.04	0.00	0.00
63.00	8.66	5.04	0.00	0.00
64.50	8.66	5.04	0.00	0.00
66.00	8.66	5.04	0.00	0.00
67.50	8.66	5.04	0.00	0.00
69.00	8.66	5.04	0.00	0.00
70.50	8.66	5.04	0.00	0.00
72.00	8.66	5.04	0.00	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 41

Summary for Pond 24P: Infiltration basin 5

Inflow Area = 2.275 ac, Inflow Depth = 7.34" for 100-Year event
Inflow = 14.33 cfs @ 12.18 hrs, Volume= 1.392 af
Outflow = 2.86 cfs @ 12.69 hrs, Volume= 0.851 af, Atten= 80%, Lag= 30.3 min
Primary = 2.86 cfs @ 12.69 hrs, Volume= 0.851 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 573.29' @ 12.69 hrs Surf.Area= 12,410 sf Storage= 34,562 cf

Plug-Flow detention time= 311.3 min calculated for 0.851 af (61% of inflow)
Center-of-Mass det. time= 189.8 min (958.1 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	570.50'	43,435 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
570.50	12,410	0	0	12,410
574.00	12,410	43,435	43,435	13,792

Device	Routing	Invert	Outlet Devices
#1	Primary	572.40'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.86 cfs @ 12.69 hrs HW=573.29' (Free Discharge)
↑ **1=Orifice/Grate** (Orifice Controls 2.86 cfs @ 3.81 fps)

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

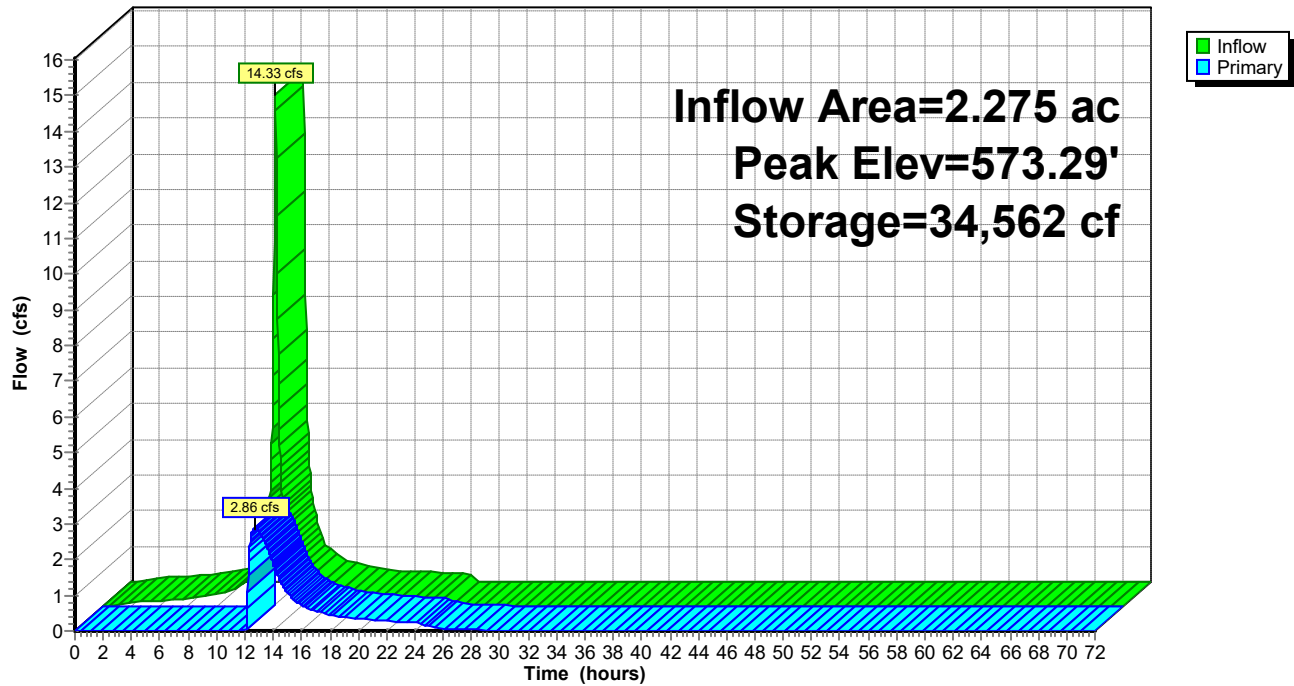
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 42

Pond 24P: Infiltration basin 5

Hydrograph



Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration
NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 43

Hydrograph for Pond 24P: Infiltration basin 5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	570.50	0.00
1.50	0.08	151	570.51	0.00
3.00	0.14	774	570.56	0.00
4.50	0.18	1,641	570.63	0.00
6.00	0.21	2,676	570.72	0.00
7.50	0.31	4,051	570.83	0.00
9.00	0.43	6,055	570.99	0.00
10.50	0.82	9,360	571.25	0.00
12.00	6.47	20,094	572.12	0.00
13.50	1.27	32,240	573.10	2.38
15.00	0.65	28,106	572.76	1.06
16.50	0.48	26,754	572.66	0.62
18.00	0.35	26,136	572.61	0.45
19.50	0.31	25,752	572.58	0.35
21.00	0.28	25,555	572.56	0.31
22.50	0.24	25,398	572.55	0.27
24.00	0.21	25,252	572.53	0.24
25.50	0.00	24,501	572.47	0.10
27.00	0.00	24,131	572.44	0.05
28.50	0.00	23,940	572.43	0.03
30.00	0.00	23,836	572.42	0.02
31.50	0.00	23,764	572.41	0.01
33.00	0.00	23,711	572.41	0.01
34.50	0.00	23,674	572.41	0.01
36.00	0.00	23,647	572.41	0.00
37.50	0.00	23,628	572.40	0.00
39.00	0.00	23,614	572.40	0.00
40.50	0.00	23,604	572.40	0.00
42.00	0.00	23,597	572.40	0.00
43.50	0.00	23,592	572.40	0.00
45.00	0.00	23,588	572.40	0.00
46.50	0.00	23,586	572.40	0.00
48.00	0.00	23,584	572.40	0.00
49.50	0.00	23,582	572.40	0.00
51.00	0.00	23,581	572.40	0.00
52.50	0.00	23,581	572.40	0.00
54.00	0.00	23,580	572.40	0.00
55.50	0.00	23,580	572.40	0.00
57.00	0.00	23,580	572.40	0.00
58.50	0.00	23,579	572.40	0.00
60.00	0.00	23,579	572.40	0.00
61.50	0.00	23,579	572.40	0.00
63.00	0.00	23,579	572.40	0.00
64.50	0.00	23,579	572.40	0.00
66.00	0.00	23,579	572.40	0.00
67.50	0.00	23,579	572.40	0.00
69.00	0.00	23,579	572.40	0.00
70.50	0.00	23,579	572.40	0.00
72.00	0.00	23,579	572.40	0.00

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 44

Stage-Discharge for Pond 24P: Infiltration basin 5

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
570.50	0.00	571.52	0.00	572.54	0.25	573.56	3.43
570.52	0.00	571.54	0.00	572.56	0.31	573.58	3.47
570.54	0.00	571.56	0.00	572.58	0.37	573.60	3.51
570.56	0.00	571.58	0.00	572.60	0.43	573.62	3.55
570.58	0.00	571.60	0.00	572.62	0.50	573.64	3.58
570.60	0.00	571.62	0.00	572.64	0.57	573.66	3.62
570.62	0.00	571.64	0.00	572.66	0.64	573.68	3.66
570.64	0.00	571.66	0.00	572.68	0.71	573.70	3.69
570.66	0.00	571.68	0.00	572.70	0.79	573.72	3.73
570.68	0.00	571.70	0.00	572.72	0.87	573.74	3.76
570.70	0.00	571.72	0.00	572.74	0.95	573.76	3.80
570.72	0.00	571.74	0.00	572.76	1.04	573.78	3.83
570.74	0.00	571.76	0.00	572.78	1.13	573.80	3.86
570.76	0.00	571.78	0.00	572.80	1.22	573.82	3.90
570.78	0.00	571.80	0.00	572.82	1.31	573.84	3.93
570.80	0.00	571.82	0.00	572.84	1.41	573.86	3.97
570.82	0.00	571.84	0.00	572.86	1.50	573.88	4.00
570.84	0.00	571.86	0.00	572.88	1.60	573.90	4.03
570.86	0.00	571.88	0.00	572.90	1.70	573.92	4.06
570.88	0.00	571.90	0.00	572.92	1.79	573.94	4.10
570.90	0.00	571.92	0.00	572.94	1.87	573.96	4.13
570.92	0.00	571.94	0.00	572.96	1.95	573.98	4.16
570.94	0.00	571.96	0.00	572.98	2.02	574.00	4.19
570.96	0.00	571.98	0.00	573.00	2.09		
570.98	0.00	572.00	0.00	573.02	2.15		
571.00	0.00	572.02	0.00	573.04	2.21		
571.02	0.00	572.04	0.00	573.06	2.27		
571.04	0.00	572.06	0.00	573.08	2.33		
571.06	0.00	572.08	0.00	573.10	2.39		
571.08	0.00	572.10	0.00	573.12	2.44		
571.10	0.00	572.12	0.00	573.14	2.50		
571.12	0.00	572.14	0.00	573.16	2.55		
571.14	0.00	572.16	0.00	573.18	2.60		
571.16	0.00	572.18	0.00	573.20	2.65		
571.18	0.00	572.20	0.00	573.22	2.70		
571.20	0.00	572.22	0.00	573.24	2.75		
571.22	0.00	572.24	0.00	573.26	2.80		
571.24	0.00	572.26	0.00	573.28	2.85		
571.26	0.00	572.28	0.00	573.30	2.89		
571.28	0.00	572.30	0.00	573.32	2.94		
571.30	0.00	572.32	0.00	573.34	2.98		
571.32	0.00	572.34	0.00	573.36	3.03		
571.34	0.00	572.36	0.00	573.38	3.07		
571.36	0.00	572.38	0.00	573.40	3.11		
571.38	0.00	572.40	0.00	573.42	3.15		
571.40	0.00	572.42	0.01	573.44	3.20		
571.42	0.00	572.44	0.04	573.46	3.24		
571.44	0.00	572.46	0.07	573.48	3.28		
571.46	0.00	572.48	0.11	573.50	3.32		
571.48	0.00	572.50	0.15	573.52	3.36		
571.50	0.00	572.52	0.20	573.54	3.40		

Proposed basin 5 R5

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 without exfiltration

NOAA 24-hr D 100-Year Rainfall=8.66"

Printed 10/29/2023

Page 45

Stage-Area-Storage for Pond 24P: Infiltration basin 5

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
570.50	12,410	0	573.05	12,410	31,645
570.55	12,410	620	573.10	12,410	32,266
570.60	12,410	1,241	573.15	12,410	32,886
570.65	12,410	1,861	573.20	12,410	33,507
570.70	12,410	2,482	573.25	12,410	34,128
570.75	12,410	3,103	573.30	12,410	34,748
570.80	12,410	3,723	573.35	12,410	35,369
570.85	12,410	4,344	573.40	12,410	35,989
570.90	12,410	4,964	573.45	12,410	36,610
570.95	12,410	5,585	573.50	12,410	37,230
571.00	12,410	6,205	573.55	12,410	37,850
571.05	12,410	6,825	573.60	12,410	38,471
571.10	12,410	7,446	573.65	12,410	39,091
571.15	12,410	8,066	573.70	12,410	39,712
571.20	12,410	8,687	573.75	12,410	40,333
571.25	12,410	9,308	573.80	12,410	40,953
571.30	12,410	9,928	573.85	12,410	41,574
571.35	12,410	10,549	573.90	12,410	42,194
571.40	12,410	11,169	573.95	12,410	42,815
571.45	12,410	11,790	574.00	12,410	43,435
571.50	12,410	12,410			
571.55	12,410	13,030			
571.60	12,410	13,651			
571.65	12,410	14,271			
571.70	12,410	14,892			
571.75	12,410	15,513			
571.80	12,410	16,133			
571.85	12,410	16,754			
571.90	12,410	17,374			
571.95	12,410	17,995			
572.00	12,410	18,615			
572.05	12,410	19,235			
572.10	12,410	19,856			
572.15	12,410	20,476			
572.20	12,410	21,097			
572.25	12,410	21,718			
572.30	12,410	22,338			
572.35	12,410	22,959			
572.40	12,410	23,579			
572.45	12,410	24,200			
572.50	12,410	24,820			
572.55	12,410	25,440			
572.60	12,410	26,061			
572.65	12,410	26,681			
572.70	12,410	27,302			
572.75	12,410	27,923			
572.80	12,410	28,543			
572.85	12,410	29,164			
572.90	12,410	29,784			
572.95	12,410	30,405			
573.00	12,410	31,025			

Proposed basin 1 R5 infil

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 1

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 1 R5 infil

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 1 2yr infiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 2

Summary for Subcatchment 32S: Basin 1 Undetained

Runoff = 1.36 cfs @ 12.18 hrs, Volume= 0.118 af, Depth= 1.20"

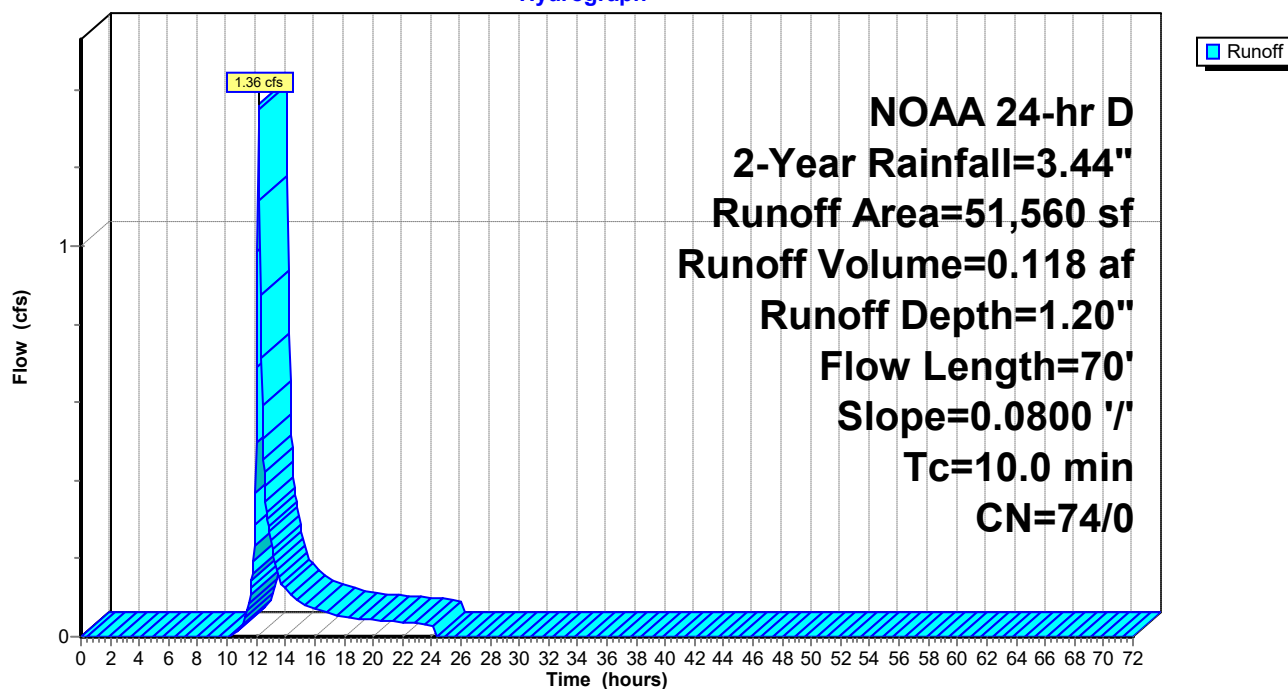
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
51,560	74	>75% Grass cover, Good, HSG C

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	70	0.0800	0.20		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
5.9	70	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 32S: Basin 1 Undetained

Hydrograph



Proposed Basin 2-1 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 1

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-1 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

basin 2-1 eith exfil WQ
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 2

Summary for Pond 41P: Pond 2-1

Inflow Area = 0.599 ac, Inflow Depth = 1.36" for 2-Year event
Inflow = 0.79 cfs @ 12.18 hrs, Volume= 0.068 af
Outflow = 0.02 cfs @ 19.47 hrs, Volume= 0.068 af, Atten= 97%, Lag= 437.2 min
Discarded = 0.02 cfs @ 19.47 hrs, Volume= 0.068 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 546.93' @ 19.47 hrs Surf.Area= 2,020 sf Storage= 1,883 cf

Plug-Flow detention time= 848.3 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 848.0 min (1,709.6 - 861.6)

Volume	Invert	Avail.Storage	Storage Description
#1	546.00'	4,040 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
546.00	2,020	0	0
548.00	2,020	4,040	4,040

Device	Routing	Invert	Outlet Devices
#1	Discarded	546.00'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	546.95'	8.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	547.20'	10.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 19.47 hrs HW=546.93' (Free Discharge)
↑ **1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=546.00' (Free Discharge)
↑ **2=Orifice/Grate** (Controls 0.00 cfs)
↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Proposed Basin 2-1 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

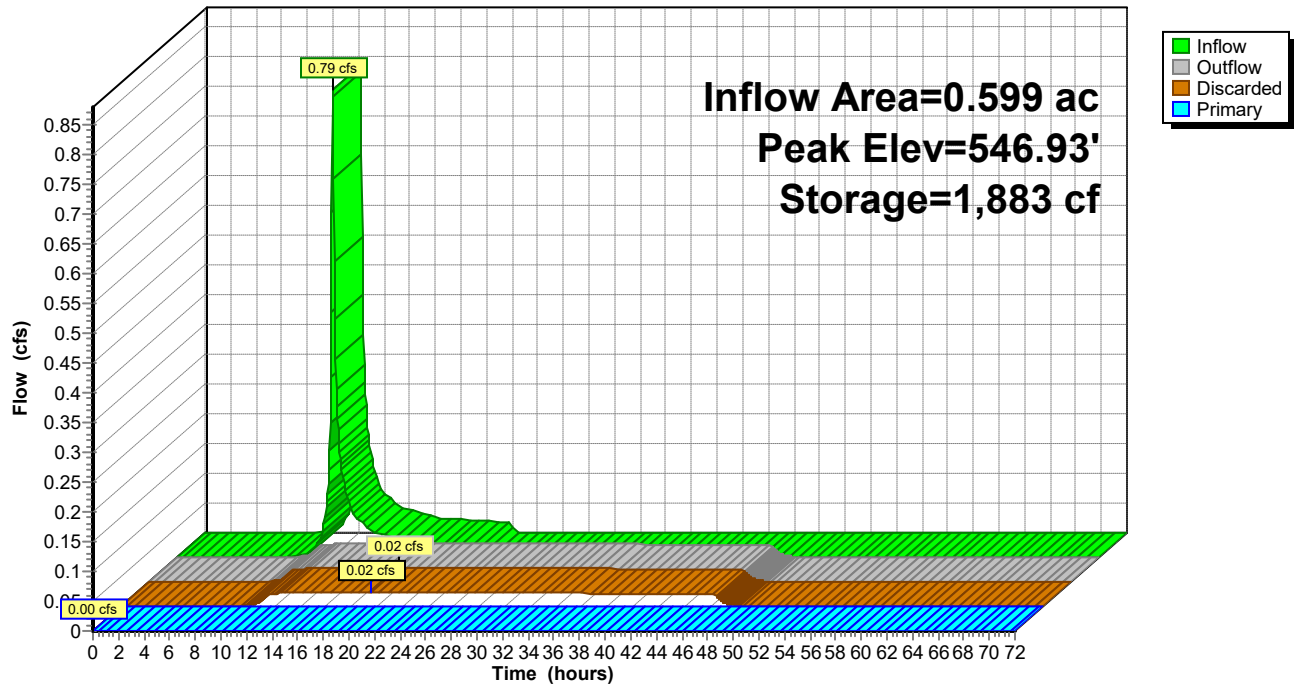
basin 2-1 eith exfil WQ
NOAA 24-hr D 2-Year Rainfall=3.44"

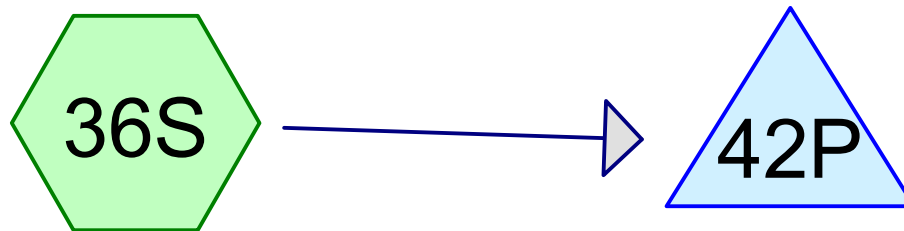
Printed 10/23/2023

Page 3

Pond 41P: Pond 2-1

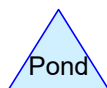
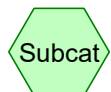
Hydrograph





Basin 2-2

Pond 2-2



Routing Diagram for Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services, Printed 10/23/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.454	74	>75% Grass cover, Good, HSG C (36S)
0.794	98	Paved parking, HSG C (36S)
0.163	98	Water Surface, 0% imp, HSG C (36S)
1.412	90	TOTAL AREA

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.412	HSG C	36S
0.000	HSG D	
0.000	Other	
1.412		TOTAL AREA

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.454	0.000	0.000	0.454	>75% Grass cover, Good	36S
0.000	0.000	0.794	0.000	0.000	0.794	Paved parking	36S
0.000	0.000	0.163	0.000	0.000	0.163	Water Surface, 0% imp	36S
0.000	0.000	1.412	0.000	0.000	1.412	TOTAL AREA	

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	36S	0.00	0.00	426.0	0.0350	0.010	0.0	12.0	8.0	

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 with exfil
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 7

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 36S: Basin 2-2

Runoff Area=61,497 sf Runoff Depth=2.51"

Flow Length=606' Tc=10.0 min CN=80/98 Runoff=3.19 cfs 0.295 af

Pond 42P: Pond 2-2

Peak Elev=543.11' Storage=7,908 cf Inflow=3.19 cfs 0.295 af

Discarded=0.09 cfs 0.295 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.295 af

Total Runoff Area = 1.412 ac Runoff Volume = 0.295 af Average Runoff Depth = 2.51"

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 with exfil
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 8

Summary for Subcatchment 36S: Basin 2-2

[47] Hint: Peak is 225% of capacity of segment #3

Runoff = 3.19 cfs @ 12.17 hrs, Volume= 0.295 af, Depth= 2.51"
Routed to Pond 42P : Pond 2-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
34,605	98	Paved parking, HSG C
19,780	74	>75% Grass cover, Good, HSG C
7,112	98	Water Surface, 0% imp, HSG C
61,497	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	60	0.1300	0.34		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.5	120	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.1	426	0.0350	6.20	1.42	Pipe Channel, 12.0" Round w/ 8.0" inside fill Area= 0.2 sf Perim= 2.2' r= 0.11' n= 0.010
4.6	606	Total, Increased to minimum Tc = 10.0 min			

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

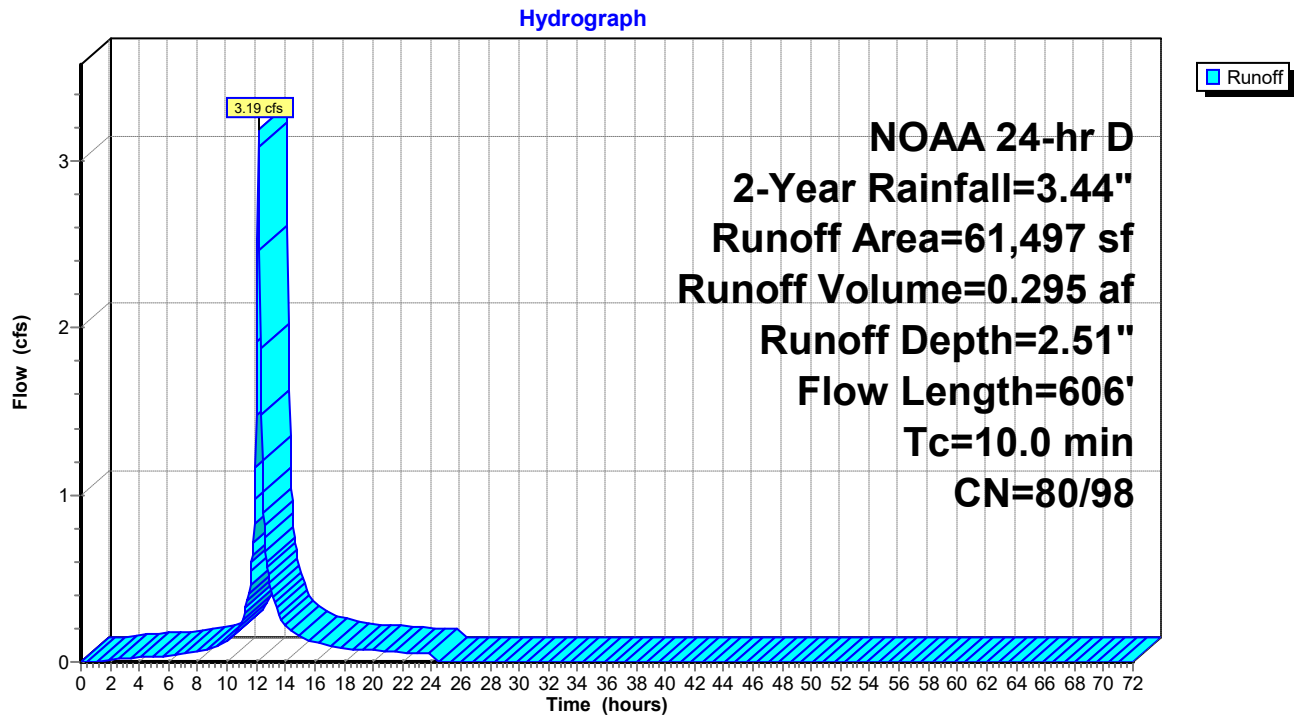
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 with exfil
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 9

Subcatchment 36S: Basin 2-2



Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-2 with exfil
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 10

Summary for Pond 42P: Pond 2-2

Inflow Area = 1.412 ac, Inflow Depth = 2.51" for 2-Year event
Inflow = 3.19 cfs @ 12.17 hrs, Volume= 0.295 af
Outflow = 0.09 cfs @ 17.29 hrs, Volume= 0.295 af, Atten= 97%, Lag= 306.9 min
Discarded = 0.09 cfs @ 17.29 hrs, Volume= 0.295 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.11' @ 17.29 hrs Surf.Area= 7,112 sf Storage= 7,908 cf

Plug-Flow detention time= 825.9 min calculated for 0.295 af (100% of inflow)
Center-of-Mass det. time= 825.5 min (1,611.8 - 786.3)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	28,448 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	7,112	0	0
546.00	7,112	28,448	28,448

Device	Routing	Invert	Outlet Devices
#1	Discarded	542.00'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 17.29 hrs HW=543.11' (Free Discharge)
↑ **1=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=542.00' (Free Discharge)
↑ **2=Orifice/Grate** (Controls 0.00 cfs)
↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Proposed Basin 2-2 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

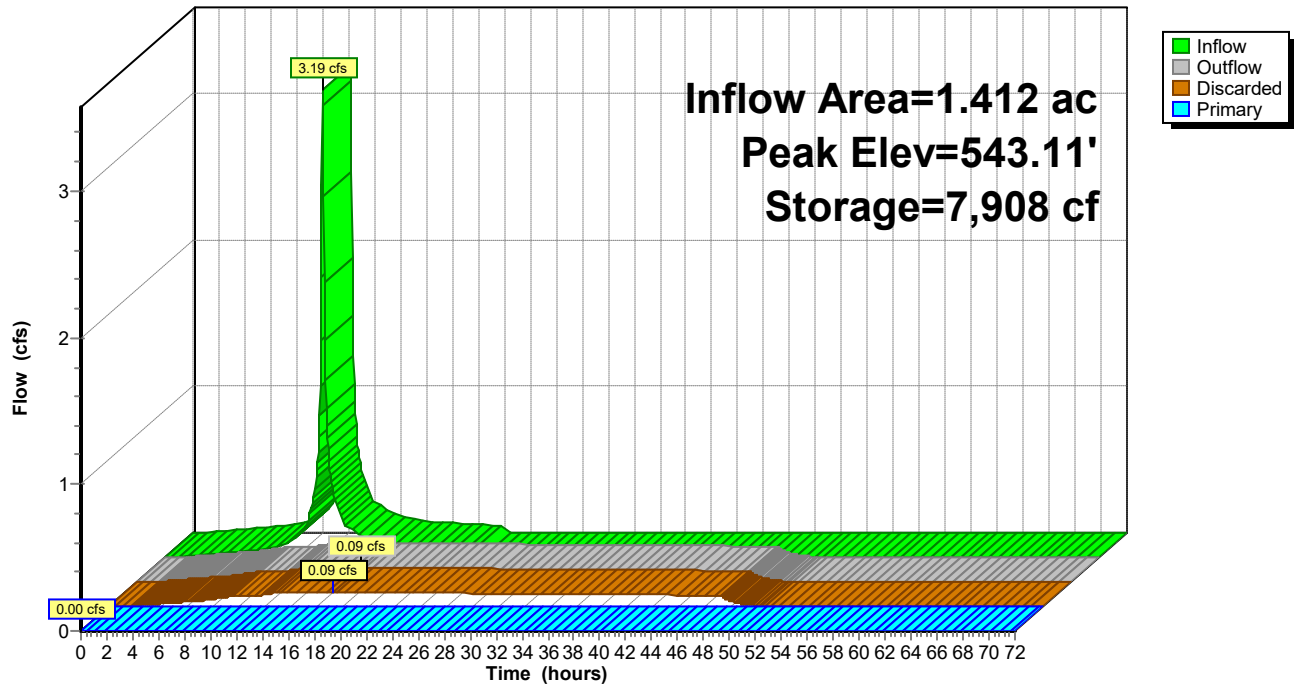
Basin 2-2 with exfil
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 11

Pond 42P: Pond 2-2

Hydrograph

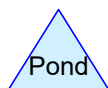
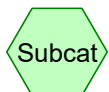




Basin 2-3



pond 2-3



Routing Diagram for Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services, Printed 10/23/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.959	74	>75% Grass cover, Good, HSG C (40S)
1.060	98	Roofs, HSG C (40S)
0.239	98	Water Surface, 0% imp, HSG C (40S)
2.259	88	TOTAL AREA

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.259	HSG C	40S
0.000	HSG D	
0.000	Other	
2.259		TOTAL AREA

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.959	0.000	0.000	0.959	>75% Grass cover, Good	40S
0.000	0.000	1.060	0.000	0.000	1.060	Roofs	40S
0.000	0.000	0.239	0.000	0.000	0.239	Water Surface, 0% imp	40S
0.000	0.000	2.259	0.000	0.000	2.259	TOTAL AREA	

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	40S	0.00	0.00	1,326.0	0.0300	0.010	0.0	15.0	0.0	

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 7

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 40S: Basin 2-3

Runoff Area=98,395 sf Runoff Depth=2.30"

Flow Length=1,558' Tc=10.5 min CN=79/98 Runoff=4.65 cfs 0.434 af

Pond 44P: pond 2-3

Peak Elev=543.12' Storage=11,645 cf Inflow=4.65 cfs 0.434 af

Discarded=0.14 cfs 0.434 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.434 af

Total Runoff Area = 2.259 ac Runoff Volume = 0.434 af Average Runoff Depth = 2.30"

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 8

Summary for Subcatchment 40S: Basin 2-3

Runoff = 4.65 cfs @ 12.18 hrs, Volume= 0.434 af, Depth= 2.30"
Routed to Pond 44P : pond 2-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
41,793	74	>75% Grass cover, Good, HSG C
46,190	98	Roofs, HSG C
10,412	98	Water Surface, 0% imp, HSG C
98,395	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.2	72	0.0800	5.74		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.9	1,326	0.0300	11.85	14.55	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
10.5	1,558	Total			

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

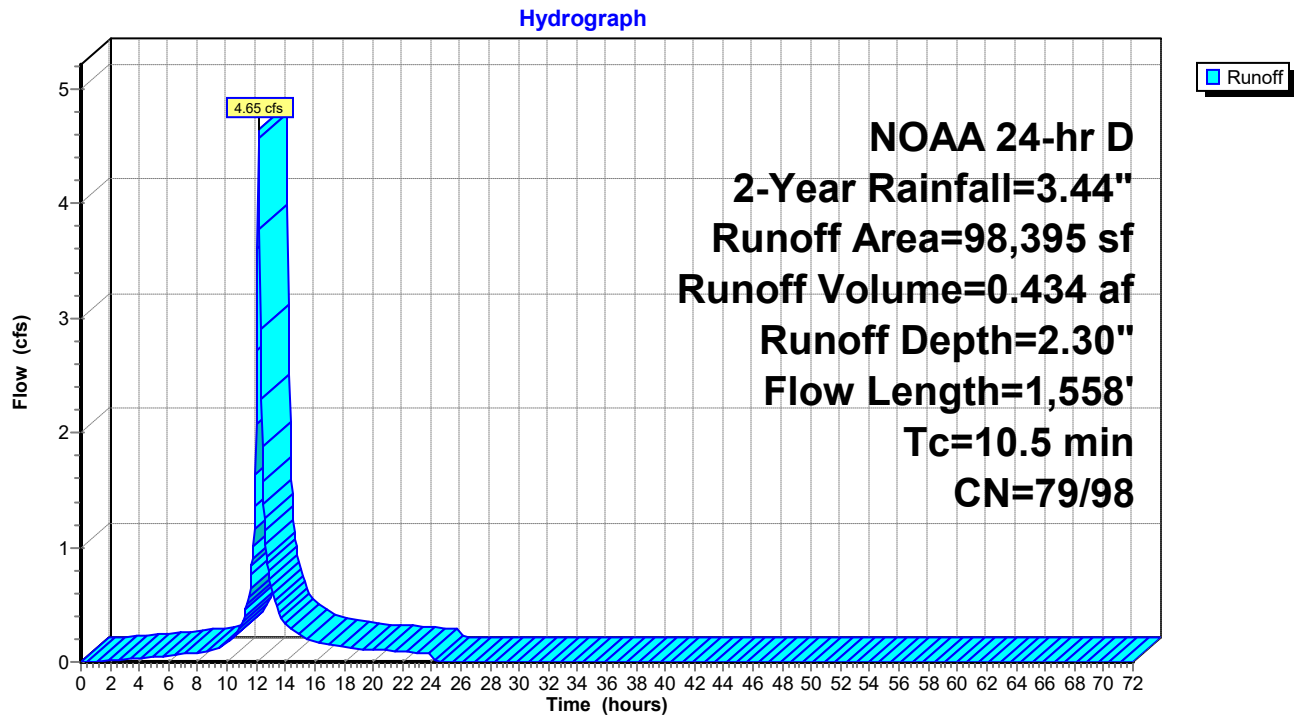
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 9

Subcatchment 40S: Basin 2-3



Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-3 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 10

Summary for Pond 44P: pond 2-3

Inflow Area = 2.259 ac, Inflow Depth = 2.30" for 2-Year event
Inflow = 4.65 cfs @ 12.18 hrs, Volume= 0.434 af
Outflow = 0.14 cfs @ 17.51 hrs, Volume= 0.434 af, Atten= 97%, Lag= 320.0 min
Discarded = 0.14 cfs @ 17.51 hrs, Volume= 0.434 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 543.12' @ 17.51 hrs Surf.Area= 10,412 sf Storage= 11,645 cf

Plug-Flow detention time= 836.6 min calculated for 0.434 af (100% of inflow)
Center-of-Mass det. time= 836.2 min (1,630.8 - 794.6)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	41,648 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	10,412	0	0
546.00	10,412	41,648	41,648

Device	Routing	Invert	Outlet Devices
#1	Discarded	542.00'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	543.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	543.75'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.14 cfs @ 17.51 hrs HW=543.12' (Free Discharge)
↑1=Exfiltration (Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=542.00' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)
↑3=Orifice/Grate (Controls 0.00 cfs)

Proposed Basin 2-3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

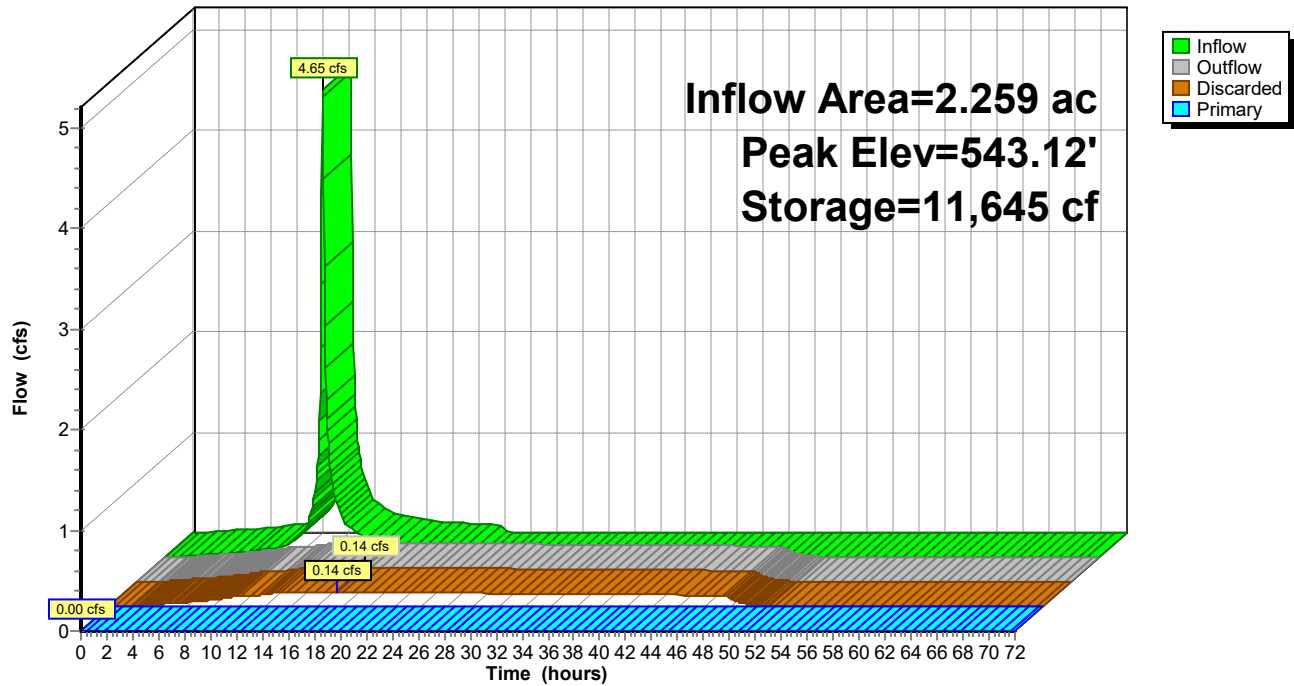
Basin 2-3 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

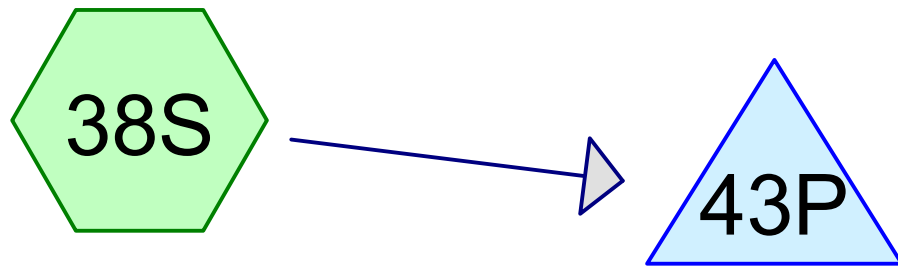
Printed 10/23/2023

Page 11

Pond 44P: pond 2-3

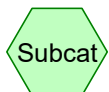
Hydrograph





Basin 2-4

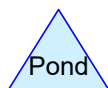
pond 2-4



Subcat



Reach



Pond



Link

Routing Diagram for Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services, Printed 10/23/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.343	74	>75% Grass cover, Good, HSG C (38S)
0.607	98	Roofs, HSG C (38S)
0.255	98	Water Surface, 0% imp, HSG C (38S)
2.205	83	TOTAL AREA

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.205	HSG C	38S
0.000	HSG D	
0.000	Other	
2.205		TOTAL AREA

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.343	0.000	0.000	1.343	>75% Grass cover, Good	38S
0.000	0.000	0.607	0.000	0.000	0.607	Roofs	38S
0.000	0.000	0.255	0.000	0.000	0.255	Water Surface, 0% imp	38S
0.000	0.000	2.205	0.000	0.000	2.205	TOTAL AREA	

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	38S	0.00	0.00	1,692.0	0.0390	0.010	0.0	15.0	10.0	

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 7

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 38S: Basin 2-4

Runoff Area=96,037 sf Runoff Depth=1.93"

Flow Length=1,912' Tc=10.1 min CN=78/98 Runoff=3.93 cfs 0.354 af

Pond 43P: pond 2-4

Peak Elev=542.81' Storage=9,019 cf Inflow=3.93 cfs 0.354 af

Discarded=0.14 cfs 0.354 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.354 af

Total Runoff Area = 2.205 ac Runoff Volume = 0.354 af Average Runoff Depth = 1.93"

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 8

Summary for Subcatchment 38S: Basin 2-4

[47] Hint: Peak is 144% of capacity of segment #3

Runoff = 3.93 cfs @ 12.18 hrs, Volume= 0.354 af, Depth= 1.93"
Routed to Pond 43P : pond 2-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
26,461	98	Roofs, HSG C
11,090	98	Water Surface, 0% imp, HSG C
58,486	74	>75% Grass cover, Good, HSG C
96,037	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0800	0.31		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.9	120	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.7	1,692	0.0390	7.60	2.72	Pipe Channel, pipe to basin 15.0" Round w/ 10.0" inside fill Area= 0.4 sf Perim= 2.7' r= 0.13' n= 0.010
10.1	1,912	Total			

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

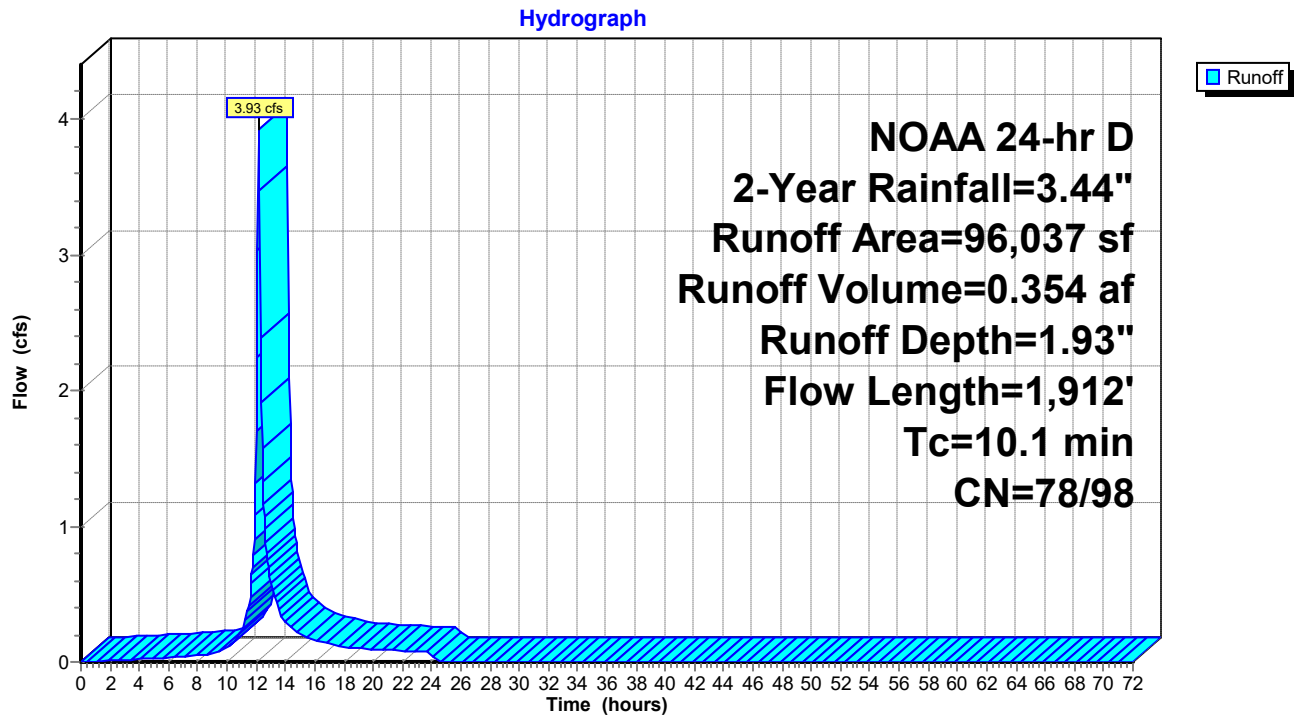
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 9

Subcatchment 38S: Basin 2-4



Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 10

Summary for Pond 43P: pond 2-4

Inflow Area = 2.205 ac, Inflow Depth = 1.93" for 2-Year event
Inflow = 3.93 cfs @ 12.18 hrs, Volume= 0.354 af
Outflow = 0.14 cfs @ 17.00 hrs, Volume= 0.354 af, Atten= 96%, Lag= 289.2 min
Discarded = 0.14 cfs @ 17.00 hrs, Volume= 0.354 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 542.81' @ 17.00 hrs Surf.Area= 11,090 sf Storage= 9,019 cf

Plug-Flow detention time= 664.6 min calculated for 0.354 af (100% of inflow)
Center-of-Mass det. time= 665.0 min (1,480.0 - 815.0)

Volume	Invert	Avail.Storage	Storage Description
#1	542.00'	44,360 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
542.00	11,090	0	0
546.00	11,090	44,360	44,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	542.00'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	542.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	543.40'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.14 cfs @ 17.00 hrs HW=542.81' (Free Discharge)
↑ **1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=542.00' (Free Discharge)
↑ **2=Orifice/Grate** (Controls 0.00 cfs)
↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Proposed Basin 2-4 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

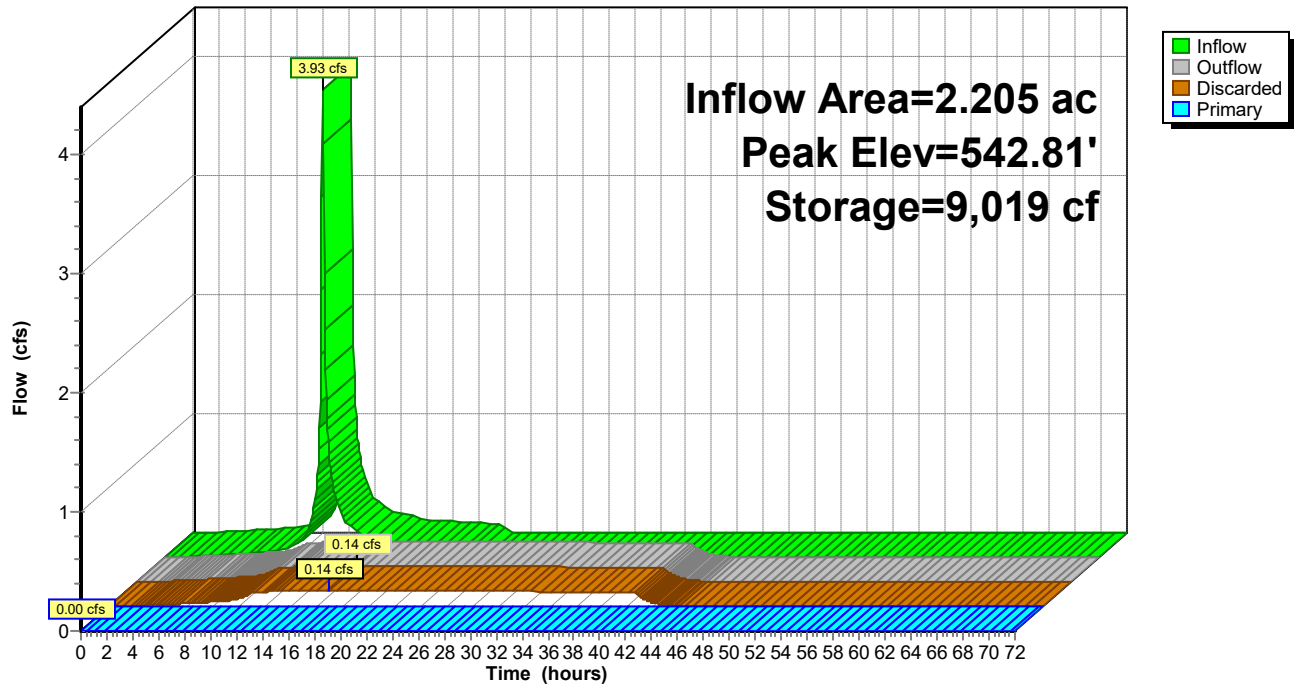
Basin 2-4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 11

Pond 43P: pond 2-4

Hydrograph



Proposed Basin 2-5 R5 infil

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 1

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-5 R5 infil

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-5 2yr w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 2

Summary for Pond 39P: pond 2-5

Inflow Area = 1.650 ac, Inflow Depth = 3.21" for 2-Year event
Inflow = 4.60 cfs @ 12.17 hrs, Volume= 0.441 af
Outflow = 0.17 cfs @ 15.57 hrs, Volume= 0.441 af, Atten= 96%, Lag= 203.9 min
Discarded = 0.17 cfs @ 15.57 hrs, Volume= 0.441 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 541.46' @ 15.57 hrs Surf.Area= 11,558 sf Storage= 11,150 cf

Plug-Flow detention time= 654.2 min calculated for 0.441 af (100% of inflow)
Center-of-Mass det. time= 654.7 min (1,415.1 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	40,453 cf	540 (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	11,558	0	0
544.00	11,558	40,453	40,453

Device	Routing	Invert	Outlet Devices
#1	Discarded	540.50'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	541.50'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.17 cfs @ 15.57 hrs HW=541.46' (Free Discharge)

↑**1=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=540.50' (Free Discharge)

↑**2=Orifice/Grate** (Controls 0.00 cfs)

Proposed Basin 2-5 R5 infil

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

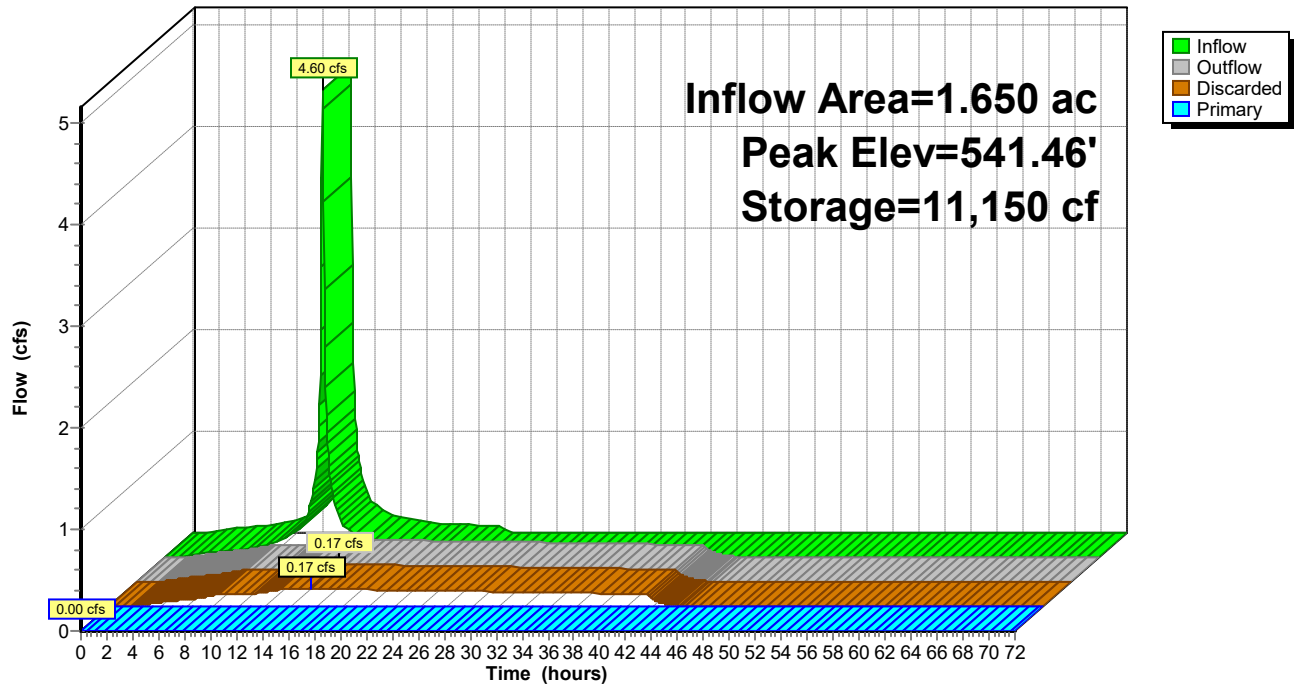
Basin 2-5 2yr w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 3

Pond 39P: pond 2-5

Hydrograph



Proposed Basin 2-6 R5 infil

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 1

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed Basin 2-6 R5 infil

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 2-6 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 2

Summary for Pond 37P: Pond 2-6

Inflow Area = 1.842 ac, Inflow Depth = 3.21" for 2-Year event
Inflow = 5.13 cfs @ 12.17 hrs, Volume= 0.492 af
Outflow = 0.17 cfs @ 16.26 hrs, Volume= 0.492 af, Atten= 97%, Lag= 245.3 min
Discarded = 0.17 cfs @ 16.26 hrs, Volume= 0.492 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 541.71' @ 16.26 hrs Surf.Area= 10,782 sf Storage= 13,026 cf

Plug-Flow detention time= 779.5 min calculated for 0.492 af (100% of inflow)
Center-of-Mass det. time= 780.1 min (1,540.5 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	540.50'	37,737 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
540.50	10,782	0	0
544.00	10,782	37,737	37,737

Device	Routing	Invert	Outlet Devices
#1	Discarded	540.50'	0.450 in/hr Exfiltration over Horizontal area Conductivity to Groundwater Elevation = 538.00'
#2	Primary	541.80'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.17 cfs @ 16.26 hrs HW=541.71' (Free Discharge)

↑1=Exfiltration (Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=540.50' (Free Discharge)

↑2=Orifice/Grate (Controls 0.00 cfs)

Proposed Basin 2-6 R5 infil

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

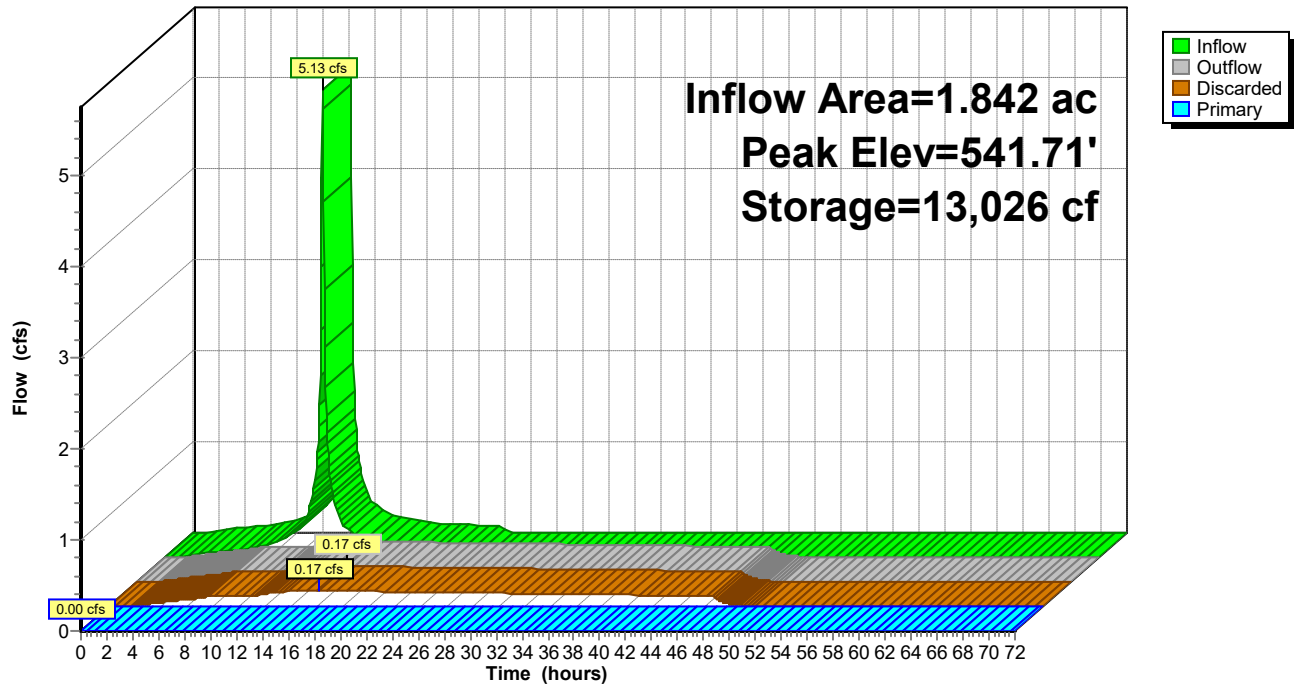
Basin 2-6 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

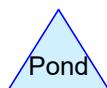
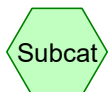
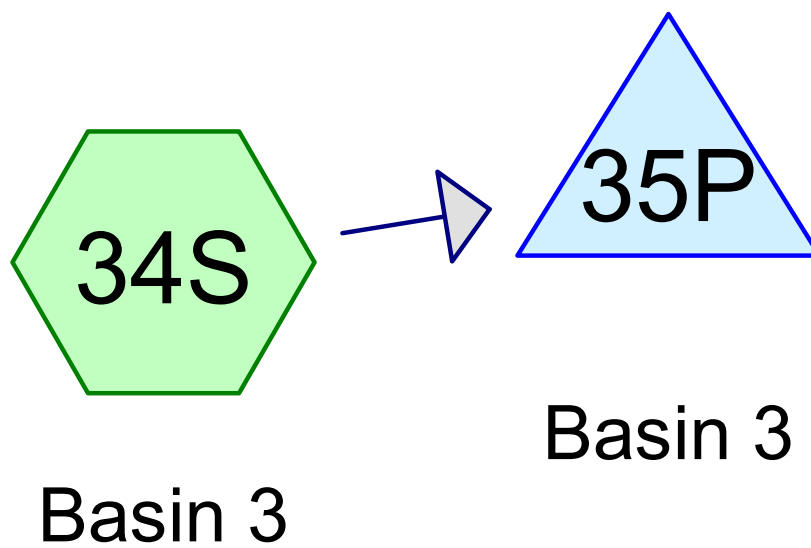
Printed 10/29/2023

Page 3

Pond 37P: Pond 2-6

Hydrograph





Routing Diagram for Proposed basin 3 R3

Prepared by Anderson Consulting Services, Printed 10/23/2023
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Proposed basin 3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.447	74	>75% Grass cover, Good, HSG C (34S)
0.744	98	Paved parking, HSG C (34S)
2.191	82	TOTAL AREA

Proposed basin 3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.191	HSG C	34S
0.000	HSG D	
0.000	Other	
2.191		TOTAL AREA

Proposed basin 3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.447	0.000	0.000	1.447	>75% Grass cover, Good	34S
0.000	0.000	0.744	0.000	0.000	0.744	Paved parking	34S
0.000	0.000	2.191	0.000	0.000	2.191	TOTAL AREA	

Proposed basin 3 R3

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	34S	0.00	0.00	450.0	0.0600	0.013	0.0	15.0	8.0	

Proposed basin 3 R3

NOAA 24-hr D 2-Year Rainfall=3.44"

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 7

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 34S: Basin 3

Runoff Area=95,425 sf Runoff Depth=1.88"

Flow Length=670' Tc=10.0 min CN=74/98 Runoff=3.73 cfs 0.343 af

Pond 35P: Basin 3

Peak Elev=530.15' Storage=11,078 cf Inflow=3.73 cfs 0.343 af

Discarded=0.07 cfs 0.301 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.301 af

Total Runoff Area = 2.191 ac Runoff Volume = 0.343 af Average Runoff Depth = 1.88"

Proposed basin 3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 3
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 8

Summary for Subcatchment 34S: Basin 3

Runoff = 3.73 cfs @ 12.17 hrs, Volume= 0.343 af, Depth= 1.88"
Routed to Pond 35P : Basin 3

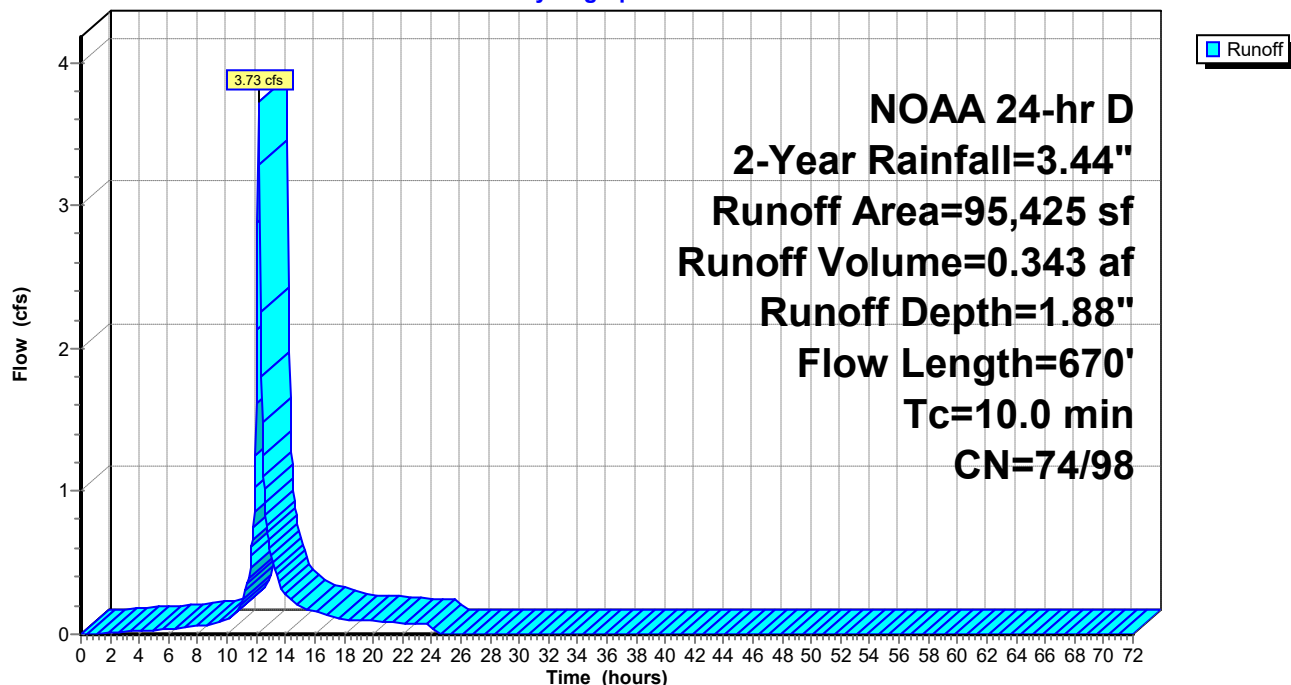
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
32,412	98	Paved parking, HSG C
63,013	74	>75% Grass cover, Good, HSG C
95,425	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	100	0.0800	0.21		Sheet Flow, Grass: Dense n= 0.240 P2= 3.44"
0.1	20	0.0800	4.24		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	100	0.0500	4.54		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	450	0.0600	8.91	5.00	Pipe Channel, 15.0" Round w/ 8.0" inside fill Area= 0.6 sf Perim= 3.1' r= 0.18' n= 0.013 Concrete sewer w/manholes & inlets
9.2	670	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 34S: Basin 3

Hydrograph



Proposed basin 3 R3

NOAA 24-hr D 2-Year Rainfall=3.44"

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 9

Summary for Pond 35P: Basin 3

Inflow Area = 2.191 ac, Inflow Depth = 1.88" for 2-Year event
 Inflow = 3.73 cfs @ 12.17 hrs, Volume= 0.343 af
 Outflow = 0.07 cfs @ 23.32 hrs, Volume= 0.301 af, Atten= 98%, Lag= 669.0 min
 Discarded = 0.07 cfs @ 23.32 hrs, Volume= 0.301 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 530.15' @ 23.32 hrs Surf.Area= 6,907 sf Storage= 11,078 cf

Plug-Flow detention time= 1,464.2 min calculated for 0.301 af (88% of inflow)
 Center-of-Mass det. time= 1,401.5 min (2,209.7 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	528.00'	26,911 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
528.00	3,437	0	0
530.00	6,648	10,085	10,085
532.00	10,178	16,826	26,911

Device	Routing	Invert	Outlet Devices
#1	Discarded	528.00'	0.370 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 520.00'
#2	Primary	530.20'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	530.60'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 23.32 hrs HW=530.15' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=528.00' (Free Discharge)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Proposed basin 3 R3

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

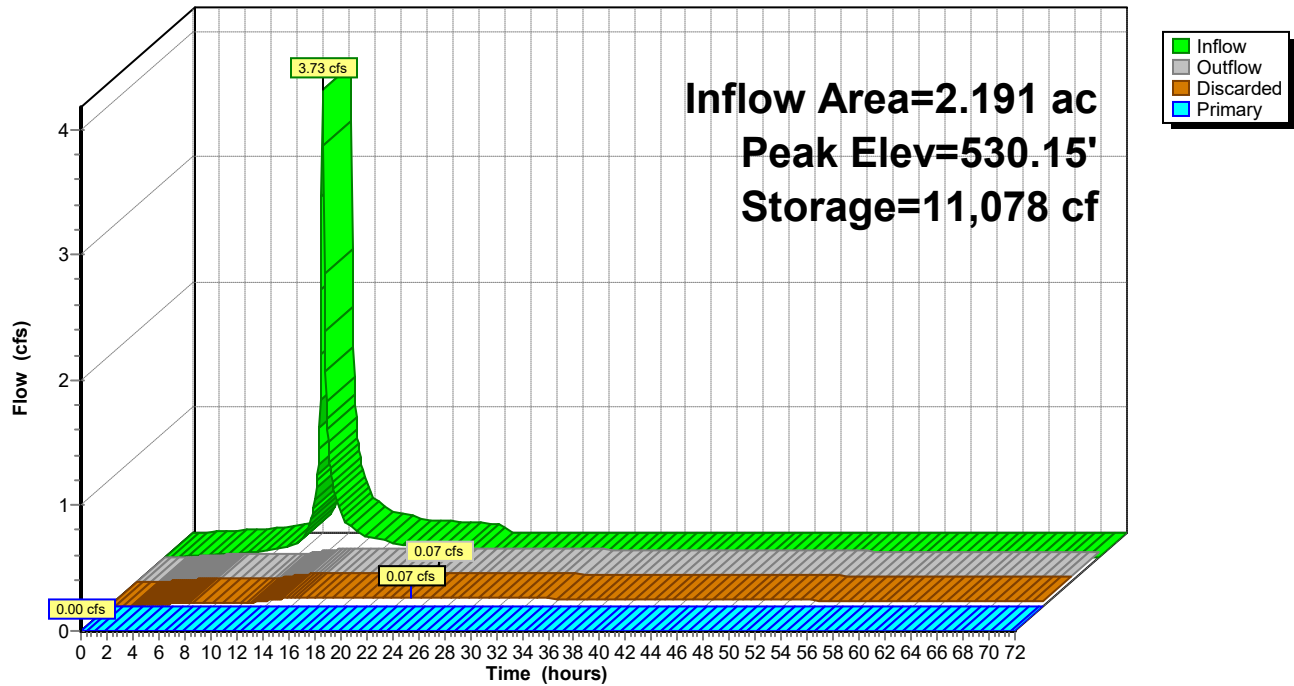
Basin 3
NOAA 24-hr D 2-Year Rainfall=3.44"

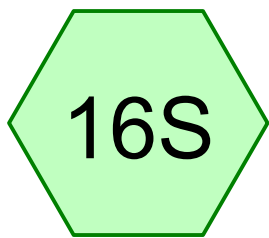
Printed 10/23/2023

Page 10

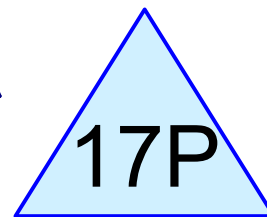
Pond 35P: Basin 3

Hydrograph

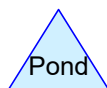
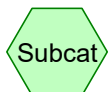




Basin 4 Porous pvmt



Porous pavement
system 4



Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 2

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.560	74	>75% Grass cover, Good, HSG C (16S)
1.408	98	roof and parking (16S)
1.968	91	TOTAL AREA

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.560	HSG C	16S
0.000	HSG D	
1.408	Other	16S
1.968		TOTAL AREA

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.560	0.000	0.000	0.560	>75% Grass cover, Good	16S
0.000	0.000	0.000	0.000	1.408	1.408	roof and parking	16S
0.000	0.000	0.560	0.000	1.408	1.968	TOTAL AREA	

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

Printed 10/23/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	16S	0.00	0.00	309.0	0.0261	0.013	0.0	15.0	9.0	

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

basin 4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 7

Time span=0.00-72.00 hrs, dt=0.03 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

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

Subcatchment 16S: Basin 4 Porous pvmt

Runoff Area=85,708 sf Runoff Depth=2.64"

Flow Length=509' Tc=8.1 min CN=74/98 Runoff=4.96 cfs 0.432 af

Pond 17P: Porous pavement system 4

Peak Elev=588.20' Storage=13,655 cf Inflow=4.96 cfs 0.432 af

Discarded=0.07 cfs 0.409 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.409 af

Total Runoff Area = 1.968 ac Runoff Volume = 0.432 af Average Runoff Depth = 2.64"

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

basin 4 with exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 8

Summary for Subcatchment 16S: Basin 4 Porous pvmt

[47] Hint: Peak is 202% of capacity of segment #3

Runoff = 4.96 cfs @ 12.15 hrs, Volume= 0.432 af, Depth= 2.64"
Routed to Pond 17P : Porous pavement system 4

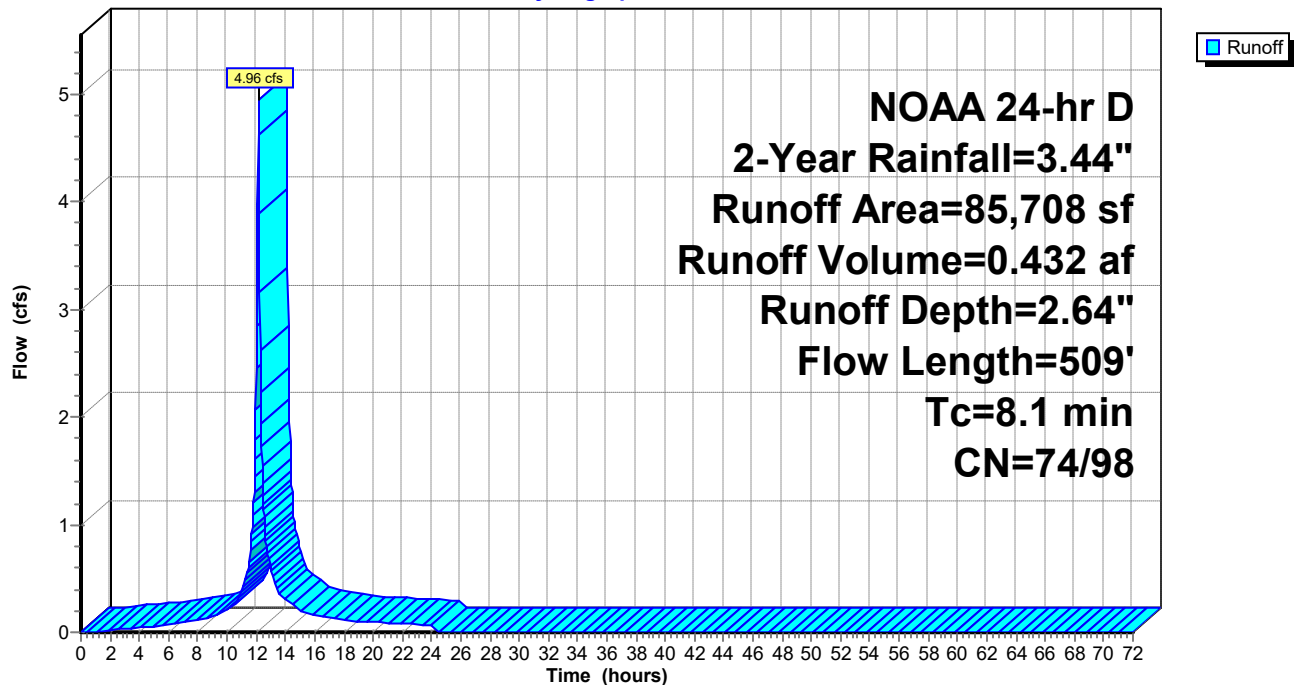
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	61,324	98	roof and parking
	24,384	74	>75% Grass cover, Good, HSG C
	85,708	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0520	0.26		Sheet Flow, grass Grass: Short n= 0.150 P2= 3.44"
0.6	100	0.0300	2.60		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.0	309	0.0261	5.35	2.45	Pipe Channel, 15.0" Round w/ 9.0" inside fill Area= 0.5 sf Perim= 2.9' r= 0.16' n= 0.013 Corrugated PE, smooth interior
8.1	509	Total			

Subcatchment 16S: Basin 4 Porous pvmt

Hydrograph



Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

basin 4 with exfiltration

NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 9

Summary for Pond 17P: Porous pavement system 4

Inflow Area = 1.968 ac, Inflow Depth = 2.64" for 2-Year event
Inflow = 4.96 cfs @ 12.15 hrs, Volume= 0.432 af
Outflow = 0.07 cfs @ 23.24 hrs, Volume= 0.409 af, Atten= 99%, Lag= 665.3 min
Discarded = 0.07 cfs @ 23.24 hrs, Volume= 0.409 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 588.20' @ 23.24 hrs Surf.Area= 10,178 sf Storage= 13,655 cf

Plug-Flow detention time= 1,551.5 min calculated for 0.409 af (95% of inflow)
Center-of-Mass det. time= 1,520.0 min (2,293.4 - 773.3)

Volume	Invert	Avail.Storage	Storage Description
#1	585.00'	32,044 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 81,424 cf Overall - 1,315 cf Embedded = 80,109 cf x 40.0% Voids
#2	586.00'	1,315 cf	36.0" Round Pipe Storage Inside #1 L= 186.0'
33,358 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
585.00	10,178	0	0
593.00	10,178	81,424	81,424

Device	Routing	Invert	Outlet Devices
#1	Discarded	585.00'	0.310 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = -7.00'
#2	Primary	588.95'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	589.90'	24.0" W x 4.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 23.24 hrs HW=588.20' (Free Discharge)

↑ **1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=585.00' (Free Discharge)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Proposed basin 4 R4 with exfiltration

Prepared by Anderson Consulting Services

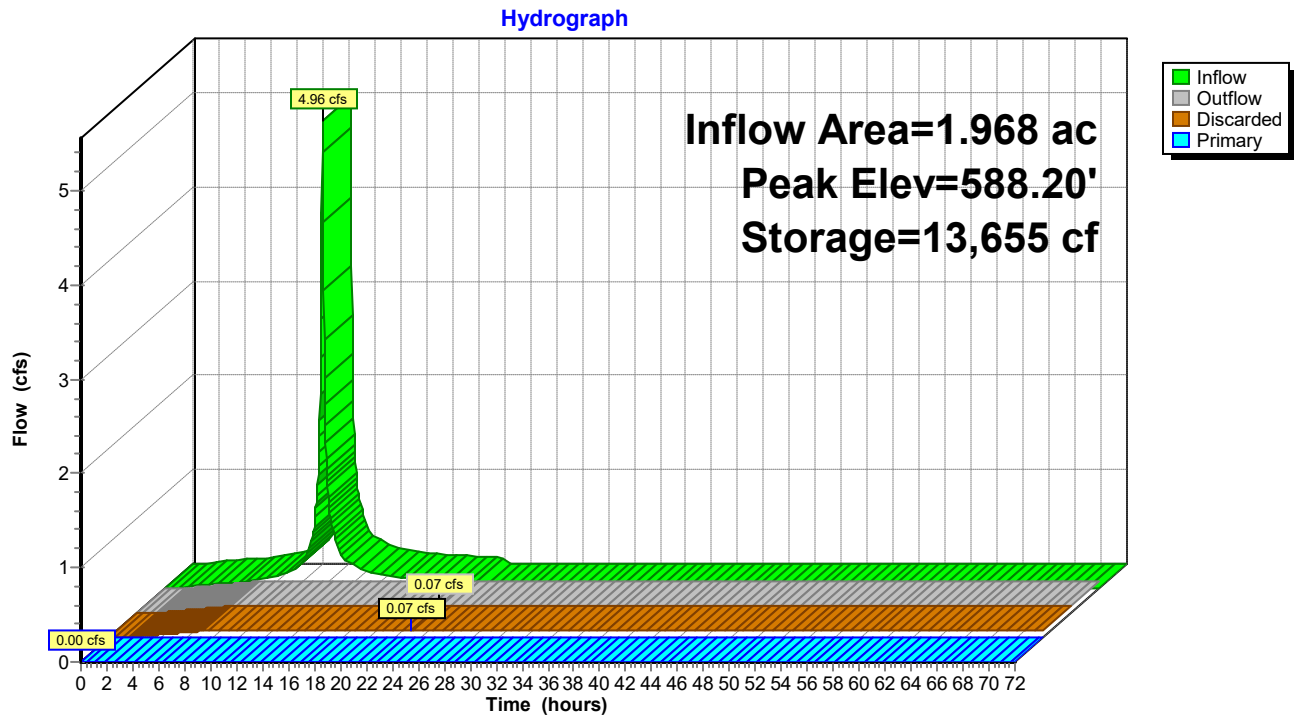
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

basin 4 with exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/23/2023

Page 10

Pond 17P: Porous pavement system 4



Proposed basin 5 R5 infiltr

Prepared by Anderson Consulting Services

Printed 10/29/2023

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Page 1

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 6606 NJ Essex-D

Proposed basin 5 R5 infilt

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 2

Summary for Pond 24P: Infiltration basin 5

Inflow Area = 2.275 ac, Inflow Depth = 2.46" for 2-Year event
Inflow = 4.83 cfs @ 12.19 hrs, Volume= 0.466 af
Outflow = 0.10 cfs @ 21.56 hrs, Volume= 0.466 af, Atten= 98%, Lag= 562.6 min
Discarded = 0.10 cfs @ 21.56 hrs, Volume= 0.466 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
Peak Elev= 571.63' @ 21.56 hrs Surf.Area= 12,410 sf Storage= 13,994 cf

Plug-Flow detention time= 1,329.6 min calculated for 0.466 af (100% of inflow)
Center-of-Mass det. time= 1,330.2 min (2,112.3 - 782.2)

Volume	Invert	Avail.Storage	Storage Description
#1	570.50'	43,435 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
570.50	12,410	0	0	12,410
574.00	12,410	43,435	43,435	13,792

Device	Routing	Invert	Outlet Devices
#1	Discarded	570.50'	0.320 in/hr Exfiltration over Wetted area Conductivity to Groundwater Elevation = -2.00'
#2	Primary	572.40'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 21.56 hrs HW=571.63' (Free Discharge)
↑1=Exfiltration (Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=570.50' (Free Discharge)
↑2=Orifice/Grate (Controls 0.00 cfs)

Proposed basin 5 R5 infilt

Prepared by Anderson Consulting Services

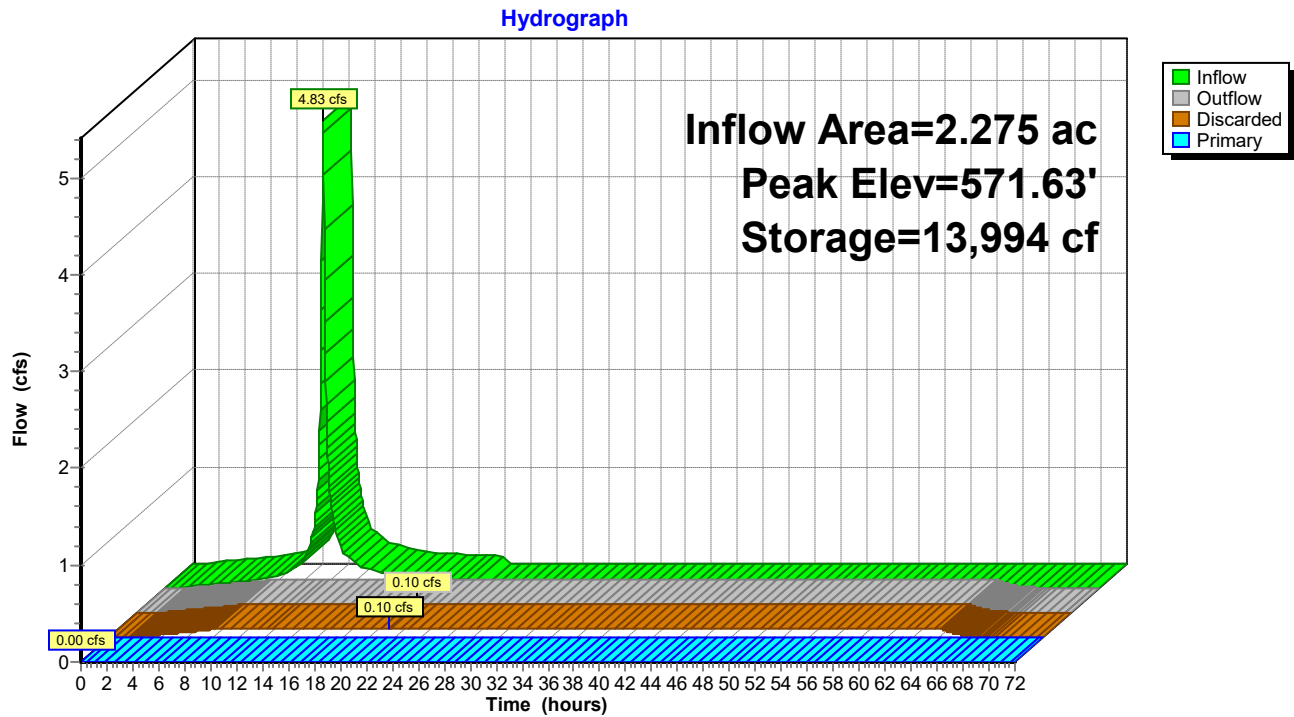
HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 3

Pond 24P: Infiltration basin 5



Proposed basin 5 R5 infilt

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 4

Hydrograph for Pond 24P: Infiltration basin 5

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	570.50	0.00	0.00	0.00
1.50	0.01	4	570.50	0.00	0.00	0.00
3.00	0.03	77	570.51	0.02	0.02	0.00
4.50	0.05	171	570.51	0.04	0.04	0.00
6.00	0.07	255	570.52	0.05	0.05	0.00
7.50	0.10	361	570.53	0.08	0.08	0.00
9.00	0.14	530	570.54	0.09	0.09	0.00
10.50	0.25	1,055	570.59	0.09	0.09	0.00
12.00	2.12	3,968	570.82	0.09	0.09	0.00
13.50	0.45	11,803	571.45	0.09	0.09	0.00
15.00	0.23	12,993	571.55	0.10	0.10	0.00
16.50	0.17	13,531	571.59	0.10	0.10	0.00
18.00	0.13	13,822	571.61	0.10	0.10	0.00
19.50	0.11	13,937	571.62	0.10	0.10	0.00
21.00	0.10	13,990	571.63	0.10	0.10	0.00
22.50	0.09	13,982	571.63	0.10	0.10	0.00
24.00	0.08	13,913	571.62	0.10	0.10	0.00
25.50	0.00	13,446	571.58	0.10	0.10	0.00
27.00	0.00	12,932	571.54	0.10	0.10	0.00
28.50	0.00	12,419	571.50	0.10	0.10	0.00
30.00	0.00	11,906	571.46	0.09	0.09	0.00
31.50	0.00	11,394	571.42	0.09	0.09	0.00
33.00	0.00	10,883	571.38	0.09	0.09	0.00
34.50	0.00	10,372	571.34	0.09	0.09	0.00
36.00	0.00	9,862	571.29	0.09	0.09	0.00
37.50	0.00	9,353	571.25	0.09	0.09	0.00
39.00	0.00	8,844	571.21	0.09	0.09	0.00
40.50	0.00	8,336	571.17	0.09	0.09	0.00
42.00	0.00	7,829	571.13	0.09	0.09	0.00
43.50	0.00	7,322	571.09	0.09	0.09	0.00
45.00	0.00	6,816	571.05	0.09	0.09	0.00
46.50	0.00	6,311	571.01	0.09	0.09	0.00
48.00	0.00	5,807	570.97	0.09	0.09	0.00
49.50	0.00	5,303	570.93	0.09	0.09	0.00
51.00	0.00	4,800	570.89	0.09	0.09	0.00
52.50	0.00	4,297	570.85	0.09	0.09	0.00
54.00	0.00	3,795	570.81	0.09	0.09	0.00
55.50	0.00	3,294	570.77	0.09	0.09	0.00
57.00	0.00	2,794	570.73	0.09	0.09	0.00
58.50	0.00	2,294	570.68	0.09	0.09	0.00
60.00	0.00	1,795	570.64	0.09	0.09	0.00
61.50	0.00	1,296	570.60	0.09	0.09	0.00
63.00	0.00	798	570.56	0.09	0.09	0.00
64.50	0.00	320	570.53	0.07	0.07	0.00
66.00	0.00	102	570.51	0.02	0.02	0.00
67.50	0.00	32	570.50	0.01	0.01	0.00
69.00	0.00	10	570.50	0.00	0.00	0.00
70.50	0.00	3	570.50	0.00	0.00	0.00
72.00	0.00	1	570.50	0.00	0.00	0.00

Proposed basin 5 R5 infiltrt

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 5

Stage-Discharge for Pond 24P: Infiltration basin 5

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
570.50	0.00	0.00	0.00	573.05	2.34	0.10	2.24
570.55	0.09	0.09	0.00	573.10	2.49	0.10	2.39
570.60	0.09	0.09	0.00	573.15	2.63	0.10	2.53
570.65	0.09	0.09	0.00	573.20	2.75	0.10	2.65
570.70	0.09	0.09	0.00	573.25	2.88	0.10	2.78
570.75	0.09	0.09	0.00	573.30	2.99	0.10	2.89
570.80	0.09	0.09	0.00	573.35	3.11	0.10	3.00
570.85	0.09	0.09	0.00	573.40	3.21	0.10	3.11
570.90	0.09	0.09	0.00	573.45	3.32	0.10	3.22
570.95	0.09	0.09	0.00	573.50	3.42	0.10	3.32
571.00	0.09	0.09	0.00	573.55	3.52	0.10	3.41
571.05	0.09	0.09	0.00	573.60	3.61	0.10	3.51
571.10	0.09	0.09	0.00	573.65	3.70	0.10	3.60
571.15	0.09	0.09	0.00	573.70	3.79	0.10	3.69
571.20	0.09	0.09	0.00	573.75	3.88	0.10	3.78
571.25	0.09	0.09	0.00	573.80	3.97	0.10	3.86
571.30	0.09	0.09	0.00	573.85	4.05	0.10	3.95
571.35	0.09	0.09	0.00	573.90	4.13	0.10	4.03
571.40	0.09	0.09	0.00	573.95	4.21	0.10	4.11
571.45	0.09	0.09	0.00	574.00	4.29	0.10	4.19
571.50	0.10	0.10	0.00				
571.55	0.10	0.10	0.00				
571.60	0.10	0.10	0.00				
571.65	0.10	0.10	0.00				
571.70	0.10	0.10	0.00				
571.75	0.10	0.10	0.00				
571.80	0.10	0.10	0.00				
571.85	0.10	0.10	0.00				
571.90	0.10	0.10	0.00				
571.95	0.10	0.10	0.00				
572.00	0.10	0.10	0.00				
572.05	0.10	0.10	0.00				
572.10	0.10	0.10	0.00				
572.15	0.10	0.10	0.00				
572.20	0.10	0.10	0.00				
572.25	0.10	0.10	0.00				
572.30	0.10	0.10	0.00				
572.35	0.10	0.10	0.00				
572.40	0.10	0.10	0.00				
572.45	0.15	0.10	0.05				
572.50	0.25	0.10	0.15				
572.55	0.38	0.10	0.28				
572.60	0.53	0.10	0.43				
572.65	0.70	0.10	0.60				
572.70	0.89	0.10	0.79				
572.75	1.10	0.10	1.00				
572.80	1.32	0.10	1.22				
572.85	1.55	0.10	1.45				
572.90	1.80	0.10	1.70				
572.95	2.01	0.10	1.91				
573.00	2.19	0.10	2.09				

Proposed basin 5 R5 infilt

Prepared by Anderson Consulting Services

HydroCAD® 10.20-3f s/n 06666 © 2023 HydroCAD Software Solutions LLC

Basin 5 w/ exfiltration
NOAA 24-hr D 2-Year Rainfall=3.44"

Printed 10/29/2023

Page 6

Stage-Area-Storage for Pond 24P: Infiltration basin 5

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
570.50	12,410	12,410	0
570.60	12,410	12,449	1,241
570.70	12,410	12,489	2,482
570.80	12,410	12,528	3,723
570.90	12,410	12,568	4,964
571.00	12,410	12,607	6,205
571.10	12,410	12,647	7,446
571.20	12,410	12,686	8,687
571.30	12,410	12,726	9,928
571.40	12,410	12,765	11,169
571.50	12,410	12,805	12,410
571.60	12,410	12,844	13,651
571.70	12,410	12,884	14,892
571.80	12,410	12,923	16,133
571.90	12,410	12,963	17,374
572.00	12,410	13,002	18,615
572.10	12,410	13,042	19,856
572.20	12,410	13,081	21,097
572.30	12,410	13,121	22,338
572.40	12,410	13,160	23,579
572.50	12,410	13,200	24,820
572.60	12,410	13,239	26,061
572.70	12,410	13,279	27,302
572.80	12,410	13,318	28,543
572.90	12,410	13,358	29,784
573.00	12,410	13,397	31,025
573.10	12,410	13,437	32,266
573.20	12,410	13,476	33,507
573.30	12,410	13,516	34,748
573.40	12,410	13,555	35,989
573.50	12,410	13,595	37,230
573.60	12,410	13,634	38,471
573.70	12,410	13,674	39,712
573.80	12,410	13,713	40,953
573.90	12,410	13,753	42,194
574.00	12,410	13,792	43,435

Input Values

R	0.32
Sy	0.150
Kh	0.32
x	51.500
y	115.000
t	62.71
hi(0)	10.00

h(max)	21.138
Δh(max)	11.138

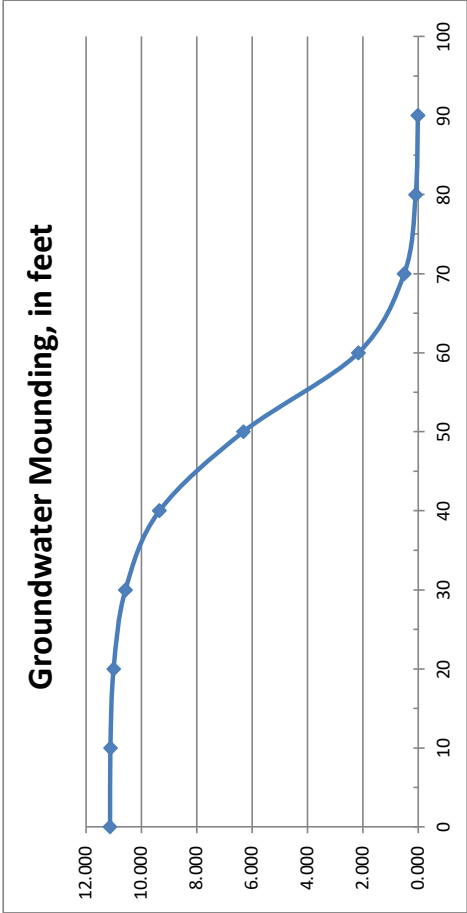
Distance from

Ground-water
Mounding, in feet center of basin in x
direction, in feet

11.138	0
11.116	10
10.996	20
10.570	30
9.350	40
6.312	50
2.167	60
0.507	70
0.089	80
0.014	90



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Basin 1

R = 0.32 in/hr

Kh = 0.32 in/hr

t = 62.71 hrs.

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)

Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	7.000
y	74.250
t	39.01
hi(0)	10.00

h(max)	15.231
Δh(max)	5.231

Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

0	5.231
10	2.965
20	0.816
30	0.150
40	0.021
50	0.005
60	0.003
70	0.003
80	0.003
90	0.003



Re-Calculate Now

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

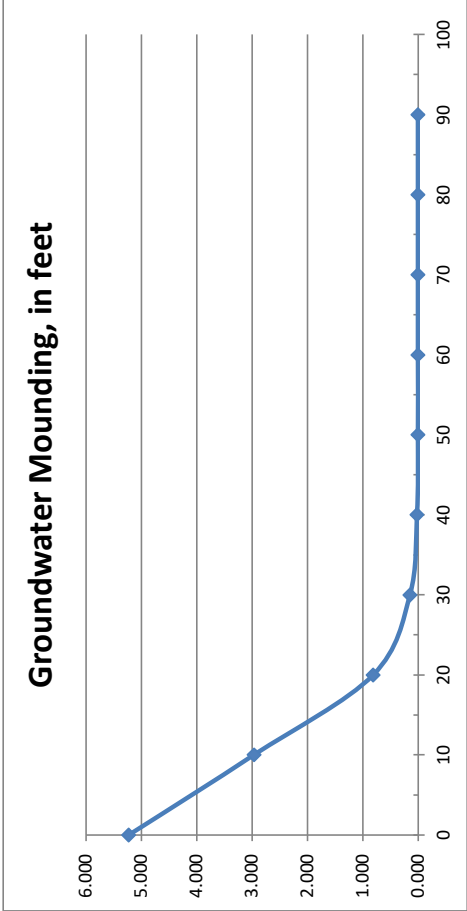
Basin 2-1

R = 0.45 in/hr

Kh = 0.45 in/hr

t = 39.01 hrs.

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	21.500
y	83.000
t	48.23
hi(0)	10.00

h(max)	20.665
Δh(max)	10.665

Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

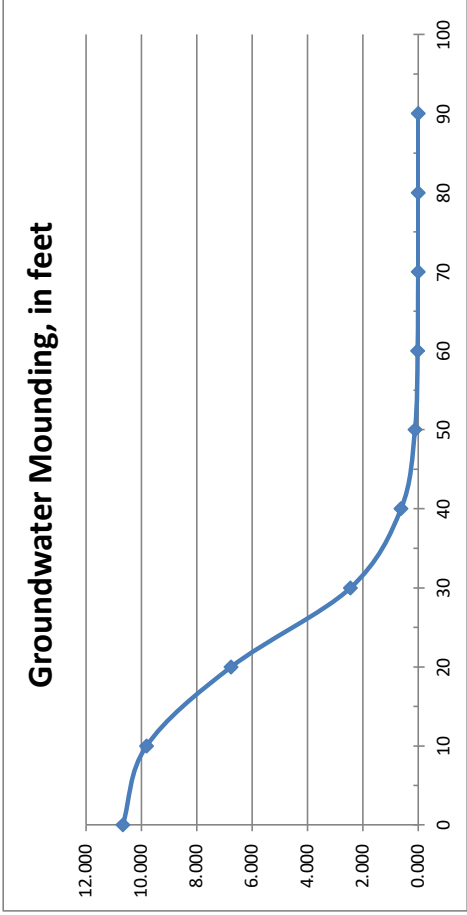
0	10.665
10	9.817
20	6.764
30	2.452
40	0.617
50	0.118
60	0.020
70	0.006
80	0.004
90	0.004

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)



Re-Calculate Now



Basin 2-2
R = 0.45 in/hr
Kh = 0.45 in/hr
t = 48.23 hrs.

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	26.500
y	97.500
t	48.38
hi(0)	10.00

h(max)	21.312
Δh(max)	11.312

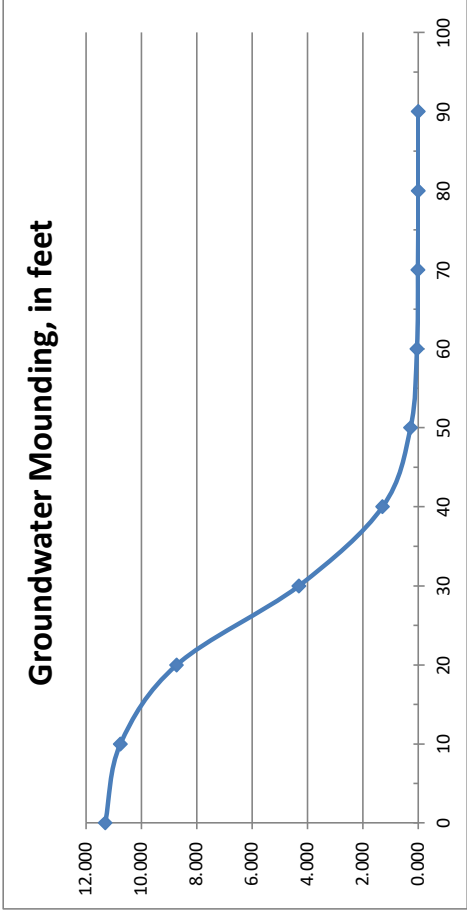
Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

0	11.312
10	10.754
20	8.730
30	4.320
40	1.287
50	0.280
60	0.048
70	0.009
80	0.004
90	0.004



Re-Calculate Now



Basin 2-3

R = 0.45 in/hr

Kh = 0.45 in/hr

t = 48.38 hrs.

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R
0.45
Sy
0.150
Kh
0.45
x
25.500
y
109.000
t
37.08
hi(0)
10.00

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Basin 2-4
R = 0.45 in/hr
Kh = 0.45 in/hr
t = 37.08 hrs.

h(max)
18.905
Δh(max)
8.905

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)

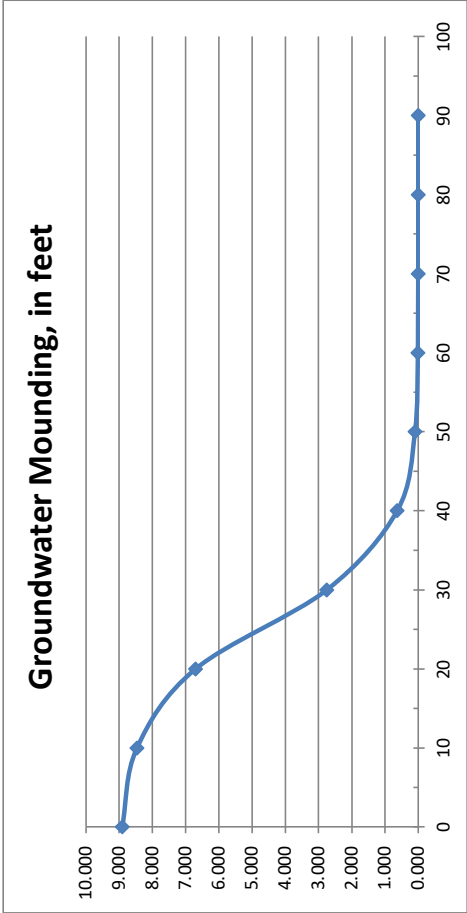
Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

8.905	0
8.467	10
6.704	20
2.755	30
0.630	40
0.099	50
0.013	60
0.004	70
0.003	80
0.003	90



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	26.500
y	108.500
t	44.31
hi(0)	10.00

h(max)	20.491
Δh(max)	10.491

Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

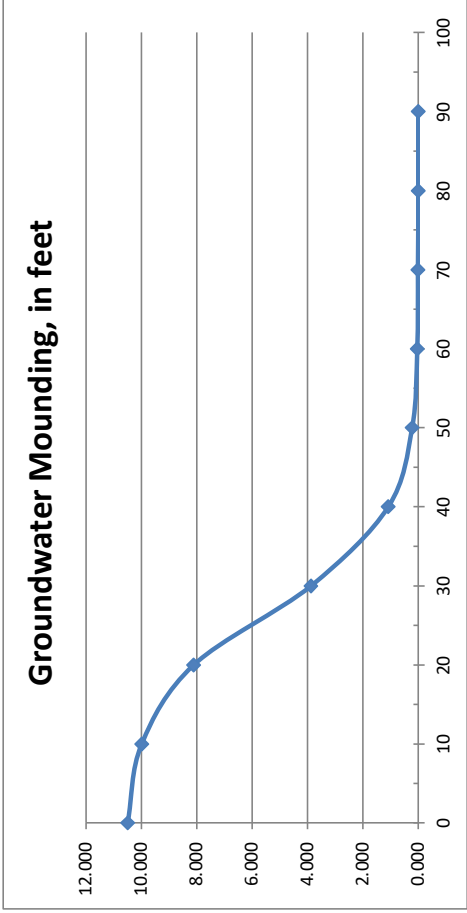
0	10.491
10	9.988
20	8.108
30	3.882
40	1.079
50	0.215
60	0.034
70	0.007
80	0.004
90	0.004

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	29.000
y	109.000
t	53.02
hi(0)	10.00

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Basin 2-6
R = 0.45 in/hr
Kh = 0.45 in/hr
t = 53.02 hrs.

h(max)	22.471
Δh(max)	12.471

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)

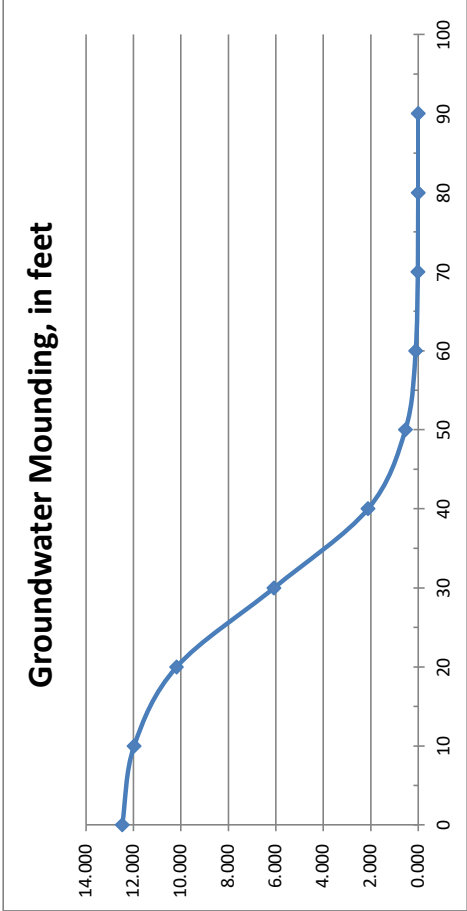
Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

12.471	0
11.969	10
10.185	20
6.081	30
2.115	40
0.537	50
0.107	60
0.019	70
0.006	80
0.005	90



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.45
Sy	0.150
Kh	0.45
x	110.000
y	135.000
t	58.73
hi(0)	10.00

h(max)	24.682
Δh(max)	14.682

Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

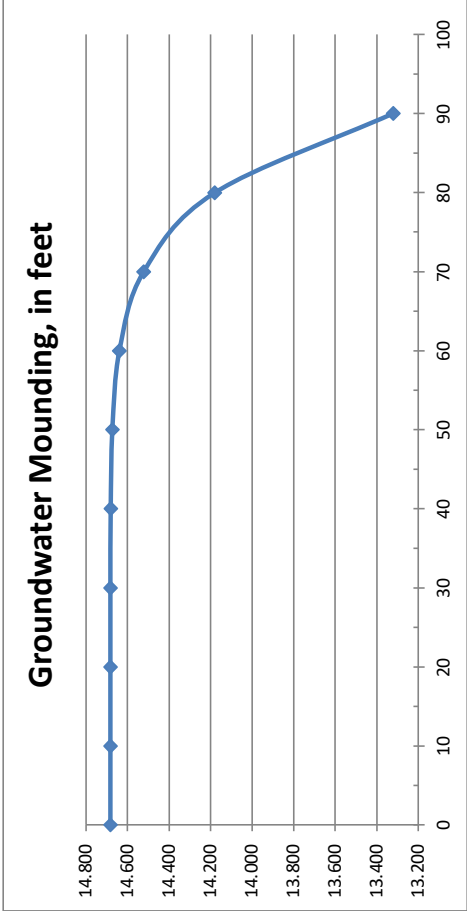
0	14.682
10	14.682
20	14.682
30	14.682
40	14.680
50	14.672
60	14.638
70	14.522
80	14.180
90	13.320

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)



Re-Calculate Now



Basin 2-Overall

R = 0.45 in/hr

Kh = 0.45 in/hr

t = 58.73 hrs.

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.37
Sy	0.150
Kh	0.37
x	17.500
y	63.500
t	47.66
hi(0)	10.00

h(max)	18.470
Δh(max)	8.470

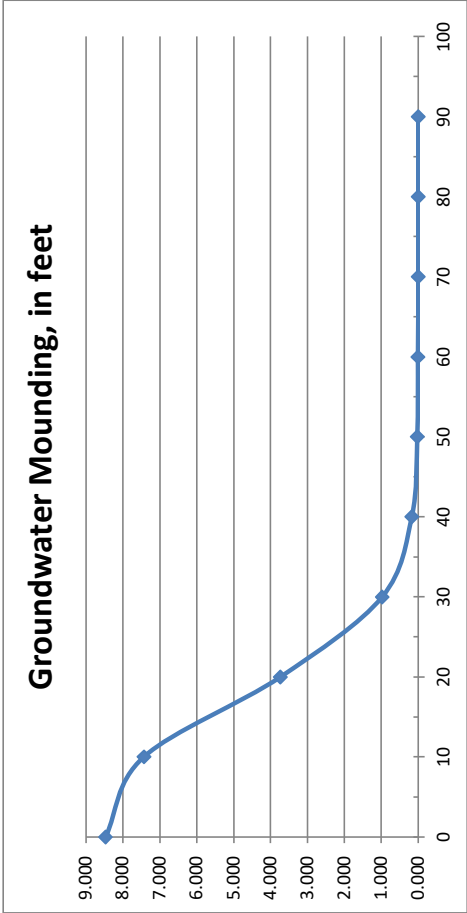
Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

8.470	0
7.432	10
3.733	20
0.977	30
0.176	40
0.024	50
0.005	60
0.003	70
0.003	80
0.003	90



Re-Calculate Now



Basin 3

R = 0.37 in/hr

Kh = 0.37 in/hr

t = 47.66 hrs.

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

0.31	R
0.150	Sy
0.31	Kh
12.000	x
129.000	y
71.59	t
10.00	hi(0)

18.395	h(max)
8.395	Δh(max)

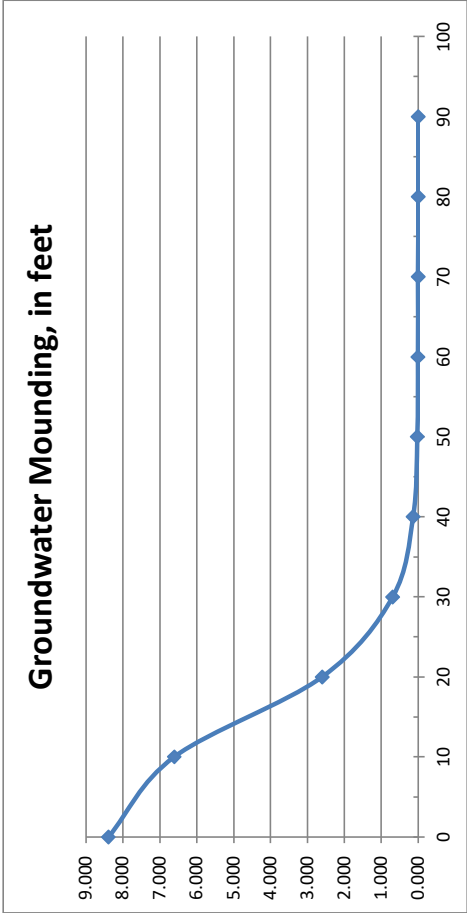
Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

8.395	0
6.609	10
2.601	20
0.692	30
0.138	40
0.023	50
0.006	60
0.004	70
0.004	80
0.004	90



Re-Calculate Now



Basin 4

R = 0.31 in/hr

Kh = 0.31 in/hr

t = 71.59 hrs.

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)

Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.32
Sy	0.150
Kh	0.32
x	32.500
y	100.000
t	61.40
hi(0)	10.00

h(max)	20.677
Δh(max)	10.677

Ground-water
Mounding, in feet
center of basin in x
direction, in feet

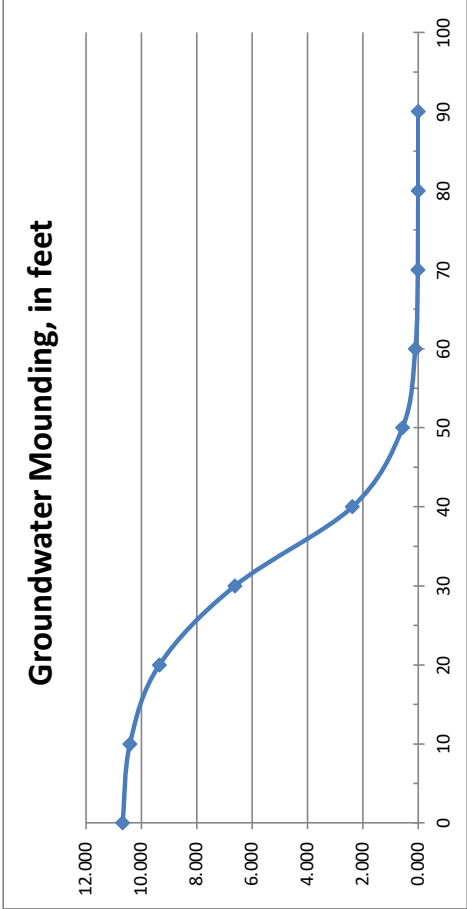
0	10.677
10	10.413
20	9.358
30	6.622
40	2.380
50	0.565
60	0.099
70	0.015
80	0.005
90	0.004

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Input Values

R	0.31
Sy	0.150
Kh	0.31
x	8.000
y	31.250
t	52.10
hi(0)	10.00

h(max)	15.382
Δh(max)	5.382

Distance from

Ground-water center of basin in x
Mounding, in feet direction, in feet

0	5.382
10	3.175
20	0.833
30	0.142
40	0.018
50	0.004
60	0.003
70	0.003
80	0.003
90	0.003



Re-Calculate Now

Recharge rate (permeability rate) (in/hr)
Specific yield, Sy (dimensionless)
default value is 0.15; max value is 0.2 provided that a lab test data is submitted
Horizontal hydraulic conductivity (in/hr)
Kh = 5xRecharge Rate (R) in the coastal plain; Kh=R outside the coastal plain
1/2 length of basin (x direction, in feet)
1/2 width of basin (y direction, in feet)
Duration of infiltration period (hours)
Initial thickness of saturated zone (feet)

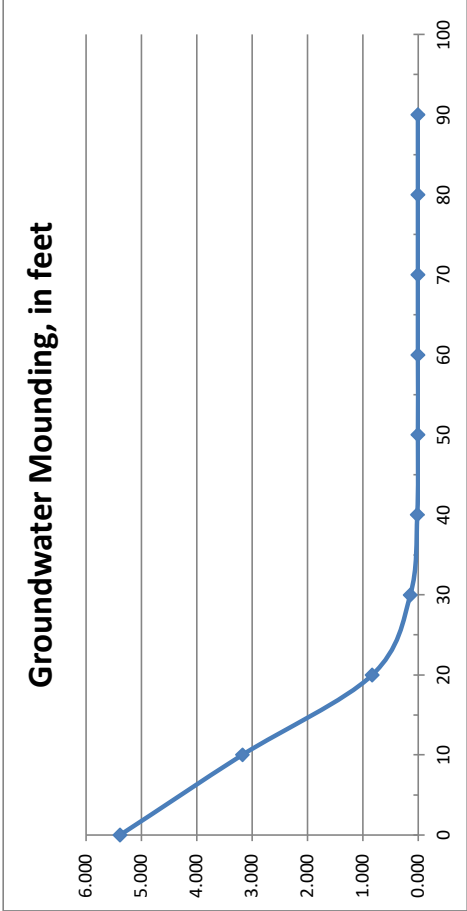
Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Basin 6 - Emergency Access Road

R = 0.31 in/hr

Kh = 0.31 in/hr

t = 52.10 hrs.



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Cascade Design Summary

West Essex Highlands

West Orange, NJ

10/19/2023

Information provided by Engineer (Anderson Consulting):

- Water Quality Flowrate = See Table
- 100-YR Peak Flowrate = See Table
- Presiding Agency = NJDEP
- TSS Removal Required = 50%

Sizing Summary:

The Cascade Separator is a hydrodynamic separator designed to protect waterways from stormwater runoff. The Cascade Separator is commonly used as a standalone stormwater quality control practice that provides pretreatment to detention, infiltration, bioretention, and rainwater harvesting systems. This innovative treatment product excels at sediment capture and retention while also removing hydrocarbons, trash, and debris from the stormwater runoff. The Cascade Separator is NJCAT verified and as a result has received final certification from the NJDEP for 50% TSS removal.

Site Designation	Water Quality Flow Rate (cfs)	100-YR Peak Flow Rate (cfs)	NJDEP Approved Flow Rate (cfs)	Cascade Model
WQU-2.2	2.26	15.95	2.81	CS-5
WQU-2.3	2.98	24.53	4.05	CS-6
WQU-2.4	1.89	23.31	2.81	CS-5
WQU-2.5	4.25	19.73	7.20	CS-8
WQU-2.6	4.74	22.02	7.20	CS-8
WQU-3.0	2.00	22.64	2.81	CS-5
WQU-5.1	1.24	10.51	1.80	CS-4
WQU-5.2	3.34	16.43	4.05	CS-6

Maintenance:

Like any stormwater best management practice, the Cascade Separator requires regular inspection and maintenance to ensure optimal performance. Maintenance frequency will be driven by site conditions. Bi-annual visual inspections are recommended, at which time the accumulation of pollutants can be determined. On average, the Cascade Separator requires annual removal of accumulated pollutants.

Thank you for the opportunity to present this information to you and your client.

Dixon J. Wiley

Stormwater Design Engineer

Contech Engineered Solutions LLC

CASCADE
separator®

West Essex Highlands Filterra HC Sizing

West Orange, NJ

10/19/2023

Sizing Basis:

Filterra High Capacity biofiltration system has received final certification from the NJDEP for 80% TSS removal. Per the NJDEP, Filterra HC is considered a Green Infrastructure (GI) MTD. The sizing for the Filterra HC system under NJDEP regulations is based on the methodology outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS method is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the parameters below were assumed.

Design Parameters:

Design Storm =	NJDEP Water Quality Design Storm (1.25-inch/2-hour storm event)
Filterra HC Media Flow Rate =	300 inches/hour
Time of Concentration =	10 minutes
Allowable Ponding in Filterra =	9"

Design Summary:

Utilizing NRCS Method and HydroCAD software, a hydrograph can be derived to represent the design storm. As seen in the provided HydroCAD report, the WQ flow is routed to an appropriately sized Filterra unit. Since the Filterra system can provide up to 9" of ponding, some flow attenuation is possible. The Filterra system is able to accommodate a portion of the water quality volume in the head space above the media and release it at the system's NJDEP certified maximum treatment flow rate.

Outfall	Inlet #	Impervious Area (sf)	Open Space/Woods Area (sf)	Tc (min)	WQF (cfs)	Filterra Model Analyzed
Basin 1	CB-1	3061	1122	10	0.18	4x6 / 6x4
	CB-2	4262	16059	10	0.27	4.5x7.83 / 7.83x4.5
	CB-3	2710	996	10	0.16	4x6 / 6x4
	CB-4	9984	14522	10	0.61	6x12 / 12x6
	CB-5	1979	736	10	0.12	4x4
	CB-6	1877	3847	10	0.12	4x4
	CB-7	3034	1131	10	0.18	4x6 / 6x4
	CB-8	10407	7883	10	0.63	6x12 / 12x6
	CB-9	3137	3241	10	0.19	4x6 / 6x4
	CB-10	9901	6075	10	0.59	6x12 / 12x6
	CB-11	21581	6562	10	1.28	18x8
	CB-12	3189	6920	10	0.2	4x6 / 6x4
	CB-13	1200	3300	10	0.08	4x4
	CB-14	9356	2246	10	0.56	6x12 / 12x6
	CB-45	9342	6767	10	0.56	6x12 / 12x6
	CB-46	21640	3216	10	1.28	18x8
	CB-47	820	2302	10	0.05	4x4
	CB-48	7588	3216	10	0.45	6x10 / 10x6
	CB-49	5637	1150	10	0.33	6x8 / 8x6
	CB-50	2151	1463	10	0.13	4x4
Undetained	CB-58	3789	2752	10	0.23	4.5x7.83 / 7.83x4.5
	CB-59	0	900	10	0.00	4x4
	CB-27	1375	436	10	0.08	4x4
	CB-28	1371	428	10	0.08	4x4
	CB-29	1585	542	10	0.09	4x4
	CB-30	1899	394	10	0.11	4x4

Thank you for the opportunity to present this to you and your client. Please do not hesitate to contact me should you have any additional questions.
Sincerely,

Dixon J. Wiley
Storm Water Design Engineer
Contech Engineered Solutions, LLC.