Prepared for

Tri-State Generation and Transmission Association, Inc.

Escalante Generating Station
297 Country Road 19
Prewitt, New Mexico 87045

Run-On and Run-Off Control System Plan Periodic Update for CCR Landfill

Escalante Generating Station
Prewitt, New Mexico

Prepared by

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October 2021

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Date: October 30, 2021

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1. INTRODUCTION

Tri-State Generation and Transmission Association, Inc. (Tri-State) owns and operates the Escalante Generating Station (EGS), located in McKinley County northwest of the Town of Prewitt, New Mexico. The facility includes a 97-acre scrubber sludge/fly ash landfill (coal combustion residuals (CCR) landfill) which comprises two disposal areas (Drawing C-001), an Active Landfill which includes approximately 3 acres of capped slide slopes and an Inactive Landfill which was capped and closed in 2015 prior to the promulgation of 40 CFR 257 Subpart D Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments Rules ("CCR Rules").

This ROROCS Plan was prepared for the Active Landfill as a periodic update of the previous ROROCS Plan to document how the run-on and run-off control systems have been designed and constructed to meet the regulatory requirements of 40 CFR 257.81 (run-on and run-off controls for CCR landfills). The supporting calculations for the run-on and run-off controls systems are provided as appendices to this ROROCS Plan.

The initial ROROCS Plan was prepared and certified when the Active Landfill was being operated in 2016. This ROROCS Plan is the first subsequent plan (i.e., the first periodic update, being completed within the required five-year timeframe) and will be placed in the EGS's operating record, as required by 40 CFR 257.105(g)(3).

Since the 2016 submittal, the closure design for the landfill was revised, which resulted in changes to the run-on and run-off control systems for the active portion of the Active Landfill. This ROROCS incorporates these modifications.

2. REGULATORY REQUIREMENTS

2.1 Federal CCR Rule

As required by 40 CFR 257.53 and 40 CFR 257.81, the owner or operator of a CCR landfill must design, construct, operate, and maintain:

- a run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and
- a run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

In the context of the CCR Rule, "active portion" is defined in 40 CFR 273. as that part of a facility that has received or is receiving wastes and has not been closed in accordance with Section 257.102.

2.2 Preamble to the Federal CCR Rule

Further clarification on the intent of this requirement of the CCR Rule is provided in the Preamble for the CCR Rule:

> *The owner or operator must design, construct, operate, and maintain the CCR landfill in such a way that any runoff generated from at least a 24-hour, 25-year storm must be collected through hydraulic structures, such as drainage ditches, toe drains, swales, or other means, and controlled so as to not adversely affect the condition of the CCR landfill. EPA has promulgated these requirements to minimize the detention time of run-off on the CCR landfill and minimize infiltration into the CCR landfill, to dissipate stormwater run-off velocity, and to minimize erosion of CCR landfill slopes. An additional concern with run-off from CCR landfills is the water quality of the run-off, which may collect suspended solids from the landfill slopes.*

A description of run-on and run-off controls systems for the Active Landfill at the EGS is included in subsequent sections of this ROROCS Plan.

3. DESIGN METHODOLOGY

3.1 Design Storm

Run-on and run-off controls systems for the Active Landfill were designed and constructed to provide hydraulic capacity for the 24-hour, 25-year storm event, as required by the CCR Rule. Site-specific precipitation estimates were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Version 3 for Prewitt, New Mexico (downloaded October 17, 2021), which indicates that the 25-year, 24-hour storm event generates 2.25 inches of precipitation at the EGS. Design calculations that support run-on and run-off control features for the assumed design storm are included in Appendix I of this ROROCS Plan.

Interim and final cover stormwater features consist of downchutes to convey stormwater from drainage benches to stormwater collection areas (ponds), downchutes to collect and manage contact water during operations, tack on berms and roadside swales to convey stormwater from the cover to the stormwater collection areas (ponds), and perimeter control berms designed and constructed for the 24-hour, 25-year design storm. Final cover stormwater features are shown on Drawing C-004.

3.2 Run-Off and Routing Methodology

The HydroCAD® computer programs were used to apply the SCS method to estimate runoff for interim and final cover conditions. Modeling was applied to calculate stormwater run-off volumes, peak flow rates, routing of rainfall event hydrographs through channels and run-off discharge quantities supporting the design and operation of the CCR landfill. Appendices I-A though I-C present detailed drainage calculations and results, including a detailed discussion of the parameters used in the analyses.

3.3 Design Drawings

Final conditions, topography and permit details for run-on and run-off control system features are presented within the EGS Closure Plan. Drawing C-004 showing the final closure topography and control system layout is included with this report.

4. RUN-ON CONTROL

Run-on is defined as water that may flow towards any portion of a landfill. This section summarizes the proposed surface water management system design and describes the drainage features and components of the landfill facility used to divert stormwater run-on from reaching an active portion of the EGS CCR landfill.

The CCR Landfill Area is bounded by the Inactive Landfill to the north, while the east, west and southern sides of the landfill tie in with existing grade. An access ramp bisects the landfill area providing access to the top deck. The CCR landfill is topographically higher than the surrounding areas; therefore, run-on potential is limited to stormwater flows from within the landfill footprint and flow from the Inactive Landfill.

During operations, exterior side slopes of the landfill may be covered with interim soil cover as CCR placement progresses to prevent stormwater from contacting CCR. Stormwater run-on controls for non-contact water during CCR placement will be built based on the final cover system design; the interim features will be constructed based on the final cover feature dimensions until final cover is constructed. Drainage swales constructed on the interim system collect and divert surface water run-on from downgradient active areas. The run-on control system design calculations for the active area are presented in Appendix I-B.

Temporary containment berms were designed to manage contact water from a sloped active portion of the CCR Landfill. The berm heights were computed based on a range of contributing contact water drainage areas and a range of stormwater collection areas at the base of the slope. The associated calculations are provided in Appendix I-B. Temporary containment berms will be constructed as needed to manage run-on.

5. RUN-OFF CONTROL

Run-off is defined as stormwater, leachate, or liquid flows generated from a project area (landfill and associated features). Stormwater run-off management encompasses two classifications of run-off:

- Contact water (run-off that has contacted CCR); and
- Stormwater (run-off that has not contacted CCR).

Run-off controls for contact water and stormwater at the Active Landfill are described below.

As part of this periodic update, runoff control should be confirmed for the landfill similar to the methods presented in the original 2016 plan and within 40 CFR 257.3-3.

5.1 Contact Water Run-Off

Contact water on the exposed CCR surface is being managed based on typical filling conditions for interim or operational filling. The landfill design assumes that the active portion of the Active Landfill is graded to drain towards two water management basins off the west side of the landfill. A perimeter containment berm may be necessary in each to prevent the contact water run-off from leaving the landfill footprint. Where a berm is used, it should be maintained during operations.

Where the active area is graded to slope towards the exterior of the landfill, a 24-inch tall (minimum) berm is required along the perimeter of the active area, assuming that this area is flat and that the entire area within the berm contributes to the storage capacity.

5.2 Stormwater Run-Off

The stormwater run-off controls for non-contact water during CCR placement were designed based on the final cover system design; the interim features will be constructed based on the final cover feature dimensions until final cover is constructed. The landfill has side slopes graded at 3 horizontal to 1 vertical (3H:1V) between drainage benches, and top deck slopes graded at three percent to maximize the removal of run-off. Drainage swales will be constructed on the interim and final cover system to collect and divert surface water run-off into downchutes away from the toe of the landfill, and then to the stormwater management areas.

Stormwater run-off controls are designed to convey flow from the 24-hour, 25-year storm event. Design calculations are provided in Appendix I-C. Some of the stormwater management features were sized to convey non-contact water run-off from the final cover installation which results in a conservative analysis for interim conditions.

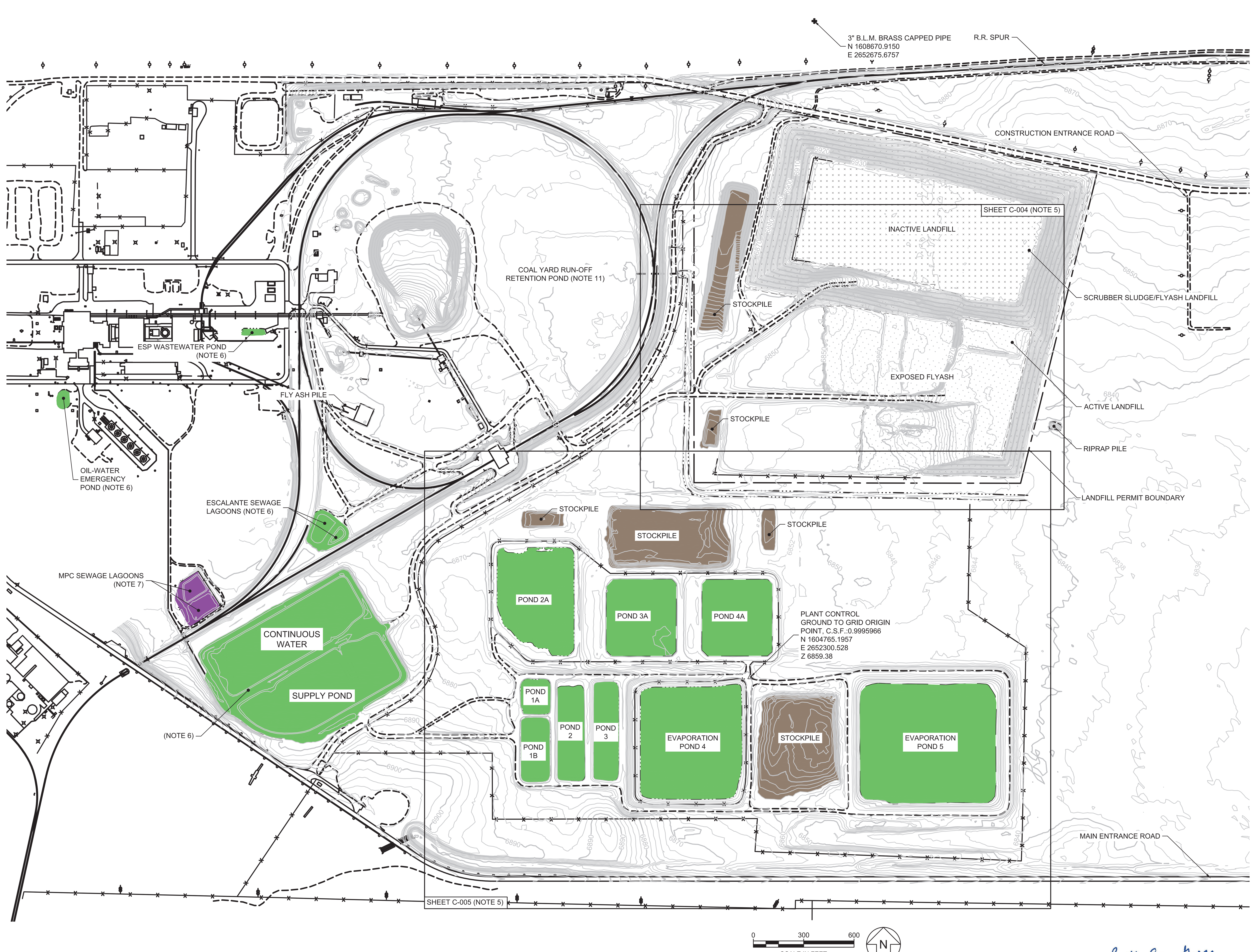
6. CONCLUSIONS

As required by 40 CFR 257.81, the run-on and run-off control systems for the Active Landfill at the EGS have been designed to manage the flow from a 25-year, 24-hour storm. Temporary and interim drainage structures will be constructed as needed to manage run-on and run-off.

7. REFERENCES

Geosyntec Consultants, 2021, Appendix F (Closure Plan Drawings) in “Discharge Permit Closure and Post-Closure Plan, Escalante Generating Station, Groundwater Discharge Permit DP-206, Revision 1,” prepared for Tri-State Generation and Transmission Association, Inc., July.

DRAWINGS



NOTES:

1. TOPOGRAPHIC AERIAL SURVEY FOR THE ESCALANTE GENERATING STATION (EGS) PROVIDED BY TRI-STATE ON 30 NOVEMBER 2020. AERIAL SURVEY CONDUCTED BY SURVEYOR ALBERT HAMMON OF HEI SURVEY.
2. TOPOGRAPHIC SURVEY HORIZONTAL DATUM IS BASED ON NEW MEXICO STATE PLANE WEST AND A MODIFIED NEW MEXICO STATE PLANE (I.E., PLANT DATUM).
3. TOPOGRAPHIC SURVEY VERTICAL DATUM IS BASED ON NORTH AMERICAN VERTICAL DATUM (NAVD) 88.
4. TOPOGRAPHY AND SITE FEATURES ARE BASED ON THE SURVEY PROVIDED BY TRI-STATE ON 30 NOVEMBER 2020; HOWEVER THEY DO NOT INCLUDE TOPOGRAPHY FOR WESTERN PORTIONS OF THE FACILITY. AS SUCH, CONDITIONS AND TOPOGRAPHY SHOULD BE CONFIRMED PRIOR TO FINAL DESIGN AND CONSTRUCTION.
5. EVAPORATION IMPOUNDMENT SEDIMENTS WILL BE EXCAVATED AND PLACED WITHIN THE LANDFILL AREA, AND THE IMPOUNDMENT AREAS WILL BE CLOSED AND GRADED ACCORDING TO SHEET C-005. THE ACTIVE LANDFILL AND TIE-IN LOCATIONS TO THE INACTIVE LANDFILL WILL BE GRADED AND FINAL COVER SOILS AND VEGETATION WILL BE INSTALLED ACCORDING TO SHEET C-004.
6. CONTINUOUS WATER SUPPLY, SEWAGE LAGOONS, ESP WASTEWATER POND, AND THE OIL-WATER EMERGENCY IMPOUNDMENT WILL BE CLOSED VIA SEDIMENT REMOVAL, BACKFILLING, AND VEGETATION. BACKFILL WILL BE WITH EXISTING BERM AND SURROUNDING SOIL MATERIALS TO PROMOTE POSITIVE STORMWATER DRAINAGE AWAY FROM EACH AREA.
7. IMPOUNDMENTS ASSOCIATED WITH THE ON-SITE WATER TREATMENT FACILITY AND WITH THE MCKINLEY PAPER COMPANY (I.E.,THE MPC SEWAGE LAGOONS) ARE NOT INCLUDED IN THIS CLOSURE PLAN FOR EGS FACILITIES.
8. PRIOR TO IMPLEMENTING CLOSURE ACTIVITIES UNDER THIS PLAN, EROSION AND SEDIMENT CONTROLS, INCLUDING SILT FENCE AND VEHICLE DECONTAMINATION PADS, MUST BE INSTALLED. THE FINAL LOCATION OF SILT FENCE AND DECONTAMINATION PADS WILL BE DETERMINED BY A CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.
9. STOCKPILES, CONSISTING OF COVER SOIL MATERIAL, WILL BE REMOVED AND RELOCATED (E.G., PLACED AS COVER SOIL MATERIAL OR BACKFILL MATERIAL) PRIOR TO FINAL GRADING OF POND AREAS.
10. IMPOUNDMENTS WILL BE DEWATERED VIA EVAPORATION PRIOR TO SEDIMENT REMOVAL. SEDIMENTS FROM PONDS WILL BE TESTED AND DISPOSED OF AT THE LANDFILL.
11. THE COAL RUN-OFF RETENTION POND AND THE COAL YARD AREA WILL BE SCRAPED TO A DEPTH OF 6-INCHES TO REMOVE COAL YARD RUN-OFF SEDIMENTS AND RESIDUALS. DEWATERED COAL COMBUSTION WASTES AND WATER TREATMENT PLANT SLUDGE WILL BE DISPOSED OF IN THE ACTIVE LANDFILL AREA PRIOR TO CLOSURE.

LEGEND

- EXISTING GROUND MAJOR CONTOUR (5') (6080)
- EXISTING GROUND MINOR CONTOUR (1')
- LANDFILL PERMIT BOUNDARY
- SECURITY FENCE
- APPROXIMATE WATER SURFACE
- EXISTING ROADS
- FACILITY BUILDING
- EXISTING FINAL COVER SOIL AREA
- EXPOSED FLYASH
- STOCKPILE
- EGS IMPOUNDMENTS FOR CLOSURE
- IMPOUNDMENTS TRANSFERRING TO MPC

Beth Ann Gross July 20, 2021

DRAWING NO.: C-001

REV	DATE	DRAWN BY	APPROVED BY	REVISION	TSGT CONTRACT No.
B	210630	STAN A.	BETH G.	ISSUED FOR PERMIT CLOSURE PLAN	
A	201214	STAN A.	BETH G.	ISSUED FOR PERMIT CLOSURE PLAN	

REFERENCE(S)
- FIELD SURVEY PERFORMED APRIL 2018, EXPANDED AUG. 03-16 & UPDATED ACTIVE FLYASH PILE TOPOGRAPHY NOV. 26, 2020, BY HEI SURVEYS, PHONE # 505-870-6901. CONTOURS AND COORDINATES ARE BASED ON TRI STATE GENERATING STATION DATUM PER TIES TO CONTROL POINTS IDENTIFIED BY PERSONNEL DURING SURVEY. THE CONTROL POINT SHOWN HEREON INDICATED AS THE G.P.S. ORIGIN AND HAS BEEN USED AS THE SCALE POINT FROM PLANT GRID TO NM83-WF GRID. CONTROL SURVEY PERFORMED TO ESTABLISH HORIZONTAL AND VERTICAL DIMENSIONAL CONTROL AS SHOWN HEREON. NO BOUNDARY SURVEY PERFORMED OR IMPLIED. THIS SURVEY COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS BASED ON THE FIELD SURVEY DATA COMPILED FROM THE CONTROL SURVEY.

DRAWING CLASSIFICATION			
CONFIDENTIAL	DESIGNED BY	JON G.	210630
CIP CONTROLLED	DRAWN BY	STAN A.	210630
✓ NOT APPLICABLE	CHECKED BY	DAVID R.	210630
	APPROVED BY	BETH G.	210630

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BETH ANN GROSS NEW MEXICO 17673 LICENSED PROFESSIONAL ENGINEER

FACILITY: ESCALANTE GENERATING STATION

TITLE: EXISTING CONDITIONS

TRI-STATE Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

TRI-STATE DWG NO.

REVISION: A

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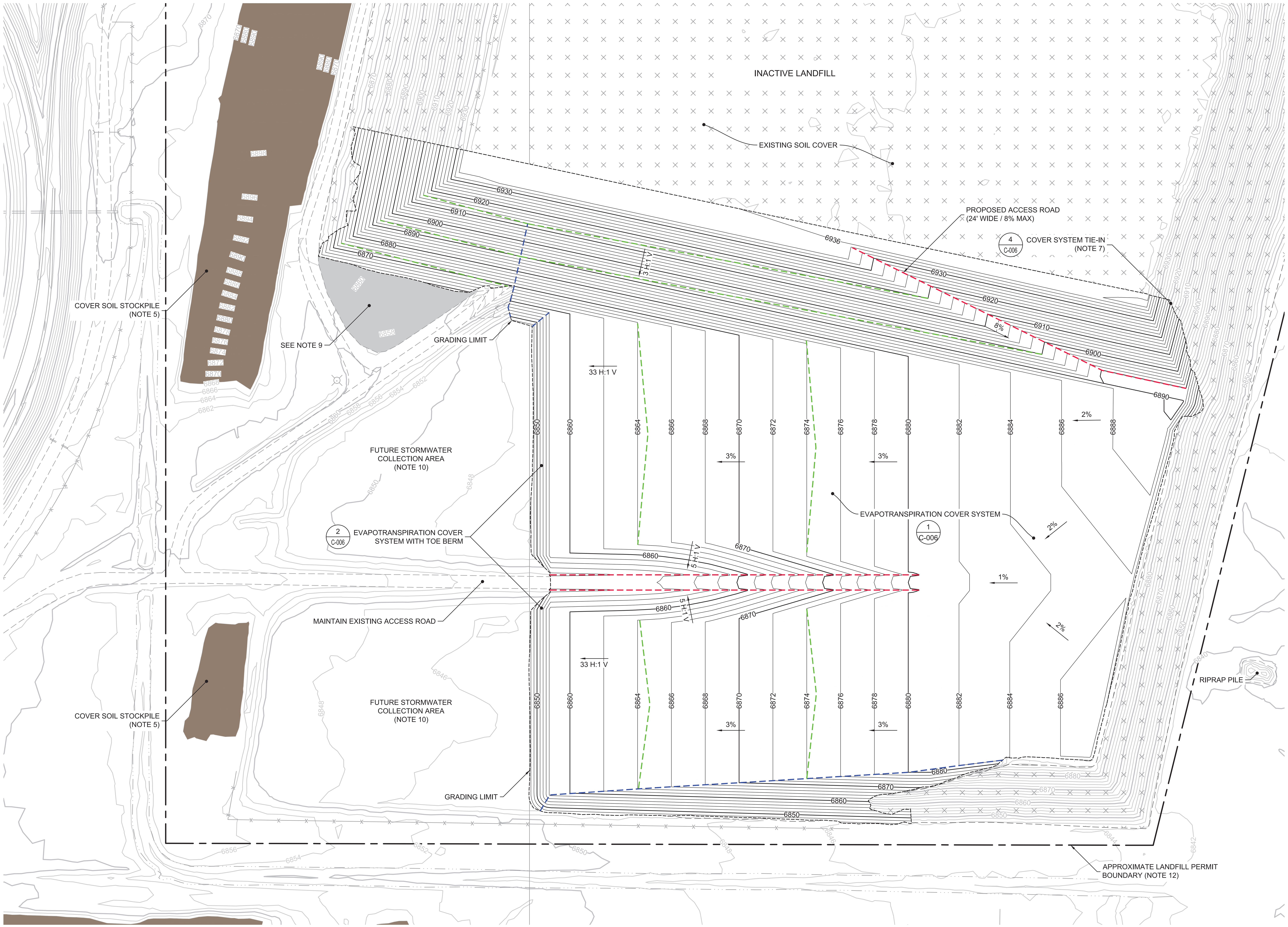

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5. STOCKPILES OF COVER SOIL MATERIAL WILL BE REMOVED, AND USED TO CONSTRUCT THE EVAPOTRANSPIRATION COVER SYSTEM. COVER SOIL STOCKPILES THEREFORE WILL BE PLACED TO ESTABLISH FINAL GRADES SHOWN.
6. TACK-ON DRAINAGE BENCHES WILL BE CONSTRUCTED AT A MINIMUM SLOPE OF 2% (OR AS NECESSARY) TO CONVEY STORMWATER TO DOWN CHUTES AND STORMWATER CHANNELS. FINAL STORMWATER LAYOUT DESIGN WILL BE INCLUDED IN THE FOR CONSTRUCTION BID DOCUMENTS.
7. COVER SOIL MATERIAL FROM THE INACTIVE LANDFILL WILL BE REMOVED, STOCKPILED, AND REPLACED AS NECESSARY WHERE FINAL GRADING TIE-INS TO THE ACTIVE LANDFILL ARE REQUIRED DURING CLOSURE (REFERENCE DRAWING C-006).
8. FINAL SLOPES 5H:V1 OR STEEPER WILL REQUIRE EITHER HIGHER SEED MIX APPLICATION RATES OR EROSION CONTROL BLANKETS.
9. EXPOSED FLY ASH AT TOE OF SLOPE TO BE RELOCATED TO WITHIN LANDFILL FOOTPRINT PRIOR TO PLACEMENT OF THE FINAL EVAPOTRANSPIRATION COVER SYSTEM.
10. FUTURE STORMWATER COLLECTION AREAS AND ASSOCIATED CULVERTS REQUIRED TO CONVEY STORMWATER TO THE EXISTING DRAINAGE CHANNEL TO THE WEST AND SOUTH OF THE LANDFILL AREA WILL BE DESIGNED AND THE FINAL CONFIGURATION PRESENTED IN THE FINAL DESIGN, PRIOR TO CONSTRUCTION.
11. THE INACTIVE LANDFILL UNIT WAS CAPPED AND REVEGETATED IN 2015, PRIOR TO THE PROMULGATION OF FEDERAL CCR RULES, AND UNDER NMED APPROVAL.
12. LANDFILL PERMIT BOUNDARY BASED ON BOUNDARY PROVIDED IN ESCALANTE GENERATING STATION ACTIVE ASH LANDFILL CLOSURE PLAN - OCTOBER 2016.

LEGEND

- 6080 — EXISTING GROUND MAJOR CONTOUR (5')
- EXISTING GROUND MINOR CONTOUR (1')
- LANDFILL PERMIT BOUNDARY
- 6090 — PROPOSED GRADING MAJOR CONTOURS (5')
- 6072 — PROPOSED GRADING MINOR CONTOURS (1')
- TACK ON BERM / DRAINAGE BENCH (NOTE 6)
- ROADSIDE SWALE / V-NOTCH DITCH
- DOWNCHUTE / TRAPEZOIDAL SWALE (3 / C-006)
- GRADING LIMIT
- SECURITY FENCE
- APPROXIMATE WATER SURFACE
- EXISTING ROADS
- FACILITY BUILDING
- EXISTING FINAL COVER SOIL AREA
- EXPOSED FLYASH
- STOCKPILE

Beth Ann Gross July 20, 2021

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DRAWING NO.: C-004

REV	DATE	DRAWN BY	APPROVED BY	REVISION	TSGT CONTRACT No.
B	210630	STAN A.	BETH G.	ISSUED FOR PERMIT CLOSURE PLAN	
A	201214	STAN A.	BETH G.	ISSUED FOR PERMIT CLOSURE PLAN	

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FACILITY
ESCALANTE GENERATING STATION

TITLE
FINAL GRADING LANDFILL AREA

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy® Cooperative

TRI-STATE DWG NO.

REVISION
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APPENDICES

APPENDIX I-A
Active Area Run-On
Control System Calculations

Written by:	**A. Taylor**	Date:	**10/11/2021**	Reviewed by:	**C. Jordan**	Date:	**10/15/2021**
Client:	**Tri-State**	Project:	**Escalante Generating Station**	Project No.:	**DE0440**	Task No.:	**10**

APPENDIX I-A
ACTIVE AREA RUN-ON CONTROL SYSTEM, ROROC PLAN
ESCALANTE GENERATING STATION
PREWITT, NEW MEXICO

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10/30/2021

1. PURPOSE

The purpose of this calculation package is to demonstrate that stormwater run-on toward the active portion of the Active Landfill, a coal combustion residuals (CCR) landfill at the Escalante Generating Station (EGS or Site), is intercepted prior to reaching the active portion of the Active Landfill.

The CCR landfill is topographically higher than the surrounding areas; therefore, run-on potential is limited to stormwater flows from the southern slope of the Inactive Landfill to the north portion of the Active Landfill.

The objective of this calculation package is to appropriately size the tack-on berm and a new channel to have the capacity to control the run-on stormwater from the 25-yr, 24-hr storm event from reaching the active portion of the Active Landfill.

2. METHODOLOGY

Hydrologic and hydraulic (H&H) analyses were performed for the proposed surface water features to confirm that these features will be capable of managing and conveying the design storm event. The design of the channels and berm was performed using hydrologic and hydraulic procedures presented in the Soil Conservation Service (SCS) Technical Release 55 (TR-55), Manning's kinematic equation, and other recognized engineering procedures as encoded in HydroCAD™ software [SCS TR-55, 1986; HydroCAD, 2019].

3. DESIGN AND CALCULATION PARAMETERS

Hydrology

Curve numbers, rainfall distributions, and other hydrologic criteria were selected to be the same as used for Geosyntec's stormwater design of the active portion of the Active Landfill (see Appendix I-C). Drainage areas are presented in Figure 1. The rainfall depth for the design storm event and for calculating the times of concentration was taken from NOAA Atlas 14, Volume 2, Version 3 for Prewitt, New Mexico. The rainfall depth used for analysis is 2.24-in. for the 25-yr, 24-hr storm (design storm).

Channels

Drainage Areas/Curve Numbers
The existing soils were verified to be hydrologic soil group (HSG) Type D based on the United States Department of Agriculture (USDA) NRCS Web Soil Survey. Selected curve numbers were developed for the drainage basin to each channel segment and are presented in Table 1. A minimum time of concentration of 6 minutes was used for the drainage areas to be consistent with the TR-55 document.

Lining Material
The tack on berm was designed to be designed to be lined with clean earth. The tack on berm was modeled with a Manning's coefficient of 0.022. The channels were designed to be lined with riprap. The channels were modeled with a Manning's coefficient of 0.035.

Capacity
Each channel was designed to convey the peak surface water run-off flow corresponding to the 25-yr, 24-hr rainfall event with a minimum of 0.5 feet of freeboard. Channel characteristics and results of the analysis are summarized in Table 2 and Table 3.

4. RESULTS AND CONCLUSIONS

The channels were able to convey the 25-yr, 24-hr storm event with a minimum of 0.5-ft of freeboard away from the active portion of the landfill.

5. REFERENCES

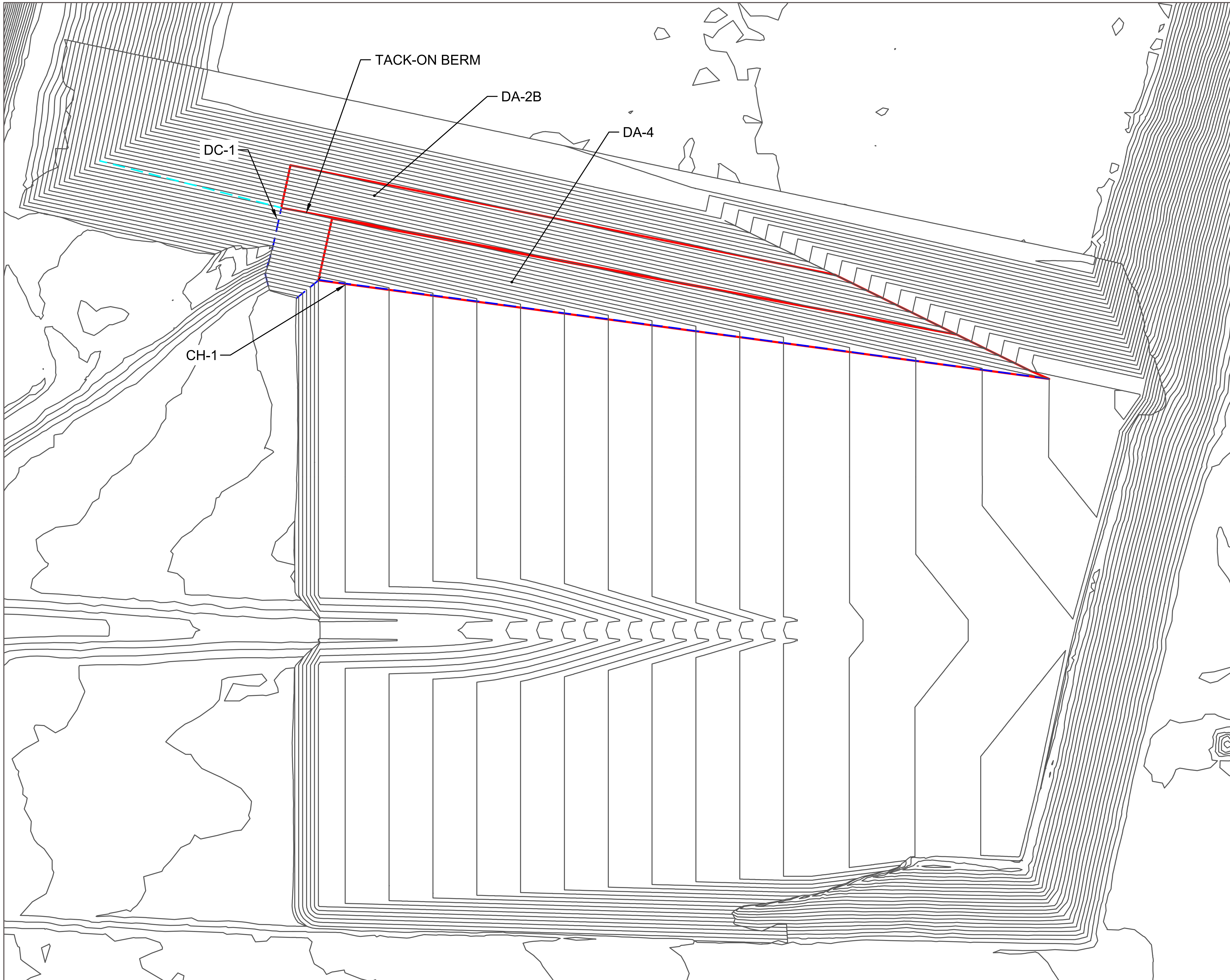
Bonnin, G.M. et al., "NOAA Atlas 14, Volume 2, Version 3, Point Precipitation Frequency Estimates", NOAA National Weather Service. Obtained October 11, 2021.

HydroCAD Software Solutions LLC. (2015). "HydroCAD Stormwater Modeling System, Version 10". Chocorua, New Hampshire.

NRCS. 2016. "Web Soil Survey". http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

SCS TR-55. (1986). *Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55),* 2nd Ed., United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

FIGURES



LEGEND

DRAINAGE AREA

DOWNCHUTE/ TRAPEZOIDAL SWALE

TACK ON BERM/ DRAINAGE BENCH

0 250
SCALE IN FEET

ESCALANTE GENERATING STATION
RUN-ON RUN-OFF CONTROL PLAN
RUN-ON DRAINAGE LAYOUT

Geosyntec consultants

FIGURE 1

PROJECT NO: DE 0440 | OCTOBER 2021

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TABLES

Table 1: Drainage Areas

Land Use Conditions		
	Grass, Poor Condition	
Drainage Area	Curve Number {CN}	Drainage Area {A} (ac)
DA-4	89	1.6
DA-2B	89	1.3

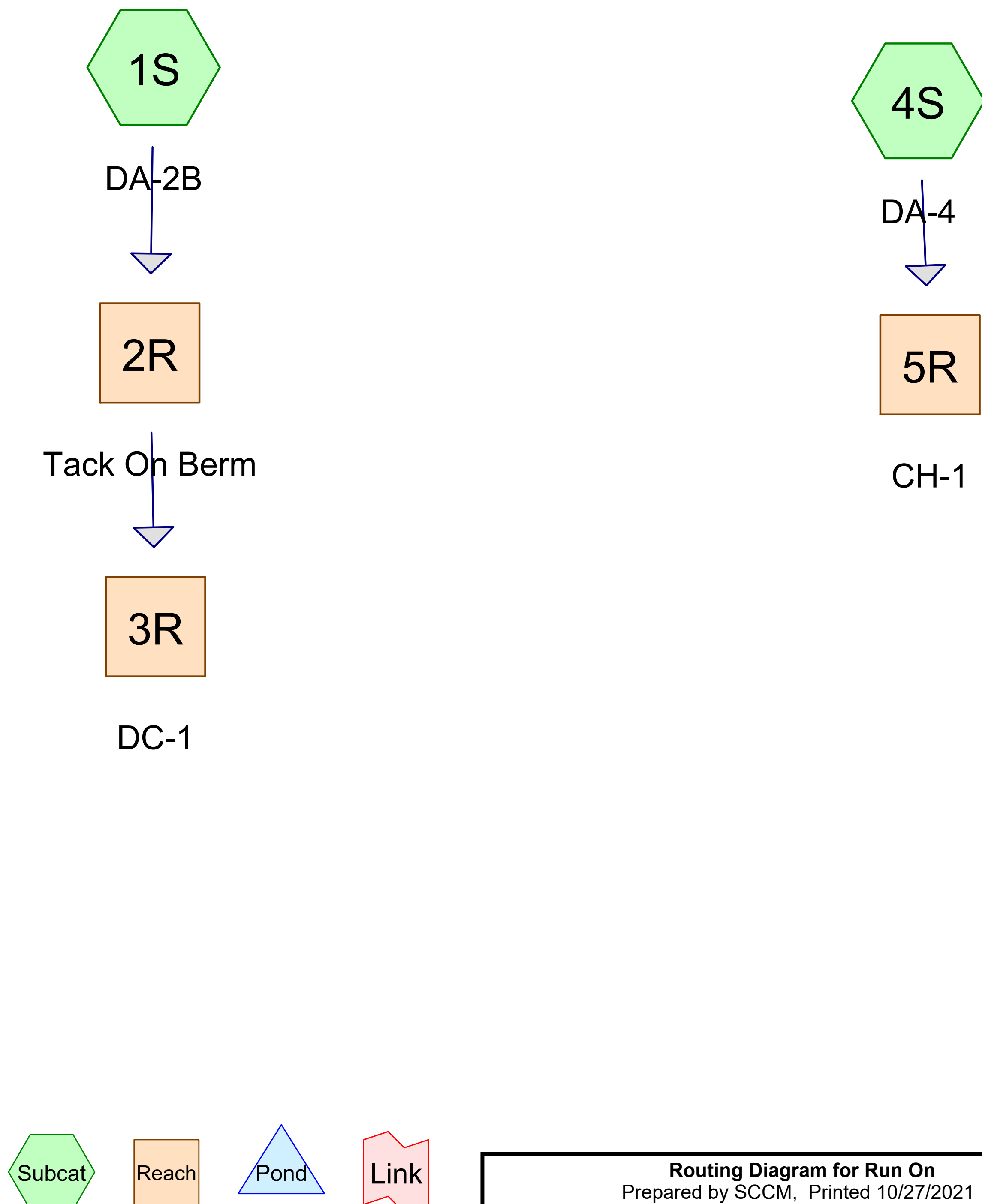
Table 2: Channel Dimensions

Channel Dimensions						
Channel ID	**Bottom Width {b} (ft)**	**Depth {D} (ft)**	**Left Side Slope {Z_1H:V}**	**Right Side Slope {Z_2H:V}**	**Top Width {T} (ft)**	**Channel Longitudinal Slope {S} (ft/ft)**
Tack On Berm	0	1.1	3	2	5.5	0.0091
CH-1	3	1	2	2	7	0.0271

Table 3: Calculation Results

Channel ID	Channel Characteristics										Hydraulic Calculations - 25-yr, 24-hr			
	Section Shape	Min Channel Depth	Start Invert Elevation (ft)	End Invert Elevation (ft)	Length (ft)	Slope (ft/ft)	Manning's n	Bottom Width	Left Side Slope M:1	Right Side Slope M:1	Q (cfs)	Peak Flow Depth (ft)	Peak Flow Velocity (fps)	Freeboard (ft)
Tack On Berm	Vee	1.1	6900	6890.47	1043.4	0.0091	0.035	0	3	2	2.68	0.57	2.63	0.53
CH-1	Trap	1	6889	6859.5	1088.3	0.0271	0.035	3	2	2	3.32	0.23	3.72	0.77

HydoCAD Model



Routing Diagram for Run On
Prepared by SCCM, Printed 10/27/2021
HydroCAD® 10.00-15 s/n 00928 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.849	89	<50% Grass cover, Poor, HSG D (1S, 4S)
2.849	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
2.849	HSG D	1S, 4S
0.000	Other	
2.849		**TOTAL AREA**

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	0.000	2.849	0.000	2.849	<50% Grass cover, Poor	1S, 4S
0.000	**0.000**	**0.000**	**2.849**	**0.000**	**2.849**	**TOTAL AREA**	

Time span=1.00-25.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: DA-2B Runoff Area=55,400 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=2.68 cfs 0.130 af

Subcatchment 4S: DA-4 Runoff Area=1.577 ac 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.32 cfs 0.162 af

Reach 2R: Tack On Berm Avg. Flow Depth=0.57' Max Vel=2.63 fps Inflow=2.68 cfs 0.130 af
n=0.022 L=1,043.4' S=0.0091 '/' Capacity=12.46 cfs Outflow=2.08 cfs 0.130 af

Reach 3R: DC-1 Inflow=2.08 cfs 0.130 af
Outflow=2.08 cfs 0.130 af

Reach 5R: CH-1 Avg. Flow Depth=0.23' Max Vel=3.72 fps Inflow=3.32 cfs 0.162 af
n=0.022 L=1,088.3' S=0.0271 '/' Capacity=42.54 cfs Outflow=2.81 cfs 0.161 af

Total Runoff Area = 2.849 ac Runoff Volume = 0.292 af Average Runoff Depth = 1.23"
100.00% Pervious = 2.849 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: DA-2B

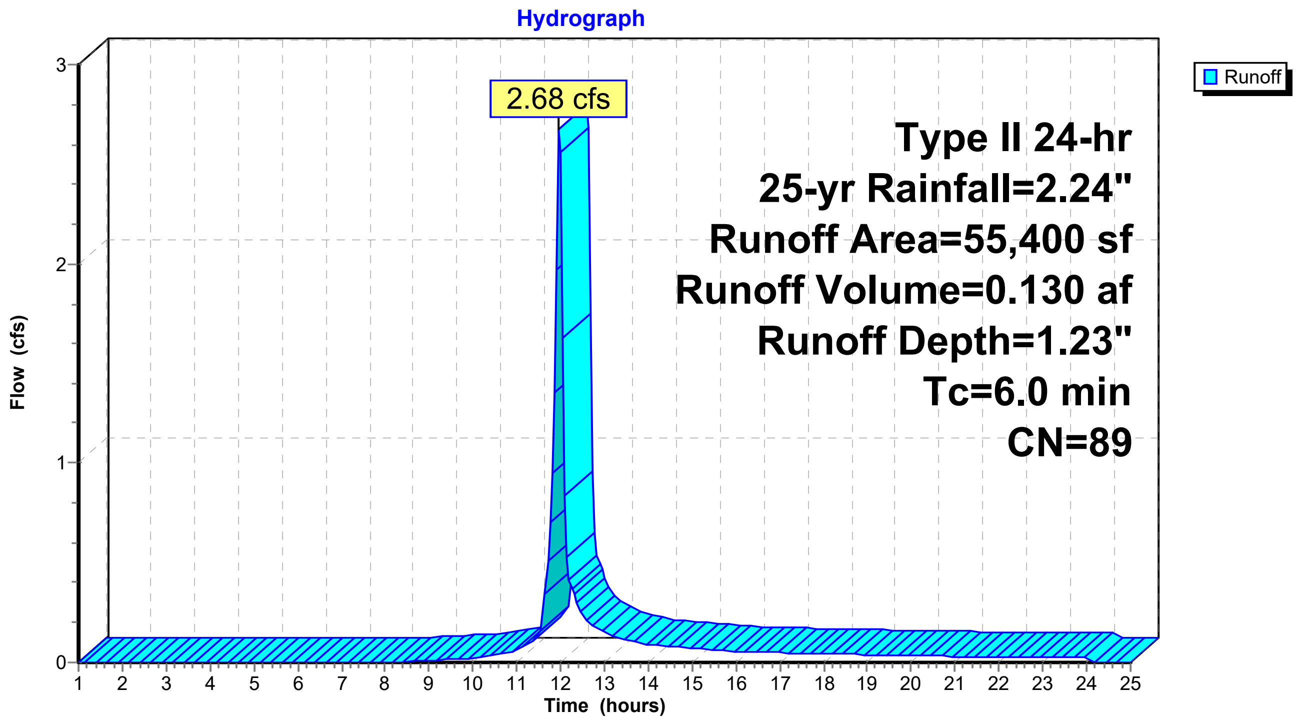
Runoff = 2.68 cfs @ 11.97 hrs, Volume= 0.130 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=2.24"

Area (sf)	CN	Description
55,400	89	<50% Grass cover, Poor, HSG D
55,400		100.00% Pervious Area

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

Subcatchment 1S: DA-2B



Summary for Subcatchment 4S: DA-4

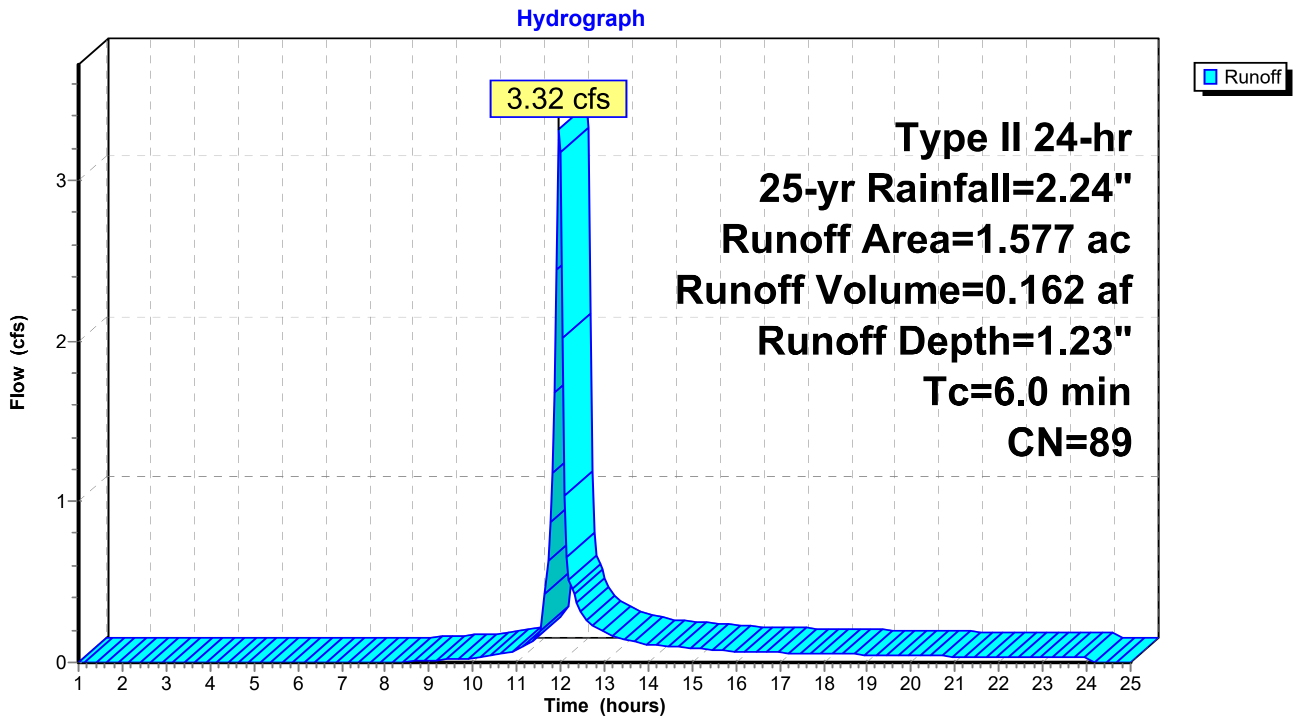
Runoff = 3.32 cfs @ 11.97 hrs, Volume= 0.162 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr Rainfall=2.24"

Area (ac)	CN	Description
1.577	89	<50% Grass cover, Poor, HSG D
1.577		100.00% Pervious Area

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

Subcatchment 4S: DA-4



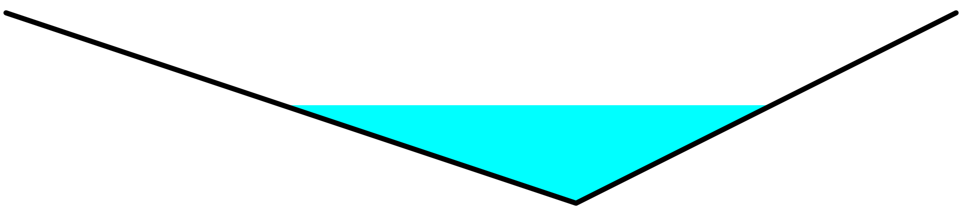
Summary for Reach 2R: Tack On Berm

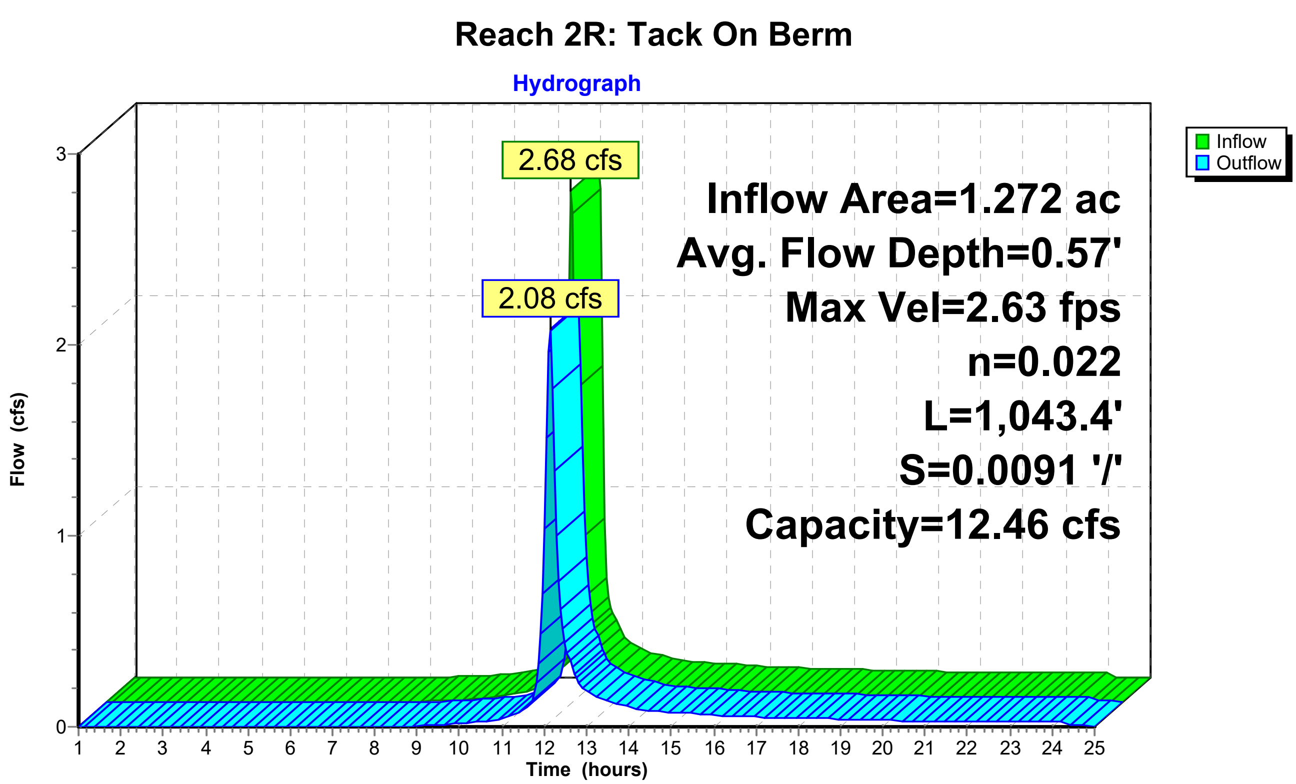
Inflow Area = 1.272 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-yr event
Inflow = 2.68 cfs @ 11.97 hrs, Volume= 0.130 af
Outflow = 2.08 cfs @ 12.14 hrs, Volume= 0.130 af, Atten= 22%, Lag= 10.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.63 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 17.3 min

Peak Storage= 836 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.10' Flow Area= 3.0 sf, Capacity= 12.46 cfs

0.00' x 1.10' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 5.50'
Length= 1,043.4' Slope= 0.0091 '/'
Inlet Invert= 6,900.00', Outlet Invert= 6,890.47'





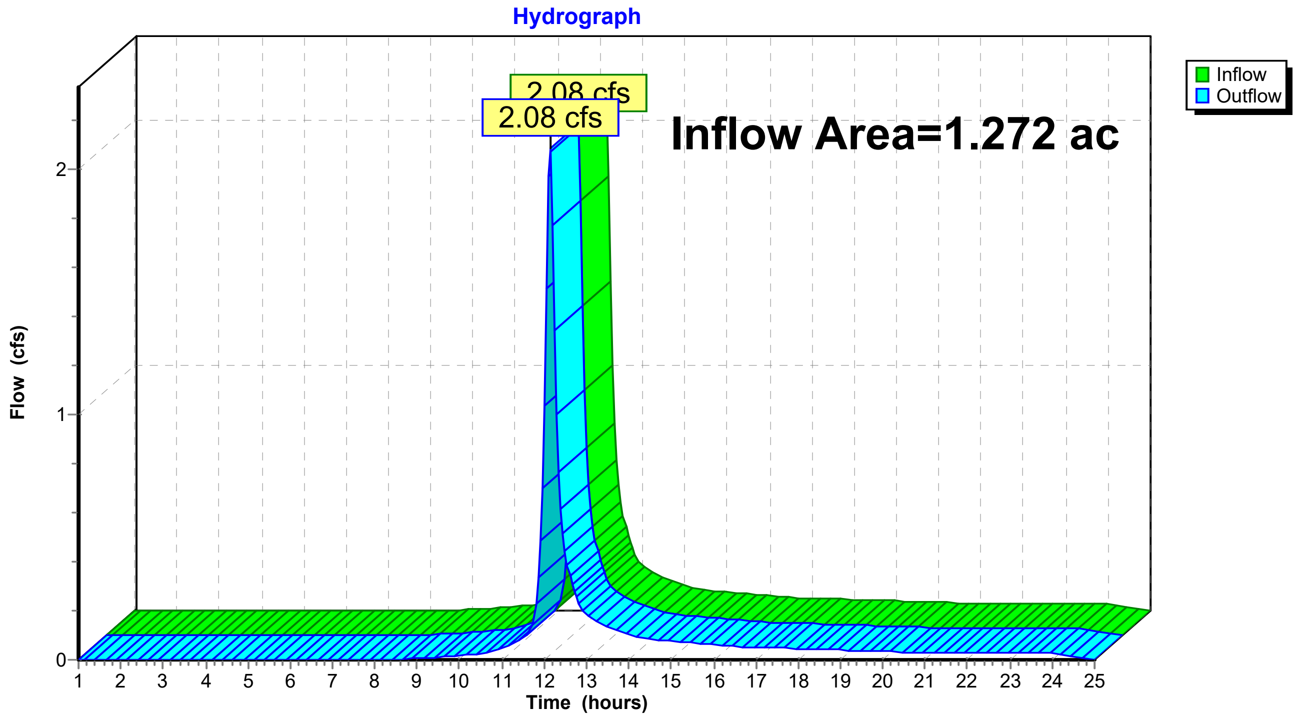
Summary for Reach 3R: DC-1

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

Inflow Area =	1.272 ac,	0.00% Impervious, Inflow Depth > 1.23"	for 25-yr event
Inflow =	2.08 cfs @	12.14 hrs, Volume=	0.130 af
Outflow =	2.08 cfs @	12.14 hrs, Volume=	0.130 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs

Reach 3R: DC-1



Summary for Reach 5R: CH-1

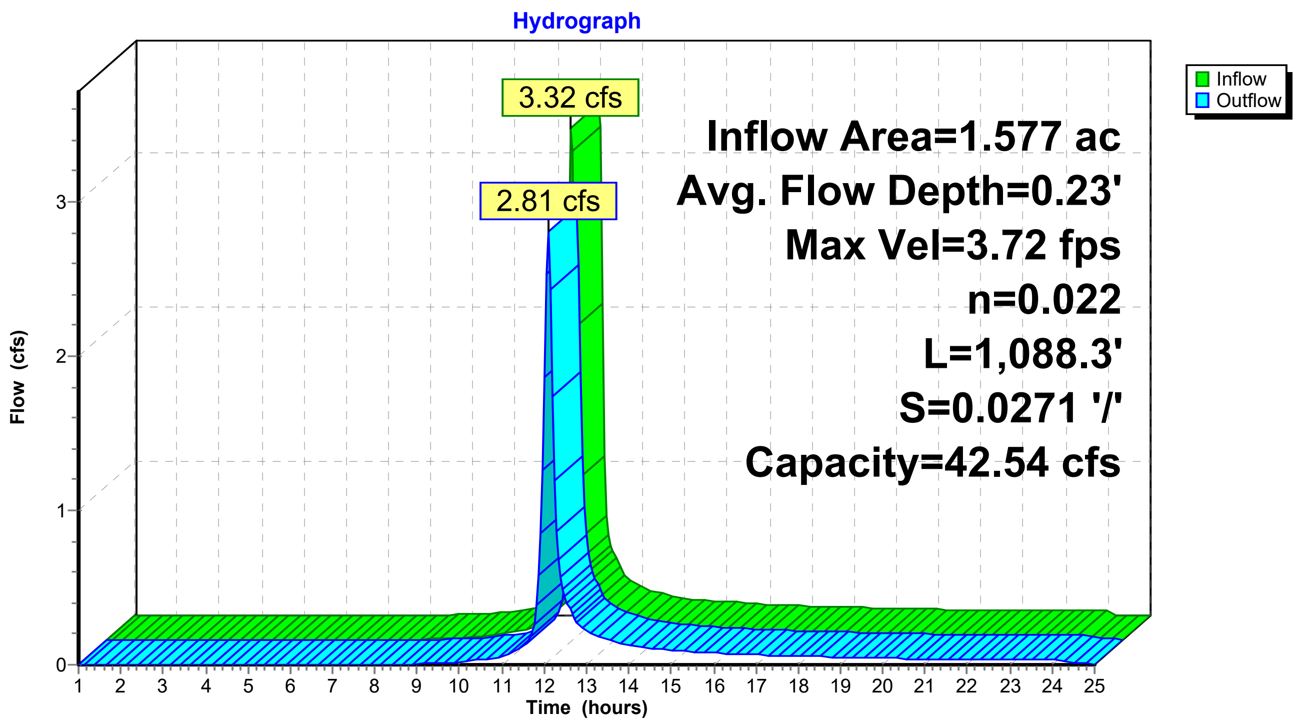
Inflow Area = 1.577 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-yr event
Inflow = 3.32 cfs @ 11.97 hrs, Volume= 0.162 af
Outflow = 2.81 cfs @ 12.10 hrs, Volume= 0.161 af, Atten= 15%, Lag= 7.5 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 19.8 min

Peak Storage= 847 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 42.54 cfs

3.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 2.0 '/' Top Width= 7.00'
Length= 1,088.3' Slope= 0.0271 '/'
Inlet Invert= 6,889.00', Outlet Invert= 6,859.50'

Reach 5R: CH-1



APPENDIX I-B

Active Area Run-On Diversion Berm Design

Written by: **A. Taylor** Date: **10/11/2021** Reviewed by: **C. Jordan** Date: **10/15/2021**

Client: **Tri-State** Project: **Escalante Generating Station** Project No.: **DE0440** Phase No.: **10**

APPENDIX I-B
ACTIVE AREA RUN-ON CONTROL DESIGN, ROROC PLAN
ESCALANTE GENERATING STATION
PREWITT, NEW MEXICO

BETH ANN GROSS
NEW MEXICO
17673
LICENSED PROFESSIONAL ENGINEER

Beth Ann Gross

10/30/2021

1 INTRODUCTION

The purpose of this calculation package is to present the analysis for the sizing of the temporary diversion berms to be utilized as necessary at the active face (i.e., diversions around areas of exposed waste) during disposal activities at the Active Landfill, a coal combustion residuals (CCR) landfill at the Escalante Generating Station (EGS or Site).

Diversion berms are temporary soil berms that will be constructed as necessary up-gradient from the active working face (exposed waste areas) to intercept storm water runoff before it comes in contact with waste. If these temporary diversion berms are used, they will route the non-contact (clean) storm water around active areas into the surface water management system and away from the active face.

To provide operator flexibility to adapt to differing conditions, rather than provide just one required design berm size for run-on control, this calculation package provides the sizing needed for a variety of cases. These are intended to capture the expected range of operational conditions, while providing operational flexibility to choose the appropriate minimum berm and ditch sizes based on the conditions that exist up-gradient from each specific active area at any point in time. As such, for these analyses, the maximum up-gradient drainage area which can be managed by each given diversion berm size, and for the 25-year, 24-hour rainfall event, is calculated for run-on controls to meet the requirements of 40 CFR § 254 and 261.

2 ASSUMPTIONS AND PROCEDURES

The section discusses the assumptions and procedures for the design of the temporary diversion berms and contact water management ditch.

Active Face Run-On Diversion Berms

It is assumed that temporary diversion berms will be installed with flow line (longitudinal) slopes ranging from 0.5% to 2%. Temporary diversion berms will be placed as needed upgradient from the active working face. The temporary diversion berms are assumed to be "tack-on" berms with a 2 horizontal to 1 vertical (2H:1V) side slope ratio to form a vee-shaped channel. A channel depth of 1.0 feet was assumed (i.e., this is a fixed parameter of these calculations).

The Rational Method is used to calculate the peak surface water. This approach is considered appropriate because it is expected that drainage areas to a given diversion berm will be on the order of 20 acres or less. The channels were sized assuming they are flowing full, which is considered adequate since they are interior, temporary site features and given other conservative selections of parameters as documented herein. The following steps were utilized to calculate the drainage areas that each diversion berm can accommodate.

1. Compute the discharge capacity of diversion berms with 0.5%, 1%, 1.5%, and 2% slopes using Manning's Equation for open channel flow.
2. Apply the Rational Method to compute the upgradient drainage area that would produce the discharge capacity calculated in Step 1.

Manning's equation was used to estimate the peak discharge capacity of the vee-shaped channel created by a temporary diversion berm. Manning's equation (Chow, 1959) is expressed as:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2} \quad (1)$$

where:

Q	=	discharge (cfs),
n	=	Manning's roughness coefficient,
A	=	area of cross-section of flow (ft^2),
P	=	wetted perimeter (ft),
R	=	hydraulic radius = A/P (ft), and
S	=	longitudinal slope (ft/ft).

The peak discharge from the contributing drainage area by the Rational Method can be computed by:

$$Q = C \times C_f \times i \times A \quad (2)$$

where:

Q	=	peak design discharge (cfs),
C	=	runoff coefficient (dimensionless),
C_f	=	frequency factor based on recurrence Interval
i	=	design rainfall intensity (in/hr), and
A	=	drainage area (acres).

For this 2021 update of the ROROC Plan, the design rainfall intensity in Equation (2) was found using the National Oceanic and Atmospheric Association (NOAA) Point Precipitation Data Frequency Server information for the EGS. From this source, the 25-year intensity is 5.45 inches per hour for a storm with a 5-minute duration, as shown in Attachment 1 of this package. Equation (2) was rearranged, and the watershed drainage area was back-calculated for each potential flow line slope of a temporary diversion berm.

3 DESIGN PARAMETERS

This section discusses the justification behind the selected design parameters for the temporary diversion berms.

The Manning's roughness coefficient (n) for the diversion berm was selected as 0.02 for unlined, bare soil channels with flow depths larger than 0.5 ft, as shown in Table 1. The peak discharge flowing to the channel is calculated using the Rational Method.

A runoff coefficient of C = 0.5 was selected to model the diversion berm scenario for graded areas with no plant cover and clayey soils having an average slope of 0% to 5% as shown in Table 2. A runoff coefficient frequency factor of $C_f = 1.1$ was selected based as shown in Table 3.

A minimum time of concentration of 6 minutes was used for the rainfall intensity by Equation (2) based on TR-55 guidance.

4 RESULTS

Diversion Berms

The results of the temporary diversion berm calculations are summarized in Table 4 for each assumed flow line slope. The calculated drainage areas represent the maximum drainage area that each temporary diversion berm configuration can accommodate for the 25-year design rainfall event. It should be noted that if, during operations, a larger area than those calculated in Table 4 will be draining towards the active face, multiple diversion berms may be constructed to comply with the drainage area requirements presented herein for the given berm height and the selected flow line slope. It is also noted that multiple berms and relative low diversion berm flow line slopes may be needed for a given drainage area to reduce erosion potential.

5 REFERENCES

Chow, V.T. (1959), *Open Channel-Hydraulics,* McGraw-Hill.

TABLES

Table 1. Manning's Roughness Coefficients for Artificial Channels

Lining Category	Lining Type	"n" at various flow depths		
		0 - 0.5 ft	0.5 - 2.0 ft	>2.0 ft
Rigid	Concrete	0.015	0.013	0.013
	Grouted Riprap	0.040	0.030	0.028
	Stone Masonry	0.042	0.032	0.030
	Soil Cement	0.025	0.022	0.020
	Asphalt	0.018	0.016	0.016
Unlined	Bare Soil	0.023	0.020	0.020
	Rock Cut	0.045	0.035	0.025
Temporary[1]	Woven Paper Net	0.016	0.015	0.015
	Jute Net	0.028	0.022	0.019
	Fiberglass Roving	0.028	0.022	0.019
	Straw with Net	0.065	0.033	0.025
	Curled Wood Mat	0.066	0.035	0.028
	Synthetic Mat	0.036	0.025	0.021
Gravel	1-inch D_{50}	0.044	0.033	0.030
	2-inch D_{50}	0.066	0.041	0.034
Rock Riprap	6-inch D_{50}	0.104	0.069	0.035
	12-inch D_{50}	---	0.078	0.040

Source: Federal Highway Administration, Design of Roadside Channels with Flexible Linings, HEC-15, 1988.
Note: Values listed are representative values for the respective depth ranges. Manning's "n" varies with the flow depth.
[1]Some "temporary" linings become permanent when buried.

Table 2. Runoff Coefficients for Rational Method

Description of Area	Runoff Coefficients "C"
Lawns:	
Sandy soil, flat, 2%	0.10
Sandy soil, average, 2 - 7%	0.15
Sandy soil, steep, > 7%	0.20
Clay soil, flat, 2%	0.17
Clay soil, average, 2 - 7%	0.22
Clay soil, steep, > 7%	0.35
Business:	
Downtown areas	0.95
Neighborhood areas	0.70
Residential:	
Single-family areas	0.50
Multi-units, detached	0.60
Multi-units, attached	0.70
Suburban	0.40
Apartment dwelling areas	0.70
Industrial:	
Light areas	0.70
Heavy areas	0.80
Parks and cemeteries	0.25
Playgrounds	0.35
Railroad yard areas	0.40
Unimproved areas (forest)	0.30
Streets:	
Asphalt and Concrete	0.95
Brick	0.85
Drives, walks, and roofs	0.95
Gravel areas	0.50
Graded or no plant cover	
Sandy soil, flat, 0 - 5%	0.30
Sandy soil, flat, 5 - 10%	0.40
Clayey soil, flat, 0 - 5%	0.50
Clayey soil, average, 5 - 10%	0.60

Table 3. Rational Method Runoff Coefficient Frequency Factors

Recurrence Interval (years)	Frequency Factor, C_f
25	1.1
50	1.2
100	1.25
Note: The product of C_f times C shall not exceed 1.0.	

Table 4. Diversion Berm Drainage Area Sizing

Depth of Channel (ft)	Diversion Berm Flow Line Slope (%)	Maximum Predicted Flow Velocity (ft/s)	Maximum Predicted Flow Rate (cfs)	Maximum Drainage Area (ac)
2	0.5%	5.05	55.58	9.9
	1.0%	7.15	78.60	14.0
	1.5%	8.75	96.27	17.1
	2.0%	10.11	111.16	19.8

Note: The back-calculated maximum allowable drainage area for the channel dimensions (geometry and slope) given above, as calculated by the Rational Method, assumes that the channel created by the diversion berm is flowing full when conveying the peak discharge during the 25-year rainfall event and from the maximum contributing drainage area.

FIGURES

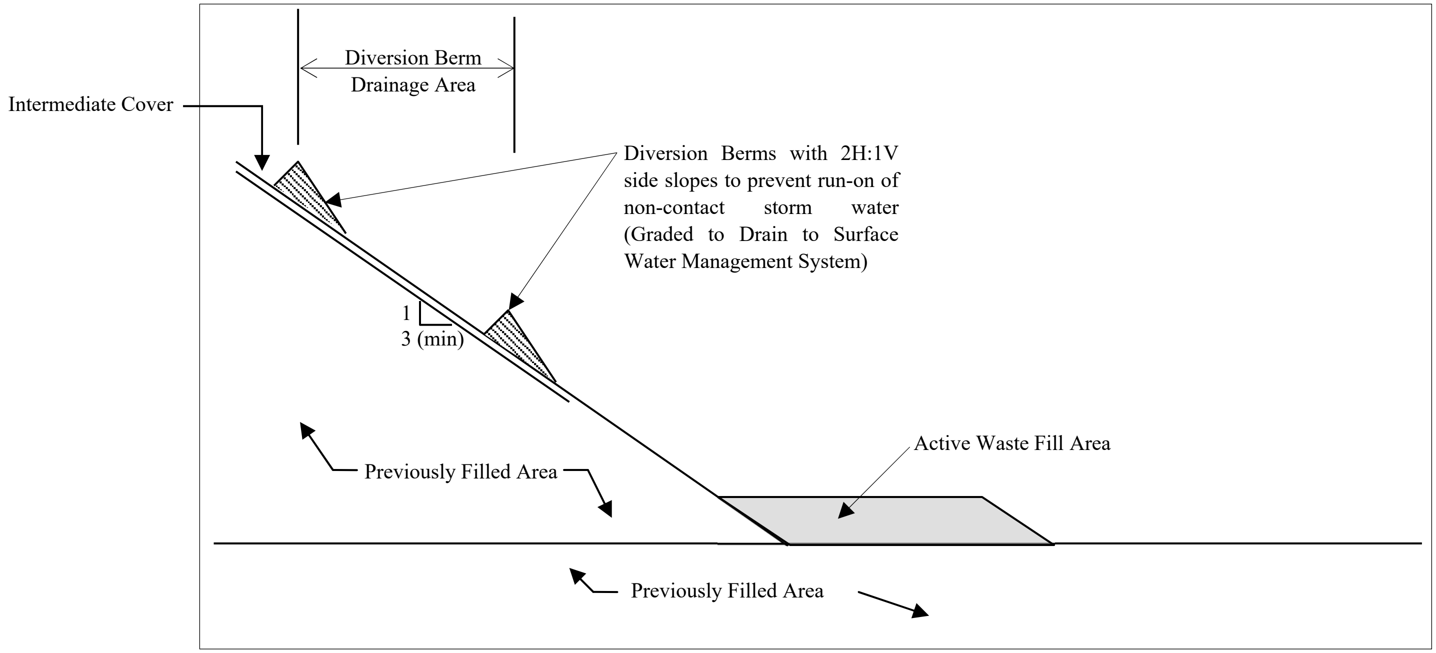


Figure 1. Typical/Schematic (Conceptual) of Phased Active Fill Area Section

(portraying possible conditions where diversion berms may be used) (Not to Scale (NTS))

APPENDIX I-C

Perimeter Slope Run-Off Berms

Written by:	A. Taylor	Date:	10/11/2021	Reviewed by:	C. Jordan	Date:	10/15/2021
Client:	Tri-State	Project:	Escalante Generating Station	Project No.:	DE0440	Task No.:	10

APPENDIX I-C
PERIMETER RUN-OFF CONTROL CALCULATIONS
ESCALANTE GENERATING STATION
PREWITT, NEW MEXICO

Beth Ann Gross

10/30/2021

1. PURPOSE

This calculation package is prepared in support of the Active Landfill, a coal combustion residuals (CCR) landfill located at the Escalante Generating Station (EGS) in Prewitt, New Mexico. The analyses presented herein were performed to demonstrate that the perimeter stormwater controls for the Active Landfill have the capacity to control non-contact water runoff generated during the 25-year, 24-hour storm event. This calculation package is provided as an appendix to the EGS Run-On Run-Off Control System (ROROCS) Plan.

Non-contact water features include the channels along the exterior of the landfill, culverts, downchutes, and open channel conveyance features on top of the landfill cover including side slope drainage channels and downchutes.

2. SURFACE WASTER SYSTEM COMPONENTS

Various non-contact water features collect and convey surface water away from the active face of the landfill. Sizing and hydraulic design of these features is presented in Section 5. Interim non-contact water features were sized and designed based on features provided for the final cover system. Interim features will be constructed of intermediate cover until final cover is installed (Figure 1).

Side Slope Tack On Benches: Side slope tack on benches are graded into the 3H:1V[1] side slopes of the cover system and route non-contact water run-off from the side slopes towards the down chutes. The side slope drainage terraces are grass-lined vee-shaped channels with 3H:1V side slopes on the up slope side and varying side slopes on the down slope side. Each drainage terrace has a maximum depth of 1.0 feet and a longitudinal slope of 2 percent.

Perimeter Drainage Channels: The perimeter drainage channels route run-off from the landfill top deck and side slopes towards the storage ponds. The perimeter drainage channels are located around the landfill's 3H:1V side slopes and run along the sides of the landfill. Surface water reaches the perimeter drainage channels via the downchutes or directly from sheet flow over the landfill side slopes.

3. SOFTWARE METHODOLOGY

The surface water runoff hydrographs, channel capacity, and pond routing for each drainage area were calculated using hydrologic and hydraulic procedures presented in the *Urban Hydrology for Small Wetlands Technical Release 55 (TR-55)* [Soil Conservation Service (SCS), 1986]; Manning's kinematic equation; and other recognized engineering procedures encoded in HydroCAD™ (HydroCAD) software [HydroCAD, 2019].

4. DESIGN AND CALCULATION PARAMETERS

4.1 Rainfall Distribution and Depths:

The rainfall depth corresponding to the 25-year, 24-hour storm was selected based on the information from the NOAA Atlas 14 Point Precipitation Frequency Estimates (NOAA Hydrometeorological Design Studies Center, retrieved 11-October-2021). The 25-year, 24-hour rainfall depth is 2.24 inches and the 100-year, 24-hour rainfall depth is 2.82 inches. The rainfall intensity used in the analysis as the SCS Type II distribution.

4.2 Catchment Areas, Curve Numbers and Times of Concentration

The surface conditions of the catchment areas were assumed to be vegetated and graded to drain toward the swales on either side of the existing access road. The existing soils were verified to be hydrologic soil group (HSG) Type D based on the United States Department

[1] H:V refers to the horizontal to vertical dimension ratio. In this case, 3H:1V represents 3 units of horizontal dimension to 1 unit of vertical dimension.

of Agriculture (USDA) NRCS Web Soil Survey. The runoff curve numbers for the catchment were assumed to be 89. Catchment sizes are described in Table 1. The drainage areas for this analysis are presented in Figure 1. The time of concentration was assumed to be 6 minutes, the minimum value allowed in TR-55.

4.3 Open Channel Conveyances

The open channel conveyances were assumed to be lined with clean earth for the channels along the cap and the tack on berms, while the downchutes were assumed to be lined with riprap. The channels were modeled with a Manning's coefficient of 0.035 for rip rap and 0.022 for clean earth lined channels based on Chow [1959]. Table 2 presents the channel dimensions for each of the proposed channels. Figure 2 presents channel identification nomenclature.

5. RESULTS AND CONCLUSIONS

5.1 Open Channel Conveyances

The calculated freeboard depths are within the channel banks for the 25-yr, 24-hr design storm event. Open channel conveyance features contain clean earth or rip rap lining based on the calculated velocities. The detailed HydroCAD modeling calculations that support the results presented in Table 4.

5.2 Detention Ponds

The detention ponds located on the west side of the CCR disposal area within the landfill footprint were evaluated for the hydraulic capacity with the new cover system. The North and South Ponds have enough hydraulic capacity to contain the 25-year, 24-hour design storm event without overtopping.

6. REFERENCES

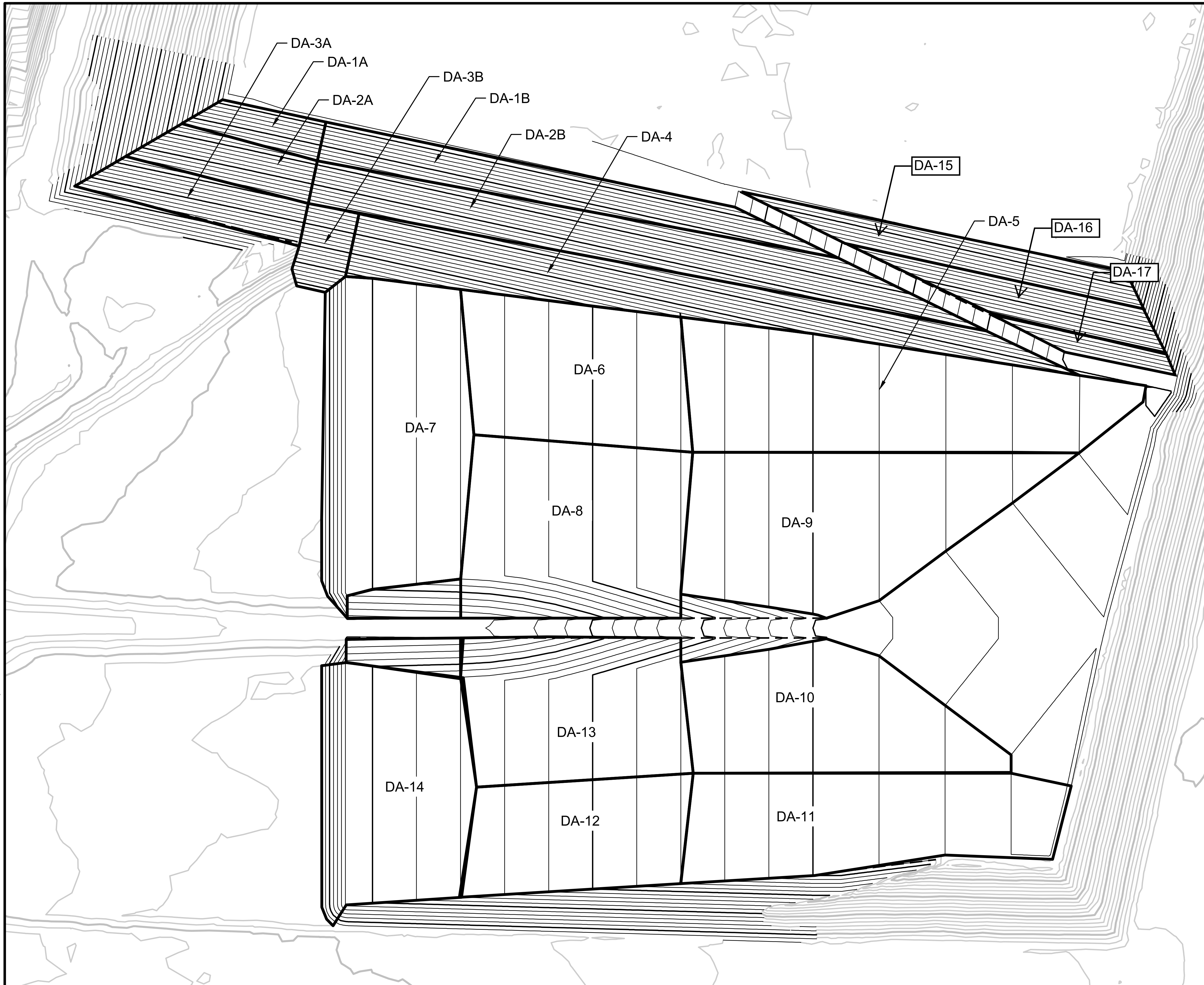
Bonnin, G.M. et al., "NOAA Atlas 14, Volume 2, Version 3, Point Precipitation Frequency Estimates", NOAA National Weather Service. Obtained October 11, 2021.

HydroCAD Software Solutions LLC. (2015). "HydroCAD Stormwater Modeling System, Version 10". Chocorua, New Hampshire.

NRCS. 2016. "Web Soil Survey". http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

SCS TR-55. (1986). *Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55),* 2nd Ed., United States Department of Agriculture, Soil Conservation Service. Washington, D.C.

FIGURES



LEGEND

6080	EXISTING GROUND MAJOR CONTOUR (5')
	EXISTING GROUND MINOR CONTOUR (1')
6090	PROPOSED GRADING MAJOR CONTOURS (5')
6072	PROPOSED GRADING MINOR CONTOURS (1')
	DRAINAGE AREA LIMITS

0 1
SCALE IN FEET

ESCONDIDO CCR LANDFILL
RUN-ON RUN-OFF CONTROL PLAN
DRAINAGE AREA LAYOUT

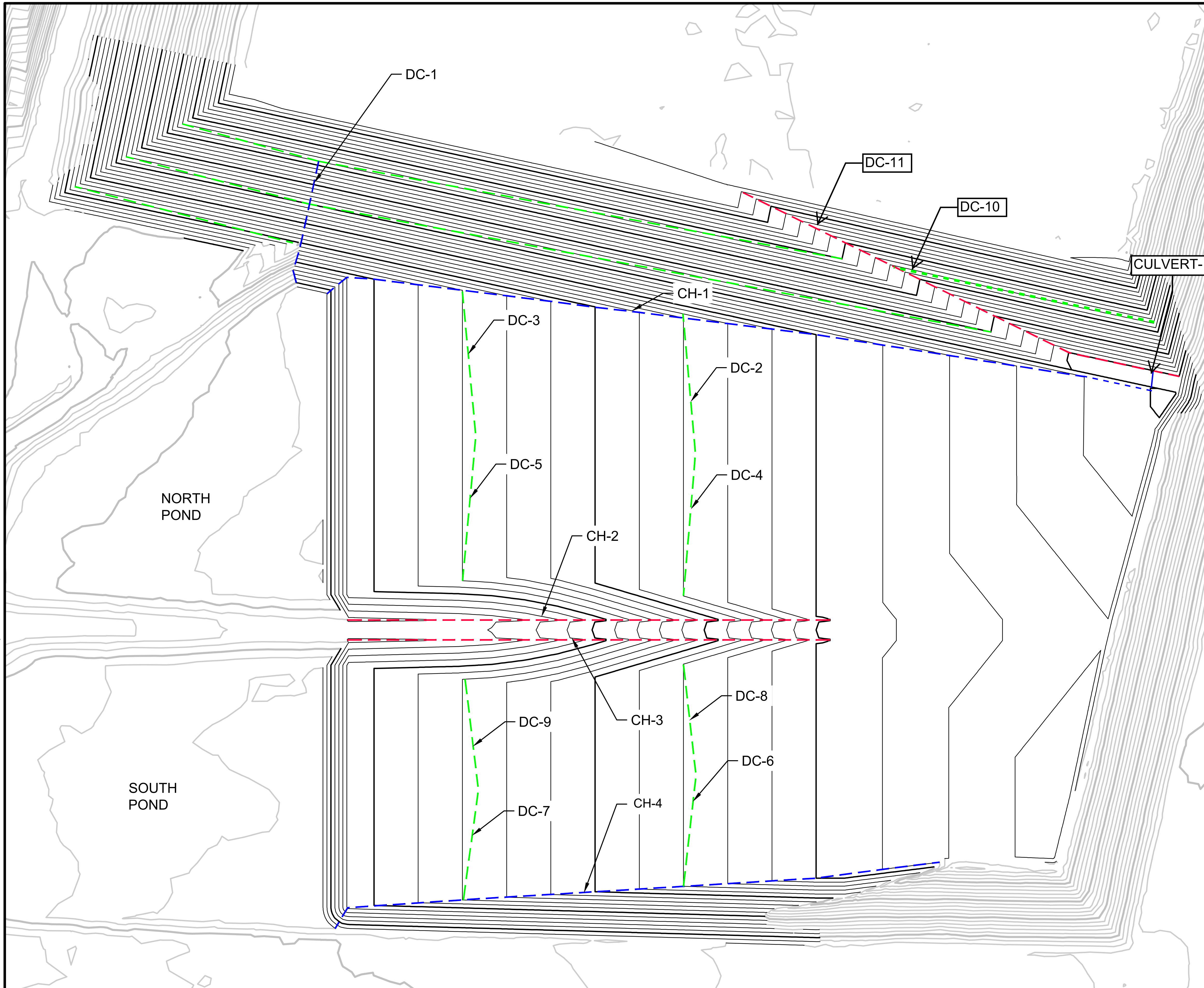
Geosyntec consultants

FIGURE 1

PROJECT NO: DE 0440

OCTOBER 2021

C:\USERS\CJORDAN\DESKTOP\FIG 1 - ESCONDIDO DA - Last Saved by: CJordan on 10/18/21



LEGEND

6080	EXISTING GROUND MAJOR CONTOUR (5')
	EXISTING GROUND MINOR CONTOUR (1')
6090	PROPOSED GRADING MAJOR CONTOURS (5')
6072	PROPOSED GRADING MINOR CONTOURS (1')
	TACK ON BERM / DRAINAGE BENCH
	ROADSIDE SWALE / V-NOTCH DITCH
	DOWNCHUTE / TRAPEZOIDAL SWALE
	CULVERT

0 150
SCALE IN FEET

ESCONDIDO CCR LANDFILL
RUN-ON RUN-OFF CONTROL PLAN
STORM WATER FEATURE LAYOUT

Geosyntec consultants

FIGURE 2

PROJECT NO: DE 0440 | OCTOBER 2021

TABLES

Table 1: Drainage Areas and Curve Numbers

Drainage Area	Grass, Good Condition	
	Curve Number {CN}	Drainage Area {A} (ac)
DA-1A	89	0.235
DA-2A	89	0.388
DA-3A	89	0.472
DA-1B	89	0.868
DA-2B	89	1.413
DA-3B	89	0.219
DA-4	89	1.578
DA-5	89	2.37
DA-6	89	1.604
DA-7	89	0.25
DA-8	89	2.027
DA-9	89	2.34
DA-10	89	1.711
DA-11	89	1.848
DA-12	89	1.259
DA-13	89	1.655
DA-14	89	0.752
DA-15	89	0.483

Table 2: Channel Dimensions

Channel Dimensions						
Channel ID	**Bottom Width {b} (ft)**	**Depth {D} (ft)**	**Left Side Slope {Z_1H:V}**	**Right Side Slope {Z_2H:V}**	**Top Width {T} (ft)**	**Channel Longitudinal Slope {S} (ft/ft)**
DC-1	1.0	1.0	3.0	3.0	7.0	0.36
DC-2	0.0	1.0	3.0	3.0	6.0	0.01
DC-3	0.0	1.0	3.0	3.0	6.0	0.01
DC-4	0.0	1.0	3.0	3.0	6.0	0.01
DC-5	0.0	1.0	3.0	3.0	6.0	0.01
DC-6	0.0	1.0	3.0	3.0	6.0	0.01
DC-7	0.0	1.0	3.0	3.0	6.0	0.01
DC-8	0.0	1.0	3.0	3.0	6.0	0.01
DC-9	0.0	1.0	3.0	3.0	6.0	0.01
DC-10	0.0	1.0	3.0	3.0	6.0	0.04
DC-11	1.0	1.0	3.0	3.0	9.0	0.07
CH-1	2.0	1.0	3.0	3.0	8.0	0.03
CH-2	0.0	1.0	3.0	3.0	7.0	0.05
CH-3	2.0	1.0	3.0	3.0	8.0	0.04
CH-4	0.0	1.0	3.0	3.0	6.0	0.04

Table 3: Channel Inflows

Channel Inflows					
Channel Reach	Rainfall		Contribution of Flow		Design Flow (cfs)
	Design Storm Event (years)	Rainfall for 24-Hour Storm {i} (in)	HydroCAD Node ID	Peak Runoff (cfs)	
DC-1	25-yr	2.24	11S	0.29	4.16
			12S	0.48	
			13S	0.58	
			14S	1.07	
			15S	1.74	
DC-2			20S	2.91	2.91
DC-3			19S	1.97	1.97
DC-4			25S	2.49	2.49
DC-5			26S	2.88	2.88
DC-6			30S	2.27	2.27
DC-7			31S	1.55	1.55
DC-8			37S	2.1	2.1
DC-9			38S	2.03	2.03
DC-10			17S	1.58	1.58
DC-11			21S	1.02	1.02
CH-1			22R	2.66	4.46
			23R	1.8	
CH-2			28R	2.27	4.89
			29R	2.62	
CH-3			32R	2.1	3.52
			33R	1.42	
CH-4			42R	1.94	3.82
			43R	1.88	

Table 4: Channel Capacity

Channel Capacity - 25 Year												
Channel ID	Channel Lining	Trial Flow Depth {d} (ft)	Manning's n {n}	Flow Area {A} (ft^2)	Wetted Perimeter {P} (ft)	Hydraulic Radius {R} (ft)	Velocity {V} (ft/s)	Calculated Channel Capacity {Q} (cfs)	Design Channel Flow {Q} (cfs)	Calculated Capacity > Design Flow?	Freeboard (in)	Permissible Shear Stress {τd} (psf)
DC-1	Earth, clean	0.3	0.022	0.57	2.90	0.20	13.75	7.83	4.16	yes	8.4	6.7
DC-2	Earth, clean	0.65	0.022	1.2675	4.11	0.31	3.09	3.92	2.91	yes	4.2	0.4
DC-3	Earth, clean	0.6	0.022	1.08	3.79	0.28	2.93	3.16	1.97	yes	4.8	0.4
DC-4	Earth, clean	0.60	0.022	1.08	3.79	0.28	2.93	3.16	2.49	yes	4.8	0.4
DC-5	Earth, clean	0.65	0.022	1.2675	4.11	0.31	3.09	3.92	2.88	yes	4.2	0.4
DC-6	Earth, clean	0.60	0.022	1.08	3.79	0.28	2.93	3.16	2.27	yes	4.8	0.4
DC-7	Earth, clean	0.50	0.022	0.75	3.16	0.24	2.60	1.95	1.55	yes	6.0	0.3
DC-8	Earth, clean	0.60	0.022	1.08	3.79	0.28	2.93	3.16	2.1	yes	4.8	0.4
DC-9	Earth, clean	0.60	0.022	1.08	3.79	0.28	2.93	3.16	2.03	yes	4.8	0.4
DC-10	Earth, clean	0.60	0.022	1.08	3.79	0.28	5.56	6.00	1.58	yes	4.8	1.3
DC-11	Earth, clean	0.60	0.022	1.68	4.79	0.35	8.97	15.07	1.02	yes	4.8	2.7
CH-1	Riprap	0.45	0.035	1.5075	4.85	0.31	3.65	5.50	4.46	yes	6.6	1.0
CH-2	Riprap	0.65	0.035	1.2675	4.11	0.31	4.31	5.47	4.89	yes	4.2	2.0
CH-3	Riprap	0.4	0.035	1.28	4.53	0.28	3.51	4.49	3.52	yes	7.2	0.9
CH-4	Riprap	0.65	0.035	1.2675	4.11	0.31	3.72	4.71	3.82	yes	4.2	1.5

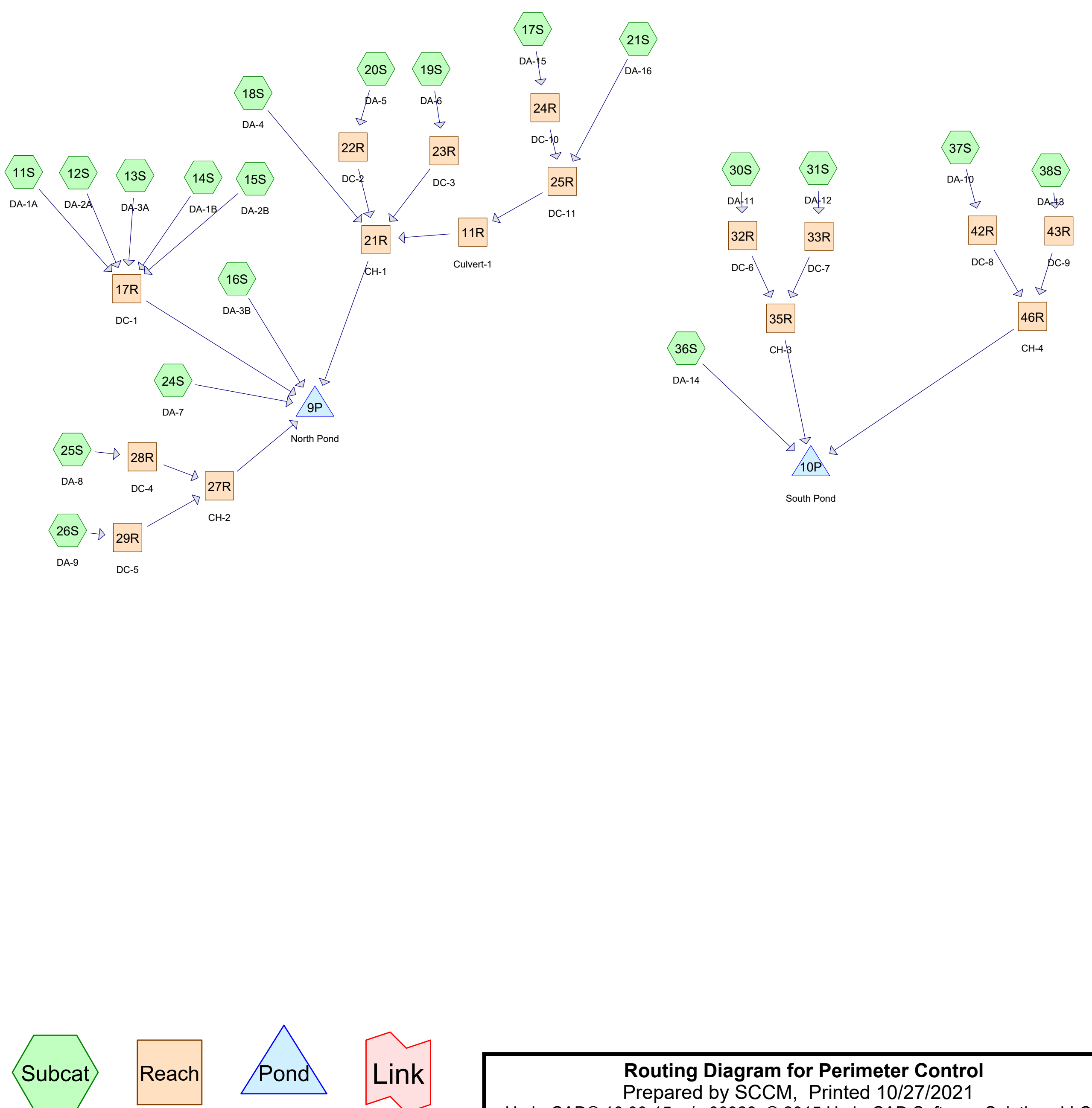
Table 5: North Pond Stage Storage

North Pond Stage Storage			
Elevation (ft)	Surface Area (sq.ft)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)
6846	1,500	0	0
6847	10,897	6,199	6,199
6848	44,958	27,928	34,126
6849	88,950	66,954	101,080
6850	122,287	105,619	206,699

Table 6: South Pond Stage Storage

South Pond Stage Storage			
Elevation (ft)	Surface Area (sq.ft)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)
6846	56,006	0	0
6847	105,818	80,912	80,912
6848	155,512	130,665	211,577
6849	194,586	175,049	386,626
6850	221,844	208,215	594,841

HydroCAD Model



Routing Diagram for Perimeter Control
Prepared by SCCM, Printed 10/27/2021
HydroCAD® 10.00-15 s/n 00928 © 2015 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
15.378	89	(12S, 13S, 15S, 16S, 19S, 20S, 24S, 25S, 30S, 31S, 36S, 37S)
6.256	89	<50% Grass cover, Poor, HSG D (11S, 14S, 17S, 18S, 21S, 26S)
1.655	89	>75% Grass cover, Good, HSG D (38S)
23.289	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
7.911	HSG D	11S, 14S, 17S, 18S, 21S, 26S, 38S
15.378	Other	12S, 13S, 15S, 16S, 19S, 20S, 24S, 25S, 30S, 31S, 36S, 37S
23.289		**TOTAL AREA**

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	0.000	0.000	15.378	15.378		12S, 13S, 15S, 16S, 19S, 20S, 24S, 25S, 30S, 31S, 36S, 37S
0.000	0.000	0.000	6.256	0.000	6.256	<50% Grass cover, Poor	11S, 14S, 17S, 18S, 21S, 26S
0.000	0.000	0.000	1.655	0.000	1.655	>75% Grass cover, Good	38S
0.000	**0.000**	**0.000**	**7.911**	**15.378**	**23.289**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	11R	6,890.00	6,889.90	20.0	0.0050	0.011	12.0	0.0	0.0

Time span=1.00-25.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 11S: DA-1A Runoff Area=10,241 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=0.50 cfs 0.024 af

Subcatchment 12S: DA-2A Runoff Area=16,901 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=0.82 cfs 0.040 af

Subcatchment 13S: DA-3A Runoff Area=20,560 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=0.99 cfs 0.048 af

Subcatchment 14S: DA-1B Runoff Area=37,810 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=1.83 cfs 0.089 af

Subcatchment 15S: DA-2B Runoff Area=61,550 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=2.98 cfs 0.145 af

Subcatchment 16S: DA-3B Runoff Area=9,540 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=0.46 cfs 0.022 af

Subcatchment 17S: DA-15 Runoff Area=0.752 ac 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=1.58 cfs 0.077 af

Subcatchment 18S: DA-4 Runoff Area=68,738 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.32 cfs 0.162 af

Subcatchment 19S: DA-6 Runoff Area=69,870 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.38 cfs 0.164 af

Subcatchment 20S: DA-5 Runoff Area=2.370 ac 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=4.99 cfs 0.243 af

Subcatchment 21S: DA-16 Runoff Area=21,046 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=1.02 cfs 0.050 af

Subcatchment 24S: DA-7 Runoff Area=0.250 ac 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=0.53 cfs 0.026 af

Subcatchment 25S: DA-8 Runoff Area=88,296 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=4.27 cfs 0.208 af

Subcatchment 26S: DA-9 Runoff Area=101,930 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=4.93 cfs 0.240 af

Subcatchment 30S: DA-11 Runoff Area=80,499 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.89 cfs 0.189 af

Subcatchment 31S: DA-12 Runoff Area=54,842 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=2.65 cfs 0.129 af

Subcatchment 36S: DA-14 Runoff Area=79,154 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.83 cfs 0.186 af

Subcatchment 37S: DA-10 Runoff Area=74,531 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.60 cfs 0.175 af

Subcatchment 38S: DA-13 Runoff Area=72,092 sf 0.00% Impervious Runoff Depth=1.23"
Tc=6.0 min CN=89 Runoff=3.49 cfs 0.170 af

Reach 11R: Culvert-1 Avg. Flow Depth=0.58' Max Vel=4.03 fps Inflow=1.92 cfs 0.127 af
12.0" Round Pipe n=0.011 L=20.0' S=0.0050 '/' Capacity=2.98 cfs Outflow=1.92 cfs 0.127 af

Reach 17R: DC-1 Avg. Flow Depth=0.36' Max Vel=9.40 fps Inflow=7.11 cfs 0.346 af
n=0.035 L=180.0' S=0.3556 '/' Capacity=67.66 cfs Outflow=7.07 cfs 0.346 af

Reach 21R: CH-1 Avg. Flow Depth=0.64' Max Vel=4.36 fps Inflow=12.56 cfs 0.696 af
n=0.035 L=1,213.0' S=0.0338 '/' Capacity=27.78 cfs Outflow=10.71 cfs 0.695 af

Reach 22R: DC-2 Avg. Flow Depth=0.71' Max Vel=3.26 fps Inflow=4.99 cfs 0.243 af
n=0.022 L=240.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=4.74 cfs 0.243 af

Reach 23R: DC-3 Avg. Flow Depth=0.61' Max Vel=2.96 fps Inflow=3.38 cfs 0.164 af
n=0.022 L=240.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=3.18 cfs 0.164 af

Reach 24R: DC-10 Avg. Flow Depth=0.54' Max Vel=1.61 fps Inflow=1.58 cfs 0.077 af
n=0.022 L=400.0' S=0.0036 '/' Capacity=7.34 cfs Outflow=1.35 cfs 0.077 af

Reach 25R: DC-11 Avg. Flow Depth=0.13' Max Vel=4.33 fps Inflow=2.00 cfs 0.127 af
n=0.022 L=614.0' S=0.0717 '/' Capacity=80.86 cfs Outflow=1.92 cfs 0.127 af

Reach 27R: CH-2 Avg. Flow Depth=0.76' Max Vel=4.76 fps Inflow=8.72 cfs 0.448 af
n=0.035 L=730.0' S=0.0493 '/' Capacity=17.20 cfs Outflow=8.07 cfs 0.448 af

Reach 28R: DC-4 Avg. Flow Depth=0.67' Max Vel=3.14 fps Inflow=4.27 cfs 0.208 af
n=0.022 L=240.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=4.04 cfs 0.208 af

Reach 29R: DC-5 Avg. Flow Depth=0.71' Max Vel=3.25 fps Inflow=4.93 cfs 0.240 af
n=0.022 L=240.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=4.68 cfs 0.240 af

Reach 32R: DC-6 Avg. Flow Depth=0.65' Max Vel=3.07 fps Inflow=3.89 cfs 0.189 af
n=0.022 L=180.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=3.74 cfs 0.189 af

Reach 33R: DC-7 Avg. Flow Depth=0.56' Max Vel=2.79 fps Inflow=2.65 cfs 0.129 af
n=0.022 L=180.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=2.54 cfs 0.129 af

Reach 35R: CH-3 Avg. Flow Depth=0.45' Max Vel=3.72 fps Inflow=6.28 cfs 0.318 af
n=0.035 L=930.0' S=0.0366 '/' Capacity=28.90 cfs Outflow=5.42 cfs 0.318 af

Reach 42R: DC-8 Avg. Flow Depth=0.63' Max Vel=3.01 fps Inflow=3.60 cfs 0.175 af
n=0.022 L=180.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=3.46 cfs 0.175 af

Reach 43R: DC-9 Avg. Flow Depth=0.62' Max Vel=2.98 fps Inflow=3.49 cfs 0.170 af
n=0.022 L=180.0' S=0.0100 '/' Capacity=12.32 cfs Outflow=3.35 cfs 0.170 af

Reach 46R: CH-4 Avg. Flow Depth=0.72' Max Vel=3.95 fps Inflow=6.81 cfs 0.345 af
n=0.035 L=930.0' S=0.0366 '/' Capacity=14.81 cfs Outflow=5.92 cfs 0.345 af

Pond 9P: North Pond Peak Elev=6,848.57' Storage=66,914 cf Inflow=21.87 cfs 1.536 af
Outflow=0.00 cfs 0.000 af

Pond 10P: South Pond Peak Elev=6,846.53' Storage=36,985 cf Inflow=12.56 cfs 0.849 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 23.289 ac Runoff Volume = 2.387 af Average Runoff Depth = 1.23"
100.00% Pervious = 23.289 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 11S: DA-1A

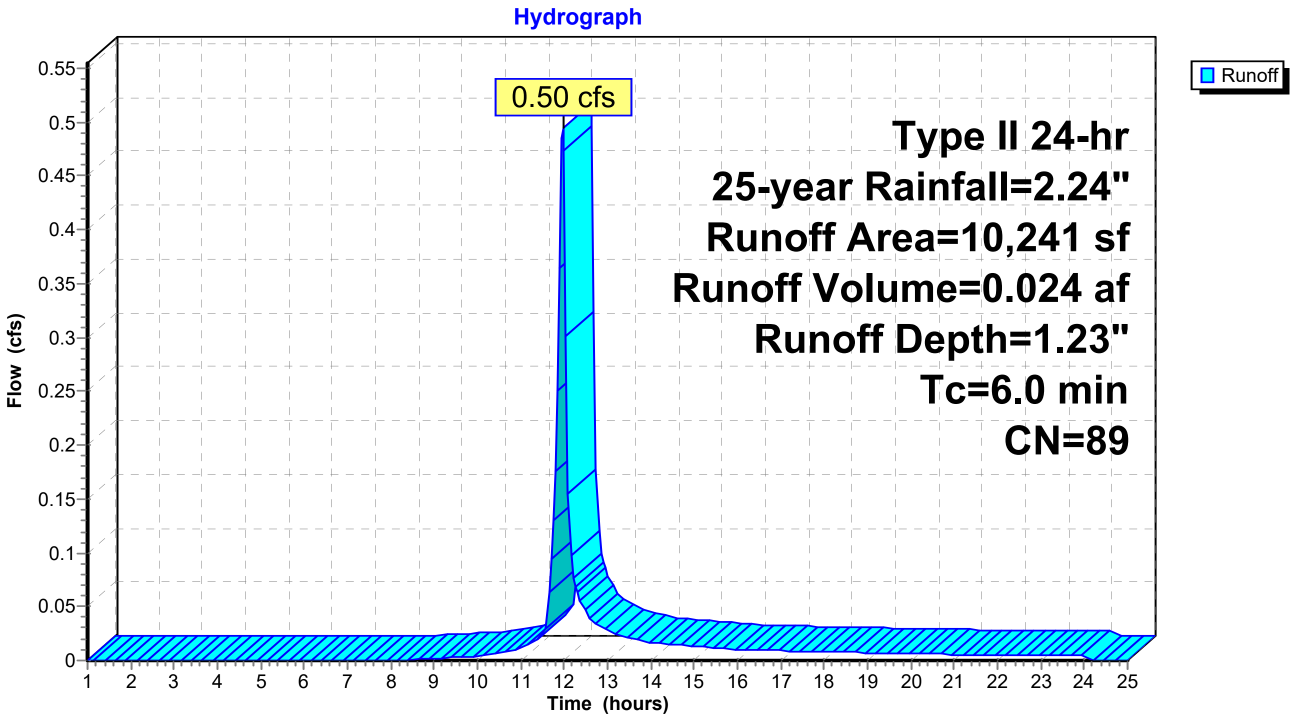
Runoff = 0.50 cfs @ 11.97 hrs, Volume= 0.024 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (sf)	CN	Description
10,241	89	<50% Grass cover, Poor, HSG D
10,241		100.00% Pervious Area

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

Subcatchment 11S: DA-1A



Summary for Subcatchment 12S: DA-2A

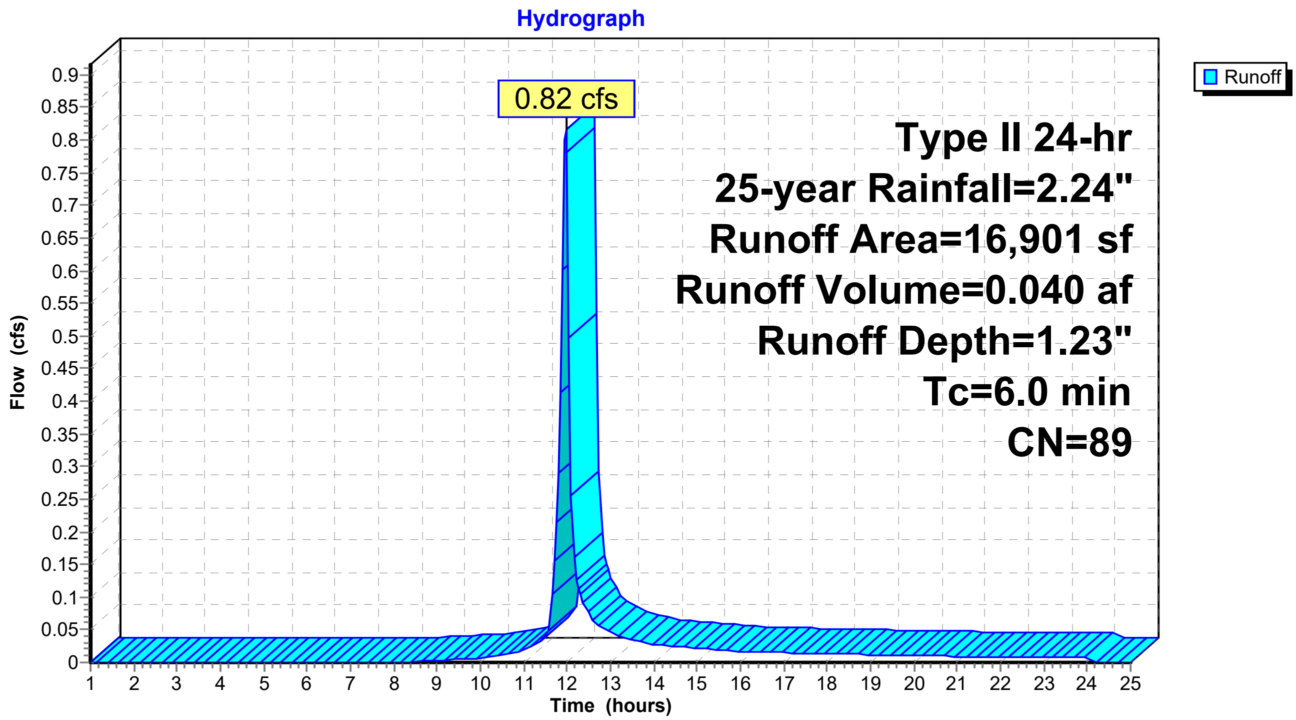
Runoff = 0.82 cfs @ 11.97 hrs, Volume= 0.040 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	16,901	89	
	16,901		100.00% Pervious Area

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

Subcatchment 12S: DA-2A



Summary for Subcatchment 13S: DA-3A

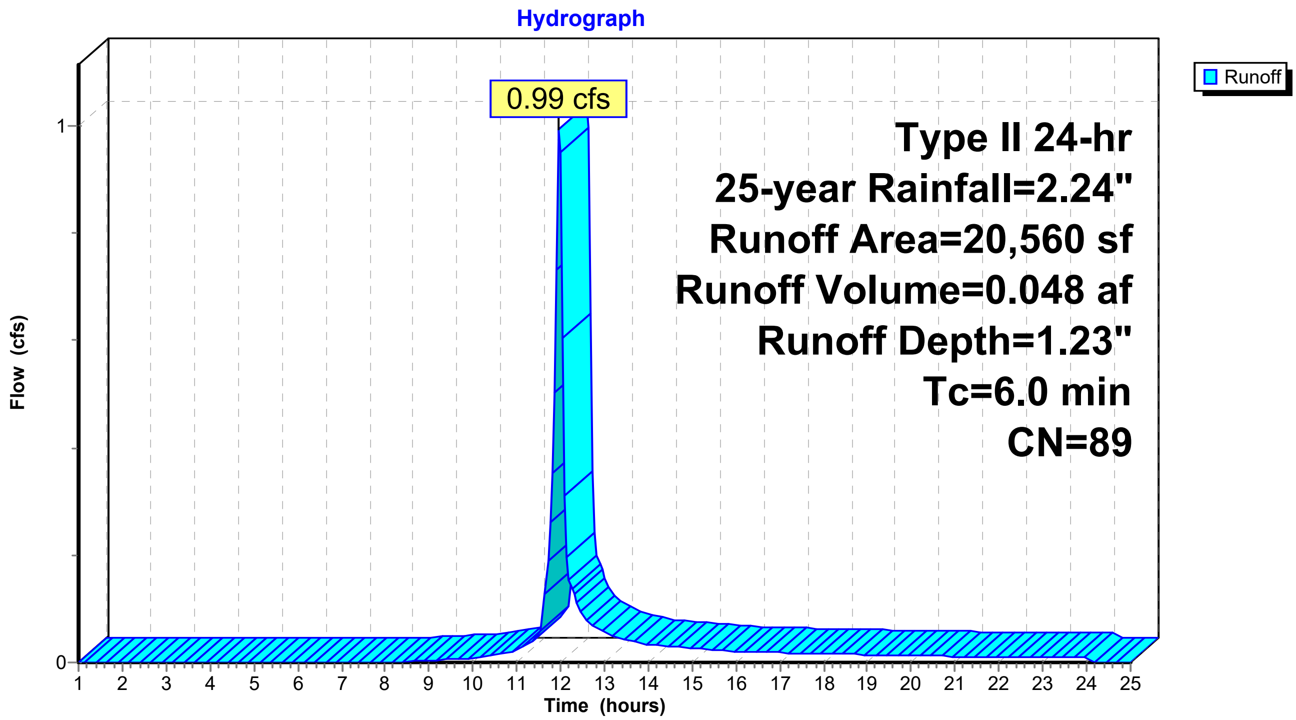
Runoff = 0.99 cfs @ 11.97 hrs, Volume= 0.048 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	20,560	89	
	20,560		100.00% Pervious Area

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

Subcatchment 13S: DA-3A



Summary for Subcatchment 14S: DA-1B

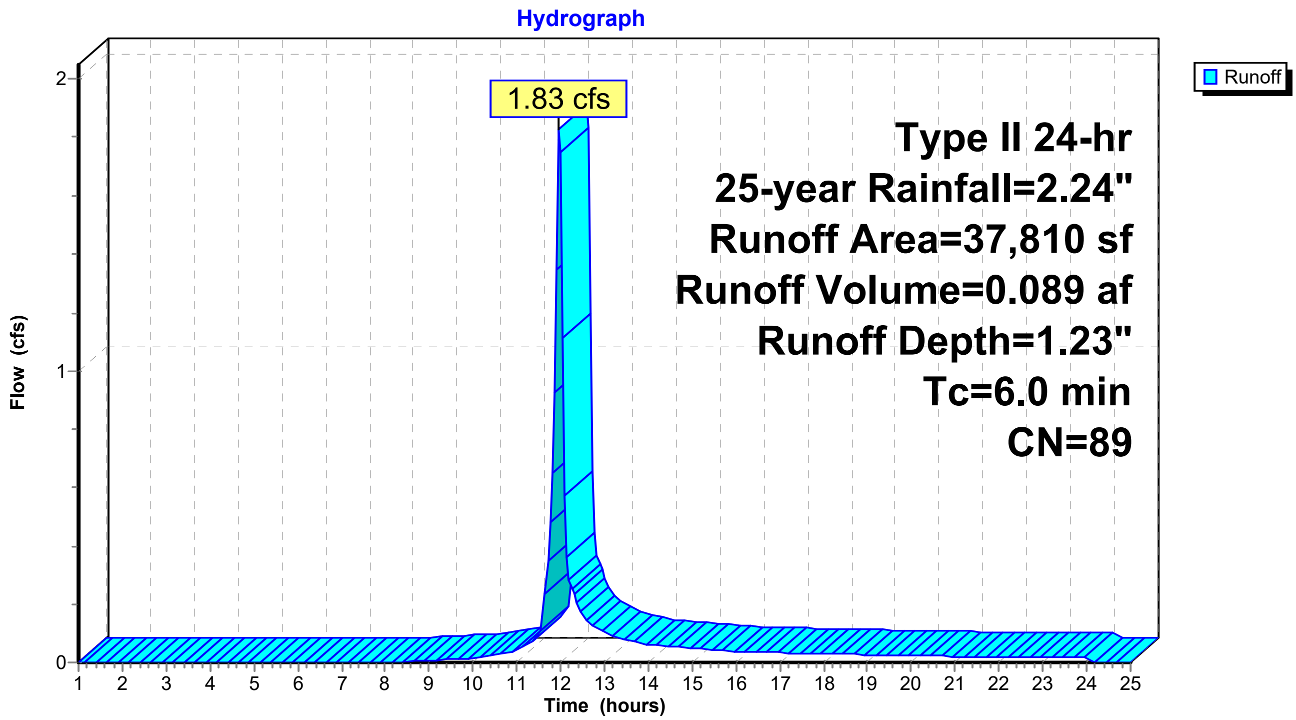
Runoff = 1.83 cfs @ 11.97 hrs, Volume= 0.089 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (sf)	CN	Description
37,810	89	<50% Grass cover, Poor, HSG D
37,810		100.00% Pervious Area

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

Subcatchment 14S: DA-1B



Summary for Subcatchment 15S: DA-2B

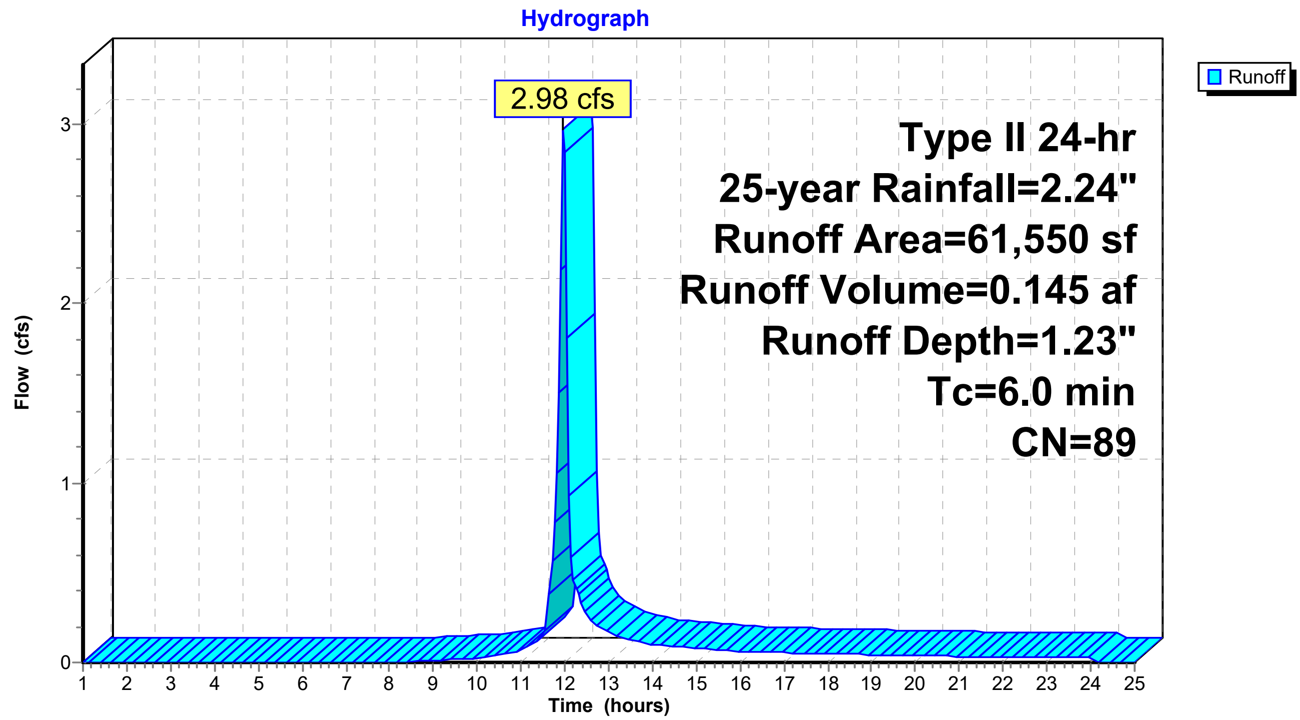
Runoff = 2.98 cfs @ 11.97 hrs, Volume= 0.145 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	61,550	89	
	61,550		100.00% Pervious Area

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

Subcatchment 15S: DA-2B



Summary for Subcatchment 16S: DA-3B

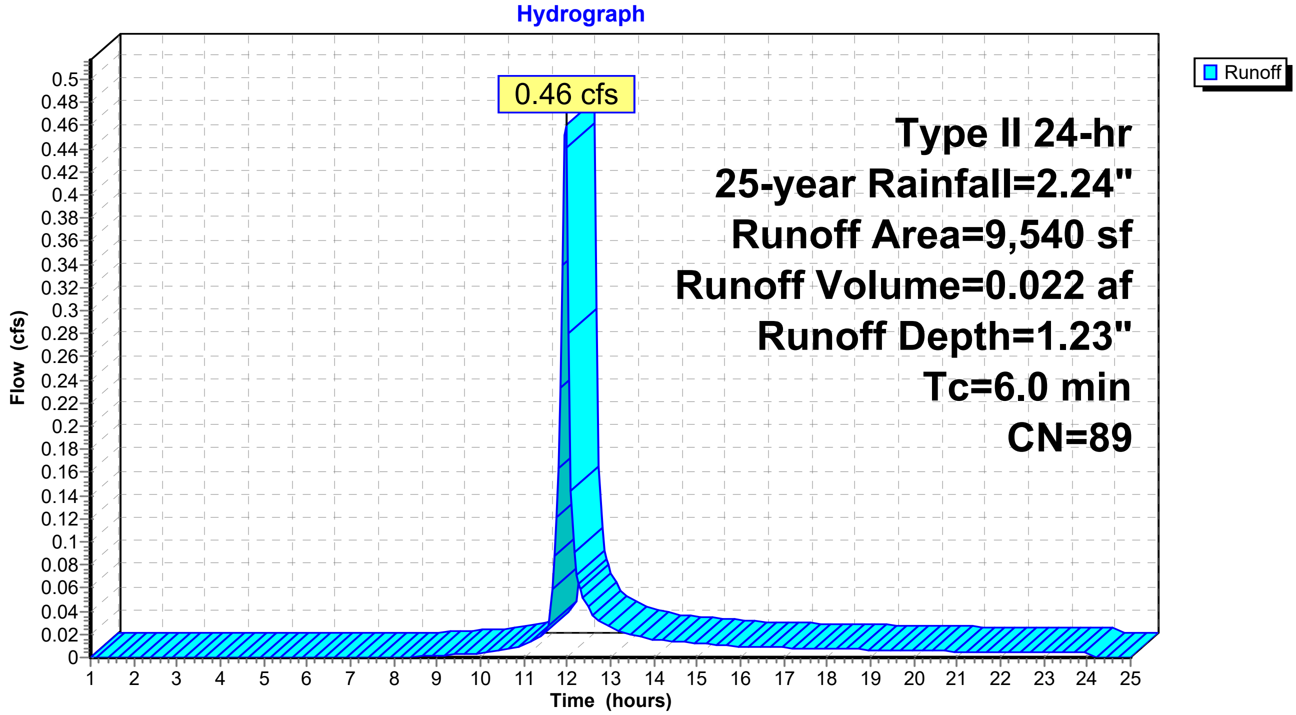
Runoff = 0.46 cfs @ 11.97 hrs, Volume= 0.022 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	9,540	89	
	9,540		100.00% Pervious Area

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

Subcatchment 16S: DA-3B



Summary for Subcatchment 17S: DA-15

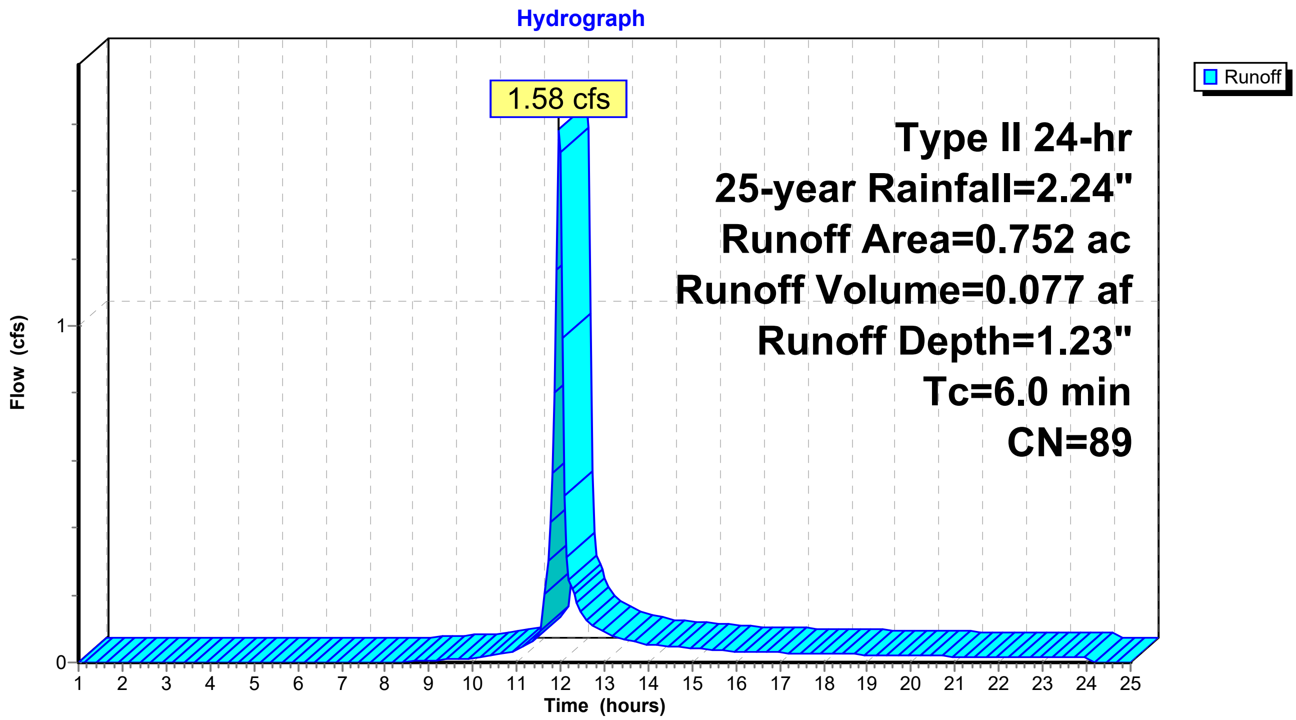
Runoff = 1.58 cfs @ 11.97 hrs, Volume= 0.077 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (ac)	CN	Description
0.752	89	<50% Grass cover, Poor, HSG D
0.752		100.00% Pervious Area

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

Subcatchment 17S: DA-15



Summary for Subcatchment 18S: DA-4

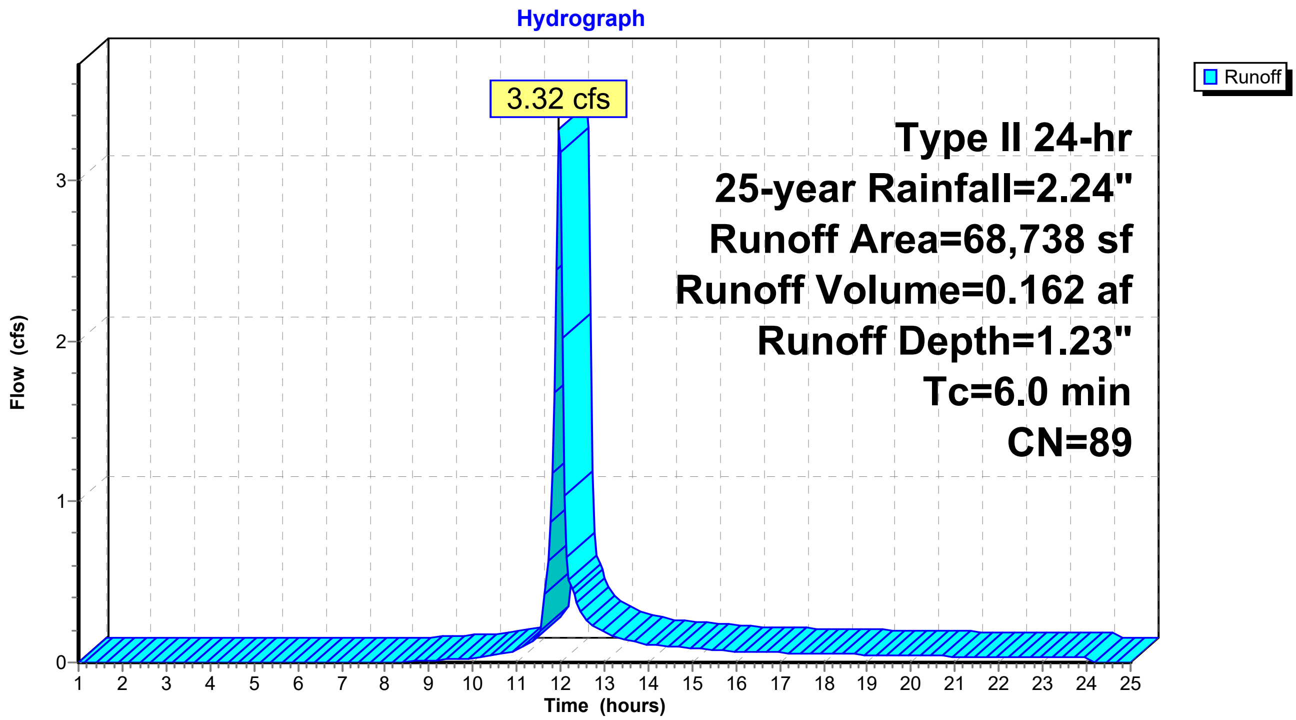
Runoff = 3.32 cfs @ 11.97 hrs, Volume= 0.162 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (sf)	CN	Description
68,738	89	<50% Grass cover, Poor, HSG D
68,738		100.00% Pervious Area

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

Subcatchment 18S: DA-4



Summary for Subcatchment 19S: DA-6

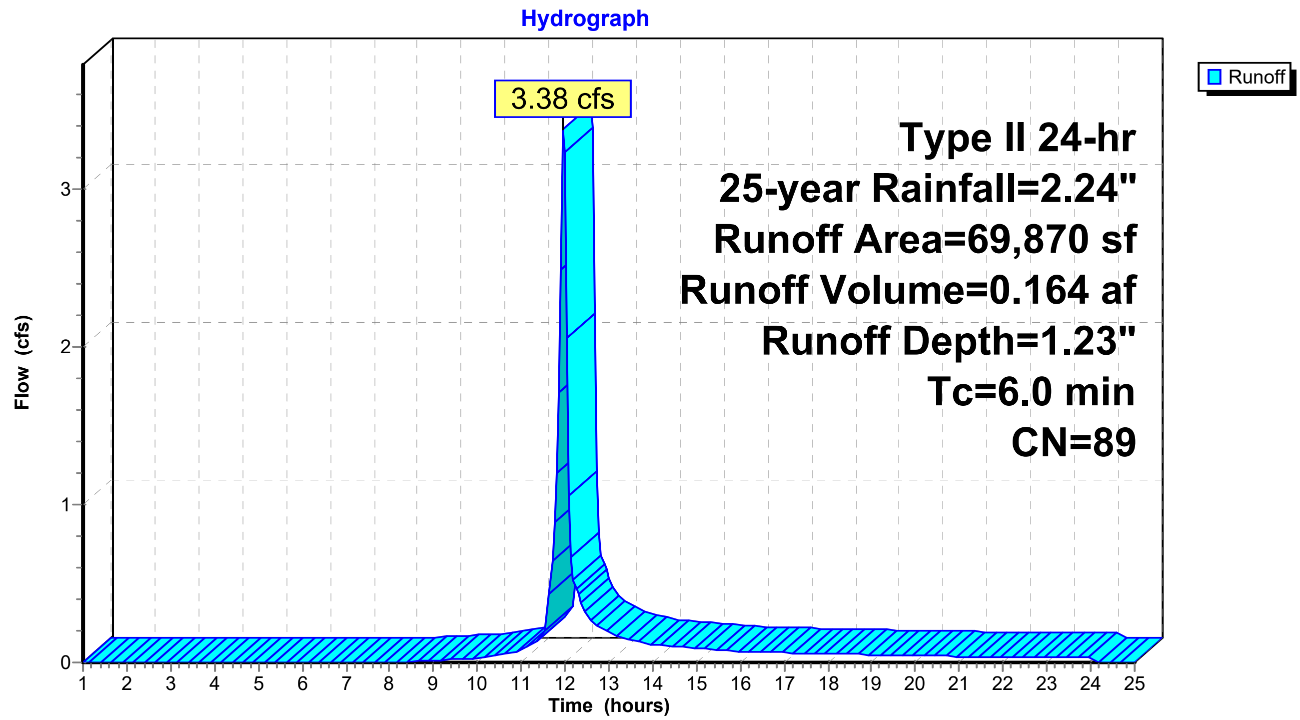
Runoff = 3.38 cfs @ 11.97 hrs, Volume= 0.164 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	69,870	89	
	69,870		100.00% Pervious Area

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

Subcatchment 19S: DA-6



Summary for Subcatchment 20S: DA-5

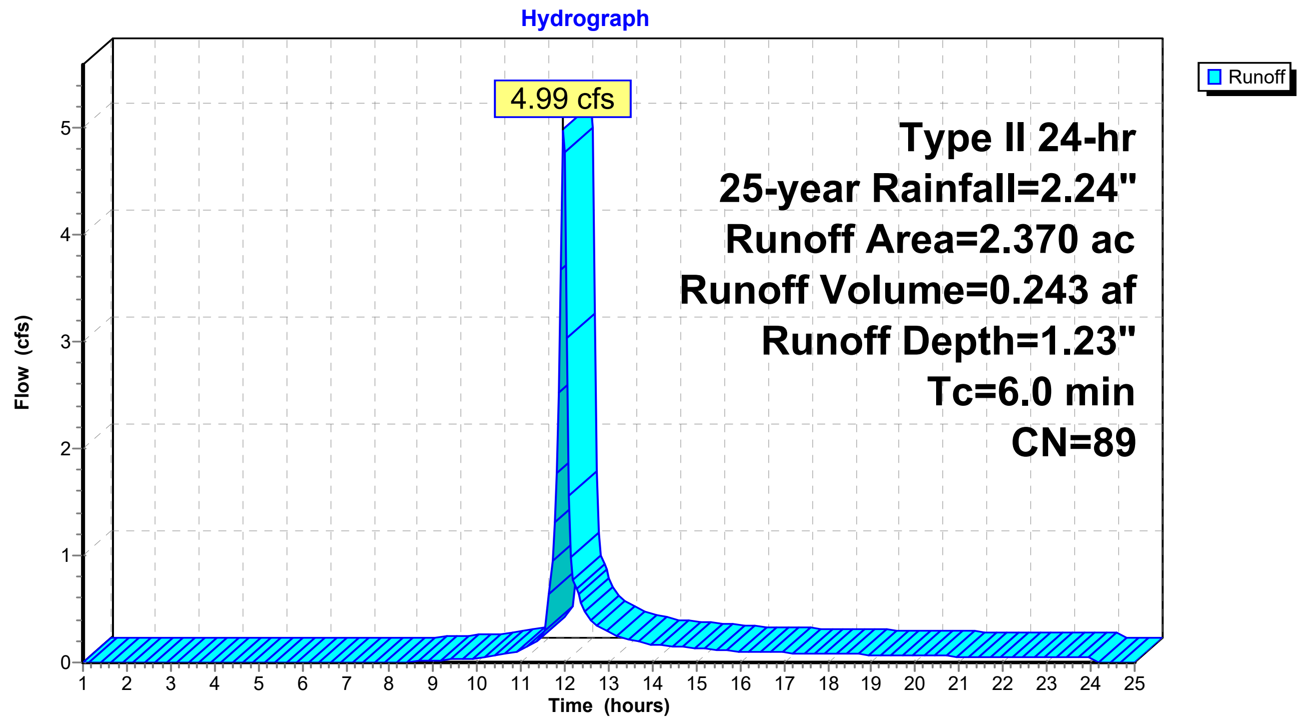
Runoff = 4.99 cfs @ 11.97 hrs, Volume= 0.243 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (ac)	CN	Description
*	2.370	89	
	2.370		100.00% Pervious Area

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

Subcatchment 20S: DA-5



Summary for Subcatchment 21S: DA-16

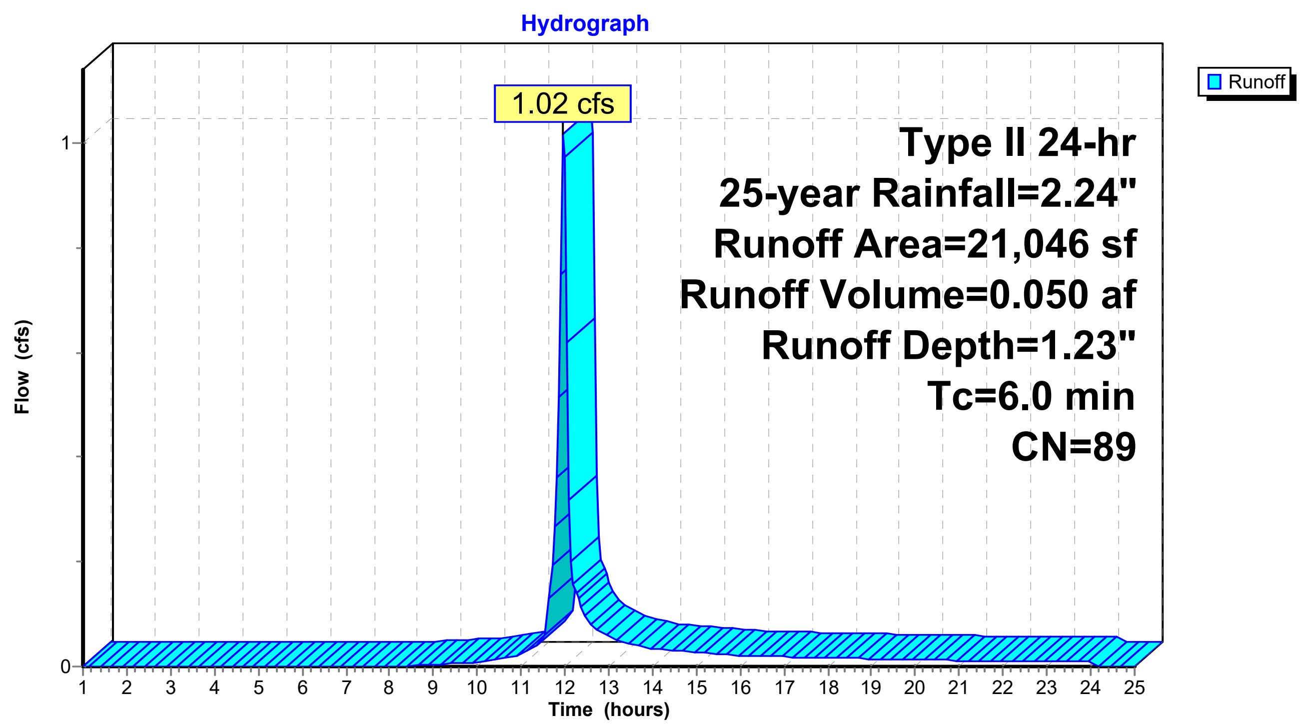
Runoff = 1.02 cfs @ 11.97 hrs, Volume= 0.050 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (sf)	CN	Description
21,046	89	<50% Grass cover, Poor, HSG D
21,046		100.00% Pervious Area

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

Subcatchment 21S: DA-16



Summary for Subcatchment 24S: DA-7

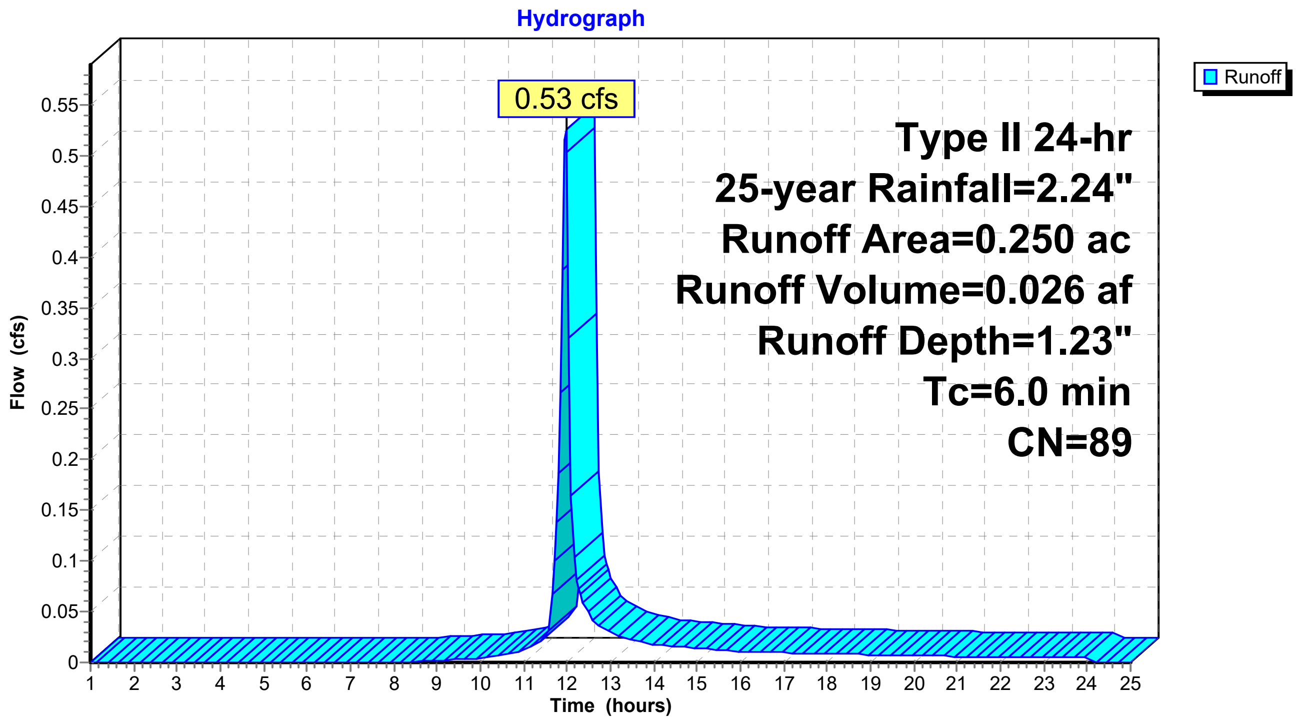
Runoff = 0.53 cfs @ 11.97 hrs, Volume= 0.026 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (ac)	CN	Description
*	0.250	89	
	0.250		100.00% Pervious Area

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

Subcatchment 24S: DA-7



Summary for Subcatchment 25S: DA-8

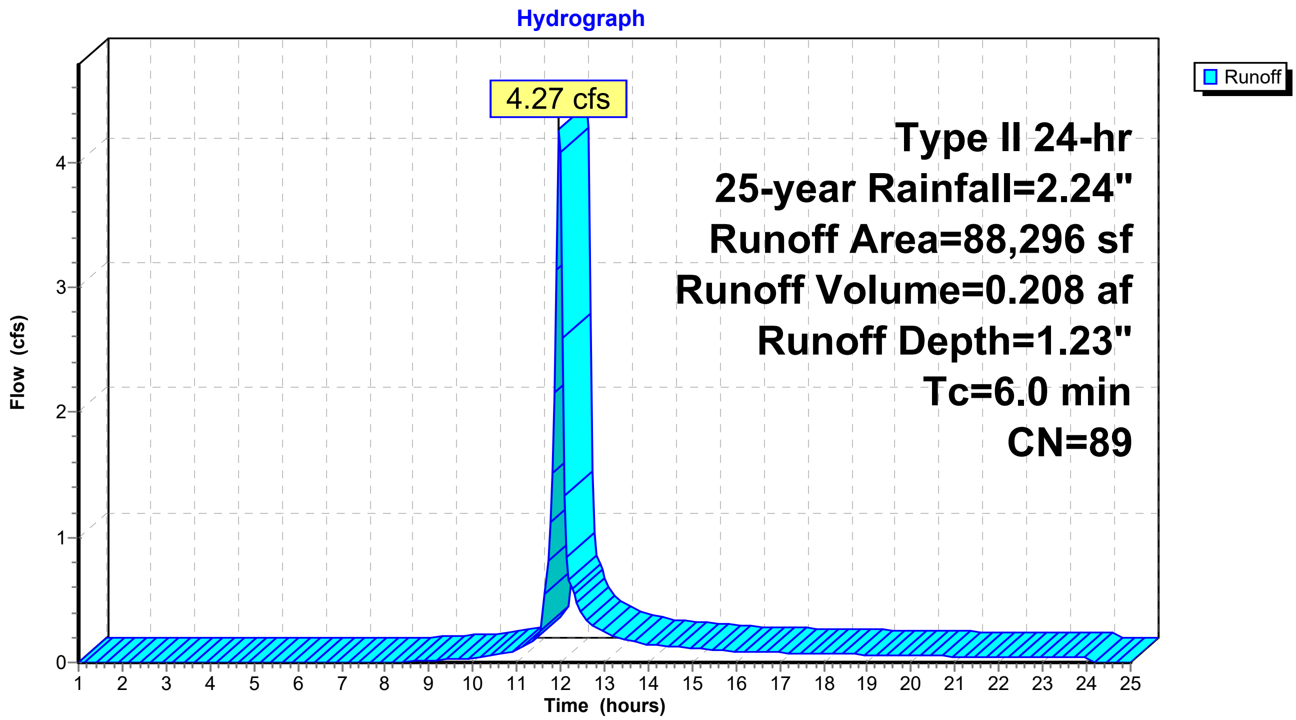
Runoff = 4.27 cfs @ 11.97 hrs, Volume= 0.208 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	88,296	89	
	88,296		100.00% Pervious Area

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

Subcatchment 25S: DA-8



Summary for Subcatchment 26S: DA-9

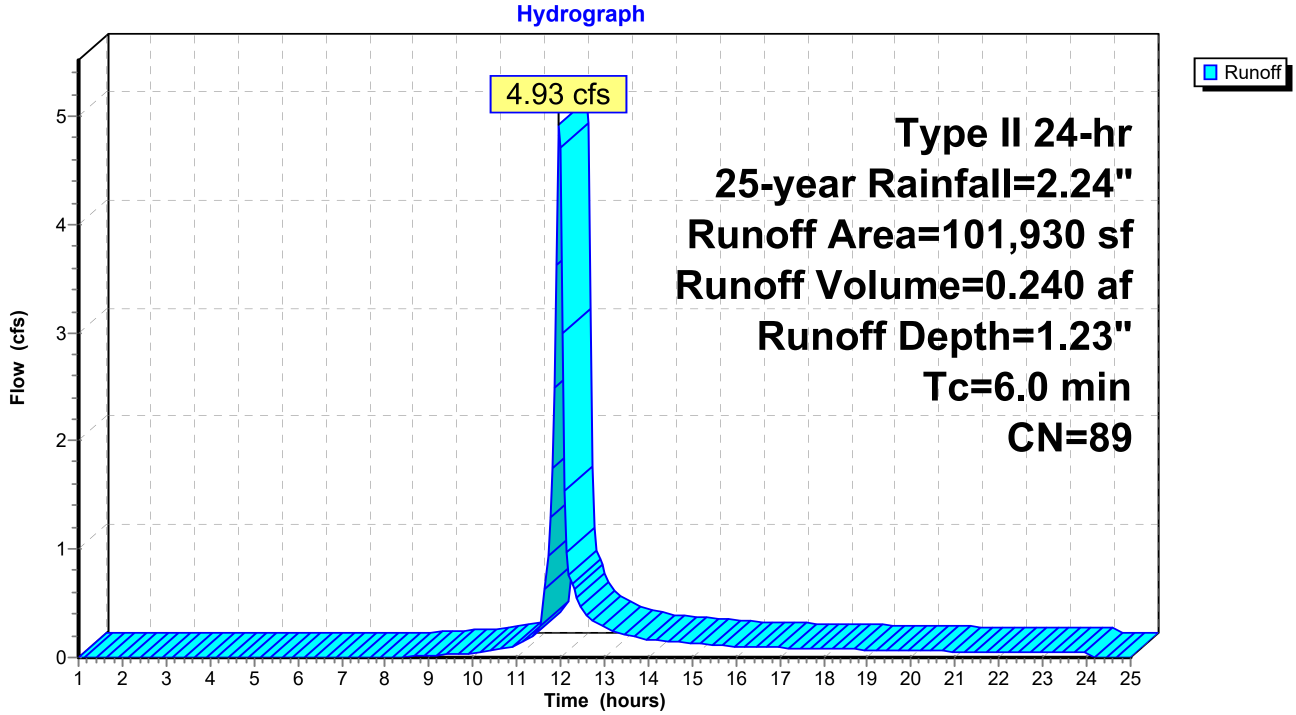
Runoff = 4.93 cfs @ 11.97 hrs, Volume= 0.240 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

Area (sf)	CN	Description
101,930	89	<50% Grass cover, Poor, HSG D
101,930		100.00% Pervious Area

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

Subcatchment 26S: DA-9



Summary for Subcatchment 30S: DA-11

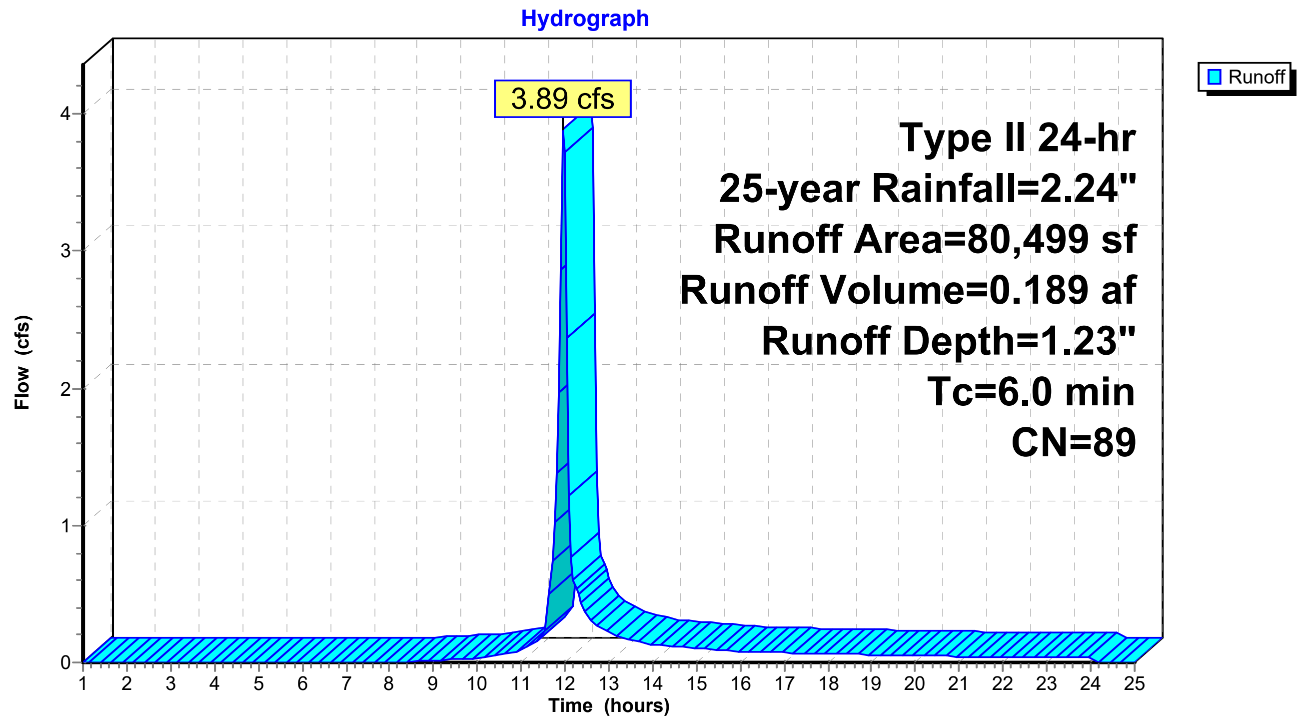
Runoff = 3.89 cfs @ 11.97 hrs, Volume= 0.189 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	80,499	89	
	80,499		100.00% Pervious Area

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

Subcatchment 30S: DA-11



Summary for Subcatchment 31S: DA-12

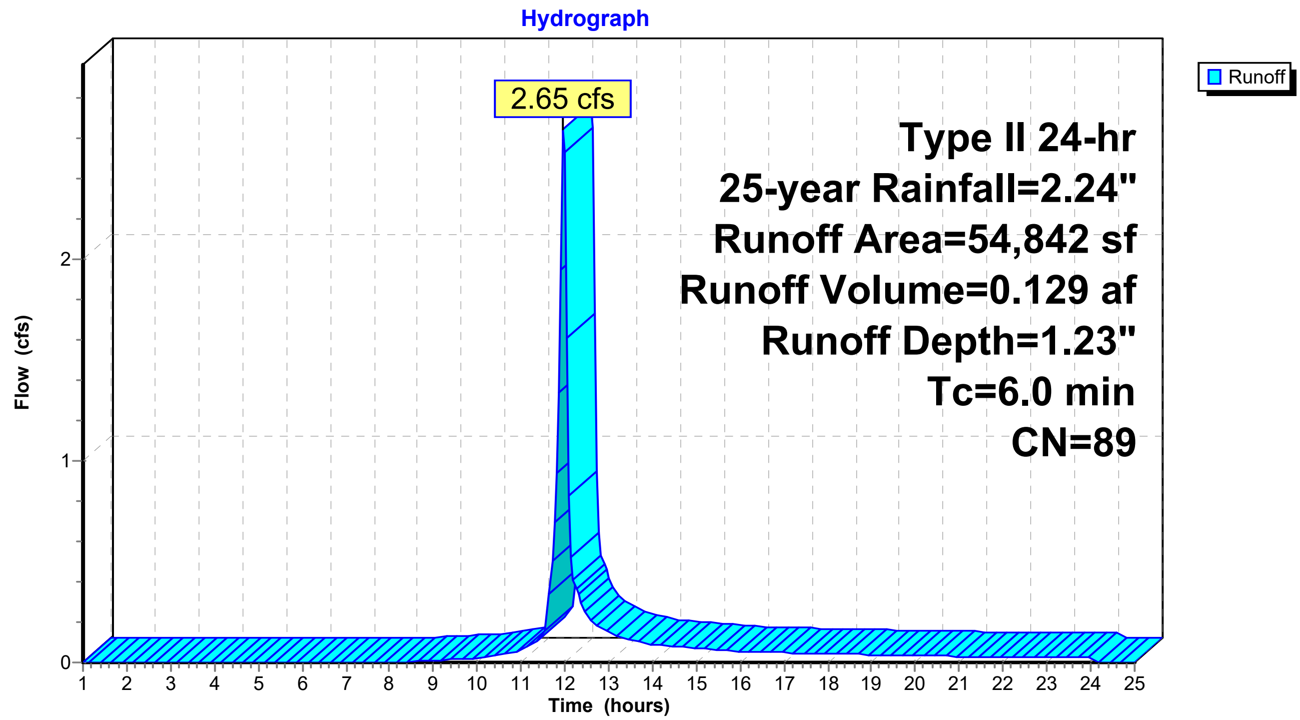
Runoff = 2.65 cfs @ 11.97 hrs, Volume= 0.129 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	54,842	89	
	54,842		100.00% Pervious Area

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

Subcatchment 31S: DA-12



Summary for Subcatchment 36S: DA-14

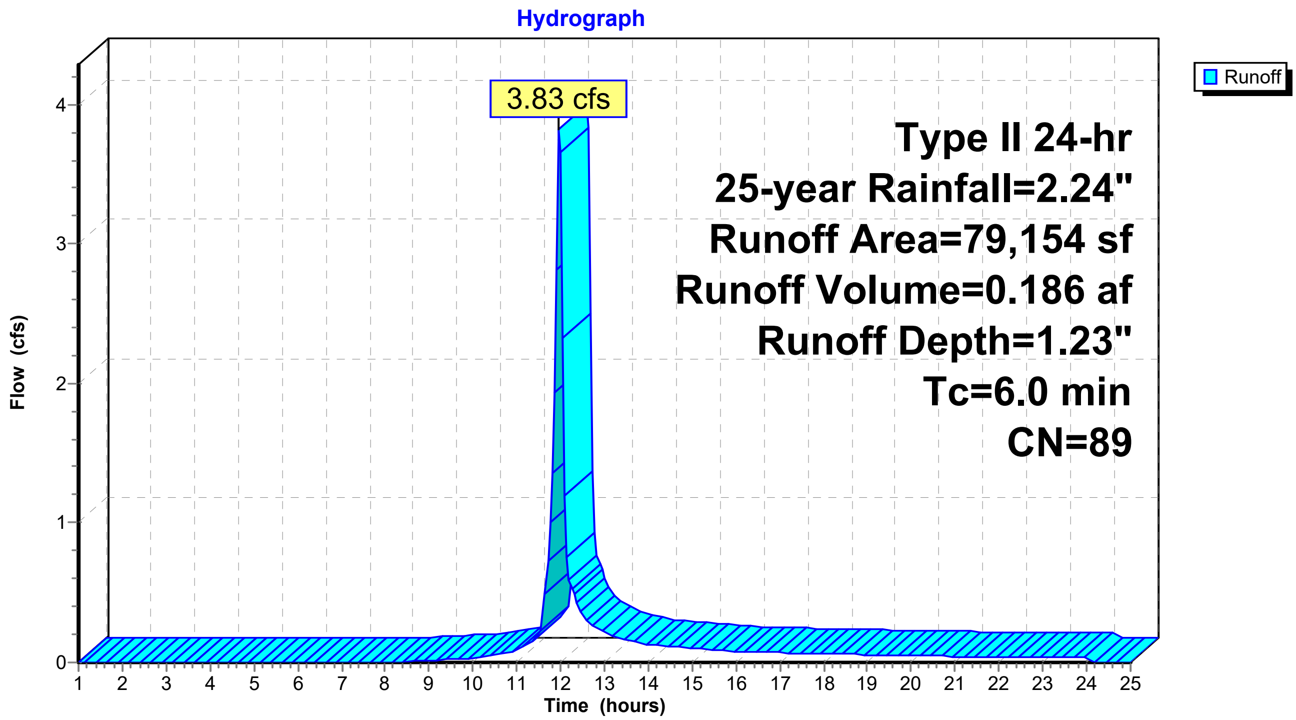
Runoff = 3.83 cfs @ 11.97 hrs, Volume= 0.186 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	79,154	89	
	79,154		100.00% Pervious Area

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

Subcatchment 36S: DA-14



Summary for Subcatchment 37S: DA-10

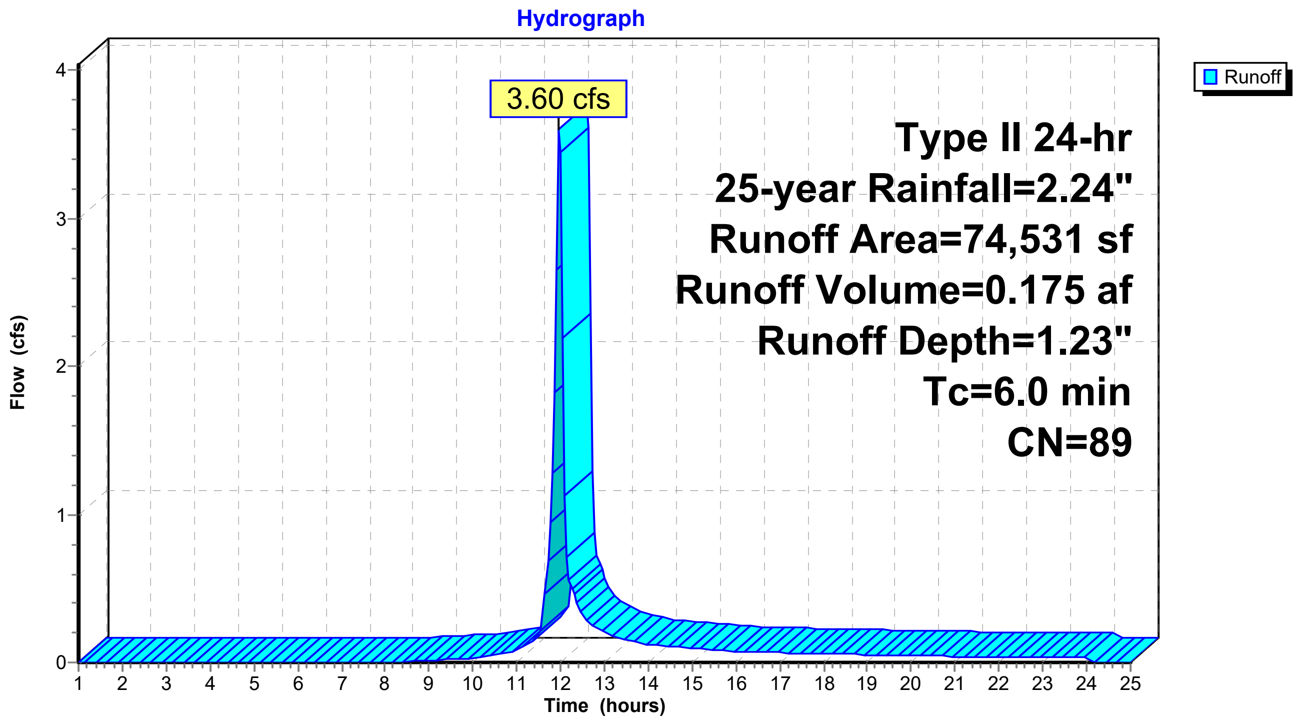
Runoff = 3.60 cfs @ 11.97 hrs, Volume= 0.175 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	74,531	89	
	74,531		100.00% Pervious Area

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

Subcatchment 37S: DA-10



Summary for Subcatchment 38S: DA-13

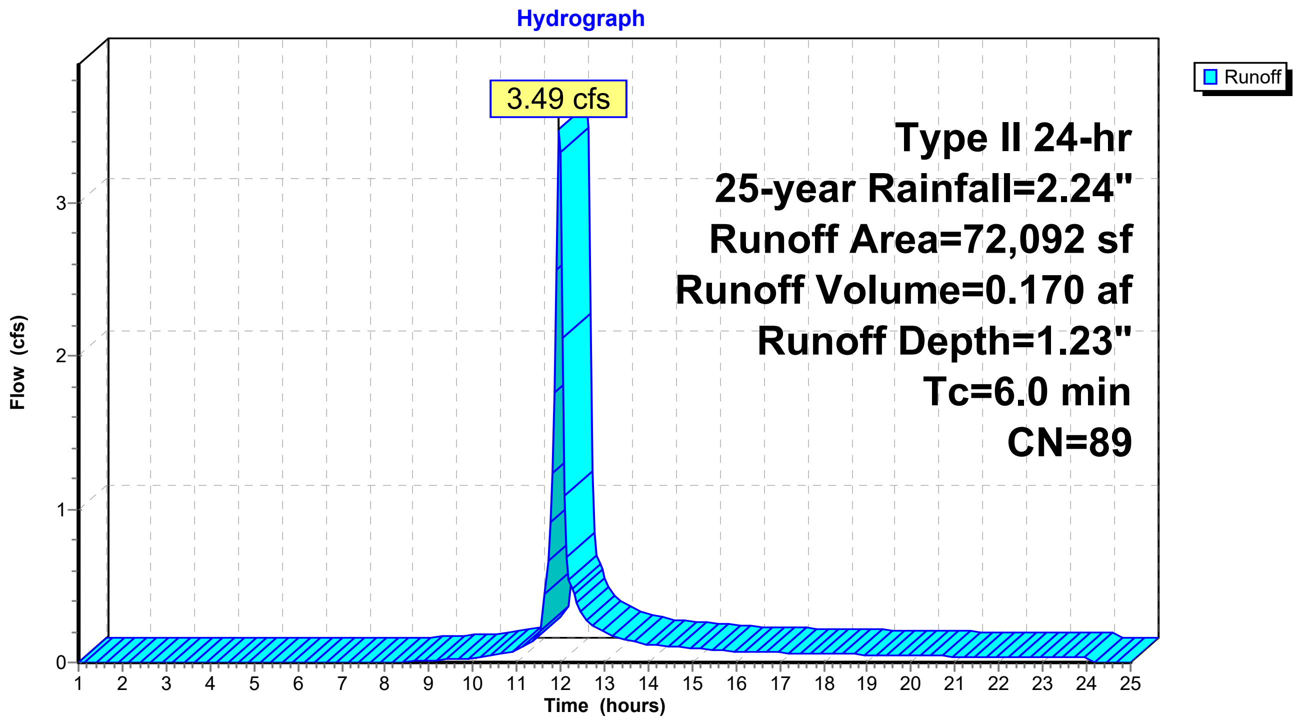
Runoff = 3.49 cfs @ 11.97 hrs, Volume= 0.170 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-year Rainfall=2.24"

	Area (sf)	CN	Description
*	72,092	89	>75% Grass cover, Good, HSG D
	72,092		100.00% Pervious Area

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

Subcatchment 38S: DA-13



Summary for Reach 11R: Culvert-1

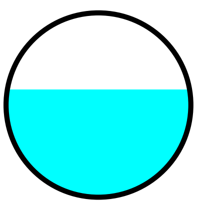
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 25R OUTLET depth by 0.46' @ 12.10 hrs

Inflow Area = 1.235 ac, 0.00% Impervious, Inflow Depth > 1.23" for 25-year event
Inflow = 1.92 cfs @ 12.09 hrs, Volume= 0.127 af
Outflow = 1.92 cfs @ 12.09 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.2 min

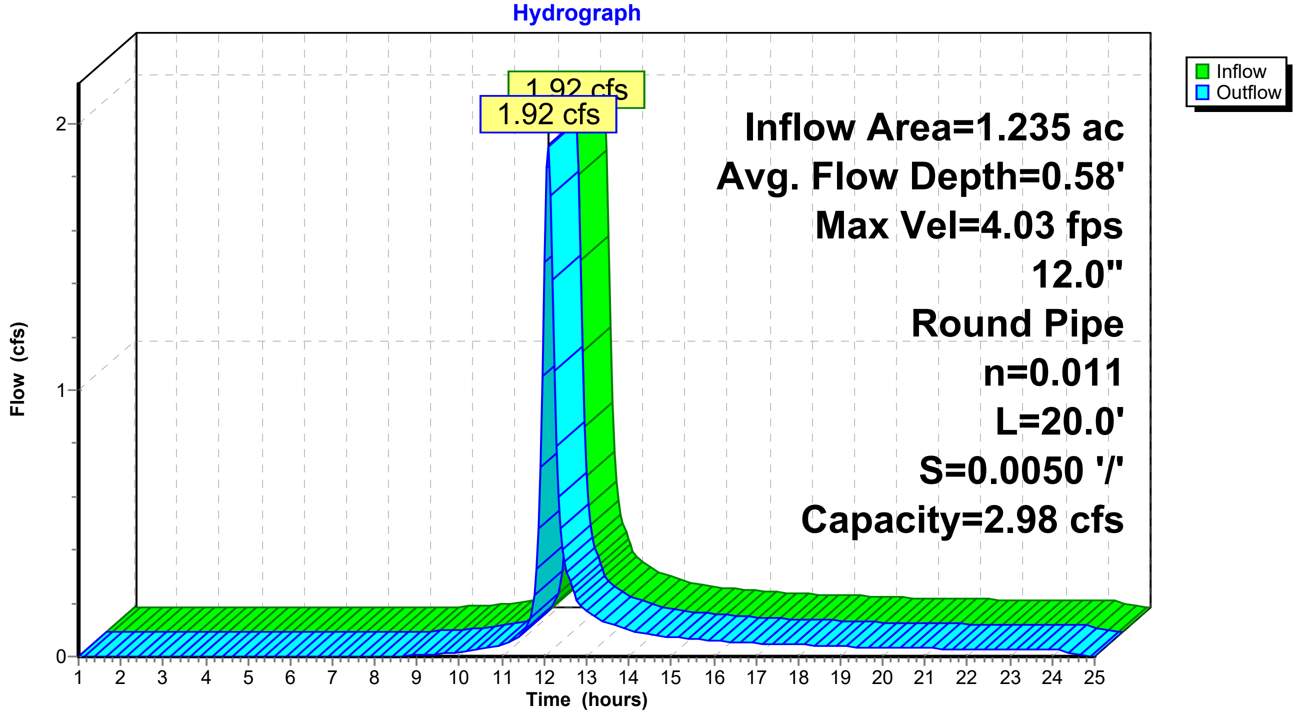
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.03 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.98 cfs

12.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 20.0' Slope= 0.0050 '/'
Inlet Invert= 6,890.00', Outlet Invert= 6,889.90'



Reach 11R: Culvert-1



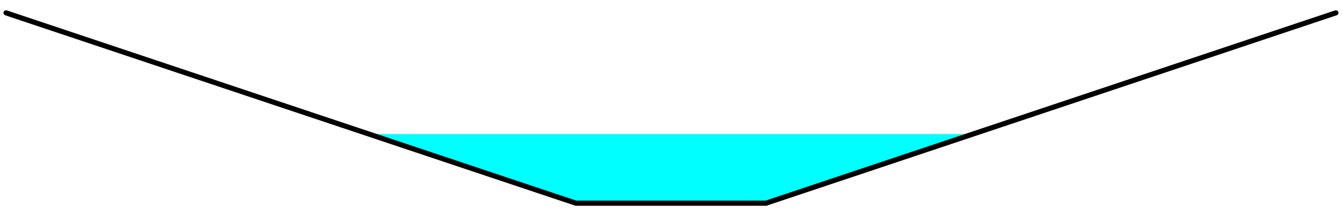
Summary for Reach 17R: DC-1

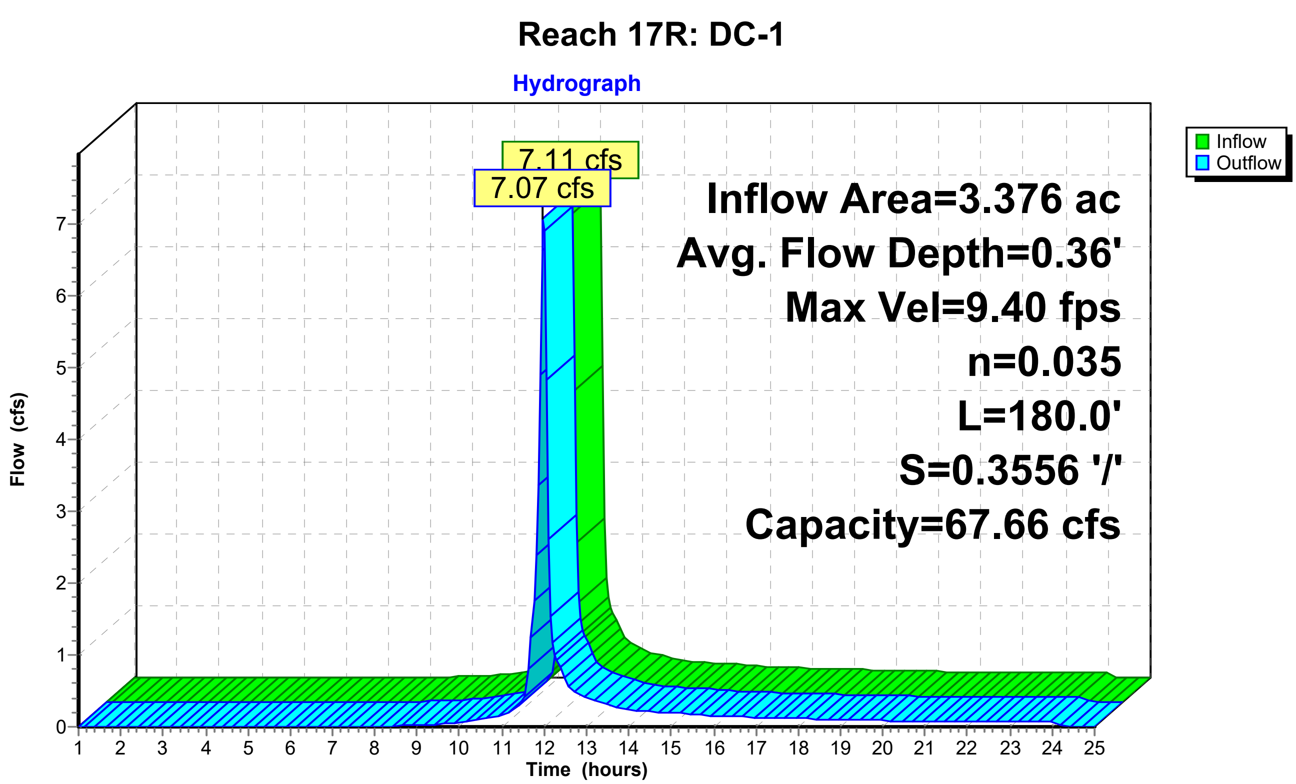
Inflow Area = 3.376 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 7.11 cfs @ 11.97 hrs, Volume= 0.346 af
Outflow = 7.07 cfs @ 11.98 hrs, Volume= 0.346 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.40 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.82 fps, Avg. Travel Time= 1.1 min

Peak Storage= 136 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 67.66 cfs

1.00' x 1.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 180.0' Slope= 0.3556 '/'
Inlet Invert= 6,912.00', Outlet Invert= 6,848.00'





Summary for Reach 21R: CH-1

[63] Warning: Exceeded Reach 22R INLET depth by 15.13' @ 12.15 hrs
[63] Warning: Exceeded Reach 23R INLET depth by 25.18' @ 12.15 hrs

Inflow Area = 6.787 ac, 0.00% Impervious, Inflow Depth > 1.23" for 25-year event
Inflow = 12.56 cfs @ 12.00 hrs, Volume= 0.696 af
Outflow = 10.71 cfs @ 12.13 hrs, Volume= 0.695 af, Atten= 15%, Lag= 7.7 min

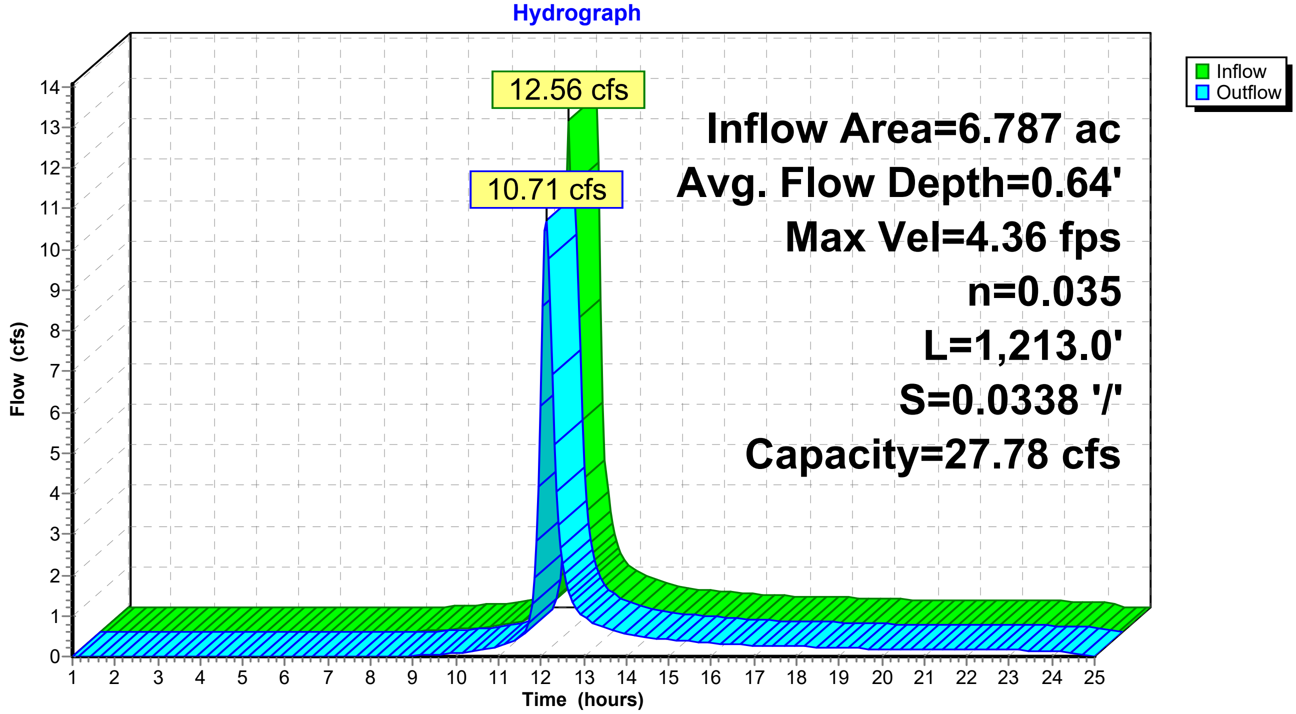
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.36 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 14.9 min

Peak Storage= 3,073 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 27.78 cfs

2.00' x 1.00' deep channel, n= 0.035 Riprap, 6-inch
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 1,213.0' Slope= 0.0338 '/'
Inlet Invert= 6,889.00', Outlet Invert= 6,848.00'

‡

Reach 21R: CH-1



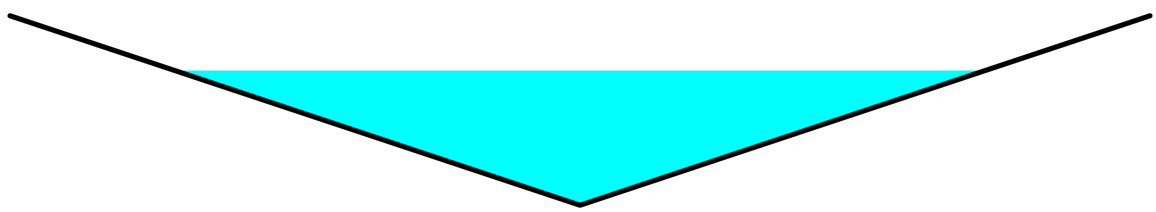
Summary for Reach 22R: DC-2

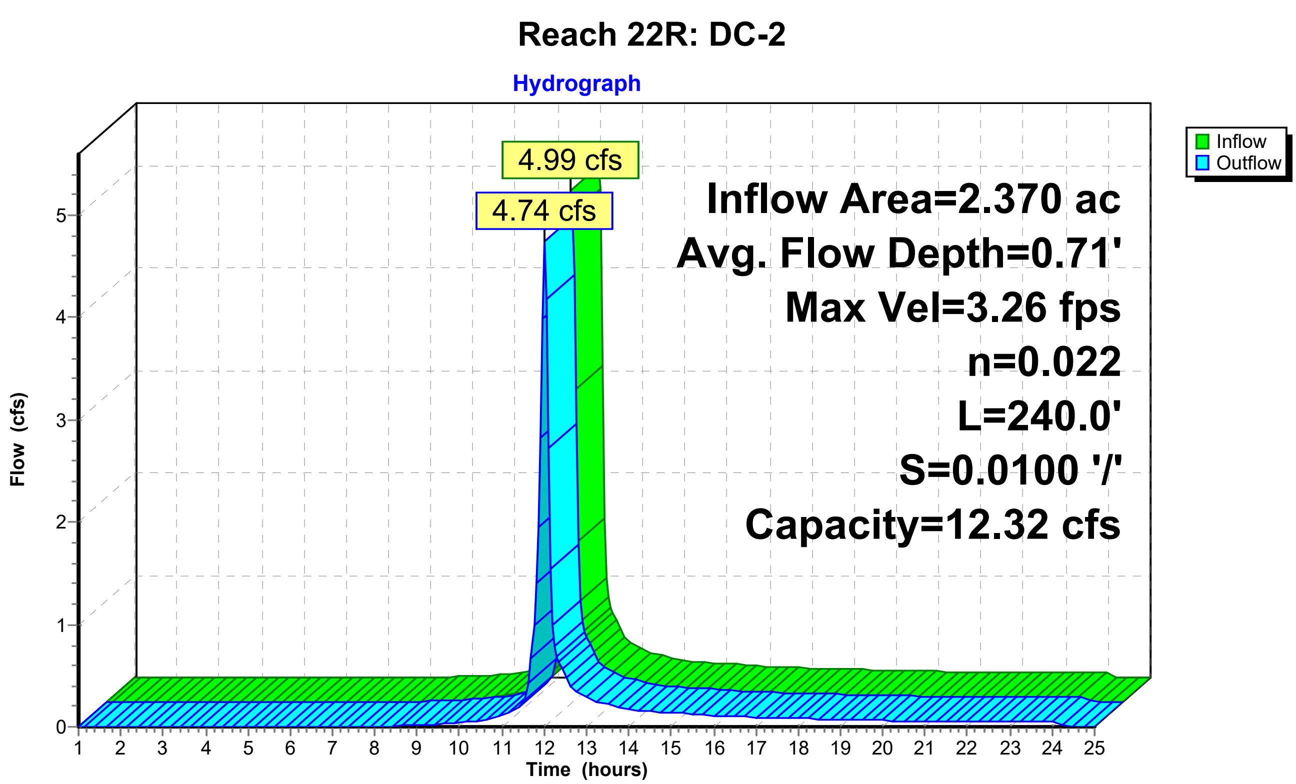
Inflow Area = 2.370 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 4.99 cfs @ 11.97 hrs, Volume= 0.243 af
Outflow = 4.74 cfs @ 12.00 hrs, Volume= 0.243 af, Atten= 5%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 3.4 min

Peak Storage= 363 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 240.0' Slope= 0.0100 '/'
Inlet Invert= 6,874.00', Outlet Invert= 6,871.60'





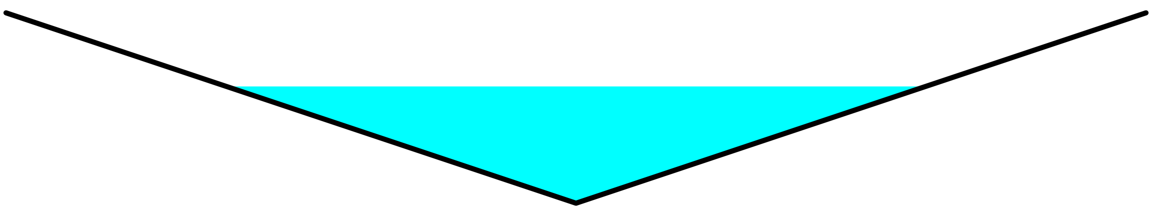
Summary for Reach 23R: DC-3

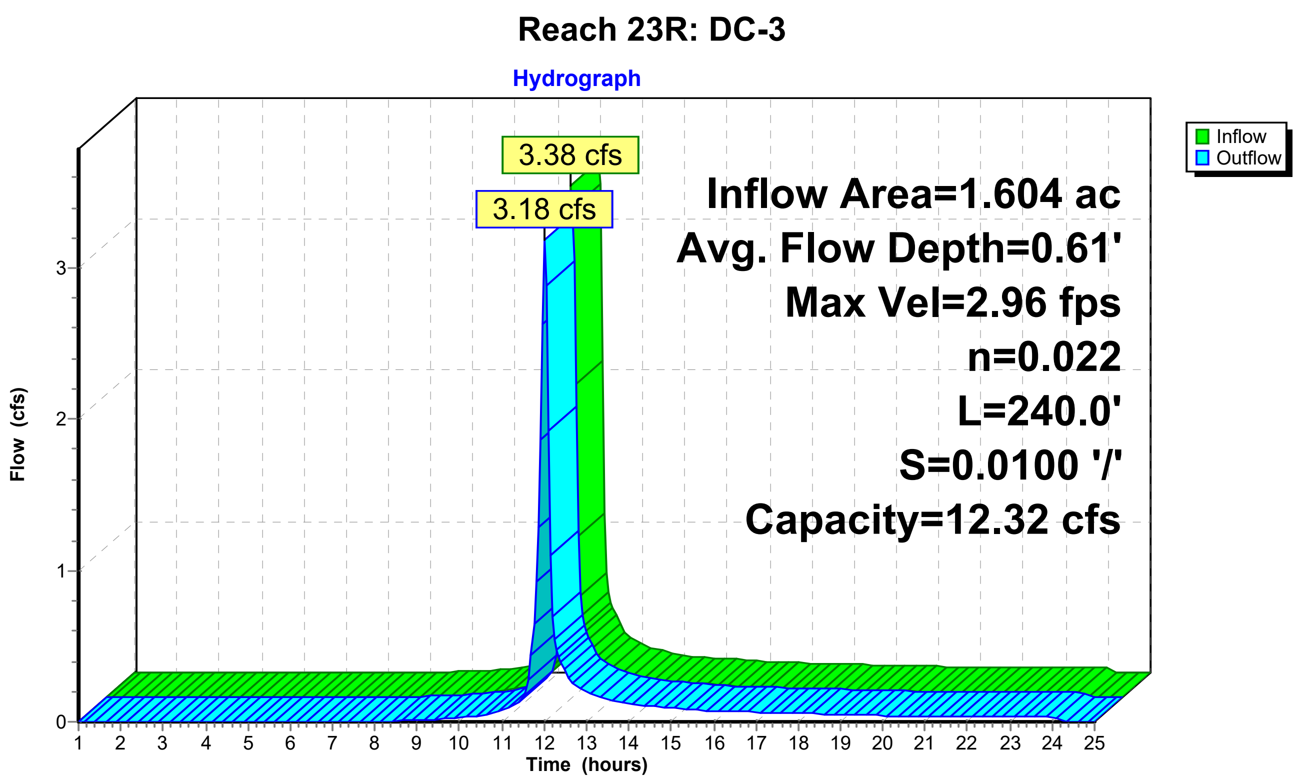
Inflow Area = 1.604 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 3.38 cfs @ 11.97 hrs, Volume= 0.164 af
Outflow = 3.18 cfs @ 12.01 hrs, Volume= 0.164 af, Atten= 6%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.96 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 3.8 min

Peak Storage= 270 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 240.0' Slope= 0.0100 '/'
Inlet Invert= 6,864.00', Outlet Invert= 6,861.60'





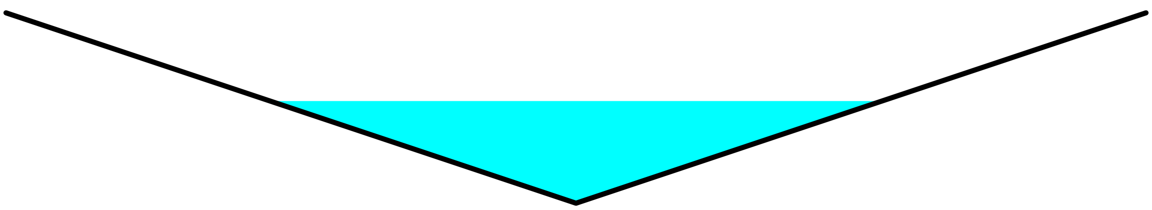
Summary for Reach 24R: DC-10

Inflow Area = 0.752 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 1.58 cfs @ 11.97 hrs, Volume= 0.077 af
Outflow = 1.35 cfs @ 12.08 hrs, Volume= 0.077 af, Atten= 15%, Lag= 6.6 min

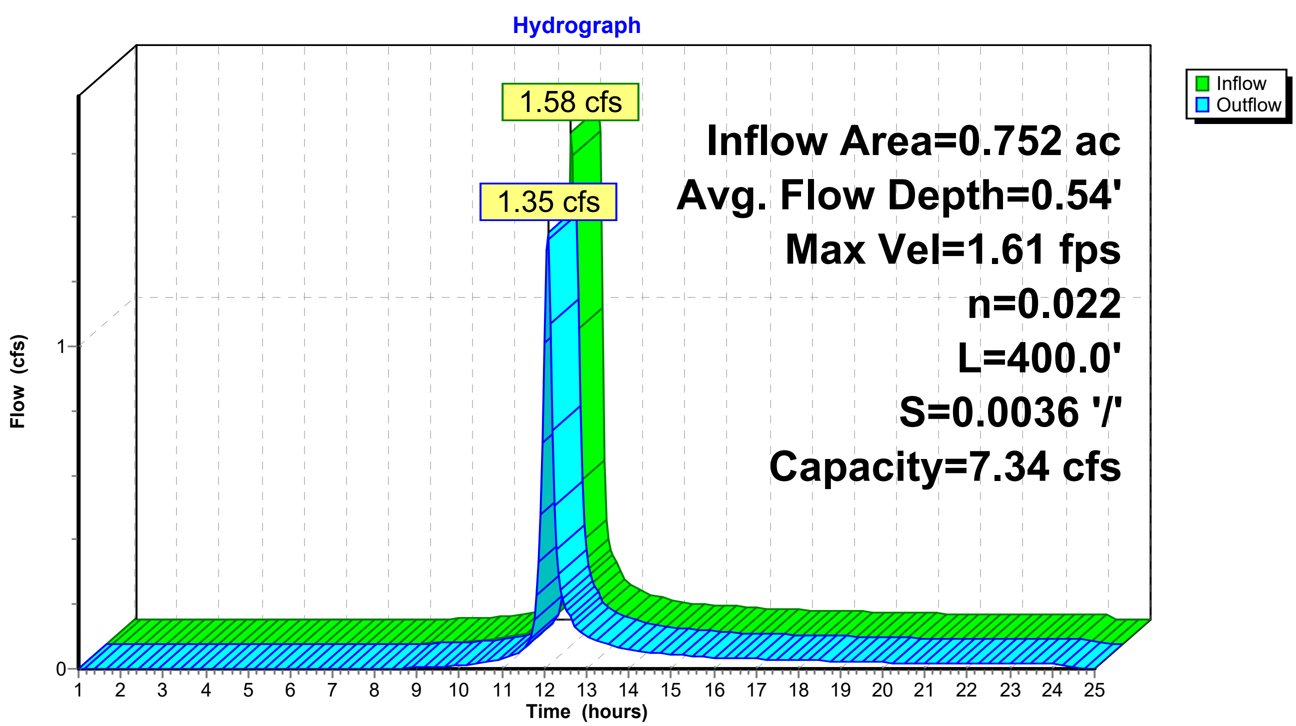
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 11.2 min

Peak Storage= 346 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 7.34 cfs

0.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 400.0' Slope= 0.0036 '/'
Inlet Invert= 6,915.00', Outlet Invert= 6,913.58'



Reach 24R: DC-10



Summary for Reach 25R: DC-11

[63] Warning: Exceeded Reach 24R INLET depth by 19.00' @ 1.00 hrs

Inflow Area =	1.235 ac,	0.00% Impervious,	Inflow Depth > 1.23"	for 25-year event	
Inflow =	2.00 cfs @	12.02 hrs,	Volume=	0.127 af	
Outflow =	1.92 cfs @	12.09 hrs,	Volume=	0.127 af,	Atten= 4%, Lag= 4.3 min

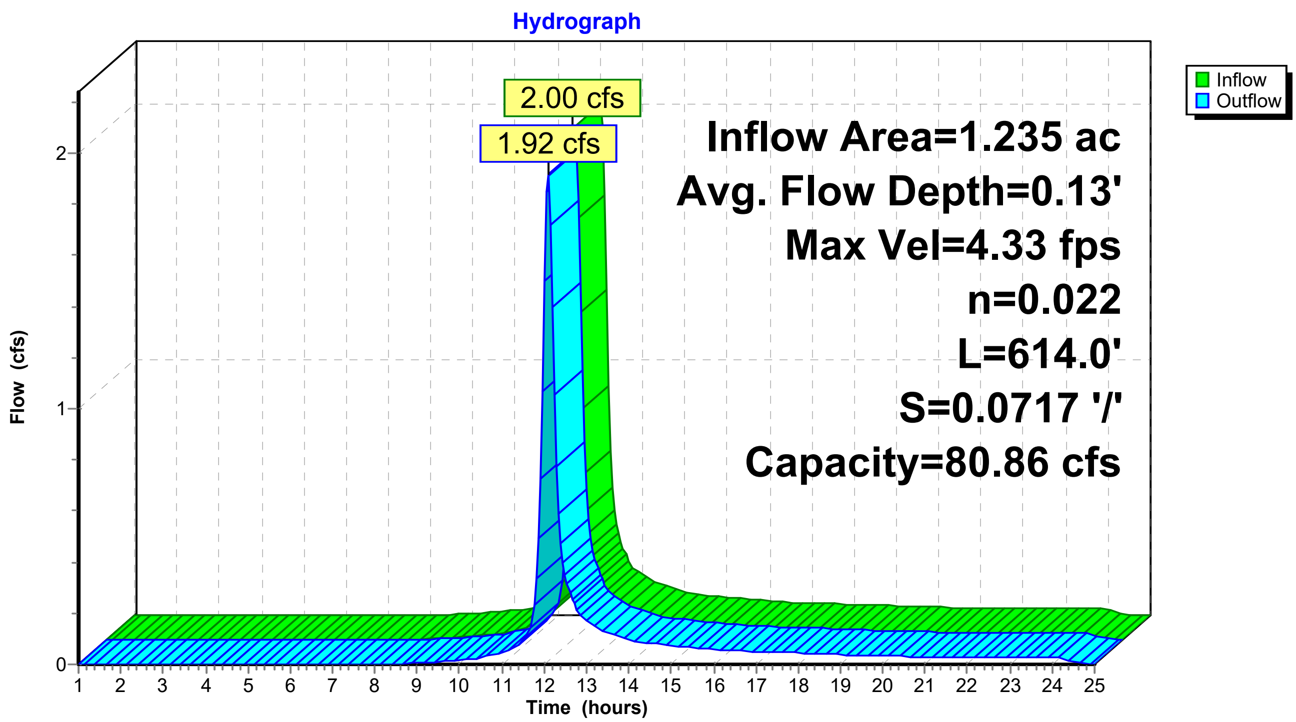
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.33 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 8.8 min

Peak Storage= 276 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 80.86 cfs

3.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 9.00'
Length= 614.0' Slope= 0.0717 '/'
Inlet Invert= 6,934.00', Outlet Invert= 6,890.00'

‡

Reach 25R: DC-11



Summary for Reach 27R: CH-2

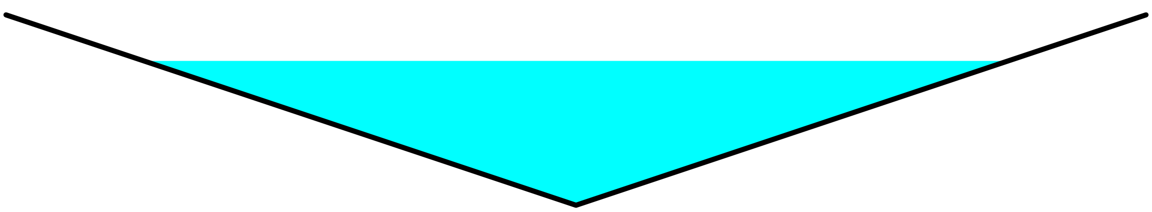
[63] Warning: Exceeded Reach 28R INLET depth by 20.22' @ 12.10 hrs
[63] Warning: Exceeded Reach 29R INLET depth by 10.19' @ 12.10 hrs

Inflow Area = 4.367 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 8.72 cfs @ 12.00 hrs, Volume= 0.448 af
Outflow = 8.07 cfs @ 12.08 hrs, Volume= 0.448 af, Atten= 7%, Lag= 4.5 min

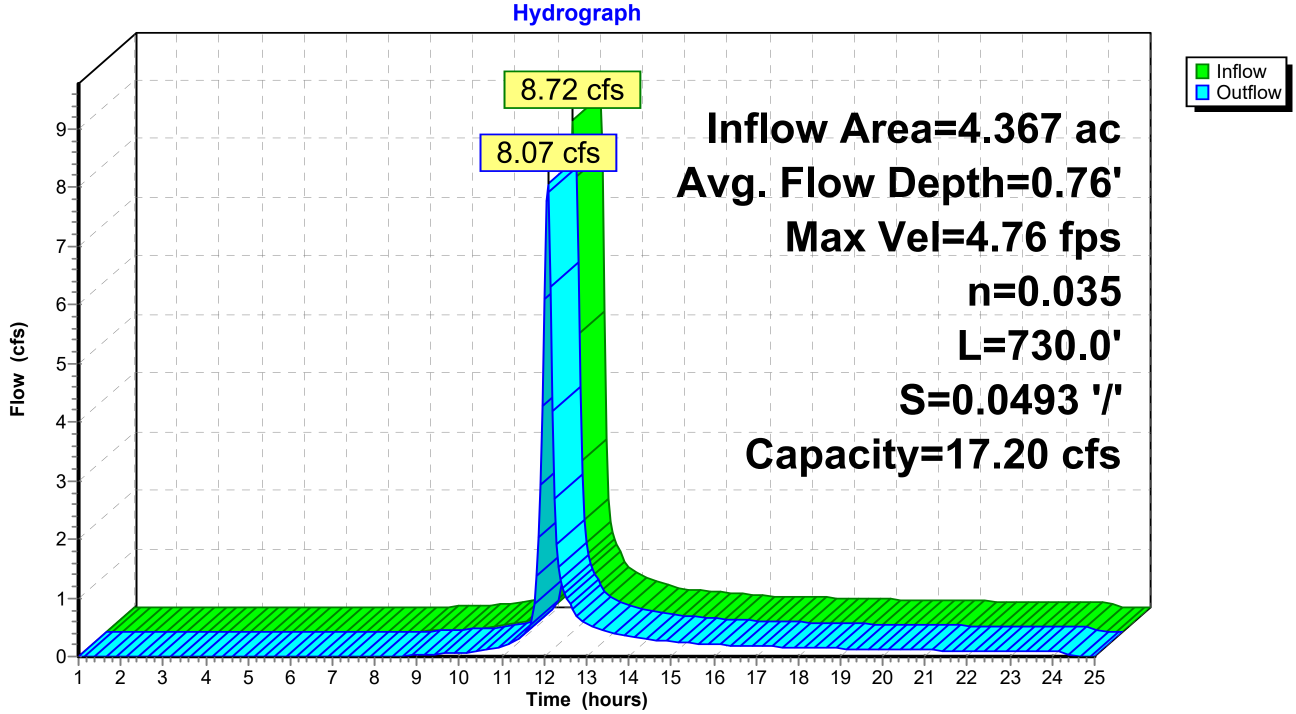
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.76 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 6.9 min

Peak Storage= 1,259 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.20 cfs

0.00' x 1.00' deep channel, n= 0.035 Riprap, 6-inch
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 730.0' Slope= 0.0493 '/'
Inlet Invert= 6,884.00', Outlet Invert= 6,848.00'



Reach 27R: CH-2



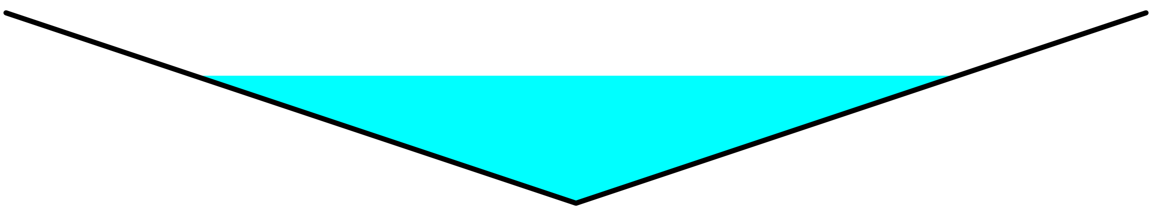
Summary for Reach 28R: DC-4

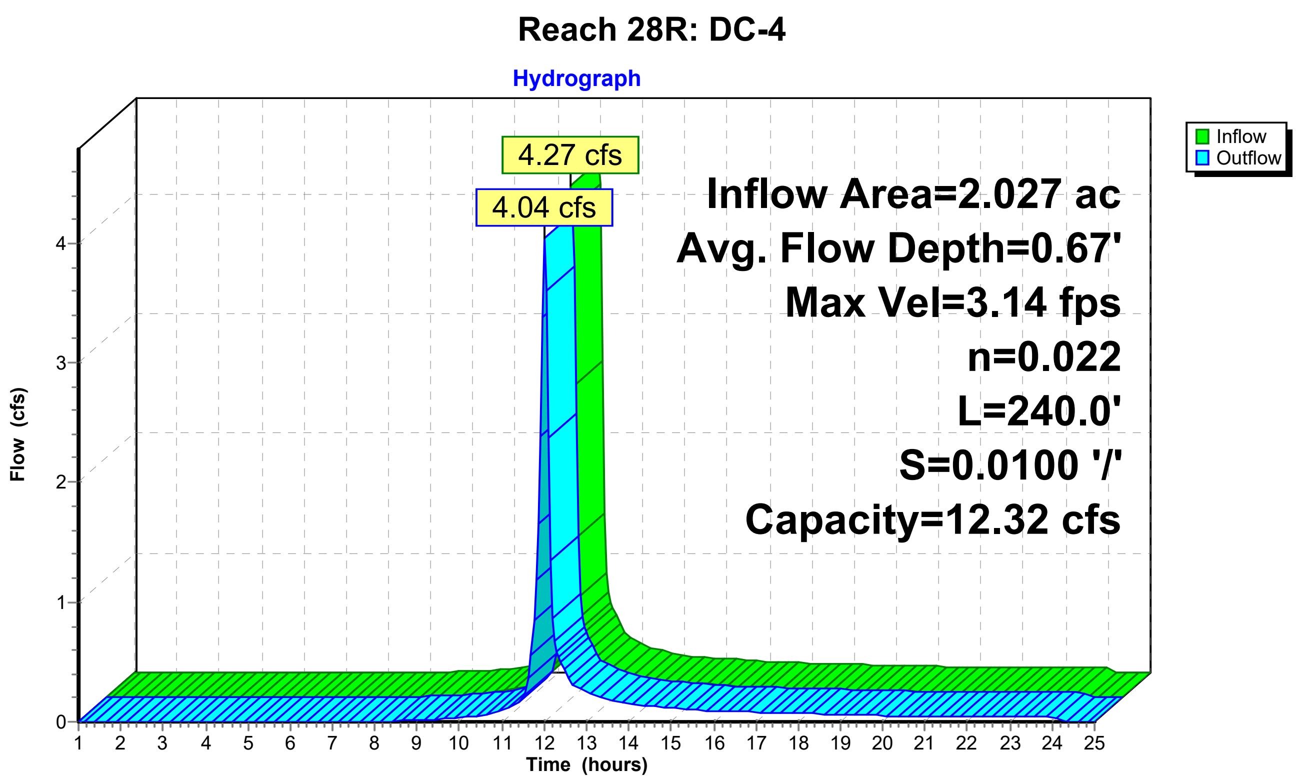
Inflow Area = 2.027 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 4.27 cfs @ 11.97 hrs, Volume= 0.208 af
Outflow = 4.04 cfs @ 12.01 hrs, Volume= 0.208 af, Atten= 5%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 3.6 min

Peak Storage= 323 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 240.0' Slope= 0.0100 '/'
Inlet Invert= 6,864.00', Outlet Invert= 6,861.60'





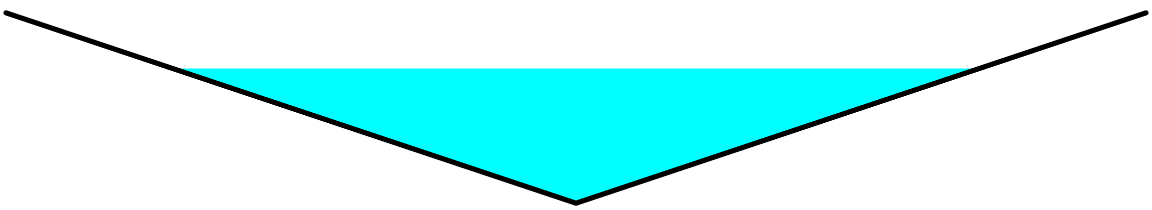
Summary for Reach 29R: DC-5

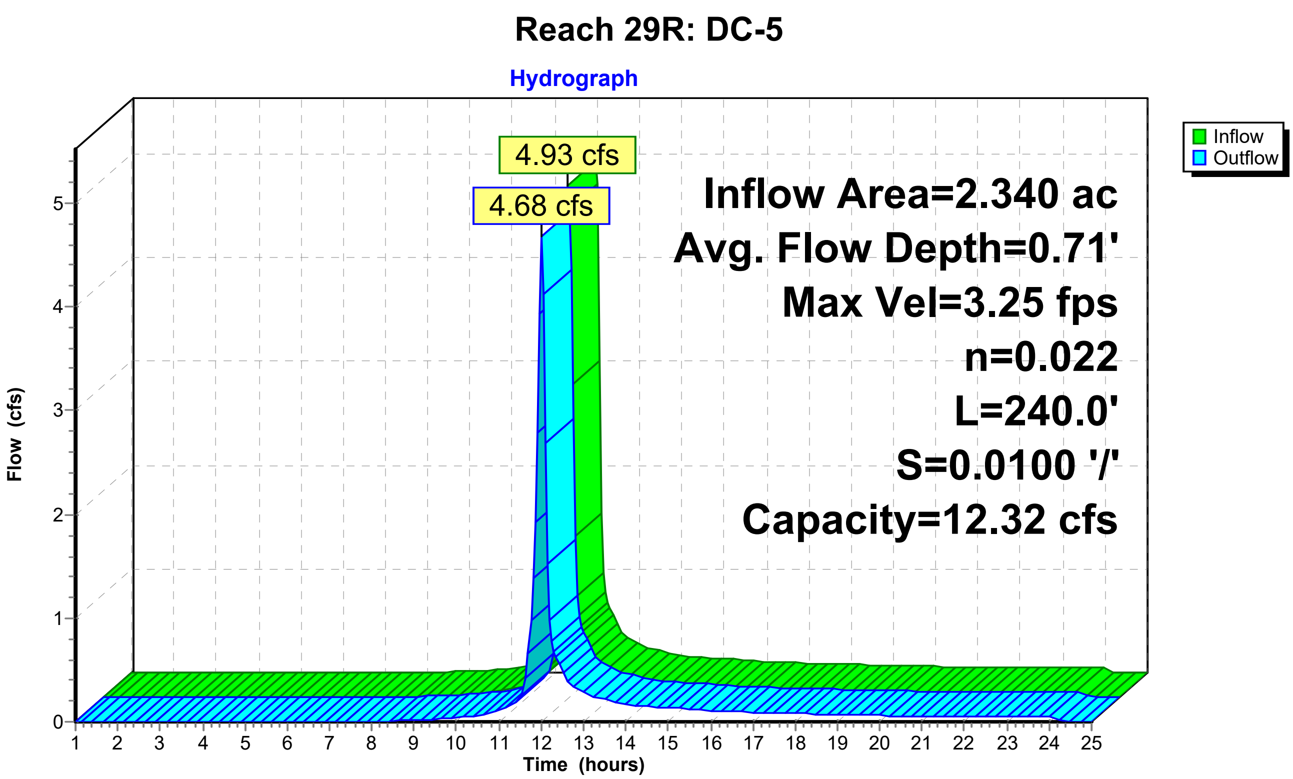
Inflow Area = 2.340 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 4.93 cfs @ 11.97 hrs, Volume= 0.240 af
Outflow = 4.68 cfs @ 12.00 hrs, Volume= 0.240 af, Atten= 5%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 3.5 min

Peak Storage= 360 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 240.0' Slope= 0.0100 '/'
Inlet Invert= 6,874.00', Outlet Invert= 6,871.60'





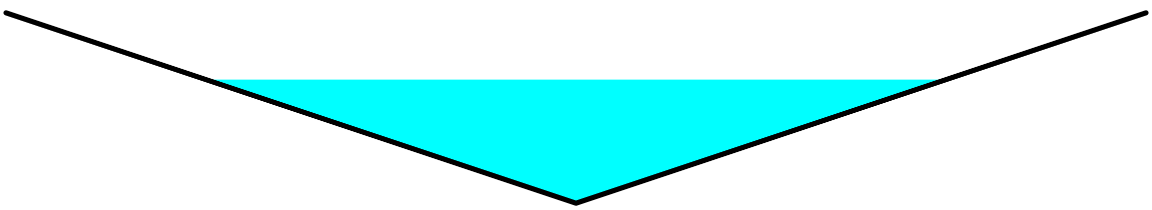
Summary for Reach 32R: DC-6

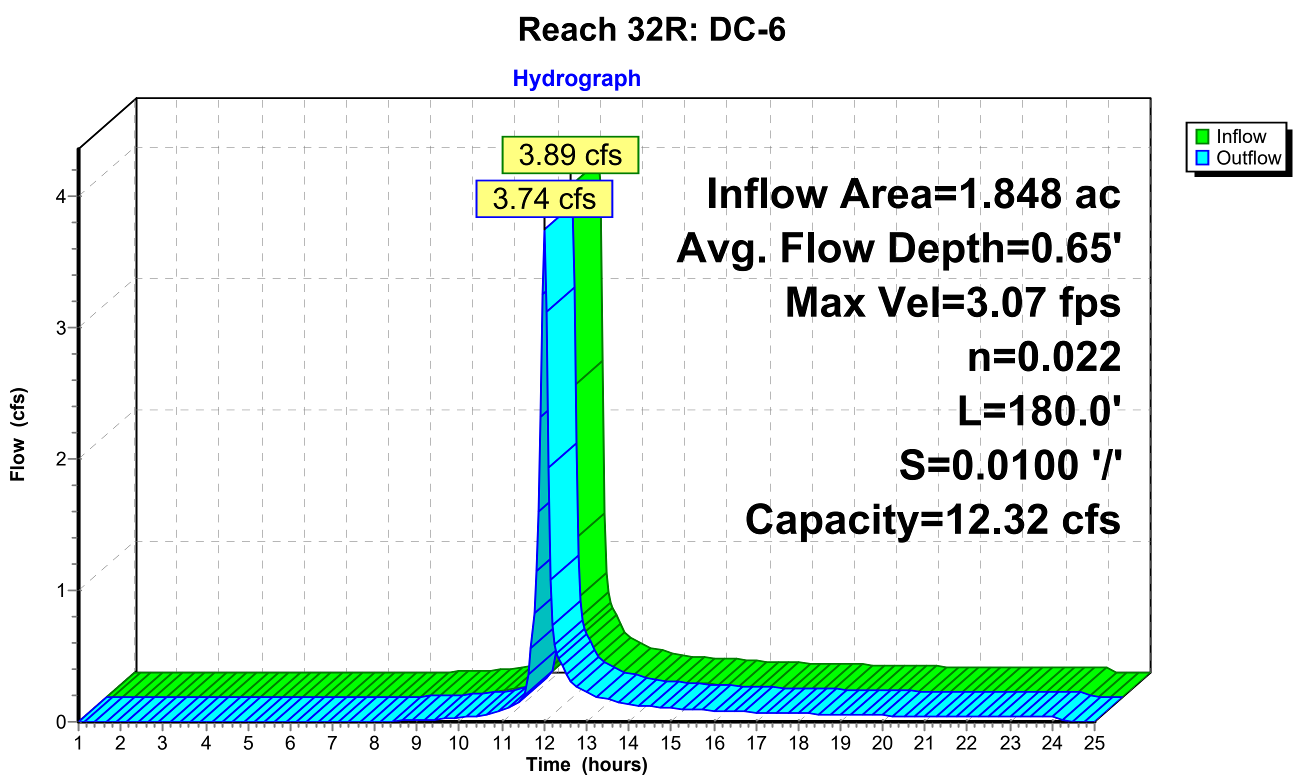
Inflow Area = 1.848 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 3.89 cfs @ 11.97 hrs, Volume= 0.189 af
Outflow = 3.74 cfs @ 12.00 hrs, Volume= 0.189 af, Atten= 4%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.07 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 2.8 min

Peak Storage= 227 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 6,874.60', Outlet Invert= 6,872.80'





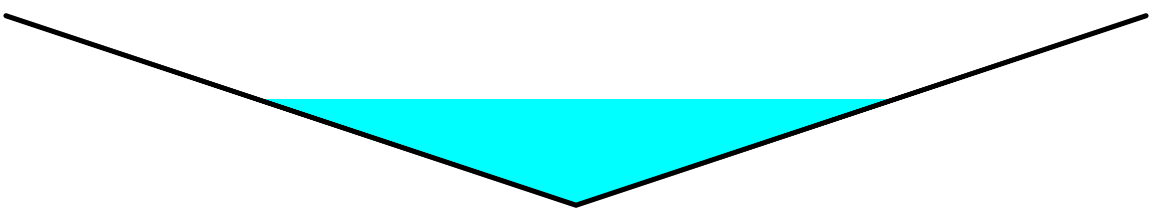
Summary for Reach 33R: DC-7

Inflow Area = 1.259 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 2.65 cfs @ 11.97 hrs, Volume= 0.129 af
Outflow = 2.54 cfs @ 12.00 hrs, Volume= 0.129 af, Atten= 4%, Lag= 1.7 min

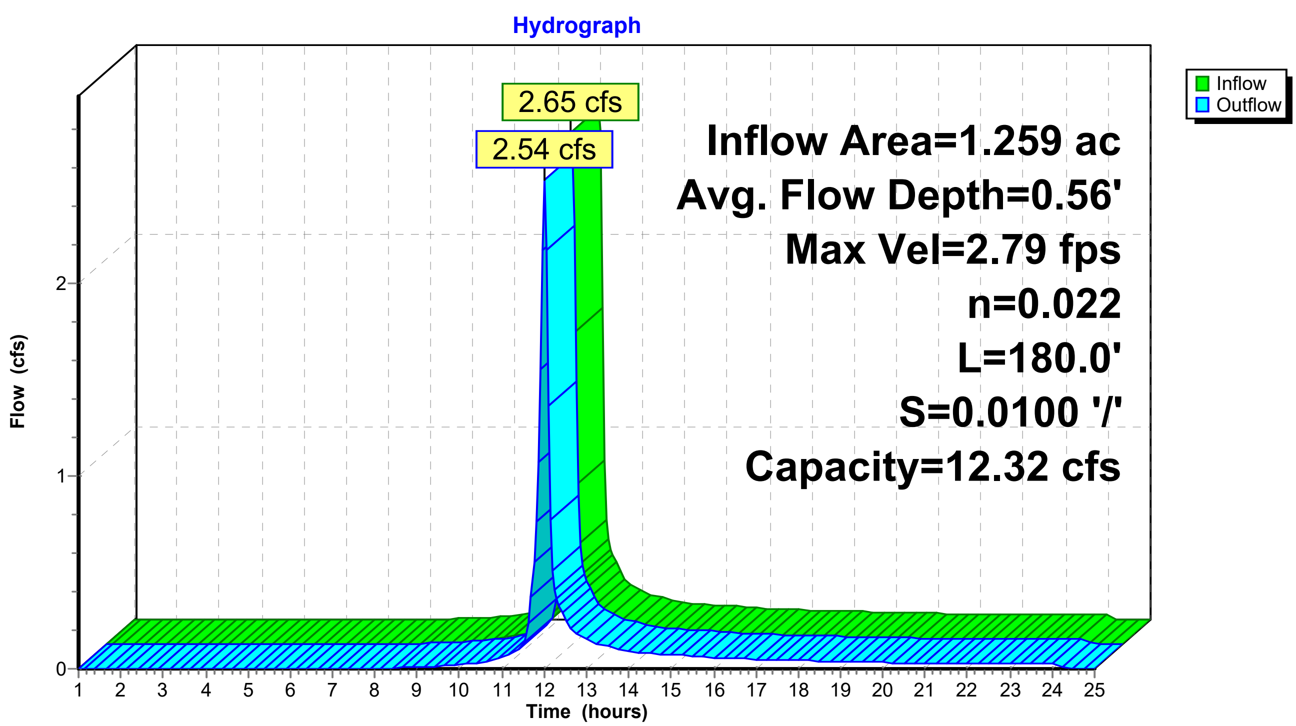
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.79 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 3.0 min

Peak Storage= 170 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 6,864.00', Outlet Invert= 6,862.20'



Reach 33R: DC-7



Summary for Reach 35R: CH-3

[63] Warning: Exceeded Reach 32R INLET depth by 7.40' @ 24.95 hrs
[63] Warning: Exceeded Reach 33R INLET depth by 18.02' @ 12.15 hrs

Inflow Area = 3.107 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 6.28 cfs @ 12.00 hrs, Volume= 0.318 af
Outflow = 5.42 cfs @ 12.11 hrs, Volume= 0.318 af, Atten= 14%, Lag= 6.7 min

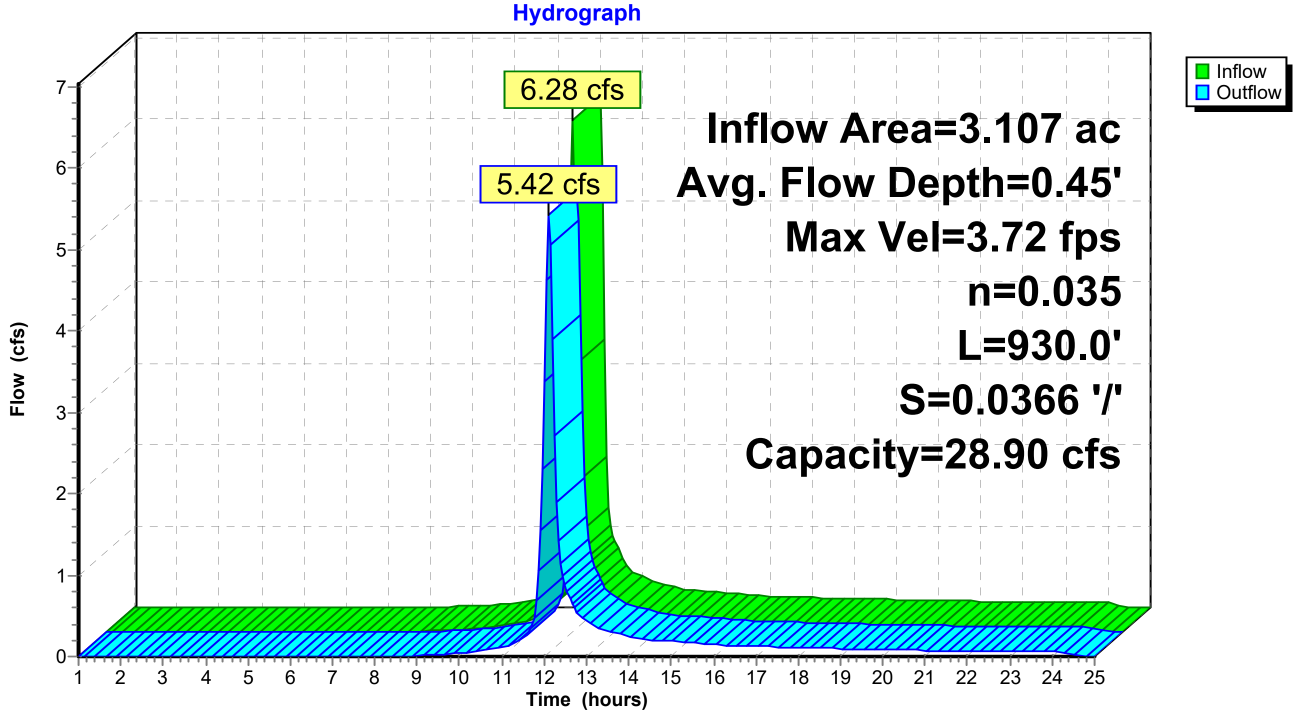
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 14.6 min

Peak Storage= 1,395 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 28.90 cfs

2.00' x 1.00' deep channel, n= 0.035 Riprap, 6-inch
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 930.0' Slope= 0.0366 '/'
Inlet Invert= 6,882.00', Outlet Invert= 6,848.00'

‡

Reach 35R: CH-3



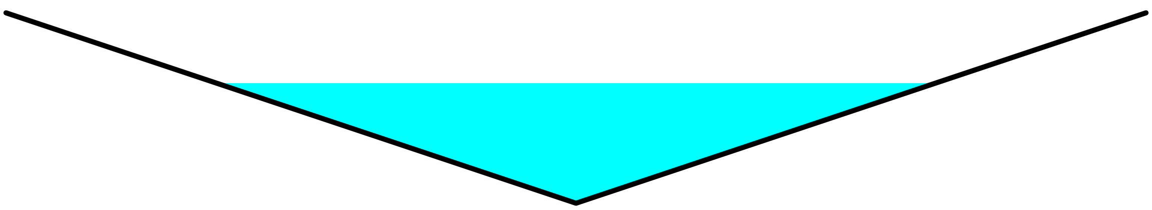
Summary for Reach 42R: DC-8

Inflow Area = 1.711 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 3.60 cfs @ 11.97 hrs, Volume= 0.175 af
Outflow = 3.46 cfs @ 12.00 hrs, Volume= 0.175 af, Atten= 4%, Lag= 1.6 min

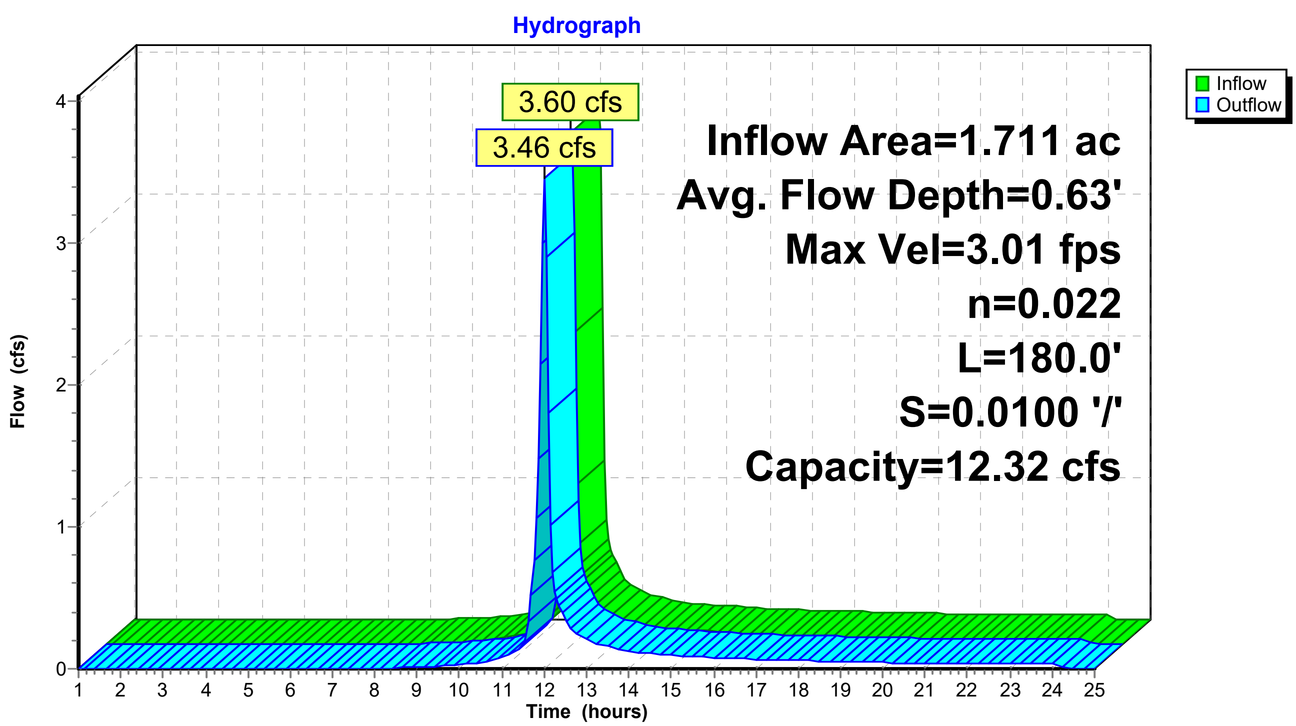
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 2.8 min

Peak Storage= 214 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 6,874.60', Outlet Invert= 6,872.80'



Reach 42R: DC-8



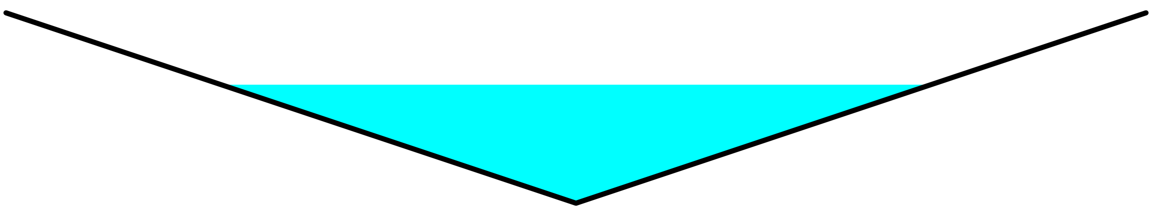
Summary for Reach 43R: DC-9

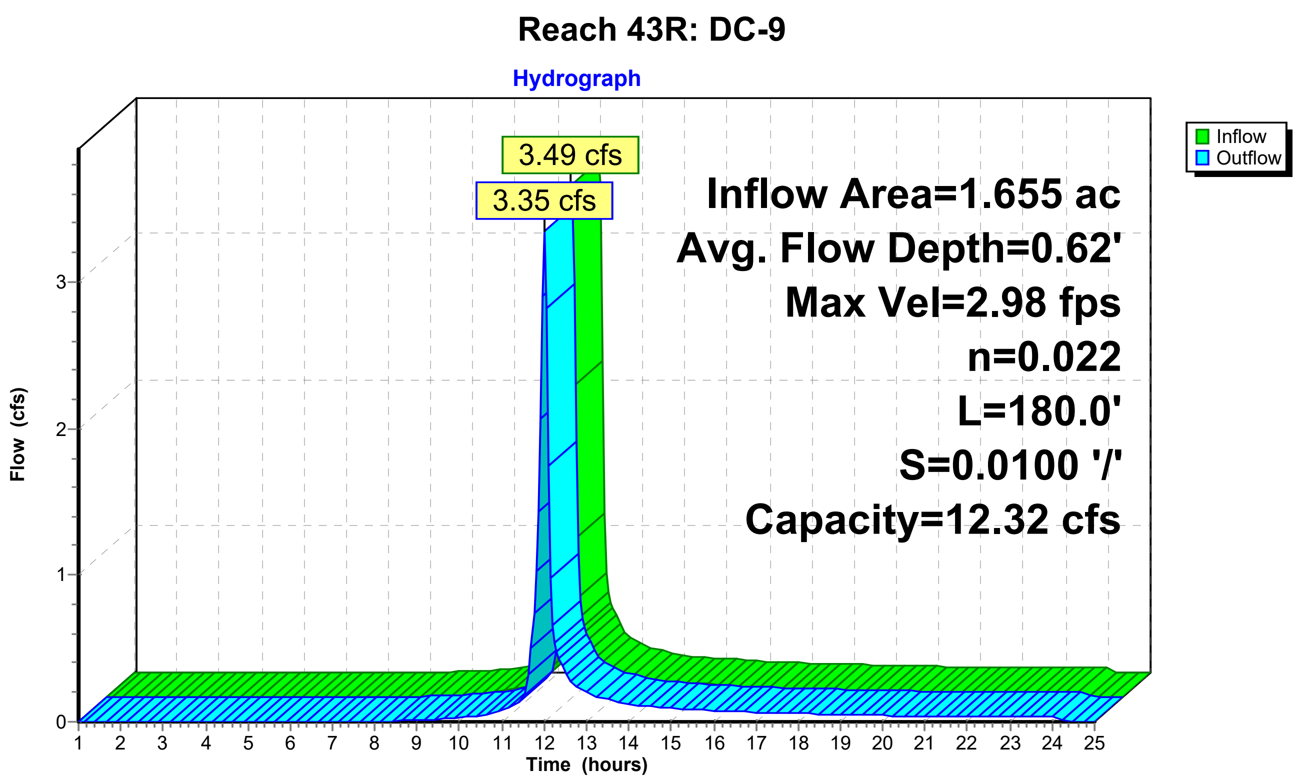
Inflow Area = 1.655 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 3.49 cfs @ 11.97 hrs, Volume= 0.170 af
Outflow = 3.35 cfs @ 12.00 hrs, Volume= 0.170 af, Atten= 4%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 2.8 min

Peak Storage= 209 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 12.32 cfs

0.00' x 1.00' deep channel, n= 0.022
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 180.0' Slope= 0.0100 '/'
Inlet Invert= 6,864.00', Outlet Invert= 6,862.20'





Summary for Reach 46R: CH-4

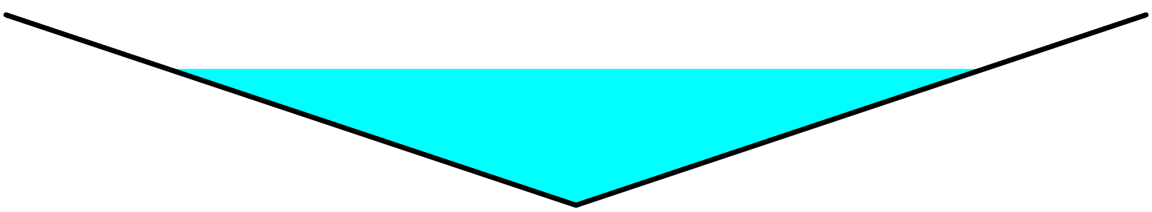
[63] Warning: Exceeded Reach 42R INLET depth by 7.63' @ 12.15 hrs
[63] Warning: Exceeded Reach 43R INLET depth by 18.23' @ 12.10 hrs

Inflow Area = 3.366 ac, 0.00% Impervious, Inflow Depth = 1.23" for 25-year event
Inflow = 6.81 cfs @ 12.00 hrs, Volume= 0.345 af
Outflow = 5.92 cfs @ 12.10 hrs, Volume= 0.345 af, Atten= 13%, Lag= 6.4 min

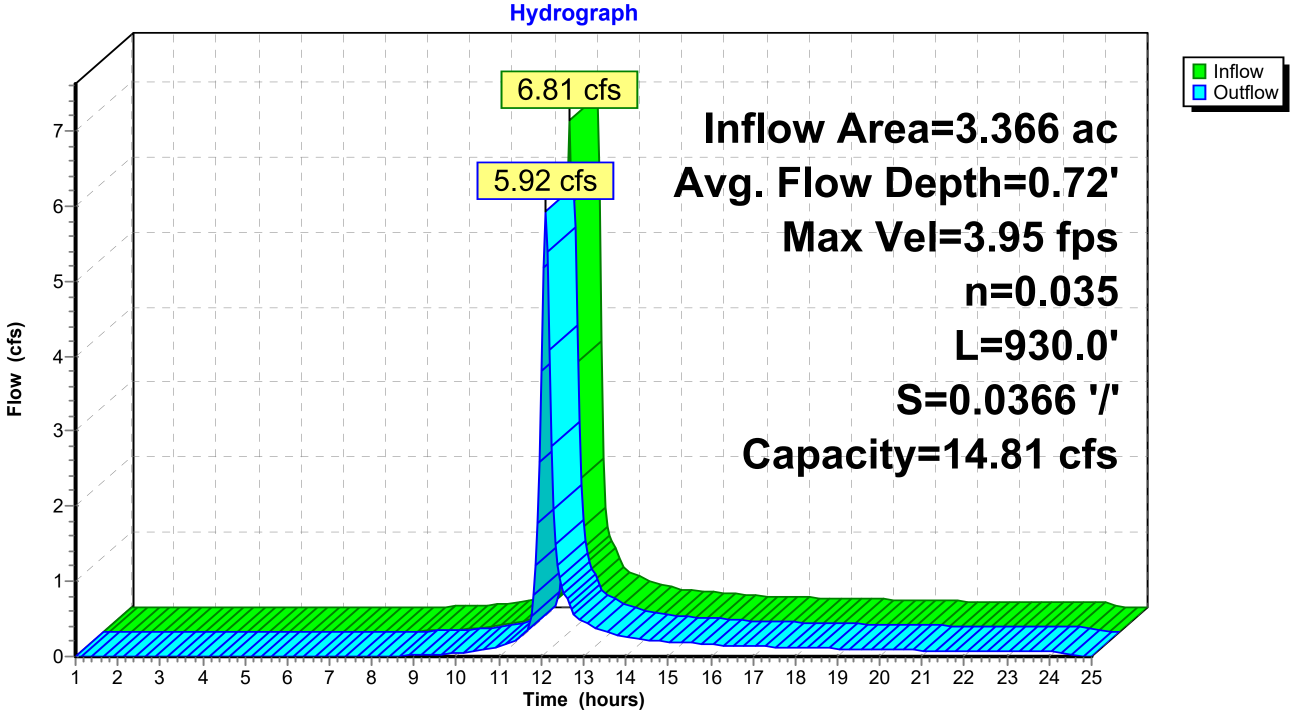
Routing by Stor-Ind+Trans method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.95 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 10.6 min

Peak Storage= 1,429 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 14.81 cfs

0.00' x 1.00' deep channel, n= 0.035 Riprap, 6-inch
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 930.0' Slope= 0.0366 '/'
Inlet Invert= 6,882.00', Outlet Invert= 6,848.00'



Reach 46R: CH-4



Summary for Pond 9P: North Pond

[62] Hint: Exceeded Reach 17R OUTLET depth by 0.57' @ 24.95 hrs
[62] Hint: Exceeded Reach 21R OUTLET depth by 0.55' @ 24.95 hrs
[62] Hint: Exceeded Reach 27R OUTLET depth by 0.54' @ 24.95 hrs

Inflow Area = 14.999 ac, 0.00% Impervious, Inflow Depth > 1.23" for 25-year event
Inflow = 21.87 cfs @ 12.06 hrs, Volume= 1.536 af
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

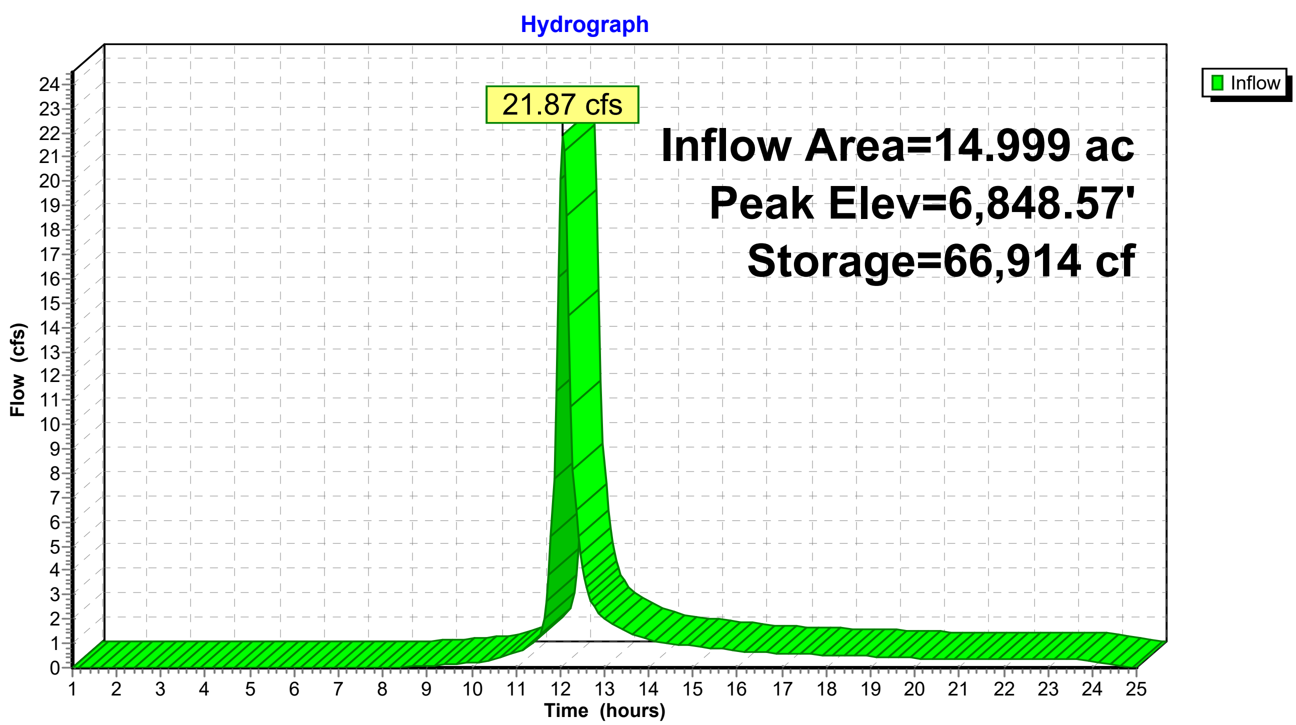
Routing by Stor-Ind method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Peak Elev= 6,848.57' @ 25.00 hrs Surf.Area= 70,043 sf Storage= 66,914 cf

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	6,846.00'	206,699 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,846.00	1,500	0	0
6,847.00	10,897	6,199	6,199
6,848.00	44,958	27,928	34,126
6,849.00	88,950	66,954	101,080
6,850.00	122,287	105,619	206,699

Pond 9P: North Pond



Summary for Pond 10P: South Pond

Inflow Area = 8.290 ac, 0.00% Impervious, Inflow Depth > 1.23" for 25-year event
Inflow = 12.56 cfs @ 12.09 hrs, Volume= 0.849 af
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-25.00 hrs, dt= 0.05 hrs
Peak Elev= 6,846.53' @ 25.00 hrs Surf.Area= 82,591 sf Storage= 36,985 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	6,846.00'	594,841 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,846.00	56,006	0	0
6,847.00	105,818	80,912	80,912
6,848.00	155,512	130,665	211,577
6,849.00	194,586	175,049	386,626
6,850.00	221,844	208,215	594,841

Pond 10P: South Pond