RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN

NEW CASTLE STATION ASH LANDFILL
WEST PITTSBURG, LAWRENCE COUNTY, PENNSYLVANIA

Prepared for:

NRG POWER MIDWEST LP
NEW CASTLE GENERATING STATION
2189 STATE ROUTE 168 SOUTH
WEST PITTSBURG, PENNSYLVANIA 16160

Prepared by:

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333 BALDWIN ROAD
PITTSBURGH, PA 15205

CEC Project 154-531.0002

October 2016

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RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN
NEW CASTLE STATION ASH LANDFILL

1.0 PURPOSE

On behalf of NRG Power Midwest LP (NRG), Civil & Environmental Consultants, Inc. (CEC) has prepared a Run-on and Run-off Control System Plan for the New Castle Station Ash Landfill in accordance with the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule 40 CFR 257.81 (§257.81) dated April 17, 2015.

A Run-on and Run-off Control System Plan must be prepared to document that the run-on and run-off control systems at the CCR landfill have been designed and implemented to meet the requirements of the CCR Rule. Each plan must be supported by appropriate engineering calculations. For existing CCR landfills, the plan must be prepared no later than October 17, 2016 and placed in the facility's operating record. The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design meets the requirements of this section. The professional engineer certification is provided in Appendix A.

2.0 BACKGROUND

New Castle Station Ash Landfill (Landfill) is located in West Pittsburg, Lawrence County, Pennsylvania. Refer to Figure 1 in Appendix B for the Site Location Map. The Landfill operates under Pennsylvania Department of Environmental Protection (PADEP) Solid Waste Permit No. 300818 issued April 23, 2008. The Landfill is a captive residual waste disposal facility that receives CCR from New Castle Generating Station (Station) and sediments from the ponds at the site (residual wastes). The Station ceased using coal to generate power on March 23, 2016. Disposal of residual wastes at the Landfill is anticipated to continue through the Station's estimated shutdown date in the mid-2030s. The Landfill has a stormwater management system permitted under PADEP Solid Waste Permit No. 300818 that is designed and constructed to control run-on and run-off. The stormwater outfall for the landfill is permitted under National Pollutant Discharge Elimination System (NPDES) Permit No. PA0005061.

A Major Permit Modification (MPM) Application to Solid Waste Permit No. 300818 was submitted to PADEP in December 2010 and approved on June 9, 2011. The MPM Application included proposed filling alternates for Stages 4, 5, and 6 of the Landfill over Stages 1, 2, and 3. The MPM Application included filling of Stage 4 over a liner/leachate collection system, installation of a final cover system for Stage 5, and either installation of a final cover system (Alternate 6A) or filling (Alternate 6B) of Stage 6. The MPM Application included design of stormwater controls for both alternates. In Stages 5 and 6, a final cover system was installed (Alternate 6A). A final cover system was also installed over portions of Stages 1, 2, and 3 that were not overlain by Stages 4, 5, and 6. Permanent stormwater controls were installed in these areas in general accordance with the Erosion and Sedimentation Control Plan for Alternate 6A that was included in the MPM Application.

The final cover system will be installed over Stage 4 after filling is complete. Permanent stormwater controls will be installed in these areas in general accordance with the Erosion and Sedimentation Control Plan for Alternate 6A, with some possible variations based on the final grades reached during filling.

The drawing showing the Erosion and Sedimentation Control Plan for Alternate 6A and drawings showing details are included in Appendix B.

3.0 COMPLIANCE WITH §257.81 – RUN-ON AND RUN-OFF CONTROLS FOR CCR LANDFILLS

§257.81 establishes requirements for run-on and run-off system controls for existing and new CCR landfills and requires the owner or operator to design, construct, operate and maintain:

> §257.81(a)(1) 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
> §258.81(a)(2) 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 addition, §257.81(b) requires that run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under §257.3-3 which relate to water quality standards for discharges of surface water.

The following sections address the information required by §257.81. This Run-On and Run-Off Control System Plan is consistent with the PADEP Form I: Soil Erosion and Sedimentation Controls dated December 2010. The approved Form I is provided in Appendix C.

4.0 RUN-ON CONTROL PLAN - §257.81(a)(1)

The stormwater run-on control system prevents flow from entering onto the active portion of the CCR unit. The run-on control system includes the perimeter berm that has been constructed on all sides of Stage 4 where filling is occurring (the active portion of the landfill). The perimeter berm is constructed of CCR from the site, and has intermediate cover on the outer slope.

The perimeter berm limits run-on from adjacent areas. Flow outside of the perimeter berm over the intermediate cover is collected as run-off and discharged to a sedimentation pond. Within the perimeter berm, CCR are generally placed in horizontal lifts. The CCR are graded to direct flow to a vertical riser at the center of the Stage which discharges through the landfill and is treated as leachate, and is ultimately conveyed to a leachate pond.

As filling progresses, the perimeter berm is built up to maintain a height of approximately 4-feet. Outside of the perimeter berm, the slopes grade away from the active portion of the landfill at approximate 3H:1V slopes. With this configuration, there is no accumulation of surface water near the berm; all flow is directed away from the berm. The 4-feet high berm is therefore a sufficient run-on control for the 24-hour, 25-year storm event.

5.0 RUN-OFF CONTROL PLAN - §257.81(a)(2)

The Landfill has a stormwater management system permitted under PADEP Solid Waste Permit No. 300818 that is designed and constructed to control run-off from the final slopes of the

landfill. The stormwater run-off control system includes benches, downchutes, channels, culverts, and the sedimentation pond. The MPM Application Form I provides the design calculations for the stormwater control system. The design calculations were completed in accordance with the PADEP Bureau of Soil and Water Conservation, Erosion and Sediment Pollution Control Manual, dated April 2000. The stormwater design includes benches, diversion berms, downchutes, channels, and culverts. This run-off control plan addresses the stormwater control system for Alternative 6A. Permanent stormwater controls will be installed in these areas in general accordance with the Erosion and Sedimentation Control Plan for Alternate 6A, with some possible variations based on the final grades reached during filling. If needed, a revised Erosion and Sedimentation Control Plan will be prepared based on the final grades reached during filling.

5.1 BENCHES

The benches of the Landfill are graded into the waste and final cover system. The final cover grading includes 3H:1V final grades with 15-feet wide benches spaced approximately every 25 feet vertically. The benches are sloped inward towards the landfill at approximate 5 percent slopes as shown on the details included on the drawings in Appendix B. The benches receive run-off from the 3H:1V final grades of the landfill and are sloped to convey the run-off to downchutes. The benches are designed to convey flow from the 25-year, 24-hour storm event. A calculation for benches was performed and is included in Appendix C with the Form I calculations.

5.2 SURFACE WATER DIVERSION BERM

Surface water diversion berms are used to convey runoff from the Landfill to downchutes. The diversion berms are generally used on slopes that are more shallow than 3H:1V. The height of the diversion berms vary. The diversion berms are designed to convey flow from the 25-year, 24-hour storm event.

5.3 DOWNCHUTES

Downchutes at the site generally convey run-off off down the 3H:1V slopes of the Landfill to perimeter channels. Downchutes are also used on shallower slopes to convey run-off to perimeter channels. The downchutes are typically trapezoidal as shown on the details included on the drawings in Appendix B. The downchutes are lined with concrete revetment due to the steepness of the slopes. The downchutes are designed to convey flow from the 25-year, 24-hour storm event. The downchutes convey run-off to perimeter channels. At the discharge point of each downchute, the concrete revetment mat extends into the perimeter channels.

5.4 CHANNELS

Channels at the site generally convey run-off around the perimeter of the Landfill through culverts as needed and ultimately to the sedimentation pond. The channels are typically trapezoidal, as shown on the details included on the drawings in Appendix B. The channels are either grass-lined, lined with R-4 riprap, or lined with concrete revetment. The lining of the channels depends on the slope of the channel and the flow through the channel during the 25-year, 24-hour storm event. The channels are designed to convey flow from the 25-year, 24-hour storm event.

5.5 CULVERTS

The culverts convey run-off between channel segments. Typically, culverts are used at road crossings. Drop inlet boxes are used to inlet flow from the perimeter channel segments into the culverts. The culverts are designed to be HDPE or concrete. The culverts are designed to convey flow from the 25-year, 24-hour storm event.

5.6 SEDIMENTATION POND

The existing sedimentation pond includes a principal and emergency spillway. The existing sedimentation pond has capacity for the 25-year, 24-hour storm event. The stormwater outfall from the sedimentation pond is permitted under NPDES Permit No. PA0005061 as outfall 006. The sedimentation pond discharges to the Beaver River.

6.0 SURFACE WATER DISCHARGE REQUIREMENTS - §257.81(b)

§257.81(b) requires that run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under §257.3-3 which relate to water quality standards for discharges of surface water. In accordance with §257.3-3, discharges from the sedimentation pond are authorized by and in compliance with PADEP under NPDES Permit No. PA0005061. Dredged material or fill material is not discharged from the Site to waters of the United States in violation of the requirements under Section 404 of the Clean Water Act. Site operations have not caused non-point source pollution to waters of the United States in violation of the requirements under Section 208 of the Clean Water Act.

7.0 CONCLUSION

The Run-on and Run-off Control System Plan demonstrates that the Site is designed, constructed, operated, and maintained in accordance with Section §257.81 of the CCR Rule. The certification statement by a qualified professional engineer is provided in Appendix A. Supporting drawings and calculations are provided in Appendices B and C. This demonstration will be placed in the operating record by October 17, 2016.

8.0 REFERENCES

1. Application for Major Permit Modification of Vertical Expansion. New Castle Ash Landfill. Permit I.D. No. 300818. December 2010. Civil & Environmental Consultants, Inc.

APPENDIX A

PROFESSIONAL ENGINEER CERTIFICATION STATEMENT

PROFESSIONAL ENGINEER CERTIFICATION

This Run-on and Run-off Control System Plan fulfills the CCR Rule requirements (40 CFR Parts 257 and 261) dated April 17, 2015. This Run-on and Run-off Control System Plan will be placed in the operating record by October 17, 2016.

I, Angela M. Ramirez, P.E., a registered professional engineer in the State of Pennsylvania, certify that the Run-on and Run-off Control System Plan for the New Castle Station Ash Landfill fulfills the requirements of §257.81. This certification is based on my review of the Run-on and Run-off Control System Plan for New Castle Station Ash Landfill.

Angela M. Ramirez, P.E.

Printed Name of Professional Engineer

Angela M. Ramirez

Signature

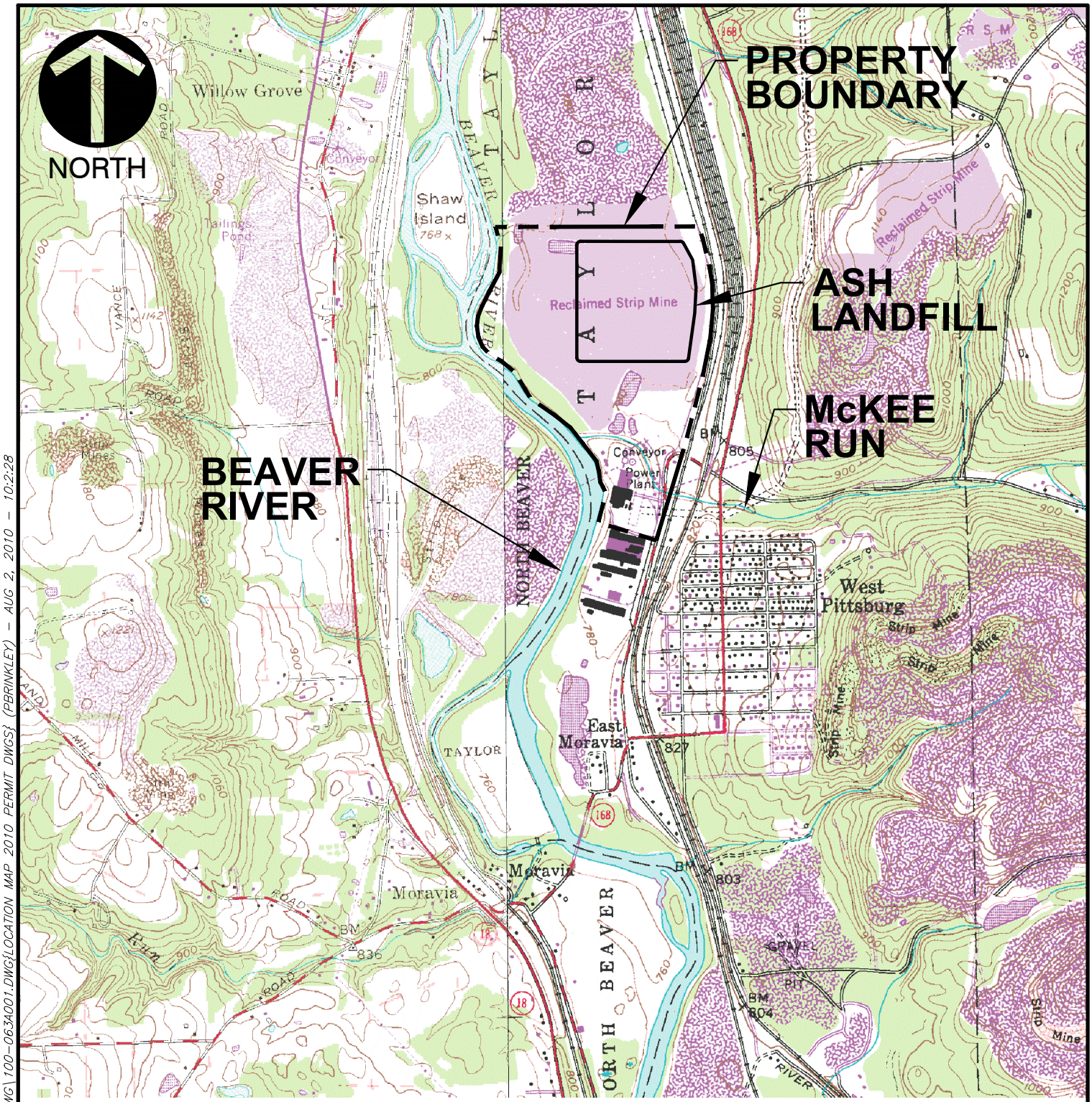
PE082317	Pennsylvania	10-14-2016
Registration No.	Registration State	Date

Stamp/Seal:

October 2016

APPENDIX B

DRAWINGS



REFERENCE

U.S.G.S 7.5 MIN. TOPOGRAPHIC QUADRANGLE NEW CASTLE SOUTH, PA (PHOTOREVISED 1990) BESSEMER, PA (PHOTOREVISED 1990)

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* HAND SIGNATURE ON FILE

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NRG POWER MIDWEST LP
NEW CASTLE STATION ASH LANDFILL
WEST PITTSBURG
LAWRENCE COUNTY, PENNSYLVANIA

SITE LOCATION MAP

DRAWN BY:	DWD	CHECKED BY:	AMR	APPROVED BY:	RJB*	FIGURE NO.:	1
DATE:	9/23/2016	DWG SCALE:	1"=2000'	PROJECT NO:	154-531.0002		

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TITLE SHEET

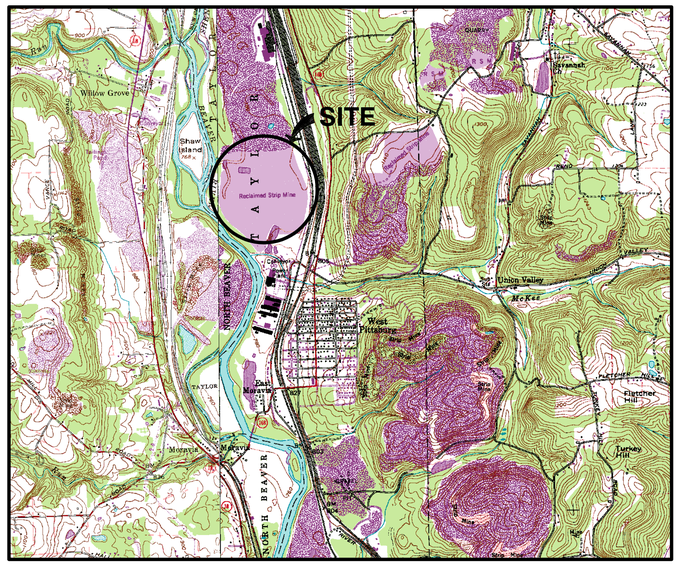
NO.	DATE	REVISION	BY	CHK.	APP.	APP.

MAJOR PERMIT MODIFICATION
OF
VERTICAL EXPANSION
STAGES 4, 5, AND 6
ORION POWER MIDWEST, L.P. - NEW CASTLE PLANT ASH LANDFILL
TAYLOR TOWNSHIP, LAWRENCE COUNTY
PENNSYLVANIA

PREPARED FOR

RRI Energy™

ORION POWER MIDWEST, L.P.
NEW CASTLE GENERATION STATION
ROUTE 168
WEST PITTSBURG, PENNSYLVANIA
16160



REFERENCE:
U.S.G.S 7.5 MIN. TOPOGRAPHIC QUADRANGLES NEW CASTLE SOUTH, PENNSYLVANIA, DATED 1958. PHOTOREVISED 1990. BESSEMER, PENNSYLVANIA, DATED 1958. PHOTOREVISED 1990.

SITE LOCATION MAP

SCALE: 1"=2000'

SCALE IN FEET
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PREPARED BY

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333 Baldwin Road
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412.429.2324 800.365.2324

PROJECT NO.: 040-654
DECEMBER 2010

LIST OF DRAWINGS

NEW DRAWING NO.	PREVIOUS DRAWING NO.	DRAWING TITLE	PREPARED BY	DRAWING DATE
		TITLE SHEET	CEC	11/10/10
728-1001	F002	EXISTING SITE CONDITIONS & SEASONALLY HIGH GROUNDWATER CONTOURS	CEC	11/10/10
728-1002	F003	1/4-MILE AND 1/2-MILE RADIUS (SHEET 1 OF 3)	CEC	11/10/10
728-1003	F004	1/4-MILE AND 1/2-MILE RADIUS (SHEET 2 OF 3)	CEC	11/10/10
728-1004	F005	1/4-MILE AND 1/2-MILE RADIUS (SHEET 3 OF 3)	CEC	11/10/10
728-1005	F015	LANDFILL STAGING PLAN STAGE 4	CEC	11/10/10
728-1006	F016	LANDFILL STAGING PLAN STAGE 5	CEC	11/10/10
728-1007	F006	TOP OF SUBBASE/GRADING PLAN (ALTERNATE 6A)	CEC	11/10/10
728-1008	F007	TOP OF FINAL COVER GRADING PLAN (ALTERNATE 6A)	CEC	11/10/10
728-1009	F008	LEACHATE COLLECTION/DETECTION PIPING PLAN (ALTERNATE 6A)	CEC	11/10/10
728-1010	F009	LANDFILL CROSS-SECTIONS (ALTERNATE 6A)	CEC	11/10/10
728-1011	F017	LANDFILL STAGING PLAN STAGE 6A (ALTERNATE 6A)	CEC	11/10/10
728-1012	F020	E&S PLAN (LANDFILL BASE GRADES ALTERNATE 6A)	CEC	11/10/10
728-1013		TOP OF SUBBASE/GRADING PLAN (ALTERNATE 6B)	CEC	11/10/10
728-1014		TOP OF FINAL COVER GRADING PLAN (ALTERNATE 6B)	CEC	11/10/10
728-1015		LEACHATE COLLECTION/DETECTION PIPING PLAN (ALTERNATE 6B)	CEC	11/10/10
728-1016		LANDFILL CROSS-SECTIONS (ALTERNATE 6B)	CEC	11/10/10
728-1017	F018	LANDFILL STAGING PLAN STAGE 6B (ALTERNATE 6B)	CEC	11/10/10
728-1018		E&S PLAN (LANDFILL FINAL GRADES ALTERNATE 6B)	CEC	11/10/10
728-1019	F010	LINER SYSTEM/FINAL COVER SYSTEM DETAILS (SHEET 1 OF 3)	CEC	11/10/10
728-1020	F011	LINER SYSTEM/FINAL COVER SYSTEM DETAILS (SHEET 2 OF 3)	CEC	11/10/10
728-1021	F025	LINER SYSTEM/FINAL COVER SYSTEM DETAILS (SHEET 3 OF 3)	CEC	11/10/10
728-1022	F012	LEACHATE MANAGEMENT SYSTEM DETAILS (SHEET 1 OF 3)	CEC	11/10/10
728-1023	F013	LEACHATE MANAGEMENT SYSTEM DETAILS (SHEET 2 OF 3)	CEC	11/10/10
728-1024	F014	LEACHATE MANAGEMENT SYSTEM DETAILS (SHEET 3 OF 3)	CEC	11/10/10
728-1025	F021	SURFACEWATER MANAGEMENT SYSTEM DETAILS (SHEET 1 OF 4)	CEC	11/10/10
728-1026	F022	SURFACEWATER MANAGEMENT SYSTEM DETAILS (SHEET 2 OF 4)	CEC	11/10/10
728-1027	F023	SURFACEWATER MANAGEMENT SYSTEM DETAILS (SHEET 3 OF 4)	CEC	11/10/10
728-1028	F026	SURFACEWATER MANAGEMENT SYSTEM DETAILS (SHEET 4 OF 4)	CEC	11/10/10
728-1029	F024	LEACHATE POND UPGRADE AND DETAILS	CEC	11/10/10
VOID	F019	E&S PLAN (LANDFILL BASE GRADES)	CEC	11/10/10

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DUANE LANDIS
ENGINEER
PE076285

FOR PERMIT ONLY

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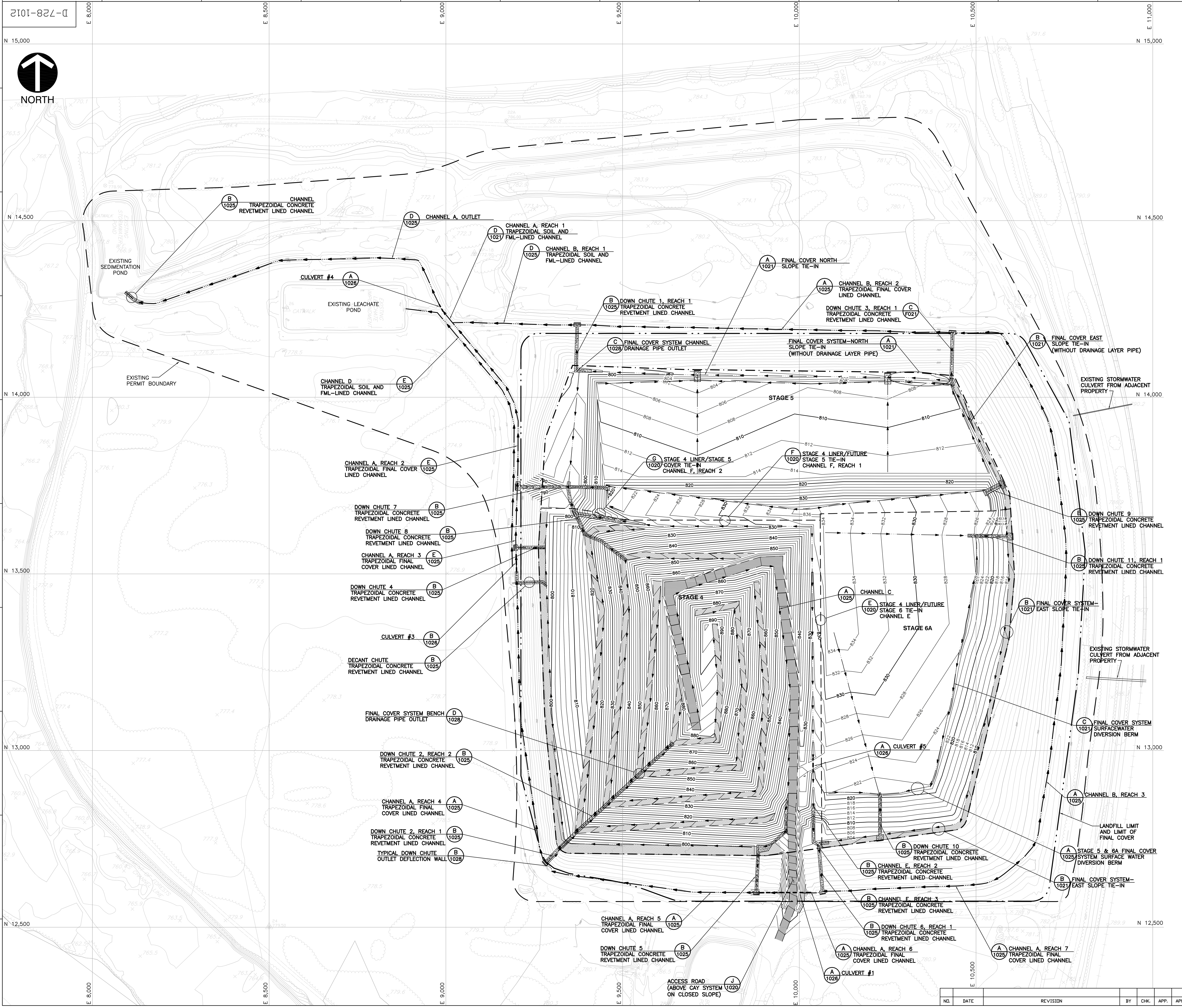

D-728-1012
NORTH
EXISTING SEDIMENTATION POND
EXISTING LEACHATE POND
EXISTING PERMIT BOUNDARY
STAGE 5
STAGE 4
STAGE 6A
CHANNEL TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL A, OUTLET
CHANNEL A, REACH 1 TRAPEZOIDAL SOIL AND FML-LINED CHANNEL
CHANNEL B, REACH 1 TRAPEZOIDAL SOIL AND FML-LINED CHANNEL
CULVERT #4
FINAL COVER NORTH SLOPE TIE-IN
CHANNEL B, REACH 2 TRAPEZOIDAL FINAL COVER LINED CHANNEL
DOWN CHUTE 1, REACH 1 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
DOWN CHUTE 3, REACH 1 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
FINAL COVER SYSTEM CHANNEL DRAINAGE PIPE OUTLET
FINAL COVER SYSTEM-NORTH SLOPE TIE-IN (WITHOUT DRAINAGE LAYER PIPE)
FINAL COVER EAST SLOPE TIE-IN (WITHOUT DRAINAGE LAYER PIPE)
CHANNEL D TRAPEZOIDAL SOIL AND FML-LINED CHANNEL
EXISTING STORMWATER CULVERT FROM ADJACENT PROPERTY
STAGE 4 LINER/STAGE 5 COVER TIE-IN CHANNEL F, REACH 2
STAGE 4 LINER/FUTURE STAGE 5 TIE-IN CHANNEL F, REACH 1
CHANNEL A, REACH 2 TRAPEZOIDAL FINAL COVER LINED CHANNEL
DOWN CHUTE 7 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
DOWN CHUTE 9 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
DOWN CHUTE 8 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL A, REACH 3 TRAPEZOIDAL FINAL COVER LINED CHANNEL
DOWN CHUTE 11, REACH 1 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
DOWN CHUTE 4 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL C
STAGE 4 LINER/FUTURE STAGE 6 TIE-IN CHANNEL E
FINAL COVER SYSTEM-EAST SLOPE TIE-IN
CULVERT #3
DECANT CHUTE TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
EXISTING STORMWATER CULVERT FROM ADJACENT PROPERTY
FINAL COVER SYSTEM BENCH DRAINAGE PIPE OUTLET
FINAL COVER SYSTEM SURFACEWATER DIVERSION BERM
CULVERT #5
DOWN CHUTE 2, REACH 2 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL B, REACH 3
CHANNEL A, REACH 4 TRAPEZOIDAL FINAL COVER LINED CHANNEL
LANDFILL LIMIT AND LIMIT OF FINAL COVER
DOWN CHUTE 2, REACH 1 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
TYPICAL DOWN CHUTE OUTLET DEFLECTION WALL
DOWN CHUTE 10 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
STAGE 5 & 6A FINAL COVER SYSTEM SURFACE WATER DIVERSION BERM
CHANNEL E, REACH 2 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
FINAL COVER SYSTEM-EAST SLOPE TIE-IN
CHANNEL F, REACH 3 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL A, REACH 5 TRAPEZOIDAL FINAL COVER LINED CHANNEL
DOWN CHUTE 6, REACH 1 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
DOWN CHUTE 5 TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
CHANNEL A, REACH 6 TRAPEZOIDAL FINAL COVER LINED CHANNEL
CHANNEL A, REACH 7 TRAPEZOIDAL FINAL COVER LINED CHANNEL
CULVERT #1
ACCESS ROAD (ABOVE CAY SYSTEM ON CLOSED SLOPE)

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- EXISTING BUILDING
- EXISTING STREAM OR RIVER
- EXISTING TREELINE
- ×778.3 EXISTING SPOT EL.
- B/1019 DETAIL / DRAWING NUMBER
- LIMITS OF VERTICAL EXPANSION DISPOSAL AREA
- STAGE LIMITS
- EXISTING PERMIT BOUNDARY
- 830 TOP OF FINAL COVER INDEX CONTOUR
- 824 TOP OF FINAL COVER INTERMEDIATE CONTOUR
- BENCH
- HAUL/ACCESS ROAD
- STORMWATER FLOW DIRECTION

REFERENCE

1. CURRENT TOPOGRAPHY PROVIDED BY AERIAL DESIGN DATA, 1201 CLAY PIKE, N. HUNTINGTON, PA 15642 FROM PHOTOGRAPHY TAKEN 1-11-07, 1"=100', 2' CONTOUR INTERVAL. AND FROM SURVEY BY NEW CASTLE ASH OF STAGE 3 AREA APRIL 2008.
2. LANDFILL AS-BUILTS BASED ON 3-18-10 GROUND SURVEY.

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* HAND SIGNATURE ON FILE

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RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

EROSION AND SEDIMENTATION
CONTROL PLAN
(LANDFILL COVER GRADE-ALTERNATE 6A)

DRAWN: 11/10/10	BY. SPS	DRAWING NUMBER
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APPROVED	DRL	
APPROVED		
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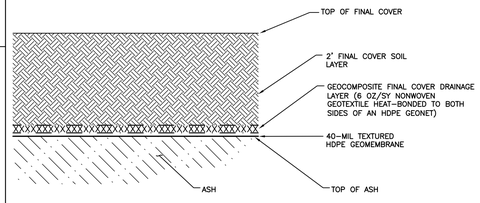
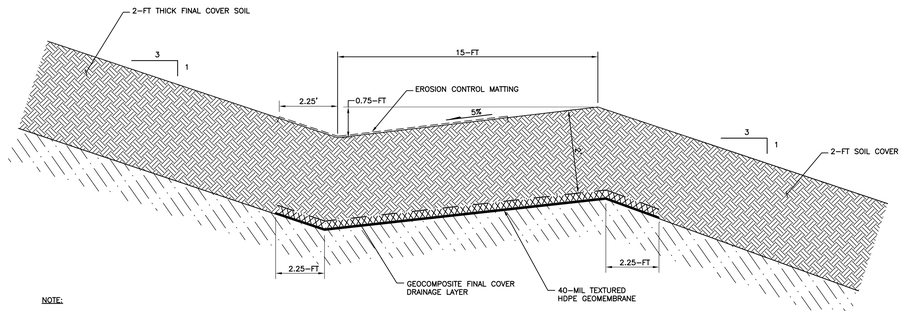


NOTE:

1. THIS FINAL COVER SYSTEM WILL BE CONSTRUCTED ON THE EXISTING LANDFILL IN AREAS WHERE THE OVERLAY LINER SYSTEM WILL NOT BE CONSTRUCTED.

DETAIL A
FINAL COVER SYSTEM

N.T.S.

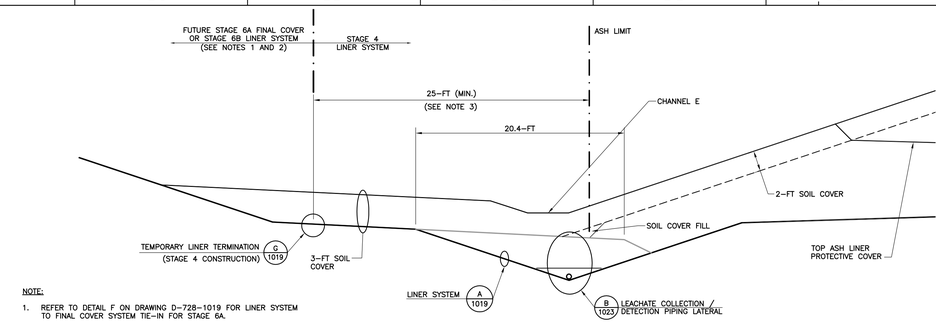


NOTE:

1. THIS FINAL COVER SYSTEM WILL BE CONSTRUCTED ON THE EXISTING LANDFILL IN AREAS WHERE THE OVERLAY LINER SYSTEM WILL BE CONSTRUCTED.

DETAIL B
FINAL COVER SYSTEM - VERTICAL EXPANSION

N.T.S.

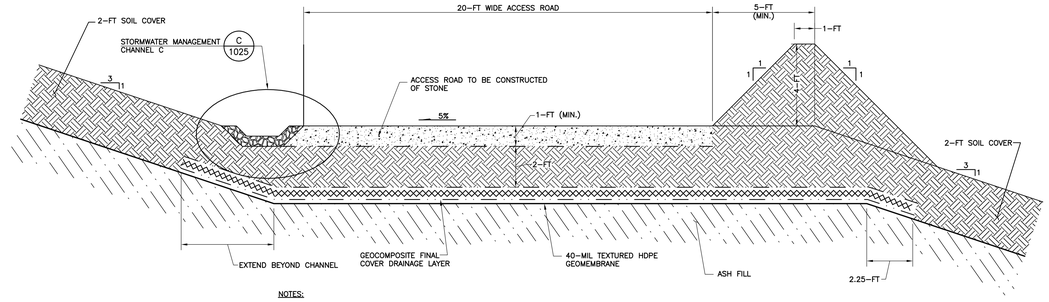


NOTE:

1. REFER TO DETAIL F ON DRAWING D-728-1019 FOR LINER SYSTEM TO FINAL COVER SYSTEM TIE-IN FOR STAGE 6A.
2. REFER TO DETAIL H ON DRAWING D-728-1019 FOR LINER SYSTEM TO LINER SYSTEM TIE-IN.
3. ADD BERM CAP LINER SYSTEM FOR STAGE 6A (SEE DETAILS H AND I ON THIS DRAWING)

DETAIL E
STAGE 4 LINER / FUTURE STAGE 6 TIE-IN

N.T.S.

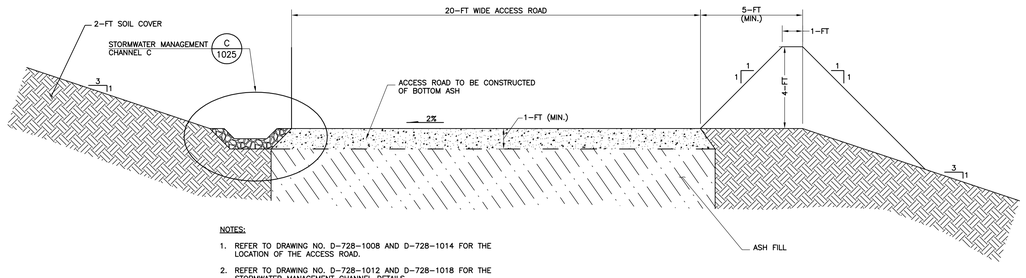


NOTES:

1. REFER TO DRAWING NO. D-728-1008 AND D-278-1014 FOR THE LOCATION OF THE ACCESS ROAD.
2. REFER TO DRAWING NO. D-728-D012 AND D-728-1018 FOR THE STORMWATER MANAGEMENT CHANNEL DETAILS.
3. FINAL COVER ACCESS ROAD TO REPLACE TEMPORARY HAUL ROAD AT LANDFILL CLOSURE.

DETAIL C
FINAL COVER ACCESS ROAD

N.T.S.

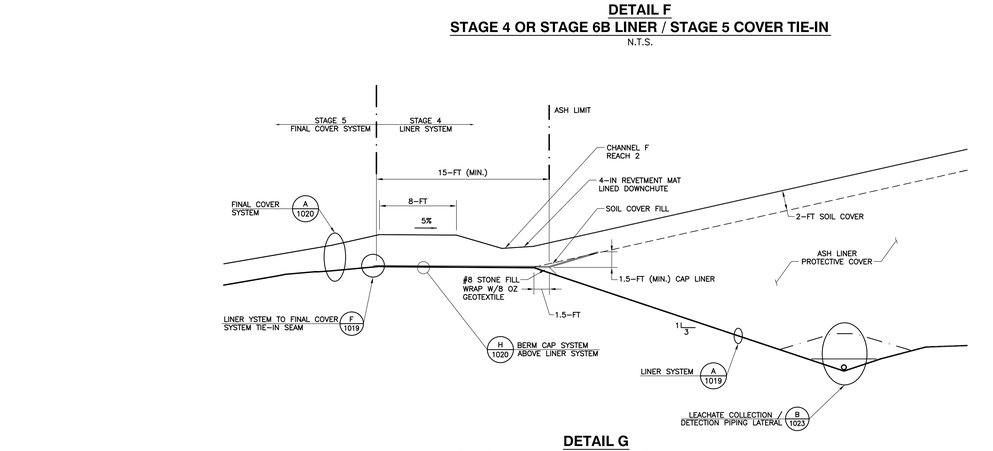


NOTES:

1. REFER TO DRAWING NO. D-728-1008 AND D-728-1014 FOR THE LOCATION OF THE ACCESS ROAD.
2. REFER TO DRAWING NO. D-728-1012 AND D-728-1018 FOR THE STORMWATER MANAGEMENT CHANNEL DETAILS.

DETAIL D
TEMPORARY HAUL/ACCESS ROAD

N.T.S.

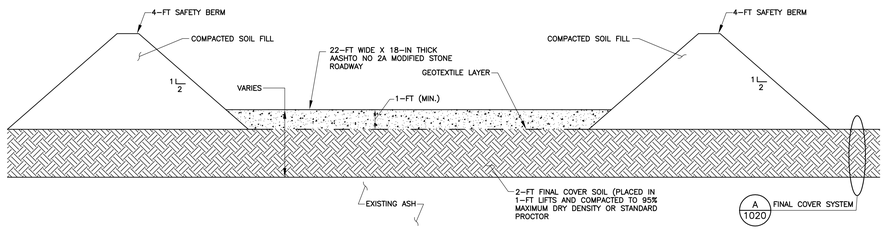


DETAIL F
STAGE 4 OR STAGE 6B LINER / STAGE 5 COVER TIE-IN

N.T.S.

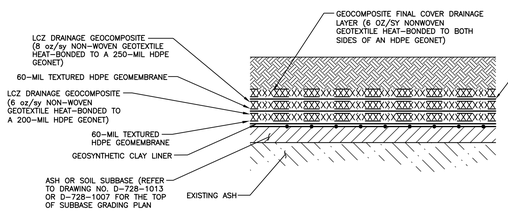
DETAIL G
STAGE 4 LINER / STAGE 5 COVER TIE-IN (WESTERN PORTION OF NORTH LIMIT)

N.T.S.



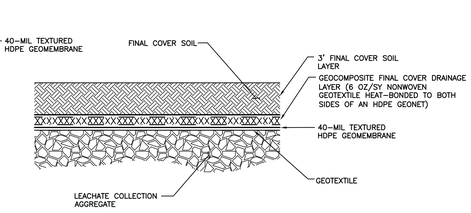
DETAIL J
ACCESS ROAD (ABOVE CAP SYSTEM ON CLOSED SLOPE)

N.T.S.



DETAIL H
BERM CAP SYSTEM ABOVE LINER SYSTEM

N.T.S.



DETAIL I
BERM CAP SYSTEM ABOVE LEACHATE COLLECTION STONE

N.T.S.

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REGISTERED PROFESSIONAL
JUANE LANDUE
ENGINEER
PE076388
COMMONWEALTH OF PENNSYLVANIA

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Civil & Environmental Consultants, Inc.
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RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

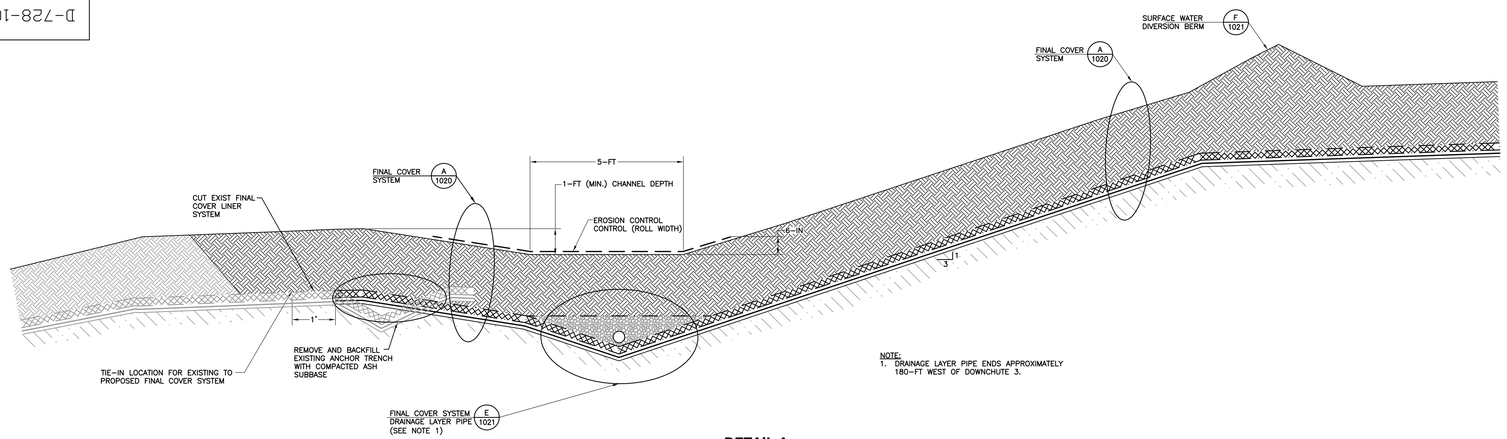
LINER SYSTEM/FINAL COVER SYSTEM DETAILS (SHEET 2 OF 3)

DRAWN: 11/10/10	BY: MJI	DRAWING NUMBER
CHECKED	DMT	D-728-1020
APPROVED	DRL	
APPROVED		
DISCIPLINE: ENG		SHEET:
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281020.DWG

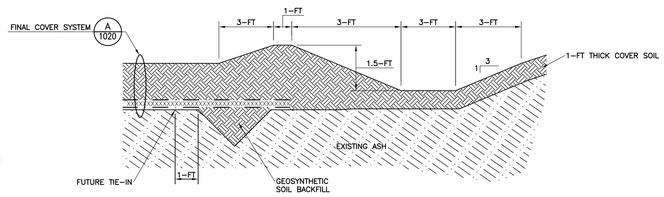
NO.	DATE	REVISION	BY	CHK.	APP.	APP.

P:\2010\100-0631-CADD\DWG\RRI\728101b_1020_1021.DWG[728-1020] (TNEWMYER) - DEC 1, 2010 - 10:13:58

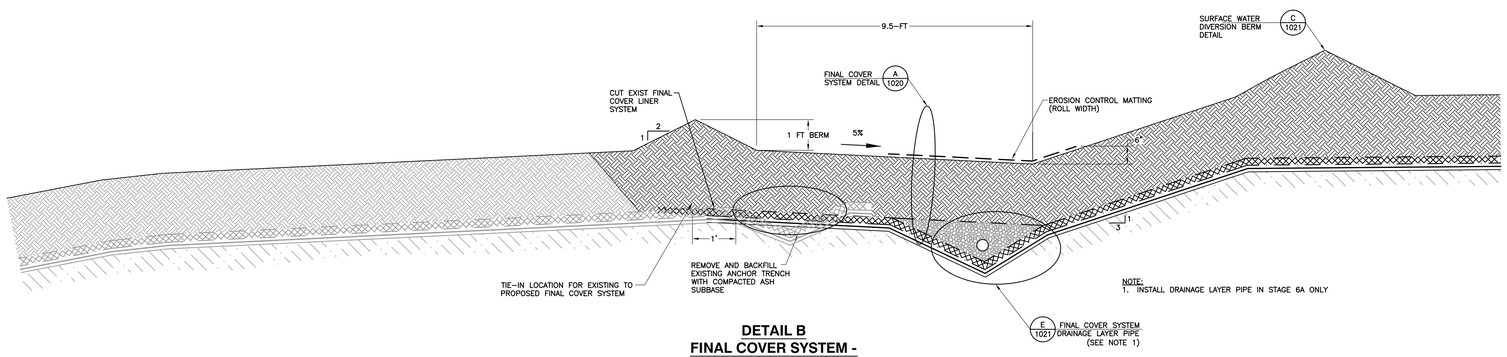
D-728-1021



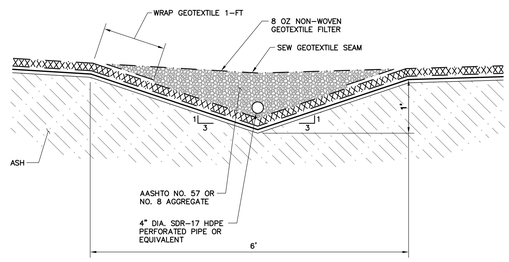
DETAIL A
FINAL COVER SYSTEM -
NORTH SLOPE TIE-IN
N.T.S.



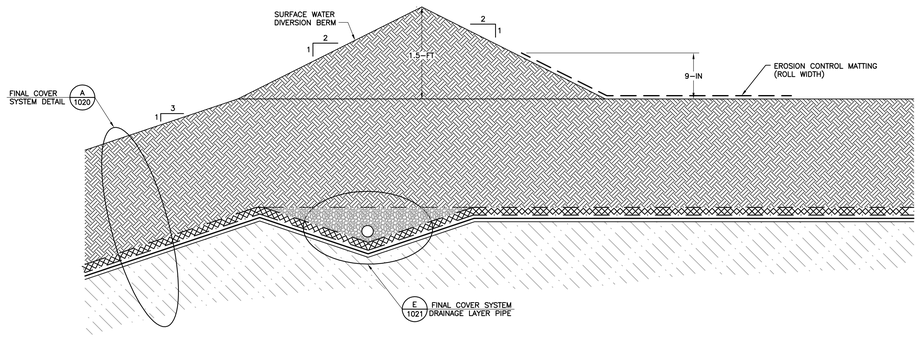
DETAIL D
TEMPORARY FINAL COVER SYSTEM
TERMINATION-AT TOP OF CLOSED SLOPES
BELOW STAGE 5 AND 6
N.T.S.



DETAIL B
FINAL COVER SYSTEM -
EAST SLOPE TIE-IN
N.T.S.



DETAIL E
FINAL COVER SYSTEM
DRAINAGE LAYER PIPE
N.T.S.



NOTE:
1. INSTALL DRAINAGE LAYER PIPE IN STAGE 6A ONLY

DETAIL C
STAGE 5 & 6A FINAL COVER SYSTEM
SURFACE WATER DIVERSION BERM
N.T.S.

REGISTERED PROFESSIONAL
DUANE LANDIS
ENGINEER
PE076388
COMMONWEALTH OF PENNSYLVANIA

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RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

LINER SYSTEM/FINAL COVER SYSTEM DETAILS (SHEET 3 OF 3)

DRAWN: 11/10/10	BY: MJI	DRAWING NUMBER
CHECKED	DMT	D-728-1021
APPROVED	DRL	
APPROVED		SHEET:
DISCIPLINE: ENG		
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281021.DWG

NO.	DATE	REVISION	BY	CHK.	APP.	APP.

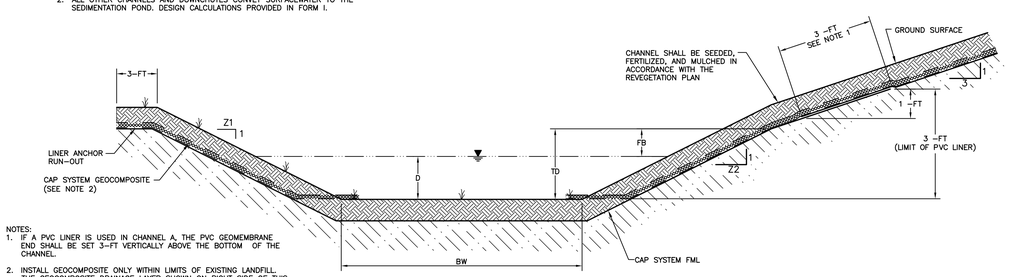
P:\2010\100-0631--CADD\DWG\7281018_1020_1021.DWG[728-1021] (THEMAYER) - DEC 1, 2010 - 10:15:49

D-728-1025

ALTERNATE 6A CHANNEL SCHEDULE

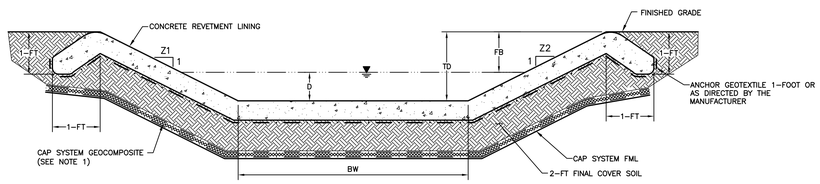
CHANNEL	REACH	BEGIN STATION	END STATION	DETAIL	DRAWING NO.	TOTAL CHANNEL DEPTH (TD) (FT)	FLOW DEPTH (FT)	TOP WIDTH (TW) (FT)	BOTTOM WIDTH (BW) (FT)	SIDE SLOPES (Z1/Z2)	FREEBOARD (FB) (FT)	LINING MATERIAL
CHANNEL A	OUTLET	0+00	9+05	D	1025	2.0	1.0	18.0	6.0	3/3	1.0	GRASS
CHANNEL A	REACH 1	9+29	10+61	D	1025	2.0	1.0	18.0	6.0	3/3	1.0	GRASS
CHANNEL A	REACH 2	10+61	15+71	E	1025	2.0	0.7	14.0	6.0	2/2	1.3	GRASS
CHANNEL A	REACH 3	15+71	17+47	E	1025	2.0	0.8	12.0	4.0	2/2	1.2	GRASS
CHANNEL A	REACH 4	17+87	26+87	A	1025	2.0	0.7	12.0	4.0	2/2	1.3	GRASS
CHANNEL A	REACH 5	26+87	33+00	A	1025	2.0	0.8	12.0	4.0	2/2	1.2	GRASS
CHANNEL A	REACH 6	33+50	34+10	A	1025	2.0	0.3	16.0	4.0	3/3	1.7	GRASS
CHANNEL A	REACH 7	34+10	39+45	A	1025	2.0	0.3	16.0	4.0	3/3	1.7	GRASS
CHANNEL B	REACH 1	0+00	3+52	D	1025	2.0	0.8	16.0	4.0	3/3	1.2	GRASS
CHANNEL B	REACH 2	3+52	14+15	A	1025	2.0	0.5	16.0	4.0	3/3	1.5	GRASS
CHANNEL B	REACH 3	14+15	31+45	A	1025	2.0	0.4	16.0	4.0	3/3	1.6	GRASS
CHANNEI C	--	0+00	15+91	C	1025	1.0	0.3	6.0	2.0	2/2	0.7	R4-RIPRAP
CHANNEL D	REACH 1	0+00	1+00	A	1025	2.0	0.4	26.0	18.0	2/2	1.6	GRASS
CHANNEL D	REACH 2	1+00	9+22	A	1025	2.0	0.8	12.0	4.0	2/2	1.2	GRASS
CHANNEL E	--	0+00	7+96	E	1020	1.0	0.2	10.0	4.0	3/3	0.8	GRASS
CHANNEL F	REACH 1	0+00	4+65	F	1020	1.0	0.3	10.0	4.0	3/3	0.7	GRASS
CHANNEL F	REACH 2	4+65	5+99	G	1020	1.0	0.2	6.5	2.5	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 1	--	0+00	1+30	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 2	--	0+00	4+79	B	1025	1.5	0.2	8.5	2.5	2/2	1.3	CONCRETE REVETMENT
DOWN CHUTE 3	--	0+00	1+26	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 4	--	0+00	0+82	B	1025	1.0	0.1	6.5	2.5	2/2	0.9	CONCRETE REVETMENT
DOWN CHUTE 5	--	0+00	1+07	B	1025	1.0	0.2	5.0	1.0	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 6	REACH 1	0+00	1+25	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 6	REACH 2	1+25	1+49	B	1025	1.5	0.2	8.5	2.5	2/2	1.3	CONCRETE REVETMENT
DOWN CHUTE 6	REACH 3	1+49	2+46	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 7	--	0+00	2+37	B	1025	1.0	0.2	6.5	2.5	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 8	--	0+00	1+60	B	1025	1.0	0.1	6.5	2.5	2/2	0.9	CONCRETE REVETMENT
DOWN CHUTE 9	--	0+00	0+43	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 10	--	0+00	1+16	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 11	--	0+00	1+08	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT

NOTES:
1. CHANNEL D CONVEYS LEACHATE TO THE LEACHATE POND. DESIGN CALCULATION PROVIDED IN FORM 17R.
2. ALL OTHER CHANNELS AND DOWNCHUTES CONVEY SURFACEWATER TO THE SEDIMENTATION POND. DESIGN CALCULATIONS PROVIDED IN FORM I.



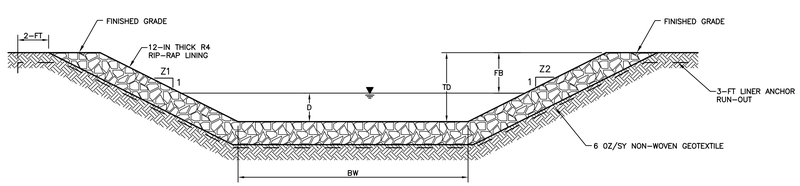
NOTES:
1. IF A PVC LINER IS USED IN CHANNEL A, THE PVC GEOMEMBRANE END SHALL BE SET 3-FT VERTICALLY ABOVE THE BOTTOM OF THE CHANNEL.
2. INSTALL GEOCOMPOSITE ONLY WITHIN LIMITS OF EXISTING LANDFILL. THE GEOCOMPOSITE DRAINAGE LAYER SHOWN ON RIGHT SIDE OF THIS DETAIL MAY NOT BE NEEDED IN ALL AREAS.
3. THE GEOCOMPOSITE DRAINAGE LAYER OUTLET END MAY BE SET ANYWHERE BETWEEN THE BOTTOM AND TOP OF THE CHANNEL.

DETAIL A
TRAPEZOIDAL FINAL COVER LINED CHANNEL
N.T.S.



NOTE:
1. INSTALL GEOCOMPOSITE ONLY WITHIN LANDFILL LIMITS.
2. INSTALL CHANNEL ABOVE FINAL COVER SYSTEM.

DETAIL B
TRAPEZOIDAL CONCRETE REVETMENT LINED CHANNEL
N.T.S.

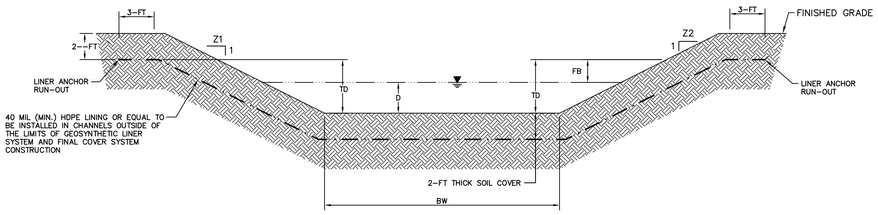


DETAIL C
TRAPEZOIDAL RIP-RAP LINED CHANNEL
N.T.S.

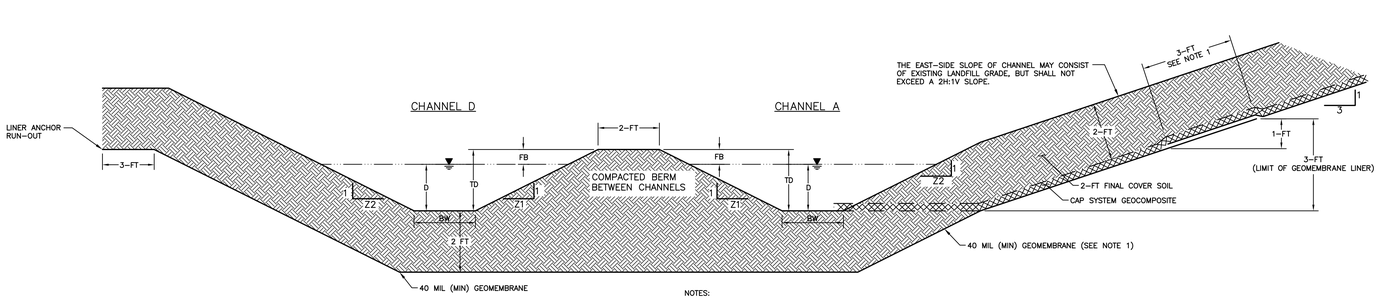
ALTERNATE 6B CHANNEL SCHEDULE

CHANNEL	REACH	BEGIN STATION	END STATION	DETAIL	DRAWING NO.	TOTAL CHANNEL DEPTH (TD) (FT)	FLOW DEPTH (FT)	TOP WIDTH (TW) (FT)	BOTTOM WIDTH (BW) (FT)	SIDE SLOPES (Z1/Z2)	FREEBOARD (FB) (FT)	LINING MATERIAL
CHANNEL A	OUTLET	0+00	9+05	D	1025	2.0	1.2	18.0	6.0	3/3	0.8	GRASS
CHANNEL A	REACH 1	9+29	10+61	D	1025	2.0	1.2	18.0	6.0	3/3	0.8	GRASS
CHANNEL A	REACH 2	10+61	15+71	E	1025	2.0	1.1	14.0	6.0	2/2	0.9	GRASS
CHANNEL A	REACH 3	15+71	17+47	E	1025	2.0	1.1	12.0	4.0	2/2	0.9	GRASS
CHANNEL A	REACH 4	17+87	26+87	A	1025	2.0	1.0	12.0	4.0	2/2	1.0	GRASS
CHANNEL A	REACH 5	25+88	33+00	A	1025	2.0	0.8	12.0	4.0	2/2	1.2	GRASS
CHANNEL A	REACH 6	33+50	34+10	A	1025	2.0	0.3	16.0	4.0	3/3	1.7	GRASS
CHANNEL A	REACH 7	34+10	39+45	A	1025	2.0	0.3	16.0	4.0	3/3	1.7	GRASS
CHANNEL B	REACH 1	0+00	3+52	D	1025	2.0	0.8	16.0	4.0	3/3	1.2	GRASS
CHANNEL B	REACH 2	3+52	14+15	A	1025	2.0	0.5	16.0	4.0	3/3	1.5	GRASS
CHANNEL B	REACH 3	14+15	31+45	A	1025	2.0	0.5	16.0	4.0	3/3	1.5	GRASS
CHANNEI C	--	0+00	14+87	C	1025	1.0	0.2	6.0	2.0	2/2	0.8	R4-RIPRAP
CHANNEL D	REACH 1	0+00	1+00	A	1025	2.0	0.4	26.0	18.0	2/2	1.6	GRASS
CHANNEL D	REACH 2	1+00	9+22	A	1025	2.0	0.8	12.0	4.0	2/2	1.2	GRASS
CHANNEL F	REACH 1	0+00	4+65	F	1020	1.0	0.3	10.0	4.0	3/3	0.7	GRASS
CHANNEL F	REACH 2	4+65	5+99	G	1020	1.0	0.2	6.5	2.5	2/2	0.8	CONCRETE REVETMENT
CHANNEL G	--	0+00	4+03	F	1020	1.0	0.2	6.5	2.5	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 1	--	0+00	1+30	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 2	--	0+00	4+79	B	1025	1.5	0.3	8.5	2.5	2/2	1.2	CONCRETE REVETMENT
DOWN CHUTE 3	--	0+00	1+26	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 4	--	0+00	0+82	B	1025	1.0	0.1	6.5	2.5	2/2	0.9	CONCRETE REVETMENT
DOWN CHUTE 5	--	0+00	1+40	B	1025	1.0	0.2	5.0	1.0	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 6	--	0+00	1+25	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 7	--	0+00	2+37	B	1025	1.0	0.2	6.5	2.5	2/2	0.8	CONCRETE REVETMENT
DOWN CHUTE 8	--	0+00	1+60	B	1025	1.0	0.1	6.5	2.5	2/2	0.9	CONCRETE REVETMENT
DOWN CHUTE 9	--	0+00	0+43	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 11	REACH 1	0+00	1+50	B	1025	1.5	0.1	8.5	2.5	2/2	1.4	CONCRETE REVETMENT
DOWN CHUTE 11	REACH 2	1+50	3+33	B	1025	1.5	0.1	8.5	1.5	2/2	1.4	CONCRETE REVETMENT

NOTES:
1. CHANNEL D CONVEYS LEACHATE TO THE LEACHATE POND. DESIGN CALCULATION PROVIDED IN FORM 17R.
2. ALL OTHER CHANNELS AND DOWNCHUTES CONVEY SURFACEWATER TO THE SEDIMENTATION POND. DESIGN CALCULATIONS PROVIDED IN FORM I.



DETAIL D
TRAPEZOIDAL SOIL AND FML-LINED CHANNEL
N.T.S.



NOTES:
1. IF A PVC LINER IS USED IN CHANNEL A, THE PVC GEOMEMBRANE END SHALL BE SET 3-FT VERTICALLY ABOVE THE BOTTOM OF THE CHANNEL.
2. THE GEOCOMPOSITE DRAINAGE LAYER OUTLET END MAY BE SET ANYWHERE BETWEEN THE BOTTOM AND TOP OF THE CHANNEL.

DETAIL E
CHANNELS A AND D
N.T.S.

* HAND SIGNATURE ON FILE

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RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

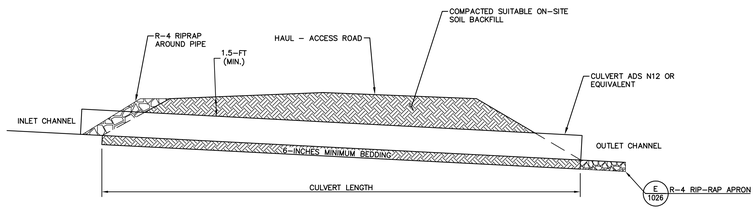
SURFACE WATER MANAGEMENT SYSTEM DETAILS (SHEET 1 OF 4)

DRAWN: 11/10/10	BY: SPS	DRAWING NUMBER
CHECKED	DMT	D-728-1025
APPROVED	DRL	
APPROVED		SHEET:
DISCIPLINE: ENG		
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281025.DWG

NO.	DATE	REVISION	BY	CHK.	APP.	APP.

P:\2010\100-0431-CADD\DWG\VOL1 OOO2 - PITTDWG\VOL1\728\1025_1026_1027_1028.DWG[728-1025] (TNEMAYER) - DEC 1, 2010 - 12:14:29

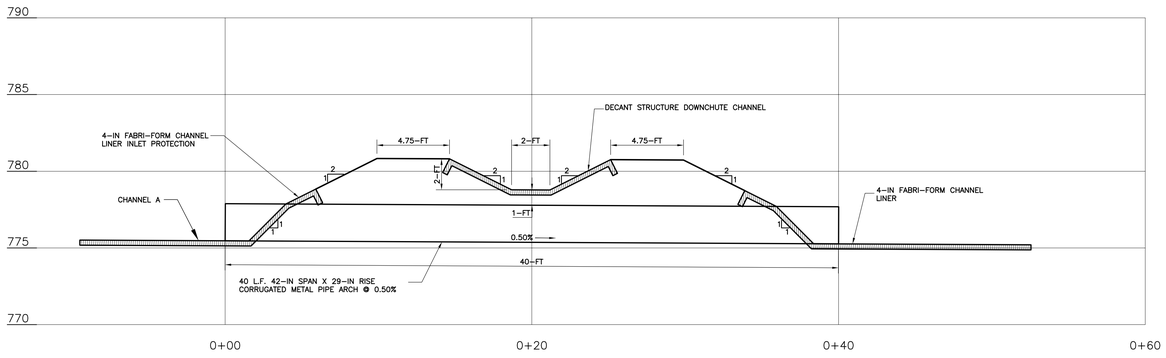
D-728-1026



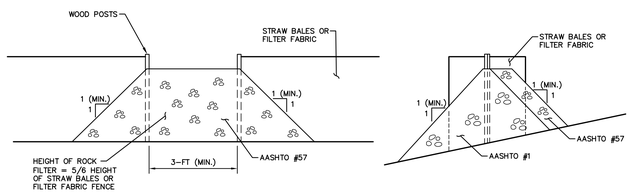
CULVERT ID.	LENGTH (FT)	SLOPE (%)	CULVERT TYPE	CULVERT DIAMETER (IN)	CULVERT QUANTITY
1	50	0.50	HDPE SMOOTH INTERIOR	24"	1
4	24	0.37	CONCRETE	30"	2 (See Note 1)
5	40	2.01	HDPE SMOOTH INTERIOR	24"	1 (See Note 2)

NOTE:
1. FOR CULVERT NO.4, THE TWO - 30-INCH DIAMETER RCP CULVERTS WILL BE INSTALLED WITH APPROXIMATLEY 1-FT SPACING BETWEEN CULVERTS.
2. CULVERT NO.5 IS INSTALLED BELOW THE STAGE 6A ACCESS ROAD.

DETAIL A
CULVERTS #1, #4, AND #5
N.T.S.



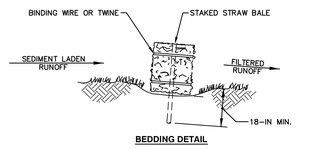
DETAIL B
CULVERT #3
N.T.S.



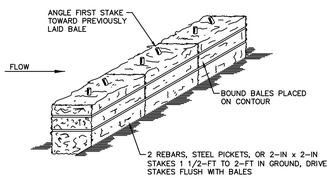
DETAIL NOTES:

1. REMOVE SEDIMENTATION WHEN IT REACHES 1/3 OF OUTLET HEIGHT.

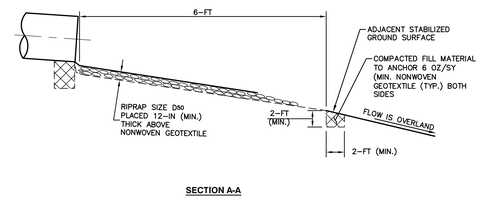
DETAIL C
ROCK FILTER OUTLET
N.T.S.



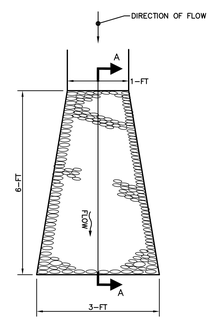
BEDDING DETAIL



DETAIL D
HAY BALES
N.T.S.

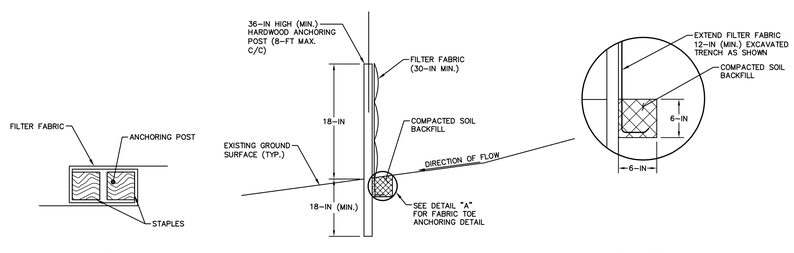


SECTION A-A



NOTE:
1. RIP RAP APRON MAY BE REPLACED WITH A MANUFACTURED CULVERT APRON

DETAIL E
TYPICAL CULVERT RIP RAP APRON
N.T.S.



TOP **ELEVATION** **DETAIL "A"**

DETAIL NOTES:

SILT FENCE MUST BE INSTALLED AT LEVEL GRADE. BOTH ENDS OF EACH FENCE SECTION MUST BE EXTENDED AT LEASE 8-FT UPSLOPE AT 45 DEGREES TO THE MAIN FENCE AUGMENT.

SEDIMENT MUST BE REMOVED WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

ANY SECTION OF FENCE UNDERMINED OR TOPPED MUST BE REPLACED WITH A ROCK FILTER OUTLET. SEE DETAIL D.

DETAIL F
SILT FENCE
N.T.S.

FOR PERMIT ONLY

REGISTERED PROFESSIONAL
DUANE LANDUE
ENGINEER
PE076385
COMMONWEALTH OF PENNSYLVANIA

* HAND SIGNATURE ON FILE

Civil & Environmental Consultants, Inc.
333 Baldwin Road - Pittsburgh, PA 15205
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www.ceciinc.com

RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

SURFACE WATER MANAGEMENT SYSTEM DETAILS (SHEET 2 OF 4)

DRAWN: 11/10/10	BY: MJI	DRAWING NUMBER
CHECKED	DMT	D-728-1026
APPROVED	DRL	
APPROVED		SHEET:
DISCIPLINE: ENG		
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281026.DWG

NO.	DATE	REVISION	BY	CHK.	APP.	APP.

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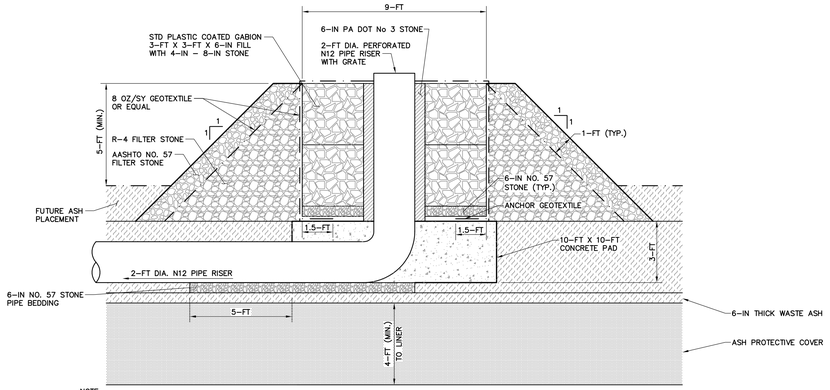
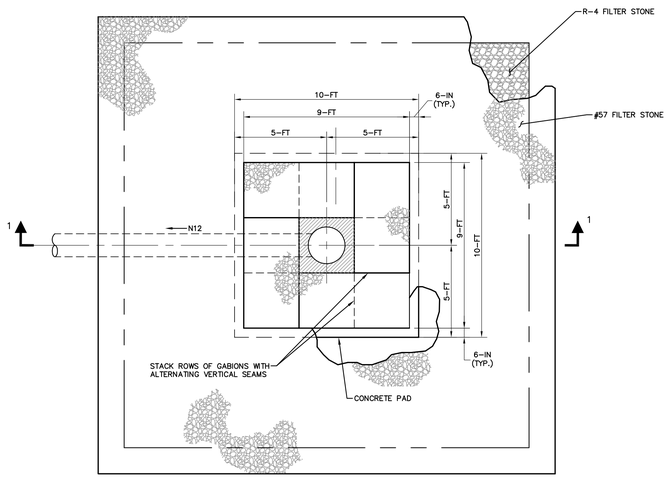
D-728-1027



NOTE:

1. RISER PIPE PERFORATIONS TO BE 3/4-IN DIA. 6 PER ROW BETWEEN EVERY OTHER PIPE RIB.

SECTION 1-1

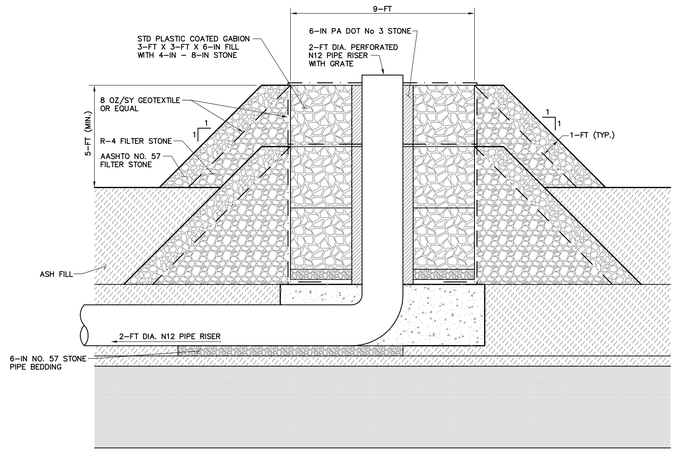


DECANT STRUCTURE MAINTENANCE:

1. AFTER MAJOR STORM EVENT, AREA SHOULD TAKE NO LONGER THAN 7 DAYS TO DEWATER. CHECK FILTER STONE AND GEOTEXTILE. REMOVE AND REPLACE IF CLOGGED.
2. AT FINAL CLOSURE, DECANT STRUCTURES WILL BE FILLED WITH CONCRETE TO ABANDON IN-PLACE.

DETAIL A
DECANT RISER STRUCTURE

N.T.S.

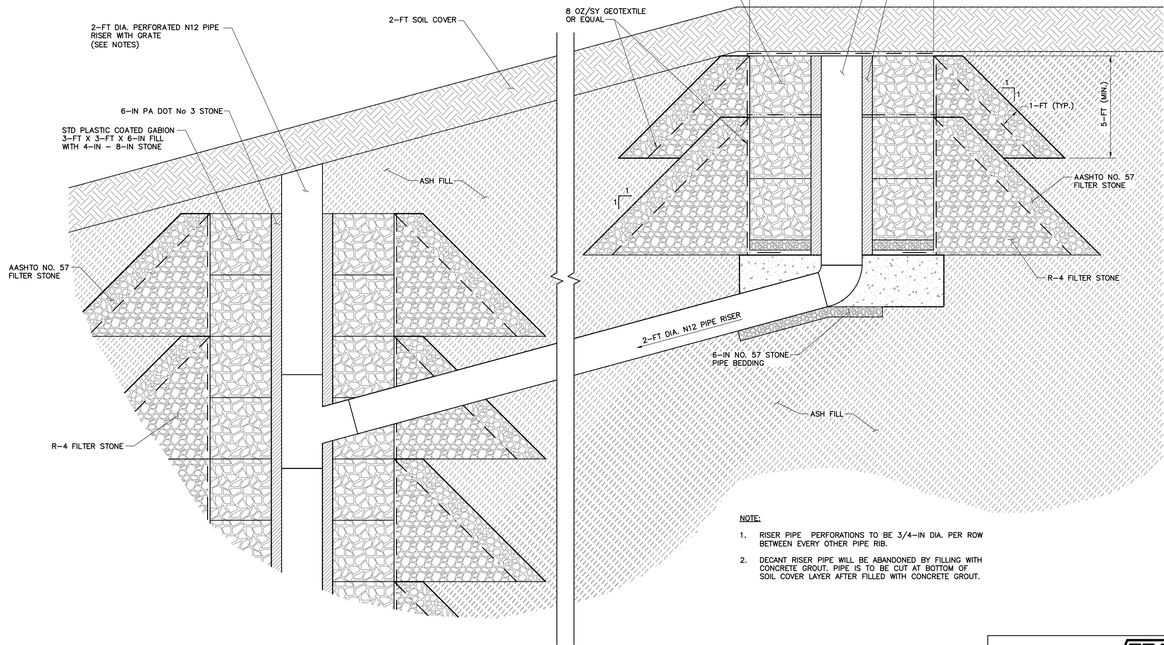


NOTE:

1. WHEN TOP OF ASH IS 5-FT BELOW TOP OF GABION BASKETS INSTALL ADDITIONAL 3-FT TO STRUCTURE.
2. ALL GEOTEXTILE SEAMS TO BE SEWN OR LEISTERED.
3. RISER PIPE PERFORATIONS TO BE 3/4-IN DIA. 6 PER ROW BETWEEN EVERY OTHER PIPE RIB.

DETAIL B
DECANT RISER STRUCTURE VERTICAL EXTENSION

N.T.S.



NOTE:

1. RISER PIPE PERFORATIONS TO BE 3/4-IN DIA. PER ROW BETWEEN EVERY OTHER PIPE RIB.
2. DECANT RISER PIPE WILL BE ABANDONED BY FILLING WITH CONCRETE GROUT. PIPE IS TO BE CUT AT BOTTOM OF SOIL COVER LAYER AFTER FILLED WITH CONCRETE GROUT.

DETAIL C
DECANT RISER STRUCTURE LATERAL EXTENSTION

N.T.S.

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NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

SURFACE WATER MANAGEMENT SYSTEM DETAILS (SHEET 3 OF 4)

DRAWN: 11/10/10	BY: SPS	DRAWING NUMBER
CHECKED	DMT	D-728-1027
APPROVED	DRL	
APPROVED		SHEET:
DISCIPLINE: ENG		
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281027.DWG

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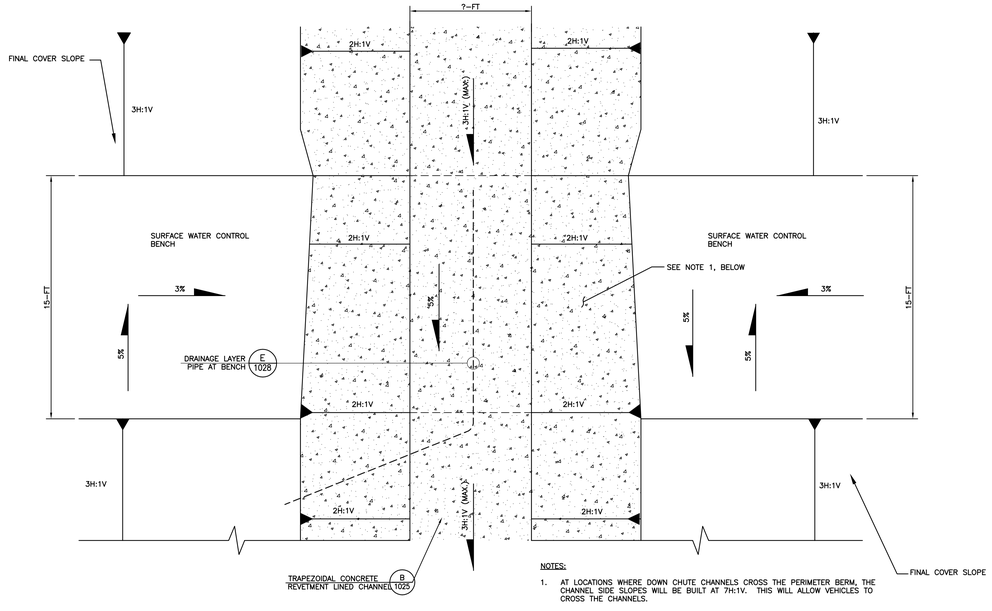
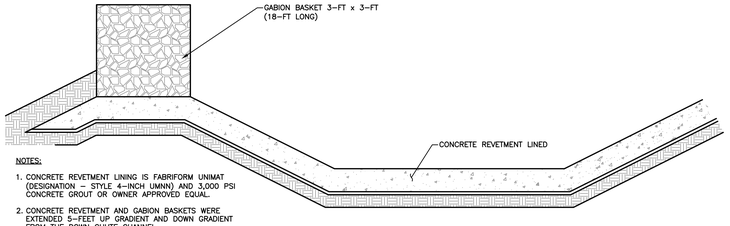
D-728-1028



NOTES:

1. AT LOCATIONS WHERE DOWN CHUTE CHANNELS CROSS THE PERIMETER BERM, THE CHANNEL SIDE SLOPES WILL BE BUILT AT 7H:1V. THIS WILL ALLOW VEHICLES TO CROSS THE CHANNELS.

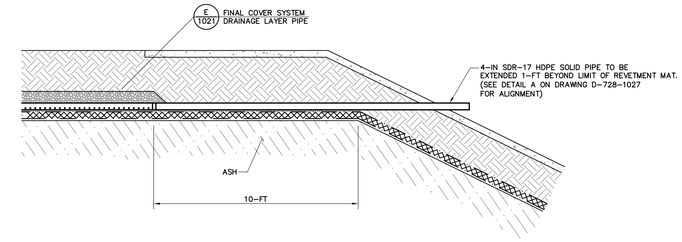
DETAIL A
SURFACE WATER BENCH/DOWN CHUTE CROSSING
N.T.S.



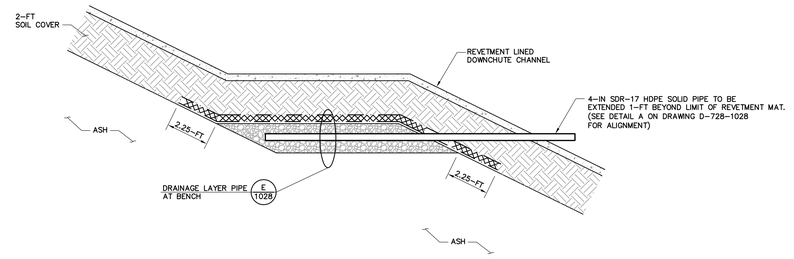
NOTES:

1. CONCRETE REVETMENT LINING IS FABRIFORM UNIMAT (DESIGNATION – STYLE 4–INCH UMNN) AND 3,000 PSI CONCRETE GROUT OR OWNER APPROVED EQUAL.
2. CONCRETE REVETMENT AND GABION BASKETS WERE EXTENDED 5–FEET UP GRADIENT AND DOWN GRADIENT FROM THE DOWN CHUTE CHANNEL.
3. CHANNEL CONFIGURATION AT EACH DOWNCHUTE OUTLET DEFLECTION WALL LOCATION IS THE SAME AS THE ADJACENT CHANNEL SECTIONS.

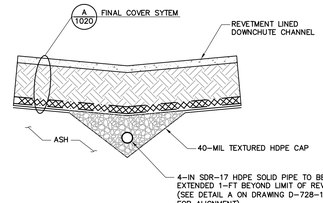
DETAIL B
TYPICAL DOWN CHUTE OUTLET DEFLECTION WALL
N.T.S.



DETAIL C
STAGE 5 NORTH SLOPE FINAL COVER SYSTEM CHANNEL DRAINAGE PIPE OUTLET
N.T.S.



DETAIL D
TYPICAL FINAL COVER SYSTEM BENCH DRAINAGE PIPE OUTLET
N.T.S.



DETAIL E
DRAINAGE LAYER PIPE AT BENCH
N.T.S.

FOR PERMIT ONLY

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DUANE LANDUE
ENGINEER
PE076388

* HAND SIGNATURE ON FILE

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RRI Energy

NEW CASTLE PLANT
UNIT NOS. 3, 4, AND 5

SURFACE WATER MANAGEMENT SYSTEM DETAILS (SHEET 4 OF 4)

DRAWN: 11/10/10	BY: MJI	DRAWING NUMBER	
CHECKED	DMT	D-728-1028	
APPROVED	DRL		
APPROVED		SHEET:	
DISCIPLINE: ENG			
SCALE: AS SHOWN	SIZE: 30X42	FILE: 7281028.DWG	

NO.	DATE	REVISION	BY	CHK.	APP.	APP.

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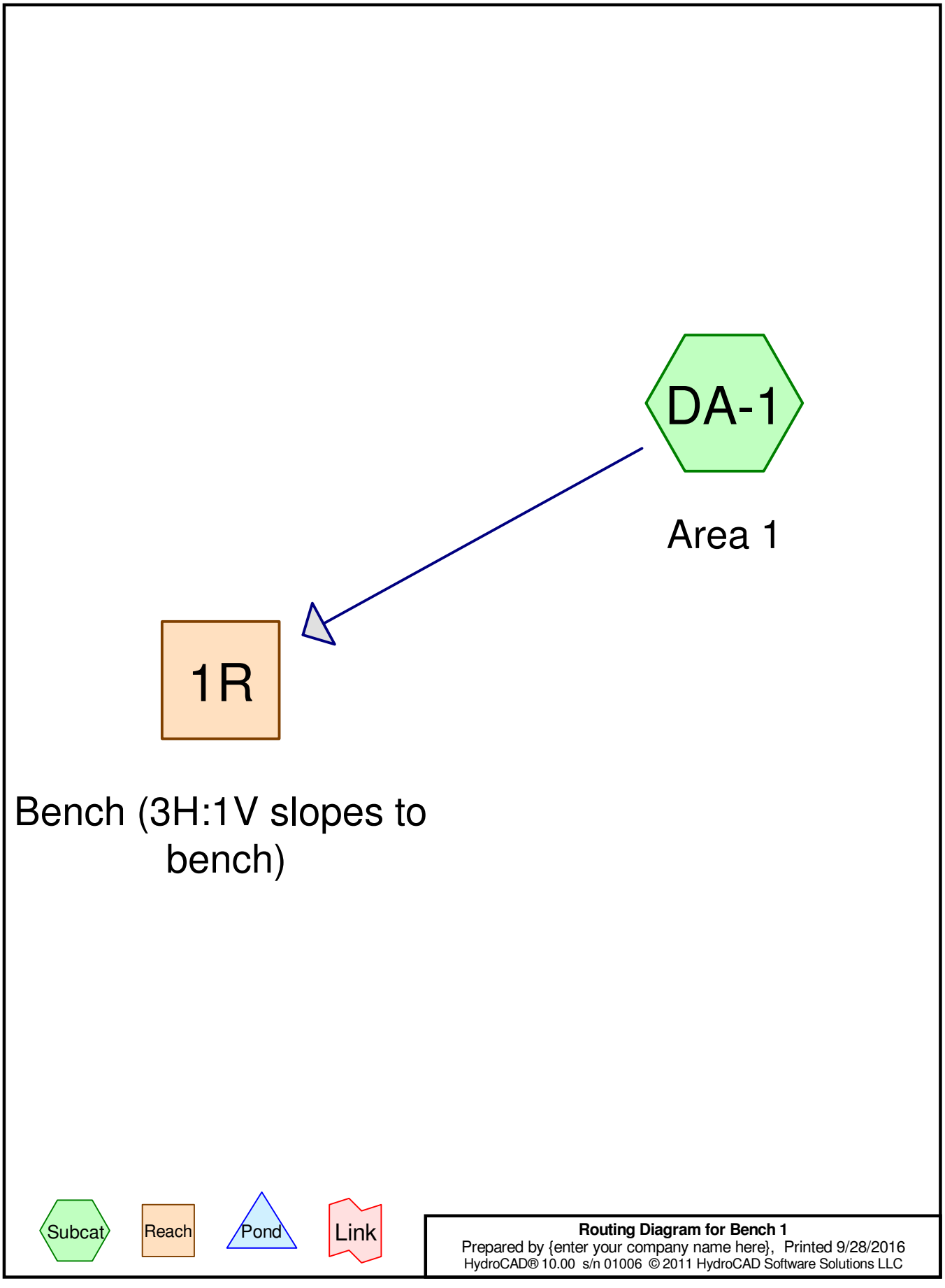
APPENDIX C

PADEP FORM I



Routing Diagram for Bench 1
Prepared by {enter your company name here}, Printed 9/28/2016
HydroCAD® 10.00 s/n 01006 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.500	61	(DA-1)
1.500	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
1.500	Other	DA-1
1.500		**TOTAL AREA**

Summary for Subcatchment DA-1: Area 1

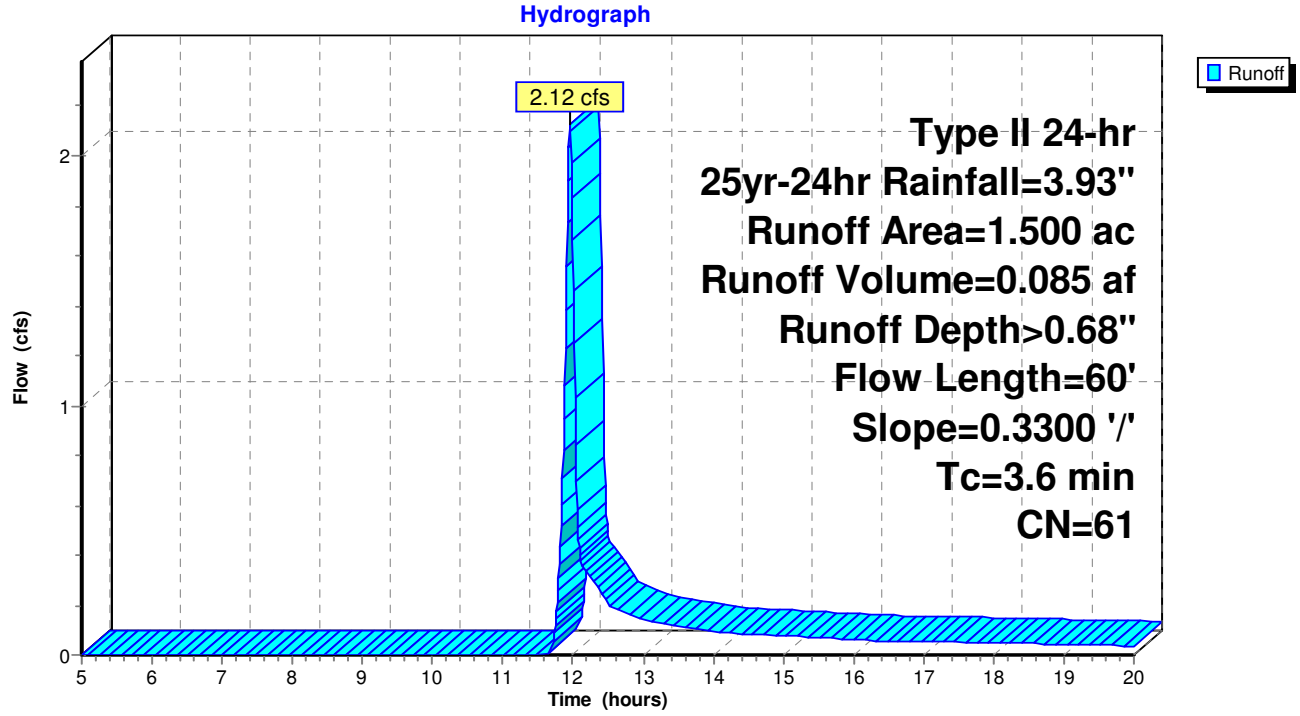
Runoff = 2.12 cfs @ 11.96 hrs, Volume= 0.085 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr-24hr Rainfall=3.93"

	Area (ac)	CN	Description
*	1.500	61	
	1.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	60	0.3300	0.28		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-1: Area 1



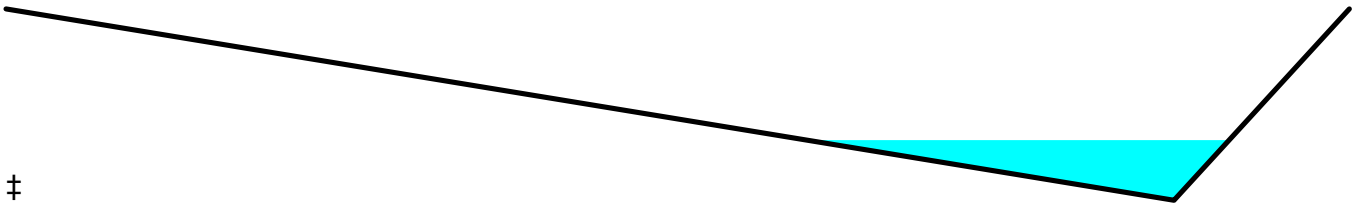
Summary for Reach 1R: Bench (3H:1V slopes to bench)

Inflow Area = 1.500 ac, 0.00% Impervious, Inflow Depth > 0.68" for 25yr-24hr event
Inflow = 2.12 cfs @ 11.96 hrs, Volume= 0.085 af
Outflow = 1.31 cfs @ 12.02 hrs, Volume= 0.084 af, Atten= 38%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 8.1 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 16.0 min

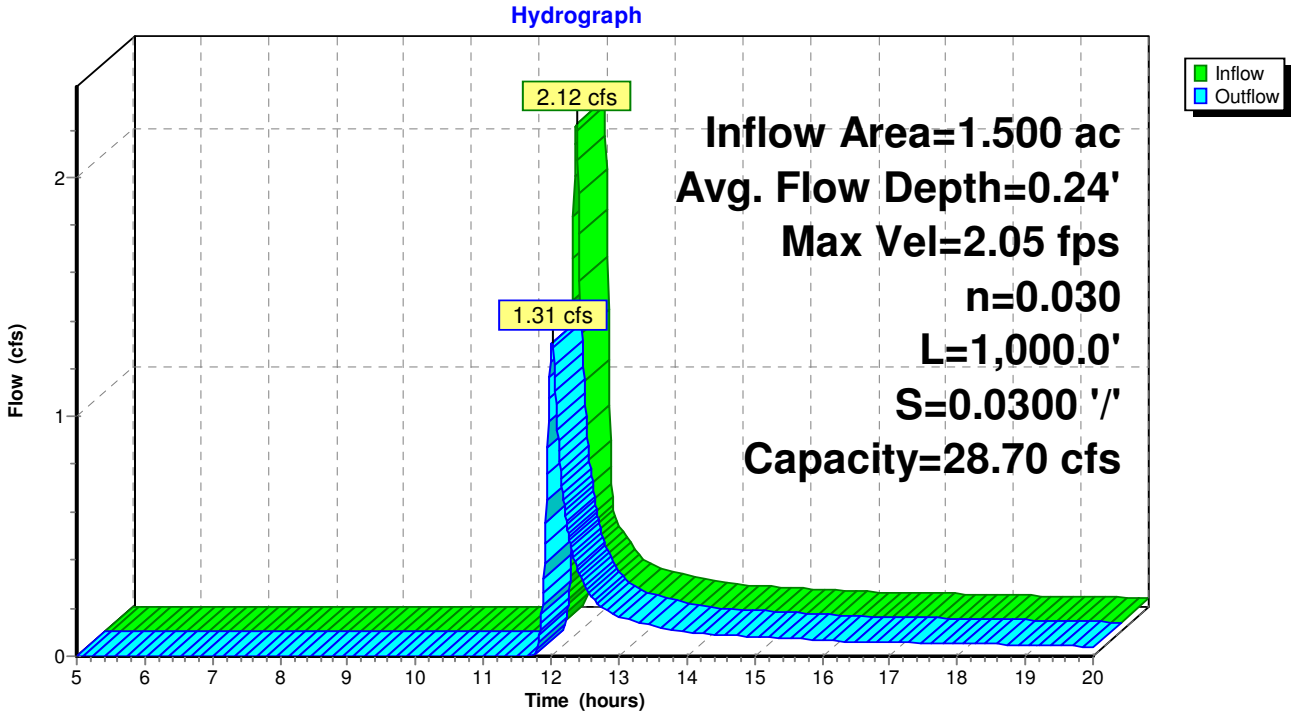
Peak Storage= 639 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 0.75' Flow Area= 6.5 sf, Capacity= 28.70 cfs

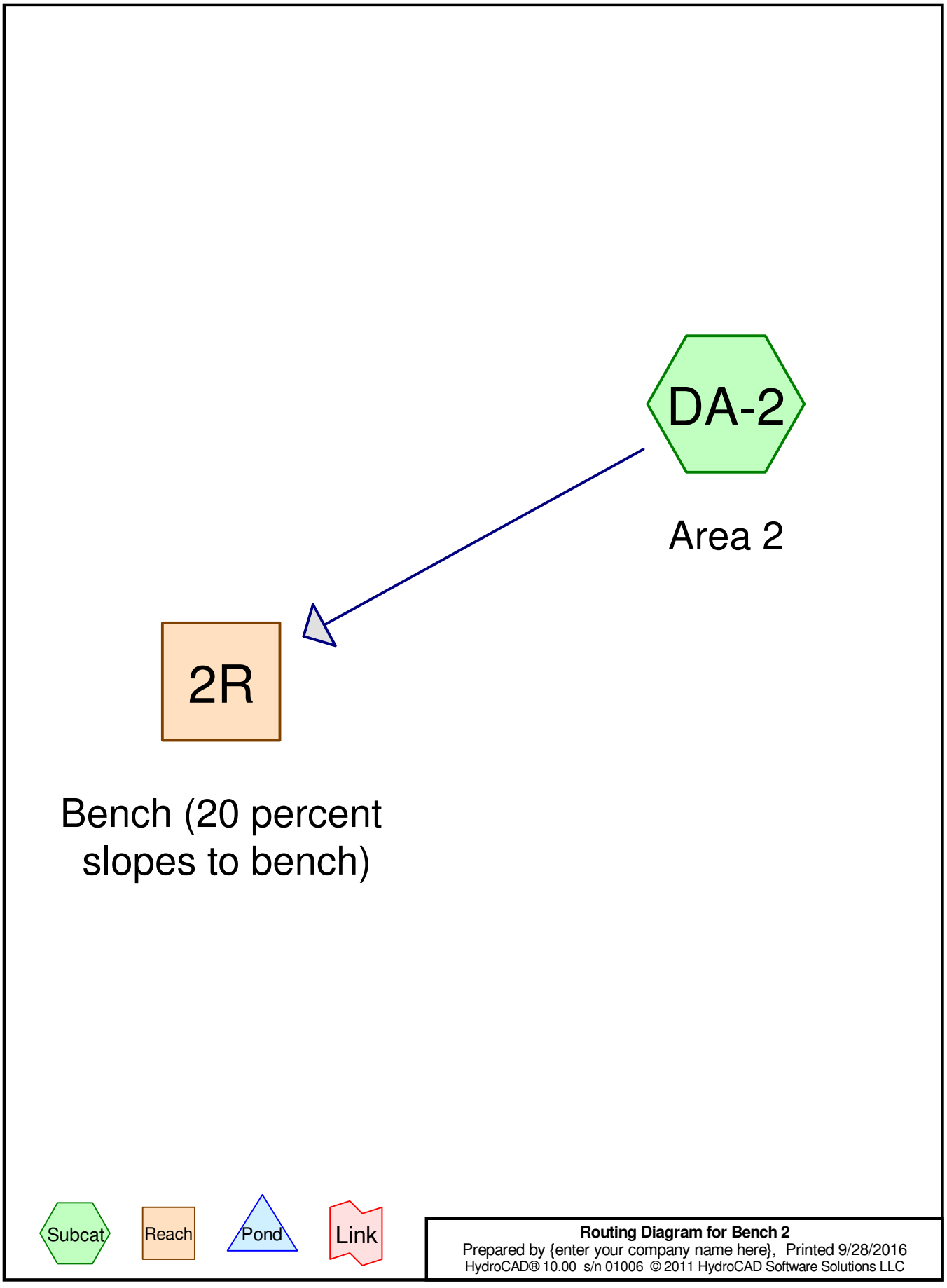
0.00' x 0.75' deep channel, n= 0.030
Side Slope Z-value= 20.0 3.0 '/' Top Width= 17.25'
Length= 1,000.0' Slope= 0.0300 '/'
Inlet Invert= 868.00', Outlet Invert= 838.00'



‡

Reach 1R: Bench (3H:1V slopes to bench)





Routing Diagram for Bench 2
Prepared by {enter your company name here}, Printed 9/28/2016

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.850	61	(DA-2)
1.850	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
1.850	Other	DA-2
1.850		**TOTAL AREA**

Summary for Subcatchment DA-2: Area 2

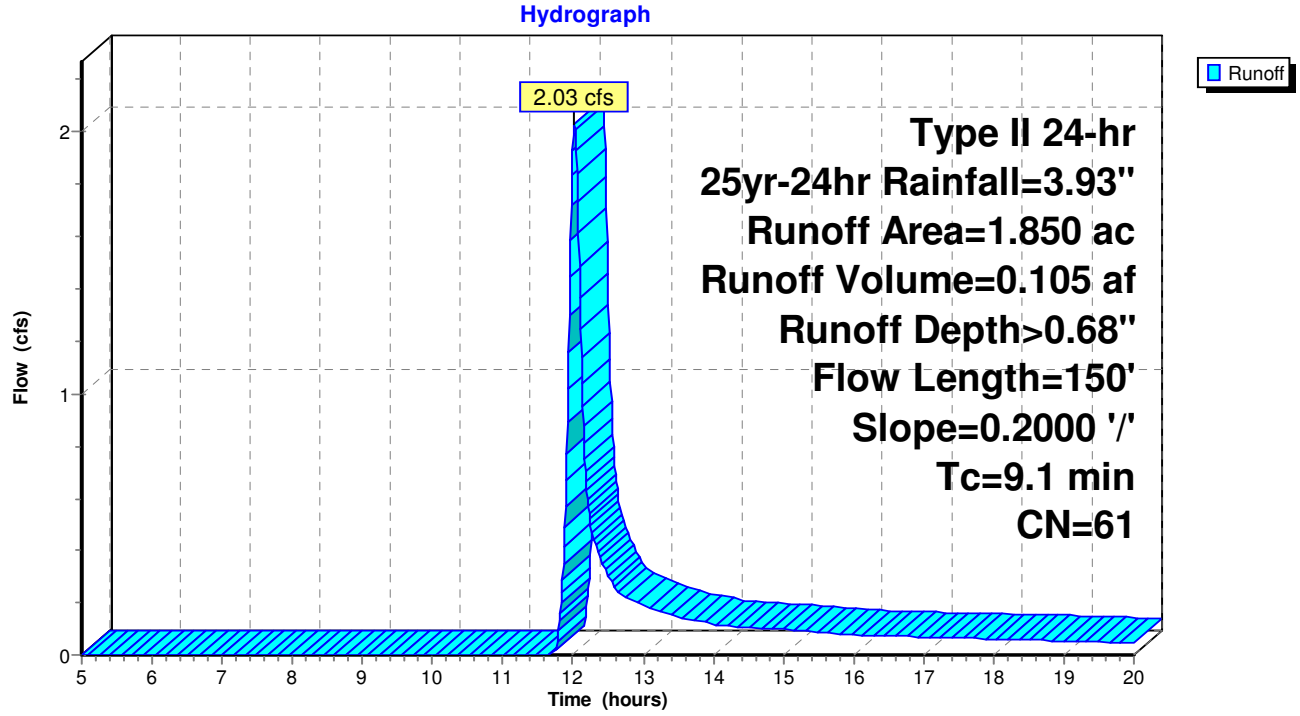
Runoff = 2.03 cfs @ 12.02 hrs, Volume= 0.105 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr-24hr Rainfall=3.93"

	Area (ac)	CN	Description
*	1.850	61	
	1.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	150	0.2000	0.27		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-2: Area 2



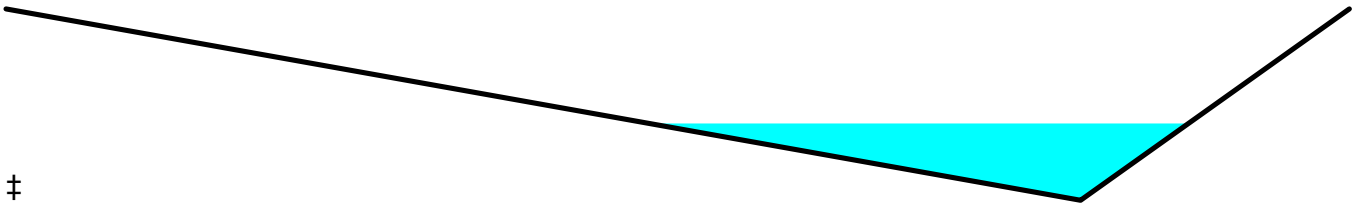
Summary for Reach 2R: Bench (20 percent slopes to bench)

Inflow Area = 1.850 ac, 0.00% Impervious, Inflow Depth > 0.68" for 25yr-24hr event
Inflow = 2.03 cfs @ 12.02 hrs, Volume= 0.105 af
Outflow = 1.59 cfs @ 12.08 hrs, Volume= 0.104 af, Atten= 21%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.40 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 11.0 min

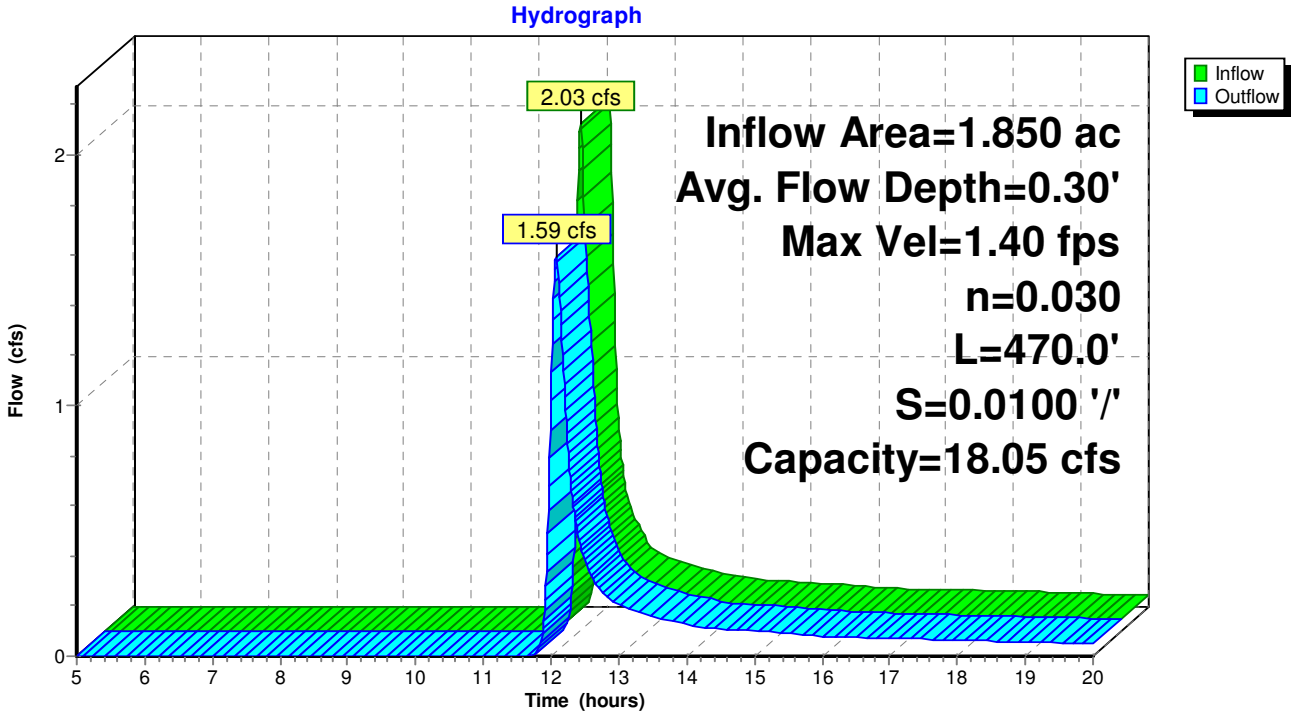
Peak Storage= 535 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.75' Flow Area= 7.0 sf, Capacity= 18.05 cfs

0.00' x 0.75' deep channel, n= 0.030
Side Slope Z-value= 20.0 5.0 '/' Top Width= 18.75'
Length= 470.0' Slope= 0.0100 '/'
Inlet Invert= 800.00', Outlet Invert= 795.30'



‡

Reach 2R: Bench (20 percent slopes to bench)



FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS

FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS
ALTERNATE 6A

2540-PM-BWM0390 6/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised
April 27, 2007 Rev. February 2008 Rev. November 3, 2008 Rev. December 2010
DEP USE ONLY
Date Received

FORM I
SOIL EROSION AND SEDIMENTATION CONTROLS

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form I, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: 273.151, 275.205, 277.151, 279.232, 281.132, 283.106, 288.151, 289.252, 291.205, 293.232, 295.132, 297.106

SECTION A. SITE IDENTIFIER

Applicant/permittee: Orion Power Midwest, L.P.

Site Name: New Castle Plant Ash Landfill

Facility ID (as issued by DEP): 300818

SECTION B. EROSION AND SEDIMENT CONTROL

Provide a plan for the control of erosion and sedimentation on land within the permit area, all borrow areas and adjacent areas to be disturbed by construction activities. Include a narrative describing the implementation of the plan, its relationship to the overall staging of earth moving activities, and detailed design and construction plans and specifications for each structure or facility used in the plan. The plan must be site specific for each phase of construction. Include design assumptions, runoff calculations, channel profiles, cross sections, channel linings, and applicable details on attached Data Sheet for all collection and interceptor ditches. Provide documentation on the capacity of existing drainage system and the effect disposal activities will have on the drainage. Show discharge points to natural drainage ways and all culverts that carry drainage away from the site. Plans and maps shall contain all details necessary for construction of the structures.

SECTION C. DIVERSION CONTROLS

Provide a plan for the collection and conveyance to a natural drainageway of the runoff from up slope undisturbed areas. Include design calculations, profiles, cross sections, and applicable details for each structure, ditch, or channel used for diverting runoff. The diversion control and erosion and sedimentation control plan shall be based on the requirements of Chapter 102 (Erosion and Sedimentation Control) of the Department's regulations. Calculations indicating water quantities shall be based on a 24-hour precipitation event with a frequency of once in 25 years. More stringent criteria may be required by the Department based on the most recent edition of the USDA-SCS, *Engineering Field Manual for conservation Practices,* or as otherwise determined necessary by the Department.

SECTION D. ACCESS ROADS (Residual Waste Facilities Must Submit Form 23R)

Access roads shall have drainage system that is compatible with the natural contours, structurally stable, and capable of passing safely the peak flow from a 25-year, 24-hour precipitation event.

Provide the following information for each haul road to be used in the operation.

a) Show the location on the application's topographic maps;

b) Description and typical cross sections showing the construction of each access road including existing and proposed contours, grades, slopes, culvert locations, outlet protection, and other drainage control;

c) Measures to control and prevent erosion and sedimentation; include proposed spacing of sediment traps, turnouts, cross drains, culverts, check dams, stabilized ditches, erosion resistant surfacing, etc.;

d) Plan for reclamation after the operation is completed;

ATTACHMENT I-1
NARRATIVE

ATTACHMENT I-1

SOIL EROSION AND SEDIMENTATION CONTROL PLAN AND STORMWATER MANAGEMENT PLAN

1.0 INTRODUCTION

This narrative presents discussions and supporting calculations for the Stormwater Management (SWM) Plan and Soil Erosion and Sedimentation Control (E&S) Plan for the vertical expansion of the existing landfill and capping outside the expansion area footprint. This E&S Plan has been prepared to comply with the appropriate standards established by the Pennsylvania Department of Environmental Protection (PADEP) Chapter 102 to reduce accelerated erosion from site activities.

Landfill expansion and capping involves the disturbance and stabilization of the existing landfill (i.e., stages 1, 2, and 3A) and the development of surface water management structures to control stormwater runoff and erosion.

The vertical landfill expansion, above the previously placed ash that made up of Stages 1, 2, and 3A, consists of new areas identified as Stages 4, 5, and 6. Stage 6 provides two options for construction. Stages 4, 5, and 6 include an layover liner or final cover system, and these areas generally correspond to the red, aqua, and green areas designated by the CO&A, respectively. Stage 4 construction sequence consists of an layover liner followed by ash placement and construction of a soil final cover system. Stage 5 construction sequence consists of construction of a final cover system. Stage 6 consists of two options, Alternates A and B for construction and fill placement. Alternate A construction sequence consists of no ash placement and the construction of a geosynthetics final cover system. Alternate B construction sequence consists of a layover liner, ash fill placement and construction of a soil final cover system. In addition to the layover liner or final cover system in Stages 4, 5, and 6, the portions of Stages 1, 2, and 3A outside of the vertical expansion footprint will be closed with a final cover system.

1.1 GENERAL SOIL EROSION/SEDIMENTATION CONTROL

Currently, stormwater runoff is directed to the Sedimentation Pond (Designated as 006 by the NPDES Permit), which is located within the Ash Impoundment at its northwest corner. The Sedimentation Pond is an existing structure that was developed during the filling of the Ash Impoundment. This structure will continue to be used for the management of stormwater collected from the landfill.

The expansion and capping of the approximate 60 acre landfill will include revisions to the current stormwater collection network of channels. New and revised perimeter channels have been designed to collect stormwater runoff from the landfill. These channels have been designed to discharge to the existing Sedimentation Pond (006); however, in the temporary condition the channels will discharge to the existing Leachate Pond (009) until ~~the channels are extended to the Sedimentation Pond in 2009~~completion of the Stage 5 final cover system. In addition, the vertical landfill expansion design includes landfill benches designed in the final cover slopes and they discharge to down chute channels that discharge to the perimeter channels.

A design feature included in the design package as an erosion control measure is the use of decant structures. Within each stage of the expansion, decant structures will be used to collect and transmit stormwater runoff collected from the top of active disposal areas, and the runoff will be conveyed through piping and a lined channel to the leachate pond. This decant structure design has been approved by the PADEP and used at other company disposal sites. The drawings present the alignment and detail for the decant structures.

1.2 GENERAL STORMWATER MANAGEMENT

The site will be developed in stages and stormwater controls will be constructed as needed for construction and operation of each landfill stage. Conveyance of stormwater to the Sedimentation Pond will be accomplished through overland flow to landfill benches and a network of stormwater management channels. Lined stormwater channels will be used to direct stormwater to the site's Sedimentation Pond.

1.3 REFERENCE DOCUMENTS

The plan presented herein incorporates SWM and E&S features required for the development and final site design in accordance with state standards. References used include:

1. HydroCAD ~~8.09~~09.10, HydroCAD Software Solutions LLC.

~~1.~~2. National Climatic Data Center. *Precipitation Frequency Estimates*, Point Precipitation Frequency Estimate From NOAA Atlas 14 for New Castle, Pennsylvania, Viewed 28 July 2010, http://hdsc.nws.noaa.gov/hdsc/pfds/index.html.

~~2.~~3. Soil Conservation Service, URBAN HYDROLOGY FOR SMALL WATERSHEDS, Technical Release 55, June 1986.

~~3.~~4. "Erosion and Sediment Pollution Control Manual (Chapter 102)," Commonwealth of Pennsylvania Department of Environmental Protection, April 2000.

~~4.~~5. "Soil Survey for Beaver and Lawrence Counties," United States Department of Agriculture, Soil Conservation Service, April 1982.

~~5.~~6. Ven Te Chow, OPEN CHANNEL HYDRAULICS, McGraw Hill Book Company, 1959

Refer to Attachment I-2 for SWM and E&S calculations for the proposed expansion area. Refer to the permit drawing set for the proposed features necessary to show a complete SWM and E&S Plan.

2.0 PROPOSED FEATURES

The development of the expansion and cap areas will utilize lined stormwater collection channels and the existing Sedimentation Pond for both SWM and E&S control during site development.

2.1 DESIGN METHODOLOGY AND ASSUMPTIONS

The following general design assumptions were made in the preparation of the SWM and E&S plans presented herein. Refer to Exhibit I-1 for stormwater routing and designs.

2.1.1 General Hydrology

1. Peak discharge estimates were developed using the computer program HydroCAD ~~8.0~~ ~~9.0~~9.10, HydroCAD Software Solutions LLC.

2. Soil types ~~reference the USDA Soil Survey for Somerset Beaver and Lawrence Countyies, Pennsylvania~~were based on samples taken for final cover and tested in the lab~~, and,~~. ~~I~~In general, the samples were a silty loam or loam material which belongs to hydrologic soil group ~~BC~~B.

3. ~~The curve number (CN) of 48 was selected to represent an undisturbed brush/grass mix condition.~~

4. The CN of ~~70~~61 was selected to represent a ~~disturbed~~ final condition with good grass cover.

2.2 CHANNELS

Lined channels have been designed to convey stormwater in contact with disturbed areas to the Sedimentation Pond. Refer to the permit drawings for channel locations and details. Stormwater

volumes are based on the 25--year, 24--hour storm event. Refer to Attachment I-2 for supporting calculations.

3.0 SEQUENCE OF OPERATION

Refer to Table I-1.1 for details regarding the staging/sequence of disturbance of the landfill and the earthmoving activities with regard to implementing E&S features.

4.0 MAINTENANCE PROGRAM

Refer to Table I-1.2 for a maintenance schedule regarding SWM and E&S features.

TABLE I-1.1
E&S AND SWM CONSTRUCTION SEQUENCE

TABLE I-1.1

E&S AND SWM CONSTRUCTION SEQUENCE

The following is a sequential order for the construction of the erosion and sedimentation (E&S) control features associated with the capping and expansion of the landfill. Refer to the permit drawings for plan views of the temporary and permanent E&S control locations.

Note: Landfill ~~overlay~~ layover liner and cap construction will be performed in stages that will occur over a 5.5 year period with significant capping and approximately one third of ~~overlay~~ layover liner construction occurring in the first year.

CONTROLS FOR DISTURBANCE OF THE LANDFILL

1. Install and maintain silt fence or straw bales along contour around the perimeter and down-gradient of areas that are to be disturbed, prior to beginning any earthmoving activities in those areas.
2. Stormwater collection channels along the landfill's perimeter are incorporated into the cap construction. Therefore, they will be constructed during cap construction.

CONSTRUCTION SEQUENCE

To maintain access to the site's active disposal area during construction, the cap around the base of the landfill will be constructed in ~~three~~ two phases, which will be completed by December 31, 2009. ~~Overlay liner~~Layover liner will be constructed in three phases that will occur over a 5.5 year period following issuance of the permit.

Stage 4 and Closure Area 1 (located south and west of Stage 4) will be constructed first and they will be constructed concurrently (see drawings for the limits of Stage 4 and Closure Area 1). Then Closure Area 2, located along the ~~north and eastern~~remaining portion of the landfill, will be constructed. ~~followed by Closure Area 3, located along the east and southern portion of the landfill (see drawings for the limits of Closure Areas 2 and 3).~~ Stages 5 and 6 will be constructed individually in separate years following Stage 4 and Closure construction.

STAGE 4 AND CLOSURE AREA 1 CONSTRUCTION

1. Install and maintain silt fence or straw bales along the contour at the toe of slope outside of the disturbed area and downgradient of Channel A, Reach 1.

2. Install a portion of Channel A, Reach 1 between the existing Leachate Pond and the northwest corner of the landfill. Channel A will temporarily discharge to the Leachate Pond and upon the completion of its construction, it will be routed to discharge into the

existing Sedimentation Pond (006). Channel D will run parallel to Channel A and discharge into the Leachate Pond.

3. Install Channel A, Reach 2 concurrently with Closure Area 1 construction.

4. Install Down Chute 2, Reach 1; Down Chutes 4 and 5; and the Decant Down Chute concurrently with the completion of Closure Area 1.

5. Following the construction of the Stage 4 layover liner and during waste filling, in areas where final grade has been achieved up to each landfill bench, construct a temporary liner in Down Chute 2, Reach 2. The temporary liner used shall provide the same protection from erosion as the final liner configuration.

CLOSURE AREA 2 CONSTRUCTION

1. Install and maintain silt fence or straw bales along the contour at the toe of slope outside of the disturbed area and down-gradient of Channel B, Reach 1.

2. Install Down Chute 1, Reach 1; Channel A, Reach 1 to the sedimentation pond; Channel B, Reach 1 between Channel A, Reach 1 and the north west corner of the landfill.

3. Install Channel B, Reach 2 concurrently with Closure Area 2 construction.

4. Install Down Chute 3, Reach 1 concurrently with Closure Area 2 construction.

5. Install Channel A, Reach 3 and the remaining portion of Channel B, Reach 2 concurrently with Closure Area 3 construction.

~~CLOSURE AREA 3 CONSTRUCTION~~

~~1. Install and maintain silt fence or straw bales along the contour at the toe of slope outside of the disturbed area.~~

STAGE 5 CONSTRUCTION

1. Install and maintain silt fence or straw bales as needed to protect down gradient final cover.

TABLE I-1.1
(Continued)

2. Following the construction of the Stage 5 ~~layover liner and during waste filling, in areas where final grade has been achieved up to each landfill bench, construct a temporary liner in Down Chute 1, Reach 2, and Down Chute 3, Reach 2. The temporary liner used shall provide the same protection from erosion as the final liner configuration~~ final cover system, channels and down chutes shall be constructed according to the design.

STAGE 6A CONSTRUCTION

1. Install and maintain silt fence or straw bales as needed to protect down gradient final cover.

2. Following the construction of the stage 6a final cover system, channels and down chutes shall be constructed according to the design.

STAGE 6B CONSTRUCTION

1. Install and maintain silt fence or straw bales as needed to protect down gradient final cover.

2. Following the construction of the Stage 6B layover liner and during waste filling, in areas where final grade has been achieved up to each landfill bench, construct a temporary liner in ~~Channel C~~channels and down chutes. The temporary liner used shall provide the same protection from erosion as the final liner configuration.

3. Following Completion of Waste Filling in Stage 6B, the final cover system, channels and down chutes shall be constructed according to the design.

~~**STAGE 7 CONSTRUCTION**~~

~~1. During waste filling in Stage 7, in areas where final grade has been achieved up to each landfill bench, construct a temporary liner in Channel C and Down Chutes 1, 2, and 3. The temporary liners used shall provide the same protection from erosion as the final liner configuration.~~

~~**CLOSURE OF STAGES 4, 5, 6, AND 7**~~

~~1. Install and maintain silt fence or straw bales as needed to protect down gradient final cover.~~

TABLE I-1.1
(Continued)

~~2. Concurrently with the Closure of Stages 4, 5, 6, and 7, Channel C and Down Chutes 1, 2, and 3 shall be constructed according to the design.~~

TABLE I-1.2
E&S AND SWM INSPECTION
FREQUENCY AND MAINTENANCE PLAN

TABLE I-1.2
E&S AND SWM INSPECTION FREQUENCY AND MAINTENANCE PLAN

Feature	Inspection Frequency	Maintenance
Channels, Benches, and/or Ponds	Weekly and after precipitation events that produce at least 0.5 inches of rainfall within a four hour period, until the drainage areas are stabilized. *	Remove sediment/debris as necessary to maintain the total design depth.
Silt Fence	Weekly and after all runoff events until drainage areas are stabilized. *	Repair any erosion rills under the silt fence. Repair silt fence sags or collapses caused by installing stone filter outlets at these locations. Remove sediment from behind the silt fence when it accumulates to 1/3 to 1/2 the height of the fabric.
Vegetation	Weekly and after all runoff events until the area is stabilized. *	Regrade, seed, fertilize, and mulch as needed to stabilize disturbed areas (Refer to the revegetation measures in Form H for more information).
Dust	Daily when conditions dictate.	Add moisture, vegetate, or apply mulch to open bare areas during dry periods.
Temporary Control Measures and Facilities	Weekly and after all runoff events until stabilized. *	Remove sediment/debris and repair as needed to conform to installation specifications.
Rock Filters/ Aprons	Weekly and after all runoff events until stabilized. *	Replace clogged filter stone and/or stone as necessary.

*Stabilization occurs when there is at least a uniform, 70 percent vegetative cover established over the up gradient area.

EXHIBIT I-1
E&S AND SWM DESIGN CALCULATIONS

EXHIBIT I-1.1
CALCULATION BRIEF

MADE BY	GDT	DATE	4/27/2007	CHECKED BY	DATE
	Rev. DMF		Revised 1/28/08		
	Rev. PAW		Revised 11/3/08		
	Rev. JJK		Revised 9/16/10	DMT	11/29/10

Design Objective:

Design the storm water management system for the expansion area. This design includes landfill down chute channels, perimeter channels, and channels outside the disposal area to the Sedimentation Pond. In addition to the stormwater channels, a landfill bench lining was designed.

Design Method & Conditions:

The Soil Conservation Service (SCS) technical Release No. 20 (TR-20) methodology within the HydroCAD computer program was used to determine the peak 25-year 24-hour runoff rates. The precipitation amount for the 25-year 24-hour storm event in Lawrence County was based on National Climatic Data Center, Precipitation Frequency Estimates, Point Precipitation Frequency Estimate From NOAA Atlas 14.~~Table 1, Pennsylvania Rainfall By Counties, provided in the PA DEP E&S Control Program Manual, dated April 2000~~. HydroCAD was used to design the channels, down chutes, and culverts. Then, Standard Worksheet #21 for Channel Design Data from the PADEP E&S Control Program Manual was used to complete each channel design. A CN of 61 was selected to represent a final condition with good grass cover. Worksheet #21 was used to design the channel linings and depth with freeboard.

Calculations:

After the final landfill configuration was designed, the limits of the watersheds contributing to stormwater channels were outlined and subdivided into sub-watersheds, including sub-watersheds for the landfill benches. Watershed areas, slope grades, and channel configurations along with runoff curve numbers were input into HydroCAD, which calculated runoff data for each sub-watershed and each channel.

The data generated by HydroCAD, was used in PA's E&S Control Program Manual Worksheet # 21 to design the final configuration and lining of each channel. See Exhibit I-1.2 for the HydroCAD output for Alternates 6A and 6B. The perimeter channels were evaluated with these tools and after sizing the channels it was determined that a grass lining was sufficient

for the channels. Refer to Exhibit I-1.3 and I-1.4 for Standard Worksheet #21 Channel Design Data calculations.

Based on the requirements included in Pennsylvania's Manual, channels with slopes of greater than 10 percent were evaluated for a riprap liner. In this design, this included all of the down chute channels. Based on the design requirements for a rip rap liner, a concrete revetment liner was selected for the down chute channel linings. This lining has been used at other facilities associated with Orion, and it has performed well in similar applications. Refer to Exhibit I-1.3 and I-1.4 for Standard Worksheet #21 Channel Design Data calculations.

At the discharge point of each down chute channel into the perimeter channels, a concrete revetment liner will be installed in the perimeter channels. To prevent down chute discharges from passing straight through the perimeter channel and overtopping its outer-bank, 3-ft x 3-ft gabion basket will be constructed along the perimeter channel's outer-bank. Construction of the gabion baskets is graphically shown in the stormwater details on the drawings. Both the concrete revetment liner and the gabion baskets will extend up-gradient and down-gradient 5-ft from the channel.

A grass lining evaluation was performed on the landfill benches. Worksheet #21 was used to determine if a grass lining has sufficient resistance to the maximum velocity and maximum flow volume. For this evaluation, the HydroCAD output data was scanned for the worst case data which was entered into Worksheet #21 (see Exhibit I-1.5). The grass lining was found to have sufficient shear resistance and is an acceptable lining material.

Conclusions:

Based on the calculations attached, the channel configurations proposed for the landfill provide sufficient capacity and lining velocity or shear resistance for the design flows.

References:

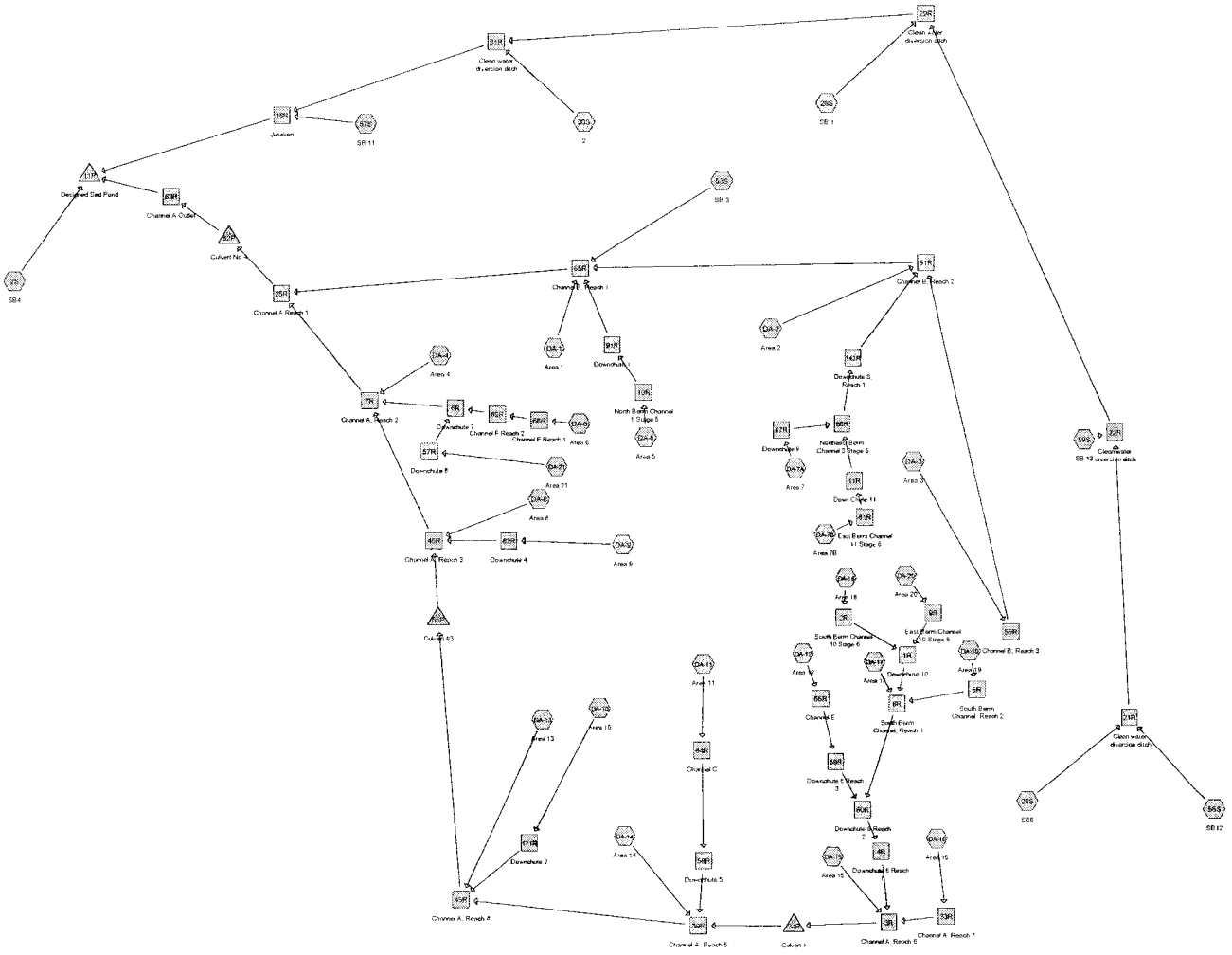
1. Soil Conservation Service, URBAN HYDROLOGY FOR SMALL WATERSHEDS, Technical Release 55, June 1986.

2. PADEP, EROSION AND SEDIMENTATION POLLUTION CONTROL PROGRAM MANUAL, April 2000.

3. Ven Te Chow, OPEN CHANNEL HYDRAULICS, Mc-Graw Hill Book Company, 1959

4. HydroCAD 8.0, HydroCAD Software Solutions LLC.

EXHIBIT I-1.2.1
ALTERNATE 6A - HYDROCAD OUTPUT



Subcat Reach Pond Link

Drainage Diagram for Phase 6A10-18-10
Prepared by Microsoft, Printed 11/19/2010

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
132.848	61	(2S, 20S, 28S, 30S, 53S, 55S, 57S, 59S, DA-10, DA-11, DA-12, DA-13, DA-14, DA-15, DA-16, DA-17, DA-18, DA-19, DA-2, DA-20, DA-21, DA-3, DA-4, DA-5, DA-6, DA-7A, DA-7B, DA-8, DA-9)
0.500	61	>75% Grass Cover, Good HGB (DA-1)
133.348	61	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
133.348	Other	2S, 20S, 28S, 30S, 53S, 55S, 57S, 59S, DA-1, DA-10, DA-11, DA-12, DA-13, DA-14, DA-15, DA-16, DA-17, DA-18, DA-19, DA-2, DA-20, DA-21, DA-3, DA-4, DA-5, DA-6, DA-7A, DA-7B, DA-8, DA-9
133.348		**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)	Fill (inches)
1	11P	762.00	761.50	50.0	0.0100	0.015	24.0	0.0	0.0
2	34P	784.35	784.10	50.0	0.0050	0.010	24.0	0.0	0.0
3	55P	776.00	775.00	40.0	0.0250	0.025	36.0	0.0	0.0
4	62P	770.51	770.42	24.0	0.0038	0.011	30.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 2S: SB4 Runoff Area=2.300 ac 0.00% Impervious Runoff Depth>0.71"
Flow Length=2,550' Tc=197.9 min CN=61 Runoff=0.31 cfs 0.135 af

Subcatchment 20S: SB6 Runoff Area=5.780 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=270' Slope=0.1000 '/' Tc=6.4 min CN=61 Runoff=7.19 cfs 0.373 af

Subcatchment 28S: SB 1 Runoff Area=2.310 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=300' Slope=0.0250 '/' Tc=12.0 min CN=61 Runoff=2.21 cfs 0.149 af

Subcatchment 30S: 2 Runoff Area=8.110 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=480' Slope=0.0158 '/' Tc=16.9 min CN=61 Runoff=6.35 cfs 0.521 af

Subcatchment 53S: SB 3 Runoff Area=7.870 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=121' Tc=2.3 min CN=61 Runoff=11.79 cfs 0.509 af

Subcatchment 55S: SB12 Runoff Area=46.500 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=1,050' Slope=0.0600 '/' Tc=13.6 min CN=61 Runoff=41.55 cfs 2.994 af

Subcatchment 57S: SB 11 Runoff Area=4.040 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=300' Slope=0.0313 '/' Tc=11.0 min CN=61 Runoff=4.05 cfs 0.260 af

Subcatchment 59S: SB 13 Runoff Area=0.578 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=55' Slope=0.0720 '/' Tc=2.0 min CN=61 Runoff=0.88 cfs 0.037 af

Subcatchment DA-1: Area 1 Runoff Area=0.500 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=114' Slope=0.1930 '/' Tc=7.4 min CN=61 Runoff=0.59 cfs 0.032 af

Subcatchment DA-10: Area 10 Runoff Area=9.240 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=444' Slope=0.0428 '/' Tc=31.2 min CN=61 Runoff=4.75 cfs 0.590 af

Subcatchment DA-11: Area 11 Runoff Area=2.770 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=30' Slope=0.3330 '/' Tc=2.1 min CN=61 Runoff=4.18 cfs 0.179 af

Subcatchment DA-12: Area 12 Runoff Area=1.660 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=83' Slope=0.2891 '/' Tc=4.9 min CN=61 Runoff=2.22 cfs 0.107 af

Subcatchment DA-13: Area 13 Runoff Area=1.300 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=61' Slope=0.1951 '/' Tc=4.5 min CN=61 Runoff=1.77 cfs 0.084 af

Subcatchment DA-14: Area 14 Runoff Area=1.270 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=108' Slope=0.1682 '/' Tc=7.5 min CN=61 Runoff=1.50 cfs 0.082 af

Subcatchment DA-15: Area 15 Runoff Area=0.550 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=114' Slope=0.1491 '/' Tc=8.2 min CN=61 Runoff=0.63 cfs 0.035 af

Subcatchment DA-16: Area 16 Runoff Area=2.020 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=197' Slope=0.1036 '/' Tc=14.8 min CN=61 Runoff=1.72 cfs 0.130 af

Subcatchment DA-17: Area 17 Runoff Area=0.440 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=138' Slope=0.1231 '/' Tc=10.4 min CN=61 Runoff=0.45 cfs 0.028 af

Subcatchment DA-18: Area 18 Runoff Area=1.400 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=464' Slope=0.0320 '/' Tc=35.3 min CN=61 Runoff=0.66 cfs 0.089 af

Subcatchment DA-19: Area 19 Runoff Area=2.240 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=113' Slope=0.1240 '/' Tc=8.8 min CN=61 Runoff=2.49 cfs 0.145 af

Subcatchment DA-2: Area 2 Runoff Area=3.100 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=120' Slope=0.2500 '/' Tc=7.0 min CN=61 Runoff=3.75 cfs 0.200 af

Subcatchment DA-20: Area 20 Runoff Area=2.350 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=378' Slope=0.0343 '/' Tc=33.2 min CN=61 Runoff=1.15 cfs 0.150 af

Subcatchment DA-21: Area 21 Runoff Area=0.600 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=265' Tc=3.9 min CN=61 Runoff=0.84 cfs 0.039 af

Subcatchment DA-3: Area 3 Runoff Area=6.920 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=204' Slope=0.0980 '/' Tc=15.5 min CN=61 Runoff=5.72 cfs 0.445 af

Subcatchment DA-4: Area 4 Runoff Area=1.260 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=197' Slope=0.1230 '/' Tc=13.8 min CN=61 Runoff=1.12 cfs 0.081 af

Subcatchment DA-5: Area 5 Runoff Area=8.780 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=374' Tc=36.3 min CN=61 Runoff=4.04 cfs 0.560 af

Subcatchment DA-6: Area 6 Runoff Area=3.370 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=752' Tc=6.1 min CN=61 Runoff=4.26 cfs 0.218 af

Subcatchment DA-7A: Area 7 Runoff Area=1.440 ac 0.00% Impervious Runoff Depth>0.76"
Flow Length=510' Slope=0.0196 '/' Tc=43.9 min CN=61 Runoff=0.57 cfs 0.091 af

Subcatchment DA-7B: Area 7B Runoff Area=2.640 ac 0.00% Impervious Runoff Depth>0.76"
Flow Length=451' Slope=0.0232 '/' Tc=40.0 min CN=61 Runoff=1.13 cfs 0.168 af

Subcatchment DA-8: Area 8 Runoff Area=0.220 ac 0.00% Impervious Runoff Depth>0.78"
Flow Length=64' Slope=0.2982 '/' Tc=3.9 min CN=61 Runoff=0.31 cfs 0.014 af

Subcatchment DA-9: Area 9 Runoff Area=1.790 ac 0.00% Impervious Runoff Depth>0.77"
Flow Length=579' Tc=11.6 min CN=61 Runoff=1.75 cfs 0.115 af

Reach 1R: Downchute 10 Avg. Flow Depth=0.09' Max Vel=6.95 fps Inflow=1.74 cfs 0.238 af
n=0.015 L=116.0' S=0.1293 '/' Capacity=273.14 cfs Outflow=1.74 cfs 0.238 af

Reach 2R: South Berm Channel 10 Avg. Flow Depth=0.40' Max Vel=1.62 fps Inflow=0.66 cfs 0.089 af
n=0.030 L=158.0' S=0.0100 '/' Capacity=47.07 cfs Outflow=0.65 cfs 0.089 af

Reach 3R: Channel A, Reach 6 Avg. Flow Depth=0.33' Max Vel=2.72 fps Inflow=4.40 cfs 0.676 af
n=0.030 L=60.0' S=0.0175 '/' Capacity=148.09 cfs Outflow=4.40 cfs 0.675 af

Reach 4R: Downchute 6 Reach 1 Avg. Flow Depth=0.13' Max Vel=8.53 fps Inflow=3.00 cfs 0.512 af
n=0.015 L=125.0' S=0.1328 '/' Capacity=276.80 cfs Outflow=3.00 cfs 0.512 af

Reach 5R: South Berm Channel, Reach Avg. Flow Depth=0.11' Max Vel=1.12 fps Inflow=2.49 cfs 0.145 af
n=0.030 L=1,036.0' S=0.0097 '/' Capacity=50.55 cfs Outflow=1.24 cfs 0.141 af

Reach 6R: Downchute 7 Avg. Flow Depth=0.15' Max Vel=10.80 fps Inflow=4.59 cfs 0.255 af
n=0.015 L=237.0' S=0.1741 '/' Capacity=138.94 cfs Outflow=4.58 cfs 0.255 af

Reach 7R: Channel A, Reach 2 Avg. Flow Depth=0.73' Max Vel=2.17 fps Inflow=11.83 cfs 2.051 af
n=0.030 L=510.0' S=0.0039 '/' Capacity=75.34 cfs Outflow=11.73 cfs 2.041 af

Reach 8R: South Berm Channel, Reach Avg. Flow Depth=0.15' Max Vel=1.77 fps Inflow=2.57 cfs 0.407 af
n=0.030 L=174.0' S=0.0172 '/' Capacity=67.57 cfs Outflow=2.57 cfs 0.406 af

Reach 9R: East Berm Channel 10 Stage Avg. Flow Depth=0.49' Max Vel=1.81 fps Inflow=1.15 cfs 0.150 af
n=0.030 L=620.2' S=0.0097 '/' Capacity=46.29 cfs Outflow=1.09 cfs 0.149 af

Reach 10R: North Berm Channel 1 Avg. Flow Depth=0.31' Max Vel=2.03 fps Inflow=4.04 cfs 0.560 af
n=0.030 L=1,050.0' S=0.0100 '/' Capacity=31.43 cfs Outflow=3.70 cfs 0.553 af

Reach 11R: Down Chute 11 Avg. Flow Depth=0.08' Max Vel=5.63 fps Inflow=1.12 cfs 0.168 af
n=0.015 L=108.0' S=0.1111 '/' Capacity=253.19 cfs Outflow=1.12 cfs 0.168 af

Reach 16R: Junction Avg. Flow Depth=0.50' Max Vel=17.37 fps Inflow=42.94 cfs 4.278 af
n=0.010 L=96.4' S=0.0467 '/' Capacity=591.65 cfs Outflow=42.94 cfs 4.278 af

Reach 21R: Clean water diversion ditch Avg. Flow Depth=1.59' Max Vel=5.09 fps Inflow=45.53 cfs 3.368 af
n=0.010 L=1,113.5' S=0.0013 '/' Capacity=175.83 cfs Outflow=41.84 cfs 3.352 af

Reach 22R: Clean water diversion ditch Avg. Flow Depth=1.22' Max Vel=7.69 fps Inflow=41.97 cfs 3.389 af
n=0.010 L=490.4' S=0.0041 '/' Capacity=306.69 cfs Outflow=41.68 cfs 3.384 af

Reach 25R: Channel A Reach 1 Avg. Flow Depth=0.97' Max Vel=2.40 fps Inflow=20.76 cfs 4.010 af
n=0.030 L=132.0' S=0.0037 '/' Capacity=85.69 cfs Outflow=20.74 cfs 4.006 af

Reach 29R: Clean water diversion ditch Avg. Flow Depth=1.50' Max Vel=5.67 fps Inflow=43.47 cfs 3.533 af
n=0.010 L=668.4' S=0.0018 '/' Capacity=202.13 cfs Outflow=42.44 cfs 3.524 af

Reach 31R: Clean water diversion ditch Avg. Flow Depth=1.74' Max Vel=4.33 fps Inflow=48.63 cfs 4.046 af
n=0.010 L=1,485.0' S=0.0009 '/' Capacity=141.74 cfs Outflow=41.43 cfs 4.018 af

Reach 33R: Channel A, Reach 7 Avg. Flow Depth=0.27' Max Vel=1.00 fps Inflow=1.72 cfs 0.130 af
n=0.030 L=535.0' S=0.0030 '/' Capacity=61.22 cfs Outflow=1.28 cfs 0.128 af

Reach 39R: Channel A, Reach 5 Avg. Flow Depth=0.82' Max Vel=1.24 fps Inflow=7.39 cfs 0.935 af
n=0.030 L=613.0' S=0.0012 '/' Capacity=31.93 cfs Outflow=5.73 cfs 0.925 af

Reach 45R: Channel A, Reach 4 Avg. Flow Depth=0.67' Max Vel=2.86 fps Inflow=10.44 cfs 1.599 af
n=0.030 L=900.0' S=0.0082 '/' Capacity=82.49 cfs Outflow=10.17 cfs 1.588 af

Reach 46R: Channel A, Reach 3 Avg. Flow Depth=0.76' Max Vel=2.55 fps Inflow=10.65 cfs 1.717 af
n=0.030 L=176.0' S=0.0057 '/' Capacity=68.81 cfs Outflow=10.64 cfs 1.715 af

Reach 51R: Channel B, Reach 2 Avg. Flow Depth=0.47' Max Vel=1.81 fps Inflow=4.79 cfs 0.892 af
n=0.030 L=1,063.0' S=0.0052 '/' Capacity=80.53 cfs Outflow=4.55 cfs 0.881 af

Reach 55R: Channel B, Reach 1 Avg. Flow Depth=0.80' Max Vel=2.21 fps Inflow=12.65 cfs 1.975 af
n=0.030 L=352.0' S=0.0043 '/' Capacity=73.08 cfs Outflow=11.28 cfs 1.969 af

Reach 56R: Channel B, Reach 3 Avg. Flow Depth=0.38' Max Vel=1.54 fps Inflow=5.72 cfs 0.445 af
n=0.030 L=1,730.0' S=0.0046 '/' Capacity=76.13 cfs Outflow=3.04 cfs 0.434 af

Reach 57R: Downchute 8 Avg. Flow Depth=0.05' Max Vel=6.28 fps Inflow=0.84 cfs 0.039 af
n=0.015 L=160.0' S=0.2250 '/' Capacity=157.93 cfs Outflow=0.84 cfs 0.039 af

Reach 58R: Downchute 5 Avg. Flow Depth=0.20' Max Vel=10.27 fps Inflow=2.83 cfs 0.177 af
n=0.015 L=107.0' S=0.1393 '/' Capacity=74.29 cfs Outflow=2.83 cfs 0.177 af

Reach 59R: Downchute 6 Reach 3 Avg. Flow Depth=0.09' Max Vel=6.61 fps Inflow=1.58 cfs 0.106 af
n=0.015 L=97.0' S=0.1237 '/' Capacity=267.16 cfs Outflow=1.58 cfs 0.106 af

Reach 60R: Downchute 6 Reach 2 Avg. Flow Depth=0.15' Max Vel=7.38 fps Inflow=3.00 cfs 0.512 af
n=0.015 L=23.5' S=0.0851 '/' Capacity=221.59 cfs Outflow=3.00 cfs 0.512 af

Reach 61R: East Berm Channel 11 Avg. Flow Depth=0.49' Max Vel=1.88 fps Inflow=1.13 cfs 0.168 af
n=0.030 L=248.0' S=0.0105 '/' Capacity=48.19 cfs Outflow=1.12 cfs 0.168 af

Reach 62R: Downchute 4 Avg. Flow Depth=0.07' Max Vel=8.88 fps Inflow=1.75 cfs 0.115 af
n=0.015 L=82.0' S=0.2805 '/' Capacity=176.33 cfs Outflow=1.75 cfs 0.115 af

Reach 63R: Channel A Outlet Avg. Flow Depth=1.04' Max Vel=2.12 fps Inflow=20.74 cfs 4.006 af
n=0.030 L=905.2' S=0.0027 '/' Capacity=72.72 cfs Outflow=20.15 cfs 3.973 af

Reach 64R: Channel C Avg. Flow Depth=0.27' Max Vel=4.10 fps Inflow=4.18 cfs 0.179 af
n=0.030 L=1,591.0' S=0.0534 '/' Capacity=33.23 cfs Outflow=2.83 cfs 0.177 af

Reach 65R: Channel E Avg. Flow Depth=0.17' Max Vel=2.02 fps Inflow=2.22 cfs 0.107 af
n=0.030 L=796.0' S=0.0201 '/' Capacity=37.94 cfs Outflow=1.58 cfs 0.106 af

Reach 66R: Northeast Berm Channel 3 Avg. Flow Depth=0.11' Max Vel=1.50 fps Inflow=1.69 cfs 0.259 af
n=0.030 L=347.0' S=0.0173 '/' Capacity=239.62 cfs Outflow=1.68 cfs 0.258 af

Reach 67R: Downchute 9 Avg. Flow Depth=0.04' Max Vel=5.55 fps Inflow=0.57 cfs 0.091 af
n=0.015 L=43.0' S=0.2326 '/' Capacity=366.30 cfs Outflow=0.57 cfs 0.091 af

Reach 68R: Channel F Reach 1 Avg. Flow Depth=0.26' Max Vel=3.15 fps Inflow=4.26 cfs 0.218 af
n=0.030 L=465.0' S=0.0301 '/' Capacity=46.43 cfs Outflow=3.96 cfs 0.217 af

Reach 69R: Channel F Reach 2 Avg. Flow Depth=0.15' Max Vel=9.76 fps Inflow=3.96 cfs 0.217 af
n=0.015 L=134.0' S=0.1493 '/' Capacity=128.63 cfs Outflow=3.96 cfs 0.217 af

Reach 91R: Downchute 1 Avg. Flow Depth=0.13' Max Vel=10.22 fps Inflow=3.70 cfs 0.553 af
n=0.015 L=130.0' S=0.1846 '/' Capacity=326.36 cfs Outflow=3.70 cfs 0.553 af

Reach 142R: Downchute 3, Reach 1 Avg. Flow Depth=0.08' Max Vel=8.22 fps Inflow=1.68 cfs 0.258 af
n=0.015 L=126.0' S=0.2302 '/' Capacity=364.40 cfs Outflow=1.68 cfs 0.257 af

Reach 171R: Downchute 2 Avg. Flow Depth=0.15' Max Vel=11.23 fps Inflow=4.75 cfs 0.590 af
n=0.015 L=479.0' S=0.1892 '/' Capacity=330.43 cfs Outflow=4.74 cfs 0.590 af

Pond 11P: Designed Sed Pond Peak Elev=763.35' Storage=3.932 af Inflow=57.25 cfs 8.386 af
Primary=7.36 cfs 5.438 af Secondary=0.00 cfs 0.000 af Outflow=7.36 cfs 5.438 af

Pond 34P: Culvert 1 Peak Elev=785.38' Inflow=4.40 cfs 0.675 af
24.0" Round Culvert n=0.010 L=50.0' S=0.0050 '/' Outflow=4.40 cfs 0.675 af

Pond 55P: Culvert #3 Peak Elev=777.39' Inflow=10.17 cfs 1.588 af
36.0" Round Culvert n=0.025 L=40.0' S=0.0250 '/' Outflow=10.17 cfs 1.588 af

Pond 62P: Culvert No.4 Peak Elev=772.19' Inflow=20.74 cfs 4.006 af
30.0" Round Culvert x 2.00 n=0.011 L=24.0' S=0.0038 '/' Outflow=20.74 cfs 4.006 af

Total Runoff Area = 133.348 ac Runoff Volume = 8.565 af Average Runoff Depth = 0.77"
100.00% Pervious = 133.348 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 2S: SB4

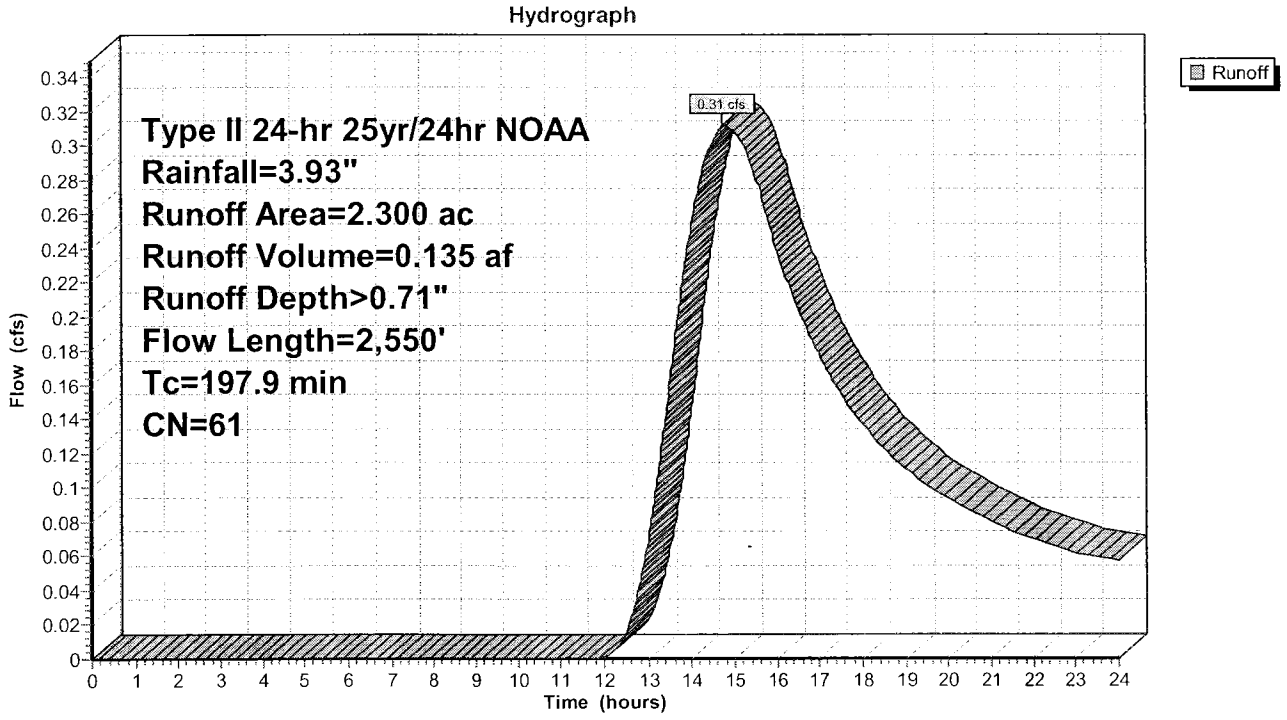
Runoff = 0.31 cfs @ 14.74 hrs, Volume= 0.135 af, Depth> 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.300	61	
	2.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
61.0	300	0.0193	0.08		**Sheet Flow, Sheet Flow Portion for SB4** Woods: Light underbrush n= 0.400 P2= 2.37"
136.9	2,250	0.0030	0.27		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
197.9	2,550	Total			

Subcatchment 2S: SB4



Summary for Subcatchment 20S: SB6

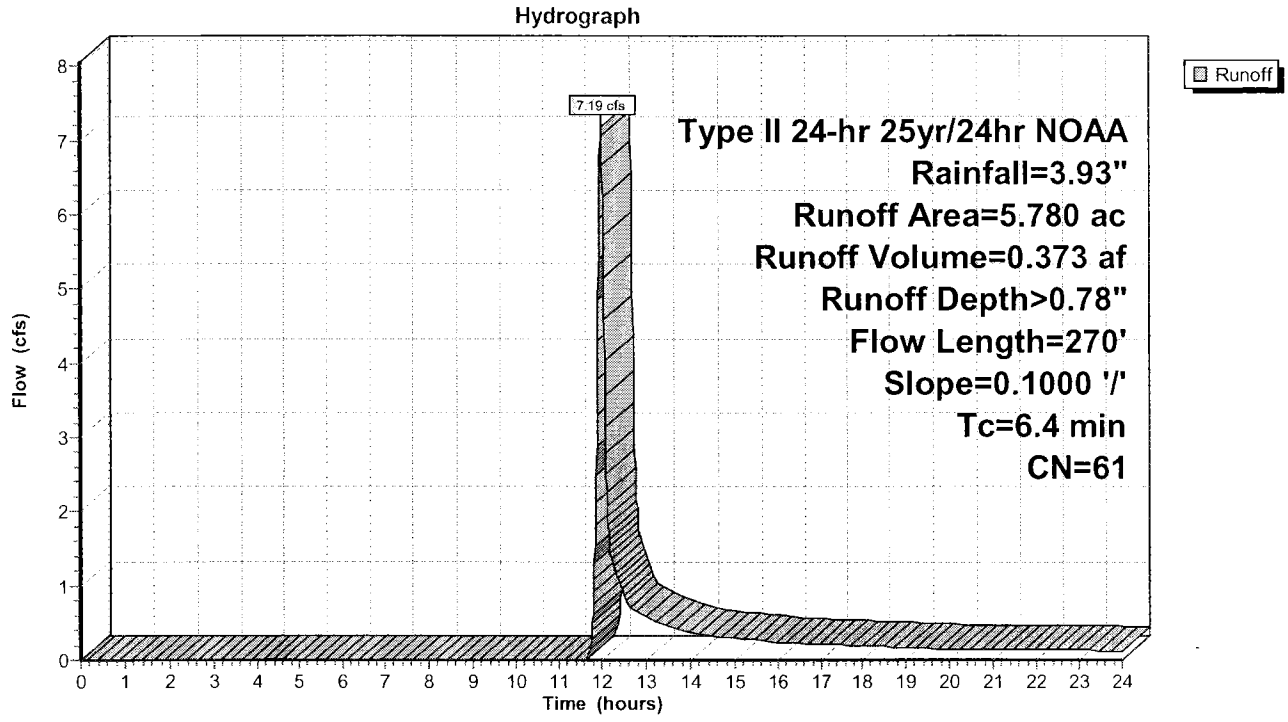
Runoff = 7.19 cfs @ 11.99 hrs, Volume= 0.373 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	5.780	61	
	5.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	270	0.1000	0.71		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"

Subcatchment 20S: SB6



Summary for Subcatchment 28S: SB 1

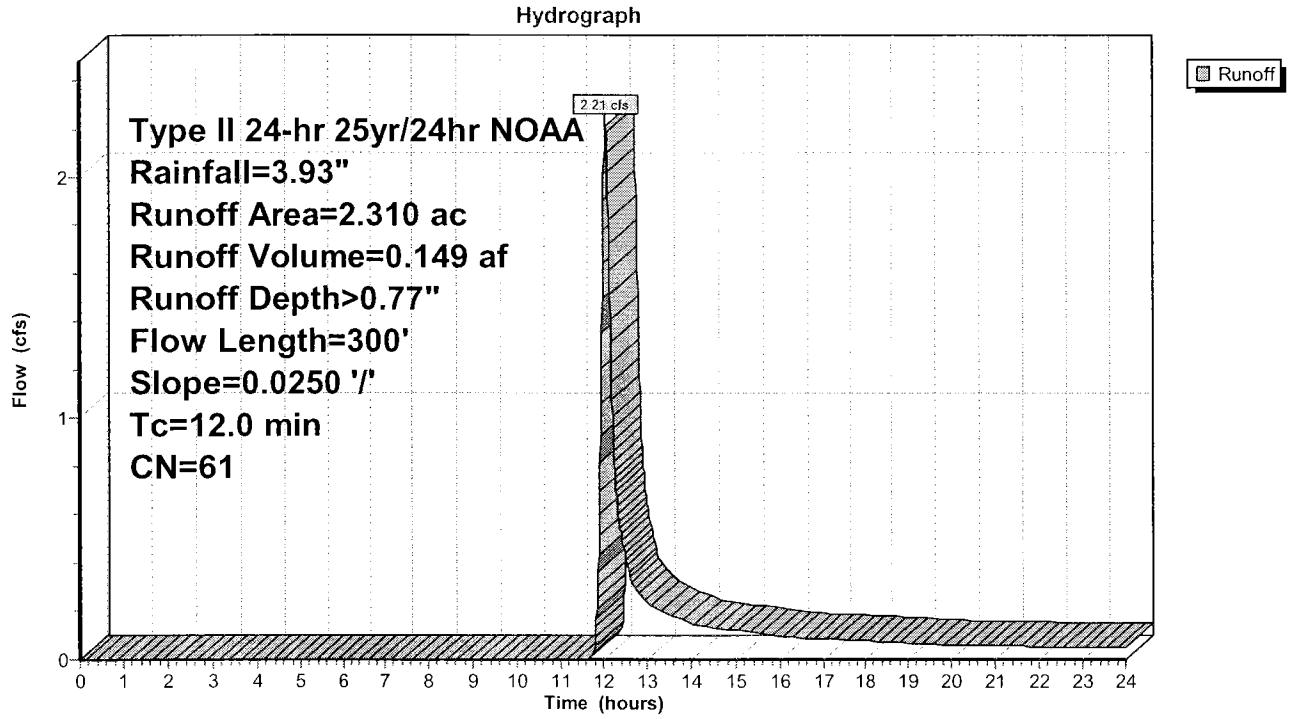
Runoff = 2.21 cfs @ 12.06 hrs, Volume= 0.149 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.310	61	
	2.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	300	0.0250	0.42		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"

Subcatchment 28S: SB 1



Summary for Subcatchment 30S: 2

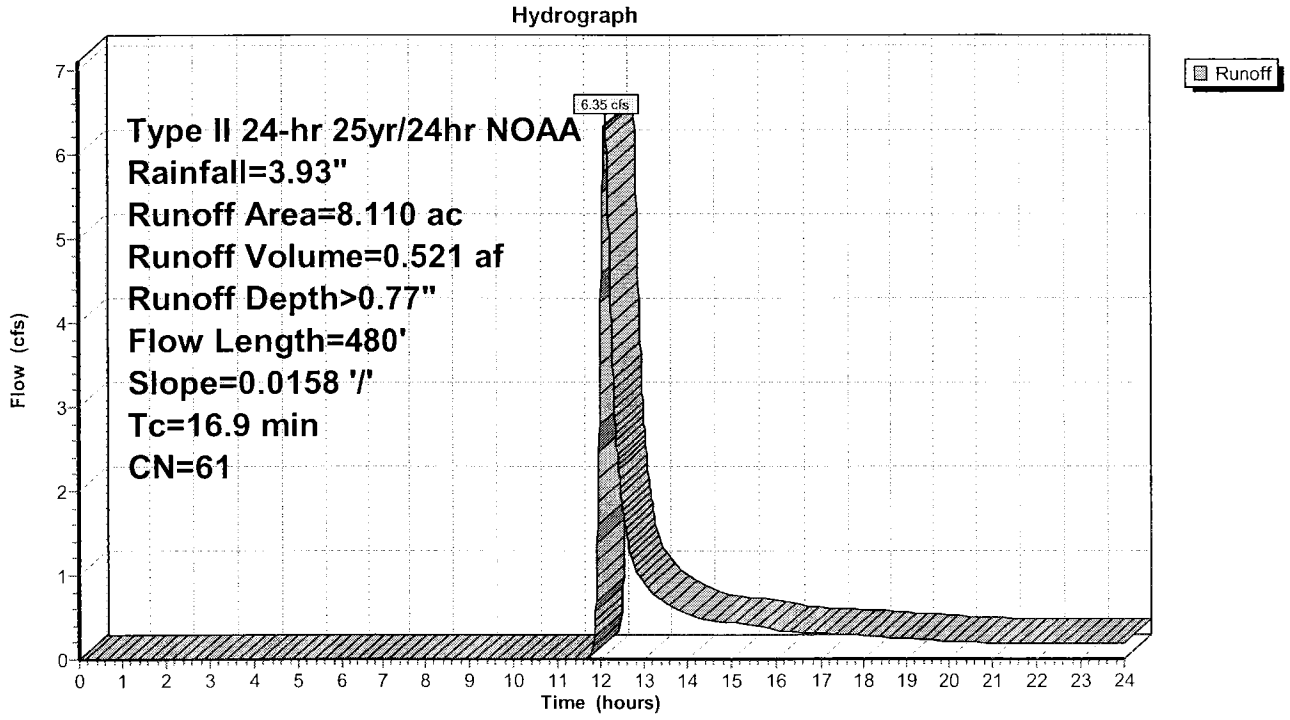
Runoff = 6.35 cfs @ 12.12 hrs, Volume= 0.521 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	8.110	61	
	8.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	300	0.0158	0.35		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"
2.4	180	0.0158	1.26		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
16.9	480	Total			

Subcatchment 30S: 2



Summary for Subcatchment 53S: SB 3

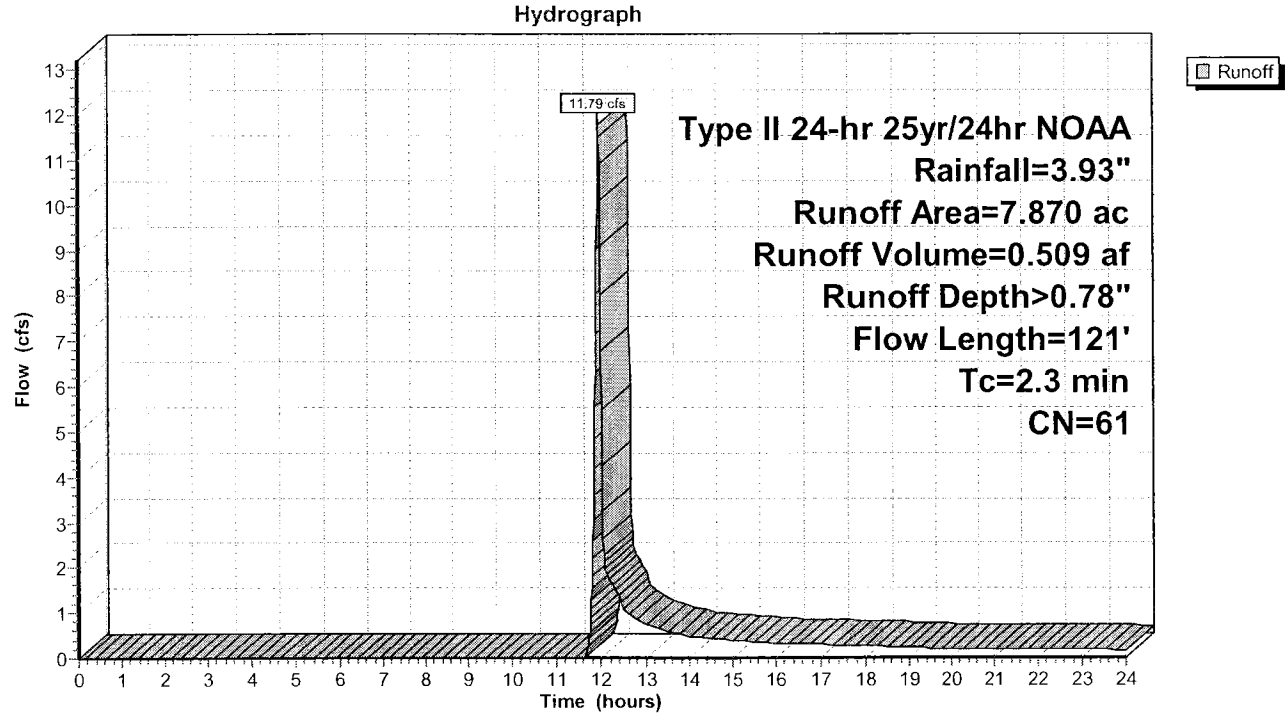
Runoff = 11.79 cfs @ 11.94 hrs, Volume= 0.509 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	7.870	61	
	7.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	1	0.0080	0.08		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"
2.1	120	0.3330	0.97		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"
2.3	121	Total			

Subcatchment 53S: SB 3



Summary for Subcatchment 55S: SB12

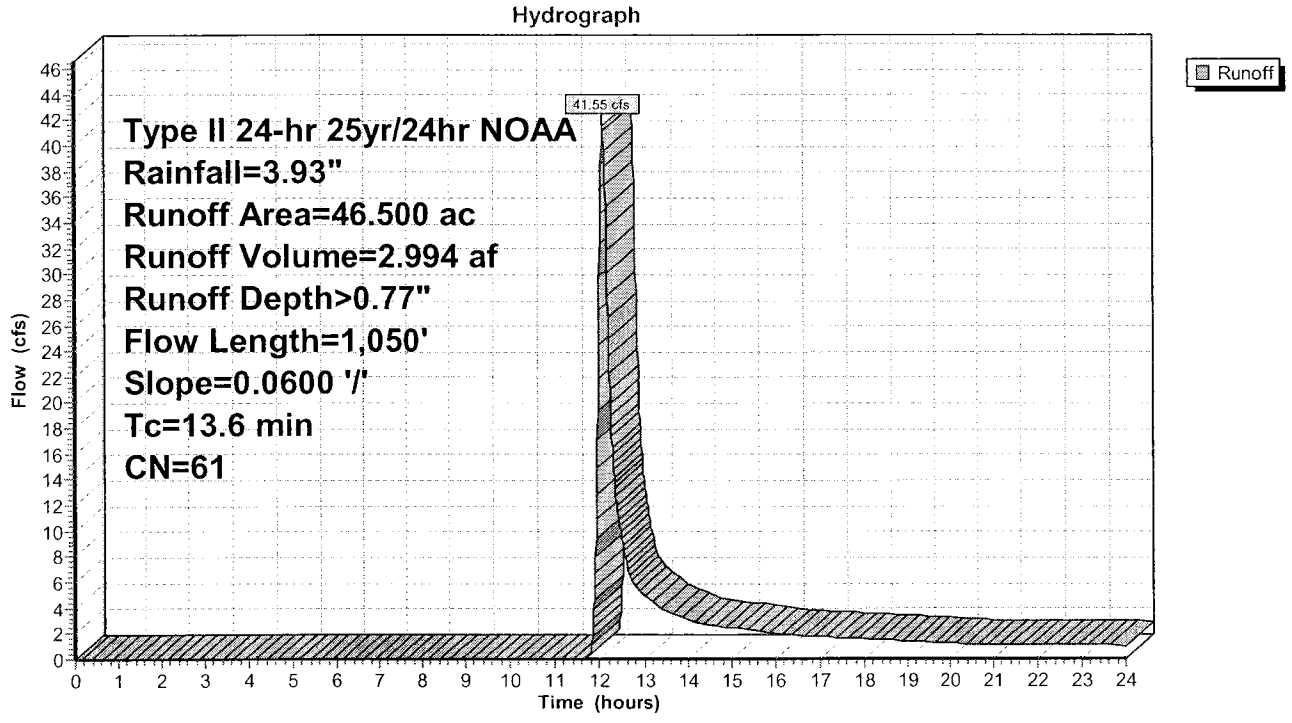
Runoff = 41.55 cfs @ 12.08 hrs, Volume= 2.994 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	46.500	61	
	46.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	300	0.0600	0.59		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"
5.1	750	0.0600	2.45		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
13.6	1,050	Total			

Subcatchment 55S: SB12



Summary for Subcatchment 57S: SB 11

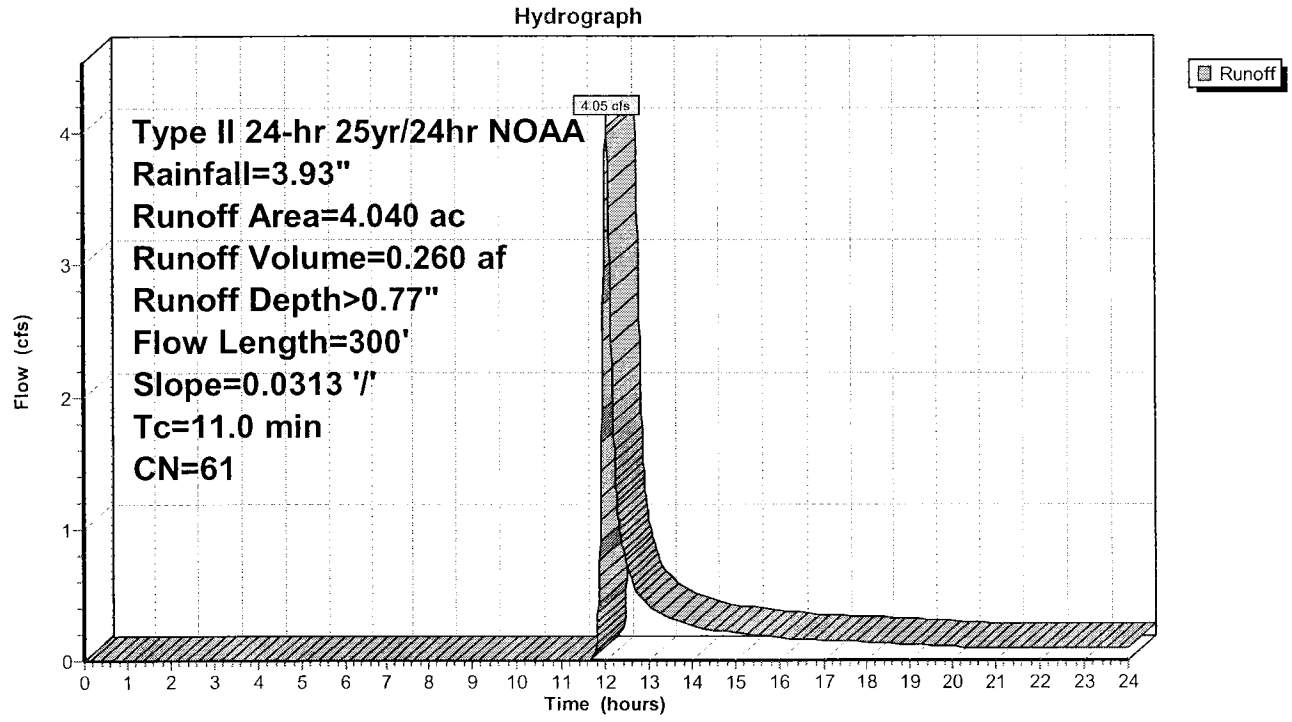
Runoff = 4.05 cfs @ 12.05 hrs, Volume= 0.260 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	4.040	61	
	4.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	300	0.0313	0.45		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"

Subcatchment 57S: SB 11



Summary for Subcatchment 59S: SB 13

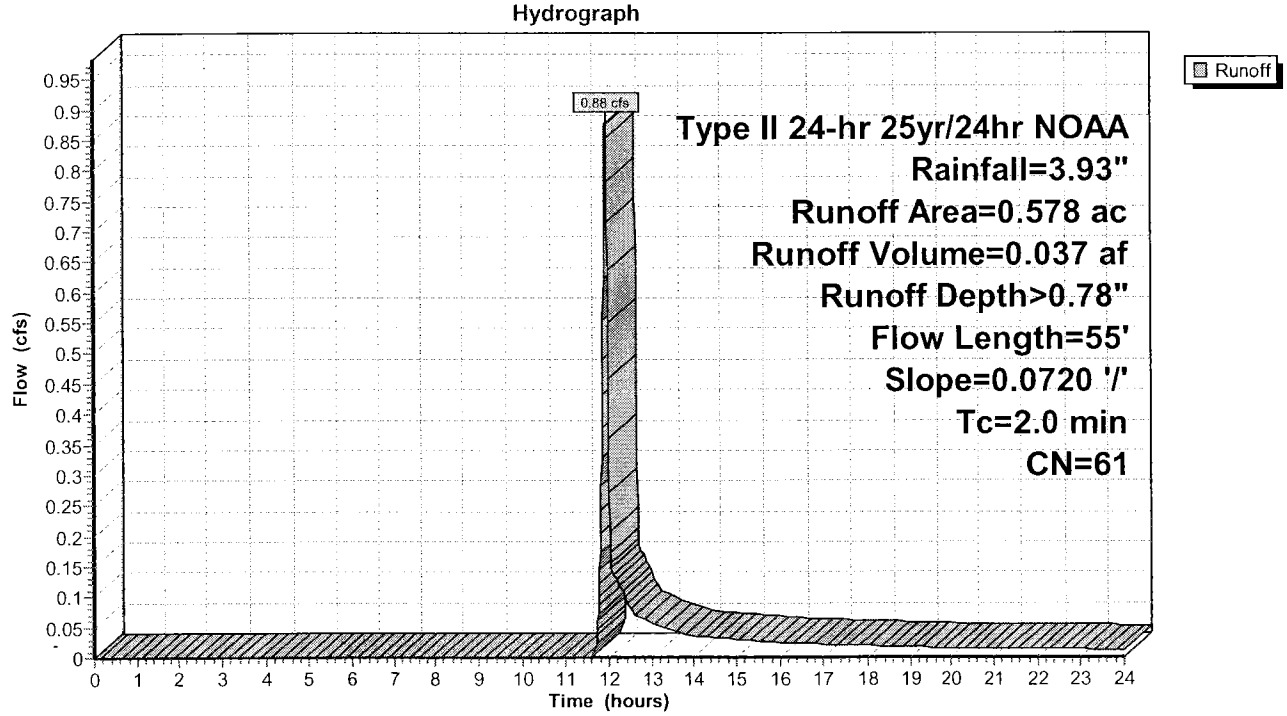
Runoff = 0.88 cfs @ 11.93 hrs, Volume= 0.037 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.578	61	
	0.578		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	55	0.0720	0.45		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.37"

Subcatchment 59S: SB 13



Summary for Subcatchment DA-1: Area 1

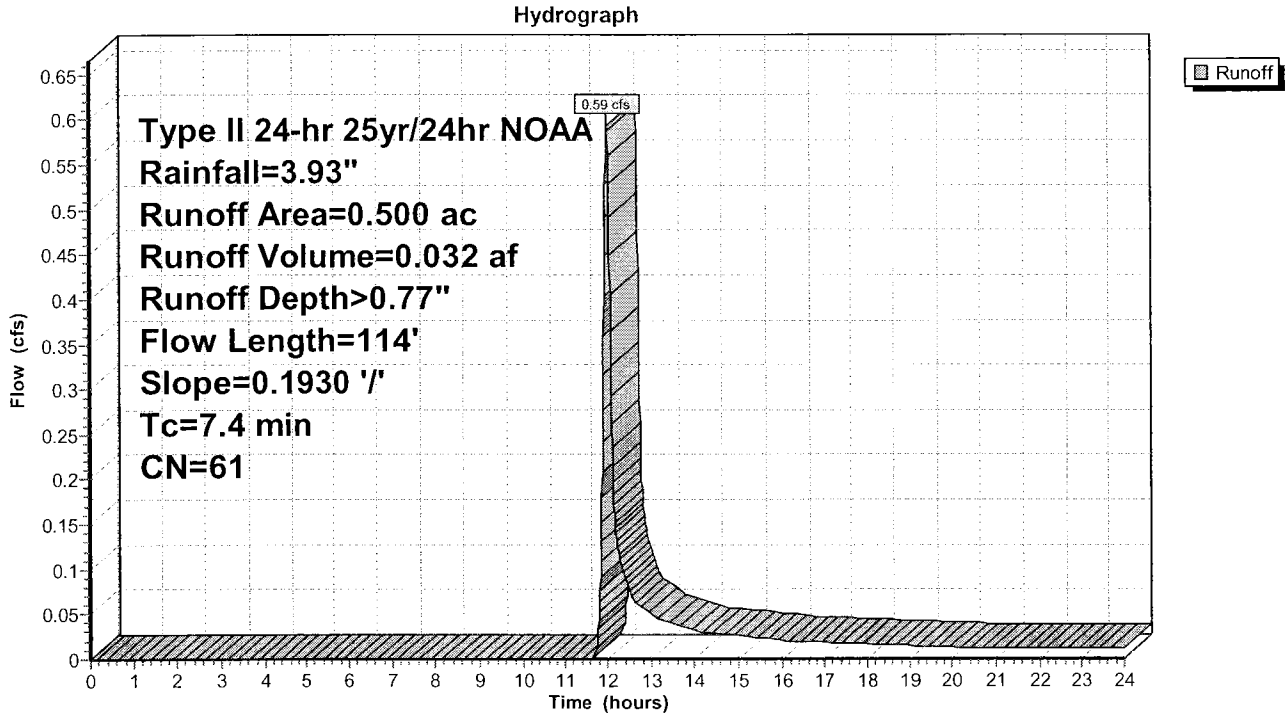
Runoff = 0.59 cfs @ 12.01 hrs, Volume= 0.032 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.500	61	>75% Grass Cover, Good HGB
	0.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	114	0.1930	0.26		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-1: Area 1



Summary for Subcatchment DA-10: Area 10

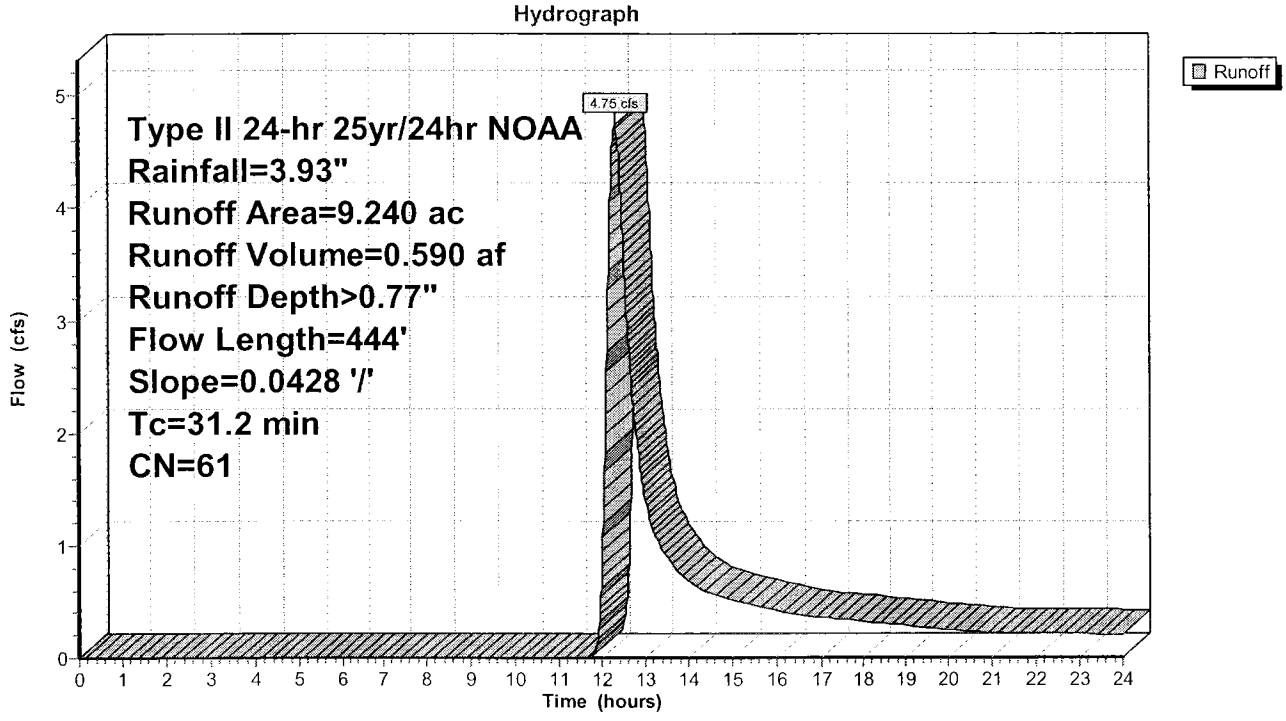
Runoff = 4.75 cfs @ 12.31 hrs, Volume= 0.590 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	9.240	61	
	9.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.5	300	0.0428	0.17		**Sheet Flow,** n= 0.240 P2= 2.37"
1.7	144	0.0428	1.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.2	444	Total			

Subcatchment DA-10: Area 10



Summary for Subcatchment DA-11: Area 11

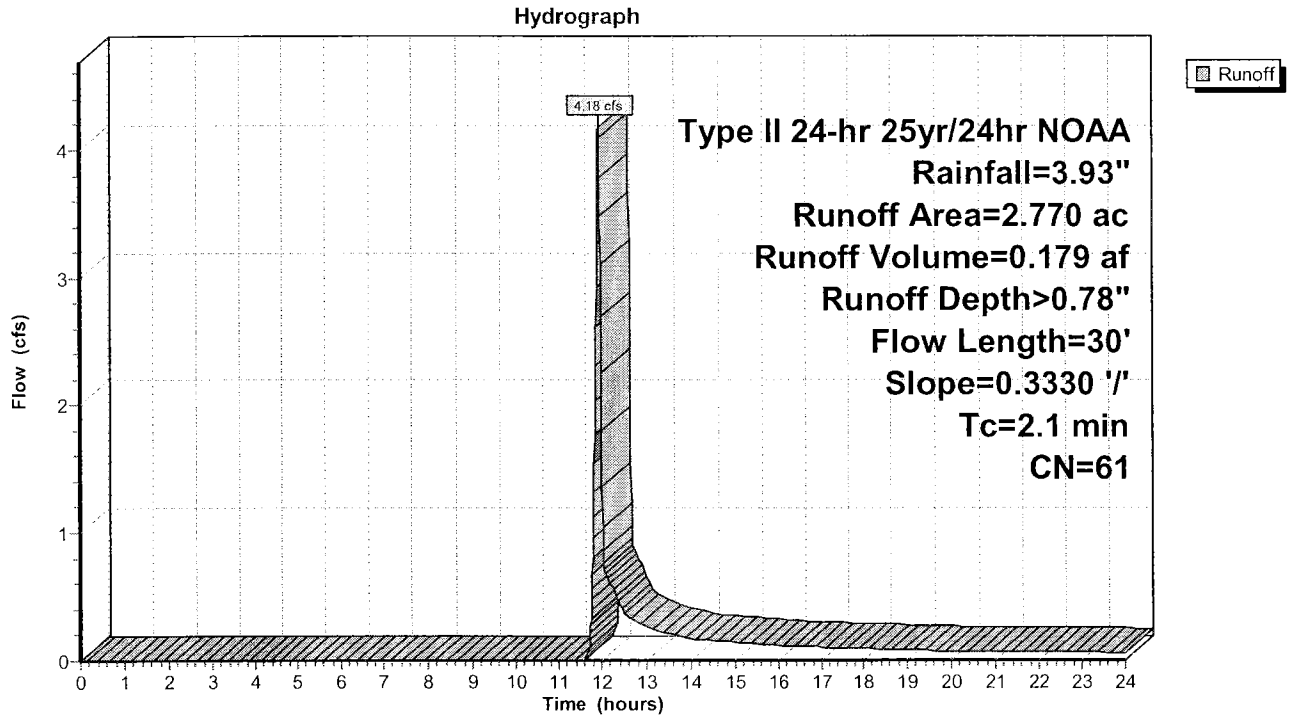
Runoff = 4.18 cfs @ 11.94 hrs, Volume= 0.179 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.770	61	
	2.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	30	0.3330	0.24		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-11: Area 11



Summary for Subcatchment DA-12: Area 12

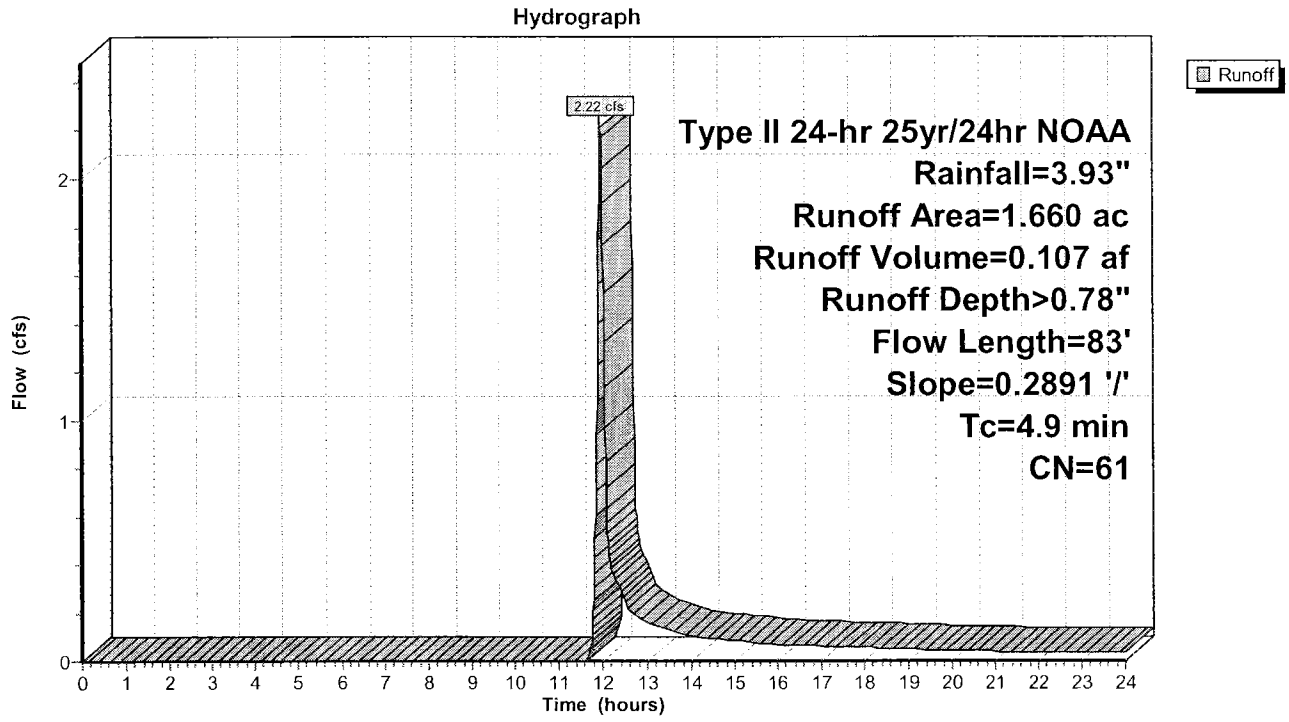
Runoff = 2.22 cfs @ 11.97 hrs, Volume= 0.107 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.660	61	
	1.660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	83	0.2891	0.28		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-12: Area 12



Summary for Subcatchment DA-13: Area 13

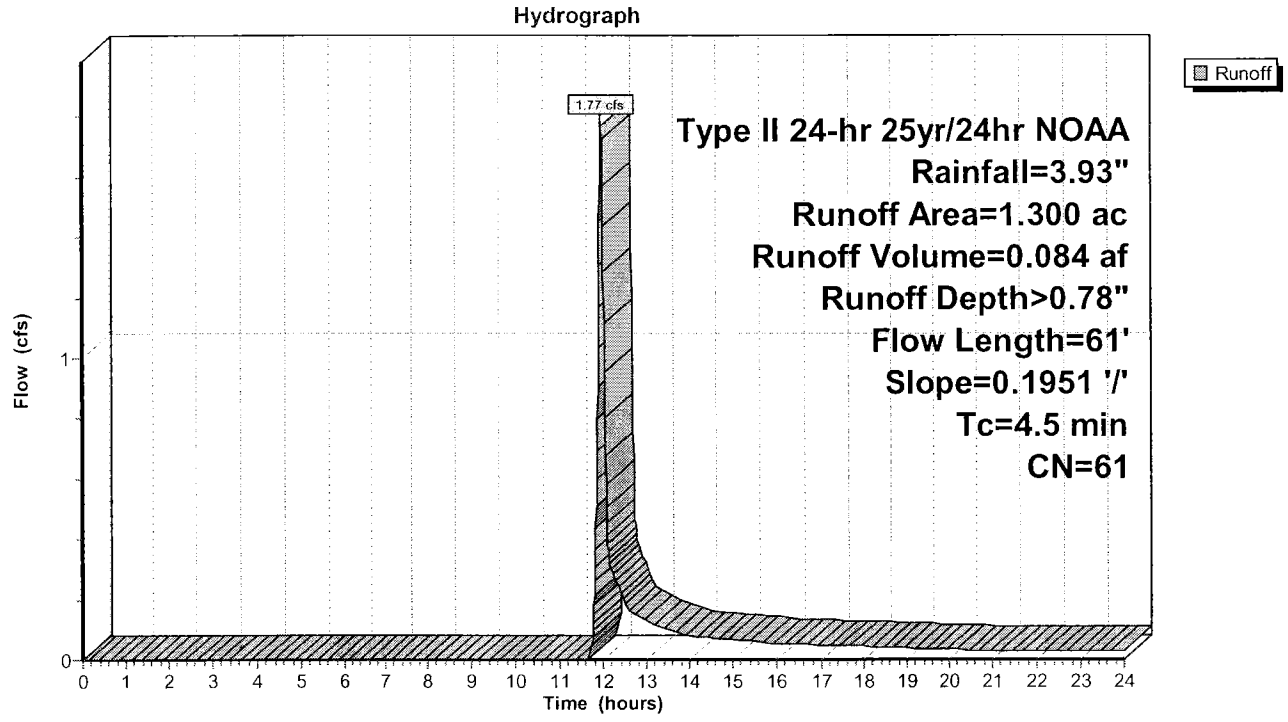
Runoff = 1.77 cfs @ 11.97 hrs, Volume= 0.084 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.300	61	
	1.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	61	0.1951	0.23		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-13: Area 13



Summary for Subcatchment DA-14: Area 14

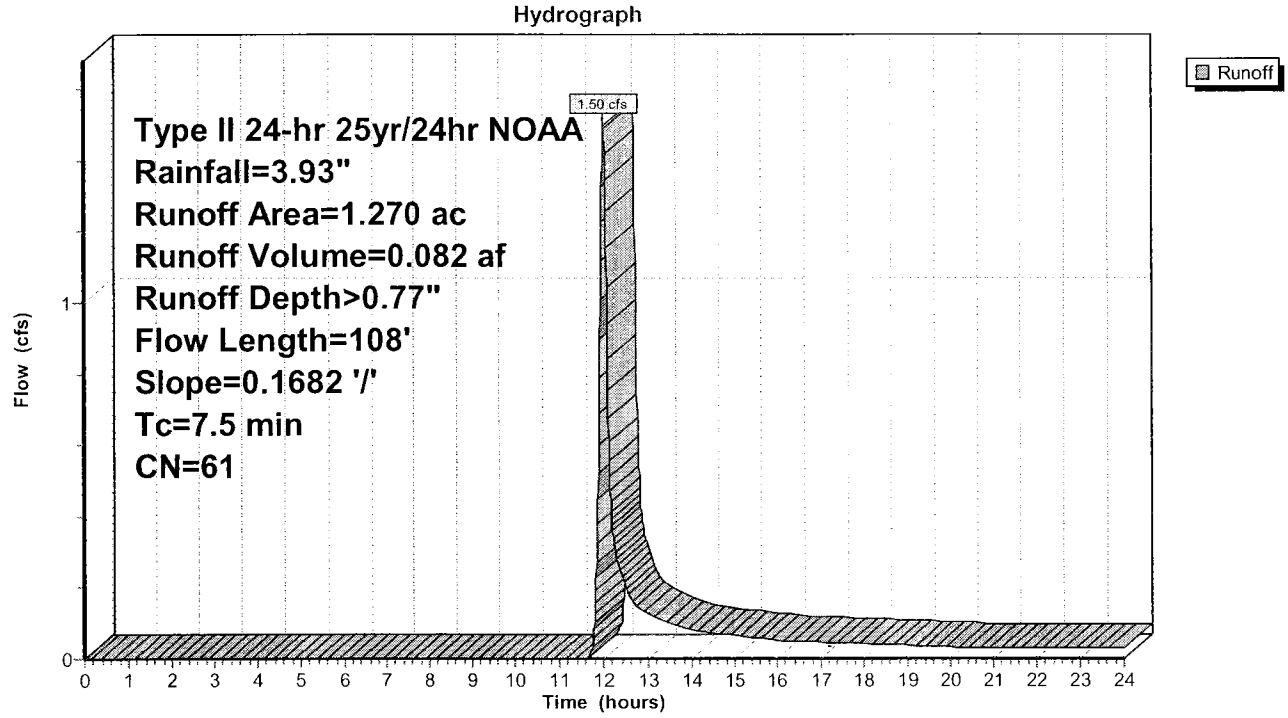
Runoff = 1.50 cfs @ 12.01 hrs, Volume= 0.082 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.270	61	
	1.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	108	0.1682	0.24		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-14: Area 14



Summary for Subcatchment DA-15: Area 15

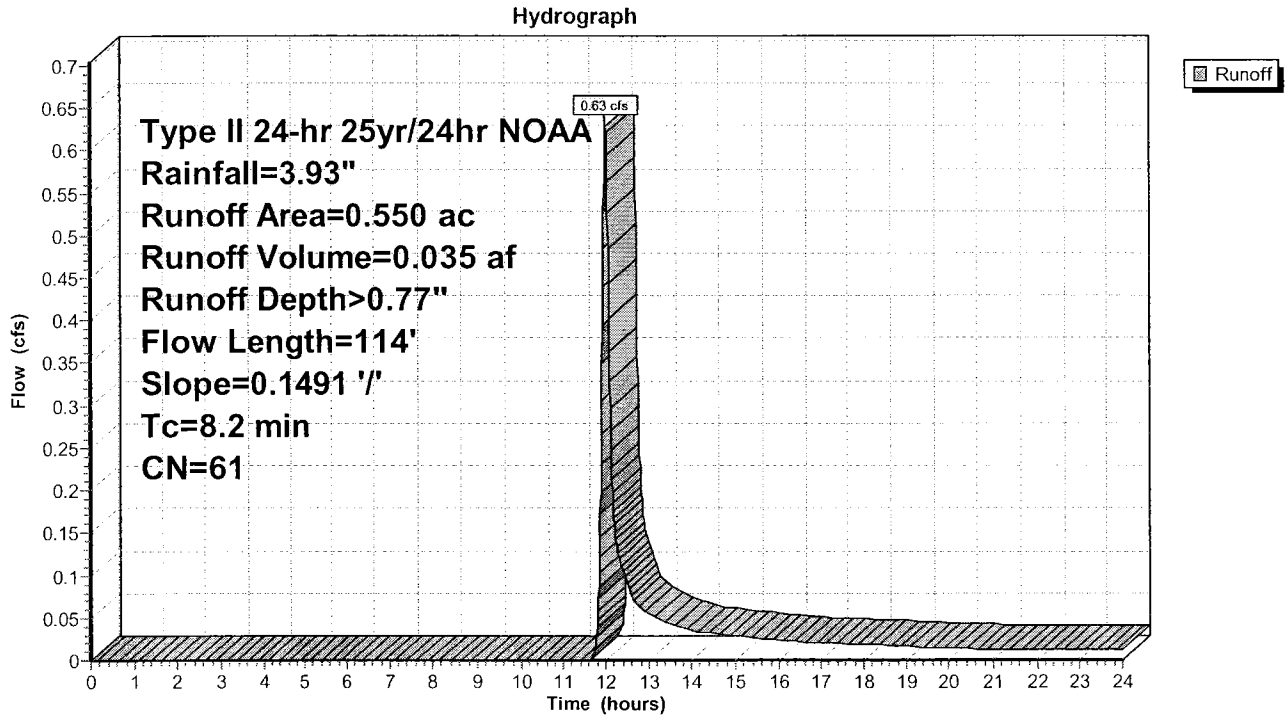
Runoff = 0.63 cfs @ 12.01 hrs, Volume= 0.035 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.550	61	
	0.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	114	0.1491	0.23		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-15: Area 15



Summary for Subcatchment DA-16: Area 16

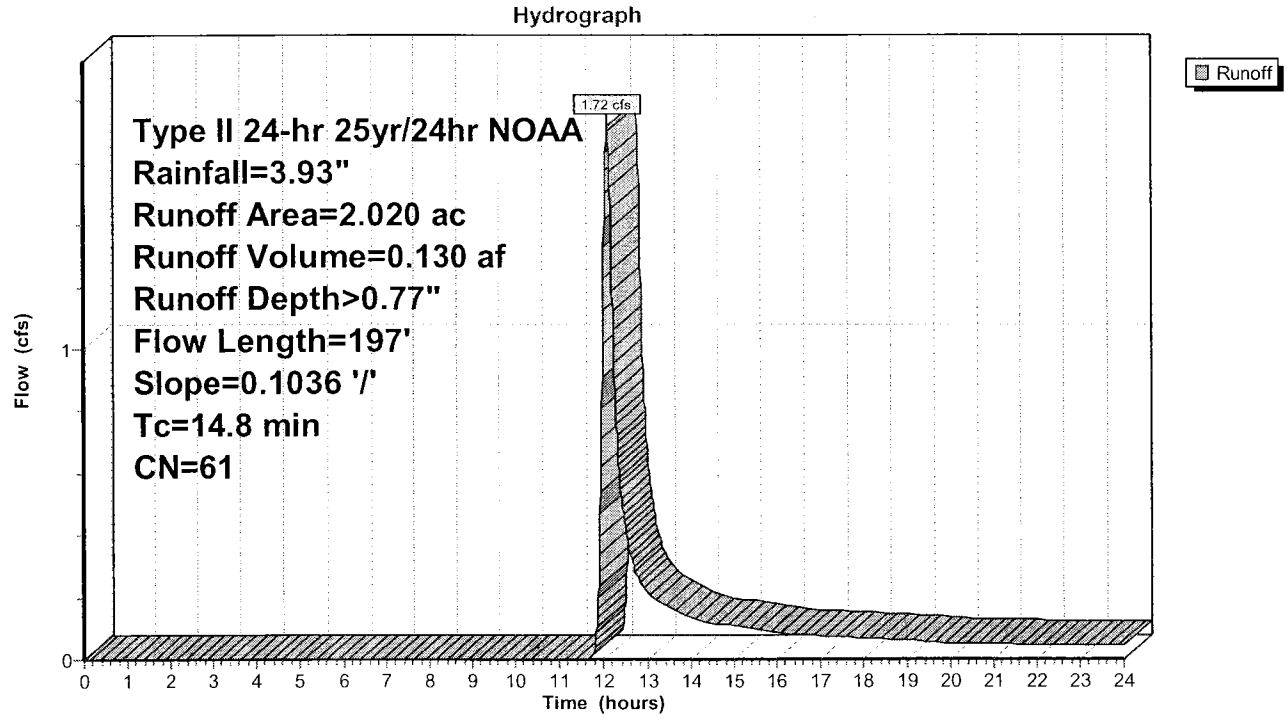
Runoff = 1.72 cfs @ 12.09 hrs, Volume= 0.130 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.020	61	
	2.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	197	0.1036	0.22		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-16: Area 16



Summary for Subcatchment DA-17: Area 17

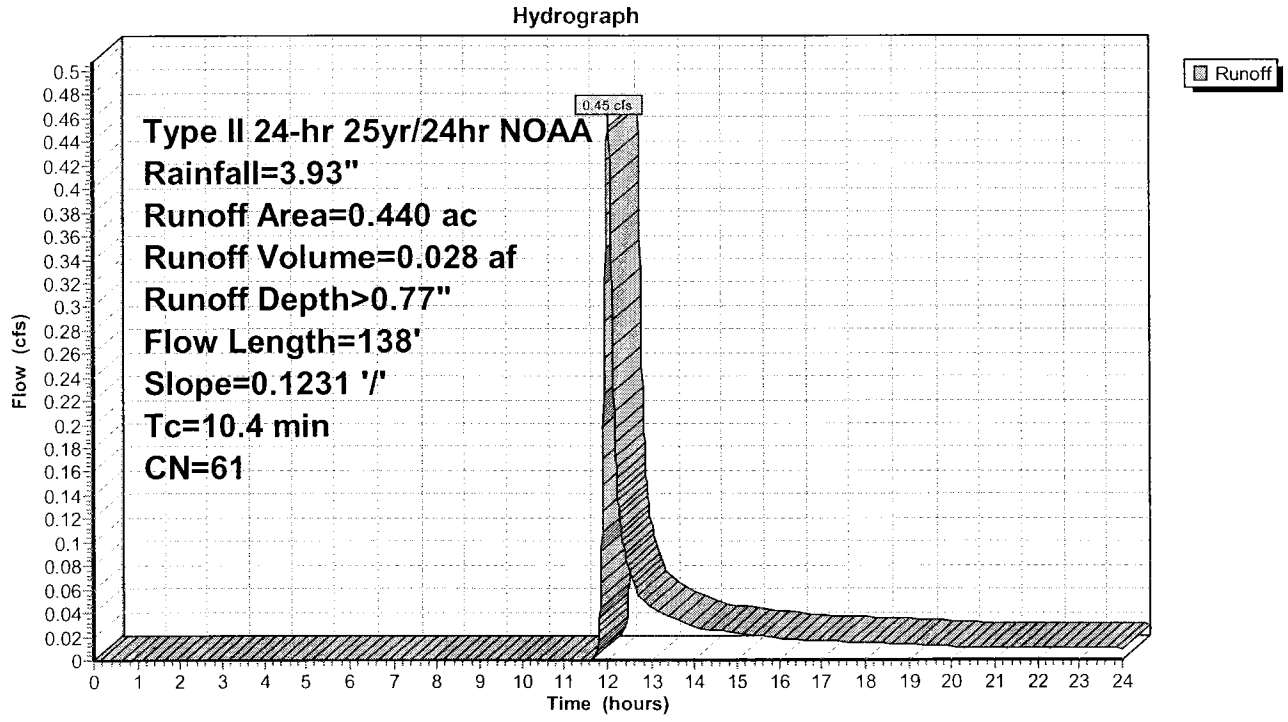
Runoff = 0.45 cfs @ 12.04 hrs, Volume= 0.028 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.440	61	
	0.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	138	0.1231	0.22		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-17: Area 17



Summary for Subcatchment DA-18: Area 18

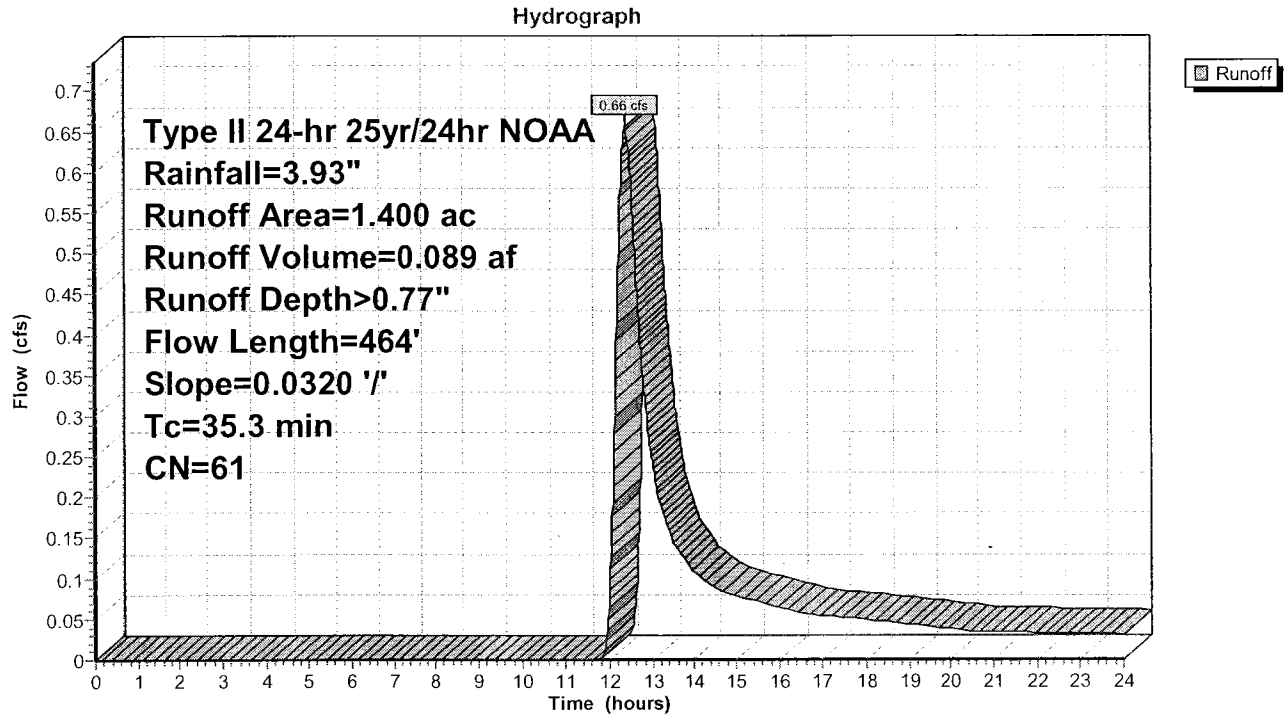
Runoff = 0.66 cfs @ 12.36 hrs, Volume= 0.089 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.400	61	
	1.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
33.1	300	0.0320	0.15		**Sheet Flow,** n= 0.240 P2= 2.37"
2.2	164	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.3	464	Total			

Subcatchment DA-18: Area 18



Summary for Subcatchment DA-19: Area 19

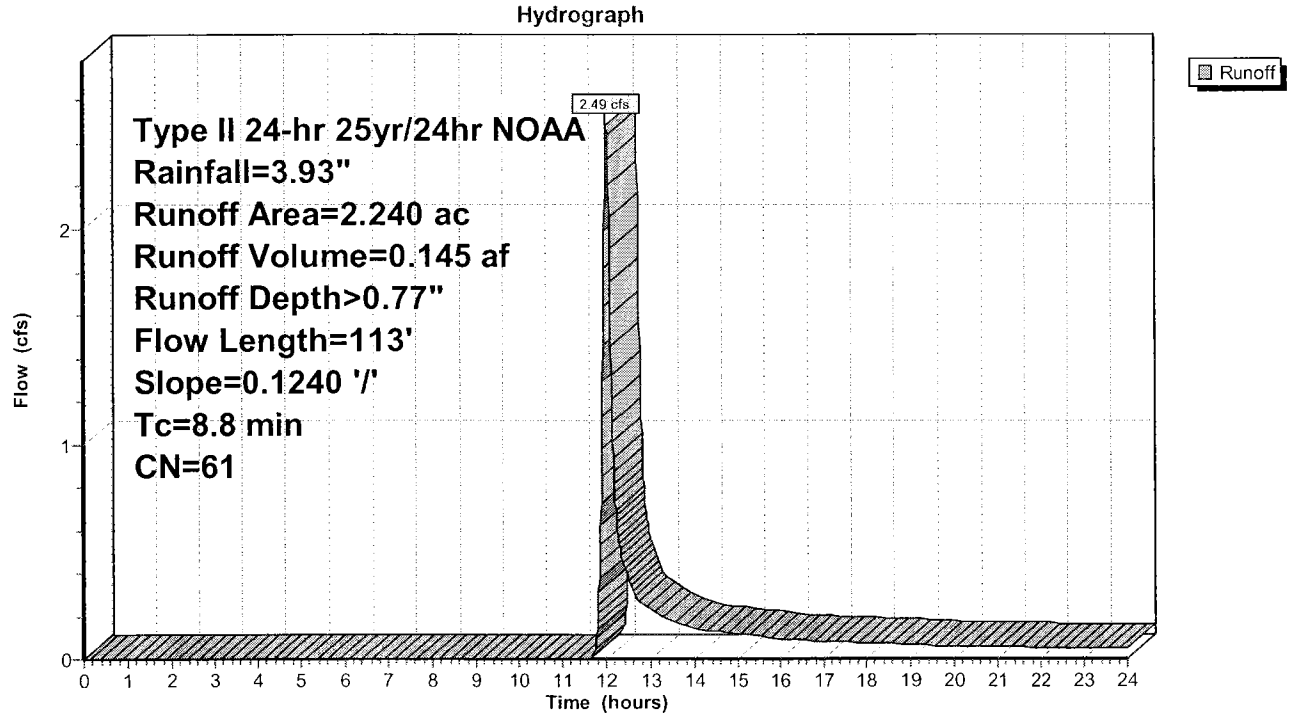
Runoff = 2.49 cfs @ 12.02 hrs, Volume= 0.145 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.240	61	
	2.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	113	0.1240	0.21		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-19: Area 19



Summary for Subcatchment DA-2: Area 2

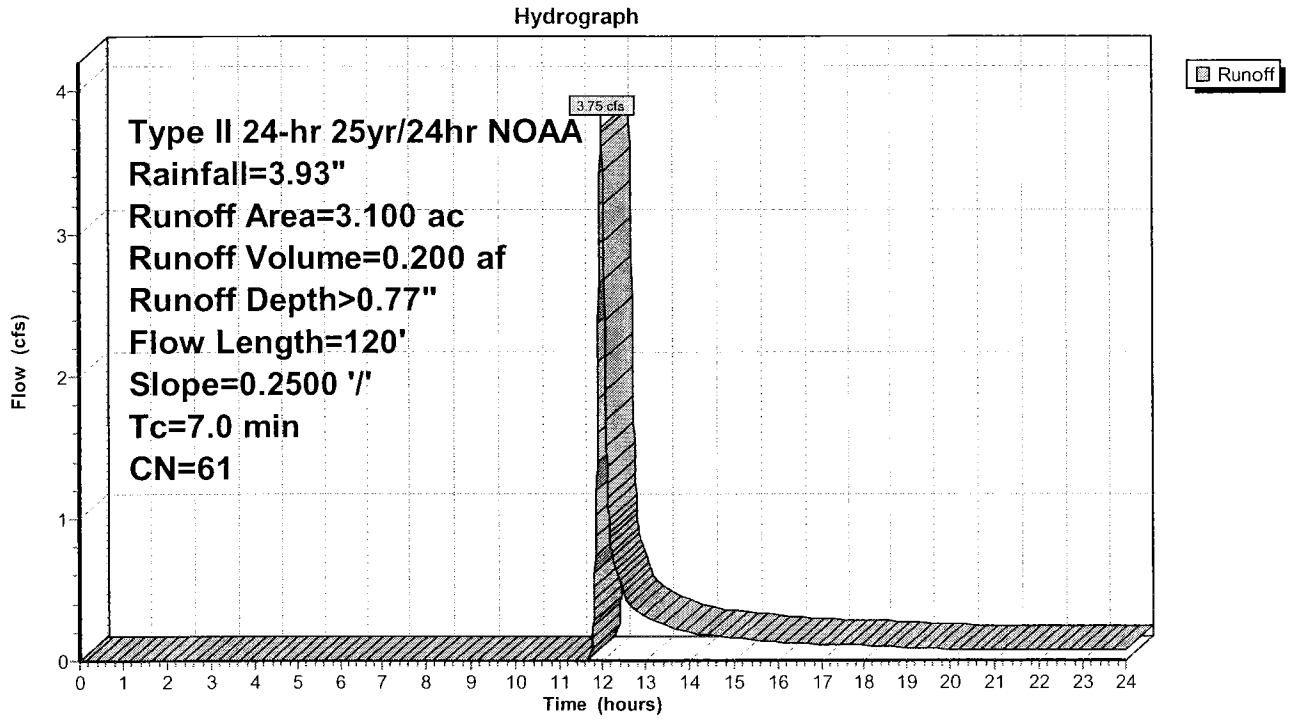
Runoff = 3.75 cfs @ 12.00 hrs, Volume= 0.200 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	3.100	61	
	3.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	120	0.2500	0.29		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-2: Area 2



Summary for Subcatchment DA-20: Area 20

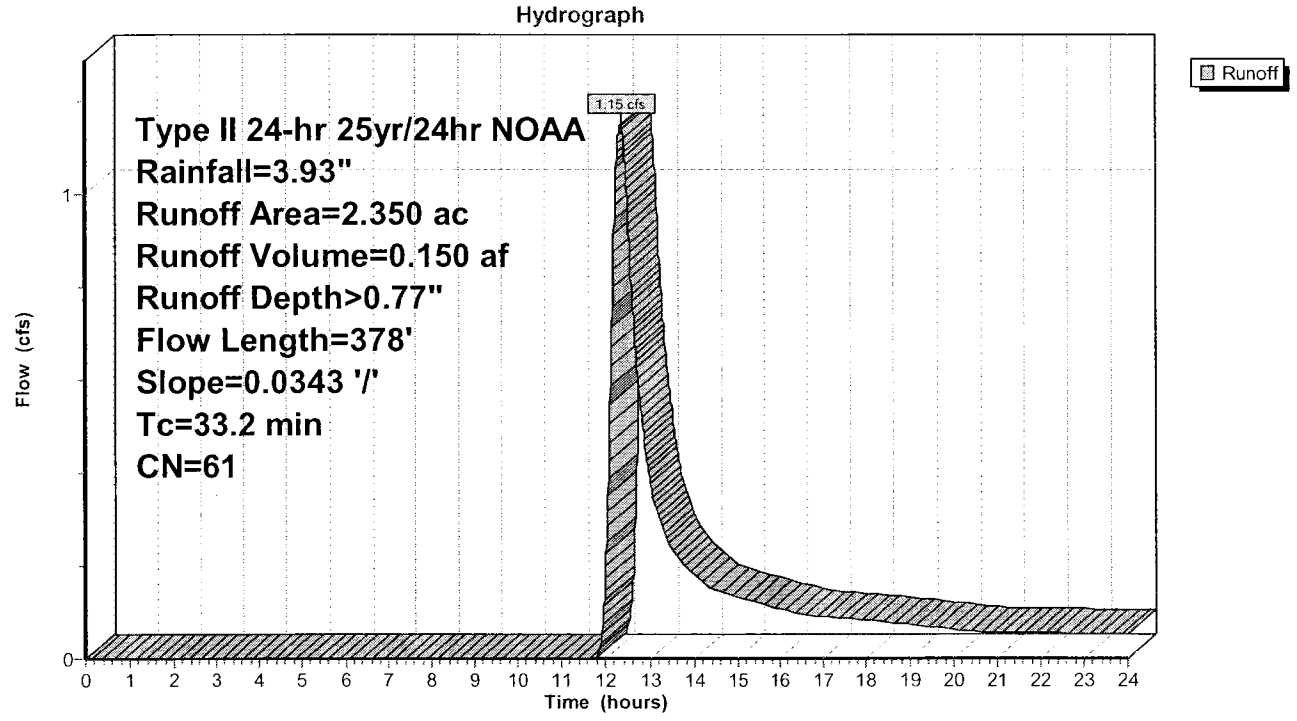
Runoff = 1.15 cfs @ 12.35 hrs, Volume= 0.150 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.350	61	
	2.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.2	300	0.0343	0.16		**Sheet Flow,** n= 0.240 P2= 2.37"
1.0	78	0.0343	1.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.2	378	Total			

Subcatchment DA-20: Area 20



Summary for Subcatchment DA-21: Area 21

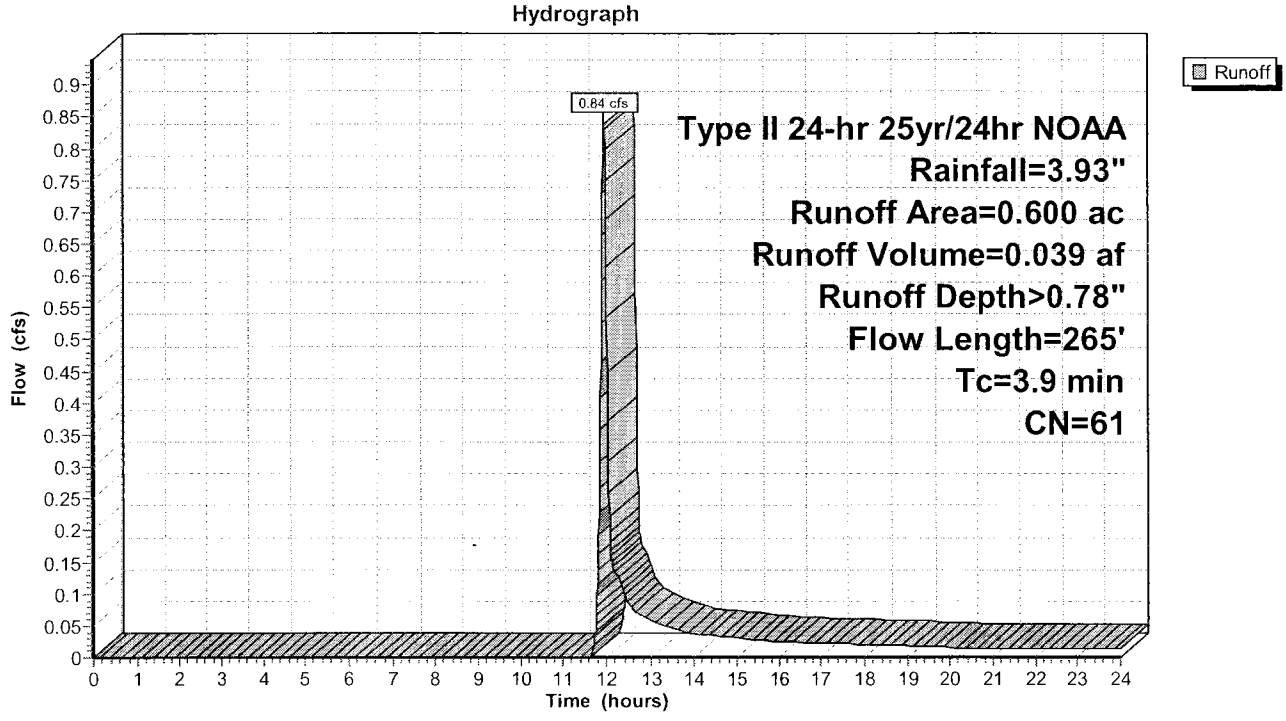
Runoff = 0.84 cfs @ 11.96 hrs, Volume= 0.039 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.600	61	
	0.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	54	0.3333	0.27		**Sheet Flow,** n= 0.240 P2= 2.37"
0.6	211	0.0280	5.88	23.51	**Channel Flow,** Area= 4.0 sf Perim= 6.7' r= 0.60' n= 0.030
3.9	265	Total			

Subcatchment DA-21: Area 21



Summary for Subcatchment DA-3: Area 3

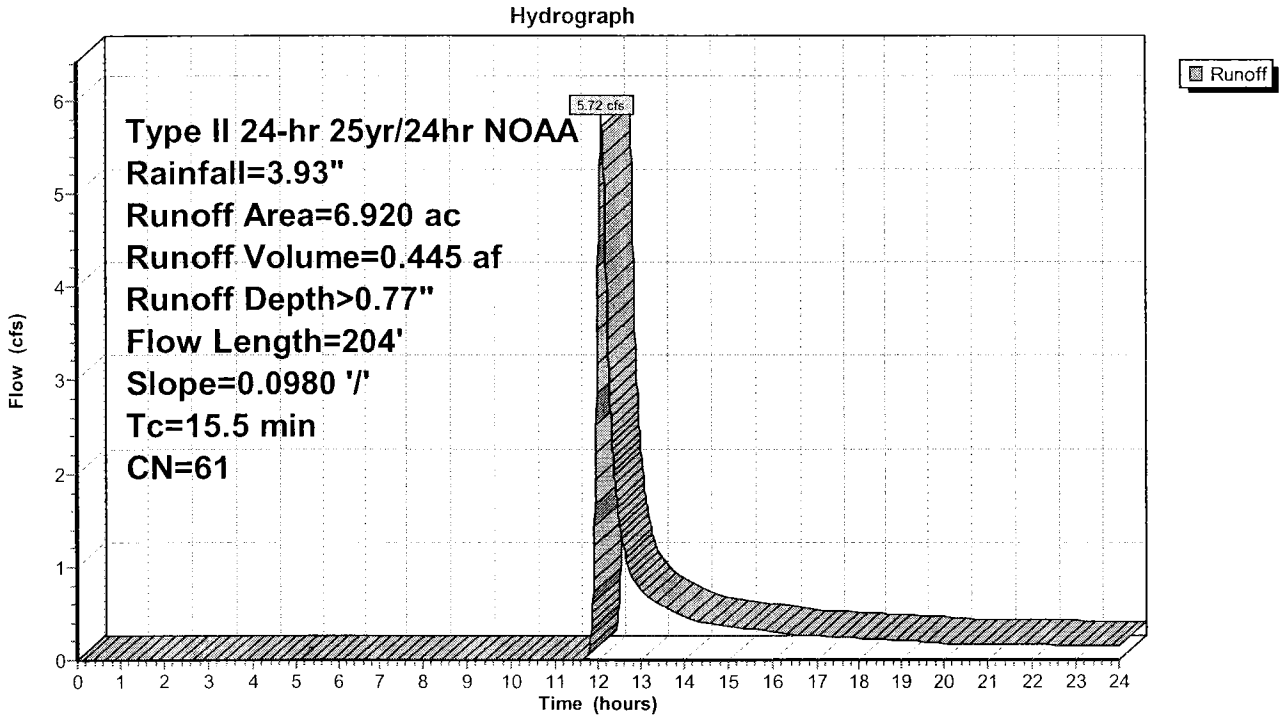
Runoff = 5.72 cfs @ 12.10 hrs, Volume= 0.445 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	6.920	61	
	6.920		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	204	0.0980	0.22		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-3: Area 3



Summary for Subcatchment DA-4: Area 4

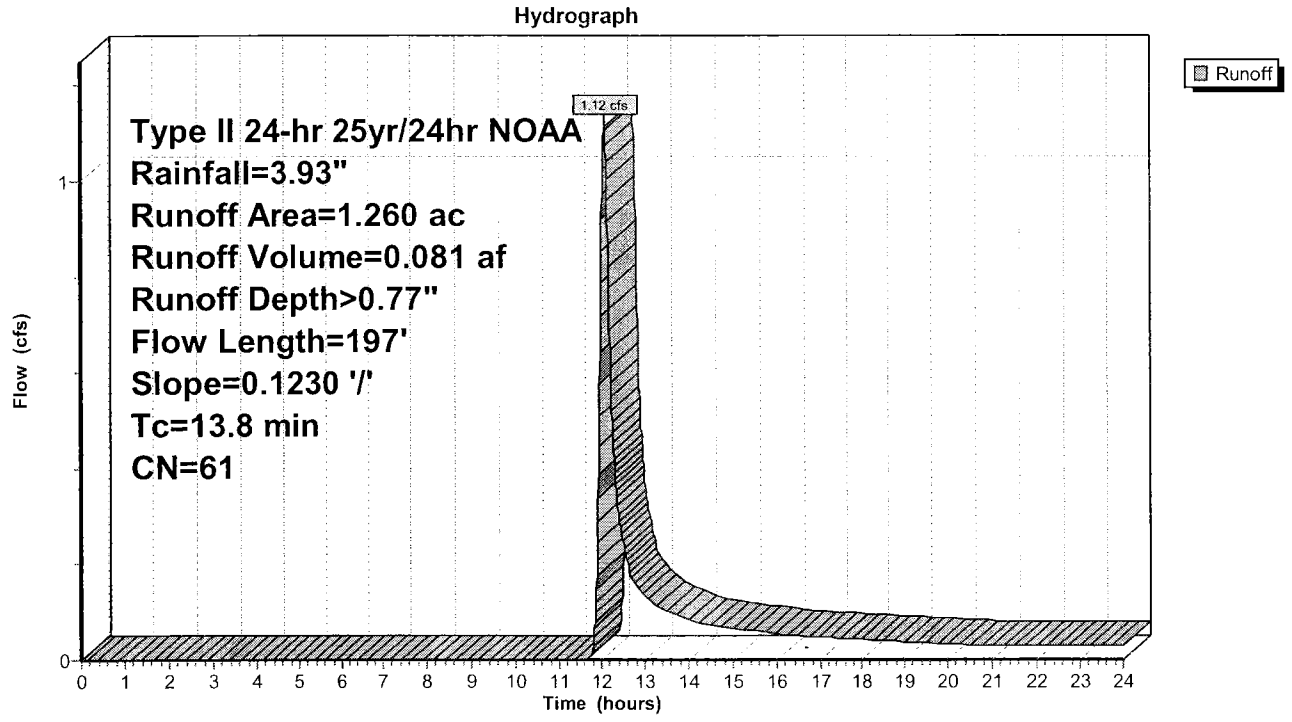
Runoff = 1.12 cfs @ 12.08 hrs, Volume= 0.081 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.260	61	
	1.260		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	197	0.1230	0.24		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-4: Area 4



Summary for Subcatchment DA-5: Area 5

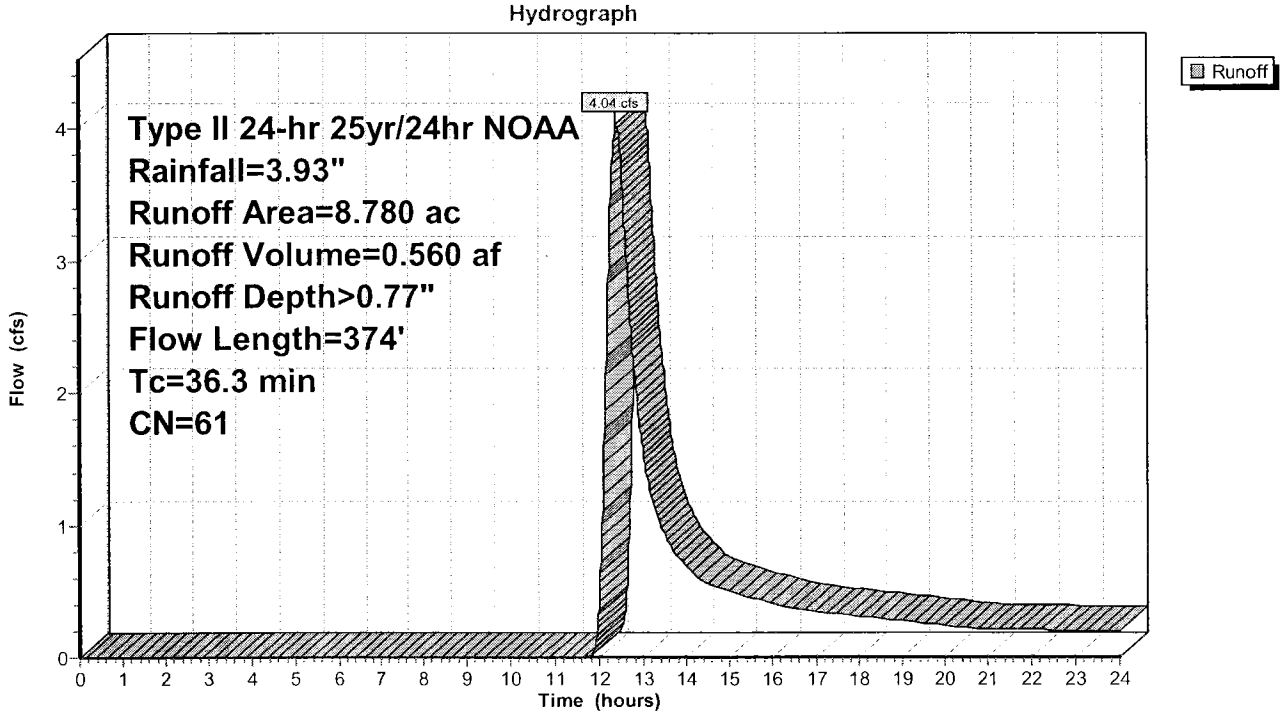
Runoff = 4.04 cfs @ 12.38 hrs, Volume= 0.560 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	8.780	61	
	8.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	83	0.2400	0.26		**Sheet Flow,** n= 0.240 P2= 2.37"
29.8	217	0.0217	0.12		**Sheet Flow,** n= 0.240 P2= 2.37"
1.2	74	0.0217	1.03		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
36.3	374	Total			

Subcatchment DA-5: Area 5



Summary for Subcatchment DA-6: Area 6

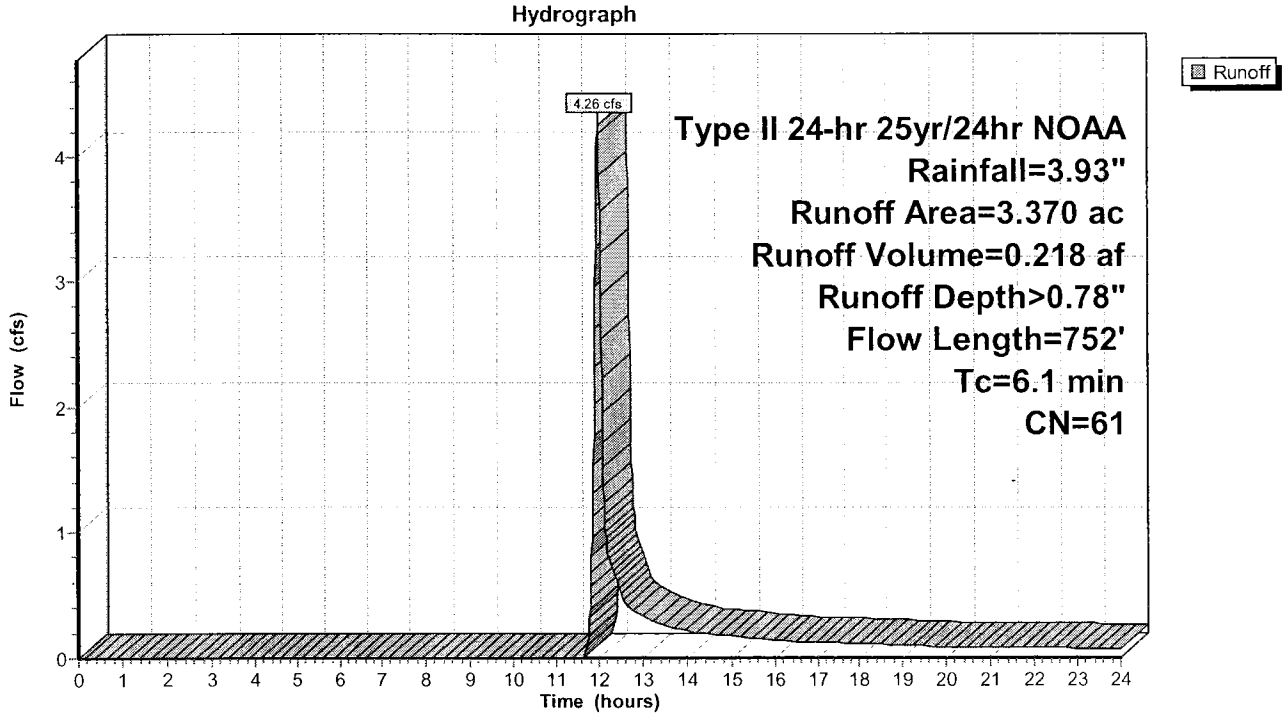
Runoff = 4.26 cfs @ 11.99 hrs, Volume= 0.218 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	3.370	61	
	3.370		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	78	0.3116	0.29		**Sheet Flow,** n= 0.240 P2= 2.37"
1.2	396	0.0252	5.58	22.30	**Channel Flow,** Area= 4.0 sf Perim= 6.7' r= 0.60' n= 0.030
0.4	278	0.1007	11.14	44.58	**Channel Flow,** Area= 4.0 sf Perim= 6.7' r= 0.60' n= 0.030
6.1	752	Total			

Subcatchment DA-6: Area 6



Summary for Subcatchment DA-7A: Area 7

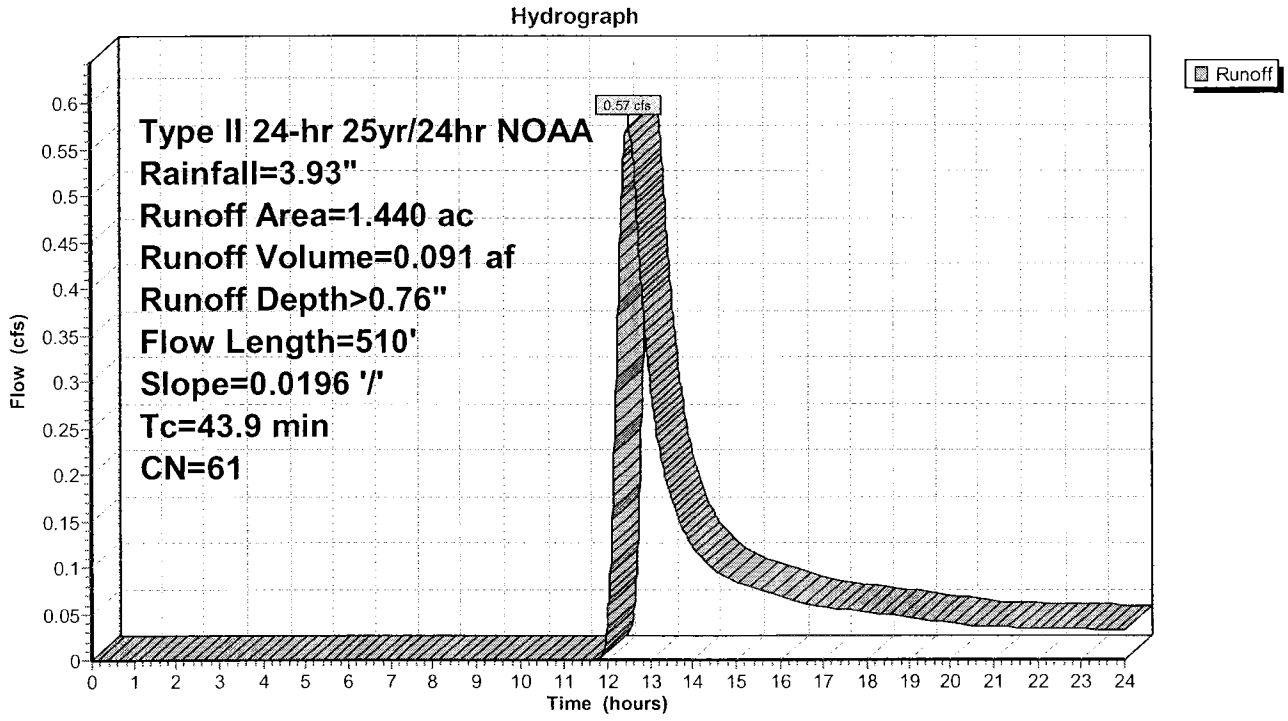
Runoff = 0.57 cfs @ 12.49 hrs, Volume= 0.091 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.440	61	
	1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.3	300	0.0196	0.12		**Sheet Flow,** n= 0.240 P2= 2.37"
3.6	210	0.0196	0.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
43.9	510	Total			

Subcatchment DA-7A: Area 7



Summary for Subcatchment DA-7B: Area 7B

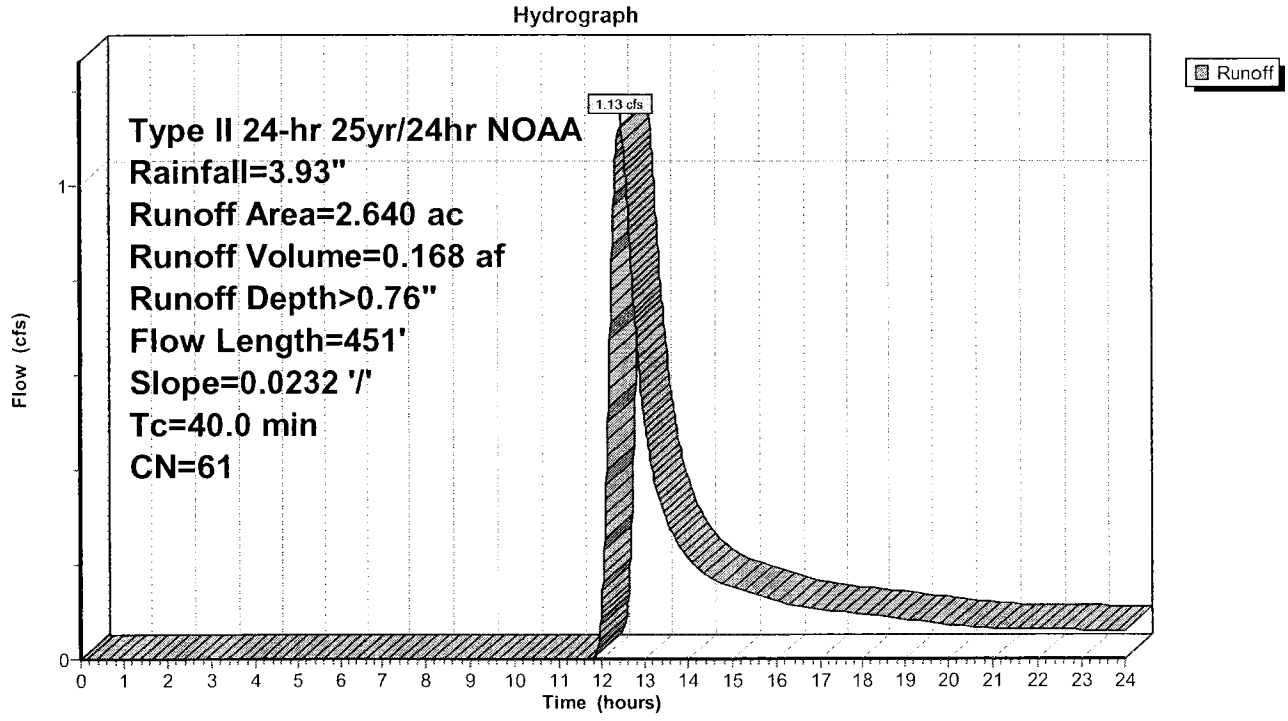
Runoff = 1.13 cfs @ 12.44 hrs, Volume= 0.168 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	2.640	61	
	2.640		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.6	300	0.0232	0.13		**Sheet Flow,** n= 0.240 P2= 2.37"
2.4	151	0.0232	1.07		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
40.0	451	Total			

Subcatchment DA-7B: Area 7B



Summary for Subcatchment DA-8: Area 8

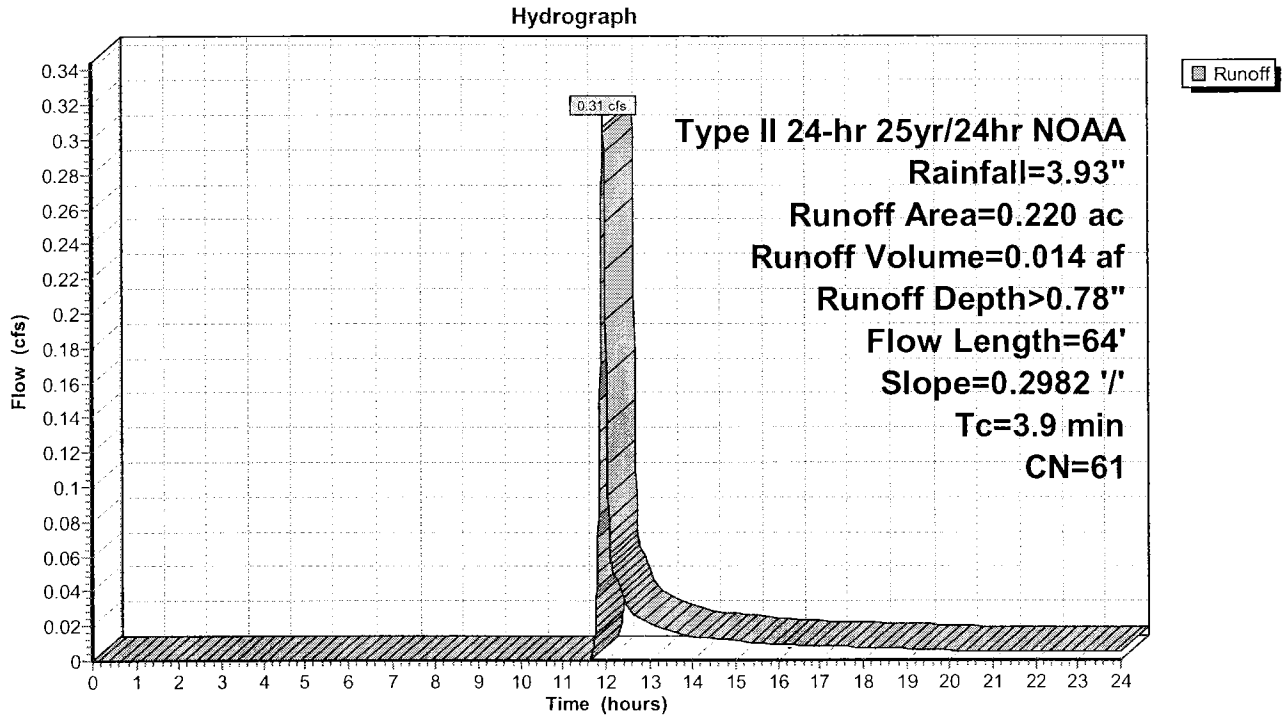
Runoff = 0.31 cfs @ 11.96 hrs, Volume= 0.014 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	0.220	61	
	0.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	64	0.2982	0.27		**Sheet Flow,** n= 0.240 P2= 2.37"

Subcatchment DA-8: Area 8



Summary for Subcatchment DA-9: Area 9

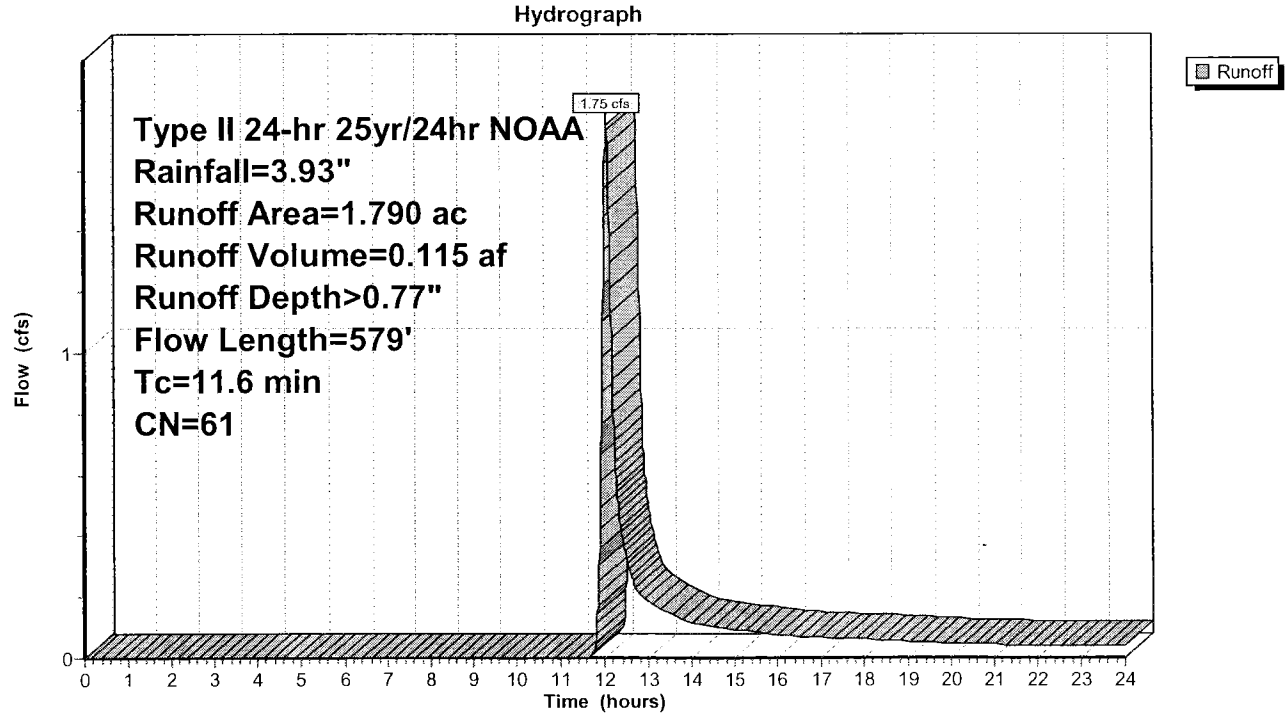
Runoff = 1.75 cfs @ 12.05 hrs, Volume= 0.115 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type II 24-hr 25yr/24hr NOAA Rainfall=3.93"

	Area (ac)	CN	Description
*	1.790	61	
	1.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	126	0.1190	0.21		**Sheet Flow,** n= 0.240 P2= 2.37"
1.8	453	0.0141	4.17	16.68	**Channel Flow,** Area= 4.0 sf Perim= 6.7' r= 0.60' n= 0.030
11.6	579	Total			

Subcatchment DA-9: Area 9



Summary for Pond 34P: Culvert 1

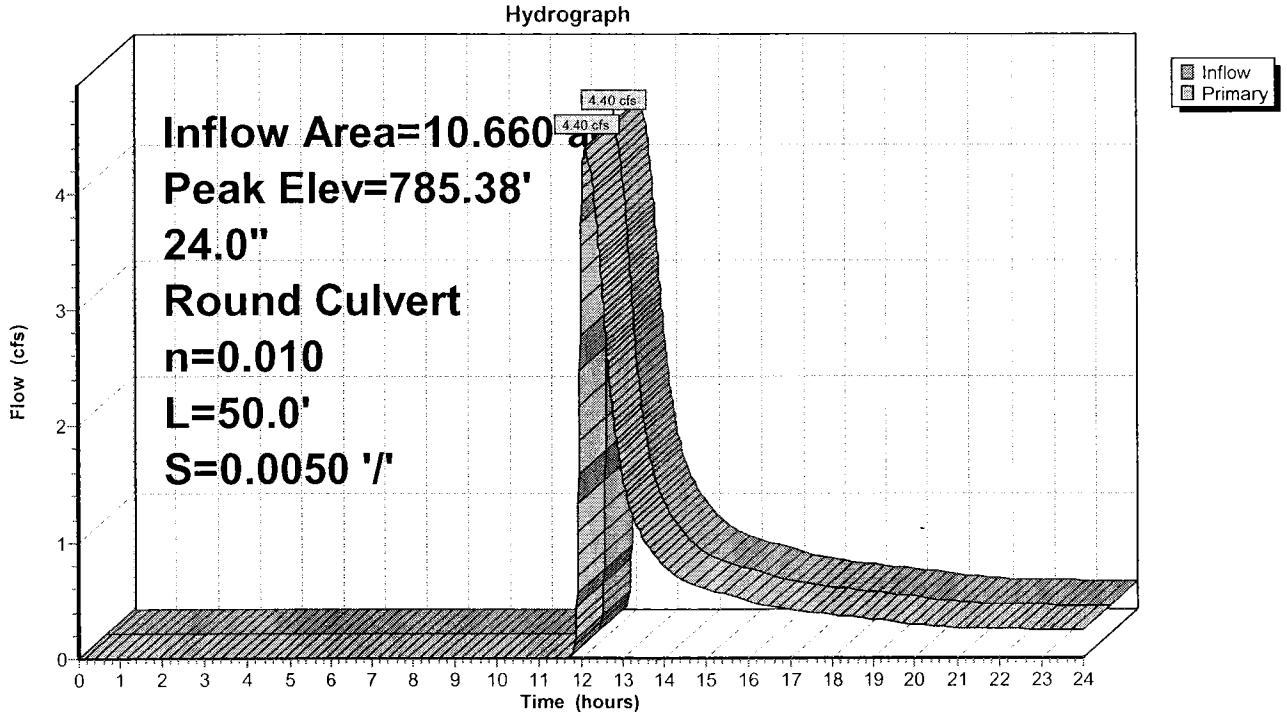
Inflow Area = 10.660 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 4.40 cfs @ 12.14 hrs, Volume= 0.675 af
Outflow = 4.40 cfs @ 12.14 hrs, Volume= 0.675 af, Atten= 0%, Lag= 0.0 min
Primary = 4.40 cfs @ 12.14 hrs, Volume= 0.675 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 785.38' @ 12.17 hrs
Flood Elev= 790.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	784.35'	**24.0" Round Culvert** L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 784.35' / 784.10' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=4.38 cfs @ 12.14 hrs HW=785.38' TW=784.91' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 4.38 cfs @ 3.91 fps)

Pond 34P: Culvert 1



Summary for Pond 55P: Culvert #3

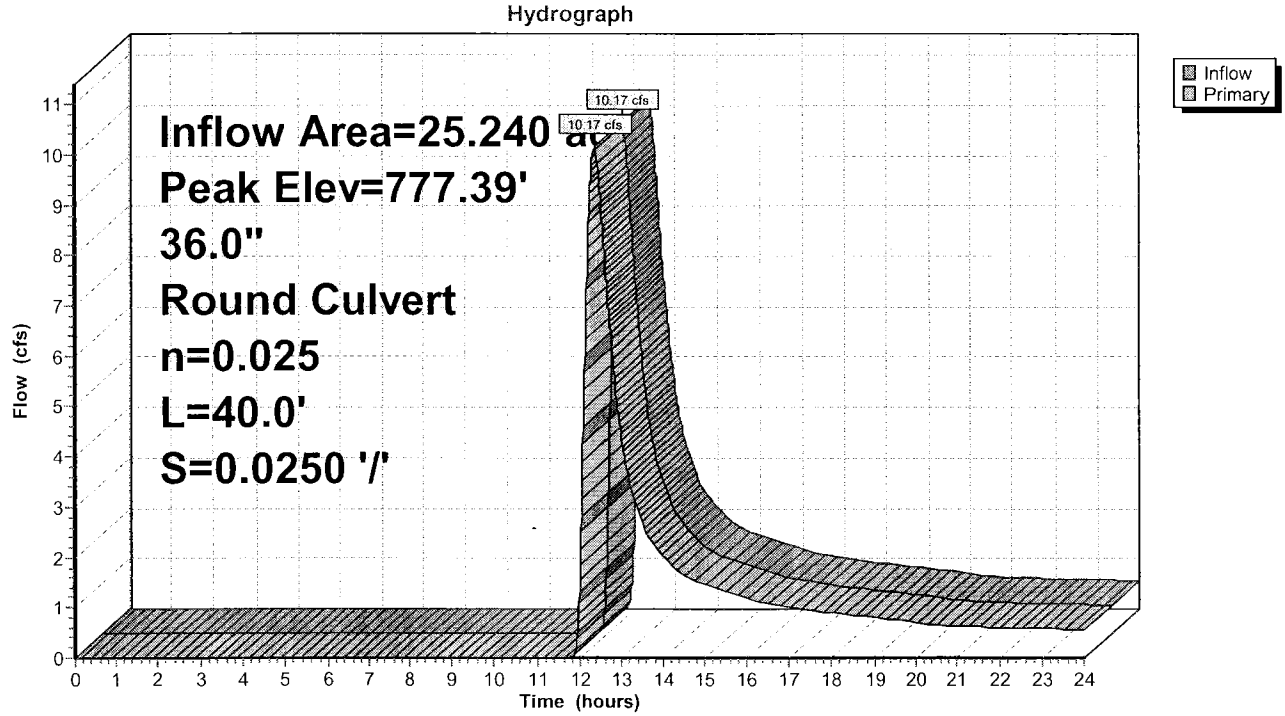
Inflow Area = 25.240 ac, 0.00% Impervious, Inflow Depth > 0.75" for 25yr/24hr NOAA event
Inflow = 10.17 cfs @ 12.35 hrs, Volume= 1.588 af
Outflow = 10.17 cfs @ 12.35 hrs, Volume= 1.588 af, Atten= 0%, Lag= 0.0 min
Primary = 10.17 cfs @ 12.35 hrs, Volume= 1.588 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 777.39' @ 12.35 hrs
Flood Elev= 782.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	776.00'	**36.0" Round Culvert** L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 776.00' / 775.00' S= 0.0250 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=10.17 cfs @ 12.35 hrs HW=777.39' TW=775.76' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.17 cfs @ 3.17 fps)

Pond 55P: Culvert #3



Summary for Pond 62P: Culvert No.4

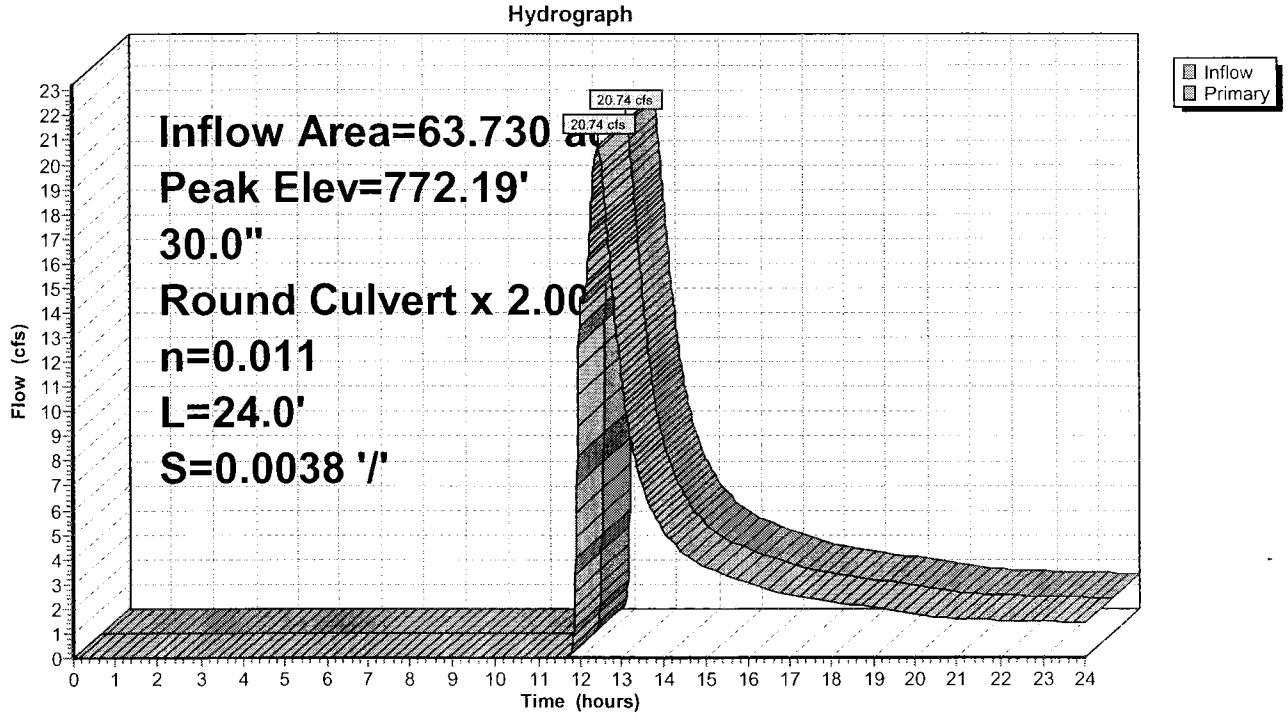
Inflow Area = 63.730 ac, 0.00% Impervious, Inflow Depth > 0.75" for 25yr/24hr NOAA event
Inflow = 20.74 cfs @ 12.45 hrs, Volume= 4.006 af
Outflow = 20.74 cfs @ 12.45 hrs, Volume= 4.006 af, Atten= 0%, Lag= 0.0 min
Primary = 20.74 cfs @ 12.45 hrs, Volume= 4.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 772.19' @ 12.45 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	770.51'	**30.0" Round Culvert #4 X 2.00** L= 24.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 770.51' / 770.42' S= 0.0038 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean

Primary OutFlow Max=20.74 cfs @ 12.45 hrs HW=772.18' TW=771.45' (Dynamic Tailwater)
↑—**1=Culvert #4** (Barrel Controls 20.74 cfs @ 4.20 fps)

Pond 62P: Culvert No.4



Summary for Reach 91R: Downchute 1

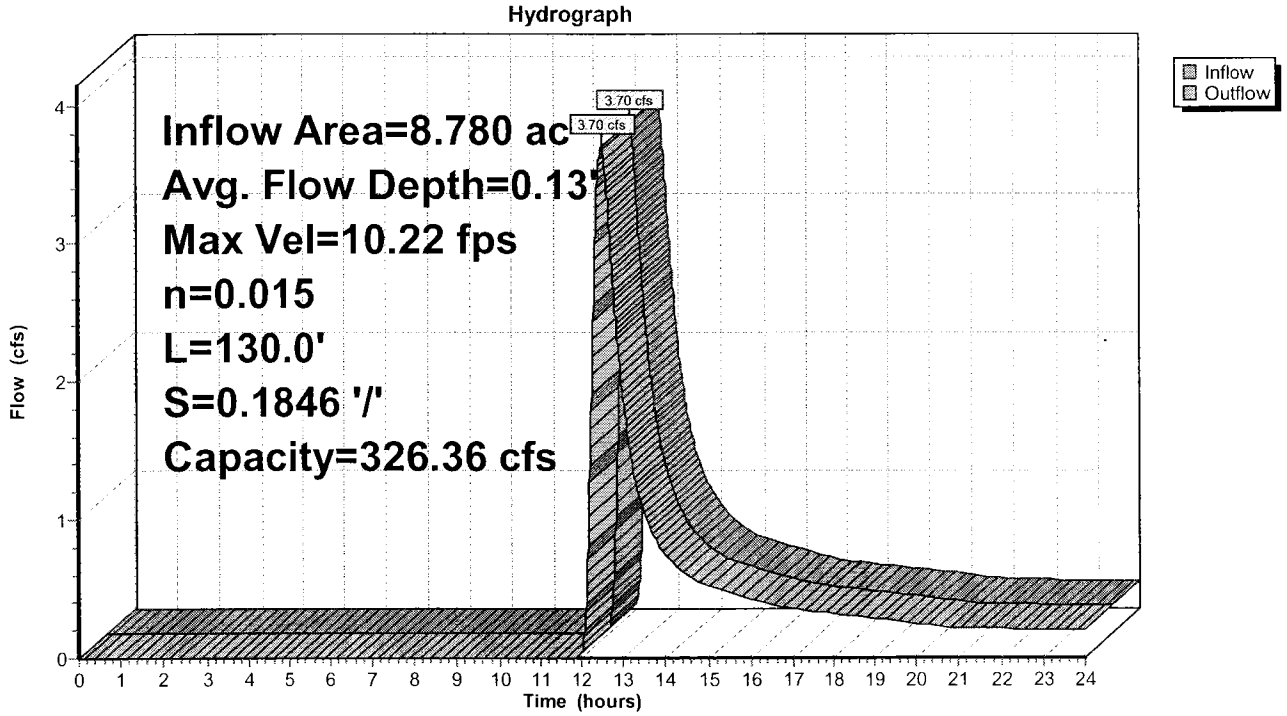
Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 3.70 cfs @ 12.50 hrs, Volume= 0.553 af
Outflow = 3.70 cfs @ 12.50 hrs, Volume= 0.553 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.22 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.61 fps, Avg. Travel Time= 0.5 min

Peak Storage= 47 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 326.36 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 130.0' Slope= 0.1846 '/'
Inlet Invert= 797.50', Outlet Invert= 773.50'

Reach 91R: Downchute 1



Summary for Reach 171R: Downchute 2

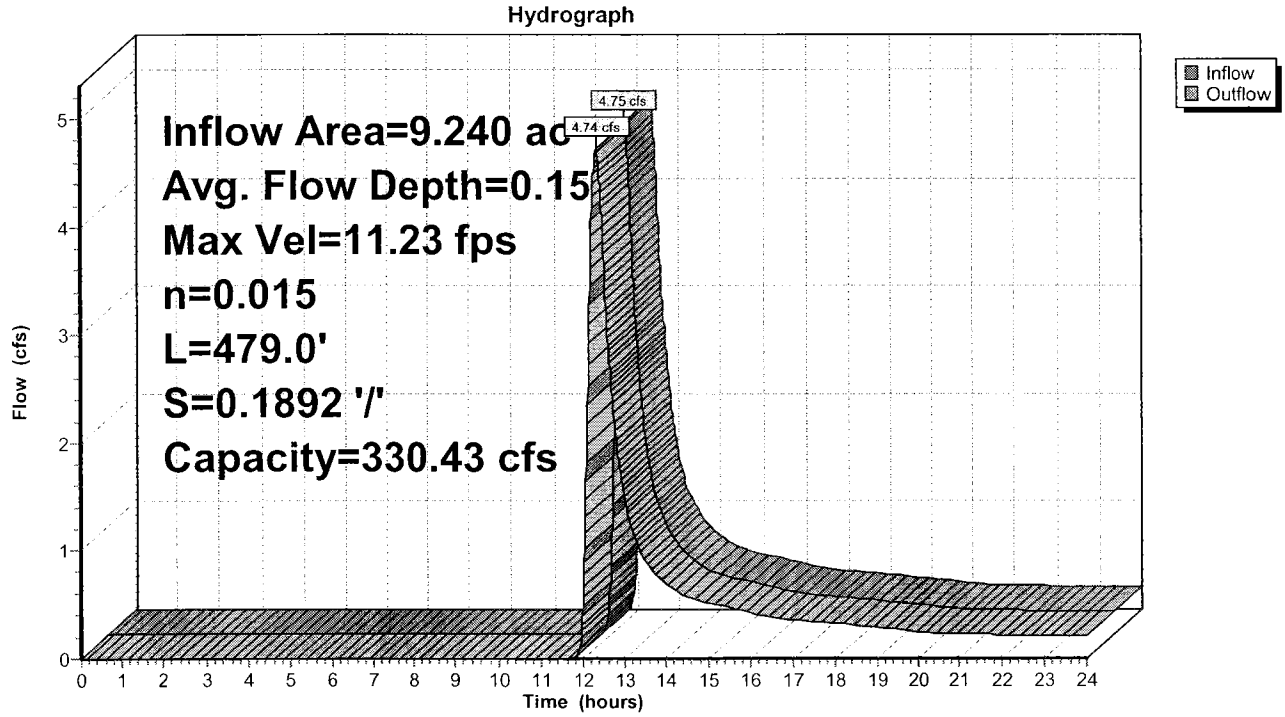
Inflow Area = 9.240 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 4.75 cfs @ 12.31 hrs, Volume= 0.590 af
Outflow = 4.74 cfs @ 12.32 hrs, Volume= 0.590 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.23 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 4.71 fps, Avg. Travel Time= 1.7 min

Peak Storage= 202 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 330.43 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 479.0' Slope= 0.1892 '/'
Inlet Invert= 874.00', Outlet Invert= 783.35'

Reach 171R: Downchute 2



Summary for Reach 142R: Downchute 3, Reach 1

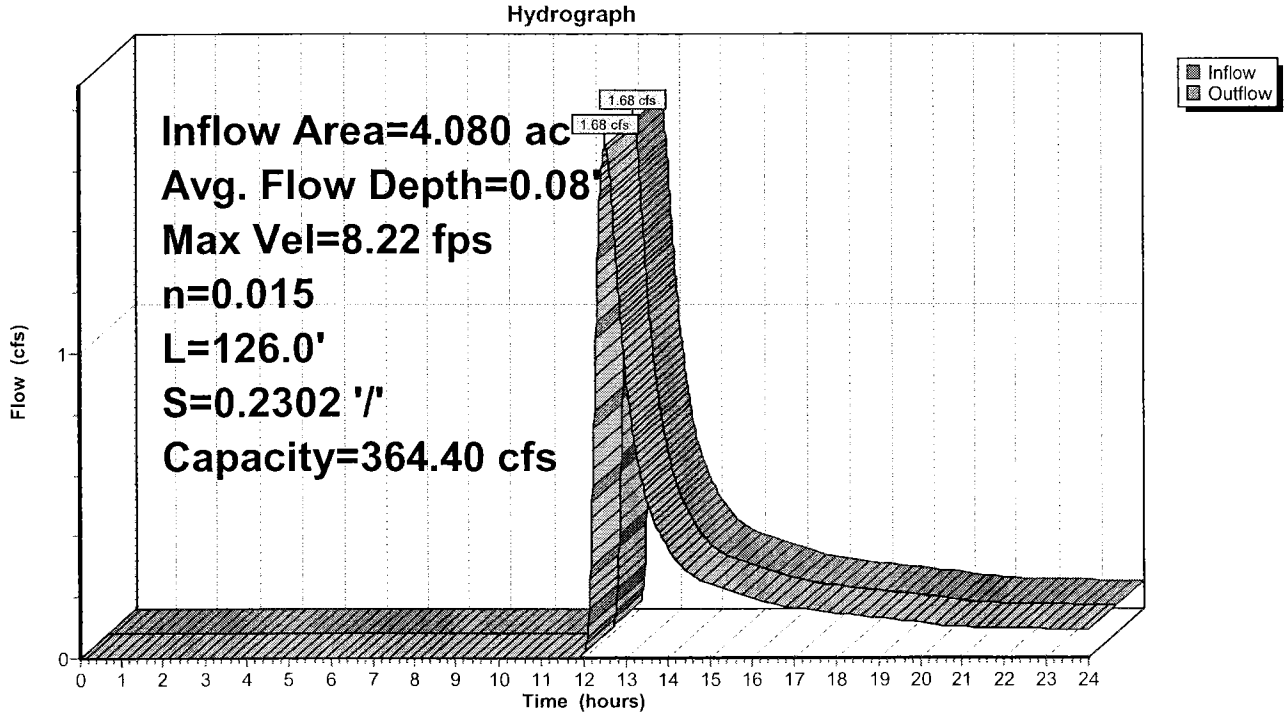
Inflow Area = 4.080 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 1.68 cfs @ 12.52 hrs, Volume= 0.258 af
Outflow = 1.68 cfs @ 12.53 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.22 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.73 fps, Avg. Travel Time= 0.6 min

Peak Storage= 26 cf @ 12.53 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 364.40 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 126.0' Slope= 0.2302 '/'
Inlet Invert= 808.00', Outlet Invert= 779.00'

Reach 142R: Downchute 3, Reach 1



Summary for Reach 62R: Downchute 4

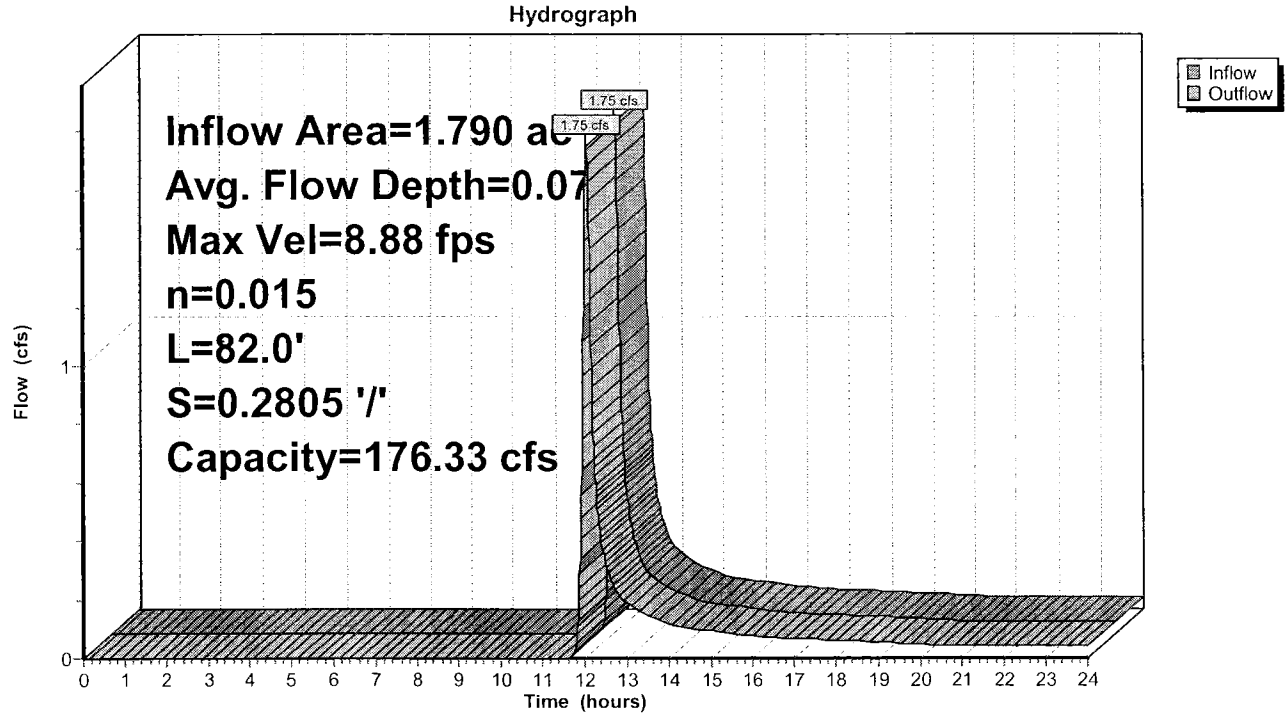
Inflow Area = 1.790 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 1.75 cfs @ 12.05 hrs, Volume= 0.115 af
Outflow = 1.75 cfs @ 12.06 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.88 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.90 fps, Avg. Travel Time= 0.5 min

Peak Storage= 16 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 176.33 cfs

2.50' x 1.00' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 6.50'
Length= 82.0' Slope= 0.2805 '/'
Inlet Invert= 798.00', Outlet Invert= 775.00'

Reach 62R: Downchute 4



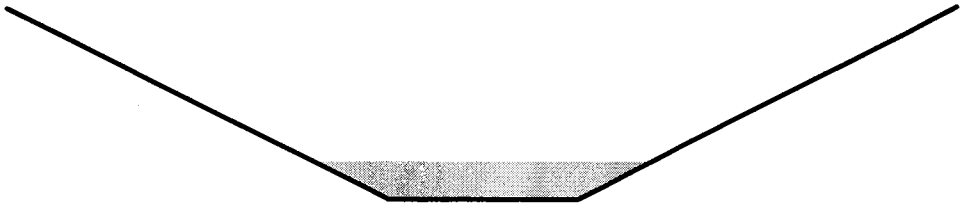
Summary for Reach 58R: Downchute 5

Inflow Area = 2.770 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 2.83 cfs @ 11.99 hrs, Volume= 0.177 af
Outflow = 2.83 cfs @ 11.99 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.1 min

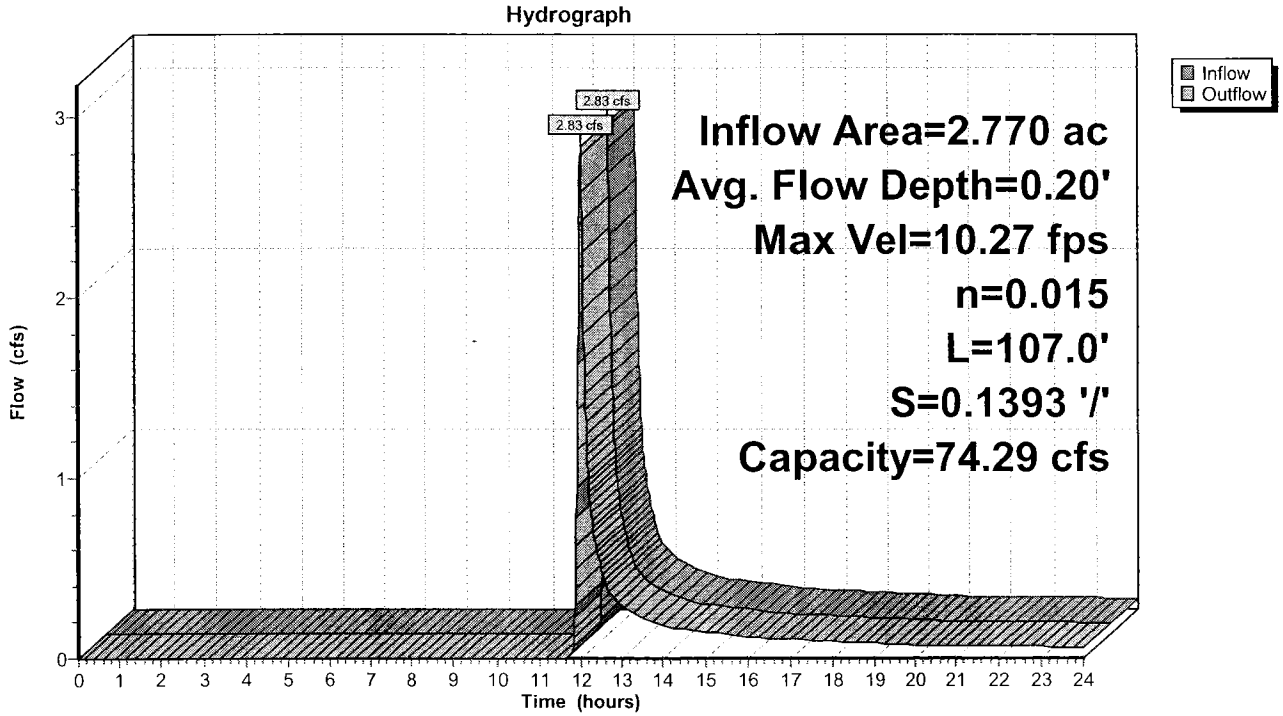
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.27 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.62 fps, Avg. Travel Time= 0.5 min

Peak Storage= 30 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 74.29 cfs

1.00' x 1.00' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 5.00'
Length= 107.0' Slope= 0.1393 '/'
Inlet Invert= 799.00', Outlet Invert= 784.10'



Reach 58R: Downchute 5



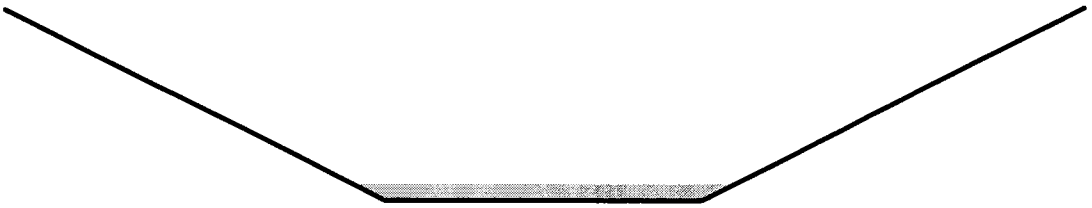
Summary for Reach 4R: Downchute 6 Reach 1

Inflow Area = 8.090 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 3.00 cfs @ 12.10 hrs, Volume= 0.512 af
Outflow = 3.00 cfs @ 12.10 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.2 min

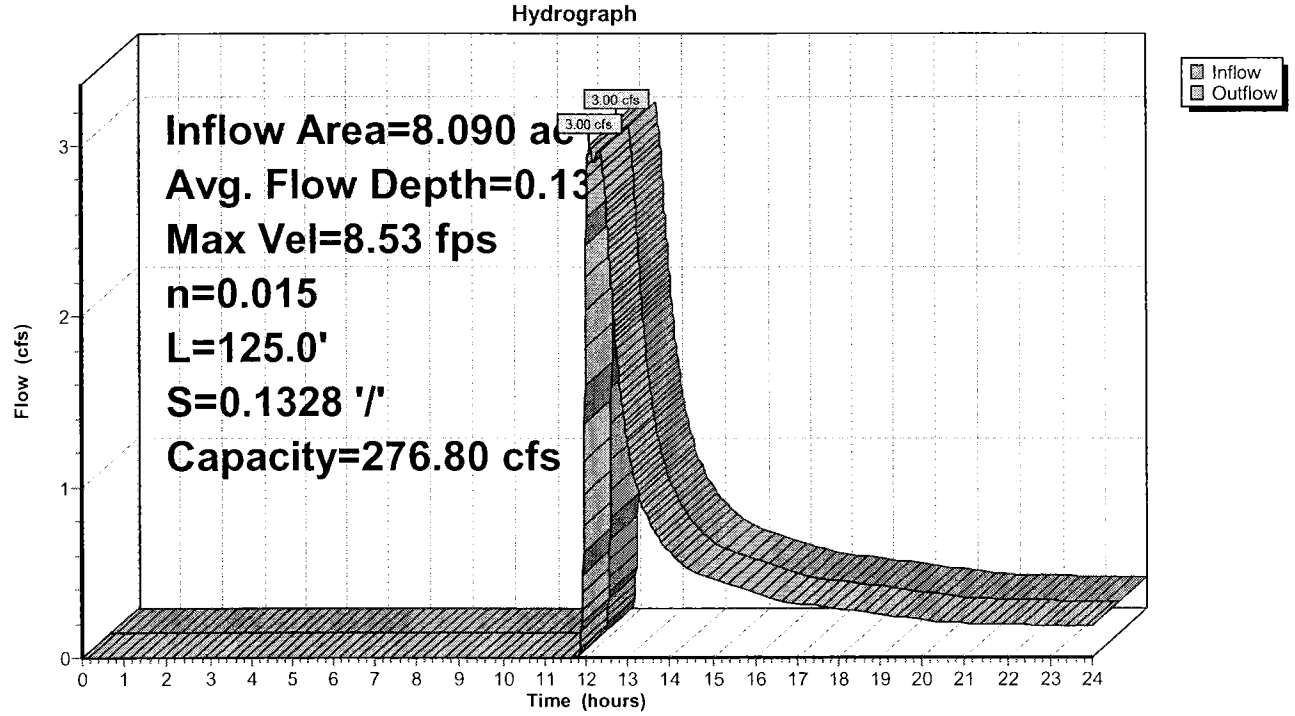
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.53 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.03 fps, Avg. Travel Time= 0.5 min

Peak Storage= 44 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 276.80 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 125.0' Slope= 0.1328 '/'
Inlet Invert= 802.00', Outlet Invert= 785.40'



Reach 4R: Downchute 6 Reach 1



Summary for Reach 60R: Downchute 6 Reach 2

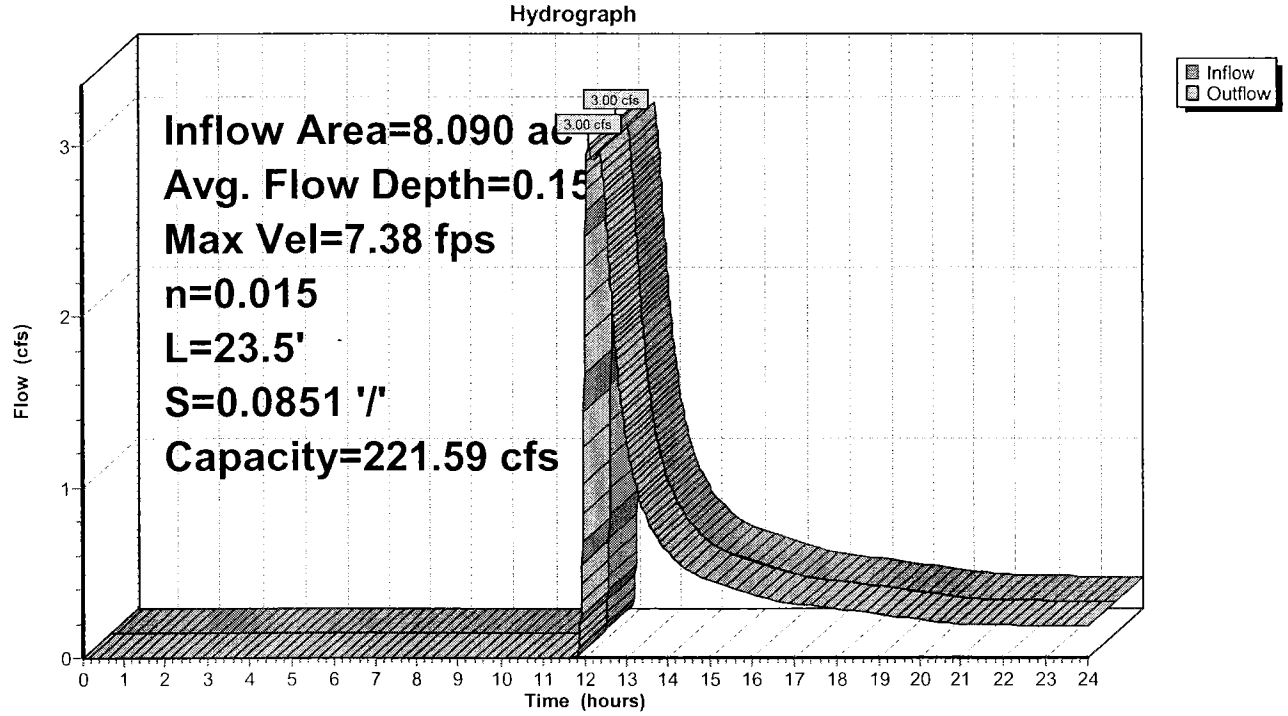
Inflow Area = 8.090 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 3.00 cfs @ 12.10 hrs, Volume= 0.512 af
Outflow = 3.00 cfs @ 12.10 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.38 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.49 fps, Avg. Travel Time= 0.1 min

Peak Storage= 10 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 221.59 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 23.5' Slope= 0.0851 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

Reach 60R: Downchute 6 Reach 2



Summary for Reach 59R: Downchute 6 Reach 3

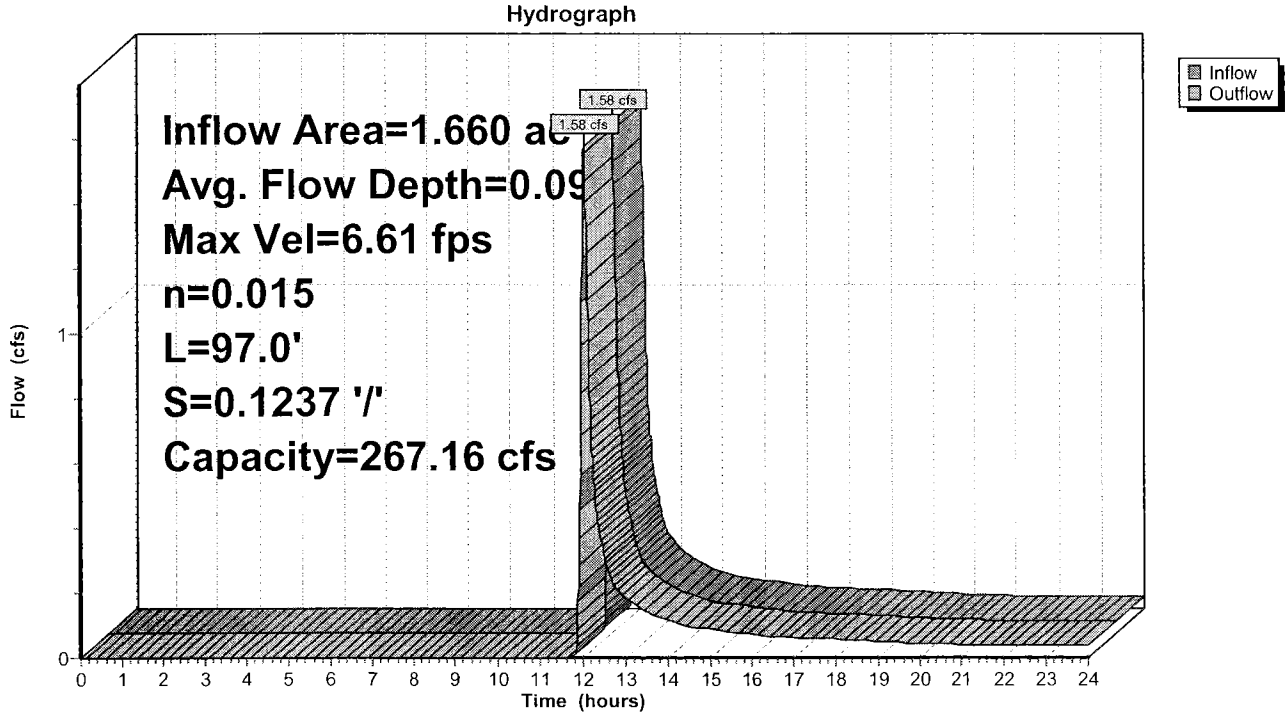
Inflow Area = 1.660 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 1.58 cfs @ 12.03 hrs, Volume= 0.106 af
Outflow = 1.58 cfs @ 12.03 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.61 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 0.7 min

Peak Storage= 23 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 267.16 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 97.0' Slope= 0.1237 '/'
Inlet Invert= 816.00', Outlet Invert= 804.00'

Reach 59R: Downchute 6 Reach 3



Summary for Reach 6R: Downchute 7

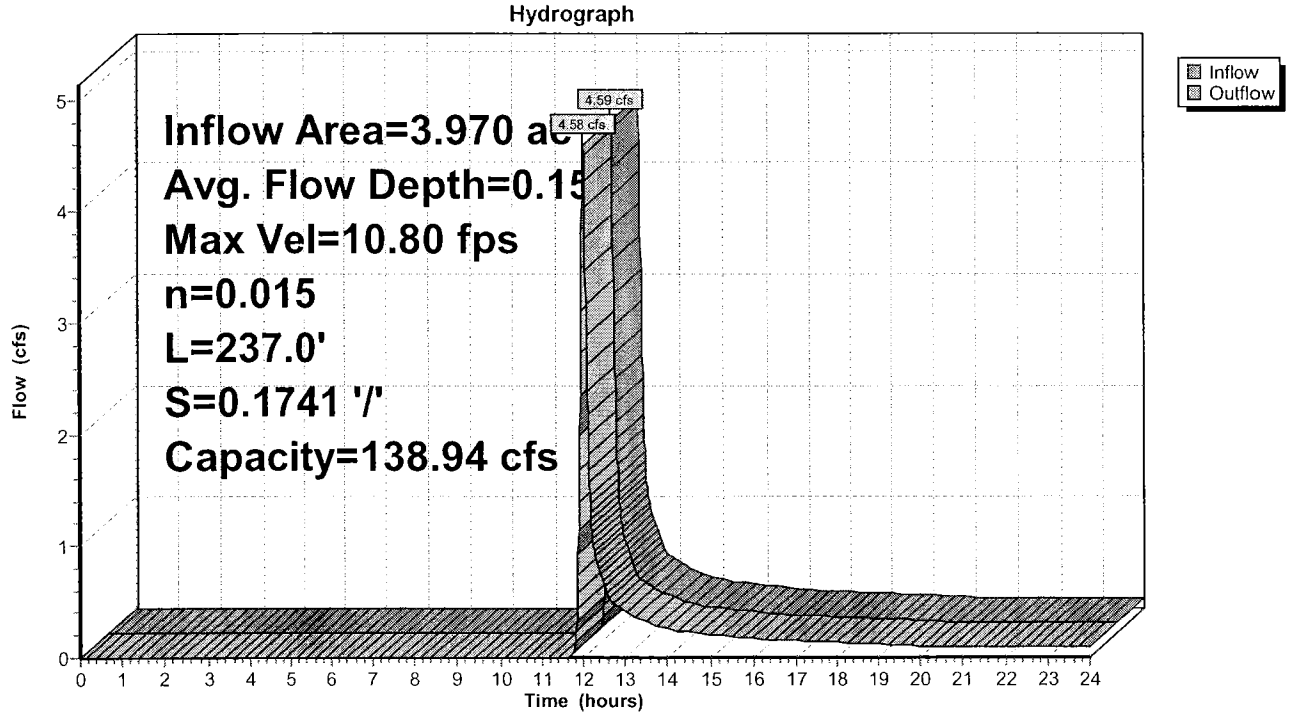
Inflow Area = 3.970 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 4.59 cfs @ 12.01 hrs, Volume= 0.255 af
Outflow = 4.58 cfs @ 12.01 hrs, Volume= 0.255 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.80 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.27 fps, Avg. Travel Time= 1.2 min

Peak Storage= 101 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 138.94 cfs

2.50' x 1.00' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 6.50'
Length= 237.0' Slope= 0.1741 '/'
Inlet Invert= 818.00', Outlet Invert= 776.73'

Reach 6R: Downchute 7



Summary for Reach 57R: Downchute 8

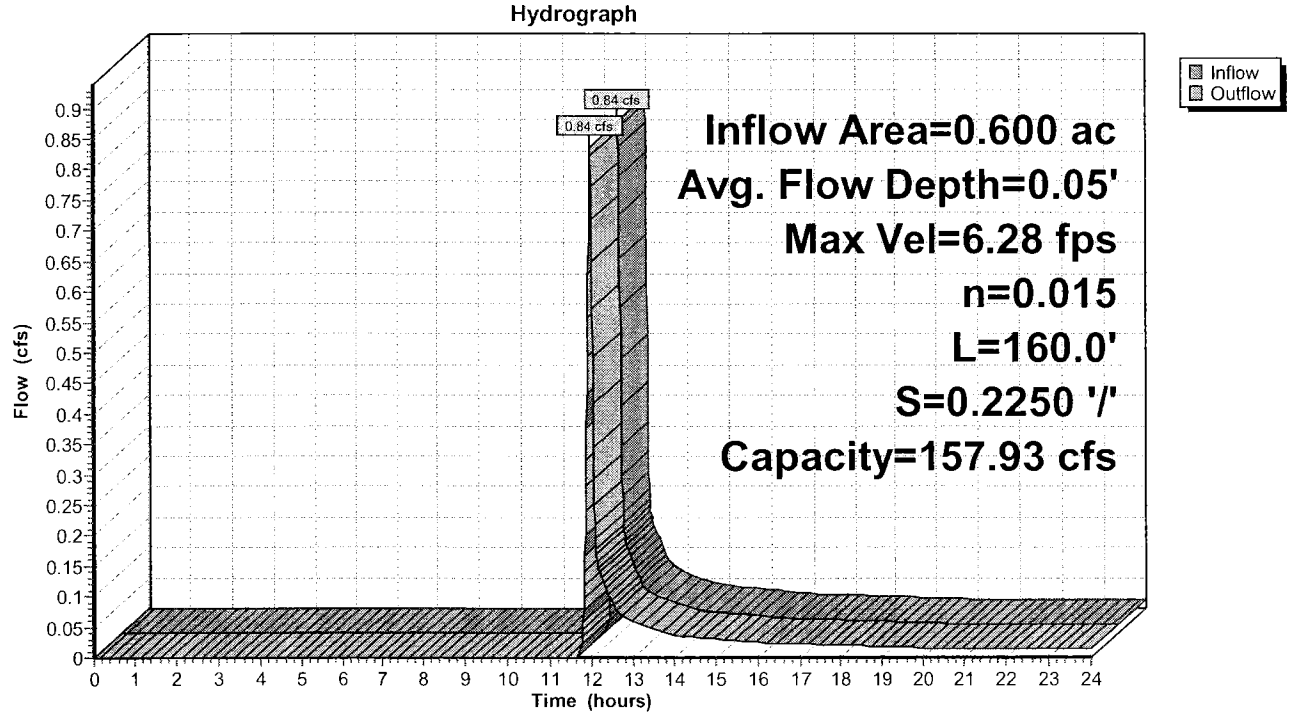
Inflow Area = 0.600 ac, 0.00% Impervious, Inflow Depth > 0.78" for 25yr/24hr NOAA event
Inflow = 0.84 cfs @ 11.96 hrs, Volume= 0.039 af
Outflow = 0.84 cfs @ 11.96 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.28 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.27 fps, Avg. Travel Time= 1.2 min

Peak Storage= 21 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 157.93 cfs

2.50' x 1.00' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 6.50'
Length= 160.0' Slope= 0.2250 '/'
Inlet Invert= 828.00', Outlet Invert= 792.00'

Reach 57R: Downchute 8



Summary for Reach 67R: Downchute 9

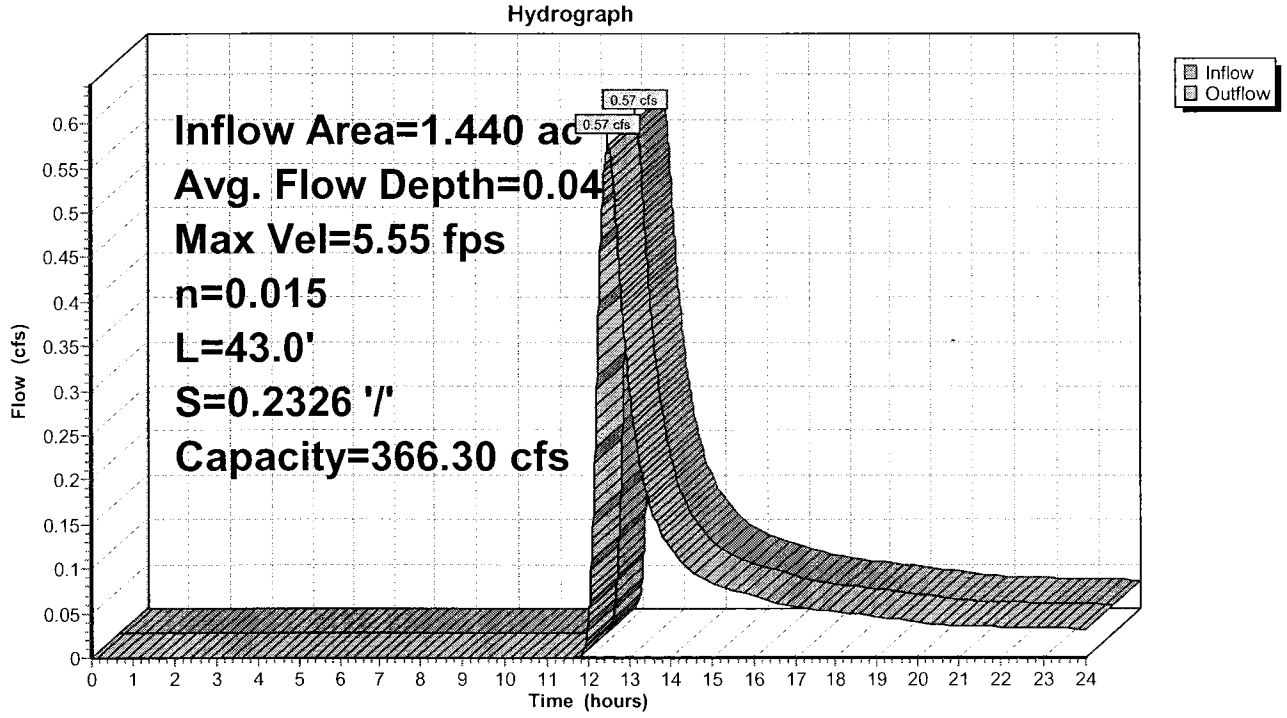
Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 0.57 cfs @ 12.49 hrs, Volume= 0.091 af
Outflow = 0.57 cfs @ 12.49 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.55 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.09 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.49 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 366.30 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 43.0' Slope= 0.2326 '/'
Inlet Invert= 824.00', Outlet Invert= 814.00'

Reach 67R: Downchute 9



Summary for Reach 1R: Downchute 10

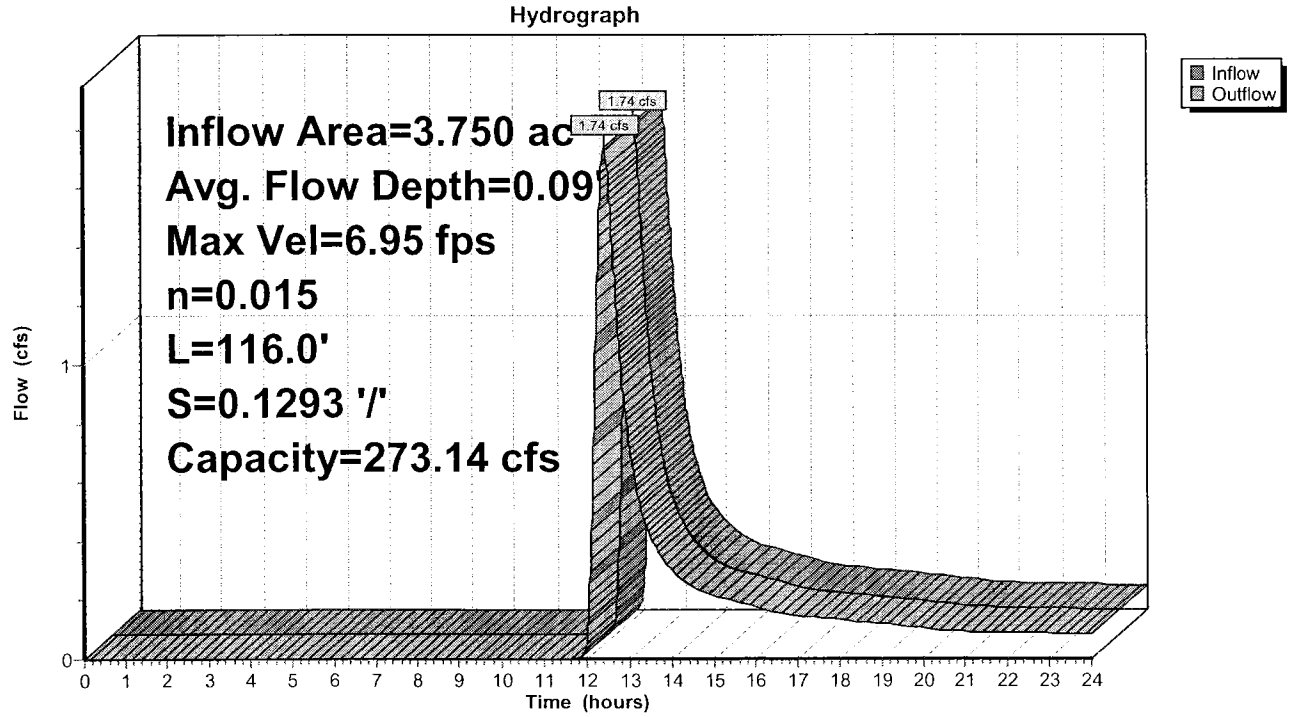
Inflow Area = 3.750 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 1.74 cfs @ 12.41 hrs, Volume= 0.238 af
Outflow = 1.74 cfs @ 12.41 hrs, Volume= 0.238 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.95 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.99 fps, Avg. Travel Time= 0.6 min

Peak Storage= 29 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 273.14 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 116.0' Slope= 0.1293 '/'
Inlet Invert= 820.00', Outlet Invert= 805.00'

Reach 1R: Downchute 10



Summary for Reach 11R: Down Chute 11

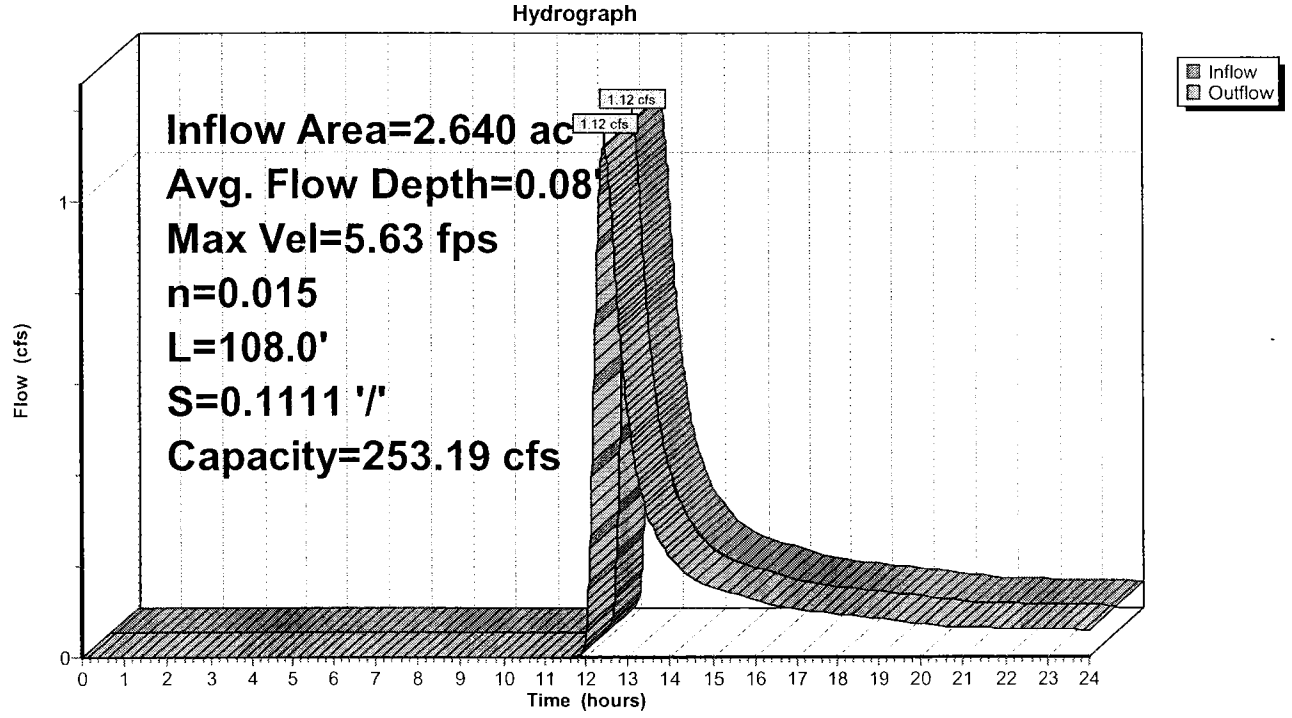
Inflow Area = 2.640 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 1.12 cfs @ 12.46 hrs, Volume= 0.168 af
Outflow = 1.12 cfs @ 12.47 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.63 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.54 fps, Avg. Travel Time= 0.7 min

Peak Storage= 22 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 253.19 cfs

2.50' x 1.50' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 8.50'
Length= 108.0' Slope= 0.1111 '/'
Inlet Invert= 826.00', Outlet Invert= 814.00'

Reach 11R: Down Chute 11



Summary for Reach 63R: Channel A Outlet

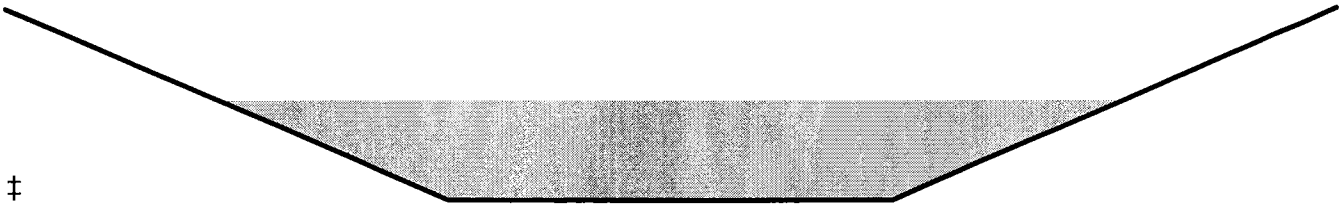
Inflow Area = 63.730 ac, 0.00% Impervious, Inflow Depth > 0.75" for 25yr/24hr NOAA event
Inflow = 20.74 cfs @ 12.45 hrs, Volume= 4.006 af
Outflow = 20.15 cfs @ 12.54 hrs, Volume= 3.973 af, Atten= 3%, Lag= 4.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 12.9 min

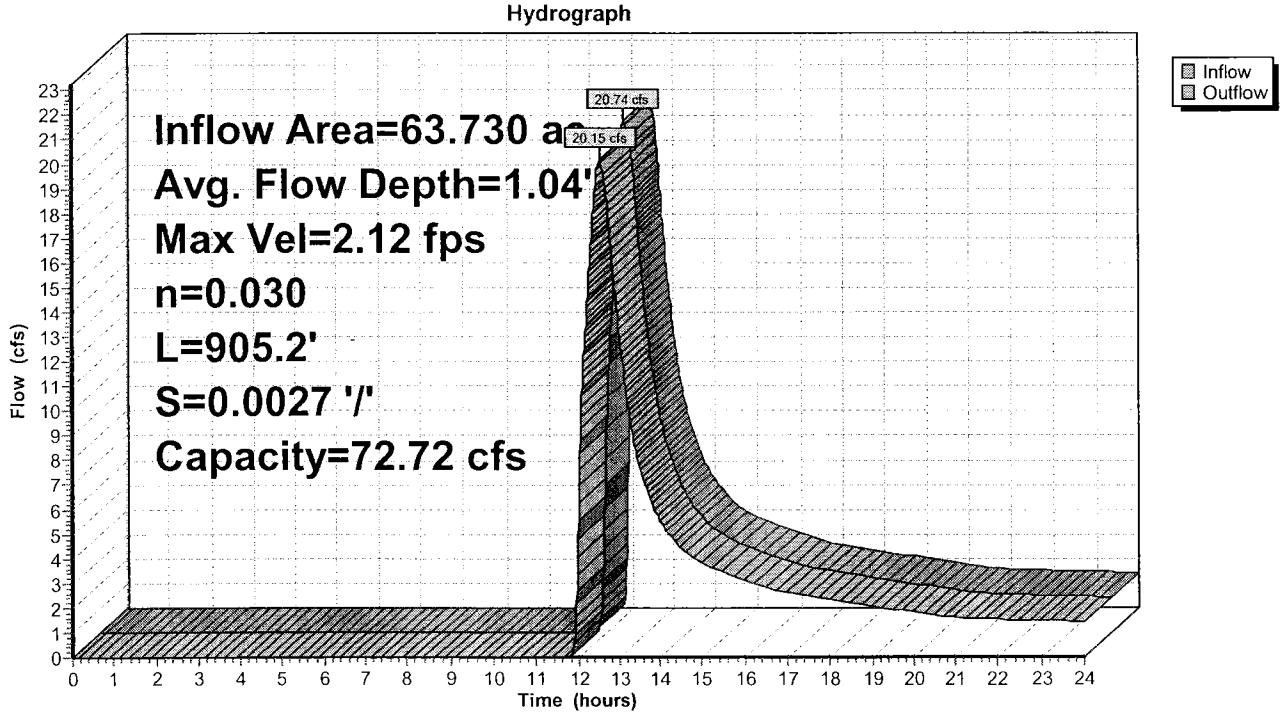
Peak Storage= 8,593 cf @ 12.54 hrs
Average Depth at Peak Storage= 1.04'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 72.72 cfs

6.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 905.2' Slope= 0.0027 '/'
Inlet Invert= 770.42', Outlet Invert= 768.00'

‡



Reach 63R: Channel A Outlet



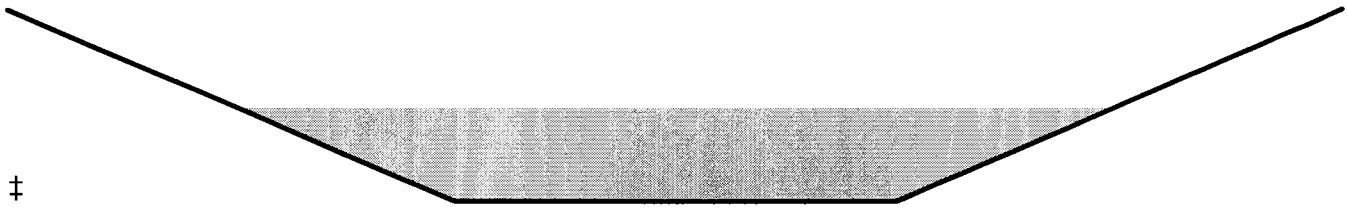
Summary for Reach 25R: Channel A Reach 1

Inflow Area = 63.730 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 20.76 cfs @ 12.44 hrs, Volume= 4.010 af
Outflow = 20.74 cfs @ 12.45 hrs, Volume= 4.006 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.40 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 1.7 min

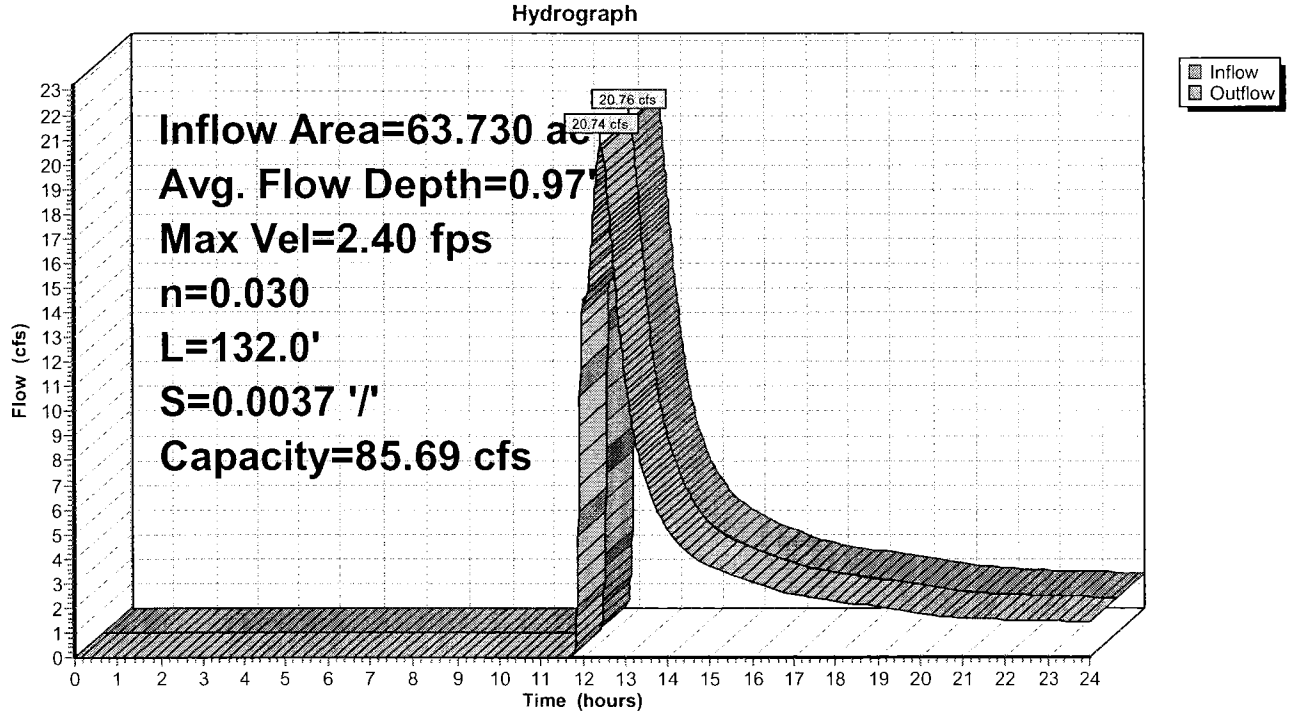
Peak Storage= 1,139 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.97'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 85.69 cfs

6.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 132.0' Slope= 0.0037 '/'
Inlet Invert= 771.00', Outlet Invert= 770.51'



‡

Reach 25R: Channel A Reach 1



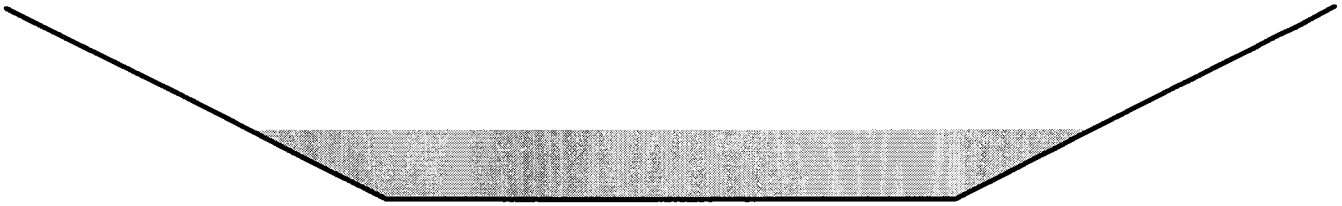
Summary for Reach 7R: Channel A, Reach 2

Inflow Area = 32.480 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 11.83 cfs @ 12.34 hrs, Volume= 2.051 af
Outflow = 11.73 cfs @ 12.38 hrs, Volume= 2.041 af, Atten= 1%, Lag= 2.5 min

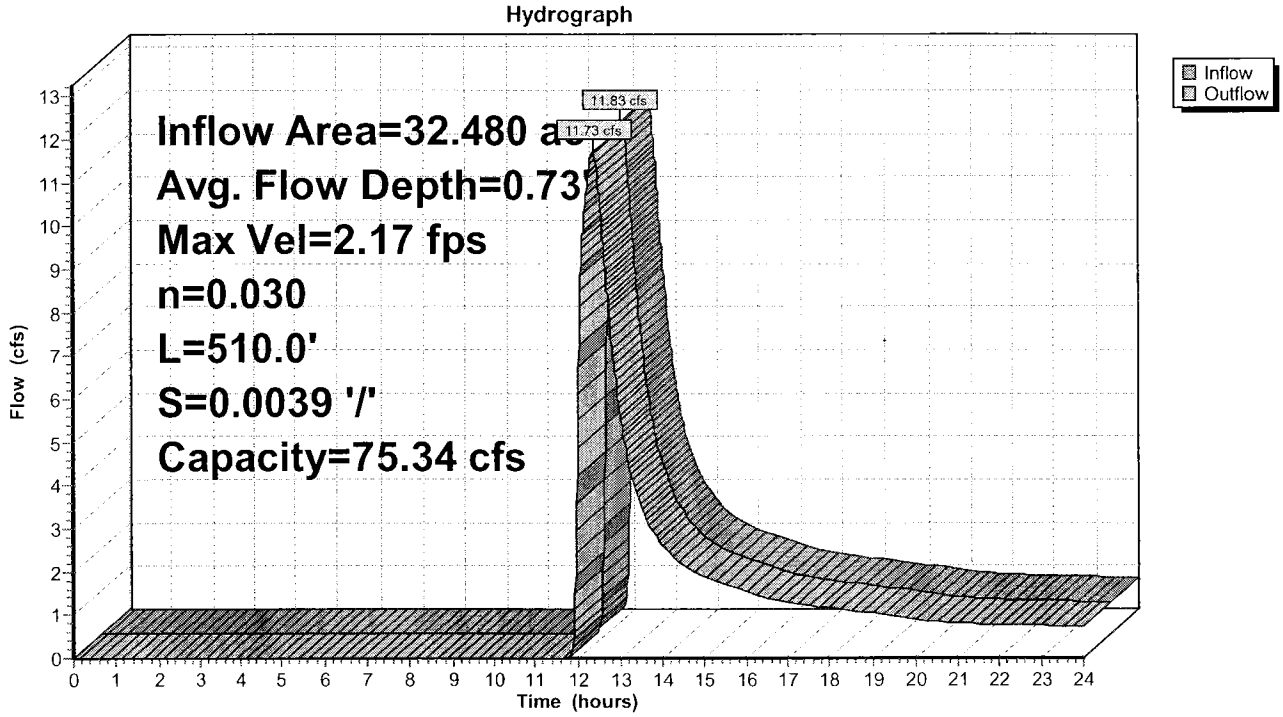
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.17 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 7.9 min

Peak Storage= 2,757 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 75.34 cfs

6.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 510.0' Slope= 0.0039 '/'
Inlet Invert= 774.00', Outlet Invert= 772.00'



Reach 7R: Channel A, Reach 2



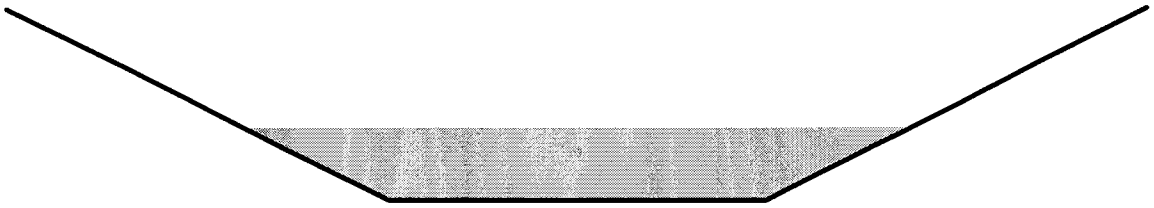
Summary for Reach 46R: Channel A, Reach 3

Inflow Area = 27.250 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 10.65 cfs @ 12.34 hrs, Volume= 1.717 af
Outflow = 10.64 cfs @ 12.36 hrs, Volume= 1.715 af, Atten= 0%, Lag= 0.9 min

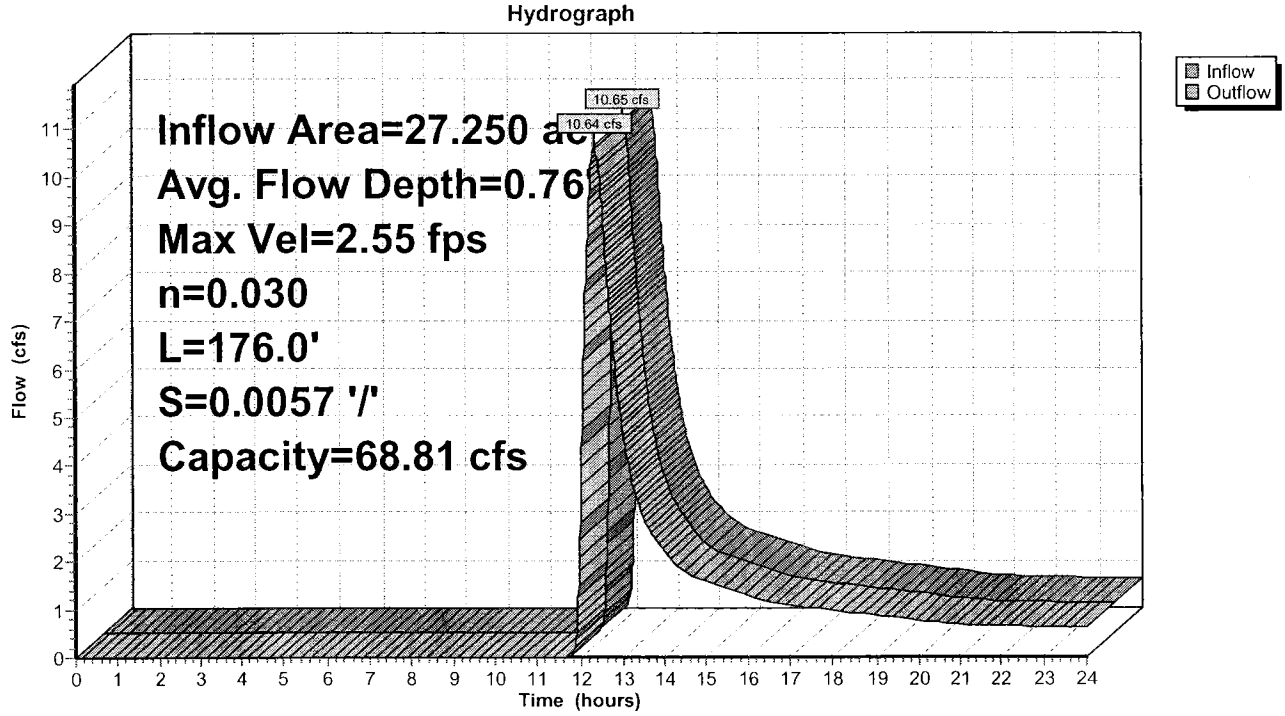
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.55 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 2.3 min

Peak Storage= 734 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 68.81 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 176.0' Slope= 0.0057 '/'
Inlet Invert= 775.00', Outlet Invert= 774.00'



Reach 46R: Channel A, Reach 3



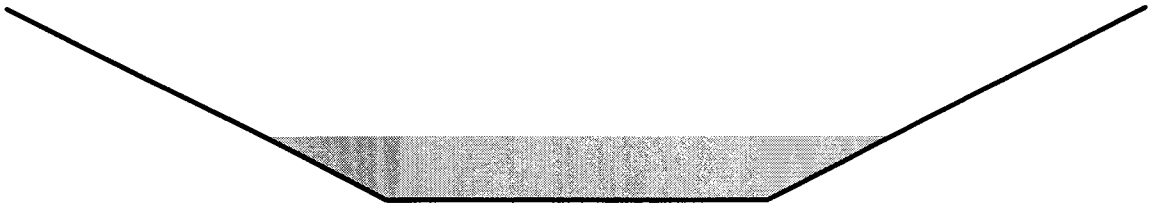
Summary for Reach 45R: Channel A, Reach 4

Inflow Area = 25.240 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 10.44 cfs @ 12.28 hrs, Volume= 1.599 af
Outflow = 10.17 cfs @ 12.35 hrs, Volume= 1.588 af, Atten= 3%, Lag= 4.2 min

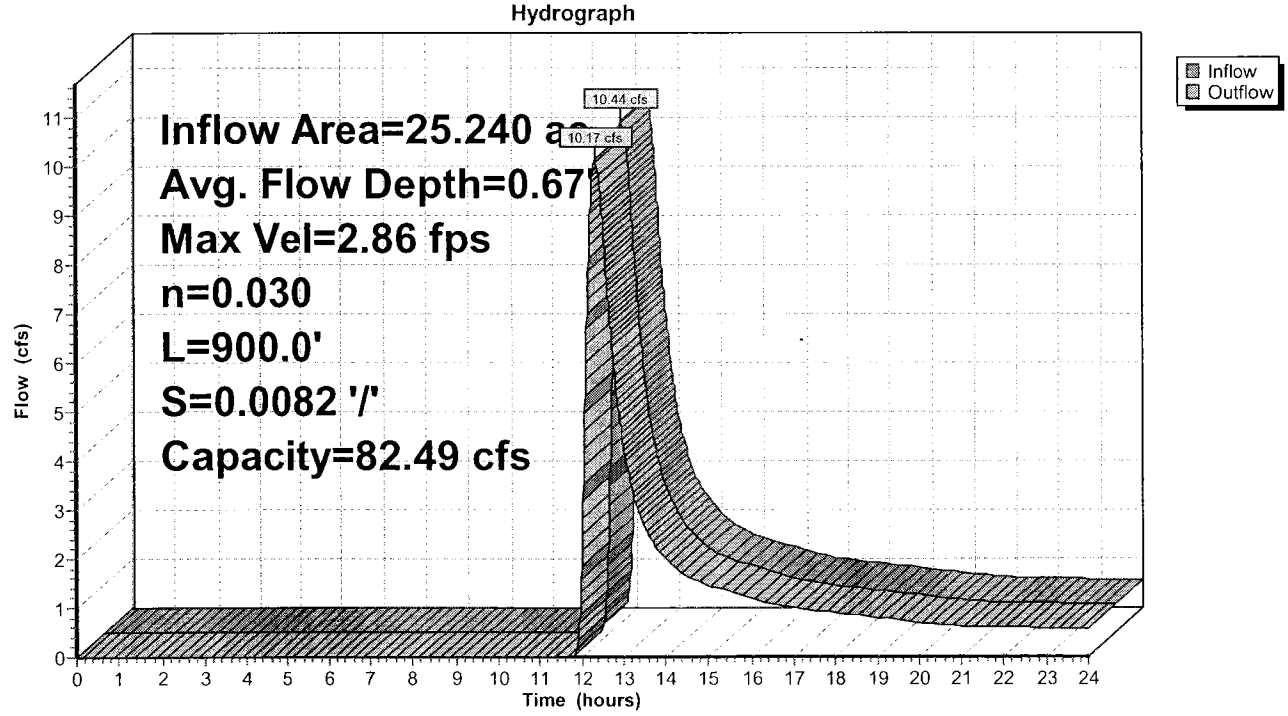
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 10.8 min

Peak Storage= 3,203 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 82.49 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 900.0' Slope= 0.0082 '/'
Inlet Invert= 783.35', Outlet Invert= 776.00'



Reach 45R: Channel A, Reach 4



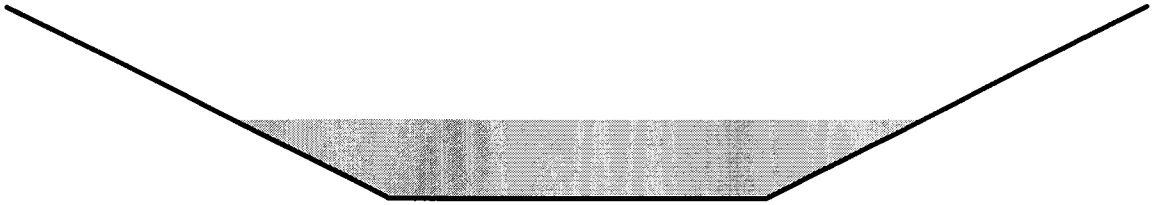
Summary for Reach 39R: Channel A, Reach 5

Inflow Area = 14.700 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 7.39 cfs @ 12.03 hrs, Volume= 0.935 af
Outflow = 5.73 cfs @ 12.18 hrs, Volume= 0.925 af, Atten= 22%, Lag= 9.4 min

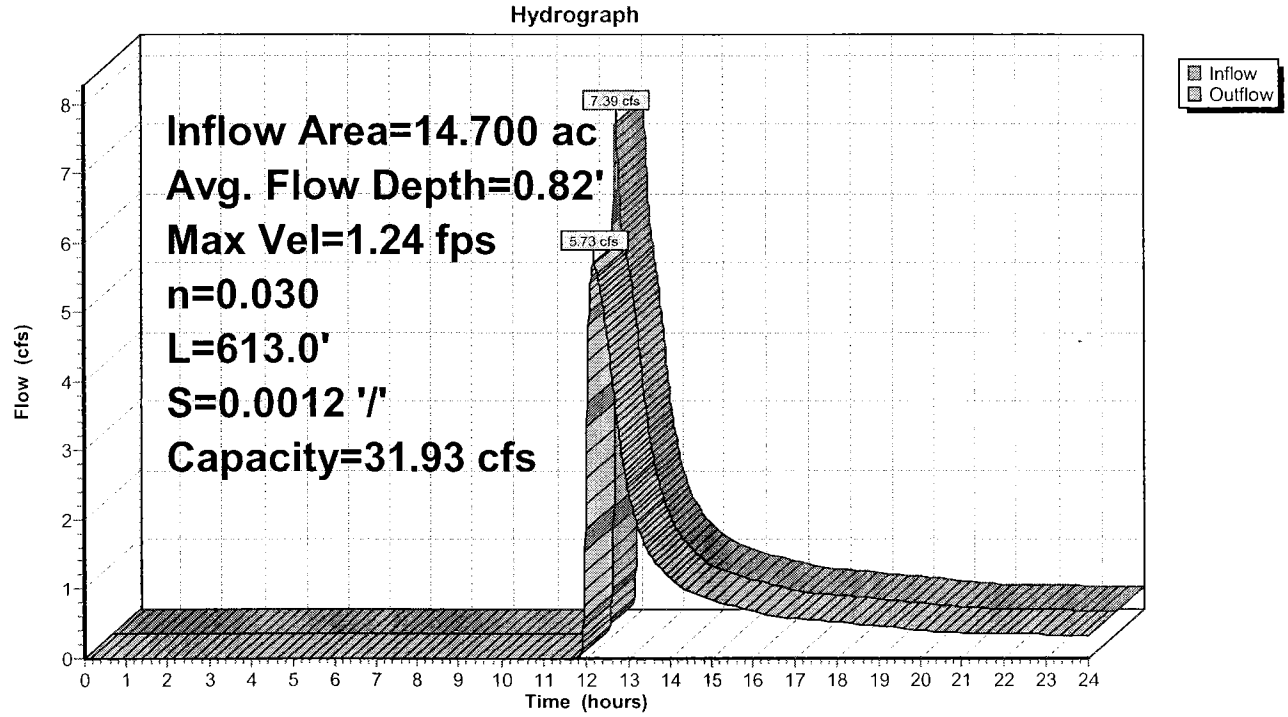
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.24 fps, Min. Travel Time= 8.3 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 16.5 min

Peak Storage= 2,838 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 31.93 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 613.0' Slope= 0.0012 '/'
Inlet Invert= 784.10', Outlet Invert= 783.35'



Reach 39R: Channel A, Reach 5



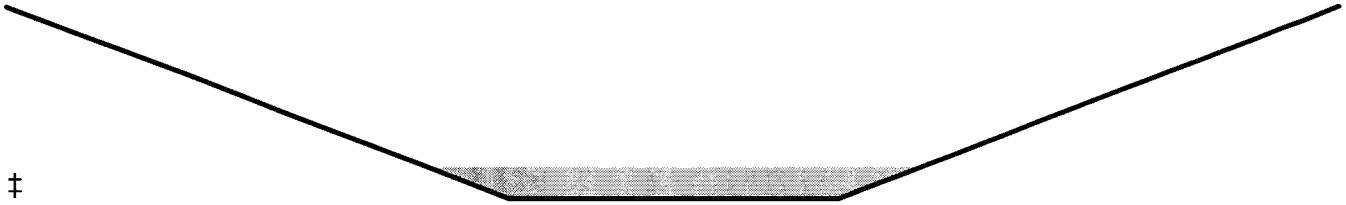
Summary for Reach 3R: Channel A, Reach 6

Inflow Area = 10.660 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 4.40 cfs @ 12.14 hrs, Volume= 0.676 af
Outflow = 4.40 cfs @ 12.14 hrs, Volume= 0.675 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.72 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 0.8 min

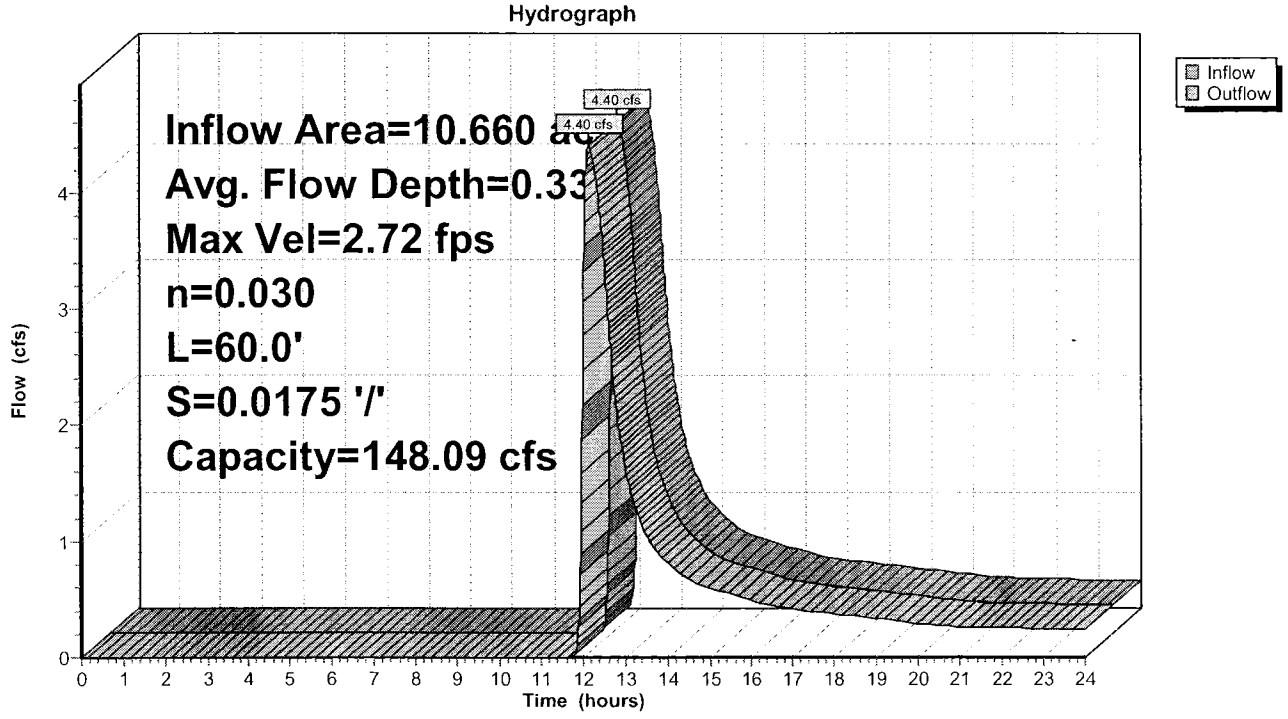
Peak Storage= 97 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 148.09 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 60.0' Slope= 0.0175 '/'
Inlet Invert= 785.40', Outlet Invert= 784.35'



‡

Reach 3R: Channel A, Reach 6



Summary for Reach 33R: Channel A, Reach 7

Inflow Area = 2.020 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 1.72 cfs @ 12.09 hrs, Volume= 0.130 af
Outflow = 1.28 cfs @ 12.19 hrs, Volume= 0.128 af, Atten= 26%, Lag= 5.7 min

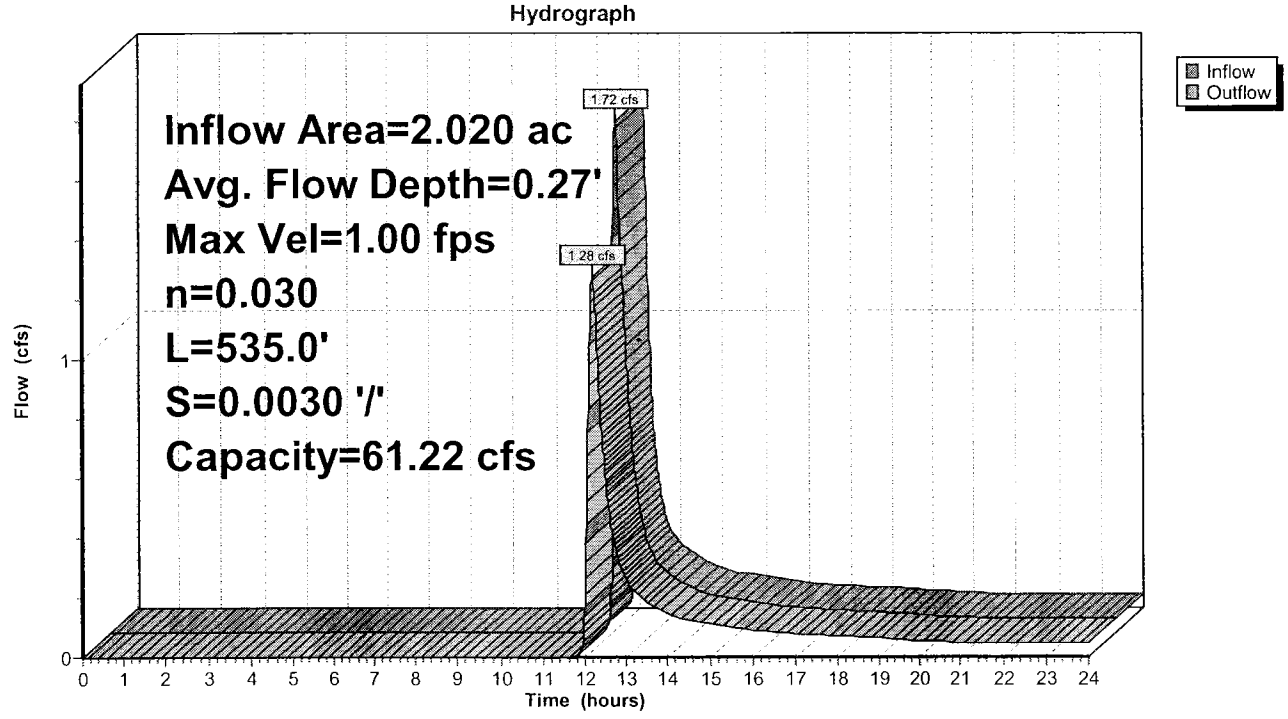
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.00 fps, Min. Travel Time= 8.9 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 22.6 min

Peak Storage= 683 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 61.22 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 535.0' Slope= 0.0030 '/'
Inlet Invert= 787.00', Outlet Invert= 785.40'

‡

Reach 33R: Channel A, Reach 7



Summary for Reach 55R: Channel B, Reach 1

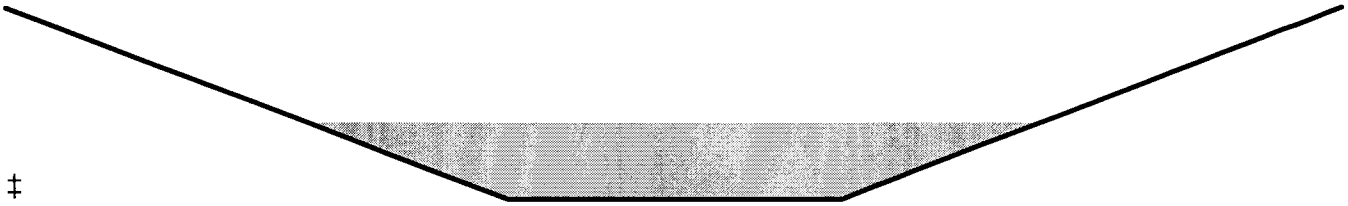
Inflow Area = 31.250 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 12.65 cfs @ 11.94 hrs, Volume= 1.975 af
Outflow = 11.28 cfs @ 11.97 hrs, Volume= 1.969 af, Atten= 11%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 5.0 min

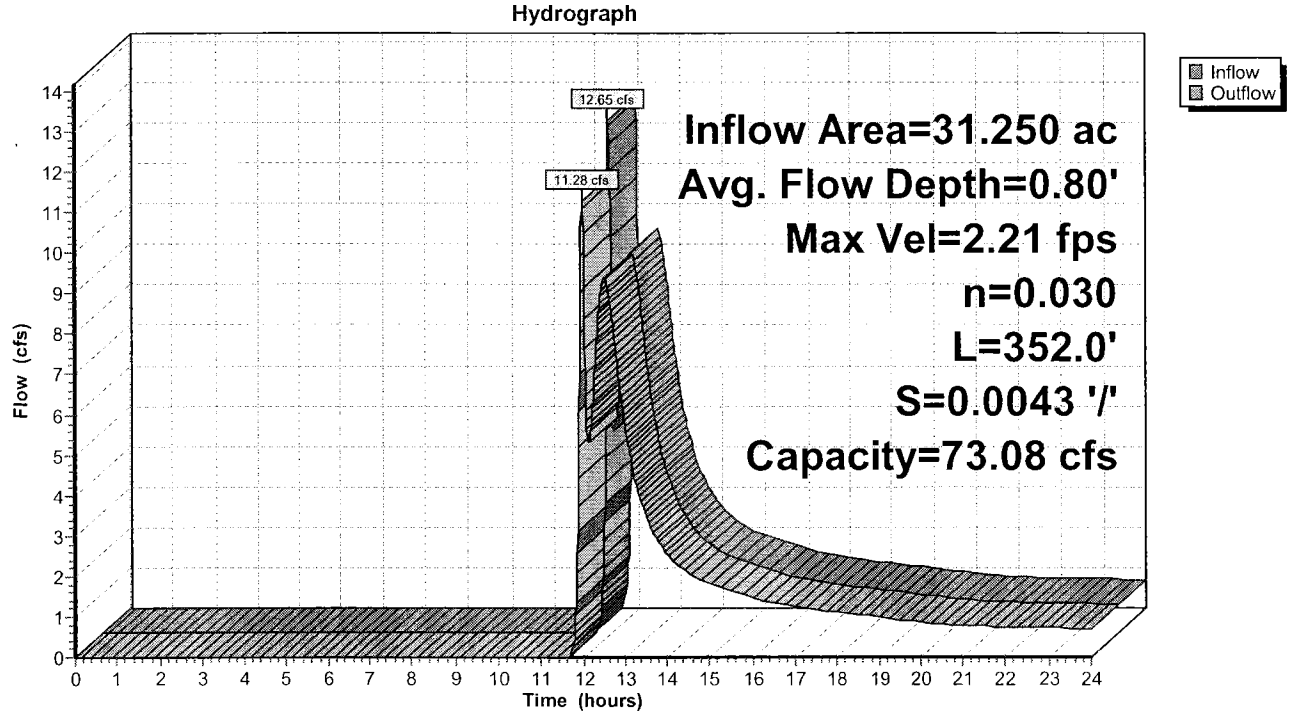
Peak Storage= 1,799 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 73.08 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 352.0' Slope= 0.0043 '/'
Inlet Invert= 773.50', Outlet Invert= 772.00'

‡



Reach 55R: Channel B, Reach 1



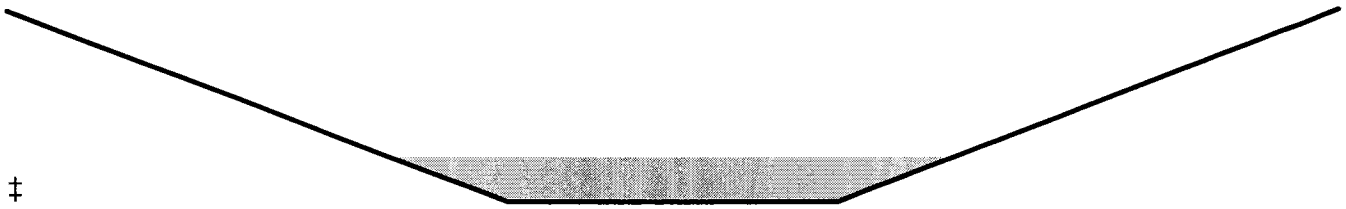
Summary for Reach 51R: Channel B, Reach 2

Inflow Area = 14.100 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 4.79 cfs @ 12.36 hrs, Volume= 0.892 af
Outflow = 4.55 cfs @ 12.48 hrs, Volume= 0.881 af, Atten= 5%, Lag= 7.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.81 fps, Min. Travel Time= 9.8 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 18.5 min

Peak Storage= 2,672 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 80.53 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,063.0' Slope= 0.0052 '/'
Inlet Invert= 779.00', Outlet Invert= 773.50'



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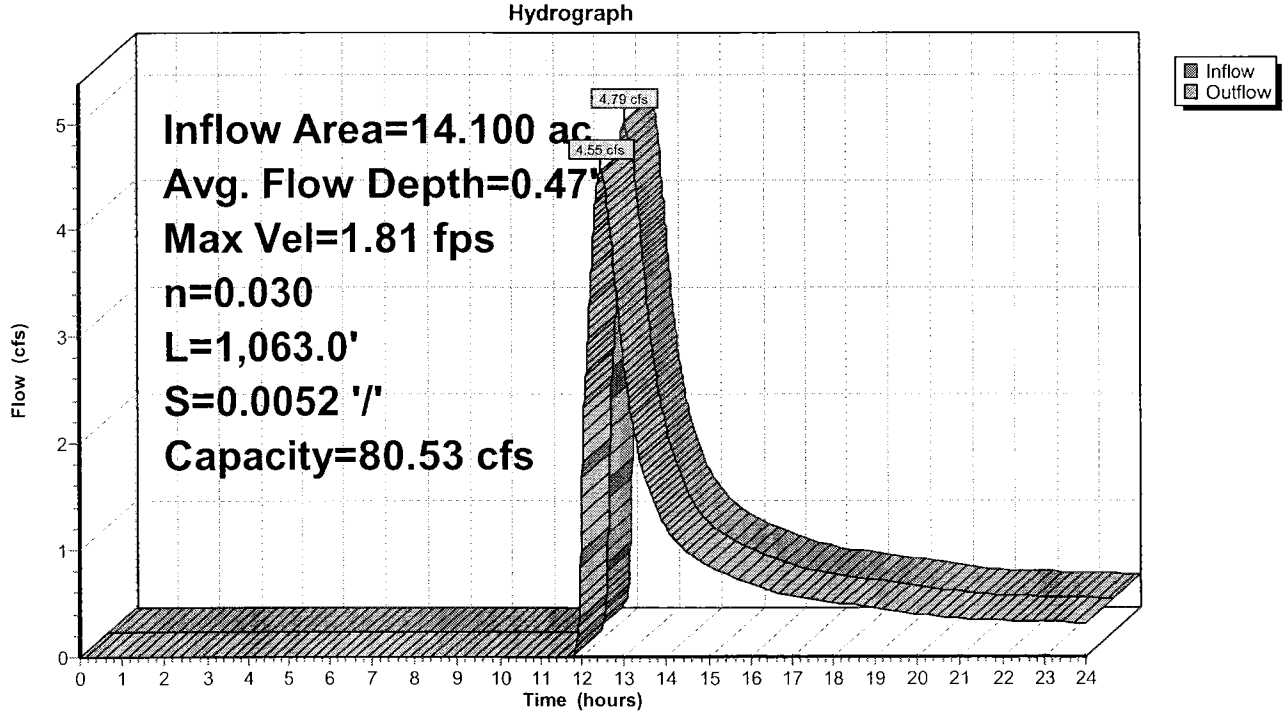
Reach 51R: Channel B, Reach 2



Summary for Reach 56R: Channel B, Reach 3

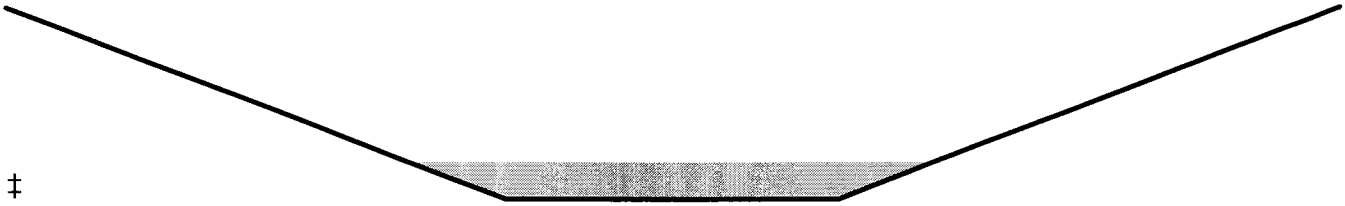
Inflow Area = 6.920 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 5.72 cfs @ 12.10 hrs, Volume= 0.445 af
Outflow = 3.04 cfs @ 12.26 hrs, Volume= 0.434 af, Atten= 47%, Lag= 9.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.54 fps, Min. Travel Time= 18.8 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 40.4 min

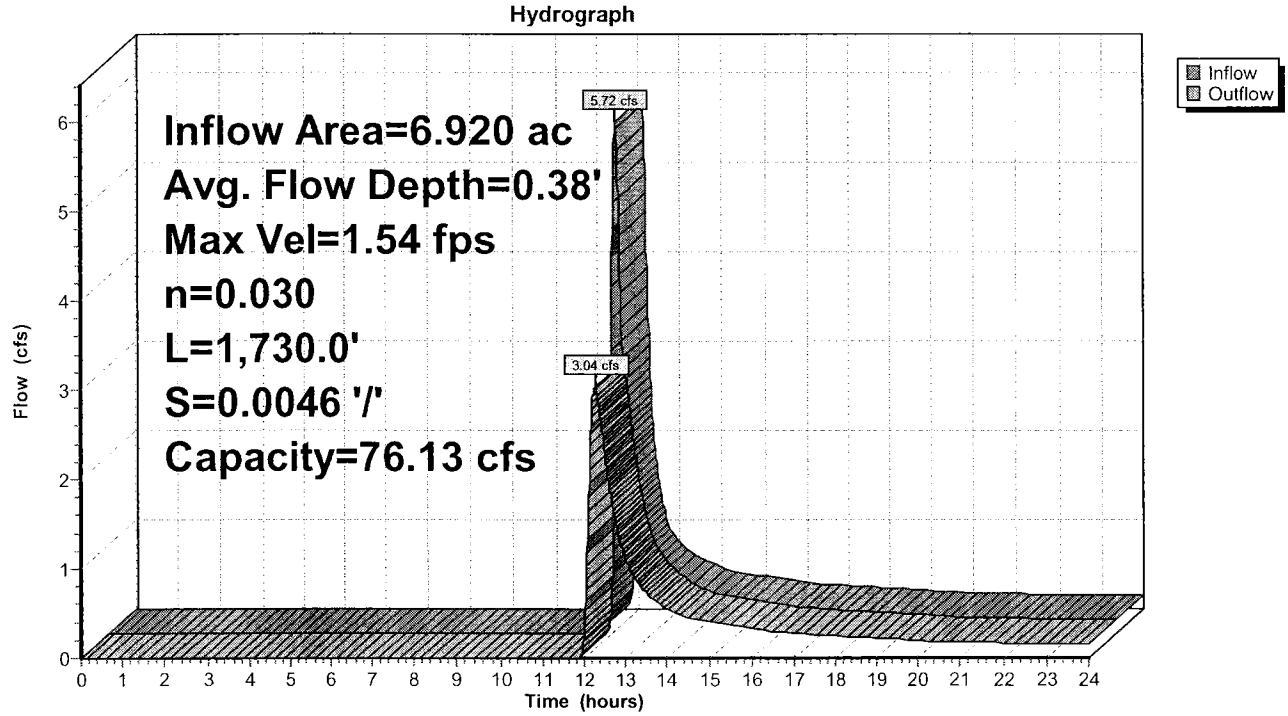
Peak Storage= 3,424 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 76.13 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 16.00'
Length= 1,730.0' Slope= 0.0046 '/'
Inlet Invert= 787.00', Outlet Invert= 779.00'

‡



Reach 56R: Channel B, Reach 3



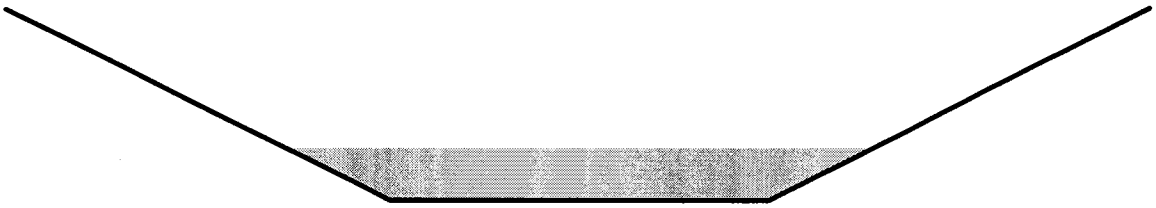
Summary for Reach 64R: Channel C

Inflow Area = 2.770 ac, 0.00% Impervious, Inflow Depth > 0.78" for 25yr/24hr NOAA event
Inflow = 4.18 cfs @ 11.94 hrs, Volume= 0.179 af
Outflow = 2.83 cfs @ 11.99 hrs, Volume= 0.177 af, Atten= 32%, Lag= 3.1 min

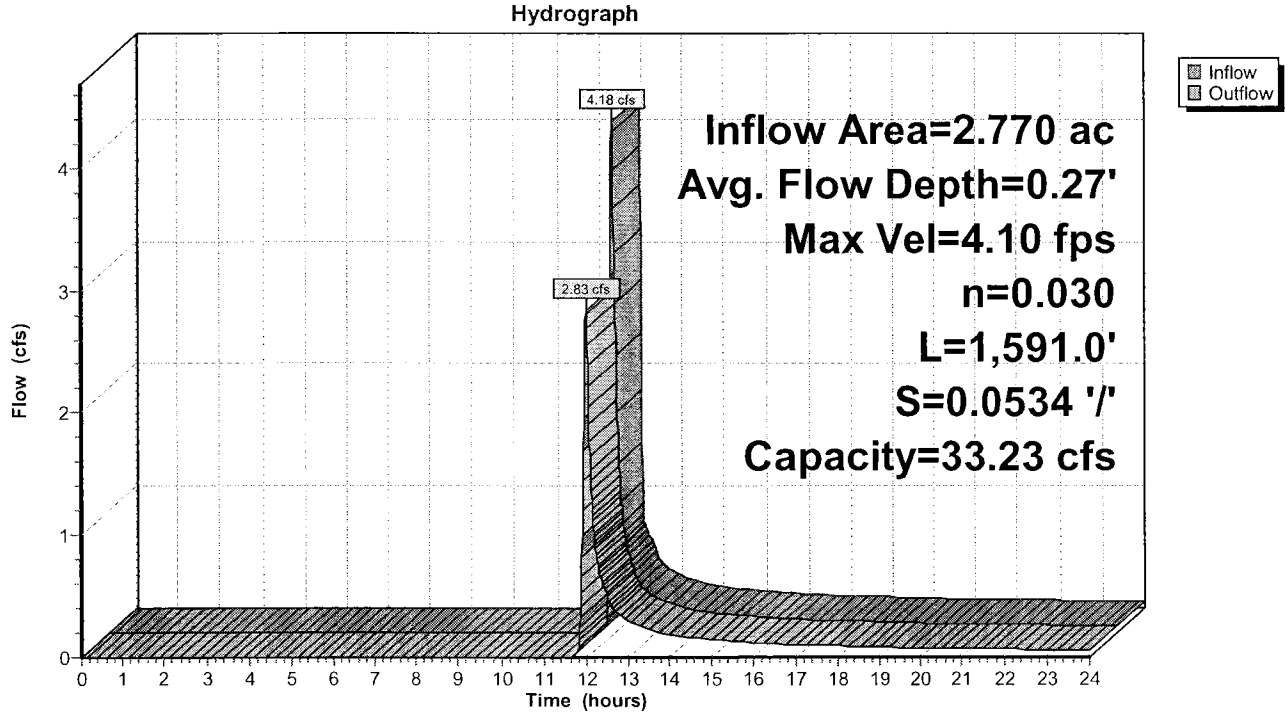
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.10 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 19.2 min

Peak Storage= 1,098 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 33.23 cfs

2.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 6.00'
Length= 1,591.0' Slope= 0.0534 '/'
Inlet Invert= 884.00', Outlet Invert= 799.00'



Reach 64R: Channel C



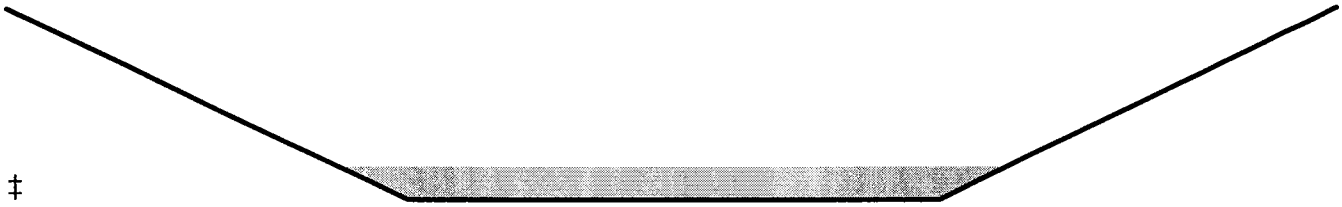
Summary for Reach 65R: Channel E

Inflow Area = 1.660 ac, 0.00% Impervious, Inflow Depth > 0.78" for 25yr/24hr NOAA event
Inflow = 2.22 cfs @ 11.97 hrs, Volume= 0.107 af
Outflow = 1.58 cfs @ 12.03 hrs, Volume= 0.106 af, Atten= 29%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.02 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 20.3 min

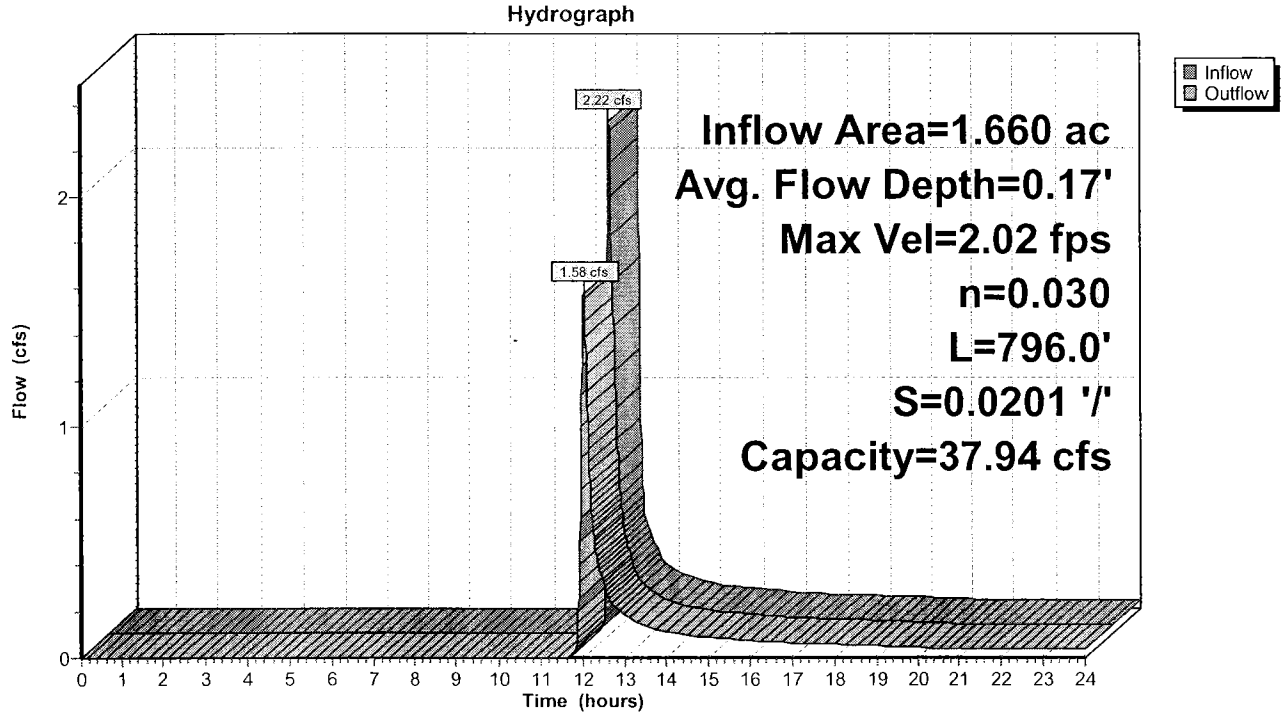
Peak Storage= 624 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 37.94 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 796.0' Slope= 0.0201 '/'
Inlet Invert= 832.00', Outlet Invert= 816.00'



‡

Reach 65R: Channel E



Summary for Reach 68R: Channel F Reach 1

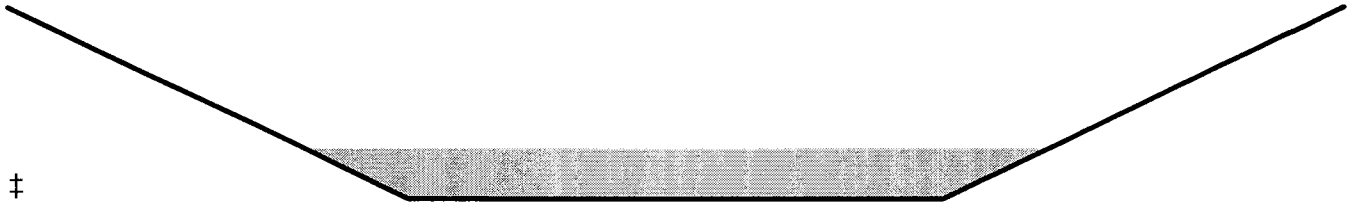
Inflow Area = 3.370 ac, 0.00% Impervious, Inflow Depth > 0.78" for 25yr/24hr NOAA event
Inflow = 4.26 cfs @ 11.99 hrs, Volume= 0.218 af
Outflow = 3.96 cfs @ 12.01 hrs, Volume= 0.217 af, Atten= 7%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.15 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 8.0 min

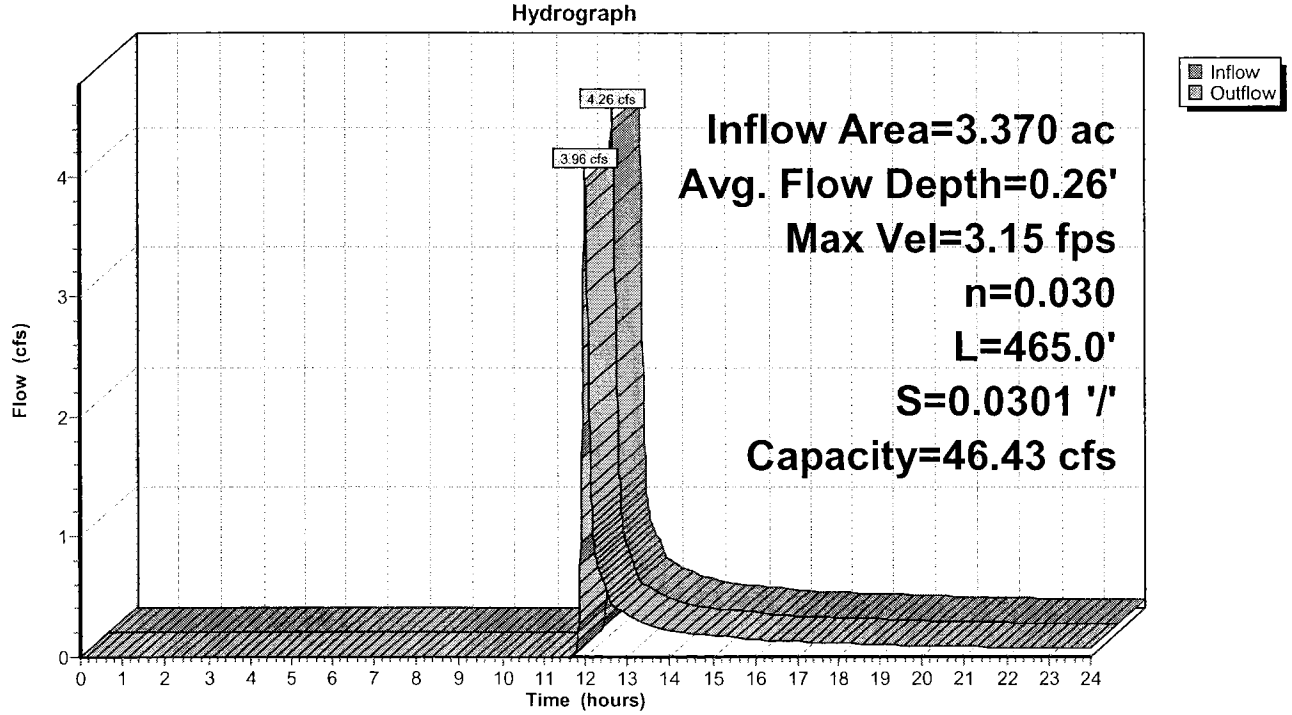
Peak Storage= 584 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 46.43 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 465.0' Slope= 0.0301 '/'
Inlet Invert= 832.00', Outlet Invert= 818.00'

‡



Reach 68R: Channel F Reach 1



Summary for Reach 69R: Channel F Reach 2

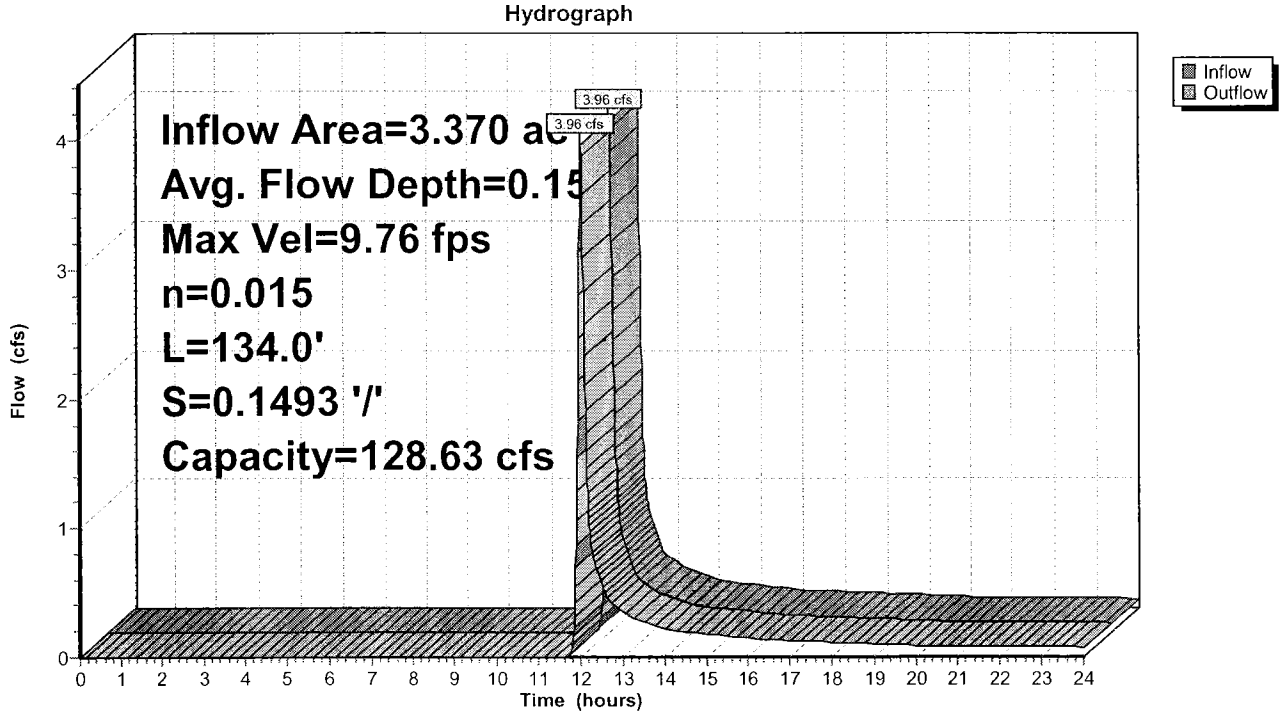
Inflow Area = 3.370 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 3.96 cfs @ 12.01 hrs, Volume= 0.217 af
Outflow = 3.96 cfs @ 12.02 hrs, Volume= 0.217 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.76 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.94 fps, Avg. Travel Time= 0.8 min

Peak Storage= 54 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 128.63 cfs

2.50' x 1.00' deep channel, n= 0.015
Side Slope Z-value= 2.0 '/' Top Width= 6.50'
Length= 134.0' Slope= 0.1493 '/'
Inlet Invert= 818.00', Outlet Invert= 798.00'

Reach 69R: Channel F Reach 2



Summary for Reach 66R: Northeast Berm Channel 3 Stage 5

Inflow Area = 4.080 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 1.69 cfs @ 12.48 hrs, Volume= 0.259 af
Outflow = 1.68 cfs @ 12.52 hrs, Volume= 0.258 af, Atten= 1%, Lag= 2.6 min

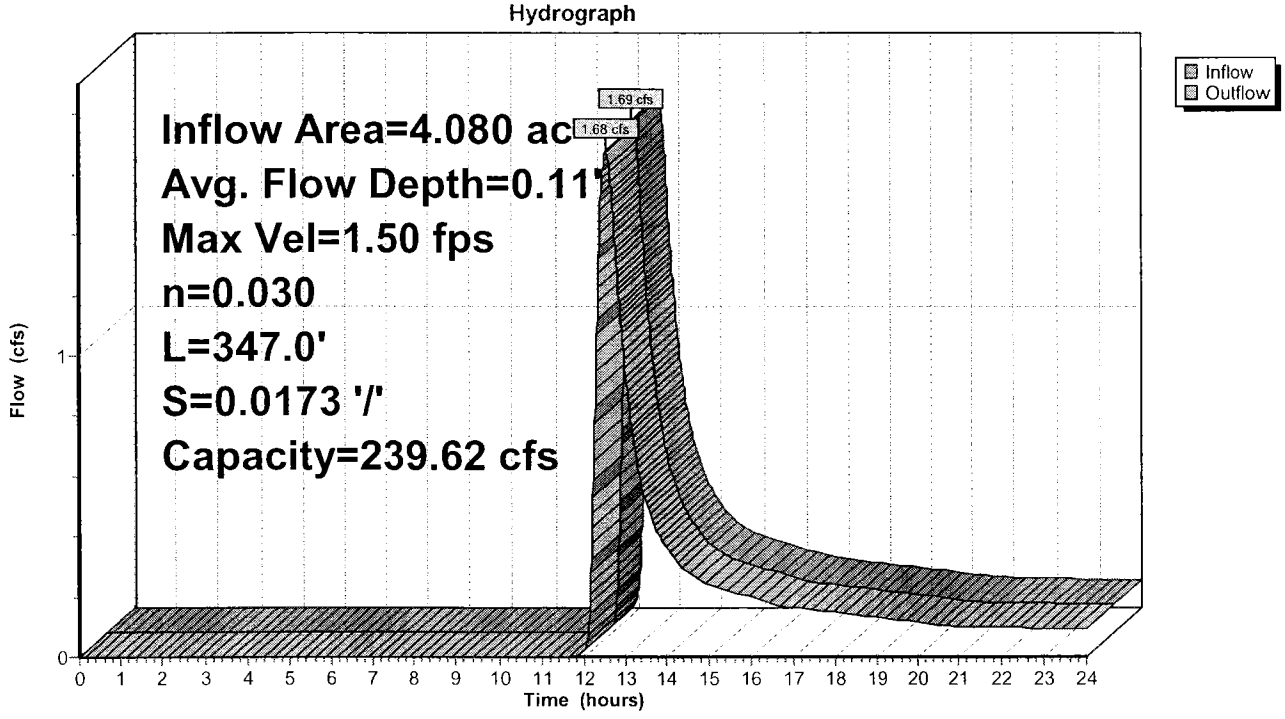
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.50 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 8.7 min

Peak Storage= 387 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 239.62 cfs

9.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 19.50'
Length= 347.0' Slope= 0.0173 '/'
Inlet Invert= 814.00', Outlet Invert= 808.00'

‡

Reach 66R: Northeast Berm Channel 3 Stage 5



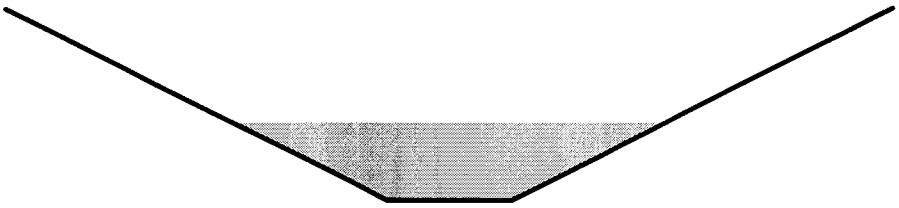
Summary for Reach 22R: Clean water diversion ditch

Inflow Area = 52.858 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 41.97 cfs @ 12.11 hrs, Volume= 3.389 af
Outflow = 41.68 cfs @ 12.13 hrs, Volume= 3.384 af, Atten= 1%, Lag= 0.8 min

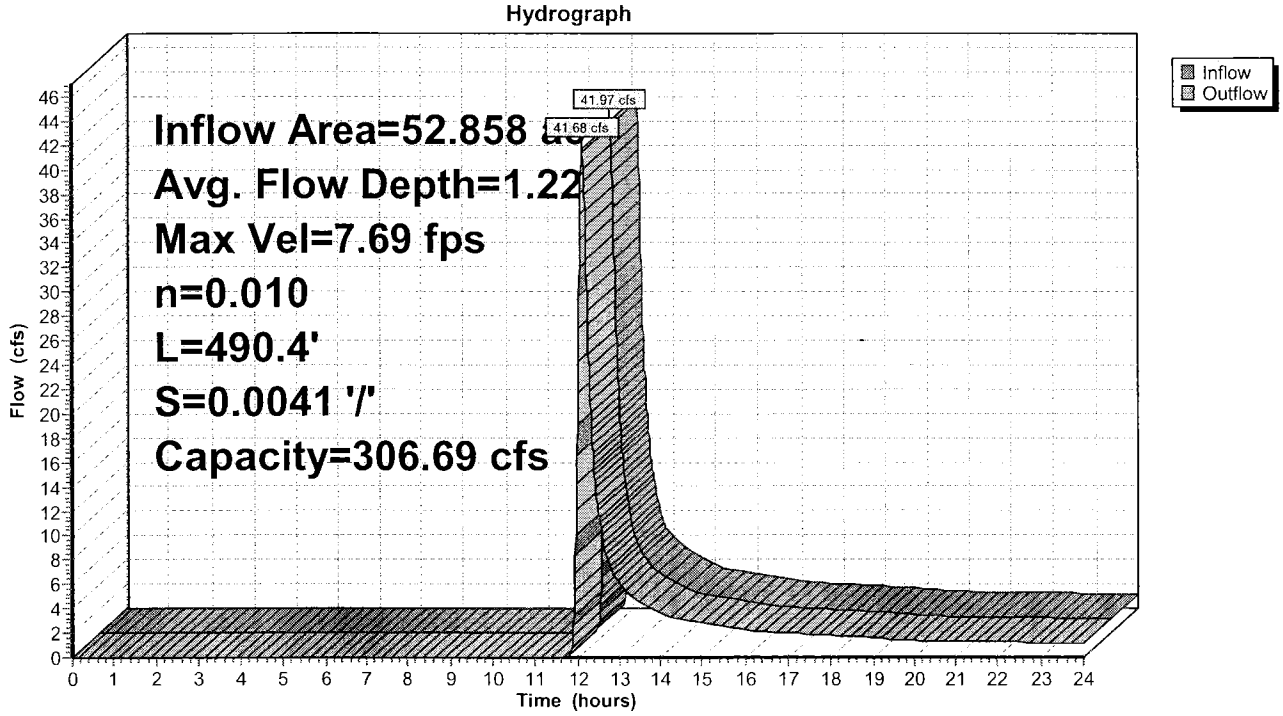
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.69 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 3.39 fps, Avg. Travel Time= 2.4 min

Peak Storage= 2,658 cf @ 12.13 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 306.69 cfs

2.00' x 3.00' deep channel, n= 0.010
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 490.4' Slope= 0.0041 '/'
Inlet Invert= 777.00', Outlet Invert= 774.99'



Reach 22R: Clean water diversion ditch



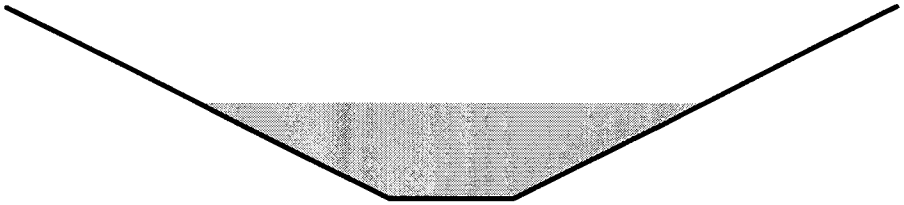
Summary for Reach 29R: Clean water diversion ditch

Inflow Area = 55.168 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 43.47 cfs @ 12.12 hrs, Volume= 3.533 af
Outflow = 42.44 cfs @ 12.15 hrs, Volume= 3.524 af, Atten= 2%, Lag= 1.6 min

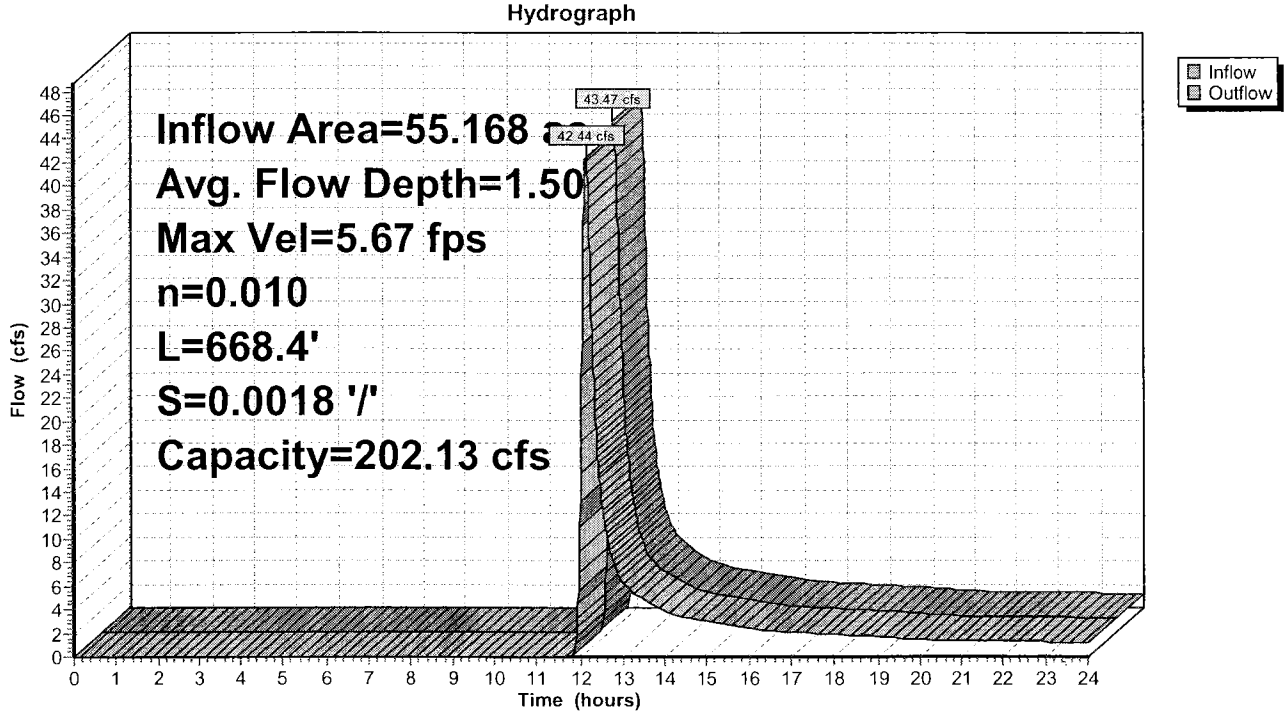
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.67 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.57 fps, Avg. Travel Time= 4.3 min

Peak Storage= 5,002 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 202.13 cfs

2.00' x 3.00' deep channel, n= 0.010 PVC, smooth interior
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 668.4' Slope= 0.0018 '/'
Inlet Invert= 774.99', Outlet Invert= 773.80'



Reach 29R: Clean water diversion ditch



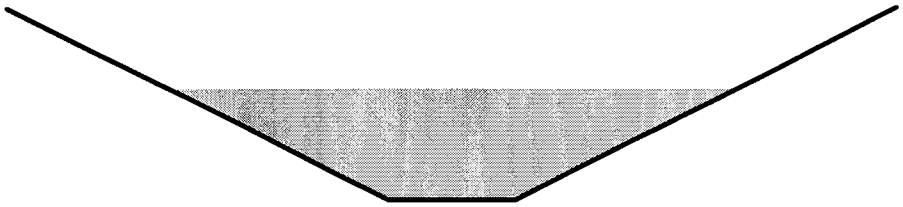
Summary for Reach 31R: Clean water diversion ditch

Inflow Area = 63.278 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 48.63 cfs @ 12.15 hrs, Volume= 4.046 af
Outflow = 41.43 cfs @ 12.22 hrs, Volume= 4.018 af, Atten= 15%, Lag= 4.5 min

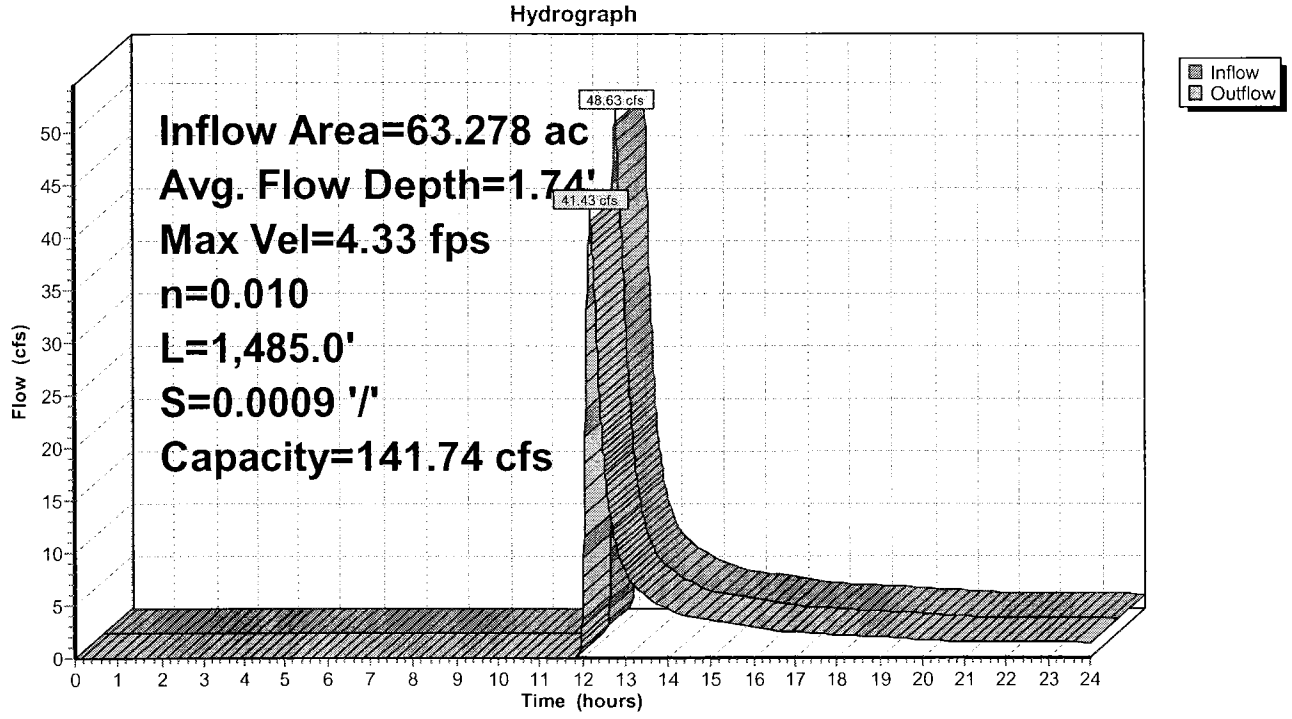
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.33 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 2.09 fps, Avg. Travel Time= 11.9 min

Peak Storage= 14,213 cf @ 12.22 hrs
Average Depth at Peak Storage= 1.74'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 141.74 cfs

2.00' x 3.00' deep channel, n= 0.010
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 1,485.0' Slope= 0.0009 '/'
Inlet Invert= 773.80', Outlet Invert= 772.50'



Reach 31R: Clean water diversion ditch



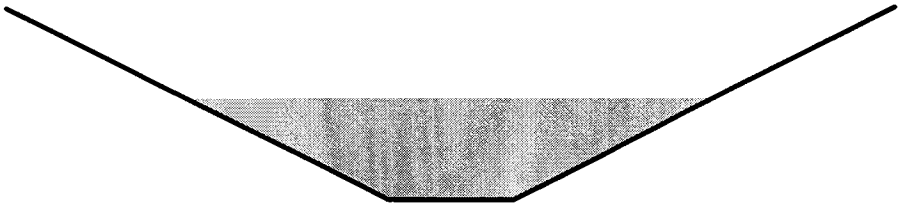
Summary for Reach 21R: Clean water diversion ditch

Inflow Area = 52.280 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 45.53 cfs @ 12.07 hrs, Volume= 3.368 af
Outflow = 41.84 cfs @ 12.11 hrs, Volume= 3.352 af, Atten= 8%, Lag= 2.7 min

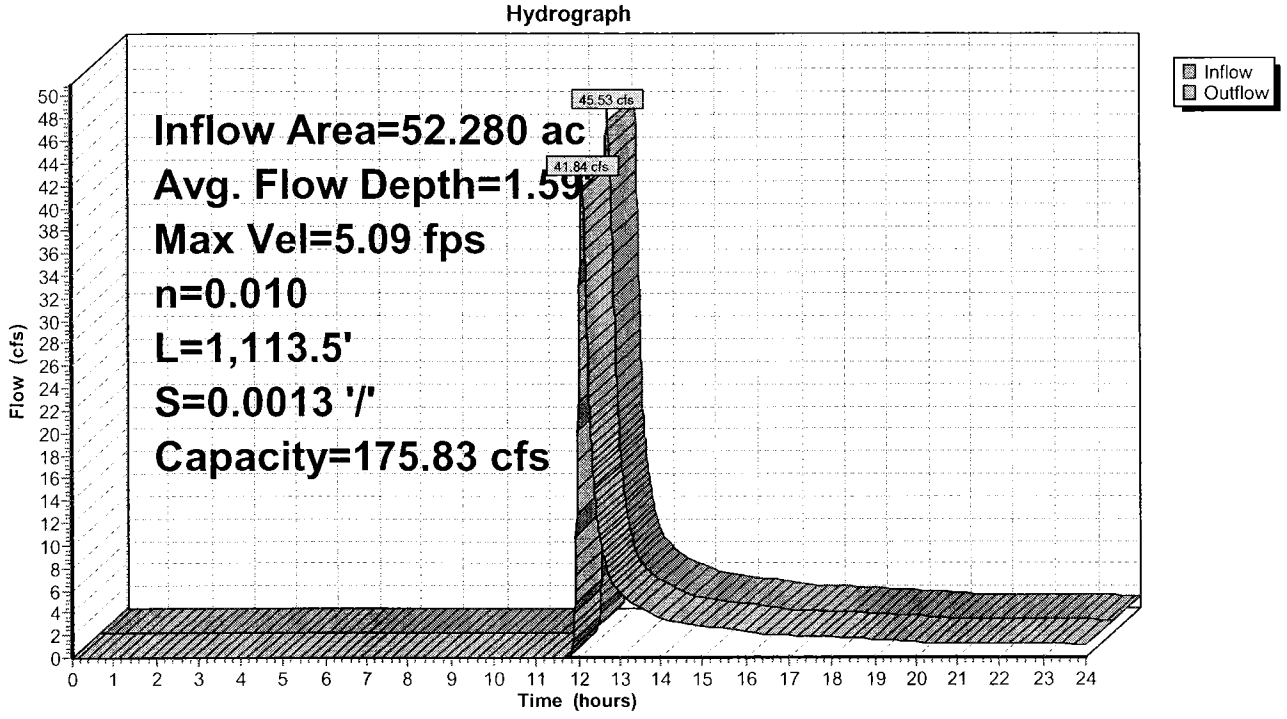
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.09 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 8.1 min

Peak Storage= 9,145 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.59'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 175.83 cfs

2.00' x 3.00' deep channel, n= 0.010 PVC, smooth interior
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 1,113.5' Slope= 0.0013 '/'
Inlet Invert= 778.50', Outlet Invert= 777.00'



Reach 21R: Clean water diversion ditch



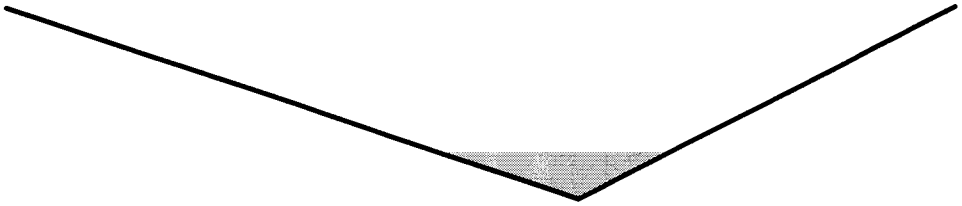
Summary for Reach 61R: East Berm Channel 11 Stage 6

Inflow Area = 2.640 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 1.13 cfs @ 12.44 hrs, Volume= 0.168 af
Outflow = 1.12 cfs @ 12.46 hrs, Volume= 0.168 af, Atten= 0%, Lag= 1.6 min

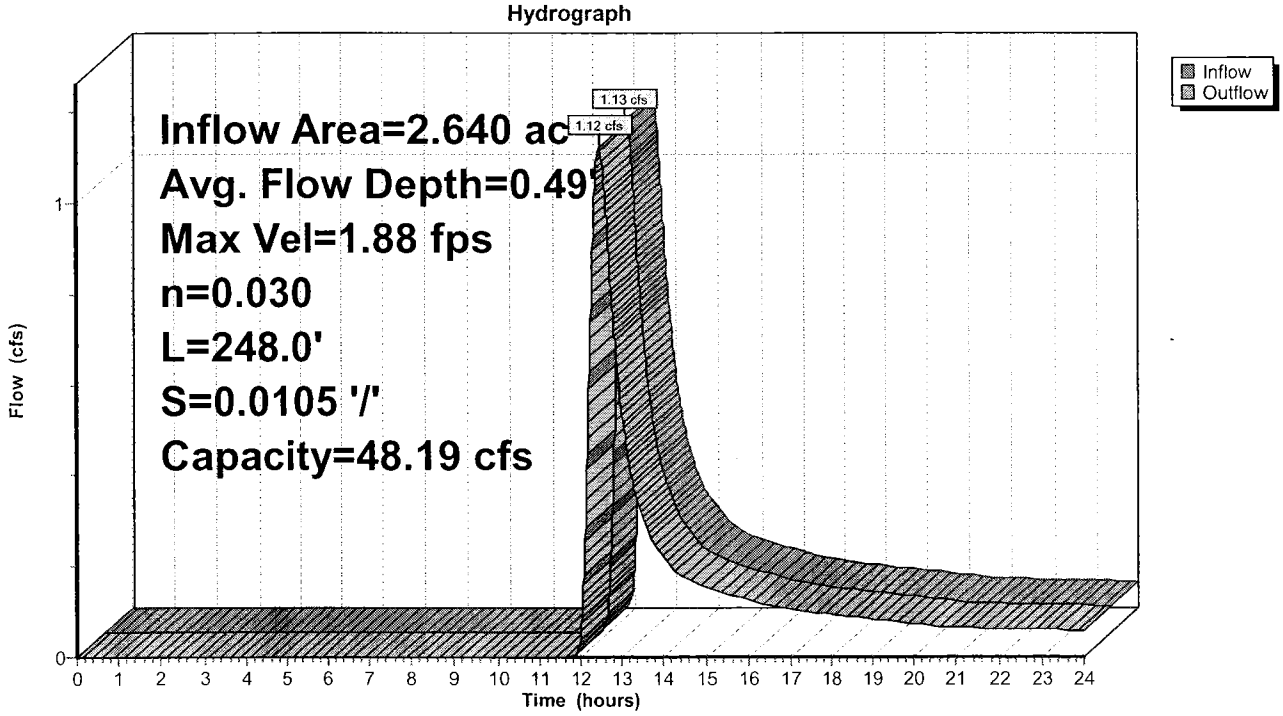
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 3.8 min

Peak Storage= 148 cf @ 12.46 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 48.19 cfs

0.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 10.00'
Length= 248.0' Slope= 0.0105 '/'
Inlet Invert= 826.00', Outlet Invert= 823.40'



Reach 61R: East Berm Channel 11 Stage 6



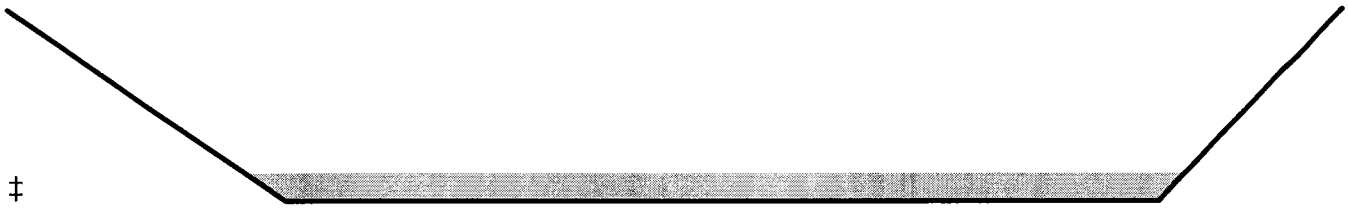
Summary for Reach 8R: South Berm Channel, Reach 1

Inflow Area = 6.430 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 2.57 cfs @ 12.36 hrs, Volume= 0.407 af
Outflow = 2.57 cfs @ 12.37 hrs, Volume= 0.406 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.77 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 3.7 min

Peak Storage= 253 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 67.57 cfs

9.50' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 14.50'
Length= 174.0' Slope= 0.0172 '/'
Inlet Invert= 805.00', Outlet Invert= 802.00'



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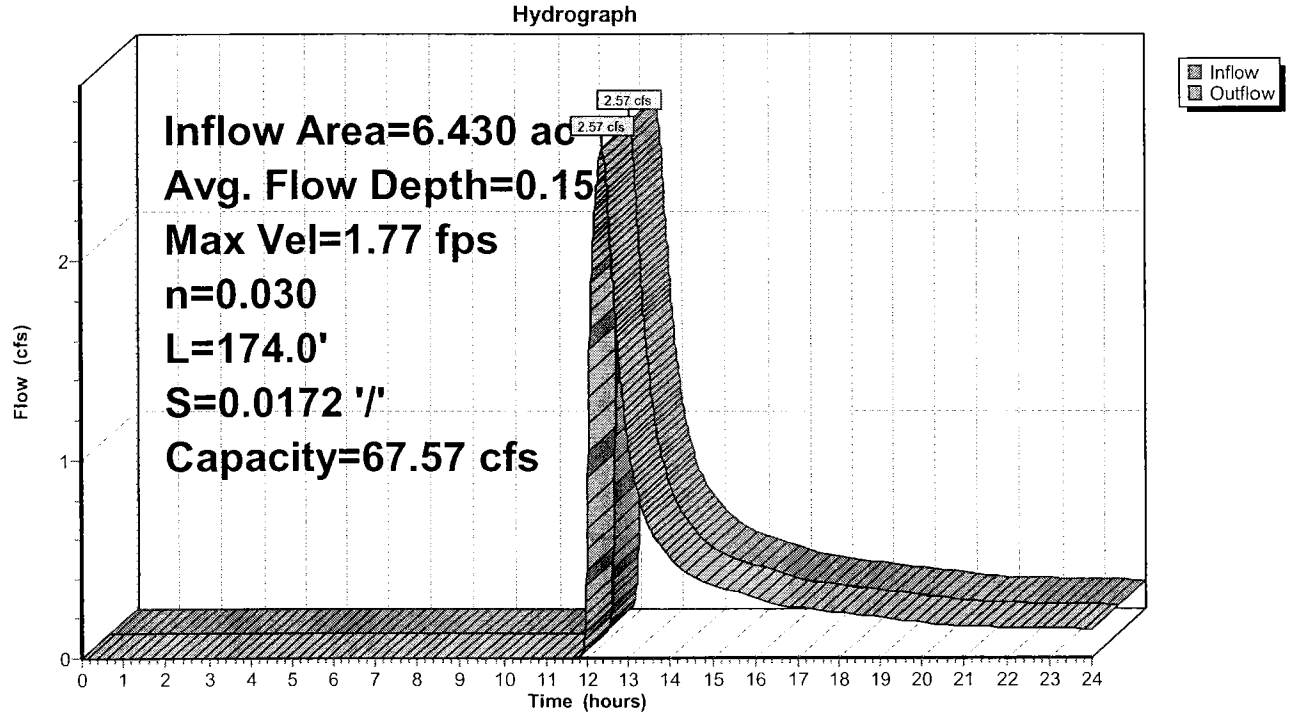
Reach 8R: South Berm Channel, Reach 1



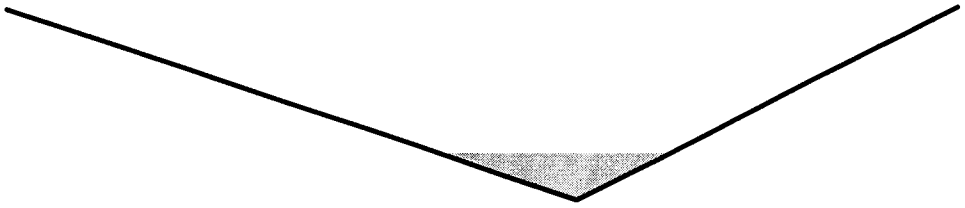
Summary for Reach 9R: East Berm Channel 10 Stage 6

Inflow Area = 2.350 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 1.15 cfs @ 12.35 hrs, Volume= 0.150 af
Outflow = 1.09 cfs @ 12.42 hrs, Volume= 0.149 af, Atten= 5%, Lag= 4.2 min

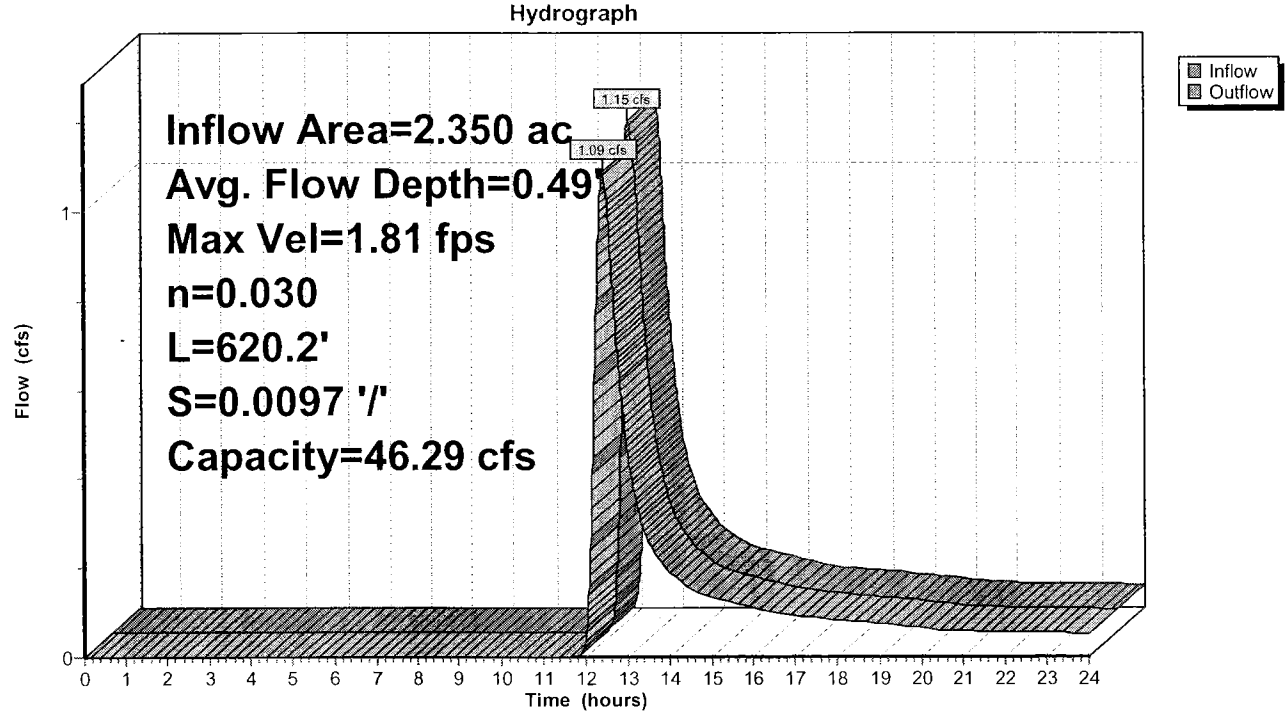
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.81 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 10.2 min

Peak Storage= 373 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 46.29 cfs

0.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 10.00'
Length= 620.2' Slope= 0.0097 '/'
Inlet Invert= 826.00', Outlet Invert= 820.00'



Reach 9R: East Berm Channel 10 Stage 6



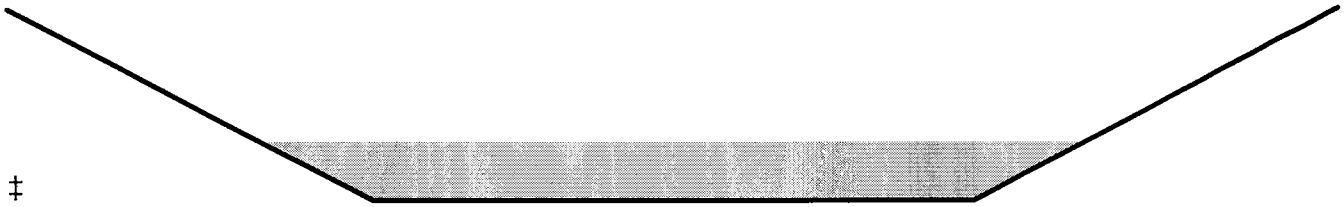
Summary for Reach 10R: North Berm Channel 1 Stage 5

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 4.04 cfs @ 12.38 hrs, Volume= 0.560 af
Outflow = 3.70 cfs @ 12.50 hrs, Volume= 0.553 af, Atten= 8%, Lag= 7.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 8.6 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 19.0 min

Peak Storage= 1,915 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 31.43 cfs

5.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 1,050.0' Slope= 0.0100 '/'
Inlet Invert= 808.00', Outlet Invert= 797.50'



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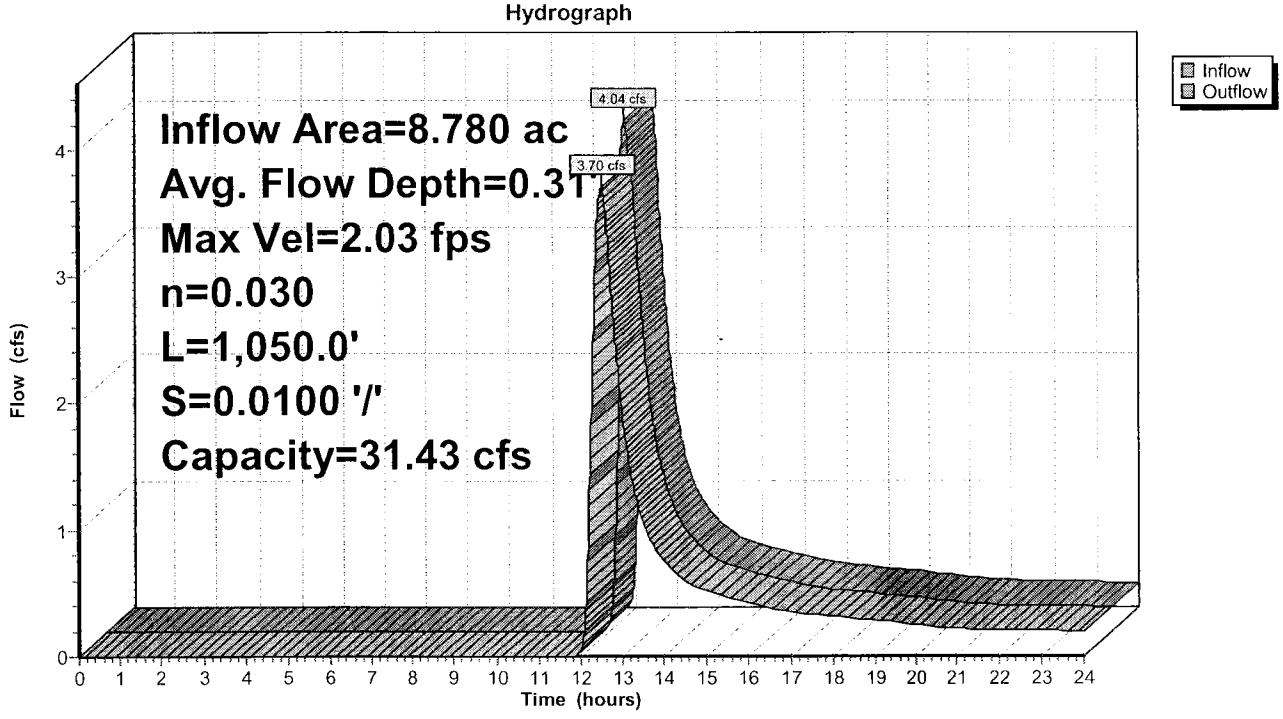
Reach 10R: North Berm Channel 1 Stage 5



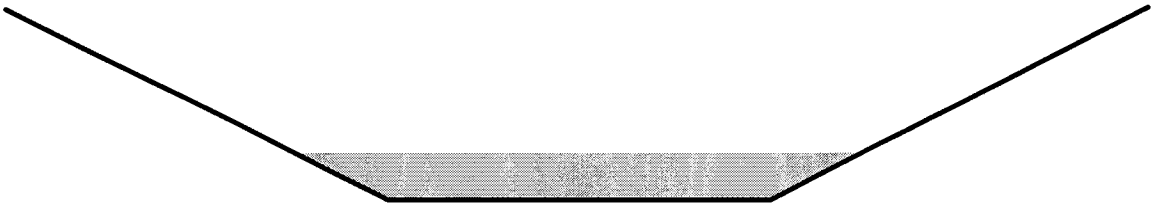
Summary for Reach 16R: Junction

Inflow Area = 67.318 ac, 0.00% Impervious, Inflow Depth > 0.76" for 25yr/24hr NOAA event
Inflow = 42.94 cfs @ 12.22 hrs, Volume= 4.278 af
Outflow = 42.94 cfs @ 12.22 hrs, Volume= 4.278 af, Atten= 0%, Lag= 0.1 min

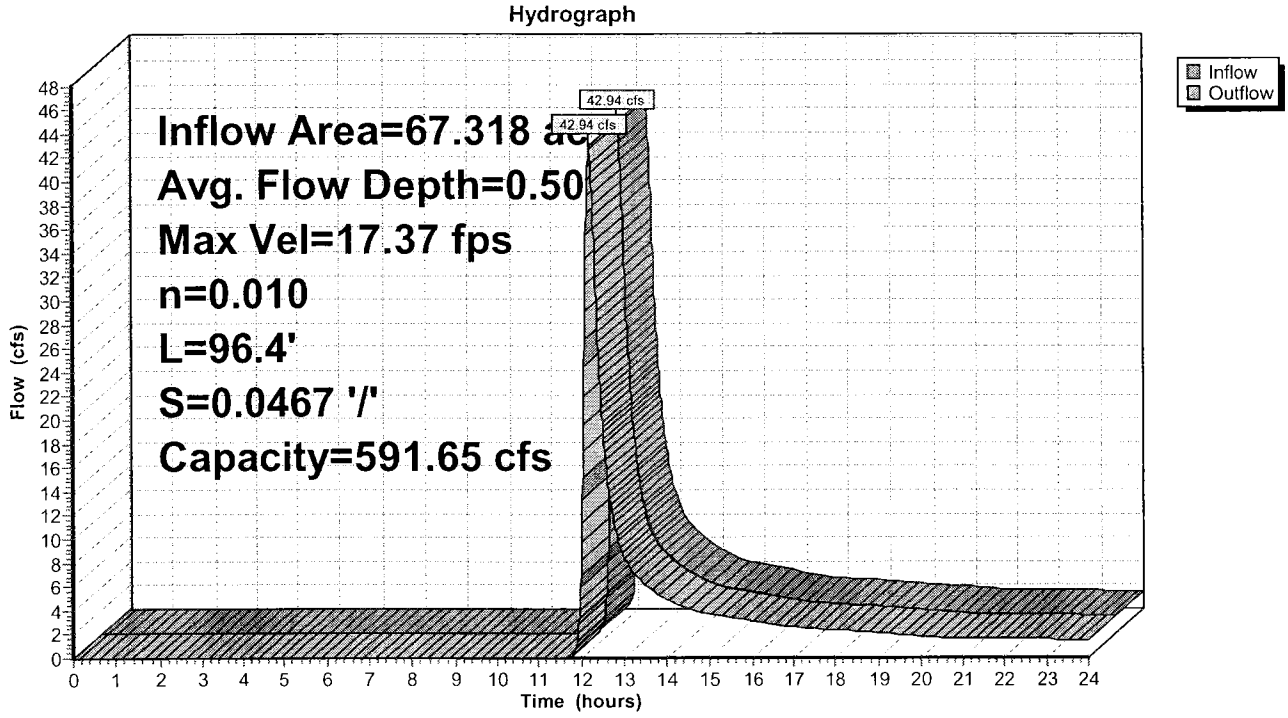
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 17.37 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.92 fps, Avg. Travel Time= 0.2 min

Peak Storage= 238 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 591.65 cfs

4.00' x 2.00' deep channel, n= 0.010
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 96.4' Slope= 0.0467 '/'
Inlet Invert= 772.50', Outlet Invert= 768.00'



Reach 16R: Junction



Summary for Reach 5R: South Berm Channel, Reach 2

Inflow Area = 2.240 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 2.49 cfs @ 12.02 hrs, Volume= 0.145 af
Outflow = 1.24 cfs @ 12.13 hrs, Volume= 0.141 af, Atten= 50%, Lag= 6.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.12 fps, Min. Travel Time= 15.4 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 40.0 min

Peak Storage= 1,152 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 50.55 cfs

9.50' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 14.50'
Length= 1,036.0' Slope= 0.0097 '/'
Inlet Invert= 815.00', Outlet Invert= 805.00'

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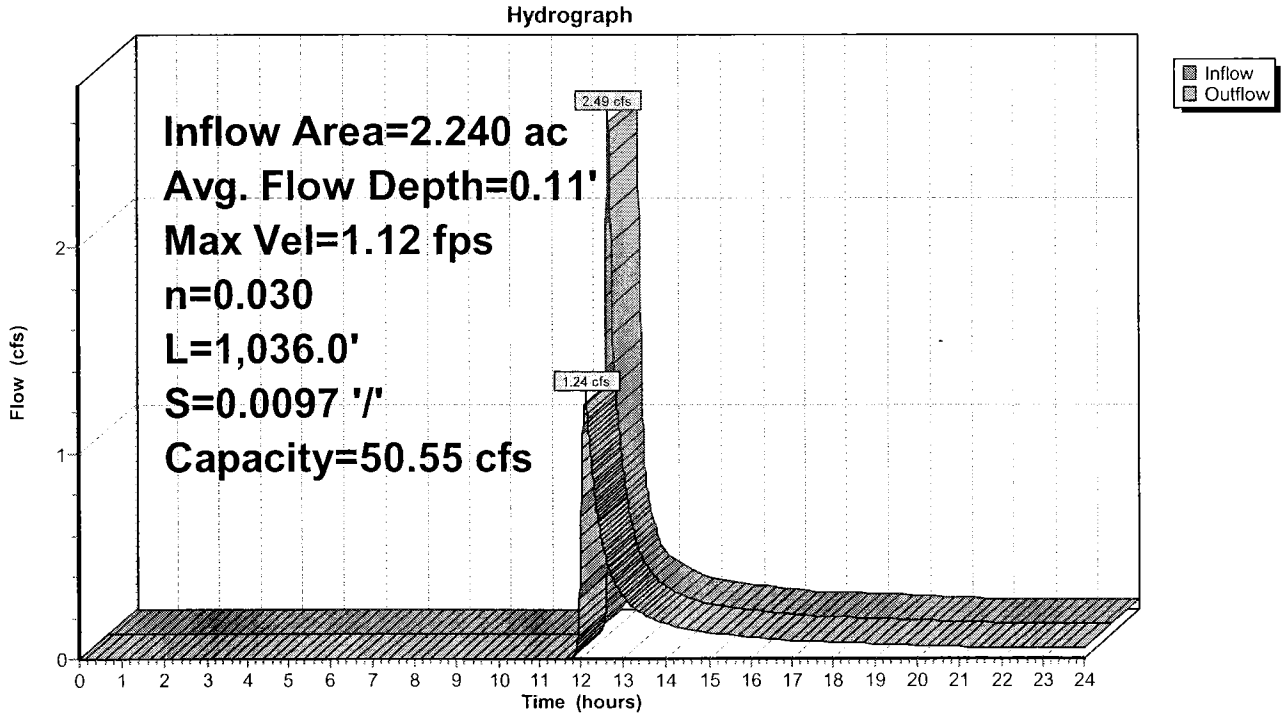
Reach 5R: South Berm Channel, Reach 2



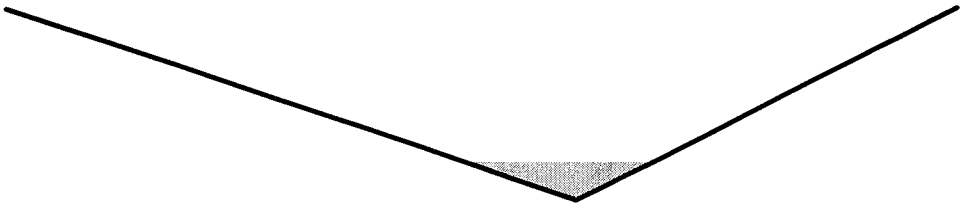
Summary for Reach 2R: South Berm Channel 10 Stage 6

Inflow Area = 1.400 ac, 0.00% Impervious, Inflow Depth > 0.77" for 25yr/24hr NOAA event
Inflow = 0.66 cfs @ 12.36 hrs, Volume= 0.089 af
Outflow = 0.65 cfs @ 12.39 hrs, Volume= 0.089 af, Atten= 1%, Lag= 1.6 min

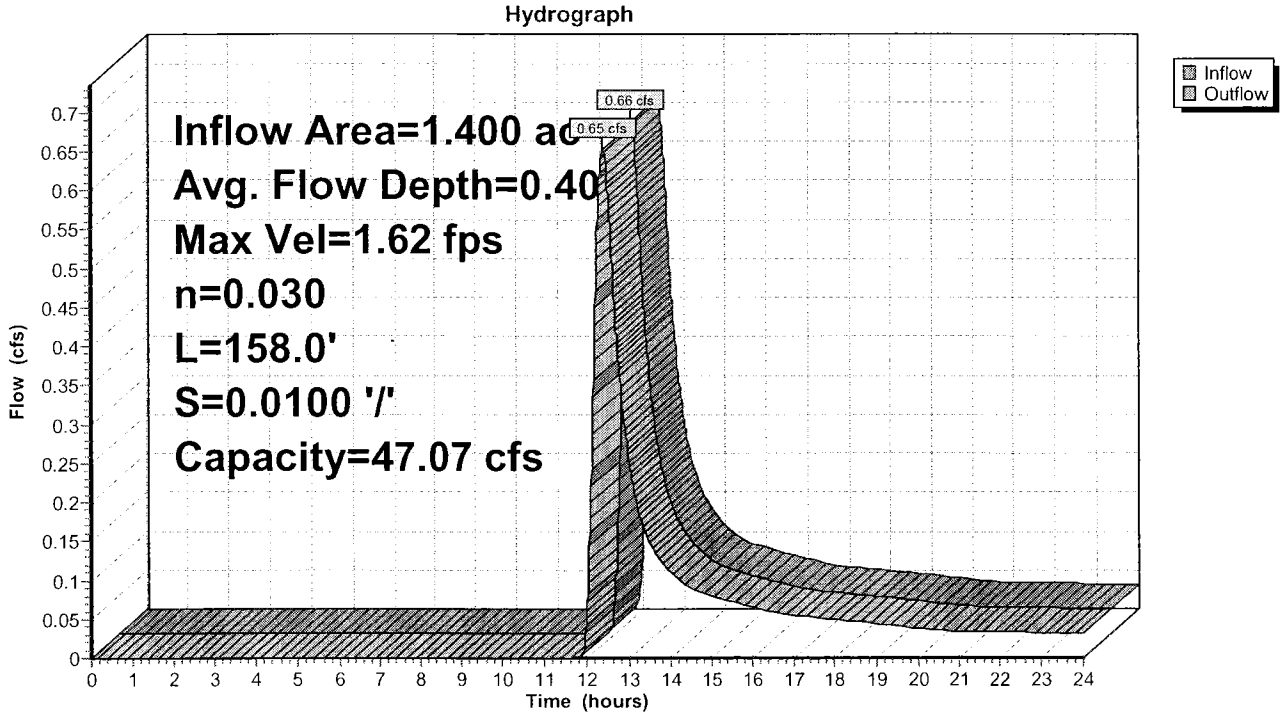
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 2.9 min

Peak Storage= 64 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 47.07 cfs

0.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 10.00'
Length= 158.0' Slope= 0.0100 '/'
Inlet Invert= 821.58', Outlet Invert= 820.00'



Reach 2R: South Berm Channel 10 Stage 6



Summary for Pond 11P: Designed Sed Pond

Inflow Area = 133.348 ac, 0.00% Impervious, Inflow Depth > 0.75" for 25yr/24hr NOAA event
Inflow = 57.25 cfs @ 12.23 hrs, Volume= 8.386 af
Outflow = 7.36 cfs @ 15.35 hrs, Volume= 5.438 af, Atten= 87%, Lag= 187.0 min
Primary = 7.36 cfs @ 15.35 hrs, Volume= 5.438 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 763.35' @ 15.35 hrs Surf.Area= 2.964 ac Storage= 3.932 af

Plug-Flow detention time= 285.0 min calculated for 5.438 af (65% of inflow)
Center-of-Mass det. time= 158.0 min (1,071.7 - 913.7)

Volume	Invert	Avail.Storage	Storage Description
#1	762.00'	18.485 af	**Sed Pond (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
762.00	2.870	0.000	0.000
763.00	2.940	2.905	2.905
764.00	3.010	2.975	5.880
765.00	3.080	3.045	8.925
766.00	3.150	3.115	12.040
767.00	3.220	3.185	15.225
768.00	3.300	3.260	18.485

Device	Routing	Invert	Outlet Devices
#1	Primary	762.00'	**24.0" Round Barrel** L= 50.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 762.00' / 761.50' S= 0.0100 '/' Cc= 0.900 n= 0.015
#2	Device 1	762.50'	**6.0" Vert. Perf Riser X 8.00 columns** X 3 rows with 6.0" cc spacing C= 0.600
#3	Device 1	764.90'	**24.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	765.40'	**Emergency Spillway, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.60 Width (feet) 100.00 102.40

Primary OutFlow Max=7.36 cfs @ 15.35 hrs HW=763.35' (Free Discharge)
└**1=Barrel** (Barrel Controls 7.36 cfs @ 4.62 fps)
  ├**2=Perf Riser** (Passes 7.36 cfs of 8.19 cfs potential flow)
  └**3=Top of Riser** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=762.00' (Free Discharge)
└**4=Emergency Spillway** (Controls 0.00 cfs)

Pond 11P: Designed Sed Pond