

COPY

APPLICATION FOR COAL PERMIT PROCESSING

C/007/0045 Incoming

#3715

OK

Permit Change New Permit Renewal Exploration Bond Release Transfer

Permittee: COVOL Engineered Fuels, LC

Mine: Wellington Dry Coal Cleaning Facility

Permit Number: C/007/0045

Title: Submittal of updated Plates 5-1 and 7-2 and Chapters 2 and 7

Description, Include reason for application and timing required to implement:

FINAL submittal of updated plates and chapters as requested by Pete Hess, UDOGM Inspector.

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

- Yes No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ increase decrease.
- Yes No 2. Is the application submitted as a result of a Division Order? DO# _____
- Yes No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
- Yes No 4. Does the application include operations in hydrologic basins other than as currently approved?
- Yes No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
- Yes No 6. Does the application require or include public notice publication?
- Yes No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
- Yes No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
- Yes No 9. Is the application submitted as a result of a Violation? NOV # _____
- Yes No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
- Yes No 11. Does the application affect the surface landowner or change the post mining land use?
- Yes No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
- Yes No 13. Does the application require or include collection and reporting of any baseline information?
- Yes No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
- Yes No 15. Does the application require or include soil removal, storage or placement?
- Yes No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
- Yes No 17. Does the application require or include construction, modification, or removal of surface facilities?
- Yes No 18. Does the application require or include water monitoring, sediment or drainage control measures?
- Yes No 19. Does the application require or include certified designs, maps or calculation?
- Yes No 20. Does the application require or include subsidence control or monitoring?
- Yes No 21. Have reclamation costs for bonding been provided?
- Yes No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
- Yes No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

John R Shaal
Print Name

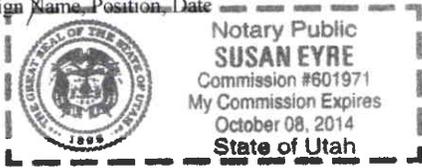
John R Shaal
Sign Name, Position, Date

Subscribed and sworn to before me this 14th day of February, 2011

Susan Eyre
Notary Public

My commission Expires: Oct. 8, 2014;

Attest: State of Utah } ss:
County of Salt Lake



<p>For Office Use Only:</p> <p>File in:</p> <p><input type="checkbox"/> Confidential</p> <p><input type="checkbox"/> Shelf</p> <p><input checked="" type="checkbox"/> Expandable</p> <p>Date Folder <u>02/16/2011</u> C/0070045</p> <p>See: <u>Incoming</u> For additional</p>	<p>Assigned Tracking Number:</p>	<p>Received by Oil, Gas & Mining</p> <p>RECEIVED</p> <p>FEB 16 2011</p> <p>DIV. OF OIL, GAS & MINING</p>
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2.3.1.4 Construction, Modification, Use, and Maintenance of Topsoil Stockpiles

The two topsoil storage piles at the facility were constructed in August 2005 and consist of approximately 500 cubic yards of soil that was removed from the ground surface during site grading prior to constructing the facility. Since the topsoil averaged less than six inches thick, it was not segregated before it was stockpiled. The stockpiled materials were initially placed on a stable surface in the southeast portion of the permit area but were then moved in October 2010 to the location indicated on Plate 5-1 to accommodate site activities. The stockpiles were protected from wind and water erosion by being revegetated on November 18, 2010 with the seed mix contained in Table 3-1 (minus *Eriogonum inflatum*, *Oenothera caespitosa*, and *Stipa hymenoides* due to a lack of availability at the time) and by installing silt fencing below the stockpiles to help trap sediment coming off the stockpiles. A marker has been placed on the piles to indicate that they contain topsoil. It is not anticipated that this topsoil will be moved or disturbed again until required for redistribution during final reclamation.

2.3.2 Topsoil and Subsoil Removal

2.3.2.1 Topsoil Removal and Segregation

It is not anticipated that additional soil disturbances will occur at the site. However, if such disturbances do occur, all topsoil thicker than 6 inches will be removed prior to disturbance as a separate layer from the subsoil, segregated, and stockpiled separately. Topsoil less than 6 inches thick will be removed according to Section 2.3.2.3.

2.3.2.2 Poor Topsoil

Topsoil that is of an insufficient quantity or of poor quality (for sustaining vegetation) will be removed as a separate layer and segregated. Such operations will be done with approval of DOGM and in compliance with R614-301-233.100.

2.3.2.3 Thin Topsoil

Topsoil to be removed that is less than 6 inches thick will be removed with the immediately underlying unconsolidated materials. This material mixture will be treated as topsoil.

2.3.3 Topsoil Substitutes and Supplements

2.3.3.1 Overburden Materials Supplementing and/or Replacing Topsoil

No overburden materials will be used in site reclamation.

2.3.3.2 Suitability of Topsoil Substitutes and Supplements

No topsoil substitutes or supplements are planned for use at the facility.

2.3.3.3 Physical and Chemical Analyses

No topsoil substitutes or supplements are planned for use at the facility. Hence, no physical or chemical analyses of substitute material are anticipated.

2.3.3.4 Testing of Substitute Topsoil

Since it will not be used at the site, no testing of substitute topsoil is anticipated.

2.3.4 Topsoil Storage

2.3.4.1 Topsoil Stockpiling

Topsoil that was removed from the area during site grading is stored in two on-site stockpiles (Section 2.3.1.4). Any topsoil removed from the site in the future will be stockpiled for later use in reclamation operations when it is impractical to promptly redistribute the topsoil on regraded areas.

2.3.4.2 Stockpiled Topsoil

Stable Stockpile Site. The topsoil removed from the site is stored in two small stockpiles (approximately 5,500 square feet each), located in a stable area in the southern portion of the permit area.

Protection from Contaminants and Compaction. Stockpiled topsoil will be located in areas away from traffic that might introduce contaminants and unnecessary compaction.

Wind and Water Erosion Protection. The topsoil stockpile will be protected from wind and water erosion by prompt establishment and maintenance of a vegetative cover. Silt fencing will be installed below the stockpile to help trap sediment runoff from the stockpile.

Topsoil Redistribution. No stockpiled topsoil will be moved until redistributed during reclamation operations unless approved by DOGM.

2.3.4.3 Topsoil Stockpile Relocation

Stockpiled topsoil in jeopardy of being detrimentally affected in terms of its quantity and quality by facility operations may be temporarily redistributed.

Host Site. Topsoil relocation may occur provided that such action does not permanently adversely affect topsoil of the host site.

Topsoil Suitability. Topsoil relocation may occur provided the topsoil is retained in a condition more suitable for redistribution than if stockpiled.

2.40 Reclamation Plan

2.4.1 General Requirements

Topsoil redistribution, amendments, and stabilization are discussed below.

2.4.2 Soil Redistribution

2.4.2.1 Soil Redistribution Practices

Under the industrial post-operation land-use scenario, the extent of the future redistribution of soil resources following facility shutdown is not currently known. However, for the sake of

around the site. Thus, the watersheds that drain the facility consist only of disturbed areas. The watershed contributing to the east sedimentation pond has been divided into five sub-watersheds which total 17.4 acres in area. The watershed contributing to the west sedimentation pond has been divided into three sub-watersheds which total 7.0 acres in area. The remaining 5.6 acres of the site are situated along the edges of the facility, outside of the diversion ditches, and is not disturbed. All of the area within the watersheds reporting to the ditches and the sedimentation ponds has been considered to be disturbed in the hydrology calculations.

The size and location of each existing diversion ditch and culvert were mapped using an aerial photograph of the site and verified in the field. All diversions are shown on Plate 7-2. The capacity and freeboard of each diversion ditch were determined based on the minimum ditch slope, while the maximum velocity and need for erosion protection were verified based on the maximum ditch slope. The capacity of each culvert was determined using the minimum culvert slope and the outlet velocity and riprap protection was verified using the culvert outlet slope. Slopes were measured from a pre-construction contour map of the site. A description of the methods used to determine diversion capacities, flow velocities, and erosion protection requirements is presented in Appendix 7-6. All diversion calculations are presented in Appendix 7-8.

Diversion of Perennial and Intermittent Streams. There are no diversions of perennial or intermittent streams at the facility.

Diversion Ditches and Culverts. A summary table of the geometry, channel slope, peak discharge, erosion protection, maximum flow velocity and minimum depth values for each diversion ditch and culvert at the facility is presented in Table 7-3. Diversion hydrology calculations are detailed in Appendix 7-8. Each ditch and culvert has been constructed to non-erosively convey the peak flow resulting from the 25-year, 6-hour precipitation event and to contain the flow resulting from the 100-year, 6-hour precipitation event. A description of the diversion ditches and culverts within the facilities area is presented below and in Table 7-2. The ditches are named according to the watersheds that they drain. Ditches prefixed by the letter "E" ultimately

report to the east sedimentation pond, and ditches prefixed by the letter "W" ultimately report to the west sedimentation pond. Since some watersheds are drained by culverts instead of ditches, the ditches are not numbered strictly chronologically. Refer to Plate 7-2 for the locations of each watershed and diversion structure.

- **Ditch E-1 (Upper).** This ditch exists on the east edge of the permit area just within the permit area boundary. It conveys runoff from the northern portion and eastern edge of the site southward toward the east sedimentation pond. It begins at the outlet of culvert C-1 and continues to the outlet of culvert C-2.
- **Ditch E-1 (Lower).** This ditch conveys runoff southward from the outlet of culvert C-2 to culvert C-7 at the inlet of the east sedimentation pond.
- **Ditch E-3.** This ditch conveys runoff from the southeastern corner of the inner yard to the east sedimentation pond.
- **Ditch E-4.** This ditch conveys runoff southward from the region between the top of the truck dump hopper embankment and the road on the east edge of the permit area.
- **Ditch E-5.** This ditch conveys runoff eastward along the southern edge of the permit area toward the east sedimentation pond. It captures runoff from the eastern watershed of the inner yard that is not captured by ditch E-3.
- **Ditch W-1 (Upper).** This ditch runs along the west edge of the permit area. It conveys runoff from the northern portion and western edge of the site southward toward the west sedimentation pond. It begins just west of the northwest corner of the yard access road and extends to the outlet of culvert C-3.
- **Ditch W-1 (Lower).** This ditch runs from the outlet of culvert C-3 to culvert C-5 at the inlet of the west sedimentation pond. It conveys runoff from the W-1 (Upper) Ditch and the W-2 Ditch into the west sedimentation pond.
- **Ditch W-2.** This ditch runs on the east side of the silo and its access road, and drains the area located to the east. It drains into culvert C-3, which feeds into Ditch W-1 (Lower).
- **Ditch W-3.** This ditch conveys runoff westward along the southern edge of the permit area toward the west sedimentation pond. It captures runoff from the area south of the perimeter access road that drains toward the west sedimentation pond.

- **Culvert C-1.** This culvert conveys runoff from watershed E-2 under the truck turn-around road in the northeastern corner of the site. It provides drainage for the area enclosed by the road embankments for the yard perimeter road and the truck turn-around.
- **Culvert C-2.** This culvert conveys runoff under the road in the southeastern corner of the permit area. It provides drainage for the area enclosed by the road embankments for watershed E-4, including the yard perimeter road and the truck dump hopper.
- **Culvert C-3.** This culvert conveys runoff under the road in the southwestern corner of the permit area. It provides a route for drainage from Ditch W-2 to travel under the road and into Ditch W-1 (Lower).
- **Culvert C-4.** This culvert is installed within Ditch W-1 (Lower) to allow vehicular access into the area south of the Loop Road.
- **Culvert C-5.** This culvert is installed at the inlet to the west sedimentation pond. Riprap with a minimum median diameter of 6 inches has been installed at the outlet of this culvert to provide erosion protection.
- **Culvert C-6.** This culvert is installed beneath the southeast corner of the Loop Road and extends a sufficient distance to allow vehicular access from the east to the area south of the road.
- **Culvert C-7.** This culvert is installed at the inlet to the east sedimentation pond. Riprap with a minimum median diameter of 10 inches has been installed at this outlet of this culvert to provide erosions protection.

7.4.2.4 Road Drainage

Roads at the facility include an access road that leads from Ridge Road into the main yard, a road around the perimeter of the main yard, and a truck turnaround north of the main yard. All of the roads have been constructed to include adequate drainage control with the use of diversion ditches, culverts, and containment berms. None of the roads are located in the channel of an intermittent or perennial stream. All roads have been located to minimize downstream

TABLE 7-2

Summary of Sedimentation Pond Data

	East Pond	West Pond
Assumed bottom elevation (ft)	5,493.8	5,498.2
Assumed crest elevation (ft)	5,505.8	5,510.0
Total Storage Capacity (ft ³)	53,900	36,070
Calculated Annual Sediment Volume (ft ³)	333	134
10-Year, 24-Hour Precip. Runoff Volume (ft ³)	36,970	14,850
Sediment Storage Capacity (ft ³)	16,930	21,220
60% Sediment Storage Cleanout Volume (ft ³)	10,160	12,730
Sediment Cleanout Elevation (ft)	5,498.6	5,505.4
Peak Stage of 10-Year, 24-Hour Precipitation Event Plus 60% Sediment Storage Capacity (ft)	5,503.0	5,506.4
Invert elevation of 3-foot wide armored spillway (ft)	5,503.7	5,508.0
Peak Pond Inflow Due to 25-Year, 6-Hour Precipitation Event (cfs)	9.24	2.70
Peak Pond Outflow due to 25-Year, 6-Hour Precipitation Event (cfs)	2.26	0.29
Peak Pond Outflow Velocity due to 25-Year, 6-Hour Precipitation Event (fps)	2.0	0.8
Peak Stage of 25-Year, 6-Hour Precipitation Event Following a 10-Year, 24-Hour Precipitation Event with Pond Full to 60% of Sediment Storage Capacity (ft)	5,504.3	5,508.1

Notes:

- Refer to Appendix 7-7 for calculations related to sedimentation pond design
- Pond dimensions were surveyed by EIS Environmental and Engineering Consulting in November 2007. Absolute elevations were assumed by superimposing the survey data on the pre-construction topography provided by Mine and Mill Engineering. Each pond has a berm extending approximately 2 ft above the ground surface.

TABLE 7-3

Summary of Drainage Ditch and Culvert Data

Structure	Description	Peak Flow (cfs) ^(a)	Max. Flow Depth (ft) ^(b)	Max. Flow Velocity (fps) ^(c)	Required Riprap D ₅₀ (in)
Ditches					
E-1 Upper	Triangular, 1:1 sides, 1.5' deep	1.75	0.91	2.57	None
E-1 Lower	Triangular, 1.5:1 sides, 1.5' deep	1.75	0.73	2.62	None
E-3	Trapezoidal, 2.5:1 left, 1:1 right, 0.5' bottom, 1.5' deep	4.80	0.84	3.41	None
E-4	Triangular, 2:1 left, 1:1 right, 1.2' deep	1.16	0.60	2.12	None
E-5	Triangular, 4:1 sides, 1.0' deep	4.98	0.76	3.40	None
W-1 Upper	Triangular, 2:1 sides, 2.0' deep	1.50	0.65	2.60	None
W-1 Lower	Triangular, 2:1 sides, 2.0' deep	2.44	0.83	2.54	None
W-2	Trapezoidal, 1:1 left, 2:1 right, 2.0' bottom, 1.0' deep	2.79	0.51	3.20	None
W-3	Triangular, 4.5:1 left, 1:1 right, 1.0' deep	1.81	0.74	2.54	None
Culverts					
C-1	Corrugated, 18" diameter	1.40	0.35	4.46	None
C-2	Corrugated, 18" diameter	0.63	0.24	3.45	None
C-3	Corrugated, 18" diameter	2.23	0.49	4.51	None
C-4	Corrugated, 18" diameter	1.17	0.44	2.76	None
C-5	Corrugated, 18" diameter	2.70	0.34	9.02	6
C-6	Corrugated, 18" diameter	4.80	0.83	4.83	None
C-7	Corrugated, 18" diameter	9.24	0.69	11.54	10

^(a) 25-yr, 6-hr event (see Appendix 7-7)

^(b) Based on minimum channel slope (see Appendix 7-8)

^(c) Based on maximum channel slope (see Appendix 7-8)

COVOL Engineered Fuels, LC
Dry-Coal Cleaning Facility

Permit Application
Revised October 2010

APPENDIX 7-7

Sedimentation Pond Hydrology Calculations

WATERSHED HYDROLOGY MODEL SUMMARIES
 COVOL ENGINEERED FUELS
 WELLINGTON DRY-COAL CLEANING FACILITY

Watersheds Reporting to East Sedimentation Pond

Watershed	Area (ft ²)	Avg. Slope (%)	Curve Number	Hydraulic Length (ft)	10-Year, 24-Hour Storm Runoff Volume (ft ³)	25-Year, 6-Hour Storm Runoff Volume (ft ³)
E-1	88,103	0.021	87	1,752	4,290	2,902
E-2	66,123	0.021	87	581	3,220	2,178
E-3	28,991	0.03	87	1,091	14,120	9,552
E-4	29,947	0.25	87	561	1,458	986
E-5	285,103	0.025	87	925	13,882	9,391

Watersheds Reporting to West Sedimentation Pond

Watershed	Area (ft ²)	Avg. Slope (%)	Curve Number	Hydraulic Length (ft)	10-Year, 24-Hour Storm Runoff Volume (ft ³)	25-Year, 6-Hour Storm Runoff Volume (ft ³)
W-1	105,474	0.025	87	1,297	5,136	3,474
W-2	128,724	0.025	87	635	6,268	4,240
W-3	70,836	0.027	87	447	3,449	2,333

Note: Curve Number assumed to be 87, which corresponds to a dirt road designation for Hydrologic Soil Group C (National Engineering Handbook, Section 4, Chapter 9)

Refer to attached HydroCAD 8.5 output for additional information

SEDIMENT YIELD CALCULATIONS
 COVOL ENGINEERED FUELS
 WELLINGTON DRY-COAL CLEANING FACILITY

Watershed	Area (sq ft)	R	K	LS	VM	A (tons/ac/yr)	Density (pcf)	Annual Sediment Volume (cubic ft/yr)
East Pond	759,267	8	0.37	0.24	1.48	1.051	110	333
West Pond	305,033	8	0.37	0.24	1.48	1.051	110	134

Notes

A = R K LS VM, after Israelsen et al, 1984

R is the rainfall factor, and is taken from a map in Israelsen et al., 1984

K is the soil erodibility factor for the Persayo-Chipeta Complex, as published by the NRCS

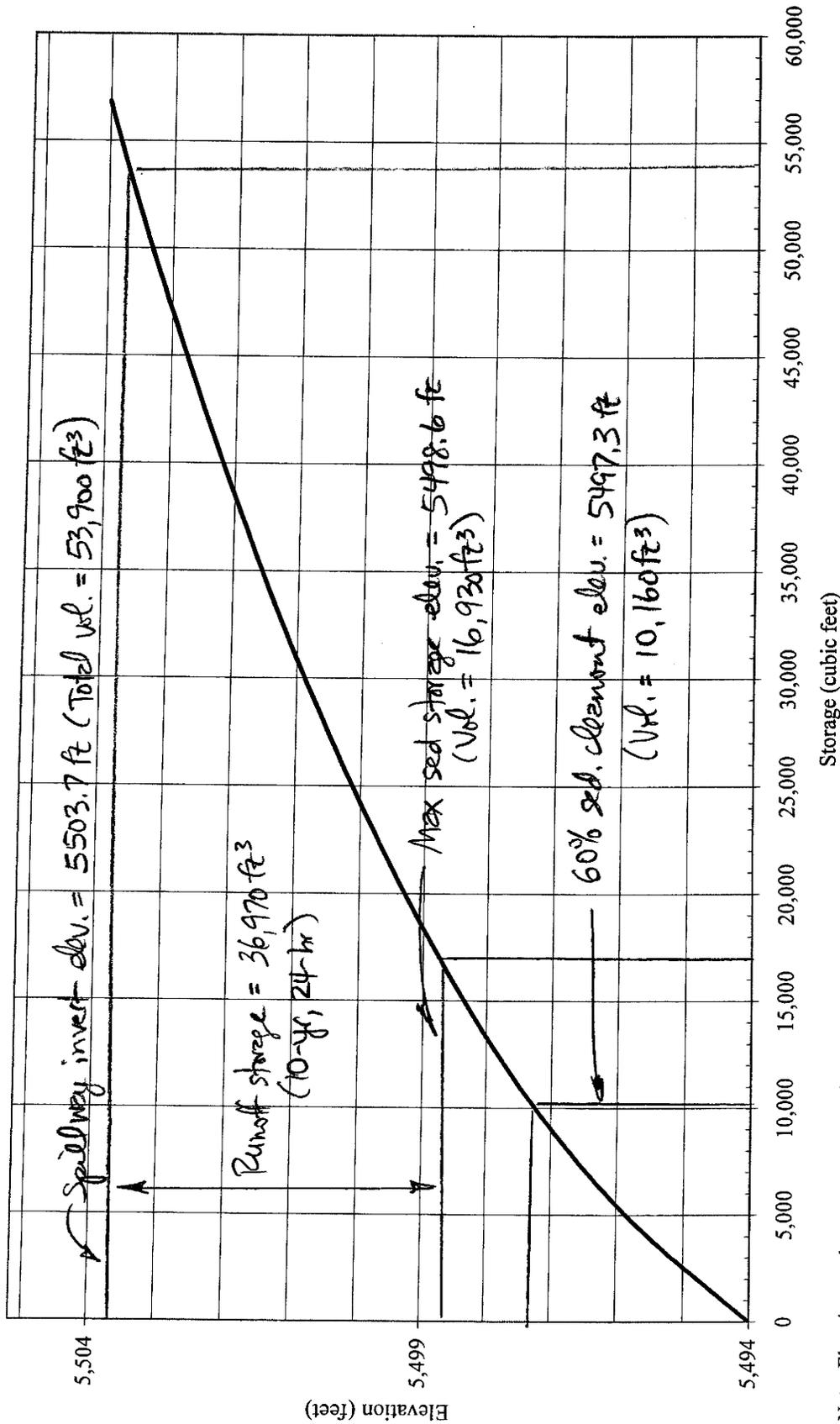
LS is the topographic factor, which is based on the length and steepness of the slope at the site. A slope length of 100 feet and a simple slope steepness of 2.5% was used. The value of LS was taken from Israelsen et al., 1984, Table 2.

VM is the erosion control factor, which was taken to be 1.48, which is the value for compacted fill as specified by Israelsen, et al., 1984, Table 3.

Density assumed to be 110 pcf

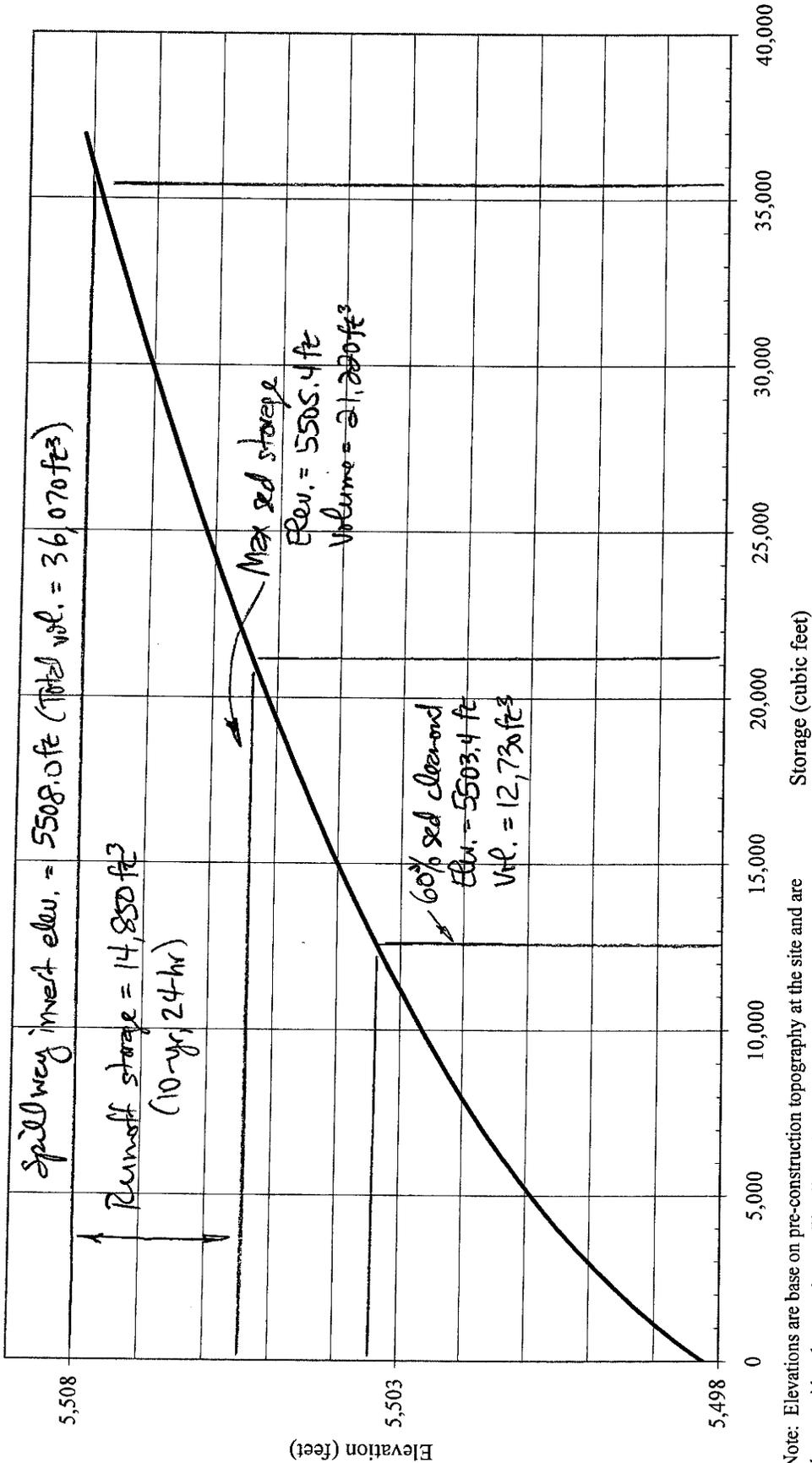
Reference:

Israelsen, C. Earl, Joel E. Fletcher, Frank W. Haws, and Eugene K. Israelsen, 1984. *Erosion and Sedimentation in Utah: A Guide for Control*. Utah Water Research Laboratory, College of Engineering, Utah State University. Hydraulics and Hydrology Series UWRL/H-84/03.



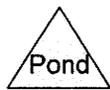
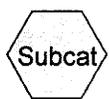
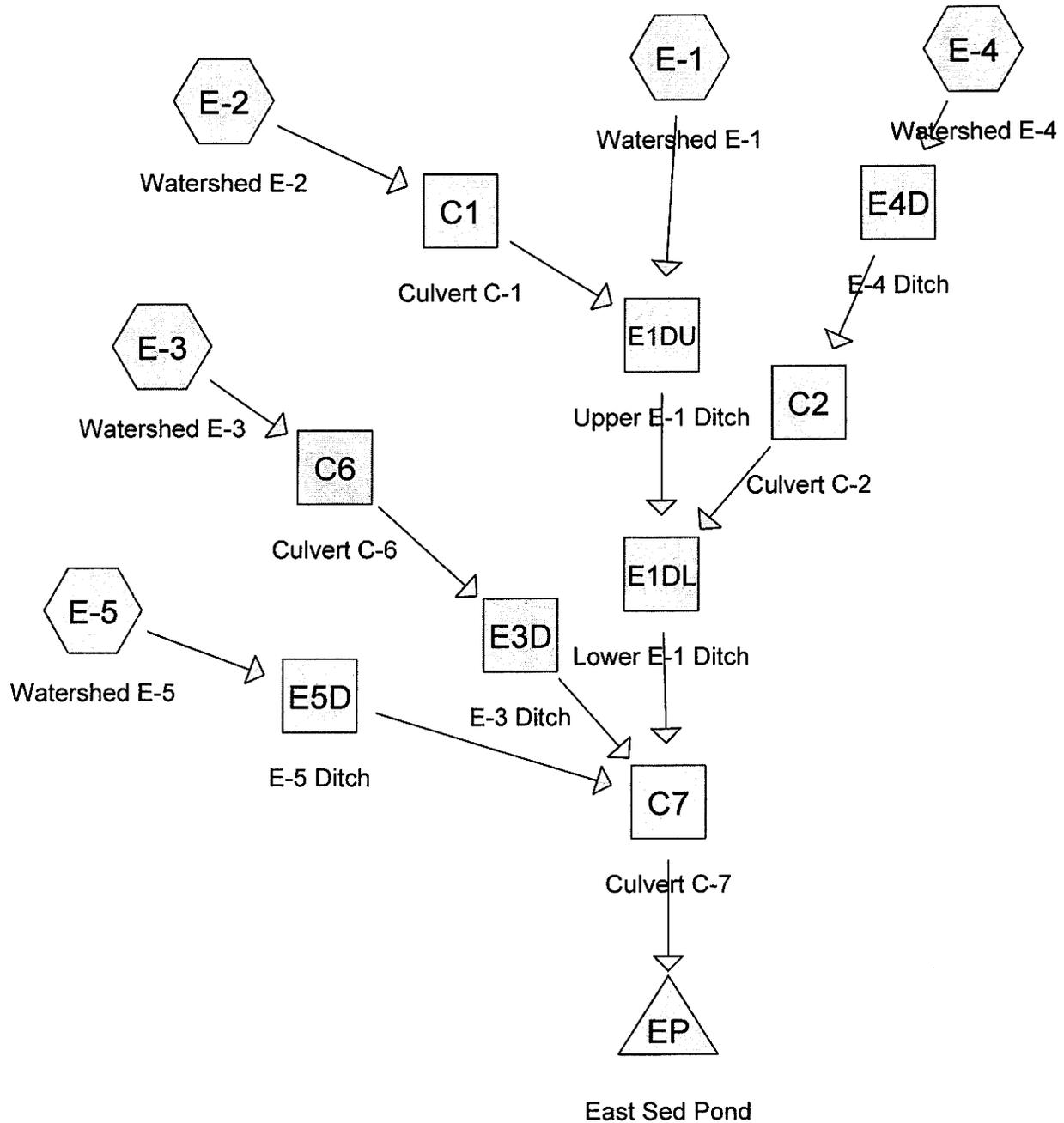
Note: Elevations are based on pre-construction topography at the site and are thus considered approximate. The dimensions and geometry of the sedimentation pond were surveyed by EIS Environmental and Engineering Consultants in November 2007. The bottom of the sedimentation pond was measured to be 10.2 feet below the surrounding ground surface, which is at an elevation of approximately 5,504.0 feet.

EAST POND STAGE VS. STORAGE



WEST POND STAGE VS. STORAGE

Note: Elevations are based on pre-construction topography at the site and are thus considered approximate. The dimensions and geometry of the sedimentation pond were surveyed by EIS Environmental and Engineering Consultants in November 2007. The bottom of the sedimentation pond was measured to be 9.8 feet below the surrounding ground surface, which is at an elevation of approximately 5,508.0 feet.



Drainage Diagram for 10yr-24hr East Pond
 Prepared by EarthFax Engineering, Inc., Printed 9/17/2010
 HydroCAD® 8.50 s/n 003900 © 2007 HydroCAD Software Solutions LLC

10yr-24hr East Pond

Prepared by EarthFax Engineering, Inc.

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
759,267	87	(E-1,E-2,E-3,E-4,E-5)
759,267		TOTAL AREA

10yr-24hr East Pond

Prepared by EarthFax Engineering, Inc.

HydroCAD® 8.50 s/n 003900 © 2007 HydroCAD Software Solutions LLC

Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
759,267	Other	E-1, E-2, E-3, E-4, E-5
759,267		TOTAL AREA

10yr-24hr East Pond

Prepared by EarthFax Engineering, Inc.

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Type II 24-hr Rainfall=1.57"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
 Runoff by SCS TR-20 method, UH=SCS
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Watershed E-1	Runoff Area=88,103 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=1,752'	Slope=0.0210 '/ Tc=27.1 min CN=87 Runoff=1.05 cfs 4,290 cf
Subcatchment E-2: Watershed E-2	Runoff Area=66,123 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=581'	Slope=0.0210 '/ Tc=11.2 min CN=87 Runoff=1.28 cfs 3,220 cf
Subcatchment E-3: Watershed E-3	Runoff Area=289,991 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=1,091'	Slope=0.0300 '/ Tc=15.5 min CN=87 Runoff=4.81 cfs 14,120 cf
Subcatchment E-4: Watershed E-4	Runoff Area=29,947 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=561'	Slope=0.2500 '/ Tc=3.2 min CN=87 Runoff=0.78 cfs 1,458 cf
Subcatchment E-5: Watershed E-5	Runoff Area=285,103 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=925'	Slope=0.0250 '/ Tc=14.9 min CN=87 Runoff=4.82 cfs 13,882 cf
Reach C1: Culvert C-1	Avg. Depth=0.33' Max Vel=4.37 fps Inflow=1.28 cfs 3,220 cf
D=18.0" n=0.020 L=40.0' S=0.0300 '/	Capacity=11.83 cfs Outflow=1.27 cfs 3,220 cf
Reach C2: Culvert C-2	Avg. Depth=0.23' Max Vel=3.34 fps Inflow=0.59 cfs 1,458 cf
D=18.0" n=0.020 L=40.0' S=0.0275 '/	Capacity=11.32 cfs Outflow=0.58 cfs 1,459 cf
Reach C6: Culvert C-6	Avg. Depth=0.83' Max Vel=4.82 fps Inflow=4.81 cfs 14,120 cf
D=18.0" n=0.025 L=200.0' S=0.0225 '/	Capacity=8.19 cfs Outflow=4.73 cfs 14,120 cf
Reach C7: Culvert C-7	Avg. Depth=0.73' Max Vel=11.79 fps Inflow=9.98 cfs 36,970 cf
D=18.0" n=0.025 L=20.0' S=0.1500 '/	Capacity=21.16 cfs Outflow=9.98 cfs 36,970 cf
Reach E1DL: Lower E-1 Ditch	Avg. Depth=0.73' Max Vel=2.50 fps Inflow=2.00 cfs 8,968 cf
n=0.035 L=287.0' S=0.0171 '/	Capacity=13.67 cfs Outflow=1.98 cfs 8,968 cf
Reach E1DU: Upper E-1 Ditch	Avg. Depth=0.86' Max Vel=2.35 fps Inflow=1.93 cfs 7,510 cf
n=0.035 L=720.0' S=0.0150 '/	Capacity=7.67 cfs Outflow=1.73 cfs 7,509 cf
Reach E3D: E-3 Ditch	Avg. Depth=0.78' Max Vel=3.17 fps Inflow=4.73 cfs 14,120 cf
n=0.035 L=283.0' S=0.0194 '/	Capacity=21.95 cfs Outflow=4.58 cfs 14,120 cf
Reach E4D: E-4 Ditch	Avg. Depth=0.48' Max Vel=1.80 fps Inflow=0.78 cfs 1,458 cf
n=0.035 L=561.0' S=0.0159 '/	Capacity=7.21 cfs Outflow=0.59 cfs 1,458 cf
Reach E5D: E-5 Ditch	Avg. Depth=0.72' Max Vel=2.00 fps Inflow=4.82 cfs 13,882 cf
n=0.035 L=746.0' S=0.0091 '/	Capacity=10.01 cfs Outflow=4.11 cfs 13,882 cf
Pond EP: East Sed Pond	Peak Elev=5,501.61' Storage=36,970 cf Inflow=9.98 cfs 36,970 cf
	Outflow=0.00 cfs 0 cf

Total Runoff Area = 759,267 sf Runoff Volume = 36,970 cf Average Runoff Depth = 0.58"
100.00% Pervious = 759,267 sf 0.00% Impervious = 0 sf

10yr-24hr East Pond

Prepared by EarthFax Engineering, Inc.

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Type II 24-hr Rainfall=1.57"

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Page 5

Summary for Subcatchment E-1: Watershed E-1

Runoff = 1.05 cfs @ 12.22 hrs, Volume= 4,290 cf, Depth= 0.58"

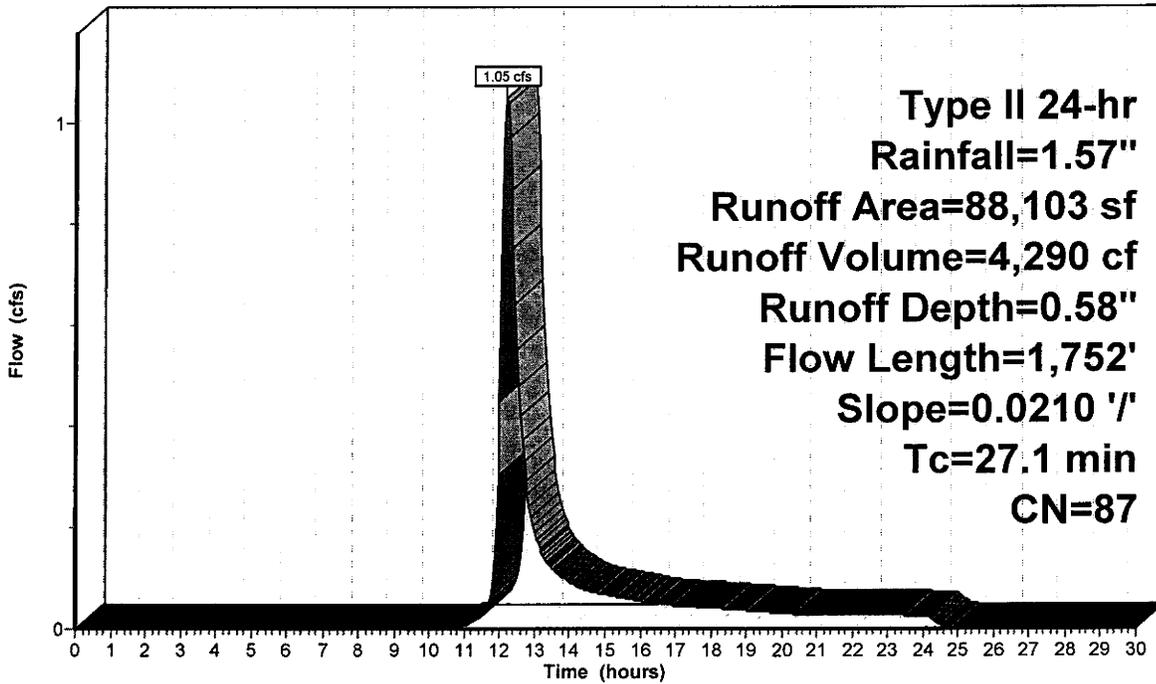
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 88,103	87	
88,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	1,752	0.0210	1.08		Lag/CN Method,

Subcatchment E-1: Watershed E-1

Hydrograph



Runoff

10yr-24hr East Pond

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Type II 24-hr Rainfall=1.57"

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Page 6

Summary for Subcatchment E-2: Watershed E-2

Runoff = 1.28 cfs @ 12.04 hrs, Volume= 3,220 cf, Depth= 0.58"

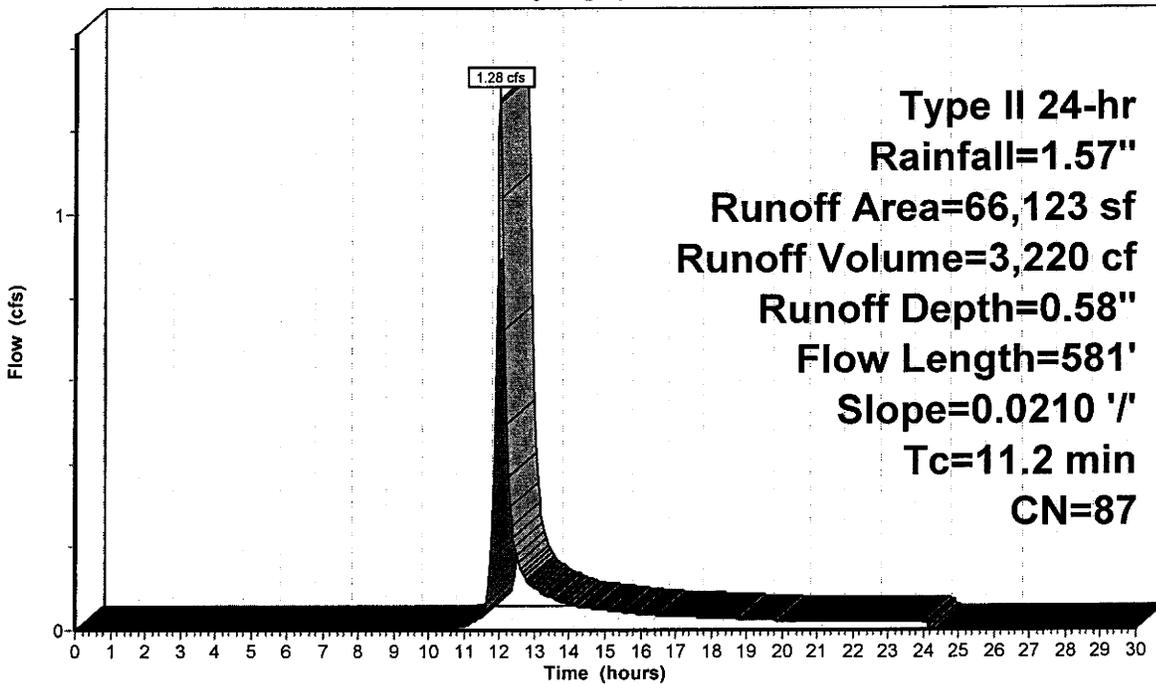
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 66,123	87	
66,123		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	581	0.0210	0.86		Lag/CN Method,

Subcatchment E-2: Watershed E-2

Hydrograph



Runoff

**Type II 24-hr
 Rainfall=1.57"
 Runoff Area=66,123 sf
 Runoff Volume=3,220 cf
 Runoff Depth=0.58"
 Flow Length=581'
 Slope=0.0210 '/
 Tc=11.2 min
 CN=87**

10yr-24hr East Pond

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Type II 24-hr Rainfall=1.57"

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Page 7

Summary for Subcatchment E-3: Watershed E-3

Runoff = 4.81 cfs @ 12.09 hrs, Volume= 14,120 cf, Depth= 0.58"

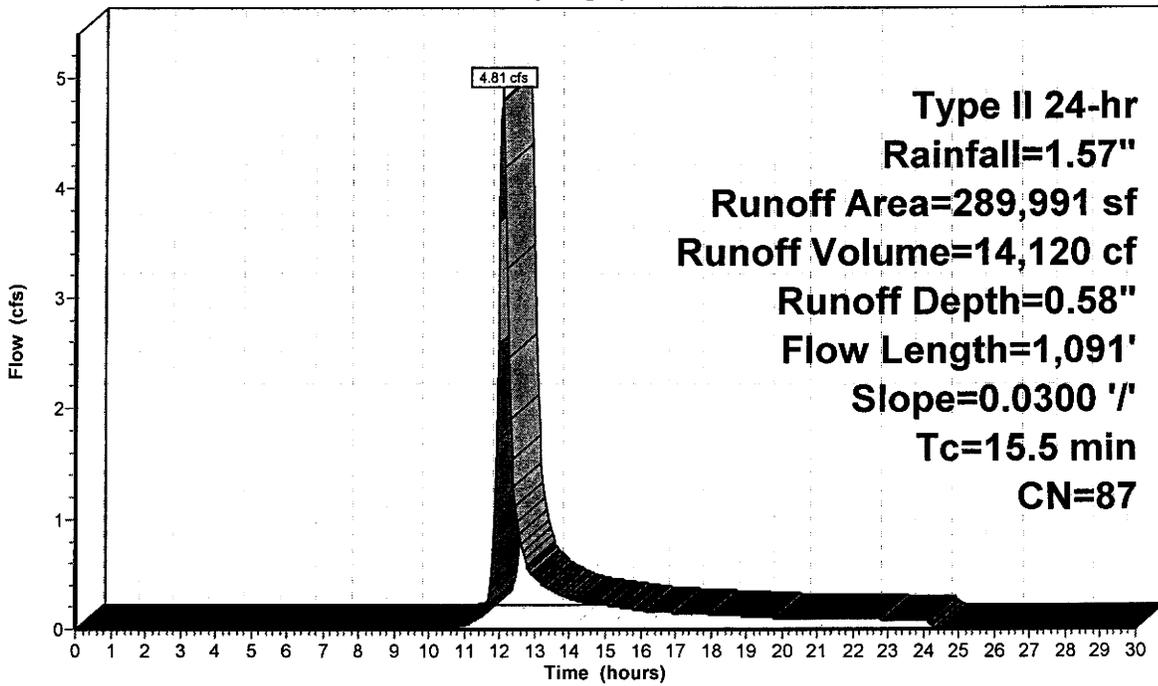
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 289,991	87	
289,991		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	1,091	0.0300	1.17		Lag/CN Method,

Subcatchment E-3: Watershed E-3

Hydrograph



10yr-24hr East Pond

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Summary for Subcatchment E-4: Watershed E-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.78 cfs @ 11.94 hrs, Volume= 1,458 cf, Depth= 0.58"

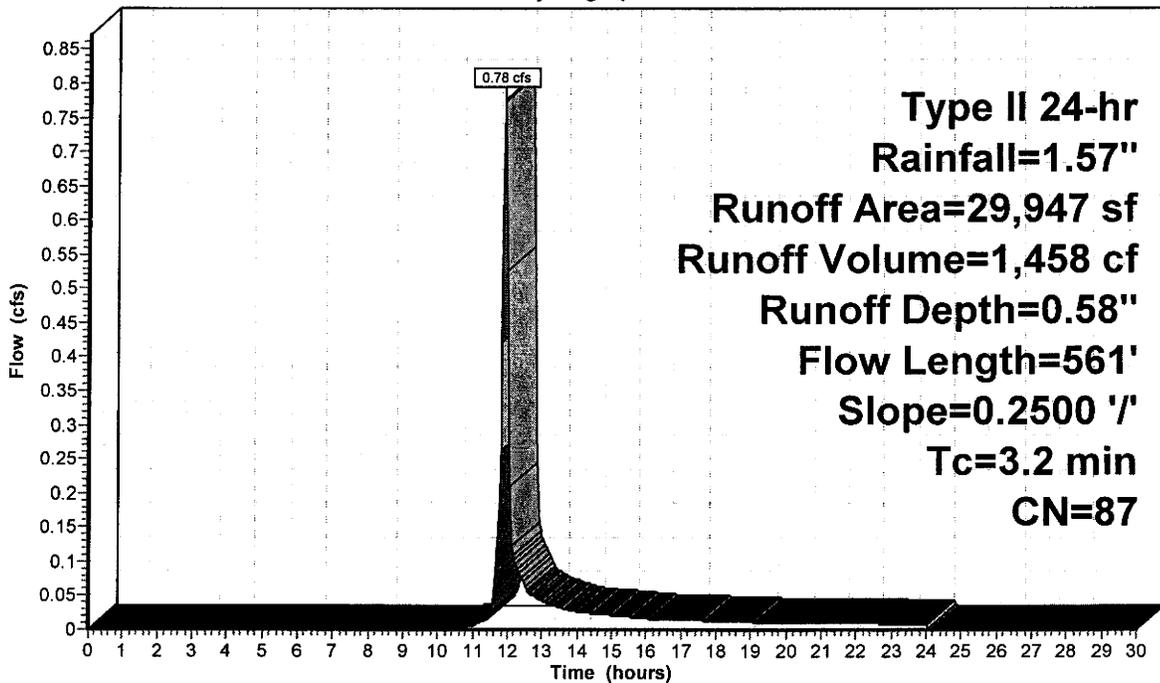
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 29,947	87	
29,947		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	561	0.2500	2.96		Lag/CN Method,

Subcatchment E-4: Watershed E-4

Hydrograph



Runoff

10yr-24hr East Pond

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Summary for Subcatchment E-5: Watershed E-5

Runoff = 4.82 cfs @ 12.08 hrs, Volume= 13,882 cf, Depth= 0.58"

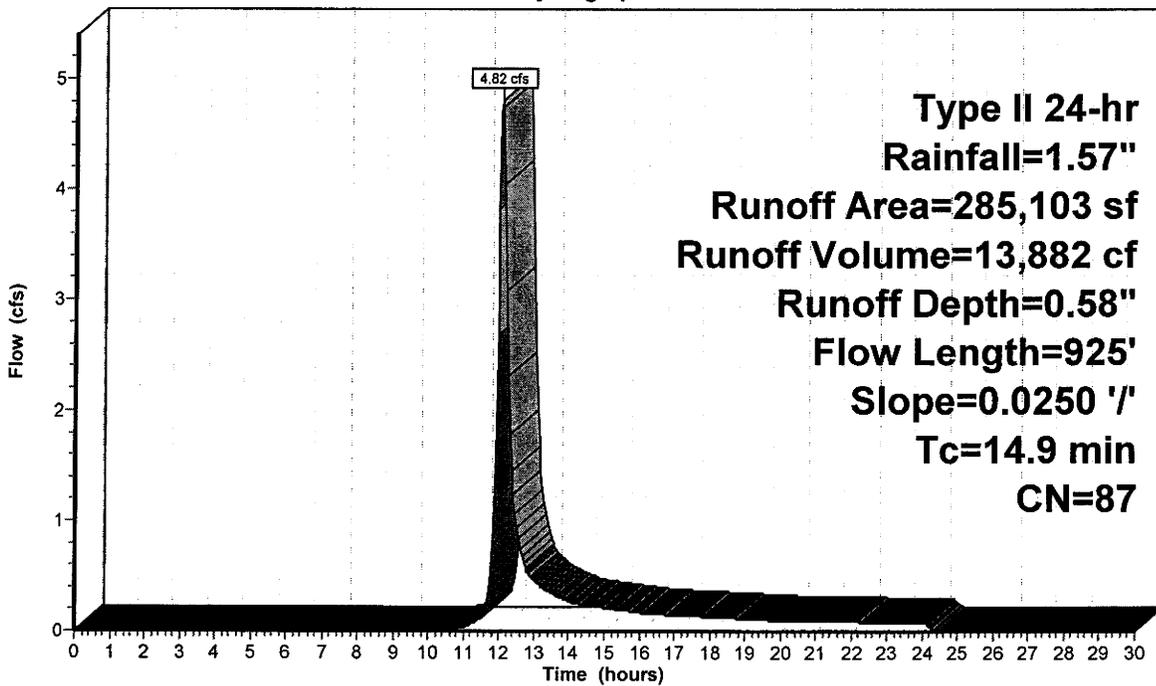
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 285,103	87	
285,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	925	0.0250	1.04		Lag/CN Method,

Subcatchment E-5: Watershed E-5

Hydrograph



10yr-24hr East Pond

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Summary for Reach C1: Culvert C-1

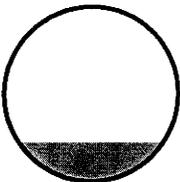
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area =	66,123 sf,	0.00% Impervious,	Inflow Depth =	0.58"
Inflow =	1.28 cfs @	12.04 hrs,	Volume=	3,220 cf
Outflow =	1.27 cfs @	12.04 hrs,	Volume=	3,220 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 4.37 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.51 fps, Avg. Travel Time= 0.4 min

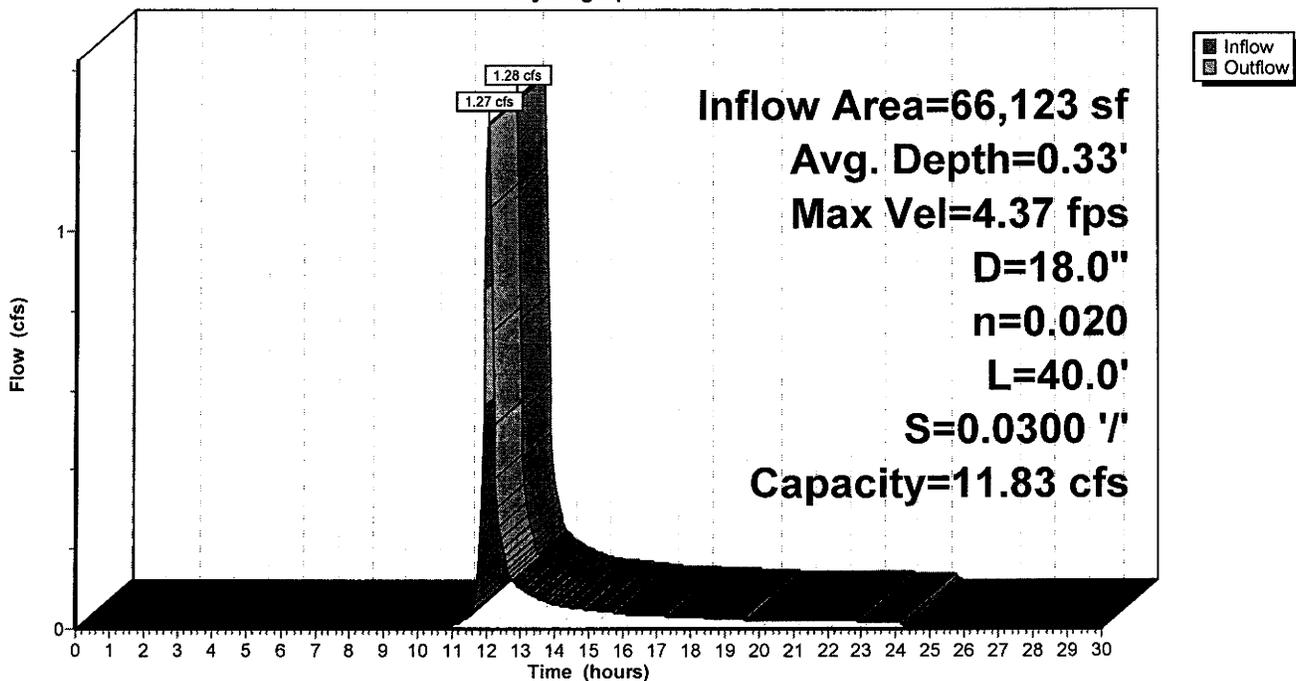
Peak Storage= 12 cf @ 12.04 hrs, Average Depth at Peak Storage= 0.33'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.83 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0300 '/'
 Inlet Invert= 5,520.70', Outlet Invert= 5,519.50'



Reach C1: Culvert C-1

Hydrograph



10yr-24hr East Pond

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Summary for Reach C2: Culvert C-2

[52] Hint: Inlet/Outlet conditions not evaluated

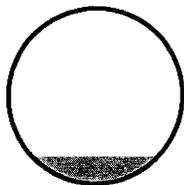
[61] Hint: Exceeded Reach E4D outlet invert by 0.23' @ 12.10 hrs

Inflow Area = 29,947 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 0.59 cfs @ 12.08 hrs, Volume= 1,458 cf
 Outflow = 0.58 cfs @ 12.08 hrs, Volume= 1,459 cf, Atten= 2%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Max. Velocity= 3.34 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.12 fps, Avg. Travel Time= 0.6 min

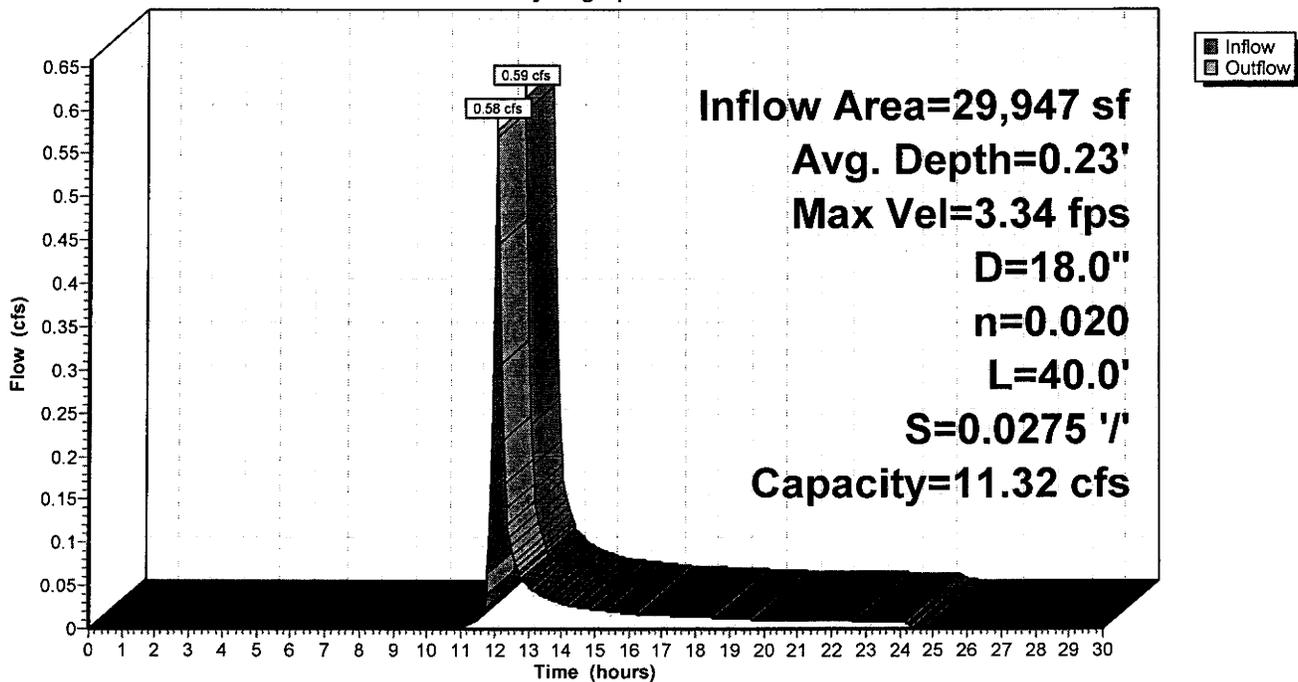
Peak Storage= 7 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.23'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.32 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0275 '/'
 Inlet Invert= 5,509.80', Outlet Invert= 5,508.70'



Reach C2: Culvert C-2

Hydrograph



10yr-24hr East Pond

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Summary for Reach C6: Culvert C-6

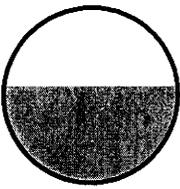
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 289,991 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 4.81 cfs @ 12.09 hrs, Volume= 14,120 cf
 Outflow = 4.73 cfs @ 12.11 hrs, Volume= 14,120 cf, Atten= 2%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 4.82 fps, Min. Travel Time= 0.7 min
 Avg. Velocity = 1.76 fps, Avg. Travel Time= 1.9 min

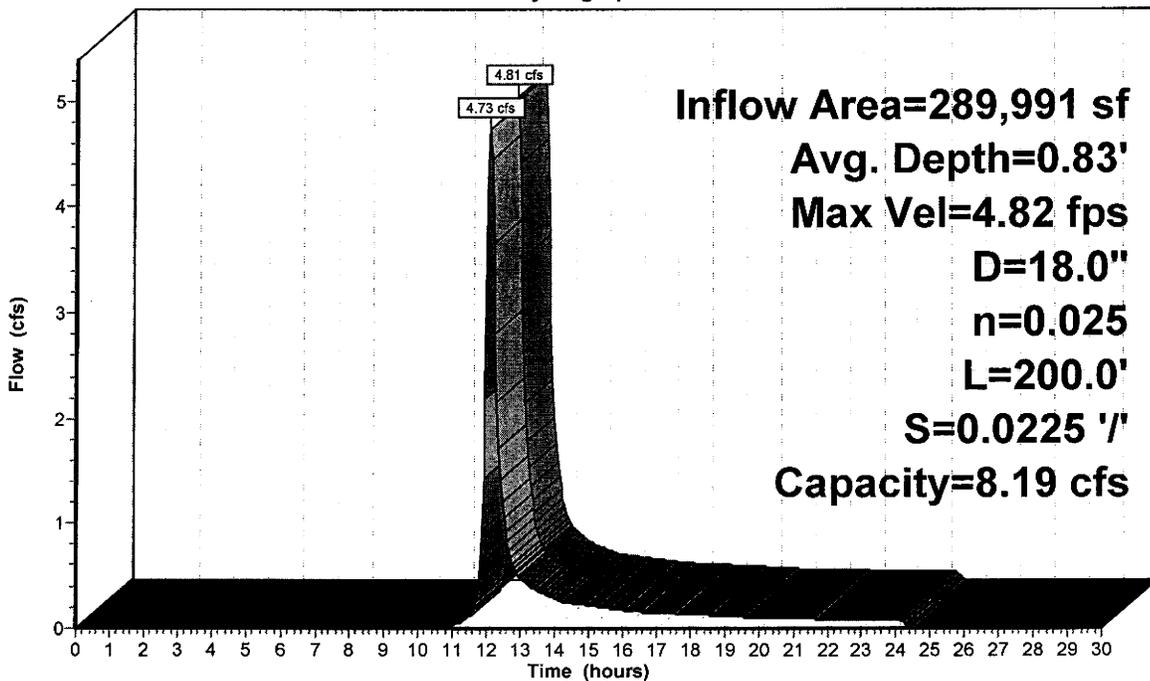
Peak Storage= 199 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.83'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.19 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 200.0' Slope= 0.0225 '/'
 Inlet Invert= 5,514.00', Outlet Invert= 5,509.50'



Reach C6: Culvert C-6

Hydrograph



Inflow
 Outflow

10yr-24hr East Pond

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Summary for Reach C7: Culvert C-7

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach E1DL OUTLET depth by 1.20' @ 10.30 hrs

[62] Warning: Exceeded Reach E3D OUTLET depth by 1.08' @ 12.35 hrs

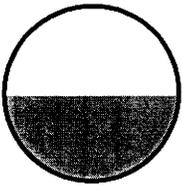
[62] Warning: Exceeded Reach E5D OUTLET depth by 1.25' @ 12.30 hrs

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 9.98 cfs @ 12.21 hrs, Volume= 36,970 cf
 Outflow = 9.98 cfs @ 12.21 hrs, Volume= 36,970 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 11.79 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 4.03 fps, Avg. Travel Time= 0.1 min

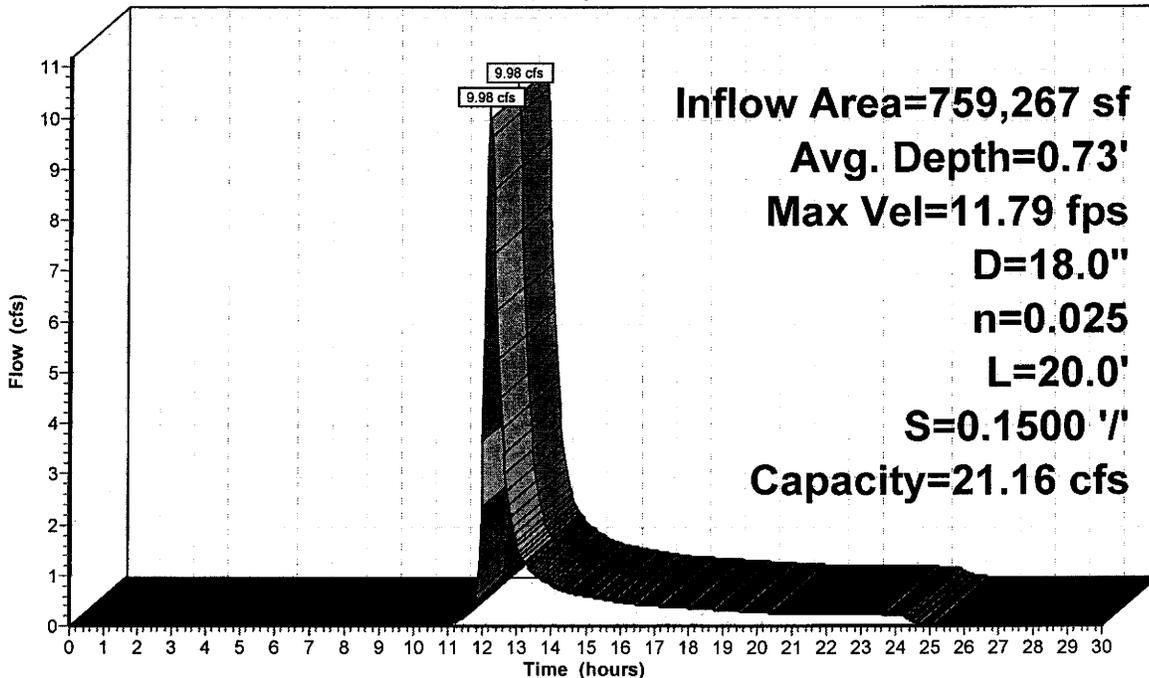
Peak Storage= 17 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.73'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.16 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 20.0' Slope= 0.1500 '/'
 Inlet Invert= 5,505.00', Outlet Invert= 5,502.00'



Reach C7: Culvert C-7

Hydrograph



■ Inflow
 ■ Outflow

10yr-24hr East Pond

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Summary for Reach E1DL: Lower E-1 Ditch

[62] Warning: Exceeded Reach C2 OUTLET depth by 0.59' @ 12.30 hrs

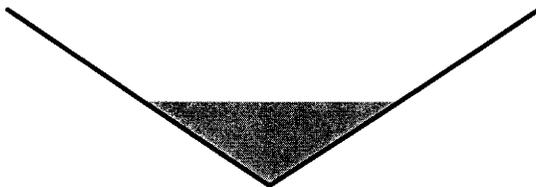
[61] Hint: Exceeded Reach E1DU outlet invert by 0.73' @ 12.25 hrs

Inflow Area =	184,173 sf,	0.00% Impervious,	Inflow Depth =	0.58"
Inflow =	2.00 cfs @	12.20 hrs,	Volume=	8,968 cf
Outflow =	1.98 cfs @	12.26 hrs,	Volume=	8,968 cf, Atten= 1%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.50 fps, Min. Travel Time= 1.9 min
 Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.9 min

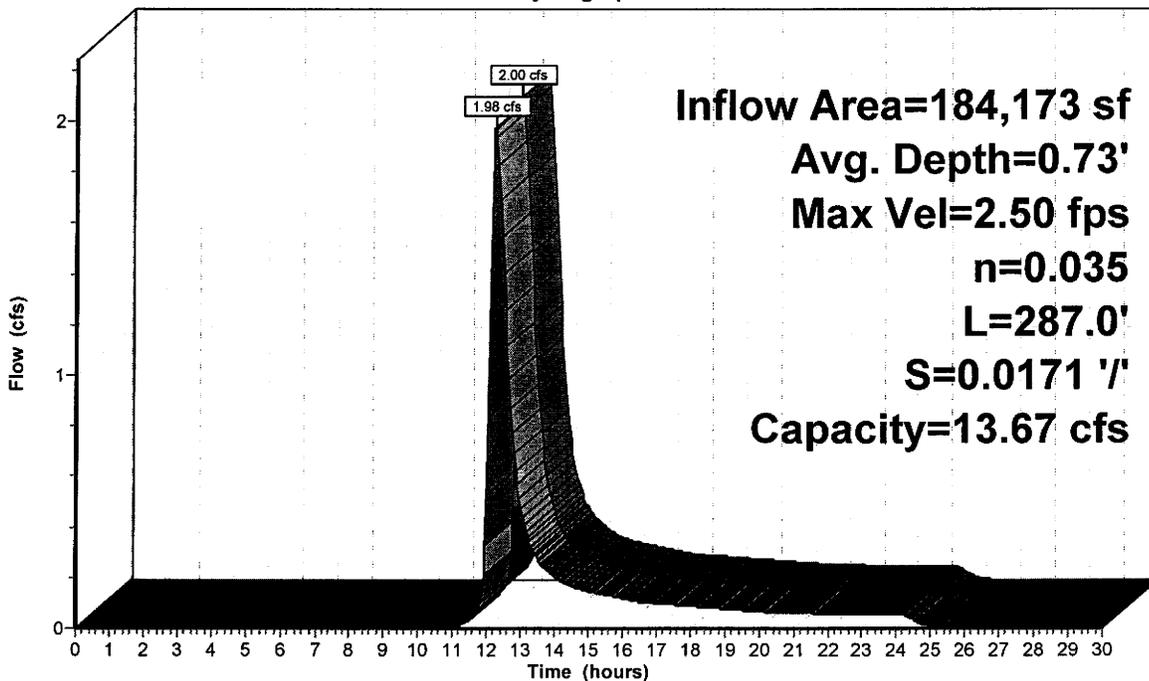
Peak Storage= 228 cf @ 12.23 hrs, Average Depth at Peak Storage= 0.73'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 13.67 cfs

0.00' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 1.5 '/' Top Width= 4.50'
 Length= 287.0' Slope= 0.0171 '/'
 Inlet Invert= 5,508.70', Outlet Invert= 5,503.80'



Reach E1DL: Lower E-1 Ditch

Hydrograph



Inflow Area=184,173 sf
Avg. Depth=0.73'
Max Vel=2.50 fps
n=0.035
L=287.0'
S=0.0171 '/'
Capacity=13.67 cfs

10yr-24hr East Pond

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Summary for Reach E1DU: Upper E-1 Ditch

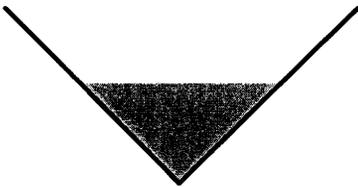
[62] Warning: Exceeded Reach C1 OUTLET depth by 0.65' @ 12.25 hrs

Inflow Area = 154,226 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 1.93 cfs @ 12.07 hrs, Volume= 7,510 cf
 Outflow = 1.73 cfs @ 12.24 hrs, Volume= 7,509 cf, Atten= 10%, Lag= 10.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.35 fps, Min. Travel Time= 5.1 min
 Avg. Velocity = 0.93 fps, Avg. Travel Time= 12.9 min

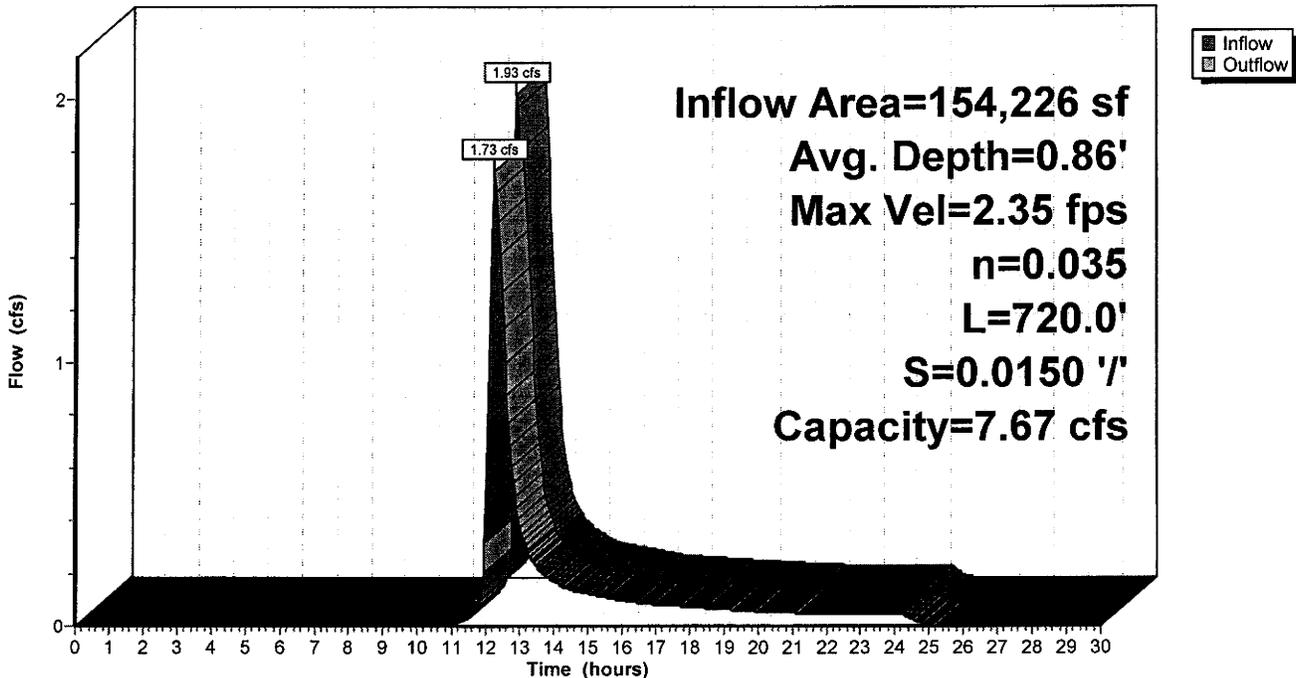
Peak Storage= 534 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.86'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 7.67 cfs

0.00' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 1.0 '/' Top Width= 3.00'
 Length= 720.0' Slope= 0.0150 '/'
 Inlet Invert= 5,519.50', Outlet Invert= 5,508.70'



Reach E1DU: Upper E-1 Ditch

Hydrograph



10yr-24hr East Pond

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Summary for Reach E3D: E-3 Ditch

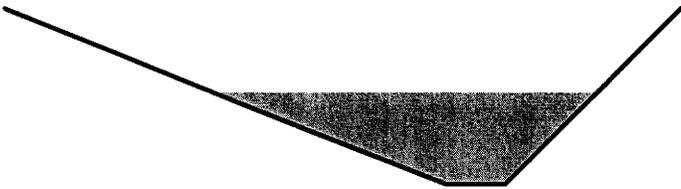
[62] Warning: Exceeded Reach C6 OUTLET depth by 0.08' @ 12.30 hrs

Inflow Area =	289,991 sf,	0.00% Impervious,	Inflow Depth =	0.58"
Inflow =	4.73 cfs @	12.11 hrs,	Volume=	14,120 cf
Outflow =	4.58 cfs @	12.15 hrs,	Volume=	14,120 cf, Atten= 3%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 3.17 fps, Min. Travel Time= 1.5 min
 Avg. Velocity = 1.24 fps, Avg. Travel Time= 3.8 min

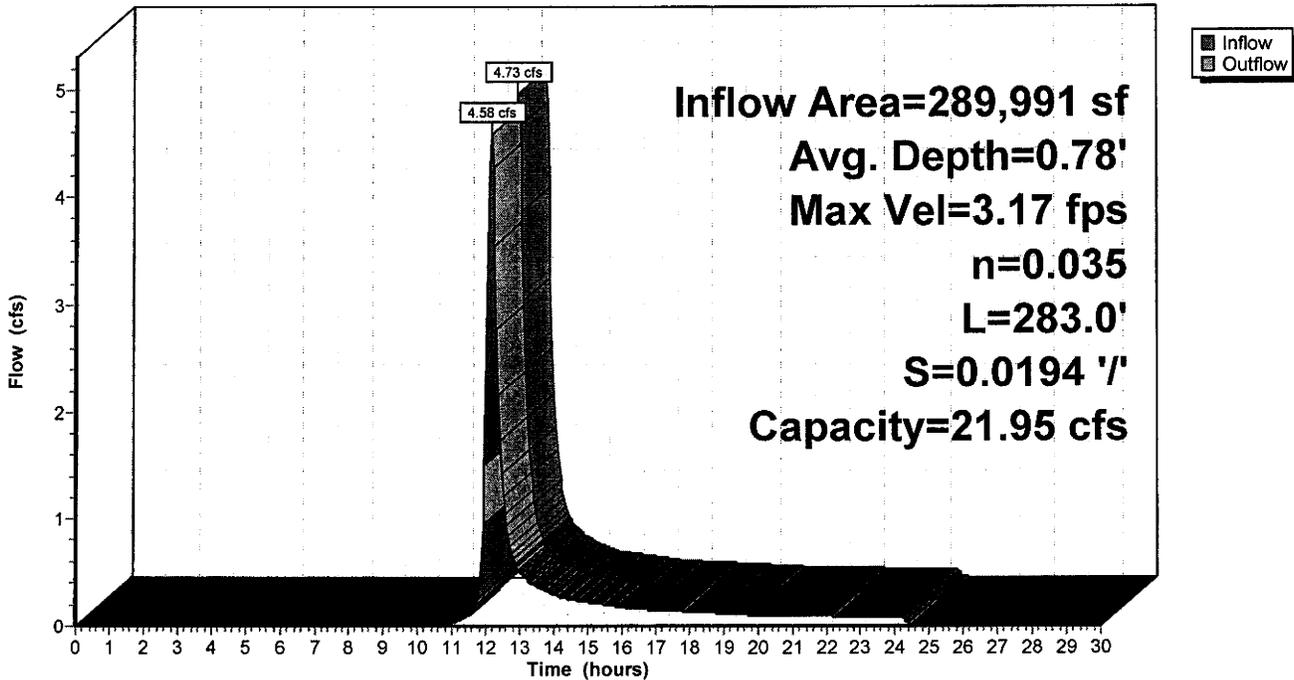
Peak Storage= 414 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.78'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.95 cfs

0.50' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 2.5 1.0 '/' Top Width= 5.75'
 Length= 283.0' Slope= 0.0194 '/'
 Inlet Invert= 5,509.50', Outlet Invert= 5,504.00'



Reach E3D: E-3 Ditch

Hydrograph



10yr-24hr East Pond

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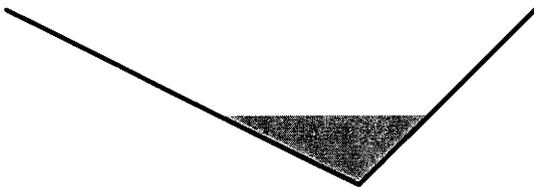
Summary for Reach E4D: E-4 Ditch

Inflow Area = 29,947 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 0.78 cfs @ 11.94 hrs, Volume= 1,458 cf
 Outflow = 0.59 cfs @ 12.08 hrs, Volume= 1,458 cf, Atten= 25%, Lag= 8.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.80 fps, Min. Travel Time= 5.2 min
 Avg. Velocity = 0.65 fps, Avg. Travel Time= 14.4 min

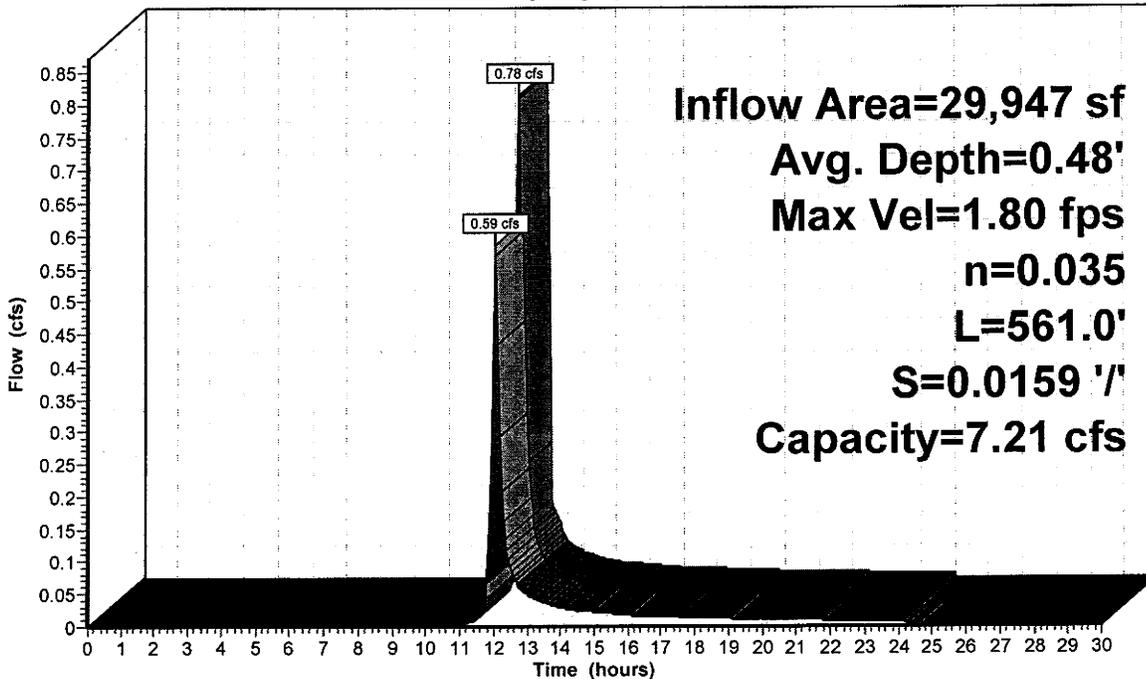
Peak Storage= 190 cf @ 11.99 hrs, Average Depth at Peak Storage= 0.48'
 Bank-Full Depth= 1.20', Capacity at Bank-Full= 7.21 cfs

0.00' x 1.20' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/' Top Width= 3.60'
 Length= 561.0' Slope= 0.0159 '/'
 Inlet Invert= 5,518.70', Outlet Invert= 5,509.80'



Reach E4D: E-4 Ditch

Hydrograph



Inflow Area=29,947 sf
Avg. Depth=0.48'
Max Vel=1.80 fps
n=0.035
L=561.0'
S=0.0159 '/'
Capacity=7.21 cfs

10yr-24hr East Pond

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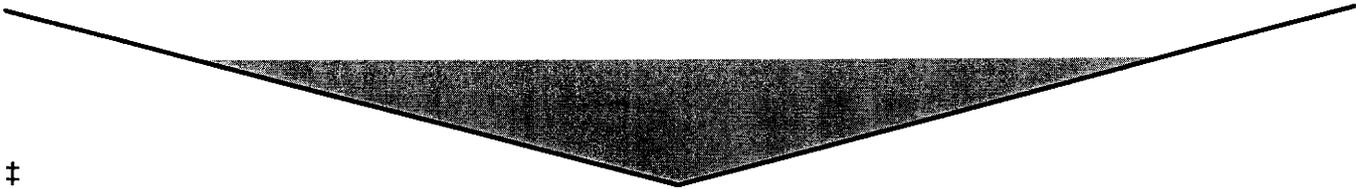
Summary for Reach E5D: E-5 Ditch

Inflow Area = 285,103 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 4.82 cfs @ 12.08 hrs, Volume= 13,882 cf
 Outflow = 4.11 cfs @ 12.25 hrs, Volume= 13,882 cf, Atten= 15%, Lag= 10.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.00 fps, Min. Travel Time= 6.2 min
 Avg. Velocity = 0.69 fps, Avg. Travel Time= 17.9 min

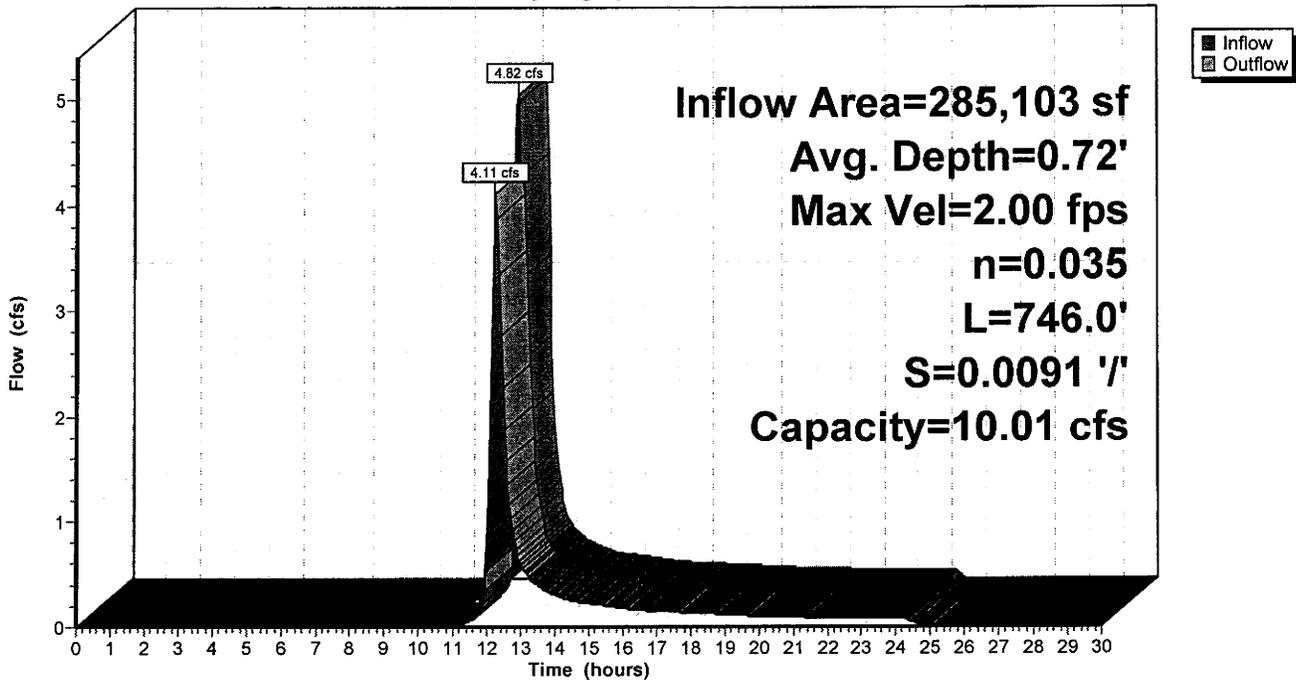
Peak Storage= 1,534 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.72'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 10.01 cfs

0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.0 '/' Top Width= 8.00'
 Length= 746.0' Slope= 0.0091 '/'
 Inlet Invert= 5,510.60', Outlet Invert= 5,503.80'



Reach E5D: E-5 Ditch

Hydrograph



10yr-24hr East Pond

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Summary for Pond EP: East Sed Pond

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 9.98 cfs @ 12.21 hrs, Volume= 36,970 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 5,501.61' @ 30.00 hrs Surf.Area= 7,938 sf Storage= 36,970 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

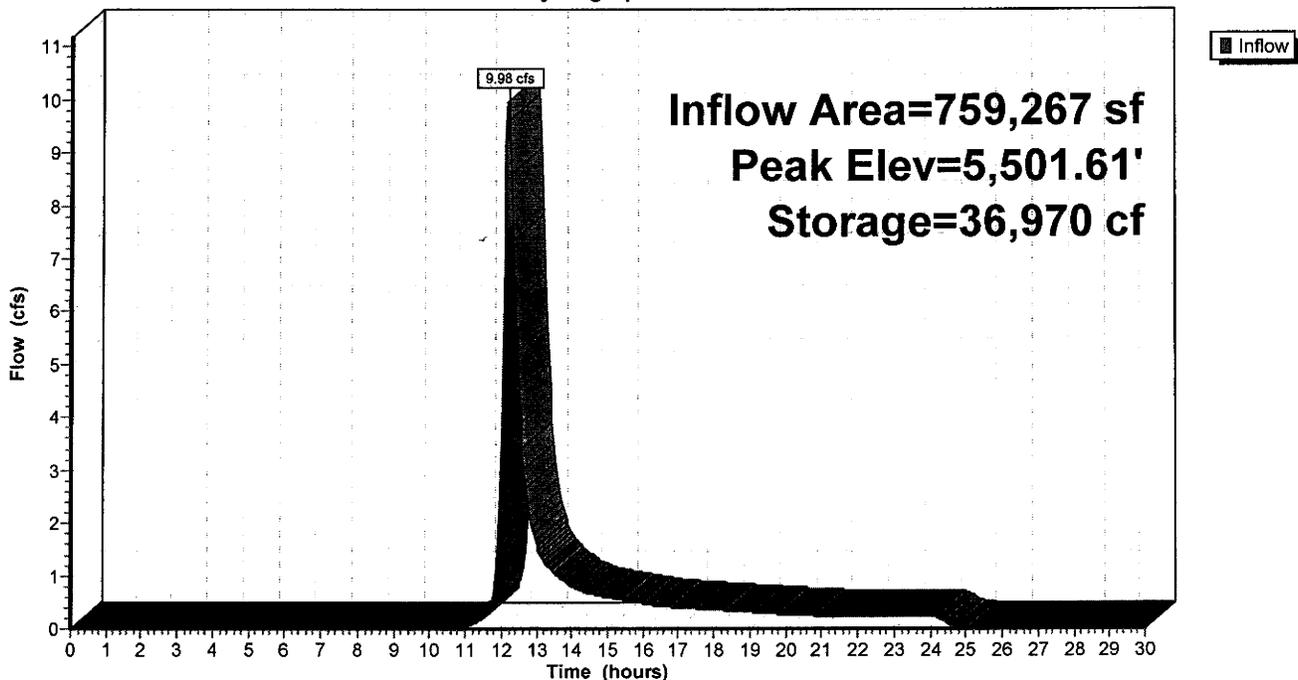
Center-of-Mass det. time= (not calculated: no outflow)

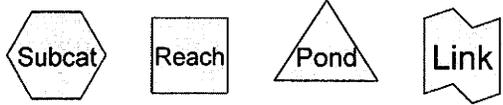
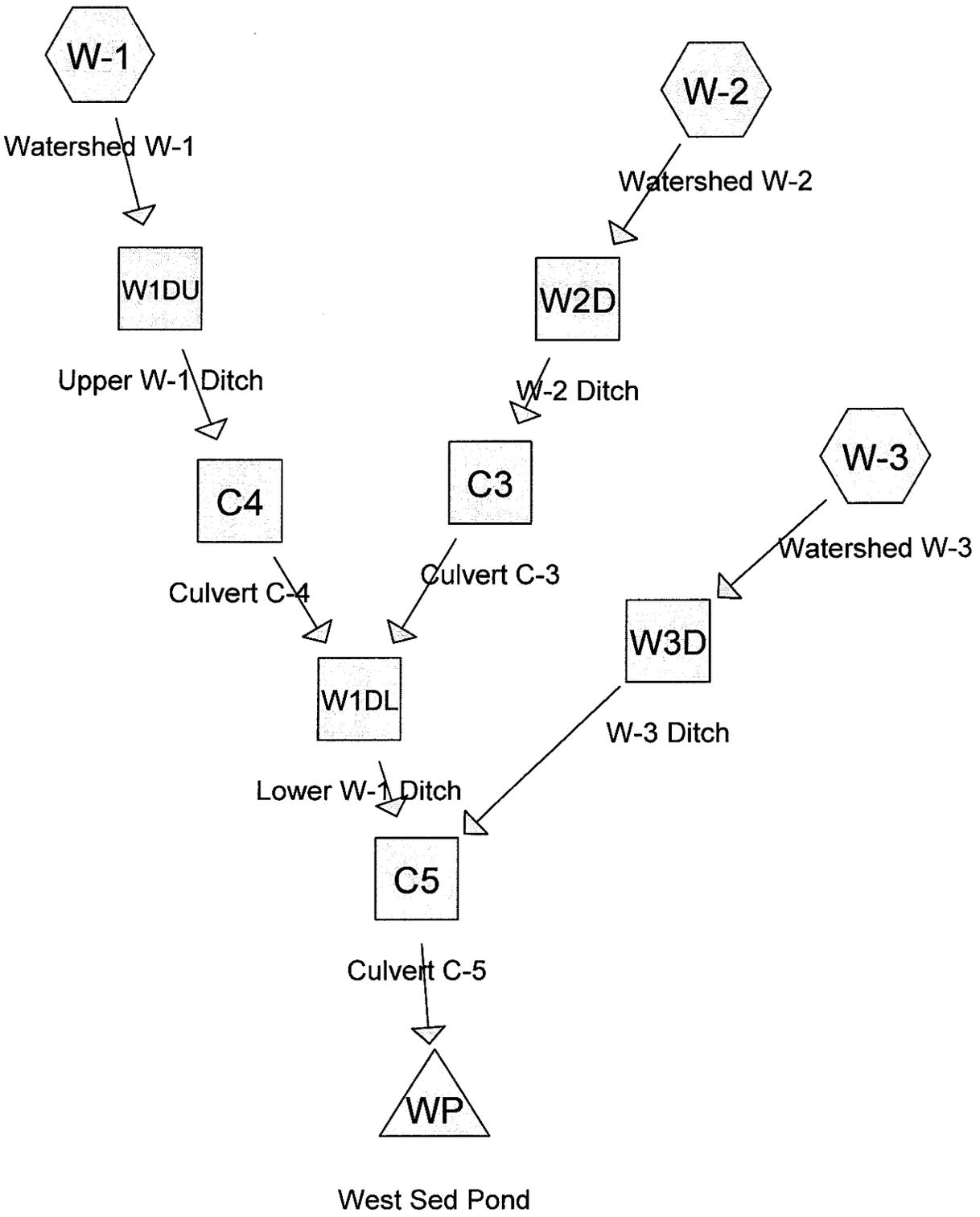
Volume	Invert	Avail.Storage	Storage Description
#1	5,493.80'	56,820 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,493.80	2,550	0	0
5,494.80	2,601	2,576	2,576
5,495.80	3,214	2,908	5,483
5,496.80	3,909	3,562	9,045
5,497.80	4,637	4,273	13,318
5,498.80	5,425	5,031	18,349
5,499.80	6,243	5,834	24,183
5,500.80	7,158	6,701	30,883
5,501.80	8,125	7,642	38,525
5,502.80	9,087	8,606	47,131
5,503.80	10,291	9,689	56,820

Pond EP: East Sed Pond

Hydrograph





Drainage Diagram for 10yr-24hr West Pond
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10yr-24hr West Pond

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
305,034	87	(W-1,W-2,W-3)
305,034		TOTAL AREA

10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
305,034	Other	W-1, W-2, W-3
305,034		TOTAL AREA

10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Type II 24-hr Rainfall=1.57"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment W-1: Watershed W-1 Runoff Area=105,474 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=1,297' Slope=0.0250 '/' Tc=19.5 min CN=87 Runoff=1.54 cfs 5,136 cf

Subcatchment W-2: Watershed W-2 Runoff Area=128,724 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=635' Slope=0.0250 '/' Tc=11.0 min CN=87 Runoff=2.50 cfs 6,268 cf

Subcatchment W-3: Watershed W-3 Runoff Area=70,836 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=447' Slope=0.0270 '/' Tc=8.0 min CN=87 Runoff=1.55 cfs 3,449 cf

Reach C3: Culvert C-3 Avg. Depth=0.43' Max Vel=5.28 fps Inflow=2.22 cfs 6,268 cf
D=18.0" n=0.020 L=40.0' S=0.0325 '/' Capacity=12.31 cfs Outflow=2.21 cfs 6,268 cf

Reach C4: Culvert C-4 Avg. Depth=0.46' Max Vel=2.83 fps Inflow=1.28 cfs 5,136 cf
D=18.0" n=0.025 L=80.0' S=0.0138 '/' Capacity=6.41 cfs Outflow=1.28 cfs 5,136 cf

Reach C5: Culvert C-5 Avg. Depth=0.36' Max Vel=9.32 fps Inflow=3.02 cfs 14,852 cf
D=18.0" n=0.025 L=20.0' S=0.1950 '/' Capacity=24.12 cfs Outflow=3.02 cfs 14,852 cf

Reach W1DL: Lower W-1 Ditch Avg. Depth=0.82' Max Vel=2.02 fps Inflow=2.74 cfs 11,403 cf
n=0.035 L=320.0' S=0.0088 '/' Capacity=29.49 cfs Outflow=2.68 cfs 11,403 cf

Reach W1DU: Upper W-1 Ditch Avg. Depth=0.56' Max Vel=2.04 fps Inflow=1.54 cfs 5,136 cf
n=0.035 L=963.0' S=0.0145 '/' Capacity=38.02 cfs Outflow=1.28 cfs 5,136 cf

Reach W2D: W-2 Ditch Avg. Depth=0.26' Max Vel=1.99 fps Inflow=2.50 cfs 6,268 cf
n=0.035 L=500.0' S=0.0158 '/' Capacity=23.56 cfs Outflow=2.22 cfs 6,268 cf

Reach W3D: W-3 Ditch Avg. Depth=0.52' Max Vel=2.02 fps Inflow=1.55 cfs 3,449 cf
n=0.035 L=160.0' S=0.0156 '/' Capacity=8.65 cfs Outflow=1.45 cfs 3,449 cf

Pond WP: West Sed Pond Peak Elev=5,503.96' Storage=14,852 cf Inflow=3.02 cfs 14,852 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 305,034 sf Runoff Volume = 14,853 cf Average Runoff Depth = 0.58"
100.00% Pervious = 305,034 sf 0.00% Impervious = 0 sf

10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Summary for Subcatchment W-1: Watershed W-1

Runoff = 1.54 cfs @ 12.13 hrs, Volume= 5,136 cf, Depth= 0.58"

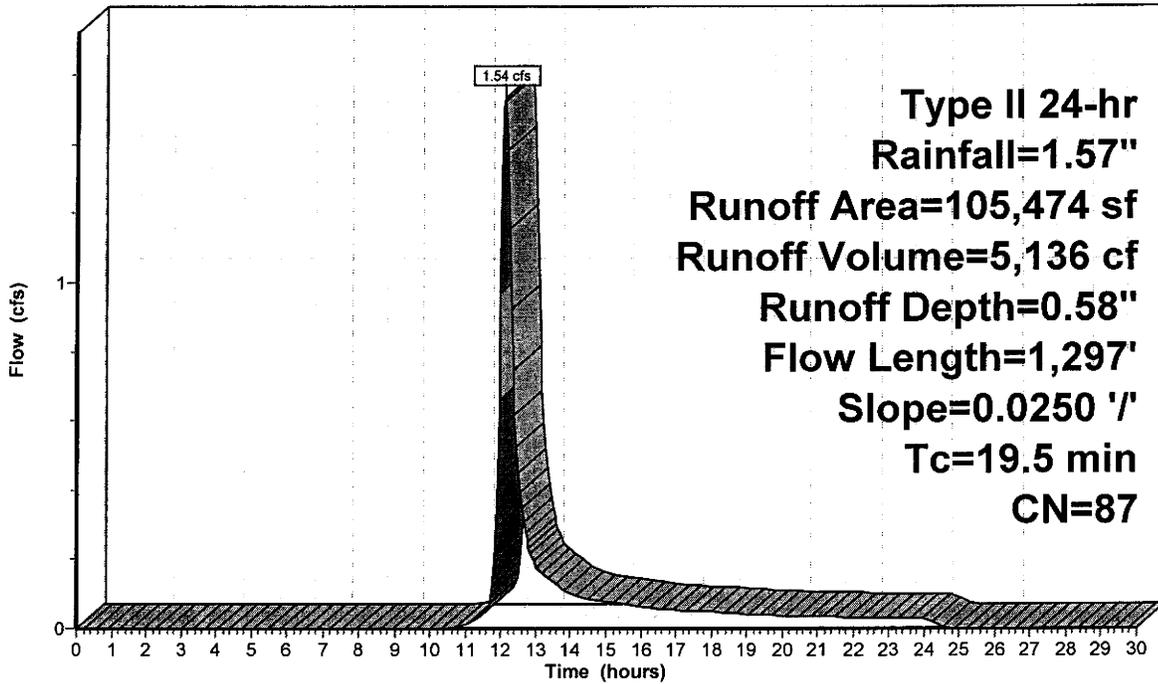
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 105,474	87	
105,474		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.5	1,297	0.0250	1.11		Lag/CN Method,

Subcatchment W-1: Watershed W-1

Hydrograph



Runoff

**Type II 24-hr
 Rainfall=1.57"
 Runoff Area=105,474 sf
 Runoff Volume=5,136 cf
 Runoff Depth=0.58"
 Flow Length=1,297'
 Slope=0.0250 '/
 Tc=19.5 min
 CN=87**

10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Type II 24-hr Rainfall=1.57"

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Summary for Subcatchment W-2: Watershed W-2

Runoff = 2.50 cfs @ 12.04 hrs, Volume= 6,268 cf, Depth= 0.58"

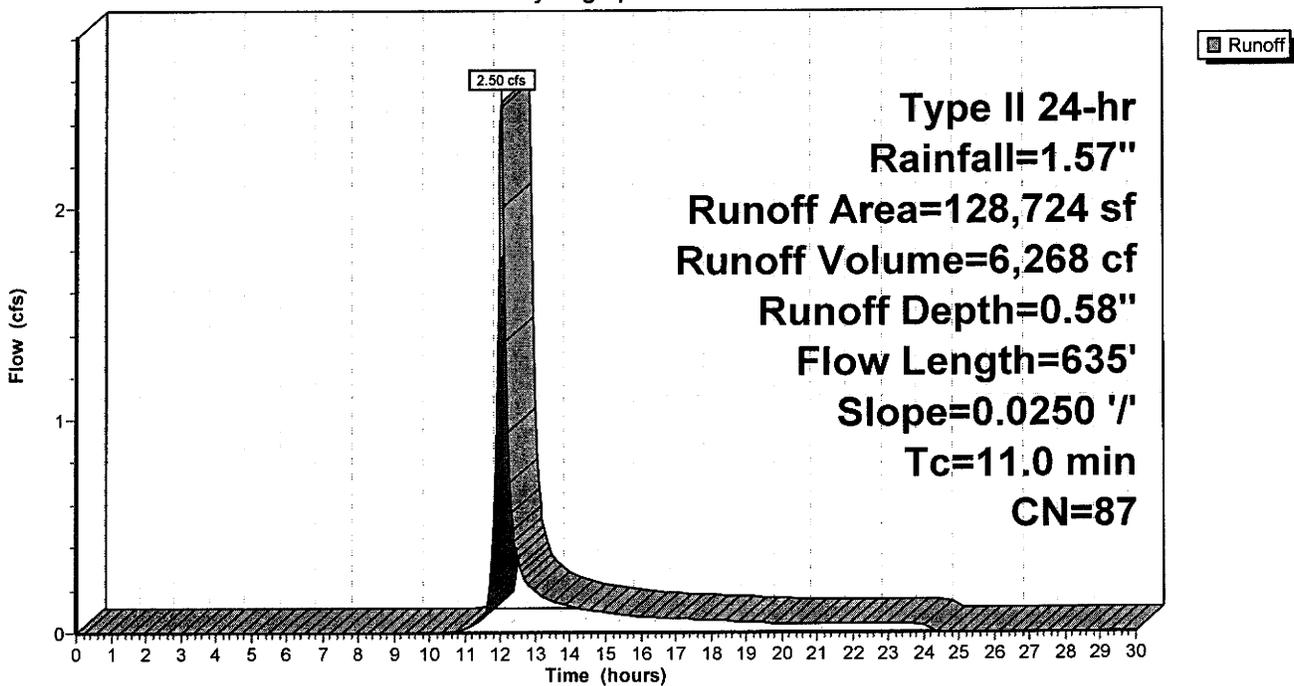
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 128,724	87	
128,724		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	635	0.0250	0.96		Lag/CN Method,

Subcatchment W-2: Watershed W-2

Hydrograph



10yr-24hr West Pond

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Type II 24-hr Rainfall=1.57"

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Summary for Subcatchment W-3: Watershed W-3

Runoff = 1.55 cfs @ 12.00 hrs, Volume= 3,449 cf, Depth= 0.58"

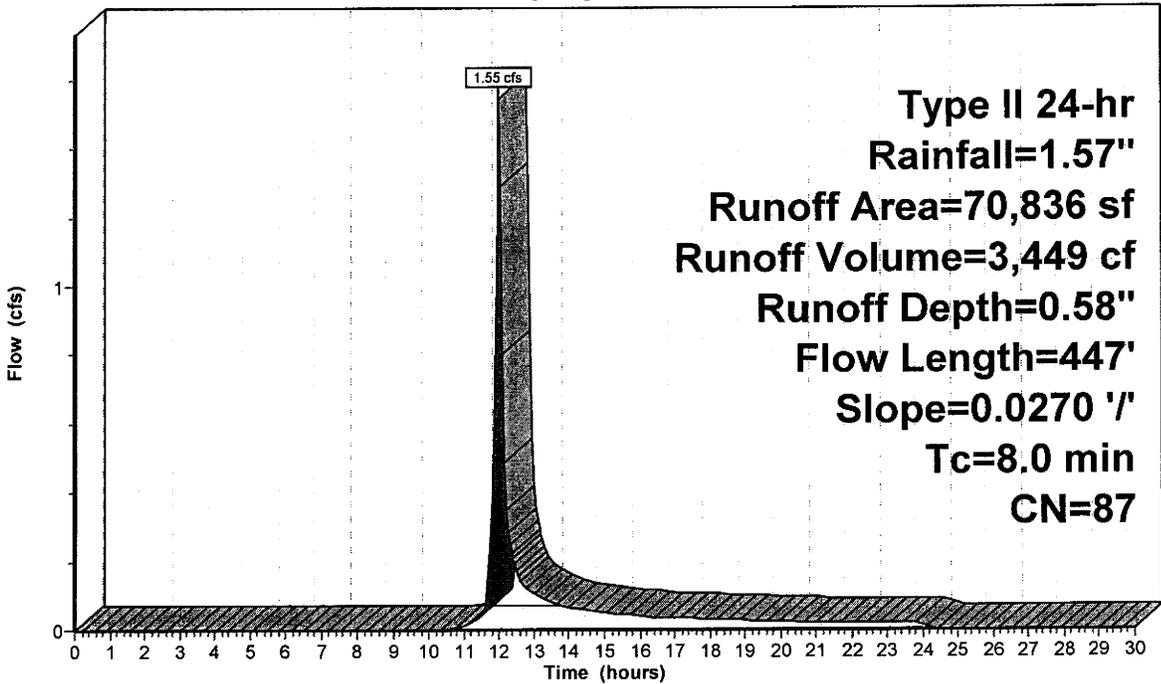
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr Rainfall=1.57"

Area (sf)	CN	Description
* 70,836	87	
70,836		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	447	0.0270	0.93		Lag/CN Method,

Subcatchment W-3: Watershed W-3

Hydrograph



**Type II 24-hr
 Rainfall=1.57"
 Runoff Area=70,836 sf
 Runoff Volume=3,449 cf
 Runoff Depth=0.58"
 Flow Length=447'
 Slope=0.0270 '/
 Tc=8.0 min
 CN=87**

10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Summary for Reach C3: Culvert C-3

[52] Hint: Inlet/Outlet conditions not evaluated

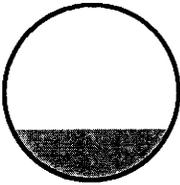
[62] Warning: Exceeded Reach W2D OUTLET depth by 0.22' @ 12.20 hrs

Inflow Area = 128,724 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 2.22 cfs @ 12.15 hrs, Volume= 6,268 cf
 Outflow = 2.21 cfs @ 12.15 hrs, Volume= 6,268 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 5.28 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 1.70 fps, Avg. Travel Time= 0.4 min

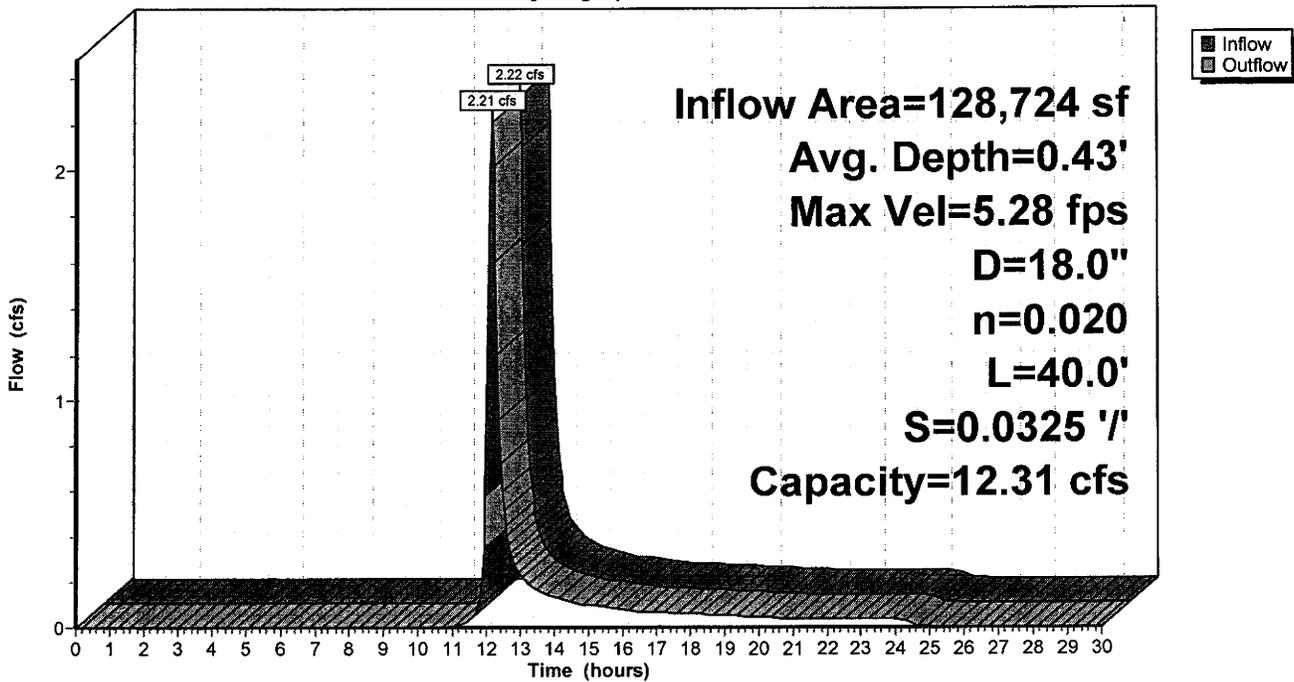
Peak Storage= 17 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.43'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 12.31 cfs

18.0" Diameter Pipe, n= 0.020
 Length= 40.0' Slope= 0.0325 '/'
 Inlet Invert= 5,512.10', Outlet Invert= 5,510.80'



Reach C3: Culvert C-3

Hydrograph



10yr-24hr West Pond

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Summary for Reach C4: Culvert C-4

[52] Hint: Inlet/Outlet conditions not evaluated

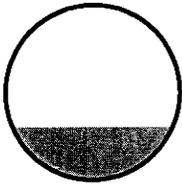
[62] Warning: Exceeded Reach W1DU OUTLET depth by 1.20' @ 0.00 hrs

Inflow Area =	105,474 sf,	0.00% Impervious,	Inflow Depth =	0.58"
Inflow =	1.28 cfs @	12.36 hrs,	Volume=	5,136 cf
Outflow =	1.28 cfs @	12.37 hrs,	Volume=	5,136 cf, Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.83 fps, Min. Travel Time= 0.5 min
 Avg. Velocity = 0.96 fps, Avg. Travel Time= 1.4 min

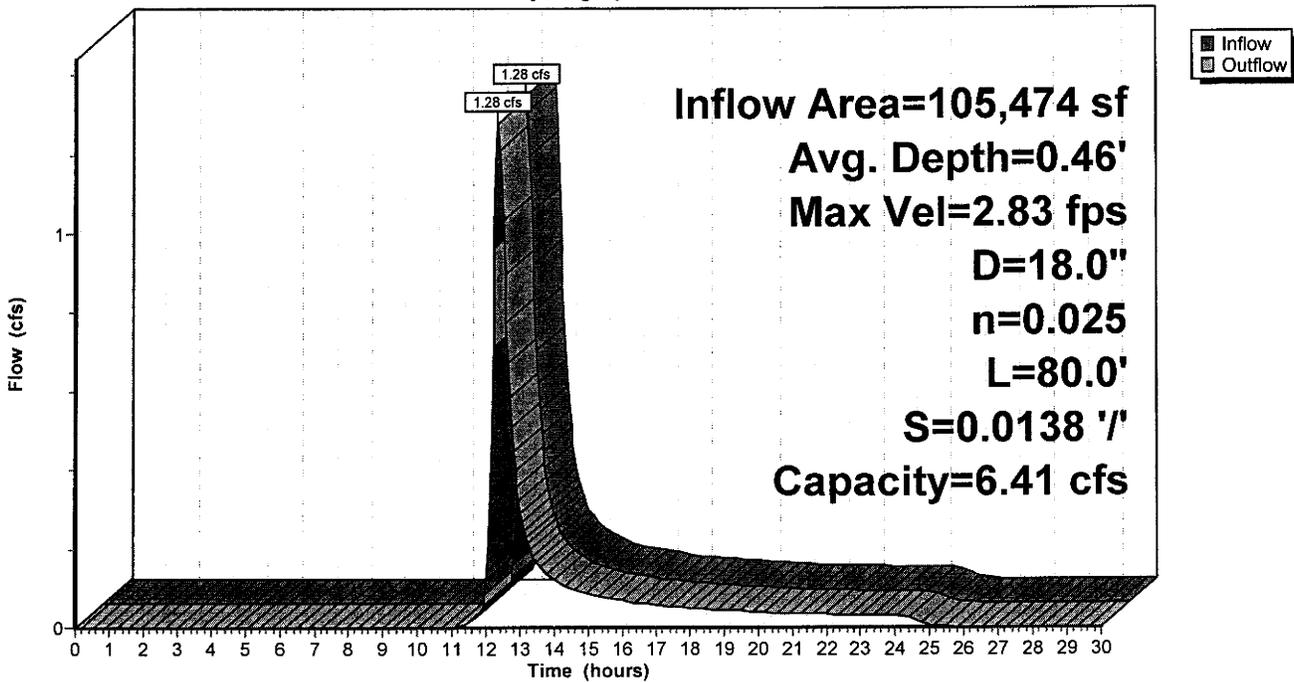
Peak Storage= 36 cf @ 12.36 hrs, Average Depth at Peak Storage= 0.46'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 6.41 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 80.0' Slope= 0.0138 '/'
 Inlet Invert= 5,512.00', Outlet Invert= 5,510.90'



Reach C4: Culvert C-4

Hydrograph



10yr-24hr West Pond

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Summary for Reach C5: Culvert C-5

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach W1DL OUTLET depth by 1.90' @ 10.55 hrs

[62] Warning: Exceeded Reach W3D OUTLET depth by 1.98' @ 12.30 hrs

Inflow Area =	305,034 sf,	0.00% Impervious,	Inflow Depth =	0.58"
Inflow =	3.02 cfs @	12.25 hrs,	Volume=	14,852 cf
Outflow =	3.02 cfs @	12.25 hrs,	Volume=	14,852 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 9.32 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 3.45 fps, Avg. Travel Time= 0.1 min

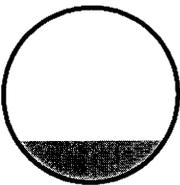
Peak Storage= 6 cf @ 12.25 hrs, Average Depth at Peak Storage= 0.36'

Bank-Full Depth= 1.50', Capacity at Bank-Full= 24.12 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal

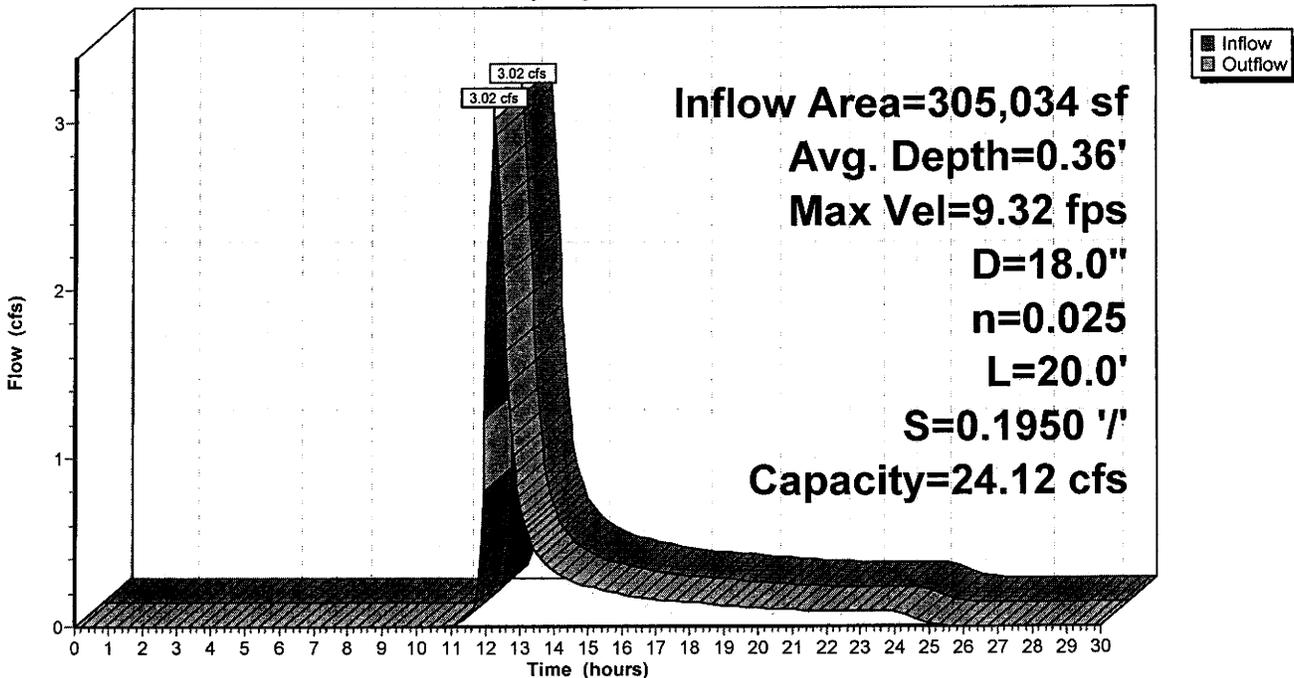
Length= 20.0' Slope= 0.1950 '/'

Inlet Invert= 5,509.90', Outlet Invert= 5,506.00'



Reach C5: Culvert C-5

Hydrograph



10yr-24hr West Pond

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Summary for Reach W1DL: Lower W-1 Ditch

[62] Warning: Exceeded Reach C3 OUTLET depth by 0.50' @ 12.40 hrs

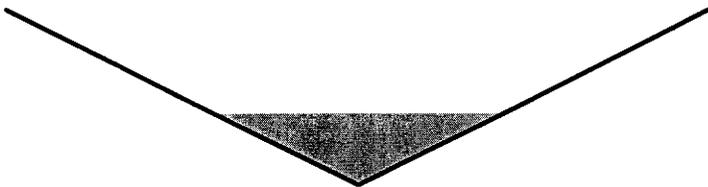
[62] Warning: Exceeded Reach C4 OUTLET depth by 0.39' @ 12.15 hrs

Inflow Area = 234,198 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 2.74 cfs @ 12.18 hrs, Volume= 11,403 cf
 Outflow = 2.68 cfs @ 12.27 hrs, Volume= 11,403 cf, Atten= 2%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.02 fps, Min. Travel Time= 2.6 min
 Avg. Velocity = 0.76 fps, Avg. Travel Time= 7.0 min

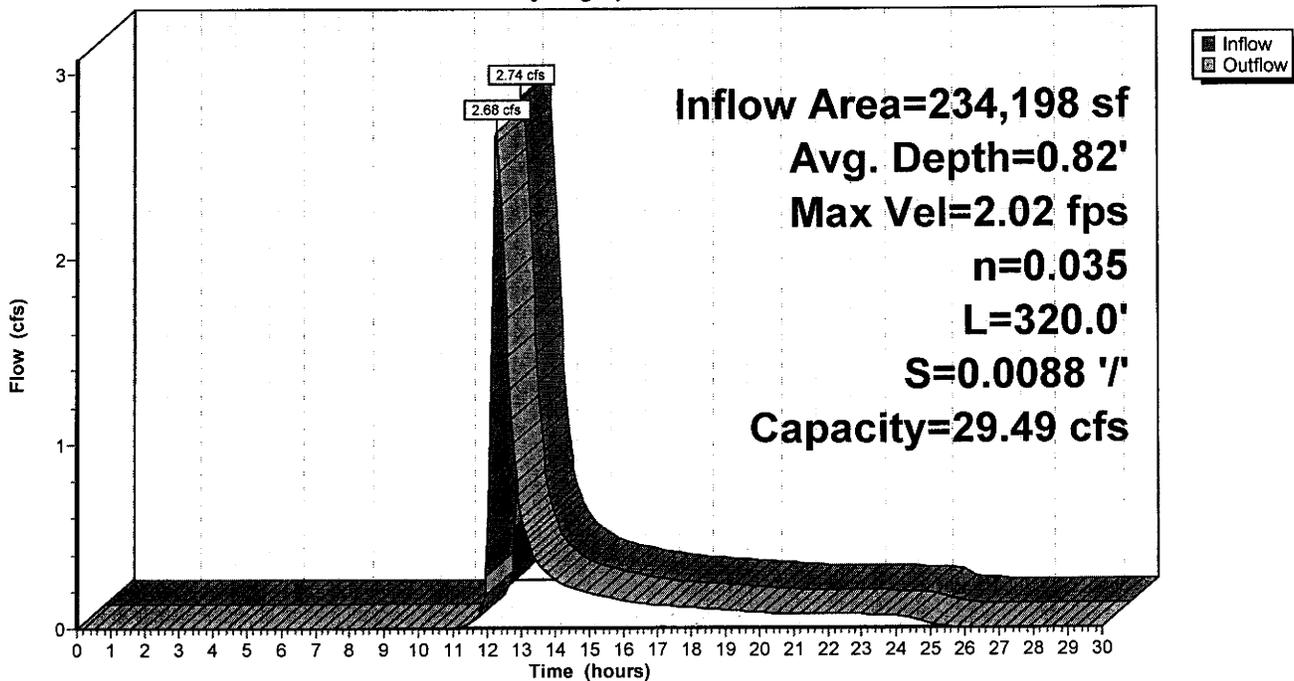
Peak Storage= 426 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.82'
 Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.49 cfs

0.00' x 2.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 '/' Top Width= 8.00'
 Length= 320.0' Slope= 0.0088 '/'
 Inlet Invert= 5,510.80', Outlet Invert= 5,508.00'



Reach W1DL: Lower W-1 Ditch

Hydrograph



10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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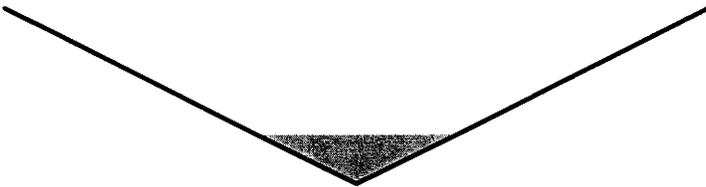
Summary for Reach W1DU: Upper W-1 Ditch

Inflow Area = 105,474 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 1.54 cfs @ 12.13 hrs, Volume= 5,136 cf
 Outflow = 1.28 cfs @ 12.36 hrs, Volume= 5,136 cf, Atten= 17%, Lag= 13.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.04 fps, Min. Travel Time= 7.9 min
 Avg. Velocity = 0.78 fps, Avg. Travel Time= 20.6 min

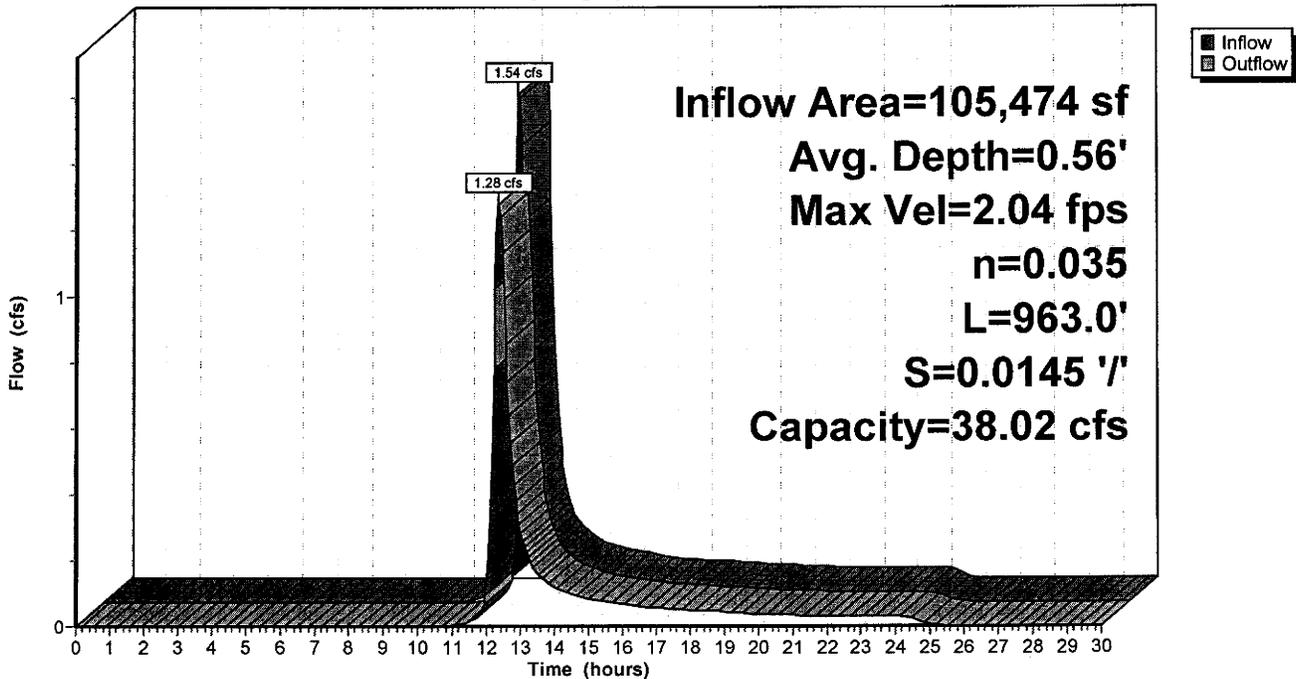
Peak Storage= 612 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.56'
 Bank-Full Depth= 2.00', Capacity at Bank-Full= 38.02 cfs

0.00' x 2.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 ' / ' Top Width= 8.00'
 Length= 963.0' Slope= 0.0145 ' / '
 Inlet Invert= 5,524.80', Outlet Invert= 5,510.80'



Reach W1DU: Upper W-1 Ditch

Hydrograph



10yr-24hr West Pond

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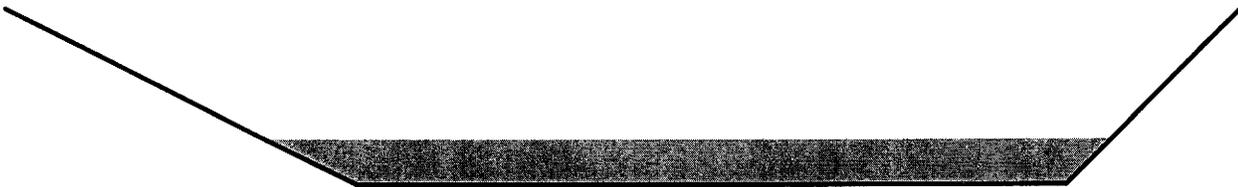
Summary for Reach W2D: W-2 Ditch

Inflow Area = 128,724 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 2.50 cfs @ 12.04 hrs, Volume= 6,268 cf
 Outflow = 2.22 cfs @ 12.15 hrs, Volume= 6,268 cf, Atten= 11%, Lag= 6.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.99 fps, Min. Travel Time= 4.2 min
 Avg. Velocity = 0.50 fps, Avg. Travel Time= 16.7 min

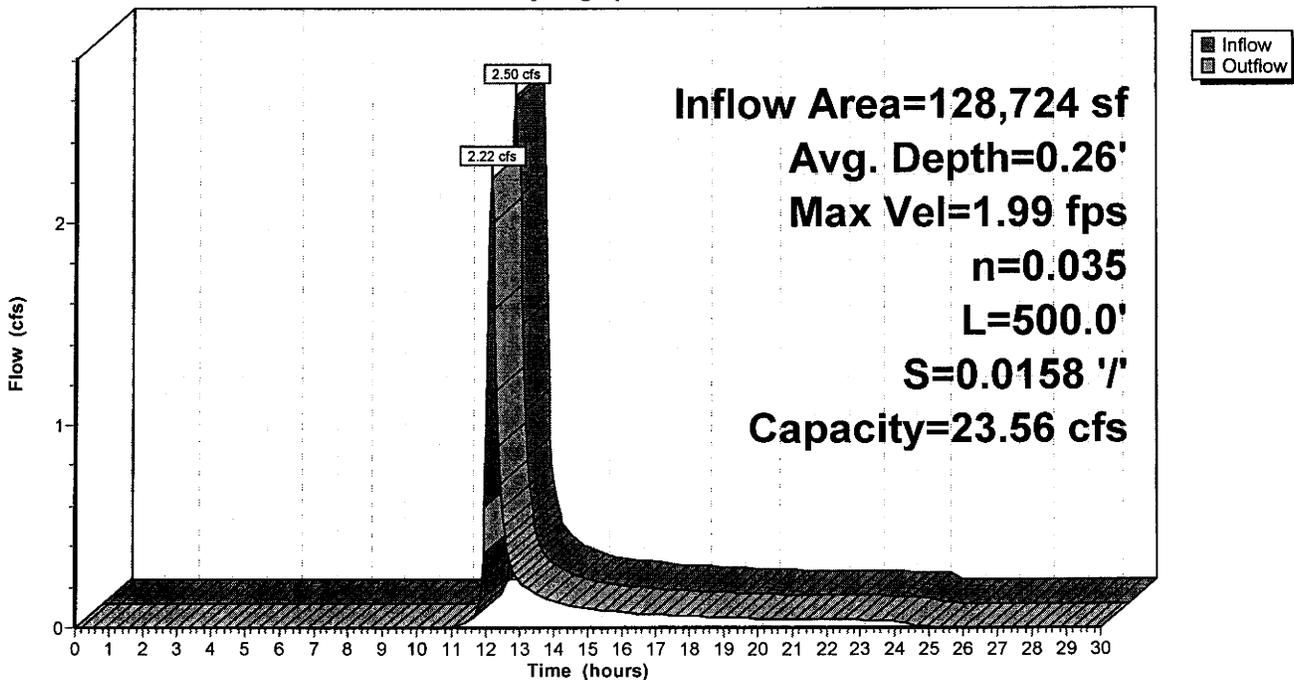
Peak Storage= 568 cf @ 12.08 hrs, Average Depth at Peak Storage= 0.26'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 23.56 cfs

4.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/' Top Width= 7.00'
 Length= 500.0' Slope= 0.0158 '/'
 Inlet Invert= 5,520.00', Outlet Invert= 5,512.10'



Reach W2D: W-2 Ditch

Hydrograph



10yr-24hr West Pond

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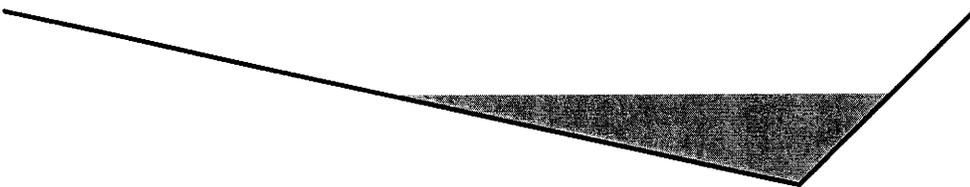
Summary for Reach W3D: W-3 Ditch

Inflow Area = 70,836 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 1.55 cfs @ 12.00 hrs, Volume= 3,449 cf
 Outflow = 1.45 cfs @ 12.04 hrs, Volume= 3,449 cf, Atten= 6%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.02 fps, Min. Travel Time= 1.3 min
 Avg. Velocity = 0.78 fps, Avg. Travel Time= 3.4 min

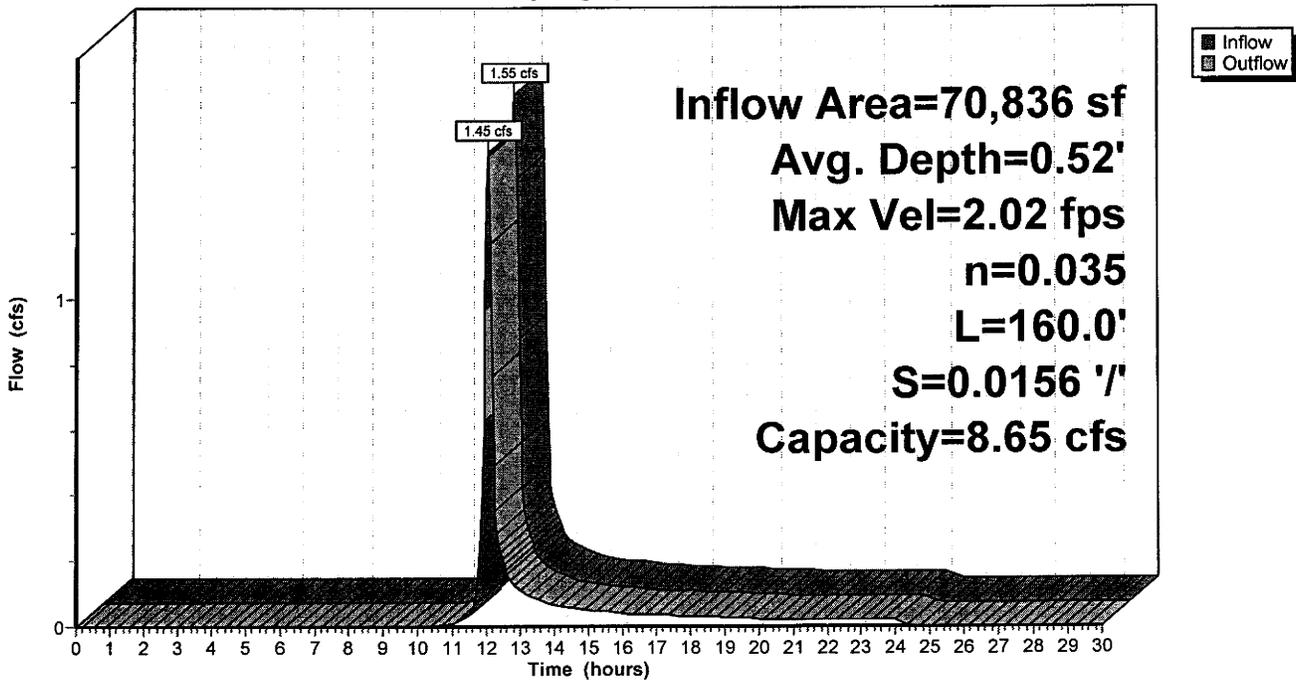
Peak Storage= 118 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.52'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.65 cfs

0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.5 1.0 '/' Top Width= 5.50'
 Length= 160.0' Slope= 0.0156 '/'
 Inlet Invert= 5,510.50', Outlet Invert= 5,508.00'



Reach W3D: W-3 Ditch

Hydrograph



10yr-24hr West Pond

Prepared by EarthFax Engineering, Inc.

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Summary for Pond WP: West Sed Pond

Inflow Area = 305,034 sf, 0.00% Impervious, Inflow Depth = 0.58"
 Inflow = 3.02 cfs @ 12.25 hrs, Volume= 14,852 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

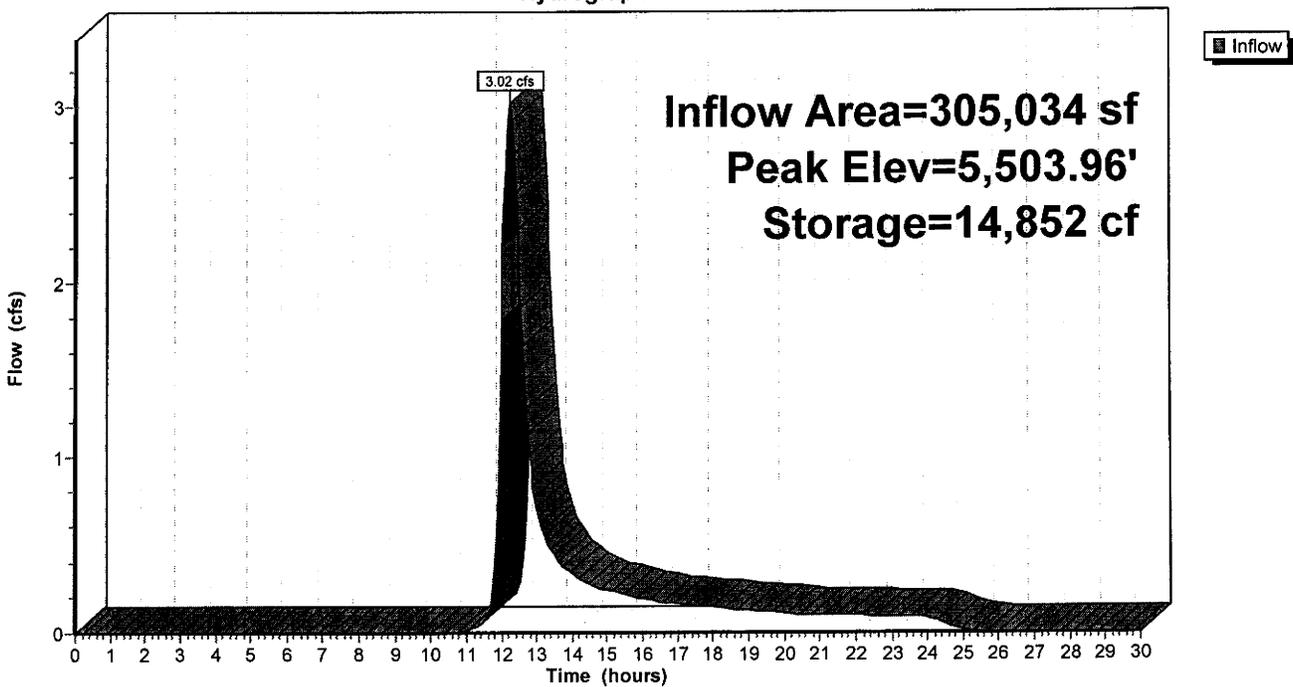
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 5,503.96' @ 30.00 hrs Surf.Area= 4,030 sf Storage= 14,852 cf

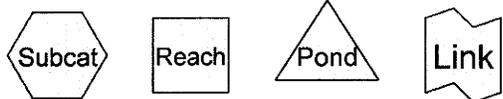
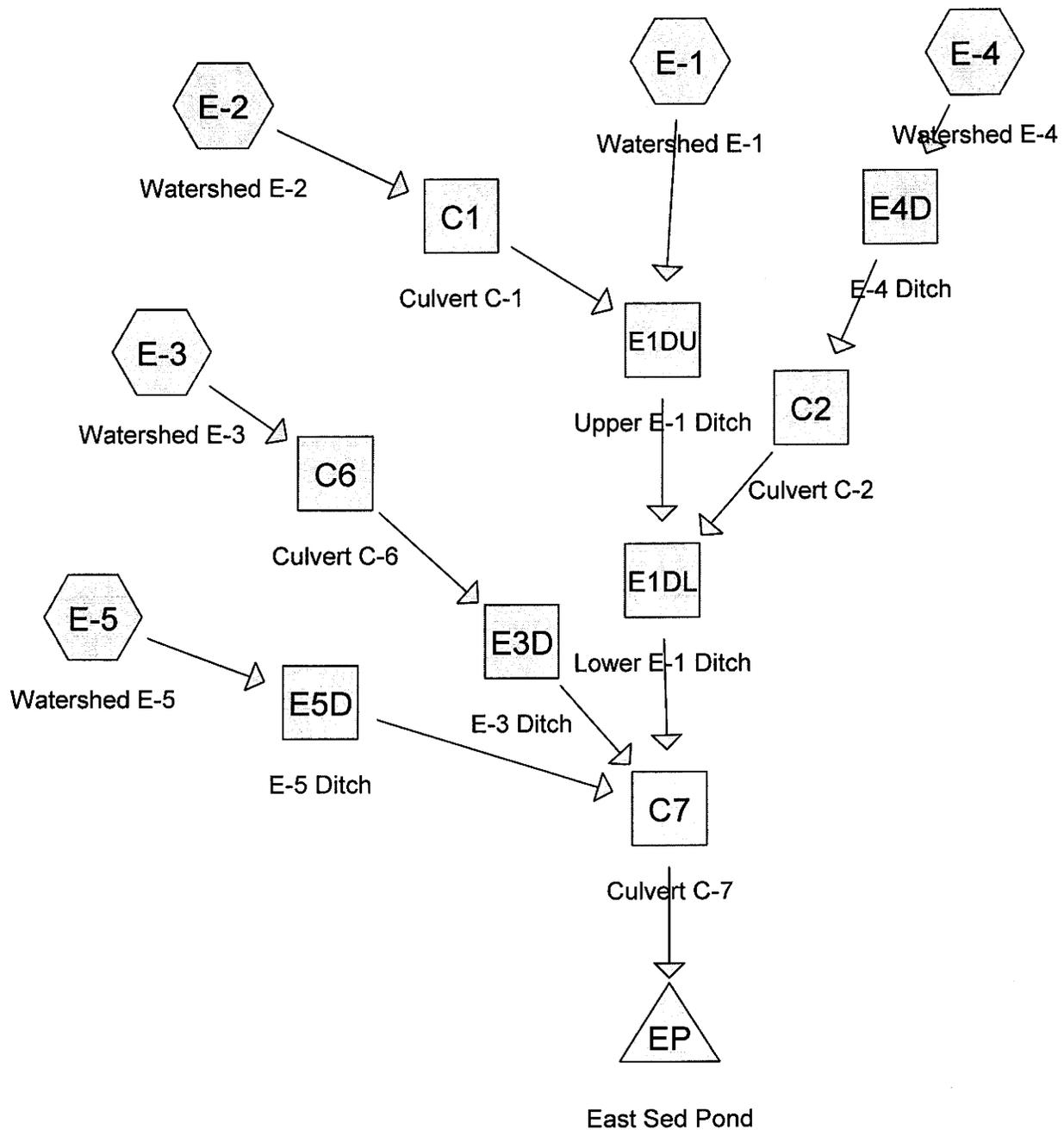
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,498.23'	36,065 cf	17.00'W x 78.00'L x 9.77'H Prismatic Z=2.0

Pond WP: West Sed Pond

Hydrograph





Drainage Diagram for 25yr-6hr East Pond
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25yr-6hr East Pond

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
759,267	87	(E-1,E-2,E-3,E-4,E-5)
759,267		TOTAL AREA

25yr-6hr East Pond

Prepared by EarthFax Engineering, Inc.

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
759,267	Other	E-1, E-2, E-3, E-4, E-5
759,267		TOTAL AREA

25yr-6hr East Pond

Prepared by EarthFax Engineering, Inc.

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Type II 24-hr 6.00 hrs Rainfall=1.29"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

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

Subcatchment E-1: Watershed E-1 Runoff Area=88,103 sf 0.00% Impervious Runoff Depth=0.40"
Flow Length=1,752' Slope=0.0210 '/ Tc=27.1 min CN=87 Runoff=0.98 cfs 2,902 cf

Subcatchment E-2: Watershed E-2 Runoff Area=66,123 sf 0.00% Impervious Runoff Depth=0.40"
Flow Length=581' Slope=0.0210 '/ Tc=11.2 min CN=87 Runoff=1.42 cfs 2,178 cf

Subcatchment E-3: Watershed E-3 Runoff Area=289,991 sf 0.00% Impervious Runoff Depth=0.40"
Flow Length=1,091' Slope=0.0300 '/ Tc=15.5 min CN=87 Runoff=4.88 cfs 9,552 cf

Subcatchment E-4: Watershed E-4 Runoff Area=29,947 sf 0.00% Impervious Runoff Depth=0.40"
Flow Length=561' Slope=0.2500 '/ Tc=3.2 min CN=87 Runoff=1.16 cfs 986 cf

Subcatchment E-5: Watershed E-5 Runoff Area=285,103 sf 0.00% Impervious Runoff Depth=0.40"
Flow Length=925' Slope=0.0250 '/ Tc=14.9 min CN=87 Runoff=4.98 cfs 9,391 cf

Reach C1: Culvert C-1 Avg. Depth=0.35' Max Vel=4.46 fps Inflow=1.42 cfs 2,178 cf
D=18.0" n=0.020 L=40.0' S=0.0300 '/ Capacity=11.83 cfs Outflow=1.40 cfs 2,178 cf

Reach C2: Culvert C-2 Avg. Depth=0.24' Max Vel=3.45 fps Inflow=0.65 cfs 986 cf
D=18.0" n=0.020 L=40.0' S=0.0275 '/ Capacity=11.32 cfs Outflow=0.63 cfs 988 cf

Reach C6: Culvert C-6 Avg. Depth=0.83' Max Vel=4.83 fps Inflow=4.88 cfs 9,552 cf
D=18.0" n=0.025 L=200.0' S=0.0225 '/ Capacity=8.19 cfs Outflow=4.80 cfs 9,552 cf

Reach C7: Culvert C-7 Avg. Depth=0.69' Max Vel=11.54 fps Inflow=9.25 cfs 25,010 cf
D=18.0" n=0.025 L=20.0' S=0.1500 '/ Capacity=21.16 cfs Outflow=9.24 cfs 25,010 cf

Reach E1DL: Lower E-1 Ditch Avg. Depth=0.69' Max Vel=2.42 fps Inflow=1.75 cfs 6,068 cf
n=0.035 L=287.0' S=0.0171 '/ Capacity=13.67 cfs Outflow=1.74 cfs 6,068 cf

Reach E1DU: Upper E-1 Ditch Avg. Depth=0.82' Max Vel=2.28 fps Inflow=1.75 cfs 5,080 cf
n=0.035 L=720.0' S=0.0150 '/ Capacity=7.67 cfs Outflow=1.53 cfs 5,080 cf

Reach E3D: E-3 Ditch Avg. Depth=0.79' Max Vel=3.18 fps Inflow=4.80 cfs 9,552 cf
n=0.035 L=283.0' S=0.0194 '/ Capacity=21.95 cfs Outflow=4.62 cfs 9,552 cf

Reach E4D: E-4 Ditch Avg. Depth=0.50' Max Vel=1.83 fps Inflow=1.16 cfs 986 cf
n=0.035 L=561.0' S=0.0159 '/ Capacity=7.21 cfs Outflow=0.65 cfs 986 cf

Reach E5D: E-5 Ditch Avg. Depth=0.70' Max Vel=1.98 fps Inflow=4.98 cfs 9,391 cf
n=0.035 L=746.0' S=0.0091 '/ Capacity=10.01 cfs Outflow=3.89 cfs 9,391 cf

Pond EP: East Sed Pond Peak Elev=5,504.26' Storage=61,684 cf Inflow=9.24 cfs 25,010 cf
Outflow=2.26 cfs 18,184 cf

Total Runoff Area = 759,267 sf Runoff Volume = 25,009 cf Average Runoff Depth = 0.40"
100.00% Pervious = 759,267 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E-1: Watershed E-1

Runoff = 0.98 cfs @ 3.34 hrs, Volume= 2,902 cf, Depth= 0.40"

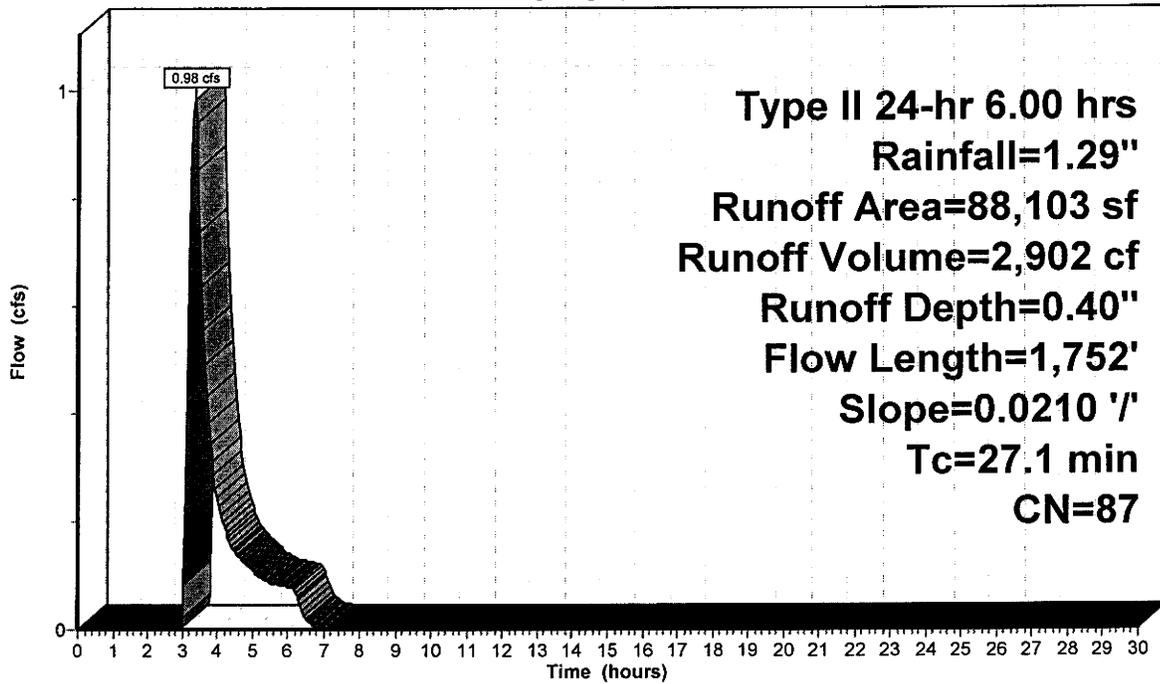
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 88,103	87	
88,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	1,752	0.0210	1.08		Lag/CN Method,

Subcatchment E-1: Watershed E-1

Hydrograph



25yr-6hr East Pond

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Type II 24-hr 6.00 hrs Rainfall=1.29"

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Summary for Subcatchment E-2: Watershed E-2

Runoff = 1.42 cfs @ 3.12 hrs, Volume= 2,178 cf, Depth= 0.40"

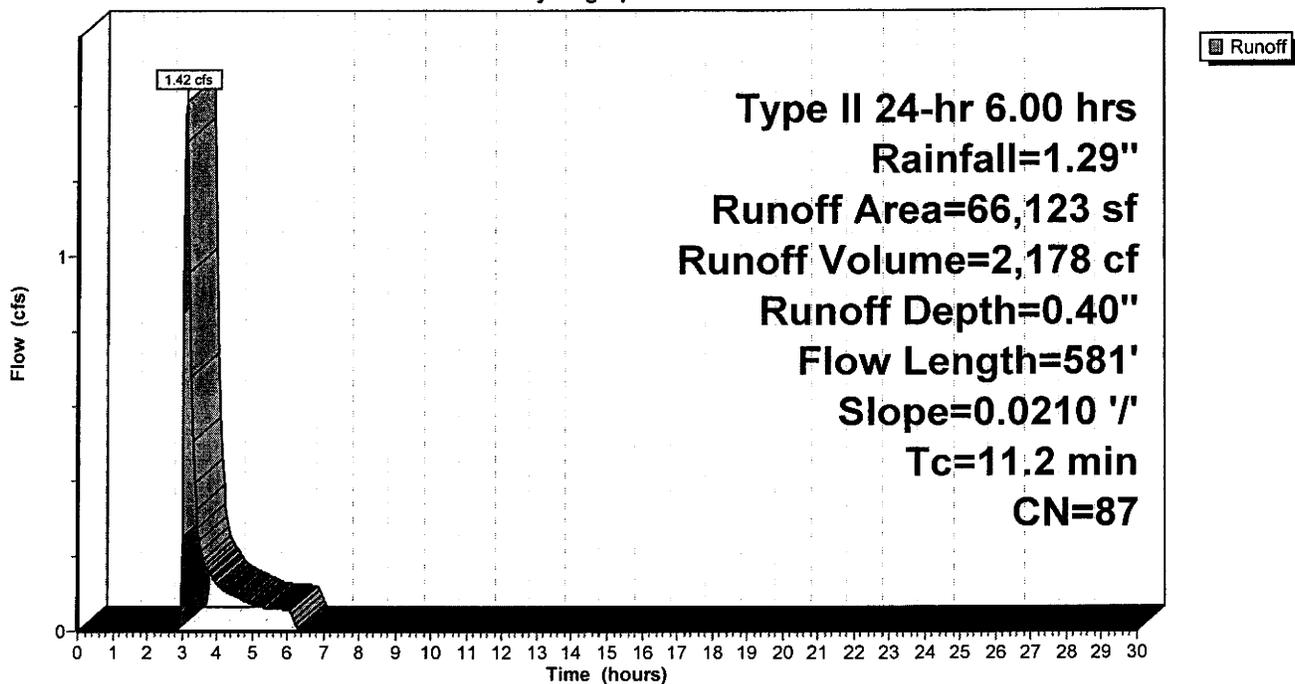
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 66,123	87	
66,123		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	581	0.0210	0.86		Lag/CN Method,

Subcatchment E-2: Watershed E-2

Hydrograph



25yr-6hr East Pond

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Type II 24-hr 6.00 hrs Rainfall=1.29"

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Page 7

Summary for Subcatchment E-3: Watershed E-3

Runoff = 4.88 cfs @ 3.18 hrs, Volume= 9,552 cf, Depth= 0.40"

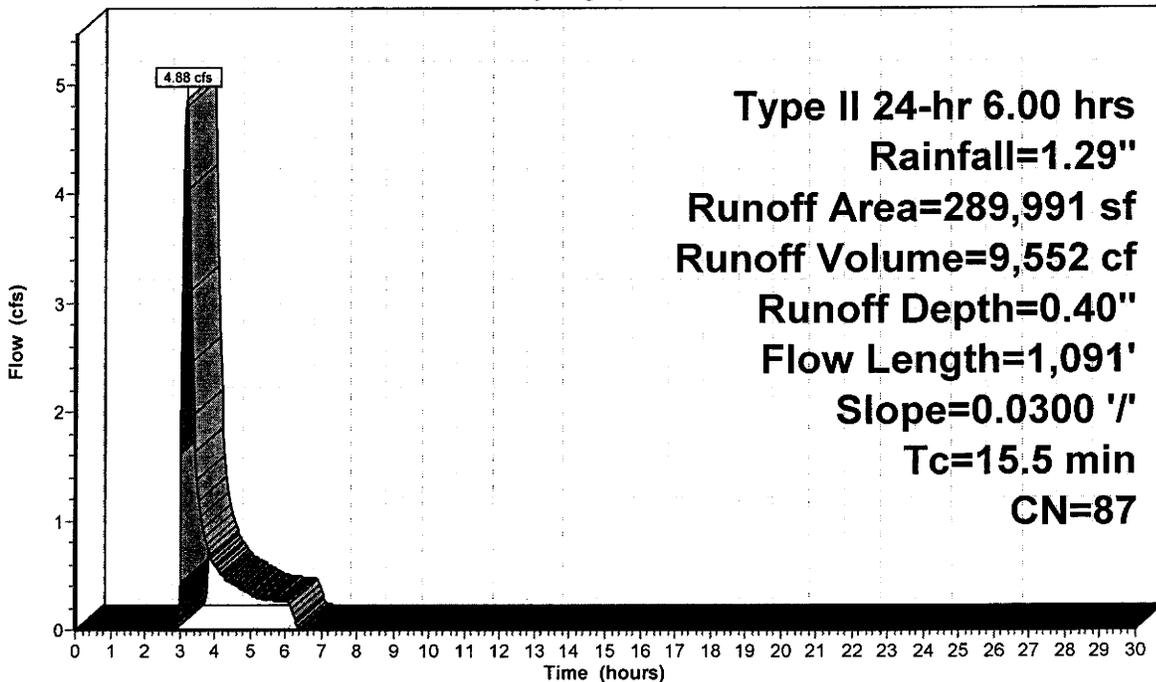
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 289,991	87	
289,991		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	1,091	0.0300	1.17		Lag/CN Method,

Subcatchment E-3: Watershed E-3

Hydrograph



25yr-6hr East Pond

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Summary for Subcatchment E-4: Watershed E-4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.16 cfs @ 3.01 hrs, Volume= 986 cf, Depth= 0.40"

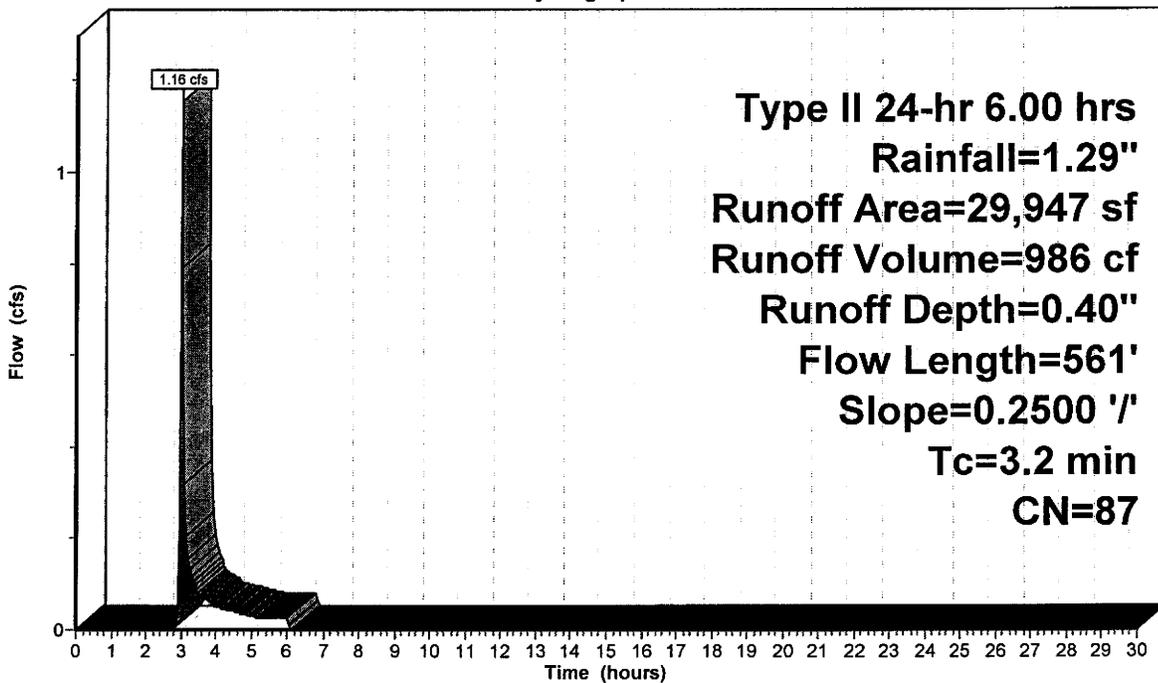
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 29,947	87	
29,947		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	561	0.2500	2.96		Lag/CN Method,

Subcatchment E-4: Watershed E-4

Hydrograph



25yr-6hr East Pond

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Summary for Subcatchment E-5: Watershed E-5

Runoff = 4.98 cfs @ 3.17 hrs, Volume= 9,391 cf, Depth= 0.40"

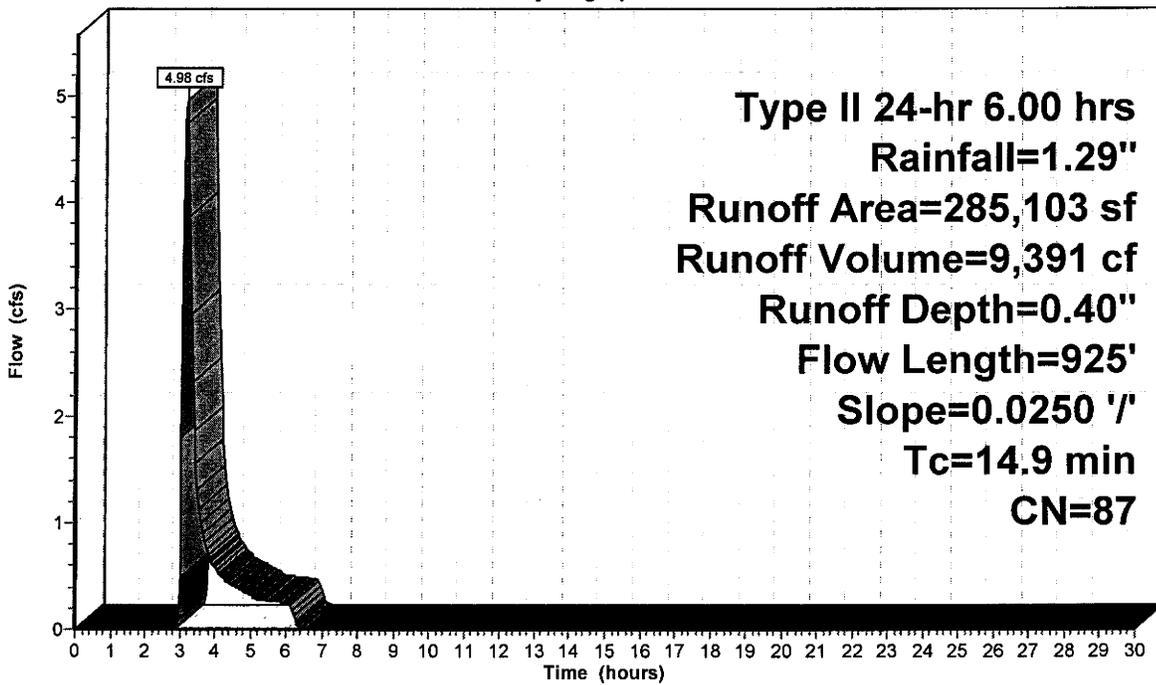
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 285,103	87	
285,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	925	0.0250	1.04		Lag/CN Method,

Subcatchment E-5: Watershed E-5

Hydrograph



25yr-6hr East Pond

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Summary for Reach C1: Culvert C-1

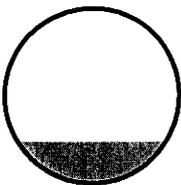
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area =	66,123 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	1.42 cfs @	3.12 hrs,	Volume=	2,178 cf
Outflow =	1.40 cfs @	3.12 hrs,	Volume=	2,178 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 4.46 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 1.99 fps, Avg. Travel Time= 0.3 min

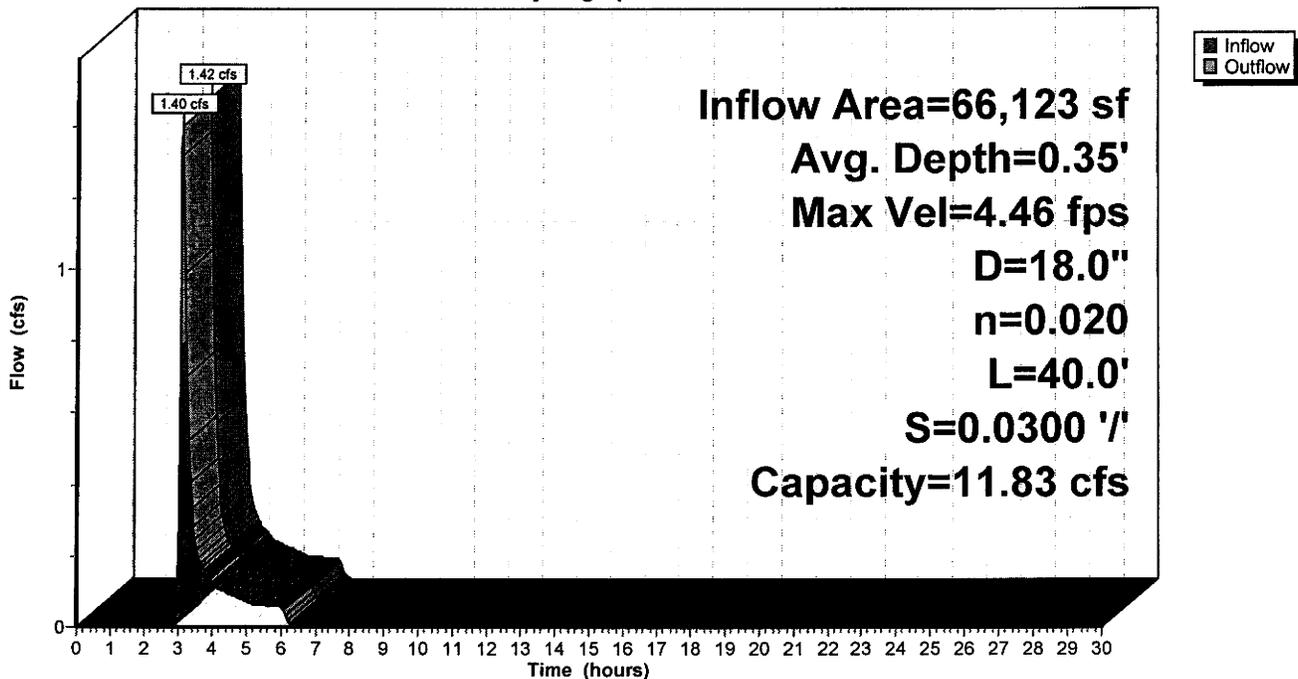
Peak Storage= 13 cf @ 3.12 hrs, Average Depth at Peak Storage= 0.35'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.83 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0300 '/'
 Inlet Invert= 5,520.70', Outlet Invert= 5,519.50'



Reach C1: Culvert C-1

Hydrograph



25yr-6hr East Pond

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Summary for Reach C2: Culvert C-2

[52] Hint: Inlet/Outlet conditions not evaluated

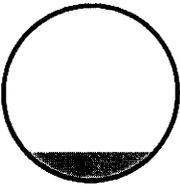
[61] Hint: Exceeded Reach E4D outlet invert by 0.24' @ 3.15 hrs

Inflow Area =	29,947 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	0.65 cfs @	3.16 hrs,	Volume=	986 cf
Outflow =	0.63 cfs @	3.16 hrs,	Volume=	988 cf, Atten= 3%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Max. Velocity= 3.45 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.27 fps, Avg. Travel Time= 0.5 min

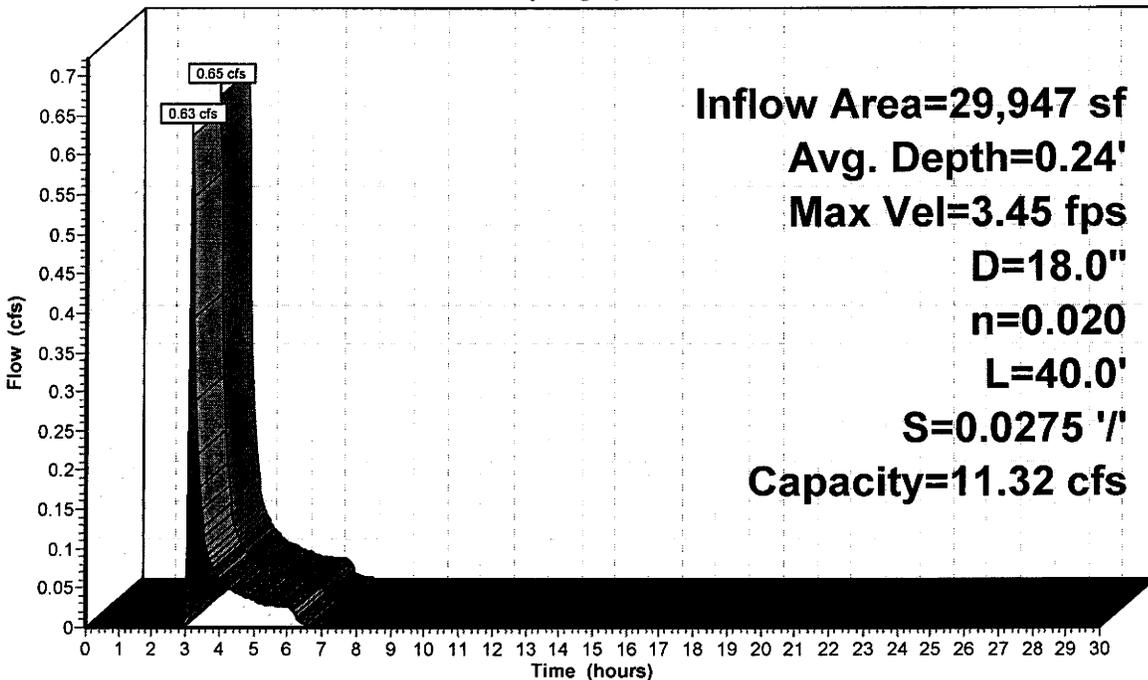
Peak Storage= 7 cf @ 3.16 hrs, Average Depth at Peak Storage= 0.24'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.32 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0275 '/'
 Inlet Invert= 5,509.80', Outlet Invert= 5,508.70'



Reach C2: Culvert C-2

Hydrograph



25yr-6hr East Pond

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Summary for Reach C6: Culvert C-6

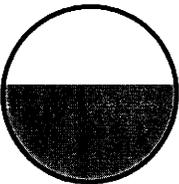
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area =	289,991 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	4.88 cfs @	3.18 hrs,	Volume=	9,552 cf
Outflow =	4.80 cfs @	3.20 hrs,	Volume=	9,552 cf, Atten= 2%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 4.83 fps, Min. Travel Time= 0.7 min
 Avg. Velocity = 2.13 fps, Avg. Travel Time= 1.6 min

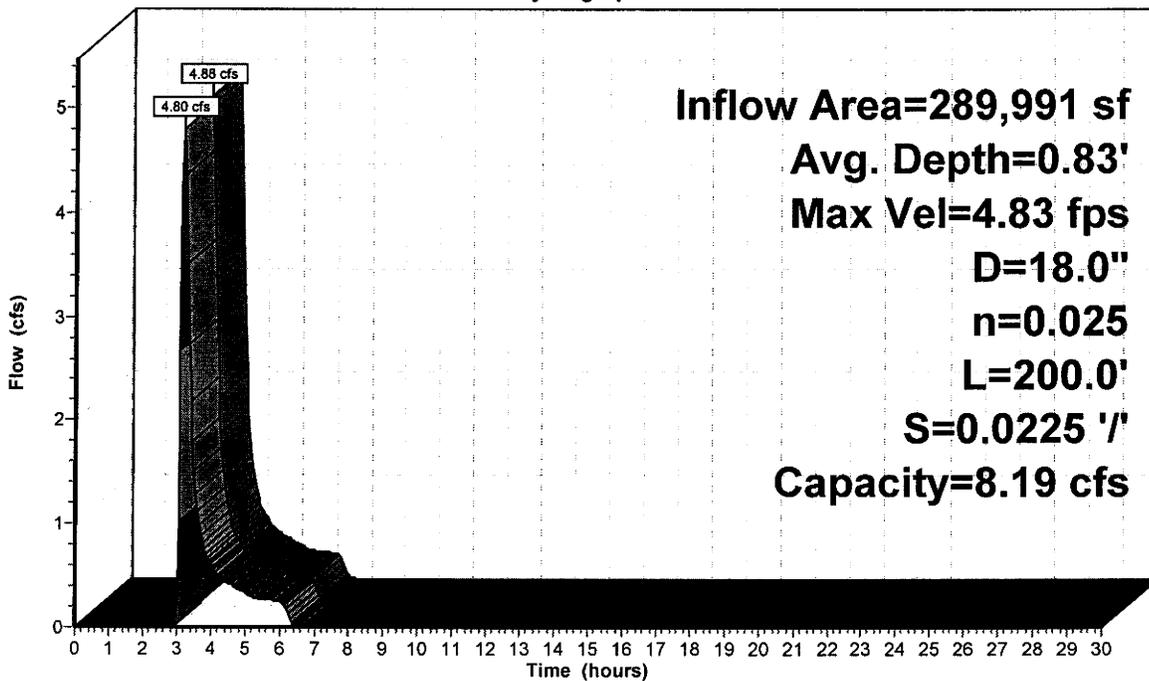
Peak Storage= 202 cf @ 3.19 hrs, Average Depth at Peak Storage= 0.83'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.19 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 200.0' Slope= 0.0225 '/
 Inlet Invert= 5,514.00', Outlet Invert= 5,509.50'



Reach C6: Culvert C-6

Hydrograph



■ Inflow
 ■ Outflow

Inflow Area=289,991 sf
Avg. Depth=0.83'
Max Vel=4.83 fps
D=18.0"
n=0.025
L=200.0'
S=0.0225 '/
Capacity=8.19 cfs

25yr-6hr East Pond

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Summary for Reach C7: Culvert C-7

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach E1DL OUTLET depth by 1.21' @ 3.30 hrs

[62] Warning: Exceeded Reach E3D OUTLET depth by 1.07' @ 3.45 hrs

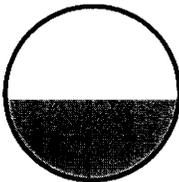
[62] Warning: Exceeded Reach E5D OUTLET depth by 1.24' @ 3.40 hrs

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 9.25 cfs @ 3.32 hrs, Volume= 25,010 cf
 Outflow = 9.24 cfs @ 3.32 hrs, Volume= 25,010 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 11.54 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 3.86 fps, Avg. Travel Time= 0.1 min

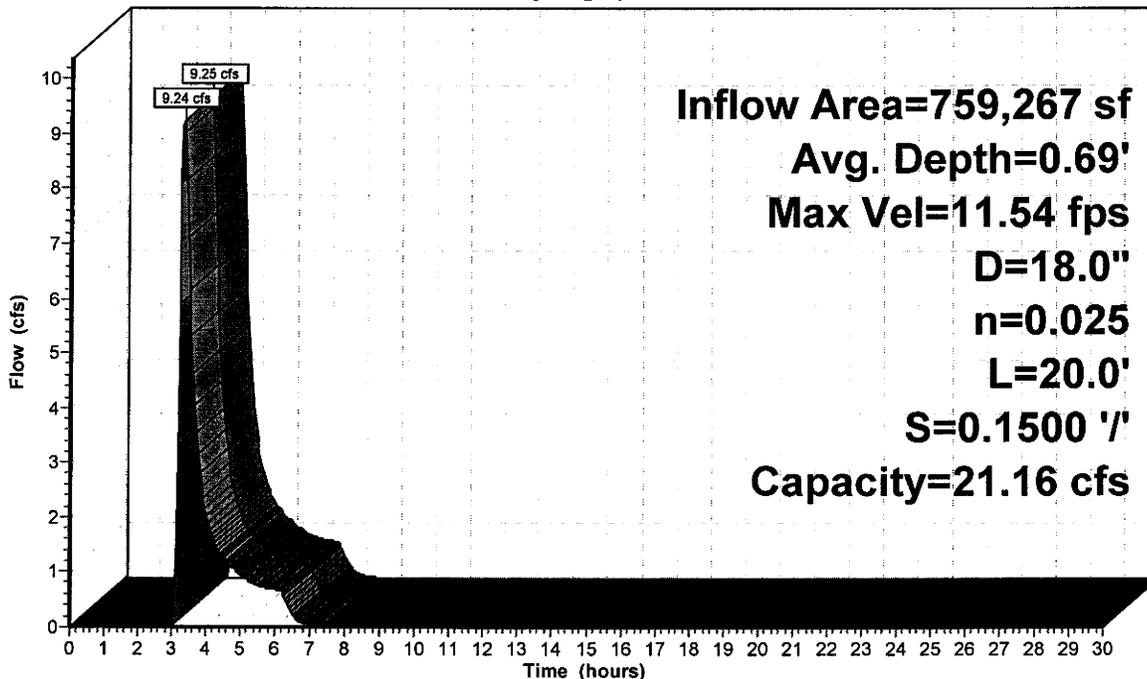
Peak Storage= 16 cf @ 3.32 hrs, Average Depth at Peak Storage= 0.69'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.16 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 20.0' Slope= 0.1500 '/'
 Inlet Invert= 5,505.00', Outlet Invert= 5,502.00'



Reach C7: Culvert C-7

Hydrograph



Inflow Area=759,267 sf
Avg. Depth=0.69'
Max Vel=11.54 fps
D=18.0"
n=0.025
L=20.0'
S=0.1500 '/'
Capacity=21.16 cfs

■ Inflow
 ▨ Outflow

Summary for Reach E1DL: Lower E-1 Ditch

[62] Warning: Exceeded Reach C2 OUTLET depth by 0.56' @ 3.40 hrs

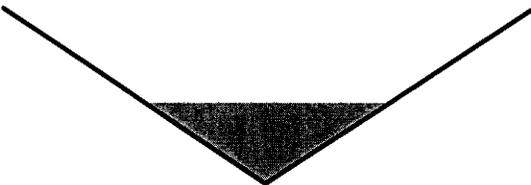
[61] Hint: Exceeded Reach E1DU outlet invert by 0.69' @ 3.35 hrs

Inflow Area = 184,173 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 1.75 cfs @ 3.33 hrs, Volume= 6,068 cf
 Outflow = 1.74 cfs @ 3.40 hrs, Volume= 6,068 cf, Atten= 1%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.42 fps, Min. Travel Time= 2.0 min
 Avg. Velocity = 0.89 fps, Avg. Travel Time= 5.4 min

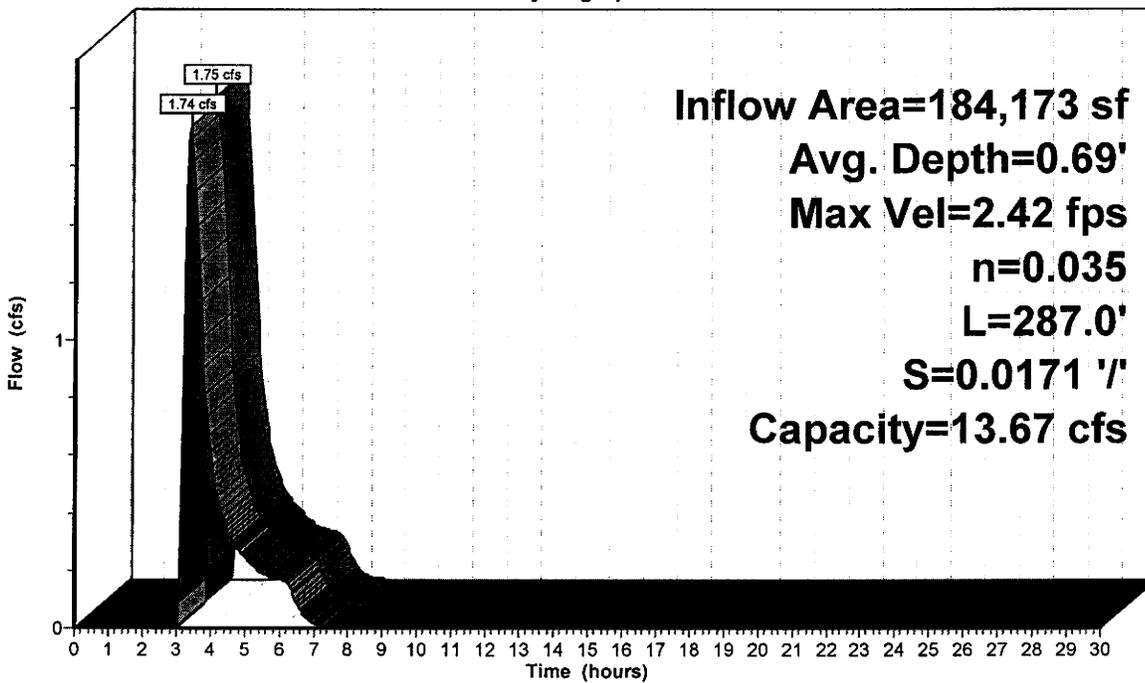
Peak Storage= 207 cf @ 3.36 hrs, Average Depth at Peak Storage= 0.69'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 13.67 cfs

0.00' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 1.5 ' / ' Top Width= 4.50'
 Length= 287.0' Slope= 0.0171 ' / '
 Inlet Invert= 5,508.70', Outlet Invert= 5,503.80'



Reach E1DL: Lower E-1 Ditch

Hydrograph



■ Inflow
 ■ Outflow

Inflow Area=184,173 sf
Avg. Depth=0.69'
Max Vel=2.42 fps
n=0.035
L=287.0'
S=0.0171 ' / '
Capacity=13.67 cfs

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Summary for Reach E1DU: Upper E-1 Ditch

[62] Warning: Exceeded Reach C1 OUTLET depth by 0.62' @ 3.40 hrs

Inflow Area =	154,226 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	1.75 cfs @	3.16 hrs,	Volume=	5,080 cf
Outflow =	1.53 cfs @	3.37 hrs,	Volume=	5,080 cf, Atten= 12%, Lag= 12.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.28 fps, Min. Travel Time= 5.3 min

Avg. Velocity = 0.85 fps, Avg. Travel Time= 14.2 min

Peak Storage= 485 cf @ 3.27 hrs, Average Depth at Peak Storage= 0.82'

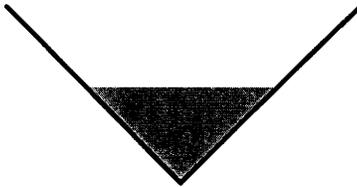
Bank-Full Depth= 1.50', Capacity at Bank-Full= 7.67 cfs

0.00' x 1.50' deep channel, n= 0.035

Side Slope Z-value= 1.0 ' Top Width= 3.00'

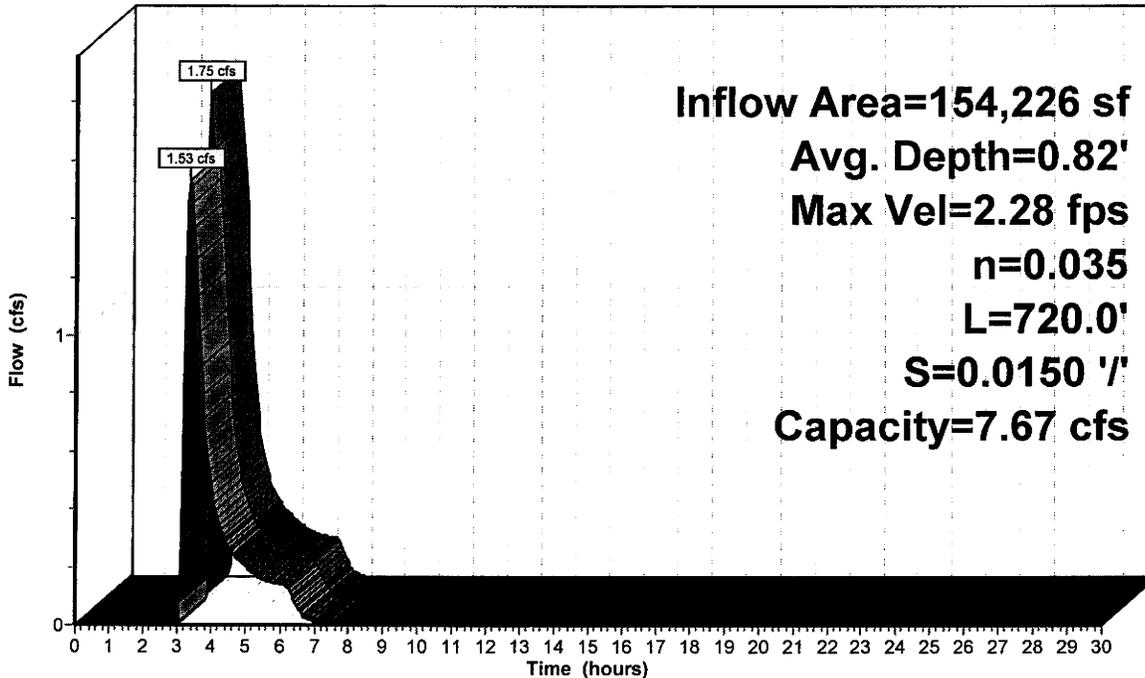
Length= 720.0' Slope= 0.0150 '/'

Inlet Invert= 5,519.50', Outlet Invert= 5,508.70'



Reach E1DU: Upper E-1 Ditch

Hydrograph



Inflow Area=154,226 sf

Avg. Depth=0.82'

Max Vel=2.28 fps

n=0.035

L=720.0'

S=0.0150 '/'

Capacity=7.67 cfs

Summary for Reach E3D: E-3 Ditch

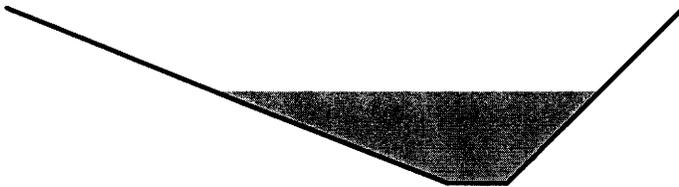
[62] Warning: Exceeded Reach C6 OUTLET depth by 0.07' @ 3.35 hrs

Inflow Area = 289,991 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 4.80 cfs @ 3.20 hrs, Volume= 9,552 cf
 Outflow = 4.62 cfs @ 3.25 hrs, Volume= 9,552 cf, Atten= 4%, Lag= 3.0 min

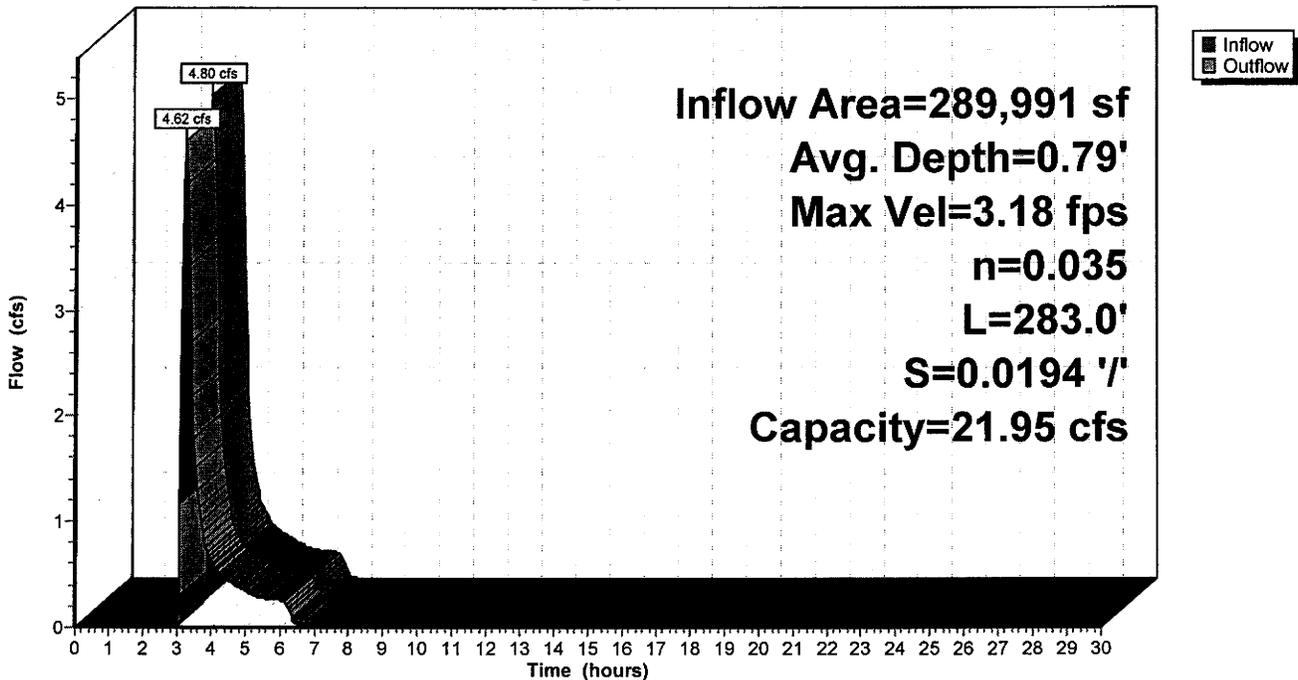
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 3.18 fps, Min. Travel Time= 1.5 min
 Avg. Velocity = 1.36 fps, Avg. Travel Time= 3.5 min

Peak Storage= 421 cf @ 3.22 hrs, Average Depth at Peak Storage= 0.79'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.95 cfs

0.50' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 2.5 1.0 '/' Top Width= 5.75'
 Length= 283.0' Slope= 0.0194 '/'
 Inlet Invert= 5,509.50', Outlet Invert= 5,504.00'



Reach E3D: E-3 Ditch
 Hydrograph



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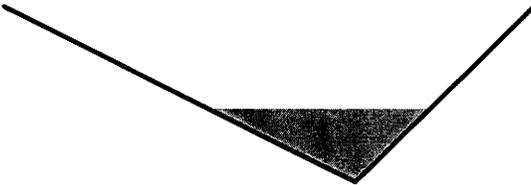
Summary for Reach E4D: E-4 Ditch

Inflow Area =	29,947 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	1.16 cfs @	3.01 hrs,	Volume=	986 cf
Outflow =	0.65 cfs @	3.16 hrs,	Volume=	986 cf, Atten= 44%, Lag= 8.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.83 fps, Min. Travel Time= 5.1 min
 Avg. Velocity = 0.64 fps, Avg. Travel Time= 14.6 min

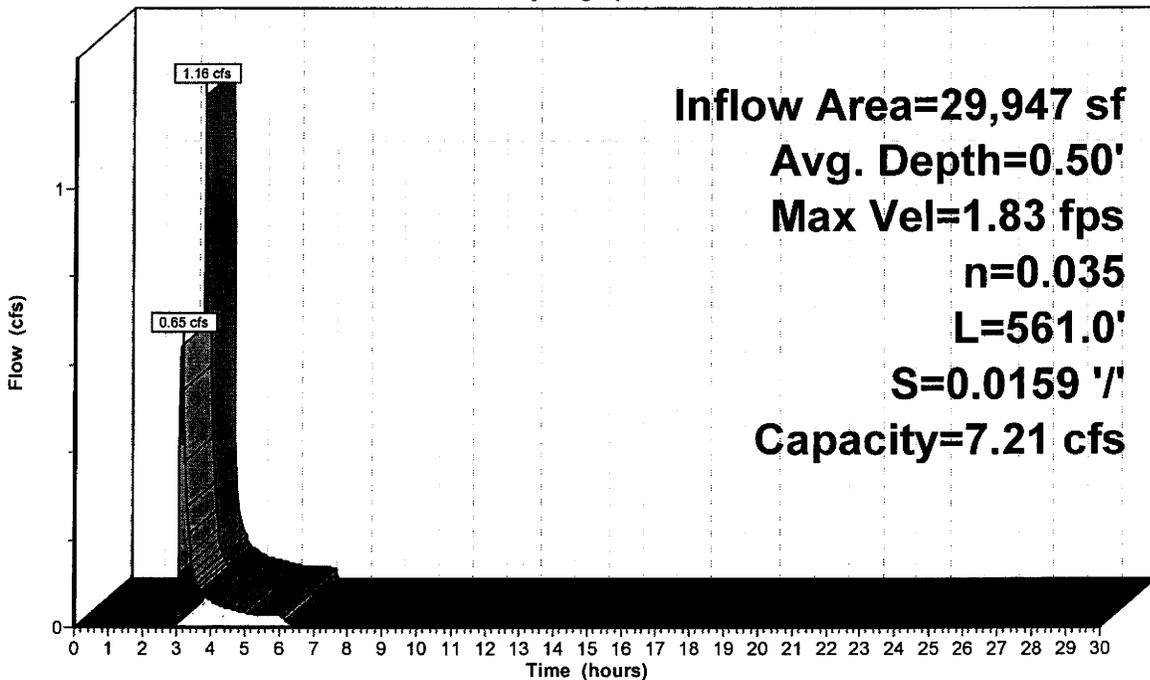
Peak Storage= 207 cf @ 3.07 hrs, Average Depth at Peak Storage= 0.50'
 Bank-Full Depth= 1.20', Capacity at Bank-Full= 7.21 cfs

0.00' x 1.20' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/' Top Width= 3.60'
 Length= 561.0' Slope= 0.0159 '/'
 Inlet Invert= 5,518.70', Outlet Invert= 5,509.80'



Reach E4D: E-4 Ditch

Hydrograph



Inflow Area=29,947 sf
Avg. Depth=0.50'
Max Vel=1.83 fps
n=0.035
L=561.0'
S=0.0159 '/'
Capacity=7.21 cfs

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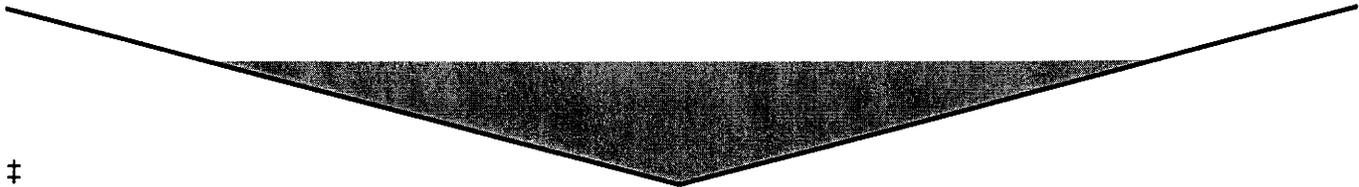
Summary for Reach E5D: E-5 Ditch

Inflow Area = 285,103 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 4.98 cfs @ 3.17 hrs, Volume= 9,391 cf
 Outflow = 3.89 cfs @ 3.36 hrs, Volume= 9,391 cf, Atten= 22%, Lag= 11.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.98 fps, Min. Travel Time= 6.3 min
 Avg. Velocity = 0.54 fps, Avg. Travel Time= 23.0 min

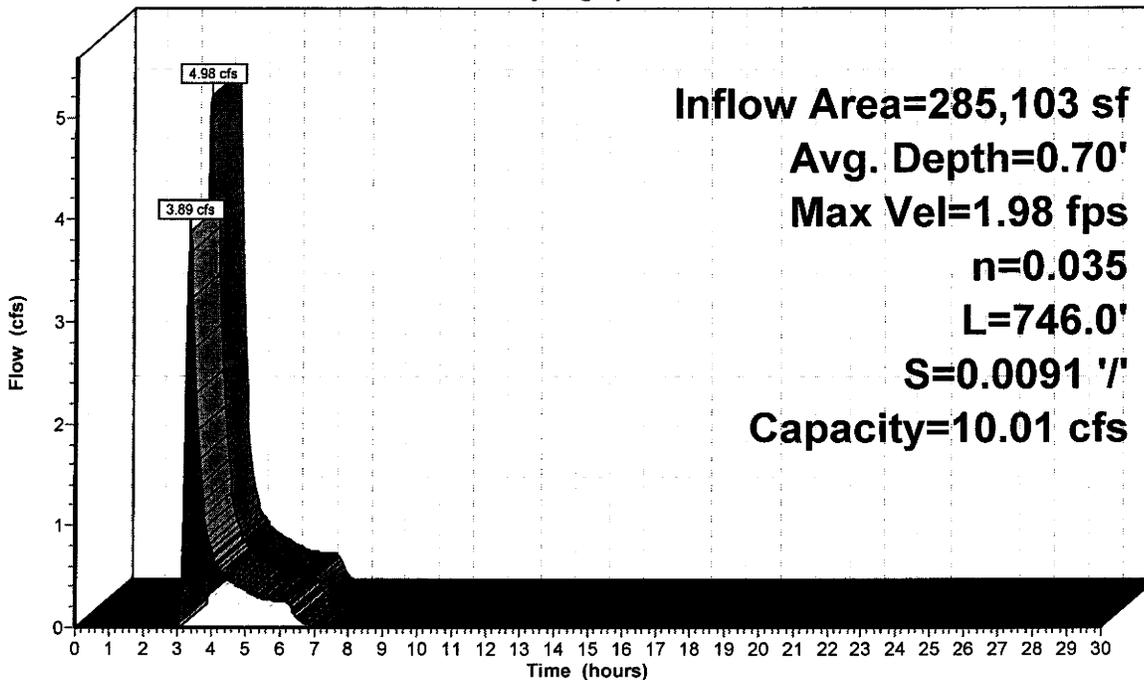
Peak Storage= 1,475 cf @ 3.26 hrs, Average Depth at Peak Storage= 0.70'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 10.01 cfs

0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.0 '/' Top Width= 8.00'
 Length= 746.0' Slope= 0.0091 '/'
 Inlet Invert= 5,510.60', Outlet Invert= 5,503.80'



Reach E5D: E-5 Ditch

Hydrograph



■ Inflow
 ▨ Outflow

Inflow Area=285,103 sf
Avg. Depth=0.70'
Max Vel=1.98 fps
n=0.035
L=746.0'
S=0.0091 '/'
Capacity=10.01 cfs

25yr-6hr East Pond

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Summary for Pond EP: East Sed Pond

[62] Warning: Exceeded Reach C7 OUTLET depth by 1.96' @ 4.15 hrs

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 9.24 cfs @ 3.32 hrs, Volume= 25,010 cf
 Outflow = 2.26 cfs @ 3.92 hrs, Volume= 18,184 cf, Atten= 76%, Lag= 36.3 min
 Primary = 2.26 cfs @ 3.92 hrs, Volume= 18,184 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Starting Elev= 5,503.00' Surf.Area= 9,328 sf Storage= 48,972 cf
 Peak Elev= 5,504.26' @ 3.92 hrs Surf.Area= 10,660 sf Storage= 61,684 cf (12,712 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 75.7 min (316.4 - 240.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5,493.80'	78,991 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,493.80	2,550	0	0
5,494.80	2,601	2,576	2,576
5,495.80	3,214	2,908	5,483
5,496.80	3,909	3,562	9,045
5,497.80	4,637	4,273	13,318
5,498.80	5,425	5,031	18,349
5,499.80	6,243	5,834	24,183
5,500.80	7,158	6,701	30,883
5,501.80	8,125	7,642	38,525
5,502.80	9,087	8,606	47,131
5,503.80	10,291	9,689	56,820
5,505.80	11,880	22,171	78,991

Device	Routing	Invert	Outlet Devices
#1	Primary	5,503.70'	2.0' long x 3.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50
			3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81
			2.92 2.97 3.07 3.32

Primary OutFlow Max=2.25 cfs @ 3.92 hrs HW=5,504.26' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 2.25 cfs @ 2.00 fps)

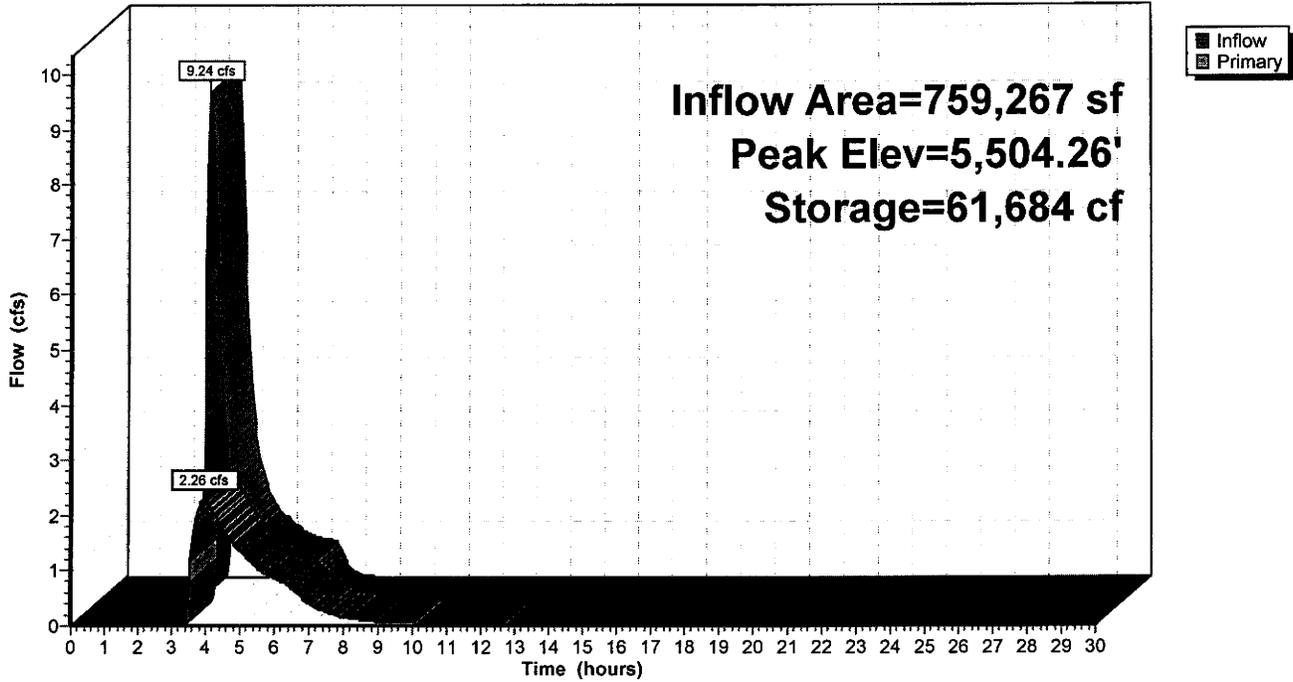
25yr-6hr East Pond

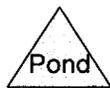
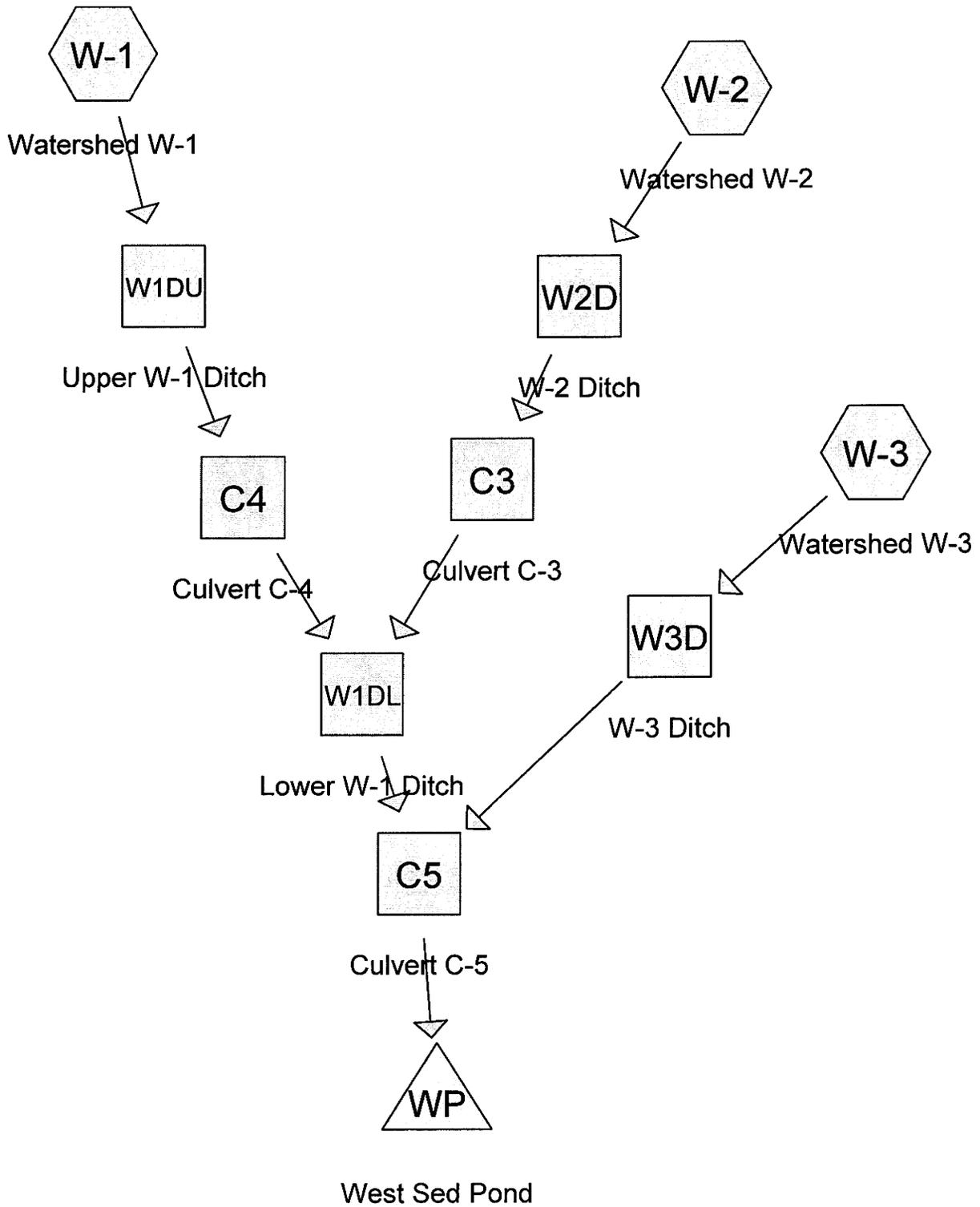
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Pond EP: East Sed Pond

Hydrograph





Drainage Diagram for 25yr-6hr West Pond
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25yr-6hr West Pond

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
305,034	87	(W-1,W-2,W-3)
305,034		TOTAL AREA

25yr-6hr West Pond

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Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
305,034	Other	W-1, W-2, W-3
305,034		TOTAL AREA

25yr-6hr West Pond

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Type II 24-hr 6.00 hrs Rainfall=1.29"

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Page 4

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

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

Subcatchment W-1: Watershed W-1	Runoff Area=105,474 sf	0.00% Impervious	Runoff Depth=0.40"
Flow Length=1,297'	Slope=0.0250 '/	Tc=19.5 min	CN=87
	Runoff=1.50 cfs	3,474 cf	
Subcatchment W-2: Watershed W-2	Runoff Area=128,724 sf	0.00% Impervious	Runoff Depth=0.40"
Flow Length=635'	Slope=0.0250 '/	Tc=11.0 min	CN=87
	Runoff=2.79 cfs	4,240 cf	
Subcatchment W-3: Watershed W-3	Runoff Area=70,836 sf	0.00% Impervious	Runoff Depth=0.40"
Flow Length=447'	Slope=0.0270 '/	Tc=8.0 min	CN=87
	Runoff=1.81 cfs	2,333 cf	
Reach C3: Culvert C-3	Avg. Depth=0.49'	Max Vel=4.51 fps	Inflow=2.24 cfs
D=18.0" n=0.025	L=40.0' S=0.0325 '/	Capacity=9.85 cfs	Outflow=2.23 cfs
		4,240 cf	
Reach C4: Culvert C-4	Avg. Depth=0.44'	Max Vel=2.76 fps	Inflow=1.18 cfs
D=18.0" n=0.025	L=80.0' S=0.0138 '/	Capacity=6.41 cfs	Outflow=1.17 cfs
		3,474 cf	
Reach C5: Culvert C-5	Avg. Depth=0.34'	Max Vel=9.02 fps	Inflow=2.70 cfs
D=18.0" n=0.025	L=20.0' S=0.1950 '/	Capacity=24.12 cfs	Outflow=2.70 cfs
		10,047 cf	
Reach W1DL: Lower W-1 Ditch	Avg. Depth=0.78'	Max Vel=1.95 fps	Inflow=2.44 cfs
n=0.035	L=320.0' S=0.0088 '/	Capacity=29.49 cfs	Outflow=2.35 cfs
		7,714 cf	
Reach W1DU: Upper W-1 Ditch	Avg. Depth=0.55'	Max Vel=2.00 fps	Inflow=1.50 cfs
n=0.035	L=963.0' S=0.0145 '/	Capacity=38.02 cfs	Outflow=1.18 cfs
		3,474 cf	
Reach W2D: W-2 Ditch	Avg. Depth=0.26'	Max Vel=2.00 fps	Inflow=2.79 cfs
n=0.035	L=500.0' S=0.0158 '/	Capacity=23.56 cfs	Outflow=2.24 cfs
		4,240 cf	
Reach W3D: W-3 Ditch	Avg. Depth=0.56'	Max Vel=2.13 fps	Inflow=1.81 cfs
n=0.035	L=160.0' S=0.0156 '/	Capacity=8.65 cfs	Outflow=1.66 cfs
		2,333 cf	
Pond WP: West Sed Pond	Peak Elev=5,508.11'	Storage=36,065 cf	Inflow=2.70 cfs
			Outflow=0.29 cfs
			411 cf

Total Runoff Area = 305,034 sf Runoff Volume = 10,047 cf Average Runoff Depth = 0.40"
100.00% Pervious = 305,034 sf 0.00% Impervious = 0 sf

25yr-6hr West Pond

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Summary for Subcatchment W-1: Watershed W-1

Runoff = 1.50 cfs @ 3.23 hrs, Volume= 3,474 cf, Depth= 0.40"

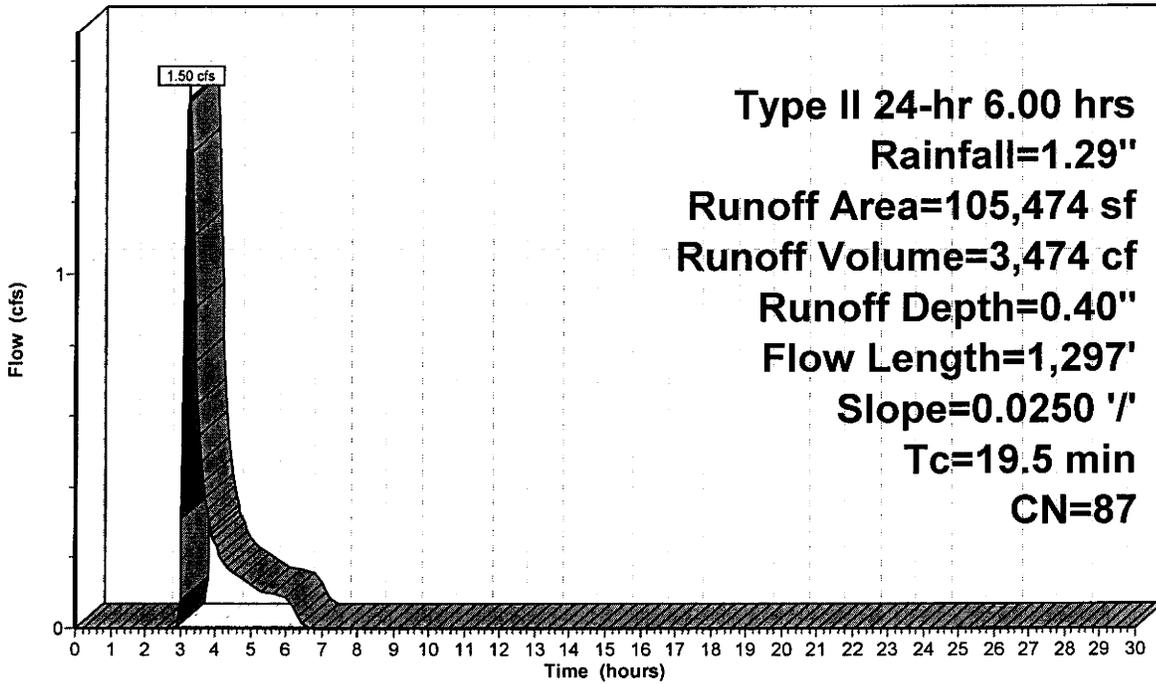
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 105,474	87	
105,474		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.5	1,297	0.0250	1.11		Lag/CN Method,

Subcatchment W-1: Watershed W-1

Hydrograph



Summary for Subcatchment W-2: Watershed W-2

Runoff = 2.79 cfs @ 3.12 hrs, Volume= 4,240 cf, Depth= 0.40"

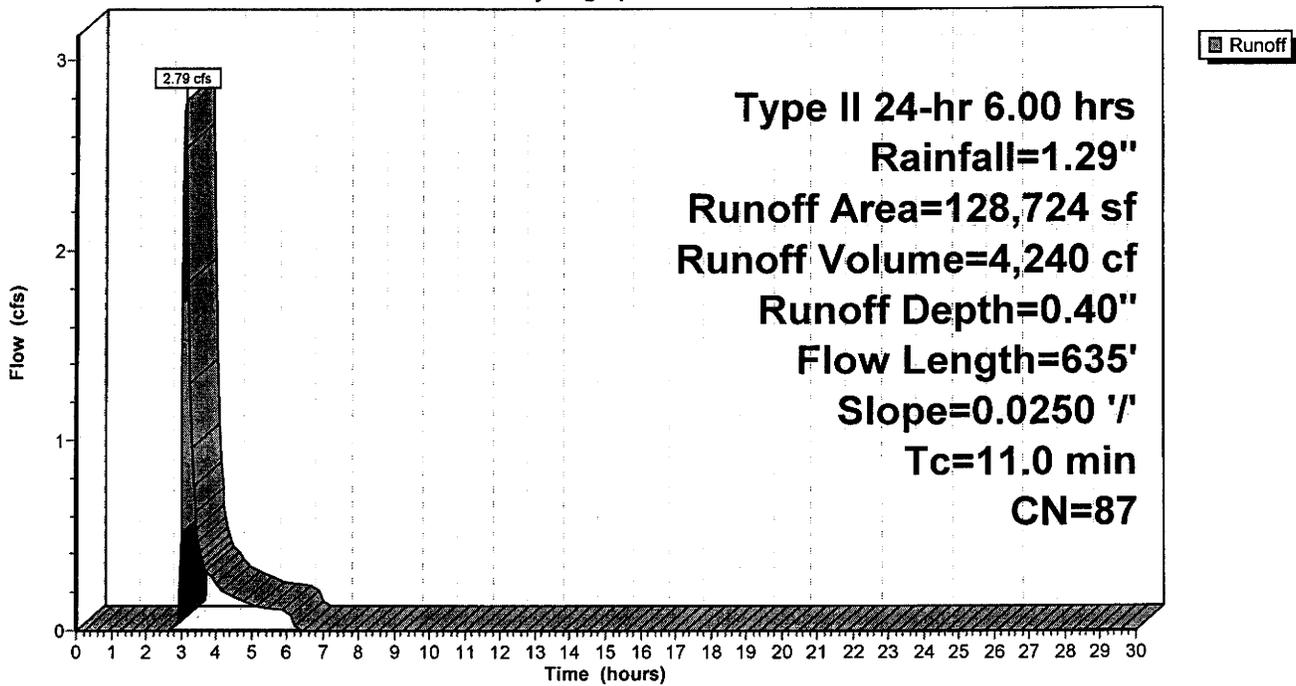
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 128,724	87	
128,724		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	635	0.0250	0.96		Lag/CN Method,

Subcatchment W-2: Watershed W-2

Hydrograph



25yr-6hr West Pond

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Summary for Subcatchment W-3: Watershed W-3

Runoff = 1.81 cfs @ 3.08 hrs, Volume= 2,333 cf, Depth= 0.40"

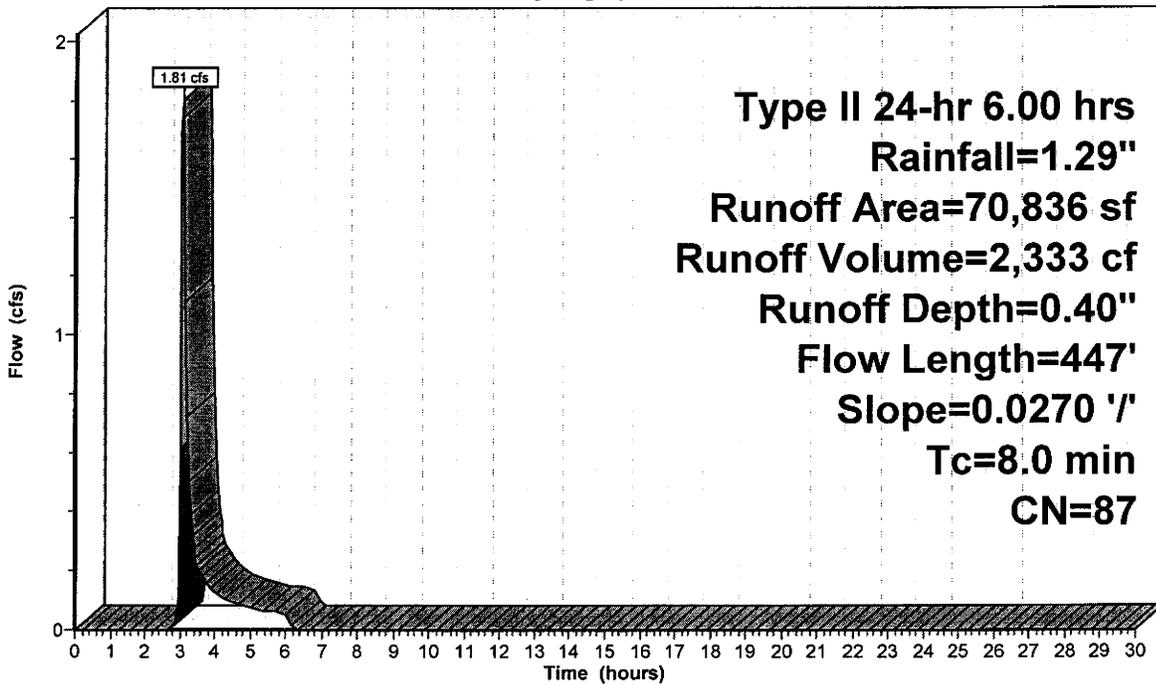
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.29"

Area (sf)	CN	Description
* 70,836	87	
70,836		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	447	0.0270	0.93		Lag/CN Method,

Subcatchment W-3: Watershed W-3

Hydrograph



25yr-6hr West Pond

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Summary for Reach C3: Culvert C-3

[52] Hint: Inlet/Outlet conditions not evaluated

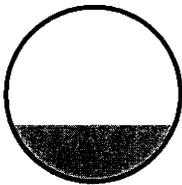
[62] Warning: Exceeded Reach W2D OUTLET depth by 0.26' @ 3.25 hrs

Inflow Area = 128,724 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 2.24 cfs @ 3.25 hrs, Volume= 4,240 cf
 Outflow = 2.23 cfs @ 3.25 hrs, Volume= 4,240 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 4.51 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 1.47 fps, Avg. Travel Time= 0.5 min

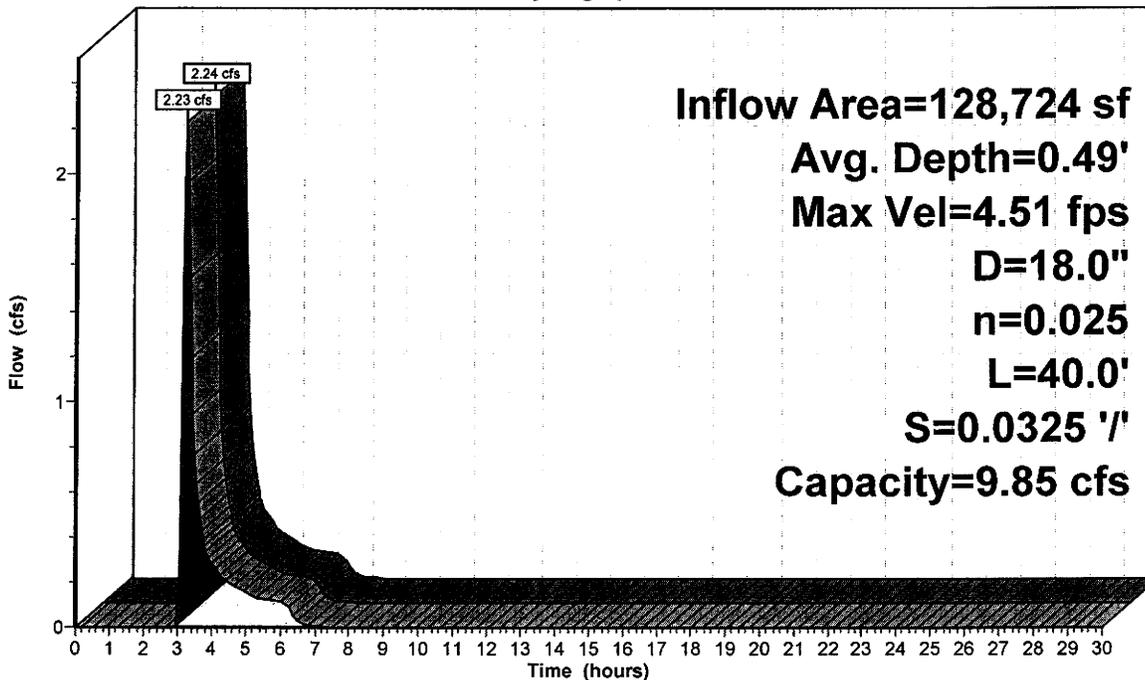
Peak Storage= 20 cf @ 3.25 hrs, Average Depth at Peak Storage= 0.49'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.85 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 40.0' Slope= 0.0325 '/'
 Inlet Invert= 5,512.10', Outlet Invert= 5,510.80'



Reach C3: Culvert C-3

Hydrograph



Inflow Area=128,724 sf
Avg. Depth=0.49'
Max Vel=4.51 fps
D=18.0"
n=0.025
L=40.0'
S=0.0325 '/'
Capacity=9.85 cfs

25yr-6hr West Pond

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Summary for Reach C4: Culvert C-4

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach W1DU OUTLET depth by 1.20' @ 0.00 hrs

Inflow Area =	105,474 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	1.18 cfs @	3.47 hrs,	Volume=	3,474 cf
Outflow =	1.17 cfs @	3.49 hrs,	Volume=	3,474 cf, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.76 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 0.92 fps, Avg. Travel Time= 1.4 min

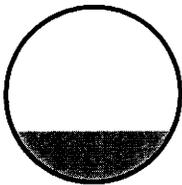
Peak Storage= 34 cf @ 3.48 hrs, Average Depth at Peak Storage= 0.44'

Bank-Full Depth= 1.50', Capacity at Bank-Full= 6.41 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal

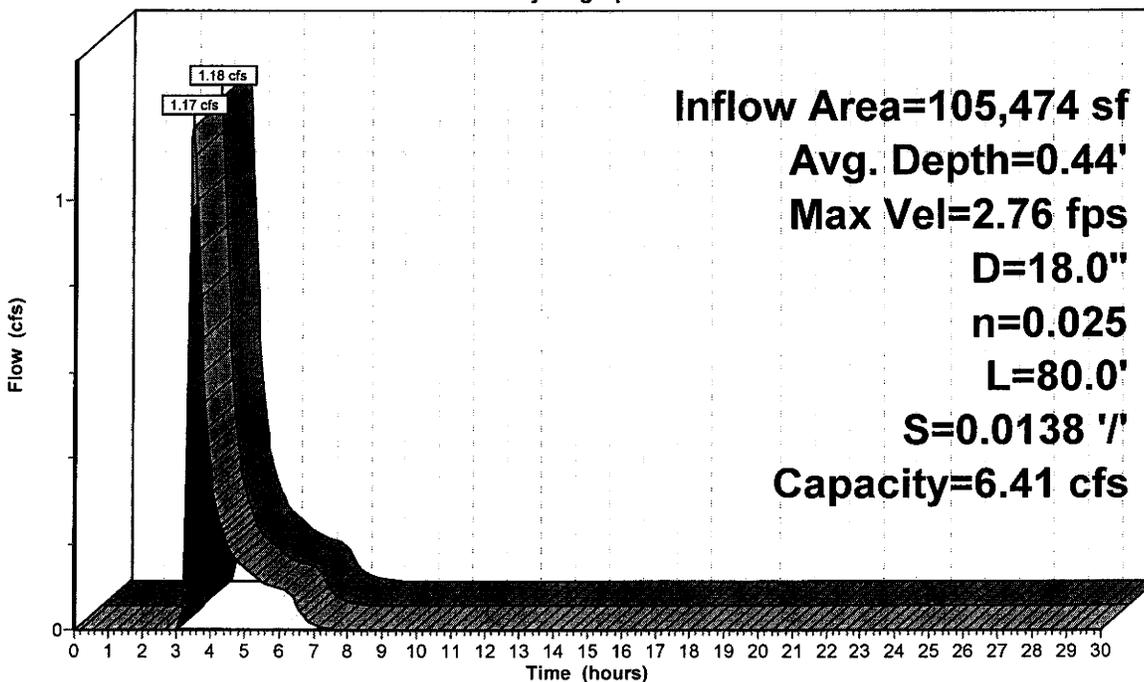
Length= 80.0' Slope= 0.0138 '/'

Inlet Invert= 5,512.00', Outlet Invert= 5,510.90'



Reach C4: Culvert C-4

Hydrograph



Inflow Area=105,474 sf
Avg. Depth=0.44'
Max Vel=2.76 fps
D=18.0"
n=0.025
L=80.0'
S=0.0138 '/'
Capacity=6.41 cfs

■ Inflow
 ▨ Outflow

25yr-6hr West Pond

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Summary for Reach C5: Culvert C-5

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach W1DL OUTLET depth by 2.03' @ 3.05 hrs

[62] Warning: Exceeded Reach W3D OUTLET depth by 1.96' @ 3.50 hrs

Inflow Area =	305,034 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	2.70 cfs @	3.36 hrs,	Volume=	10,047 cf
Outflow =	2.70 cfs @	3.36 hrs,	Volume=	10,047 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 9.02 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 3.48 fps, Avg. Travel Time= 0.1 min

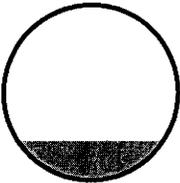
Peak Storage= 6 cf @ 3.36 hrs, Average Depth at Peak Storage= 0.34'

Bank-Full Depth= 1.50', Capacity at Bank-Full= 24.12 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal

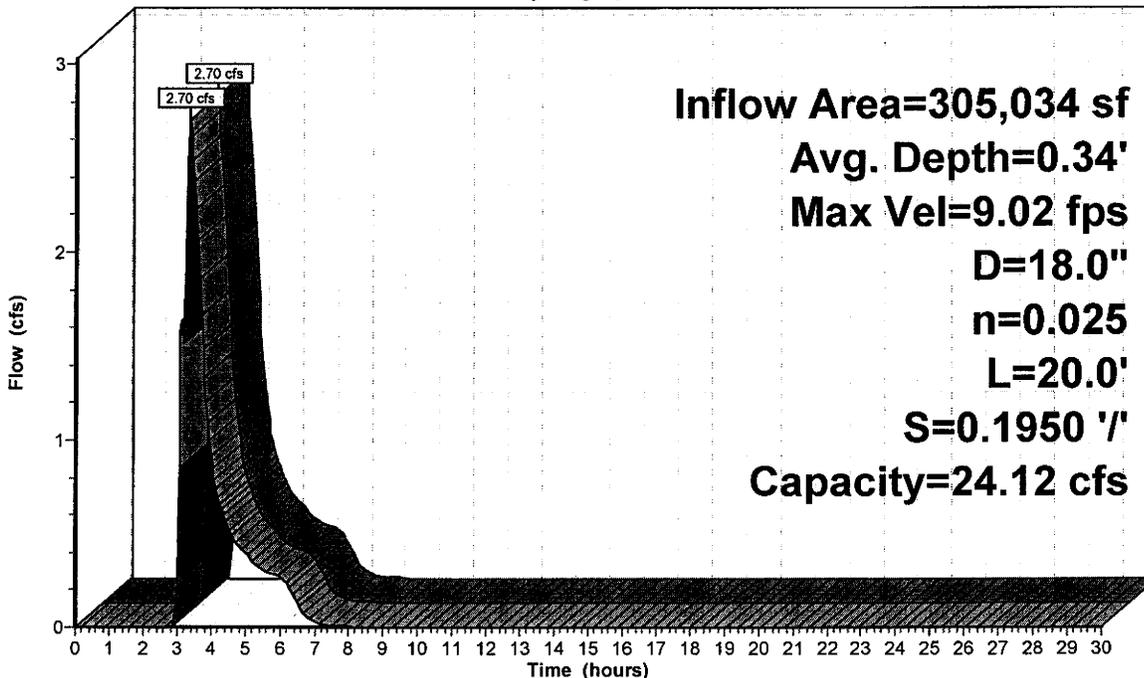
Length= 20.0' Slope= 0.1950 '/'

Inlet Invert= 5,509.90', Outlet Invert= 5,506.00'



Reach C5: Culvert C-5

Hydrograph



■	Inflow
■	Outflow

25yr-6hr West Pond

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Summary for Reach W1DL: Lower W-1 Ditch

[62] Warning: Exceeded Reach C3 OUTLET depth by 0.45' @ 3.55 hrs

[62] Warning: Exceeded Reach C4 OUTLET depth by 0.45' @ 3.25 hrs

Inflow Area =	234,198 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	2.44 cfs @	3.27 hrs,	Volume=	7,714 cf
Outflow =	2.35 cfs @	3.37 hrs,	Volume=	7,714 cf, Atten= 4%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.95 fps, Min. Travel Time= 2.7 min

Avg. Velocity = 0.65 fps, Avg. Travel Time= 8.3 min

Peak Storage= 384 cf @ 3.32 hrs, Average Depth at Peak Storage= 0.78'

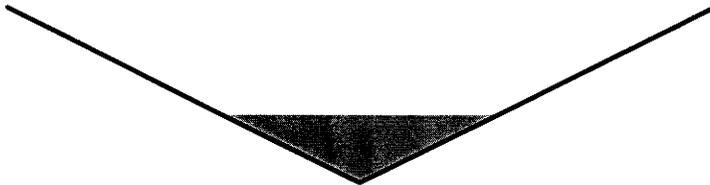
Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.49 cfs

0.00' x 2.00' deep channel, n= 0.035

Side Slope Z-value= 2.0 ' / ' Top Width= 8.00'

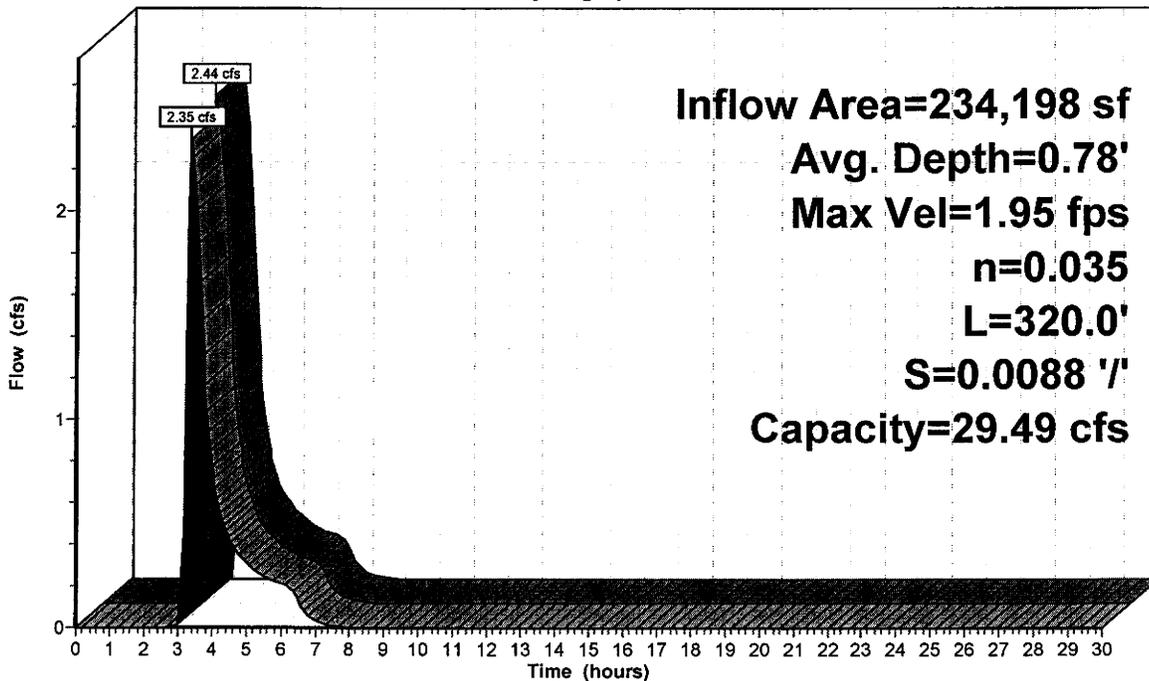
Length= 320.0' Slope= 0.0088 ' / '

Inlet Invert= 5,510.80', Outlet Invert= 5,508.00'



Reach W1DL: Lower W-1 Ditch

Hydrograph



■	Inflow
■	Outflow

25yr-6hr West Pond

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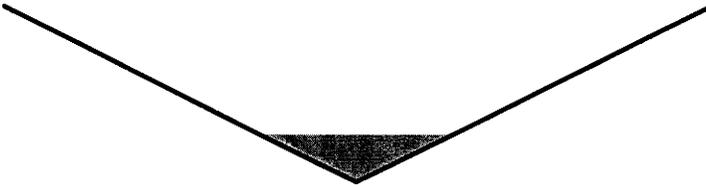
Summary for Reach W1DU: Upper W-1 Ditch

Inflow Area = 105,474 sf, 0.00% Impervious, Inflow Depth = 0.40"
Inflow = 1.50 cfs @ 3.23 hrs, Volume= 3,474 cf
Outflow = 1.18 cfs @ 3.47 hrs, Volume= 3,474 cf, Atten= 21%, Lag= 14.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 8.0 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 22.8 min

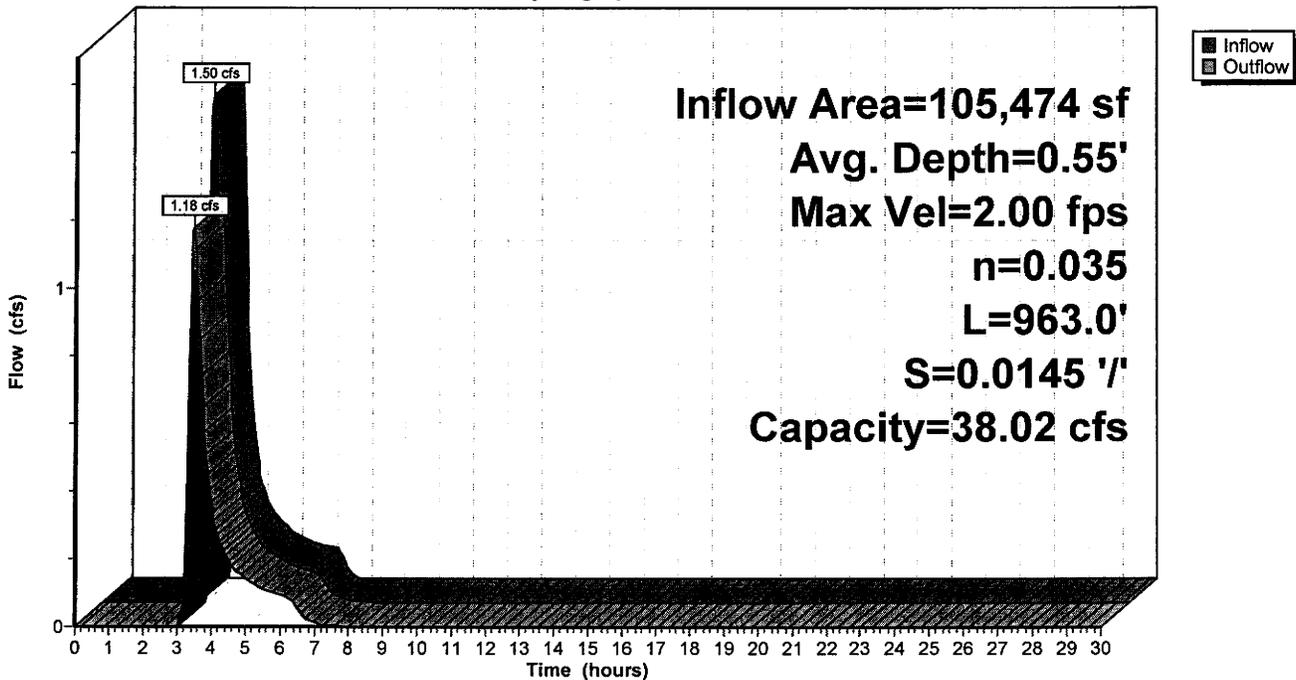
Peak Storage= 572 cf @ 3.34 hrs, Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 38.02 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 963.0' Slope= 0.0145 '/'
Inlet Invert= 5,524.80', Outlet Invert= 5,510.80'



Reach W1DU: Upper W-1 Ditch

Hydrograph



25yr-6hr West Pond

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Summary for Reach W2D: W-2 Ditch

Inflow Area =	128,724 sf,	0.00% Impervious,	Inflow Depth =	0.40"
Inflow =	2.79 cfs @	3.12 hrs,	Volume=	4,240 cf
Outflow =	2.24 cfs @	3.25 hrs,	Volume=	4,240 cf, Atten= 20%, Lag= 7.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.00 fps, Min. Travel Time= 4.2 min
 Avg. Velocity = 0.55 fps, Avg. Travel Time= 15.3 min

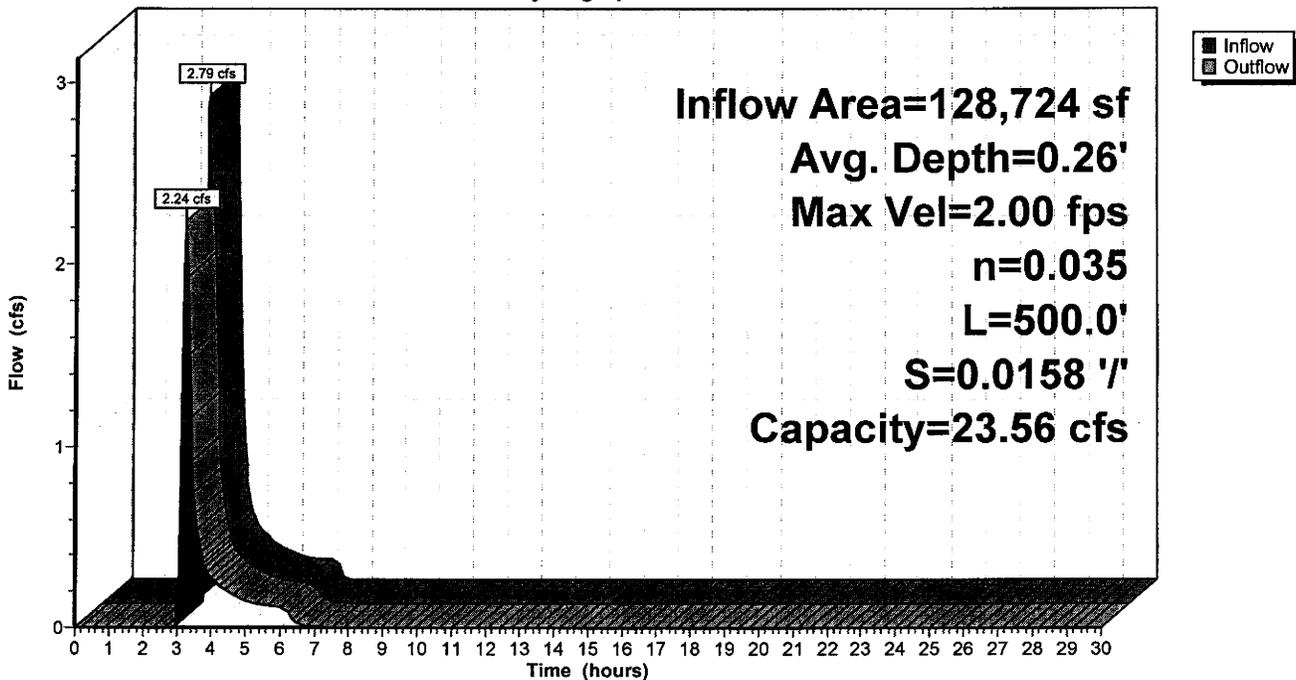
Peak Storage= 582 cf @ 3.17 hrs, Average Depth at Peak Storage= 0.26'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 23.56 cfs

4.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/' Top Width= 7.00'
 Length= 500.0' Slope= 0.0158 '/'
 Inlet Invert= 5,520.00', Outlet Invert= 5,512.10'



Reach W2D: W-2 Ditch

Hydrograph



25yr-6hr West Pond

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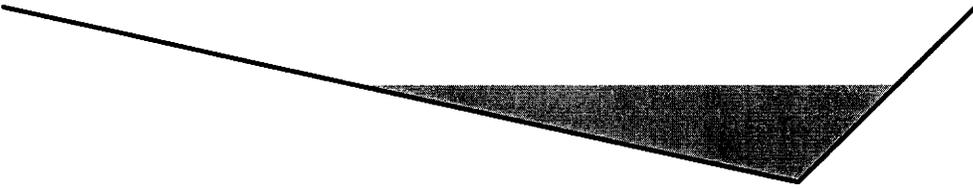
Summary for Reach W3D: W-3 Ditch

Inflow Area = 70,836 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 1.81 cfs @ 3.08 hrs, Volume= 2,333 cf
 Outflow = 1.66 cfs @ 3.12 hrs, Volume= 2,333 cf, Atten= 8%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.13 fps, Min. Travel Time= 1.3 min
 Avg. Velocity = 0.88 fps, Avg. Travel Time= 3.0 min

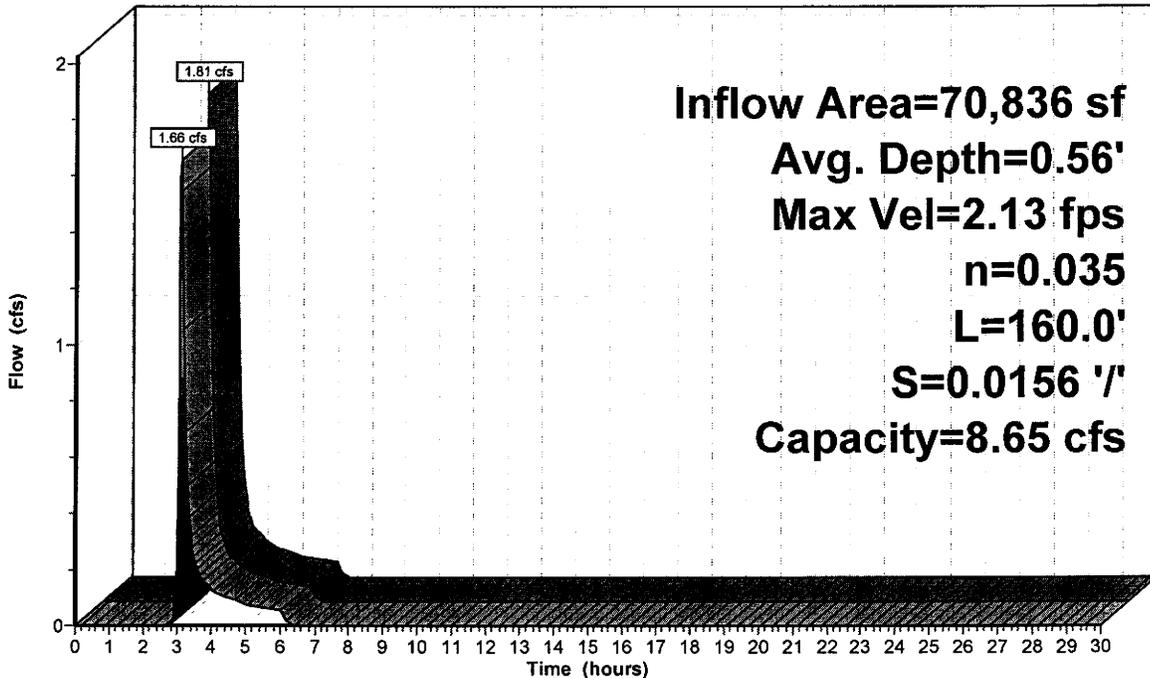
Peak Storage= 137 cf @ 3.10 hrs, Average Depth at Peak Storage= 0.56'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.65 cfs

0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.5 1.0 '/' Top Width= 5.50'
 Length= 160.0' Slope= 0.0156 '/'
 Inlet Invert= 5,510.50', Outlet Invert= 5,508.00'



Reach W3D: W-3 Ditch

Hydrograph



Inflow Area=70,836 sf
Avg. Depth=0.56'
Max Vel=2.13 fps
n=0.035
L=160.0'
S=0.0156 '/'
Capacity=8.65 cfs

25yr-6hr West Pond

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Summary for Pond WP: West Sed Pond

[93] Warning: Storage range exceeded by 0.11'

[85] Warning: Oscillations may require Finer Routing>1

[62] Warning: Exceeded Reach C5 OUTLET depth by 2.00' @ 6.20 hrs

Inflow Area = 305,034 sf, 0.00% Impervious, Inflow Depth = 0.40"
 Inflow = 2.70 cfs @ 3.36 hrs, Volume= 10,047 cf
 Outflow = 0.29 cfs @ 6.21 hrs, Volume= 411 cf, Atten= 89%, Lag= 170.9 min
 Primary = 0.29 cfs @ 6.21 hrs, Volume= 411 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Starting Elev= 5,506.40' Surf.Area= 5,499 sf Storage= 26,424 cf
 Peak Elev= 5,508.11' @ 6.21 hrs Surf.Area= 6,566 sf Storage= 36,065 cf (9,641 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 152.4 min (396.6 - 244.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5,498.23'	36,065 cf	17.00'W x 78.00'L x 9.77'H Prismatic Z=2.0

Device	Routing	Invert	Outlet Devices
#1	Primary	5,508.00'	3.0' long x 2.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.24 cfs @ 6.21 hrs HW=5,508.10' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 0.24 cfs @ 0.81 fps)

25yr-6hr West Pond

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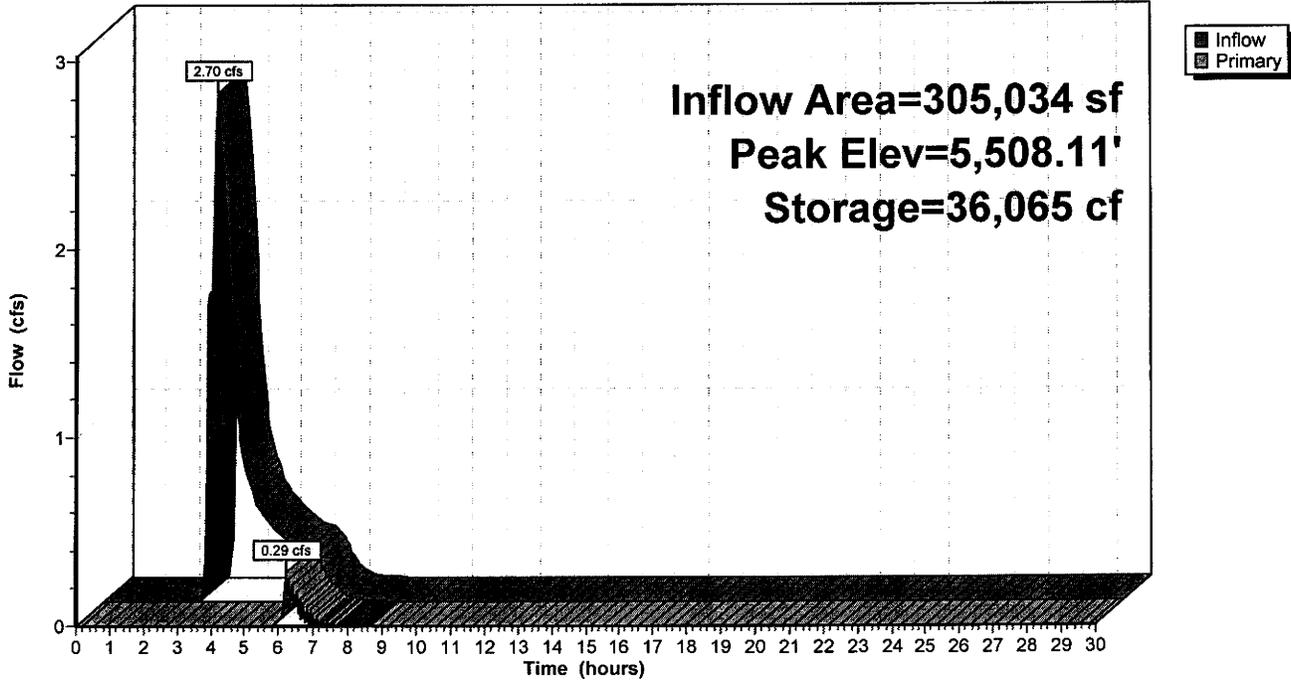
Type II 24-hr 6.00 hrs Rainfall=1.29"

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Pond WP: West Sed Pond

Hydrograph

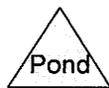
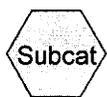
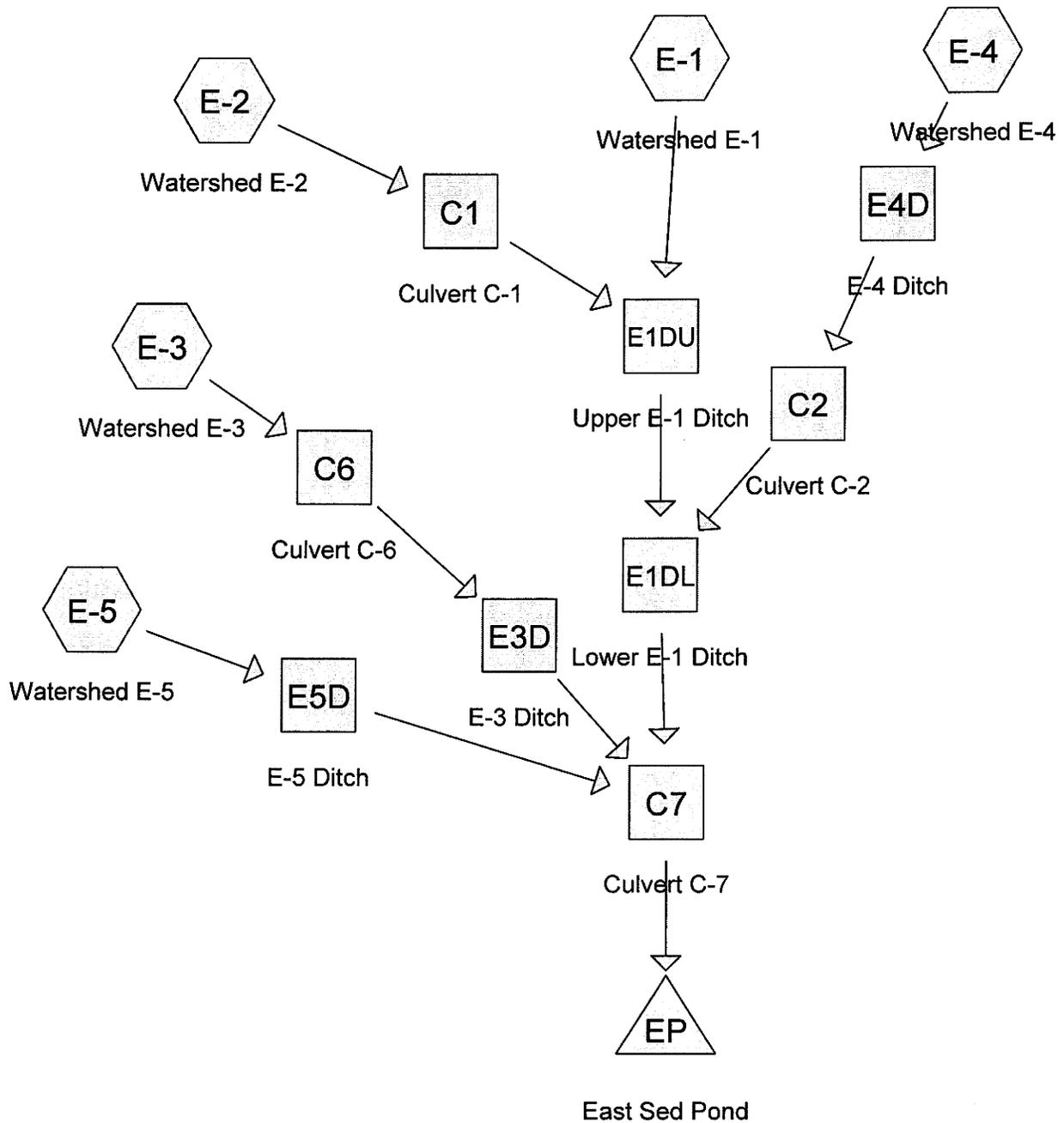


COVOL Engineered Fuels, LC
Dry-Coal Cleaning Facility

Permit Application
Revised October 2010

APPENDIX 7-8

Drainage Channel and Culvert
Hydrology Calculations



Drainage Diagram for 100yr-6hr East Pond
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100yr-6hr East Pond

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
759,267	87	(E-1,E-2,E-3,E-4,E-5)
759,267		TOTAL AREA

100yr-6hr East Pond

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Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
759,267	Other	E-1, E-2, E-3, E-4, E-5
759,267		TOTAL AREA

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
 Runoff by SCS TR-20 method, UH=SCS
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Watershed E-1	Runoff Area=88,103 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=1,752' Slope=0.0210 '/ Tc=27.1 min CN=87 Runoff=1.88 cfs 5,195 cf
Subcatchment E-2: Watershed E-2	Runoff Area=66,123 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=581' Slope=0.0210 '/ Tc=11.2 min CN=87 Runoff=2.70 cfs 3,899 cf
Subcatchment E-3: Watershed E-3	Runoff Area=289,991 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=1,091' Slope=0.0300 '/ Tc=15.5 min CN=87 Runoff=9.41 cfs 17,098 cf
Subcatchment E-4: Watershed E-4	Runoff Area=29,947 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=561' Slope=0.2500 '/ Tc=3.2 min CN=87 Runoff=2.20 cfs 1,766 cf
Subcatchment E-5: Watershed E-5	Runoff Area=285,103 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=925' Slope=0.0250 '/ Tc=14.9 min CN=87 Runoff=9.49 cfs 16,810 cf
Reach C1: Culvert C-1	Avg. Depth=0.49' Max Vel=5.39 fps Inflow=2.70 cfs 3,899 cf D=18.0" n=0.020 L=40.0' S=0.0300 '/ Capacity=11.83 cfs Outflow=2.68 cfs 3,899 cf
Reach C2: Culvert C-2	Avg. Depth=0.34' Max Vel=4.20 fps Inflow=1.27 cfs 1,766 cf D=18.0" n=0.020 L=40.0' S=0.0275 '/ Capacity=11.32 cfs Outflow=1.24 cfs 1,769 cf
Reach C6: Culvert C-6	Avg. Depth=1.50' Max Vel=5.26 fps Inflow=9.41 cfs 17,098 cf D=18.0" n=0.025 L=200.0' S=0.0225 '/ Capacity=8.19 cfs Outflow=8.50 cfs 17,098 cf
Reach C7: Culvert C-7	Avg. Depth=1.10' Max Vel=13.53 fps Inflow=18.87 cfs 44,770 cf D=18.0" n=0.025 L=20.0' S=0.1500 '/ Capacity=21.16 cfs Outflow=18.86 cfs 44,770 cf
Reach E1DL: Lower E-1 Ditch	Avg. Depth=0.89' Max Vel=2.87 fps Inflow=3.44 cfs 10,862 cf n=0.035 L=287.0' S=0.0171 '/ Capacity=13.67 cfs Outflow=3.40 cfs 10,862 cf
Reach E1DU: Upper E-1 Ditch	Avg. Depth=1.06' Max Vel=2.70 fps Inflow=3.37 cfs 9,093 cf n=0.035 L=720.0' S=0.0150 '/ Capacity=7.67 cfs Outflow=3.02 cfs 9,093 cf
Reach E3D: E-3 Ditch	Avg. Depth=1.02' Max Vel=3.70 fps Inflow=8.50 cfs 17,098 cf n=0.035 L=283.0' S=0.0194 '/ Capacity=21.95 cfs Outflow=8.44 cfs 17,098 cf
Reach E4D: E-4 Ditch	Avg. Depth=0.65' Max Vel=2.22 fps Inflow=2.20 cfs 1,766 cf n=0.035 L=561.0' S=0.0159 '/ Capacity=7.21 cfs Outflow=1.27 cfs 1,766 cf
Reach E5D: E-5 Ditch	Avg. Depth=0.91' Max Vel=2.35 fps Inflow=9.49 cfs 16,810 cf n=0.035 L=746.0' S=0.0091 '/ Capacity=10.01 cfs Outflow=7.79 cfs 16,810 cf
Pond EP: East Sed Pond	Peak Elev=5,502.54' Storage=44,769 cf Inflow=18.86 cfs 44,770 cf Outflow=0.00 cfs 0 cf

Total Runoff Area = 759,267 sf Runoff Volume = 44,768 cf Average Runoff Depth = 0.71"
100.00% Pervious = 759,267 sf 0.00% Impervious = 0 sf

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment E-1: Watershed E-1

Runoff = 1.88 cfs @ 3.33 hrs, Volume= 5,195 cf, Depth= 0.71"

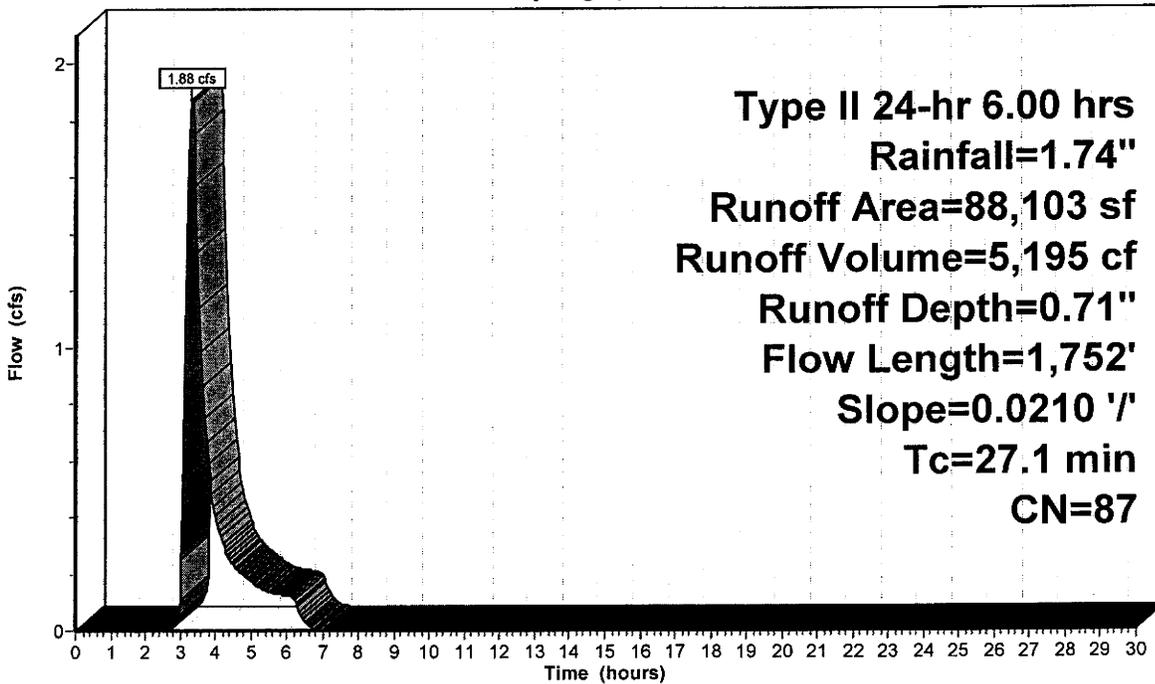
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 88,103	87	
88,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	1,752	0.0210	1.08		Lag/CN Method,

Subcatchment E-1: Watershed E-1

Hydrograph



Runoff

**Type II 24-hr 6.00 hrs
 Rainfall=1.74"
 Runoff Area=88,103 sf
 Runoff Volume=5,195 cf
 Runoff Depth=0.71"
 Flow Length=1,752'
 Slope=0.0210 '/
 Tc=27.1 min
 CN=87**

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment E-2: Watershed E-2

Runoff = 2.70 cfs @ 3.12 hrs, Volume= 3,899 cf, Depth= 0.71"

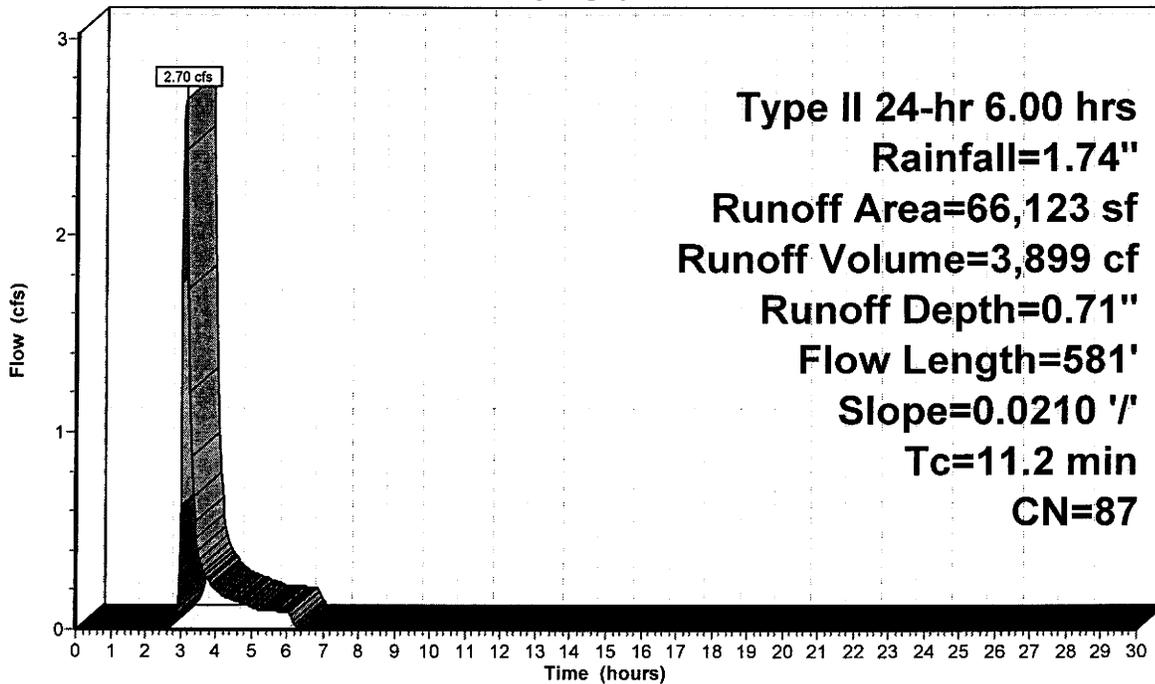
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 66,123	87	
66,123		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	581	0.0210	0.86		Lag/CN Method,

Subcatchment E-2: Watershed E-2

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment E-3: Watershed E-3

Runoff = 9.41 cfs @ 3.17 hrs, Volume= 17,098 cf, Depth= 0.71"

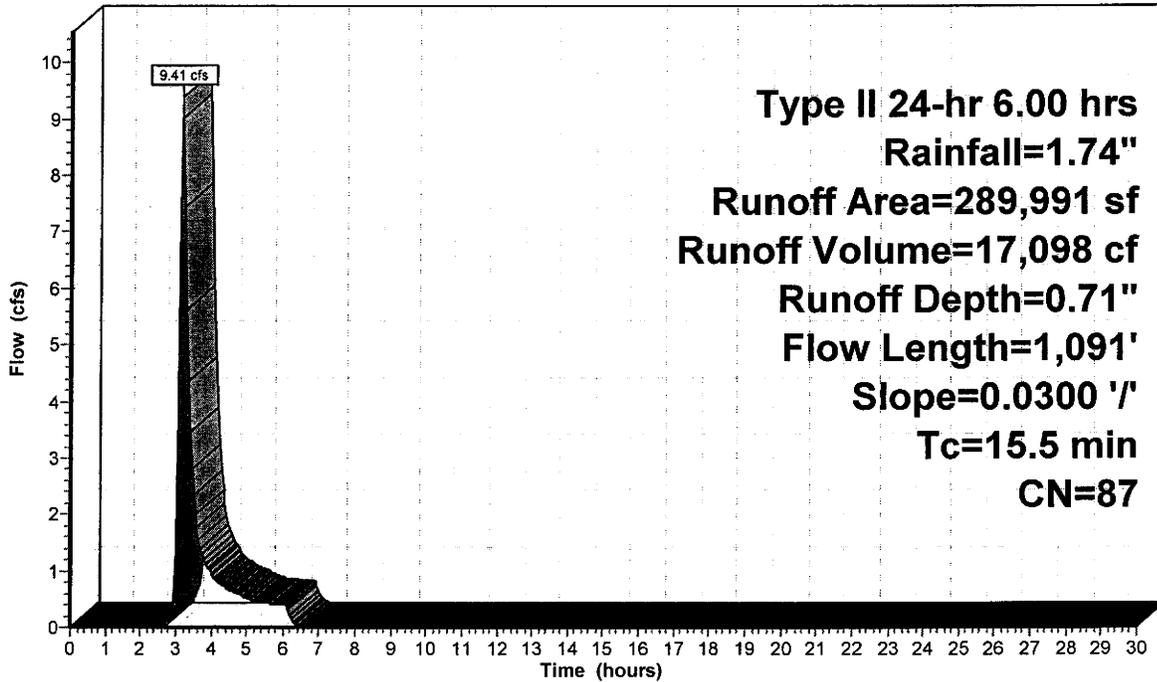
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 289,991	87	
289,991		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	1,091	0.0300	1.17		Lag/CN Method,

Subcatchment E-3: Watershed E-3

Hydrograph



Runoff

**Type II 24-hr 6.00 hrs
 Rainfall=1.74"
 Runoff Area=289,991 sf
 Runoff Volume=17,098 cf
 Runoff Depth=0.71"
 Flow Length=1,091'
 Slope=0.0300 '/
 Tc=15.5 min
 CN=87**

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment E-4: Watershed E-4

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.20 cfs @ 3.01 hrs, Volume= 1,766 cf, Depth= 0.71"

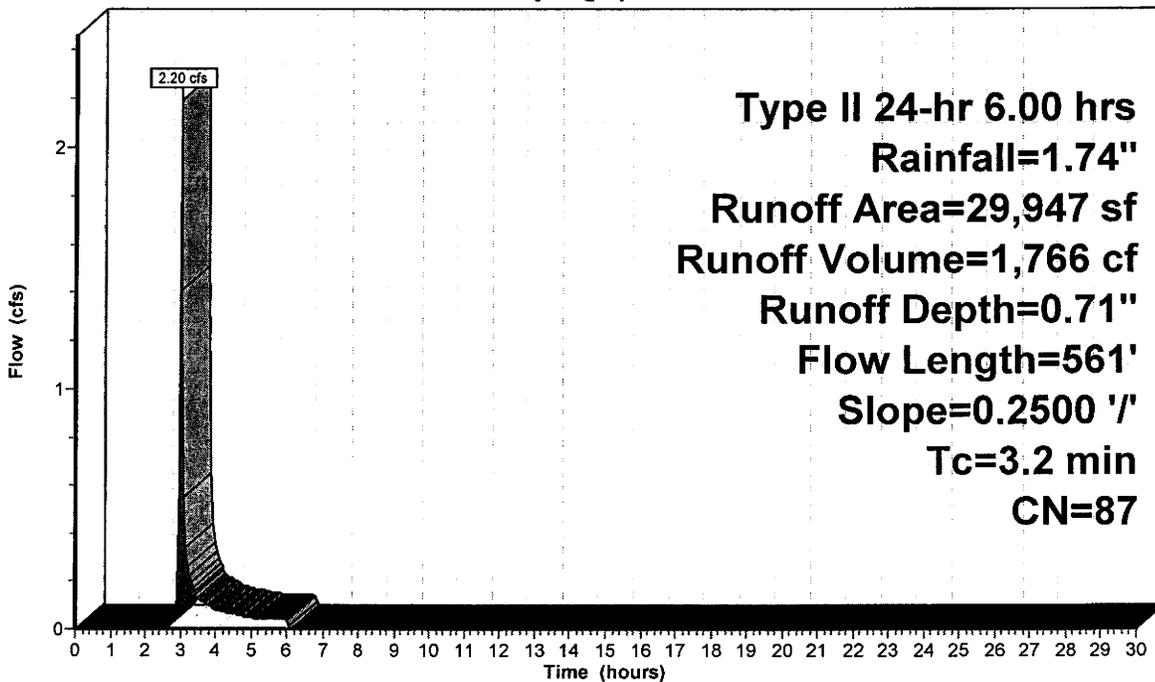
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 29,947	87	
29,947		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	561	0.2500	2.96		Lag/CN Method,

Subcatchment E-4: Watershed E-4

Hydrograph



Runoff

**Type II 24-hr 6.00 hrs
 Rainfall=1.74"
 Runoff Area=29,947 sf
 Runoff Volume=1,766 cf
 Runoff Depth=0.71"
 Flow Length=561'
 Slope=0.2500 '/
 Tc=3.2 min
 CN=87**

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment E-5: Watershed E-5

Runoff = 9.49 cfs @ 3.16 hrs, Volume= 16,810 cf, Depth= 0.71"

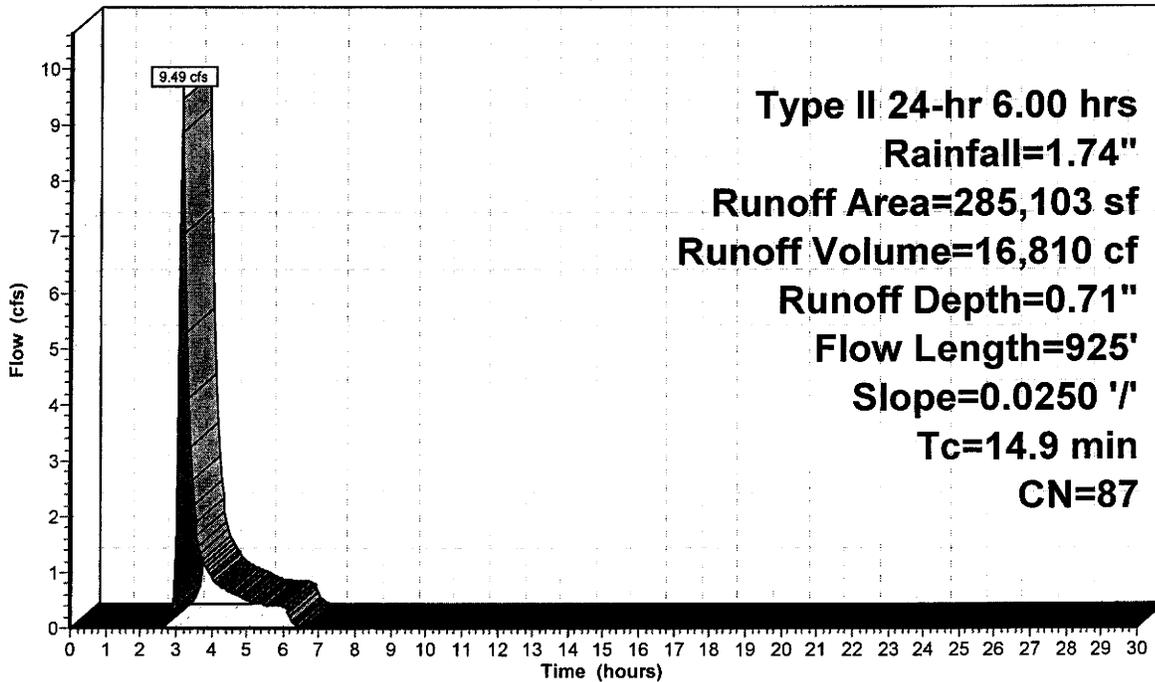
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 285,103	87	
285,103		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	925	0.0250	1.04		Lag/CN Method,

Subcatchment E-5: Watershed E-5

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C1: Culvert C-1

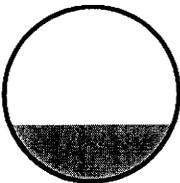
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area =	66,123 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	2.70 cfs @	3.12 hrs,	Volume=	3,899 cf
Outflow =	2.68 cfs @	3.12 hrs,	Volume=	3,899 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 5.39 fps, Min. Travel Time= 0.1 min
 Avg. Velocity = 2.26 fps, Avg. Travel Time= 0.3 min

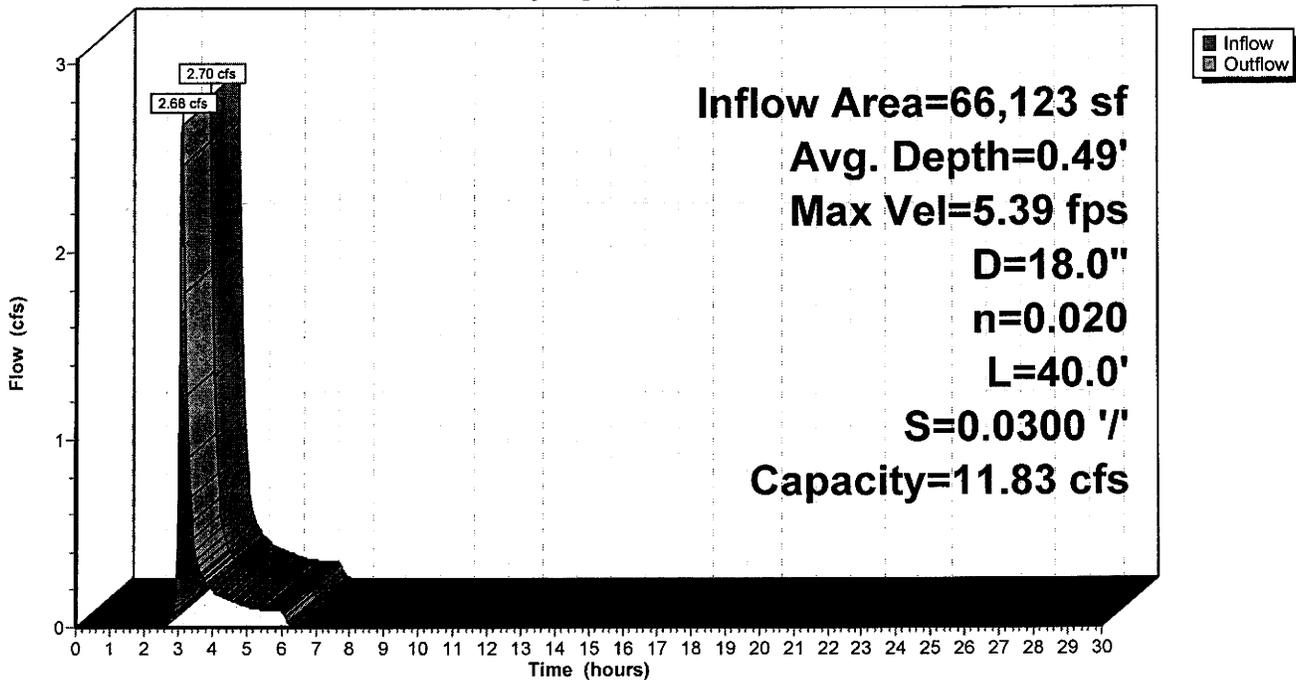
Peak Storage= 20 cf @ 3.12 hrs, Average Depth at Peak Storage= 0.49'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.83 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0300 '/'
 Inlet Invert= 5,520.70', Outlet Invert= 5,519.50'



Reach C1: Culvert C-1

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C2: Culvert C-2

[52] Hint: Inlet/Outlet conditions not evaluated

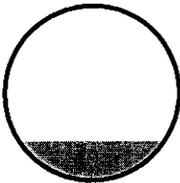
[61] Hint: Exceeded Reach E4D outlet invert by 0.33' @ 3.15 hrs

Inflow Area = 29,947 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 1.27 cfs @ 3.13 hrs, Volume= 1,766 cf
 Outflow = 1.24 cfs @ 3.14 hrs, Volume= 1,769 cf, Atten= 2%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Max. Velocity= 4.20 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.42 fps, Avg. Travel Time= 0.5 min

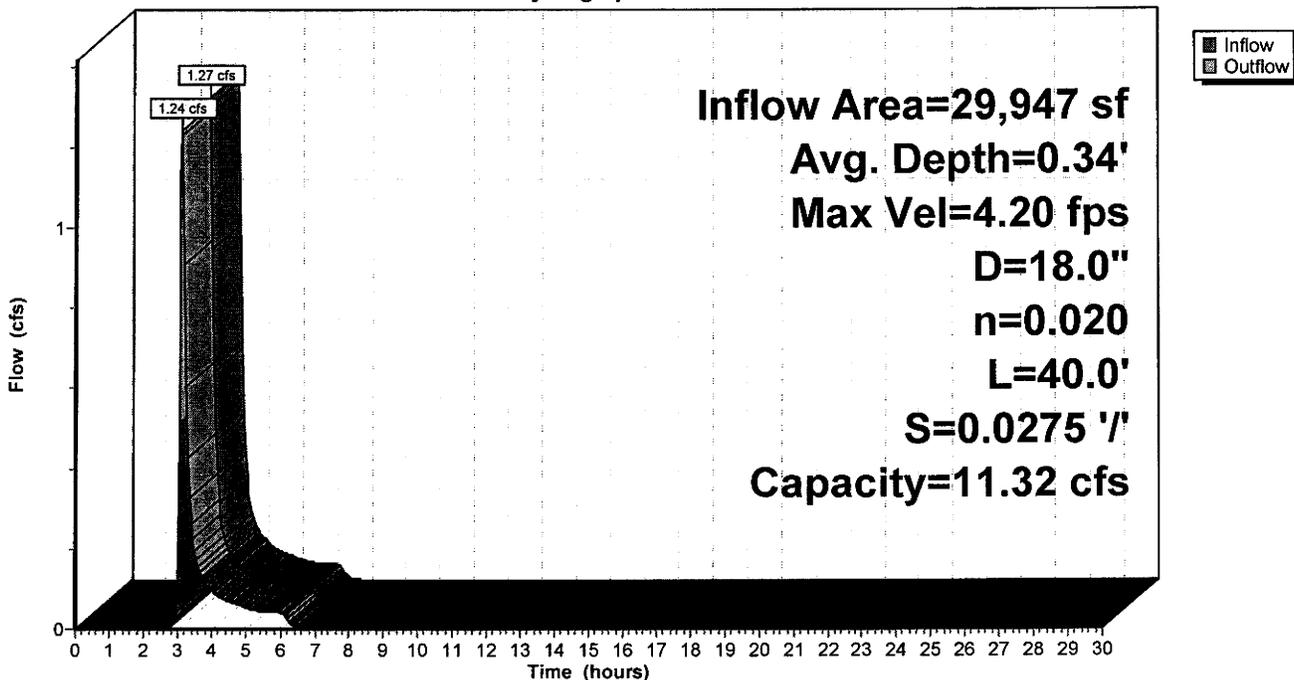
Peak Storage= 12 cf @ 3.13 hrs, Average Depth at Peak Storage= 0.34'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 11.32 cfs

18.0" Diameter Pipe, n= 0.020 Corrugated PE, corrugated interior
 Length= 40.0' Slope= 0.0275 '/'
 Inlet Invert= 5,509.80', Outlet Invert= 5,508.70'



Reach C2: Culvert C-2

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C6: Culvert C-6

[52] Hint: Inlet/Outlet conditions not evaluated

[55] Hint: Peak inflow is 115% of Manning's capacity

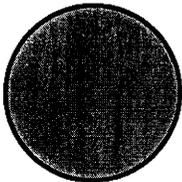
[76] Warning: Detained 202 cf (Pond w/culvert advised)

Inflow Area = 289,991 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 9.41 cfs @ 3.17 hrs, Volume= 17,098 cf
 Outflow = 8.50 cfs @ 3.25 hrs, Volume= 17,098 cf, Atten= 10%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 5.26 fps, Min. Travel Time= 0.6 min
 Avg. Velocity = 2.39 fps, Avg. Travel Time= 1.4 min

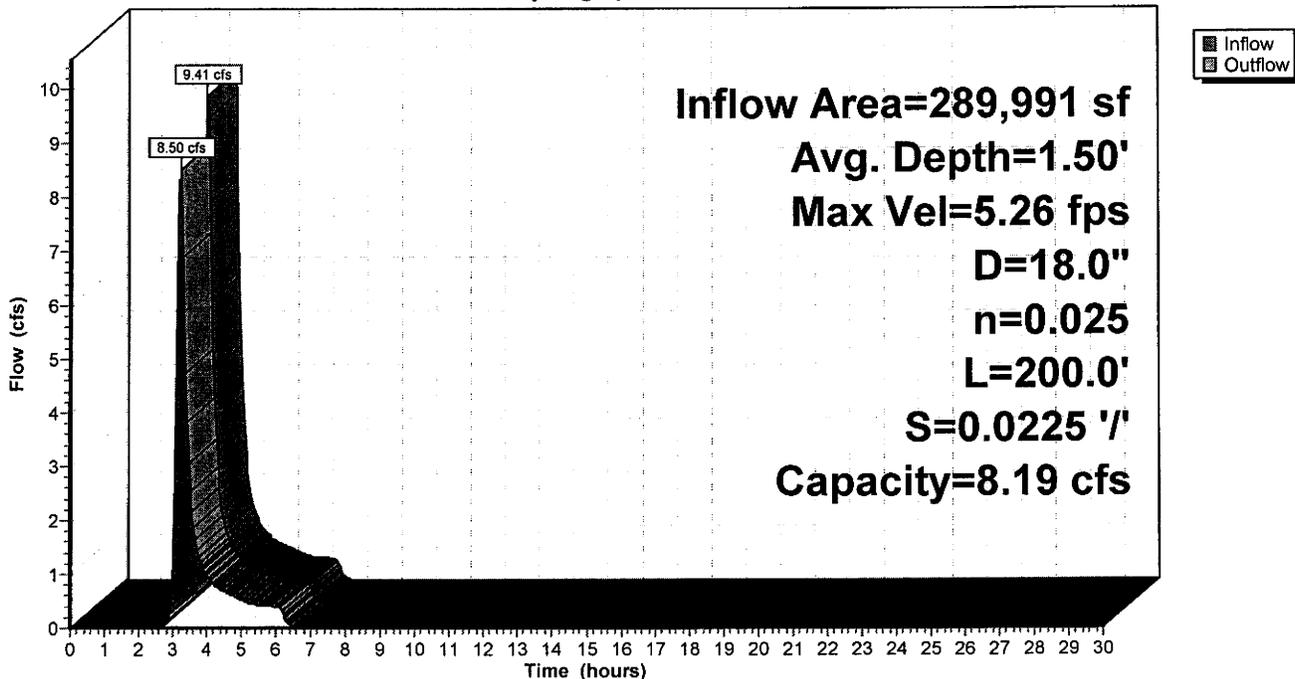
Peak Storage= 354 cf @ 3.19 hrs, Average Depth at Peak Storage= 1.50'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.19 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 200.0' Slope= 0.0225 '/'
 Inlet Invert= 5,514.00', Outlet Invert= 5,509.50'



Reach C6: Culvert C-6

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C7: Culvert C-7

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach E1DL OUTLET depth by 1.41' @ 3.30 hrs

[62] Warning: Exceeded Reach E3D OUTLET depth by 1.19' @ 3.35 hrs

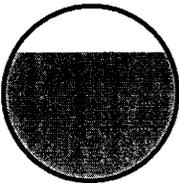
[62] Warning: Exceeded Reach E5D OUTLET depth by 1.43' @ 3.30 hrs

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 18.87 cfs @ 3.30 hrs, Volume= 44,770 cf
 Outflow = 18.86 cfs @ 3.30 hrs, Volume= 44,770 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 13.53 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 4.32 fps, Avg. Travel Time= 0.1 min

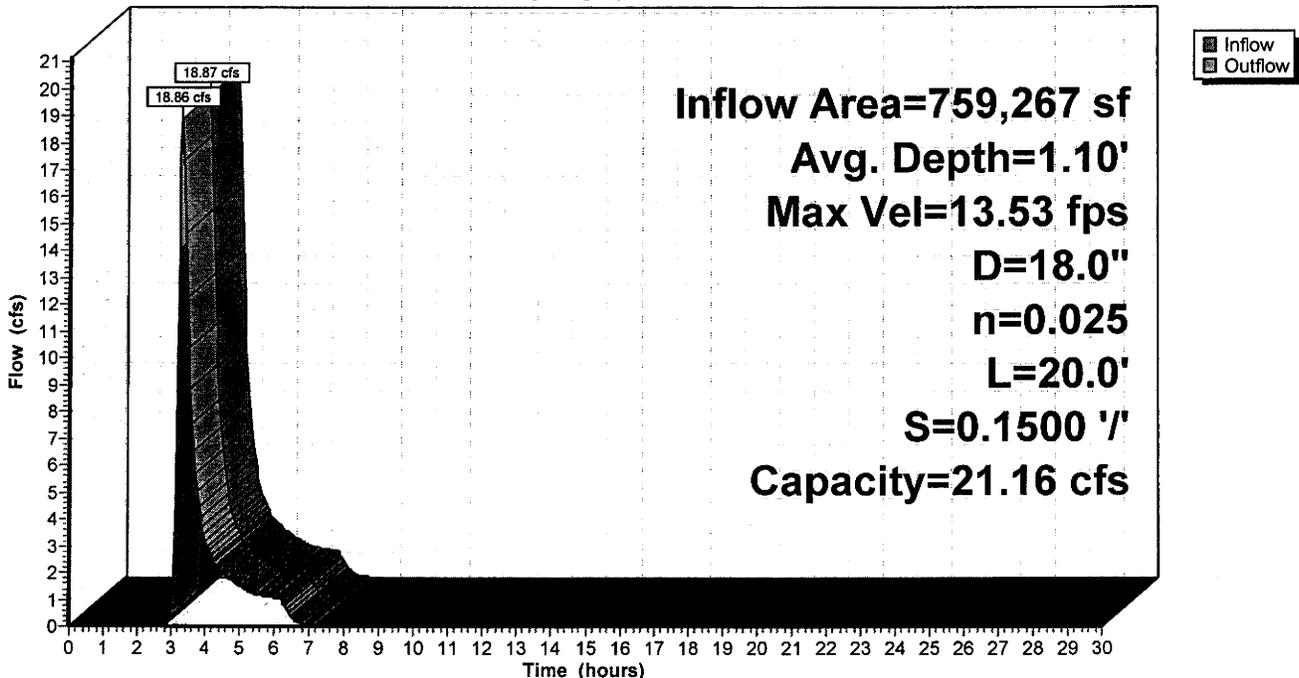
Peak Storage= 28 cf @ 3.30 hrs, Average Depth at Peak Storage= 1.10'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.16 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 20.0' Slope= 0.1500 '/'
 Inlet Invert= 5,505.00', Outlet Invert= 5,502.00'



Reach C7: Culvert C-7

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach E1DL: Lower E-1 Ditch

[62] Warning: Exceeded Reach C2 OUTLET depth by 0.71' @ 3.35 hrs

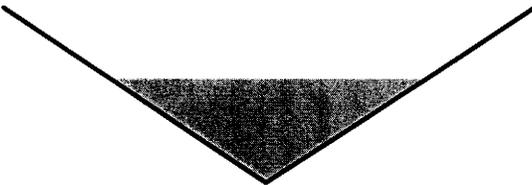
[61] Hint: Exceeded Reach E1DU outlet invert by 0.89' @ 3.30 hrs

Inflow Area =	184,173 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	3.44 cfs @	3.28 hrs,	Volume=	10,862 cf
Outflow =	3.40 cfs @	3.34 hrs,	Volume=	10,862 cf, Atten= 1%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.87 fps, Min. Travel Time= 1.7 min
 Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.9 min

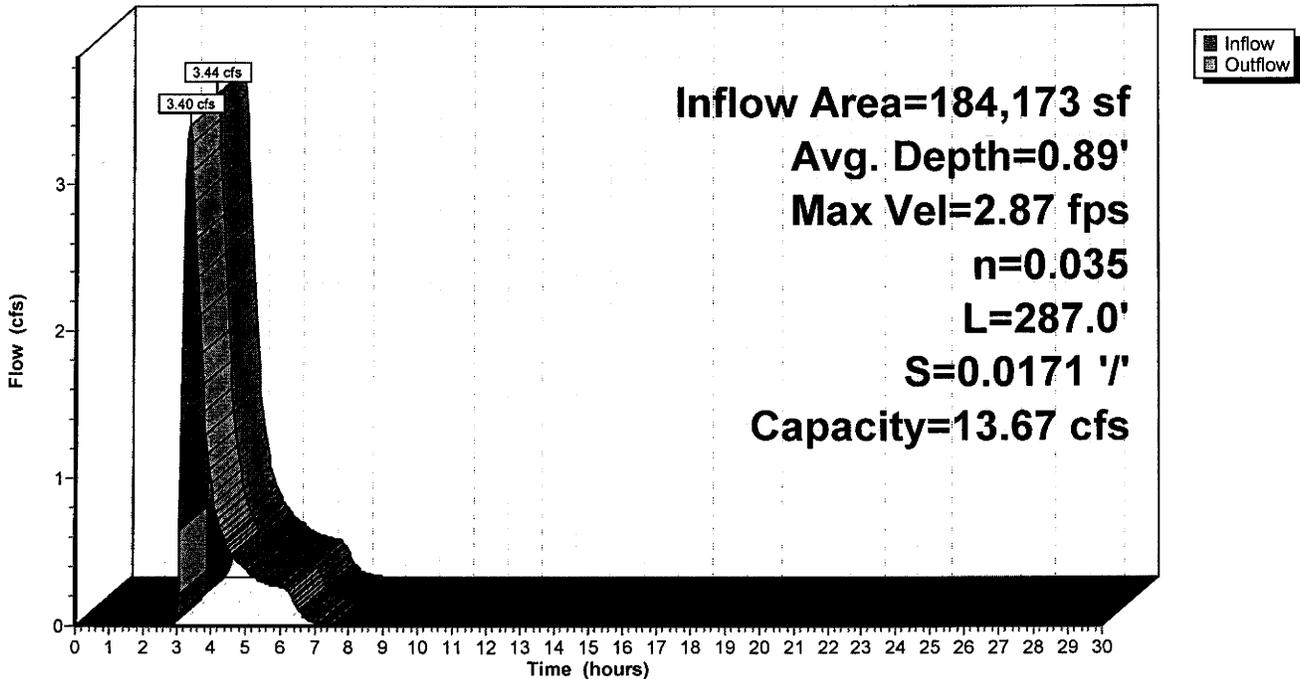
Peak Storage= 344 cf @ 3.31 hrs, Average Depth at Peak Storage= 0.89'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 13.67 cfs

0.00' x 1.50' deep channel, n= 0.035
 Side Slope Z-value= 1.5 '/' Top Width= 4.50'
 Length= 287.0' Slope= 0.0171 '/'
 Inlet Invert= 5,508.70', Outlet Invert= 5,503.80'



Reach E1DL: Lower E-1 Ditch

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach E1DU: Upper E-1 Ditch

[62] Warning: Exceeded Reach C1 OUTLET depth by 0.78' @ 3.35 hrs

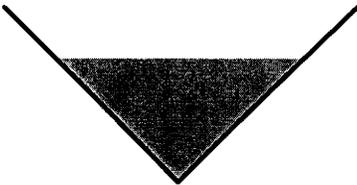
Inflow Area =	154,226 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	3.37 cfs @	3.15 hrs,	Volume=	9,093 cf
Outflow =	3.02 cfs @	3.32 hrs,	Volume=	9,093 cf, Atten= 10%, Lag= 10.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.70 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 12.7 min

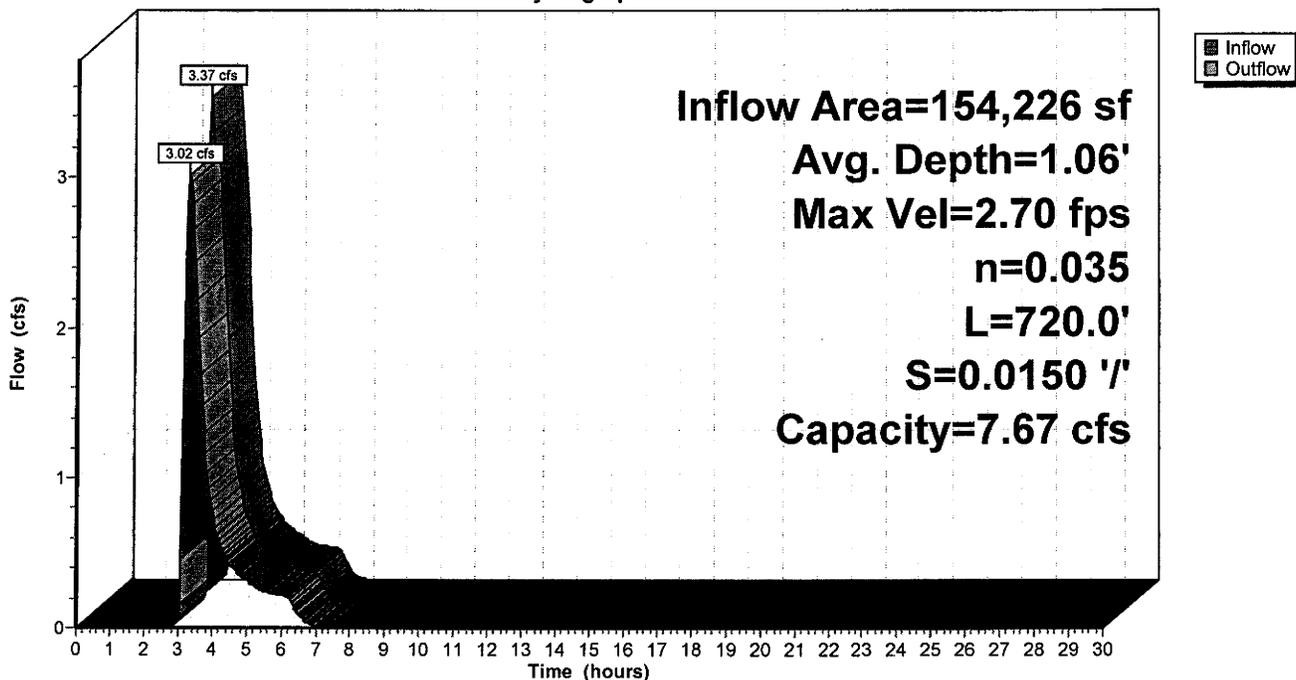
Peak Storage= 806 cf @ 3.23 hrs, Average Depth at Peak Storage= 1.06'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 7.67 cfs

0.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 1.0 '/' Top Width= 3.00'
Length= 720.0' Slope= 0.0150 '/'
Inlet Invert= 5,519.50', Outlet Invert= 5,508.70'



Reach E1DU: Upper E-1 Ditch

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach E3D: E-3 Ditch

[62] Warning: Exceeded Reach C6 OUTLET depth by 0.07' @ 3.35 hrs

Inflow Area =	289,991 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	8.50 cfs @	3.25 hrs,	Volume=	17,098 cf
Outflow =	8.44 cfs @	3.25 hrs,	Volume=	17,098 cf, Atten= 1%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.70 fps, Min. Travel Time= 1.3 min

Avg. Velocity = 1.52 fps, Avg. Travel Time= 3.1 min

Peak Storage= 656 cf @ 3.22 hrs, Average Depth at Peak Storage= 1.02'

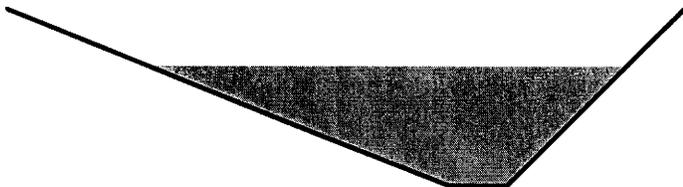
Bank-Full Depth= 1.50', Capacity at Bank-Full= 21.95 cfs

0.50' x 1.50' deep channel, n= 0.035

Side Slope Z-value= 2.5 1.0 '/' Top Width= 5.75'

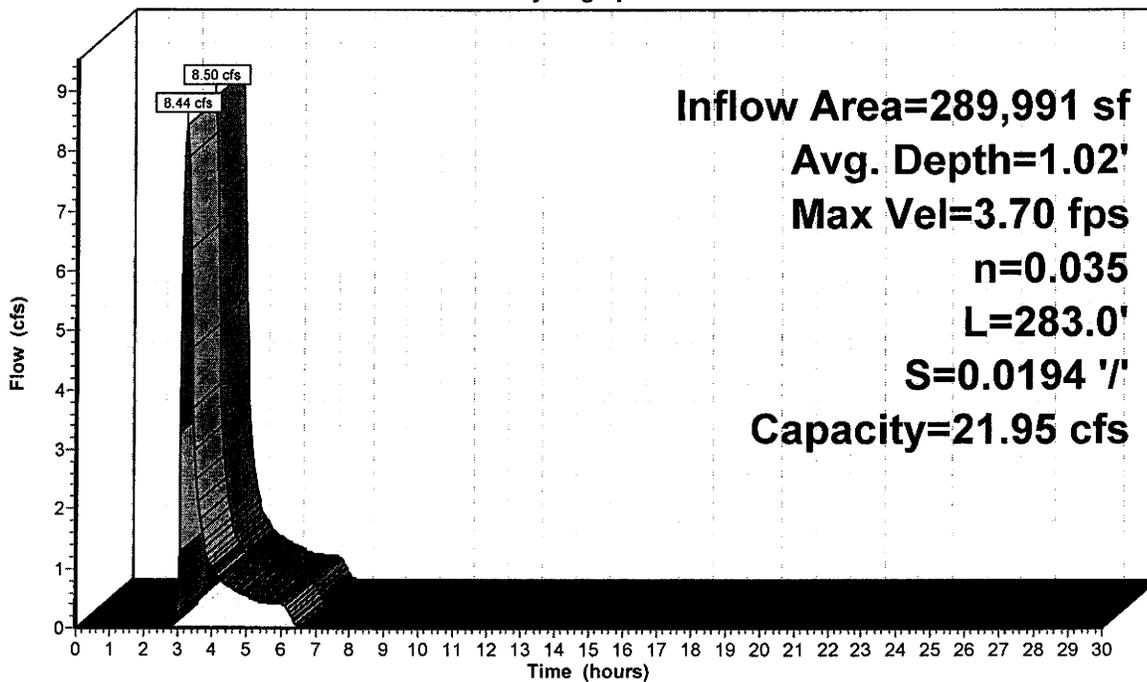
Length= 283.0' Slope= 0.0194 '/'

Inlet Invert= 5,509.50', Outlet Invert= 5,504.00'



Reach E3D: E-3 Ditch

Hydrograph



	Inflow
	Outflow

Inflow Area=289,991 sf
Avg. Depth=1.02'
Max Vel=3.70 fps
n=0.035
L=283.0'
S=0.0194 '/'
Capacity=21.95 cfs

100yr-6hr East Pond

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Type II 24-hr 6.00 hrs Rainfall=1.74"

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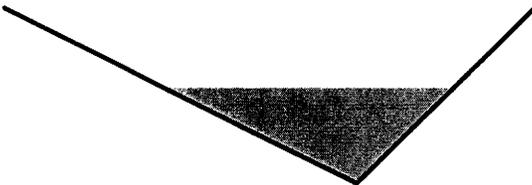
Summary for Reach E4D: E-4 Ditch

Inflow Area = 29,947 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 2.20 cfs @ 3.01 hrs, Volume= 1,766 cf
 Outflow = 1.27 cfs @ 3.13 hrs, Volume= 1,766 cf, Atten= 42%, Lag= 7.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.22 fps, Min. Travel Time= 4.2 min
 Avg. Velocity = 0.71 fps, Avg. Travel Time= 13.2 min

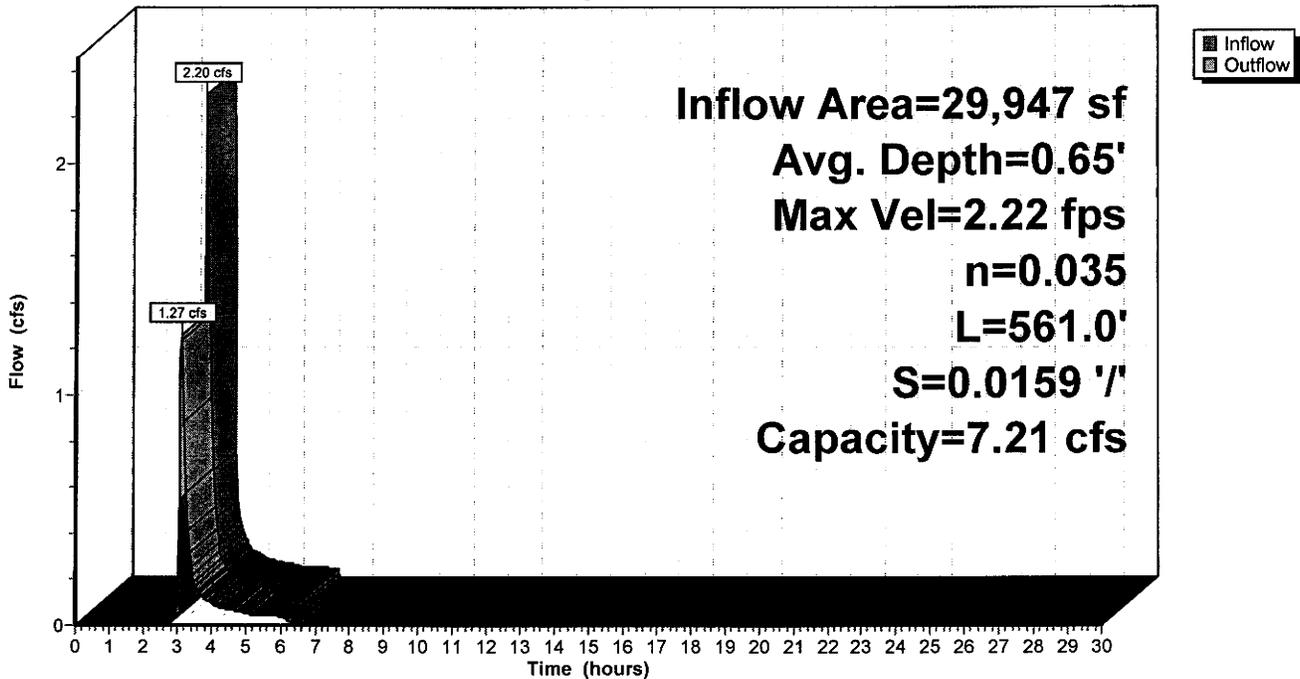
Peak Storage= 359 cf @ 3.06 hrs, Average Depth at Peak Storage= 0.65'
 Bank-Full Depth= 1.20', Capacity at Bank-Full= 7.21 cfs

0.00' x 1.20' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/ Top Width= 3.60'
 Length= 561.0' Slope= 0.0159 '/
 Inlet Invert= 5,518.70', Outlet Invert= 5,509.80'



Reach E4D: E-4 Ditch

Hydrograph



100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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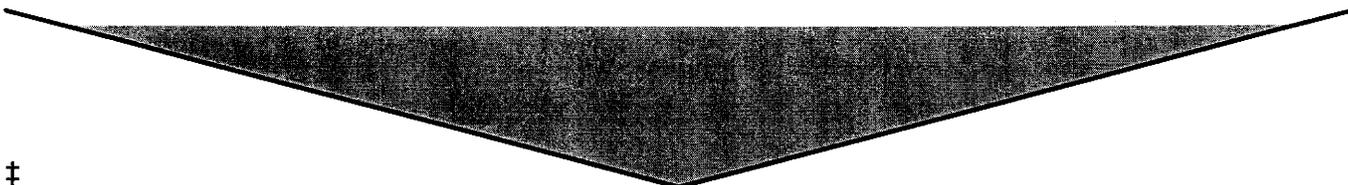
Summary for Reach E5D: E-5 Ditch

Inflow Area = 285,103 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 9.49 cfs @ 3.16 hrs, Volume= 16,810 cf
 Outflow = 7.79 cfs @ 3.32 hrs, Volume= 16,810 cf, Atten= 18%, Lag= 9.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.35 fps, Min. Travel Time= 5.3 min
 Avg. Velocity = 0.60 fps, Avg. Travel Time= 20.8 min

Peak Storage= 2,486 cf @ 3.24 hrs, Average Depth at Peak Storage= 0.91'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 10.01 cfs

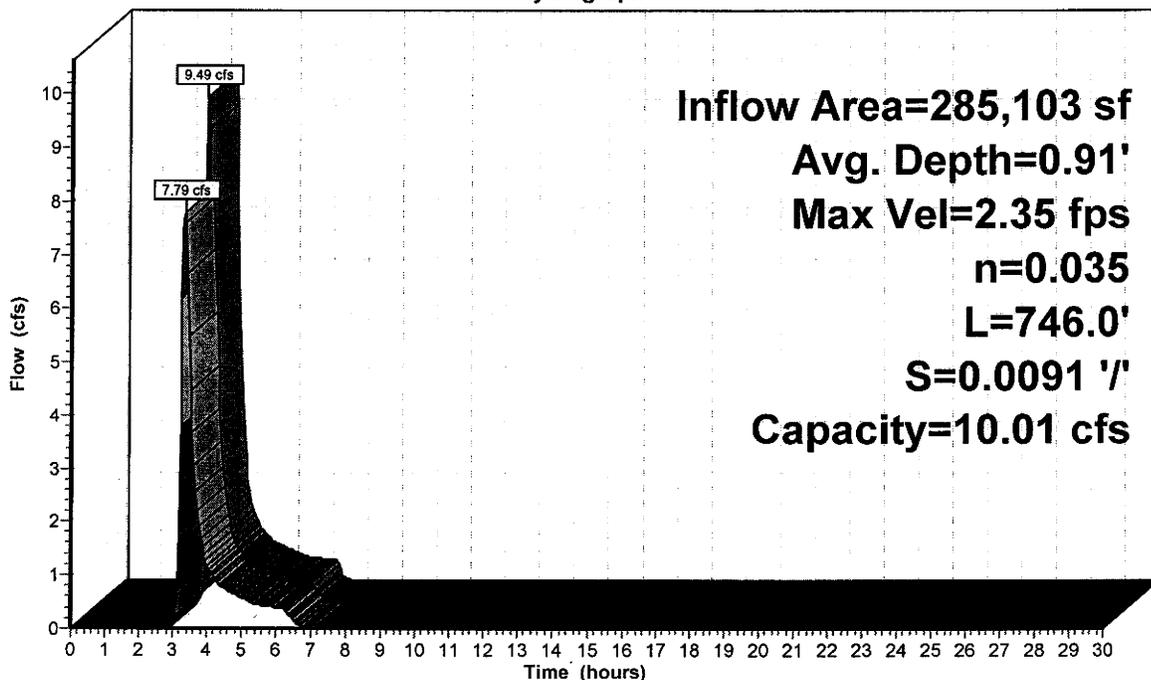
0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.0 ' / ' Top Width= 8.00'
 Length= 746.0' Slope= 0.0091 ' / '
 Inlet Invert= 5,510.60', Outlet Invert= 5,503.80'



‡

Reach E5D: E-5 Ditch

Hydrograph



■ Inflow
 ■ Outflow

Inflow Area=285,103 sf
Avg. Depth=0.91'
Max Vel=2.35 fps
n=0.035
L=746.0'
S=0.0091 ' / '
Capacity=10.01 cfs

100yr-6hr East Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Pond EP: East Sed Pond

[62] Warning: Exceeded Reach C7 OUTLET depth by 0.54' @ 29.95 hrs

Inflow Area = 759,267 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 18.86 cfs @ 3.30 hrs, Volume= 44,770 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 5,502.54' @ 30.00 hrs Surf.Area= 8,833 sf Storage= 44,769 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	5,493.80'	56,820 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
5,493.80	2,550	0	0
5,494.80	2,601	2,576	2,576
5,495.80	3,214	2,908	5,483
5,496.80	3,909	3,562	9,045
5,497.80	4,637	4,273	13,318
5,498.80	5,425	5,031	18,349
5,499.80	6,243	5,834	24,183
5,500.80	7,158	6,701	30,883
5,501.80	8,125	7,642	38,525
5,502.80	9,087	8,606	47,131
5,503.80	10,291	9,689	56,820

100yr-6hr East Pond

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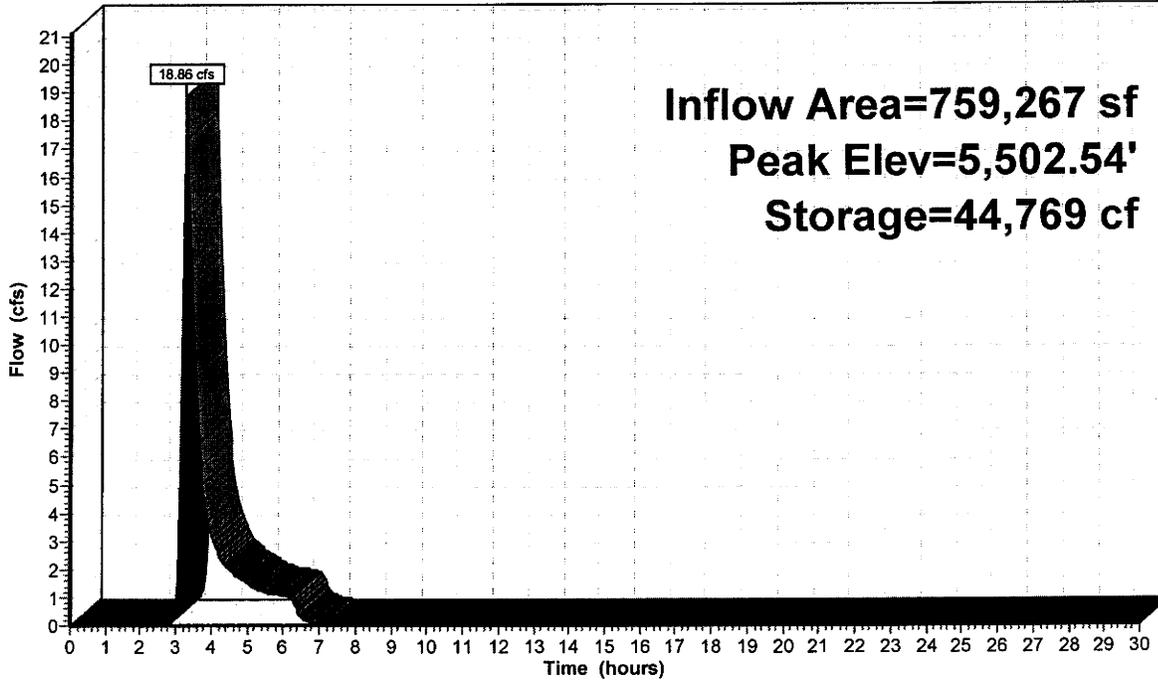
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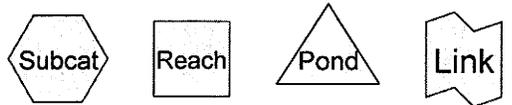
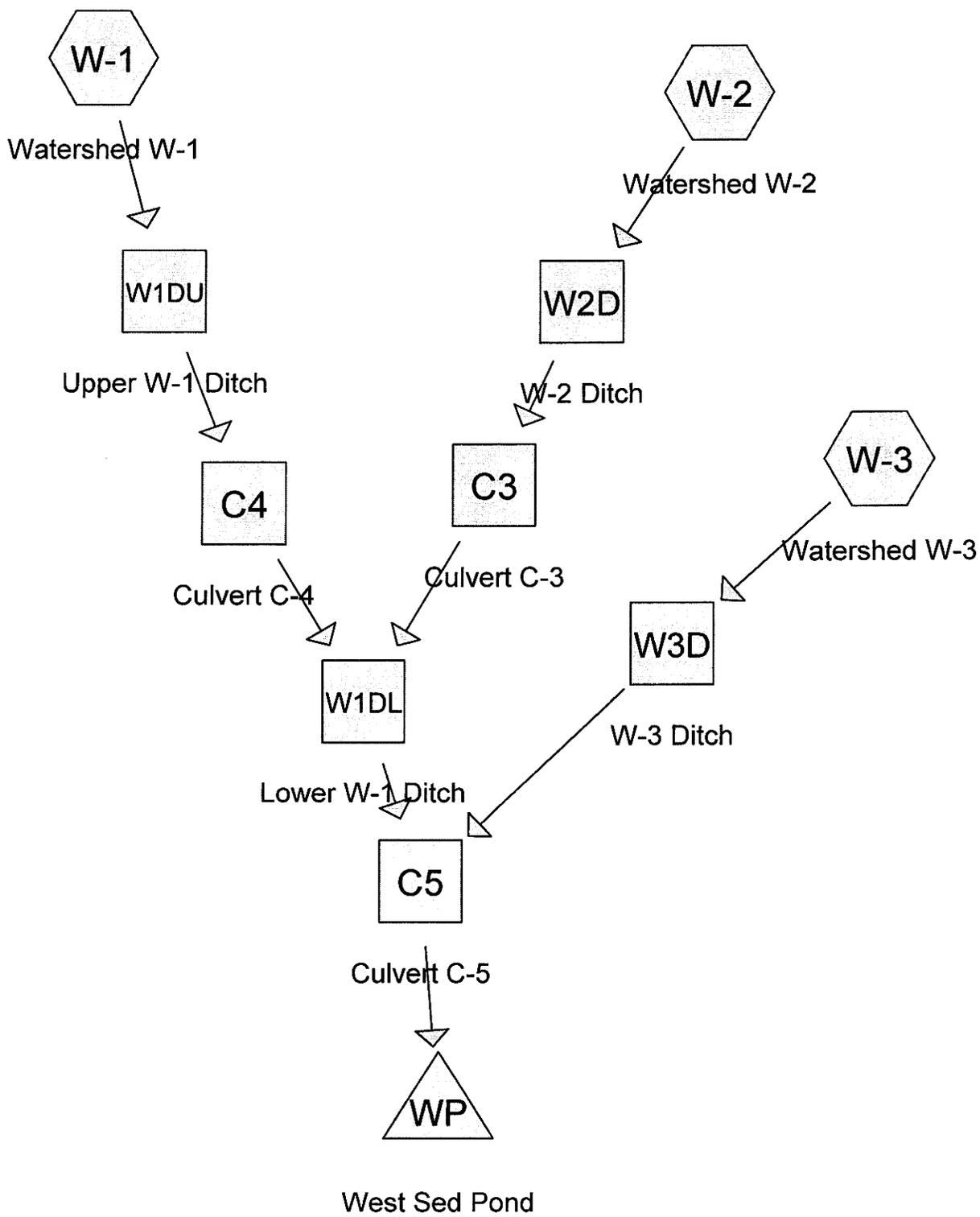
Type II 24-hr 6.00 hrs Rainfall=1.74"

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Pond EP: East Sed Pond

Hydrograph





Drainage Diagram for 100yr-6hr West Pond
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100yr-6hr West Pond

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
305,034	87	(W-1,W-2,W-3)
305,034		TOTAL AREA

100yr-6hr West Pond

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Page 3

Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
305,034	Other	W-1, W-2, W-3
305,034		TOTAL AREA

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

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

Subcatchment W-1: Watershed W-1 Runoff Area=105,474 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=1,297' Slope=0.0250 '/' Tc=19.5 min CN=87 Runoff=2.88 cfs 6,219 cf

Subcatchment W-2: Watershed W-2 Runoff Area=128,724 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=635' Slope=0.0250 '/' Tc=11.0 min CN=87 Runoff=5.32 cfs 7,590 cf

Subcatchment W-3: Watershed W-3 Runoff Area=70,836 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=447' Slope=0.0270 '/' Tc=8.0 min CN=87 Runoff=3.52 cfs 4,177 cf

Reach C3: Culvert C-3 Avg. Depth=0.64' Max Vel=6.47 fps Inflow=4.68 cfs 7,590 cf
D=18.0" n=0.020 L=40.0' S=0.0325 '/' Capacity=12.31 cfs Outflow=4.65 cfs 7,590 cf

Reach C4: Culvert C-4 Avg. Depth=0.63' Max Vel=3.35 fps Inflow=2.37 cfs 6,219 cf
D=18.0" n=0.025 L=80.0' S=0.0137 '/' Capacity=6.41 cfs Outflow=2.35 cfs 6,219 cf

Reach C5: Culvert C-5 Avg. Depth=0.49' Max Vel=11.15 fps Inflow=5.67 cfs 17,985 cf
D=18.0" n=0.025 L=20.0' S=0.1950 '/' Capacity=24.12 cfs Outflow=5.67 cfs 17,985 cf

Reach W1DL: Lower W-1 Ditch Avg. Depth=1.03' Max Vel=2.35 fps Inflow=5.01 cfs 13,809 cf
n=0.035 L=320.0' S=0.0088 '/' Capacity=29.49 cfs Outflow=4.90 cfs 13,809 cf

Reach W1DU: Upper W-1 Ditch Avg. Depth=0.71' Max Vel=2.38 fps Inflow=2.88 cfs 6,219 cf
n=0.035 L=963.0' S=0.0145 '/' Capacity=38.02 cfs Outflow=2.37 cfs 6,219 cf

Reach W2D: W-2 Ditch Avg. Depth=0.40' Max Vel=2.58 fps Inflow=5.32 cfs 7,590 cf
n=0.035 L=500.0' S=0.0158 '/' Capacity=23.56 cfs Outflow=4.68 cfs 7,590 cf

Reach W3D: W-3 Ditch Avg. Depth=0.71' Max Vel=2.50 fps Inflow=3.52 cfs 4,177 cf
n=0.035 L=160.0' S=0.0156 '/' Capacity=8.65 cfs Outflow=3.21 cfs 4,177 cf

Pond WP: West Sed Pond Peak Elev=5,504.70' Storage=17,985 cf Inflow=5.67 cfs 17,985 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 305,034 sf Runoff Volume = 17,985 cf Average Runoff Depth = 0.71"
100.00% Pervious = 305,034 sf 0.00% Impervious = 0 sf

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment W-1: Watershed W-1

Runoff = 2.88 cfs @ 3.22 hrs, Volume= 6,219 cf, Depth= 0.71"

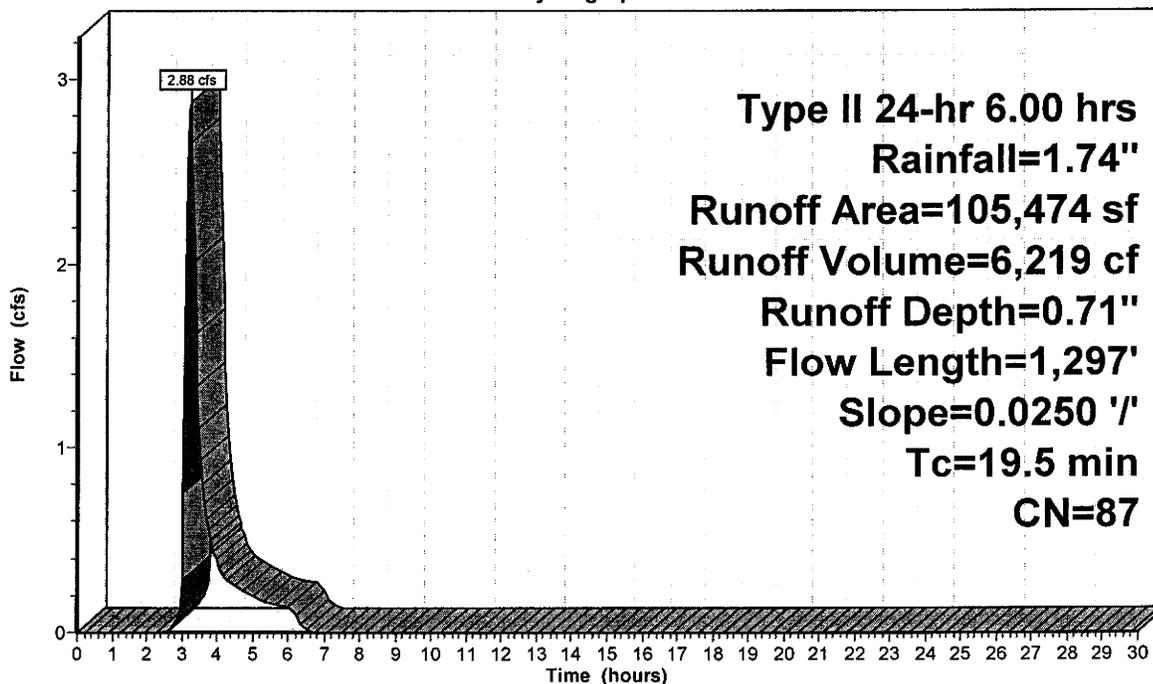
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 105,474	87	
105,474		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.5	1,297	0.0250	1.11		Lag/CN Method,

Subcatchment W-1: Watershed W-1

Hydrograph



Runoff

**Type II 24-hr 6.00 hrs
 Rainfall=1.74"
 Runoff Area=105,474 sf
 Runoff Volume=6,219 cf
 Runoff Depth=0.71"
 Flow Length=1,297'
 Slope=0.0250 '/
 Tc=19.5 min
 CN=87**

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment W-2: Watershed W-2

Runoff = 5.32 cfs @ 3.11 hrs, Volume= 7,590 cf, Depth= 0.71"

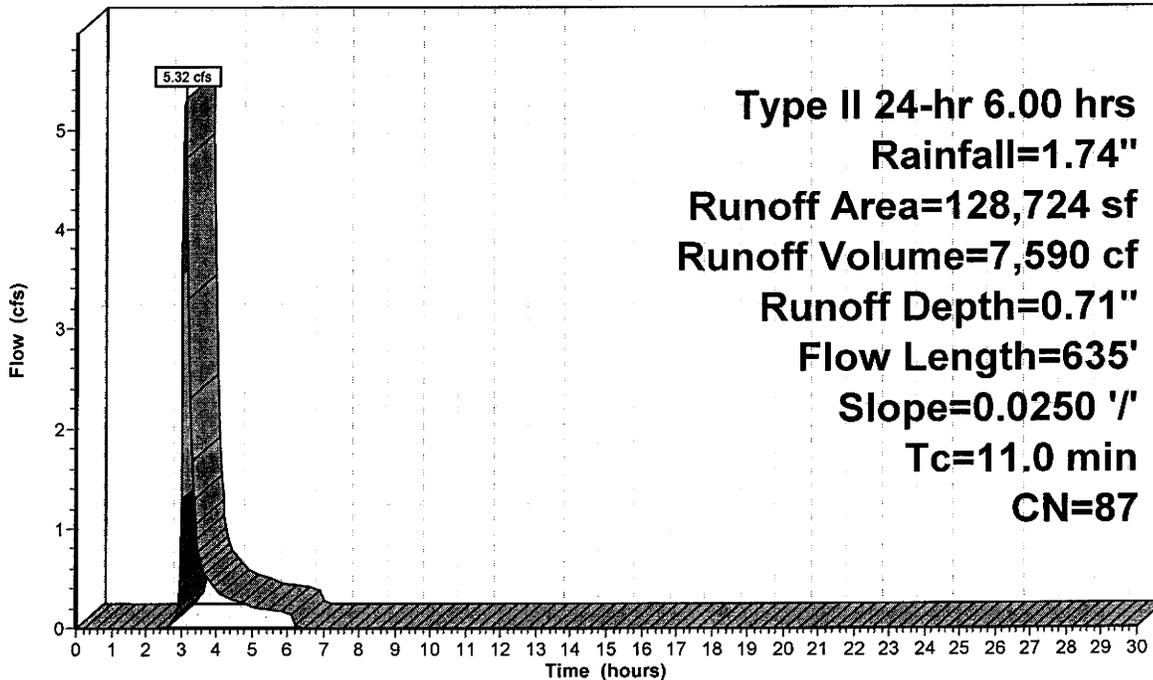
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 128,724	87	
128,724		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	635	0.0250	0.96		Lag/CN Method,

Subcatchment W-2: Watershed W-2

Hydrograph



Runoff

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Subcatchment W-3: Watershed W-3

Runoff = 3.52 cfs @ 3.07 hrs, Volume= 4,177 cf, Depth= 0.71"

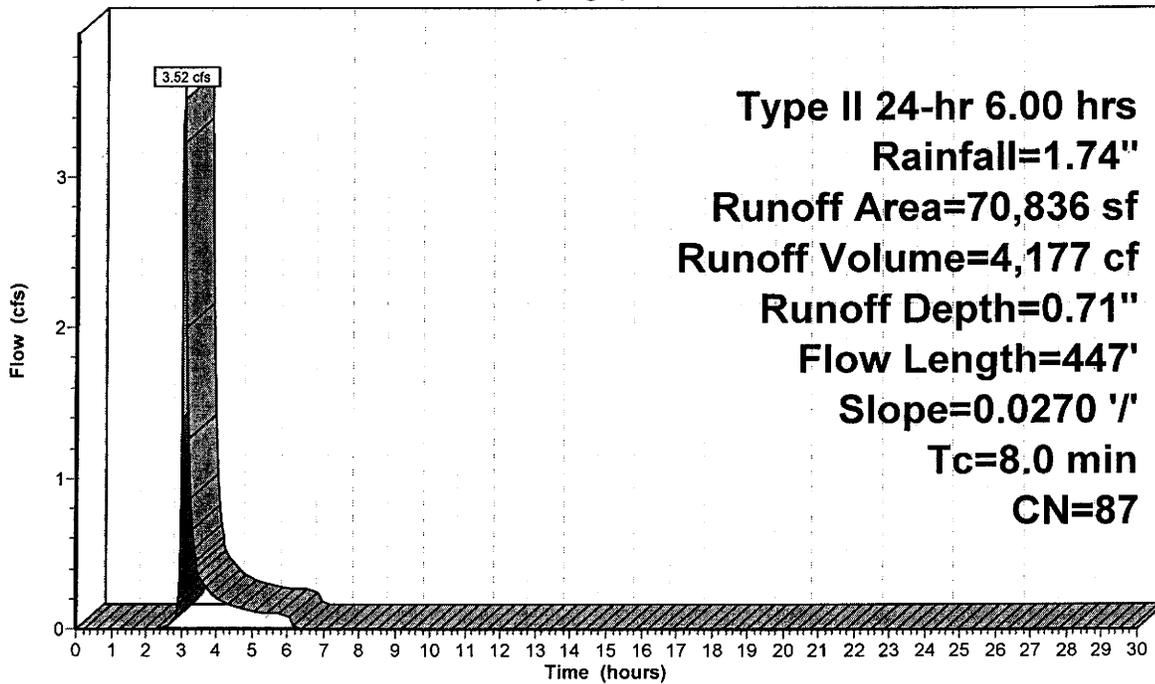
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Type II 24-hr 6.00 hrs Rainfall=1.74"

Area (sf)	CN	Description
* 70,836	87	
70,836		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	447	0.0270	0.93		Lag/CN Method,

Subcatchment W-3: Watershed W-3

Hydrograph



**Type II 24-hr 6.00 hrs
 Rainfall=1.74"
 Runoff Area=70,836 sf
 Runoff Volume=4,177 cf
 Runoff Depth=0.71"
 Flow Length=447'
 Slope=0.0270 '/
 Tc=8.0 min
 CN=87**

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C3: Culvert C-3

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach W2D OUTLET depth by 0.29' @ 3.25 hrs

Inflow Area =	128,724 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	4.68 cfs @	3.21 hrs,	Volume=	7,590 cf
Outflow =	4.65 cfs @	3.21 hrs,	Volume=	7,590 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.47 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.96 fps, Avg. Travel Time= 0.3 min

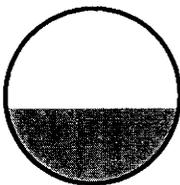
Peak Storage= 29 cf @ 3.21 hrs, Average Depth at Peak Storage= 0.64'

Bank-Full Depth= 1.50', Capacity at Bank-Full= 12.31 cfs

18.0" Diameter Pipe, n= 0.020

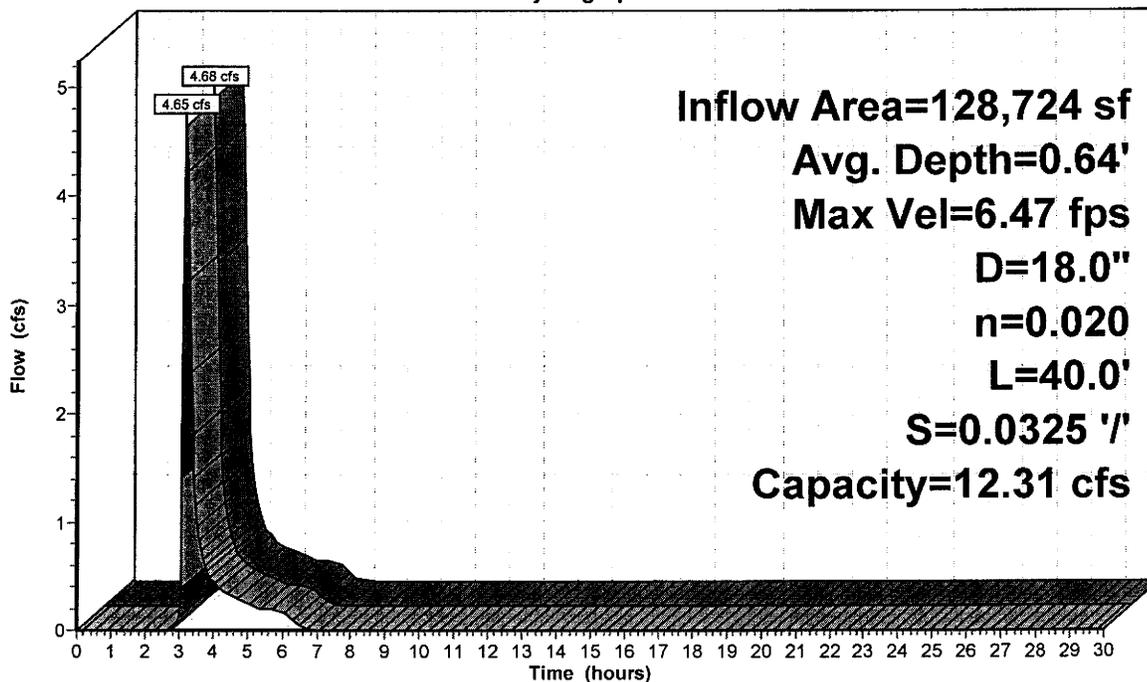
Length= 40.0' Slope= 0.0325 '/

Inlet Invert= 5,512.10', Outlet Invert= 5,510.80'



Reach C3: Culvert C-3

Hydrograph



	Inflow
	Outflow

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C4: Culvert C-4

[52] Hint: Inlet/Outlet conditions not evaluated

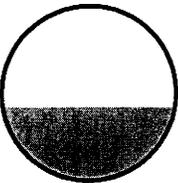
[62] Warning: Exceeded Reach W1DU OUTLET depth by 1.20' @ 0.00 hrs

Inflow Area =	105,474 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	2.37 cfs @	3.43 hrs,	Volume=	6,219 cf
Outflow =	2.35 cfs @	3.44 hrs,	Volume=	6,219 cf, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 3.35 fps, Min. Travel Time= 0.4 min
 Avg. Velocity = 1.03 fps, Avg. Travel Time= 1.3 min

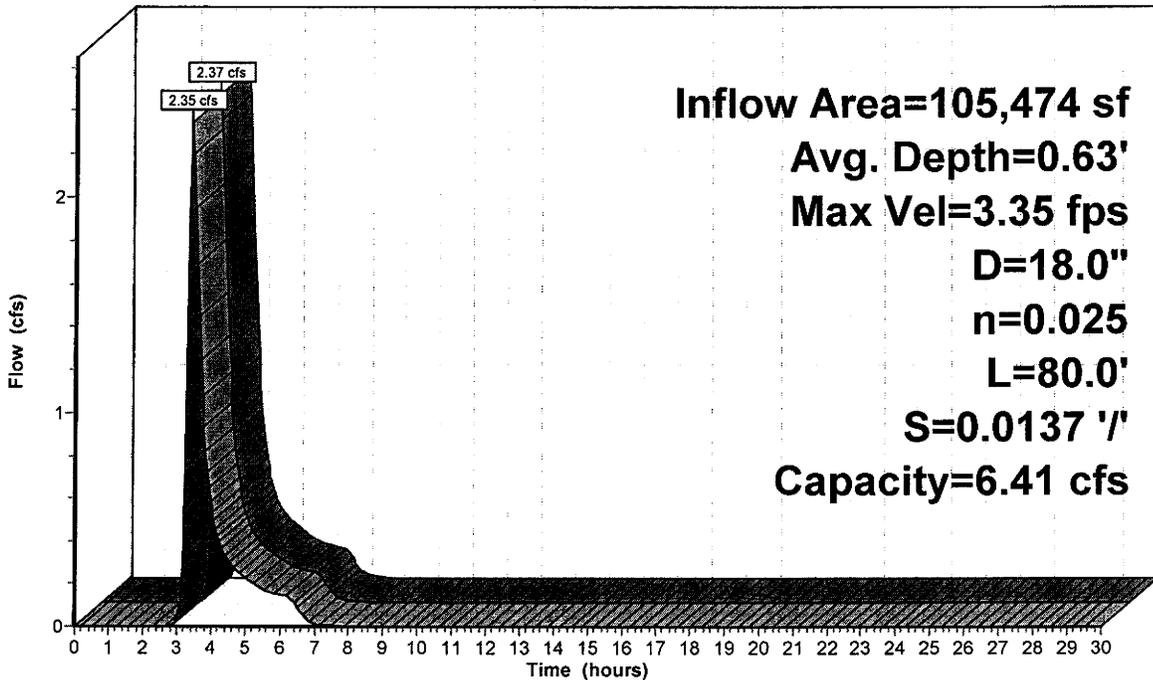
Peak Storage= 57 cf @ 3.43 hrs, Average Depth at Peak Storage= 0.63'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 6.41 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 80.0' Slope= 0.0137 '/'
 Inlet Invert= 5,512.00', Outlet Invert= 5,510.90'



Reach C4: Culvert C-4

Hydrograph



■ Inflow
 ▨ Outflow

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach C5: Culvert C-5

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Warning: Exceeded Reach W1DL OUTLET depth by 1.92' @ 2.70 hrs

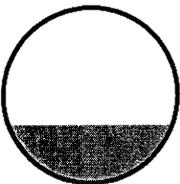
[62] Warning: Exceeded Reach W3D OUTLET depth by 2.02' @ 3.45 hrs

Inflow Area =	305,034 sf,	0.00% Impervious,	Inflow Depth =	0.71"
Inflow =	5.67 cfs @	3.30 hrs,	Volume=	17,985 cf
Outflow =	5.67 cfs @	3.30 hrs,	Volume=	17,985 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 11.15 fps, Min. Travel Time= 0.0 min
 Avg. Velocity = 3.89 fps, Avg. Travel Time= 0.1 min

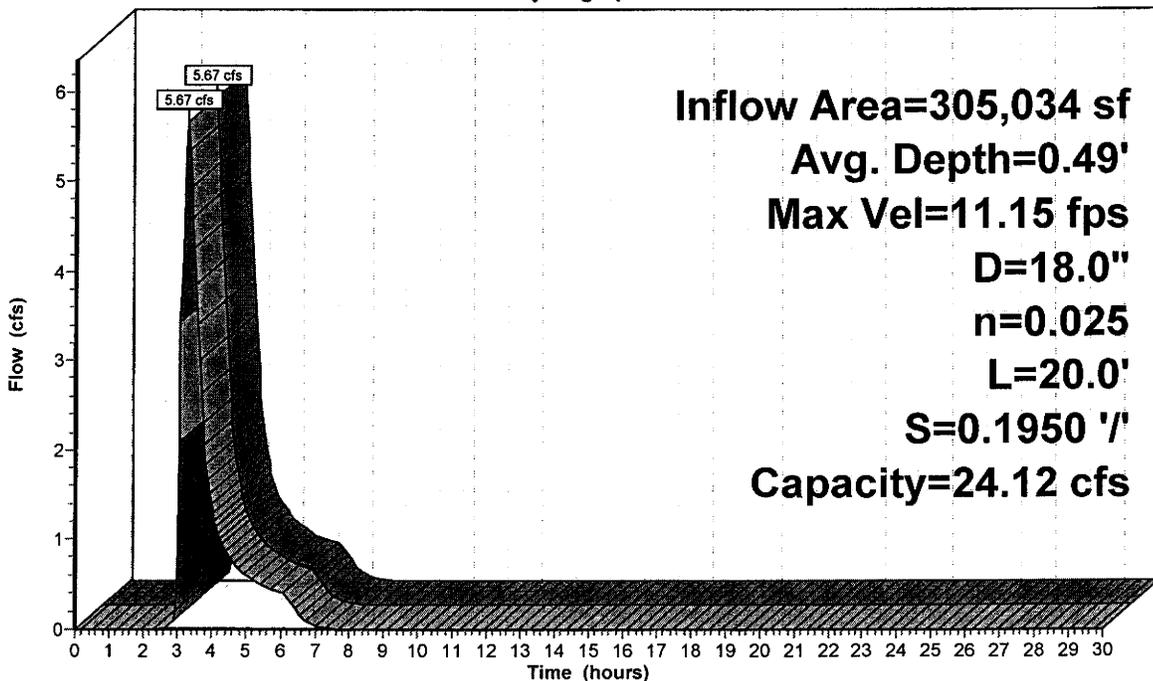
Peak Storage= 10 cf @ 3.30 hrs, Average Depth at Peak Storage= 0.49'
 Bank-Full Depth= 1.50', Capacity at Bank-Full= 24.12 cfs

18.0" Diameter Pipe, n= 0.025 Corrugated metal
 Length= 20.0' Slope= 0.1950 '/'
 Inlet Invert= 5,509.90', Outlet Invert= 5,506.00'



Reach C5: Culvert C-5

Hydrograph



Inflow
 Outflow

Inflow Area=305,034 sf
Avg. Depth=0.49'
Max Vel=11.15 fps
D=18.0"
n=0.025
L=20.0'
S=0.1950 '/
Capacity=24.12 cfs

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Reach W1DL: Lower W-1 Ditch

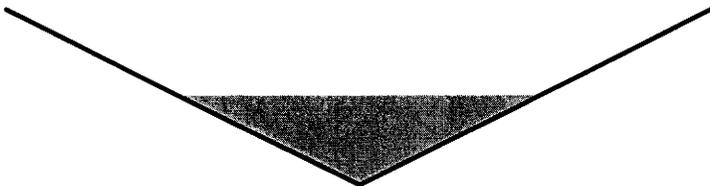
[62] Warning: Exceeded Reach C3 OUTLET depth by 0.60' @ 3.50 hrs
 [62] Warning: Exceeded Reach C4 OUTLET depth by 0.60' @ 3.20 hrs

Inflow Area = 234,198 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 5.01 cfs @ 3.23 hrs, Volume= 13,809 cf
 Outflow = 4.90 cfs @ 3.32 hrs, Volume= 13,809 cf, Atten= 2%, Lag= 5.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.35 fps, Min. Travel Time= 2.3 min
 Avg. Velocity = 0.71 fps, Avg. Travel Time= 7.5 min

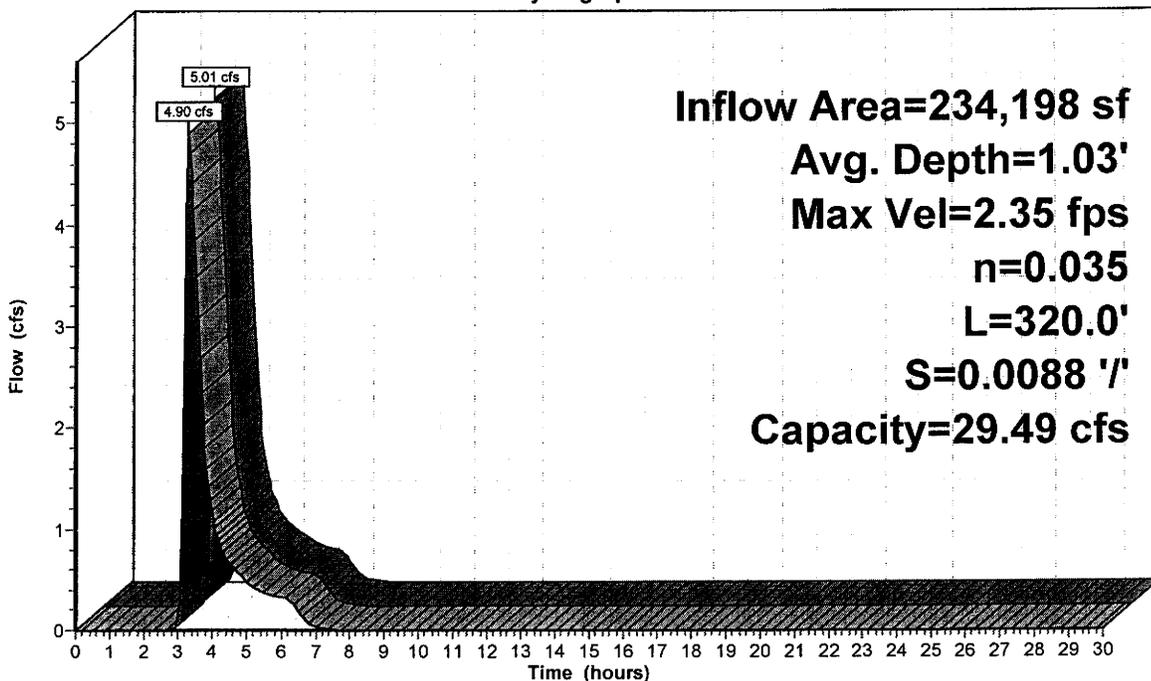
Peak Storage= 672 cf @ 3.27 hrs, Average Depth at Peak Storage= 1.03'
 Bank-Full Depth= 2.00', Capacity at Bank-Full= 29.49 cfs

0.00' x 2.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 '/' Top Width= 8.00'
 Length= 320.0' Slope= 0.0088 '/'
 Inlet Invert= 5,510.80', Outlet Invert= 5,508.00'



Reach W1DL: Lower W-1 Ditch

Hydrograph



Inflow Area=234,198 sf
Avg. Depth=1.03'
Max Vel=2.35 fps
n=0.035
L=320.0'
S=0.0088 '/'
Capacity=29.49 cfs

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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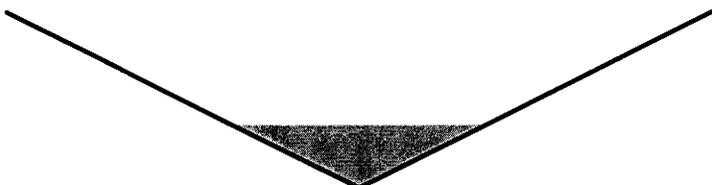
Summary for Reach W1DU: Upper W-1 Ditch

Inflow Area = 105,474 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 2.88 cfs @ 3.22 hrs, Volume= 6,219 cf
 Outflow = 2.37 cfs @ 3.43 hrs, Volume= 6,219 cf, Atten= 18%, Lag= 12.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.38 fps, Min. Travel Time= 6.7 min
 Avg. Velocity = 0.77 fps, Avg. Travel Time= 20.8 min

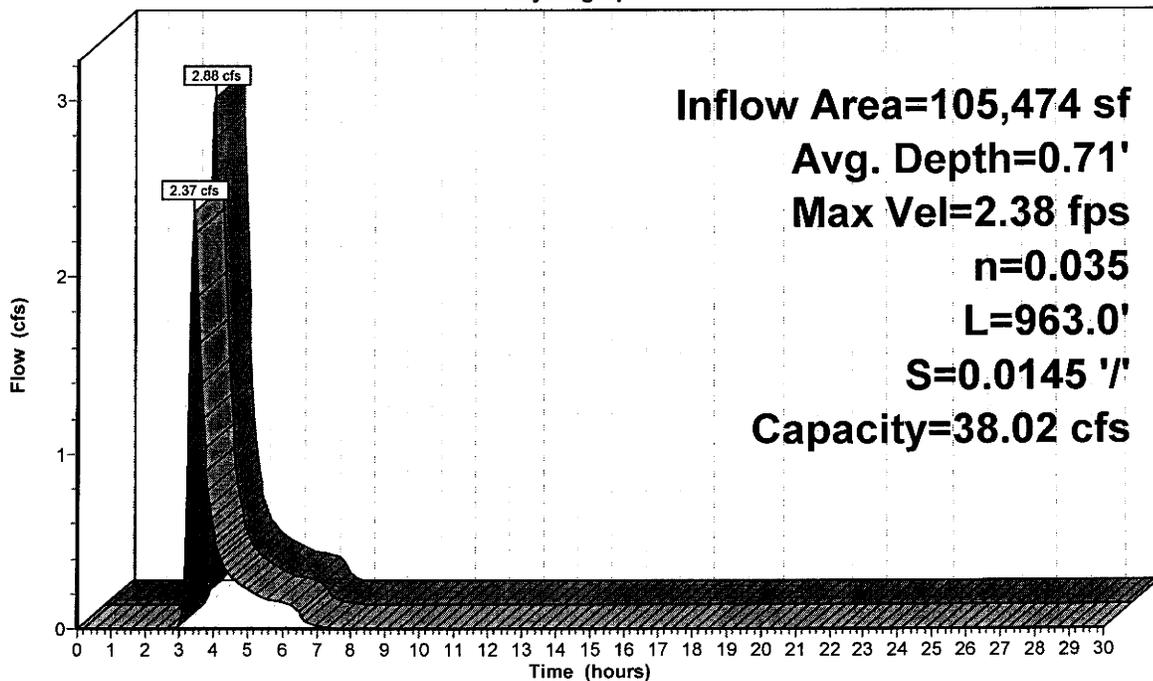
Peak Storage= 971 cf @ 3.31 hrs, Average Depth at Peak Storage= 0.71'
 Bank-Full Depth= 2.00', Capacity at Bank-Full= 38.02 cfs

0.00' x 2.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 ' / ' Top Width= 8.00'
 Length= 963.0' Slope= 0.0145 ' / '
 Inlet Invert= 5,524.80', Outlet Invert= 5,510.80'



Reach W1DU: Upper W-1 Ditch

Hydrograph



Inflow Area=105,474 sf
Avg. Depth=0.71'
Max Vel=2.38 fps
n=0.035
L=963.0'
S=0.0145 ' / '
Capacity=38.02 cfs

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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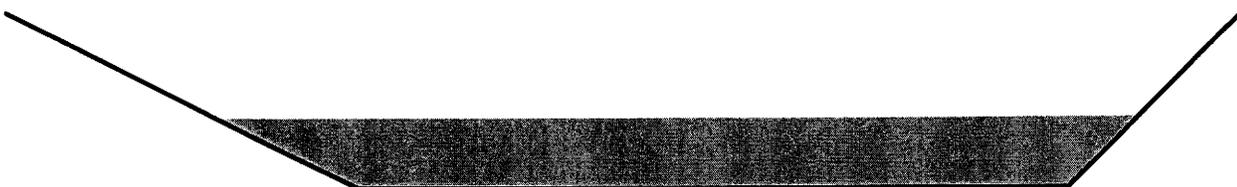
Summary for Reach W2D: W-2 Ditch

Inflow Area = 128,724 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 5.32 cfs @ 3.11 hrs, Volume= 7,590 cf
 Outflow = 4.68 cfs @ 3.21 hrs, Volume= 7,590 cf, Atten= 12%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.58 fps, Min. Travel Time= 3.2 min
 Avg. Velocity = 0.62 fps, Avg. Travel Time= 13.3 min

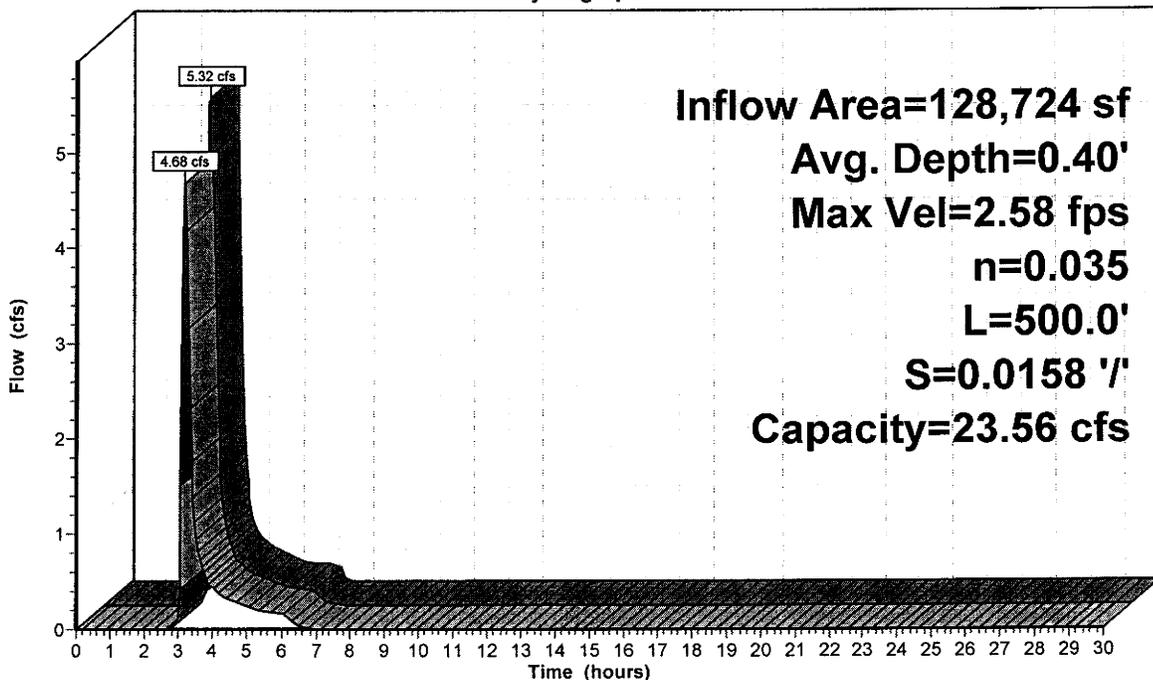
Peak Storage= 918 cf @ 3.16 hrs, Average Depth at Peak Storage= 0.40'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 23.56 cfs

4.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 2.0 1.0 '/' Top Width= 7.00'
 Length= 500.0' Slope= 0.0158 '/'
 Inlet Invert= 5,520.00', Outlet Invert= 5,512.10'



Reach W2D: W-2 Ditch

Hydrograph



■ Inflow
 ■ Outflow

Inflow Area=128,724 sf
Avg. Depth=0.40'
Max Vel=2.58 fps
n=0.035
L=500.0'
S=0.0158 '/'
Capacity=23.56 cfs

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

Prepared by EarthFax Engineering, Inc.

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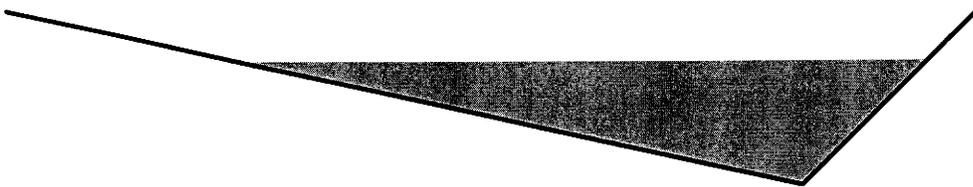
Summary for Reach W3D: W-3 Ditch

Inflow Area = 70,836 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 3.52 cfs @ 3.07 hrs, Volume= 4,177 cf
 Outflow = 3.21 cfs @ 3.11 hrs, Volume= 4,177 cf, Atten= 9%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.50 fps, Min. Travel Time= 1.1 min
 Avg. Velocity = 0.98 fps, Avg. Travel Time= 2.7 min

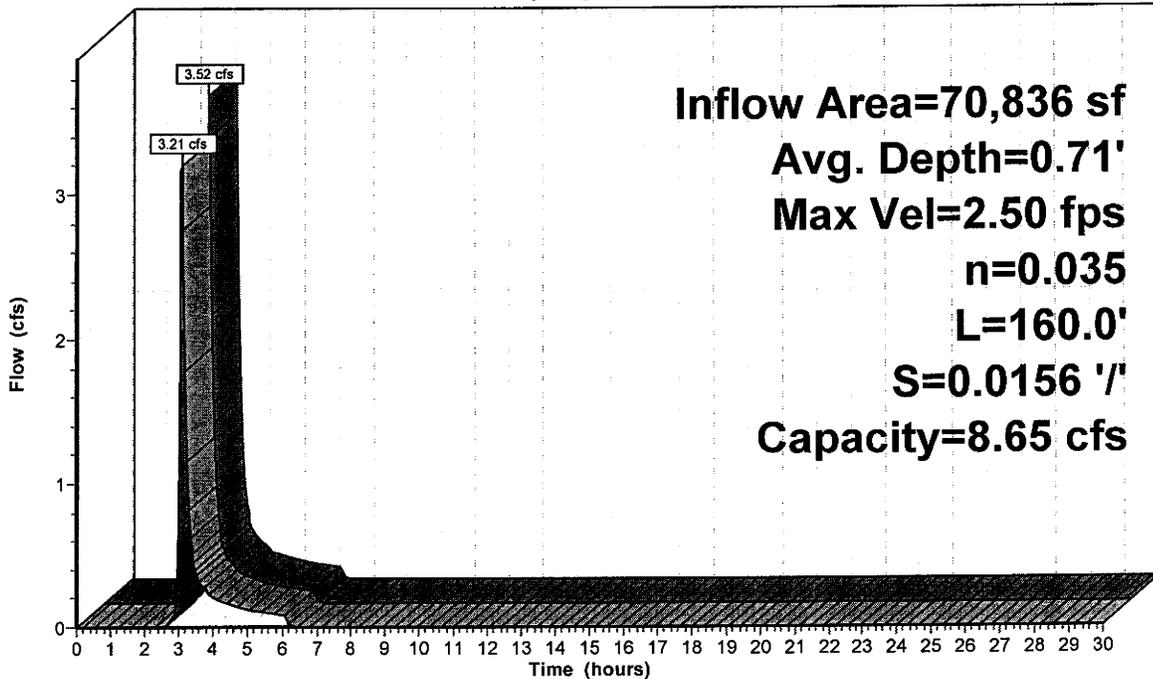
Peak Storage= 221 cf @ 3.10 hrs, Average Depth at Peak Storage= 0.71'
 Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.65 cfs

0.00' x 1.00' deep channel, n= 0.035
 Side Slope Z-value= 4.5 1.0 '/ Top Width= 5.50'
 Length= 160.0' Slope= 0.0156 '/
 Inlet Invert= 5,510.50', Outlet Invert= 5,508.00'



Reach W3D: W-3 Ditch

Hydrograph



■ Inflow
 ■ Outflow

Inflow Area=70,836 sf
Avg. Depth=0.71'
Max Vel=2.50 fps
n=0.035
L=160.0'
S=0.0156 '/
Capacity=8.65 cfs

100yr-6hr West Pond

Type II 24-hr 6.00 hrs Rainfall=1.74"

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Summary for Pond WP: West Sed Pond

Inflow Area = 305,034 sf, 0.00% Impervious, Inflow Depth = 0.71"
 Inflow = 5.67 cfs @ 3.30 hrs, Volume= 17,985 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

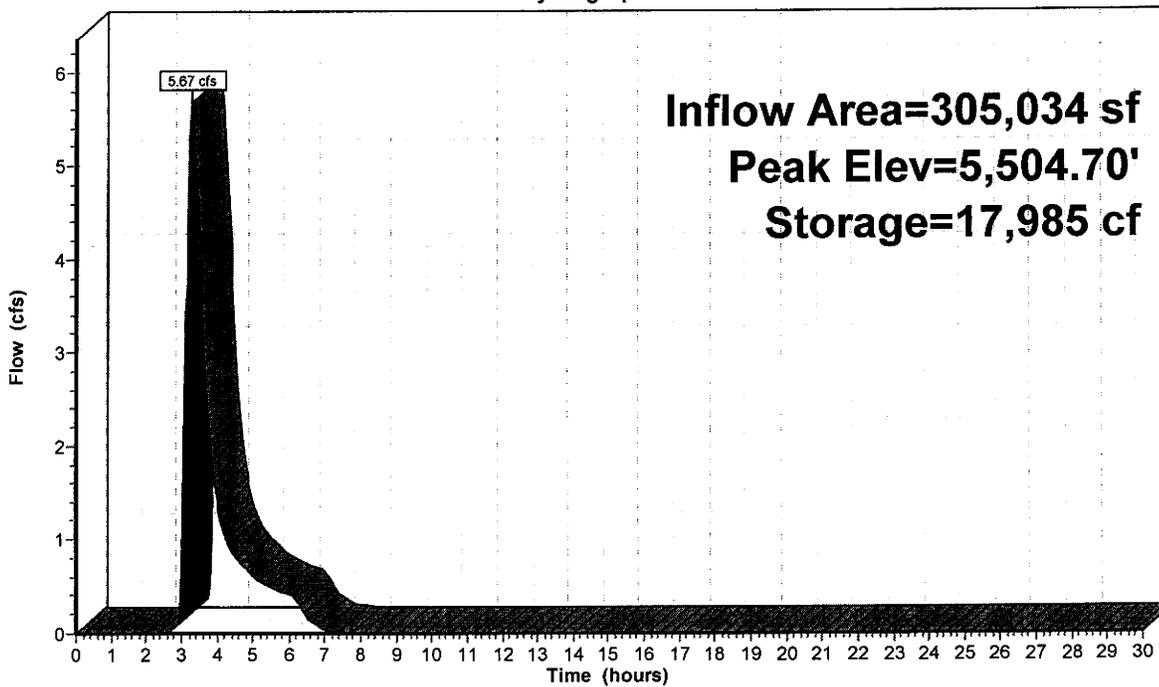
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 5,504.70' @ 29.95 hrs Surf.Area= 4,455 sf Storage= 17,985 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	5,498.23'	36,065 cf	17.00'W x 78.00'L x 9.77'H Prismatic Z=2.0

Pond WP: West Sed Pond

Hydrograph



**Upper E-1, Min Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.011000 ft/ft
Left Side Slope	1.00 H : V
Right Side Slope	1.00 H : V
Discharge	1.75 cfs

Results

Depth	0.91 ft
Flow Area	0.8 ft ²
Wetted Perimeter	2.58 ft
Top Width	1.83 ft
Critical Depth	0.72 ft
Critical Slope	0.039876 ft/ft
Velocity	2.10 ft/s
Velocity Head	0.07 ft
Specific Energy	0.98 ft
Froude Number	0.55
Flow Type	Subcritical

**Upper E-1, Max Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.019000 ft/ft
Left Side Slope	1.00 H : V
Right Side Slope	1.00 H : V
Discharge	1.75 cfs

Results

Depth	0.82 ft
Flow Area	0.7 ft ²
Wetted Perimeter	2.33 ft
Top Width	1.65 ft
Critical Depth	0.72 ft
Critical Slope	0.039876 ft/ft
Velocity	2.57 ft/s
Velocity Head	0.10 ft
Specific Energy	0.93 ft
Froude Number	0.71
Flow Type	Subcritical

**Lower E-1, Min Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.013000 ft/ft
Left Side Slope	1.50 H : V
Right Side Slope	1.50 H : V
Discharge	1.75 cfs

Results

Depth	0.73 ft
Flow Area	0.8 ft ²
Wetted Perimeter	2.63 ft
Top Width	2.19 ft
Critical Depth	0.61 ft
Critical Slope	0.033882 ft/ft
Velocity	2.19 ft/s
Velocity Head	0.07 ft
Specific Energy	0.80 ft
Froude Number	0.64
Flow Type	Subcritical

Lower E-1, Max Slope Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.021000 ft/ft
Left Side Slope	1.50 H : V
Right Side Slope	1.50 H : V
Discharge	1.75 cfs

Results

Depth	0.67 ft
Flow Area	0.7 ft ²
Wetted Perimeter	2.41 ft
Top Width	2.00 ft
Critical Depth	0.61 ft
Critical Slope	0.033882 ft/ft
Velocity	2.62 ft/s
Velocity Head	0.11 ft
Specific Energy	0.77 ft
Froude Number	0.80
Flow Type	Subcritical

E-3, Min Slope
Worksheet for Trapezoidal Channel

Project Description

Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.015000 ft/ft
Left Side Slope	2.50 H : V
Right Side Slope	1.00 H : V
Bottom Width	0.50 ft
Discharge	4.80 cfs

Results

Depth	0.84 ft
Flow Area	1.7 ft ²
Wetted Perimeter	3.94 ft
Top Width	3.44 ft
Critical Depth	0.73 ft
Critical Slope	0.028443 ft/ft
Velocity	2.91 ft/s
Velocity Head	0.13 ft
Specific Energy	0.97 ft
Froude Number	0.74
Flow Type	Subcritical

E-3, Max Slope
Worksheet for Trapezoidal Channel

Project Description

Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.023000 ft/ft
Left Side Slope	2.50 H : V
Right Side Slope	1.00 H : V
Bottom Width	0.50 ft
Discharge	4.80 cfs

Results

Depth	0.76 ft
Flow Area	1.4 ft ²
Wetted Perimeter	3.64 ft
Top Width	3.18 ft
Critical Depth	0.73 ft
Critical Slope	0.028443 ft/ft
Velocity	3.41 ft/s
Velocity Head	0.18 ft
Specific Energy	0.95 ft
Froude Number	0.90
Flow Type	Subcritical

E-4, Constant Slope Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.016000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	1.00 H : V
Discharge	1.16 cfs

Results

Depth	0.60 ft
Flow Area	0.5 ft ²
Wetted Perimeter	2.20 ft
Top Width	1.81 ft
Critical Depth	0.52 ft
Critical Slope	0.036385 ft/ft
Velocity	2.12 ft/s
Velocity Head	0.07 ft
Specific Energy	0.67 ft
Froude Number	0.68
Flow Type	Subcritical

E-5, Min Slope
Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.009500 ft/ft
Left Side Slope	4.00 H : V
Right Side Slope	4.00 H : V
Discharge	4.98 cfs

Results

Depth	0.76 ft
Flow Area	2.3 ft ²
Wetted Perimeter	6.30 ft
Top Width	6.11 ft
Critical Depth	0.63 ft
Critical Slope	0.027371 ft/ft
Velocity	2.13 ft/s
Velocity Head	0.07 ft
Specific Energy	0.83 ft
Froude Number	0.61
Flow Type	Subcritical

E-5, Max Slope Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.033000 ft/ft
Left Side Slope	4.00 H : V
Right Side Slope	4.00 H : V
Discharge	4.98 cfs

Results

Depth	0.60 ft
Flow Area	1.5 ft ²
Wetted Perimeter	4.99 ft
Top Width	4.84 ft
Critical Depth	0.63 ft
Critical Slope	0.027371 ft/ft
Velocity	3.40 ft/s
Velocity Head	0.18 ft
Specific Energy	0.78 ft
Froude Number	1.09
Flow Type	Supercritical

**Upper W-1, Min Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.009100 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Discharge	1.50 cfs

Results

Depth	0.65 ft
Flow Area	0.8 ft ²
Wetted Perimeter	2.91 ft
Top Width	2.60 ft
Critical Depth	0.51 ft
Critical Slope	0.032636 ft/ft
Velocity	1.78 ft/s
Velocity Head	0.05 ft
Specific Energy	0.70 ft
Froude Number	0.55
Flow Type	Subcritical

**Upper W-1, Max Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.025000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Discharge	1.50 cfs

Results

Depth	0.54 ft
Flow Area	0.6 ft ²
Wetted Perimeter	2.40 ft
Top Width	2.15 ft
Critical Depth	0.51 ft
Critical Slope	0.032635 ft/ft
Velocity	2.60 ft/s
Velocity Head	0.10 ft
Specific Energy	0.64 ft
Froude Number	0.88
Flow Type	Subcritical

**Lower W-1, Min Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.006700 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Discharge	2.44 cfs

Results

Depth	0.83 ft
Flow Area	1.4 ft ²
Wetted Perimeter	3.69 ft
Top Width	3.30 ft
Critical Depth	0.62 ft
Critical Slope	0.030586 ft/ft
Velocity	1.79 ft/s
Velocity Head	0.05 ft
Specific Energy	0.88 ft
Froude Number	0.49
Flow Type	Subcritical

**Lower W-1, Max Slope
Worksheet for Triangular Channel**

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.017000 ft/ft
Left Side Slope	2.00 H : V
Right Side Slope	2.00 H : V
Discharge	2.44 cfs

Results

Depth	0.69 ft
Flow Area	1.0 ft ²
Wetted Perimeter	3.10 ft
Top Width	2.77 ft
Critical Depth	0.62 ft
Critical Slope	0.030586 ft/ft
Velocity	2.54 ft/s
Velocity Head	0.10 ft
Specific Energy	0.79 ft
Froude Number	0.76
Flow Type	Subcritical

W-2, Min Slope
Worksheet for Trapezoidal Channel

Project Description

Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.008300 ft/ft
Left Side Slope	1.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	2.00 ft
Discharge	2.79 cfs

Results

Depth	0.51 ft
Flow Area	1.4 ft ²
Wetted Perimeter	3.86 ft
Top Width	3.53 ft
Critical Depth	0.36 ft
Critical Slope	0.029556 ft/ft
Velocity	1.98 ft/s
Velocity Head	0.06 ft
Specific Energy	0.57 ft
Froude Number	0.55
Flow Type	Subcritical

W-2, Max Slope
Worksheet for Trapezoidal Channel

Project Description

Worksheet	Trapezoidal Channel - 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.033000 ft/ft
Left Side Slope	1.00 H : V
Right Side Slope	2.00 H : V
Bottom Width	2.00 ft
Discharge	2.79 cfs

Results

Depth	0.35 ft
Flow Area	0.9 ft ²
Wetted Perimeter	3.26 ft
Top Width	3.04 ft
Critical Depth	0.36 ft
Critical Slope	0.029556 ft/ft
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.51 ft
Froude Number	1.05
Flow Type	Supercritical

W-3, Min Slope
Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.003300 ft/ft
Left Side Slope	4.50 H : V
Right Side Slope	1.00 H : V
Discharge	1.81 cfs

Results

Depth	0.74 ft
Flow Area	1.5 ft ²
Wetted Perimeter	4.48 ft
Top Width	4.09 ft
Critical Depth	0.49 ft
Critical Slope	0.032311 ft/ft
Velocity	1.19 ft/s
Velocity Head	0.02 ft
Specific Energy	0.77 ft
Froude Number	0.34
Flow Type	Subcritical

W-3, Max Slope
Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.035
Slope	0.025000 ft/ft
Left Side Slope	4.50 H : V
Right Side Slope	1.00 H : V
Discharge	1.81 cfs

Results

Depth	0.51 ft
Flow Area	0.7 ft ²
Wetted Perimeter	3.07 ft
Top Width	2.80 ft
Critical Depth	0.49 ft
Critical Slope	0.032310 ft/ft
Velocity	2.54 ft/s
Velocity Head	0.10 ft
Specific Energy	0.61 ft
Froude Number	0.89
Flow Type	Subcritical
