Submitted to
Southern Indiana
Gas & Electric Company
dba Vectren Power
Supply, Inc. (SIGECO)
One Vectren Square
Evansville, IN 47702

Submitted by
AECOM
9400 Amberglen Boulevard
Austin, Texas 78729

February 10, 2017

CCR Certification:
Amended Inflow Design Flood Control System Plan
§257.82

for the

East Ash Pond

at the

F.B. Culley Generating Station

Revision 1

Table of Contents

Tables

Appendices

Executive Summary

This Coal Combustion Residuals (CCR) Amended Inflow Design Flood Control System Plan (Inflow Flood Control Plan) for the East Ash Pond at the Southern Indiana Gas & Electric Company, dba Vectren Power Supply, Inc. F.B. Culley Generating Station has been prepared in accordance with the requirements specified in the USEPA CCR Rule under 40 Code of Federal Regulations CFR §257.82 (e). These regulations require that the specified documentation, assessments and plans for an existing CCR surface impoundment be amended per §257.82 (c)(2) when there is a change in conditions that would substantially affect the written plan in effect. CCR was recently removed from the East Ash Pond and the normal operating level was lowered to 396 which changed the storage capacity of the pond. In addition, a power generating unit at the plant returned to operation, increasing the process inflow into the pond; therefore the Initial Inflow Flood Control Plan has been amended.

This Inflow Flood Control Plan meets the regulatory requirements as summarized in **Table ES-1.**

Table ES-1 – Certification Summary

Report Section	CCR Rule Reference	Requirement Summary	Requirement Met?	Comments
Initial Inflow Design Flood Control System Plan				
4.1	§257.82 (a)(1)	*Adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood*	Yes	CCR unit has the storage capacity to handle the inflow design flood
4.2	§257.82 (a)(2)	*Adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood*	Yes	The pond has adequate capacity to contain 1,000-year 24-hour storm with or without operational outlet pumps.
4.3	§257.82 (a)(3)	*Required Inflow design flood for Significant Hazard Potential Impoundment*	Yes	Inflow design flood utilized was the 1,000-year event
4.4	§257.82 (b)	*Discharge handled in accordance with* §257.3 – 3	Yes	CCR unit discharges in accordance with the existing NPDES permit

The East Ash Pond is considered to be a significant hazard potential CCR surface impoundment, therefore per §257.82 (a)(3), the inflow design flood is the 1,000-year flood. In accordance with the requirements of §257.82

(a)(3), an Inflow Flood Control Plan was developed for the East Ash Pond. This was accomplished by evaluating the effects of a 24-hour duration design storm for the 1,000-year Inflow Design Flood (IDF) to evaluate the East Ash Pond's ability to collect and control the 1,000-year IDF of 10.2-inches, under existing operational and maintenance procedures. In accordance with the requirements of §257.82 (c)(2), changes in the conditions that would substantially affect the written plan in effect requires the amendment of the Inflow Flood Control Plan. Since the October 2017 certification of the Initial Inflow Design Flood Control System Plan, CCR material has been removed, the interior of the East Ash Pond has been regraded pond, and process inflow rate to the pond has changed. The East Ash Pond consists of two interconnected ponds. The only outlet from the pond is a pump station. This outlet does not allow for free flow discharge if the pump station was to malfunction or lose power. To simulate the worst case scenario, the analysis was completed with no pumps running in the East Ash Pond as if there was a malfunction or power outage at the pump station. Therefore, the East Ash Pond would be required to collect and store the 1,000-year IDF. The results of the modeling for the East Ash Pond indicate that the CCR unit has sufficient storage capacity and outlet structures to adequately manage inflows and collect and control outflows during peak discharge conditions created by the 1,000-year IDF.

1 Introduction

1.1 Purpose of This Report

The purpose of the Amended Inflow Design Flood Control System Plan (Inflow Flood Control Plan) is to document that the requirements specified in 40 code of Federal Regulations (CFR) §257.82 have been met to support the certification required under each of the applicable regulatory provisions for the F.B. Culley Generating Station (Culley) East Ash Pond. The East Ash Pond is an existing Coal Combustion Residuals (CCR) surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the, Inflow Flood Control Plan for an existing CCR surface impoundment be amended per §257.82 (c)(2) when there is a change in conditions that would substantially affect the written plan in effect. CCR was recently removed from the pond and the normal operating level of the pond was lowered which changed the storage capacity of the pond. In addition, a power generating unit at the plant returned to operation, increasing the process inflow into the pond. Therefore, the Inflow Flood Control Plan has been amended to reflect these changes.

The East Ash Pond has been evaluated to determine whether the inflow design flood control system requirements are met. The following table summarizes the documentation required within the CCR Rule and the sections that specifically respond to those requirements of this plan.

Table 1-1 – CCR Rule Cross Reference Table

Report Section	Title	CCR Rule Reference
4.1	Inflow Analysis	§257.82 (a)(1)
4.2	Outflow Analysis	§257.82 (a)(2)
4.3	Inflow Design Flood	§257.82 (a)(3)
4.4	Discharge handled in accordance with *§257.3 – 3*	§257.82 (b)

Analyses completed for the hydrologic and hydraulic assessments of the East Ash Pond are described in this report. Data and analyses results in the following sections are based on spillway design information shown on design drawings, topographic surveys, information about operational and maintenance procedures provided by Southern Indiana Gas & Electric Company, dba Vectren Power Supply, Inc. (SIGECO), and limited field measurements collected by AECOM. The analysis approach and results of the hydrologic and hydraulic analyses presented in the following sections were used by AECOM to confirm that the East Ash Pond meets the hydrologic and hydraulic capacity requirements of the rules referenced above for CCR surface impoundments.

1.2 Brief Description of Impoundment

The Culley station is located in Warrick County, Indiana, southeast of Newburgh, Indiana, and is owned and operated by SIGECO. The station is located along the north bank of the Ohio River and the west bank of the Little Pigeon Creek along the southeast portion of the site. The Culley station consists of two CCR surface

impoundments, identified as the West Pond and East Ash Pond. The East Ash Pond is located directly east of the station and is approximately 10 acres in size.

The East Ash Pond was commissioned in or around 1971 and operates as an unlined CCR impoundment. Earthen embankments were constructed along the south and east sides of the impoundment. Structural fill used for the original construction of the Culley station in the 1950's borders the impoundment to the west side, and west end of the north side. The east embankment intersects a natural hillside on the east end of the north side of the impoundment. The embankment is approximately 1,200 feet long, 30 feet high, and has 2.4 to 1 (horizontal to vertical) exterior side slopes covered with grassy vegetation. Interior side slopes varied from 2.5 to 1 (horizontal to vertical) to 2 to 1 (horizontal to vertical) for the upper and lower portion of the embankment, respectively. The embankment crest elevation varies from 392.67 feet[1] to 396.42 feet and has a crest width of approximately 15 feet. Within the west side structural fill, along the plant side of the East Ash Pond, there is a gravel layer forming the top of the embankment. This was uncovered during excavation of CCR material. The base elevation of the gravel is at approximately 392 feet. The surface area of the impoundment is approximately 9.8 acres. The recent construction activity has reshaped the interior of the pond to form two smaller ponds within the East Ash Pond, separated by a berm 26 feet wide and 330 feet long with a 24-inch culvert connecting them. The ponding water has a surface area of approximately 7.26 acres and has a normal operating water level of 386 feet.

A site Location Map showing the area surrounding the station is in **Figure 1** of **Appendix A**. **Figure 2** in **Appendix A** presents the F.B. Culley Generating Station Site Map.

1.2.1 Inflow from Plant Operations and Stormwater Runoff

Flue gas desulphurization (FGD) blowdown material is currently sluiced from the plant into the eastern side of the impoundment as well as clarified river raw water for a total inflow rate of approximately 0.2 cubic feet per second (cfs). Unit 2 and 3 discharges from air heater wash, the pyrite systems, boiler water, and flow from the west yard sump pump flow into the western part of the impoundment at a rate of 2.1 cfs. The water is discharged from the impoundment via pumping station through a permitted National Pollutant Discharge Elimination System (NPDES) outfall, identified as Internal Outfall 201, at a rate of 0.42 cfs.

In addition to rainfall directly into the impoundment, there are upstream areas that contribute runoff to the impoundment. The grassy areas to the north drain directly to the East Ash Pond through ditches and culverts. The rest of the site drainage areas, including the plant area, coal pile, and grassy areas to the northwest of the site drain to the inactive West Pond where collected stormwater in the pond is pumped to the West Pond pump station and is discharged to the Ohio River through permitted Outfall 001. The total drainage area to the East Ash Pond impoundment is approximately 30.69 acres.

1.2.2 Outlet Structures

Water discharges from the impoundment through a pump station located at the west side of the East Ash Pond. The pond pump station consists of two, CP 3170 LT 3~603 model 5,400 gpm submersible pumps manufactured by Flygt. The 10-inch pump discharge connects to a manhole on an 84-inch pipe that discharges to an underground discharge tunnel, which collects stormwater and other clean process water from throughout the Culley station and then discharges to the Ohio River through NPDES permitted Outfall 001.

[1] Unless otherwise noted, all elevations in this report are in the NAVD88 datum.

2 Hydrologic Analysis

2.1 Design Storm

The East Ash Pond has been categorized as a Significant hazard potential CCR impoundment, which requires that the inflow design flood is the 1,000-year return frequency design storm event. The full analysis for this classification determination is included in the *CCR Certification: Initial Hazard Potential Classification for the East Ash Pond at the F.B. Culley Generating Station*.

2.2 Rainfall Data

The rainfall information used in the analysis was based on the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Version 3 which provides rainfall data for storm events with average recurrence intervals ranging from 1 to 1,000 years and durations ranging from 5 minutes to 60 days. The design storm rainfall depth, obtained from the NOAA website, is 10.2 inches for the 24-hour, 1,000-year storm. The Indiana Huff, Third Quartile rainfall distribution was used by AECOM and is appropriate to use for storms up to the 1,000-year, 24-hr flood at the project site.

2.3 Runoff Computations

The drainage areas for the East Ash Pond were estimated using a computer-aided design (CAD) analysis of aerial survey conducted in 2011 and topographic ground surveys completed in 2015 by Three I Design and a drone topographic survey completed in 2016 by the Lochmueller Group. The grassy areas to the north drain directly to the East Ash Pond. The total drainage area to the East Ash Pond is approximately 30.69 acres. See **Appendix A** for the Drainage Area Maps.

Runoff was calculated using the SCS Curve Number Method, where curve numbers (CN) were assigned to each subcatchment based on the type of land cover and soil type present. Using the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey, the soil type of the site was selected as hydrologic soil group B. CN values for the land cover were selected from the CN Table available in HydroCAD. This data was obtained from the SCS NRCS Technical Release-55 (TR-55) publication. Ash, Industrial Areas, Water Surface, 50-75% grass cover, and >75% grass covers that are located on site were estimated to have CN values of 88, 88, 98, 69 and 61 respectively. A composite CN was calculated for each subcatchment area by summing the products of each CN multiplied by its percentage of the total area.

The time of concentration is commonly defined as the time required for runoff to travel from the most hydrologically distant point to the point of collection. Calculations for the time of concentration for each sub-watershed were performed in HydroCAD and are included in **Appendix B**.

Stormwater runoff from the 1,000-year event into the impoundment has a peak inflow of 40.35 cfs and total inflow volume of 41.83 acre-feet. Refer to **Appendix B** for HydroCAD results.

3 Hydraulic Analyses

3.1 Process Flows

Process water containing ash maximum flow rate from the plant into the East Ash Pond is of 2.3 cubic feet per second (cfs) or 1.45 million gallons per day (MGD).

3.2 Storage Capacity

The storage volume for the East Ash Pond was evaluated using a computer-aided design (CAD) analysis to estimate the volume of the pond under the present conditions. A survey was performed on November 30, 2016 to verify the available volume within the East Ash Pond after ash removal operations. Initially, the lowest elevation within the embankment surrounding the pond was used as the overtopping elevation. The excavation of CCR material uncovered a gravel layer within the structural fill forming the west side of the East Ash Pond with the base of the gravel layer at approximate elevation 392 feet. This elevation was used as the overtopping elevation to minimize the chance of stormwater migrating into this rock layer. The volume of storage was calculated by estimating the incremental storage volume present for each 1 foot elevation within the updated topographic surface supplied by SIGECO representatives in 2016. The incremental storage volume was then used to calculate a cumulative storage volume and was input into HydroCAD. The volume of storage provided by the two interconnected ponds within the East Ash Pond from normal pool elevation of 386 feet to the base of gravel seam located along the west side of the pond at an approximate elevation of 392 feet is approximately 46.57 acre-feet. This volume was determined with the knowledge that the two ponds within the East Ash Pond basin are connected by a single 24-inch culvert, allowing storm volumes to be shared by the two ponds. Refer to **Appendix B** for further storage volumes details.

3.3 Discharge Analysis

A hydraulic model was created in HydroCAD 10.00 to assess the capacity of the pond to store and convey the storm flows. HydroCAD has the capability to evaluate each pond within the network, to respond to variable tailwater, pumping rates, permit flow loops, and reversing flows. HydroCAD routing calculations reevaluate the pond systems' discharge capability at each time increment, making the program an efficient and dynamic tool for this evaluation.

The analyzed scenario assumes the starting water surface elevation of the interconnected ponds within the East Ash Pond is 386 feet, the normal operating level of the ponds. For the purposes of this analysis, the East Ash Pond was analyzed as if neither discharge pump within the pump station was operational. This represents a worst case scenario and the East Ash Pond must be capable of storing the design storm. As such, the facility would not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the NPDES under section 402 of the Clean Water Act.

4 Results

The hydrologic and hydraulic conditions of the East Ash Pond were modeled with the peak discharge of the 1,000-year storm event.

Regulatory Citation: 40 CFR §257.82 (a); The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.

4.1 Inflow Analysis

Regulatory Citation: 40 CFR §257.82 (a);

- *(1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflows design flood specified in paragraph (3).*

Background and Assessment

The East Ash Pond collects runoff from only a small area of the Culley station site and this runoff drains to the pond through sheet flow, overland ditching, and culverts located on the northwest side of the pond. These runoff volumes, in addition to the rainfall falling within the pond itself, and the plant process flows, produce the total inflow to the East Ash Pond. Using the HydroCAD model, the total inflow was stored within the East Ash Pond to evaluate the resulting peak water surface elevation.

Table 4-1 summarizes the maximum water surface elevation of the ponds within the East Ash Pond prior to and after the inflow design flood.

Table 4-1 - Summary of Hydrologic and Hydraulic Analysis
1,000-Year, 24-Hour Storm

CCR Unit	Beginning WSE[1] (feet)	Peak WSE (feet)	Base of Gravel within West Embankment (feet)	Freeboard Above Peak WSE (feet)
East Ash Pond	386	390.98	392	1

Notes:
[1] WSE = Water Surface Elevation

Conclusion and Recommendation

As there is adequate storage within the East Ash Pond to manage the inflow design flood, there is no anticipated overtopping of the East Ash Pond embankment, which meets the requirements in §257.82 (a)(1).

4.2 Outflow Analysis

Regulatory Citation: 40 CFR §257.82 (a);

- *(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (3) of this section.*

Background and Assessment

The East Ash Pond currently collects stormwater from a small area of the site including the grass areas to the north routed through a series of ditches and culverts, as well as any rainfall that falls directly within the perimeter embankments. The rain falling within the pond, the stormwater runoff directly draining to the pond, and the plant process inflows, combine to produce the total inflow to the East Ash Pond. The HydroCAD model was used to estimate the peak water surface elevation within the East Ash Pond during the design storm when the Ohio River is experiencing a 100-year flood.

Table 4-2 summarizes the peak flowrates and velocities through each of the outlet devices.

Table 4-2 - Summary of Outlet Devices
1,000-Year, 24-Hour Storm

Outlet Device	Type and Size	Invert Elevation (feet)	Peak Flowrate (cfs)	Velocity at Peak Flowrate (fps)
Pump Station - Outlet	2 pump – 5400 GPM; CP 3170 LT 3~ 603	386	N/A	N/A
Base of Gravel within West Embankment	Weir	392	0.00	0.00

Conclusion and Recommendation

In the case where the East Ash Pond pump station is not operational, AECOM recommends the Culley station provide pumping capacity equal to the existing lift station pumps by means of providing supplemental pumps or bringing the existing lift station pumps online within 48-hours.

As the East Ash Pond can store the design storm from the plant without utilizing its pump station and without the peak water surface elevation reaching the base of the gravel along the west embankment, the pond meets the requirements in §257.82 (a)(2).

4.3 Inflow Design Flood

Regulatory Citation: 40 CFR §257.82 (a);

- *(3) The inflow design flood is:*
    - *(i) For a high hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the probable maximum flood;*
    - *(ii) For a significant hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the 1,000-year flood;*
    - *(iii) For a low hazard potential CCR surface impoundment, as determined under §257.73(a)(2), the 100-year flood; or*
    - *(iv) For an incised CCR surface impoundment, the 25-year flood.*

Background and Assessment

The calculations for the inflow design flood are based on the hazard potential given to the impoundment. The different classifications of the impoundment hazard potential are high, significant, and low.

Conclusion and Recommendation

As the impoundment was given a significant hazard potential, the 1,000 year design storm was utilized in the analysis, which meets the requirements in §257.82 (a)(3).

4.4 Discharge

Regulatory Citation: 40 CFR §257.82 (b); Discharge from the CCR unit must be handled in accordance with the surface water requirements under: §257.3 – 3.

Background and Assessment

The East Ash Pond was modeled without a working pump station to simulate a worst case scenario. As such, there is no discharge from the pond in this model scenario. However, during normal operating conditions the discharge from the East Ash Pond pump station is conveyed through a 10-inch pipe that connects to a manhole on an 84-inch pipe and discharges to an underground discharge tunnel, which also collects discharge water from the cooling water system and various other clean discharge water sources located throughout the power plant. The underground discharge tunnel runs by the basement of Unit 2 within the power plant and discharges directly to the Ohio River through NPDES Permitted Outfall 001. The Ohio River was modeled at the FEMA 100 year flood elevation of 383.5'. The discharge must meet the requirements of the NDPES under section 402 of the Clean Water Act to meet the CCR rule.

Conclusion and Recommendation

No modifications are necessary or recommended to this unit for compliance with the CCR Rule.

Runoff discharges from the site through a permitted NPDES outfall. As per the current NPDES permit, all discharged water is tested for pollutants to meet the minimum regulatory requirements of the permit, and thereby meets the requirements in §257.82 (b).

5 Conclusions

The Inflow Flood Control Plan of the East Ash Pond adequately manages flow into the CCR unit during and following the peak discharge of the 1,000-year frequency storm event inflow design flood. The inflow design flood control system of the East Ash Pond adequately manages flow from the CCR unit to collect and control the peak discharge resulting from the 1,000-year frequency storm event inflow design flood. Therefore, the East Ash Pond meets the requirements for certification.

In the case where the East Ash Pond pump station is not operational, AECOM recommends that the Culley Generating Station provide pumping capacity equal to the existing lift station pumps by means of providing supplemental pumps or bringing the existing lift station pumps online within 48-hours.

The contents of this report, specifically **Sections 1** through **4**, represent the Amended Inflow Design Flood Control System Plan for this site.

6 Certification

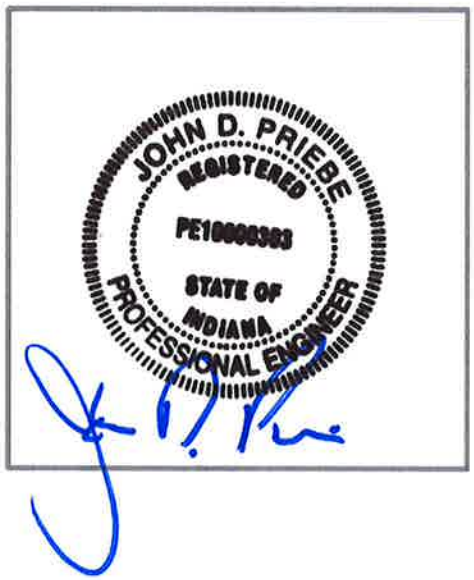
This Certification Statement documents that the East Ash Pond at the F.B. Culley Generating Station meets the Inflow Design Flood Control System Plan requirements specified in 40 CFR §257.82. The East Ash Pond is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that the Inflow Design Flood Control System Plan for an existing CCR surface impoundment be amended per §257.82 (c)(2) when there is a change in conditions that would substantially affect the written plan in effect. CCR material was recently removed from the pond and the normal operating level was lowered which changed the storage capacity of the pond. In addition a power generating unit at the plant became operational again, increasing the process inflow into the pond; therefore the Initial Inflow Flood Control Plan submitted on October 17, 2016, has been amended.

CCR Unit: Southern Indiana Gas & Electric Company; F.B. Culley Generating Station; East Ash Pond

I, John Priebe, being a Registered Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the Amended Inflow Design Flood Control System Plan dated February 10, 2017, meets the requirements of 40 CFR § 257.82.

JOHN D. PRIEBE
Printed Name

2/10/17
Date



7 Limitations

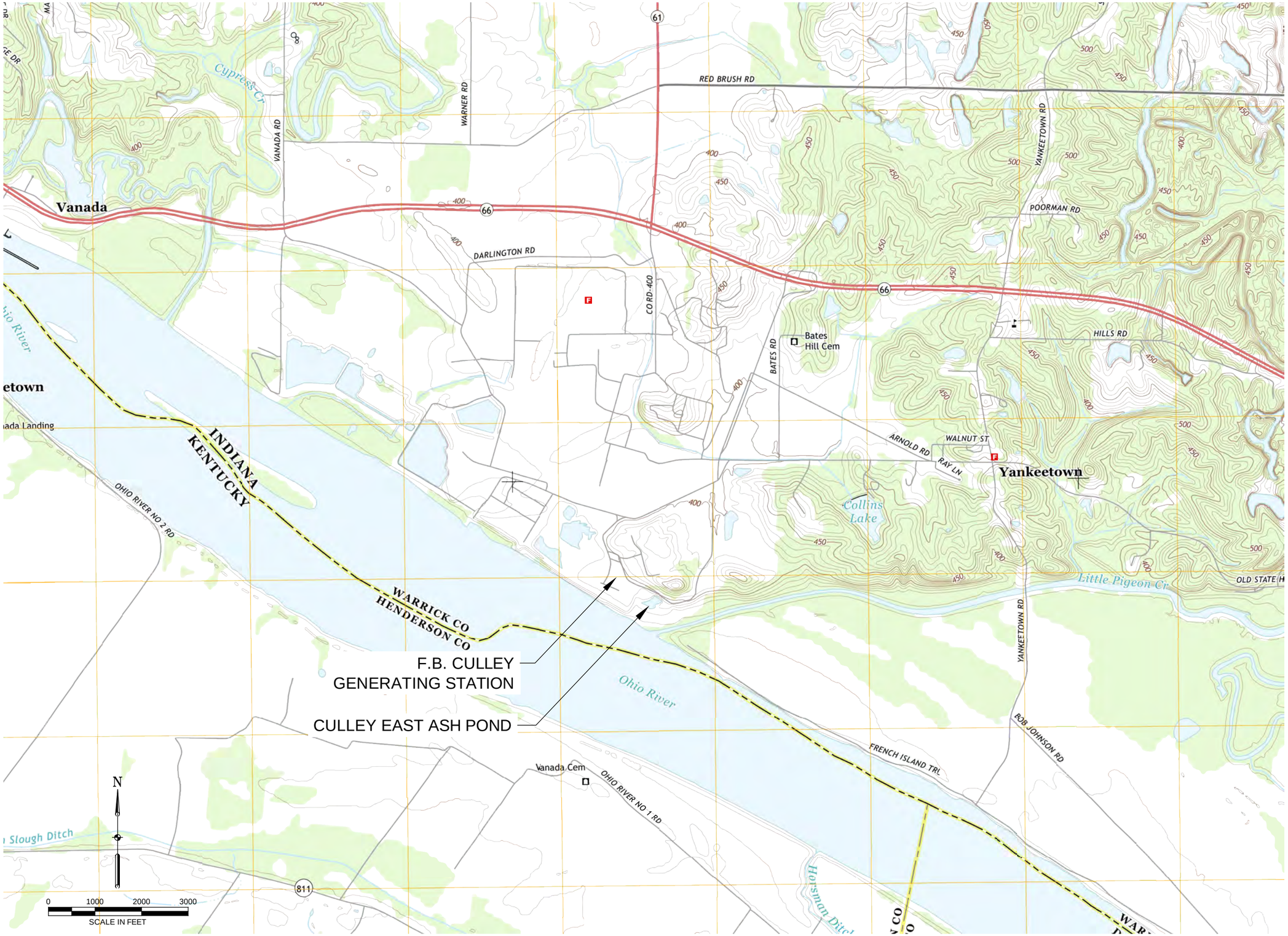
Background information, design basis, and other data which AECOM has used in preparing this report have been furnished to AECOM by SIGECO. AECOM has relied on this information as furnished, and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as provided by SIGECO. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings, and revise the report if necessary.

This hydrologic and hydraulic analysis was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

While the CCR unit adequately manages the inflow design flood, SIGECO must perform routine maintenance on the CCR unit to continually manage flood events without failure. The pump station should be cleared of debris that could block or damage the device. The two ponds within the East Ash Pond should maintain an operating water surface elevation at or below 386 feet. Pipes, intake structures, and pumps should be monitored and repaired if deterioration or deformation occurs. All grass lined slopes should be examined for erosion and repaired if damaged. Rip rap lined channels should be inspected for stones that have shifted or bare spots that have formed. Replace rip rap as needed. Additionally, in the case where the East Ash Pond pump station is not working, SIGECO shall provide pumping capacity equal to the existing lift station pumps by means of providing supplemental pumps or bringing the existing lift station pumps online within 48-hours.

Appendix A
Figures



AECOM
9400 Amberglen Boulevard
Austin, TX 78729-1100
512-454-4797 (phone)
512-454-8807 (fax)

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
dba VECTREN POWER SUPPLY, INC.

One Vectren Square
Evansville, IN 47708
1-800-227-1376 (phone)

F.B. CULLEY
GENERATING STATION
NEWBURGH, IN

CCR ANNUAL
INSPECTION
EAST ASH POND

ISSUED FOR CERTIFICATION

ISSUED FOR BIDDING	DATE	BY
ISSUED FOR CONSTRUCTION	DATE	BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60442676
DRAWN BY:	MJC
DESIGNED BY:	MJC
CHECKED BY:	TLE
DATE CREATED:	01/10/2017
PLOT DATE:	2/9/2017
SCALE:	1" = 1000'
ACAD VER:	2014

SHEET TITLE

LOCATION MAP

FIGURE 1

LU, TINA, 2/9/2017 5:09 PM

AECOM
9400 Amberglen Boulevard
Austin, TX 78729-1100
512-454-4797 (phone)
512-454-8807 (fax)

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
dba VECTREN POWER SUPPLY, INC.

One Vectren Square
Evansville, IN 47708
1-800-227-1376 (phone)

F.B. CULLEY GENERATING STATION
NEWBURGH, IN

CCR ANNUAL INSPECTION
EAST ASH POND

ISSUED FOR CERTIFICATION

ISSUED FOR BIDDING	DATE	BY
ISSUED FOR CONSTRUCTION	DATE	BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60442676
DRAWN BY:	MJC
DESIGNED BY:	MJC
CHECKED BY:	TLE
DATE CREATED:	01/10/2017
PLOT DATE:	2/9/2017
SCALE:	1" = 200'
ACAD VER:	2014

SHEET TITLE

SITE MAP

FIGURE 2

AECOM DRAWING PATH: P:\Projects\Environmental\60442676_VectrenCCR\7.0_CAD_GIS\7.04_Plan_Sheets\CULLEY-SITE MAP.dwg

AECOM
9400 Amberglen Boulevard
Austin, TX 78729-1100
512-454-4797 (phone)
512-454-8807 (fax)

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
dba VECTREN POWER SUPPLY, INC.

One Vectren Square
Evansville, IN 47708
1-800-227-1376 (phone)

F.B. CULLEY
GENERATING STATION
NEWBURGH, IN

CCR CERTIFICATION
EAST ASH POND

ISSUED FOR CERTIFICATION

ISSUED FOR BIDDING	DATE	BY
ISSUED FOR CONSTRUCTION	DATE	BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60442676
DRAWN BY:	MJC
DESIGNED BY:	MJC
CHECKED BY:	TLE
DATE CREATED:	8/24/2016
PLOT DATE:	4/22/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

SITE MAP

FIGURE 3

Appendix B
Hydrologic and Hydraulic Calculations

NOAA Precipitation Data
Soils Data
Water Balance
HydroCAD Output

NOAA Precipitation Data

NOAA Atlas 14, Volume 2, Version 3
Location name: Newburgh, Indiana, US*
Latitude: 37.9163°, Longitude: -87.3369°
Elevation: 394 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.382** (0.347-0.418)	**0.450** (0.411-0.494)	**0.530** (0.483-0.581)	**0.595** (0.541-0.652)	**0.677** (0.612-0.740)	**0.742** (0.668-0.810)	**0.802** (0.718-0.875)	**0.868** (0.774-0.948)	**0.953** (0.843-1.04)	**1.02** (0.896-1.12)
10-min	**0.596** (0.542-0.653)	**0.706** (0.644-0.775)	**0.831** (0.758-0.911)	**0.925** (0.840-1.01)	**1.04** (0.945-1.14)	**1.14** (1.02-1.24)	**1.22** (1.10-1.33)	**1.31** (1.17-1.44)	**1.43** (1.26-1.56)	**1.51** (1.33-1.65)
15-min	**0.734** (0.668-0.805)	**0.870** (0.793-0.954)	**1.03** (0.937-1.13)	**1.15** (1.04-1.26)	**1.30** (1.18-1.42)	**1.41** (1.27-1.54)	**1.53** (1.37-1.67)	**1.64** (1.46-1.79)	**1.78** (1.58-1.95)	**1.89** (1.66-2.07)
30-min	**0.981** (0.892-1.07)	**1.17** (1.07-1.29)	**1.42** (1.29-1.56)	**1.61** (1.46-1.76)	**1.86** (1.68-2.03)	**2.05** (1.84-2.24)	**2.24** (2.00-2.44)	**2.43** (2.17-2.66)	**2.69** (2.38-2.94)	**2.89** (2.54-3.16)
60-min	**1.20** (1.09-1.32)	**1.45** (1.32-1.59)	**1.79** (1.63-1.96)	**2.06** (1.87-2.26)	**2.42** (2.19-2.65)	**2.72** (2.45-2.97)	**3.02** (2.70-3.29)	**3.33** (2.96-3.63)	**3.75** (3.32-4.10)	**4.09** (3.60-4.48)
2-hr	**1.45** (1.32-1.59)	**1.75** (1.60-1.92)	**2.19** (1.99-2.40)	**2.54** (2.30-2.77)	**3.01** (2.72-3.28)	**3.39** (3.06-3.70)	**3.79** (3.39-4.13)	**4.20** (3.74-4.58)	**4.77** (4.21-5.20)	**5.22** (4.57-5.70)
3-hr	**1.56** (1.42-1.71)	**1.88** (1.71-2.07)	**2.35** (2.13-2.58)	**2.73** (2.47-2.99)	**3.26** (2.94-3.57)	**3.69** (3.31-4.04)	**4.15** (3.70-4.53)	**4.62** (4.10-5.04)	**5.29** (4.64-5.78)	**5.83** (5.07-6.38)
6-hr	**1.91** (1.74-2.10)	**2.30** (2.10-2.54)	**2.87** (2.61-3.15)	**3.34** (3.02-3.66)	**3.99** (3.60-4.37)	**4.53** (4.06-4.95)	**5.10** (4.55-5.57)	**5.71** (5.06-6.22)	**6.56** (5.74-7.16)	**7.25** (6.30-7.92)
12-hr	**2.27** (2.07-2.50)	**2.74** (2.50-3.01)	**3.40** (3.09-3.73)	**3.94** (3.57-4.32)	**4.70** (4.24-5.14)	**5.32** (4.78-5.81)	**5.97** (5.34-6.52)	**6.66** (5.92-7.28)	**7.63** (6.72-8.34)	**8.42** (7.34-9.21)
24-hr	**2.72** (2.54-2.92)	**3.28** (3.05-3.52)	**4.08** (3.80-4.38)	**4.73** (4.39-5.08)	**5.65** (5.22-6.07)	**6.41** (5.89-6.88)	**7.20** (6.58-7.74)	**8.04** (7.29-8.66)	**9.21** (8.26-9.98)	**10.2** (9.03-11.0)
2-day	**3.25** (3.02-3.50)	**3.91** (3.63-4.21)	**4.87** (4.52-5.24)	**5.66** (5.23-6.09)	**6.80** (6.25-7.32)	**7.75** (7.09-8.36)	**8.76** (7.95-9.47)	**9.85** (8.87-10.7)	**11.4** (10.1-12.5)	**12.7** (11.2-13.9)
3-day	**3.47** (3.23-3.73)	**4.16** (3.87-4.48)	**5.17** (4.81-5.57)	**6.01** (5.57-6.47)	**7.23** (6.66-7.79)	**8.25** (7.57-8.90)	**9.34** (8.51-10.1)	**10.5** (9.51-11.4)	**12.2** (10.9-13.4)	**13.6** (12.0-15.0)
4-day	**3.68** (3.44-3.97)	**4.41** (4.11-4.76)	**5.47** (5.10-5.90)	**6.36** (5.91-6.86)	**7.66** (7.08-8.26)	**8.75** (8.05-9.45)	**9.93** (9.06-10.7)	**11.2** (10.1-12.2)	**13.0** (11.7-14.3)	**14.6** (12.9-16.0)
7-day	**4.29** (3.99-4.63)	**5.14** (4.78-5.55)	**6.38** (5.92-6.89)	**7.42** (6.86-8.02)	**8.94** (8.22-9.67)	**10.2** (9.35-11.1)	**11.6** (10.6-12.6)	**13.2** (11.8-14.3)	**15.4** (13.6-16.9)	**17.2** (15.1-19.0)
10-day	**4.84** (4.50-5.25)	**5.79** (5.39-6.29)	**7.17** (6.66-7.78)	**8.32** (7.70-9.02)	**10.0** (9.21-10.8)	**11.4** (10.4-12.4)	**12.9** (11.7-14.1)	**14.6** (13.1-15.9)	**16.9** (15.0-18.6)	**18.9** (16.6-20.9)
20-day	**6.66** (6.27-7.11)	**7.91** (7.44-8.43)	**9.50** (8.92-10.1)	**10.8** (10.1-11.5)	**12.6** (11.7-13.4)	**14.0** (13.0-14.9)	**15.4** (14.3-16.5)	**16.9** (15.6-18.2)	**19.0** (17.3-20.5)	**20.6** (18.6-22.4)
30-day	**8.21** (7.75-8.70)	**9.70** (9.16-10.3)	**11.5** (10.8-12.1)	**12.9** (12.1-13.6)	**14.8** (13.9-15.7)	**16.3** (15.3-17.3)	**17.9** (16.6-19.0)	**19.4** (18.0-20.7)	**21.6** (19.8-23.1)	**23.2** (21.1-25.0)
45-day	**10.3** (9.79-10.9)	**12.1** (11.5-12.8)	**14.2** (13.4-14.9)	**15.8** (14.9-16.6)	**17.9** (16.9-18.9)	**19.6** (18.4-20.7)	**21.2** (19.9-22.4)	**22.9** (21.3-24.3)	**25.1** (23.2-26.7)	**26.7** (24.6-28.6)
60-day	**12.3** (11.7-12.9)	**14.5** (13.7-15.2)	**16.8** (15.9-17.7)	**18.5** (17.6-19.5)	**20.9** (19.7-22.0)	**22.6** (21.3-23.9)	**24.3** (22.9-25.7)	**26.0** (24.3-27.5)	**28.1** (26.2-29.9)	**29.7** (27.5-31.7)

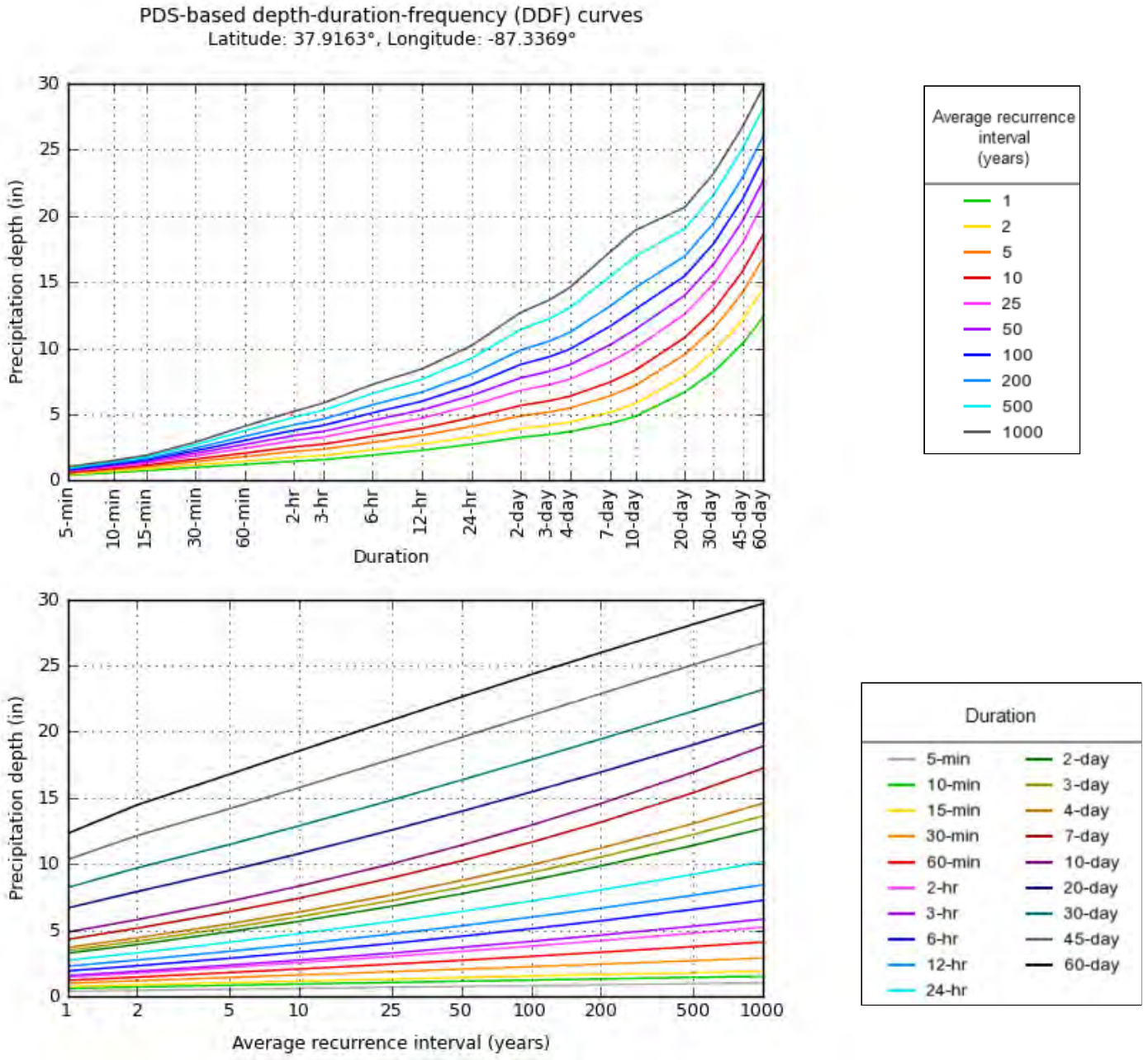
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



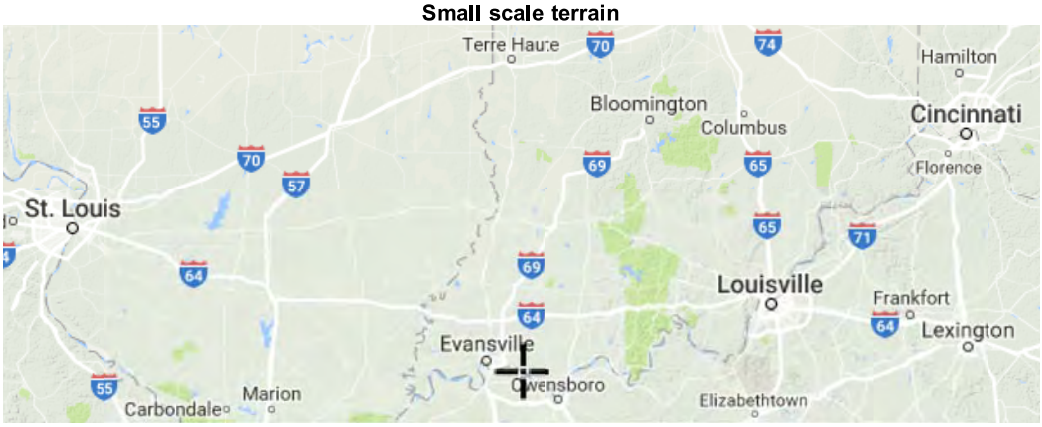
NOAA Atlas 14, Volume 2, Version 3

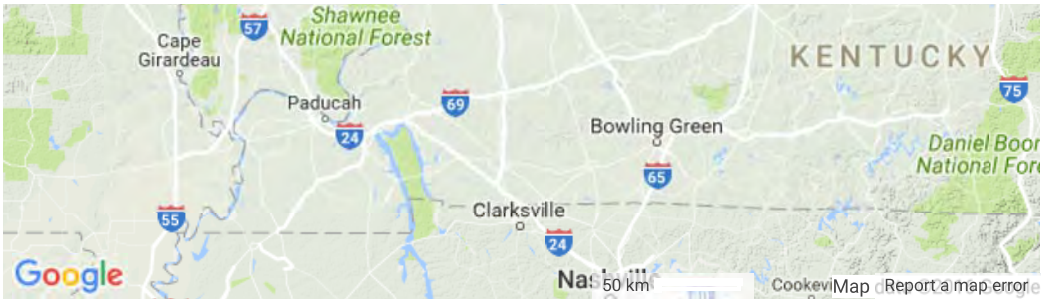
Created (GMT): Fri Aug 5 19:42:56 2016

Back to Top

Maps & aerials

Small scale terrain

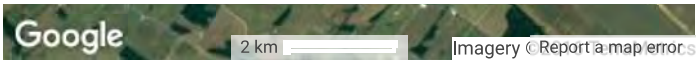




Large scale terrain

Large scale map

Large scale aerial



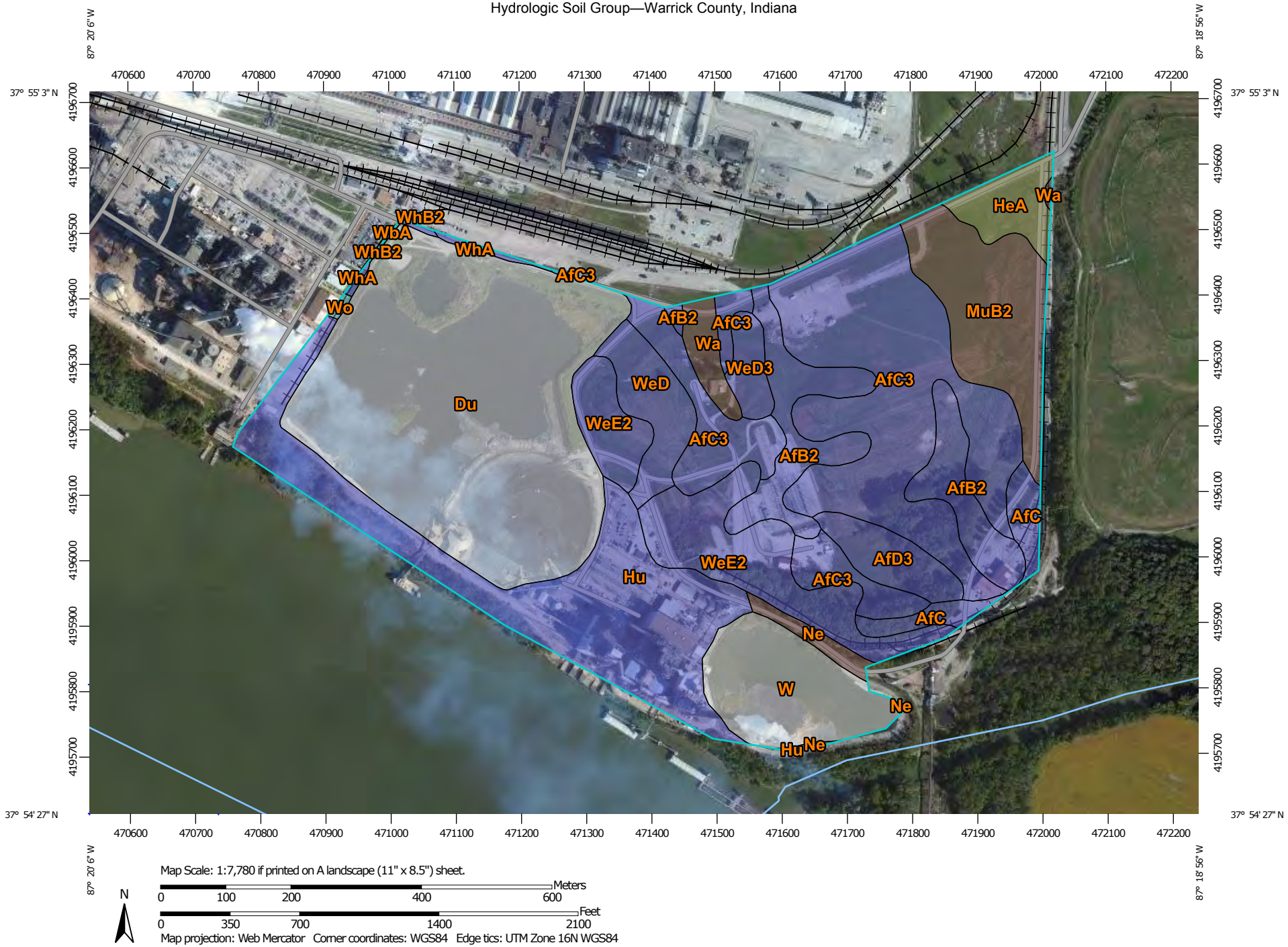
Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Soils Data

Hydrologic Soil Group—Warrick County, Indiana



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Warrick County, Indiana
Survey Area Data: Version 18, Sep 11, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 3, 2011—Oct 4, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Warrick County, Indiana (IN173)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AfB2	Alford silt loam, 2 to 6 percent slopes, eroded	B	11.4	6.6%
AfC	Alford silt loam, 6 to 12 percent slopes	B	3.1	1.8%
AfC3	Alford silt loam, 6 to 12 percent slopes, severely eroded	B	35.2	20.3%
AfD3	Alford silt loam, 12 to 18 percent slopes, severely eroded	B	3.7	2.1%
Du	Dumps, mine		46.4	26.8%
HeA	Henshaw silt loam, 0 to 2 percent slopes, rarely flooded	C/D	3.5	2.0%
Hu	Huntington silt loam, frequently flooded	B	23.6	13.6%
MuB2	Muren silt loam, 2 to 6 percent slopes, eroded	B/D	11.4	6.6%
Ne	Newark silty clay loam, frequently flooded	B/D	1.4	0.8%
W	Water		9.9	5.7%
Wa	Wakeland silt loam, frequently flooded	B/D	2.1	1.2%
WbA	Weinbach silt loam, 0 to 2 percent slopes	C/D	0.0	0.0%
WeD	Wellston silt loam, 12 to 18 percent slopes	B	4.9	2.8%
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded	B	2.1	1.2%
WeE2	Wellston silt loam, 18 to 25 percent slopes, eroded	B	13.9	8.0%
WhA	Wheeling silt loam, 0 to 2 percent slopes	B	0.5	0.3%
WhB2	Wheeling silt loam, 2 to 6 percent slopes, eroded	B	0.1	0.1%
Wo	Woodmere silty clay loam, occasionally flooded	C	0.2	0.1%
Totals for Area of Interest			**173.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Water Balance

FB Culley - Final Conditions Process Pond

Area	Source	Flow	
Unit 3 Area	Unit 3 Air Heater	0.001578	mgd
	Unit 3 Pyrite System	0.13271	mgd
	FDG WW Mercury System	0.0951	mgd
	Clarified River Raw Water	0.03541	mgd
	West Yard Sump Pump	0.7916	mgd
	Unit 3 Oil trap Tank	0.012246	mgd
	Unit 3 Boiler Sump Pumps	0.1726	mgd
Unit 2 Area	Unit 2 Air Heater Wash	0.001578	mgd
	Unit 2 Pyrite System	0.0663	mgd
	Unit 2 Boiler Seal Trough and Sump Pumps	0.1425	mgd

To main Pond:			To Gypsum Pond:		
TOTAL PROCESS FLOW	1.321112	mgd	TOTAL PROCESS FLOW	0.13051	mgd
	1321112	gallons/day		130510	gallons/day
	176619.3	cft/day		17447.86	cft/day
	2.044204	cfs		0.201943	cfs
Round up:	**2.1**	**cfs**	**Round up:**	**0.2**	**cfs**

Other Supporting Documentation

CP 3170 LT 3~ 603 (Discontinued)

Performance curve

Pump

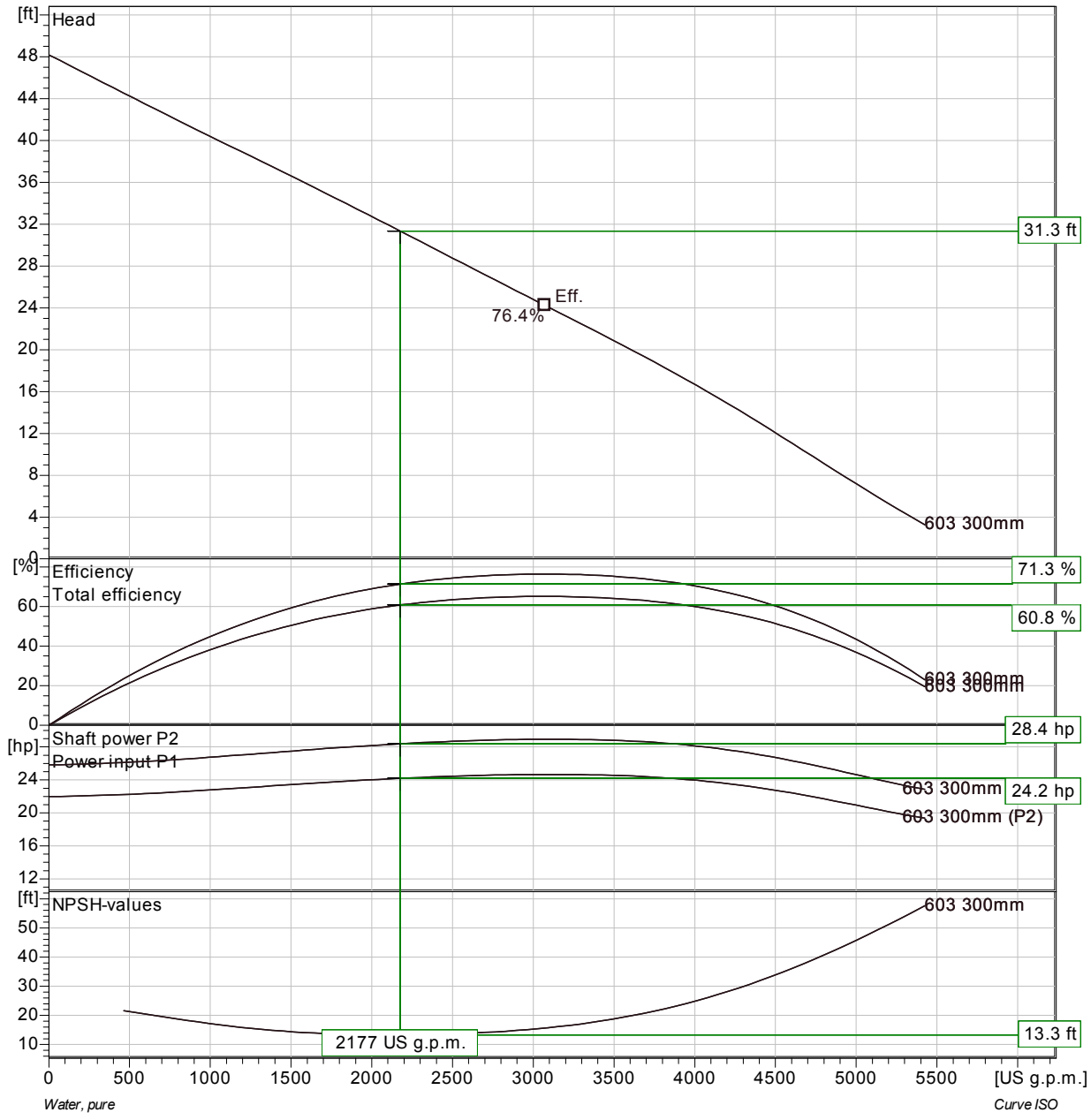
Discharge Flange Diameter	9 13/16 inch
Inlet diameter	250 mm
Impeller diameter	$11^{13}/_{16}$"
Number of blades	2
Throughlet diameter	4 inch

Motor

Motor #	C3170.180 27-20-6AA-W 25hp
Stator variant	37
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	25 hp
Rated current	34 A
Starting current	219 A
Rated speed	1170 rpm

Power factor	
1/1 Load	0.81
3/4 Load	0.75
1/2 Load	0.64

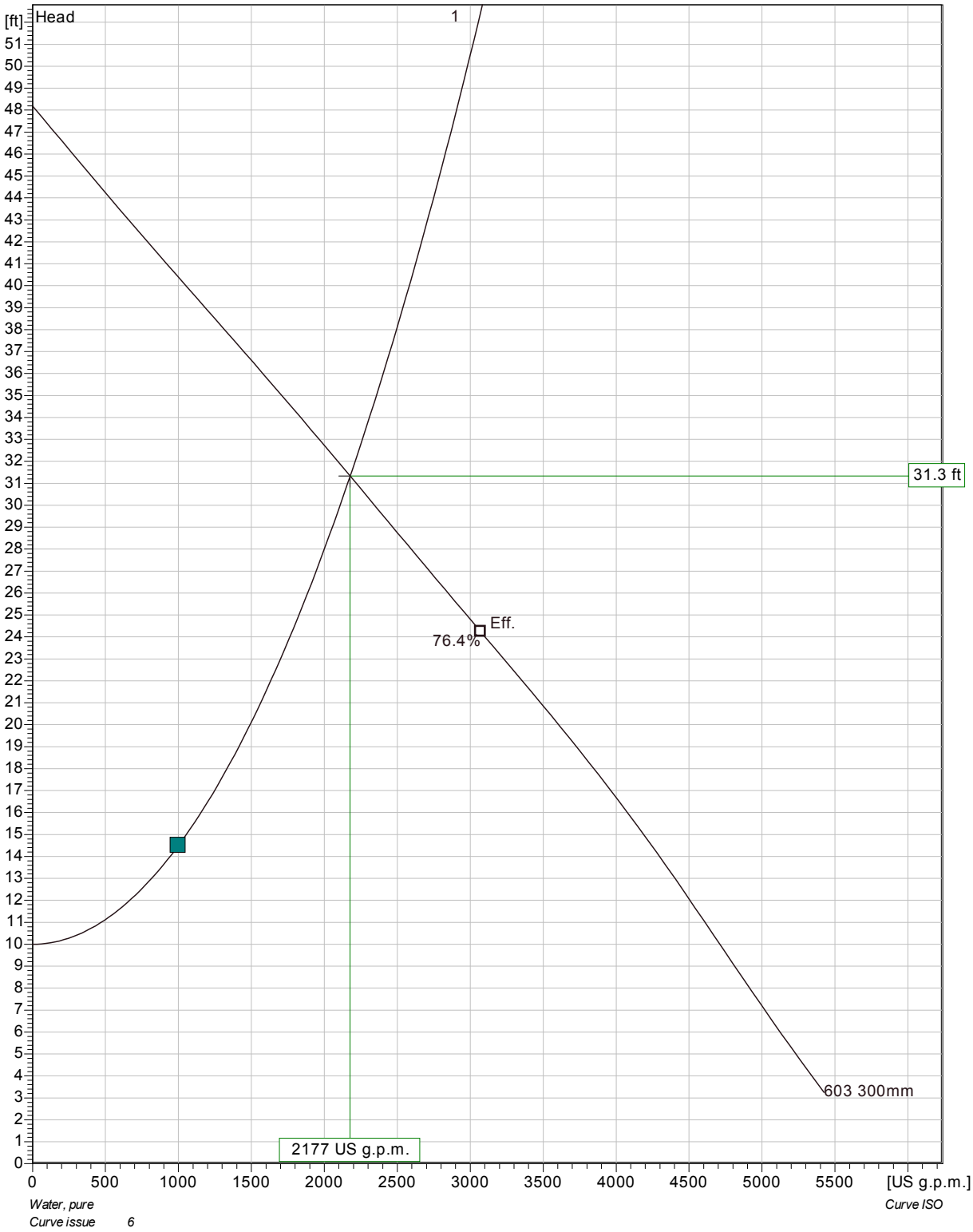
Efficiency	
1/1 Load	85.0 %
3/4 Load	84.5 %
1/2 Load	81.5 %



Project	Project ID	Created by	Created on	Last update
			2015-08-14	

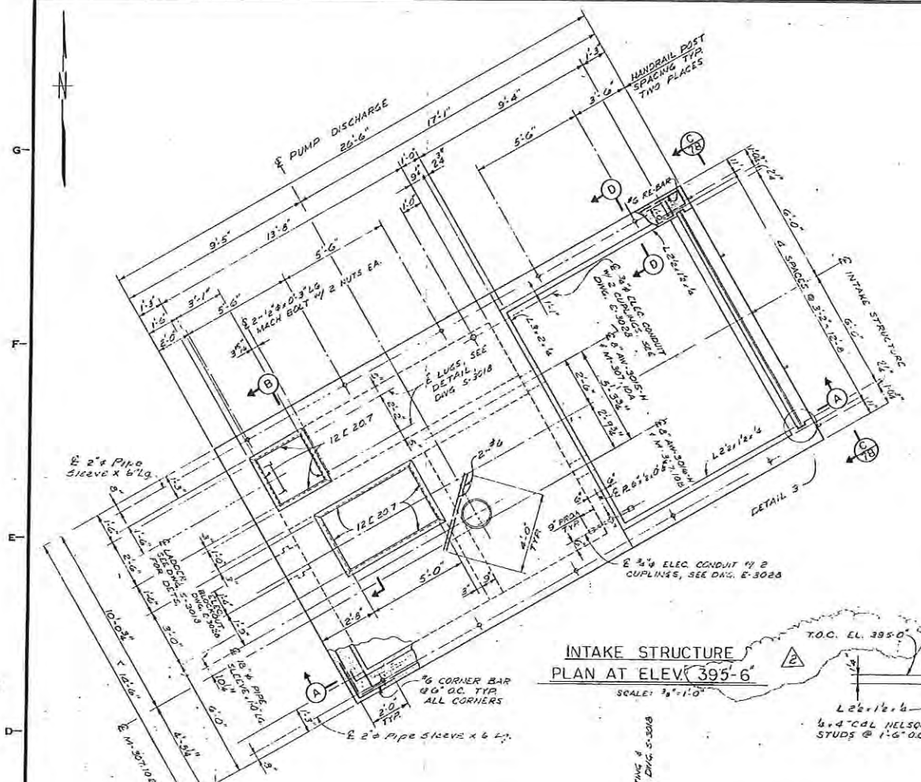
CP 3170 LT 3~ 603 (Discontinued)

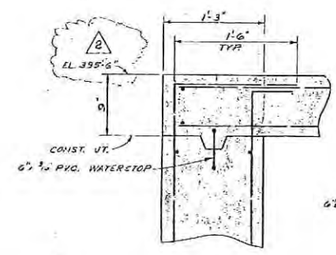
Duty Analysis



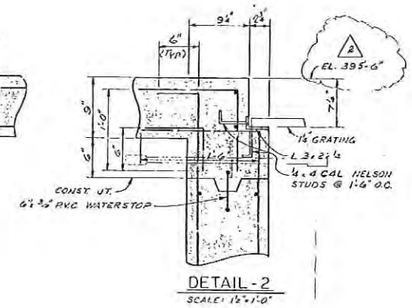
Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	2180 US g.p.m.	31.3 ft	24.2 hp	2180 US g.p.m.	31.3 ft	24.2 hp	71.3 %	162 kWh/US MG	13.3 ft

Project	Project ID	Created by	Created on	Last update
			2015-08-14	

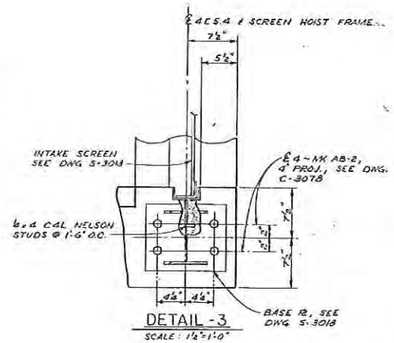




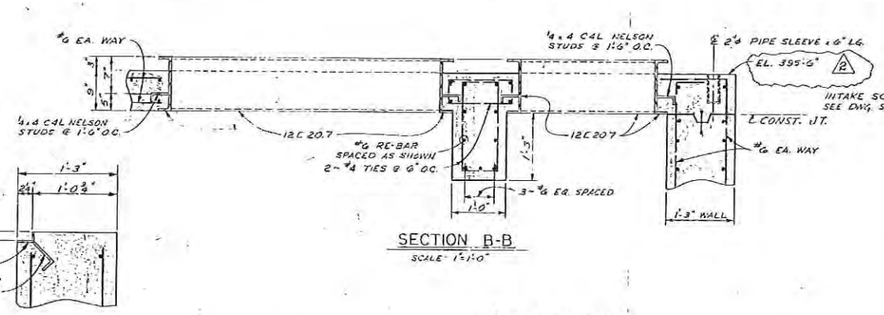
DETAIL - 1
SCALE 1½"=1'-0"



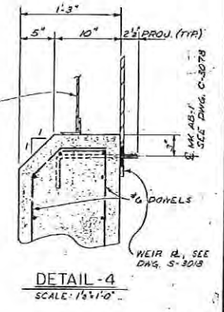
DETAIL - 2
SCALE: 1½"=1'-0"



DETAIL - 3
SCALE: 1½"=1'-0"

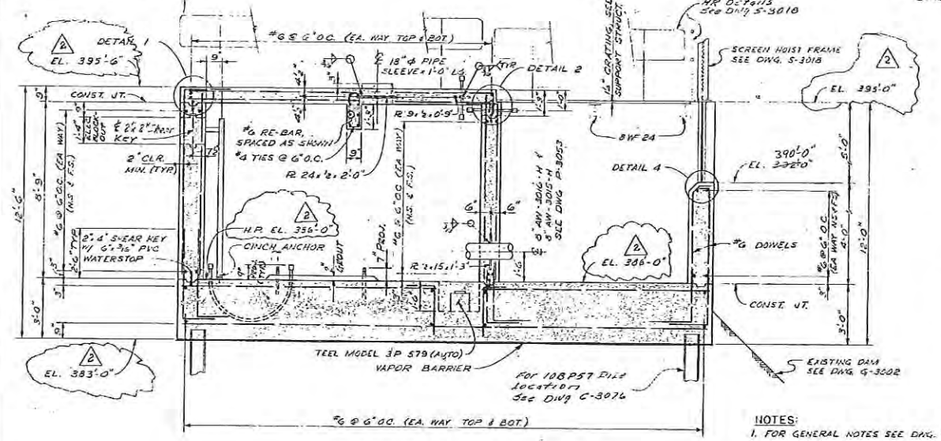


SECTION B-B
SCALE: 1½"=1'-0"

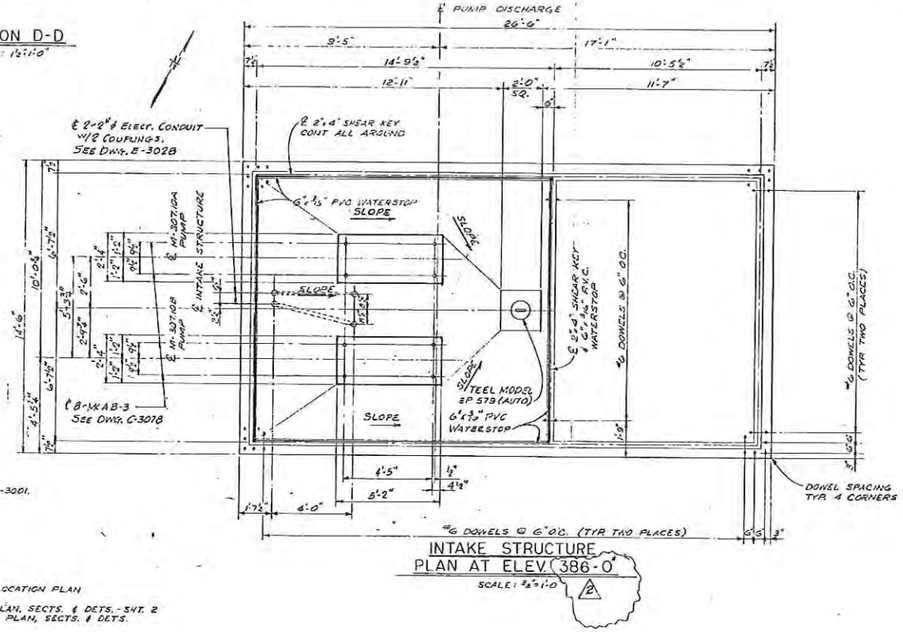


DETAIL - 4
SCALE: 1½"=1'-0"

SECTION D-D
SCALE: 1½"=1'-0"



SECTION A-A
SCALE: ⅜"=1'-0"



INTAKE STRUCTURE
PLAN AT ELEV. 386'-0"
SCALE: ⅜"=1'-0"

NOTES:
1. FOR GENERAL NOTES SEE DWG. C-3001.

REFERENCE DRAWINGS:
C-3001 - CONCRETE - FOUNDATION LOCATION PLAN
C-3075 - " - PILING PLAN
C-3076 - " - FOUNDATION PLAN, SECTS. & DETS. - SHT. 2
S-3018 - STRUCTURAL - MISC. STEEL PLAN, SECTS. & DETS.

NO.	DATE	REVISION	BY	CHK.	APP.
2	7-18-73	Elevation Revised	CA	RBT	
1	1-16-73	Relocated Pump M-307.13, Added Pump Suppt. & Removed Hold.	CA	RBT	
	11-15-72	ISSUED FOR CONSTRUCTION	BL		

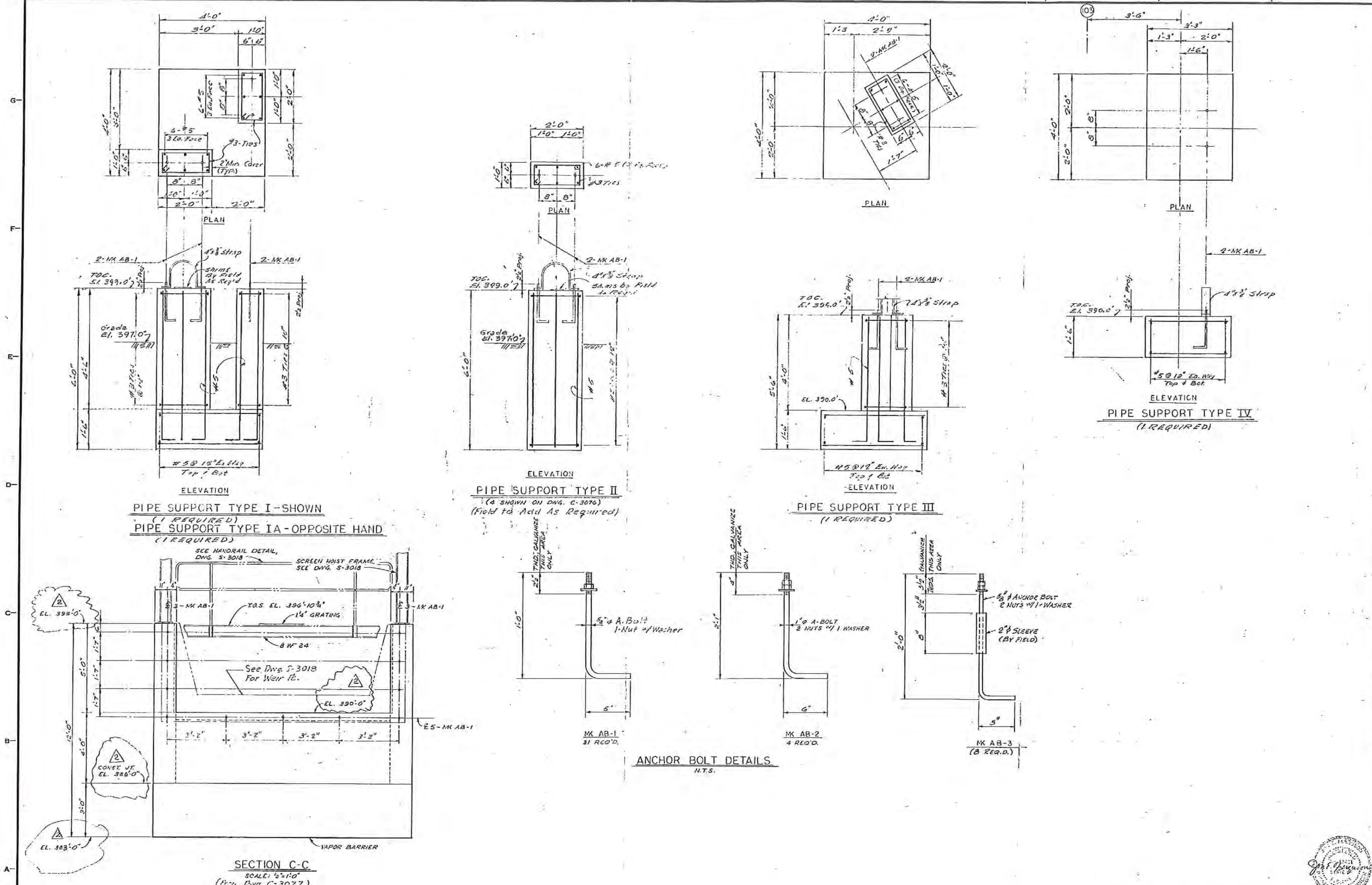
DRAWN: B. LINTON
CHECKED: E.J.D.
APPROVED:
CUSTOMER APP.

BROWN & ROOT, INC.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

SOUTHERN INDIANA GAS & ELECTRIC CO.
EVANSVILLE, INDIANA
CULLEY STATION
UNIT NO. 3

DRAWING TITLE
CONCRETE
ASH POND DEWATERING SYSTEM
FOUNDATION PLAN, SECTIONS & DETAILS
SHEET 1

CONTRACT NO. ER-0231
DATE: 11-01-72
SCALE: NOTED
B & R DRAWING NO. C-3077-2



NOTE:
1. FOR NOTES AND REFERENCE DRAWINGS SEE DRAWING C-3077.
2. SEE DWG. C-3076 FOR FOUNDATION LOCATION

NO.	DATE	REVISION	BY	CHK.	APP.
2	7-13-73	Elev. Revision			
1		ADDED ANCHOR BOLT MK AB-3.			
		ISSUED FOR CONSTRUCTION (ER 0231-500)	JD	CMH	

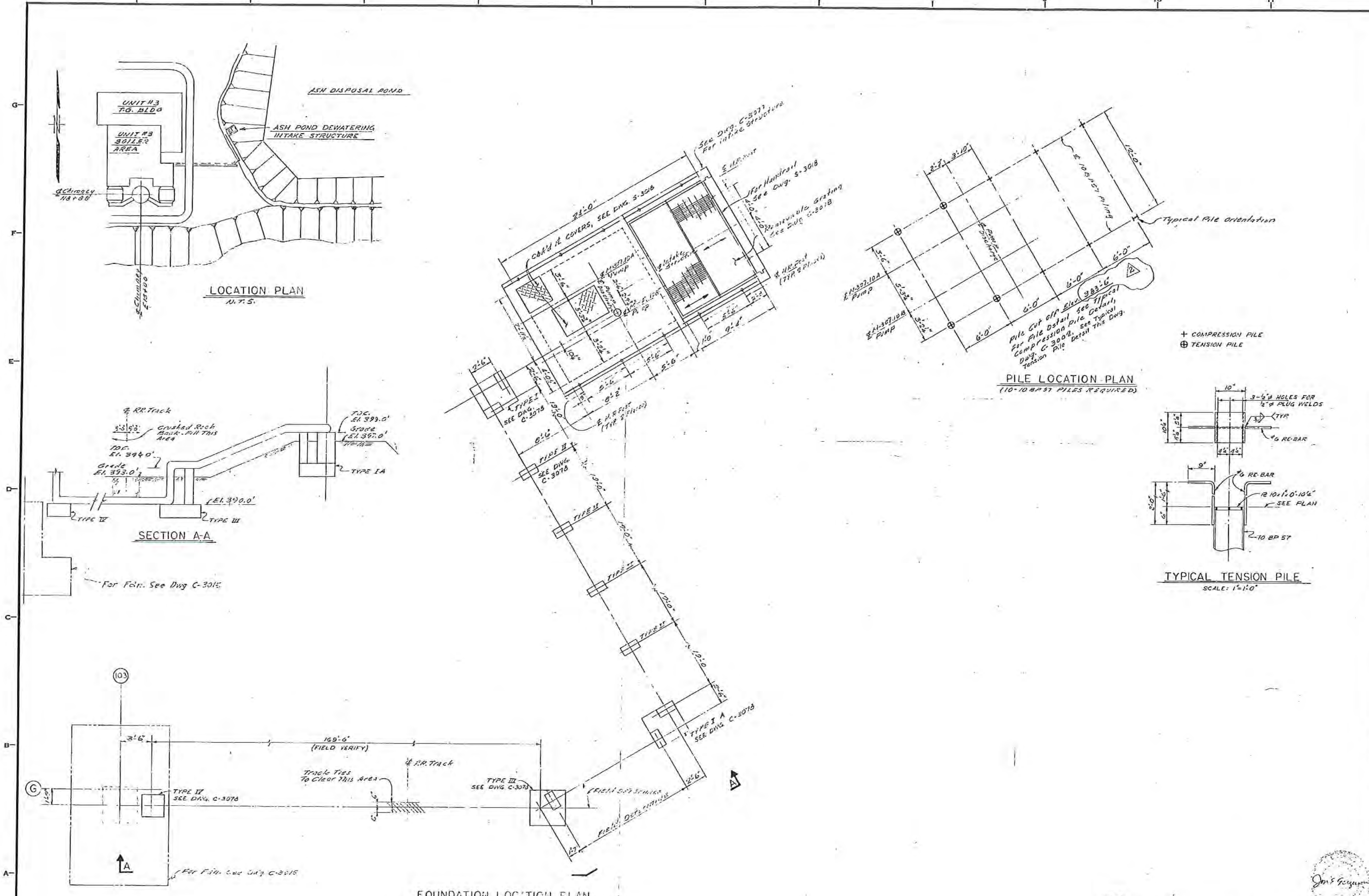
DRAWN: De Verona
CHECKED: E.J.A.
APPROVED
CUSTOMER APP.

BROWN & ROOT, INC.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

SOUTHERN INDIANA GAS & ELECTRIC CO.
EVANSVILLE, INDIANA
CULLEY STATION
UNIT NO. 3

DRAWING TITLE
CONCRETE
ASH POND DEWATERING SYSTEM
FOUNDATION PLAN, SECTIONS & DETAILS
SHEET 2

CONTRACT NO. ER-0231
DATE: 11-03-72
SCALE: ¾"=1'-0" U.N.O.
B & R DRAWING NO. C-3078-2



NOTE:
1. FOR NOTES AND REFERENCE DRAWINGS SEE DRAWING C-3077
2. PILING TO BE DRIVEN TO REFUSAL

NO.	DATE	REVISION	BY	CHK.	APP.
2	[illegible]	[illegible]			
1	[illegible]	MOVED PUMP M-307.10B			
0	[illegible]	ISSUED FOR CONSTRUCTION (ER-[illegible])	BL		

DRAWN De Varona
CHECKED F.J.B.
APPROVED
CUSTOMER APP.

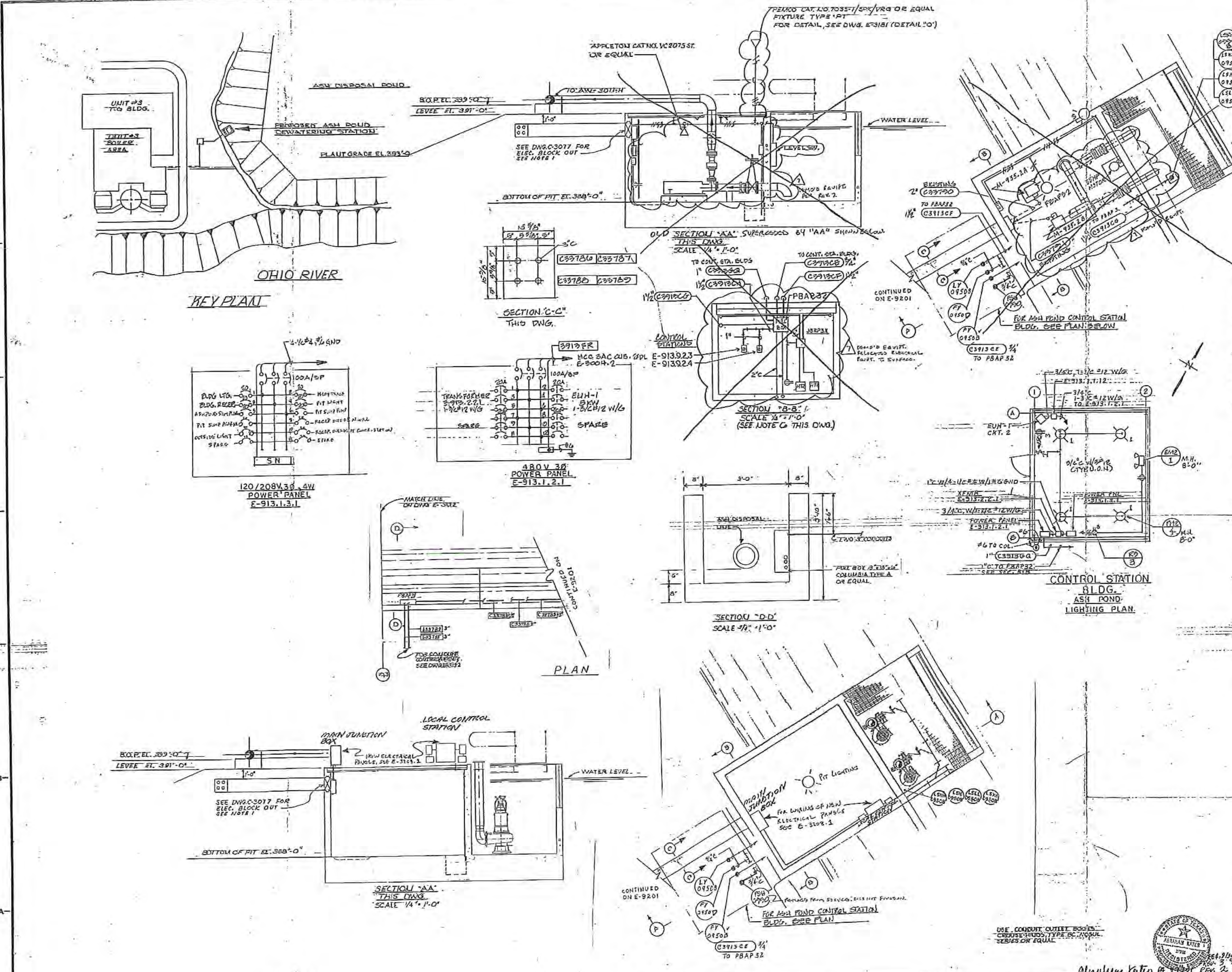
BROWN & ROOT, INC.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

SOUTHERN INDIANA GAS & ELECTRIC CO.
EVANSVILLE, INDIANA

CULLEY STATION
UNIT NO. 3

DRAWING TITLE
CONCRETE
ASH POND DEWATERING SYSTEM
PILING & FOUNDATION LOCATION PLAN

CONTRACT NO. ER-0231
DATE: 11-01-72
SCALE: 1/4"=1'-0" U.N.
B & R DRAWING NO. C-3076-2



NOTES

1. MAKE TRANSITION TO RIGID CONDUIT USING DUCT REDUCING ADAPTER AND CONDUIT REDUCER AS REQUIRED. DRILL 3½" HOLES THRU 8" CONCRETE WALL & GROUT IN AFTER CONDUIT IS IN PLACE.
2. 3" Ø DUCT BENDS ARE 24" RADIUS
3. ONE (1) JUNCTION BOX (JB-AP3X) FOR BOTH PUMPS WITH TWO (2) 12-POINTS TERMINAL BLOCKS.
4. ALL CONTROL CIRCUIT CABLES: 2/C #19/25 CU. POLYETHYLENE PVC.
5. LIGHTING CIRCUIT WIRE SIZE: #12 AWG. CU. THW. EXCEPT AS NOTED.
6. THE SIZE OF CONDUITS IN PUMPING STATION IS 3/4 INCH EXCEPT AS NOTED.
7. SPACE HEATERS (2) ARE 1000 WATTS EA. EACH HEATER HAS INTEGRAL THERMOSTAT.
8. VENT FAN MOTOR IS 1/4 H.P.-120V-1-60. FAN CONTROLLED BY LINE VOLTAGE THERMOSTAT, LOCATED ON WALL 5 FT. FROM FIN. FLR.
9. FOR GROUNDING NOTES & DETAILS SEE DWG. E-3203.

HEATING & VENTILATING EQUIPMENT

FAN-FILTER UNIT: FURNISH ONE BUFFALO FORGE CO. STYLE "H" SKYVENT, SIZE 18", 1/4 H.P., 120 VOLT-SINGLE PHASE. FURNISH WITH FILTER HEADS, 4-16"x20"x2" HY-2 FILTERS, GRAVITY SUPPLY SHUTTER, SENTINEL SWITCH, HONEYWELL T631C AIRSWITCH CONTROLLER. FAN CAPACITY SHALL BE 2300 CFM AT 1/8" S.P. W.G.

SPACE HEATERS: FURNISH TWO CHROMALOX UTILITY AND PUMP HOUSE HEATERS MODEL HVT-2411, 120 VOLT-SINGLE PHASE, 1000 WATT W/ INTEGRAL THERMOSTAT.

REFERENCES:

1. BILL OF MATERIAL E-3215 SHT. 1 THRU 6 (ER-0231-500)
2. CONDUIT SCHEDULE E-3218 SHT. 214, 222, 223, 224, 235, 239 (ER-0231). SHT. 240 (ER-0231-500)
3. CABLE SCHEDULE E-3217 SHT. 312 (ER-0231-500)
4. E-3004, E-3026.3, E-3027.4, E-3035, E-3042, E-3111, E-3132, E-9201
5. E-91356, SCHEMATIC WIRING DIAGRAM FGD M/U WATER TRANSFER PUMP.
6. E-9130 BILL OF MATERIALS, FGD PROJECT

REV. 4, 9/13/93 REV. 3 8/2/93 REV. 2 7/7/93

NO.	DATE	REVISION	BY	CHK.	APP.
7	2-6-07	REPLACED PUMPS WITH SUBMERSIBLES AND REVISED ELECTRICAL SYSTEM AS SHOWN.	JO		
6	5-25-94	AS BUILT	NN		
5	10-13-93	REVISED CONDUIT SIZE - ME1 PKG.	AN		
4	9-13-93	ISSUED FOR CONSTRUCTION - ME-1 PKG	NN		
3	8-2-93	DELETED EUH, REVISED SCOPE - REISSUED ME-1 BID			
2	6-23-93	ISSUED FOR BID & CLIENT REVIEW - ME-1 PACKAGE	GO		
1	9-30-92	ISSUED FOR CONSTRUCTION MVI JOB No. EF-0611	JL		
	4-3-74	AS BUILT REVISION - NO CHANGE			
0	11-20-72	ISSUED FOR CONSTRUCTION	DV	BJO	KB

DRAWN D. V.
CHECKED B. J. Oh
APPROVED
CUSTOMER APP.

BROWN & ROOT, INC.
ENGINEERS AND CONSTRUCTORS
HOUSTON, TEXAS

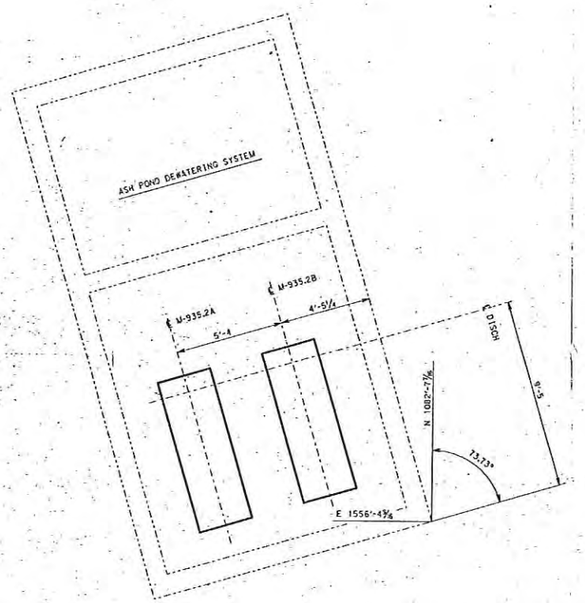
SOUTHERN INDIANA GAS & ELECTRIC CO.
EVANSVILLE, INDIANA
CULLEY STATION
UNIT NO. 3

DRAWING TITLE
ELECTRICAL
SCHEMATIC AND LAYOUT DIAGRAM
ASH POND DEWATERING PUMPS "A" & "B"

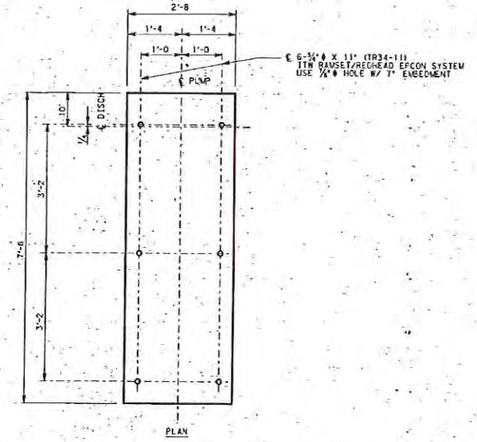
CONTRACT NO. ER-0231-500
DATE: 11-20-72
SCALE: AS NOTED
B & R DRAWING NO. E-3208
REV. 7

DRAWING NO. C-9480 REV. 2

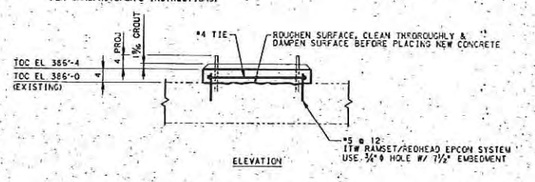
UNLESS NOTED



PLAN



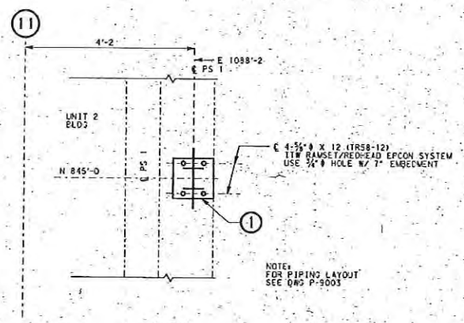
NOTE :
FILL PUMP BASE WITH GROUT PER MANUFACTURER'S INSTRUCTIONS.



FDN FOR M-935.2A & B

SCALE : ¾" = 1'-0

(11)

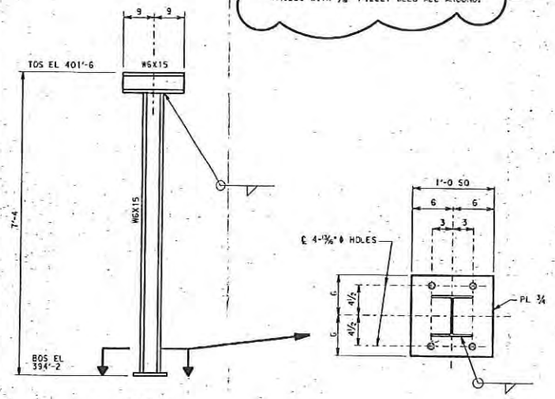


FDN FOR PS-1

SCALE : ¾" = 1'-0

NOTES:
1. REMOVE EXISTING PUMP FOUNDATIONS, REBAR AND ANCHOR BOLTS, AS REQUIRED TO PLACE NEW PUMP FOUNDATIONS.
2. PROVIDE ¾"ø HOLES @ 1'-0" CENTERS ON ℄ OF VERTICAL LEG.
3. STRIP ANCHORS SHALL BE WELDED TO EMBEDDED ANGLES WITH ¾" FILLET WELD ALL AROUND.

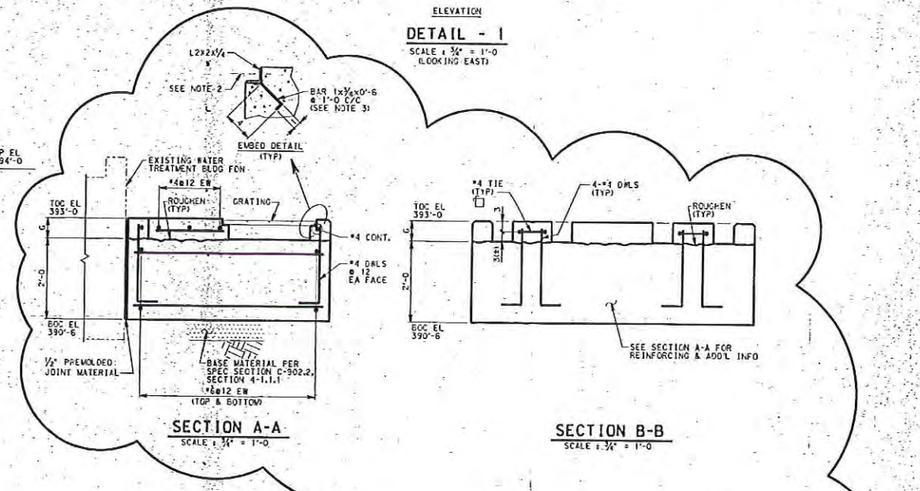
2



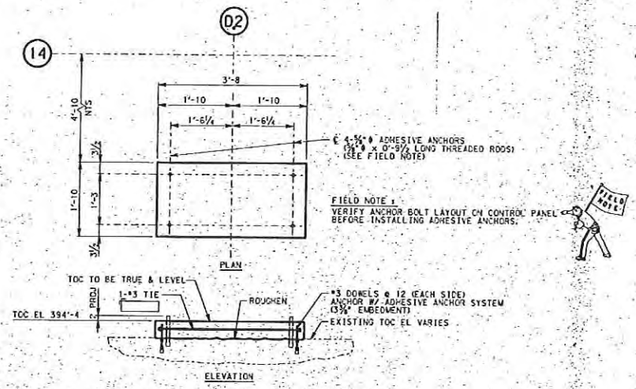
ELEVATION

DETAIL - 1

SCALE : ¾" = 1'-0
(LOOKING EAST)



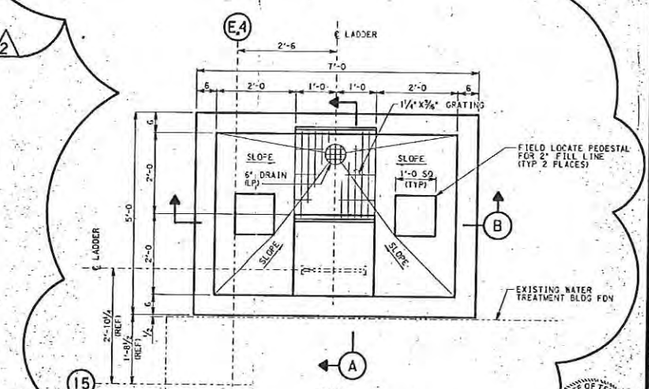
(14) (D2)



FDN FOR WATER UTILITIES LOCAL CONTROL PANEL

WATER TREATMENT BUILDING
SCALE : ¾" = 1'-0

2



FOUNDATION FOR LADDER PAD

WATER TREATMENT BUILDING
SCALE : ¾" = 1'-0

STATE OF TEXAS
S.R.S. PULVER
3334
REGISTERED PROFESSIONAL ENGINEER
7-15-94

NO.	DATE	REVISIONS	BY	CHK'D	APP'D
A	07-07-93	ISSUED FOR OFFICE CHECK	RLS	KL	
B	07-12-93	ISSUED FOR BID AND CLIENT REVIEW	RLS	KL	GLF
C	09-04-93	DELETED CONTROL STA & SECT A-A/ADDENDUM 2 FOR BID	AKP	SCM	JLW
0	10-22-93	ISSUED FOR CONSTRUCTION	AKP	KB	JLW
1	12-08-93	ADDED FOUNDATION FOR CONTROL PANEL	AKP	PCL	JLW
2	01-14-94	ADDED LADDER PAD FDN DETAIL WITH SECTS A-A & B-B	AKP	PCL	JLW

REFERENCES	NO.	RELEASED FOR	BY	DATE
C-3077 - ASH POND DEWATERING SYSTEM				
C-9490 - CONCRETE GENERAL NOTES				

DRAWN BY DATE	RLS 06-09-93
CHECKED BY DATE	KL 07-07-93
COST/SCHED-AREA	
SCALE	½" = 1'-0

Mid-Valley, Inc.
ENGINEERS • CONSTRUCTORS

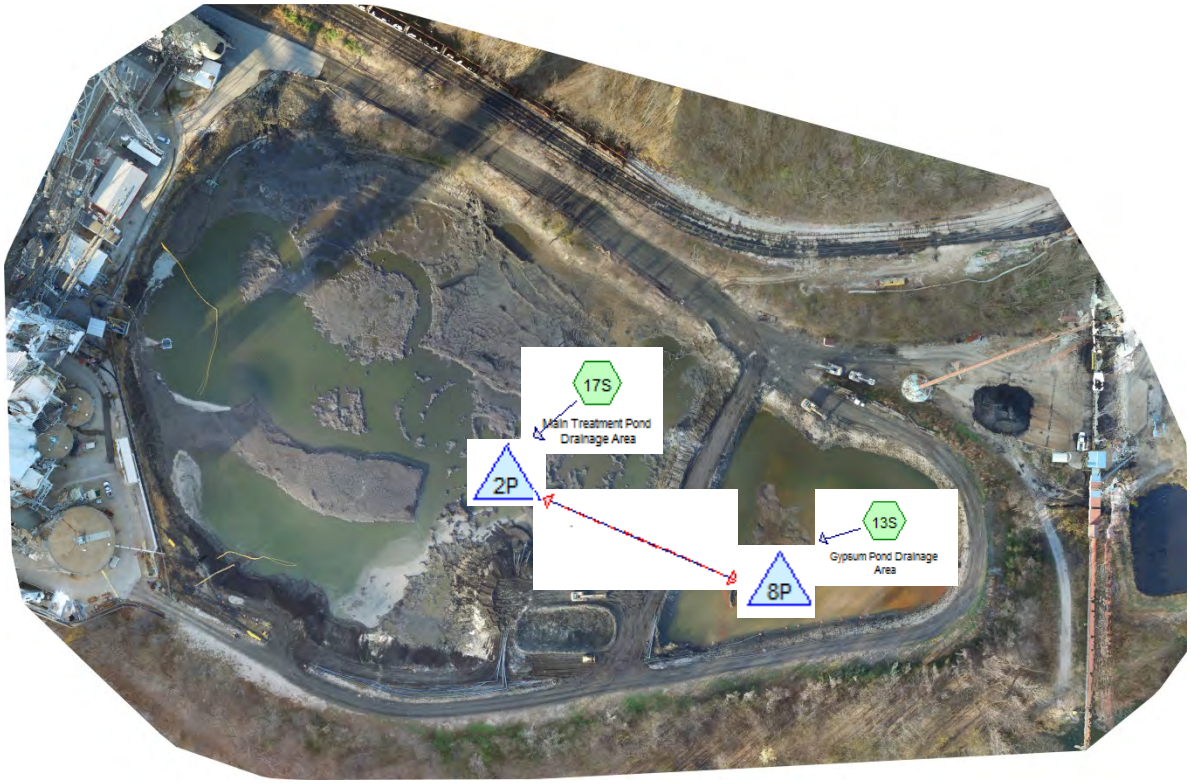
SOUTHERN INDIANA GAS & ELECTRIC CO.
F. B. CULLEY STATION
FLUE GAS DESULFURIZATION SYSTEM PROJECT
CONCRETE
ASH POND DEWATERING SYSTEM
FNDS FOR M-935.2A/B, PS-1, PANEL & LADDER 2

CONTRACT NO. EF-0611	OWNER NO.
APPROVED BY G. L. FISHER	DATE 07-07-93
APPROVED BY	DATE
DRAWING NO. C-9480	REV. 2

HydroCAD Output Report

The East Ash Pond was constructed using structural fill on the west side and west end of the north side of the impoundment. The east embankment intersects a natural hillside on the east end of the north side of the impoundment. The embankment is approximately 1,200 feet long, 30 feet high, and has 2.4 to 1 (horizontal to vertical) exterior side slopes covered with grassy vegetation. Interior side slopes varied from 2.5 to 1 (horizontal to vertical) to 2 to 1 (horizontal to vertical) for the upper and lower portion of the embankment, respectively. The embankment crest elevation varies from 392.67 feet[1] to 396.42 feet and has a crest width of approximately 15 feet. The surface area of the impoundment is approximately 9.8 acres. Within the pond, there are two separate ponds that are being utilized for treatment and separation of CCR material within the pond.

The diagram below depicts the two pond scenario conditions within the Culley East Pond as the HydroCAD model was setup and analyzed for the certification. The two interconnected ponds include ponds 2P and 8P. These 2 ponds are connected with a single 24 inch culvert under the berm separating the two ponds. The culvert is used to equalize the water surface elevations within the ponds during rainfall events and to prevent overtopping. The pump station wet well is located on the west side of the main treatment pond and discharges through a NPDES permitted outfall to the Ohio River.



The subcatchments for each pond were measured using a computer-aided design (CAD) analysis to calculate the area of drainage to each pond based on the most recent topographic survey. The runoff computations were completed the SCS Curve Number Method, where curve numbers (CN) were assigned to each subcatchment based on the type of land cover and soil type present. Using the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey, the soil type of the site was selected

[1] unless otherwise noted, all elevations in this report are in the NAVD88 datum

as hydrologic soil group B. CN values for the land cover were selected from the CN Table available in HydroCAD. As all of the subcatchments except 9S are within the East Ash Pond, a CN value of 98 was specified as 'water surface'. This provides the most conservative runoff values.

The storage capacity for each pond was evaluated using CAD to estimate the volume of the ponds under the conditions presented in the latest topographic survey dated November 30th, 2016. The volume of storage was calculated by estimating the incremental storage volume present for each 1 foot elevation within the updated topographic surface. The incremental storage volume was then used to calculate a cumulative storage volume and was input into HydroCAD. This volume was determined with the assumption that the two ponds will be maintained with an operating water surface elevation at or below 386 feet.

A hydraulic model was created in HydroCAD 10.00 to assess the capacity of the ponds to store and convey the storm flows. HydroCAD has the capability to evaluate each pond within the network, to respond to variable tailwater, pumping rates, permit flow loops, and reversing flows. HydroCAD routing calculations reevaluate the ponds' systems discharge capability at each time increment, making the program an efficient and dynamic tool for this evaluation.

The East Ash Pond pump station is the only discharge point for the East Ash Pond. For the purposes of this analysis, the East Ash Pond was analyzed as if neither pump within the pump station was operational. This represents a worst case scenario. As such, the ponds within the East Ash Pond must store the design storm. The detailed output from the HydroCAD model is presented in the following pages.

Subcat Reach Pond Link

Routing Diagram for Culley East 2017 Certifying FINAL Conditions_rev_starting WSE 386

Prepared by AECOM Corporation, Printed 1/30/2017

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.000	61	>75% Grass cover, Good, HSG B (2S)
32.318	69	50-75% Grass cover, Fair, HSG B (3S, 4S, 6S, 9S)
31.715	88	Urban industrial, 72% imp, HSG B (1S, 2S, 8S)
35.494	98	Water Surface, HSG B (7S, 13S, 17S)
104.527	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
104.527	HSG B	1S, 2S, 3S, 4S, 6S, 7S, 8S, 9S, 13S, 17S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
104.527		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	32.318	0.000	0.000	0.000	32.318	50-75% Grass cover, Fair	3S, 4S, 6S, 9S
0.000	5.000	0.000	0.000	0.000	5.000	>75% Grass cover, Good	2S
0.000	31.715	0.000	0.000	0.000	31.715	Urban industrial, 72% imp	1S, 2S, 8S
0.000	35.494	0.000	0.000	0.000	35.494	Water Surface	7S, 13S, 17S
0.000	**104.527**	**0.000**	**0.000**	**0.000**	**104.527**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	385.82	386.07	92.0	-0.0027	0.013	24.0	0.0	0.0
2	8P	386.07	385.82	92.0	0.0027	0.013	24.0	0.0	0.0

Notes Listing (all nodes)

Line#	Node Number	Notes
1	1S	Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for class B soils and urban industrial was 88.
2		Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.
3		To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.
4	2S	Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for grass cover over 75% for class B soils is 61 and a CN of 88 was used for urban industrial. Each CN was used for half of the site.
5		Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.
6		To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.
7	3S	Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for grass cover between 50-75% for class B soils of 69 was used.
8		Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.
9		To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.
10	4S	Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN for class B soils and water surface was 98.
11		Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.
12		To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.
13	9S	Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for class B soils and grass 50 - 75% was used .
14		Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.
15		To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.
16	1P	Culley West Pond is mostly dewatered. Any stormwater runoff draining to the Culley West Pond is pumped via trash pumps into the pump station where it is discharged to the underground tunnel and out to the Ohio River through the NPDES permitted outfall.

Notes Listing (all nodes) (continued)

Line#	Node Number	Notes
17		For the purpose of this analysis the assumption is that the lift station is out of order and no pumps are running.
18	2P	Pump curve modeled off of the given pumps for Culley East pump curves. Two Flyght pumps, CP 3170 LT 3~ 603.
19		Base flow directed to the Main Treatment Pond ncludes: Unit 2 & 3 Pyrite, Unit 2 & 3 Heater Wash, Unit 2 & 3 Boiler Sumps, Unit 3 Oil Trap, and West Yard Sumps. The total of these was given by the water balance as 1.32 MGD, converted equates to 2.04 cfs.
20		Vectren has maintained operating WSE of 378'.
21		For the purpose of this analysis the assumption is that the lift station is out of order and no pumps are running. This simulates the worst case scenario at the pond for the certifying design storm.
22		Volume calculated based on 11-30-16 topographic survey.
23	3P	Arbitrary storage entered for the Ohio River, begins at elevation of 383.5, the 100 year flood elevation.
24	8P	Process Flow FGD Waste and Clarified River Water total to 0.131 MGD per the process flow diagram supplied by the Vectren. Which equals 0.20cfs.
25		Starting WSE = 386.5'
26		Volume calculated based on 11-30-16 topographic survey.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Subcatchment 1 Runoff Area=15.790 ac 72.00% Impervious Runoff Depth=8.73"
Flow Length=1,384' Slope=0.0070 '/' Tc=13.6 min CN=88 Runoff=13.52 cfs 11.485 af

Subcatchment 2S: Subcatchment 2 Runoff Area=10.000 ac 36.00% Impervious Runoff Depth=7.06"
Flow Length=1,269' Tc=15.6 min CN=75 Runoff=7.64 cfs 5.886 af

Subcatchment 3S: Subcatchment 3 Runoff Area=12.330 ac 0.00% Impervious Runoff Depth=6.27"
Flow Length=1,083' Tc=17.9 min CN=69 Runoff=8.76 cfs 6.444 af

Subcatchment 4S: Subcatchment 4 Runoff Area=11.270 ac 0.00% Impervious Runoff Depth=6.27"
Flow Length=479' Slope=0.0140 '/' Tc=4.5 min CN=69 Runoff=8.03 cfs 5.890 af

Subcatchment 6S: Subcatchment 6 Runoff Area=3.818 ac 0.00% Impervious Runoff Depth=6.27"
Flow Length=501' Tc=9.4 min CN=69 Runoff=2.72 cfs 1.996 af

Subcatchment 7S: Subcatchment 7 Runoff Area=24.624 ac 100.00% Impervious Runoff Depth=9.96"
Tc=0.0 min CN=98 Runoff=22.17 cfs 20.436 af

Subcatchment 8S: Subcatchment 8 Runoff Area=10.925 ac 72.00% Impervious Runoff Depth=8.73"
Flow Length=470' Slope=0.0060 '/' Tc=5.0 min CN=88 Runoff=9.36 cfs 7.946 af

Subcatchment 9S: Subcatchment 9 Runoff Area=4.900 ac 0.00% Impervious Runoff Depth=6.27"
Flow Length=282' Tc=6.8 min CN=69 Runoff=3.49 cfs 2.561 af

Subcatchment 13S: Gypsum Pond Runoff Area=2.130 ac 100.00% Impervious Runoff Depth=9.96"
Tc=0.0 min CN=98 Runoff=1.92 cfs 1.768 af

Subcatchment 17S: Main Treatment Pond Runoff Area=8.740 ac 100.00% Impervious Runoff Depth=9.96"
Tc=0.0 min CN=98 Runoff=7.87 cfs 7.254 af

Reach 1R: Ditch 1 Avg. Flow Depth=0.92' Max Vel=3.01 fps Inflow=7.64 cfs 5.886 af
n=0.030 L=780.0' S=0.0112 '/' Capacity=110.14 cfs Outflow=7.63 cfs 5.886 af

Reach 2R: Ditch 2 Avg. Flow Depth=1.01' Max Vel=3.72 fps Inflow=11.48 cfs 8.440 af
n=0.030 L=450.0' S=0.0149 '/' Capacity=127.15 cfs Outflow=11.47 cfs 8.440 af

Pond 1P: Culley West Pond Peak Elev=387.69' Storage=50.646 af Inflow=51.98 cfs 50.647 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 2P: Main Treatment Pond Peak Elev=390.98' Storage=75.135 af Inflow=34.18 cfs 35.771 af
Primary=0.00 cfs 0.000 af Secondary=4.14 cfs 3.496 af Tertiary=0.00 cfs 0.000 af Outflow=4.14 cfs 3.496 af

Pond 3P: Ohio River Peak Elev=383.50' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 8P: Gypsum Pond Peak Elev=390.98' Storage=5.802 af Inflow=6.17 cfs 6.057 af
Primary=0.42 cfs 0.255 af Secondary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.255 af

Total Runoff Area = 104.527 ac Runoff Volume = 71.667 af Average Runoff Depth = 8.23"
44.20% Pervious = 46.198 ac 55.80% Impervious = 58.329 ac

Summary for Subcatchment 1S: Subcatchment 1

Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for class B soils and urban industrial was 88.

Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.

To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.

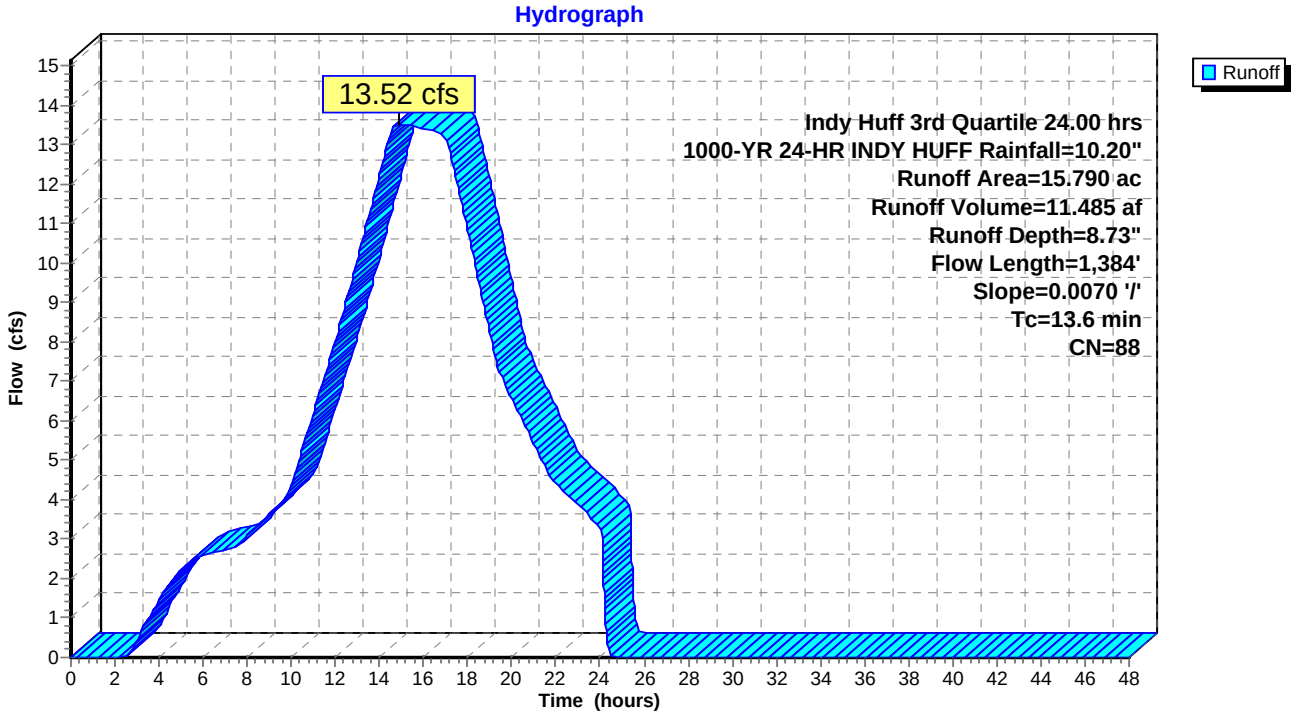
Runoff = 13.52 cfs @ 14.85 hrs, Volume= 11.485 af, Depth= 8.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
15.790	88	Urban industrial, 72% imp, HSG B
4.421		28.00% Pervious Area
11.369		72.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	1,384	0.0070	1.70		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 1S: Subcatchment 1



Hydrograph for Subcatchment 1S: Subcatchment 1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.01	0.46
3.50	0.54	0.04	0.98
4.00	0.66	0.09	1.45
4.50	0.80	0.15	1.87
5.00	0.93	0.22	2.25
5.50	1.07	0.29	2.46
6.00	1.20	0.37	2.59
6.50	1.32	0.46	2.68
7.00	1.45	0.54	2.73
7.50	1.57	0.63	2.81
8.00	1.70	0.73	3.08
8.50	1.83	0.83	3.36
9.00	1.98	0.95	3.64
9.50	2.13	1.07	3.92
10.00	2.29	1.20	4.42
10.50	2.49	1.37	5.29
11.00	2.71	1.56	6.19
11.50	2.96	1.78	7.12
12.00	3.24	2.03	8.05
12.50	3.55	2.31	9.06
13.00	3.89	2.63	10.11
13.50	4.27	2.98	11.17
14.00	4.67	3.36	12.23
14.50	5.11	3.77	**13.29**
15.00	5.55	4.20	**13.52**
15.50	5.99	4.62	13.47
16.00	6.43	5.04	13.43
16.50	6.86	5.46	13.35
17.00	7.29	5.88	13.21
17.50	7.68	6.26	12.06
18.00	8.03	6.60	10.82
18.50	8.34	6.90	9.55
19.00	8.61	7.17	8.28
19.50	8.84	7.39	7.15
20.00	9.05	7.60	6.57
20.50	9.25	7.79	6.00
21.00	9.42	7.96	5.43
21.50	9.58	8.12	4.86
22.00	9.72	8.26	4.40
22.50	9.85	8.39	4.14
23.00	9.98	8.51	3.87
23.50	10.09	8.62	3.60
24.00	**10.20**	**8.73**	3.33
24.50	10.20	8.73	0.06
25.00	10.20	8.73	0.00
25.50	10.20	8.73	0.00
26.00	10.20	8.73	0.00
26.50	10.20	8.73	0.00
27.00	10.20	8.73	0.00
27.50	10.20	8.73	0.00
28.00	10.20	8.73	0.00
28.50	10.20	8.73	0.00
29.00	10.20	8.73	0.00
29.50	10.20	8.73	0.00
30.00	10.20	8.73	0.00
30.50	10.20	8.73	0.00
31.00	10.20	8.73	0.00
31.50	10.20	8.73	0.00
32.00	10.20	8.73	0.00
32.50	10.20	8.73	0.00
33.00	10.20	8.73	0.00
33.50	10.20	8.73	0.00
34.00	10.20	8.73	0.00
34.50	10.20	8.73	0.00
35.00	10.20	8.73	0.00
35.50	10.20	8.73	0.00
36.00	10.20	8.73	0.00
36.50	10.20	8.73	0.00
37.00	10.20	8.73	0.00
37.50	10.20	8.73	0.00
38.00	10.20	8.73	0.00
38.50	10.20	8.73	0.00
39.00	10.20	8.73	0.00
39.50	10.20	8.73	0.00
40.00	10.20	8.73	0.00
40.50	10.20	8.73	0.00
41.00	10.20	8.73	0.00
41.50	10.20	8.73	0.00
42.00	10.20	8.73	0.00
42.50	10.20	8.73	0.00
43.00	10.20	8.73	0.00
43.50	10.20	8.73	0.00
44.00	10.20	8.73	0.00
44.50	10.20	8.73	0.00
45.00	10.20	8.73	0.00
45.50	10.20	8.73	0.00
46.00	10.20	8.73	0.00
46.50	10.20	8.73	0.00
47.00	10.20	8.73	0.00
47.50	10.20	8.73	0.00
48.00	10.20	8.73	0.00

Summary for Subcatchment 2S: Subcatchment 2

Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for grass cover over 75% for class B soils is 61 and a CN of 88 was used for urban industrial. Each CN was used for half of the site.

Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.

To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.

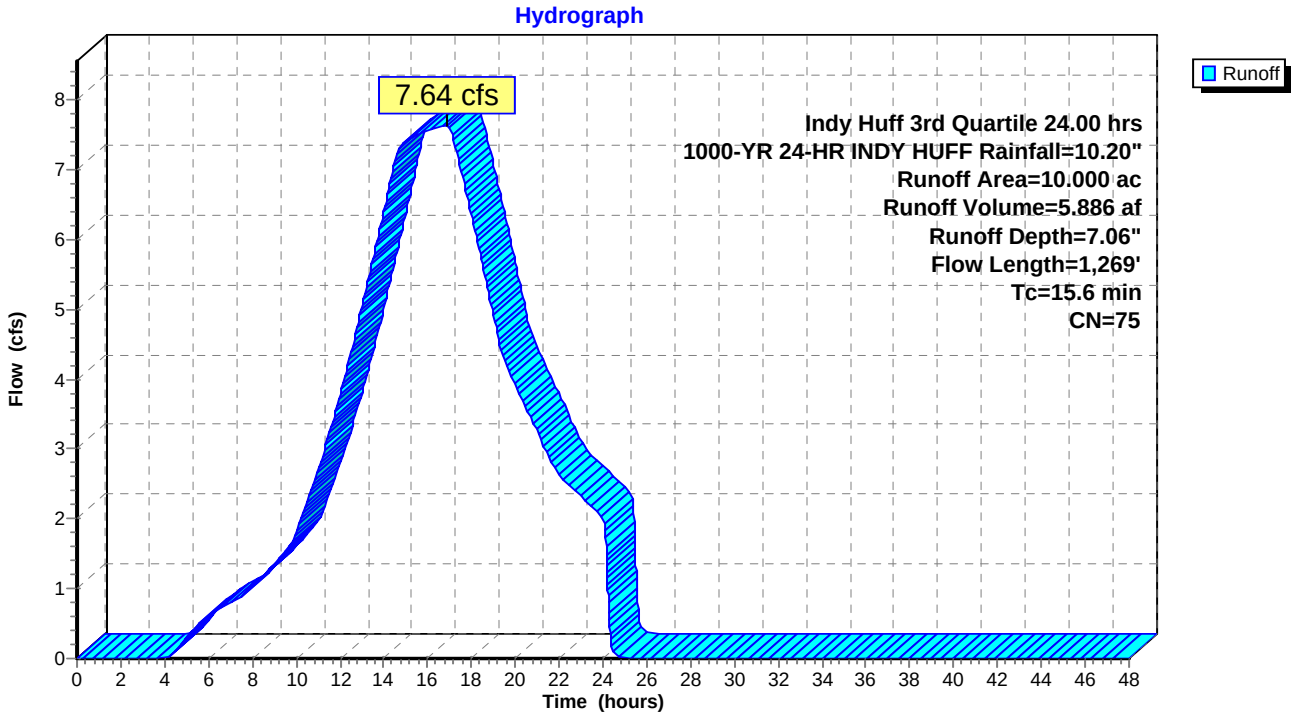
Runoff = 7.64 cfs @ 16.90 hrs, Volume= 5.886 af, Depth= 7.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
5.000	61	>75% Grass cover, Good, HSG B
5.000	88	Urban industrial, 72% imp, HSG B
10.000	75	Weighted Average
6.400		64.00% Pervious Area
3.600		36.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	104	0.0379	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.28"
5.4	600	0.0083	1.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	565	0.0619	3.73		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.6	1,269	Total			

Subcatchment 2S: Subcatchment 2



Hydrograph for Subcatchment 2S: Subcatchment 2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.00	0.00
3.50	0.54	0.00	0.00
4.00	0.66	0.00	0.00
4.50	0.80	0.00	0.10
5.00	0.93	0.02	0.30
5.50	1.07	0.04	0.47
6.00	1.20	0.07	0.60
6.50	1.32	0.11	0.72
7.00	1.45	0.15	0.80
7.50	1.57	0.19	0.89
8.00	1.70	0.24	1.03
8.50	1.83	0.30	1.19
9.00	1.98	0.37	1.36
9.50	2.13	0.44	1.53
10.00	2.29	0.53	1.78
10.50	2.49	0.64	2.21
11.00	2.71	0.78	2.70
11.50	2.96	0.93	3.22
12.00	3.24	1.12	3.77
12.50	3.55	1.34	4.38
13.00	3.89	1.59	5.03
13.50	4.27	1.87	5.72
14.00	4.67	2.19	6.41
14.50	5.11	2.54	7.12
15.00	5.55	2.91	7.41
15.50	5.99	3.28	7.50
16.00	6.43	3.65	7.57
16.50	6.86	4.03	**7.61**
17.00	7.29	4.41	**7.61**
17.50	7.68	4.76	7.04
18.00	8.03	5.07	6.35
18.50	8.34	5.35	5.65
19.00	8.61	5.60	4.92
19.50	8.84	5.81	4.26
20.00	9.05	6.00	3.91
20.50	9.25	6.18	3.58
21.00	9.42	6.34	3.25
21.50	9.58	6.49	2.92
22.00	9.72	6.62	2.64
22.50	9.85	6.74	2.48
23.00	9.98	6.86	2.32
23.50	10.09	6.96	2.16
24.00	**10.20**	**7.06**	2.01
24.50	10.20	7.06	0.07
25.00	10.20	7.06	0.00
25.50	10.20	7.06	0.00
26.00	10.20	7.06	0.00
26.50	10.20	7.06	0.00
27.00	10.20	7.06	0.00
27.50	10.20	7.06	0.00
28.00	10.20	7.06	0.00
28.50	10.20	7.06	0.00
29.00	10.20	7.06	0.00
29.50	10.20	7.06	0.00
30.00	10.20	7.06	0.00
30.50	10.20	7.06	0.00
31.00	10.20	7.06	0.00
31.50	10.20	7.06	0.00
32.00	10.20	7.06	0.00
32.50	10.20	7.06	0.00
33.00	10.20	7.06	0.00
33.50	10.20	7.06	0.00
34.00	10.20	7.06	0.00
34.50	10.20	7.06	0.00
35.00	10.20	7.06	0.00
35.50	10.20	7.06	0.00
36.00	10.20	7.06	0.00
36.50	10.20	7.06	0.00
37.00	10.20	7.06	0.00
37.50	10.20	7.06	0.00
38.00	10.20	7.06	0.00
38.50	10.20	7.06	0.00
39.00	10.20	7.06	0.00
39.50	10.20	7.06	0.00
40.00	10.20	7.06	0.00
40.50	10.20	7.06	0.00
41.00	10.20	7.06	0.00
41.50	10.20	7.06	0.00
42.00	10.20	7.06	0.00
42.50	10.20	7.06	0.00
43.00	10.20	7.06	0.00
43.50	10.20	7.06	0.00
44.00	10.20	7.06	0.00
44.50	10.20	7.06	0.00
45.00	10.20	7.06	0.00
45.50	10.20	7.06	0.00
46.00	10.20	7.06	0.00
46.50	10.20	7.06	0.00
47.00	10.20	7.06	0.00
47.50	10.20	7.06	0.00
48.00	10.20	7.06	0.00

Summary for Subcatchment 3S: Subcatchment 3

Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for grass cover between 50-75% for class B soils of 69 was used.

Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.

To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.

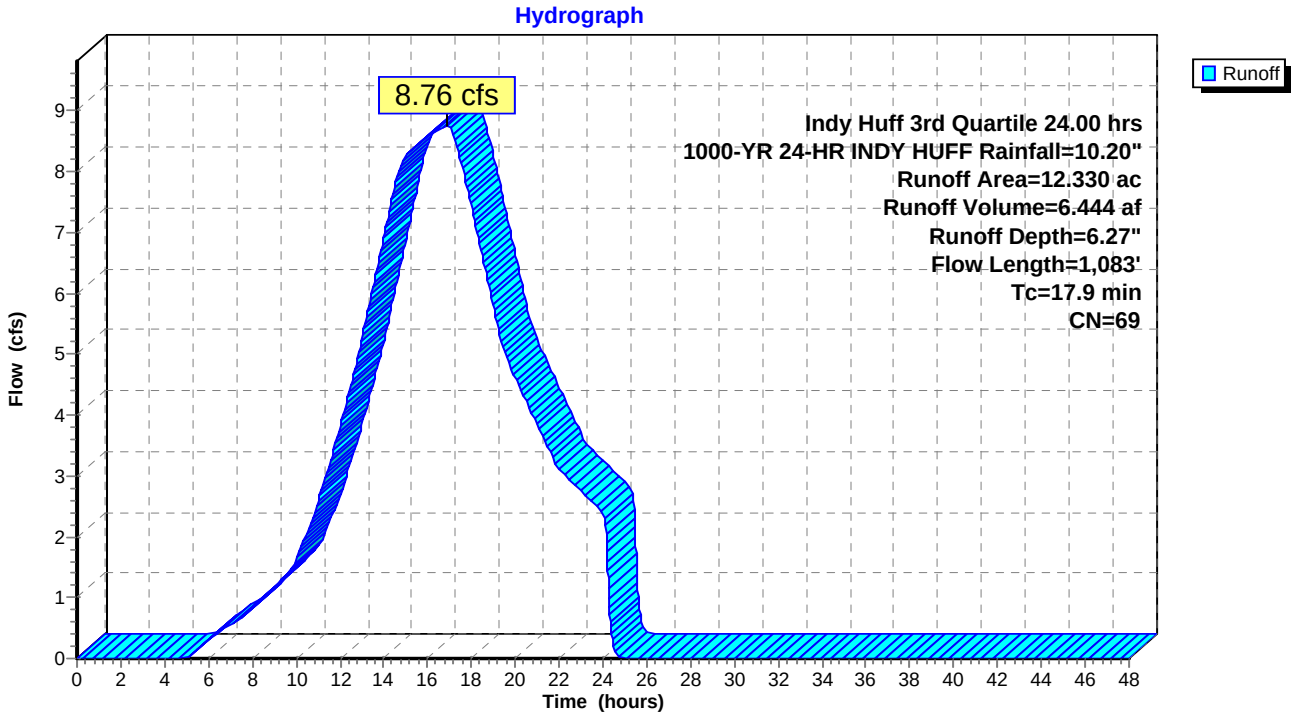
Runoff = 8.76 cfs @ 16.93 hrs, Volume= 6.444 af, Depth= 6.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
12.330	69	50-75% Grass cover, Fair, HSG B
12.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	802	0.0370	2.89		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.3	281	0.0711	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.28"
17.9	1,083	Total			

Subcatchment 3S: Subcatchment 3



Hydrograph for Subcatchment 3S: Subcatchment 3

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.00	0.00
3.50	0.54	0.00	0.00
4.00	0.66	0.00	0.00
4.50	0.80	0.00	0.00
5.00	0.93	0.00	0.00
5.50	1.07	0.01	0.14
6.00	1.20	0.02	0.30
6.50	1.32	0.04	0.44
7.00	1.45	0.06	0.56
7.50	1.57	0.09	0.67
8.00	1.70	0.12	0.82
8.50	1.83	0.16	0.99
9.00	1.98	0.21	1.17
9.50	2.13	0.26	1.36
10.00	2.29	0.33	1.63
10.50	2.49	0.41	2.07
11.00	2.71	0.52	2.59
11.50	2.96	0.65	3.16
12.00	3.24	0.80	3.79
12.50	3.55	0.98	4.49
13.00	3.89	1.20	5.26
13.50	4.27	1.44	6.07
14.00	4.67	1.72	6.91
14.50	5.11	2.04	7.79
15.00	5.55	2.37	8.23
15.50	5.99	2.71	8.43
16.00	6.43	3.05	8.57
16.50	6.86	3.40	**8.69**
17.00	7.29	3.75	**8.75**
17.50	7.68	4.08	8.17
18.00	8.03	4.38	7.43
18.50	8.34	4.64	6.62
19.00	8.61	4.87	5.80
19.50	8.84	5.07	5.02
20.00	9.05	5.26	4.61
20.50	9.25	5.43	4.23
21.00	9.42	5.58	3.84
21.50	9.58	5.72	3.46
22.00	9.72	5.85	3.12
22.50	9.85	5.96	2.94
23.00	9.98	6.07	2.75
23.50	10.09	6.18	2.57
24.00	**10.20**	**6.27**	2.38
24.50	10.20	6.27	0.15
25.00	10.20	6.27	0.00
25.50	10.20	6.27	0.00
26.00	10.20	6.27	0.00
26.50	10.20	6.27	0.00
27.00	10.20	6.27	0.00
27.50	10.20	6.27	0.00
28.00	10.20	6.27	0.00
28.50	10.20	6.27	0.00
29.00	10.20	6.27	0.00
29.50	10.20	6.27	0.00
30.00	10.20	6.27	0.00
30.50	10.20	6.27	0.00
31.00	10.20	6.27	0.00
31.50	10.20	6.27	0.00
32.00	10.20	6.27	0.00
32.50	10.20	6.27	0.00
33.00	10.20	6.27	0.00
33.50	10.20	6.27	0.00
34.00	10.20	6.27	0.00
34.50	10.20	6.27	0.00
35.00	10.20	6.27	0.00
35.50	10.20	6.27	0.00
36.00	10.20	6.27	0.00
36.50	10.20	6.27	0.00
37.00	10.20	6.27	0.00
37.50	10.20	6.27	0.00
38.00	10.20	6.27	0.00
38.50	10.20	6.27	0.00
39.00	10.20	6.27	0.00
39.50	10.20	6.27	0.00
40.00	10.20	6.27	0.00
40.50	10.20	6.27	0.00
41.00	10.20	6.27	0.00
41.50	10.20	6.27	0.00
42.00	10.20	6.27	0.00
42.50	10.20	6.27	0.00
43.00	10.20	6.27	0.00
43.50	10.20	6.27	0.00
44.00	10.20	6.27	0.00
44.50	10.20	6.27	0.00
45.00	10.20	6.27	0.00
45.50	10.20	6.27	0.00
46.00	10.20	6.27	0.00
46.50	10.20	6.27	0.00
47.00	10.20	6.27	0.00
47.50	10.20	6.27	0.00
48.00	10.20	6.27	0.00

Summary for Subcatchment 4S: Subcatchment 4

Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN for class B soils and water surface was 98.

Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.

To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.

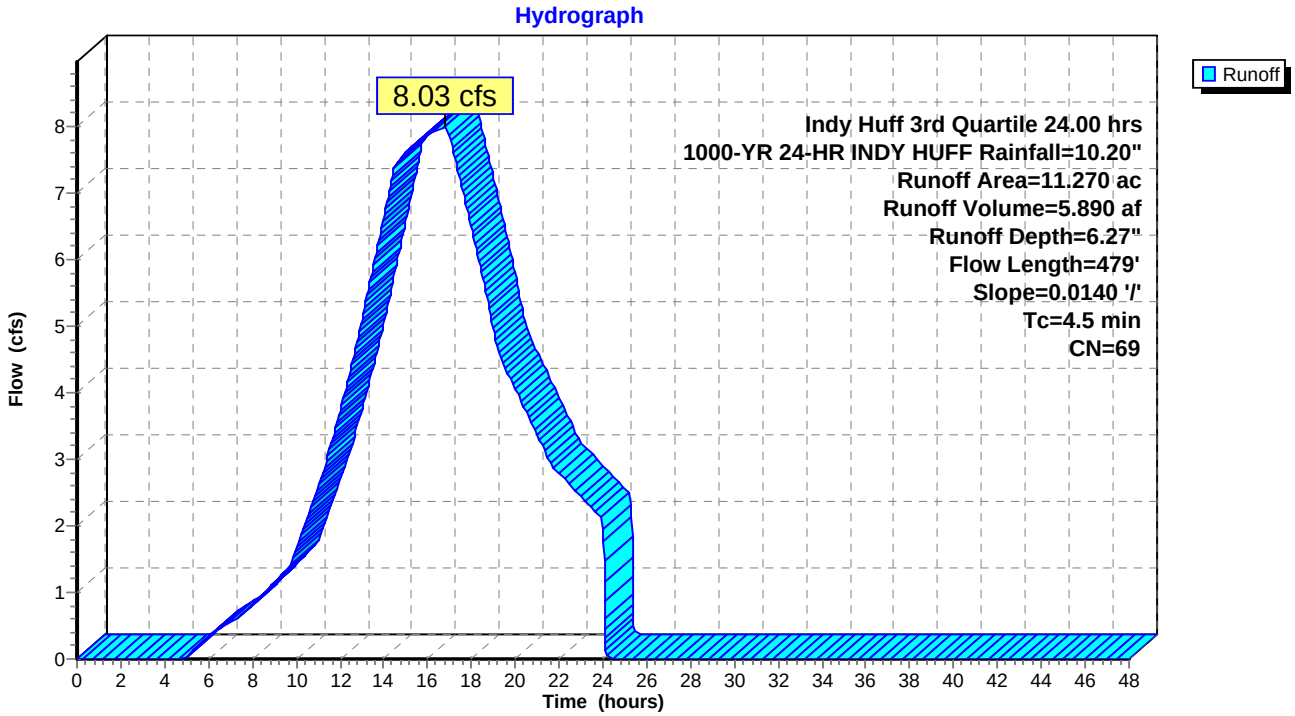
Runoff = 8.03 cfs @ 16.83 hrs, Volume= 5.890 af, Depth= 6.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
11.270	69	50-75% Grass cover, Fair, HSG B
11.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	479	0.0140	1.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 4S: Subcatchment 4



Hydrograph for Subcatchment 4S: Subcatchment 4

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.00	0.00
3.50	0.54	0.00	0.00
4.00	0.66	0.00	0.00
4.50	0.80	0.00	0.00
5.00	0.93	0.00	0.02
5.50	1.07	0.01	0.19
6.00	1.20	0.02	0.33
6.50	1.32	0.04	0.45
7.00	1.45	0.06	0.55
7.50	1.57	0.09	0.67
8.00	1.70	0.12	0.81
8.50	1.83	0.16	0.97
9.00	1.98	0.21	1.14
9.50	2.13	0.26	1.32
10.00	2.29	0.33	1.64
10.50	2.49	0.41	2.08
11.00	2.71	0.52	2.58
11.50	2.96	0.65	3.12
12.00	3.24	0.80	3.72
12.50	3.55	0.98	4.39
13.00	3.89	1.20	5.11
13.50	4.27	1.44	5.86
14.00	4.67	1.72	6.64
14.50	5.11	2.04	7.41
15.00	5.55	2.37	7.61
15.50	5.99	2.71	7.76
16.00	6.43	3.05	7.88
16.50	6.86	3.40	**7.98**
17.00	7.29	3.75	**7.86**
17.50	7.68	4.08	7.20
18.00	8.03	4.38	6.49
18.50	8.34	4.64	5.75
19.00	8.61	4.87	4.98
19.50	8.84	5.07	4.41
20.00	9.05	5.26	4.07
20.50	9.25	5.43	3.72
21.00	9.42	5.58	3.37
21.50	9.58	5.72	3.01
22.00	9.72	5.85	2.78
22.50	9.85	5.96	2.61
23.00	9.98	6.07	2.45
23.50	10.09	6.18	2.28
24.00	**10.20**	**6.27**	2.11
24.50	10.20	6.27	0.00
25.00	10.20	6.27	0.00
25.50	10.20	6.27	0.00
26.00	10.20	6.27	0.00
26.50	10.20	6.27	0.00
27.00	10.20	6.27	0.00
27.50	10.20	6.27	0.00
28.00	10.20	6.27	0.00
28.50	10.20	6.27	0.00
29.00	10.20	6.27	0.00
29.50	10.20	6.27	0.00
30.00	10.20	6.27	0.00
30.50	10.20	6.27	0.00
31.00	10.20	6.27	0.00
31.50	10.20	6.27	0.00
32.00	10.20	6.27	0.00
32.50	10.20	6.27	0.00
33.00	10.20	6.27	0.00
33.50	10.20	6.27	0.00
34.00	10.20	6.27	0.00
34.50	10.20	6.27	0.00
35.00	10.20	6.27	0.00
35.50	10.20	6.27	0.00
36.00	10.20	6.27	0.00
36.50	10.20	6.27	0.00
37.00	10.20	6.27	0.00
37.50	10.20	6.27	0.00
38.00	10.20	6.27	0.00
38.50	10.20	6.27	0.00
39.00	10.20	6.27	0.00
39.50	10.20	6.27	0.00
40.00	10.20	6.27	0.00
40.50	10.20	6.27	0.00
41.00	10.20	6.27	0.00
41.50	10.20	6.27	0.00
42.00	10.20	6.27	0.00
42.50	10.20	6.27	0.00
43.00	10.20	6.27	0.00
43.50	10.20	6.27	0.00
44.00	10.20	6.27	0.00
44.50	10.20	6.27	0.00
45.00	10.20	6.27	0.00
45.50	10.20	6.27	0.00
46.00	10.20	6.27	0.00
46.50	10.20	6.27	0.00
47.00	10.20	6.27	0.00
47.50	10.20	6.27	0.00
48.00	10.20	6.27	0.00

Summary for Subcatchment 6S: Subcatchment 6

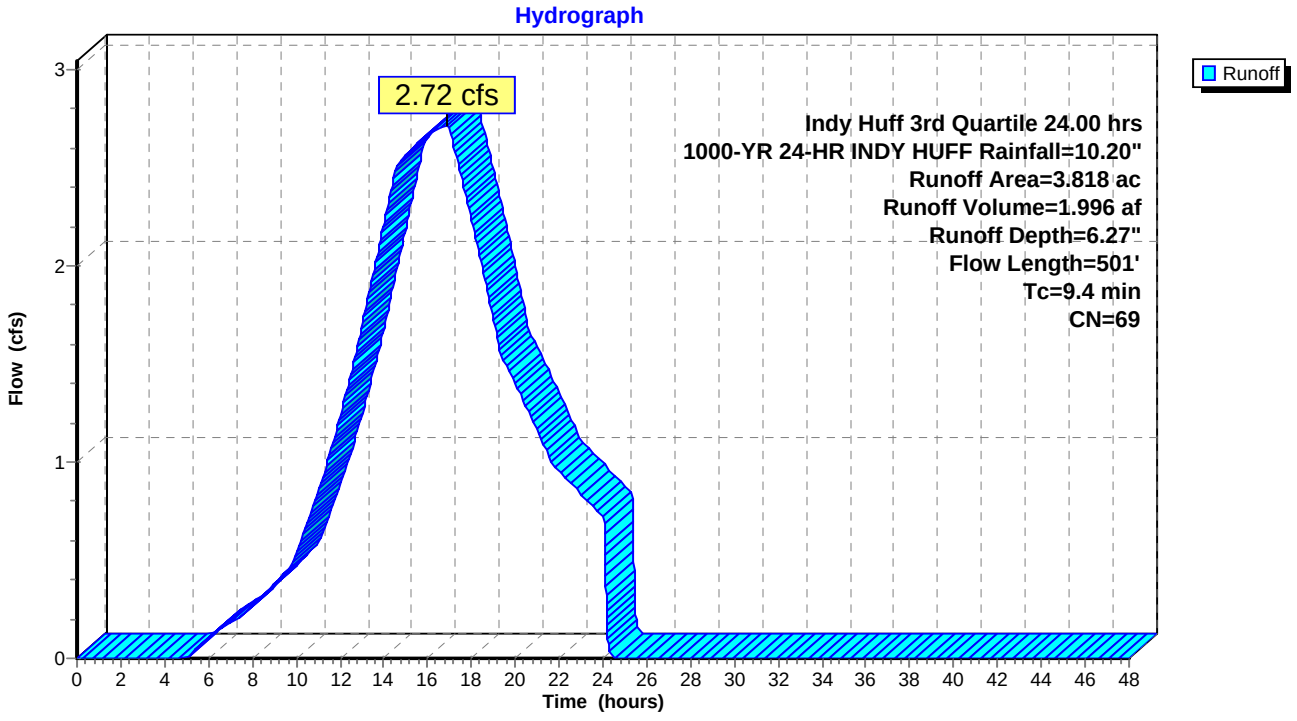
Runoff = 2.72 cfs @ 16.87 hrs, Volume= 1.996 af, Depth= 6.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
3.818	69	50-75% Grass cover, Fair, HSG B
3.818		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	150	0.0670	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.28"
1.1	351	0.1225	5.25		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
9.4	501	Total			

Subcatchment 6S: Subcatchment 6



Hydrograph for Subcatchment 6S: Subcatchment 6

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.00	0.00
3.50	0.54	0.00	0.00
4.00	0.66	0.00	0.00
4.50	0.80	0.00	0.00
5.00	0.93	0.00	0.00
5.50	1.07	0.01	0.06
6.00	1.20	0.02	0.11
6.50	1.32	0.04	0.15
7.00	1.45	0.06	0.18
7.50	1.57	0.09	0.22
8.00	1.70	0.12	0.27
8.50	1.83	0.16	0.32
9.00	1.98	0.21	0.38
9.50	2.13	0.26	0.44
10.00	2.29	0.33	0.54
10.50	2.49	0.41	0.68
11.00	2.71	0.52	0.85
11.50	2.96	0.65	1.03
12.00	3.24	0.80	1.23
12.50	3.55	0.98	1.45
13.00	3.89	1.20	1.69
13.50	4.27	1.44	1.95
14.00	4.67	1.72	2.21
14.50	5.11	2.04	2.48
15.00	5.55	2.37	2.57
15.50	5.99	2.71	2.62
16.00	6.43	3.05	2.66
16.50	6.86	3.40	**2.70**
17.00	7.29	3.75	**2.69**
17.50	7.68	4.08	2.47
18.00	8.03	4.38	2.23
18.50	8.34	4.64	1.99
19.00	8.61	4.87	1.73
19.50	8.84	5.07	1.51
20.00	9.05	5.26	1.40
20.50	9.25	5.43	1.28
21.00	9.42	5.58	1.16
21.50	9.58	5.72	1.04
22.00	9.72	5.85	0.95
22.50	9.85	5.96	0.89
23.00	9.98	6.07	0.84
23.50	10.09	6.18	0.78
24.00	**10.20**	**6.27**	0.72
24.50	10.20	6.27	0.00
25.00	10.20	6.27	0.00
25.50	10.20	6.27	0.00
26.00	10.20	6.27	0.00
26.50	10.20	6.27	0.00
27.00	10.20	6.27	0.00
27.50	10.20	6.27	0.00
28.00	10.20	6.27	0.00
28.50	10.20	6.27	0.00
29.00	10.20	6.27	0.00
29.50	10.20	6.27	0.00
30.00	10.20	6.27	0.00
30.50	10.20	6.27	0.00
31.00	10.20	6.27	0.00
31.50	10.20	6.27	0.00
32.00	10.20	6.27	0.00
32.50	10.20	6.27	0.00
33.00	10.20	6.27	0.00
33.50	10.20	6.27	0.00
34.00	10.20	6.27	0.00
34.50	10.20	6.27	0.00
35.00	10.20	6.27	0.00
35.50	10.20	6.27	0.00
36.00	10.20	6.27	0.00
36.50	10.20	6.27	0.00
37.00	10.20	6.27	0.00
37.50	10.20	6.27	0.00
38.00	10.20	6.27	0.00
38.50	10.20	6.27	0.00
39.00	10.20	6.27	0.00
39.50	10.20	6.27	0.00
40.00	10.20	6.27	0.00
40.50	10.20	6.27	0.00
41.00	10.20	6.27	0.00
41.50	10.20	6.27	0.00
42.00	10.20	6.27	0.00
42.50	10.20	6.27	0.00
43.00	10.20	6.27	0.00
43.50	10.20	6.27	0.00
44.00	10.20	6.27	0.00
44.50	10.20	6.27	0.00
45.00	10.20	6.27	0.00
45.50	10.20	6.27	0.00
46.00	10.20	6.27	0.00
46.50	10.20	6.27	0.00
47.00	10.20	6.27	0.00
47.50	10.20	6.27	0.00
48.00	10.20	6.27	0.00

Summary for Subcatchment 7S: Subcatchment 7

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

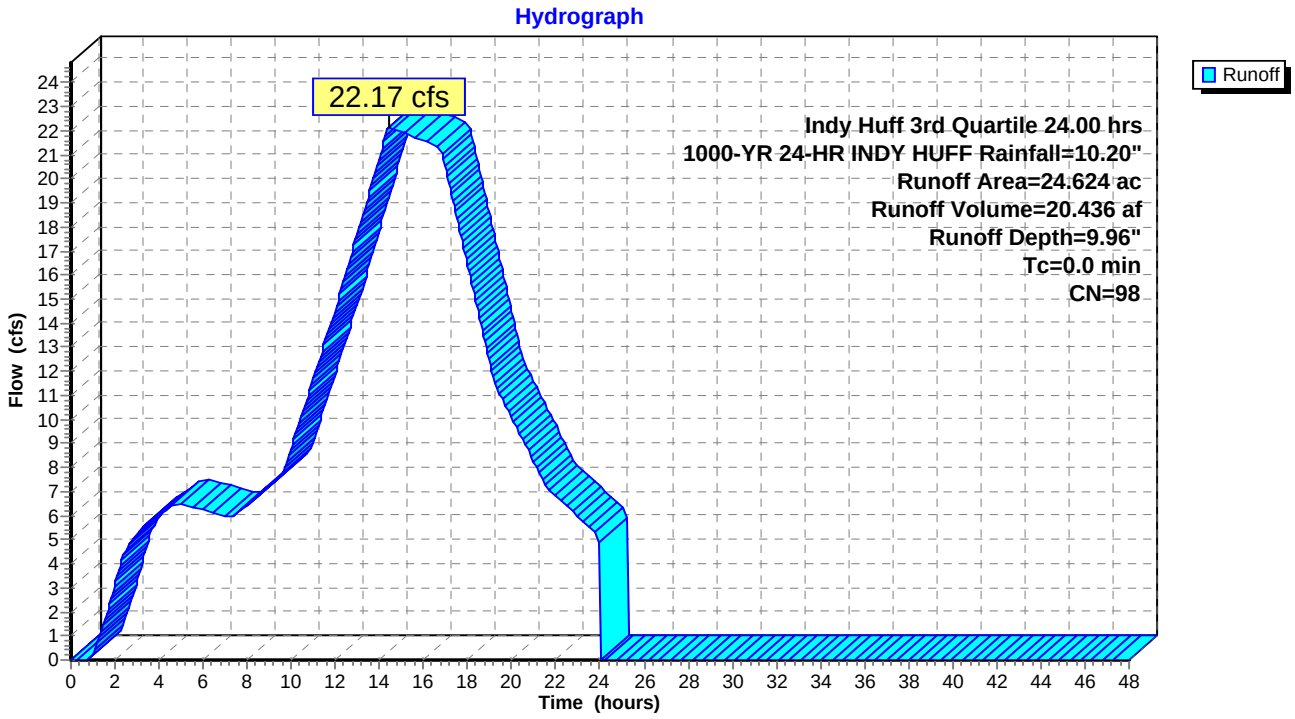
Runoff = 22.17 cfs @ 14.41 hrs, Volume= 20.436 af, Depth= 9.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
24.624	98	Water Surface, HSG B
24.624		100.00% Impervious Area

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

Subcatchment 7S: Subcatchment 7



Hydrograph for Subcatchment 7S: Subcatchment 7

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.15
1.50	0.11	0.02	1.53
2.00	0.19	0.06	3.16
2.50	0.30	0.14	4.61
3.00	0.42	0.24	5.22
3.50	0.54	0.35	5.67
4.00	0.66	0.47	6.04
4.50	0.80	0.60	6.36
5.00	0.93	0.73	6.49
5.50	1.07	0.86	6.37
6.00	1.20	0.98	6.23
6.50	1.32	1.11	6.08
7.00	1.45	1.23	5.93
7.50	1.57	1.35	6.09
8.00	1.70	1.47	6.48
8.50	1.83	1.61	6.86
9.00	1.98	1.75	7.24
9.50	2.13	1.90	7.62
10.00	2.29	2.06	8.84
10.50	2.49	2.26	10.28
11.00	2.71	2.48	11.71
11.50	2.96	2.73	13.14
12.00	3.24	3.01	14.58
12.50	3.55	3.32	16.16
13.00	3.89	3.66	17.74
13.50	4.27	4.03	19.33
14.00	4.67	4.44	**20.91**
14.50	5.11	4.87	**22.14**
15.00	5.55	5.32	21.95
15.50	5.99	5.76	21.76
16.00	6.43	6.19	21.58
16.50	6.86	6.63	21.39
17.00	7.29	7.05	20.46
17.50	7.68	7.44	18.42
18.00	8.03	7.79	16.39
18.50	8.34	8.10	14.35
19.00	8.61	8.37	12.32
19.50	8.84	8.60	10.96
20.00	9.05	8.81	10.05
20.50	9.25	9.01	9.14
21.00	9.42	9.18	8.23
21.50	9.58	9.34	7.32
22.00	9.72	9.48	6.80
22.50	9.85	9.61	6.37
23.00	9.98	9.74	5.94
23.50	10.09	9.85	5.52
24.00	**10.20**	**9.96**	2.55
24.50	10.20	9.96	0.00
25.00	10.20	9.96	0.00
25.50	10.20	9.96	0.00
26.00	10.20	9.96	0.00
26.50	10.20	9.96	0.00
27.00	10.20	9.96	0.00
27.50	10.20	9.96	0.00
28.00	10.20	9.96	0.00
28.50	10.20	9.96	0.00
29.00	10.20	9.96	0.00
29.50	10.20	9.96	0.00
30.00	10.20	9.96	0.00
30.50	10.20	9.96	0.00
31.00	10.20	9.96	0.00
31.50	10.20	9.96	0.00
32.00	10.20	9.96	0.00
32.50	10.20	9.96	0.00
33.00	10.20	9.96	0.00
33.50	10.20	9.96	0.00
34.00	10.20	9.96	0.00
34.50	10.20	9.96	0.00
35.00	10.20	9.96	0.00
35.50	10.20	9.96	0.00
36.00	10.20	9.96	0.00
36.50	10.20	9.96	0.00
37.00	10.20	9.96	0.00
37.50	10.20	9.96	0.00
38.00	10.20	9.96	0.00
38.50	10.20	9.96	0.00
39.00	10.20	9.96	0.00
39.50	10.20	9.96	0.00
40.00	10.20	9.96	0.00
40.50	10.20	9.96	0.00
41.00	10.20	9.96	0.00
41.50	10.20	9.96	0.00
42.00	10.20	9.96	0.00
42.50	10.20	9.96	0.00
43.00	10.20	9.96	0.00
43.50	10.20	9.96	0.00
44.00	10.20	9.96	0.00
44.50	10.20	9.96	0.00
45.00	10.20	9.96	0.00
45.50	10.20	9.96	0.00
46.00	10.20	9.96	0.00
46.50	10.20	9.96	0.00
47.00	10.20	9.96	0.00
47.50	10.20	9.96	0.00
48.00	10.20	9.96	0.00

Summary for Subcatchment 8S: Subcatchment 8

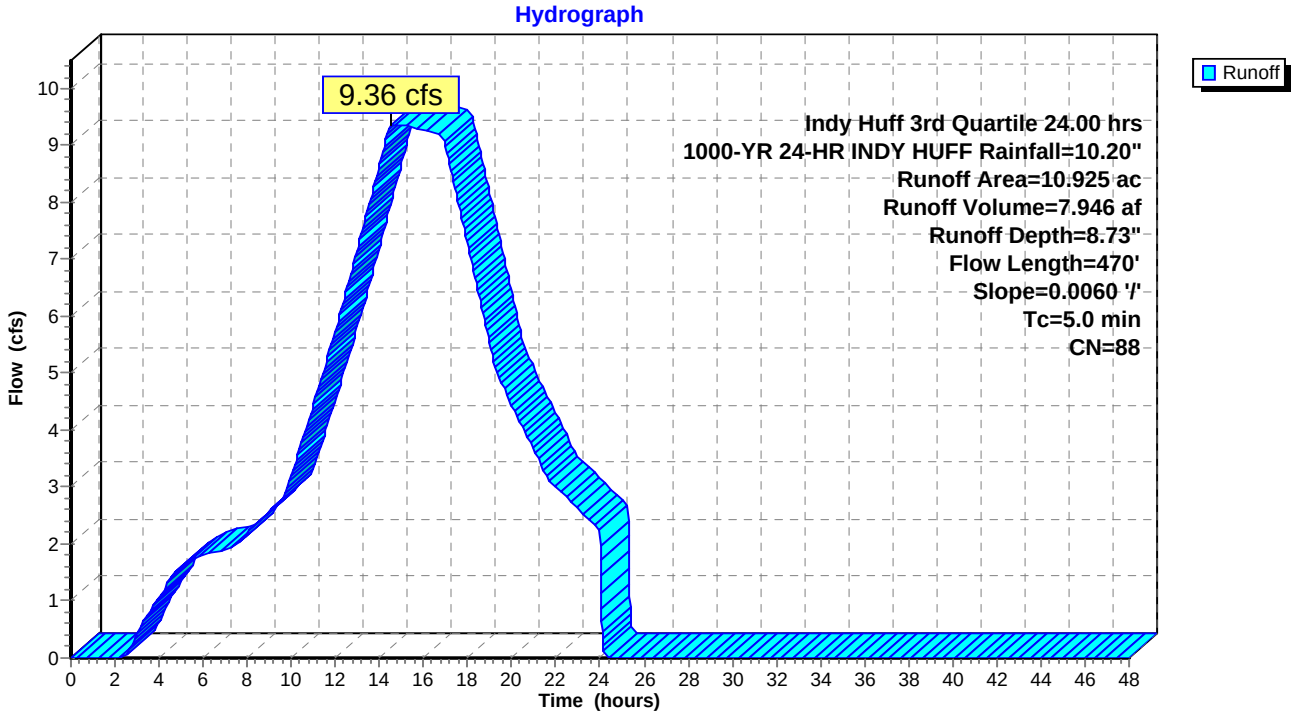
Runoff = 9.36 cfs @ 14.56 hrs, Volume= 7.946 af, Depth= 8.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
10.925	88	Urban industrial, 72% imp, HSG B
3.059		28.00% Pervious Area
7.866		72.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	470	0.0060	1.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps

Subcatchment 8S: Subcatchment 8



Hydrograph for Subcatchment 8S: Subcatchment 8

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.03
3.00	0.42	0.01	0.42
3.50	0.54	0.04	0.77
4.00	0.66	0.09	1.09
4.50	0.80	0.15	1.37
5.00	0.93	0.22	1.61
5.50	1.07	0.29	1.73
6.00	1.20	0.37	1.81
6.50	1.32	0.46	1.87
7.00	1.45	0.54	1.90
7.50	1.57	0.63	1.99
8.00	1.70	0.73	2.18
8.50	1.83	0.83	2.38
9.00	1.98	0.95	2.57
9.50	2.13	1.07	2.77
10.00	2.29	1.20	3.22
10.50	2.49	1.37	3.82
11.00	2.71	1.56	4.45
11.50	2.96	1.78	5.09
12.00	3.24	2.03	5.75
12.50	3.55	2.31	6.46
13.00	3.89	2.63	7.19
13.50	4.27	2.98	7.92
14.00	4.67	3.36	8.66
14.50	5.11	3.77	**9.35**
15.00	5.55	4.20	**9.34**
15.50	5.99	4.62	9.31
16.00	6.43	5.04	9.27
16.50	6.86	5.46	9.22
17.00	7.29	5.88	8.97
17.50	7.68	6.26	8.12
18.00	8.03	6.60	7.25
18.50	8.34	6.90	6.37
19.00	8.61	7.17	5.50
19.50	8.84	7.39	4.83
20.00	9.05	7.60	4.44
20.50	9.25	7.79	4.05
21.00	9.42	7.96	3.65
21.50	9.58	8.12	3.26
22.00	9.72	8.26	3.00
22.50	9.85	8.39	2.81
23.00	9.98	8.51	2.63
23.50	10.09	8.62	2.44
24.00	**10.20**	**8.73**	2.25
24.50	10.20	8.73	0.00
25.00	10.20	8.73	0.00
25.50	10.20	8.73	0.00
26.00	10.20	8.73	0.00
26.50	10.20	8.73	0.00
27.00	10.20	8.73	0.00
27.50	10.20	8.73	0.00
28.00	10.20	8.73	0.00
28.50	10.20	8.73	0.00
29.00	10.20	8.73	0.00
29.50	10.20	8.73	0.00
30.00	10.20	8.73	0.00
30.50	10.20	8.73	0.00
31.00	10.20	8.73	0.00
31.50	10.20	8.73	0.00
32.00	10.20	8.73	0.00
32.50	10.20	8.73	0.00
33.00	10.20	8.73	0.00
33.50	10.20	8.73	0.00
34.00	10.20	8.73	0.00
34.50	10.20	8.73	0.00
35.00	10.20	8.73	0.00
35.50	10.20	8.73	0.00
36.00	10.20	8.73	0.00
36.50	10.20	8.73	0.00
37.00	10.20	8.73	0.00
37.50	10.20	8.73	0.00
38.00	10.20	8.73	0.00
38.50	10.20	8.73	0.00
39.00	10.20	8.73	0.00
39.50	10.20	8.73	0.00
40.00	10.20	8.73	0.00
40.50	10.20	8.73	0.00
41.00	10.20	8.73	0.00
41.50	10.20	8.73	0.00
42.00	10.20	8.73	0.00
42.50	10.20	8.73	0.00
43.00	10.20	8.73	0.00
43.50	10.20	8.73	0.00
44.00	10.20	8.73	0.00
44.50	10.20	8.73	0.00
45.00	10.20	8.73	0.00
45.50	10.20	8.73	0.00
46.00	10.20	8.73	0.00
46.50	10.20	8.73	0.00
47.00	10.20	8.73	0.00
47.50	10.20	8.73	0.00
48.00	10.20	8.73	0.00

Summary for Subcatchment 9S: Subcatchment 9

Acre number found using LIDAR data from 2012 and measuring areas in AutoCAD. CN used for class B soils and grass 50 - 75% was used .

Time of concentration data was determined using LIDAR data from 2012 and measuring lengths in AutoCAD.

To complete time of concentration, a method of sheet flow, shallow flow, or channel flow is needed. These are estimated using LIDAR data. Other things that are needed include a surface description, length of flow, manning's number, land slope, and P2 are needed. The program then computes a Tc.

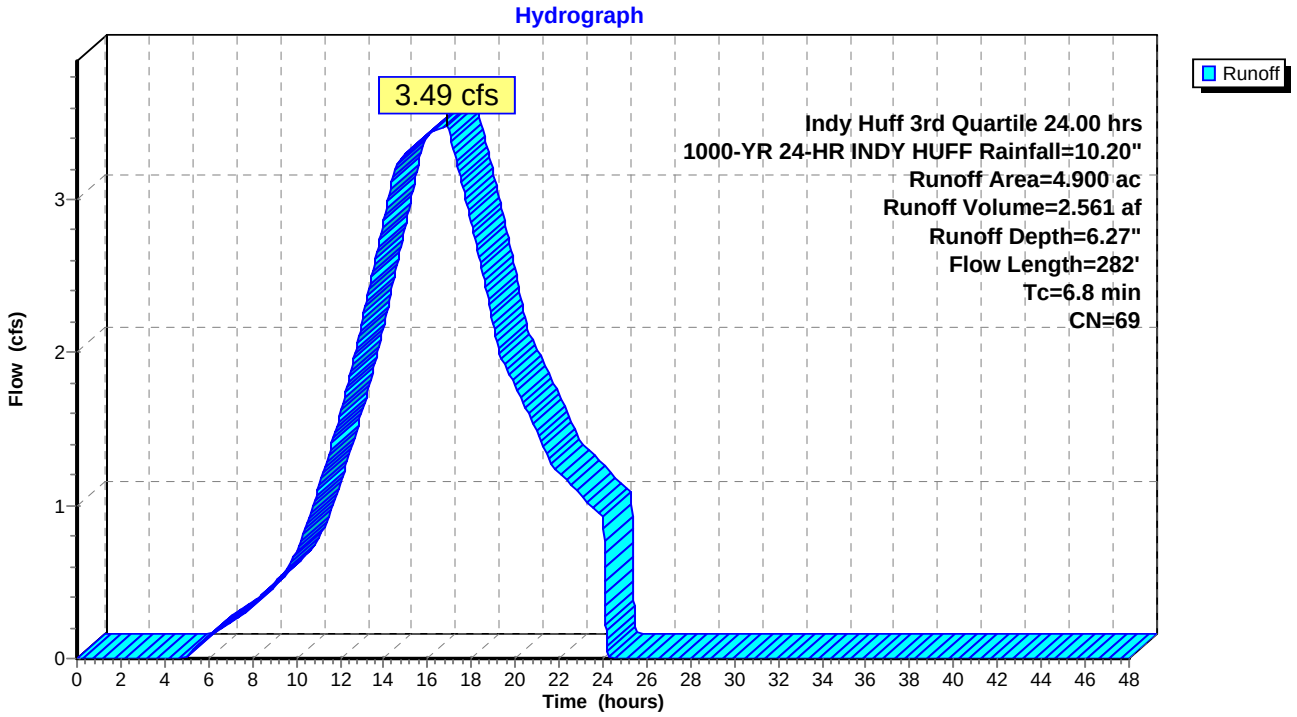
Runoff = 3.49 cfs @ 16.84 hrs, Volume= 2.561 af, Depth= 6.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
4.900	69	50-75% Grass cover, Fair, HSG B
4.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	127	0.2360	0.33		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.28"
0.4	155	0.1900	6.54		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	282	Total			

Subcatchment 9S: Subcatchment 9



Hydrograph for Subcatchment 9S: Subcatchment 9

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.00
1.50	0.11	0.00	0.00
2.00	0.19	0.00	0.00
2.50	0.30	0.00	0.00
3.00	0.42	0.00	0.00
3.50	0.54	0.00	0.00
4.00	0.66	0.00	0.00
4.50	0.80	0.00	0.00
5.00	0.93	0.00	0.01
5.50	1.07	0.01	0.08
6.00	1.20	0.02	0.14
6.50	1.32	0.04	0.19
7.00	1.45	0.06	0.24
7.50	1.57	0.09	0.29
8.00	1.70	0.12	0.35
8.50	1.83	0.16	0.42
9.00	1.98	0.21	0.49
9.50	2.13	0.26	0.57
10.00	2.29	0.33	0.70
10.50	2.49	0.41	0.89
11.00	2.71	0.52	1.10
11.50	2.96	0.65	1.34
12.00	3.24	0.80	1.60
12.50	3.55	0.98	1.89
13.00	3.89	1.20	2.20
13.50	4.27	1.44	2.53
14.00	4.67	1.72	2.86
14.50	5.11	2.04	3.21
15.00	5.55	2.37	3.30
15.50	5.99	2.71	3.37
16.00	6.43	3.05	3.42
16.50	6.86	3.40	**3.47**
17.00	7.29	3.75	**3.44**
17.50	7.68	4.08	3.15
18.00	8.03	4.38	2.84
18.50	8.34	4.64	2.52
19.00	8.61	4.87	2.19
19.50	8.84	5.07	1.93
20.00	9.05	5.26	1.78
20.50	9.25	5.43	1.63
21.00	9.42	5.58	1.48
21.50	9.58	5.72	1.32
22.00	9.72	5.85	1.21
22.50	9.85	5.96	1.14
23.00	9.98	6.07	1.07
23.50	10.09	6.18	1.00
24.00	**10.20**	**6.27**	0.92
24.50	10.20	6.27	0.00
25.00	10.20	6.27	0.00
25.50	10.20	6.27	0.00
26.00	10.20	6.27	0.00
26.50	10.20	6.27	0.00
27.00	10.20	6.27	0.00
27.50	10.20	6.27	0.00
28.00	10.20	6.27	0.00
28.50	10.20	6.27	0.00
29.00	10.20	6.27	0.00
29.50	10.20	6.27	0.00
30.00	10.20	6.27	0.00
30.50	10.20	6.27	0.00
31.00	10.20	6.27	0.00
31.50	10.20	6.27	0.00
32.00	10.20	6.27	0.00
32.50	10.20	6.27	0.00
33.00	10.20	6.27	0.00
33.50	10.20	6.27	0.00
34.00	10.20	6.27	0.00
34.50	10.20	6.27	0.00
35.00	10.20	6.27	0.00
35.50	10.20	6.27	0.00
36.00	10.20	6.27	0.00
36.50	10.20	6.27	0.00
37.00	10.20	6.27	0.00
37.50	10.20	6.27	0.00
38.00	10.20	6.27	0.00
38.50	10.20	6.27	0.00
39.00	10.20	6.27	0.00
39.50	10.20	6.27	0.00
40.00	10.20	6.27	0.00
40.50	10.20	6.27	0.00
41.00	10.20	6.27	0.00
41.50	10.20	6.27	0.00
42.00	10.20	6.27	0.00
42.50	10.20	6.27	0.00
43.00	10.20	6.27	0.00
43.50	10.20	6.27	0.00
44.00	10.20	6.27	0.00
44.50	10.20	6.27	0.00
45.00	10.20	6.27	0.00
45.50	10.20	6.27	0.00
46.00	10.20	6.27	0.00
46.50	10.20	6.27	0.00
47.00	10.20	6.27	0.00
47.50	10.20	6.27	0.00
48.00	10.20	6.27	0.00

Summary for Subcatchment 13S: Gypsum Pond Drainage Area

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

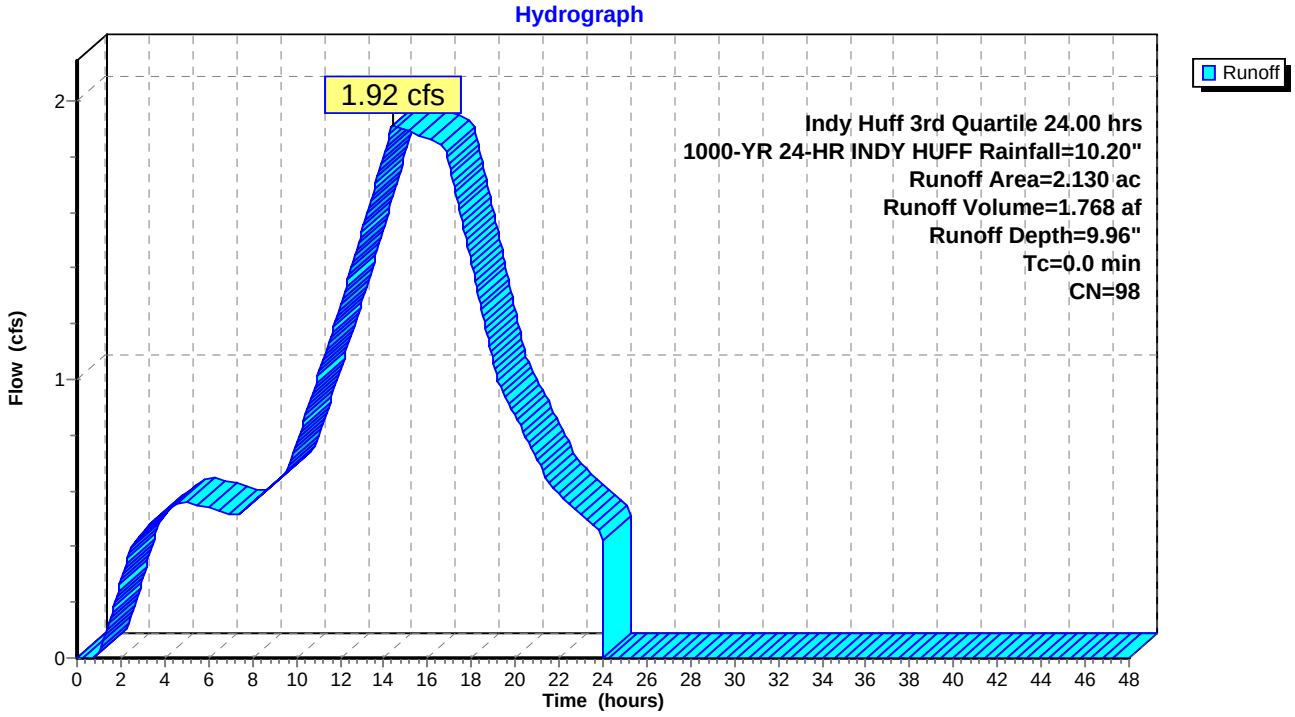
Runoff = 1.92 cfs @ 14.41 hrs, Volume= 1.768 af, Depth= 9.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
2.130	98	Water Surface, HSG B
2.130		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry, 0**

Subcatchment 13S: Gypsum Pond Drainage Area



Hydrograph for Subcatchment 13S: Gypsum Pond Drainage Area

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.01
1.50	0.11	0.02	0.13
2.00	0.19	0.06	0.27
2.50	0.30	0.14	0.40
3.00	0.42	0.24	0.45
3.50	0.54	0.35	0.49
4.00	0.66	0.47	0.52
4.50	0.80	0.60	0.55
5.00	0.93	0.73	0.56
5.50	1.07	0.86	0.55
6.00	1.20	0.98	0.54
6.50	1.32	1.11	0.53
7.00	1.45	1.23	0.51
7.50	1.57	1.35	0.53
8.00	1.70	1.47	0.56
8.50	1.83	1.61	0.59
9.00	1.98	1.75	0.63
9.50	2.13	1.90	0.66
10.00	2.29	2.06	0.76
10.50	2.49	2.26	0.89
11.00	2.71	2.48	1.01
11.50	2.96	2.73	1.14
12.00	3.24	3.01	1.26
12.50	3.55	3.32	1.40
13.00	3.89	3.66	1.53
13.50	4.27	4.03	1.67
14.00	4.67	4.44	**1.81**
14.50	5.11	4.87	**1.91**
15.00	5.55	5.32	1.90
15.50	5.99	5.76	1.88
16.00	6.43	6.19	1.87
16.50	6.86	6.63	1.85
17.00	7.29	7.05	1.77
17.50	7.68	7.44	1.59
18.00	8.03	7.79	1.42
18.50	8.34	8.10	1.24
19.00	8.61	8.37	1.07
19.50	8.84	8.60	0.95
20.00	9.05	8.81	0.87
20.50	9.25	9.01	0.79
21.00	9.42	9.18	0.71
21.50	9.58	9.34	0.63
22.00	9.72	9.48	0.59
22.50	9.85	9.61	0.55
23.00	9.98	9.74	0.51
23.50	10.09	9.85	0.48
24.00	**10.20**	**9.96**	0.22
24.50	10.20	9.96	0.00
25.00	10.20	9.96	0.00
25.50	10.20	9.96	0.00
26.00	10.20	9.96	0.00
26.50	10.20	9.96	0.00
27.00	10.20	9.96	0.00
27.50	10.20	9.96	0.00
28.00	10.20	9.96	0.00
28.50	10.20	9.96	0.00
29.00	10.20	9.96	0.00
29.50	10.20	9.96	0.00
30.00	10.20	9.96	0.00
30.50	10.20	9.96	0.00
31.00	10.20	9.96	0.00
31.50	10.20	9.96	0.00
32.00	10.20	9.96	0.00
32.50	10.20	9.96	0.00
33.00	10.20	9.96	0.00
33.50	10.20	9.96	0.00
34.00	10.20	9.96	0.00
34.50	10.20	9.96	0.00
35.00	10.20	9.96	0.00
35.50	10.20	9.96	0.00
36.00	10.20	9.96	0.00
36.50	10.20	9.96	0.00
37.00	10.20	9.96	0.00
37.50	10.20	9.96	0.00
38.00	10.20	9.96	0.00
38.50	10.20	9.96	0.00
39.00	10.20	9.96	0.00
39.50	10.20	9.96	0.00
40.00	10.20	9.96	0.00
40.50	10.20	9.96	0.00
41.00	10.20	9.96	0.00
41.50	10.20	9.96	0.00
42.00	10.20	9.96	0.00
42.50	10.20	9.96	0.00
43.00	10.20	9.96	0.00
43.50	10.20	9.96	0.00
44.00	10.20	9.96	0.00
44.50	10.20	9.96	0.00
45.00	10.20	9.96	0.00
45.50	10.20	9.96	0.00
46.00	10.20	9.96	0.00
46.50	10.20	9.96	0.00
47.00	10.20	9.96	0.00
47.50	10.20	9.96	0.00
48.00	10.20	9.96	0.00

Summary for Subcatchment 17S: Main Treatment Pond Drainage Area

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

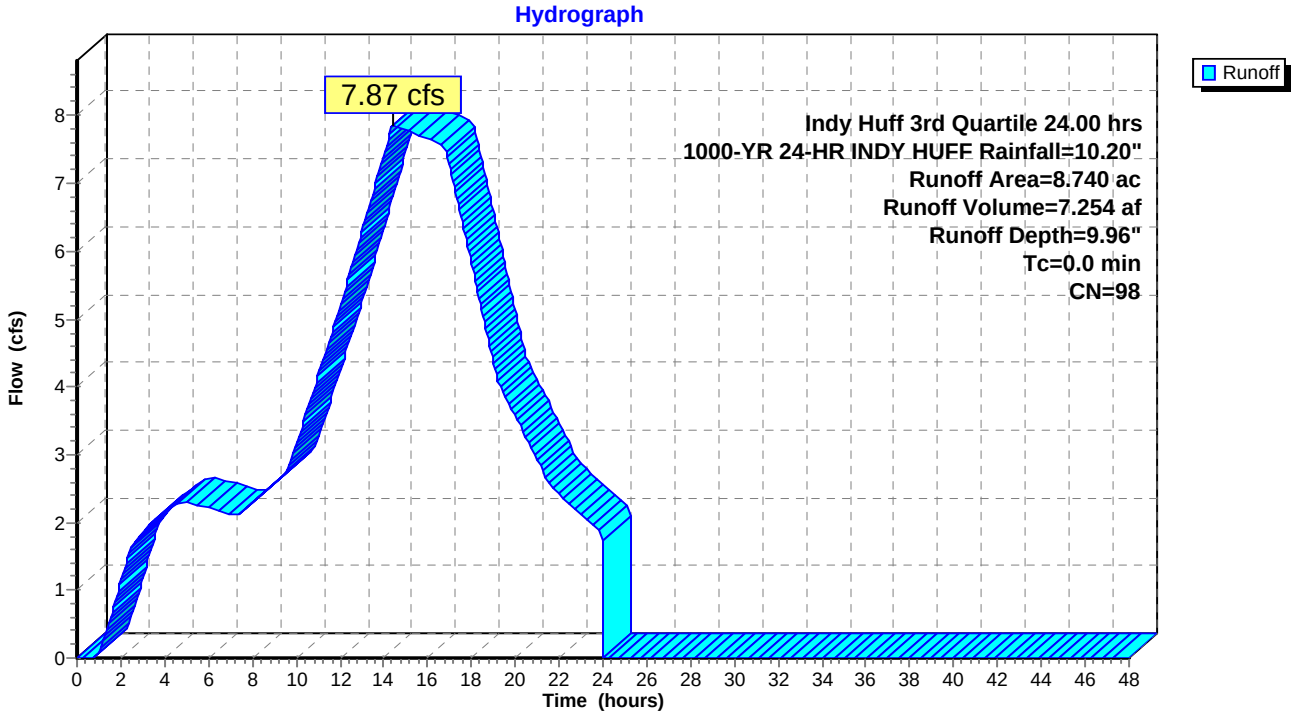
Runoff = 7.87 cfs @ 14.41 hrs, Volume= 7.254 af, Depth= 9.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Indy Huff 3rd Quartile 24.00 hrs 1000-YR 24-HR INDY HUFF Rainfall=10.20"

Area (ac)	CN	Description
8.740	98	Water Surface, HSG B
8.740		100.00% Impervious Area

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

Subcatchment 17S: Main Treatment Pond Drainage Area



Hydrograph for Subcatchment 17S: Main Treatment Pond Drainage Area

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00
0.50	0.01	0.00	0.00
1.00	0.05	0.00	0.05
1.50	0.11	0.02	0.54
2.00	0.19	0.06	1.12
2.50	0.30	0.14	1.64
3.00	0.42	0.24	1.85
3.50	0.54	0.35	2.01
4.00	0.66	0.47	2.14
4.50	0.80	0.60	2.26
5.00	0.93	0.73	2.30
5.50	1.07	0.86	2.26
6.00	1.20	0.98	2.21
6.50	1.32	1.11	2.16
7.00	1.45	1.23	2.10
7.50	1.57	1.35	2.16
8.00	1.70	1.47	2.30
8.50	1.83	1.61	2.43
9.00	1.98	1.75	2.57
9.50	2.13	1.90	2.71
10.00	2.29	2.06	3.14
10.50	2.49	2.26	3.65
11.00	2.71	2.48	4.16
11.50	2.96	2.73	4.67
12.00	3.24	3.01	5.18
12.50	3.55	3.32	5.74
13.00	3.89	3.66	6.30
13.50	4.27	4.03	6.86
14.00	4.67	4.44	**7.42**
14.50	5.11	4.87	**7.86**
15.00	5.55	5.32	7.79
15.50	5.99	5.76	7.72
16.00	6.43	6.19	7.66
16.50	6.86	6.63	7.59
17.00	7.29	7.05	7.26
17.50	7.68	7.44	6.54
18.00	8.03	7.79	5.82
18.50	8.34	8.10	5.09
19.00	8.61	8.37	4.37
19.50	8.84	8.60	3.89
20.00	9.05	8.81	3.57
20.50	9.25	9.01	3.24
21.00	9.42	9.18	2.92
21.50	9.58	9.34	2.60
22.00	9.72	9.48	2.41
22.50	9.85	9.61	2.26
23.00	9.98	9.74	2.11
23.50	10.09	9.85	1.96
24.00	**10.20**	**9.96**	0.90
24.50	10.20	9.96	0.00
25.00	10.20	9.96	0.00
25.50	10.20	9.96	0.00
26.00	10.20	9.96	0.00
26.50	10.20	9.96	0.00
27.00	10.20	9.96	0.00
27.50	10.20	9.96	0.00
28.00	10.20	9.96	0.00
28.50	10.20	9.96	0.00
29.00	10.20	9.96	0.00
29.50	10.20	9.96	0.00
30.00	10.20	9.96	0.00
30.50	10.20	9.96	0.00
31.00	10.20	9.96	0.00
31.50	10.20	9.96	0.00
32.00	10.20	9.96	0.00
32.50	10.20	9.96	0.00
33.00	10.20	9.96	0.00
33.50	10.20	9.96	0.00
34.00	10.20	9.96	0.00
34.50	10.20	9.96	0.00
35.00	10.20	9.96	0.00
35.50	10.20	9.96	0.00
36.00	10.20	9.96	0.00
36.50	10.20	9.96	0.00
37.00	10.20	9.96	0.00
37.50	10.20	9.96	0.00
38.00	10.20	9.96	0.00
38.50	10.20	9.96	0.00
39.00	10.20	9.96	0.00
39.50	10.20	9.96	0.00
40.00	10.20	9.96	0.00
40.50	10.20	9.96	0.00
41.00	10.20	9.96	0.00
41.50	10.20	9.96	0.00
42.00	10.20	9.96	0.00
42.50	10.20	9.96	0.00
43.00	10.20	9.96	0.00
43.50	10.20	9.96	0.00
44.00	10.20	9.96	0.00
44.50	10.20	9.96	0.00
45.00	10.20	9.96	0.00
45.50	10.20	9.96	0.00
46.00	10.20	9.96	0.00
46.50	10.20	9.96	0.00
47.00	10.20	9.96	0.00
47.50	10.20	9.96	0.00
48.00	10.20	9.96	0.00

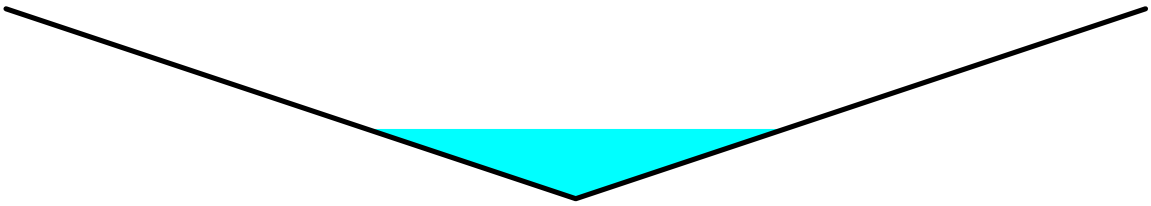
Summary for Reach 1R: Ditch 1

Inflow Area = 10.000 ac, 36.00% Impervious, Inflow Depth = 7.06" for 1000-YR 24-HR INDY HUFF event
Inflow = 7.64 cfs @ 16.90 hrs, Volume= 5.886 af
Outflow = 7.63 cfs @ 16.91 hrs, Volume= 5.886 af, Atten= 0%, Lag= 0.8 min

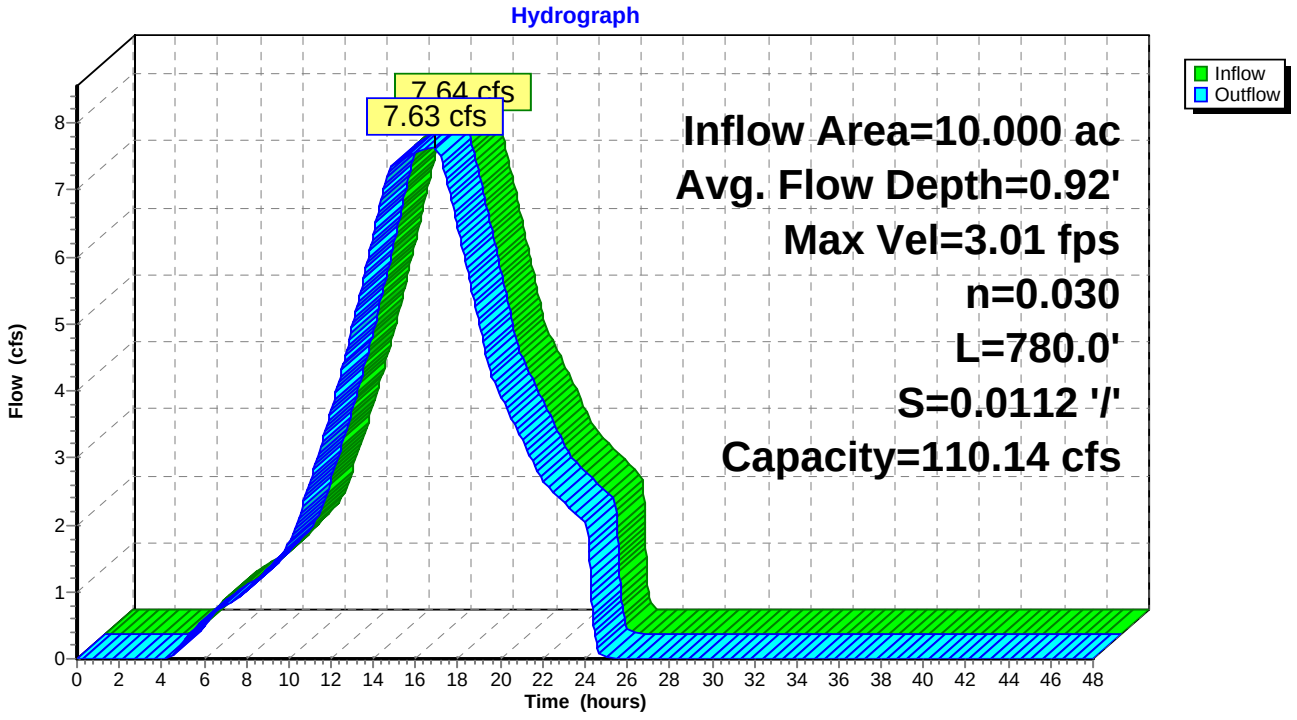
Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 7.3 min

Peak Storage= 1,976 cf @ 16.91 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 2.50' Flow Area= 18.8 sf, Capacity= 110.14 cfs

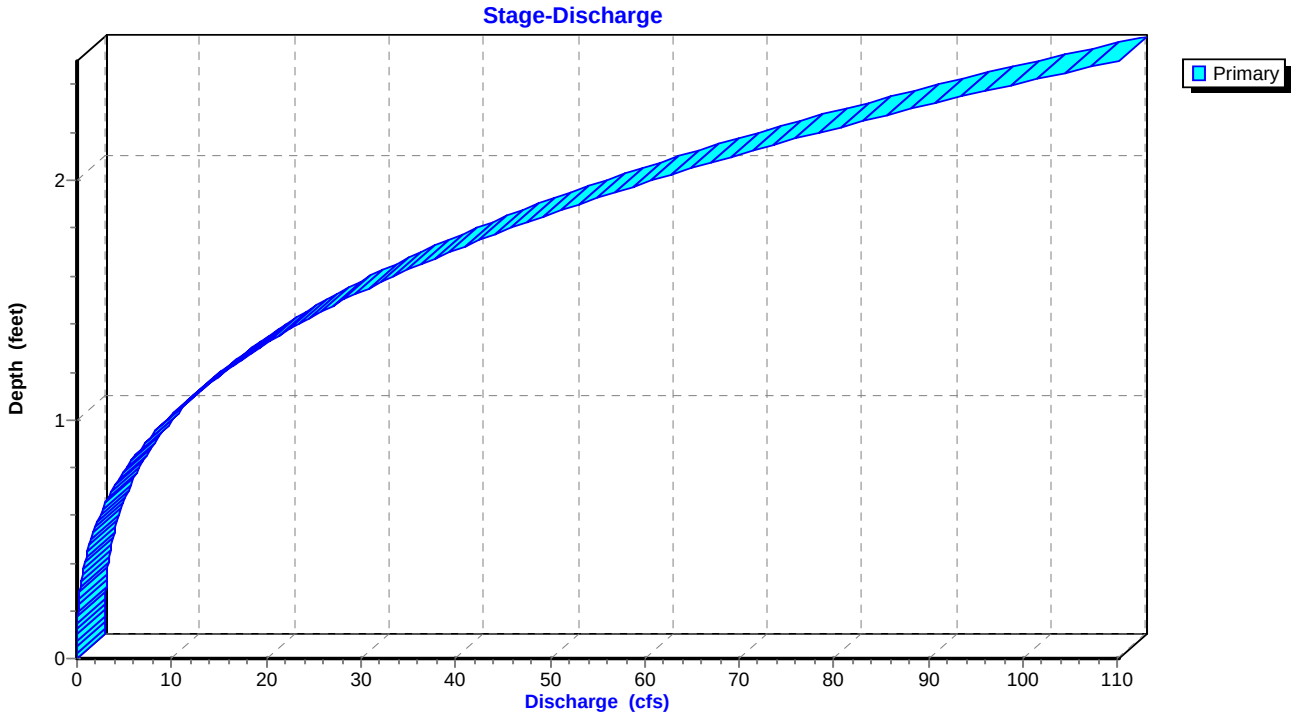
0.00' x 2.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 780.0' Slope= 0.0112 '/'
Inlet Invert= 400.20', Outlet Invert= 391.46'



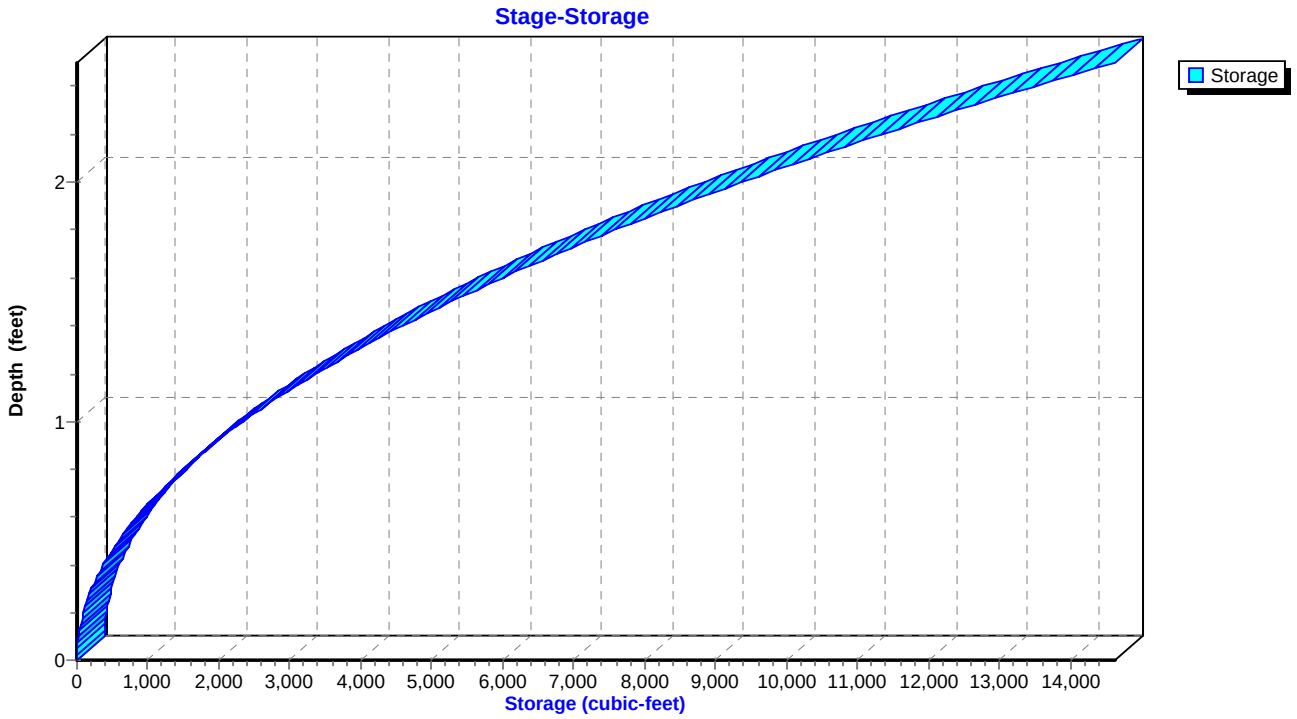
Reach 1R: Ditch 1



Reach 1R: Ditch 1



Reach 1R: Ditch 1



Hydrograph for Reach 1R: Ditch 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	400.20	0.00
1.00	0.00	0	400.20	0.00
2.00	0.00	0	400.20	0.00
3.00	0.00	0	400.20	0.00
4.00	0.00	0	400.20	0.00
5.00	0.30	151	400.45	0.25
6.00	0.60	286	400.55	0.58
7.00	0.80	360	400.59	0.79
8.00	1.03	432	400.63	1.01
9.00	1.36	532	400.68	1.33
10.00	1.78	648	400.73	1.73
11.00	2.70	887	400.82	2.63
12.00	3.77	1,147	400.90	3.70
13.00	5.03	1,429	400.98	4.95
14.00	6.41	1,717	401.06	6.33
15.00	7.41	1,929	401.11	7.39
16.00	**7.57**	**1,962**	**401.12**	**7.56**
17.00	**7.61**	**1,974**	**401.12**	**7.63**
18.00	6.35	1,737	401.06	6.43
19.00	4.92	1,440	400.98	5.01
20.00	3.91	1,206	400.92	3.95
21.00	3.25	1,052	400.87	3.29
22.00	2.64	898	400.82	2.67
23.00	2.32	816	400.79	2.35
24.00	2.01	732	400.76	2.03
25.00	0.00	23	400.30	0.02
26.00	0.00	3	400.23	0.00
27.00	0.00	1	400.22	0.00
28.00	0.00	1	400.21	0.00
29.00	0.00	0	400.21	0.00
30.00	0.00	0	400.21	0.00
31.00	0.00	0	400.21	0.00
32.00	0.00	0	400.21	0.00
33.00	0.00	0	400.20	0.00
34.00	0.00	0	400.20	0.00
35.00	0.00	0	400.20	0.00
36.00	0.00	0	400.20	0.00
37.00	0.00	0	400.20	0.00
38.00	0.00	0	400.20	0.00
39.00	0.00	0	400.20	0.00
40.00	0.00	0	400.20	0.00
41.00	0.00	0	400.20	0.00
42.00	0.00	0	400.20	0.00
43.00	0.00	0	400.20	0.00
44.00	0.00	0	400.20	0.00
45.00	0.00	0	400.20	0.00
46.00	0.00	0	400.20	0.00
47.00	0.00	0	400.20	0.00
48.00	0.00	0	400.20	0.00

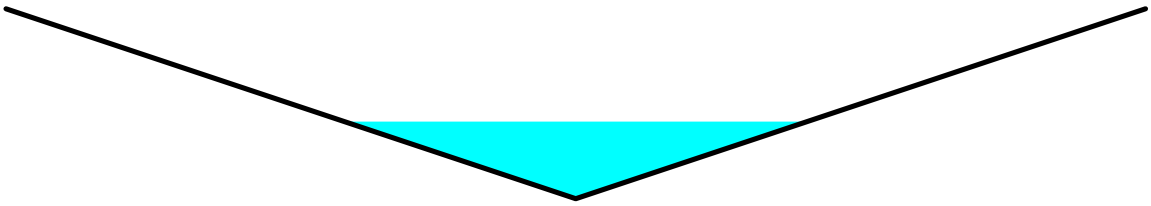
Summary for Reach 2R: Ditch 2

Inflow Area = 16.148 ac, 0.00% Impervious, Inflow Depth = 6.27" for 1000-YR 24-HR INDY HUFF event
Inflow = 11.48 cfs @ 16.89 hrs, Volume= 8.440 af
Outflow = 11.47 cfs @ 16.94 hrs, Volume= 8.440 af, Atten= 0%, Lag= 3.0 min

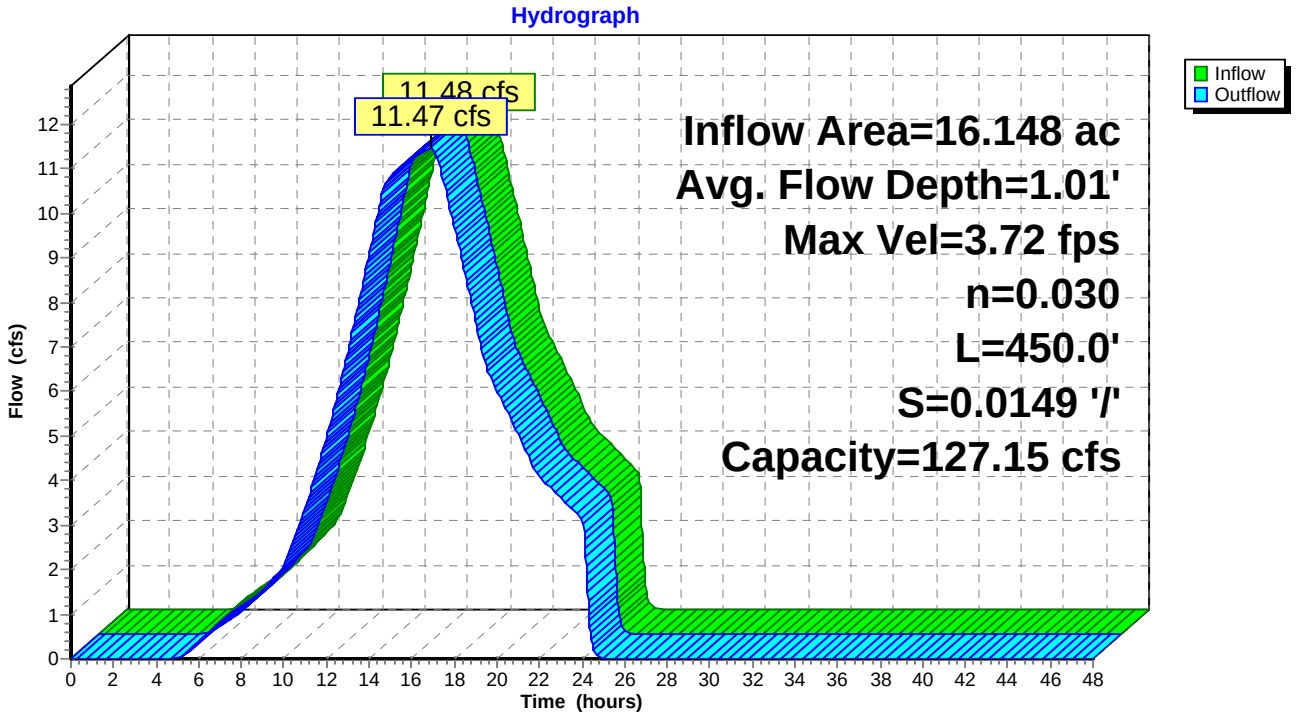
Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 2.45 fps, Avg. Travel Time= 3.1 min

Peak Storage= 1,389 cf @ 16.94 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.50' Flow Area= 18.8 sf, Capacity= 127.15 cfs

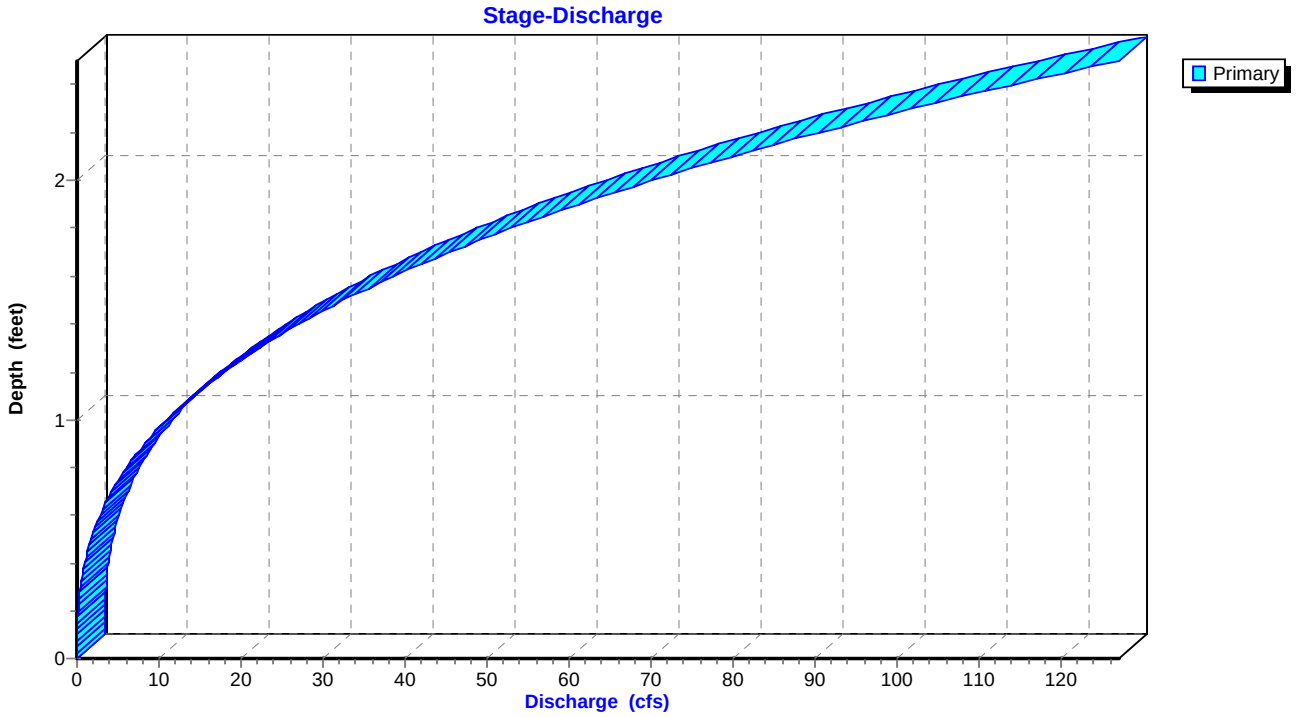
0.00' x 2.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 450.0' Slope= 0.0149 '/'
Inlet Invert= 398.00', Outlet Invert= 391.28'



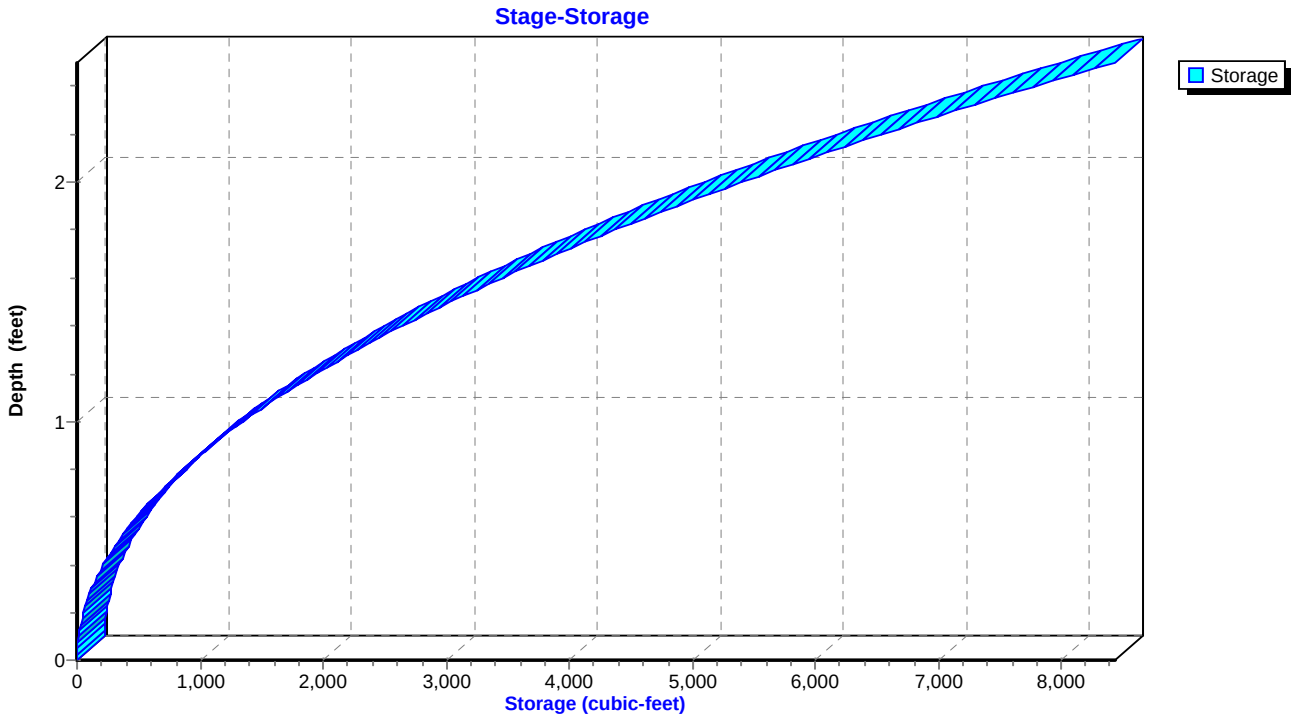
Reach 2R: Ditch 2



Reach 2R: Ditch 2



Reach 2R: Ditch 2



Hydrograph for Reach 2R: Ditch 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.00	0	398.00	0.00
1.00	0.00	0	398.00	0.00
2.00	0.00	0	398.00	0.00
3.00	0.00	0	398.00	0.00
4.00	0.00	0	398.00	0.00
5.00	0.00	0	398.01	0.00
6.00	0.41	109	398.28	0.38
7.00	0.74	176	398.36	0.73
8.00	1.09	235	398.42	1.07
9.00	1.55	307	398.48	1.53
10.00	2.16	392	398.54	2.12
11.00	3.44	556	398.64	3.39
12.00	5.02	742	398.74	4.97
13.00	6.95	948	398.84	6.89
14.00	9.12	1,164	398.93	9.06
15.00	10.80	1,327	398.99	10.79
16.00	**11.24**	**1,367**	**399.01**	**11.23**
17.00	**11.45**	**1,388**	**399.01**	**11.45**
18.00	9.66	1,226	398.95	9.71
19.00	7.53	1,019	398.87	7.59
20.00	6.00	858	398.80	6.03
21.00	5.00	749	398.74	5.04
22.00	4.07	642	398.69	4.09
23.00	3.59	583	398.66	3.61
24.00	3.10	523	398.62	3.12
25.00	0.00	7	398.07	0.01
26.00	0.00	0	398.01	0.00
27.00	0.00	0	398.01	0.00
28.00	0.00	0	398.01	0.00
29.00	0.00	0	398.00	0.00
30.00	0.00	0	398.00	0.00
31.00	0.00	0	398.00	0.00
32.00	0.00	0	398.00	0.00
33.00	0.00	0	398.00	0.00
34.00	0.00	0	398.00	0.00
35.00	0.00	0	398.00	0.00
36.00	0.00	0	398.00	0.00
37.00	0.00	0	398.00	0.00
38.00	0.00	0	398.00	0.00
39.00	0.00	0	398.00	0.00
40.00	0.00	0	398.00	0.00
41.00	0.00	0	398.00	0.00
42.00	0.00	0	398.00	0.00
43.00	0.00	0	398.00	0.00
44.00	0.00	0	398.00	0.00
45.00	0.00	0	398.00	0.00
46.00	0.00	0	398.00	0.00
47.00	0.00	0	398.00	0.00
48.00	0.00	0	398.00	0.00

Summary for Pond 1P: Culley West Pond

Culley West Pond is mostly dewatered. Any stormwater runoff draining to the Culley West Pond is pumped via trash pumps into the pump station where it is discharged to the underground tunnel and out to the Ohio River through the NPDES permitted outfall.

For the purpose of this analysis the assumption is that the lift station is out of order and no pumps are running.

Inflow Area = 62.967 ac, 51.60% Impervious, Inflow Depth > 9.65" for 1000-YR 24-HR INDY HUFF event
Inflow = 51.98 cfs @ 16.26 hrs, Volume= 50.647 af, Incl. 2.00 cfs Base Flow
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 387.69' @ 48.00 hrs Surf.Area= 22.937 ac Storage= 50.646 af

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

Volume	Invert	Avail.Storage	Storage Description
#1	385.40'	221.589 af	**Custom Stage Data (Irregular)**Listed below (Recalc)

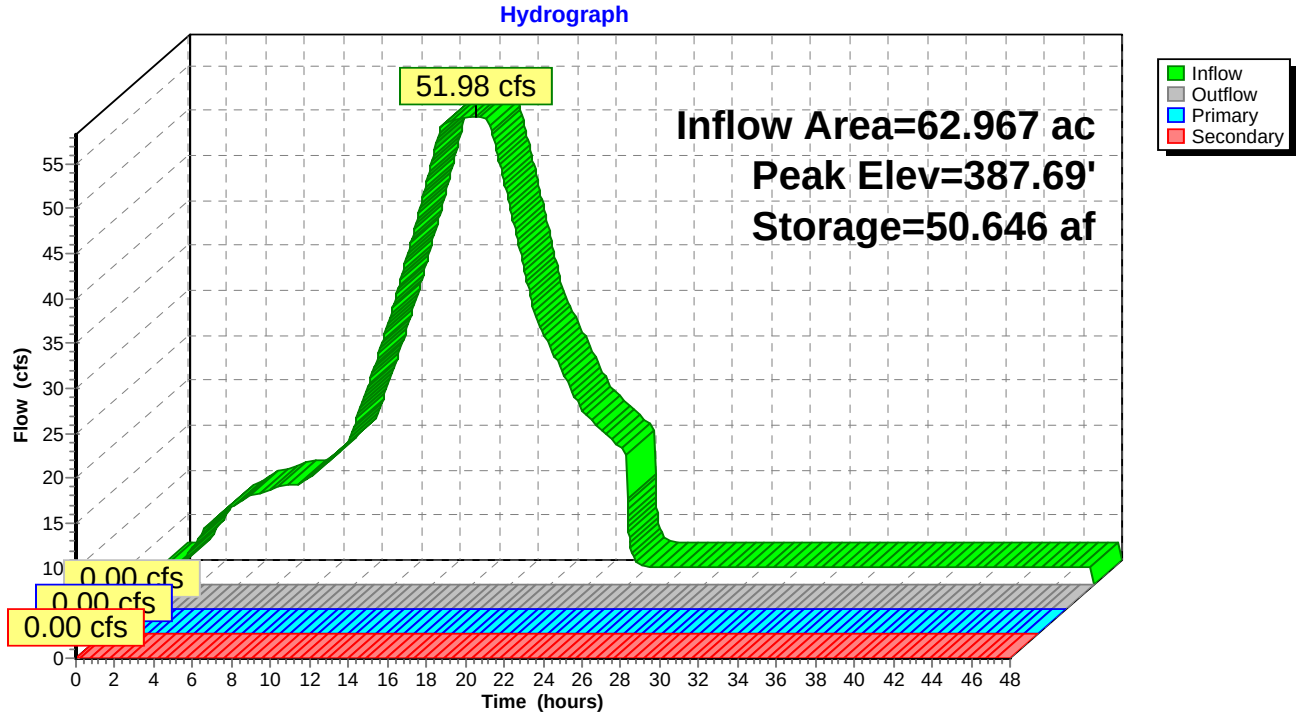
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
385.40	21.310	6,108.0	0.000	0.000	21.310
390.00	24.640	7,040.0	105.592	105.592	43.707
392.00	29.560	7,301.0	54.125	159.718	50.553
394.01	32.020	7,400.0	61.871	221.589	53.233

Device	Routing	Invert	Outlet Devices
#1	Primary	385.50'	**10" Pump X 0.00** Discharges@387.00' Turns Off@385.41' 12.0" Diam. x 2,300.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 120.6 800.8 1,514.3 2,318.7 3,086.9 3,714.0 4,273.0 Head (feet)= 47.78 42.92 37.58 31.01 24.77 19.34 13.87 -Loss (feet)= 0.12 3.87 12.58 27.69 47.03 66.24 85.88 =Lift (feet)= 47.66 39.05 25.00 3.32 -22.26 -46.90 -72.01
#2	Primary	385.50'	**6" Pump X 0.00** Discharges@387.00' Turns Off@385.41' 12.0" Diam. x 2,300.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 0.0 500.0 800.0 1,200.0 1,400.0 1,600.0 1,800.0 Head (feet)= 64.00 48.00 36.00 28.00 20.00 16.00 6.00 -Loss (feet)= 0.00 1.62 3.86 8.18 10.88 13.93 17.32 =Lift (feet)= 64.00 46.38 32.14 19.82 9.12 2.07 -11.32
#3	Secondary	394.00'	**10.0' long Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

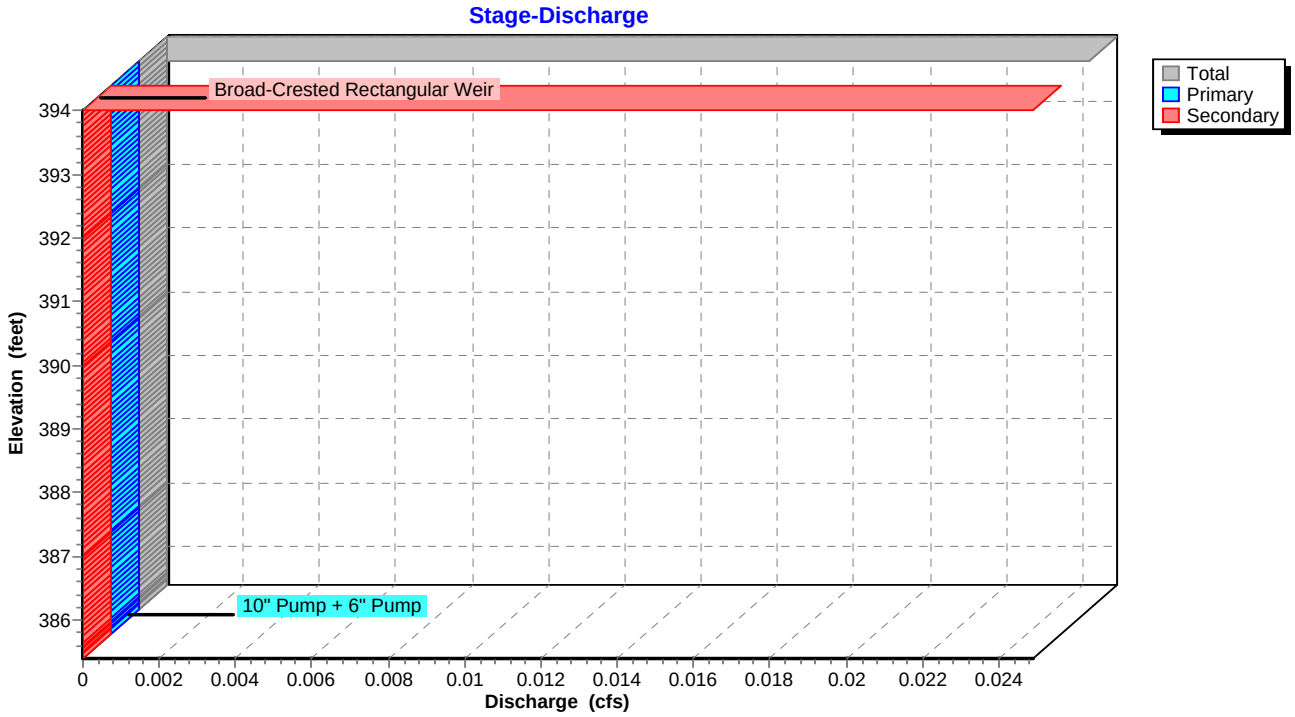
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=385.40' TW=383.50' (Dynamic Tailwater)
└─**1=10" Pump** (Controls 0.00 cfs)
└─**2=6" Pump** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=385.40' TW=383.50' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

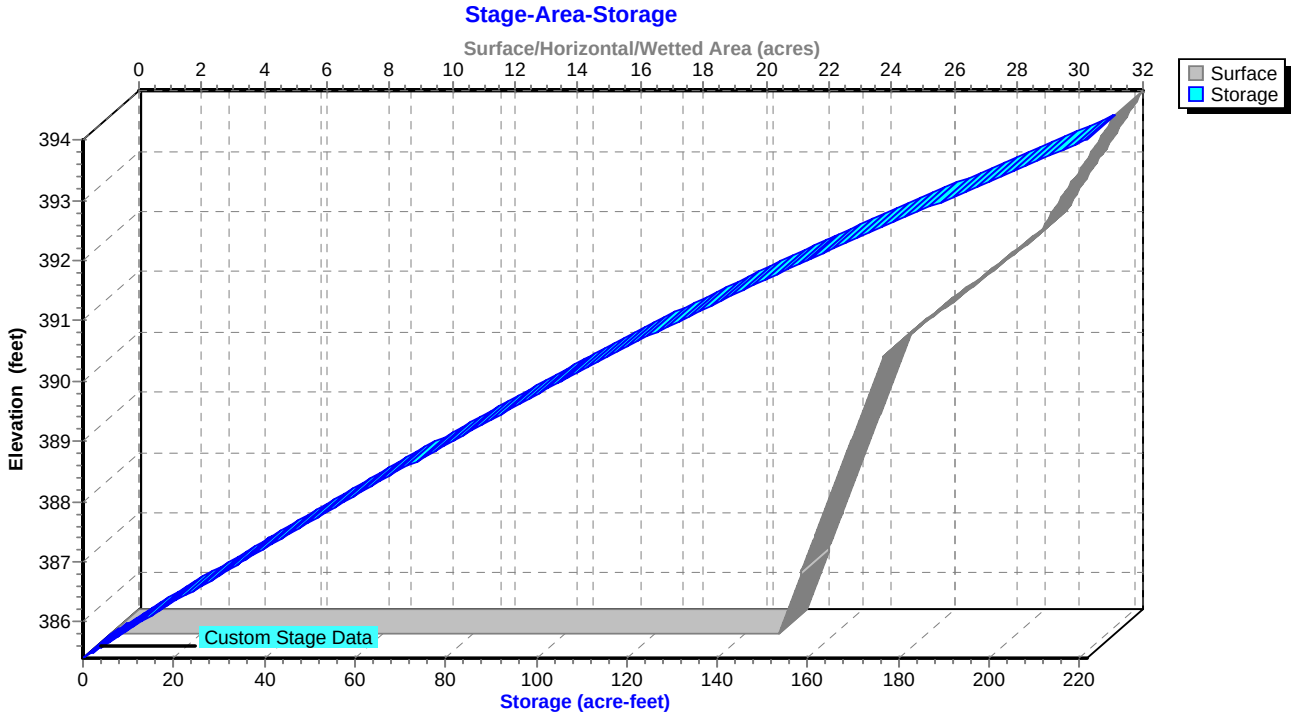
Pond 1P: Culley West Pond



Pond 1P: Culley West Pond



Pond 1P: Culley West Pond



Hydrograph for Pond 1P: Culley West Pond

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	2.00	0.000	385.40	**0.00**	**0.00**	**0.00**
1.00	2.15	0.166	385.41	0.00	0.00	0.00
2.00	5.16	0.460	385.42	0.00	0.00	0.00
3.00	7.64	1.001	385.45	0.00	0.00	0.00
4.00	9.12	1.696	385.48	0.00	0.00	0.00
5.00	10.12	2.498	385.52	0.00	0.00	0.00
6.00	10.76	3.360	385.56	0.00	0.00	0.00
7.00	11.11	4.266	385.60	0.00	0.00	0.00
8.00	12.55	5.230	385.64	0.00	0.00	0.00
9.00	14.49	6.346	385.70	0.00	0.00	0.00
10.00	17.82	7.645	385.76	0.00	0.00	0.00
11.00	24.12	9.371	385.84	0.00	0.00	0.00
12.00	31.01	11.643	385.94	0.00	0.00	0.00
13.00	38.93	14.525	386.07	0.00	0.00	0.00
14.00	47.27	18.082	386.24	0.00	0.00	0.00
15.00	51.69	22.247	386.43	0.00	0.00	0.00
16.00	**51.96**	26.533	386.62	0.00	0.00	0.00
17.00	**50.75**	30.819	386.81	0.00	0.00	0.00
18.00	41.83	34.658	386.98	0.00	0.00	0.00
19.00	32.39	37.730	387.12	0.00	0.00	0.00
20.00	26.59	40.128	387.23	0.00	0.00	0.00
21.00	22.29	42.150	387.32	0.00	0.00	0.00
22.00	18.67	43.825	387.39	0.00	0.00	0.00
23.00	16.62	45.284	387.46	0.00	0.00	0.00
24.00	12.03	46.574	387.51	0.00	0.00	0.00
25.00	2.01	46.845	387.52	0.00	0.00	0.00
26.00	2.00	47.010	387.53	0.00	0.00	0.00
27.00	2.00	47.176	387.54	0.00	0.00	0.00
28.00	2.00	47.341	387.55	0.00	0.00	0.00
29.00	2.00	47.506	387.55	0.00	0.00	0.00
30.00	2.00	47.672	387.56	0.00	0.00	0.00
31.00	2.00	47.837	387.57	0.00	0.00	0.00
32.00	2.00	48.002	387.57	0.00	0.00	0.00
33.00	2.00	48.168	387.58	0.00	0.00	0.00
34.00	2.00	48.333	387.59	0.00	0.00	0.00
35.00	2.00	48.498	387.60	0.00	0.00	0.00
36.00	2.00	48.663	387.60	0.00	0.00	0.00
37.00	2.00	48.829	387.61	0.00	0.00	0.00
38.00	2.00	48.994	387.62	0.00	0.00	0.00
39.00	2.00	49.159	387.62	0.00	0.00	0.00
40.00	2.00	49.325	387.63	0.00	0.00	0.00
41.00	2.00	49.490	387.64	0.00	0.00	0.00
42.00	2.00	49.655	387.65	0.00	0.00	0.00
43.00	2.00	49.820	387.65	0.00	0.00	0.00
44.00	2.00	49.986	387.66	0.00	0.00	0.00
45.00	2.00	50.151	387.67	0.00	0.00	0.00
46.00	2.00	50.316	387.68	0.00	0.00	0.00
47.00	2.00	50.482	387.68	0.00	0.00	0.00
48.00	0.00	**50.647**	**387.69**	0.00	0.00	0.00

Summary for Pond 2P: Main Treatment Pond

Pump curve modeled off of the given pumps for Culley East pump curves. Two Flyght pumps, CP 3170 LT 3~ 603.

Base flow directed to the Main Treatment Pond ncludes: Unit 2 & 3 Pyrite, Unit 2 & 3 Heater Wash, Unit 2 & 3 Boiler Sumps, Unit 3 Oil Trap, and West Yard Sumps. The total of these was given by the water balance as 1.32 MGD, converted equates to 2.04 cfs.

Vectren has maintained operating WSE of 378'.

For the purpose of this analysis the assumption is that the lift station is out of order and no pumps are running. This simulates the worst case scenario at the pond for the certifying design storm.

Volume calculated based on 11-30-16 topographic survey.

Inflow	=	34.18 cfs @	15.73 hrs,	Volume=	35.771 af, Incl. 2.10 cfs Base Flow
Outflow	=	4.14 cfs @	16.95 hrs,	Volume=	3.496 af, Atten= 88%, Lag= 73.0 min
Primary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af
Secondary	=	4.14 cfs @	16.95 hrs,	Volume=	3.496 af
Tertiary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 386.00' Surf.Area= 0.000 ac Storage= 42.860 af
Peak Elev= 390.98' @ 48.00 hrs Surf.Area= 0.000 ac Storage= 75.135 af (32.275 af above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 163.8 min (1,196.8 - 1,033.1)

Volume	Invert	Avail.Storage	Storage Description
#1	377.00'	89.160 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
377.00	0.000
378.00	1.030
379.00	4.760
380.00	9.240
381.00	14.100
382.00	19.250
383.00	24.770
384.00	30.650
385.00	36.700
386.00	42.860
387.00	49.120
388.00	55.500
389.00	61.990
390.00	68.580
391.00	75.260
392.00	82.060
393.00	89.160

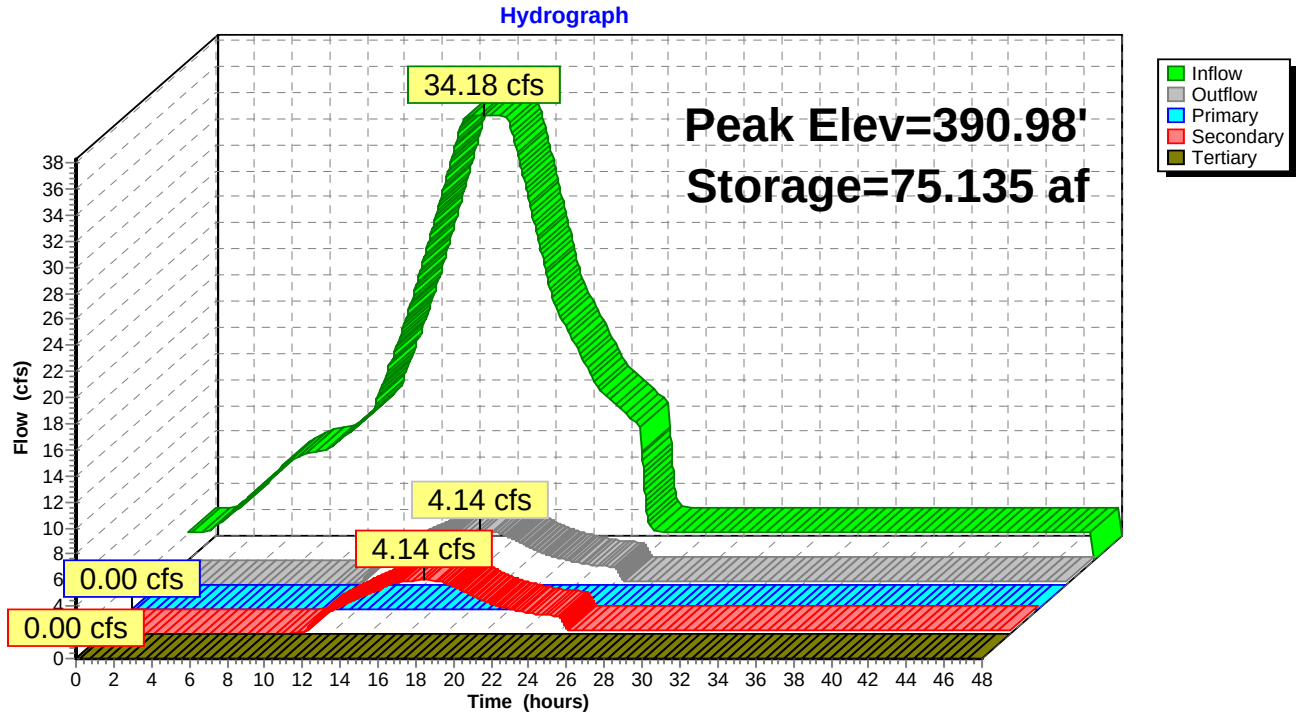
Device	Routing	Invert	Outlet Devices
#1	Device 3	386.50'	**12.0' long x 1.2' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.66 2.69 2.71 2.78 2.89 2.99 3.09 3.20 3.21 3.19 3.30 3.32
#2	Device 4	386.50'	**12.0' long x 1.2' 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 Coef. (English) 2.66 2.69 2.71 2.78 2.89 2.99 3.09 3.20 3.21 3.19 3.30 3.32
#3	Primary	387.00'	**Dewatering Pump #1 X 0.00** Discharges@390.15' Turns Off@386.98' 10.0" Diam. x 500.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 0.0 2,177.0 4,500.0 5,400.0 Head (feet)= 48.00 31.30 12.00 4.00 -Loss (feet)= 0.00 13.01 49.94 69.99 =Lift (feet)= 48.00 18.29 -37.94 -65.99
#4	Primary	388.00'	**Dewatering Pump #2 X 0.00** Discharges@390.15' Turns Off@387.01' 10.0" Diam. x 500.0' Long Discharge, Hazen-Williams C= 130 Flow (gpm)= 0.0 2,177.0 4,500.0 5,400.0 Head (feet)= 48.00 31.30 12.00 4.00 -Loss (feet)= 0.00 13.01 49.94 69.99 =Lift (feet)= 48.00 18.29 -37.94 -65.99
#5	Tertiary	392.67'	**10.0' long Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Secondary	386.07'	**24.0" Round Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 385.82' / 386.07' S= -0.0027 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.00' TW=383.50' (Dynamic Tailwater)
- **3=Dewatering Pump #1** (Controls 0.00 cfs)
  - **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **4=Dewatering Pump #2** (Controls 0.00 cfs)
  - **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

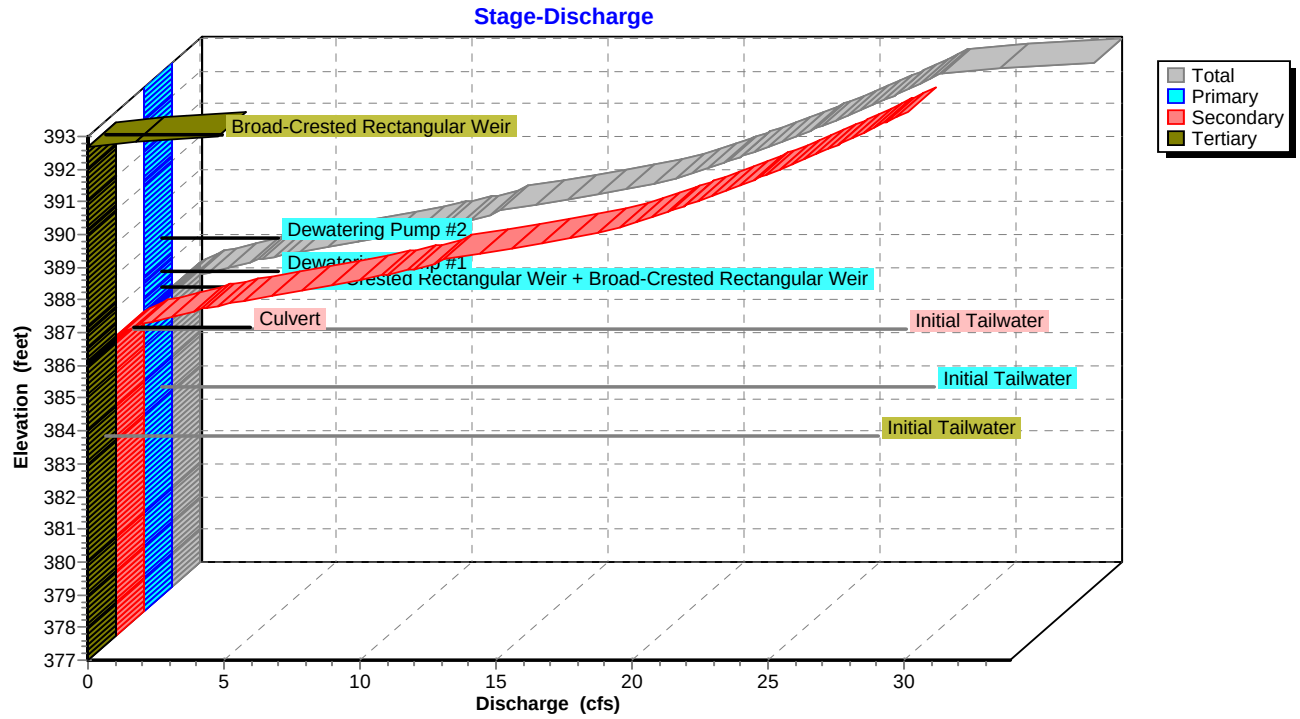
Secondary OutFlow Max=4.07 cfs @ 16.95 hrs HW=389.00' TW=388.88' (Dynamic Tailwater)
- **6=Culvert** (Inlet Controls 4.07 cfs @ 1.30 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.00' TW=383.50' (Dynamic Tailwater)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

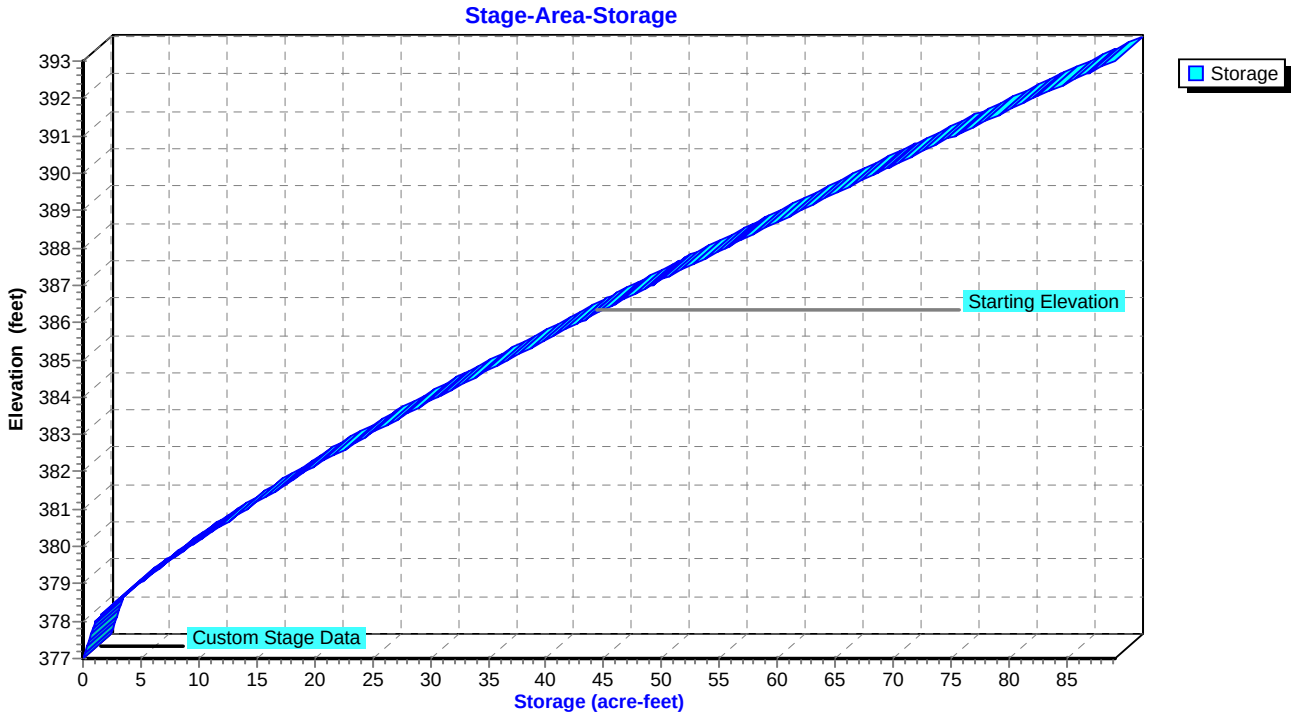
Pond 2P: Main Treatment Pond



Pond 2P: Main Treatment Pond



Pond 2P: Main Treatment Pond



Hydrograph for Pond 2P: Main Treatment Pond

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)	Tertiary (cfs)
0.00	2.10	42.860	386.00	0.00	**0.00**	0.00	**0.00**
1.00	2.15	43.034	386.03	0.00	0.00	0.00	0.00
2.00	3.22	43.253	386.06	0.00	0.00	0.00	0.00
3.00	4.45	43.566	386.11	0.00	0.00	0.00	0.00
4.00	5.85	43.993	386.18	0.00	0.00	0.00	0.00
5.00	7.22	44.531	386.27	0.00	0.00	0.00	0.00
6.00	8.03	45.165	386.37	0.00	0.00	0.00	0.00
7.00	8.37	45.845	386.48	0.00	0.00	0.00	0.00
8.00	9.18	46.561	386.59	0.00	0.00	0.00	0.00
9.00	10.34	47.367	386.72	0.00	0.00	0.00	0.00
10.00	12.27	48.279	386.87	0.05	0.00	0.05	0.00
11.00	16.17	49.438	387.05	0.82	0.00	0.82	0.00
12.00	20.62	50.845	387.27	1.75	0.00	1.75	0.00
13.00	25.65	52.577	387.54	2.45	0.00	2.45	0.00
14.00	30.95	54.684	387.87	3.08	0.00	3.08	0.00
15.00	**34.11**	57.142	388.25	3.71	0.00	3.71	0.00
16.00	**34.17**	59.641	388.64	**4.05**	0.00	**4.05**	0.00
17.00	33.63	62.119	389.02	**4.14**	0.00	**4.14**	0.00
18.00	28.00	64.341	389.36	3.94	0.00	3.94	0.00
19.00	21.95	66.106	389.62	3.32	0.00	3.32	0.00
20.00	17.97	67.485	389.83	2.57	0.00	2.57	0.00
21.00	15.22	68.666	390.01	2.09	0.00	2.09	0.00
22.00	12.80	69.657	390.16	1.75	0.00	1.75	0.00
23.00	11.49	70.526	390.29	1.53	0.00	1.53	0.00
24.00	9.28	71.303	390.41	1.35	0.00	1.35	0.00
25.00	2.16	71.547	390.44	0.26	0.00	0.26	0.00
26.00	2.14	71.703	390.47	0.25	0.00	0.25	0.00
27.00	2.14	71.859	390.49	0.25	0.00	0.25	0.00
28.00	2.14	72.015	390.51	0.25	0.00	0.25	0.00
29.00	2.14	72.171	390.54	0.25	0.00	0.25	0.00
30.00	2.14	72.327	390.56	0.25	0.00	0.25	0.00
31.00	2.14	72.483	390.58	0.25	0.00	0.25	0.00
32.00	2.14	72.639	390.61	0.25	0.00	0.25	0.00
33.00	2.14	72.795	390.63	0.25	0.00	0.25	0.00
34.00	2.14	72.951	390.65	0.25	0.00	0.25	0.00
35.00	2.14	73.107	390.68	0.25	0.00	0.25	0.00
36.00	2.14	73.263	390.70	0.25	0.00	0.25	0.00
37.00	2.14	73.419	390.72	0.25	0.00	0.25	0.00
38.00	2.14	73.575	390.75	0.25	0.00	0.25	0.00
39.00	2.14	73.731	390.77	0.25	0.00	0.25	0.00
40.00	2.14	73.887	390.79	0.25	0.00	0.25	0.00
41.00	2.14	74.043	390.82	0.25	0.00	0.25	0.00
42.00	2.14	74.199	390.84	0.25	0.00	0.25	0.00
43.00	2.14	74.355	390.86	0.25	0.00	0.25	0.00
44.00	2.14	74.511	390.89	0.25	0.00	0.25	0.00
45.00	2.14	74.667	390.91	0.25	0.00	0.25	0.00
46.00	2.14	74.823	390.93	0.25	0.00	0.25	0.00
47.00	2.14	74.979	390.96	0.25	0.00	0.25	0.00
48.00	0.00	**75.135**	**390.98**	0.25	0.00	0.25	0.00

Summary for Pond 3P: Ohio River

Arbitrary storage entered for the Ohio River, begins at elevation of 383.5, the 100 year flood elevation.

Inflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 383.50' @ 0.00 hrs Surf.Area= 1,000.000 ac Storage= 0.000 af

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

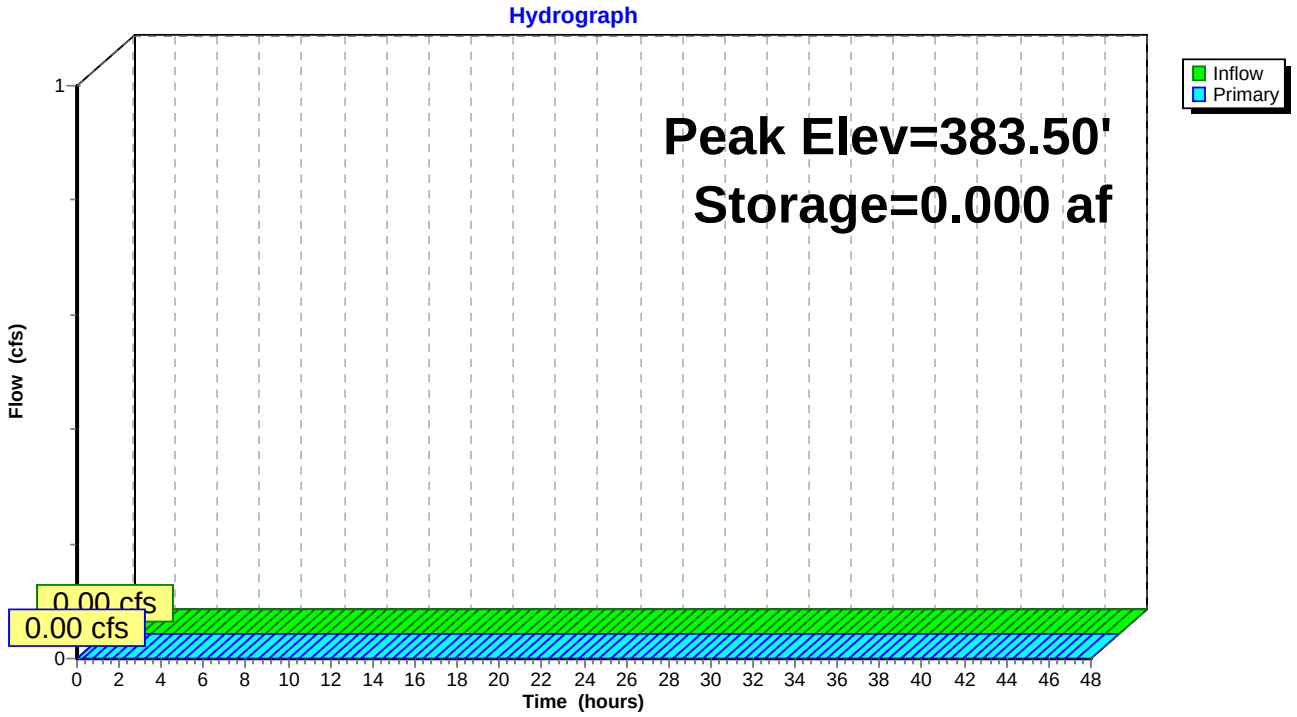
Volume	Invert	Avail.Storage	Storage Description
#1	383.50'	3,250.000 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
383.50	1,000.000	0.000	0.000
384.00	2,000.000	750.000	750.000
385.00	3,000.000	2,500.000	3,250.000

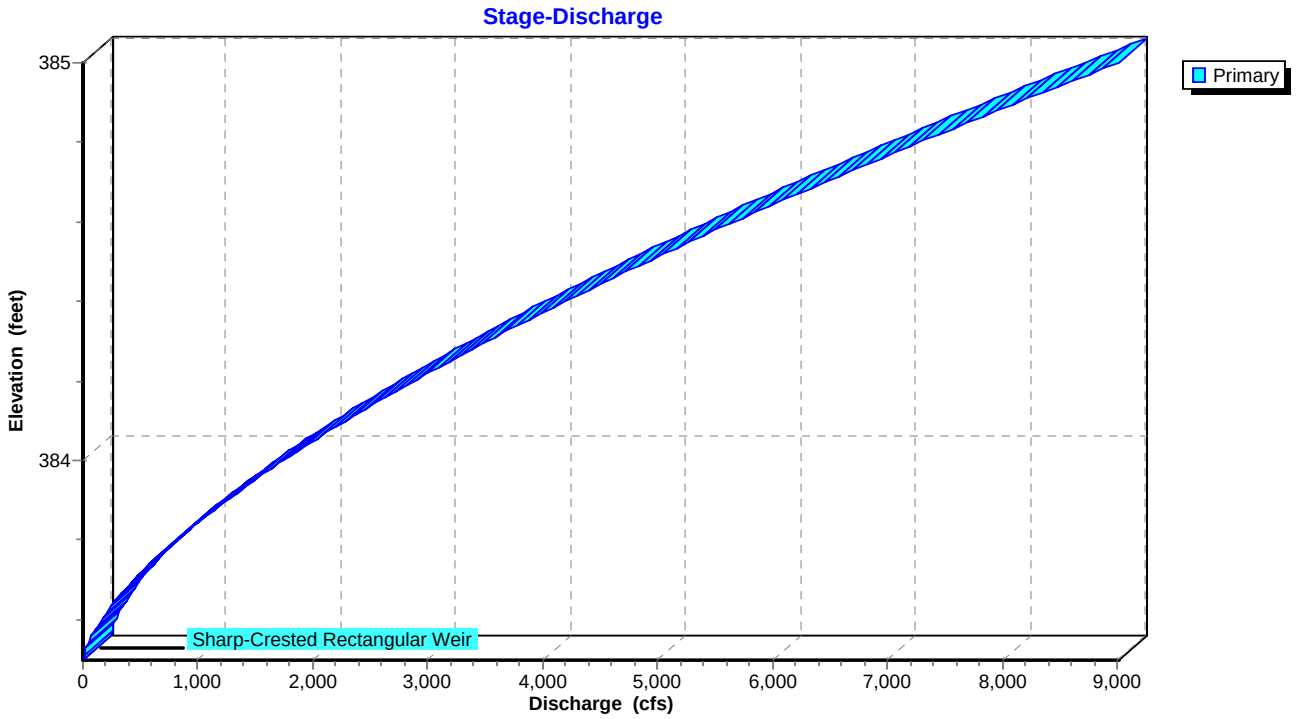
Device	Routing	Invert	Outlet Devices
#1	Primary	383.50'	**1,500.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=383.50' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

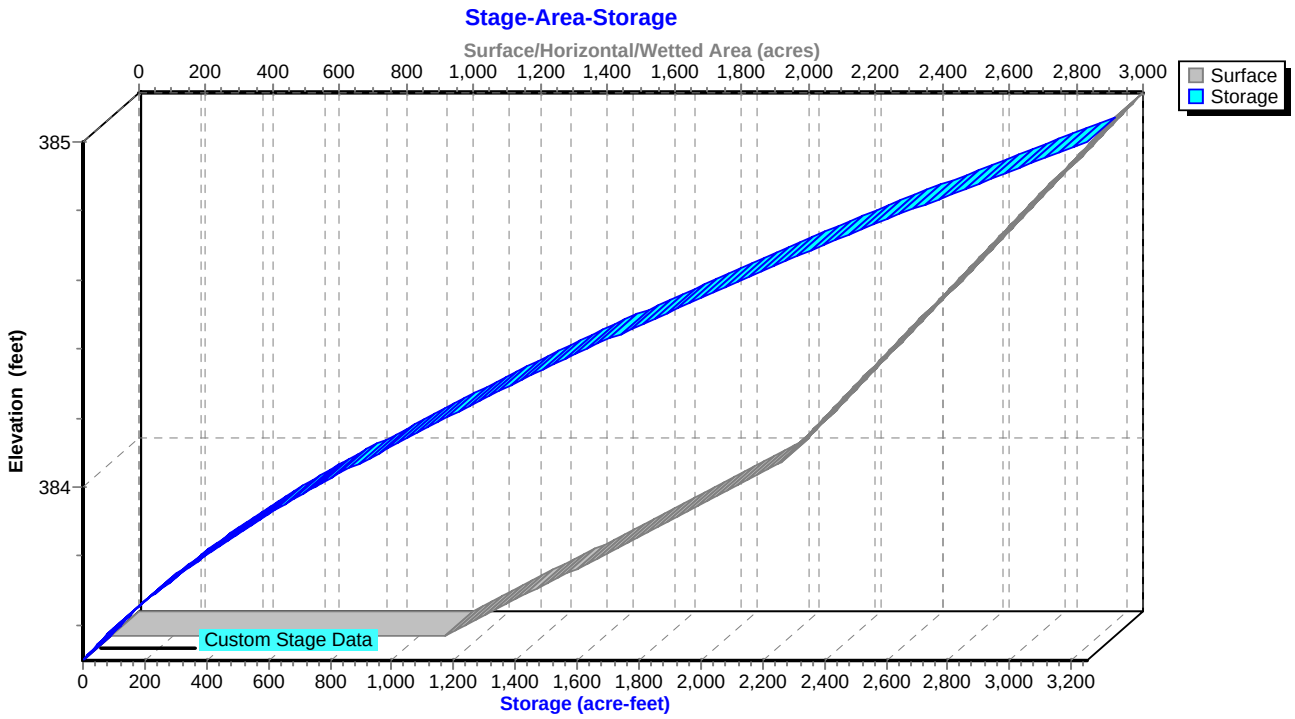
Pond 3P: Ohio River



Pond 3P: Ohio River



Pond 3P: Ohio River



Hydrograph for Pond 3P: Ohio River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	**0.00**	**383.50**	**0.00**
0.50	0.00	383.50	0.00
1.00	0.00	383.50	0.00
1.50	0.00	383.50	0.00
2.00	0.00	383.50	0.00
2.50	0.00	383.50	0.00
3.00	0.00	383.50	0.00
3.50	0.00	383.50	0.00
4.00	0.00	383.50	0.00
4.50	0.00	383.50	0.00
5.00	0.00	383.50	0.00
5.50	0.00	383.50	0.00
6.00	0.00	383.50	0.00
6.50	0.00	383.50	0.00
7.00	0.00	383.50	0.00
7.50	0.00	383.50	0.00
8.00	0.00	383.50	0.00
8.50	0.00	383.50	0.00
9.00	0.00	383.50	0.00
9.50	0.00	383.50	0.00
10.00	0.00	383.50	0.00
10.50	0.00	383.50	0.00
11.00	0.00	383.50	0.00
11.50	0.00	383.50	0.00
12.00	0.00	383.50	0.00
12.50	0.00	383.50	0.00
13.00	0.00	383.50	0.00
13.50	0.00	383.50	0.00
14.00	0.00	383.50	0.00
14.50	0.00	383.50	0.00
15.00	0.00	383.50	0.00
15.50	0.00	383.50	0.00
16.00	0.00	383.50	0.00
16.50	0.00	383.50	0.00
17.00	0.00	383.50	0.00
17.50	0.00	383.50	0.00
18.00	0.00	383.50	0.00
18.50	0.00	383.50	0.00
19.00	0.00	383.50	0.00
19.50	0.00	383.50	0.00
20.00	0.00	383.50	0.00
20.50	0.00	383.50	0.00
21.00	0.00	383.50	0.00
21.50	0.00	383.50	0.00
22.00	0.00	383.50	0.00
22.50	0.00	383.50	0.00
23.00	0.00	383.50	0.00
23.50	0.00	383.50	0.00
24.00	0.00	383.50	0.00
24.50	0.00	383.50	0.00
25.00	0.00	383.50	0.00
25.50	0.00	383.50	0.00
26.00	0.00	383.50	0.00
26.50	0.00	383.50	0.00
27.00	0.00	383.50	0.00
27.50	0.00	383.50	0.00
28.00	0.00	383.50	0.00
28.50	0.00	383.50	0.00
29.00	0.00	383.50	0.00
29.50	0.00	383.50	0.00
30.00	0.00	383.50	0.00
30.50	0.00	383.50	0.00
31.00	0.00	383.50	0.00
31.50	0.00	383.50	0.00
32.00	0.00	383.50	0.00
32.50	0.00	383.50	0.00
33.00	0.00	383.50	0.00
33.50	0.00	383.50	0.00
34.00	0.00	383.50	0.00
34.50	0.00	383.50	0.00
35.00	0.00	383.50	0.00
35.50	0.00	383.50	0.00
36.00	0.00	383.50	0.00
36.50	0.00	383.50	0.00
37.00	0.00	383.50	0.00
37.50	0.00	383.50	0.00
38.00	0.00	383.50	0.00
38.50	0.00	383.50	0.00
39.00	0.00	383.50	0.00
39.50	0.00	383.50	0.00
40.00	0.00	383.50	0.00
40.50	0.00	383.50	0.00
41.00	0.00	383.50	0.00
41.50	0.00	383.50	0.00
42.00	0.00	383.50	0.00
42.50	0.00	383.50	0.00
43.00	0.00	383.50	0.00
43.50	0.00	383.50	0.00
44.00	0.00	383.50	0.00
44.50	0.00	383.50	0.00
45.00	0.00	383.50	0.00
45.50	0.00	383.50	0.00
46.00	0.00	383.50	0.00
46.50	0.00	383.50	0.00
47.00	0.00	383.50	0.00
47.50	0.00	383.50	0.00
48.00	0.00	383.50	0.00

Summary for Pond 8P: Gypsum Pond

Process Flow FGD Waste and Clarified River Water total to 0.131 MGD per the process flow diagram supplied by the Vectren. Which equals 0.20cfs.

Starting WSE = 386.5'

Volume calculated based on 11-30-16 topographic survey.

Inflow	=	6.17 cfs @	16.79 hrs,	Volume=	6.057 af, Incl. 0.20 cfs Base Flow
Outflow	=	0.42 cfs @	6.58 hrs,	Volume=	0.255 af, Atten= 93%, Lag= 0.0 min
Primary	=	0.42 cfs @	6.58 hrs,	Volume=	0.255 af
Secondary	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af

Routing by Sim-Route method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 390.98' @ 48.00 hrs Surf.Area= 0.000 ac Storage= 5.802 af

Plug-Flow detention time= 770.2 min calculated for 0.255 af (4% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	386.00'	9.040 af	**Custom Stage Data** Listed below

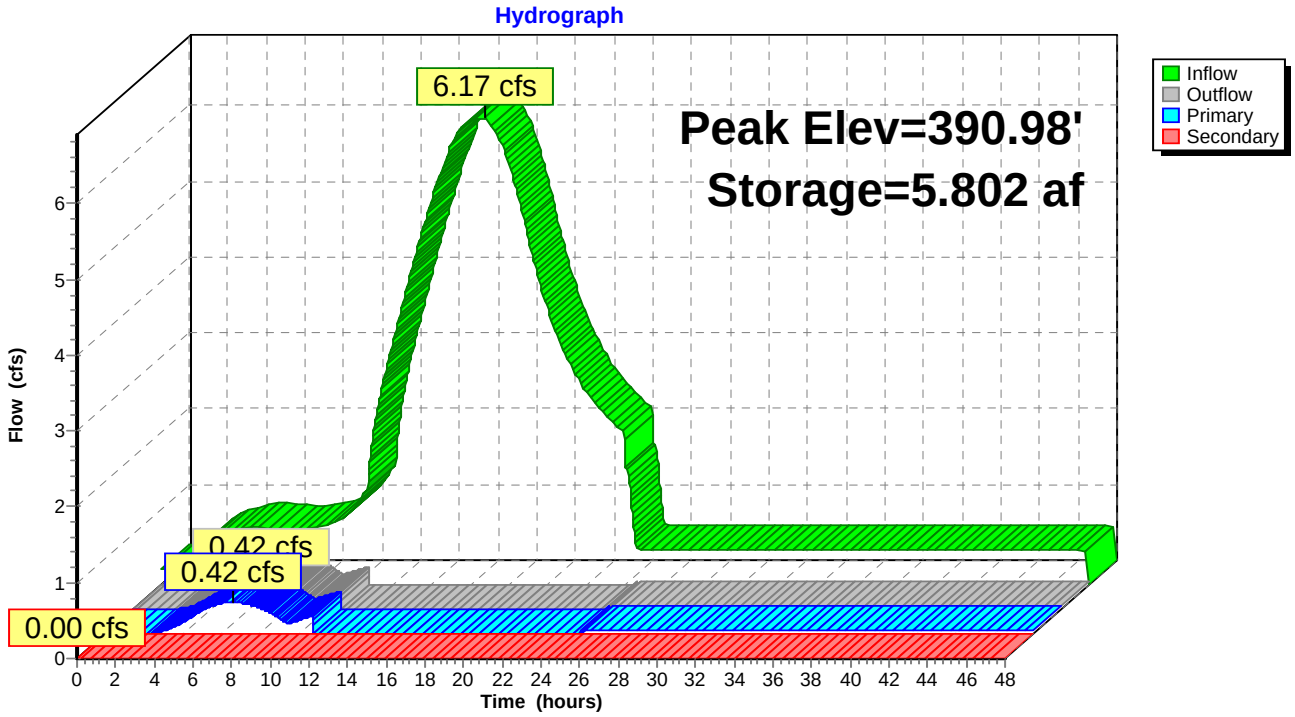
Elevation (feet)	Cum.Store (acre-feet)
386.00	0.000
387.00	0.430
388.00	1.610
389.00	2.960
390.00	4.370
391.00	5.830
392.00	7.370
393.00	9.040

Device	Routing	Invert	Outlet Devices
#1	Primary	386.07'	**24.0" Round Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 386.07' / 385.82' S= 0.0027 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	392.00'	**250.0' long x 50.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

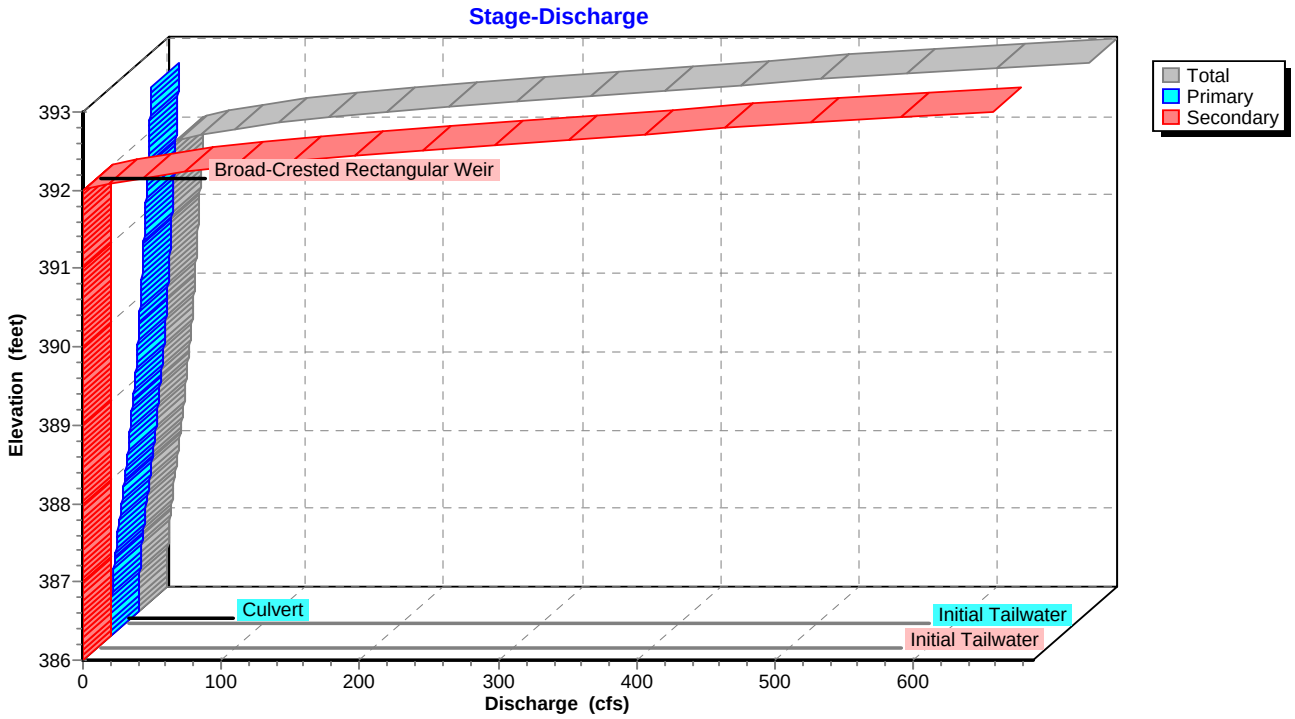
Primary OutFlow Max=0.41 cfs @ 6.58 hrs HW=386.54' TW=386.43' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.41 cfs @ 1.12 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=386.00' TW=386.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

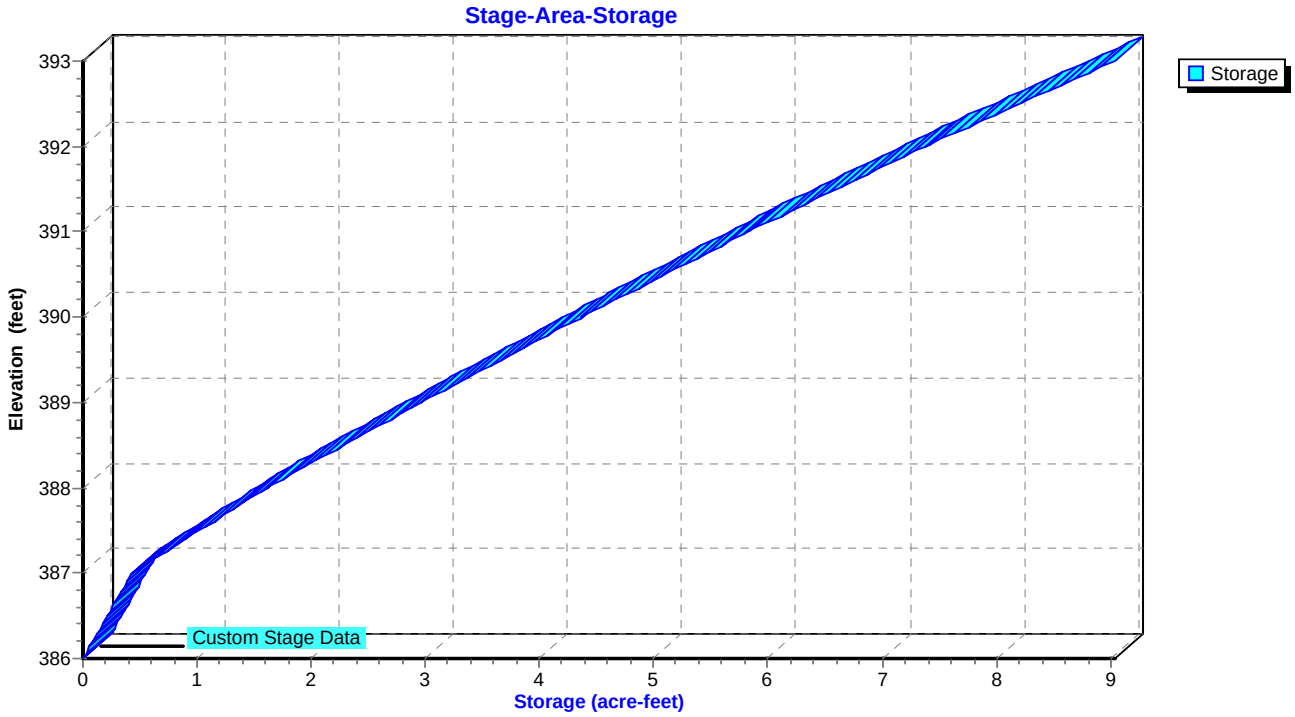
Pond 8P: Gypsum Pond



Pond 8P: Gypsum Pond



Pond 8P: Gypsum Pond



Hydrograph for Pond 8P: Gypsum Pond

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.20	0.000	386.00	0.00	0.00	**0.00**
1.00	0.21	0.017	386.04	0.00	0.00	0.00
2.00	0.47	0.044	386.10	0.00	0.00	0.00
3.00	0.65	0.091	386.21	0.04	0.04	0.00
4.00	0.72	0.141	386.33	0.16	0.16	0.00
5.00	0.76	0.183	386.43	0.31	0.31	0.00
6.00	0.74	0.216	386.50	**0.40**	**0.40**	0.00
7.00	0.71	0.242	386.56	**0.41**	**0.41**	0.00
8.00	0.76	0.270	386.63	0.34	0.34	0.00
9.00	0.83	0.312	386.73	0.21	0.21	0.00
10.00	1.02	0.373	386.87	0.18	0.18	0.00
11.00	2.03	0.467	387.03	0.00	0.00	0.00
12.00	3.21	0.687	387.22	0.00	0.00	0.00
13.00	4.19	0.993	387.48	0.00	0.00	0.00
14.00	5.08	1.376	387.80	0.00	0.00	0.00
15.00	5.81	1.826	388.16	0.00	0.00	0.00
16.00	**6.11**	2.322	388.53	0.00	0.00	0.00
17.00	**6.11**	2.830	388.90	0.00	0.00	0.00
18.00	5.56	3.314	389.25	0.00	0.00	0.00
19.00	4.58	3.736	389.55	0.00	0.00	0.00
20.00	3.64	4.073	389.79	0.00	0.00	0.00
21.00	3.00	4.347	389.98	0.00	0.00	0.00
22.00	2.54	4.576	390.14	0.00	0.00	0.00
23.00	2.25	4.773	390.28	0.00	0.00	0.00
24.00	1.77	4.948	390.40	0.00	0.00	0.00
25.00	0.46	5.018	390.44	0.04	0.04	0.00
26.00	0.45	5.052	390.47	0.04	0.04	0.00
27.00	0.45	5.086	390.49	0.04	0.04	0.00
28.00	0.45	5.121	390.51	0.04	0.04	0.00
29.00	0.45	5.155	390.54	0.04	0.04	0.00
30.00	0.45	5.189	390.56	0.04	0.04	0.00
31.00	0.45	5.223	390.58	0.04	0.04	0.00
32.00	0.45	5.257	390.61	0.04	0.04	0.00
33.00	0.45	5.291	390.63	0.04	0.04	0.00
34.00	0.45	5.325	390.65	0.04	0.04	0.00
35.00	0.45	5.359	390.68	0.04	0.04	0.00
36.00	0.45	5.393	390.70	0.04	0.04	0.00
37.00	0.45	5.427	390.72	0.04	0.04	0.00
38.00	0.45	5.461	390.75	0.04	0.04	0.00
39.00	0.45	5.496	390.77	0.04	0.04	0.00
40.00	0.45	5.530	390.79	0.04	0.04	0.00
41.00	0.45	5.564	390.82	0.04	0.04	0.00
42.00	0.45	5.598	390.84	0.04	0.04	0.00
43.00	0.45	5.632	390.86	0.04	0.04	0.00
44.00	0.45	5.666	390.89	0.04	0.04	0.00
45.00	0.45	5.700	390.91	0.04	0.04	0.00
46.00	0.45	5.734	390.93	0.04	0.04	0.00
47.00	0.45	5.768	390.96	0.04	0.04	0.00
48.00	0.00	**5.802**	**390.98**	0.04	0.04	0.00

9400 Amberglen Boulevard
Austin, Texas 78729
1-512-454-4797

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.