

October 7, 2016

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

**Initial Inflow Design Flood Control System Plan
Ash Pond A
EPA Final CCR Rule
TVA Gallatin Fossil Plant
Sumner County, Tennessee**

1.0 PURPOSE

This letter documents AECOM's certification of the initial inflow design flood control system plan for the TVA Gallatin Fossil (GAF) Plant's Ash Pond A. Based on the assessment, the Ash Pond A complies with the inflow design flood control requirements in the Final CCR Rule 40 CFR 257.82.

2.0 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

As described in 40 CFR 257.82(c), an inflow design flood control system plan must be prepared to document how the inflow design flood control system has been designed and constructed to manage the design storm required by the hazard classification. Based on Hazard Potential Classification the Ash Pond A has been assigned a significant hazard potential classification rating. Thus, the 1,000 year storm event was selected from §257.82(a)(3) as the inflow design storm flood event based upon a hazard potential classification.

3.0 SUMMARY OF FINDINGS

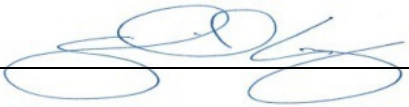
The attached plan presents the analysis of the inflow design flood control system for the Ash Pond A. The resulting water surface elevations are shown in the following table. The plan and results show that the impoundment meets the requirements set forth in 40 CFR 257.82(a) and (b).

Plant	Facility	Inflow Design Storm	Water Surface Elevation (feet)	Minimum Embankment Elevation (feet)
GAF	Ash Pond A	1,000 year	468.0	473.5

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Gabriel W. Lang, PE, being a Professional Engineer in good standing in the State of Tennessee do hereby certify, to the best of my knowledge, information, and belief:

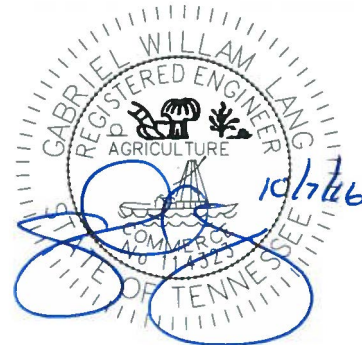
1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below; and
3. that the inflow design flood control system plan for the TVA Gallatin Fossil Plant's Ash Pond A meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE  _____ DATE 10/7/2016

ADDRESS: AECOM
1600 Perimeter Park Drive
Morrisville, NC 27560

TELEPHONE: (919) 461-1100

ATTACHMENTS: Initial Inflow Design Flood Control System Plan (40 CFR 257.8) For Coal Combustion Residuals (CCR) - Existing Surface Impoundments
TVA - Ash Pond A, Gallatin Fossil Plant, Sumner County, Tennessee



COAL COMBUSTION PRODUCT DISPOSAL PROGRAM

TENNESSEE VALLEY AUTHORITY – ASH POND A
GALLATIN FOSSIL PLANT
SUMNER COUNTY, TENNESSEE

INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN (40 CFR §257.82) FOR COAL COMBUSTION RESIDUALS (CCR) EXISTING SURFACE IMPOUNDMENTS

Prepared for



Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402-2801

October 7, 2016 - Rev0



Prepared by





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1. BACKGROUND

This plan outlines compliance to Rule **§ 257.82** of the EPA Final CCR Rule.

The owner or operator of an existing CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in Rule **§257.82 (a)**, which is directly stated below for clarity.

Rule **§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 inflow design flood.

Rule **§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.

Rule **§257.82(a)(3)**: The inflow design flood is:

- (i): For a high hazard potential CCR surface impoundment, the probable maximum flood;
- (ii): For a significant hazard potential CCR surface impoundment, the 1,000-year flood;
- (iii): For a low hazard potential CCR surface impoundment, the 100-year flood; or
- (iv): For an incised CCR surface impoundment, the 25-year flood.

According to Rule **§257.82(b)**, discharge from the CCR unit must be handled in accordance with the surface water requirements under **§257.3-3**.

Section **§257.82(c)(1)** states that the owner or operator must prepare initial and periodic inflow design flood control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4). The plans must document how the inflow design flood control system has been designed and constructed to meet the requirements of the section. Each plan must be supported by appropriate engineering calculations. The owner or operator of the CCR unit has completed the inflow design flood control system plan when the plan has been placed in the facility's operation record.

Section **§257.82(c)(2)** allows amendments to the written inflow design flood control system plan at any time and requires amendments to the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect. The revised plan must be placed in the facility's operating record.

Section **§257.82(c)(3)** requires that the initial inflow design flood control system plan be completed no later than October 17, 2016.

Section **§257.82(c)(4)** states that the owner or operator must prepare periodic inflow design flood control system plans every five years.

Section **§257.82(c)(5)** requires a certification from a qualified professional engineer stating that the initial and periodic inflow design flood controls system plans meet the requirements of Rule **§257.82**.

According to Rule **§257.82(d)**, the owner or operator must comply with recordkeeping, notification, and internet requirements specified elsewhere in the Rule.

1.1 SITE LOCATION

TVA owns and operates the Gallatin Fossil Plant (GAF) facility. The plant is located at 1499 Steam Plant Road in Sumner County, Tennessee on the north bank of the Cumberland River, approximately four miles southeast of the center of the City of Gallatin.

The property occupies approximately 1,730 acres of land along the Cumberland River (Old Hickory Lake). Plant facilities are located on the south portion of the peninsula. The Ash Pond Complex is located north of the fossil plant facilities. The Ash Pond Complex is comprised of Ash Pond A, Middle Pond A, Bottom Ash Pond, and Ash Pond E. The Stilling Ponds B, C, and D are part of the GAF's stormwater conveyance system and wastewater treatment. Refer to Figure 1: Site Location Map.



Figure 1: Site Location Map

1.2 SITE HISTORY

Ash Pond A (Pond A) is located in the northeast corner of the GAF complex and receives bottom ash from the sluice ditch. The sluice ditch alignment starts at Bottom Ash Pond, then flows through Middle Pond A and discharges in Pond A. Therefore, Pond A is hydraulically connected to Bottom Ash Pond and Middle Pond A, via the sluice ditch and attenuated stormwater flows. Under normal operating conditions, the sluice ditch receives continuous process flow. Pond A also receives storm water runoff from the Rail Loop areas and the North Railroad Loop (NRL) Landfill.

2. EXISTING CONDITIONS - § 257.82(a)(1)

Based on the 2015 aerial survey, Pond A covers an area of approximately 261 acres. The offsite drainage tributary to Pond A watershed covers an additional area of approximately 262 acres. As shown on Figure 2, the offsite drainage area was broken into eight (8) sub-drainage areas (Sub-Basins 1 through 8) to reflect the drainage characteristics of the topography and land use. The offsite drainage in the southeast corner of Pond A (labeled as Sub-Basin 8 on Figure 2) consists of the recently built eastern cell (Cell No. 1) of the NRL Landfill. This area drains to Sediment Basin No. 1 and is released via Sediment Basin No. 1 outlet structure. The offsite drainage area labeled as Sub-Basin 7 is the future location of the NRL Landfill, (Cell No. 2). The drainage from this area is conveyed via a newly built outlet structure. The drainage from the Rail Loop (Sub-Basins 5 and 6), Middle Pond A (Sub-Basins 3 and 4), and Bottom Ash Pond (Sub-Basins 1 and 2) are all conveyed via multiple culvert structures listed in more detail in Section 3 – Methodology/Design Criteria.



Figure 2: Drainage Area Map

Pond A has six (6) identical siphons outlets located in the north end of the pond. The siphon system is the primary spillway set to keep normal water surface elevation at 463.0 feet (vertical datum currently used on GAF is NAVD88). The secondary spillway consists of three “Morning Glory” spillways with 48-inch diameter concrete risers topped with stainless weir rings set at elevation 464.2 feet. The openings are equipped with 60-inch diameter steel skimmers. The triple secondary spillways discharge through 30-inch diameter, reinforced concrete pipes. The 30-inch pipes discharge to the Stilling Pond B at an invert elevation of 451.5 feet. The normal water surface elevation of Stilling Pond B is 456.5 feet.

3. METHODOLOGY/DESIGN CRITERIA

The purpose of the analysis was to examine the adequacy of Pond A to safely store and pass stormwater flows resulting from the Inflow Design Flood (IDF). Based on Hazard Potential Classification Assessment (Reference 3), Pond A is considered a significant hazard unit. Therefore the 1000-year, 6-hr flood is selected for the IDF.

The 6-hour, 1000-year precipitation depth was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 2, Version 3. In addition to the typical SCS Type II temporal distribution, “Early Peak” and “Late Peak” distributions were analyzed as first presented in the GAF Complex Breach Analysis (Reference 5). Table 1 summarizes the storm events and temporal distributions used for the analysis.

Table 1: IDF Characteristics

Reoccurrence Interval	Storm Duration	Rainfall	Storm Distribution
1,000 year	6 hours	7.11 inches	SCS Type II
1,000 year	6 hours	7.11 inches	Early Peak
1,000 year	6 hours	7.11 inches	Late Peak

An H&H computer model (HEC-HMS, version 4.1) was developed to examine the hydraulic behavior of Pond A during all three storm events. The model inputs included (1) a stage-storage relationship for Pond A, (2) watershed characteristics, (3) offsite drainage area culverts and outlet structure data, (4) an stage-discharge curve for Pond A outlet structure, and (5) base flow conditions. These hydrologic inputs are described as follows:

(1) Stage-storage curves used in the HEC-HMS are included in Appendix B1. Pond A storage capacity was developed based upon:

- Lidar, aerial mapping performed by Tuck Mapping Solutions, Inc. dated July, 2015;
- Bathymetric survey and plans and reports provided by TVA field data dated collected by TVA surveying personnel dated 2016; and
- Observations made during site visits by AECOM personnel.

(2) Runoff characteristics for the drainage areas are listed in Table 2 below.



Table 2: Pond E Watershed Characteristics for HMS

Description	HMS node	Area (acres)	Curve Number (CN)	Lag Time (min)
Bottom Ash Pond	Sub-basin 1	4.0	90	12
Bottom Ash Pond	Sub-basin 2	21.1	80	12
Middle Pond A	Sub-basin 3	1.9	90	3
Middle Pond A	Sub-basin 4	30.4	90	11
West Loop 1	Sub-basin 5	68.4	70	22
West Loop 2	Sub-basin 6	56.4	70	26
Railroad Loop Landfill Cell 1	Sub-basin 7	21.9	70	14
Railroad Loop Landfill Cell 2	Sub-basin 8	58.1	80	6
Pond A	Sub-basin 9	260.8	87	22

(3) As-built survey, as well as field observations, were used to gather information on the existing culverts and outlet structures and are summarized in Table 3.

Table 3: Culvert/Outlet Structure Data

HMS Node	Type	Description
Sub-basin 1	Culvert	3 x 48" RCP
Sub-basin 2	Culvert	48" CMP & 36" RCP
Sub-basin 3	Culvert	48" RCP
Sub-basin 4	Culvert	2x48" RCP and 48" HDPE (44.5" ID)
Sub-basin 5	Culvert	4 x 24" HDPE
Sub-basin 6	Culvert	3 x 36" HDPE
Sub-basin 7	Outlet & Emergency Spillway	2 x 24" RCP
Sub-basin 8	Outlet & Emergency Spillway	2 x 24" RCP

- (4) The stage-discharge curve for Pond A outlet was developed using U.S. EPA SWMM (Version 5.1) program. A SWMM model included modeling six siphon outlets, three “Morning Glory” spillways, and 30-inch outlet pipes into Stilling Pond B. Since Pond A outlet discharges into Stilling Pond B, Dynamic Wave routing method was selected to include effects of tailwater into the calculations. The input parameters included tailwater conditions for all three modeled storm events as shown in Table 4. The tailwater conditions were calculated using the GAF HydroCAD model (Reference 7). The SWMM model layout and output results are presented in Appendix B2.

Table 4: Tailwater Elevation for Pond A Outlet

Storm Event	Temporal Distribution	Tailwater Elevation, TW (NAV83, ft)	Tailwater Depth TW-451.5' (ft)
1000-yr, 6-hr	Type II	458.3	7.3
1000-yr, 6-hr	Early Peak	458.12	7.2
1000-yr, 6-hr	Late Peak	458.2	7.2

- (5) Total base process flows entering Bottom Ash Pond from the coal yard runoff ditch and the bottom ash sluice stream were estimated to be 30.21 cfs based on the NPDES permit schematic provided in Appendix B3. The coal yard runoff ditch process flows may also be diverted away from Bottom Ash Pond and discharged instead to Pond E. However, this analysis assumes that these wastewater flows enter Bottom Ash Pond in order to model the most conservative flow scenario for the unit.

4. CALCULATION RESULTS - §257.82(a)(2)

The hydrologic modeling results were reviewed to determine the performance of Pond A during the 1000-year, 6-hour storm. Table 5 contains the estimated peak inflow and estimated peak water surface elevation for the modeled storm events. The outlet structure safely passes the design storm flows with the maximum water surface elevation being 468.0 feet, approximately 3.8-feet above the secondary spillway weir at elevation 464.2 feet. The top of the divider dike separating Pond A from Pond E and the Stilling Ponds is at an elevation of approximately 473.5 feet, providing 5.5-feet of freeboard. The model layout and output results are provided in Appendix A.

Table 5: Estimated Peak Inflow and Peak Pool Elevation

Storm Event	Peak Inflow (cfs)	Max. Pool Elevation (NAV83, ft)	Freeboard to Top of Divider Dike (ft)
1000-yr, 6-hr, Type II	1376	468.0	5.5
1000-yr, 6-hr, Early Peak	1376	467.9	5.6
1000-yr, 6-hr, Late Peak	1262	465.8	7.7

5. CONCLUSIONS

The inflow design flood control system adequately manages flow into the CCR unit during and following the peak discharge of the inflow design flood. Discharge is handled in accordance with the surface water requirements under § 257.82.

6. REFERENCES

1. Environmental Protection Agency, "Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities", Federal Register, April 17, 2015.
2. Bonnin G. M. et al, NOAA Atlas 14, Precipitation Frequency Atlas of the United States, Volume 2, Version 3, 2006.
3. Stantec Consulting Services Inc., "Ash Pond A, Hazard Potential Classification Assessment, Gallatin Fossil Plant, Sumner County, Tennessee", September 8, 2015.
4. United States Army Corps of Engineers, Hydrologic Modeling System (HEC-HMS), Version 4.1, July 31, 2015.
5. Stantec Consulting Services Inc., "Report of Breach Analysis, Ash Pond Complex, Gallatin Fossil Plant, Sumner County, Tennessee", September 25, 2013.
6. U.S. Environmental Protection Agency, Storm Water Management Model (SWMM), Version 5.1, September 30, 2015.
7. AECOM Inc., HydroCAD Version 10 electronic files, "100% Design of Ash Pond Lowering and Flow Diversion Project", January 21, 2016.
8. OHM Advisors Inc., As-Built Drawings, "Ash Haul Road A, 57 Stone Subgrade, TVA Project ID 604756", September 18, 2015.
9. AECOM Inc., Issued for Construction Drawings, "Spillway Modification Details, Ash Pond Lowering and Flow Diversion", Drawing No. 10W510-9, January 8, 2016.
10. URS Inc., As-Built Drawings, "Class II Disposal Facility, North Rail Loop Site, Cell 1 Construction", March 31, 2016.
11. Tennessee Valley Authority, Gallatin Fossil Plant Flow Schematic Diagram, NPDES Permit No. TN0005428, May 2009 and updated June 2016.

APPENDIX A

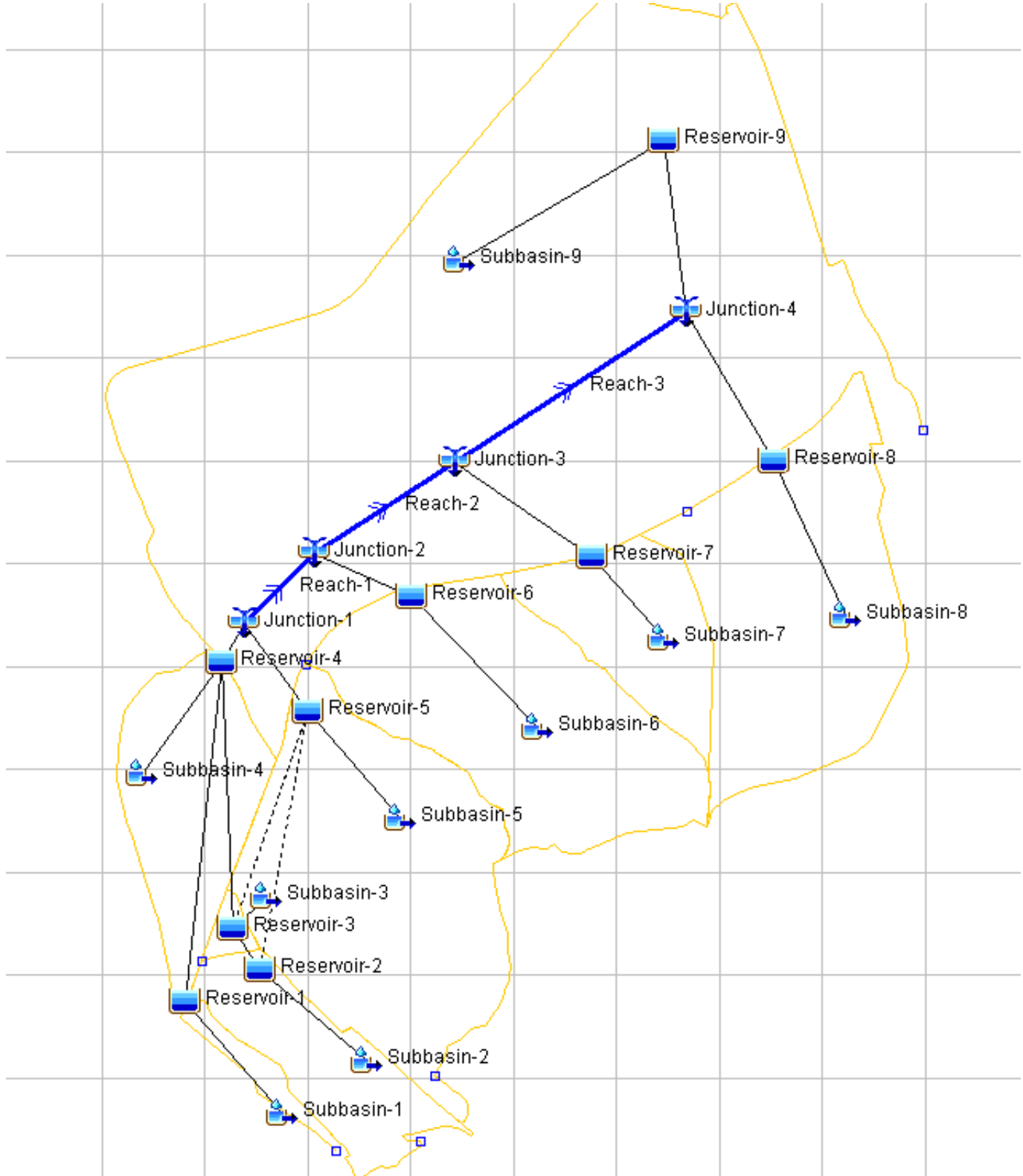
HEC-HMS OUTPUT RESULTS



HEC-HMS

Project : Pond A

Basin Model : Pond A watershed
Jul 27 23:20:33 EDT 2016



Project: Pond A Simulation Run: 1000 yr, 6hr, Type II

Start of Run: 23May2016, 00:00

Basin Model: Pond A watershed

End of Run: 23May2016, 06:00

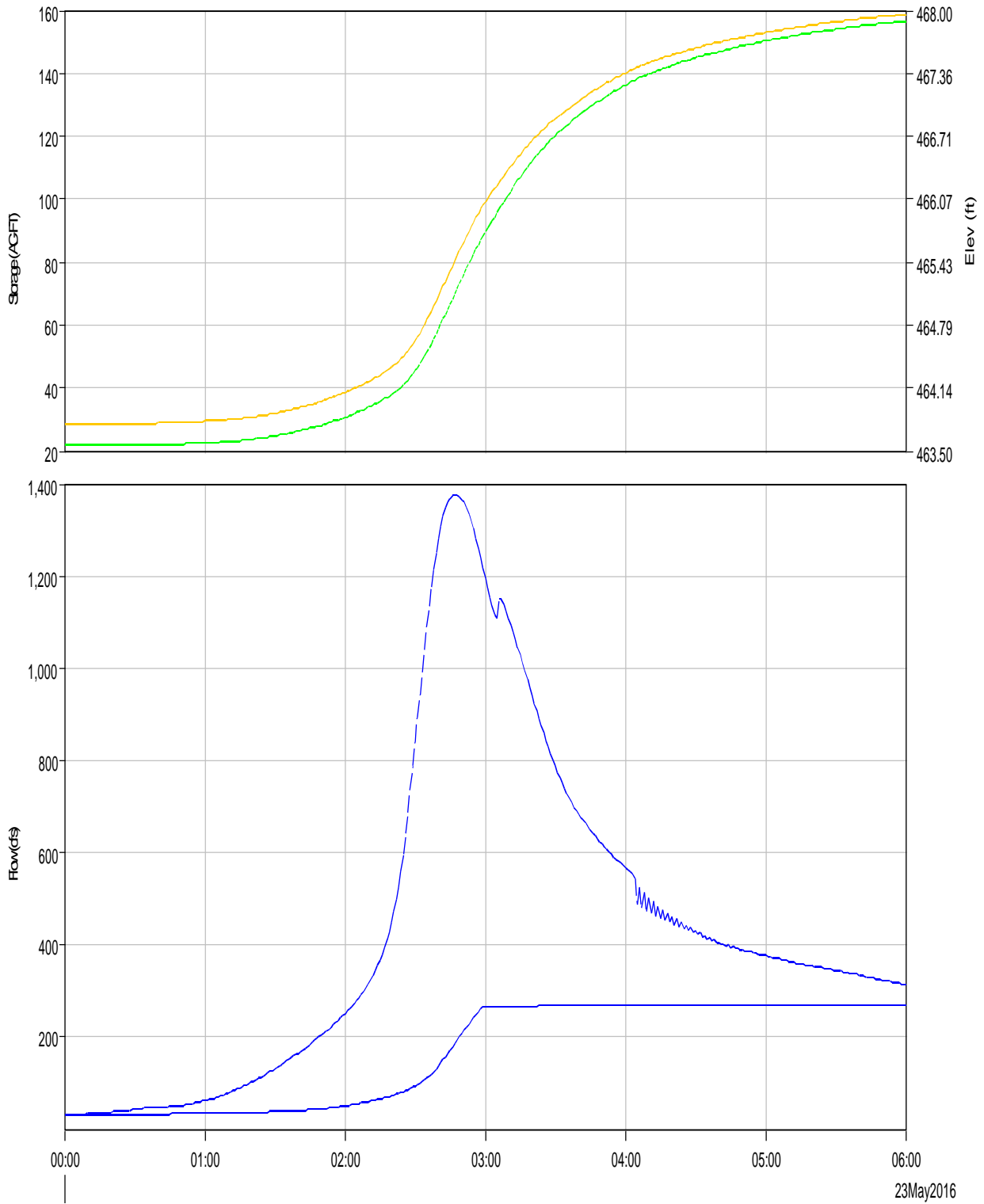
Meteorologic Model: 1000 yr 6 hr - Type

Compute Time: 29Sep2016, 10:13:27

Control Specifications: 6 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Subbasin-5	0.10680	206.9	23May2016, 02:46	23.0
Reservoir-5	0.10680	211.2	23May2016, 02:48	23.4
Subbasin-4	0.0474824	184.1	23May2016, 02:34	14.7
Subbasin-2	0.0329521	107.5	23May2016, 02:35	9.0
Reservoir-2	0.0329521	37.0	23May2016, 02:54	4.9
Subbasin-3	0.0029290	15.5	23May2016, 02:25	0.9
Reservoir-3	0.0358811	33.5	23May2016, 03:07	5.5
Subbasin-1	0.0062741	54.2	23May2016, 02:35	17.0
Reservoir-1	0.0062741	48.3	23May2016, 02:43	17.0
Reservoir-4	0.0896376	160.7	23May2016, 02:48	36.4
Junction-1	0.1964376	371.9	23May2016, 02:48	59.8
Reach-1	0.1964376	371.9	23May2016, 02:54	59.3
Subbasin-6	0.0881506	155.5	23May2016, 02:50	18.8
Reservoir-6	0.0881506	32.0	23May2016, 02:41	9.7
Junction-2	0.2845882	403.9	23May2016, 02:54	69.0
Reach-2	0.2845882	403.9	23May2016, 02:59	68.4
Subbasin-7	0.0342067	83.4	23May2016, 02:38	7.5
Reservoir-7	0.0342067	37.9	23May2016, 02:58	6.9
Junction-3	0.3187949	441.7	23May2016, 02:59	75.2
Reach-3	0.3187949	441.7	23May2016, 03:12	73.3
Subbasin-8	0.0908375	356.9	23May2016, 02:29	24.5
Reservoir-8	0.0908375	97.6	23May2016, 02:42	22.4
Junction-4	0.4096324	538.9	23May2016, 03:12	95.8
Subbasin-9	0.40941	1117.9	23May2016, 02:45	121.7
Reservoir-9	0.8190424	269.0	23May2016, 06:00	82.6

Reservoir "Reservoir-9" Results for Run "1000 yr, 6hr, Type II"



--- Run:1000 yr, 6hr, Type II Element:Reservoir-9 Result:Storage
--- Run:1000 yr, 6hr, Type II Element:Reservoir-9 Result:Pool Elevation
--- Run:1000 yr, 6hr, Type II Element:Reservoir-9 Result:Outflow
--- Run:1000 yr, 6hr, Type II Element:Reservoir-9 Result:Combined Inflow

Project: Pond A Simulation Run: 1000 yr, 6hr, Type II
Reservoir: Reservoir-9

Start of Run: 23May2016, 00:00	Basin Model: Pond A watershed
End of Run: 23May2016, 06:00	Meteorologic Model: 1000 yr 6 hr - Type II
Compute Time: 29Sep2016, 10:13:27	Control Specifications: 6 hr

Volume Units: AC-FT

Computed Results

Peak Inflow: 1376.2 (CFS)	Date/Time of Peak Inflow: 23May2016, 02:47
Peak Discharge: 269.0 (CFS)	Date/Time of Peak Discharge: 23May2016, 06:00
Inflow Volume: 217.4 (AC-FT)	Peak Storage: 156.5 (AC-FT)
Discharge Volume: 82.6 (AC-FT)	Peak Elevation: 468.0 (FT)

Project: Pond A Simulation Run: 1000 yr, 6hr, Early

Start of Run: 23May2016, 00:00

Basin Model: Pond A watershed

End of Run: 23May2016, 06:00

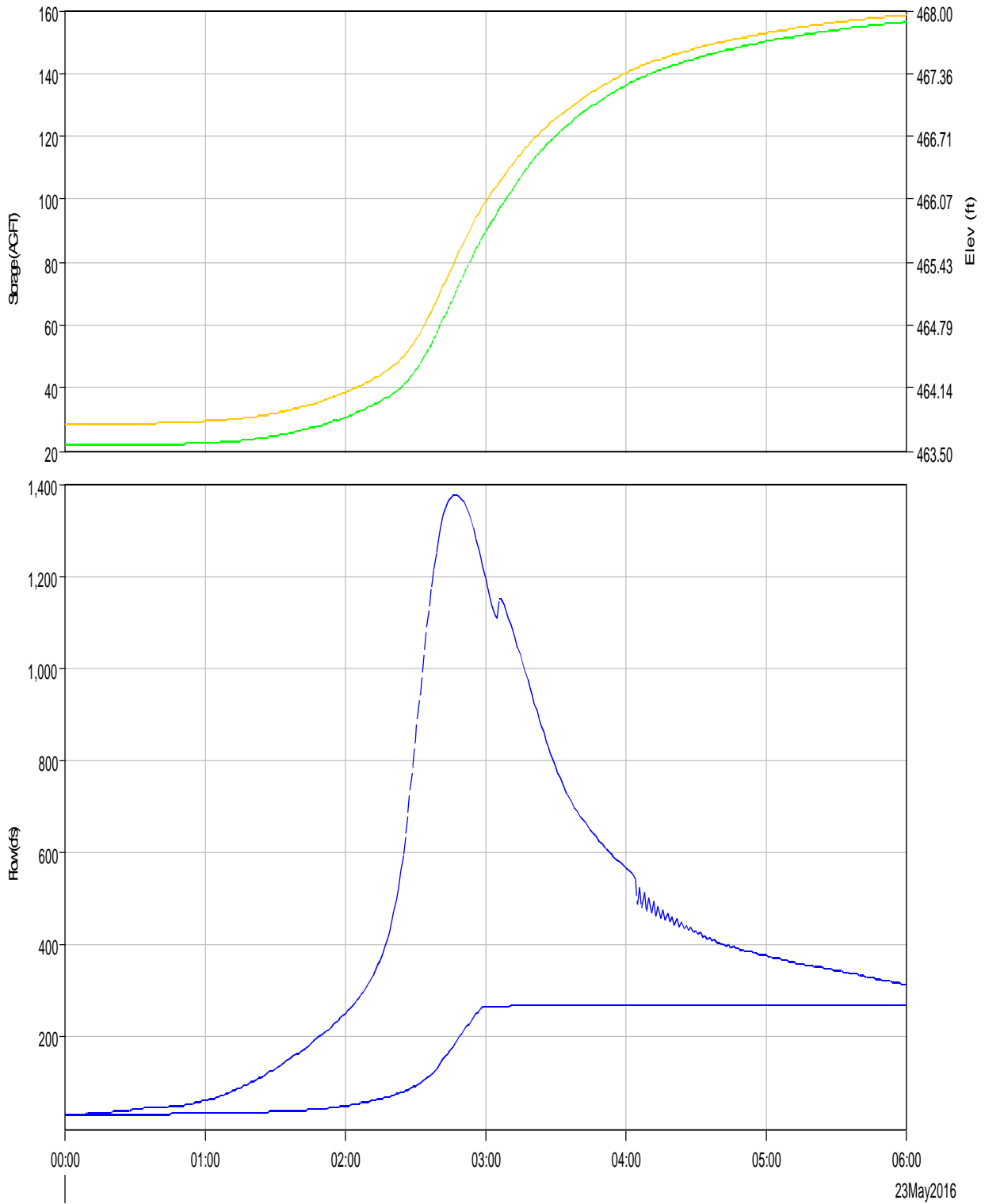
Meteorologic Model: 1000 yr 6 hr - Early

Compute Time: 29Sep2016, 10:10:19

Control Specifications: 6 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Subbasin-5	0.10680	206.9	23May2016, 02:46	23.0
Reservoir-5	0.10680	211.2	23May2016, 02:48	23.4
Subbasin-4	0.0474824	184.1	23May2016, 02:34	14.7
Subbasin-2	0.0329521	107.5	23May2016, 02:35	9.0
Reservoir-2	0.0329521	37.0	23May2016, 02:54	4.9
Subbasin-3	0.0029290	15.5	23May2016, 02:25	0.9
Reservoir-3	0.0358811	33.5	23May2016, 03:07	5.5
Subbasin-1	0.0062741	54.2	23May2016, 02:35	17.0
Reservoir-1	0.0062741	48.3	23May2016, 02:43	17.0
Reservoir-4	0.0896376	160.7	23May2016, 02:48	36.4
Junction-1	0.1964376	371.9	23May2016, 02:48	59.8
Reach-1	0.1964376	371.9	23May2016, 02:54	59.3
Subbasin-6	0.0881506	155.5	23May2016, 02:50	18.8
Reservoir-6	0.0881506	32.0	23May2016, 02:41	9.7
Junction-2	0.2845882	403.9	23May2016, 02:54	69.0
Reach-2	0.2845882	403.9	23May2016, 02:59	68.4
Subbasin-7	0.0342067	83.4	23May2016, 02:38	7.5
Reservoir-7	0.0342067	37.9	23May2016, 02:58	6.9
Junction-3	0.3187949	441.7	23May2016, 02:59	75.2
Reach-3	0.3187949	441.7	23May2016, 03:12	73.3
Subbasin-8	0.0908375	356.9	23May2016, 02:29	24.5
Reservoir-8	0.0908375	97.6	23May2016, 02:42	22.4
Junction-4	0.4096324	538.9	23May2016, 03:12	95.8
Subbasin-9	0.40941	1117.9	23May2016, 02:45	121.7
Reservoir-9	0.8190424	269.9	23May2016, 06:00	82.8

Reservoir "Reservoir-9" Results for Run "1000 yr, 6hr, Early"



- Run:1000 yr, 6hr, Early Element:Reservoir-9 Result:Storage
- Run:1000 yr, 6hr, Early Element:Reservoir-9 Result:Pool Elevation
- Run:1000 yr, 6hr, Early Element:Reservoir-9 Result:Outflow
- Run:1000 yr, 6hr, Early Element:Reservoir-9 Result:Combined Inflow

Project: Pond A Simulation Run: 1000 yr, 6hr, Early
Reservoir: Reservoir-9

Start of Run: 23May2016, 00:00	Basin Model: Pond A watershed
End of Run: 23May2016, 06:00	Meteorologic Model: 1000 yr 6 hr - Early
Compute Time: 29Sep2016, 10:10:19	Control Specifications: 6 hr

Volume Units: AC-FT

Computed Results

Peak Inflow: 1376.2 (CFS)	Date/Time of Peak Inflow: 23May2016, 02:47
Peak Discharge: 269.9 (CFS)	Date/Time of Peak Discharge: 23May2016, 06:00
Inflow Volume: 217.4 (AC-FT)	Peak Storage: 156.2 (AC-FT)
Discharge Volume: 82.8 (AC-FT)	Peak Elevation: 467.9 (FT)

Project: Pond A Simulation Run: 1000 yr, 6hr, Late

Start of Run: 23May2016, 00:00

Basin Model: Pond A watershed

End of Run: 23May2016, 06:00

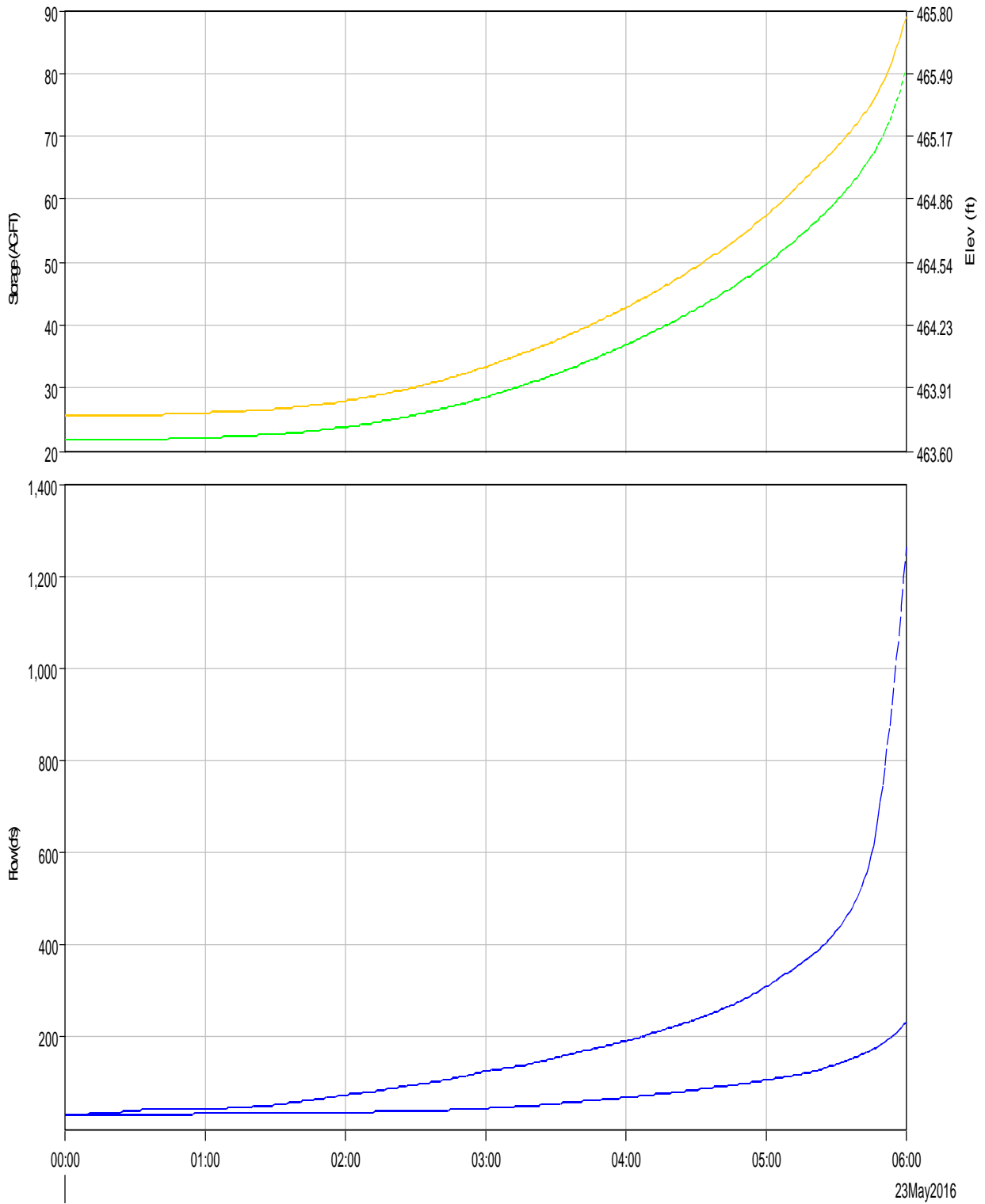
Meteorologic Model: 1000 yr 6 hr - Late

Compute Time: 29Sep2016, 09:23:08

Control Specifications: 6 hr

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
Subbasin-5	0.10680	202.0	23May2016, 06:00	8.7
Reservoir-5	0.10680	105.5	23May2016, 06:00	8.1
Subbasin-4	0.0474824	232.5	23May2016, 06:00	9.0
Subbasin-2	0.0329521	139.5	23May2016, 06:00	5.1
Reservoir-2	0.0329521	50.8	23May2016, 06:00	0.6
Subbasin-3	0.0029290	24.2	23May2016, 06:00	0.8
Reservoir-3	0.0358811	35.4	23May2016, 06:00	0.8
Subbasin-1	0.0062741	59.3	23May2016, 06:00	16.2
Reservoir-1	0.0062741	46.4	23May2016, 06:00	15.9
Reservoir-4	0.0896376	152.6	23May2016, 06:00	22.1
Junction-1	0.1964376	258.1	23May2016, 06:00	30.2
Reach-1	0.1964376	212.3	23May2016, 06:00	28.6
Subbasin-6	0.0881506	132.9	23May2016, 06:00	6.5
Reservoir-6	0.0881506	32.0	23May2016, 05:53	3.3
Junction-2	0.2845882	244.4	23May2016, 06:00	31.9
Reach-2	0.2845882	215.4	23May2016, 06:00	30.5
Subbasin-7	0.0342067	109.1	23May2016, 06:00	3.6
Reservoir-7	0.0342067	31.1	23May2016, 06:00	1.8
Junction-3	0.3187949	246.5	23May2016, 06:00	32.4
Reach-3	0.3187949	166.7	23May2016, 06:00	29.4
Subbasin-8	0.0908375	567.7	23May2016, 06:00	17.7
Reservoir-8	0.0908375	97.6	23May2016, 05:58	8.1
Junction-4	0.4096324	264.3	23May2016, 06:00	37.5
Subbasin-9	0.40941	998.0	23May2016, 06:00	54.5
Reservoir-9	0.8190424	232.8	23May2016, 06:00	33.0

Reservoir "Reservoir-9" Results for Run "1000 yr, 6hr, Late"



--- Run:1000 yr, 6hr, Late Element:Reservoir-9 Result:Storage
— Run:1000 yr, 6hr, Late Element:Reservoir-9 Result:Outflow

--- Run:1000 yr, 6hr, Late Element:Reservoir-9 Result:Pool Elevation
--- Run:1000 yr, 6hr, Late Element:Reservoir-9 Result:Combined Inflow

Project: Pond A Simulation Run: 1000 yr, 6hr, Late
Reservoir: Reservoir-9

Start of Run: 23May2016, 00:00	Basin Model: Pond A watershed
End of Run: 23May2016, 06:00	Meteorologic Model: 1000 yr 6 hr - Late
Compute Time: 29Sep2016, 09:23:08	Control Specifications: 6 hr

Volume Units: AC-FT

Computed Results

Peak Inflow: 1262.3 (CFS)	Date/Time of Peak Inflow: 23May2016, 06:00
Peak Discharge: 232.8 (CFS)	Date/Time of Peak Discharge: 23May2016, 06:00
Inflow Volume: 91.9 (AC-FT)	Peak Storage: 80.6 (AC-FT)
Discharge Volume: 33.0 (AC-FT)	Peak Elevation: 465.8 (FT)

APPENDIX B

REFERENCES

APPENDIX B1:
STAGE/STORAGE DATA

Stage/Storage for Bottom Ash Pond - West

HEC-HMS Model Reservoir 1				
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)
478.5	0	0.00	0.18	0.00
479	0.5	0.72	0.76	0.18
480	1.5	0.80	0.41	0.94
480.5	2	0.83		1.35
Total Volume=			1.35 ac-ft	

Notes:

Information based on 2015 aerial survey.

Stage/Storage for Bottom Ash Pond - East

HEC-HMS Model Reservoir 2				
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)
478	0	1.21	0.00	0.00
479	1	1.51	1.36	1.36
480	2	1.87	1.69	3.04
481	3	3.48	2.67	5.72
482	4	6.63	5.05	10.77
Total Volume=			10.77 ac-ft	

Notes:

Information based on 2015 aerial survey.

Stage/Storage for Middle Pond A - Southeast Corner

HEC-HMS Model Reservoir 3				
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)
477.79	0	0.06	0.01	0.00
478	0.21	0.07	0.14	0.01
479	1.21	0.21	0.25	0.16
480	2.21	0.29	0.68	0.40
481	3.21	1.07	0.61	1.08
481.5	3.71	1.38		1.70

Total Volume= 1.70 ac-ft

Notes:

Information based on 2015 aerial survey.

Stage/Storage for Middle Pond A

HEC-HMS Model Reservoir 4				
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)
468.21	0	0.00	0.08	0.00
469	0.79	0.20	0.52	0.08
470	1.79	0.85	1.04	0.60
471	2.79	1.23	1.39	1.64
472	3.79	1.56	1.64	3.03
473	4.79	1.73	1.97	4.67
474	5.79	2.22	2.54	6.64
475	6.79	2.86	3.53	9.18
476	7.79	4.21		12.72
Total Volume=			12.72 ac-ft	

Notes:

Information based on 2015 aerial survey.

Stage/Storage/Discharge for Rail Loop 1

HEC-HMS Model Reservoir 5					
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)	Discharge (cfs)
469.7	0	0.00	0.00	0.00	0
470	0.3	0.01	0.02	0.0022	91.52
471	1.3	0.04	0.05	0.03	100
472	2.3	0.06	0.36	0.07	100
473	3.3	0.66	0.41	0.43	100
473.5	3.8	0.96	0.20	0.84	107.74
473.7	4	1.00		1.04	150
Total Volume=			1.04 ac-ft		

Notes:

Information based on 2015 aerial survey.

Stage/Storage/Discharge for Rail Loop 2

HEC-HMS Model Reservoir 6					
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)	Discharge (cfs)
472.25	0	2.33	2.37	0.00	0
473	0.75	4.00	4.67	2.37	32.01
474	1.75	5.34	6.25	7.04	32.01
475	2.75	7.16		13.29	32.01
Total Volume=			13.29 ac-ft		

Notes:

Information based on 2015 aerial survey.

Stage/Storage/Discharge for NRL Landfill, Future Cell 2

HEC-HMS Model Reservoir 7					
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)	Discharge (cfs)
484	0	2.16	2.19	0.00	0
485	1	2.22	2.25	2.19	37.86
486	2	2.28	2.74	4.44	39.74
487	3	3.20	3.67	7.18	56.43
488	4	4.13	4.23	10.85	90.97
489	5	4.34		15.08	90.97
Total Volume=			15.08 ac-ft		

Notes:

Information based on 2015 aerial survey and Landfill as-bulits dated March 31, 2016

Stage/Storage/Discharge for NRL Landfill, Cell 1

HEC-HMS Reservoir 8					
Elevation (msl)	Depth (ft)	Area (ac)	Average Volume (ac-ft)	Cumulative Storage (ac-ft)	Discharge (cfs)
484.33	0	2.01	1.37	0.00	0
485	0.67	2.08	2.13	1.37	36.05
486	1.67	2.19	2.24	3.50	47.65
487	2.67	2.29	2.35	5.74	95.54
488	3.67	2.40	2.46	8.09	97.64
489	4.67	2.52		10.55	97.64

Total Volume= 10.55 ac-ft

Notes:

Information based on 2015 aerial survey and Landfill as-bulits dated March 31, 2016

Stage/Storage for Pond A based on Aerial and Bathymetric Survey

HEC-HMS Reservoir 9				
Elevation*	Depth	Area	Average Volume	Cumulative Volume
(msl)	(ft)	(acres)	(ac-ft)	(ac-ft)
463	0	26.50	0.00	0.00
464	1	28.05	13.64	13.64
465	2	29.77	28.91	42.55
466	3	33.43	31.60	74.14
467	4	35.42	34.42	108.57
468	5	37.08	36.25	144.82
469	6	50.40	43.74	188.56
470	7	56.99	53.69	242.25
471	8	90.66	73.82	316.07
472	9	126.31	108.49	424.56
473	10	153.95	140.13	564.69

463

Total Volume= 564.69 ac-ft

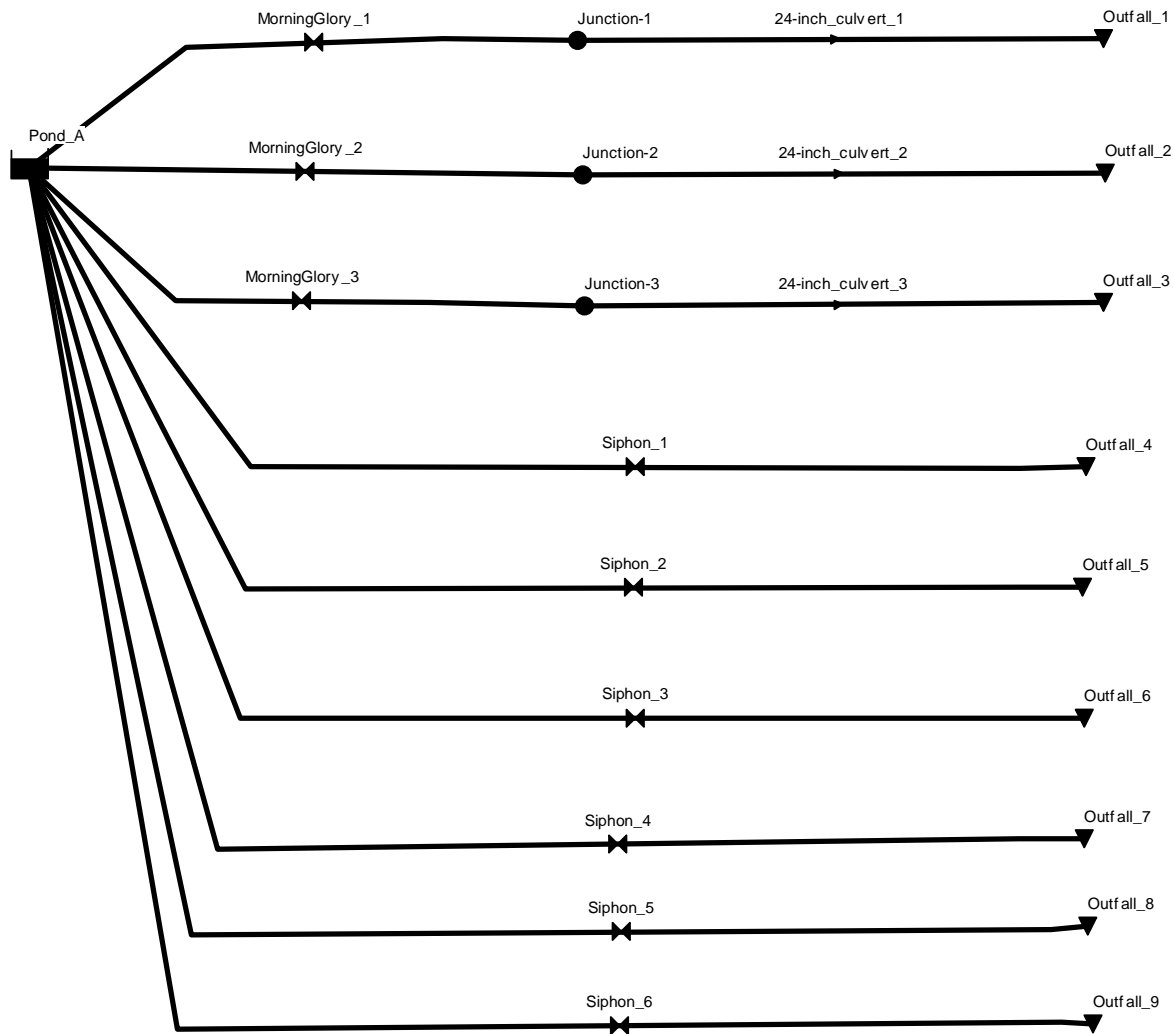
*Starting Elevation = 463 (Pond A Normal Pool Elevation)

% Impervious = 10%

APPENDIX B2:
SWMM MODEL STORAGE/DISCHARGE RESULTS
FOR POND A OUTLET STRUCTURE

POND A OUTLET STRUCTURE

06/16/2016 00:05:00



SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Type II with Tailwater Elevation =458.26

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)
0:05:00	463.35	408978.6	9	0:05:00	0	0:05:00	6.33	37.98
0:10:00	463.69	817176.6	19	0:10:00	0	0:10:00	6.78	40.68
0:15:00	464.03	1224594	28	0:15:00	0	0:15:00	7.21	43.26
0:20:00	464.36	1631024	37	0:20:00	1.23	0:20:00	7.6	49.29
0:25:00	464.68	2031676	47	0:25:00	11.03	0:25:00	7.94	80.73
0:30:00	464.98	2420303	56	0:30:00	25.25	0:30:00	8.28	125.43
0:35:00	465.26	2793810	64	0:35:00	41.13	0:35:00	8.57	174.81
0:40:00	465.53	3151448	72	0:40:00	57.9	0:40:00	8.83	226.68
0:45:00	465.77	3493040	80	0:45:00	69.66	0:45:00	9.05	263.28
0:50:00	466	3821886	88	0:50:00	69.66	0:50:00	9.27	264.60
0:55:00	466.22	4144889	95	0:55:00	69.66	0:55:00	9.47	265.80
1:00:00	466.43	4462935	102	1:00:00	69.66	1:00:00	9.67	267.00
1:05:00	466.64	4776440	110	1:05:00	69.66	1:05:00	9.76	267.54
1:10:00	466.85	5085912	117	1:10:00	69.66	1:10:00	9.8	267.78
1:15:00	467.04	5391624	124	1:15:00	69.66	1:15:00	9.83	267.96
1:20:00	467.24	5693790	131	1:20:00	69.66	1:20:00	9.87	268.20
1:25:00	467.43	5992598	138	1:25:00	69.66	1:25:00	9.9	268.38
1:30:00	467.62	6288213	144	1:30:00	69.66	1:30:00	9.93	268.56
1:35:00	467.8	6580783	151	1:35:00	69.66	1:35:00	9.96	268.74
1:40:00	467.98	6870440	158	1:40:00	69.66	1:40:00	9.99	268.92
1:45:00	468.15	7157314	164	1:45:00	69.66	1:45:00	10.02	269.10
1:50:00	468.32	7441624	171	1:50:00	69.66	1:50:00	10.05	269.28
1:55:00	468.47	7723567	177	1:55:00	69.66	1:55:00	10.08	269.46
2:00:00	468.61	8003316	184	2:00:00	69.66	2:00:00	10.1	269.58
2:05:00	468.75	8281015	190	2:05:00	69.66	2:05:00	10.13	269.76
2:10:00	468.88	8556789	196	2:10:00	69.66	2:10:00	10.15	269.88
2:15:00	469.01	8830748	203	2:15:00	69.66	2:15:00	10.17	270.00
2:20:00	469.13	9102903	209	2:20:00	69.66	2:20:00	10.27	270.60
2:25:00	469.25	9373253	215	2:25:00	69.66	2:25:00	10.37	271.20
2:30:00	469.37	9641858	221	2:30:00	69.66	2:30:00	10.47	271.80
2:35:00	469.49	9908771	227	2:35:00	69.66	2:35:00	10.56	272.34
2:40:00	469.6	10174050	234	2:40:00	69.66	2:40:00	10.64	272.82
2:45:00	469.71	10437780	240	2:45:00	69.66	2:45:00	10.71	273.24
2:50:00	469.82	10699980	246	2:50:00	69.66	2:50:00	10.79	273.72
2:55:00	469.92	10960710	252	2:55:00	69.66	2:55:00	10.86	274.14
3:00:00	470.03	11220000	258	3:00:00	69.66	3:00:00	10.93	274.56
3:05:00	470.13	11477870	263	3:05:00	69.66	3:05:00	11.02	275.10
3:10:00	470.22	11734420	269	3:10:00	69.66	3:10:00	11.11	275.64
3:15:00	470.31	11989700	275	3:15:00	69.66	3:15:00	11.19	276.12
3:20:00	470.4	12243800	281	3:20:00	69.66	3:20:00	11.27	276.60
3:25:00	470.48	12496770	287	3:25:00	69.66	3:25:00	11.35	277.08
3:30:00	470.55	12748680	293	3:30:00	69.66	3:30:00	11.41	277.44
3:35:00	470.63	12999580	298	3:35:00	69.66	3:35:00	11.46	277.74
3:40:00	470.7	13249520	304	3:40:00	69.66	3:40:00	11.52	278.10
3:45:00	470.77	13498540	310	3:45:00	69.66	3:45:00	11.57	278.40
3:50:00	470.84	13746680	316	3:50:00	69.66	3:50:00	11.62	278.70
3:55:00	470.91	13993950	321	3:55:00	69.66	3:55:00	11.67	279.00
4:00:00	470.97	14240400	327	4:00:00	69.66	4:00:00	11.71	279.24
4:05:00	471.03	14486040	333	4:05:00	69.66	4:05:00	11.76	279.54
4:10:00	471.09	14730910	338	4:10:00	69.66	4:10:00	11.8	279.78
4:15:00	471.15	14975020	344	4:15:00	69.66	4:15:00	11.85	280.08
4:20:00	471.21	15218410	349	4:20:00	69.66	4:20:00	11.89	280.32

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Type II with Tailwater Elevation =458.26

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)
4:25:00	471.26	15461080	355	4:25:00	69.66	4:25:00	11.93	280.56
4:30:00	471.32	15703060	360	4:30:00	69.66	4:30:00	11.97	280.80
4:35:00	471.37	15944370	366	4:35:00	69.66	4:35:00	12.01	281.04
4:40:00	471.43	16185010	372	4:40:00	69.66	4:40:00	12.04	281.22
4:45:00	471.48	16425020	377	4:45:00	69.66	4:45:00	12.08	281.46
4:50:00	471.53	16664390	383	4:50:00	69.66	4:50:00	12.12	281.70
4:55:00	471.58	16903160	388	4:55:00	69.66	4:55:00	12.15	281.88
5:00:00	471.63	17141320	394	5:00:00	69.66	5:00:00	12.19	282.12
5:05:00	471.67	17378900	399	5:05:00	69.66	5:05:00	12.22	282.30
5:10:00	471.72	17615910	404	5:10:00	69.66	5:10:00	12.25	282.48
5:15:00	471.77	17852350	410	5:15:00	69.66	5:15:00	12.29	282.72
5:20:00	471.81	18088240	415	5:20:00	69.66	5:20:00	12.32	282.90
5:25:00	471.86	18323580	421	5:25:00	69.66	5:25:00	12.35	283.08
5:30:00	471.9	18558400	426	5:30:00	69.66	5:30:00	12.38	283.26
5:35:00	471.95	18792690	431	5:35:00	69.66	5:35:00	12.41	283.44
5:40:00	471.99	19026460	437	5:40:00	69.66	5:40:00	12.44	283.62
5:45:00	472.03	19259730	442	5:45:00	69.66	5:45:00	12.47	283.80
5:50:00	472.07	19492510	447	5:50:00	69.66	5:50:00	12.5	283.98
5:55:00	472.11	1.97E+07	453	5:55:00	69.66	5:55:00	12.53	284.16
6:00:00	472.16	2.00E+07	458	6:00:00	69.66	6:00:00	12.55	284.28
6:05:00	472.2	20187910	463	6:05:00	69.66	6:05:00	12.58	284.46
6:10:00	472.24	20418760	469	6:10:00	69.66	6:10:00	12.61	284.64
6:15:00	472.28	20649150	474	6:15:00	69.66	6:15:00	12.64	284.82
6:20:00	472.31	20879080	479	6:20:00	69.66	6:20:00	12.66	284.94
6:25:00	472.35	21108550	485	6:25:00	69.66	6:25:00	12.69	285.12
6:30:00	472.39	21337580	490	6:30:00	69.66	6:30:00	12.72	285.30
6:35:00	472.43	21566160	495	6:35:00	69.66	6:35:00	12.74	285.42
6:40:00	472.47	21794300	500	6:40:00	69.66	6:40:00	12.77	285.60
6:45:00	472.51	22022010	506	6:45:00	69.66	6:45:00	12.79	285.72
6:50:00	472.54	22249290	511	6:50:00	69.66	6:50:00	12.82	285.90
6:55:00	472.58	22476150	516	6:55:00	69.66	6:55:00	12.84	286.02
7:00:00	472.62	22702590	521	7:00:00	69.66	7:00:00	12.87	286.20
7:05:00	472.65	22928620	526	7:05:00	69.66	7:05:00	12.89	286.32
7:10:00	472.69	23154230	532	7:10:00	69.66	7:10:00	12.92	286.50
7:15:00	472.72	23379450	537	7:15:00	69.66	7:15:00	12.94	286.62
7:20:00	472.76	23604250	542	7:20:00	69.66	7:20:00	12.96	286.74
7:25:00	472.79	23828670	547	7:25:00	69.66	7:25:00	12.99	286.92
7:30:00	472.83	24052690	552	7:30:00	69.66	7:30:00	13.01	287.04
7:35:00	472.86	24276320	557	7:35:00	69.66	7:35:00	13.03	287.16
7:40:00	472.9	24499560	562	7:40:00	69.66	7:40:00	13.06	287.34
7:45:00	472.93	24722420	568	7:45:00	69.66	7:45:00	13.08	287.46
7:50:00	472.96	24944910	573	7:50:00	69.66	7:50:00	13.1	287.58
7:55:00	473	25167020	578	7:55:00	69.66	7:55:00	13.13	287.76
8:00:00	473	25191840	578	8:00:00	69.66	8:00:00	13.13	287.76
8:05:00	473	25191840	578	8:05:00	69.66	8:05:00	13.13	287.76
8:10:00	473	25191840	578	8:10:00	69.66	8:10:00	13.13	287.76
8:15:00	473	25191840	578	8:15:00	69.66	8:15:00	13.13	287.76
8:20:00	473	25191840	578	8:20:00	69.66	8:20:00	13.13	287.76
8:25:00	473	25191840	578	8:25:00	69.66	8:25:00	13.13	287.76
8:30:00	473	25191840	578	8:30:00	69.66	8:30:00	13.13	287.76
8:35:00	473	25191840	578	8:35:00	69.66	8:35:00	13.13	287.76
8:40:00	473	25191840	578	8:40:00	69.66	8:40:00	13.13	287.76

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Type II with Tailwater Elevation =458.26

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)
8:45:00	473	25191840	578	8:45:00	69.66	8:45:00	13.13	287.76
8:50:00	473	25191840	578	8:50:00	69.66	8:50:00	13.13	287.76
8:55:00	473	25191840	578	8:55:00	69.66	8:55:00	13.13	287.76
9:00:00	473	25191840	578	9:00:00	69.66	9:00:00	13.13	287.76
9:05:00	473	25191840	578	9:05:00	69.66	9:05:00	13.13	287.76
9:10:00	473	25191840	578	9:10:00	69.66	9:10:00	13.13	287.76
9:15:00	473	2.52E+07	578	9:15:00	69.66	9:15:00	13.13	287.76
9:20:00	473	25191840	578	9:20:00	69.66	9:20:00	13.13	287.76
9:25:00	473	25191840	578	9:25:00	69.66	9:25:00	13.13	287.76
9:30:00	473	25191840	578	9:30:00	69.66	9:30:00	13.13	287.76
9:35:00	473	25191840	578	9:35:00	69.66	9:35:00	13.13	287.76
9:40:00	473	25191840	578	9:40:00	69.66	9:40:00	13.13	287.76
9:45:00	473	25191840	578	9:45:00	69.66	9:45:00	13.13	287.76
9:50:00	473	25191840	578	9:50:00	69.66	9:50:00	13.13	287.76
9:55:00	473	2.52E+07	578	9:55:00	69.66	9:55:00	13.13	287.76

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Early Peak with Tailwater Elevation =458.19

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)	
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)	
0:05:00	463.35	408844.6	9	0:05:00	0	0:05:00	6.33	37.98	
0:10:00	463.69	817042.8	19	0:10:00	0	0:10:00	6.78	40.68	
0:15:00	464.03	1224461	28	0:15:00	0	0:15:00	7.21	43.26	
0:20:00	464.36	1630944	37	0:20:00	1.27	0:20:00	7.6	49.41	
0:25:00	464.68	2031599	47	0:25:00	11.3	0:25:00	7.96	81.66	
0:30:00	464.98	2420195	56	0:30:00	25.25	0:30:00	8.28	125.43	
0:35:00	465.26	2793707	64	0:35:00	41.12	0:35:00	8.57	174.78	
0:40:00	465.53	3151349	72	0:40:00	57.9	0:40:00	8.83	226.68	
0:45:00	465.77	3492939	80	0:45:00	70.06	0:45:00	9.05	264.48	
0:50:00	466	3821788	88	0:50:00	70.06	0:50:00	9.27	265.8	
0:55:00	466.22	4144793	95	0:55:00	70.06	0:55:00	9.47	267	
1:00:00	466.43	4462840	102	1:00:00	70.06	1:00:00	9.67	268.2	
1:05:00	466.64	4776347	110	1:05:00	70.06	1:05:00	9.76	268.74	
1:10:00	466.85	5085820	117	1:10:00	70.06	1:10:00	9.8	268.98	
1:15:00	467.04	5391532	124	1:15:00	70.06	1:15:00	9.83	269.16	
1:20:00	467.24	5693700	131	1:20:00	70.06	1:20:00	9.87	269.4	
1:25:00	467.43	5992509	138	1:25:00	70.06	1:25:00	9.9	269.58	
1:30:00	467.62	6288125	144	1:30:00	70.06	1:30:00	9.93	269.76	
1:35:00	467.8	6580695	151	1:35:00	70.06	1:35:00	9.96	269.94	
1:40:00	467.98	6870354	158	1:40:00	70.06	1:40:00	9.99	270.12	
1:45:00	468.15	7157228	164	1:45:00	70.06	1:45:00	10.02	270.3	
1:50:00	468.32	7441538	171	1:50:00	70.06	1:50:00	10.05	270.48	
1:55:00	468.47	7723483	177	1:55:00	70.06	1:55:00	10.08	270.66	
2:00:00	468.61	8003233	184	2:00:00	70.06	2:00:00	10.1	270.78	
2:05:00	468.75	8280932	190	2:05:00	70.06	2:05:00	10.13	270.96	
2:10:00	468.88	8556706	196	2:10:00	70.06	2:10:00	10.15	271.08	
2:15:00	469.01	8830666	203	2:15:00	70.06	2:15:00	10.17	271.2	
2:20:00	469.13	9102821	209	2:20:00	70.06	2:20:00	10.27	271.8	
2:25:00	469.25	9373172	215	2:25:00	70.06	2:25:00	10.37	272.4	
2:30:00	469.37	9641777	221	2:30:00	70.06	2:30:00	10.47	273	
2:35:00	469.49	9908691	227	2:35:00	70.06	2:35:00	10.56	273.54	
2:40:00	469.6	10173980	234	2:40:00	70.06	2:40:00	10.64	274.02	
2:45:00	469.71	10437700	240	2:45:00	70.06	2:45:00	10.71	274.44	
2:50:00	469.82	10699900	246	2:50:00	70.06	2:50:00	10.79	274.92	
2:55:00	469.92	10960630	252	2:55:00	70.06	2:55:00	10.86	275.34	
3:00:00	470.03	11219920	258	3:00:00	70.06	3:00:00	10.93	275.76	
3:05:00	470.13	11477800	263	3:05:00	70.06	3:05:00	11.02	276.3	
3:10:00	470.22	11734340	269	3:10:00	70.06	3:10:00	11.11	276.84	
3:15:00	470.31	11989620	275	3:15:00	70.06	3:15:00	11.19	277.32	
3:20:00	470.4	12243720	281	3:20:00	70.06	3:20:00	11.27	277.8	
3:25:00	470.48	12496700	287	3:25:00	70.06	3:25:00	11.35	278.28	
3:30:00	470.55	12748600	293	3:30:00	70.06	3:30:00	11.41	278.64	
3:35:00	470.63	12999500	298	3:35:00	70.06	3:35:00	11.46	278.94	
3:40:00	470.7	13249450	304	3:40:00	70.06	3:40:00	11.52	279.3	
3:45:00	470.77	13498470	310	3:45:00	70.06	3:45:00	11.57	279.6	
3:50:00	470.84	13746600	316	3:50:00	70.06	3:50:00	11.62	279.9	
3:55:00	470.91	13993880	321	3:55:00	70.06	3:55:00	11.67	280.2	
4:00:00	470.97	14240320	327	4:00:00	70.06	4:00:00	11.71	280.44	
4:05:00	471.03	14485970	333	4:05:00	70.06	4:05:00	11.76	280.74	
4:10:00	471.09	14730840	338	4:10:00	70.06	4:10:00	11.8	280.98	
4:15:00	471.15	14974950	344	4:15:00	70.06	4:15:00	11.85	281.28	
4:20:00	471.21	15218330	349	4:20:00	70.06	4:20:00	11.89	281.52	
4:25:00	471.26	15461010	355	4:25:00	70.06	4:25:00	11.93	281.76	
4:30:00	471.32	15702990	360	4:30:00	70.06	4:30:00	11.97	282	
4:35:00	471.37	15944290	366	4:35:00	70.06	4:35:00	12.01	282.24	

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Early Peak with Tailwater Elevation =458.19

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)
4:40:00	471.43	16184940	372	4:40:00	70.06	4:40:00	12.04	282.42
4:45:00	471.48	16424950	377	4:45:00	70.06	4:45:00	12.08	282.66
4:50:00	471.53	16664320	383	4:50:00	70.06	4:50:00	12.12	282.9
4:55:00	471.58	16903090	388	4:55:00	70.06	4:55:00	12.15	283.08
5:00:00	471.63	17141250	394	5:00:00	70.06	5:00:00	12.19	283.32
5:05:00	471.67	17378830	399	5:05:00	70.06	5:05:00	12.22	283.5
5:10:00	471.72	17615840	404	5:10:00	70.06	5:10:00	12.25	283.68
5:15:00	471.77	17852280	410	5:15:00	70.06	5:15:00	12.29	283.92
5:20:00	471.81	18088170	415	5:20:00	70.06	5:20:00	12.32	284.1
5:25:00	471.86	18323510	421	5:25:00	70.06	5:25:00	12.35	284.28
5:30:00	471.9	18558330	426	5:30:00	70.06	5:30:00	12.38	284.46
5:35:00	471.95	18792620	431	5:35:00	70.06	5:35:00	12.41	284.64
5:40:00	471.99	19026390	437	5:40:00	70.06	5:40:00	12.44	284.82
5:45:00	472.03	19259660	442	5:45:00	70.06	5:45:00	12.47	285
5:50:00	472.07	19492440	447	5:50:00	70.06	5:50:00	12.5	285.18
5:55:00	472.11	1.97E+07	453	5:55:00	70.06	5:55:00	12.53	285.36
6:00:00	472.16	2.00E+07	458	6:00:00	70.06	6:00:00	12.55	285.48
6:05:00	472.2	20187840	463	6:05:00	70.06	6:05:00	12.58	285.66
6:10:00	472.24	20418700	469	6:10:00	70.06	6:10:00	12.61	285.84
6:15:00	472.28	20649080	474	6:15:00	70.06	6:15:00	12.64	286.02
6:20:00	472.31	20879010	479	6:20:00	70.06	6:20:00	12.66	286.14
6:25:00	472.35	21108480	485	6:25:00	70.06	6:25:00	12.69	286.32
6:30:00	472.39	21337510	490	6:30:00	70.06	6:30:00	12.72	286.50
6:35:00	472.43	21566090	495	6:35:00	70.06	6:35:00	12.74	286.62
6:40:00	472.47	21794230	500	6:40:00	70.06	6:40:00	12.77	286.80
6:45:00	472.51	22021940	506	6:45:00	70.06	6:45:00	12.79	286.92
6:50:00	472.54	22249220	511	6:50:00	70.06	6:50:00	12.82	287.10
6:55:00	472.58	22476080	516	6:55:00	70.06	6:55:00	12.84	287.22
7:00:00	472.62	22702520	521	7:00:00	70.06	7:00:00	12.87	287.40
7:05:00	472.65	22928550	526	7:05:00	70.06	7:05:00	12.89	287.52
7:10:00	472.69	23154170	532	7:10:00	70.06	7:10:00	12.92	287.70
7:15:00	472.72	23379380	537	7:15:00	70.06	7:15:00	12.94	287.82
7:20:00	472.76	23604190	542	7:20:00	70.06	7:20:00	12.96	287.94
7:25:00	472.79	23828600	547	7:25:00	70.06	7:25:00	12.99	288.12
7:30:00	472.83	24052620	552	7:30:00	70.06	7:30:00	13.01	288.24
7:35:00	472.86	24276250	557	7:35:00	70.06	7:35:00	13.03	288.36
7:40:00	472.9	24499490	562	7:40:00	70.06	7:40:00	13.06	288.54
7:45:00	472.93	24722360	568	7:45:00	70.06	7:45:00	13.08	288.66
7:50:00	472.96	24944840	573	7:50:00	70.06	7:50:00	13.1	288.78
7:55:00	473	25166950	578	7:55:00	70.06	7:55:00	13.13	288.96
8:00:00	473	25191840	578	8:00:00	70.06	8:00:00	13.13	288.96
8:05:00	473	25191840	578	8:05:00	70.06	8:05:00	13.13	288.96
8:10:00	473	25191840	578	8:10:00	70.06	8:10:00	13.13	288.96
8:15:00	473	25191840	578	8:15:00	70.06	8:15:00	13.13	288.96
8:20:00	473	25191840	578	8:20:00	70.06	8:20:00	13.13	288.96
8:25:00	473	25191840	578	8:25:00	70.06	8:25:00	13.13	288.96
8:30:00	473	25191840	578	8:30:00	70.06	8:30:00	13.13	288.96
8:35:00	473	25191840	578	8:35:00	70.06	8:35:00	13.13	288.96
8:40:00	473	25191840	578	8:40:00	70.06	8:40:00	13.13	288.96
8:45:00	473	25191840	578	8:45:00	70.06	8:45:00	13.13	288.96
8:50:00	473	25191840	578	8:50:00	70.06	8:50:00	13.13	288.96
8:55:00	473	25191840	578	8:55:00	70.06	8:55:00	13.13	288.96
9:00:00	473	25191840	578	9:00:00	70.06	9:00:00	13.13	288.96
9:05:00	473	25191840	578	9:05:00	70.06	9:05:00	13.13	288.96
9:10:00	473	25191840	578	9:10:00	70.06	9:10:00	13.13	288.96

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Early Peak with Tailwater Elevation =458.19

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Single Discharge (CFS)	Hours	Single Discharge (CFS)	Discharge (CFS)
9:15:00	473	2.52E+07	578	9:15:00	70.06	9:15:00	13.13	288.96
9:20:00	473	25191840	578	9:20:00	70.06	9:20:00	13.13	288.96
9:25:00	473	25191840	578	9:25:00	70.06	9:25:00	13.13	288.96
9:30:00	473	25191840	578	9:30:00	70.06	9:30:00	13.13	288.96
9:35:00	473	25191840	578	9:35:00	70.06	9:35:00	13.13	288.96
9:40:00	473	25191840	578	9:40:00	70.06	9:40:00	13.13	288.96
9:45:00	473	25191840	578	9:45:00	70.06	9:45:00	13.13	288.96
9:50:00	473	25191840	578	9:50:00	70.06	9:50:00	13.13	288.96
9:55:00	473	2.52E+07	578	9:55:00	70.06	9:55:00	13.13	288.96

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Late Peak with Tailwater Elevation =458.23

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)	
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Discharge (CFS)	Hours	Discharge (CFS)	Discharge (CFS)	
0:05:00	463.35	408978.6	9	0:05:00	0	0:05:00	6.33	37.98	
0:10:00	463.69	817176.6	19	0:10:00	0	0:10:00	6.78	40.68	
0:15:00	464.03	1224594	28	0:15:00	0	0:15:00	7.21	43.26	
0:20:00	464.36	1631060	37	0:20:00	1.28	0:20:00	7.6	49.44	
0:25:00	464.68	2031712	47	0:25:00	11.31	0:25:00	7.96	81.69	
0:30:00	464.98	2420305	56	0:30:00	25.25	0:30:00	8.28	125.43	
0:35:00	465.26	2793812	64	0:35:00	41.13	0:35:00	8.57	174.81	
0:40:00	465.53	3151450	72	0:40:00	57.9	0:40:00	8.83	226.68	
0:45:00	465.77	3493041	80	0:45:00	69.83	0:45:00	9.05	263.79	
0:50:00	466	3821888	88	0:50:00	69.83	0:50:00	9.27	265.11	
0:55:00	466.22	4144891	95	0:55:00	69.83	0:55:00	9.47	266.31	
1:00:00	466.43	4462937	102	1:00:00	69.83	1:00:00	9.67	267.51	
1:05:00	466.64	4776442	110	1:05:00	69.83	1:05:00	9.76	268.05	
1:10:00	466.85	5085914	117	1:10:00	69.83	1:10:00	9.8	268.29	
1:15:00	467.04	5391625	124	1:15:00	69.83	1:15:00	9.83	268.47	
1:20:00	467.24	5693791	131	1:20:00	69.83	1:20:00	9.87	268.71	
1:25:00	467.43	5992599	138	1:25:00	69.83	1:25:00	9.9	268.89	
1:30:00	467.62	6288215	144	1:30:00	69.83	1:30:00	9.93	269.07	
1:35:00	467.8	6580784	151	1:35:00	69.83	1:35:00	9.96	269.25	
1:40:00	467.98	6870442	158	1:40:00	69.83	1:40:00	9.99	269.43	
1:45:00	468.15	7157316	164	1:45:00	69.83	1:45:00	10.02	269.61	
1:50:00	468.32	7441625	171	1:50:00	69.83	1:50:00	10.05	269.79	
1:55:00	468.47	7723569	177	1:55:00	69.83	1:55:00	10.08	269.97	
2:00:00	468.61	8003318	184	2:00:00	69.83	2:00:00	10.1	270.09	
2:05:00	468.75	8281017	190	2:05:00	69.83	2:05:00	10.13	270.27	
2:10:00	468.88	8556790	196	2:10:00	69.83	2:10:00	10.15	270.39	
2:15:00	469.01	8830749	203	2:15:00	69.83	2:15:00	10.17	270.51	
2:20:00	469.13	9102904	209	2:20:00	69.83	2:20:00	10.27	271.11	
2:25:00	469.25	9373254	215	2:25:00	69.83	2:25:00	10.37	271.71	
2:30:00	469.37	9641859	221	2:30:00	69.83	2:30:00	10.47	272.31	
2:35:00	469.49	9908772	227	2:35:00	69.83	2:35:00	10.56	272.85	
2:40:00	469.6	10174060	234	2:40:00	69.83	2:40:00	10.64	273.33	
2:45:00	469.71	10437780	240	2:45:00	69.83	2:45:00	10.71	273.75	
2:50:00	469.82	10699980	246	2:50:00	69.83	2:50:00	10.79	274.23	
2:55:00	469.92	10960710	252	2:55:00	69.83	2:55:00	10.86	274.65	
3:00:00	470.03	11220000	258	3:00:00	69.83	3:00:00	10.93	275.07	
3:05:00	470.13	11477880	263	3:05:00	69.83	3:05:00	11.02	275.61	
3:10:00	470.22	11734420	269	3:10:00	69.83	3:10:00	11.11	276.15	
3:15:00	470.31	11989700	275	3:15:00	69.83	3:15:00	11.19	276.63	
3:20:00	470.4	12243800	281	3:20:00	69.83	3:20:00	11.27	277.11	
3:25:00	470.48	12496770	287	3:25:00	69.83	3:25:00	11.35	277.59	
3:30:00	470.55	12748680	293	3:30:00	69.83	3:30:00	11.41	277.95	
3:35:00	470.63	12999580	298	3:35:00	69.83	3:35:00	11.46	278.25	
3:40:00	470.7	13249520	304	3:40:00	69.83	3:40:00	11.52	278.61	
3:45:00	470.77	13498550	310	3:45:00	69.83	3:45:00	11.57	278.91	
3:50:00	470.84	13746680	316	3:50:00	69.83	3:50:00	11.62	279.21	
3:55:00	470.91	13993950	321	3:55:00	69.83	3:55:00	11.67	279.51	
4:00:00	470.97	14240400	327	4:00:00	69.83	4:00:00	11.71	279.75	
4:05:00	471.03	14486040	333	4:05:00	69.83	4:05:00	11.76	280.05	
4:10:00	471.09	14730910	338	4:10:00	69.83	4:10:00	11.8	280.29	
4:15:00	471.15	14975030	344	4:15:00	69.83	4:15:00	11.85	280.59	
4:20:00	471.21	15218410	349	4:20:00	69.83	4:20:00	11.89	280.83	
4:25:00	471.26	15461080	355	4:25:00	69.83	4:25:00	11.93	281.07	

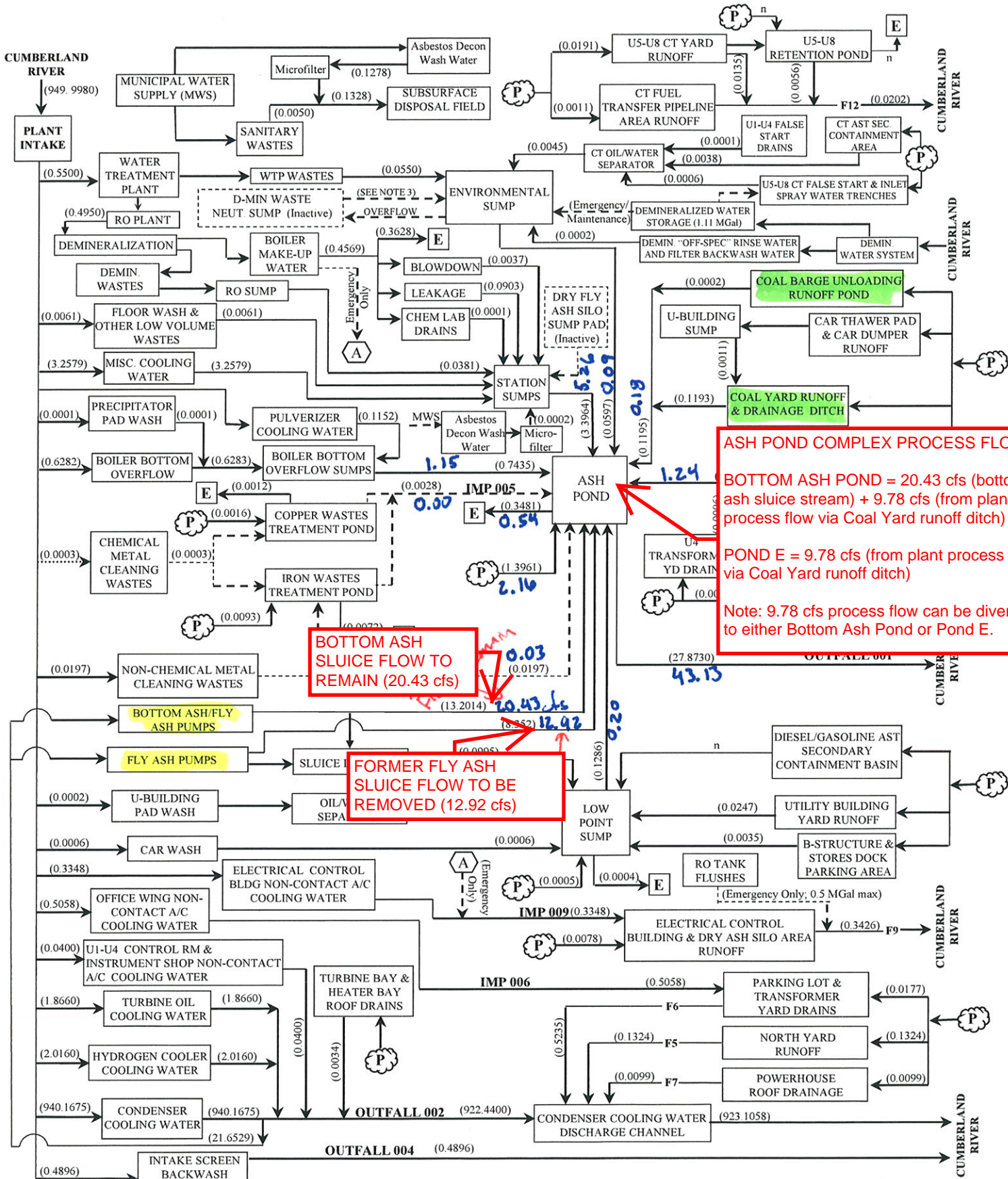
SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Late Peak with Tailwater Elevation =458.23

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Discharge (CFS)	Hours	Discharge (CFS)	Discharge (CFS)
4:30:00	471.32	15703060	360	4:30:00	69.83	4:30:00	11.97	281.31
4:35:00	471.37	15944370	366	4:35:00	69.83	4:35:00	12.01	281.55
4:40:00	471.43	16185010	372	4:40:00	69.83	4:40:00	12.04	281.73
4:45:00	471.48	16425020	377	4:45:00	69.83	4:45:00	12.08	281.97
4:50:00	471.53	16664400	383	4:50:00	69.83	4:50:00	12.12	282.21
4:55:00	471.58	16903160	388	4:55:00	69.83	4:55:00	12.15	282.39
5:00:00	471.63	17141330	394	5:00:00	69.83	5:00:00	12.19	282.63
5:05:00	471.67	17378910	399	5:05:00	69.83	5:05:00	12.22	282.81
5:10:00	471.72	17615910	404	5:10:00	69.83	5:10:00	12.25	282.99
5:15:00	471.77	17852350	410	5:15:00	69.83	5:15:00	12.29	283.23
5:20:00	471.81	18088240	415	5:20:00	69.83	5:20:00	12.32	283.41
5:25:00	471.86	18323590	421	5:25:00	69.83	5:25:00	12.35	283.59
5:30:00	471.9	18558400	426	5:30:00	69.83	5:30:00	12.38	283.77
5:35:00	471.95	18792690	431	5:35:00	69.83	5:35:00	12.41	283.95
5:40:00	471.99	19026460	437	5:40:00	69.83	5:40:00	12.44	284.13
5:45:00	472.03	19259740	442	5:45:00	69.83	5:45:00	12.47	284.31
5:50:00	472.07	19492510	447	5:50:00	69.83	5:50:00	12.5	284.49
5:55:00	472.11	1.97E+07	453	5:55:00	69.83	5:55:00	12.53	284.67
6:00:00	472.16	2.00E+07	458	6:00:00	69.83	6:00:00	12.55	284.79
6:05:00	472.2	20187910	463	6:05:00	69.83	6:05:00	12.58	284.97
6:10:00	472.24	20418770	469	6:10:00	69.83	6:10:00	12.61	285.15
6:15:00	472.28	20649150	474	6:15:00	69.83	6:15:00	12.64	285.33
6:20:00	472.31	20879080	479	6:20:00	69.83	6:20:00	12.66	285.45
6:25:00	472.35	21108550	485	6:25:00	69.83	6:25:00	12.69	285.63
6:30:00	472.39	21337580	490	6:30:00	69.83	6:30:00	12.72	285.81
6:35:00	472.43	21566160	495	6:35:00	69.83	6:35:00	12.74	285.93
6:40:00	472.47	21794300	500	6:40:00	69.83	6:40:00	12.77	286.11
6:45:00	472.51	22022010	506	6:45:00	69.83	6:45:00	12.79	286.23
6:50:00	472.54	22249290	511	6:50:00	69.83	6:50:00	12.82	286.41
6:55:00	472.58	22476150	516	6:55:00	69.83	6:55:00	12.84	286.53
7:00:00	472.62	22702590	521	7:00:00	69.83	7:00:00	12.87	286.71
7:05:00	472.65	22928620	526	7:05:00	69.83	7:05:00	12.89	286.83
7:10:00	472.69	23154240	532	7:10:00	69.83	7:10:00	12.92	287.01
7:15:00	472.72	23379450	537	7:15:00	69.83	7:15:00	12.94	287.13
7:20:00	472.76	23604260	542	7:20:00	69.83	7:20:00	12.96	287.25
7:25:00	472.79	23828670	547	7:25:00	69.83	7:25:00	12.99	287.43
7:30:00	472.83	24052690	552	7:30:00	69.83	7:30:00	13.01	287.55
7:35:00	472.86	24276320	557	7:35:00	69.83	7:35:00	13.03	287.67
7:40:00	472.9	24499560	562	7:40:00	69.83	7:40:00	13.06	287.85
7:45:00	472.93	24722420	568	7:45:00	69.83	7:45:00	13.08	287.97
7:50:00	472.96	24944910	573	7:50:00	69.83	7:50:00	13.1	288.09
7:55:00	473	25167020	578	7:55:00	69.83	7:55:00	13.13	288.27
8:00:00	473	25191840	578	8:00:00	69.83	8:00:00	13.13	288.27
8:05:00	473	25191840	578	8:05:00	69.83	8:05:00	13.13	288.27
8:10:00	473	25191840	578	8:10:00	69.83	8:10:00	13.13	288.27
8:15:00	473	25191840	578	8:15:00	69.83	8:15:00	13.13	288.27
8:20:00	473	25191840	578	8:20:00	69.83	8:20:00	13.13	288.27
8:25:00	473	25191840	578	8:25:00	69.83	8:25:00	13.13	288.27
8:30:00	473	25191840	578	8:30:00	69.83	8:30:00	13.13	288.27
8:35:00	473	25191840	578	8:35:00	69.83	8:35:00	13.13	288.27
8:40:00	473	25191840	578	8:40:00	69.83	8:40:00	13.13	288.27
8:45:00	473	25191840	578	8:45:00	69.83	8:45:00	13.13	288.27
8:50:00	473	25191840	578	8:50:00	69.83	8:50:00	13.13	288.27

SWMM 5 Results - Stage/Storage/Discharge for 1000 yr, 6 hr, Late Peak with Tailwater Elevation =458.23

Table - Node Pond_E				Table - Morning Glory (MG)		Table - Siphon (S)		All Outfalls (3xMG+6xS)
Hours	WSE (ft)	Volume (ft3)	Volume (ac-ft)	Hours	Discharge (CFS)	Hours	Discharge (CFS)	Discharge (CFS)
8:55:00	473	25191840	578	8:55:00	69.83	8:55:00	13.13	288.27
9:00:00	473	25191840	578	9:00:00	69.83	9:00:00	13.13	288.27
9:05:00	473	25191840	578	9:05:00	69.83	9:05:00	13.13	288.27
9:10:00	473	25191840	578	9:10:00	69.83	9:10:00	13.13	288.27
9:15:00	473	25191840	578	9:15:00	69.83	9:15:00	13.13	288.27
9:20:00	473	25191840	578	9:20:00	69.83	9:20:00	13.13	288.27
9:25:00	473	25191840	578	9:25:00	69.83	9:25:00	13.13	288.27
9:30:00	473	25191840	578	9:30:00	69.83	9:30:00	13.13	288.27
9:35:00	473	25191840	578	9:35:00	69.83	9:35:00	13.13	288.27
9:40:00	473	25191840	578	9:40:00	69.83	9:40:00	13.13	288.27
9:45:00	473	25191840	578	9:45:00	69.83	9:45:00	13.13	288.27
9:50:00	473	25191840	578	9:50:00	69.83	9:50:00	13.13	288.27
9:55:00	473	25191840	578	9:55:00	69.83	9:55:00	13.13	288.27

APPENDIX B3:
GALLATIN FOSSIL PLANT WASTEWATER
FLOW SCHEMATIC



ASH POND COMPLEX PROCESS FLOW

BOTTOM ASH POND = 20.43 cfs (bottom ash sluice stream) + 9.78 cfs (from plant process flow via Coal Yard runoff ditch)

POND E = 9.78 cfs (from plant process flow via Coal Yard runoff ditch)

Note: 9.78 cfs process flow can be diverted to either Bottom Ash Pond or Pond E.

BOTTOM ASH SLUICE FLOW TO REMAIN (20.43 cfs)

FORMER FLY ASH SLUICE FLOW TO BE REMOVED (12.92 cfs)

NOTATIONS:

1. All flows are annualized & in millions of gallons per day (MGD)
2. The Demineralizer Waste Neutralization Sump has been removed from service. If necessary, accumulated rainwater will be pumped to the Environmental Sump.
3. GAF's 21 fire hydrants receive raw water and are flushed twice each year. Hydrant flushes discharge to F6, F7, F10-F12, the Powerhouse Extension (unwatering) Sump, the Low Point Sump, the Environmental Sump, and/or the Ash Pond.
4. --> Represents intermittent flows
5. Precipitation (P) Evaporation (E) Ground Water (G) Municipal Water Supply - MWS n - negligible Internal Monitoring Point - IMP

**GALLATIN FOSSIL PLANT
FLOW SCHEMATIC DIAGRAM
NPDES Permit No. TN0005428
May 2009**

Process flow updated based on year 2016 conditions