INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

CFR 257.82(c)

Bottom Ash Pond Complex
Cardinal Plant
Brilliant, Ohio

September, 2016

Prepared for: Cardinal Operating Company - Cardinal Plant

Brilliant, Ohio

Prepared by: Geotechnical Engineering Services

American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

GERS-16-089

INFLOW DESIGN FLOOD CONTROL PLAN
CFR 257.82
BOTTOM ASH POND COMPLEX
CARDINAL PLANT

GERS-16-089

PREPARED BY DATE 9/21/2016

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REVIEWED BY DATE 9-22-2016

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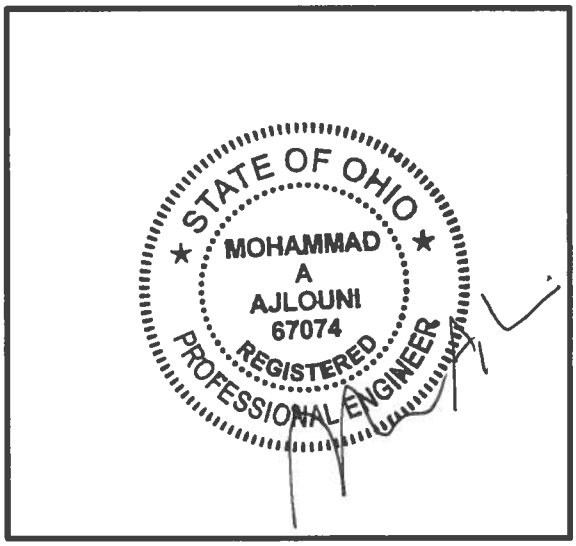

I certify to the best of my knowledge, information, and belief that the information contained in Inflow Design Flood Control System Plan meets the requirements of 40 CFR § 257.82

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1.0 OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of CFR 257.82 for the Inflow Design Flood Control System plan of Existing CCR Surface Impoundments.

2.0 DESCRIPTION OF THE CCR UNIT

The Cardinal Power Plant in Wells Township, Jefferson County, near the town of Brilliant in eastern Ohio.

The Cardinal Power Plant is owned by Buckeye Power and AEP Generation Resources (GENCO) a unit of American Electric Power and is operated by Cardinal Operating Company. The facility operates two surface impoundments for storing CCR; the Bottom Ash Complex and Cardinal Fly Ash Reservoir II (FAR II) Dam. The focus of this report is the Bottom Ash Complex.

The Bottom Ash Pond Complex (BAP) complex is comprised of diked embankments on the east and west sides while the north and south sides of the BAP are incised. The complex consists of two separate ponds, the larger bottom ash pond and the smaller recirculation pond.

The pond complex was originally developed as part of the construction of Units 1 and 2 in the 1960s. The crest of the dikes forming the original pond was at El. 658.0. However, the pond complex was raised to a crest elevation of 970.0 and extensively modified in 1974 as part of the construction of Unit 3.

3.0 INFLOW DESIGN FLOOD 257.82(a)(3)

The Bottom Ash Pond has been determined to be a Significant Hazard Potential CCR impoundment. Based on this hazard classification the design flood as determined by section 257.82(a)(3) to be the 1000-year storm (7 inches). An analysis was performed for the 50% Probable Maximum Flood (PMF), which looks at 50% of the runoff from PMP storm of 33 inches in 24 hours. This produces significantly more runoff than the 1000-year storm and therefore exceeds the requirements of section 257.82(a)(3). The complete analysis is included in Attachment A.

4.0 FLOOD CONTROL PLAN 257.82(c)

The Cardinal Bottom Ash Complex is comprised of diked embankments on three sides which directs storm water away from the impoundment and limits runoff to that which falls directly on the pond surface. The area of the pond is approximately 24.3 acres. The pond also receives pumped inflow from plant facilities and stormwater collection areas.
Discharge water from bottom ash pond flows into the clear water pond through a 36 inch diameter pipe. Most of the flow into the reclaim water pond is pumped backed to the plant for reuse in sluicing the fly ash from the plant to the FAR II Dam.

The analysis in Attachment A includes excerpts of the 2010 design report and the associated report Appendix C that provides the description of the spillway system, flood storage capacity, inflow peak discharge and volume, peak discharge from the facility and maximum pool elevation. The maximum pumped inflow from plant facilities and stormwater collection areas to the Bottom Ash Pond is 23.32 MGD (36 cfs) according to AEP's water balance diagram.

The calculations show that the facility has the capacity to manage the inflow design flood.

5.0 SUMMARY OF INFLOWS, OUTFLOWS AND FLOOD ELEVATIONS

The following table provides the maximum inflows, outflows and flood elevations for each portion of the pond complex. See the analysis include in Attachment A for detailed calculations.

Bottom Ash Pond Complex	
Storm Event	½ 24-hour PMP
Peak Inflow	406.2 cfs
Peak Outflow	67.7 cfs
Maximum Pool Elevation	668.1 ft.
Crest Elevation	670 ft.

ATTACHMENT A

Hydrologic and Hydraulics Analysis

Cardinal Generating Plant
Addendum to Bottom Ash Pond Investigation

Brilliant, Ohio

Report to

American Electric Power Service Corp.
Columbus, Ohio

Prepared by

BBC&M Engineering, Inc.
Dublin, Ohio

December, 2010
Addendum to August, 2009 Report

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H&H ANALYSIS

Introduction

The Bottom Ash Pond is located to the north of the Recirculation Pond and they are separated by an earthen embankment. The crest of the embankment surrounding the Bottom Ash Pond is protected with a gravel wearing surface. Water is pumped into the pond from the plant facilities for treatment. Water flows from the Bottom Ash Pond to the Recirculation Pond via a spillway structure. Water is pumped from the Recirculation Pond back into the plant system as necessary. Any overflow would exit the pond to the Ohio River via an NPDES outfall incorporating a weir control structure.

The Bottom Ash Pond is identified as a Class II dam by ODNR, and as such must safely pass 50% of the Probable Maximum Flood (PMF) in accordance with OAC Rule 1501:21-13-02. Regarding minimum required freeboard, OAC Rule 1501:21-13-07(A) states "*...the minimum elevation of the top of the dam shall be at least five feet higher than the elevation of the designed maximum operating pool level unless otherwise approved by the chief*".

Existing Conditions

The crest elevation for the Bottom Ash Pond is listed on the ODNR fact sheet as nominal Elevation 670.0 (msl). A field survey performed by AEP in November 2010, showed that the crest varies in Elevation from 668.3' to 669.4' (see Plate 1 of Appendix C). It is understood that AEP plans to perform maintenance to restore the crest to the original Elevation of 670.0.

The ODNR fact sheet, as well as a stormwater report by FMSM dated December 2005 and provided by AEP, lists the pond drainage area as 24.3 acres, which is slightly larger than the pond footprint. The maximum pumped inflow from plant facilities and stormwater collection areas to the Bottom Ash Pond is 23.32 MGD (36 cfs) according to an AEP water balance diagram dated 7/12/2006. The pond is isolated from substantial exterior surface water runoff.

The outlet works for the Bottom Ash Pond consists of a drop inlet spillway structure with slide gates. The gates are 4 feet in length. A 36-inch oulet pipe conveys the water to the Recirculation Pond. The elevation of the top of the current slide gate is 665.24 according to the field survey. A site visit on October 7, 2010 noted the pool level in the Bottom Ash Pond at Elevation 665.5. The pool level in the Recirculation Pond was at 663.8 during the site visit and is controlled by a 4-foot wide weir surveyed at Elevation 666.20. As the Recirculation Pond level was below the outlet weir, active discharging was not occurring during our site visit.

Analysis

This design storm was analyzed, along with the maximum pumped inflow, to develop maximum pool operating levels. A storage-area-elevation table was developed for the pond's live storage (from normal pool to top of dam) based on 1994 aerial mapping provided by AEP. This table is presented on Plate 6 of Appendix C. Since negligible drainage area runoff is occurring, 50% of the Probable Maximum Precipitation (PMP) was taken as being equivalent to 50% of the PMF. The PMP value used for this site was 33.0 inches for a 24-hour storm event, based on charts contained in HMR-51. A curve number (CN) of 99 was used for the pond area.

Using accepted engineering equations, rating curves for the outlet system were estimated, as shown on Plates 2 through 5 of Appendix C. The total inflow was routed through the pond system using the HEC-HMS computer program, which was developed by the U.S. Army Corps

of Engineers. The analysis was performed assuming tailwater in the Recirculation Pond at Elevation 663.0. Rating curves and other input values are contained in Appendix C. Several cases and iterations were performed with different beginning water elevations to determine the maximum safe operating levels, described as follows:

Case 1: The pond was analyzed with the normal operating level being located at the top of the slide gate weir (Elevation 665.24).

Case 2: Iterations were performed to find the maximum safe operating pool level that would not overtop the dam crest (Elevation 670.0) during the design storm.

Case 3: The pond was analyzed with the normal operating level being located at Elevation 665.0 (5 feet of freeboard).

Case 4: The pond was analyzed with the normal operating level being located at Elevation 666.0 (4 feet of freeboard). It is understood a variance from 5 feet to 4 feet may be requested for the freeboard requirement.

Results

The results of the analysis routing the design storm and pumped inflow through the pond for the various cases are summarized in Table 2.

Table 2: Summary of Pond Routing Results

Case	Normal Operating Water Level El.	Freeboard with nominal Crest El. 670	Max. Resultant Water Level El.
1	665.24	4.76 feet	668.3
2	667.1	2.9 feet	670.0
3	665.0	5.0 feet	668.1
4	666.0	4.0 feet	669.0

Detailed computed results, including flow rates and pond hydrographs, are included on Plates 7 through 15 of Appendix C.

Conclusions

The pond storage is sufficient to contain the design storm. However, the current normal pool level is not sufficient to meet the 5-foot freeboard requirement. It is understood that material will be added to the road surrounding the pond to restore the crest to a consistent elevation of 670.0. If this work is completed, a slide gate will still have to be removed to lower the normal pool level in the Bottom Ash Pond. Based on construction drawings by Sargent & Lundy, dated August 1973, the slide gates each have a height of 1 foot. A reduced weir elevation of 664.24 would allow for a maximum operating pool level of Elevation 665.0 and 5 feet of freeboard. This pool level creates 0.76 feet of head over the spillway weir and allows for a normal pumping inflow rate of 5.5 MGD, given that the pool level (tailwater) for the Recirculation Pond is lower than Elevation 665.0.

One option would be to obtain a variance to change the minimum freeboard requirement to 4 feet. If this is obtained, the maximum operating pool level in the Bottom Ash Pond may be maintained at Elevation 666.0. The maximum operating pool level of the Recirculation Pond should be maintained below the maximum operating pool level of the Bottom Ash Pond.

APPENDIX C

H & H Analysis

BOTTOM ASH POND.

W.E. 663.4

W.E. 670.8

OHIO RIVER

NOTE: TOPOGRAPHY AND FEATURES SHOWN ARE FROM 1994 AERIAL MAPPING PROVIDED BY AEP.

0 150 300

SCALE IN FEET

LEGEND

700.0 SURVEY DATA,PERFORMED BY AEP DURING NOVEMBER 2010

FIELD SURVEY DATA

BOTTOM ASH POND
CARDINAL GENERATING STATION

Project: 011-11497-013	Drawn By: ARW	
Drawing Date: 12-16-2010	Approved By: AJS	
Last Updated: 12-16-2010	Scale: 1"=150'	1:1

BBCM SOLUTIONS TO BUILD ON
Columbus (614) 793-2226
Cleveland (216) 901-1000
Cincinnati (513) 771-8471
Dayton (937) 424-1011

PLATE 1

Images:
Xrefs:
File Last Updated: Dec 16, 2010
Plot Info: 12-16-2010 @ 4:39pm By: AWeinandy
BBC&M Filename: I:\DEPTS\CADD\Drawings\Projects\011-11497-013\Civil3D\Base 11-16-10.dwg Layout: 11x17

Bottom Ash Pond Spillway Capacity - Case 1 - Existing Conditions						
Lake Elevation	Stop Log Weir Flow	Pipe Inlet Flow	Pressure Pipe Flow	**Control Flow**	***Total Outflow***	Control Type
feet	cfs	cfs	cfs	**cfs**	***MGD***	
663.00	0.0	83.3	0.0	**0.0**	***0.0***	Stop Log Weir Flow
664.00	0.0	90.0	31.6	**0.0**	***0.0***	Stop Log Weir Flow
665.00	0.0	96.2	44.7	**0.0**	***0.0***	Stop Log Weir Flow
666.00	8.5	102.1	54.7	**8.5**	***5.5***	Stop Log Weir Flow
667.00	29.8	107.6	63.2	**29.8**	***19.3***	Stop Log Weir Flow
668.00	58.5	112.8	70.7	**58.5**	***37.8***	Stop Log Weir Flow
669.00	93.1	117.8	77.4	**77.4**	***50.0***	Pressure Pipe Flow
670.00	132.6	122.7	83.6	**83.6**	***54.0***	Pressure Pipe Flow

Bottom Ash Pond Spillway Capacity - Case 2 - Max Water at Elev 670						
Lake Elevation	Stop Log Weir Flow	Pipe Inlet Flow	Pressure Pipe Flow	**Control Flow**	***Total Outflow***	Control Type
feet	cfs	cfs	cfs	**cfs**	***MGD***	
665.00	0.0	96.2	44.7	**0.0**	***0.0***	Stop Log Weir Flow
666.00	0.0	102.1	54.7	**0.0**	***0.0***	Stop Log Weir Flow
667.00	0.0	107.6	63.2	**0.0**	***0.0***	Stop Log Weir Flow
668.00	12.8	112.8	70.7	**12.8**	***8.2***	Stop Log Weir Flow
669.00	36.1	117.8	77.4	**36.1**	***23.3***	Stop Log Weir Flow
670.00	66.3	122.7	83.6	**66.3**	***42.9***	Stop Log Weir Flow
671.00	102.1	127.3	89.4	**89.4**	***57.8***	Pressure Pipe Flow

Bottom Ash Pond Spillway Capacity - Case 3 - NP Elev 665						
Lake Elevation	Stop Log Weir Flow	Pipe Inlet Flow	Pressure Pipe Flow	**Control Flow**	***Total Outflow***	Control Type
feet	cfs	cfs	cfs	**cfs**	***MGD***	
664.00	0.0	90.0	31.6	**0.0**	***0.0***	Stop Log Weir Flow
665.00	0.0	96.2	44.7	**0.0**	***0.0***	Stop Log Weir Flow
666.00	12.8	102.1	54.7	**12.8**	***8.2***	Stop Log Weir Flow
667.00	36.1	107.6	63.2	**36.1**	***23.3***	Stop Log Weir Flow
668.00	66.3	112.8	70.7	**66.3**	***42.9***	Stop Log Weir Flow
669.00	102.1	117.8	77.4	**77.4**	***50.0***	Pressure Pipe Flow
670.00	142.7	122.7	83.6	**83.6**	***54.0***	Pressure Pipe Flow

Bottom Ash Pond Spillway Capacity - Case 4 - NP Elev 666						
Lake Elevation	Stop Log Weir Flow	Pipe Inlet Flow	Pressure Pipe Flow	**Control Flow**	***Total Outflow***	Control Type
feet	cfs	cfs	cfs	**cfs**	***MGD***	
665.00	0.0	96.2	44.7	**0.0**	***0.0***	Stop Log Weir Flow
666.00	0.0	102.1	54.7	**0.0**	***0.0***	Stop Log Weir Flow
667.00	12.8	107.6	63.2	**12.8**	***8.2***	Stop Log Weir Flow
668.00	36.1	112.8	70.7	**36.1**	***23.3***	Stop Log Weir Flow
669.00	66.3	117.8	77.4	**66.3**	***42.9***	Stop Log Weir Flow
670.00	102.1	122.7	83.6	**83.6**	***54.0***	Pressure Pipe Flow

Bottom Ash Pond Weir Rating - Case 1
Weir Flow

$$Q = C_{SCW}\, LH^{\frac{3}{2}}$$

$$C_{SCW} = 3.27 + 0.4\left(\frac{H}{H_c}\right)$$

for $H/H_c < 0.3$, C_{SCW} becomes 3.33

***L*= 3.83**
***g*= 32.2**
***Crest Elevation*= 665.24**

Elevation	H	Q
665.24	0.00	0.0
666.00	0.76	8.5
667.00	1.76	29.8
668.00	2.76	58.5
669.00	3.76	93.1
670.00	4.76	132.6

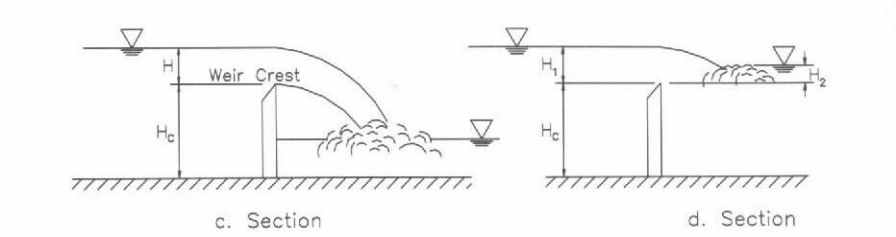


Figure 8-13. Sharp crested weirs.

Reference:
FHWA-SA-96-078
Urban Drainage Design Manual
Hydraulic Engineering Circular 22
November, 1996

Bottom Ash Pond 36" Pipe Rating
Pipe Inlet Control

$$Q = CA\sqrt{2gh_1}$$

for C=0.6 orifice equation becomes:

$$Q = 3.78D^2\sqrt{h_1}$$

d= **36.0** **INCHES**

Orifice Elevation = **657.00**

Headwater Elevation (ft.)	Orifice	
	Discharge (cfs)	Velocity (ft/s)
657.00	*0.0*	0.0
658.00	*34.0*	4.8
659.00	*48.1*	6.8
660.00	*58.9*	8.3
661.00	*68.0*	9.6
662.00	*76.1*	10.8
663.00	*83.3*	11.8
664.00	*90.0*	12.7
665.00	*96.2*	13.6
666.00	*102.1*	14.4
667.00	*107.6*	15.2
668.00	*112.8*	16.0
669.00	*117.8*	16.7
670.00	*122.7*	17.4
671.00	*127.3*	18.0

Reference:
FHWA-SA-96-078
Urban Drainage Design Manual
Hydraulic Engineering Circular 22
November, 1996

Pressure Pipe Flow Computed with the Energy Equation

(from inlet to Recirc. Pond)

Manning's n= 0.013
Inlet Invert: 657
Outlet Invert (z_2): 656
Entrance Coefficent K_e= 0.5
Outlet Coefficent K_o= 1
Bend Coefficent K_b= 0
Pipe Diameter in inches= 36
Pipe Diameter in feet (D)= *3.00*
Pipe Length in feet (L)= 100
Darcy-Weisbach *f* = *0.022*

(Assuming tailwater at El. 663.0):

Headwater Elevation (z_1) (ft)	Outlet Velocity (ft/s)	Outlet Flow Rate (ft^3/s)
657.00	0.00	0.00
658.00	0.00	0.00
659.00	0.00	0.00
660.00	0.00	0.00
661.00	0.00	0.00
662.00	0.00	0.00
663.00	0.00	0.00
664.00	4.47	31.60
665.00	6.32	44.69
666.00	7.74	54.73
667.00	8.94	63.20
668.00	10.00	70.66
669.00	10.95	77.40
670.00	11.83	83.60
671.00	12.64	89.38

The Darcy-Weisbach friction factor is related to Manning's n through the following equation:

$$f = \frac{185 \quad n^{2}}{D^{\frac{1}{3}}}$$

The Energy Equation is:

$$\frac{p_1}{\gamma}+\frac{v_1^2}{2g}+z_1=\frac{p_2}{\gamma}+\frac{v_2^2}{2g}+z_2+\sum h_L$$

Where:

$$\sum h_L=\frac{v^2}{2g}\left(f\frac{L}{D}+K_e+K_o+K_b\right)$$

Because p_1, v_1 and p_2 all are equal to 0 the energy equation becomes:

$$z_1-z_2=\frac{v^2}{2g}+\frac{v^2}{2g}\left(f\frac{L}{D}+K_e+K_o+K_b\right)$$

Solving for v gives:

$$v=\sqrt{\frac{2g(z_1-z_2)}{\left(1+\left(f\frac{L}{D}+K_e+K_o+K_b\right)\right)}}$$

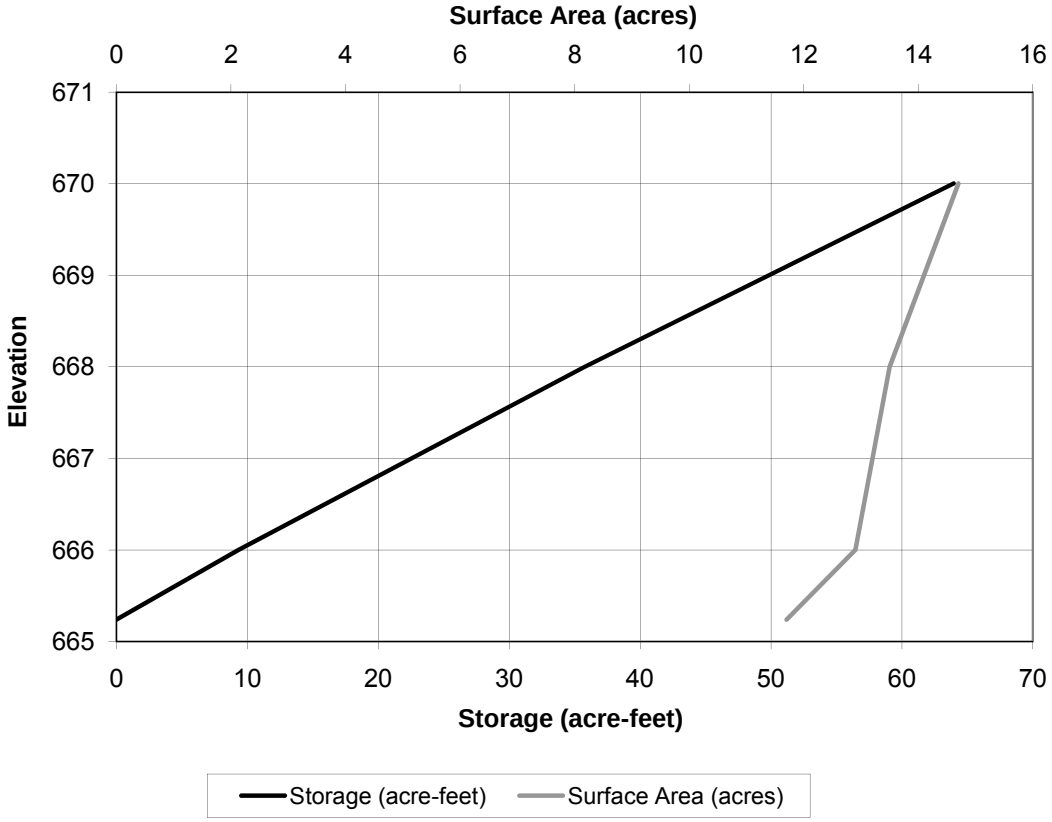
Determine flow rate Q by:

$$Q = VA$$

Bottom Ash Pond - Live Storage Volume Computations					
Elevation	Area	Avg Area	Distance	Volume	Cum Vol
	acres	acres	feet	ac-ft	ac-ft
Normal Pool 665.24	11.70				0
		12.30	0.76	9.35	
666	12.90				9.3
		13.20	2	26.40	
668	13.50				35.7
		14.10	2	28.20	
670	14.70				63.9

Bottom Ash Pond- Surface Area/Storage/Elevation

Note: From topography provided by AEP



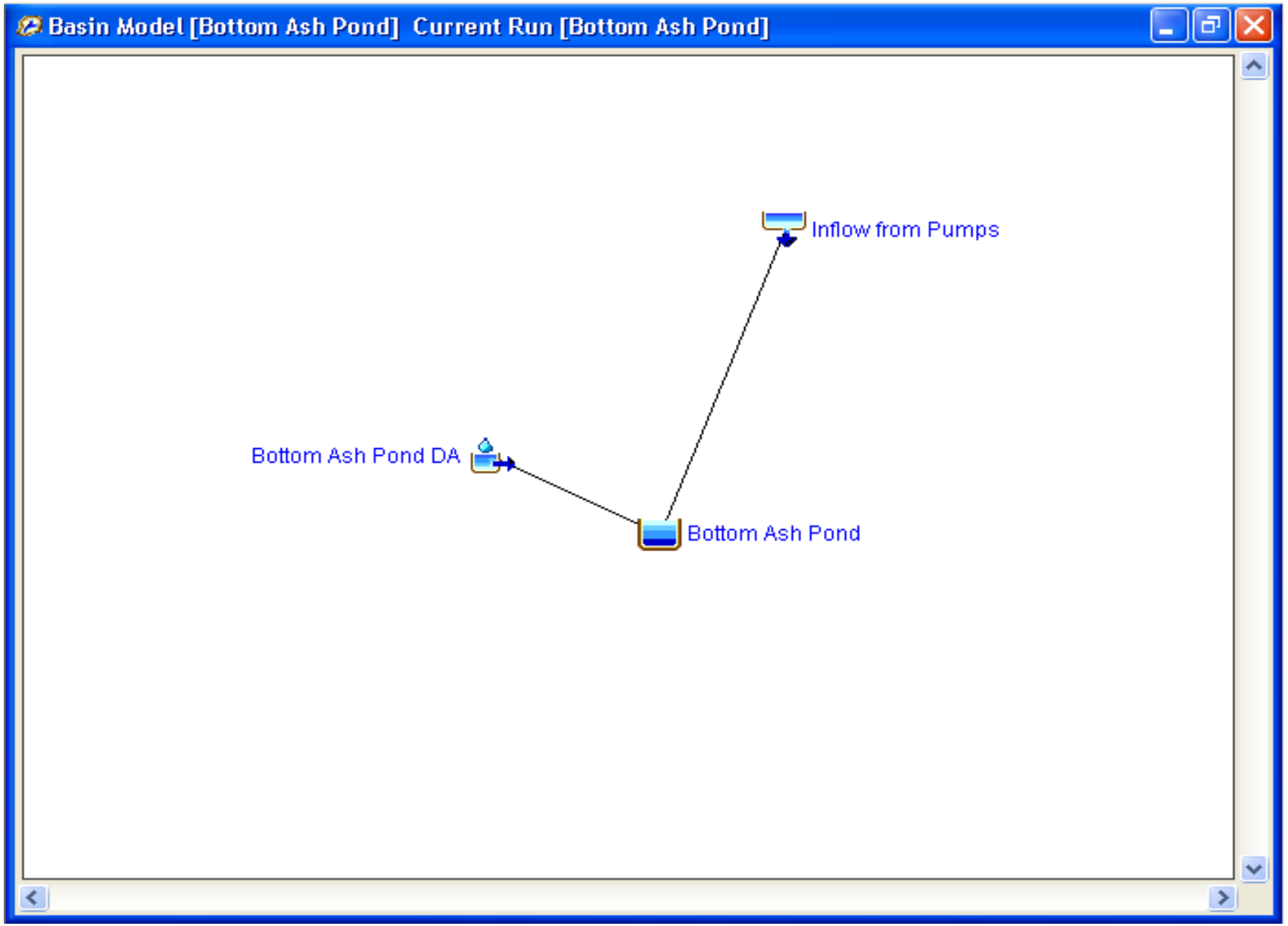

Basin Model [Bottom Ash Pond] Current Run [Bottom Ash Pond]
Inflow from Pumps
Bottom Ash Pond DA
Bottom Ash Pond

PLATE 7

Project: Bottom Ash Pond

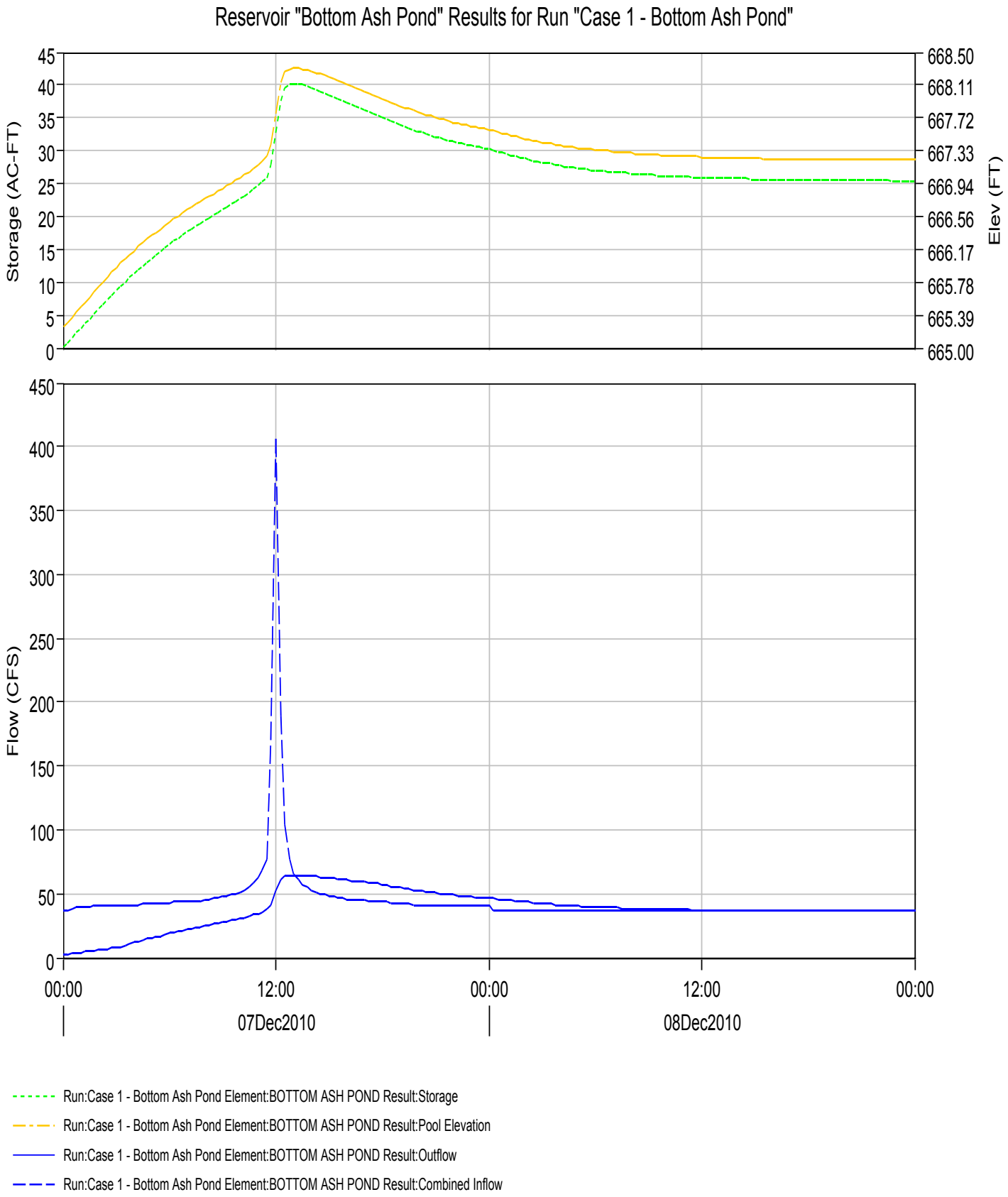
Simulation Run: Case 1 - Bottom Ash Pond Reservoir: Bottom Ash Pond

Start of Run:	07Dec2010, 00:00	Basin Model:	Case 1 - Bottom Ash Pond
End of Run:	09Dec2010, 00:00	Meteorologic Model:	50 Percent PMP - 24 Hour
Compute Time:	08Dec2010, 12:23:27	Control Specifications:	Bottom Ash Pond

Volume Units: AC-FT

Computed Results

Peak Inflow :	406.2 (CFS)	Date/Time of Peak Inflow :	07Dec2010, 12:00
Peak Outflow :	64.4 (CFS)	Date/Time of Peak Outflow :	07Dec2010, 13:00
Total Inflow :	176.0 (AC-FT)	Peak Storage :	40.1 (AC-FT)
Total Outflow :	150.7 (AC-FT)	Peak Elevation :	668.3 (FT)


Reservoir "Bottom Ash Pond" Results for Run "Case 1 - Bottom Ash Pond"
Storage (AC-FT)
Elev (FT)
45
40
35
30
25
20
15
10
5
0
668.50
668.11
667.72
667.33
666.94
666.56
666.17
665.78
665.39
665.00
Flow (CFS)
450
400
350
300
250
200
150
100
50
0
00:00
12:00
00:00
12:00
00:00
07Dec2010
08Dec2010
Run:Case 1 - Bottom Ash Pond Element:BOTTOM ASH POND Result:Storage
Run:Case 1 - Bottom Ash Pond Element:BOTTOM ASH POND Result:Pool Elevation
Run:Case 1 - Bottom Ash Pond Element:BOTTOM ASH POND Result:Outflow
Run:Case 1 - Bottom Ash Pond Element:BOTTOM ASH POND Result:Combined Inflow

Project: Bottom Ash Pond

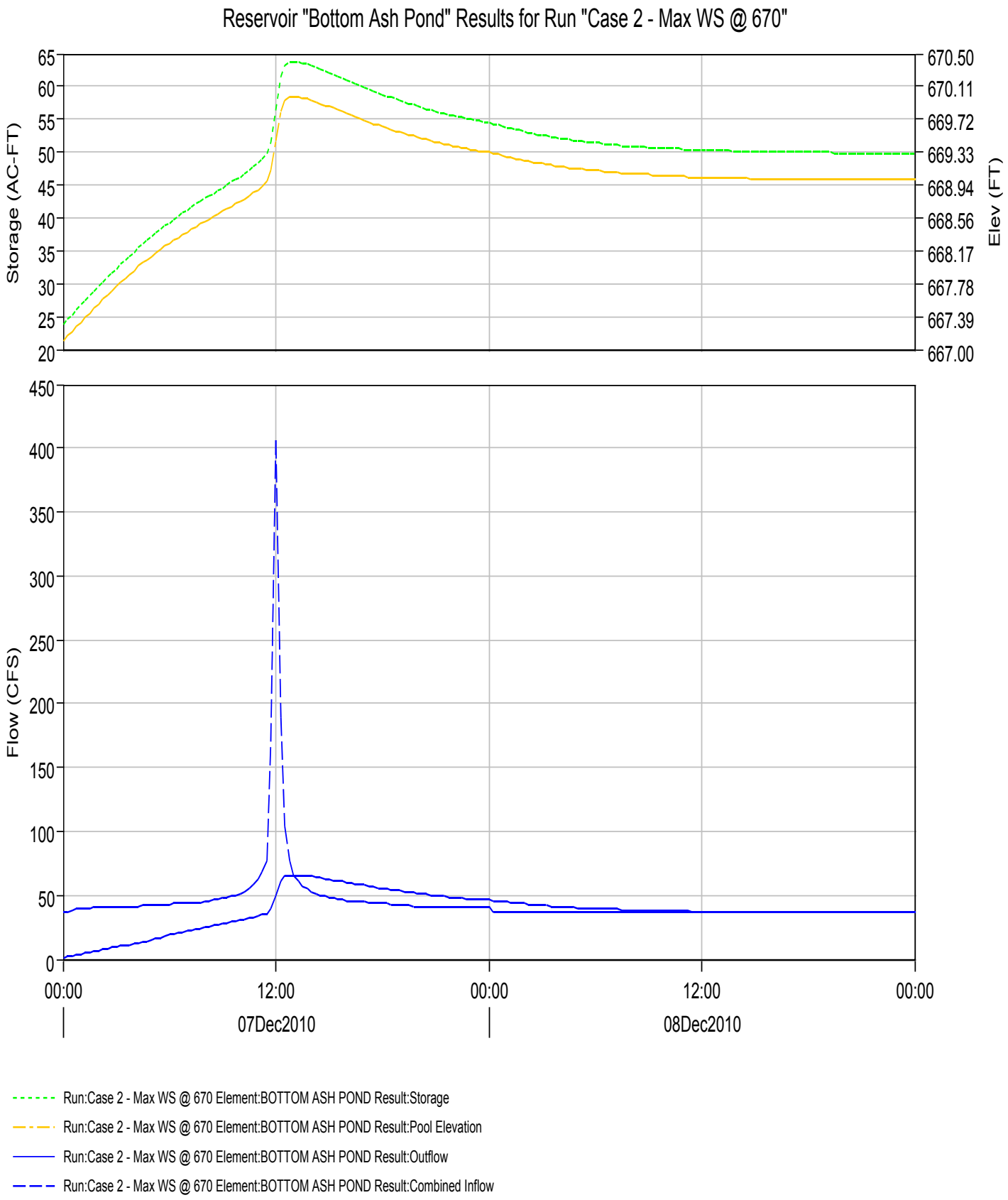
Simulation Run: Case 2 - Max WS @ 670 Reservoir: Bottom Ash Pond

Start of Run:	07Dec2010, 00:00	Basin Model:	Case 2 - Bottom Ash Pond
End of Run:	09Dec2010, 00:00	Meteorologic Model:	50 Percent PMP - 24 Hour
Compute Time:	08Dec2010, 12:34:32	Control Specifications:	Bottom Ash Pond

Volume Units: AC-FT

Computed Results

Peak Inflow :	406.2 (CFS)	Date/Time of Peak Inflow :	07Dec2010, 12:00
Peak Outflow :	66.1 (CFS)	Date/Time of Peak Outflow :	07Dec2010, 13:00
Total Inflow :	176.0 (AC-FT)	Peak Storage :	63.8 (AC-FT)
Total Outflow :	150.0 (AC-FT)	Peak Elevation :	670.0 (FT)


Reservoir "Bottom Ash Pond" Results for Run "Case 2 - Max WS @ 670"
Storage (AC-FT)
Elev (FT)
65
60
55
50
45
40
35
30
25
20
670.50
670.11
669.72
669.33
668.94
668.56
668.17
667.78
667.39
667.00
Flow (CFS)
450
400
350
300
250
200
150
100
50
0
00:00
12:00
00:00
12:00
00:00
07Dec2010
08Dec2010
Run:Case 2 - Max WS @ 670 Element:BOTTOM ASH POND Result:Storage
Run:Case 2 - Max WS @ 670 Element:BOTTOM ASH POND Result:Pool Elevation
Run:Case 2 - Max WS @ 670 Element:BOTTOM ASH POND Result:Outflow
Run:Case 2 - Max WS @ 670 Element:BOTTOM ASH POND Result:Combined Inflow

Project: Bottom Ash Pond

Simulation Run: Case 3 - NP @ 665.0 Reservoir: Bottom Ash Pond

Start of Run:	07Dec2010, 00:00	Basin Model:	Case 3 - Bottom Ash Pond
End of Run:	09Dec2010, 00:00	Meteorologic Model:	50 Percent PMP - 24 Hour
Compute Time:	08Dec2010, 12:17:34	Control Specifications:	Bottom Ash Pond

Volume Units: AC-FT

Computed Results

Peak Inflow :	406.2 (CFS)	Date/Time of Peak Inflow :	07Dec2010, 12:00
Peak Outflow :	67.7 (CFS)	Date/Time of Peak Outflow :	07Dec2010, 13:00
Total Inflow :	176.0 (AC-FT)	Peak Storage :	37.5 (AC-FT)
Total Outflow :	153.6 (AC-FT)	Peak Elevation :	668.1 (FT)

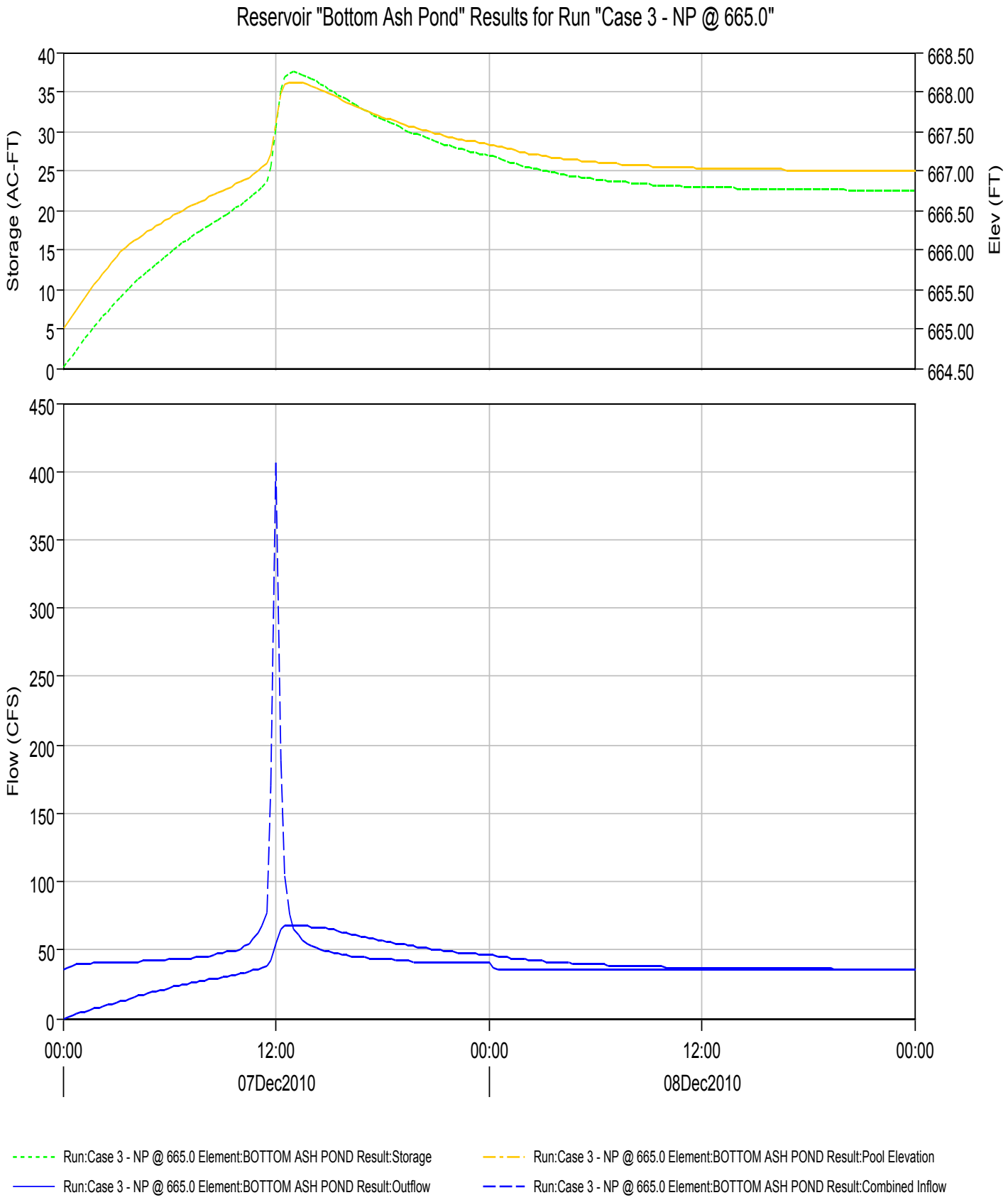

Reservoir "Bottom Ash Pond" Results for Run "Case 3 - NP @ 665.0"
Storage (AC-FT)
Elev (FT)
Flow (CFS)
0
5
10
15
20
25
30
35
40
664.50
665.00
665.50
666.00
666.50
667.00
667.50
668.00
668.50
0
50
100
150
200
250
300
350
400
450
00:00
12:00
00:00
12:00
00:00
07Dec2010
08Dec2010
Run:Case 3 - NP @ 665.0 Element:BOTTOM ASH POND Result:Storage
Run:Case 3 - NP @ 665.0 Element:BOTTOM ASH POND Result:Pool Elevation
Run:Case 3 - NP @ 665.0 Element:BOTTOM ASH POND Result:Outflow
Run:Case 3 - NP @ 665.0 Element:BOTTOM ASH POND Result:Combined Inflow

PLATE 13

Project: Bottom Ash Pond

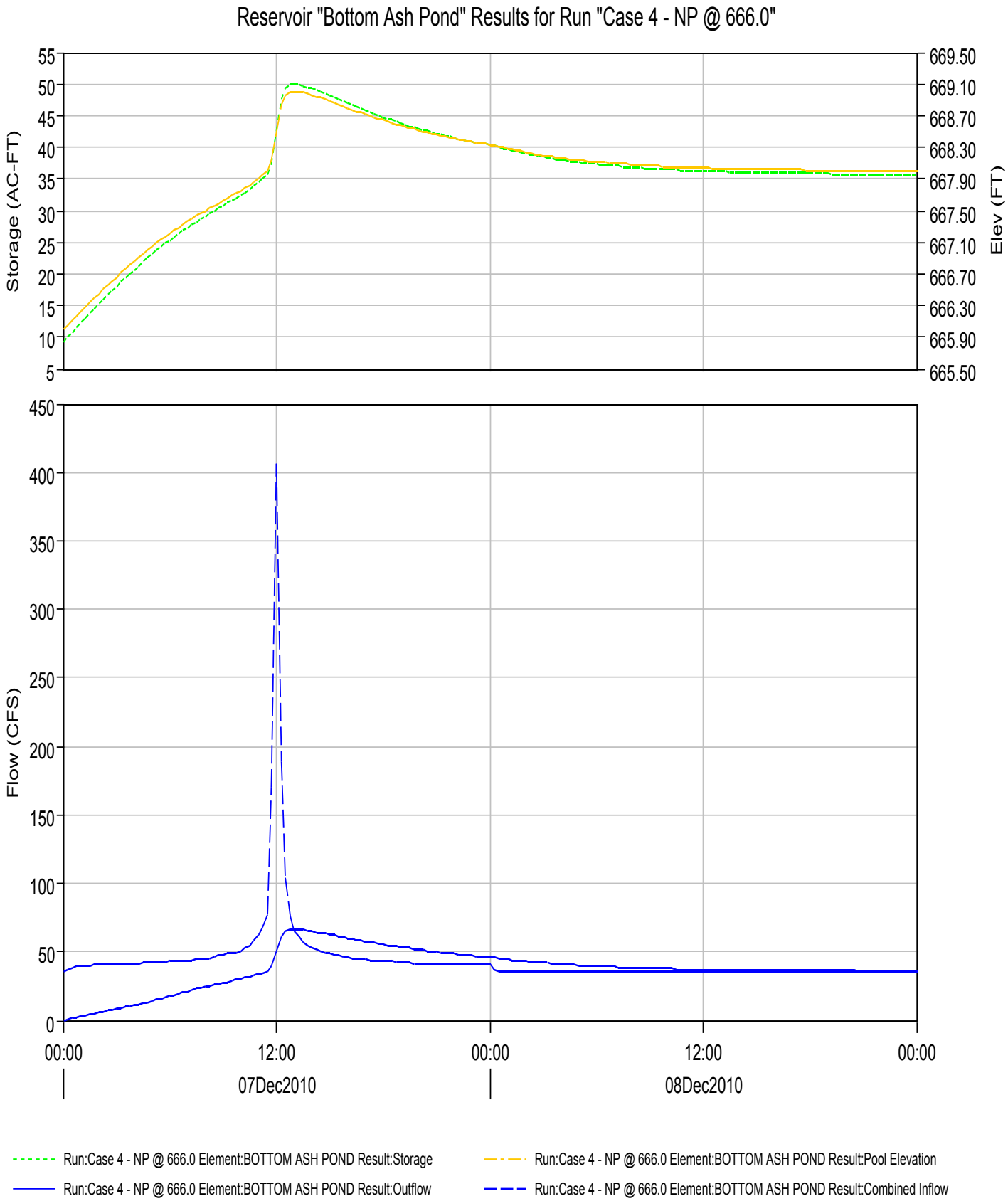
Simulation Run: Case 4 - NP @ 666.0 Reservoir: Bottom Ash Pond

Start of Run:	07Dec2010, 00:00	Basin Model:	Case 4 - Bottom Ash Pond
End of Run:	09Dec2010, 00:00	Meteorologic Model:	50 Percent PMP - 24 Hour
Compute Time:	08Dec2010, 12:21:45	Control Specifications:	Bottom Ash Pond

Volume Units: AC-FT

Computed Results

Peak Inflow :	406.2 (CFS)	Date/Time of Peak Inflow :	07Dec2010, 12:00
Peak Outflow :	66.4 (CFS)	Date/Time of Peak Outflow :	07Dec2010, 13:00
Total Inflow :	176.0 (AC-FT)	Peak Storage :	49.9 (AC-FT)
Total Outflow :	149.6 (AC-FT)	Peak Elevation :	669.0 (FT)


Reservoir "Bottom Ash Pond" Results for Run "Case 4 - NP @ 666.0"
Storage (AC-FT)
Elev (FT)
55
50
45
40
35
30
25
20
15
10
5
669.50
669.10
668.70
668.30
667.90
667.50
667.10
666.70
666.30
665.90
665.50
Flow (CFS)
450
400
350
300
250
200
150
100
50
0
00:00
12:00
00:00
12:00
00:00
07Dec2010
08Dec2010
Run:Case 4 - NP @ 666.0 Element:BOTTOM ASH POND Result:Storage
Run:Case 4 - NP @ 666.0 Element:BOTTOM ASH POND Result:Pool Elevation
Run:Case 4 - NP @ 666.0 Element:BOTTOM ASH POND Result:Outflow
Run:Case 4 - NP @ 666.0 Element:BOTTOM ASH POND Result:Combined Inflow