

INFLOW DESIGN FLOOD CONTROL PLAN

CFR 257.82

East and West Bottom Ash Pond

Pirkey Power Plant
Hallsville, Texas

October, 2016

Prepared for: Southwest Electric Power Company – Pirkey Power Plant

Hallsville, Texas

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215



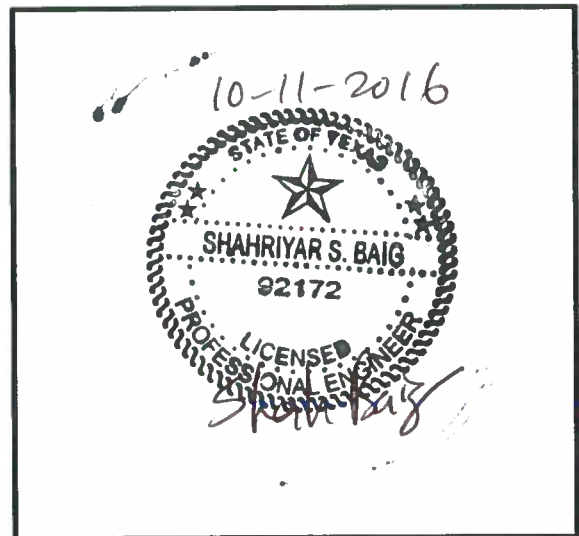
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INFLOW DESIGN FLOOD CONTROL PLAN
CFR 257.82
PIRKEY POWER PLANT
EAST AND WEST BOTTOM ASH POND

PREPARED BY Brett A. Dreger DATE 9/19/2016
Brett A. Dreger, P.E.

REVIEWED BY Shahriyar S. Baig DATE 9-19-2016
Shahriyar S. Baig, P.E.

APPROVED BY Gary F. Zych DATE 10/6/2016
Gary F. Zych, P.E.
Manager – AEP Geotechnical Engineering



I certify to the best of my knowledge, information, and belief that the information contained in this Inflow Design Flood Control 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 hydrologic and hydraulic evaluation of CCR surface impoundments.

2.0 DESCRIPTION OF THE CCR UNIT

The Henry W. Pirkey Power Station is located at 2400 FM 3251 and south of Hallsville, Texas. It is owned and operated by Southwest Electric Power Company (SWEPCO). The facility operates two surface impoundments for storing CCR materials called the East Bottom Ash Pond (East BAP) and the West Bottom Ash Pond (West BAP).

The East BAP is located directly adjacent to and east of the West BAP. The East BAP receives sluiced bottom ash and has a surface area of 30.9 acres and a storage capacity of 188 acre-feet. The pond is almost entirely incised, with a reported maximum embankment height of 4 feet.

The West BAP, which also receives sluiced bottom ash, is located northwest of the main plant buildings and shares its eastern border with the western border of the East BAP. The West BAP receives sluiced bottom ash and has a surface area of 30 acres and a storage capacity of 188 acre-feet. The maximum embankment height is 25 feet. The main upstream embankment slopes are 3 feet horizontal to 1 foot vertical (3:1 H:V); while the main downstream slopes are 2.5:1 H:V.

3.0 INFLOW DESIGN FLOOD 257.82(a)(3)

The facility is classified as a Low Hazard Potential Dam. The Inflow Design Flood is the 100-year storm event.

4.0 FLOOD CONTROL PLAN 257.82(c)

All storm water runoff from the watershed drains into the reservoir created by the Bottom Ash Pond Dam. The design to safely pass the inflow design flood without overtopping the crest of the dam is based on the normal pool being at maximum normal operating pool and utilizing the principal spillway and emergency spillway to handle the 100-year design storm without overtopping the crest of the dam.

The analysis in Attachment A includes related excerpts from the 2015 Pirkey H&H Analysis report 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 calculations show that the facility has the capacity to manage the inflow design flood, as well as large flood events.

ATTACHMENT A

Hydrology and Hydraulic Report

East and West Ash Ponds

H.W. Pirkey Power Plant

JPI Project
2313-016

HYDROLOGY & HYDRAULIC REPORT

**NORTH SURGE POND
EAST & WEST ASH PONDS
SECONDARY ASH POND
LANDFILL POND**

**H.W. PIRKEY POWER PLANT
HALLSVILLE, TEXAS**

Prepared for:

H.W. Pirkey Power Plant
2450 FM 3251
Hallsville, Texas 75650

Prepared by:

Johnson & Pace Incorporated
Union Plaza I
1201 NW Loop 281 – LB1
Longview, Texas 75604
TBPE Firm Reg. #4691

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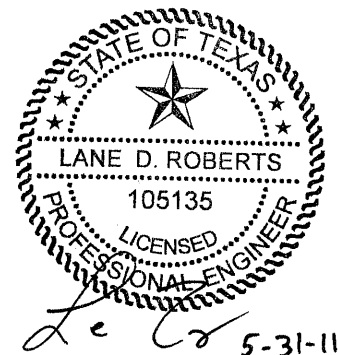


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HYDROLOGIC & HYDRAULIC CALCULATIONS 10-YR, 24-HR RAINFALL EVENT

HYDROLOGIC & HYDRAULIC CALCULATIONS 25% OF PMP EVENT

APPENDIX - A

Exhibits

Introduction

H.W. Pirkey Power Plant which is located in Hallsville, Texas is a subsidiary of American Electric Power. Plant operation requires a series of water impoundments utilized in the process of power generation, including surge ponds, the bottom ash ponds, and the landfill stormwater runoff pond. The purpose of this report is to analyze and document the Hydrologic & Hydraulic characteristics of the subject existing impoundments at Pirkey Power Plant.

Five existing impoundments identified in this report as, North Surge Pond (also known as Auxiliary Surge Pond), East and West Ash Ponds, Secondary Ash Pond and Landfill Stormwater Pond (for flue gas desulfurization (FGD) and fly ash sludge runoff), have been analyzed and pertinent results from these analyses are included in this report. An overall location map identifying the different ponds is included as Exhibit A in Appendix A of this submittal.

Hydrologic Methodology

This section describes the general outline of the hydrologic methodologies used to evaluate the total runoff tributary to the ponds. Specific characteristics of each pond are discussed under individual subheadings later on in this report.

In accordance with section 3G on page 13 of the TPDES Permit No. WQ0002496000, dated May 17, 2007, the storage capacity of the all the ponds were analyzed for a 10-yr, 24-hr rainfall event. The rainfall depth for a 10-yr, 24-hr rainfall event in the vicinity of the structure is 7.1 inches (see figure 1). In order to evaluate the storage capacity of each pond during the worst case situation, another set of calculations were performed for a 25% of the Probable Maximum Flood (PMF) which is based on a Probable Maximum Precipitation (PMP) event. Impoundments such as the North Surge Pond, the East & West Ash Ponds and the Secondary Ash Pond, considered off-channel impoundments, are specifically exempt from TCEQ Dam Safety regulations. However all these impoundments have been conservatively treated as low hazard dams and therefore have been analyzed to evaluate the impact during a 25% of PMF event.

Soil Conservation Service's (SCS) curve number method was adopted to perform the hydrologic analyses for these ponds. Due to characteristics of the North Surge Pond, East & West Ash Ponds and the Secondary Ash Pond a simplistic approach was adopted to ascertain the inflow and because of the complexity of the Landfill Pond a more elaborate approach was adopted.

The North Surge Pond, East & West Ash Ponds and the Secondary Pond are all total containment ponds. Watershed areas contributing to the flow into these ponds are the ponds and berms/access roads themselves; in other words these ponds have no additional runoff areas

tributary to them. Therefore, a conservative approach is to adopt a curve number 100 and to consider that every inch of rainfall will directly increase the water surface elevation.

According to Natural Resource Conservation Service (formerly SCS) Technical Release 55, the peak flow is calculated using the formula:

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

where,

Q = runoff (inches)

P = rainfall (inches)

S = potential maximum retention after runoff begins (inches) = (1000/curve number) – 10

Applying a curve number of 100 to the formula above will ultimately result in Q = P (because S=0); which implies that the total runoff contributing to the flow in each of the ponds is directly a function of the rainfall event.

The Hydrologic methodology for the Landfill Pond is described later on in the report under a separate subheading.

Hydraulic Methodology

This section describes the general outline of the hydraulic methodologies used to analyze the storage capacity of the ponds. Specific characteristics of each pond are discussed under individual subheadings later on in this report.

The plant's TPDES permit requires a minimum freeboard of 2ft below the maximum storage capacity of the impoundment; Therefore, the normal operating level for each pond was established to ensure that the water surface elevation during a 10-yr, 24-hr rainfall event does not undermine the minimum freeboard requirement. Using actual field survey data (performed by JPI) an elevation-area-storage table was developed for all the ponds and is included in the tables section of this report. Hydraflow Hydrographs was utilized to evaluate storage capacity and the water surface elevations in each pond during the specific rainfall events. Due to software limitations the 25% PMF models are identified as 100-Year events although PMP values were input into the model.

Detailed Hydrologic & Hydraulic characteristics of each pond, specifically, are discussed below.

NORTH SURGE POND:

The North Surge Pond located to the north of Pirkey Power Plant is an impoundment used to temporarily store process water for making up to the FGD unit. Field survey of the embankment around the impoundment indicates that the top of the embankment is at an elevation of 376.0msl, which is consistent with original design drawings. Therefore, based on this top of embankment elevation the minimum freeboard elevation was established at 374.0msl and the Normal Operating Level at 373.0msl. The watershed area contributing to the flow into this pond was estimated to be 5.08 acres, which is the area of the pond and perimeter berm itself.

As mentioned earlier the storage capacity for each pond was analyzed for a 10-yr, 24-hr rainfall event (7.1 inches) and for 25% of PMF. Because the North Surge Pond is a total containment pond, this structure was analyzed for a 25% of PMF which is calculated based on 25% of the 72-hour PMP. A 72-hr PMP in the vicinity of this structure is estimated to be 51 inches (See Figure 3), and the 25% PMP was calculated to be 12.8 inches.

Water surface elevation was calculated for the 10-yr, 24-hr rainfall event with a normal operating level (373.0msl) as the baseline elevation and for the 25% of PMF the minimum freeboard elevation (374.0msl) was used as the baseline elevation. Results from Hydraflow Hydrograph indicates that the water surface elevation during the 10-yr, 24-hr rainfall will be 373.62msl which is less than 374.0msl (2ft below embankment top) and during the 25% PMF it will be 375.09msl which is less than 376.0msl (top of embankment)

EAST ASH POND:

The East Ash Pond is located to the east of the rail road track and north of the Pirkey Power Plant. This is a coal combustion waste pond used to settle bottom ash that has been sluiced from the plant boiler. Field survey of the embankment around the impoundment indicates that the top of the embankment is at an elevation of 357.0msl, which is consistent with original design drawings. Therefore, based on this top of embankment elevation the minimum freeboard elevation was established at 355.0msl and the normal operating level at 354.0msl. The watershed area contributing to the flow into this pond was estimated to be 29.63 acres.

As mentioned earlier the storage capacity for each pond was analyzed for a 10-yr, 24-hr rainfall event (7.1 inches) and for 25% of PMF. Because the East Ash Pond is a total containment pond, this structure was analyzed for a 25% of PMF which is calculated based on 25% of the 72-hour PMP. A 72-hr PMP in the vicinity of this structure is estimated to be 51 inches (See Figure 3), and the 25% PMP was calculated to be 12.8 inches.

Water surface elevation was calculated for the 10-yr, 24-hr rainfall event with a normal operating level (354.0msl) as the baseline elevation and for the 25% of PMF the minimum freeboard elevation (355.0msl) was used as the baseline elevation. Results from Hydraflow Hydrograph indicates that the water surface elevation during the 10-yr, 24-hr rainfall will be 354.62msl which is less than 355.0msl (2ft below embankment top) and during the 25% PMF it will be 356.11msl which is less than 357.0msl (top of embankment).

WEST ASH POND:

The West Ash Pond is located to the west of the rail road track and adjacent to the east ash pond. This is a coal combustion waste pond used to settle bottom ash that has been sluiced from the plant boiler. Field survey of the embankment around the impoundment indicates that the top of the embankment is at an elevation of 357.0msl, which is consistent with original design drawings. Therefore, based on this top of embankment elevation the minimum freeboard elevation was established at 355.0msl and the normal operating level at 354.0msl. The watershed area contributing to the flow into this pond was estimated to be 33.44 acres.

As mentioned earlier the storage capacity for each pond was analyzed for a 10-yr, 24-hr rainfall event (7.1 inches) and for 25% of PMF. Because the West Ash Pond is a total containment pond, this structure was analyzed for a 25% of PMF which is calculated based on 25% of the 72-hour PMP. A 72-hr PMP in the vicinity of this structure is estimated to be 51 inches (See Figure 3), and the 25% PMP was calculated to be 12.8 inches.

Water surface elevation was calculated for the 10-yr, 24-hr rainfall event with a normal operating level (354.0msl) as the baseline elevation and for the 25% of PMF the minimum freeboard elevation (355.0msl) was used as the baseline elevation. Results from Hydraflow Hydrograph indicates that the water surface elevation during the 10-yr, 24-hr rainfall will be 354.64msl which is less than 355.0msl (2ft below embankment top) and during the 25% PMF it will be 356.13msl which is less than 357.0msl (top of embankment)

SECONDARY ASH POND:

The Secondary Ash Pond is located to the east of the rail road track and directly south of the east ash pond. This is a coal combustion waste pond that receives water from the east or west bottom ash ponds and provides final ash settling prior to being recycled to the plant boiler for additional bottom ash removal. Because every inch of rainfall will directly increase the water surface elevation of each pond, the pipe between the ponds has no effect on the hydraulics of the pond system and thus each ash pond was studied independently. Field survey of the

embankment around the impoundment indicates that the top of the embankment is at an elevation of 357.0msl, which is consistent with original design drawings. Therefore, based on this top of embankment elevation the minimum freeboard elevation was established at 355.0msl and the normal operating level at 354.0msl. The watershed area contributing to the flow into this pond was estimated to be 4.35 acres.

As mentioned earlier the storage capacity for each pond was analyzed for a 10-yr, 24-hr rainfall event (7.1 inches) and for 25% of PMF. Because the Secondary Ash Pond is a total containment pond, this structure was analyzed for a 25% of PMF which is calculated based on 25% of the 72-hour PMP. A 72-hr PMP in the vicinity of this structure is estimated to be 51 inches (See Figure 3), and the 25% PMP was calculated to be 12.8 inches.

Water surface elevation was calculated for the 10-yr, 24-hr rainfall event with a normal operating level (354.0msl) as the baseline elevation and for the 25% of PMF the minimum freeboard elevation (355.0msl) was used as the baseline elevation. Results from Hydraflow Hydrograph indicates that the water surface elevation during the 10-yr, 24-hr rainfall will be 354.74msl which is less than 355.0msl (2ft below embankment top) and during the 25% PMF it will be 356.28msl which is less than 357.0msl (top of embankment)

LANDFILL POND:

The purpose of the landfill pond is to capture storm water runoff primarily from the Flue Gas Desulfurization (FGD) Sludge landfill. A comprehensive study of the existing pond and its tributary watershed was performed to analyze the storage capacity for existing and future conditions to accommodate a 10-year, 24-hour rainfall event. Pirkey Power Plant anticipates that routine operations will generate additional FGD Sludge, thereby increasing the landfill area which will contribute runoff to this pond, consequently affecting the existing storage capacity.

Included in this section are the Hydrologic & Hydraulic analyses and calculations to substantiate the storage capacity of this impoundment.

The hydrologic and hydraulic analyses are the basis of the expansion plan. Similar to the total containment ponds discussed above the existing and future storage capacities of the Landfill pond were also analyzed for a 10-yr, 24-hr rainfall event, which is in accordance with section 3G on page 13 of the TPDES Permit No. WQ0002496000, dated May 17, 2007.

Hydrologic Analysis:

The purpose of the Landfill pond is to capture the runoff from landfill areas; therefore, as mentioned earlier a more elaborate SCS curve number method was adopted to compute the runoff volume. Beacon Aviation, Inc. provided an aerial image and topographic map to assist in determining the following watershed parameters:

1) *Watershed Area*

Existing Condition:

The watershed area contributing to the flow into the landfill pond in the existing condition is 139.88 acres in size as determined from topographic mapping of the area.

Proposed Condition:

The Watershed area map for the proposed condition encapsulates additional areas anticipated to be future FGD Sludge landfill. Therefore, the watershed area tributary to the Landfill Pond in the proposed condition is 166.63 acres, an increase of approximately 20 percent.

2) *Runoff Curve Number*

The runoff curve number is used to describe the infiltration capacity of the soil in the watershed based upon the hydrologic soil group, land use/cover, and the hydrologic condition. The hydrologic soil group of the watersheds was assumed to be group "C" for all pervious land covers. For more impervious land covers, the soil group does not have an effect on the curve number.

Appropriate curve numbers were chosen for each land cover based on tables listed in the Natural Resource Conservation Service (formerly SCS) Technical Release 55. Table 1 includes various curve numbers from this document. For the disturbed area land cover, a composite curve number was needed. The area is reasonably smooth; contour graded with no cover and should exhibit the condition providing the most runoff per unit area while disturbed. To satisfactorily simulate this "worst case" condition, the runoff curve number for the following land use was used: row crops, cover treatment or practice - contoured, hydrologic condition - poor. For the fly ash, FGD Sludge and lignite piles, a curve number of 93 was assumed. Other land cover types inside the watershed include ponds, roads, pasture, and forest.

The hydrologic condition indicates the effects of the density of plant cover on each particular land cover type. “Good” hydrologic condition indicates the soil has a high infiltration, low runoff potential for that particular cover type, while “poor” generally indicates there is not much vegetative cover on the land cover type and runoff is higher.

A composite curve number was then determined based upon soil type and land use as identified in Tables 2 and 3. This calculated curve number corresponds to antecedent moisture condition II. In East Texas, the SCS recommends adjusting the curve number to a position between II and III using the following formula.

$$\text{Adjusted CN} = \text{CN(AMCII)} + 0.2 (\text{CN[AMCIII]} - \text{CN[AMCII]})$$

Existing Condition:

For Watershed 1 in the existing condition, the composite curve number was calculated to be 88.4. Therefore, the adjusted curve number is calculated as follows.

$$\begin{aligned}\text{Adjusted CN} &= \text{CN(AMCII)} + 0.2 (\text{CN[AMCIII]} - \text{CN[AMCII]}) \\ &= 88.4 + 0.2(95-88.4) \\ &= 89.7\end{aligned}$$

Proposed Condition:

Similarly the composite curve number calculated for the proposed condition is 89.3 and the adjusted curve number is 90.5.

3) *Rainfall Depth*

The rainfall depth for a 10-year, 24-hour rainfall event in the vicinity of the structure is 7.1 inches. (See Figure 1)

4) *Total Runoff Volume*

Using the calculated CN for each watershed, a rainfall depth of 7.1 inches, and the watershed areas, the total runoff volumes for Watersheds 1 in the **existing condition** is **68.65** acre-feet (110,755 cy, 22.40 MG) and in the **proposed condition** is **82.94** ac-ft (133,810 cy, 27.02 MG).

Hydraulic Analysis of Landfill Pond – Existing Condition:

One-foot contours within the pond, which correlates to the storage at that elevation, were generated from a DTM and the area at each contour elevation was determined. The operating level of 288.0 was used as the baseline for all capacity calculations. The capacity at each

elevation was then calculated, as shown in Table 6. The maximum storage capacity occurs at the spillway elevation of 294.5 ft msl and was calculated to be 49.73 ac-ft (80,240 cy, 16.21 MG). The Plant's TPDES permit requires a minimum freeboard of 2 feet below the spillway. Therefore, the maximum operating level of the pond was set at elevation 292.5 ft msl. At this elevation, the storage was calculated to be 30.92 ac-ft (49,880 cy, 10.07 MG).

Based on the above calculations, and without employing other contingency operations, the pond does not have adequate capacity to contain the calculated runoff during a 10-year, 24-hour rainfall event. The existing pond will be designed and expanded to increase the overall capacity for the existing and proposed future conditions.

Hydraulic Analysis of Landfill Pond – Proposed Expansion

Increasing the capacity of the existing pond will be accomplished by increasing the surface area of the pond footprint, raising the pond embankment and de-silting the existing pond bottom. In an effort to minimize disturbance, the existing clay liner within the pond and embankment will remain in place. The proposed expansion will be lined similarly with clay to mimic existing conditions to practically possible extents. The existing embankment will be raised from its current elevation of 296.0 msl to 302.0 msl, consequently the spillway crest elevation will be raised from 294.5 msl to 300.0 msl. The proposed expansion will increase the pond storage volumes to 121.25 ac-ft (at the spillway crest elevation of 300.0) and 90.63 ac-ft (at 2ft below spillway crest elevation of 298.0).

Hydraflow Hydrograph was utilized to compute the water surface elevation during the 10-year, 24-hour rainfall event and the results are included in this report. The results indicate that the water surface elevation will be 297.43 msl which is more than 6inches below the elevation of 298.0 msl (2ft below spillway). An additional model was created for the proposed condition to analyze the 25% of PMF event through the emergency spillway. A series of simulations were performed for different durations of the PMP (1, 2, 3, 6, 12, 24, 48 and 72 hours) to ascertain the exact storm duration that resulted in the maximum water surface elevation. It was observed that the maximum water surface elevation was attained during the 25% of 12-hr PMP with a precipitation of 9.3inches (See Figure 2). Using a baseline elevation of 298.0msl (which is the min. freeboard elevation) the water surface elevation during the 25% of 12-hr PMF was calculated to be 301.63msl, which is below the top of the proposed dam elevation (elevation 302.0msl).

The table shown below is a comparison summary of the Landfill Pond in its existing & proposed conditions.

Comparison Summary between Existing & Proposed Condition		
	Existing Condition	Proposed Condition
Runoff Storage	68.65 ac-ft	82.94 ac-ft
Height of Embankment	296.0msl	302.0msl
Spillway Crest Elevation	294.5msl	300.0msl
Surface Area at Spillway Crest	10.0 ac	15.64 ac
Nominal Storage at Spillway Crest	49.73 ac-ft	121.25 ac-ft
Storage at 2ft below Spillway Crest	30.92 ac-ft	90.63 ac-ft
10-yr, 24-hr Water Surface Elevation	294.97msl	297.43msl
25% of PMF Water Surface Elevation	Not Analyzed	301.63msl

Based upon SCS runoff calculations for the existing conditions, the pond receives 68.65 ac-ft of runoff volume from Watershed 1. The volume of the existing pond storage was calculated to be 30.92 ac-ft. The proposed pond expansion will increase the storage volume for a 10-year, 24-hour rainfall event to 90.63 ac-ft for the calculated increased watershed of 82.94 ac-ft.

Summary

Water surface elevations calculated from Hydraflow Hydrographs are tabulated below:

SUMMARY OF POND HYDRAULIC CHARACTERISTICS					
	TOP OF EMBANKMENT	2FT FREE BOARD	OPERATING LEVEL	10YR-24HR WSEL	25% PMF WSEL
NORTH SURGE POND	376.00	374.00	373.00	373.62	375.09
EAST ASH POND	357.00	355.00	354.00	354.62	356.11
WEST ASH POND	357.00	355.00	354.00	354.64	356.13
SECONDARY ASH POND	357.00	355.00	354.00	354.74	356.28
LANDFILL POND	302 (Top of Embank) & 300 (Spillway Elev.)	298.00	288.00	297.43	301.63

As evident from the table above, it is the opinion of Johnson & Pace Incorporated that the existing North Surge Pond, the East & West Ash Ponds, and the Secondary Ash Pond will serve to adequately contain runoff during the calculated rainfall events. In addition, the Landfill Pond expansion will be constructed to accommodate runoff from the existing landfill area and from future landfill expansions.

TABLES

TABLE 1

Runoff Curve Numbers for Hydrologic Soil-Cover Complexes
 (Antecedent Moisture Condition II, and Ia= 0.2 S)
 (Adapted from NRCS Technical Release 55)

Land Use	Treatment or Practice	Hydrologic Condition	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight Row	----	77	86	91	94
Row Crops	Straight Row	Poor	72	81	88	91
	Straight Row	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	Contoured	Good	65	75	82	86
	Contoured and Terraced	Poor	66	74	80	82
	Contoured and Terraced	Good	62	71	78	81
Small Grain	Straight Row	Poor	65	76	84	88
	Straight Row	Good	63	75	83	87
	Contoured	Poor	63	74	82	85
	Contoured	Good	61	73	81	84
	Contoured and Terraced	Poor	61	72	79	82
	Contoured and Terraced	Good	59	70	78	81
Close-Seeded, Legumes, Rotation Meadow	Straight Row	Poor	66	77	85	89
	Straight Row	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	Contoured	Good	55	69	78	83
	Contoured and Terraced	Poor	63	73	80	83
	Contoured and Terraced	Good	51	67	76	80
Pasture Or Range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads/Facilities		----	74	84	90	92

TABLE 2
NORTH SURGE POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
EXISTING CONDITION
NORMAL OPERATING POOL AT 373.0

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
372.00	4.34	0.00	0.00	0.00
373.00	4.47	4.41	7,110	1.44
374.00	4.60	8.94	14,420	2.91
375.00	4.72	13.60	21,940	4.43
376.00	4.87	18.40	29,680	5.99

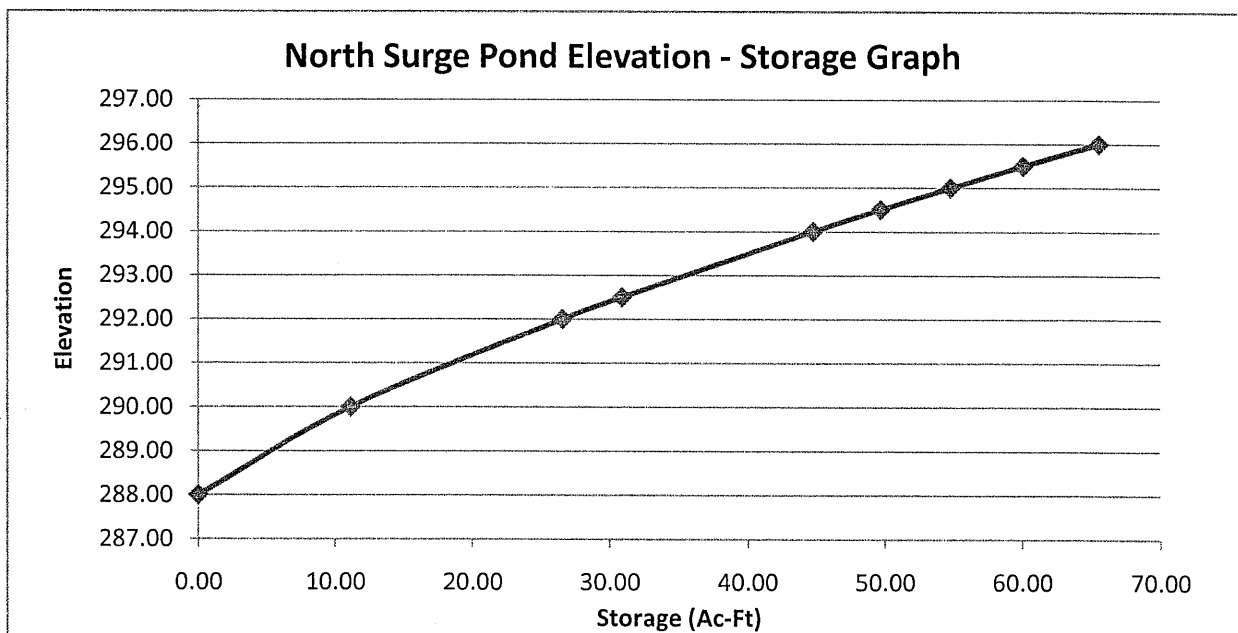


TABLE 3
EAST ASH POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
EXISTING CONDITION
NORMAL OPERATING POOL AT 354.0

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
352.00	25.70	0.00	0.00	0.00
353.00	25.99	25.85	41,700	8.42
354.00	26.29	51.99	83,870	16.94
355.00	26.59	78.43	126,530	25.56
356.00	26.88	105.16	169,660	34.27
357.00	27.19	132.20	213,270	43.07

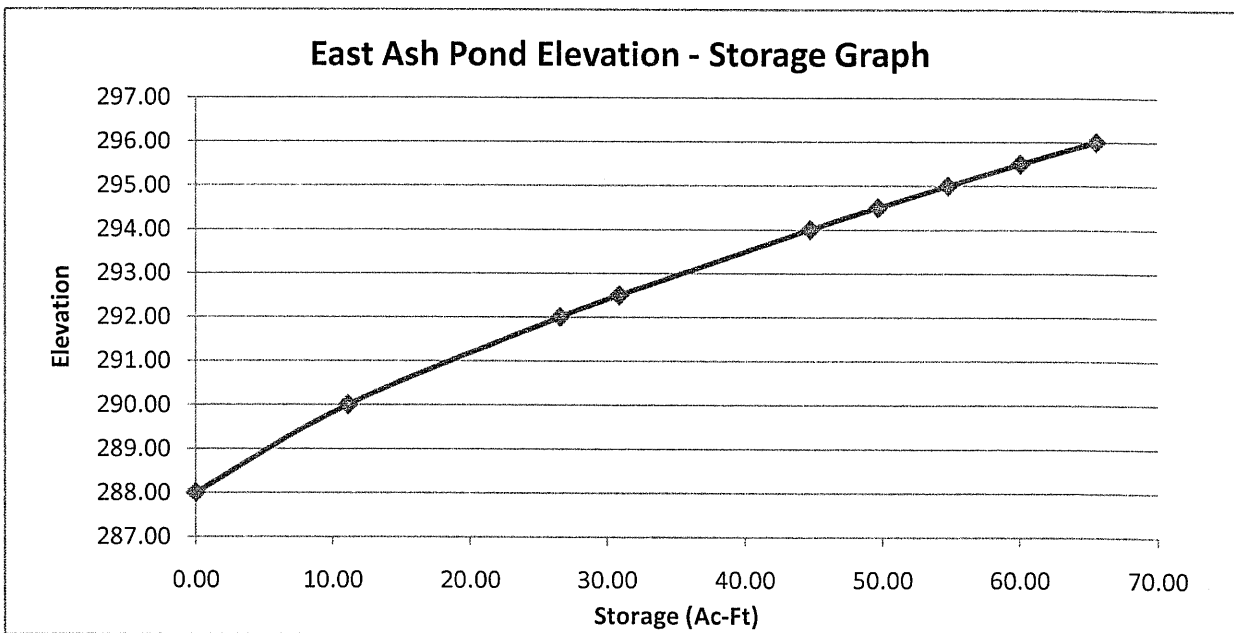


TABLE 4
WEST ASH POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
EXISTING CONDITION
NORMAL OPERATING POOL AT 354.0

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
352.00	28.43	0.00	0	0.00
353.00	28.74	28.59	46,120	9.31
354.00	29.05	57.48	92,730	18.73
355.00	29.36	86.69	139,850	28.25
356.00	29.67	116.20	187,470	37.86
357.00	30.47	146.27	235,980	47.66

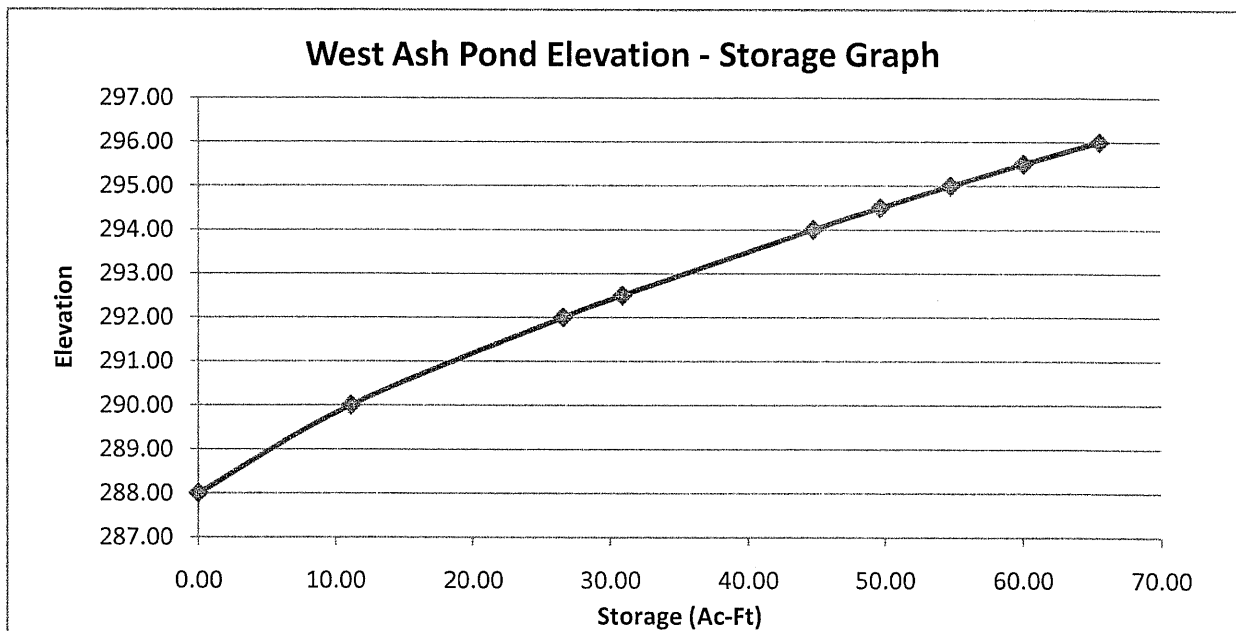
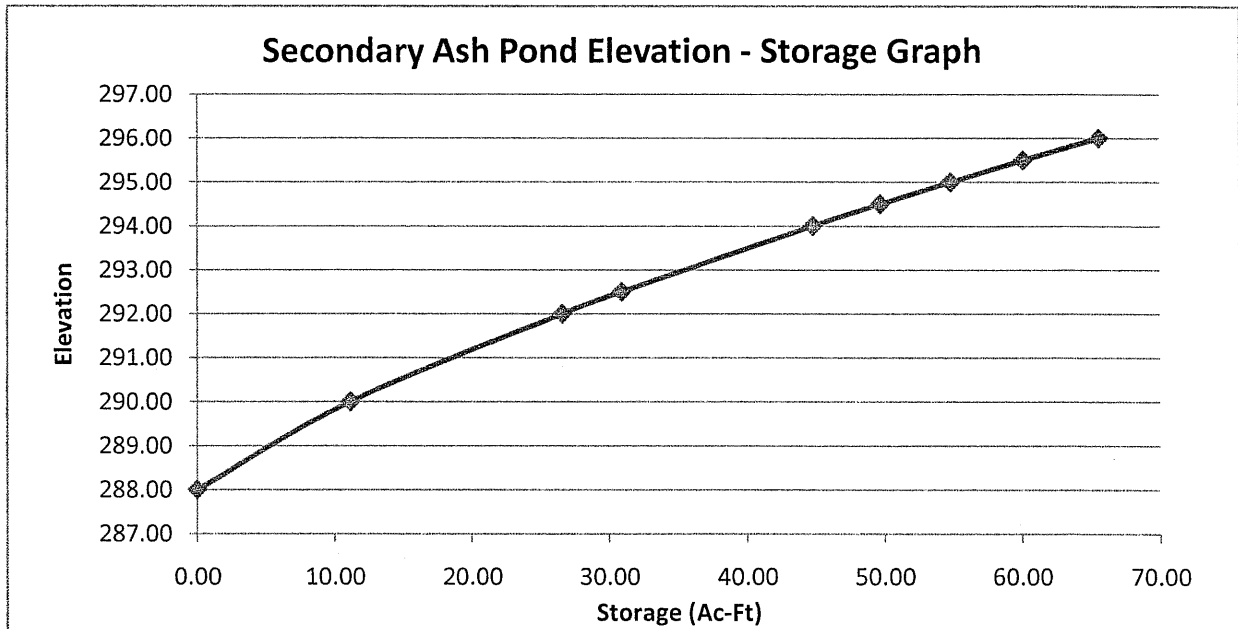


TABLE 5
SECONDARY ASH POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
EXISTING CONDITION
NORMAL OPERATING POOL AT 354.0

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
352.00	3.00	0.00	0.00	0.00
353.00	3.10	3.05	4,920	0.99
354.00	3.21	6.21	10,010	2.02
355.00	3.32	9.47	15,280	3.09
356.00	3.43	12.85	20,720	4.18
357.00	3.54	16.33	26,350	5.32



TABLES

2011 LANDFILL POND

TABLE 6
LANDFILL POND - EXISTING CONDITION

TOTAL REQUIRED STORAGE DETERMINATION

HYDROLOGIC SOIL GROUP	LAND COVER	HYDROLOGIC CONDITION	RUNOFF CURVE NUMBER	ACRES
N/A	Ponds	Good	100	12.78
N/A	Sludge	Poor	93	47.19
N/A	Lignite	Poor	93	14.59
N/A	Roads/Facilities	Poor	90	16.92
C	Disturbed	Poor	84	26.42
C	Pasture	Good	74	15.43
C	Forest	Good	70	6.55
Total Acres in Watershed (A)				139.88
Weighted Average RCN - AMC II				88.4
Runoff Curve Number - AMC III				95.0
Adjusted Runoff Curve Number				89.7
Potential Maximum Retention (S) (in)				1.1
10 YR/24 Hr Rainfall (P) (in)				7.1
Runoff (Q) (in)				5.9
Required Runoff Storage (R) (ac-ft)				68.65

where:

$$S = (1000/CN) - 10$$

$$Q = \frac{(P - 0.2*S)^2}{(P + 0.8*S)}$$

$$R = Q*A$$

TABLE 7
LANDFILL POND - PROPOSED CONDITION

TOTAL REQUIRED STORAGE DETERMINATION

HYDROLOGIC SOIL GROUP	LAND COVER	HYDROLOGIC CONDITION	RUNOFF CURVE NUMBER	ACRES
N/A	Ponds	Good	100	17.75
N/A	Fly Ash	Poor	93	68.60
N/A	Lignite	Poor	93	14.59
N/A	Roads/Impervious	Poor	90	16.42
C	Disturbed	Poor	84	27.29
C	Pasture	Good	74	15.43
C	Forest	Good	70	6.55
Total Acres in Watershed (A)				166.63
Weighted Average RCN - AMC II				89.3
Runoff Curve Number - AMC III				95.0
Adjusted Runoff Curve Number				90.5
Potential Maximum Retention (S) (in)				1.1
10 YR/24 Hr Rainfall (P) (in)				7.1
Runoff (Q) (in)				6.0
Required Runoff Storage (R) (ac-ft)				82.94

where:

$$S = (1000/CN) - 10$$

$$Q = \frac{(P - 0.2*S)^2}{(P + 0.8*S)}$$

$$R = Q*A$$

TABLE 8
LANDFILL POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
EXISTING CONDITION
NORMAL OPERATING POOL AT 288.0 & SPILLWAY AT 294.5

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
288.00	4.23	0.00	0	0.00
290.00	6.91	11.14	17,970	3.63
292.00	8.53	26.58	42,880	8.66
292.50	8.83	30.92	49,880	10.07
294.00	9.69	44.81	72,290	14.60
294.50	10.00	49.73	80,240	16.21
295.00	10.41	54.84	88,470	17.87
295.50	10.77	60.13	97,010	19.59
296.00	11.13	65.61	105,840	21.38

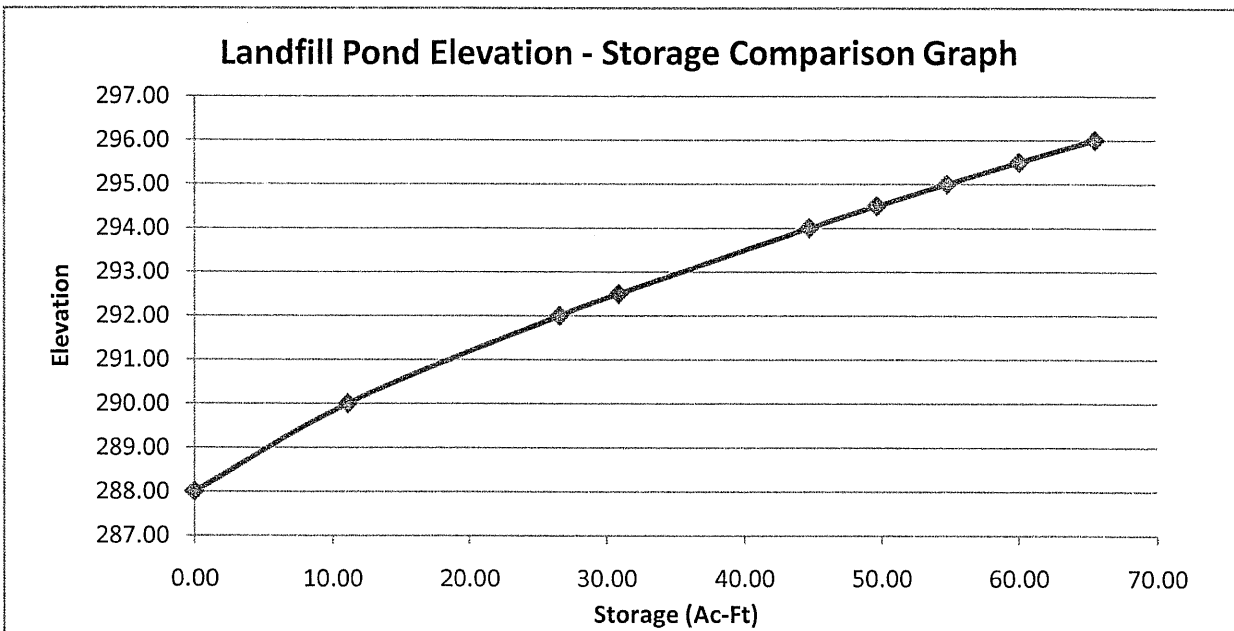
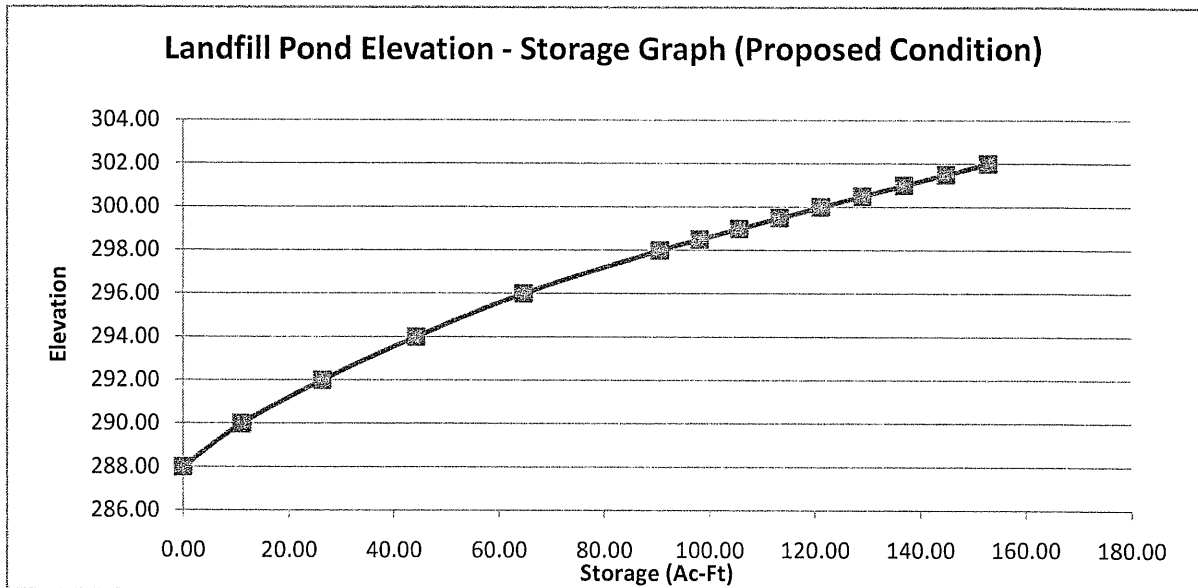


TABLE 9
LANDFILL POND ELEVATION-AREA-STORAGE TABLE
H.W. PIRKEY POWER PLANT
PROPOSED CONDITION
NORMAL OPERATING POOL AT 288.0 & SPILLWAY AT 300

ELEVATION (ft)	AREA (Acres)	STORAGE (Ac-Ft)	STORAGE (Cubic Yards)	STORAGE (Million Gallons)
288.00	4.23	0.00	0	0.00
290.00	6.86	11.09	17,890	3.61
292.00	8.42	26.37	42,540	8.59
294.00	9.51	44.30	71,470	14.43
296.00	10.92	64.73	104,430	21.09
298.00	14.98	90.63	146,220	29.53
298.50	15.14	98.16	158,360	31.98
299.00	15.31	105.77	170,650	34.47
299.50	15.48	113.47	183,060	36.97
300.00	15.64	121.25	195,620	39.51
300.50	15.79	129.11	208,290	42.07
301.00	15.94	137.04	221,090	44.65
301.50	16.09	145.05	234,010	47.26
302.00	16.25	153.13	247,050	49.90



FIGURES

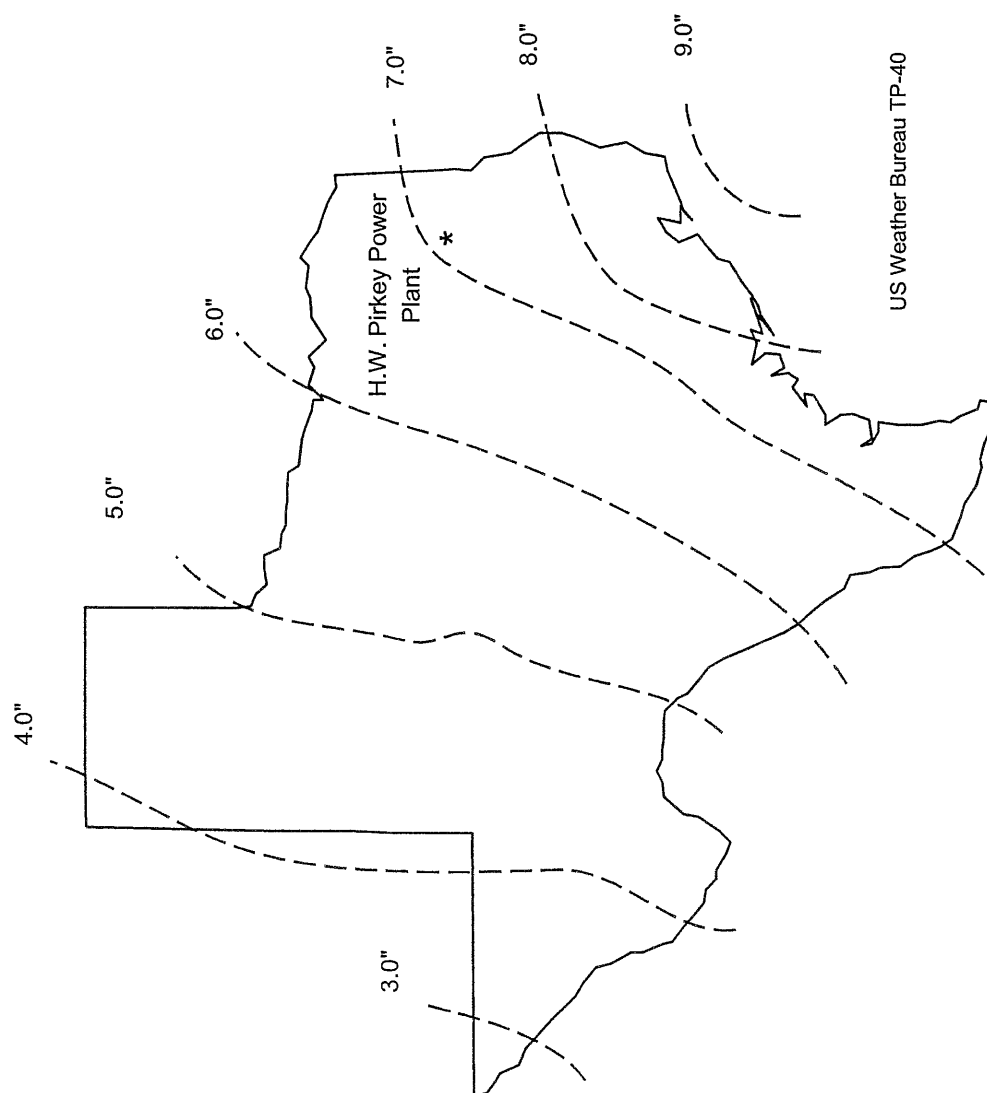


Figure 1
10 Year - 24 Hour Rainfall

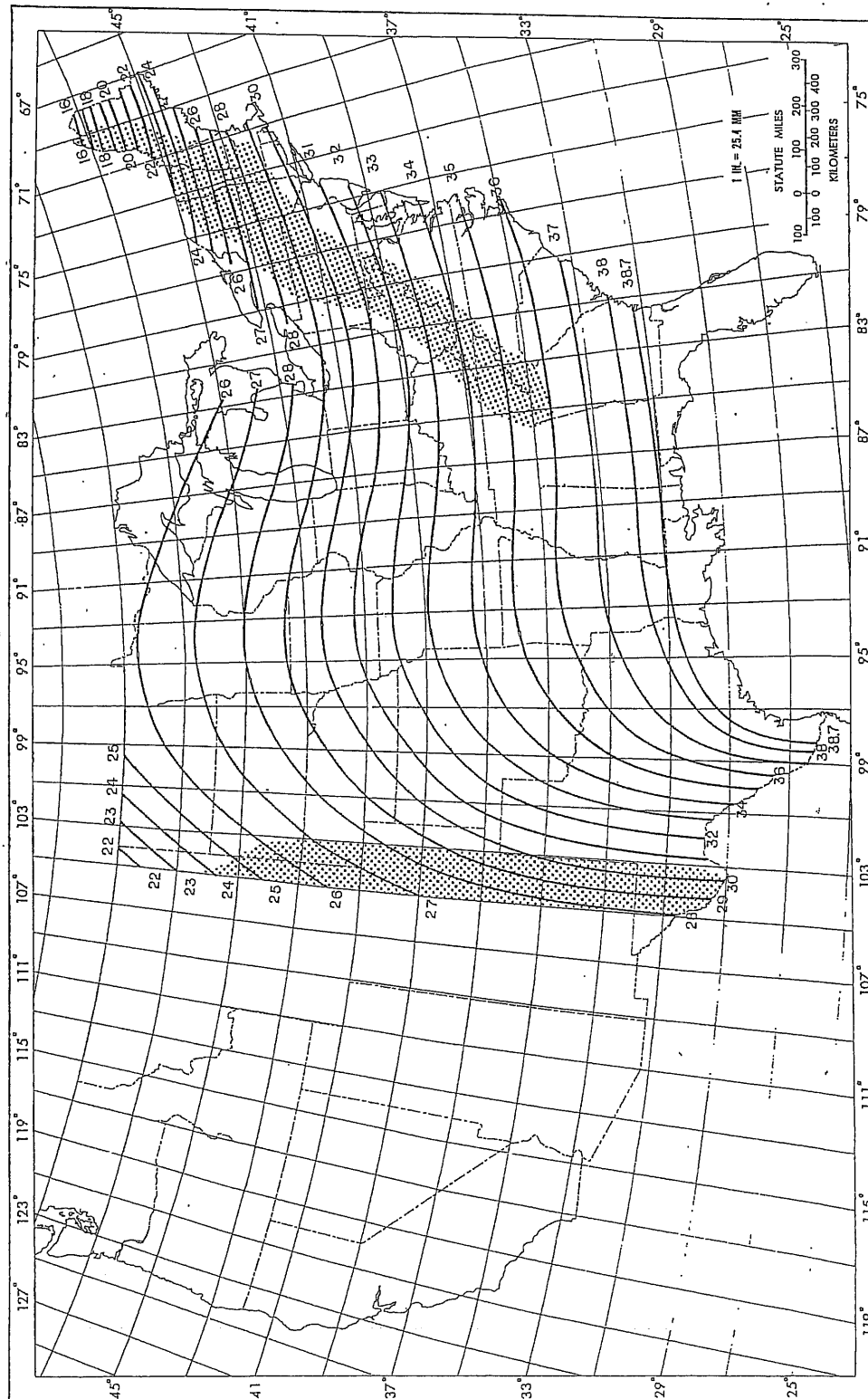


Figure 2. ---All-season PMP (in.) for 12 hr 10 m² (26 km²).

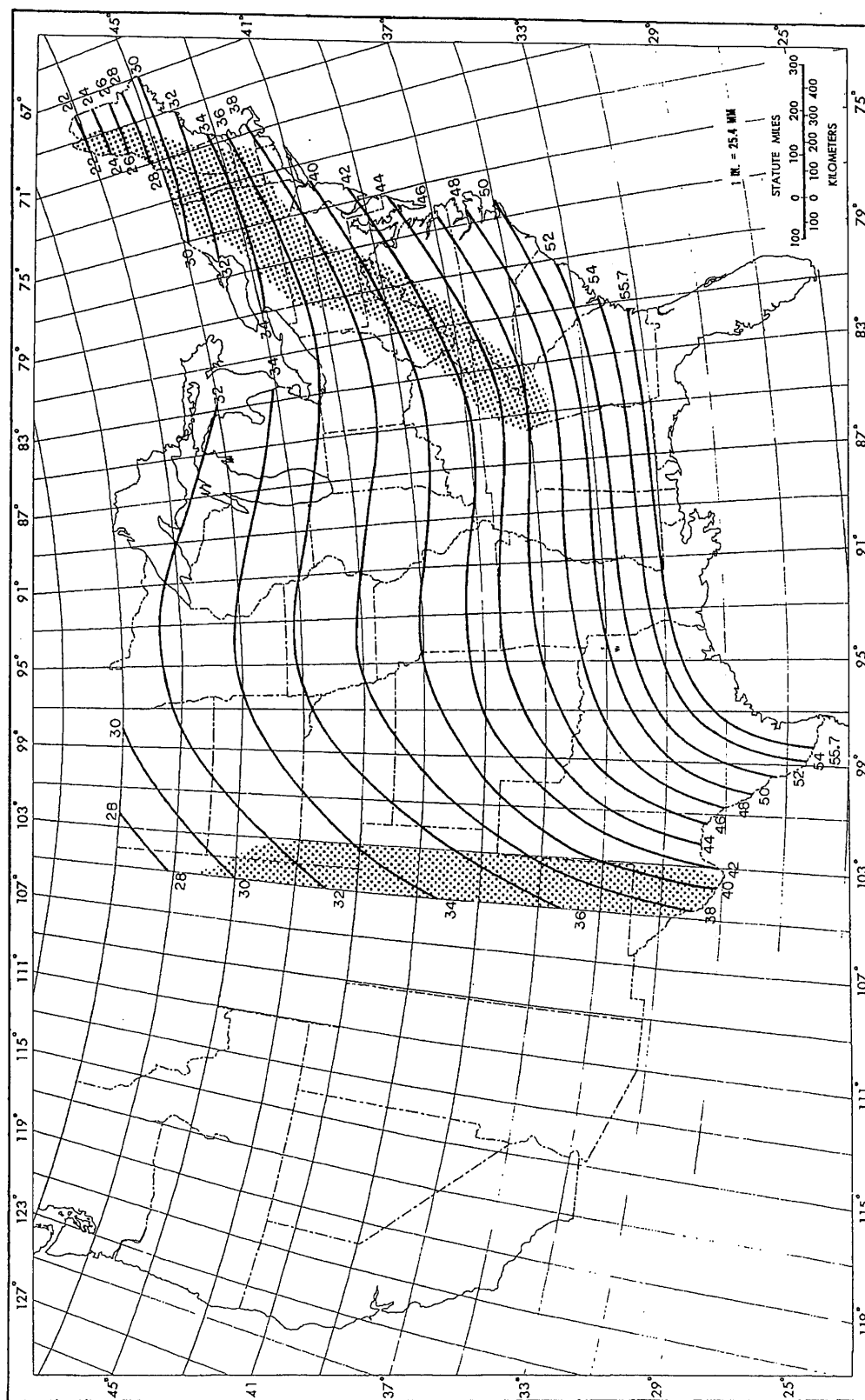


Figure 3 --All-season PMP (in.) for 72 hr 10 mi.² (26 km.²).

HYDROLOGIC & HYDRAULIC CALCULATIONS

10-YEAR, 24-RAINFALL EVENT

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North Surge Pond - 10yr-24hr.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	30.73	3	726	122,744	-----	-----	-----	North Surge Pond
2	Reservoir	0.000	3	n/a	0	1	373.62	314,599	North Surge Pond
North Surge Pond - 10yr-24hr.gpw					Return Period: 10 Year			Wednesday, May 25, 2011	

Hydrograph Report

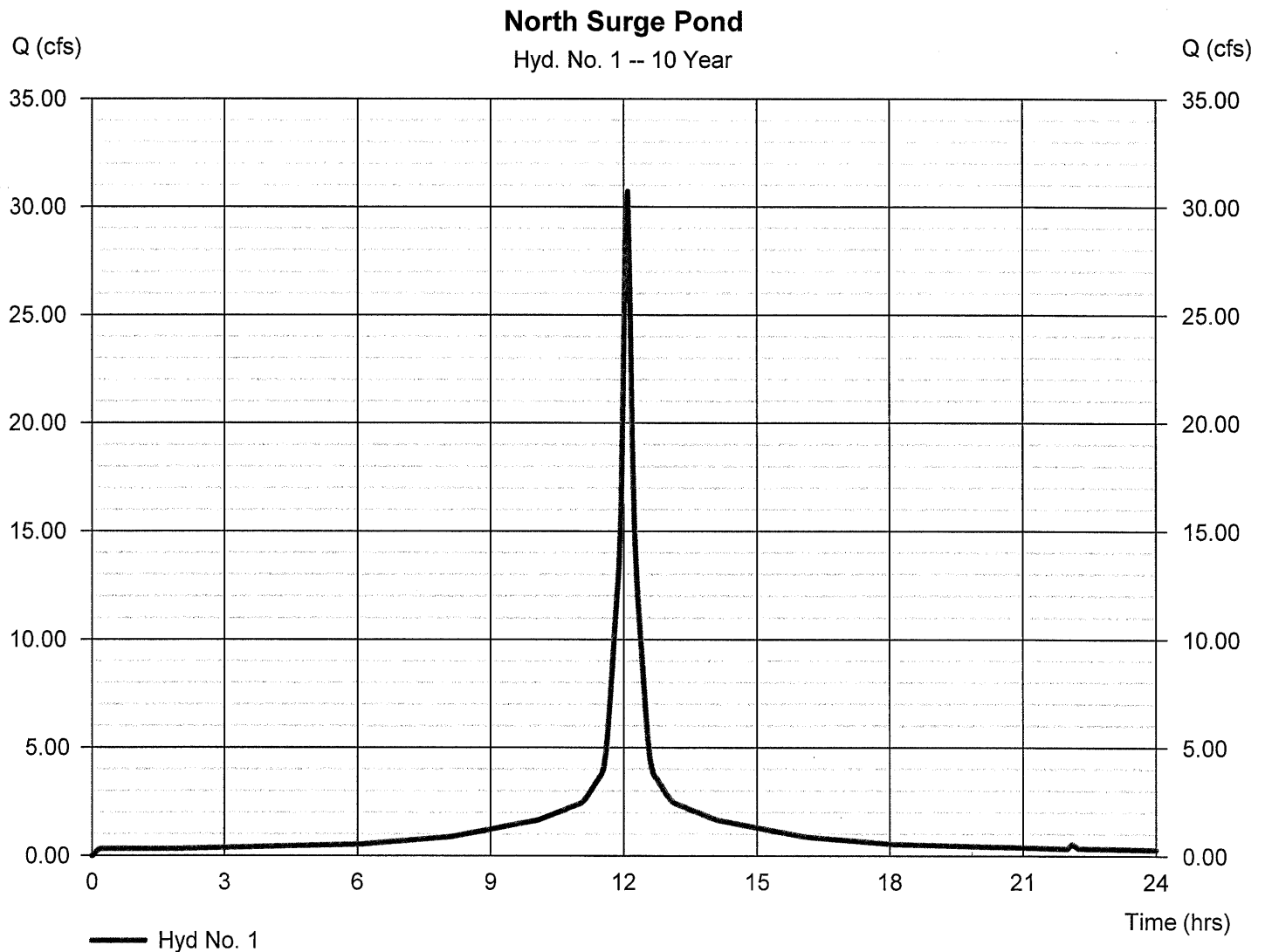
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Hyd. No. 1

North Surge Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 30.73 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 122,744 cuft
Drainage area	= 5.080 ac	Curve number	= 100
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

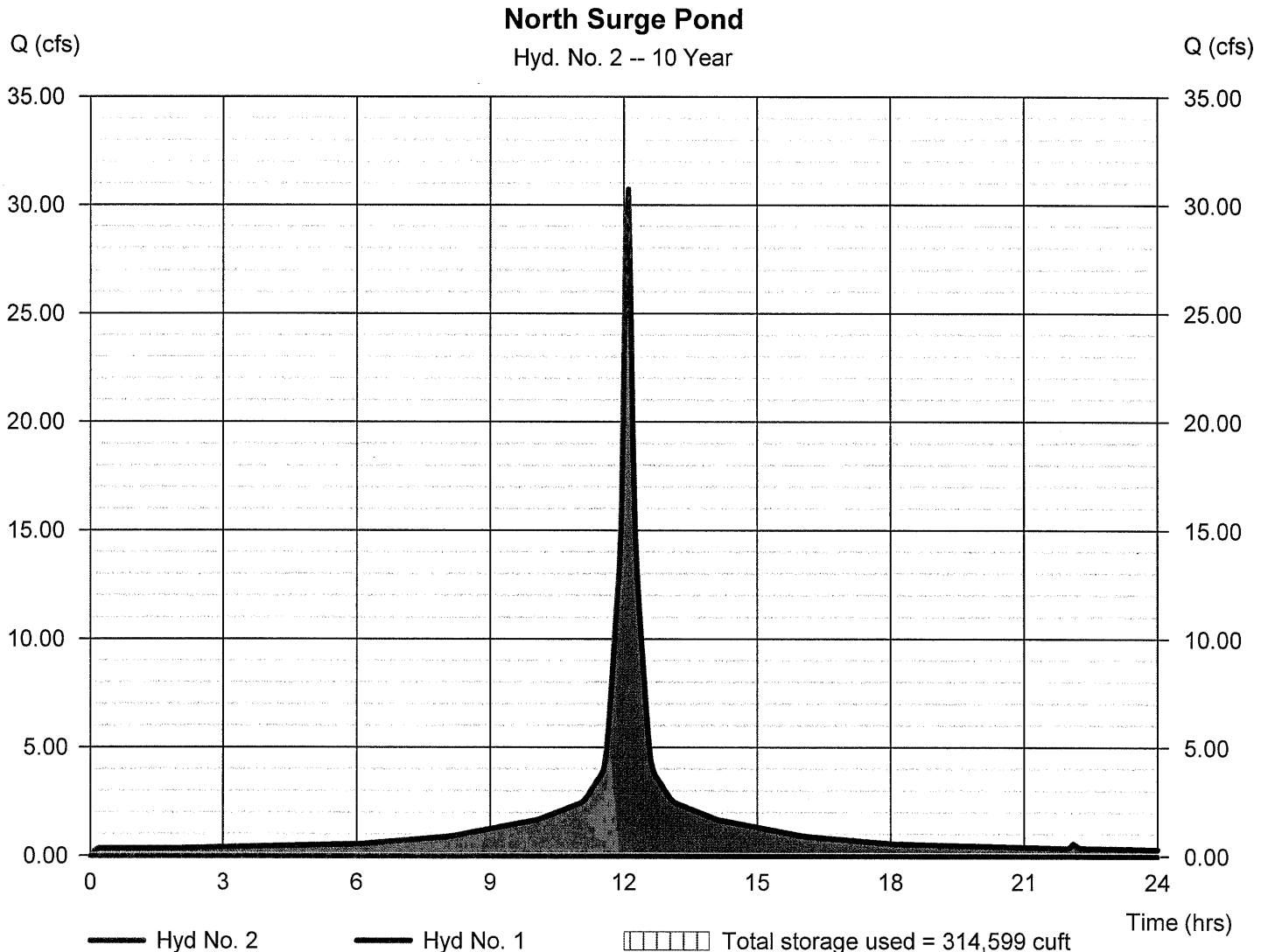
Wednesday, May 25, 2011

Hyd. No. 2

North Surge Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - North Surge Pond	Max. Elevation	= 373.62 ft
Reservoir name	= North Surge Pond	Max. Storage	= 314,599 cuft

Storage Indication method used. Wet pond routing start elevation = 373.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - North Surge Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 372.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	372.00	189,050	0	0
1.00	373.00	194,713	191,855	191,855
2.00	374.00	200,376	197,518	389,373
3.00	375.00	205,603	202,964	592,337
4.00	376.00	212,137	208,841	801,178

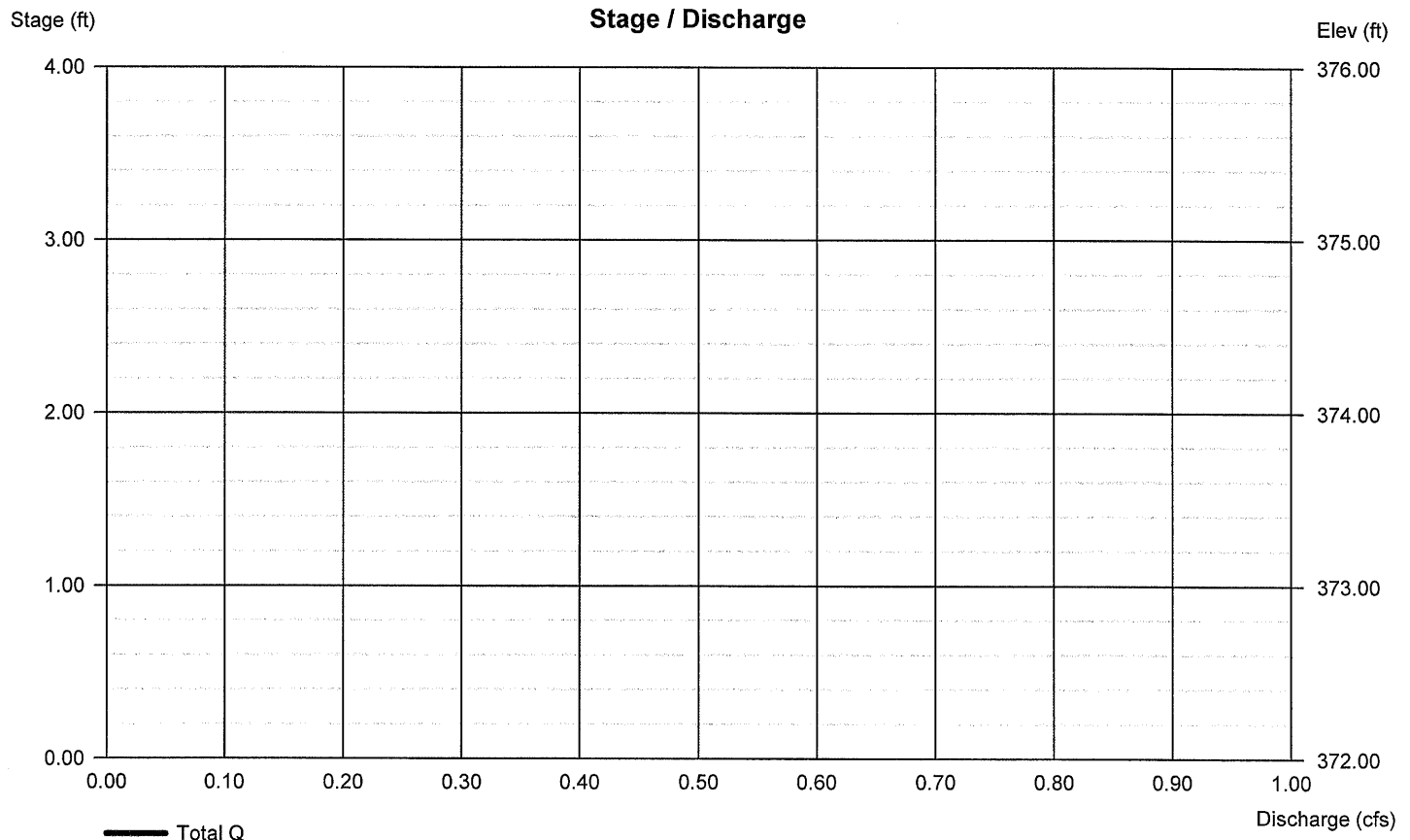
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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East Ash Pond - 10yr-24hr.gpw

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	179.22	3	726	715,926	-----	-----	-----	East Ash Pond
2	Reservoir	0.000	3	n/a	0	1	354.62	2,980,154	East Ash Pond
East Ash Pond - 10yr-24hr.gpw					Return Period: 10 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

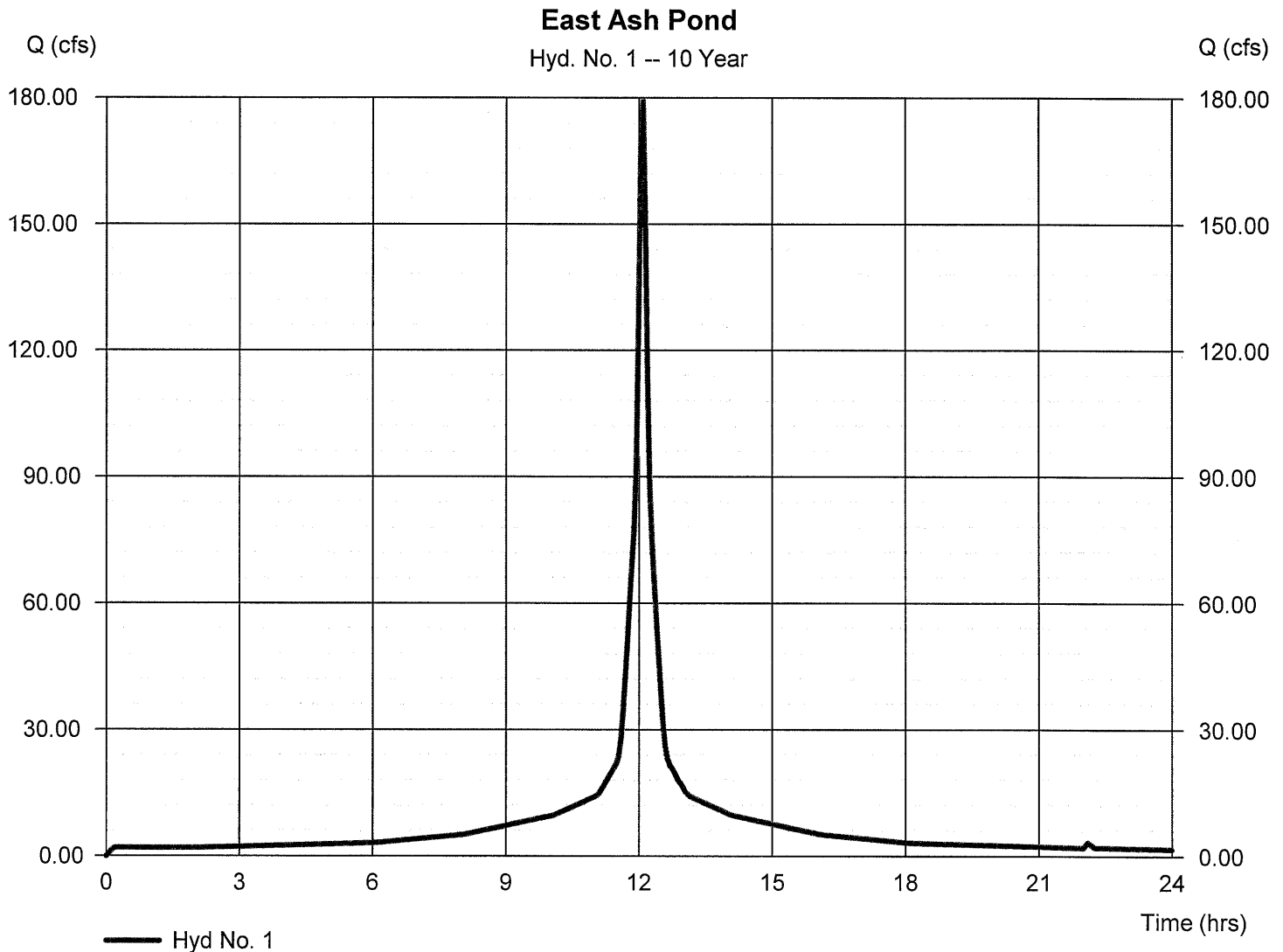
Wednesday, May 25, 2011

Hyd. No. 1

East Ash Pond

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 3 min
 Drainage area = 29.630 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 7.10 in
 Storm duration = 24 hrs

Peak discharge = 179.22 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 715,926 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

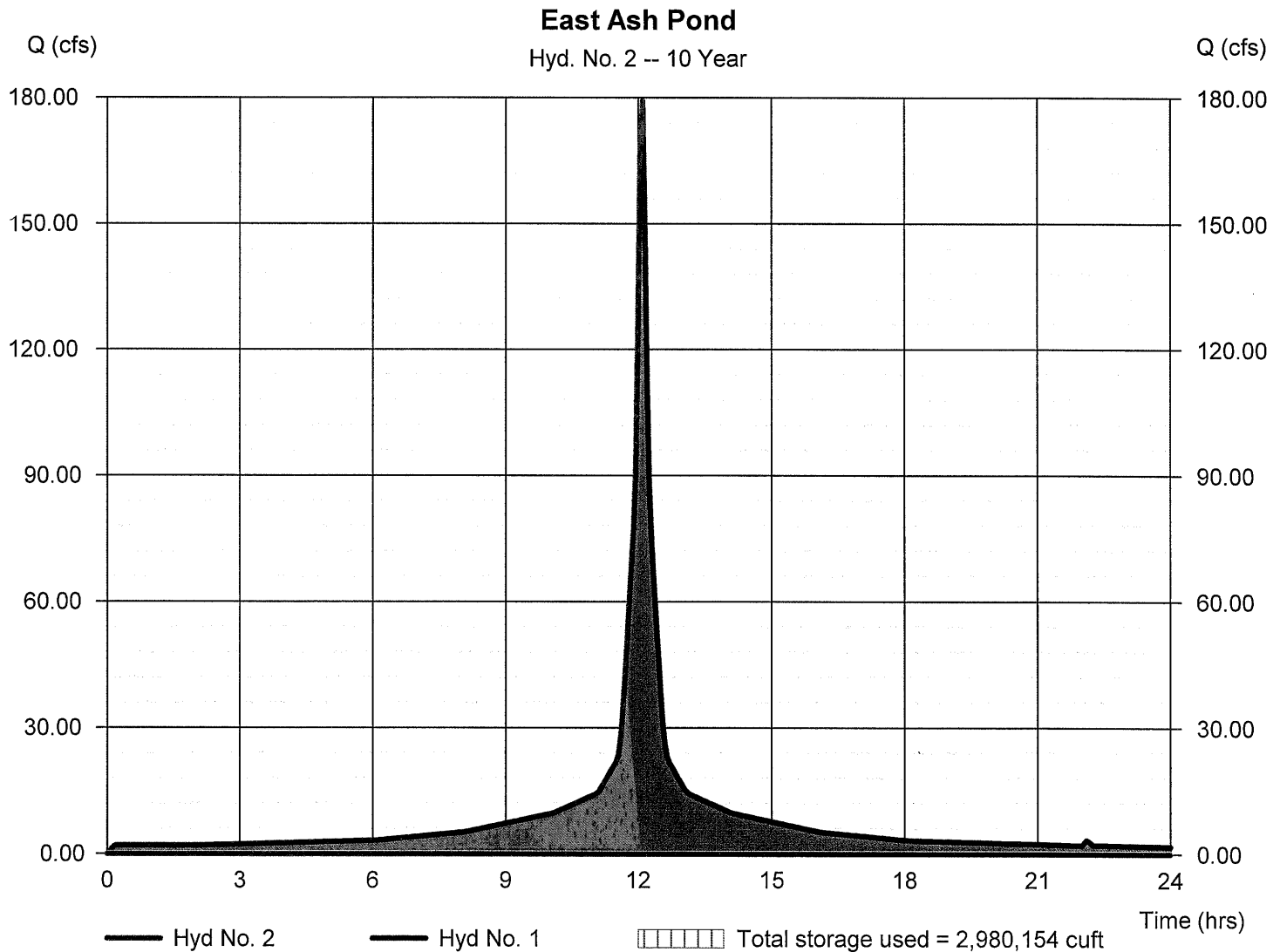
Wednesday, May 25, 2011

Hyd. No. 2

East Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - East Ash Pond	Max. Elevation	= 354.62 ft
Reservoir name	= East Ash Pond	Max. Storage	= 2,980,154 cuft

Storage Indication method used. Wet pond routing start elevation = 354.00 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - East Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	1,119,492	0	0
1.00	353.00	1,132,124	1,125,690	1,125,690
2.00	354.00	1,145,192	1,138,538	2,264,228
3.00	355.00	1,158,260	1,151,604	3,415,832
4.00	356.00	1,170,893	1,164,455	4,580,287
5.00	357.00	1,184,396	1,177,520	5,757,807

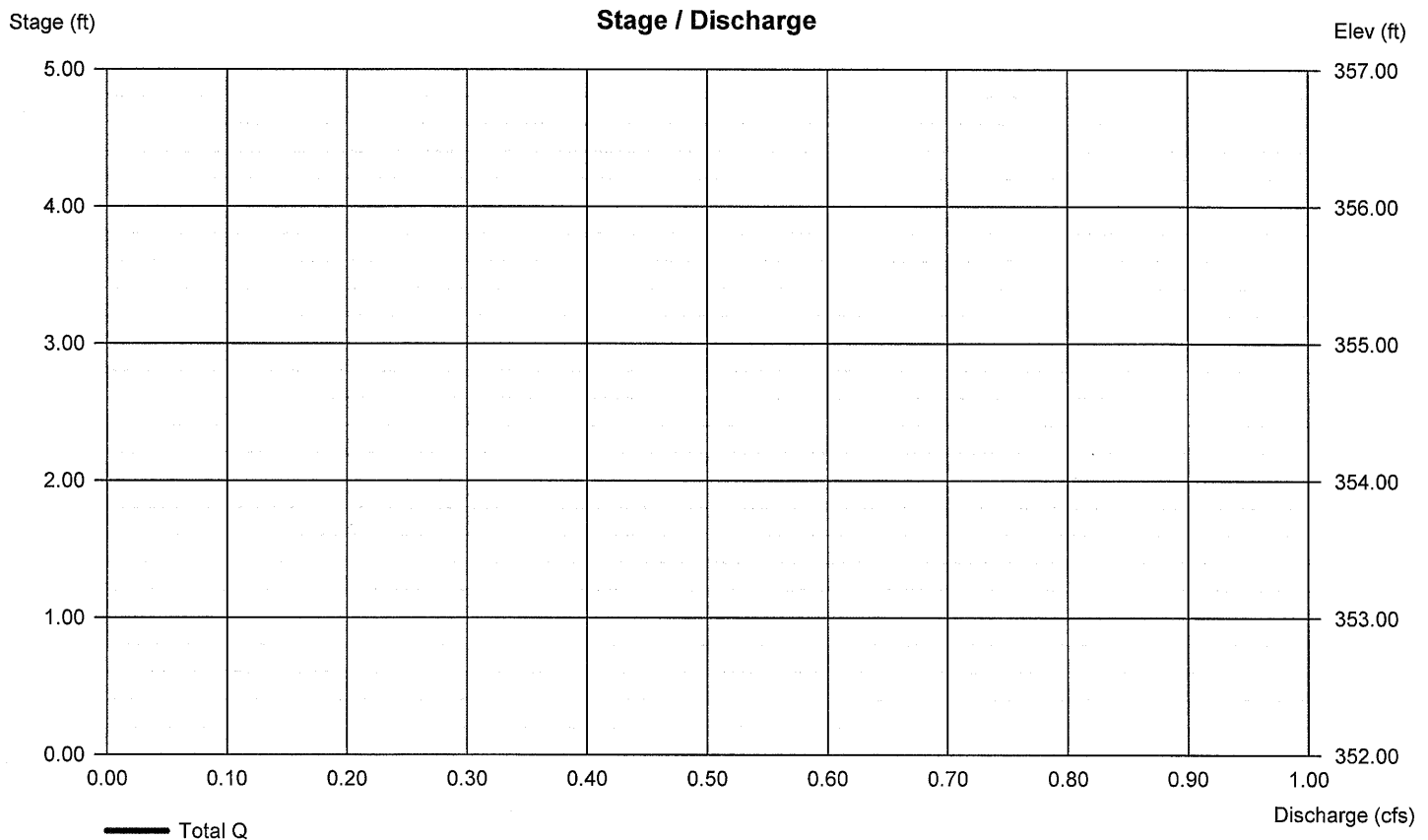
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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West Ash Pond - 10yr-24hr.gpw

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. no.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	202.27	3	726	807,984	-----	-----	-----	West Ash Pond
2	Reservoir	0.000	3	n/a	0	1	354.64	3,311,550	West Ash Pond
West Ash Pond - 10yr-24hr.gpw					Return Period: 10 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

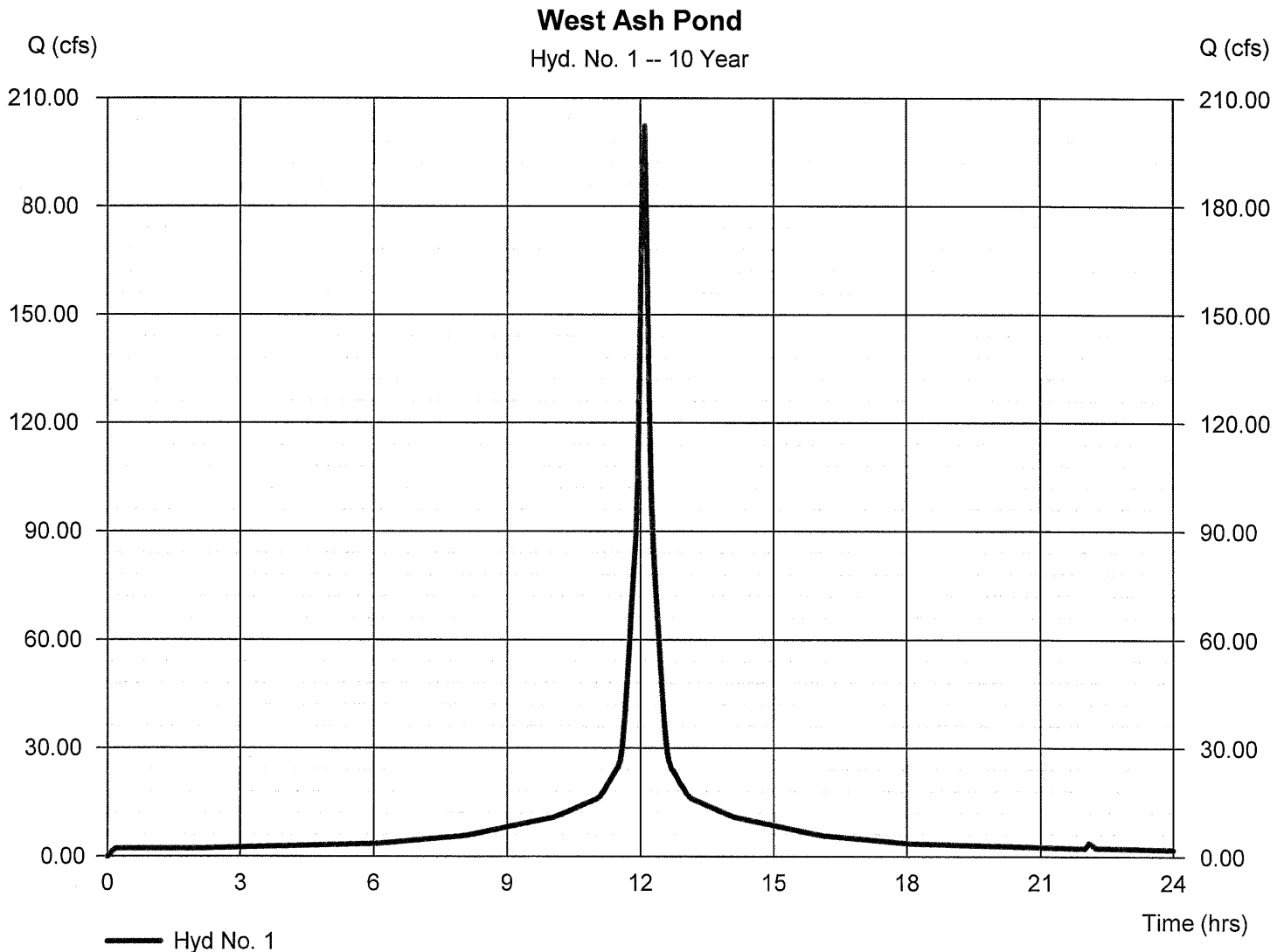
Wednesday, May 25, 2011

Hyd. No. 1

West Ash Pond

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 3 min
 Drainage area = 33.440 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 7.10 in
 Storm duration = 24 hrs

Peak discharge = 202.27 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 807,984 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

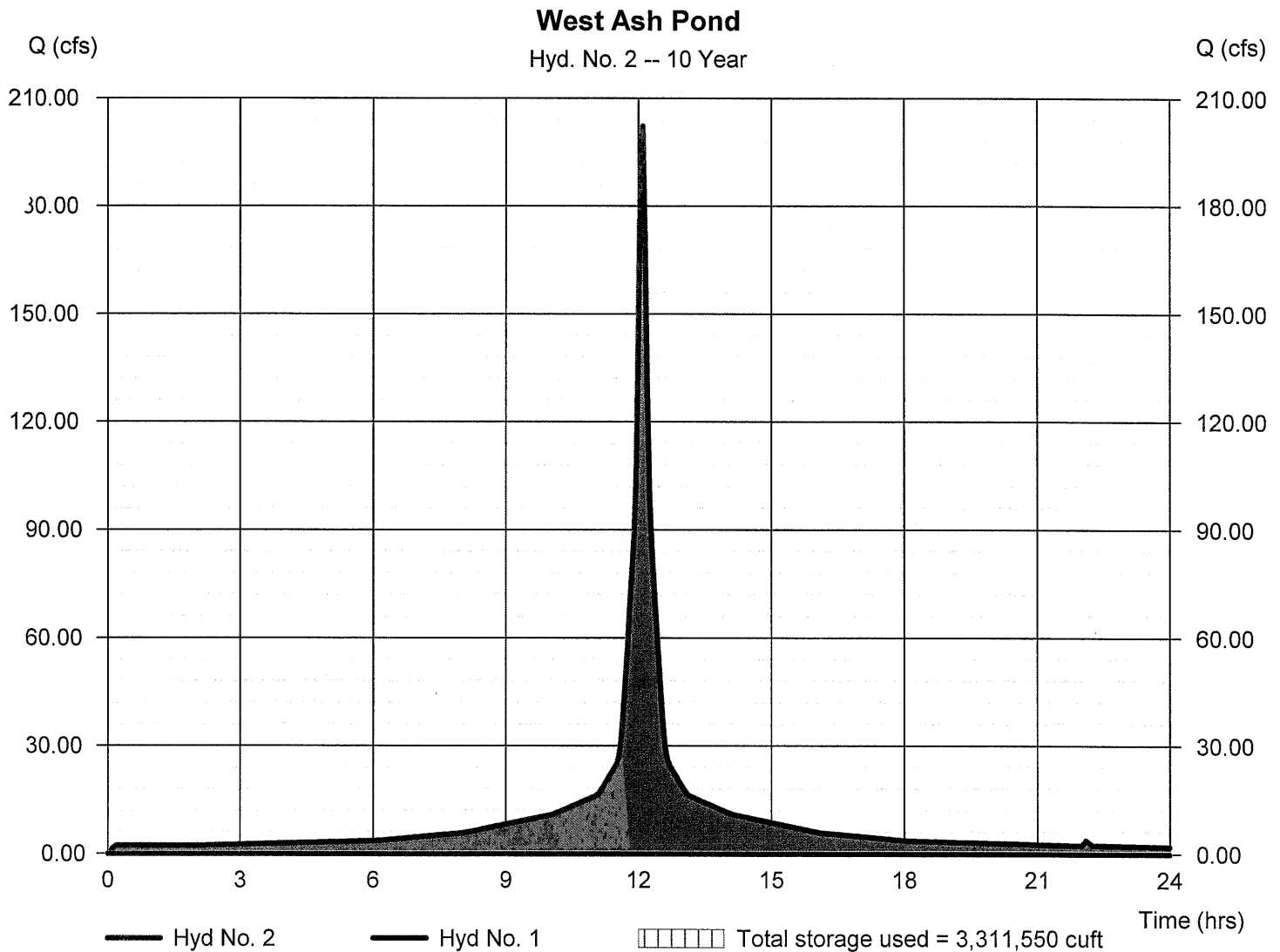
Wednesday, May 25, 2011

Hyd. No. 2

West Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - West Ash Pond	Max. Elevation	= 354.64 ft
Reservoir name	= West Ash Pond	Max. Storage	= 3,311,550 cuft

Storage Indication method used. Wet pond routing start elevation = 354.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - West Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	1,238,411	0	0
1.00	353.00	1,251,914	1,245,032	1,245,032
2.00	354.00	1,265,418	1,258,534	2,503,566
3.00	355.00	1,278,922	1,272,037	3,775,603
4.00	356.00	1,292,425	1,285,539	5,061,142
5.00	357.00	1,327,273	1,309,680	6,370,822

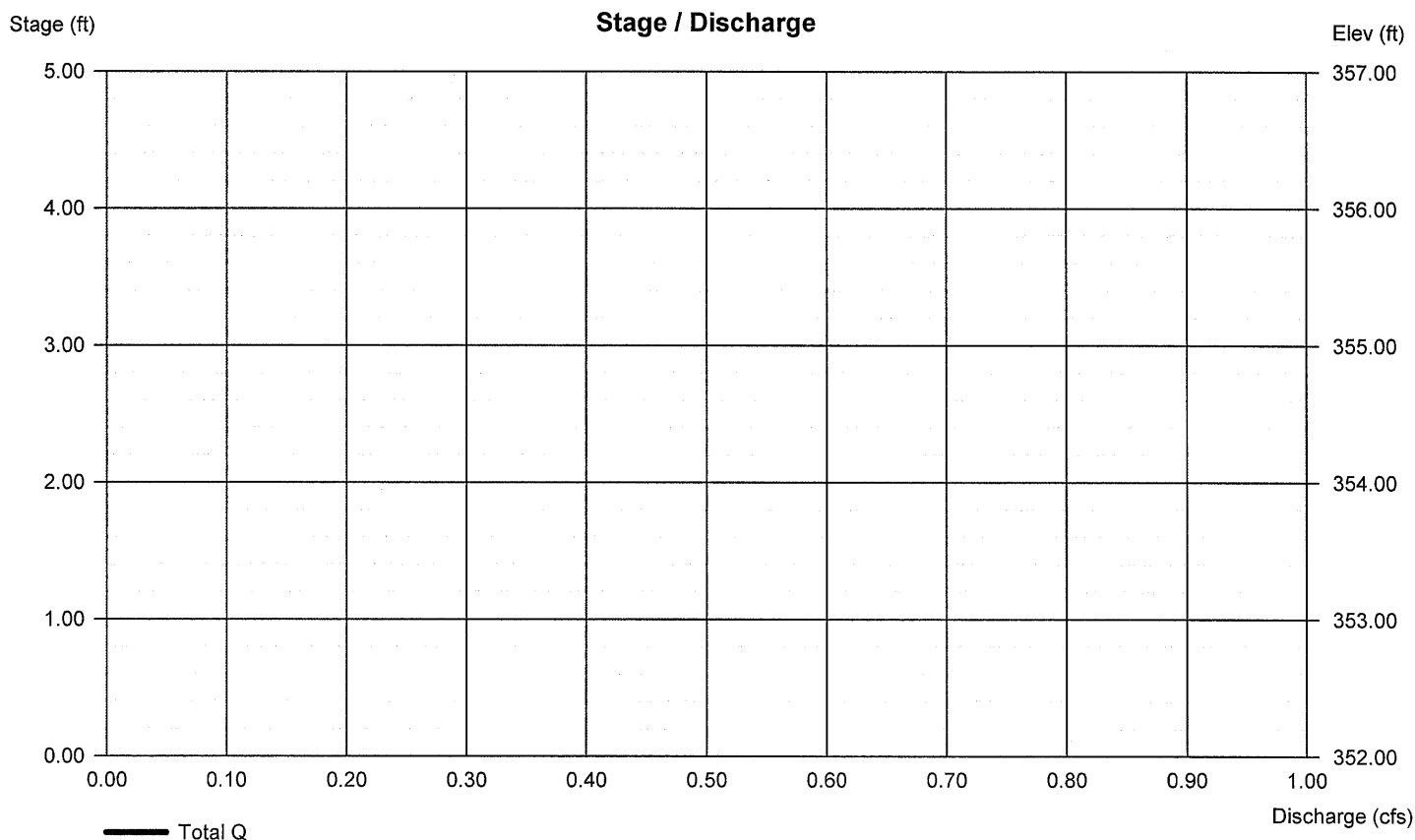
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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Secondary Ash Pond - 10yr-24hr.gpw

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	26.31	3	726	105,106	-----	-----	-----	Secondary Ash Pond
2	Reservoir	0.000	3	n/a	0	1	354.74	375,356	Secondary Ash Pond
Secondary Ash Pond - 10yr-24hr.gpw					Return Period: 10 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

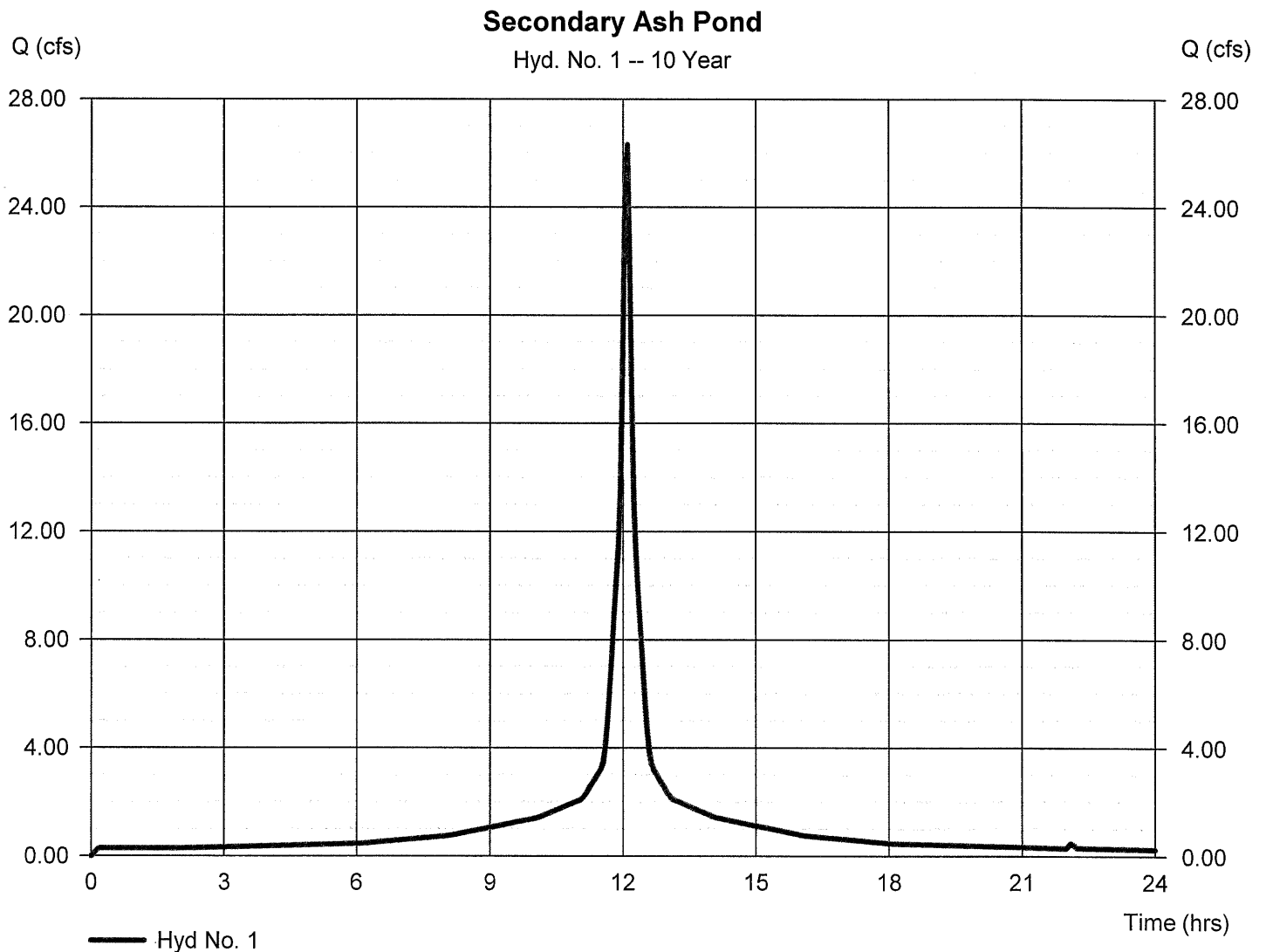
Wednesday, May 25, 2011

Hyd. No. 1

Secondary Ash Pond

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 3 min
 Drainage area = 4.350 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 7.10 in
 Storm duration = 24 hrs

Peak discharge = 26.31 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 105,106 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

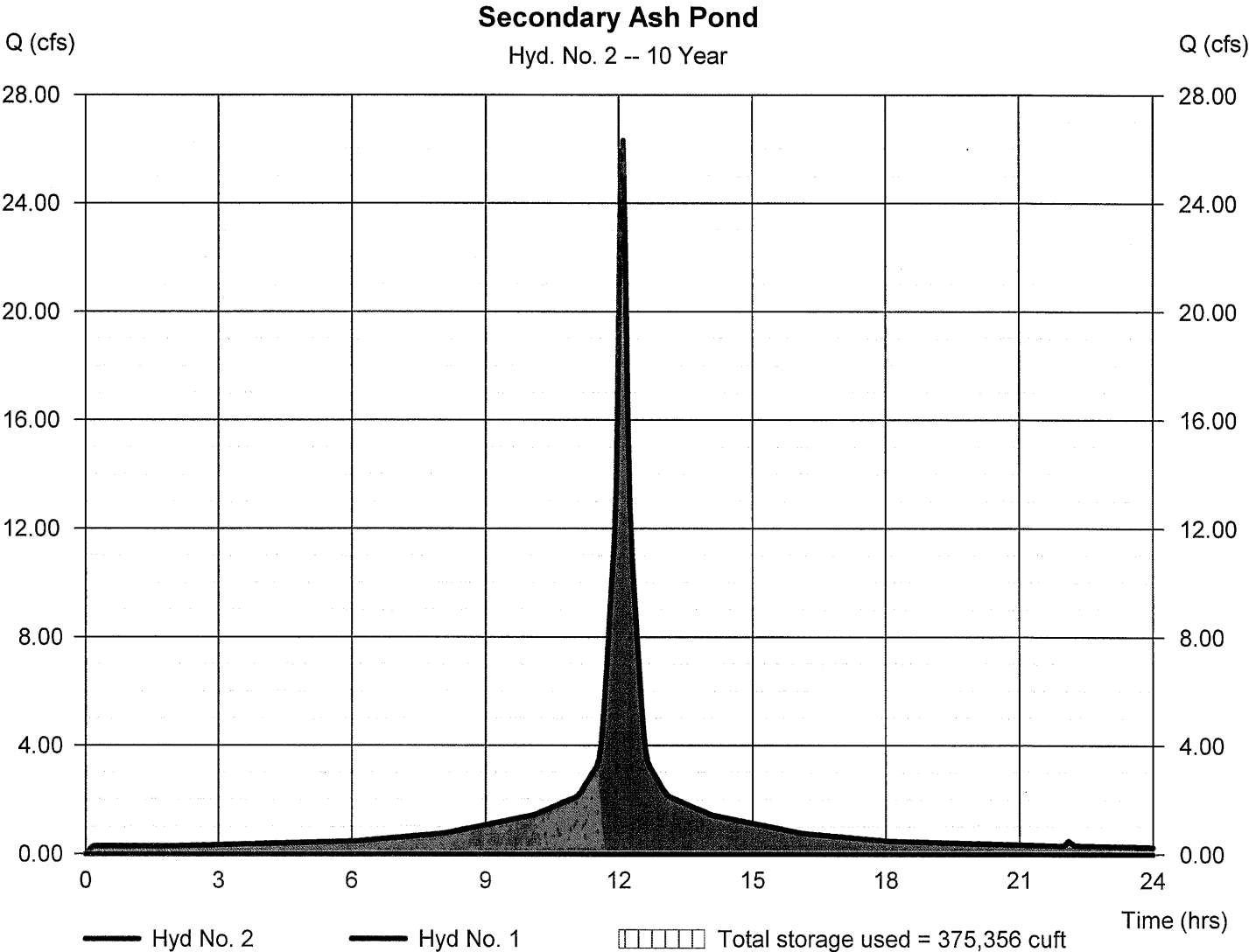
Wednesday, May 25, 2011

Hyd. No. 2

Secondary Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - Secondary Ash Pond	Max. Elevation	= 354.74 ft
Reservoir name	= Secondary Ash Pond	Max. Storage	= 375,356 cuft

Storage Indication method used. Wet pond routing start elevation = 354.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - Secondary Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	130,680	0	0
1.00	353.00	135,036	132,839	132,839
2.00	354.00	139,828	137,411	270,250
3.00	355.00	144,619	142,203	412,453
4.00	356.00	149,411	146,994	559,446
5.00	357.00	154,202	151,785	711,231

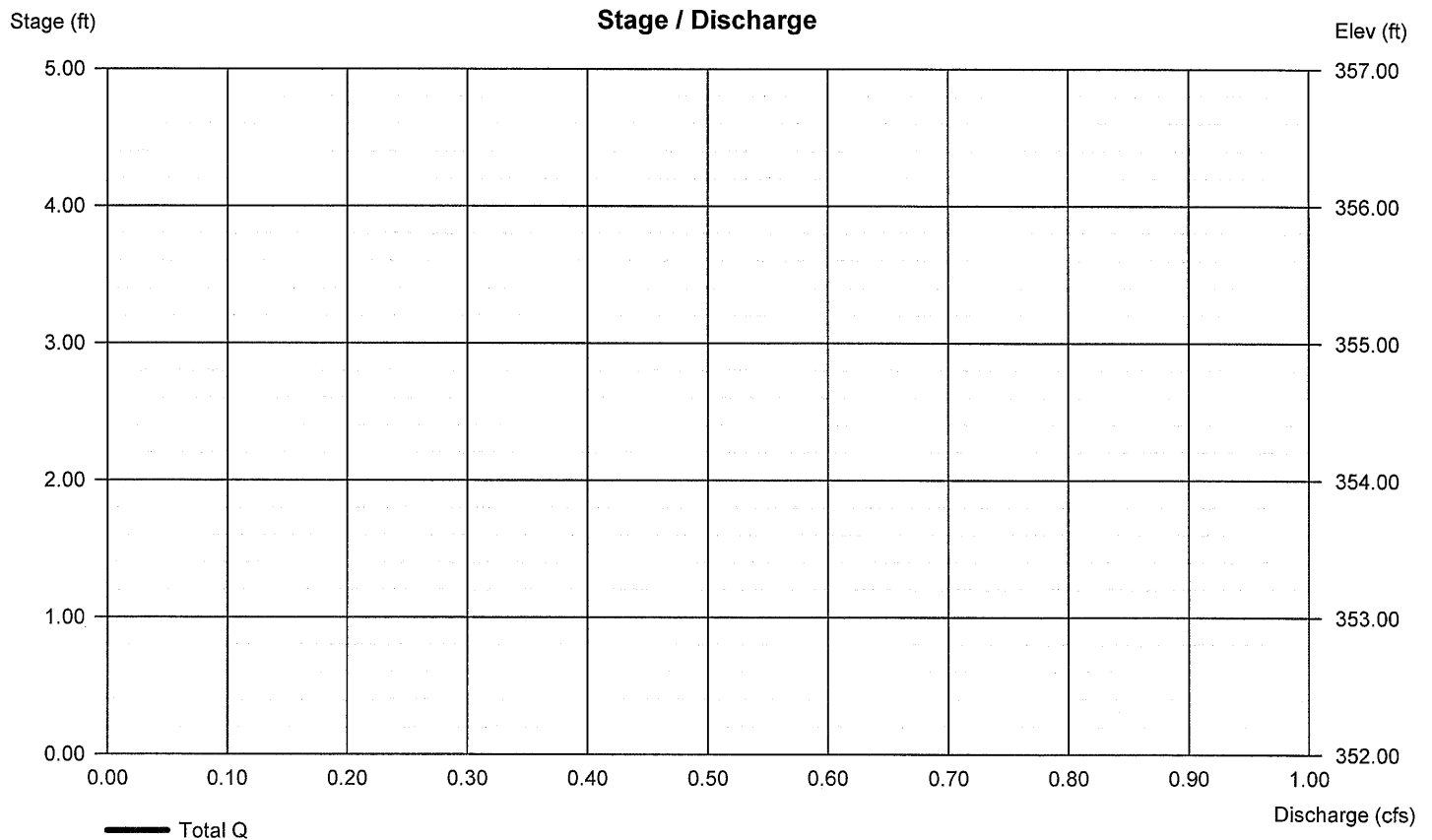
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Table of Contents

Landfill Pond - Spillway 10yr-24hr.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Tuesday, May 31, 2011

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- IDF Report..... 5**

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	538.30	3	747	3,616,569	-----	-----	-----	LANDFILL POND
2	Reservoir	0.000	3	n/a	0	1	297.43	3,616,570	LANDFILL POND
Landfill Pond - Spillway 10yr-24hr.gpw					Return Period: 10 Year			Tuesday, May 31, 2011	

Hydrograph Report

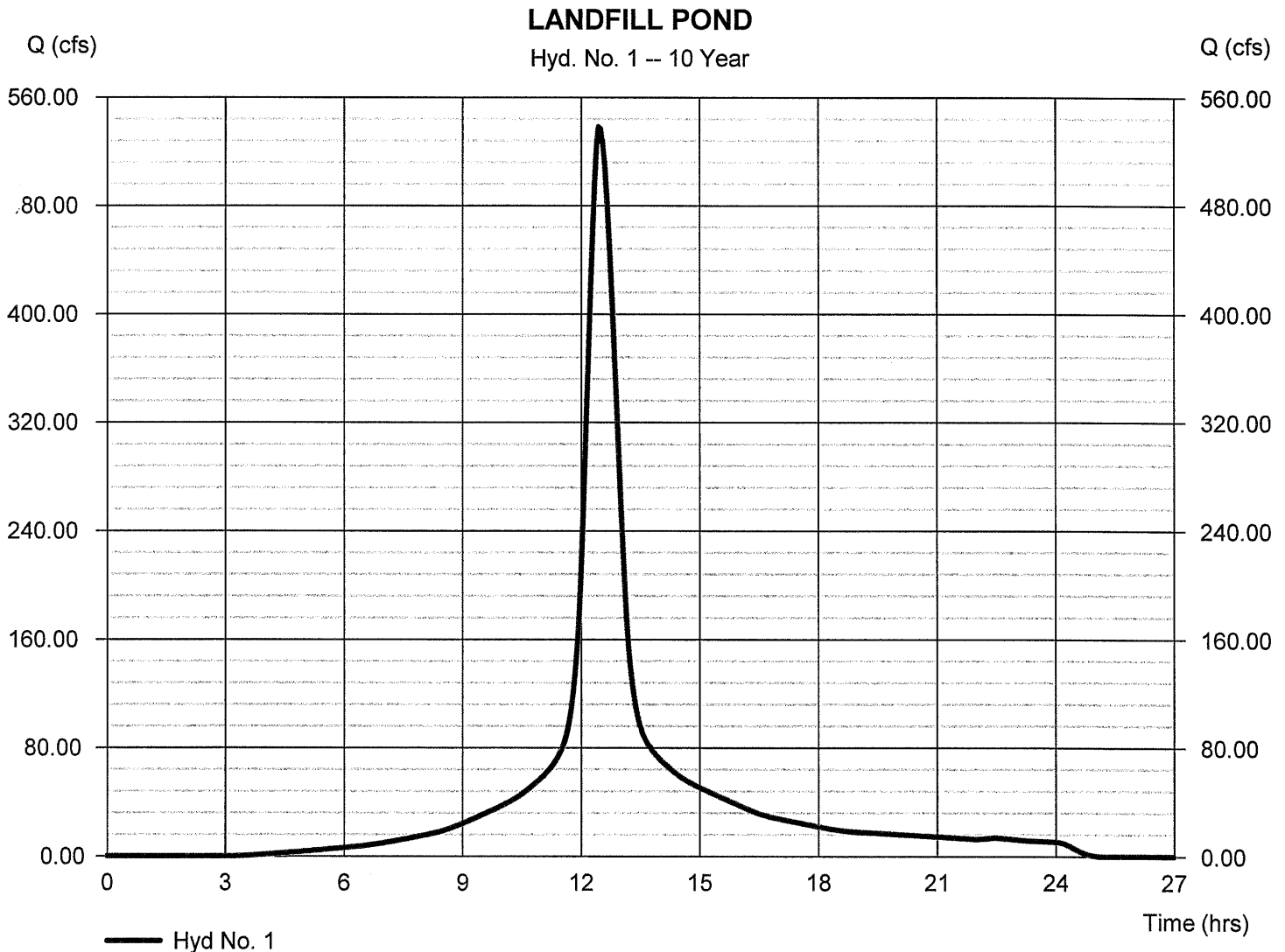
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Tuesday, May 31, 2011

Hyd. No. 1

LANDFILL POND

Hydrograph type	= SCS Runoff	Peak discharge	= 538.30 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.45 hrs
Time interval	= 3 min	Hyd. volume	= 3,616,569 cuft
Drainage area	= 166.630 ac	Curve number	= 90.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

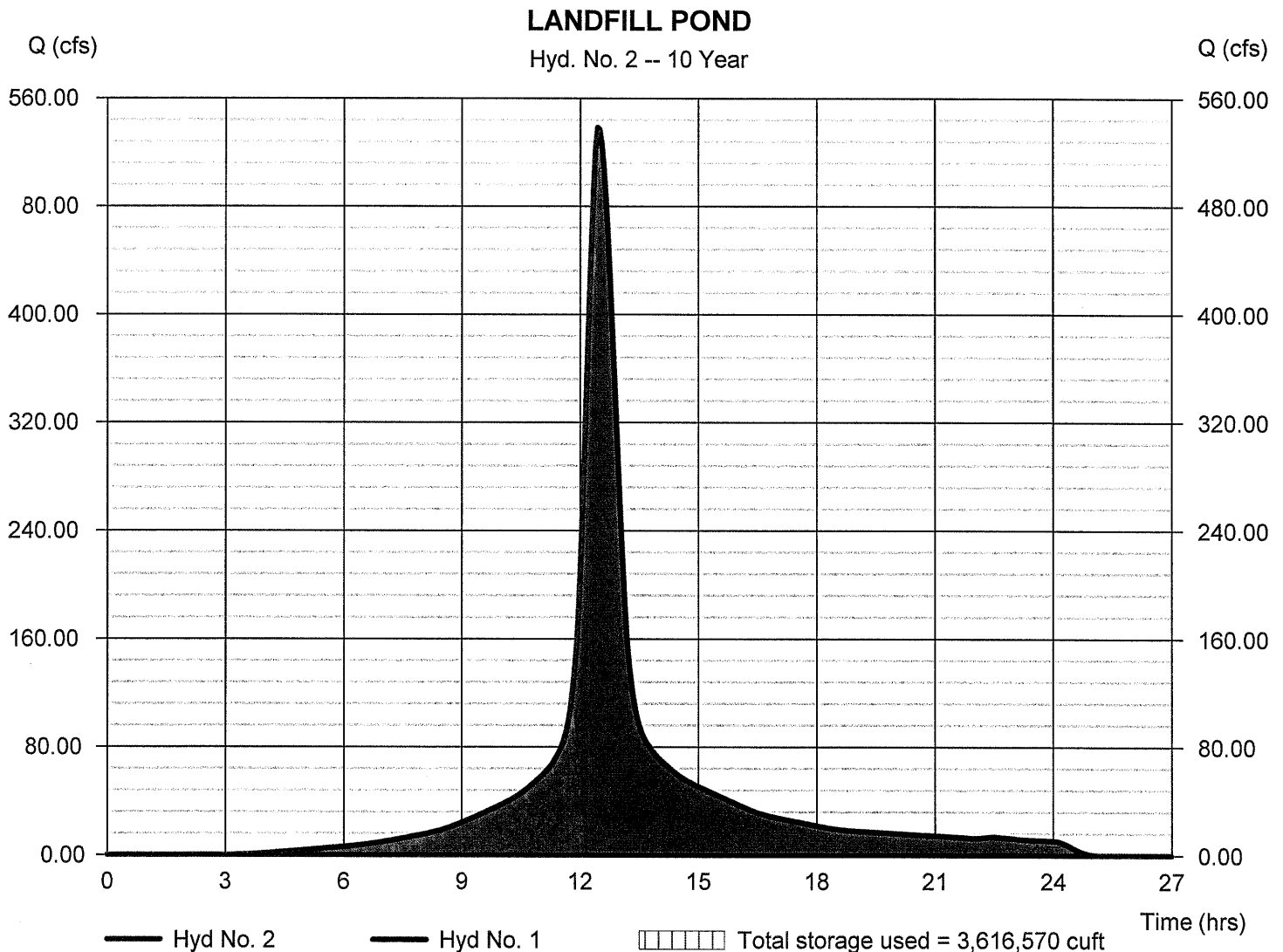
Tuesday, May 31, 2011

Hyd. No. 2

LANDFILL POND

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - LANDFILL POND	Max. Elevation	= 297.43 ft
Reservoir name	= LANDFILL POND	Max. Storage	= 3,616,570 cuft

Storage Indication method used.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Tuesday, May 31, 2011

Pond No. 1 - LANDFILL POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 288.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	288.00	184,259	0	0
2.00	290.00	298,822	478,439	478,439
4.00	292.00	366,775	664,371	1,142,810
6.00	294.00	414,256	780,471	1,923,281
8.00	296.00	475,675	889,135	2,812,416
10.00	298.00	652,529	1,123,442	3,935,858
10.50	298.50	659,498	327,973	4,263,831
11.00	299.00	666,904	331,565	4,595,396
11.50	299.50	674,309	335,268	4,930,664
12.00	300.00	681,278	338,862	5,269,526
12.50	300.50	687,812	342,237	5,611,763
13.00	301.00	694,346	345,504	5,957,267
13.50	301.50	700,880	348,770	6,306,037
14.00	302.00	707,850	352,146	6,658,183

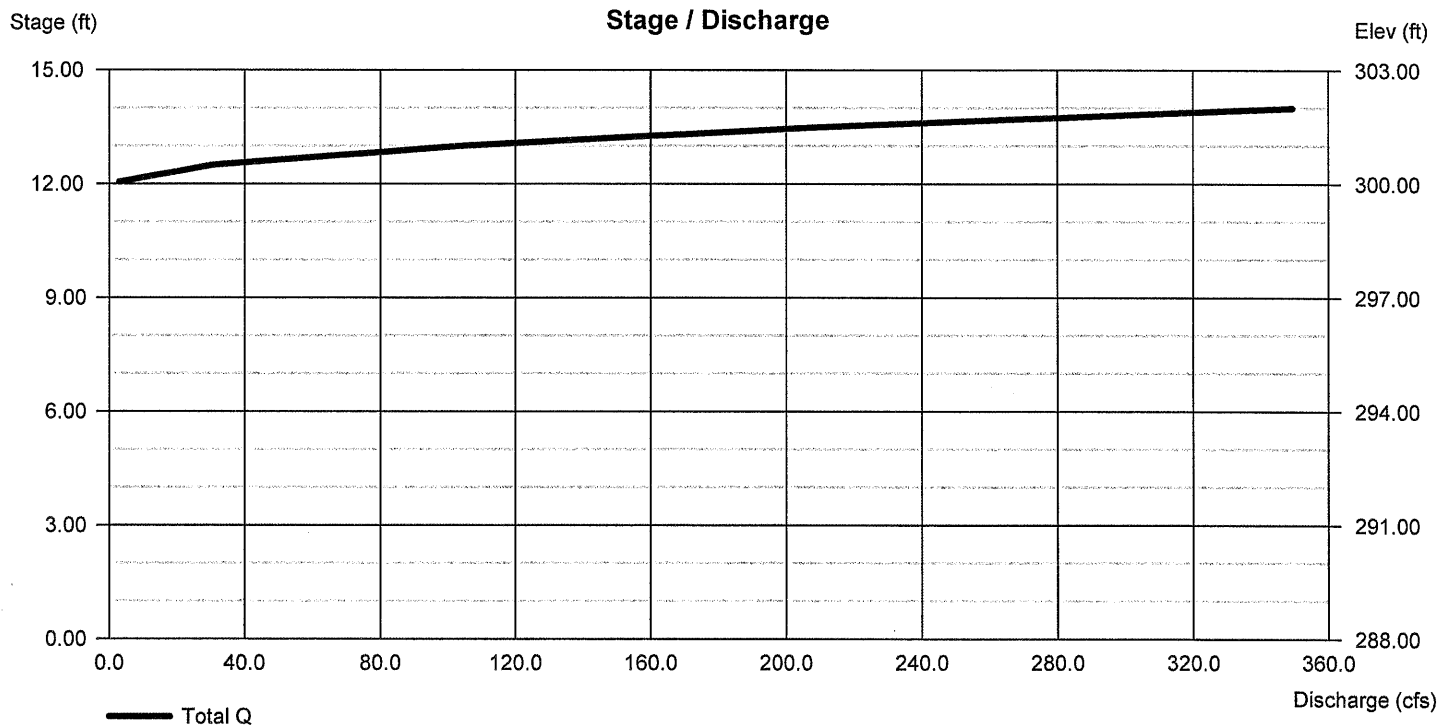
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 300.00	0.00	0.00	0.00
Weir Coeff.	= 2.60.00	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



HYDROLOGIC & HYDRAULIC CALCULATIONS

25% OF PMP EVENT

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.213	3	1068	221,285	-----	-----	-----	North Surge Pond
2	Reservoir	0.000	3	n/a	0	1	375.09	610,661	North Surge Pond
North Surge Pond - QuatPMF.gpw					Return Period: 100 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

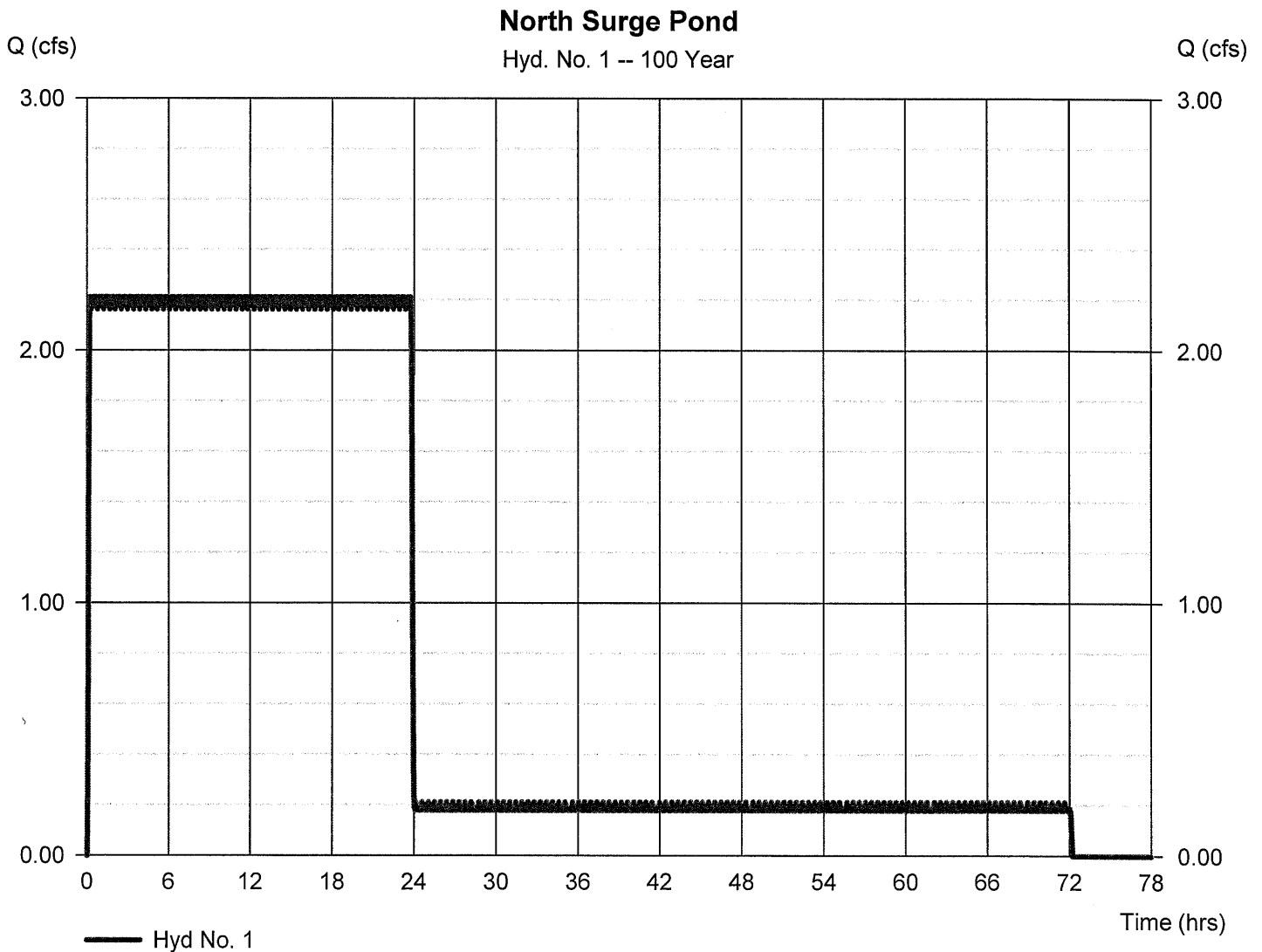
Wednesday, May 25, 2011

Hyd. No. 1

North Surge Pond

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 3 min
 Drainage area = 5.080 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 12.80 in

Peak discharge = 2.213 cfs
 Time to peak = 17.80 hrs
 Hyd. volume = 221,285 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Custom



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

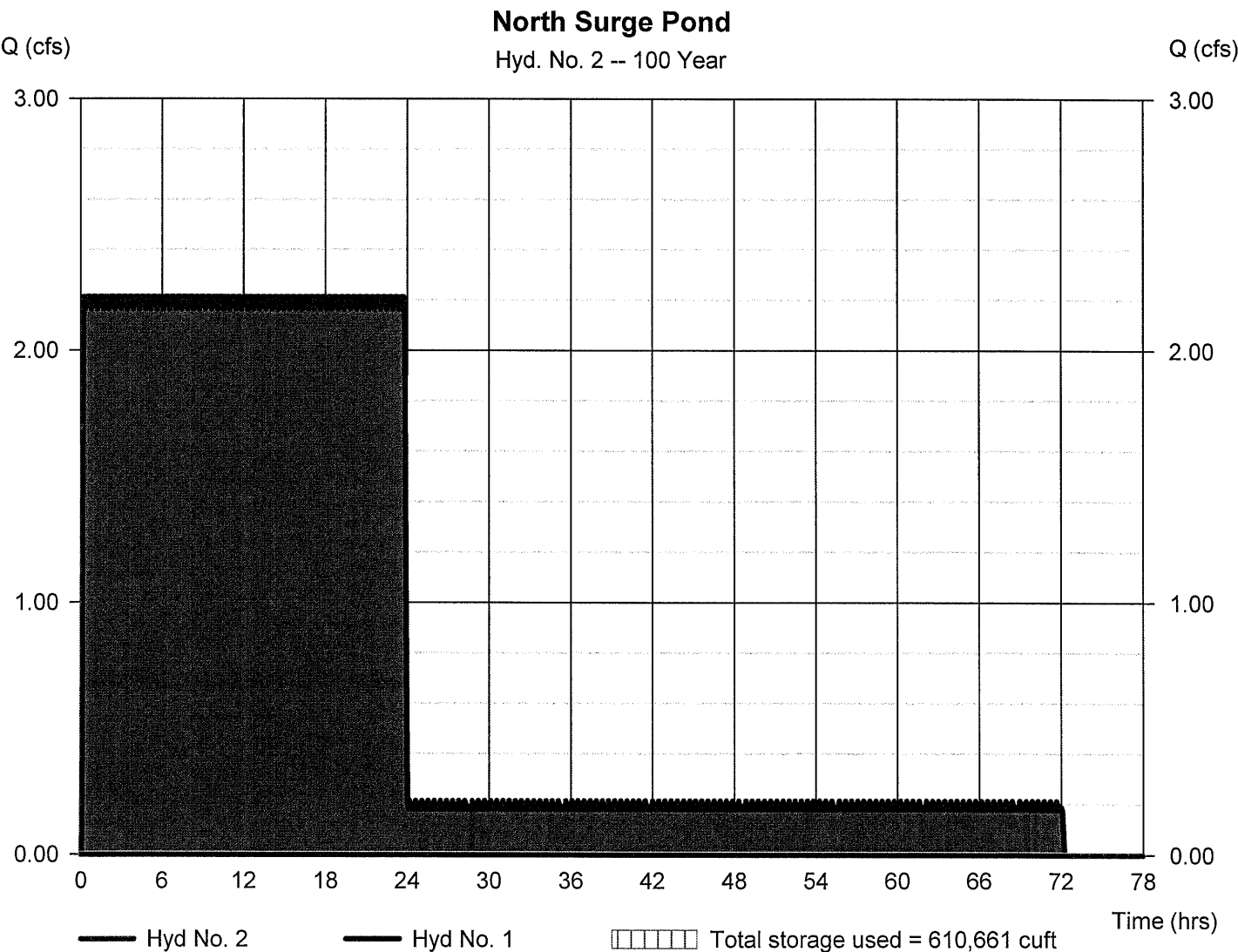
Wednesday, May 25, 2011

Hyd. No. 2

North Surge Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - North Surge Pond	Max. Elevation	= 375.09 ft
Reservoir name	= North Surge Pond	Max. Storage	= 610,661 cuft

Storage Indication method used. Wet pond routing start elevation = 374.00 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - North Surge Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 372.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	372.00	189,050	0	0
1.00	373.00	194,713	191,855	191,855
2.00	374.00	200,376	197,518	389,373
3.00	375.00	205,603	202,964	592,337
4.00	376.00	212,137	208,841	801,178

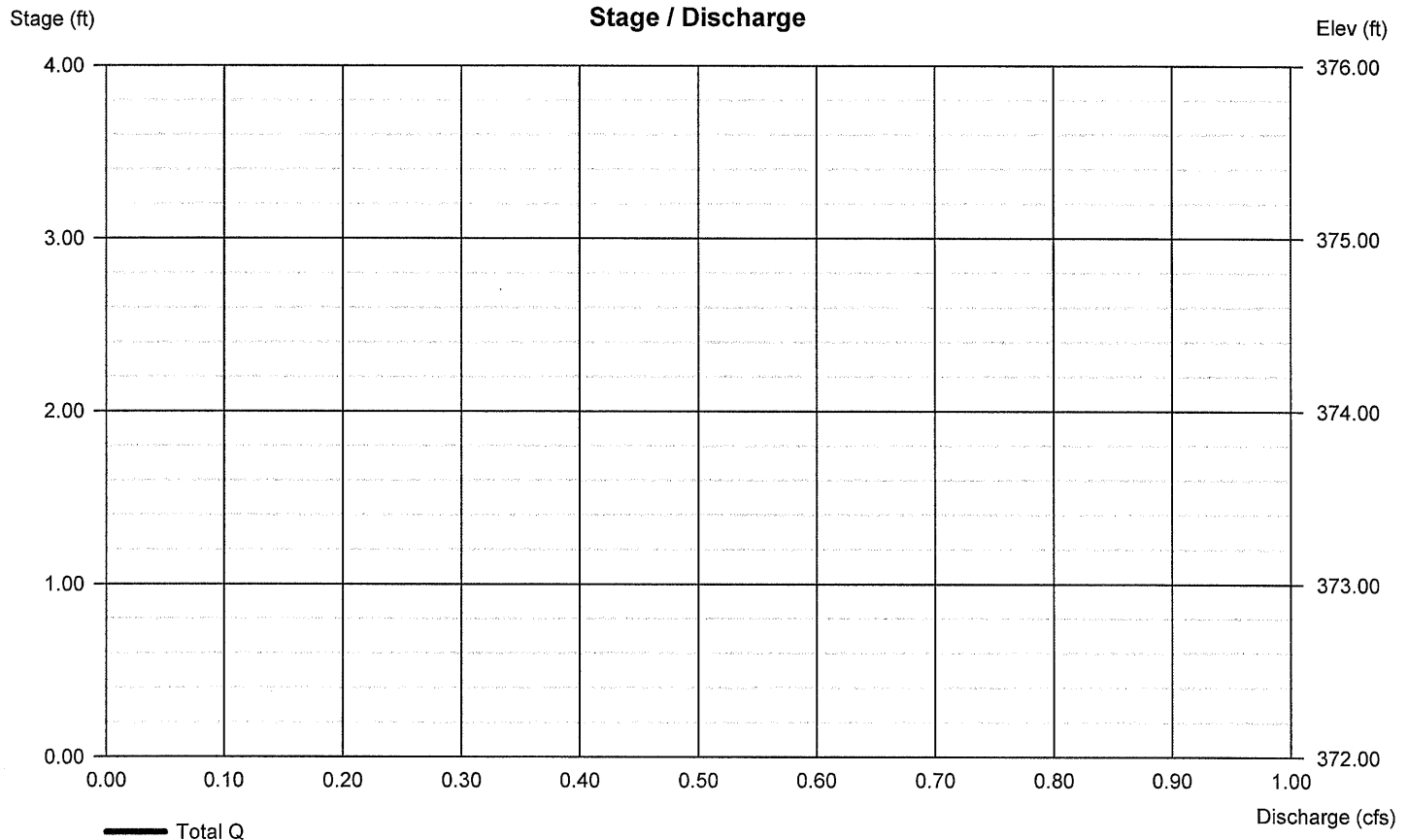
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hydrograph no.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph Description
1	SCS Runoff	12.91	3	1068	1,290,675	-----	-----	-----	East Ash Pond
2	Reservoir	0.000	3	n/a	0	1	356.11	4,706,525	East Ash Pond
East Ash Pond - QuatPMF.gpw					Return Period: 100 Year			Wednesday, May 25, 2011	

Hydrograph Report

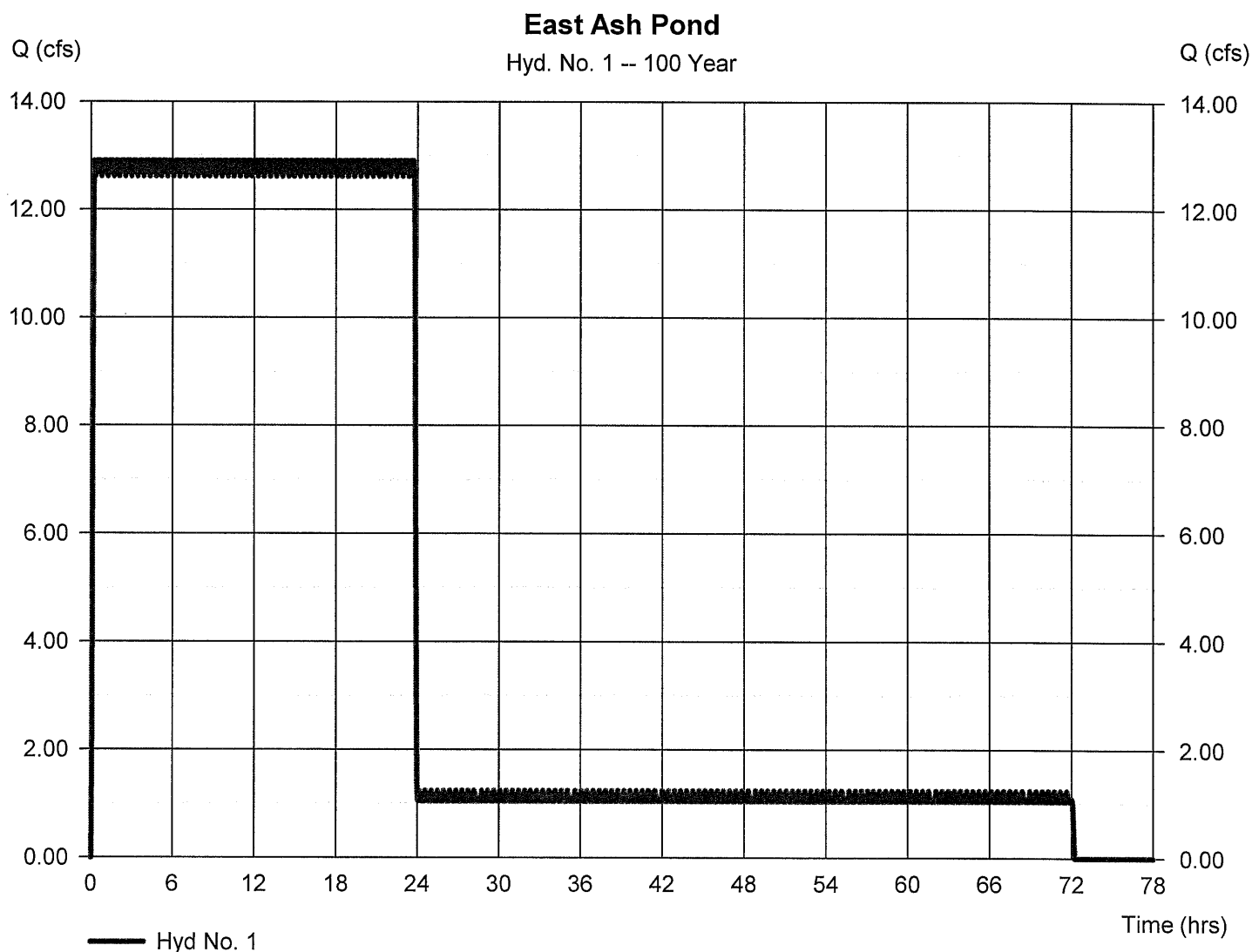
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Hyd. No. 1

East Ash Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 12.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 17.80 hrs
Time interval	= 3 min	Hyd. volume	= 1,290,675 cuft
Drainage area	= 29.630 ac	Curve number	= 100
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 12.80 in	Distribution	= Custom



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

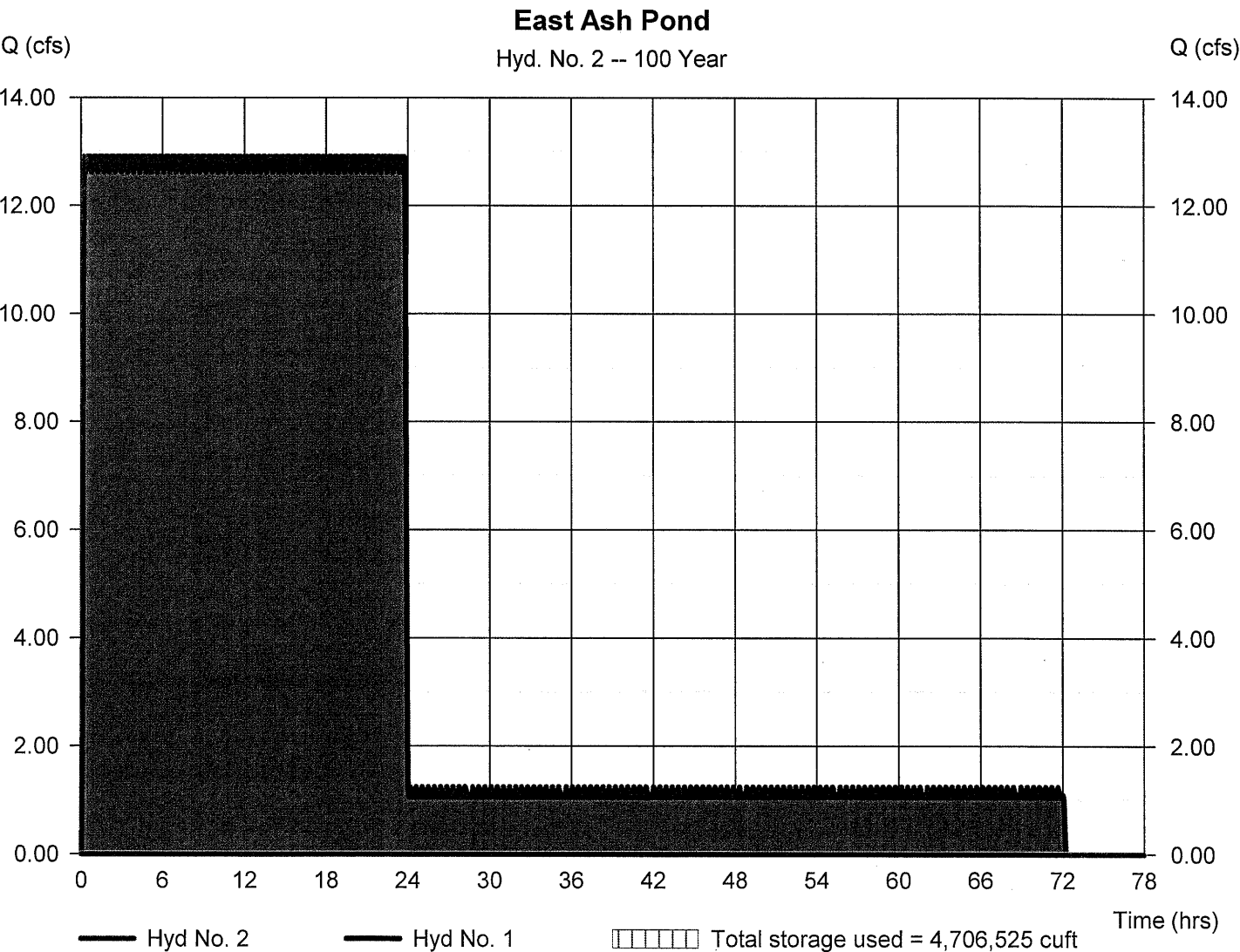
Wednesday, May 25, 2011

Hyd. No. 2

East Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - East Ash Pond	Max. Elevation	= 356.11 ft
Reservoir name	= East Ash Pond	Max. Storage	= 4,706,525 cuft

Storage Indication method used. Wet pond routing start elevation = 355.00 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - East Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	1,119,492	0	0
1.00	353.00	1,132,124	1,125,690	1,125,690
2.00	354.00	1,145,192	1,138,538	2,264,228
3.00	355.00	1,158,260	1,151,604	3,415,832
4.00	356.00	1,170,893	1,164,455	4,580,287
5.00	357.00	1,184,396	1,177,520	5,757,807

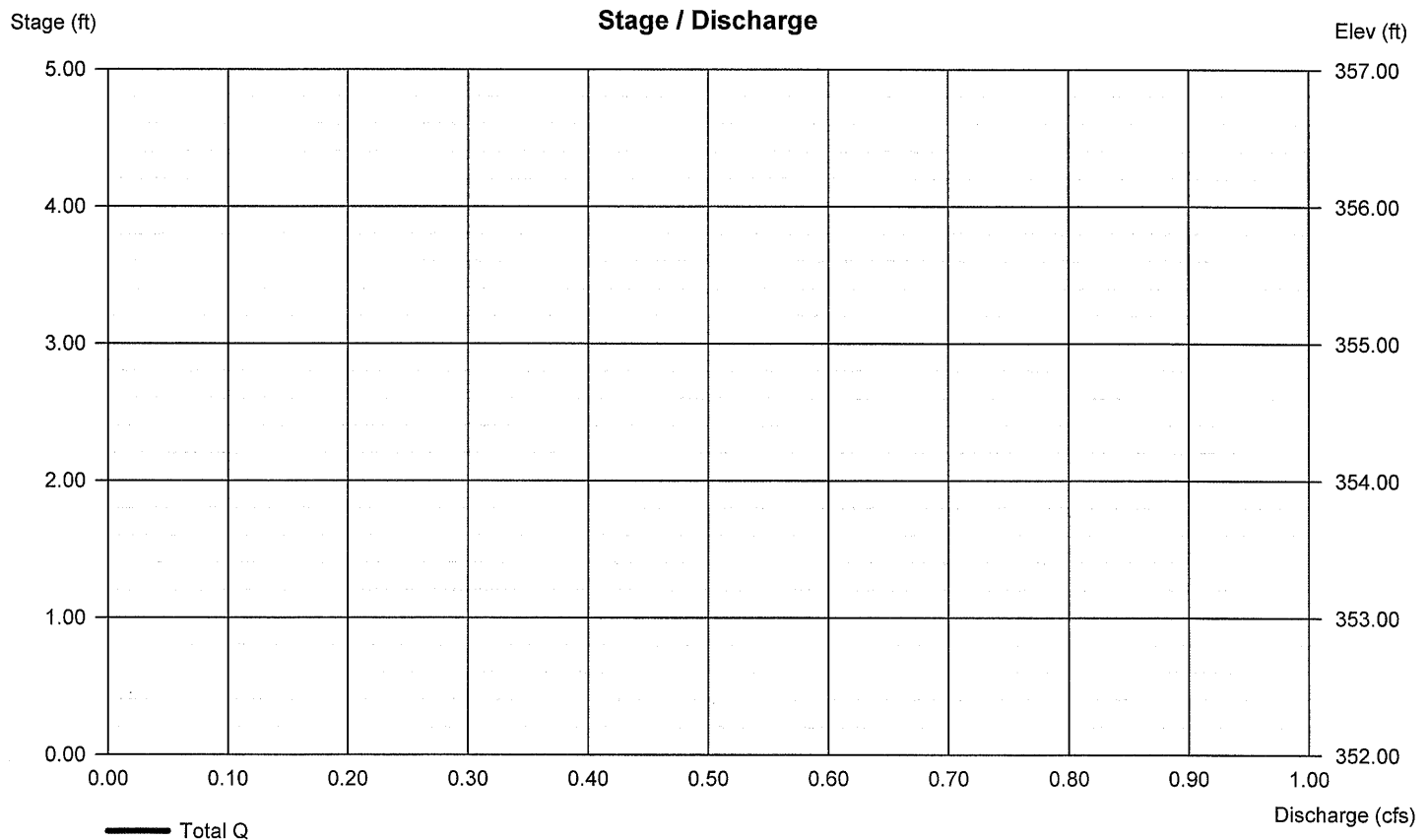
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	14.57	3	1068	1,456,646	-----	-----	-----	West Ash Pond
2	Reservoir	0.000	3	n/a	0	1	356.13	5,232,251	West Ash Pond
West Ash Pond - QuatPMF.gpw					Return Period: 100 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

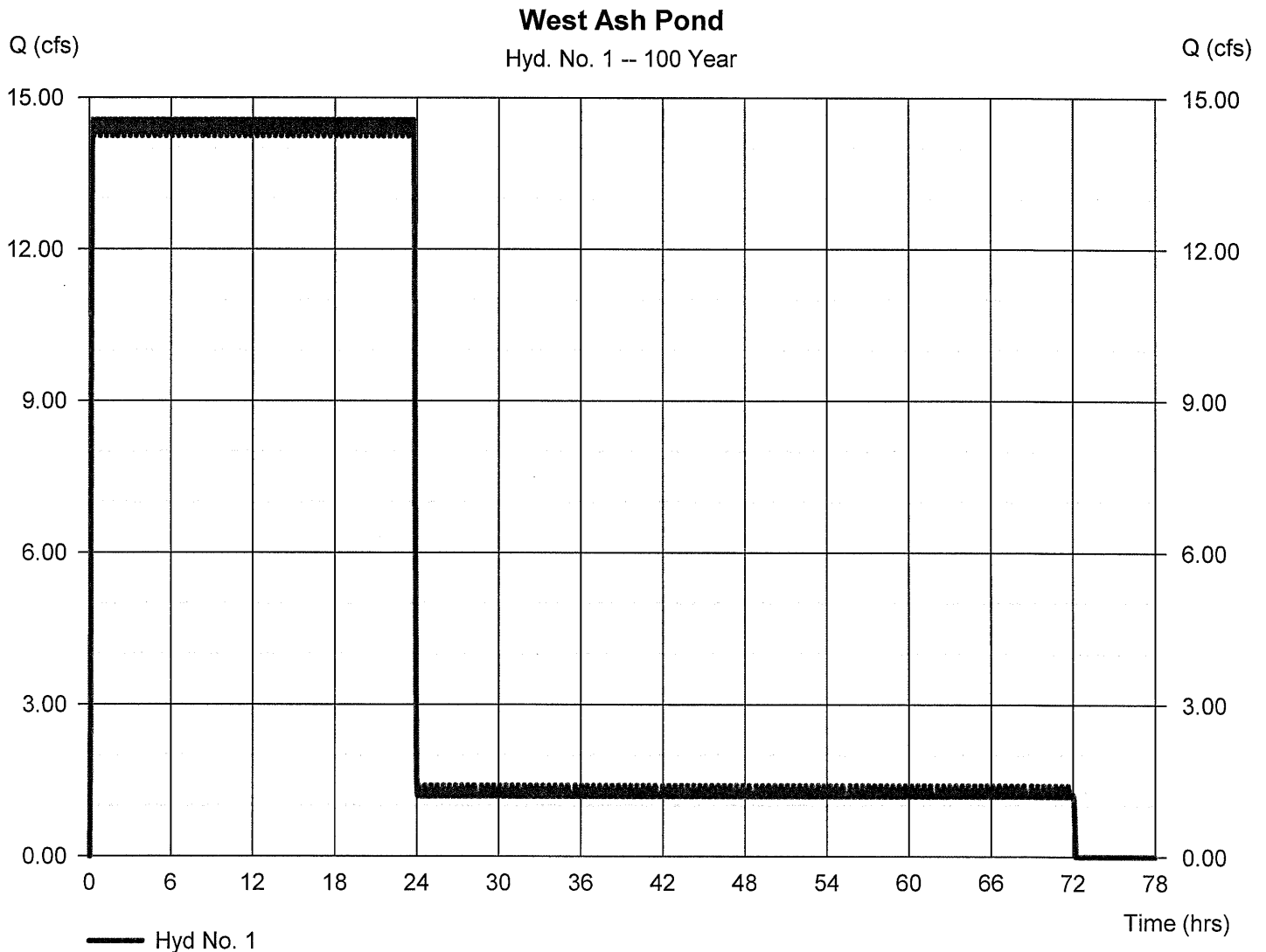
Wednesday, May 25, 2011

Hyd. No. 1

West Ash Pond

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 3 min
 Drainage area = 33.440 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 12.80 in

Peak discharge = 14.57 cfs
 Time to peak = 17.80 hrs
 Hyd. volume = 1,456,646 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Custom



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

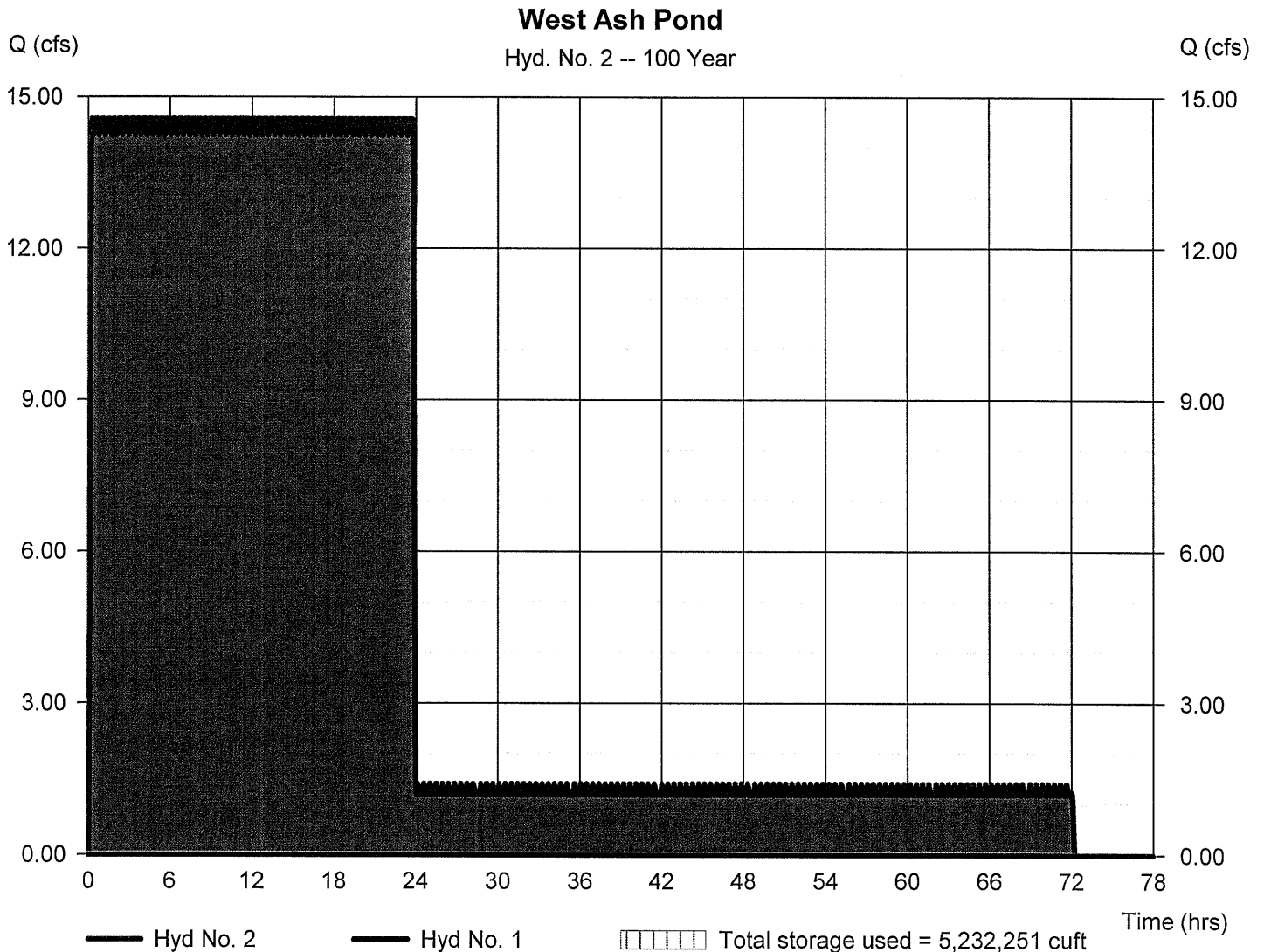
Wednesday, May 25, 2011

Hyd. No. 2

West Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - West Ash Pond	Max. Elevation	= 356.13 ft
Reservoir name	= West Ash Pond	Max. Storage	= 5,232,251 cuft

Storage Indication method used. Wet pond routing start elevation = 355.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - West Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	1,238,411	0	0
1.00	353.00	1,251,914	1,245,032	1,245,032
2.00	354.00	1,265,418	1,258,534	2,503,566
3.00	355.00	1,278,922	1,272,037	3,775,603
4.00	356.00	1,292,425	1,285,539	5,061,142
5.00	357.00	1,327,273	1,309,680	6,370,822

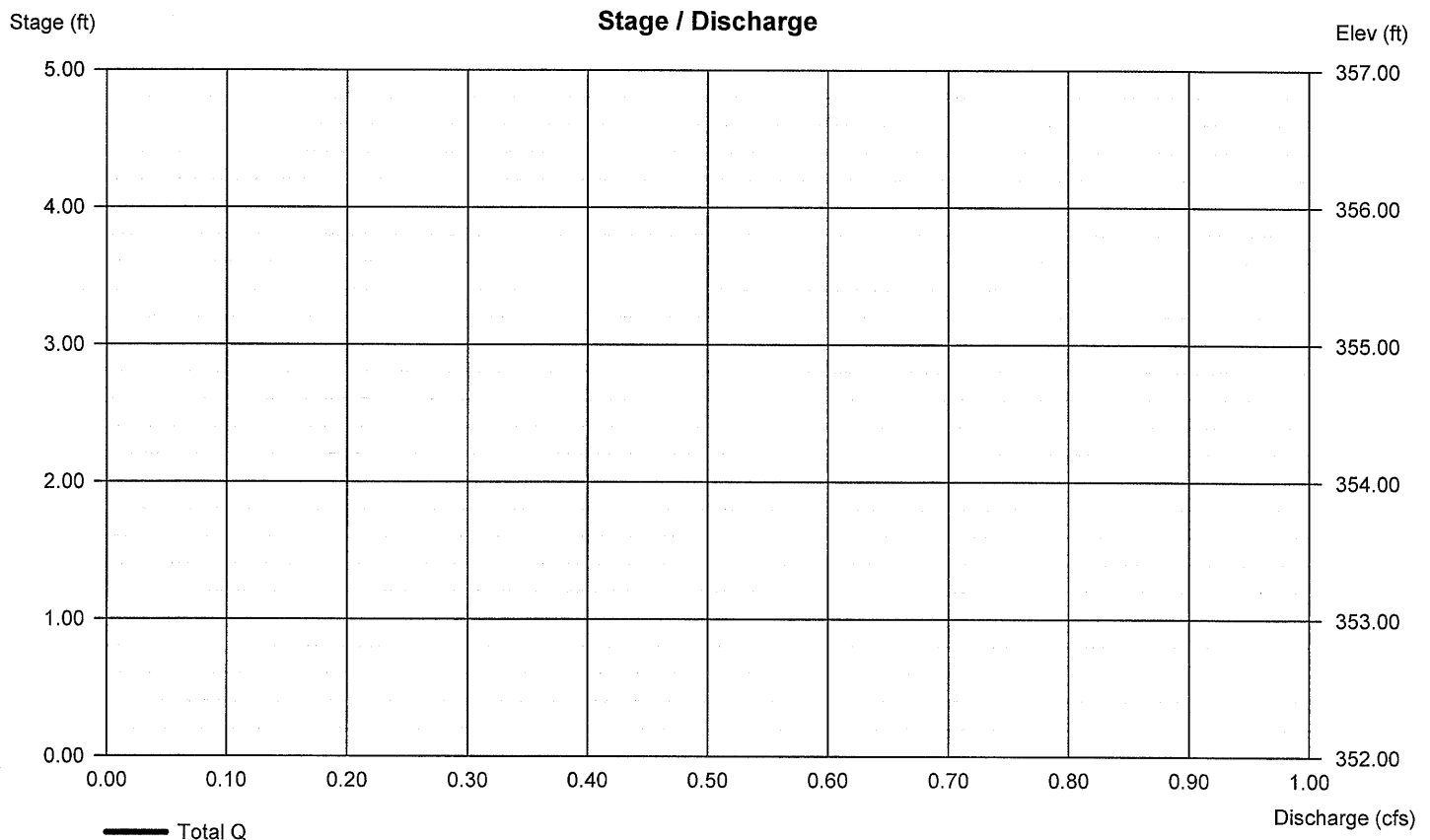
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.895	3	1068	189,486	-----	-----	-----	Secondary Ash Pond
2	Reservoir	0.000	3	n/a	0	1	356.28	601,938	Secondary Ash Pond
Secondary Ash Pond - QuatPMF.gpw					Return Period: 100 Year			Wednesday, May 25, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

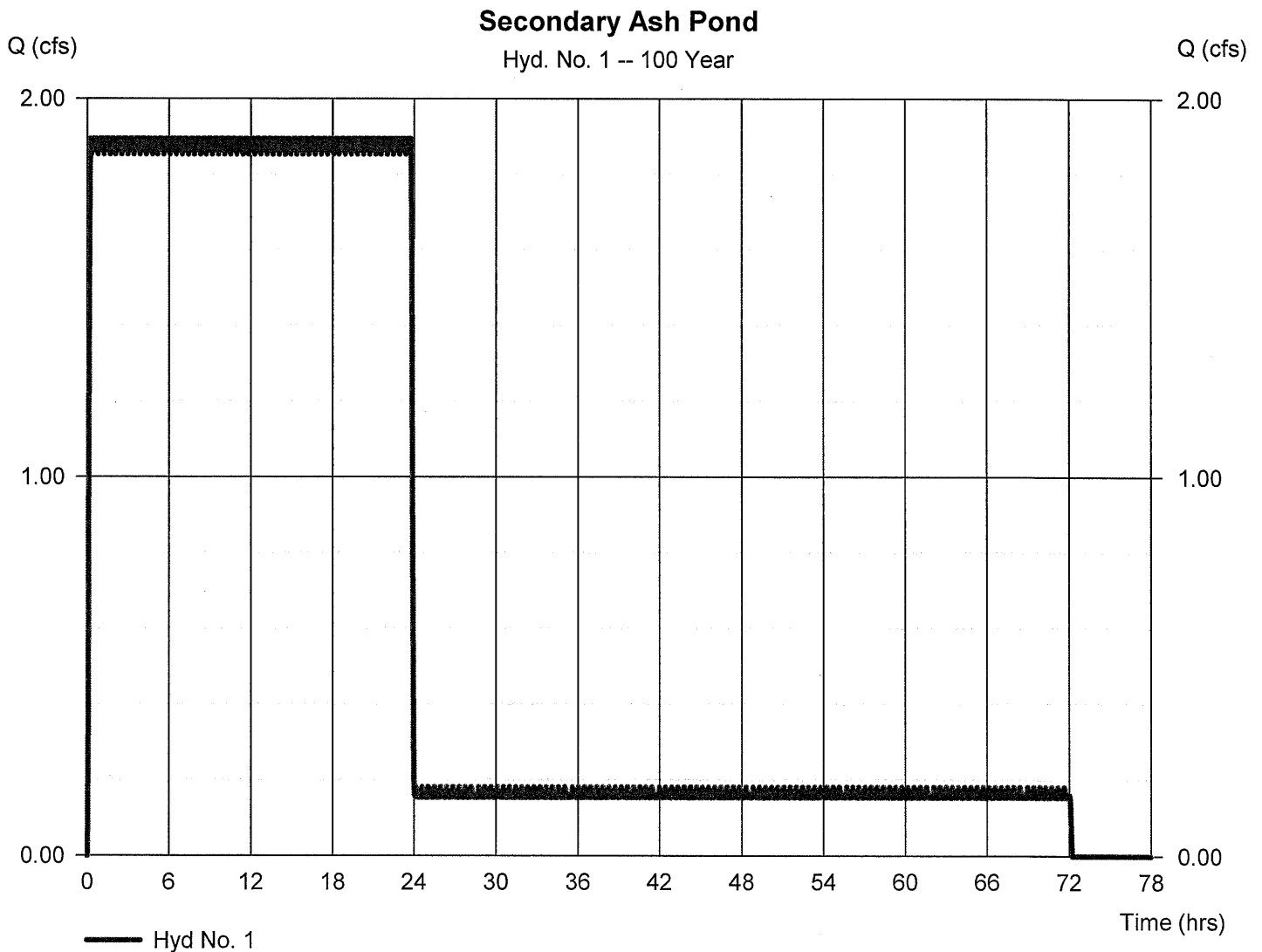
Wednesday, May 25, 2011

Hyd. No. 1

Secondary Ash Pond

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 3 min
 Drainage area = 4.350 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 12.80 in

Peak discharge = 1.895 cfs
 Time to peak = 17.80 hrs
 Hyd. volume = 189,486 cuft
 Curve number = 100
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Custom



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

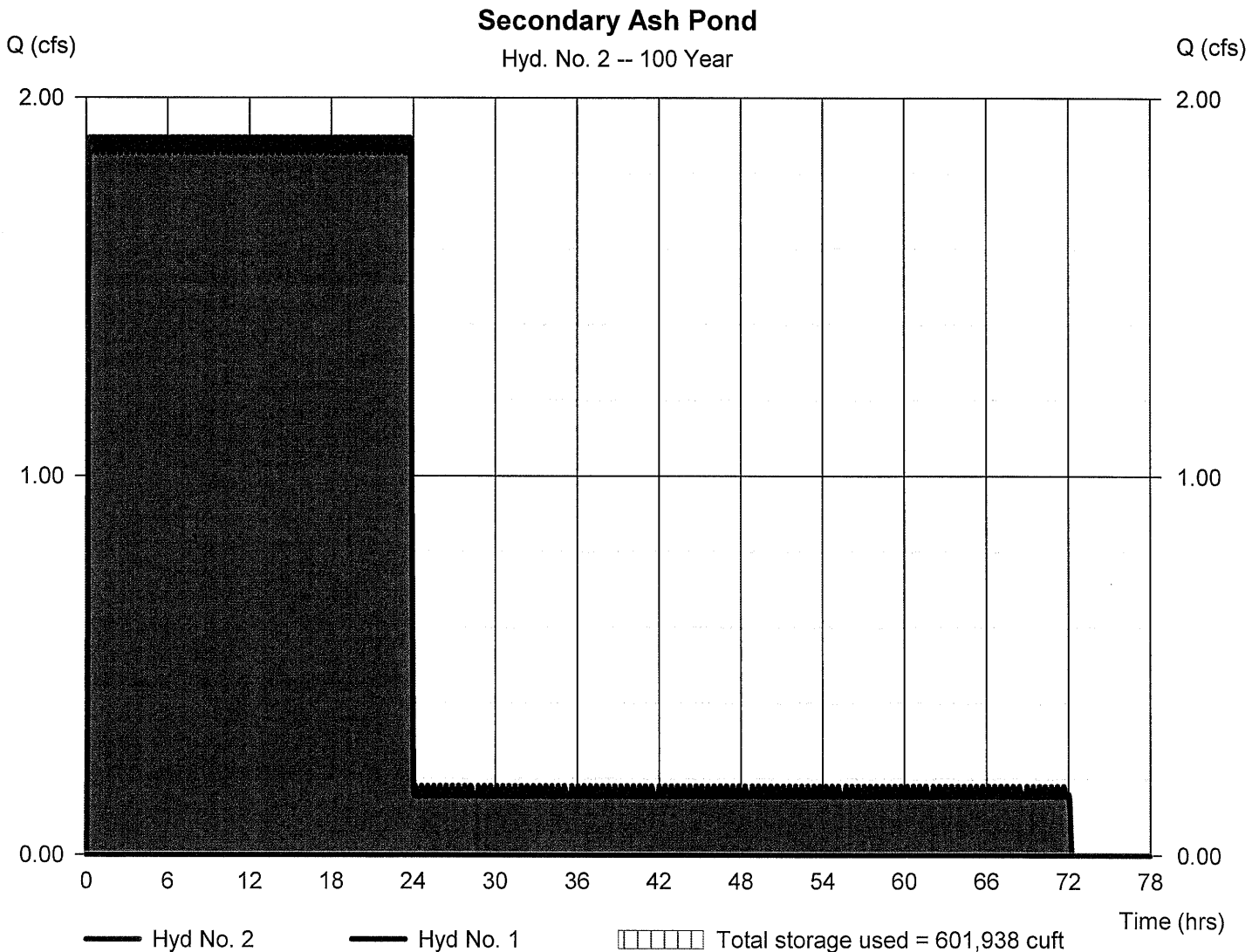
Wednesday, May 25, 2011

Hyd. No. 2

Secondary Ash Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - Secondary Ash Pond	Max. Elevation	= 356.28 ft
Reservoir name	= Secondary Ash Pond	Max. Storage	= 601,938 cuft

Storage Indication method used. Wet pond routing start elevation = 355.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Wednesday, May 25, 2011

Pond No. 1 - Secondary Ash Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 352.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	352.00	130,680	0	0
1.00	353.00	135,036	132,839	132,839
2.00	354.00	139,828	137,411	270,250
3.00	355.00	144,619	142,203	412,453
4.00	356.00	149,411	146,994	559,446
5.00	357.00	154,202	151,785	711,231

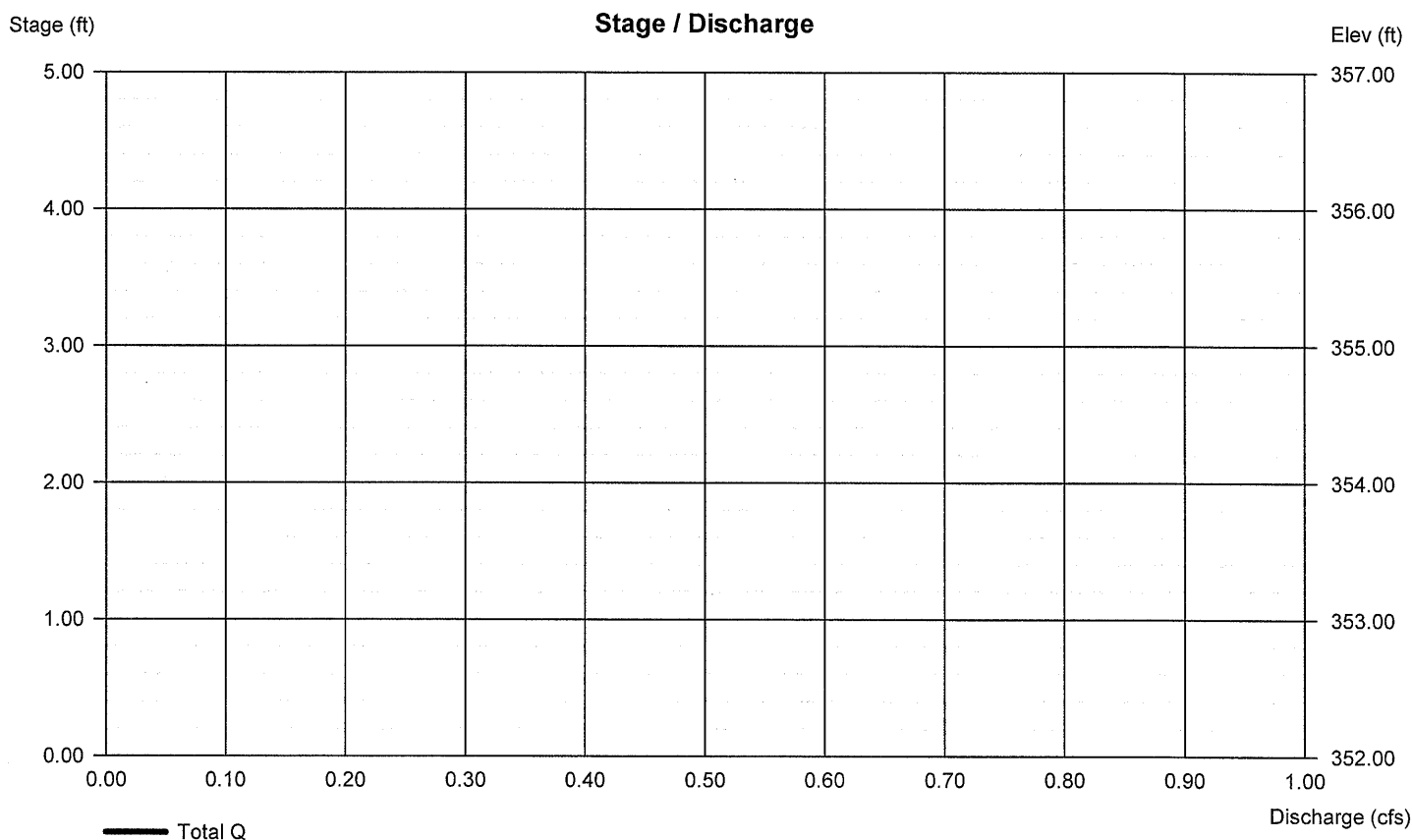
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .000	.000	.000	n/a
Orifice Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Table of Contents

Landfill Pond - Spillway QuatPMF.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Tuesday, May 31, 2011

100 - Year

Summary Report.....	1
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Hydrograph No. 2, Reservoir, LANDFILL POND.....	3
Pond Report - LANDFILL POND.....	4
IDF Report.....	5

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	276.24	3	96	5,625,263	-----	-----	-----	LANDFILL POND
2	Reservoir	246.08	3	255	4,291,583	1	301.63	6,396,093	LANDFILL POND
Landfill Pond - Spillway QuatPMF.gpw					Return Period: 100 Year			Tuesday, May 31, 2011	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

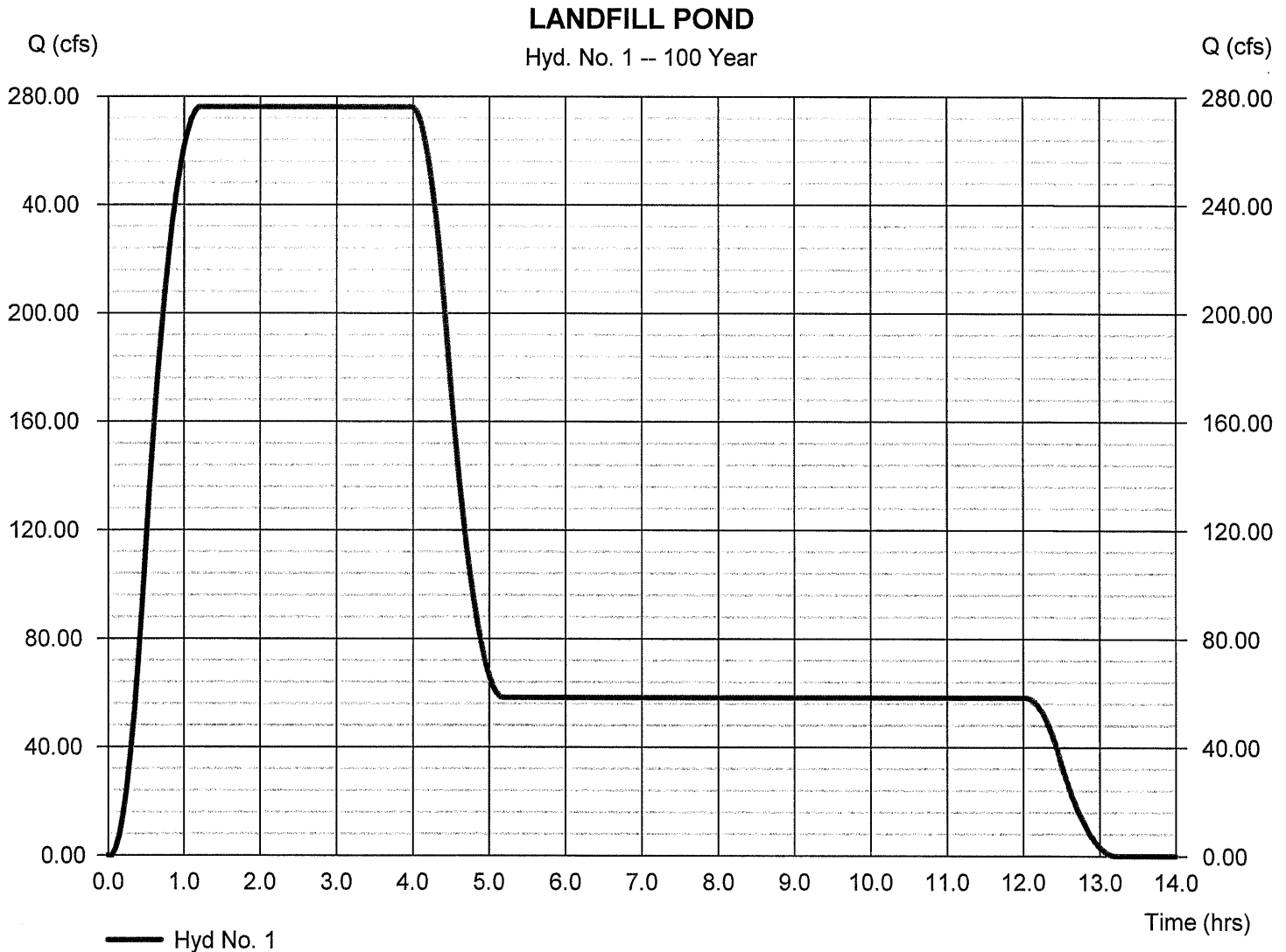
Tuesday, May 31, 2011

Hyd. No. 1

LANDFILL POND

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 3 min
 Drainage area = 166.630 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 9.30 in

Peak discharge = 276.24 cfs
 Time to peak = 1.60 hrs
 Hyd. volume = 5,625,263 cuft
 Curve number = 90.5
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 42.00 min
 Distribution = Custom



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

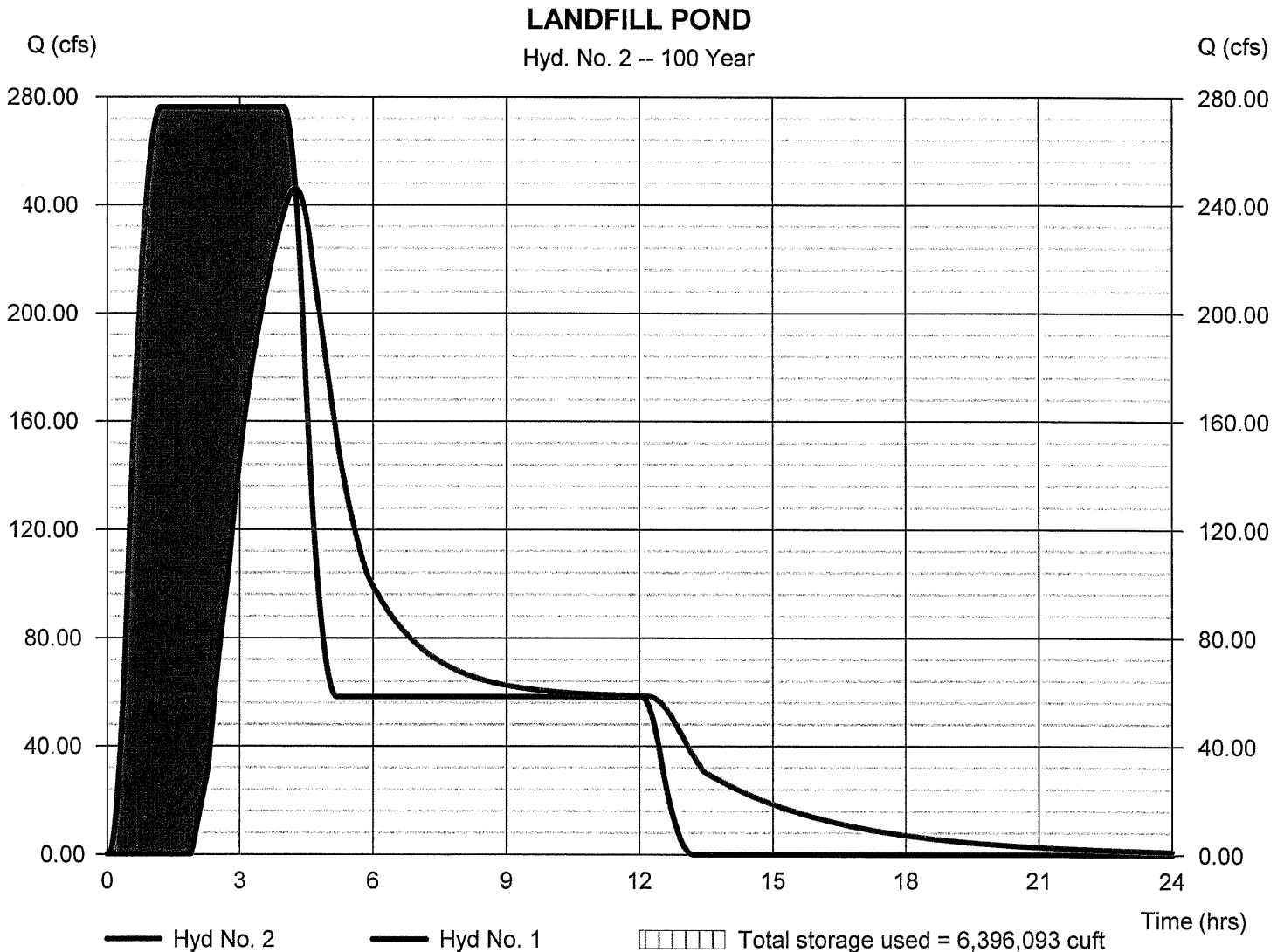
Tuesday, May 31, 2011

Hyd. No. 2

LANDFILL POND

Hydrograph type	= Reservoir	Peak discharge	= 246.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.25 hrs
Time interval	= 3 min	Hyd. volume	= 4,291,583 cuft
Inflow hyd. No.	= 1 - LANDFILL POND	Max. Elevation	= 301.63 ft
Reservoir name	= LANDFILL POND	Max. Storage	= 6,396,093 cuft

Storage Indication method used. Wet pond routing start elevation = 298.00 ft.



Pond Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2010 by Autodesk, Inc. v9.25

Tuesday, May 31, 2011

Pond No. 1 - LANDFILL POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 288.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	288.00	184,259	0	0
2.00	290.00	298,822	478,439	478,439
4.00	292.00	366,775	664,371	1,142,810
6.00	294.00	414,256	780,471	1,923,281
8.00	296.00	475,675	889,135	2,812,416
10.00	298.00	652,529	1,123,442	3,935,858
10.50	298.50	659,498	327,973	4,263,831
11.00	299.00	666,904	331,566	4,595,396
11.50	299.50	674,309	335,268	4,930,664
12.00	300.00	681,278	338,862	5,269,526
12.50	300.50	687,812	342,237	5,611,763
13.00	301.00	694,346	345,504	5,957,267
13.50	301.50	700,880	348,771	6,306,037
14.00	302.00	707,850	352,146	6,658,183

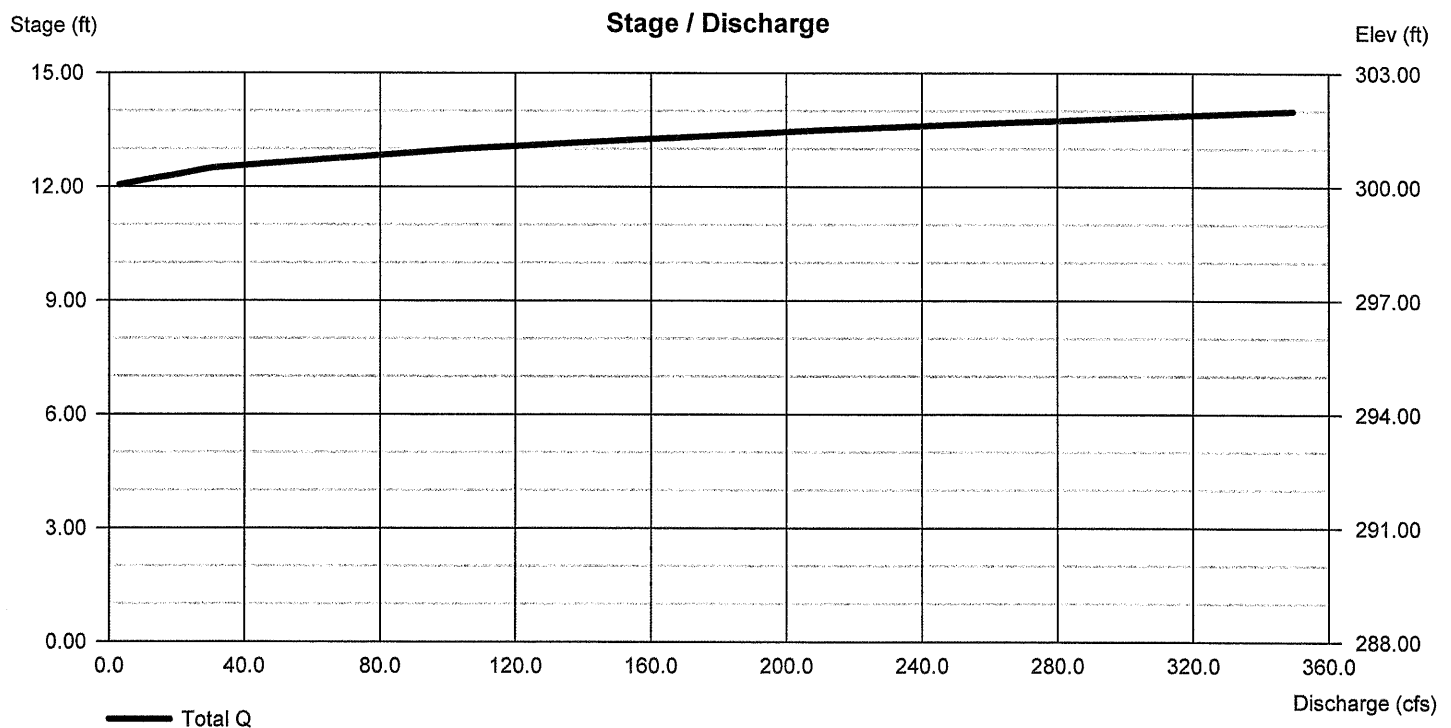
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

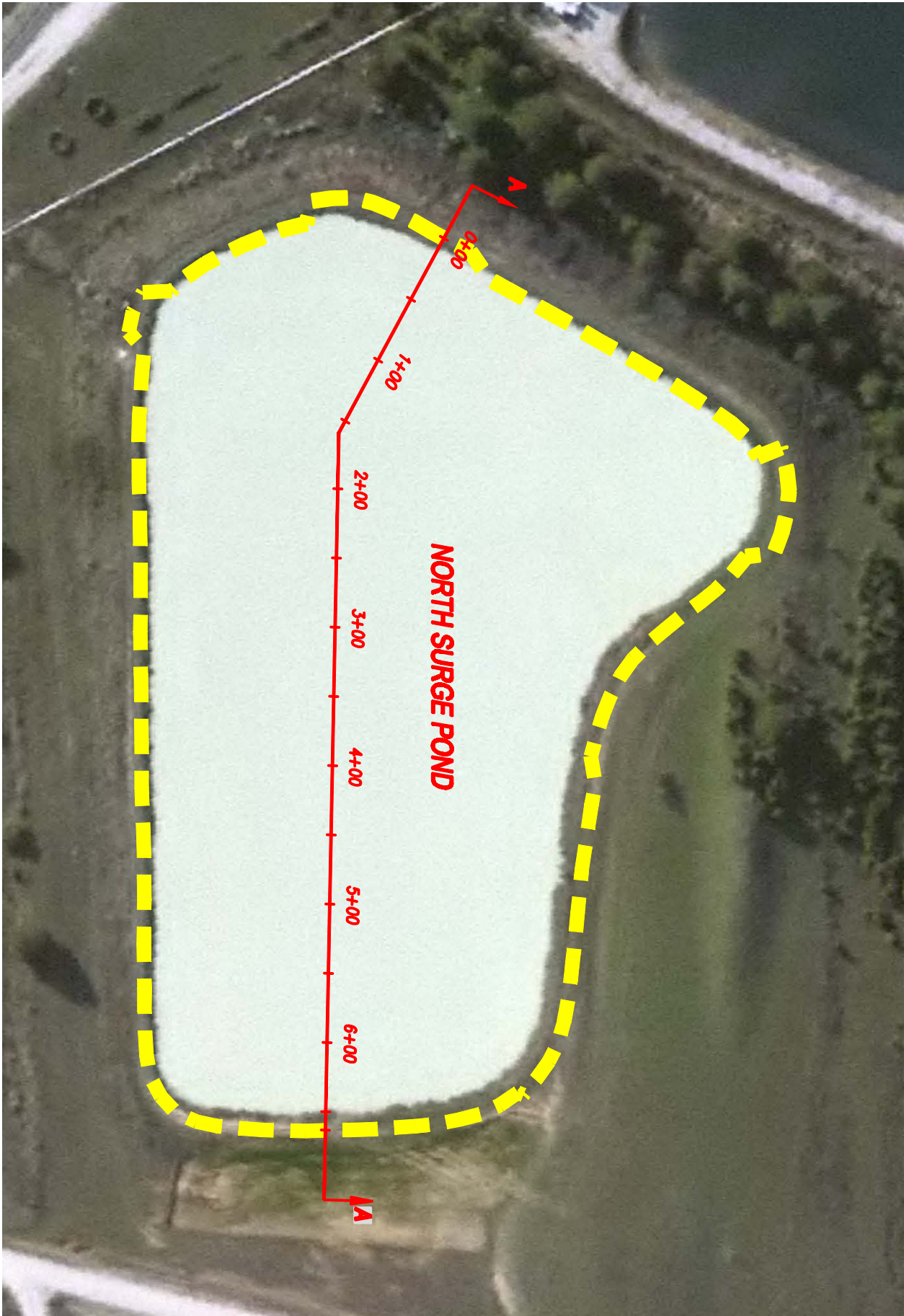
	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 300.00	0.00	0.00	0.00
Weir Coeff.	= 2.60.00	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

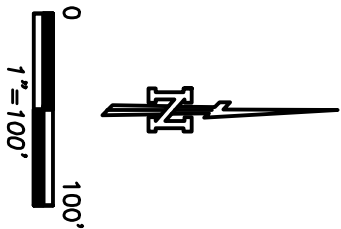


APPENDIX – A

EXHIBITS



PLAN VIEW
SCALE: 1"=100'

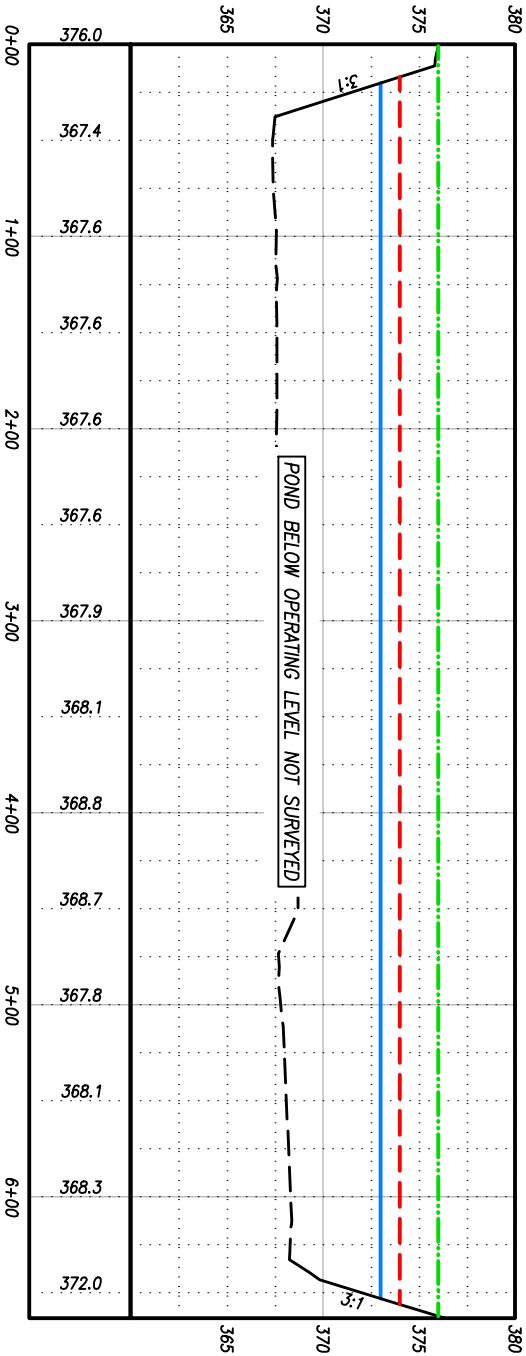


WATERSHED BOUNDARY

LEGEND

TOP OF EMBANKMENT ELEV. = 376.00
MINIMUM FREEBOARD ELEV. = 374.00
NORMAL OPERATING LEVEL = 373.00

LEGEND



SECTION A-A
HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=10'

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website: www.johnsonpace.com
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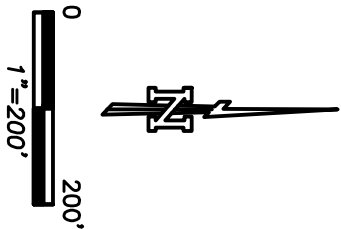
EXHIBIT B
NORTH SURGE POND
CROSS SECTION

H.W. PIRKEY
POWER PLANT
HALLSVILLE, TEXAS

DRAWING
DATE
MAY 2011
SCALE
AS NOTED
REVISIONS
SHEET NO.
2



PLAN VIEW
SCALE: 1"=200'

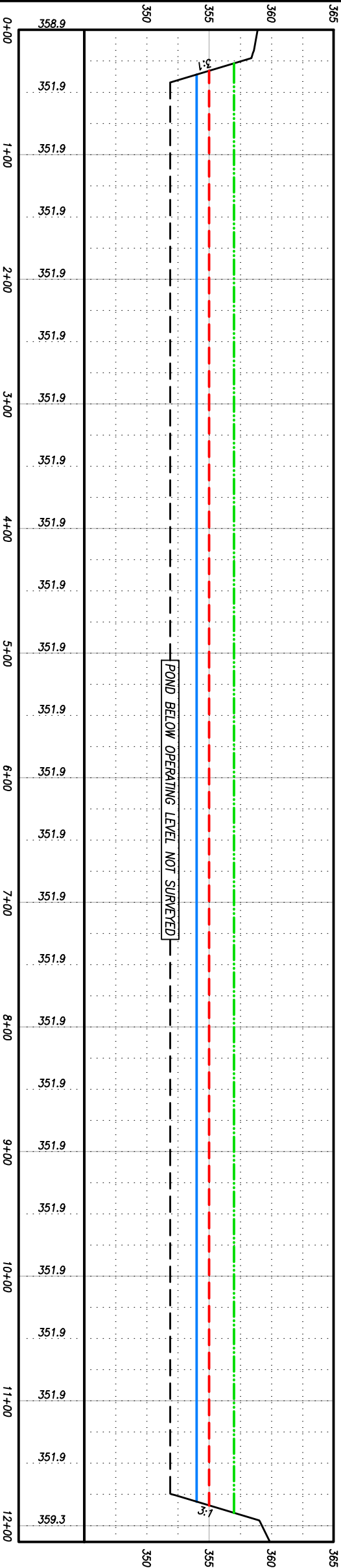


WATERSHED BOUNDARY

LEGEND

- TOP OF EMBANKMENT
ELEV. = 357.00
- MINIMUM FREEBOARD
ELEV. = 355.00
- NORMAL OPERATING
LEVEL = 354.00

LEGEND



SECTION B-B
HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=10'

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DRAWN	DATE
REVISED	DATE
AS NOTED	DATE
REVISIONS	DATE
SHEET NO.	3

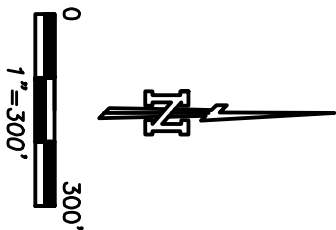
H.W. PIRKEY
POWER PLANT
HALLSVILLE, TEXAS

EXHIBIT C
EAST ASH POND
CROSS SECTION



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LEGEND

WATERSHED BOUNDARY

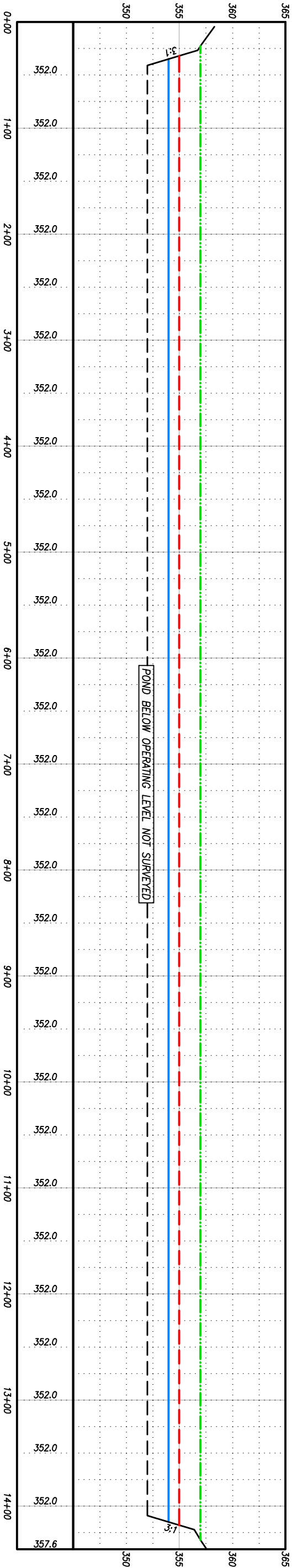
PLAN VIEW
SCALE: 1"=300'

LEGEND

TOP OF EMBANKMENT ELEV. = 357.00

MINIMUM FREEBOARD ELEV. = 355.00

NORMAL OPERATING LEVEL = 354.00



SECTION C-C
HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=10'

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DRAWN	DATE
REVISED	2011
AS NOTED	2011
REVISIONS	4
SHEET NO.	4

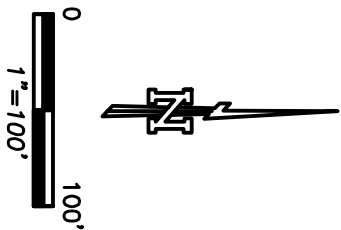
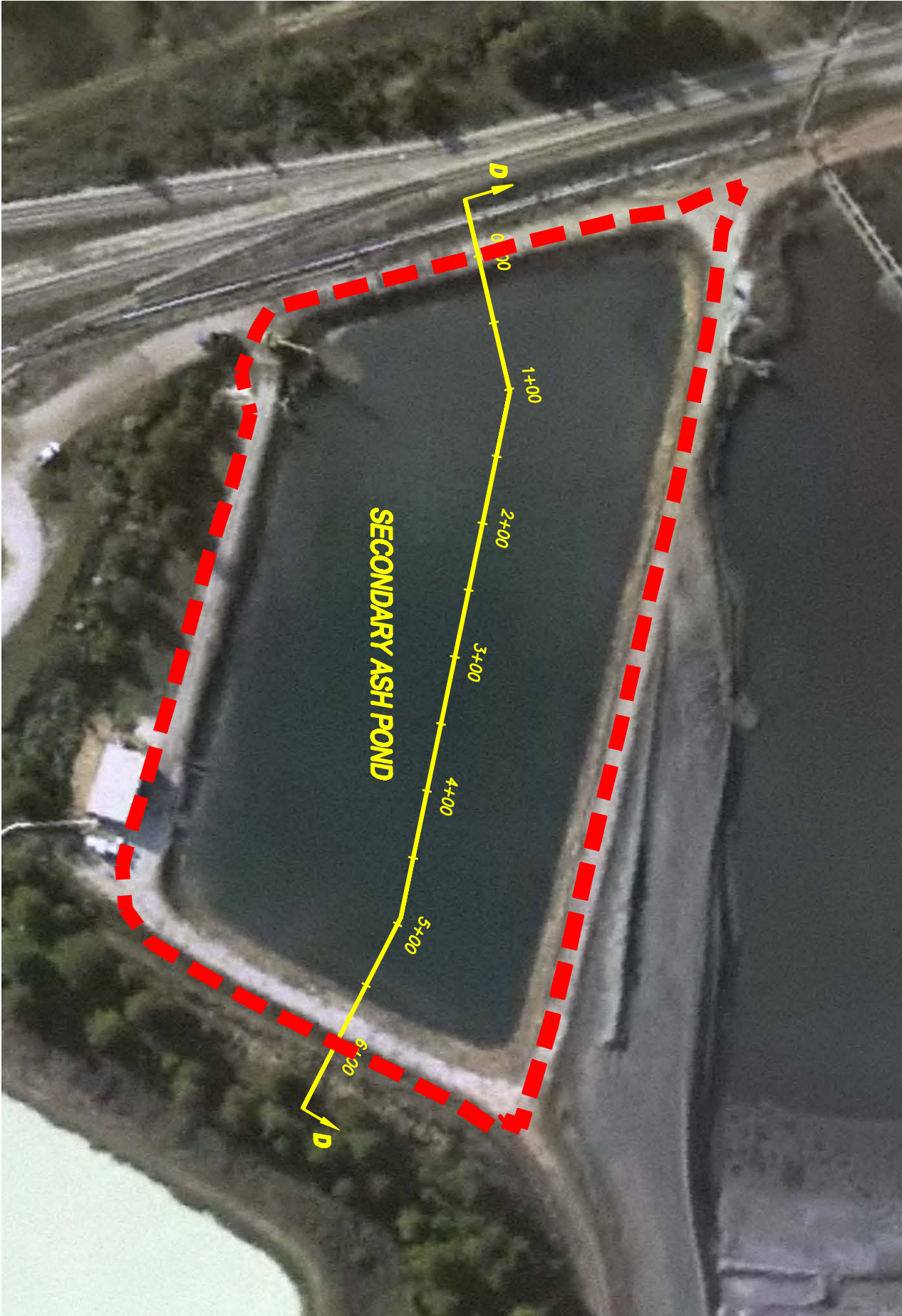
H.W. PIRKEY
POWER PLANT
HALLSVILLE, TEXAS

EXHIBIT D
WEST ASH POND
CROSS SECTION



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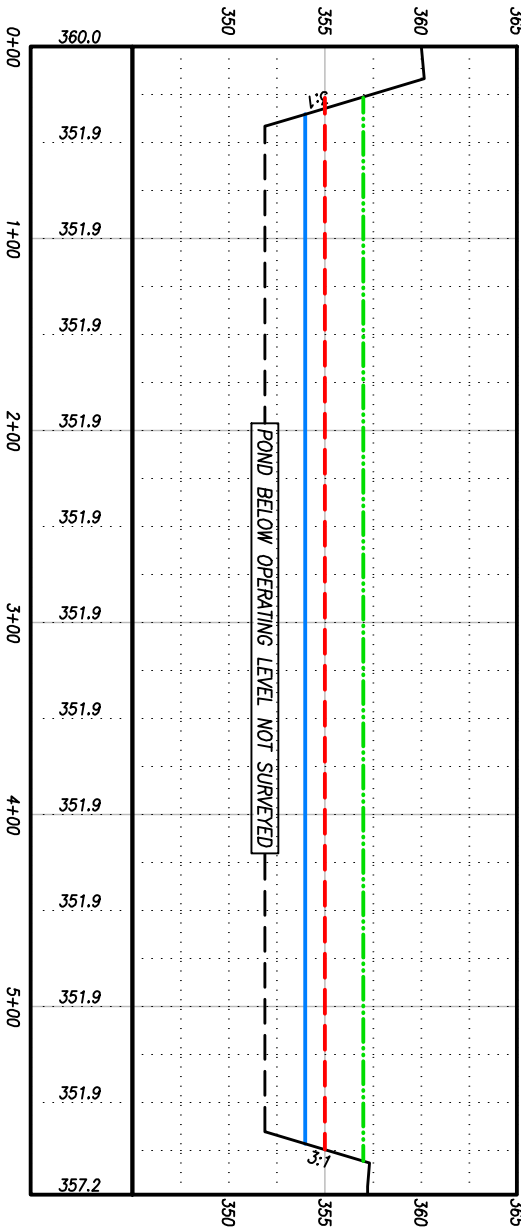


LEGEND

WATERSHED BOUNDARY

PLAN VIEW
SCALE: 1"=100'

365
360
355
350



LEGEND

TOP OF EMBANKMENT ELEV. = 357.00

MINIMUM FREEBOARD ELEV. = 355.00

NORMAL OPERATING LEVEL = 354.00

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EXHIBIT E
SECONDARY ASH POND
CROSS SECTION

H.W. PIRKEY
POWER PLANT
HALLSVILLE, TEXAS

DRAWN
DATE
MAY 2011
SCALE
AS NOTED
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SHEET NO.
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