HISTORY OF CONSTRUCTION

CFR 257.73(c)(1)

Bottom Ash Complex

Mitchell Power Plant
Marshall County, West Virginia

October, 2016

Prepared for: Wheeling Power Company & Kentucky Power Company

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

GERS-16-085

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Attachments

<u>1.0</u> OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of the CCR rule section 257.73(c)(1).

<u>2.0</u> DESCRIPTION OF CCR THE IMPOUNDMENT

The Mitchell Bottom Ash Pond Complex is located at the Mitchell Power Plant in Marshall County, West Virginia. The impoundment was constructed in 1977 and is comprised of a Bottom Ash Pond and a Clear Water Pond. The purpose of the pond is for the disposal of Bottom Ash produced at the Mitchell Power Plant.

The complex is surrounded by the Mitchell Power Plant on its north side, West Virginia State Route 2 on its east side, the adjacent wallboard facility and ancillary structures on its south side, and the metal cleaning tank, railroad tracks, and the Ohio River on its west side. The Bottom Ash Pond Complex is approximately 17 acres in size and consists of two impounding facilities, the Bottom Ash Pond which is approximately 10 acres, and the Clear Water Pond which is approximately 7 acres. The Bottom Ash Pond comprises the north portion of the complex and the Clear Water Pond comprises the southern portion. The Mitchell Bottom Ash Complex is regulated by the West Virginia Division of Water and Waste Management (WVDWWM) as a Hazard Class "2" Structure.

The Bottom Ash Pond is separated into ponding areas in its western and northeastern portions. In general, the bottom ash is sluiced into the northeastern portion of the pond; where after, the sluice water is routed through an interior splitter dike to the western portion of the pond. Flow though the western portion of the pond is routed around three interior flow diversion dikes. The southeastern portion of the Bottom Ash Pond is above the normal operating pool (pond) level and is used as an excavation and loadout area for bottom ash.

The Bottom Ash Pond and Clear Water Pond were constructed partially as incised ponds and partially using raised dike construction. Specifically, the pool level on the east side of the pond complex is generally below the bottom elevation of the east dike. The inside slopes of the Bottom Ash Pond and Clear Water Pond are lined with a composite soil and PVC liner.

<u>3.0</u> SUMMARY OF OWNERSHIP 257.73(c)(1)(i)

[The name and address of the person(s) owning or operating the CCR unit: the name associated with the CCR unit: and the identification number of the CCR unit if one has been assigned by the state.]

The Mitchell Power Plant is located at 8999 Energy Road, Gate 3, Moundsville, WV 26041. The Mitchell Bottom Ash Pond Complex is equally owned by Wheeling Power Company and Kentucky Power Company (KPC) and it is operated by KPC. The WVDWWM ID number is 05108.

<u>4.0</u> LOCATION OF THE CCR UNIT 257.73 (c)(1)(ii)

[The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7 ½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.]

A location map is included in Attachment A.

<u>5.0</u> STATEMENT OF PURPOSE 257.73 (c)(1)(iii)

[A statement of the purpose for which the CCR unit is being used.]

The Bottom Ash Pond is a surface impoundment for the purpose of disposal and storage of bottom ash. Bottom Ash is settled and stored until it is removed and landfilled. The pond also receives other plant miscellaneous waste streams.

<u>6.0</u> NAME AND SIZE OF WATERSHED THE CCR UNIT IS LOCATED 257.73 (c)(1)(iv)

[The name and size in acres of the watershed within which the CCR unit is located.]

The Bottom Ash Pond Complex is located with the Upper Ohio Wheeling watershed (HUC: 05030106) which has a listed acreage of approximately 962,298 acres. The Bottom Ash Pond Complex is a diked impoundment where the only inflows are from plant process water. There is no stormwater run-on from an offsite watershed.

<u>7.0</u> DESCRIPTION OF THE FOUNDATION AND ABUTMENT MATERIALS 257.73(c)(1)(v)

[A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is located.]

The foundation materials of the Bottom Ash Pond complex consist primarily of loose to very dense sands and gravels with N-values ranging from 3 to 50. Foundation and abutment soil properties were determined from a subsurface investigation. The following properties of the foundation materials were determined from laboratory testing:

Moist Unit Weight: 120 pcf
Saturated Unit Weight: 130 pcf
Coehsion: 0 psf
Friction Angle: 34 degrees

<u>8.0</u> DESCRIPTION OF EACH CONSTRUCTED ZONE OR STAGE OF THE CCR UNIT 257.73 (c)(1)(vi)

[A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.]

The Bottom Ash Pond complex was originally constructed in 1977. The original design drawings show the embankment being constructed of earthen fill with the lower portion of the impoundment excavated into the existing ground (incised). The embankment has an approximate top width of 20 feet. The crest of the Bottom Ash Pond is at elevation 690 feet-msl and the Clear Water Pond is approximately 675 feet-msl. The tallest section of embankment is approximately 19 feet at north and west embankments of the Bottom Ash Pond. The inboard and outboard slopes were constructed with a 3 horizontal to 1 vertical slopes. On top of the dike there is a gravel access road used for maintaining and operating the impoundment. There have been no successive raisings of the impoundment. A subsurface investigation describing the engineering properties of the embankment soils is included in Attachment B and design drawings are included in Attachment C.

<u>9.0</u> ENGINEERING STRUCTURES AND APPURTENANCES, 257.73 (c)(1)(vii)

[At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection…]

Bottom ash is sluiced into the Bottom Ash Pond via sluice lines which are supported by a wooden truss structure at the northeast portion of the pond. Overflow from the western portion of the Bottom Ash Pond is conveyed to the Clear Water Pond via a concrete overflow shaft and a 30-inch diameter reinforced concrete pipe to a 30-inch diameter perforated distribution pipe in the Clear Water Pond. The Clear Water Pond was constructed using both incised pond and diked pond construction methods. In general, the pool levels along the southern and eastern sides of the Clear Water Pond are primarily incised. The inside slopes of the Bottom Ash Pond and Clear Water Pond are lined with a PVC liner overlaid by soil as recommended to prevent seepage. Overflow from the Clear Water Pond is conveyed through an overflow tower into a 36-inch diameter reinforced concrete pipe through the embankment and then a series of 36-inch diameter corrugated metal pipes which discharge into a riprap-lined channel leading to the Ohio River. Other plant process water is sent to the bottom ash pond though piping and valve structures located on the embankment. Detailed dimensional drawings are included in Attachment C.

Primarily the inboard slopes are protected by grass, aggregate or a layer of bottom ash. The outboard slopes primarily consist of grass vegetation.

There are four piezometers located within the dike. A map with instrumentation locations in provided in Attachment D.

<u>10.0</u> SUMMARY OF POOL SURFACE ELEVATIONS, AND MAXIMUM DEPTH OF CCR, 257.73 (c)(1)(vii)

[…in addition to the normal operating pool surface elevation and the maximum pool elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment.]

The Bottom Ash Complex has been determined to be a Significant Hazard potential CCR impoundment. Based on this hazard classification the design flood is determined by section 257.82(a)(3) to be the 1000-year storm which corresponds to 7.10 inches in 24 hours for this site taken from NOAA Atlas 14. An analysis was performed which demonstrates the Bottom Ash Complex can safely pass the 1/2 PMP (Probable Maximum Precipitation), which is equivalent to 13.45 inches in 6 hours and therefore exceeds the requirements of section 257.82(a)(3). The complete analysis is included in Attachment E.

	Bottom Ash Pond	Clear Water Pond
Normal Pool Elevation	676.0	664.0
Maximum Pool Elevation following peak discharge from design flood (1/2 PMP)	683.51	666.5
Expected Maximum depth of CCR within impoundment	30 ft	Trace amount

11.0 FEATURES THAT COULD ADVERSELY AFFECT OPERATION DUE TO MALFUNCTION OR MIS-OPERATION 257.73 (c)(1)(vii)

[…and any identifiable natural or manmade features that could adversely affect operations of the CCR unit due to malfunction or mis-operation]

In the event of malfunction or mis-operation of any of the pond's appurtenances the ponds operations could be adversely affected. These structures include the outlet spillway structures located in the Bottom Ash Pond and Clear Water Pond and influent sluicing piping and structures. See design drawings in Attachment C for location and details of all appurtenances.

12.0 DESCRIPTION OF THE TYPE, PURPOSE AND LOCATION OF EXISTING INSTRUMENTATION 257.73 (c)(1)(viii)

[A description of the type, purpose, and location of existing instrumentation.]

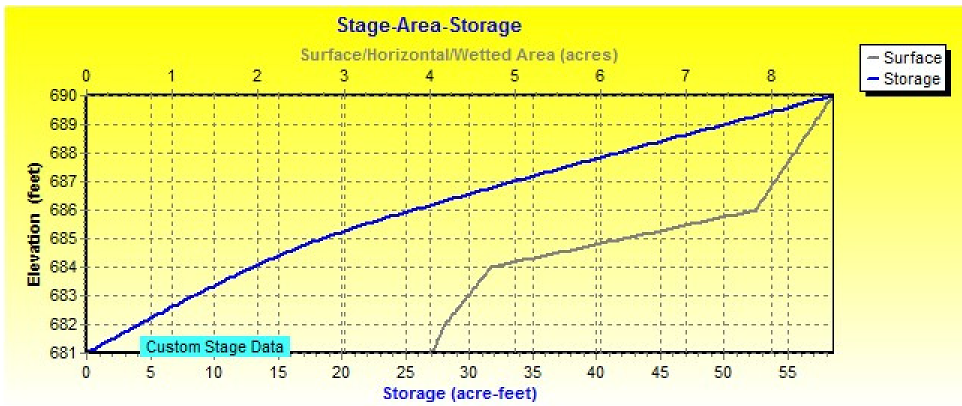
The Bottom Ash Pond complex has 4 piezometers located within the dam. These piezometers are read a minimum of every 30 days for the purpose of determining the phreatic water level within the dike. A location map is provided in Attachment D.

13.0 AREA – CAPACITY CURVES FOR THE CCR UNIT 257.73 (c)(1)(ix)

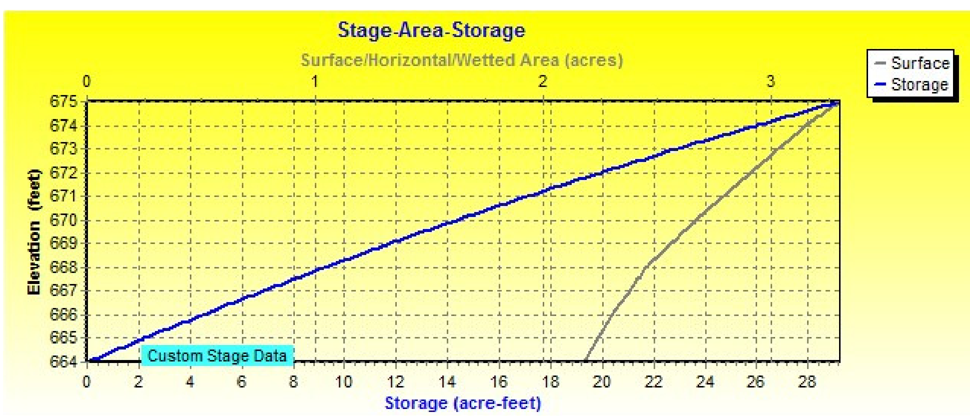
[Area-capacity curves for the CCR unit.]

The area capacity curves for the Bottom Ash Pond Complex are shown below:

Bottom Ash Pond



Clear Water Pond



14.0 DESCRIPTION OF EACH SPILLWAY AND DIVERSION 257.73 (c)(1)(x)

[A description of each spillway and diversion design features and capacities and calculations used in their determination.]

Overflow from the western portion of the Bottom Ash Pond is conveyed to the Clear Water Pond via a concrete overflow shaft and a 30-inch diameter reinforced concrete pipe to a 30-inch diameter perforated distribution pipe in the Clear Water Pond. Overflow from the Clear Water Pond is conveyed through an overflow tower into a 36-inch diameter reinforced concrete pipe through the embankment and then a series of 36-inch diameter corrugated metal pipes which discharge into a riprap-lined channel leading to the Ohio River. Detailed dimensional drawings are included in Attachment C. Capacities and Calculations are included in Attachment E. Drainage is diverted around the Bottom Ash Pond Complex by natural drainage channels and grass lined ditches.

15.0 SUMMARY CONSTRUCTION SPECIFICATIONS AND PROVISIONS FOR SURVEILLANCE, MAINTENANCE AND REPAIR 257.73 (c)(1)(xi)

[The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.]

Construction of the Bottom Ash Pond Complex was completed around 1977. Original construction specifications are unavailable. Original design drawings are included in Attachment C. A subsurface investigation detailing the constructed soil material of the embankment is included in Attachment B.

As required by the CCR rules the Bottom Ash Pond is inspected at least every 7 days by a qualified person. Also as a requirement of the CCR rules the impoundment is also inspected annual by a professional engineer. Maintenance items are addressed as they are discovered as part of those inspections.

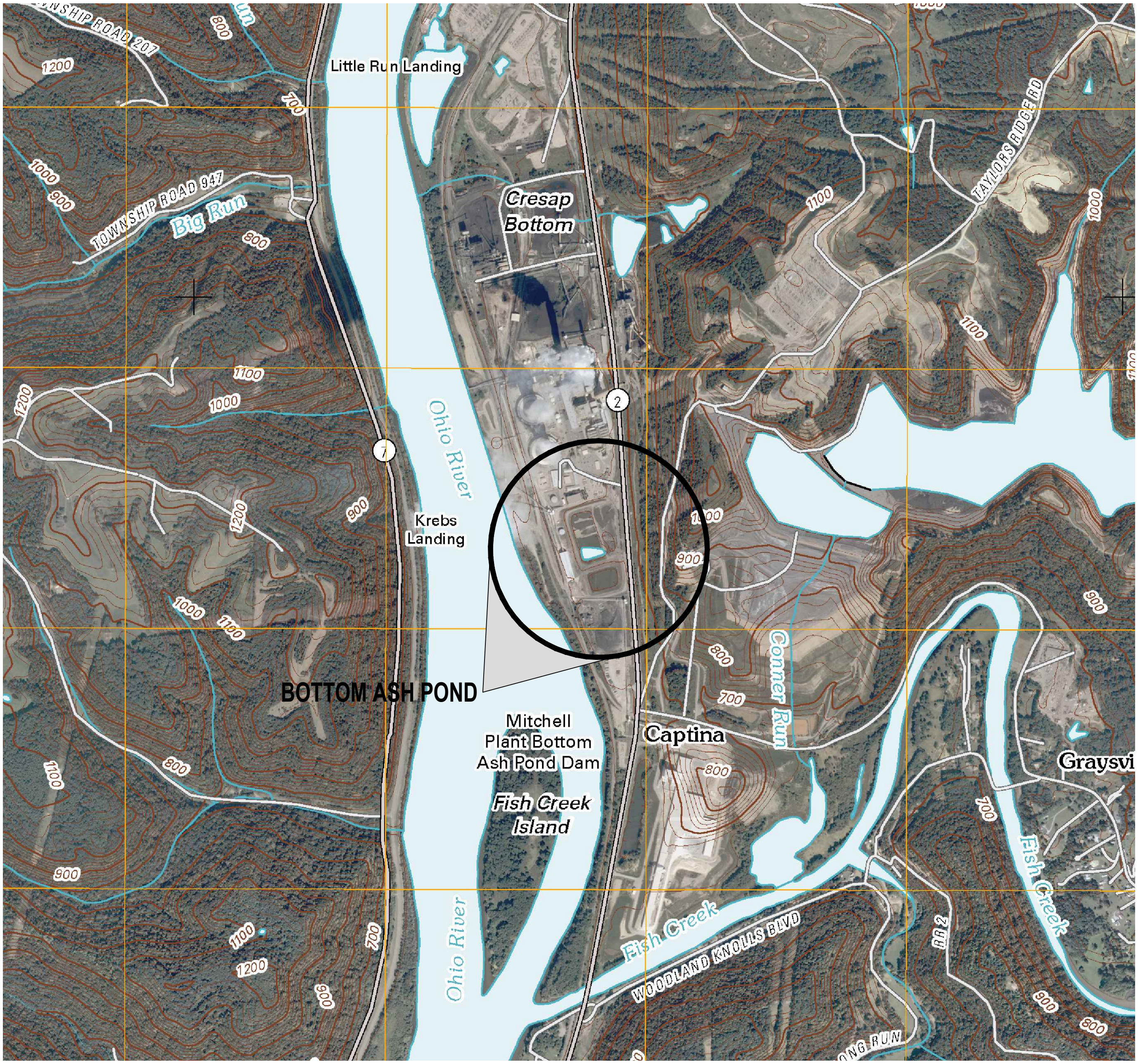
16.0 RECORD OR KNOWLEDGE OF STRUCTURAL INSTABILITY 257.73 (c)(1)(xii)

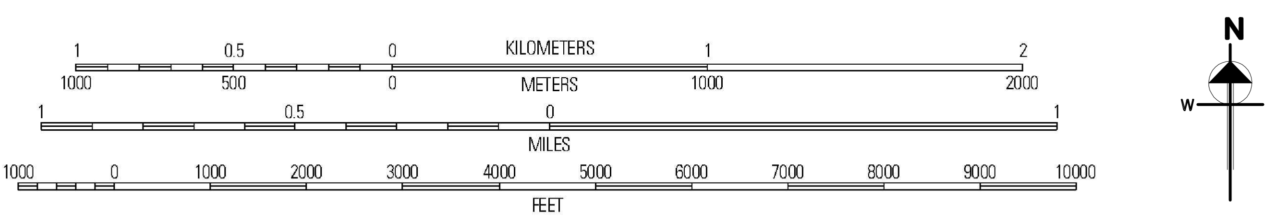
[Any record or knowledge of the structural instability of the CCR unit.]

To date there has been no known record or knowledge of structural instability of the CCR unit.

ATTACHMENT A

LOCATION MAP





THIS DRAWING IS CLASSIFIED AS:

AEP PUBLIC

REFERENCE AEP's CORPORATE INFORMATION SECURITY POLICY

OHIO POWER COMPANY

MITCHELL PLANT

CRESAP WEST VIRGINIA

UNIT: 34

DRAWING NUMBER: LOCATION MAP

REV: 1

SCALE: 1"=2000'

CIVIL ENGINEERING

DR:

CH:

SUP:

ENG:

DATE: 9/13/16

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BOTTOM ASH POND

USGS TOPO MAP

7.5-MINUTE SERIES

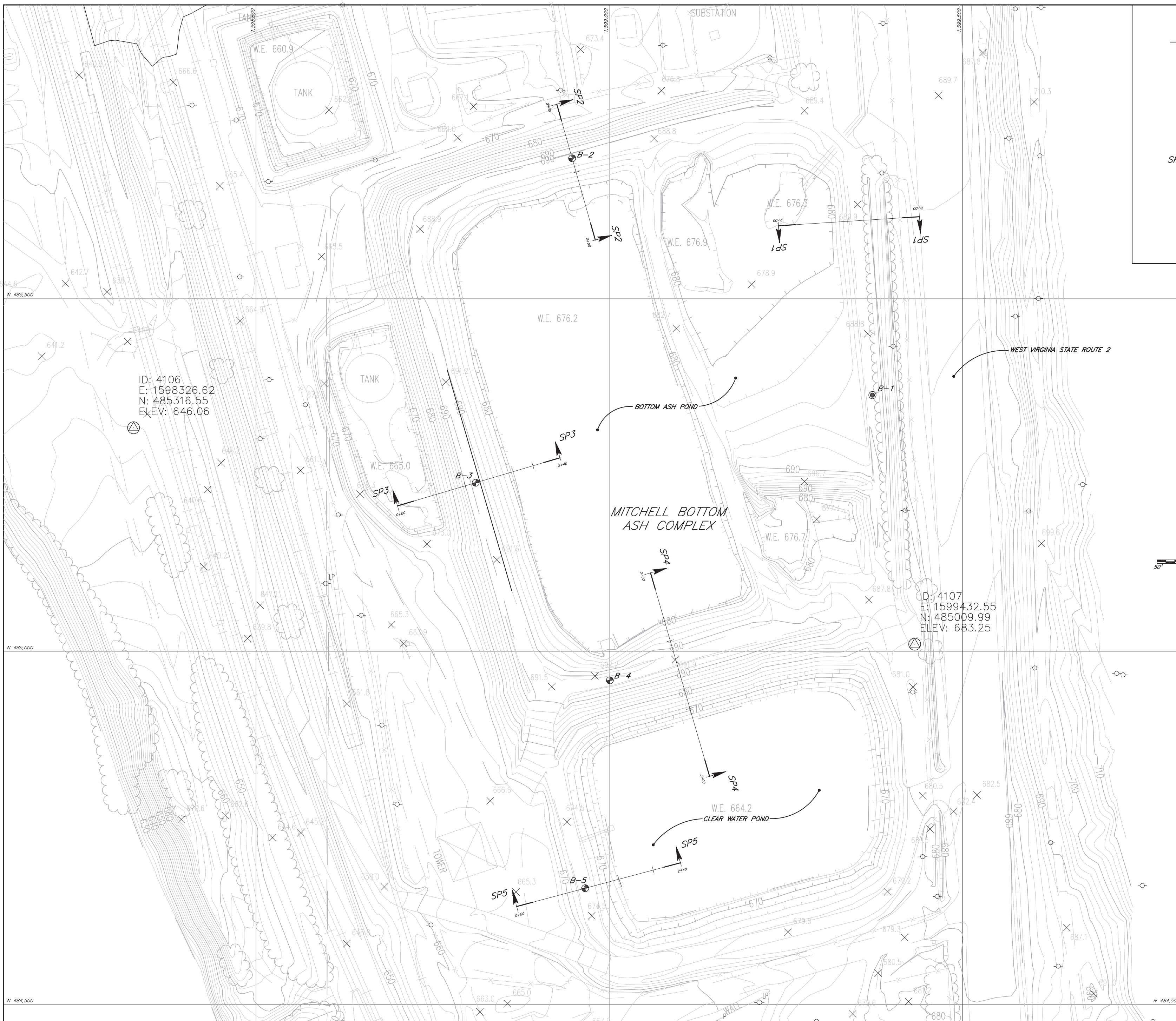
AEP AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

ATTACHMENT B

SUBSURFACE INVESTIGATION

Laboratory Testing Data



NOTES

1. PLAN ADAPTED FROM DRAWINGS PROVIDED BY AEPSC, DATED 4-13-01
2. BOREHOLE LOCATIONS AND ELEVATIONS PROVIDED BY AEPSC, SURVEYED 3-5-09.

LEGEND

SP1 — SP1 PROFILE LIMITS

B-1 SAMPLED BOREHOLE LOCATION

B-2 SAMPLED BOREHOLE LOCATION WITH PIEZOMETER

"I, the undersigned, hereby certify that this map is correct and shows, to the best of my knowledge and belief, all the information required by the surface mining laws of the State of West Virginia."

ROGER W. CECIL, R.P.E. No. 14367

State of Tennessee, County of Knox, taken, subscribed, and sworn to before me this ______ day of ______________, ________.

Notary Public

My Commission Expires ____________

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

PLAN VIEW

WVDWWM ORDER RESPONSES (ITEM 2)
MITCHELL BOTTOM ASH COMPLEX
MARSHALL COUNTY, WEST VIRGINIA

SCALE: AS SHOWN | DR RWC | CHK SWF | REV RWC

PREPARED FOR:

AEP SERVICE CORPORATION

PREPARED BY:

Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

PROJ: 09-379 | DATE: 3-18-09 | SHEET 1 OF 3

SUMMARY OF LABORATORY TEST RESULTS

							ATTERBERG LIMITS				Project: Mitchell Bottom Ash Pond Project Number: 09-379 Date: March 18, 2009
Boring	Sample No.	Sample Type*	Depth (ft)	Natural Moisture	Dry Density	Specific Gravity	Liquid Limit	Plasticity Index	USCS	Other Test	Soil Description
B-1	S-3	SS	7.0-8.5	11.0	--	2.68	19	7	SC-SM	S	Sand, clayey, silty, brown, black, gray w/rock
B-1	S-11	SS	35.0-36.5	15.2	--	2.74	12	np	SW-SM	S	Sand, silty, black w/rock
B-2	S-5	SS	12.0-13.5	5.7	--	2.67	15	5	SP-SC	S	Sand, clayey, silty, brown, dark brown w/rock
B-2	S-10	SS	29.0-30.5	5.4	--	2.71	--	np	SP-SM	S	Sand, brown
B-2	ST-2	ST	34.5-36.5	8.7	105.5	2.70	--	np	SM	K,S,T	Sand, brown, light brown (Sand Foundation)
B-3	S-6	SS	17.0-18.5	9.2	--	2.71	17	5	SC-SM	S	Sand, clayey, silty, dark brown, brown w/rock
B-3	S-11	SS	29.5-31.0	13.0	--	2.65	17	5	SC-SM	S	Sand, clayey, silty, black, brown, w/rock &
B-3	ST-2	ST	34.5-35.5	18.5	112.1	2.62	26	9	CL	K,S,U	Clay, silty, sandy, brown w/rock
B-4	S-4	SS	12.0-13.5	7.9	--	2.69	--	np	SM	S	Sand, silty, brown, dark brown w/rock
B-4	S-12	SS	39.5-41.0	5.2	--	2.71	--	np	SP	S	Sand, brown
B-1,B-3,B-4	ST-1	ST	9.5-10.0	9.3	114.5	2.68	16	4	SC-SM	K,S,T	Sand, clayey, silty, brown w/rock
B-5	S-3	SS	7.0-8.5	7.9	--	2.70	12	np	SM	S	Sand, silty, dark brown w/rock
B-5	S-8	SS	24.5-26.0	7.8	--	2.66	16	4	SP-SC	S	Sand, clayey, silty, brown w/rock
na	B	B	na	3.6	--	2.26	--	np	SP	S	Bottom Ash

*ST-SHELBY TUBE SAMPLE, SS-SPLIT SPOON SAMPLE, B-BAG SAMPLE, J-JAR SAMPLE

**TEST RESULTS REPORTED ON OTHER SHEETS:

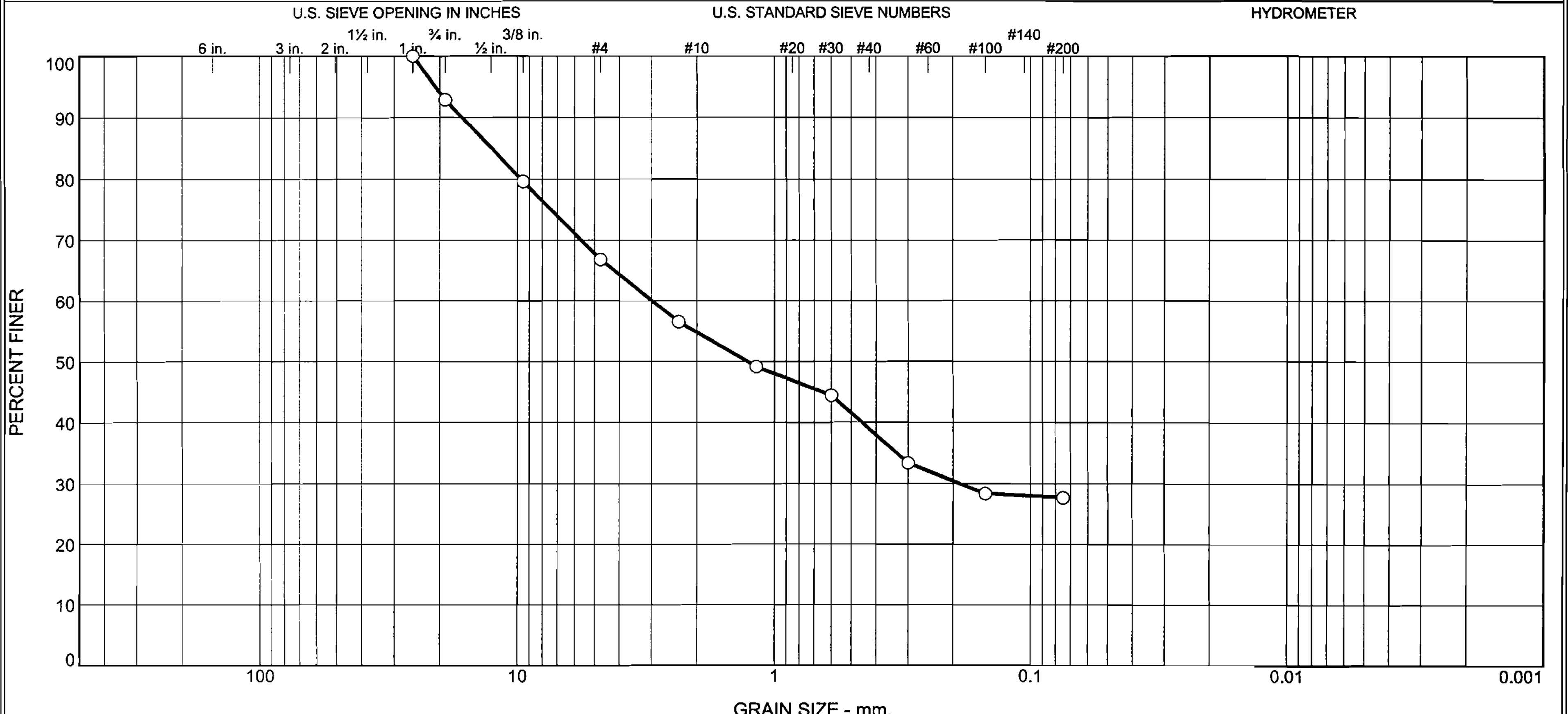
T-TRIAXIAL
S-SIEVE OR GRAIN SIZE ANALYSIS
U-UNCONFINED COMPRESSION

P-PROCTOR TEST
K-PERMEABILITY
C-CONSOLIDATION

Geo/Environmental Associates

DATA CHECKED BY ________

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.2	26.0	12.1	15.8	11.3	27.6	

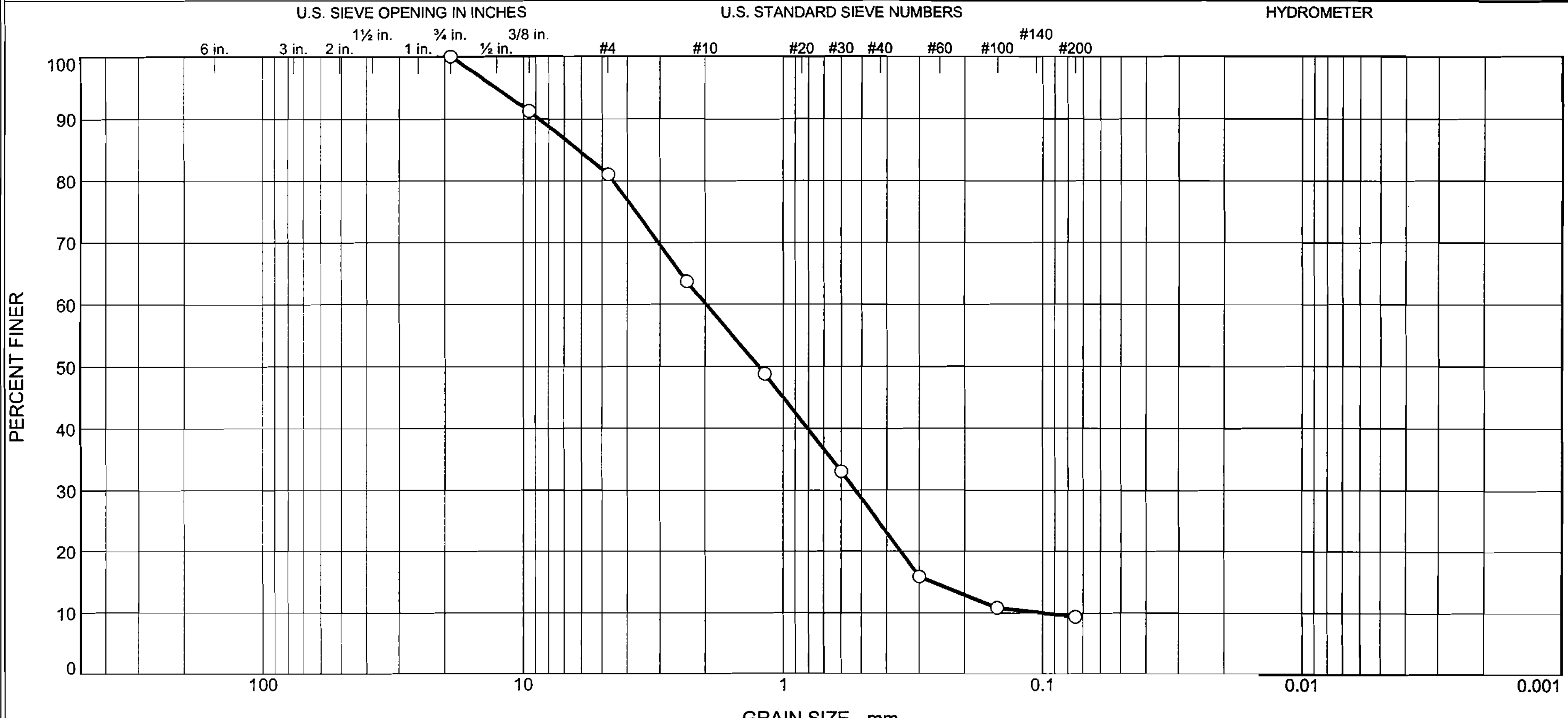
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1 S-3	7.0'-8.5'		SC-SM	Sand, clayey, silty, brown, black, gray w/rock	11.0	19	12

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	19.0	20.9	35.6	15.1	9.4	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1 S-11	35.0'-36.5'		SW-SM	Sand, silty, black w/rock	15.2	12	np

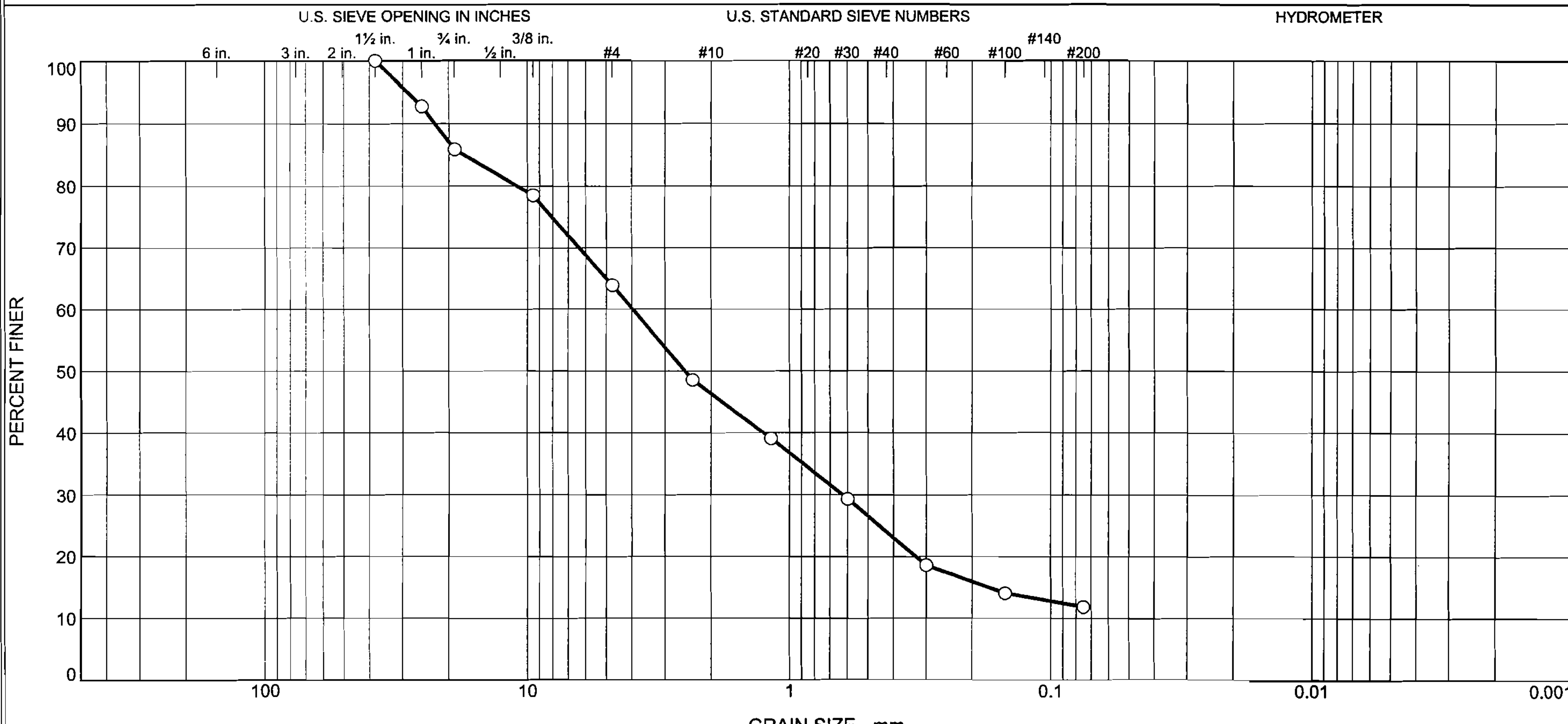
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	14.2	21.9	17.7	22.2	12.2	11.8	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 S-5	12.0'-13.5'		SP-SC	Sand, clayey, silty, brown, dark brown w/rock	5.7	15	10

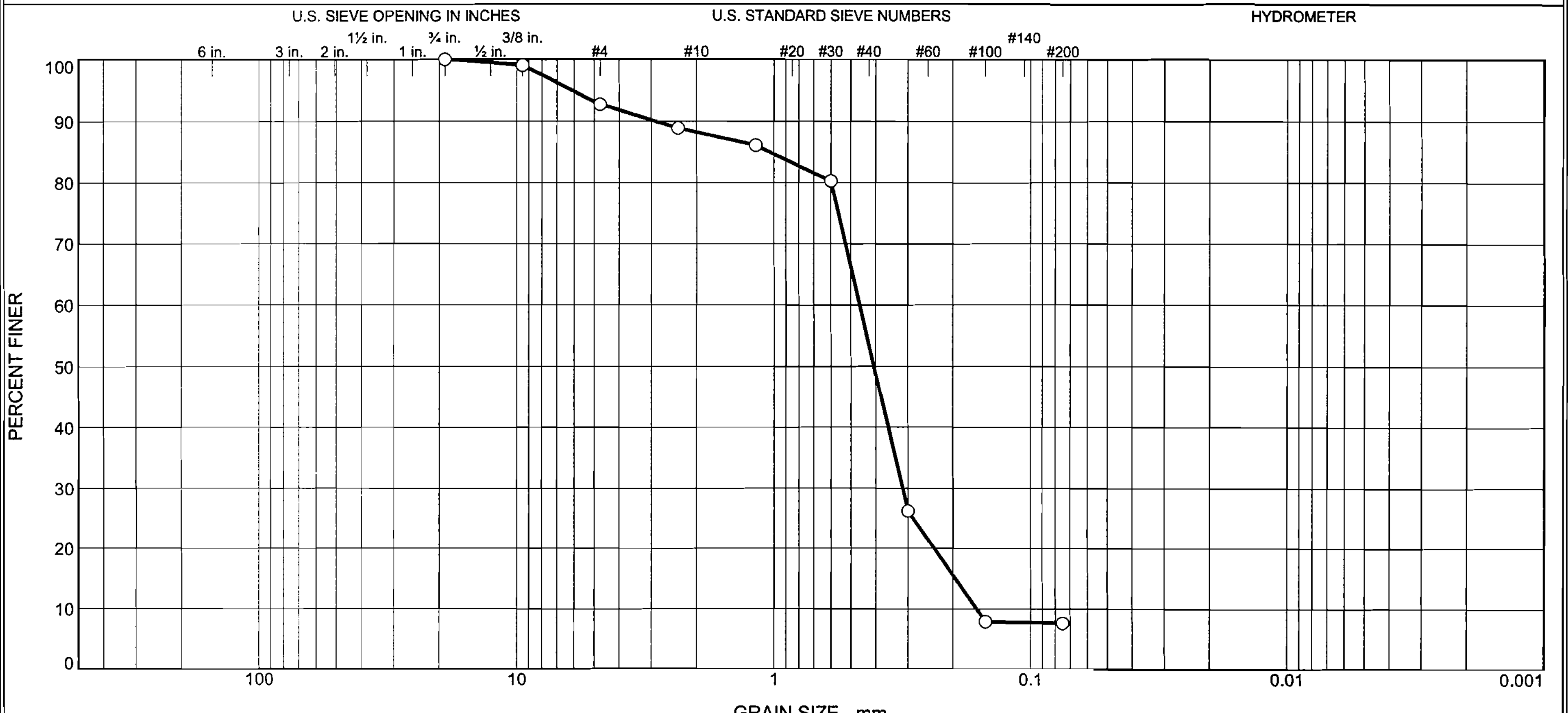
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 | Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	7.3	4.5	34.9	45.7	7.6	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 S-10	29.0'-30.5'		SP-SM	Sand, brown	5.4	nv	np

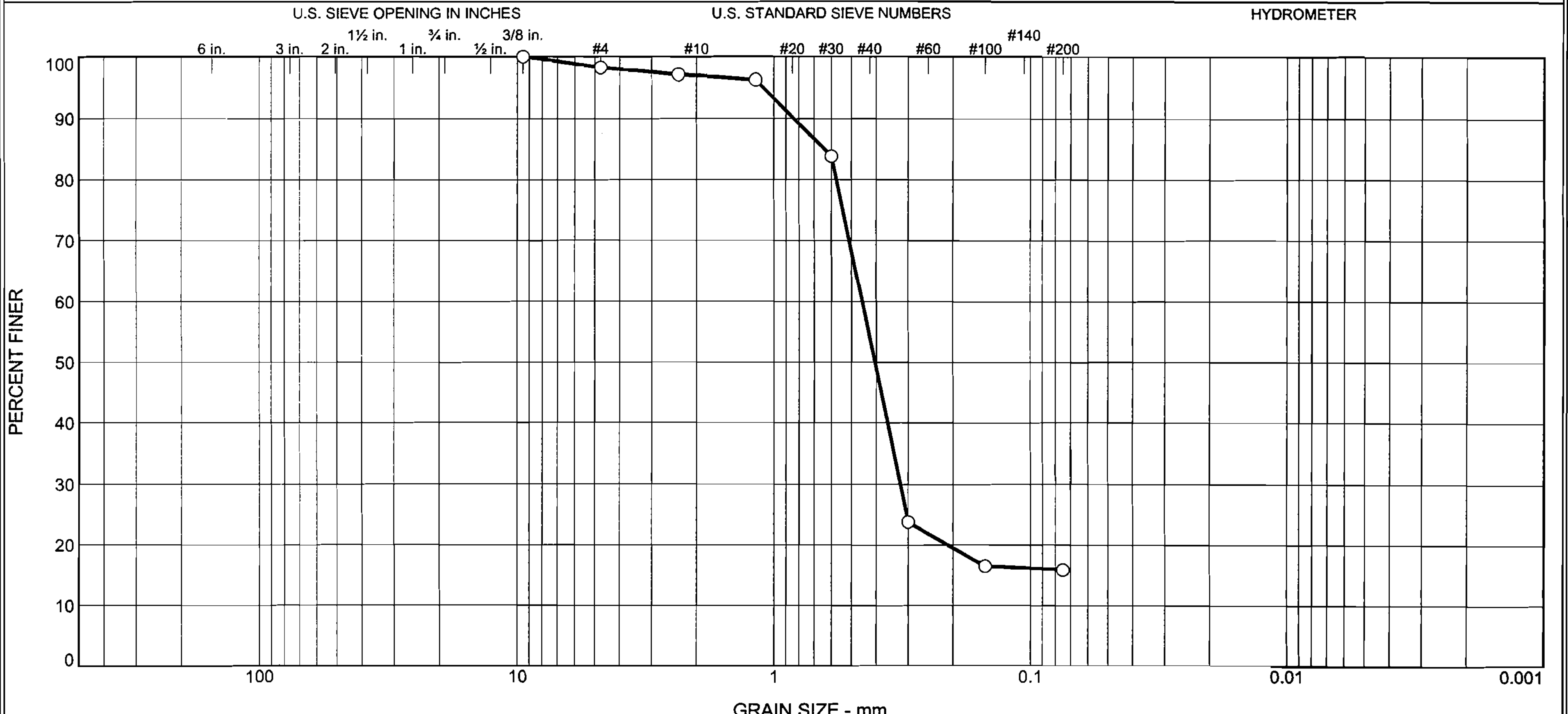
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.8	1.3	43.0	38.0	15.9	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-2 ST-2	34.5'-36.5'		SM	Sand, brown, light brown	8.7	nv	np

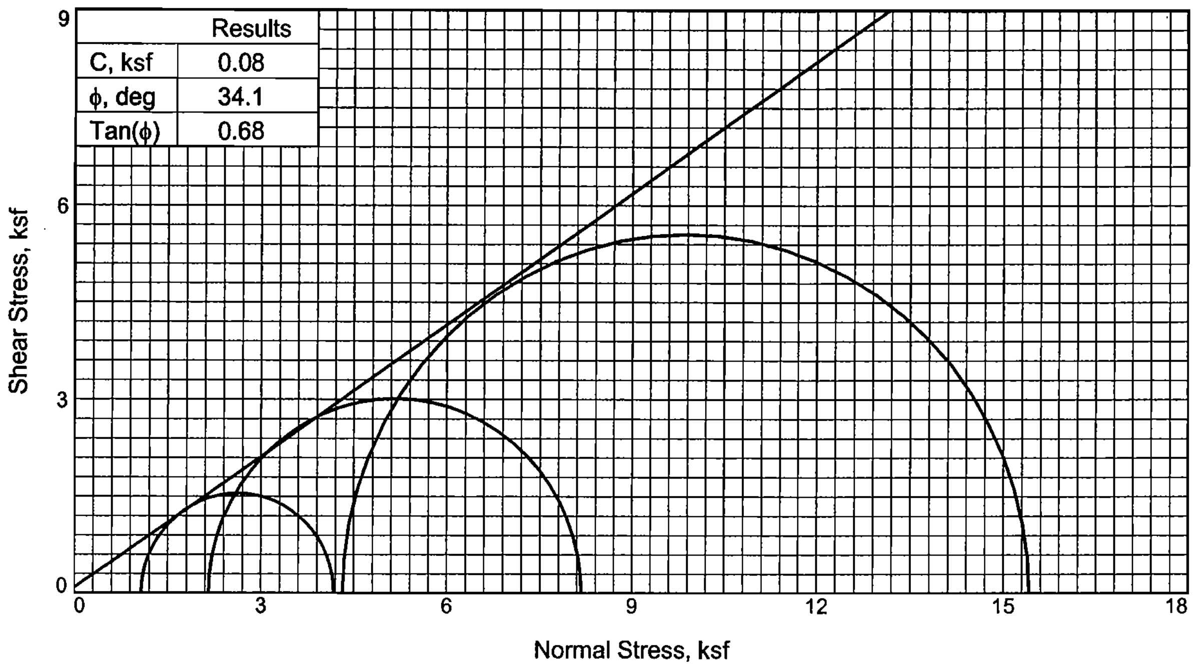
Client American Electric Power

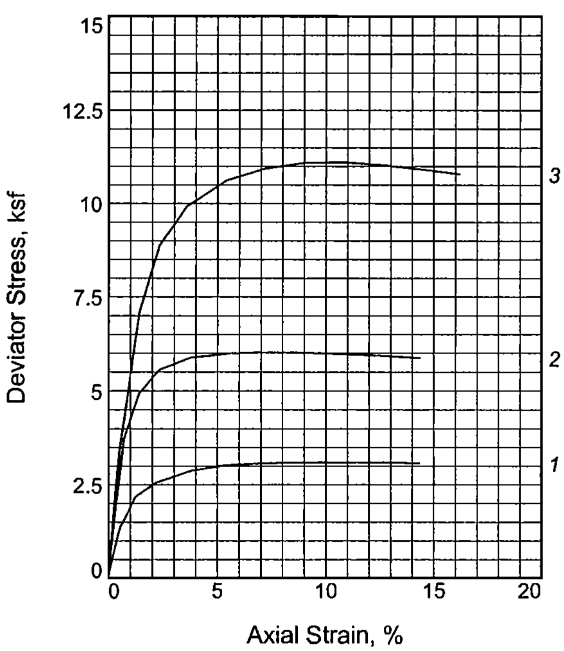
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

○ Sand Foundation Material





Sample No.		1	2	3
Initial	Water Content, %	8.6	9.0	8.7
	Dry Density, pcf	105.3	105.8	105.5
	Saturation, %	38.7	40.9	39.3
	Void Ratio	0.6009	0.5926	0.5976
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	21.6	21.0	20.8
	Dry Density, pcf	106.4	107.6	107.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5838	0.5670	0.5618
	Diameter, in.	2.79	2.78	2.78
	Height, in.	5.58	5.57	5.56
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		7.50	15.00	30.00
Fail. Stress, ksf		3.1	6.0	11.1
Ult. Stress, ksf				
σ_1 Failure, ksf		4.2	8.2	15.4
σ_3 Failure, ksf		1.1	2.2	4.3

Type of Test:
Consolidated Drained

Sample Type: Shelby Tube

Description: Sand, brown, light brown

LL= nv **PI=** np

Specific Gravity= 2.70

Remarks:

Figure 1

Client: American Electric Power

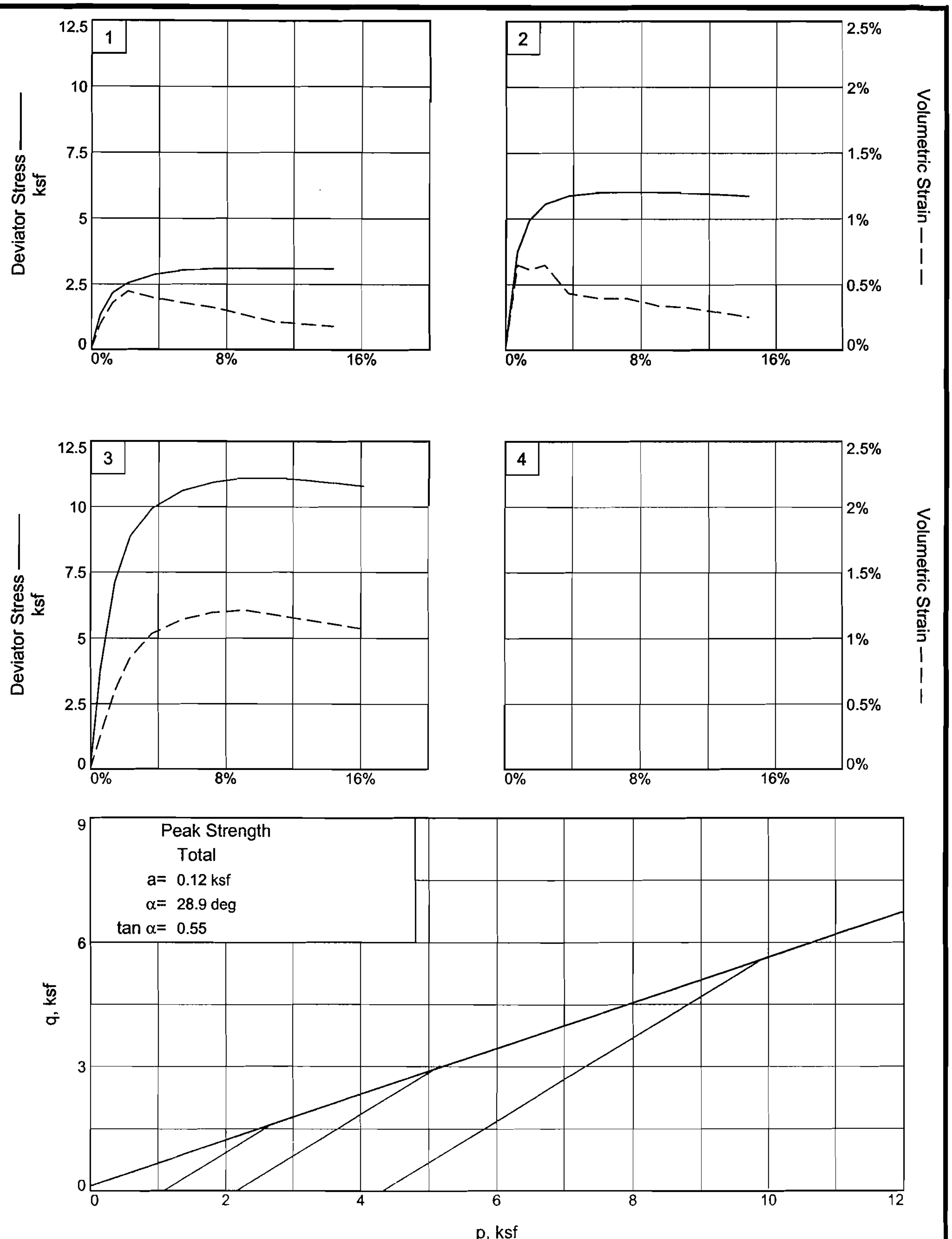
Project: Mitchell Bottom Ash Pond

Sample Number: B-2 ST-2 **Depth:** 34.5'-36.5'

Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.



Client: American Electric Power
Project: Mitchell Bottom Ash Pond
Depth: 34.5'-36.5' **Sample Number:** B-2 ST-2
Project No.: 09-379

Figure 2

Geo/Environmental Associates, Inc.

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME	: Mitchell Bottom Ash Pond	**PROJECT NUMBER**	: 09-379
CLIENT	: American Electric Power	**DATE**	: March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2 **Depth of Tested Sample** : 34.5'-35.5'

Specimen : 7.5 psi Triaxial Specimen **Remolded** : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.):	5.6	**Volume (ft^3):**	0.0200	**Wet Density (PCF):**	114.3
Diameter (in.):	2.8	**Weight (lbs):**	2.28	**Dry Density (PCF):**	105.3
Area (ft^2):	0.0428	**Moisture (%):**	8.6		

Chamber Pressure (psi):	5	**Change in Pore Pressure (psi):**	2.0
Influent Pressure (psi):	3	**Change in Chamber Pressure (psi):**	2.0
Back Pressure (psi):	0	**"B" Factor:**	1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(893)(211.01)}$$

$$= \frac{9,954.00}{7,486,400.58}$$

$$= 1.33 \times 10^{-3} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond | **PROJECT NUMBER** : 09-379

CLIENT : American Electric Power | **DATE** : March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2 | **Depth of Tested Sample** : 34.5'-35.5'

Specimen : 15 psi Triaxial Specimen | **Remolded** : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 | **Volume (ft^3):** 0.0200 | **Wet Density (PCF):** 115.3

Diameter (in.): 2.8 | **Weight (lbs):** 2.30 | **Dry Density (PCF):** 105.8

Area (ft^2): 0.0428 | **Moisture (%):** 9.0

Chamber Pressure (psi): 8 | **Change in Pore Pressure (psi):** 2.0

Influent Pressure (psi): 6 | **Change in Chamber Pressure (psi):** 2.0

Back Pressure (psi): 3 | **"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(942)(211.01)}$$

$$= \frac{9{,}954.00}{7{,}897{,}188.52}$$

$$= 1.26 \times 10^{-3} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-2 ST-2

Depth of Tested Sample : 34.5'-35.5'

Specimen : 30 psi Triaxial Specimen

Remolded : Yes

Sample Description : Sand, brown, light brown (Sand Foundation)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 114.7

Diameter (in.): 2.8 **Weight (lbs):** 2.29 **Dry Density (PCF):** 105.5

Area (ft^2): 0.0428 **Moisture (%):** 8.7

Chamber Pressure (psi): 10 **Change in Pore Pressure (psi):** 5.0

Influent Pressure (psi): 8 **Change in Chamber Pressure (psi):** 5.0

Back Pressure (psi): 5 **"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

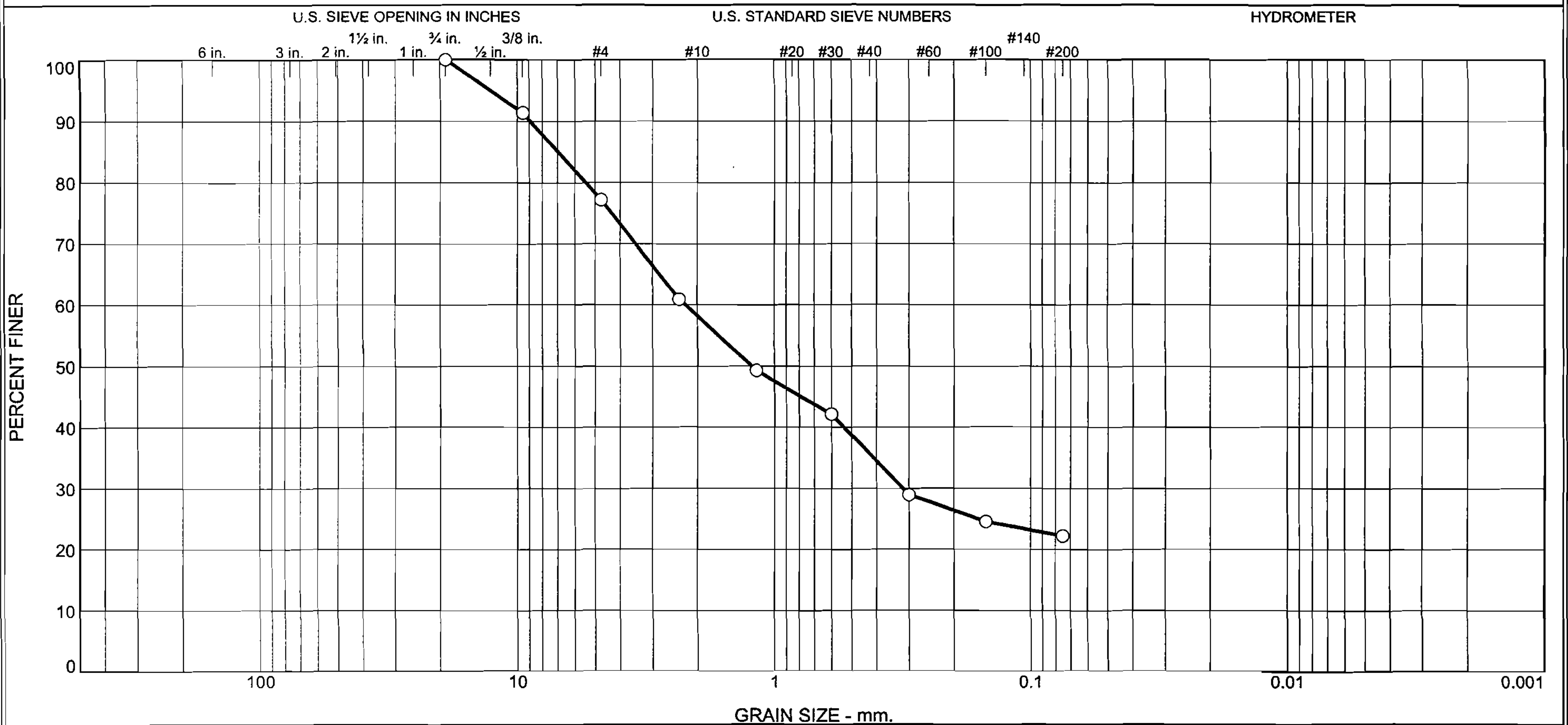
$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(735)(211.01)}$$

$$= \frac{9{,}954.00}{6{,}161{,}819.07}$$

$$= 1.62 \times 10^{-3} \text{ cm/sec}$$

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	22.8	19.1	22.6	13.3	22.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 S-6	17.0'-18.5'		SC-SM	Sand, clayey, silty, dark brown, brown w/rock	9.2	17	12

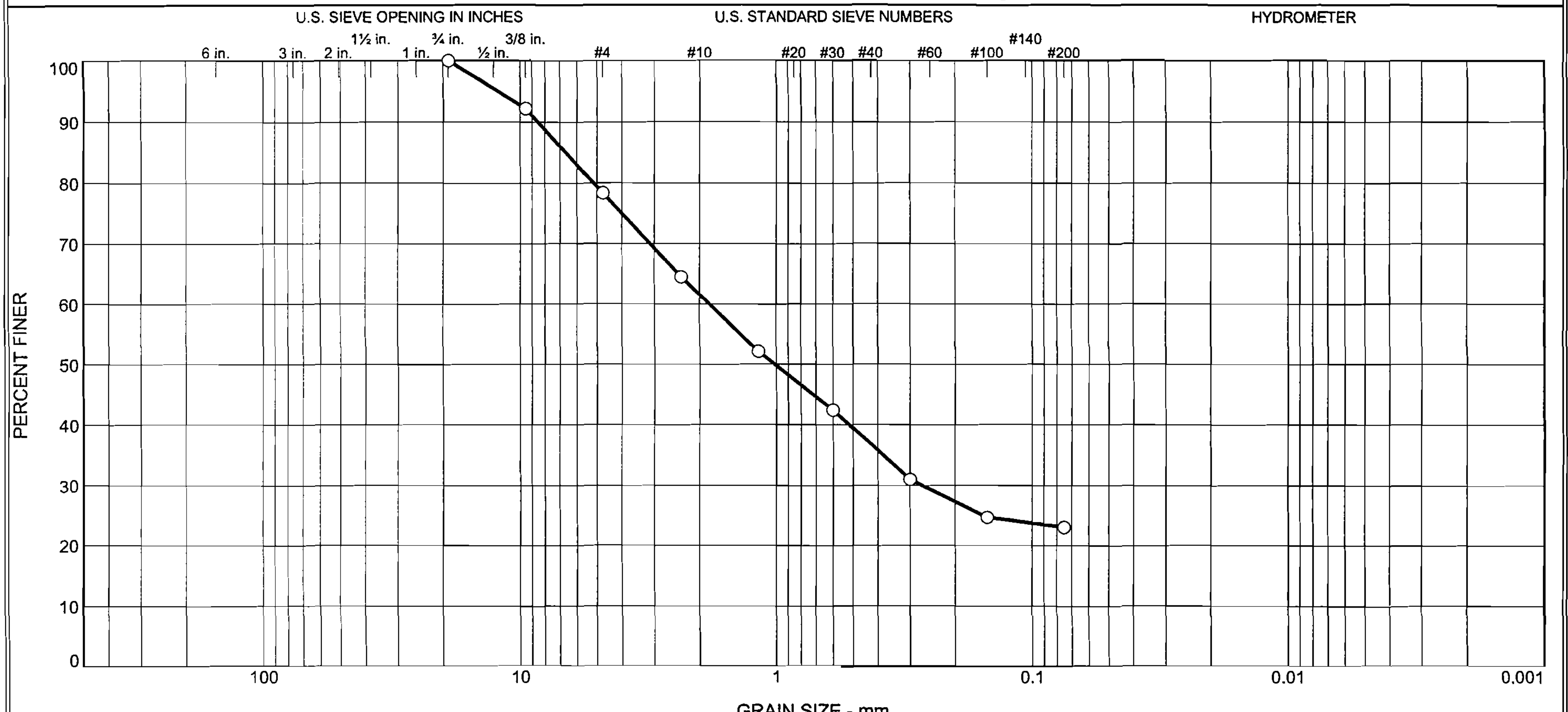
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	21.7	16.8	24.8	13.7	23.0	

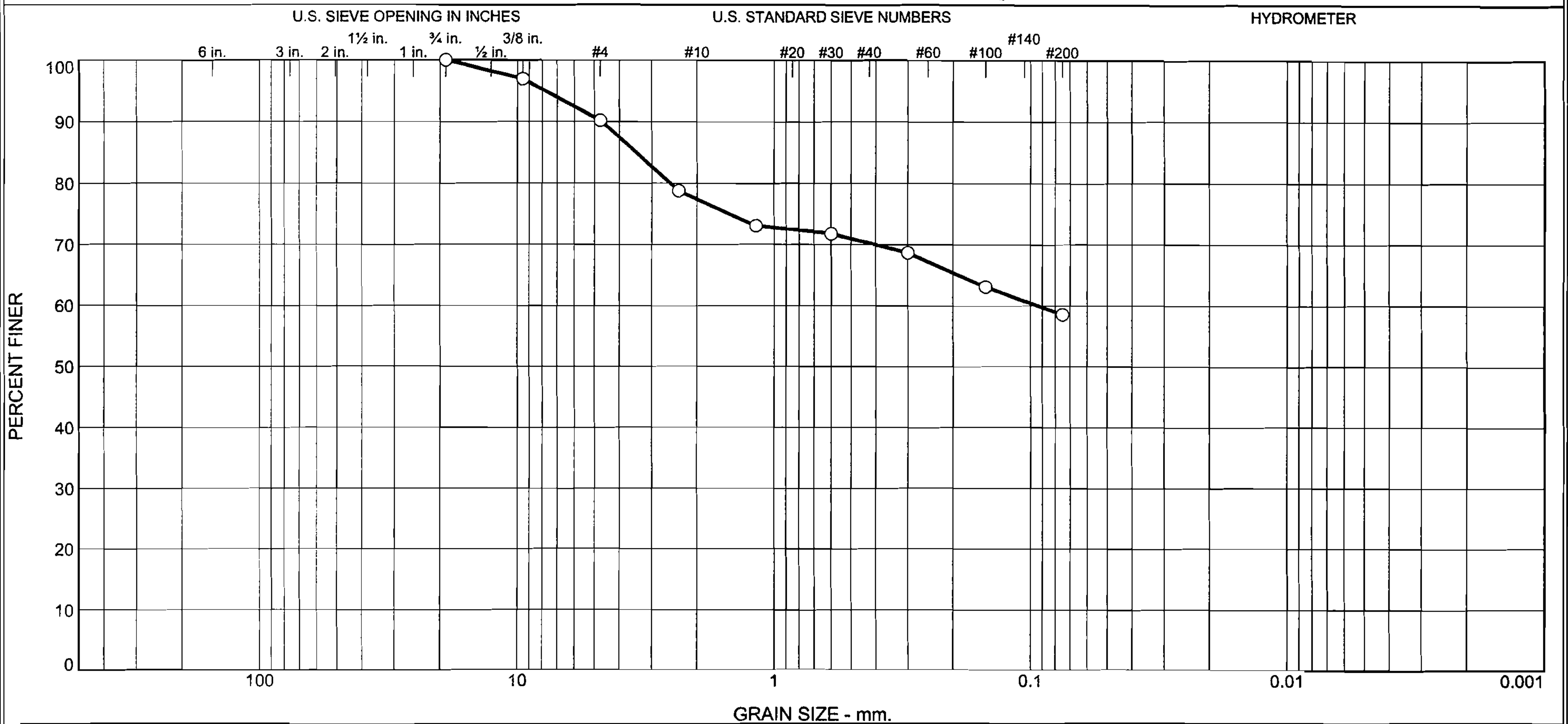
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 S-11	29.5'-31.0'		SC-SM	Sand, clayey, silty, black, brown w/rock & cinders	13.0	17	12

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.8	12.8	7.2	11.7	58.5	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-3 ST-2	34.5'-35.5'		CL	Clay, silty, sandy, brown w/rock	18.5	26	17

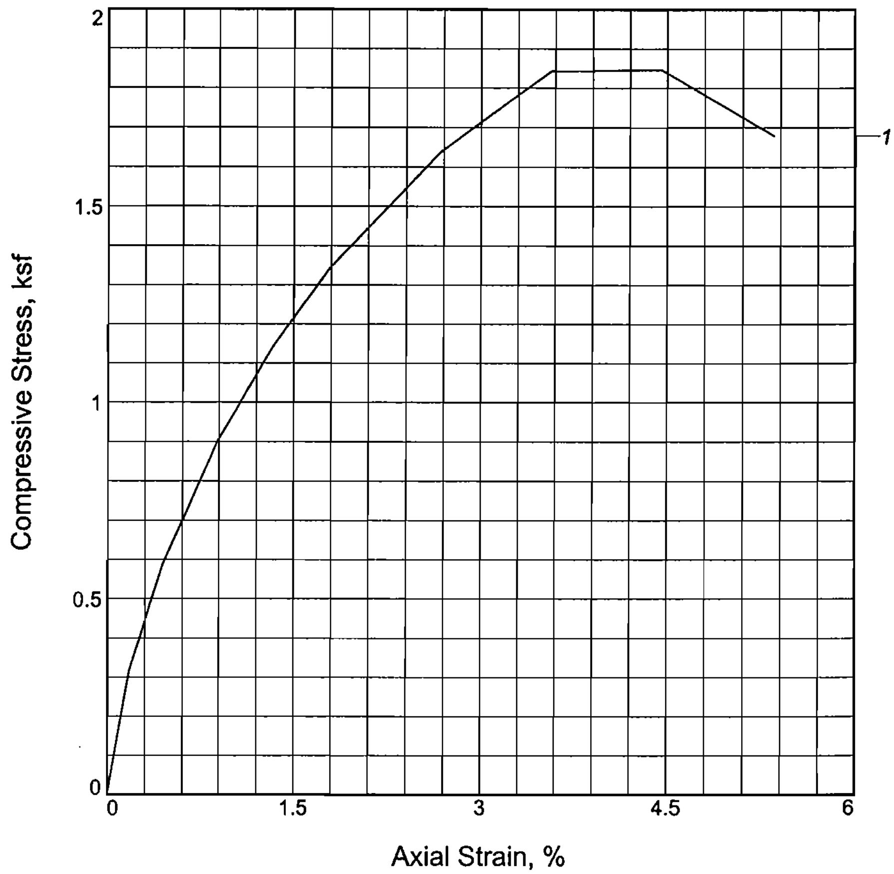
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	1.85			
Undrained shear strength, ksf	0.92			
Failure strain, %	4.5			
Strain rate, in./min.	0.01			
Water content, %	12.6			
Wet density, pcf	131.2			
Dry density, pcf	116.5			
Saturation, %	82.0			
Void ratio	0.4041			
Specimen diameter, in.	2.84			
Specimen height, in.	5.61			
Height/diameter ratio	1.98			

Description: Clay, silty, sandy, brown w/rock

LL = 26	PL = 17	PI = 9	GS= 2.62	Type: Shelby Tube

Project No.: 09-379
Date Sampled:
Remarks:

Client: American Electric Power

Project: Mitchell Bottom Ash Pond

Sample Number: B-3 ST-2 **Depth:** 34.5'-35.5'

UNCONFINED COMPRESSION TEST

Geo/Environmental Associates, Inc.

Figure _______

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME	: Mitchell Bottom Ash Pond	**PROJECT NUMBER**	: 09-379
CLIENT	: American Electric Power	**DATE**	: March 13, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-3 ST-2 **Depth of Tested Sample** : 34.5'-35.5'

Date Tested : 03/10/09 **Remolded** : no

Sample Description : Clay, silty, sandy, brown w/rock

INITIAL SPECIMEN PROPERTIES

Length (in.):	4.25	**Volume (ft^3):**	0.0159	**Wet Density (PCF):**	132.8
Diameter (in.):	2.87	**Weight (lbs):**	2.11	**Dry Density (PCF):**	112.1
Area (ft^2):	0.0449	**Moisture (%):**	18.5		

Chamber Pressure (psi):	20	**Change in Pore Pressure (psi):**	5.0
Influent Pressure (psi):	18	**Change in Chamber Pressure (psi):**	5.0
Back Pressure (psi):	15	**"B" Factor:**	1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

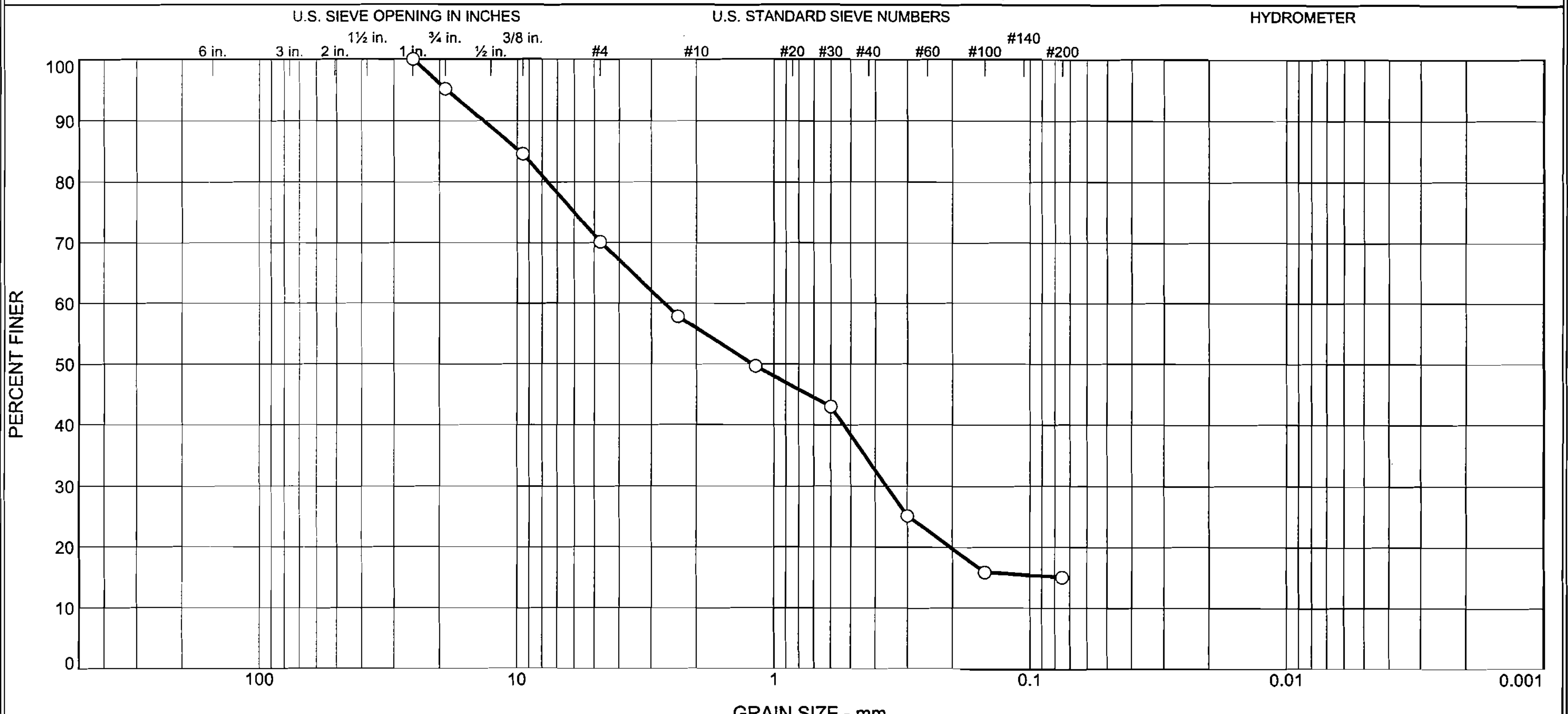
$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(15.2)(10.80)}{(41.74)(155{,}400)(211.01)}$$

$$= \frac{164.16}{1{,}368{,}694{,}419.96}$$

$$= 1.20 \times 10^{-7} \text{ cm/sec}$$

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.8	25.1	14.2	21.8	19.1	15.0	

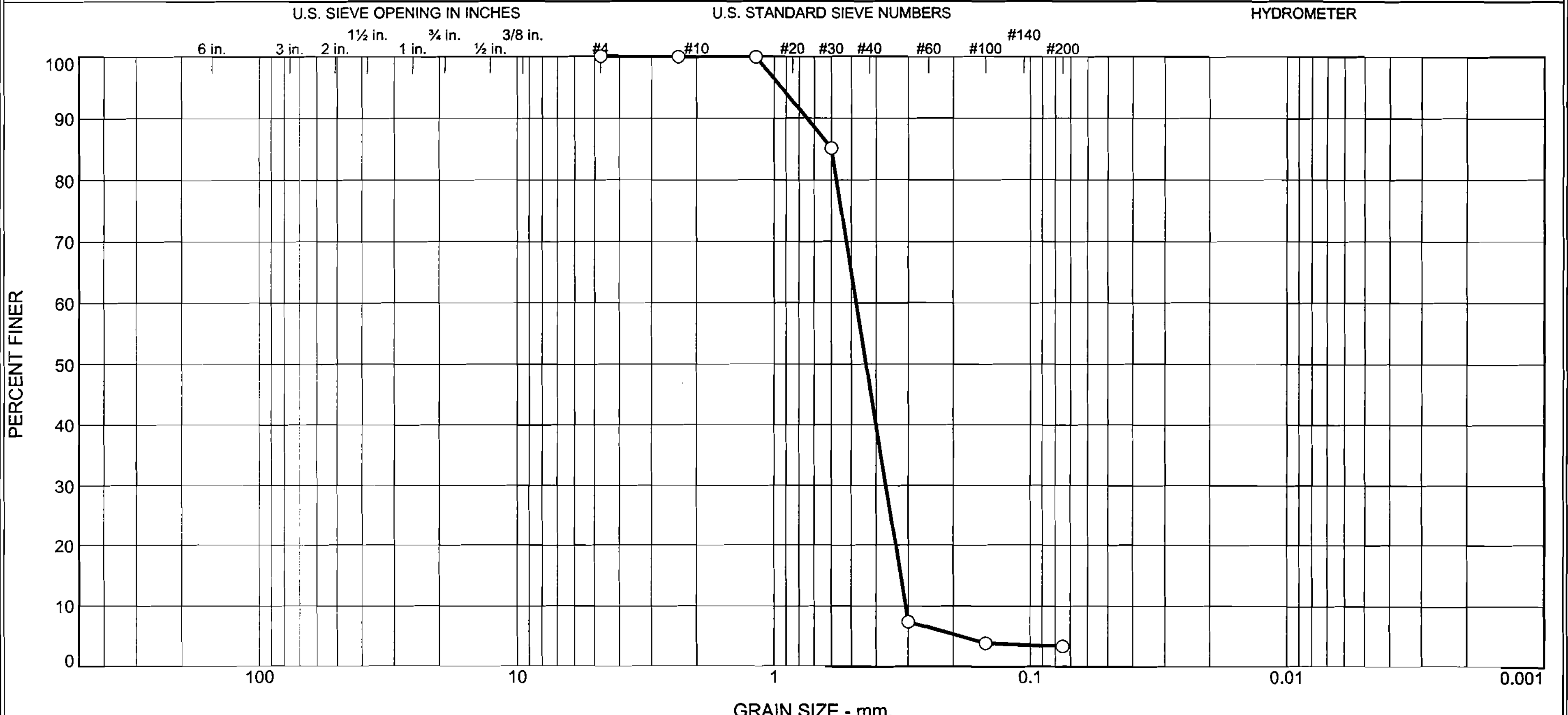
	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-4 S-4	12.0'-13.5'		SM	Sand, silty, brown, dark brown w/rock	7.9	nv	np

Client American Electric Power
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	53.4	43.2	3.3	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-4 S-12	39.5'-41.0'		SP	Sand, brown	5.2	nv	np

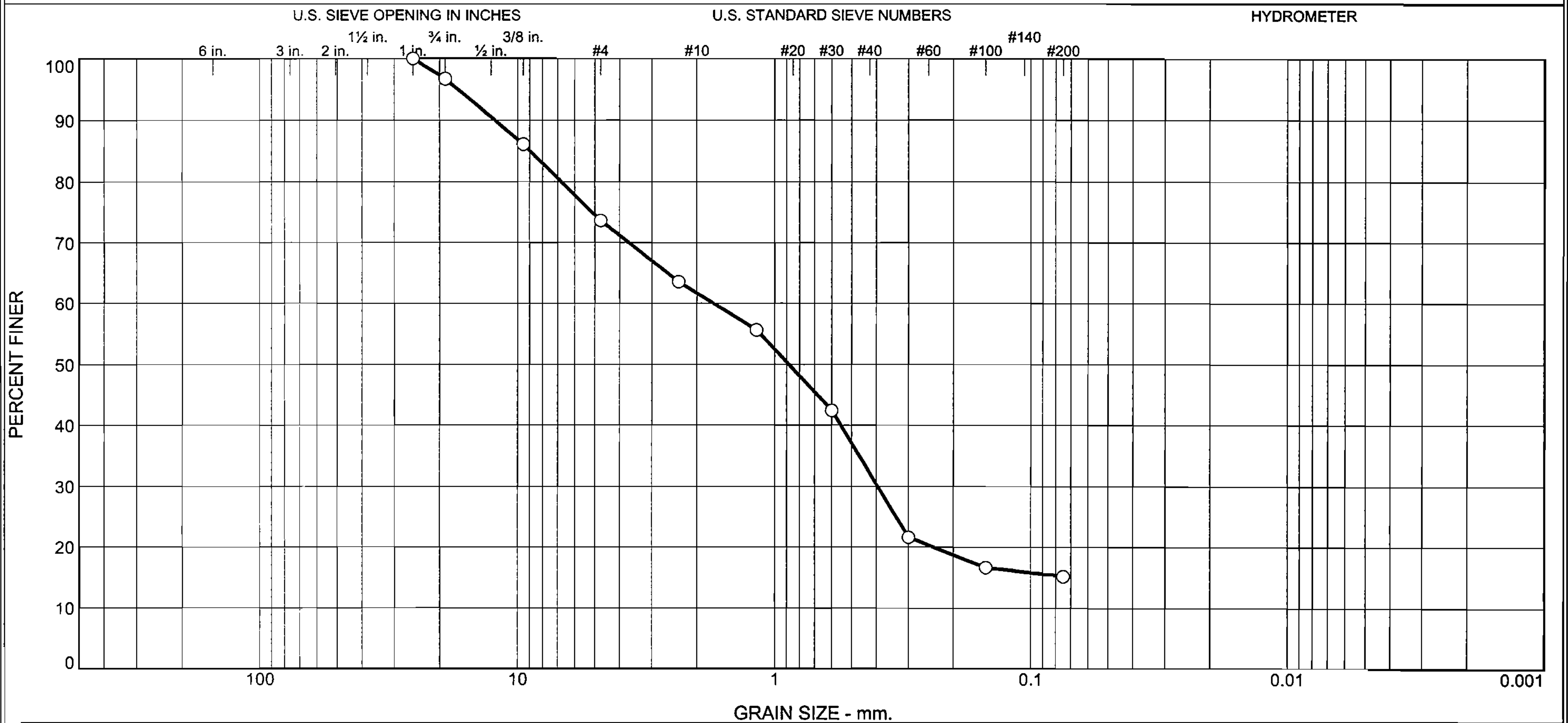
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.3	23.1	12.0	29.5	16.9	15.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-1,B-3,B-4 ST-1	9.5'-10.0'		SC-SM	Sand, clayey, silty, brown w/rock	9.3	16	12

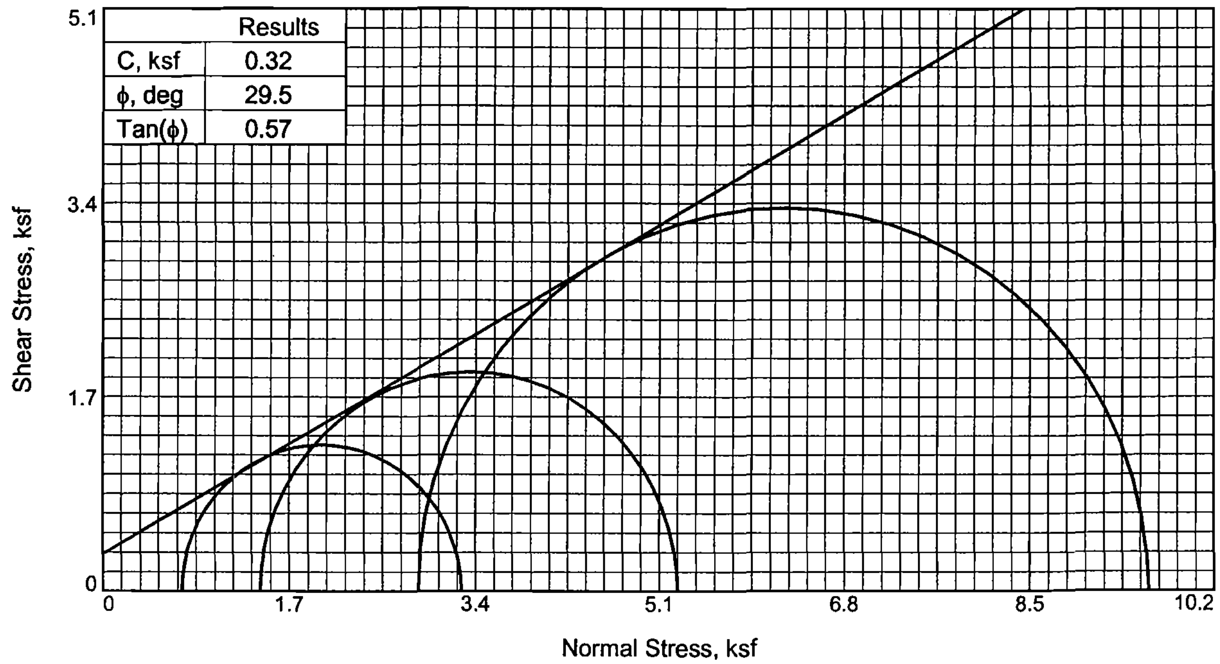
Client American Electric Power

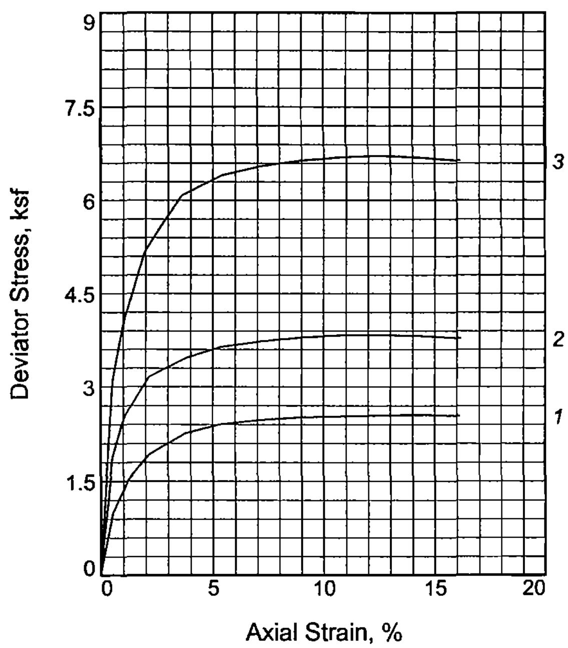
Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc. Knoxville, Tennessee

○ Sand Dike Material





Sample No.		1	2	3
Initial	Water Content, %	9.2	9.3	9.3
	Dry Density, pcf	114.3	114.5	113.2
	Saturation, %	53.1	53.8	52.0
	Void Ratio	0.4632	0.4617	0.4774
	Diameter, in.	2.80	2.80	2.80
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	16.8	16.2	16.9
	Dry Density, pcf	115.5	116.6	115.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4491	0.4344	0.4538
	Diameter, in.	2.79	2.78	2.78
	Height, in.	5.58	5.56	5.57
Strain rate, in./min.		0.00	0.00	0.00
Back Pressure, psi		0.00	0.00	0.00
Cell Pressure, psi		5.00	10.00	20.00
Fail. Stress, ksf		2.55	3.83	6.72
Ult. Stress, ksf				
σ_1 Failure, ksf		3.27	5.27	9.60
σ_3 Failure, ksf		0.72	1.44	2.88

Type of Test:
Consolidated Drained

Sample Type: Shelby Tubes

Description: Sand, clayey, silty, brown w/rock

LL= 16 **PL=** 12 **PI=** 4

Specific Gravity= 2.68

Remarks: Remolded specimens from B-1 ST-1, B-3 ST-1 & B-4 ST-1

Figure 1

Client: American Electric Power

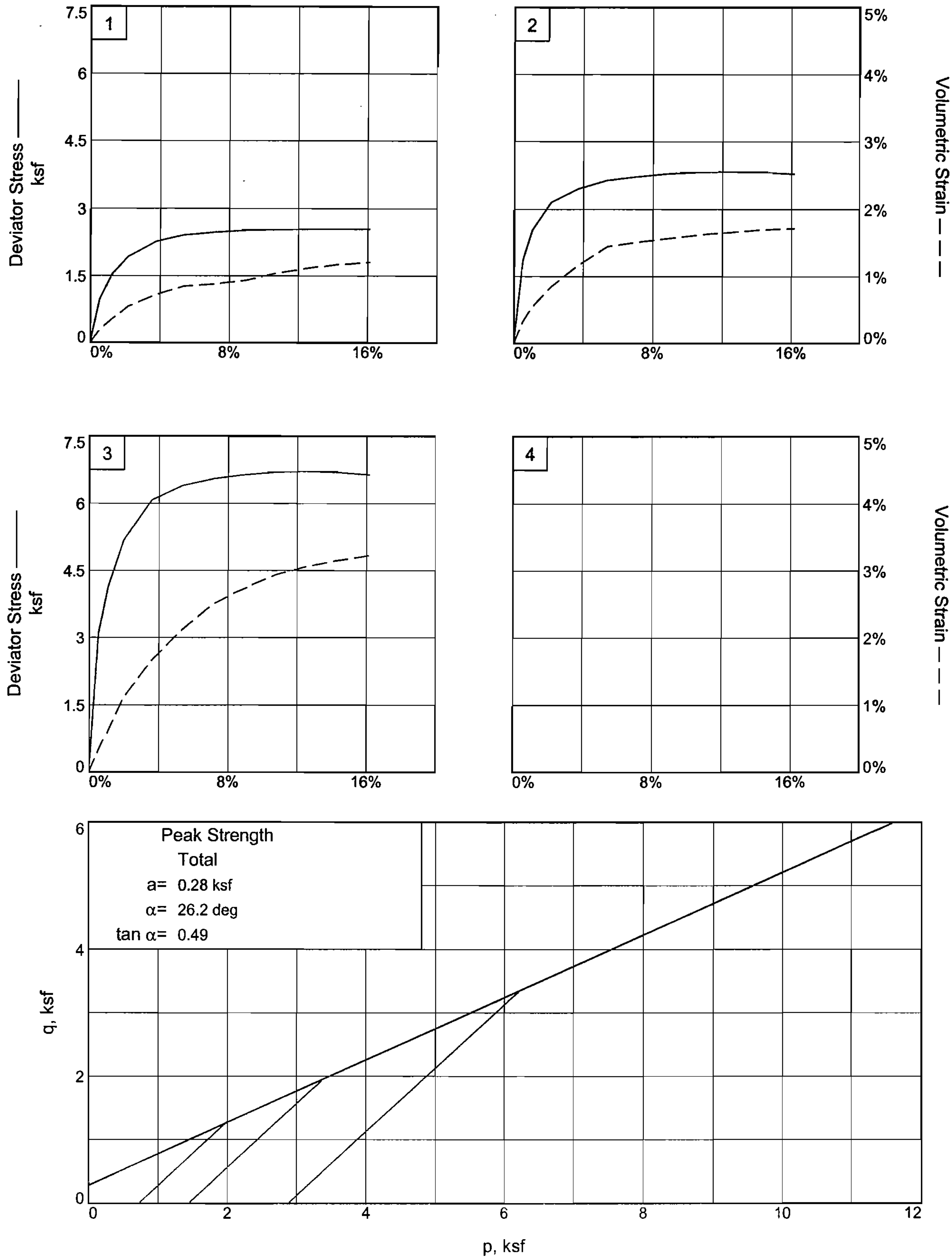
Project: Mitchell Bottom Ash Pond

Sample Number: B-1,B-3,B-4 ST-1 **Depth:** 9.5'-10.0'

Proj. No.: 09-379 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Geo/Environmental Associates, Inc.



Client: American Electric Power
Project: Mitchell Bottom Ash Pond
Depth: 9.5'-10.0' **Sample Number:** B-1,B-3,B-4 ST-1
Project No.: 09-379 **Figure** 2

Geo/Environmental Associates, Inc.

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME	: Mitchell Bottom Ash Pond	**PROJECT NUMBER**	: 09-379
CLIENT	: American Electric Power	**DATE**	: March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1 **Depth of Tested Sample** : 9.5'-10.0'

Specimen : 5 psi Triaxial Specimen **Remolded** : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.):	5.6	**Volume (ft^3):**	0.0200	**Wet Density (PCF):**	124.8
Diameter (in.):	2.8	**Weight (lbs):**	2.49	**Dry Density (PCF):**	114.3
Area (ft^2):	0.0428	**Moisture (%):**	9.2		

Chamber Pressure (psi):	5	**Change in Pore Pressure (psi):**	2.0
Influent Pressure (psi):	3	**Change in Chamber Pressure (psi):**	2.0
Back Pressure (psi):	0	**"B" Factor:**	1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(2352)(211.01)}$$

$$= \frac{9{,}954.00}{19{,}717{,}821.01}$$

$$= 5.05 \times 10^{-4} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond — **PROJECT NUMBER** : 09-379

CLIENT : American Electric Power — **DATE** : March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1 — **Depth of Tested Sample** : 9.5'-10.0'

Specimen : 10 psi Triaxial Specimen — **Remolded** : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 — **Volume (ft^3):** 0.0200 — **Wet Density (PCF):** 125.1

Diameter (in.): 2.8 — **Weight (lbs):** 2.50 — **Dry Density (PCF):** 114.5

Area (ft^2): 0.0428 — **Moisture (%):** 9.3

Chamber Pressure (psi): 7 — **Change in Pore Pressure (psi):** 2.0

Influent Pressure (psi): 5 — **Change in Chamber Pressure (psi):** 2.0

Back Pressure (psi): 2 — **"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

$$k = \frac{QL}{Ath} = \text{cm/sec}$$

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

$$k = \frac{(700.0)(14.22)}{(39.73)(2662)(211.01)}$$

A = Cross-sectional area of specimen, (cm^2)

$$= \frac{9{,}954.00}{22{,}316{,}683.47}$$

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

$$= 4.46 \times 10^{-4} \text{ cm/sec}$$

CONSTANT HEAD PERMEABILITY TESTING
ASTM D5084-90/SW846 Method 9100 Section 2.8

PROJECT NAME : Mitchell Bottom Ash Pond

PROJECT NUMBER : 09-379

CLIENT : American Electric Power

DATE : March 16, 2009

SAMPLE LOCATION AND CONDITIONS

Sample Id. : B-1, B-3 & B-4; ST-1

Depth of Tested Sample : 9.5'-10.0'

Specimen : 20 psi Triaxial Specimen

Remolded : Yes

Sample Description : Sand, clayey, silty, brown w/rock (Sand Dike)

INITIAL SPECIMEN PROPERTIES

Length (in.): 5.6 **Volume (ft^3):** 0.0200 **Wet Density (PCF):** 123.7

Diameter (in.): 2.8 **Weight (lbs):** 2.47 **Dry Density (PCF):** 113.2

Area (ft^2): 0.0428 **Moisture (%):** 9.3

Chamber Pressure (psi): 10 **Change in Pore Pressure (psi):** 2.0

Influent Pressure (psi): 8 **Change in Chamber Pressure (psi):** 2.0

Back Pressure (psi): 5 **"B" Factor:** 1.0

PERMEABILITY CALCULATIONS

k = Hydraulic Conductivity, (cm/sec)

L = Length of Sample, along path of flow, (cm)

Q = Quantity of flow, taken as the average of inflow and outflow, (cm^3)

A = Cross-sectional area of specimen, (cm^2)

t = Interval of time, over which the flow Q occurs, (sec)

h = Difference in hydraulic head across specimen, (cm)

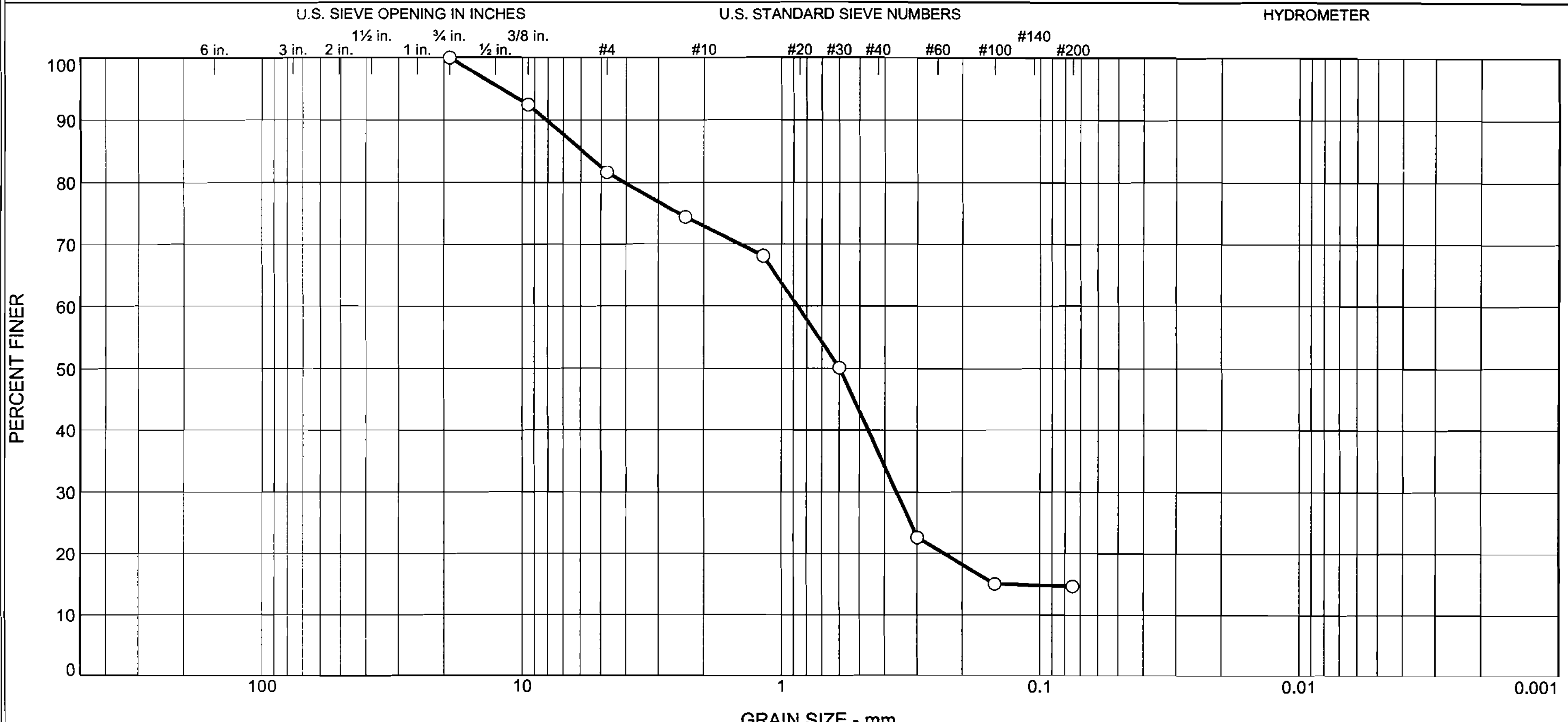
$$k = \frac{QL}{Ath} = \text{cm/sec}$$

$$k = \frac{(700.0)(14.22)}{(39.73)(1424)(211.01)}$$

$$= \frac{9{,}954.00}{11{,}938{,}000.48}$$

$$= 8.34 \times 10^{-4} \text{ cm/sec}$$

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	18.4	8.8	36.4	21.8	14.6	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-5 S-3	7.0'-8.5'		SM	Sand, silty, dark brown w/rock	7.9	12	np

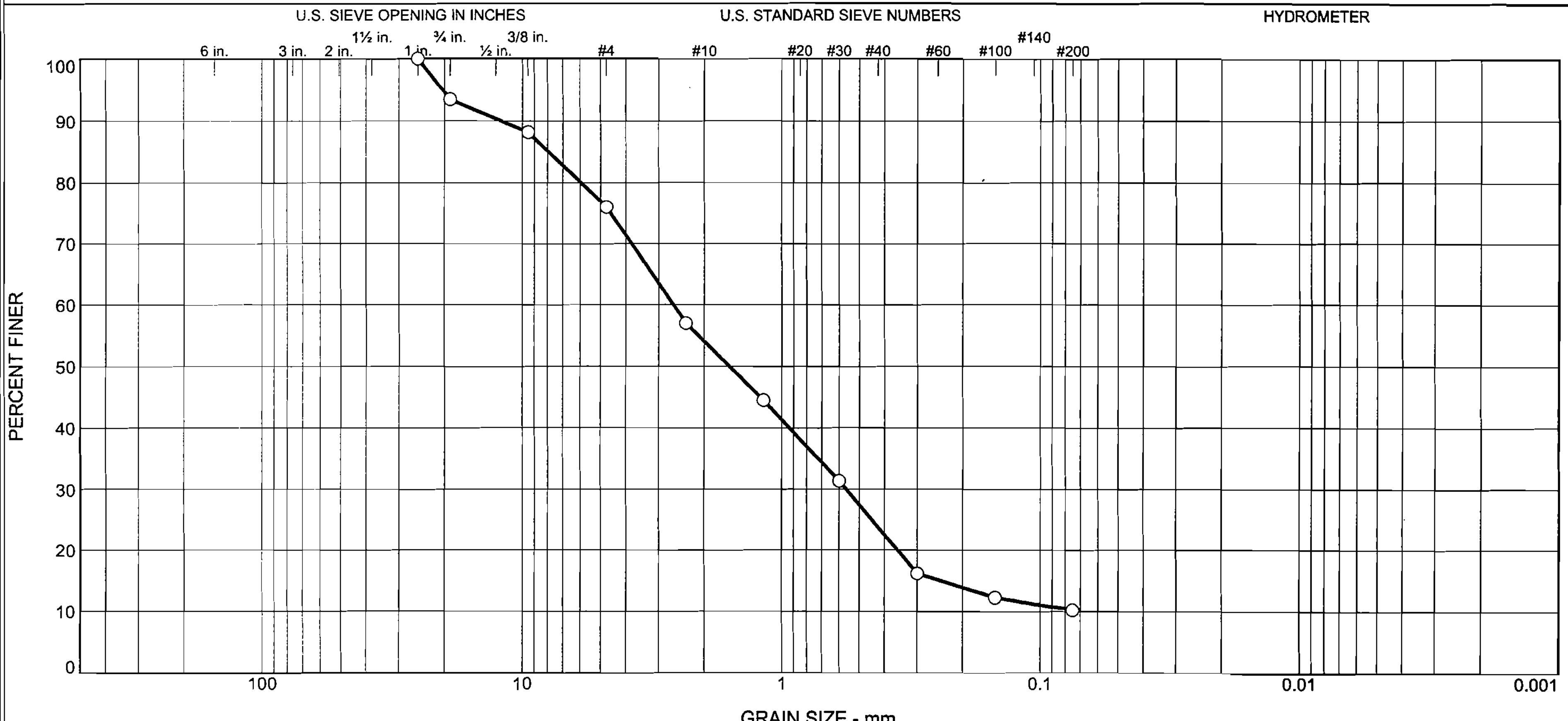
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	6.6	17.4	22.0	30.2	13.6	10.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		B-5 S-8	24.5'-26.0'		SP-SC	Sand, clayey, silty, brown w/rock	7.9	16	12

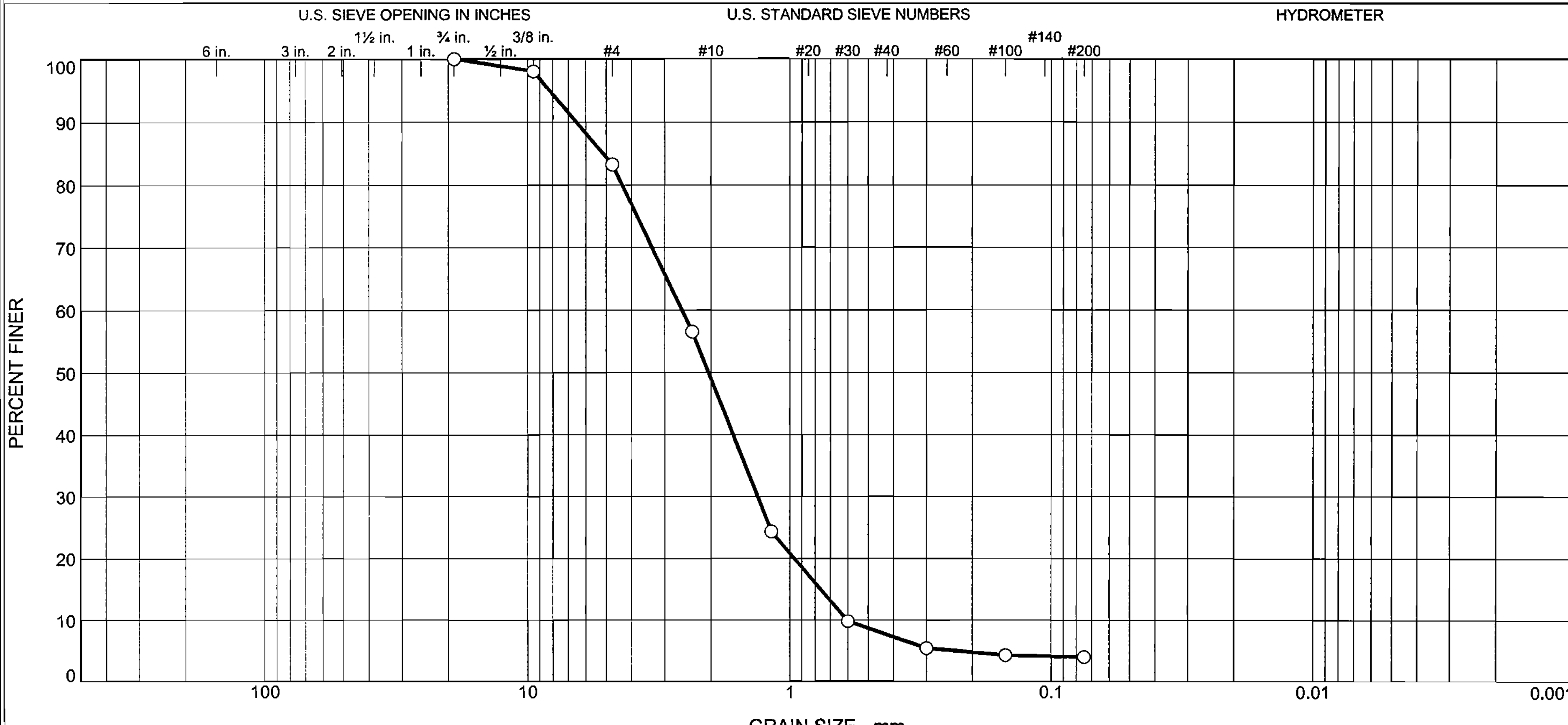
Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379 Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	16.8	34.4	41.2	3.6	4.0	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○		Bucket			SP	Bottom Ash	3.6	nv	np

Client American Electric Power

Project Mitchell Bottom Ash Pond

Project No. 09-379

Figure

Geo/Environmental Associates, Inc.
Knoxville, Tennessee

Borehole Data

Geo/Environmental Associates, Inc.

Boring No. B-1

Page 1 Of 2

PROJECT: AEP Mitchell BAP	**PROJECT NO: 09-379**
Start Date: 3-4-09	Drilling Contractor: Horn and Associates
Finish Date: 3-4-09	Driller: Tom Leininger
Logged By: Seth Frank	Helper: Jared and Bradley
Location: N 485362.82 E 1599372.71NAD83	Drill Type: Dietrick D50
Ground Elevation: 692.42' NAVD88	
Notes:	Thickness of Soil:
	Depth Drilled In Rock:
	Total Depth of Boring: 51.0'

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1 / 1.2'	SAND, brown w/green & yellow, gravel, dense, damp	15-22-19
4.5	6.0	S-2 / 1.3'	SAND, brown w/grey & yellow, gravel, very dense, damp	17-32-24
7.0	8.5	S-3 / 1.3'	SAND, clayey, silty , brown, gravel, medium dense, moist	10-11-15
9.5	9.9	ST-1 / 0.4'	SAND, clayey, silty, brown, gravel, moist	
12.0	13.5	S-4 / 1.4'	0-0.2': SAND, brown, gravel; 0.2-0.6': SAND, black (possible bottom of preexisting fill); 0.6-1.0': SAND, grey/white; 1.0-1.4': SAND- silty, brown, dense, damp	10-20-19
14.5	16.0	S-5 / 1.2'	SILT, sandy, clayey, gravel, medium dense to very stiff (qu>5tsf), damp	8-12-13
17.0	18.5	S-6 / 1.5'	SAND, brown, gravel, medium dense, damp	9-9-10
19.5	20.5	S-7 / 1.1'	SAND, gravely, brown, medium dense, damp	6-7-5
22.0	23.5	S-8 / 1.3'	SAND, brown, gravel, medium dense, damp	5-5-6

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring Log No.: B-1

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
24.5	26.0	S-9 / 1.3'	SAND, brown, river rock, medium dense, wet	4-5-6
30.0	31.5	S-10 / 1.2'	GRAVEL, sandy, brown, very loose, wet	1-2-1
35.0	36.5	S-11 / 1.3'	SAND, silty, brown, gravel, loose, wet	3-4-3
39.5	42.0	ST-2 / 2.3'	SAND, gravely, brown, wet	
44.5	46.0	S-12 / 1.2'	SAND, gravely, brown, loose, wet	4-4-4
49.5	51.0	S-13 / 1.2'	SAND, brown, mottled black, medium dense, wet	5-5-5
			TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 10.0'-12.0'	

Geo/Environmental Associates, Inc.

Boring No. B-2

Page 1 **Of** 2

PROJECT: AEP Mitchell BAP

PROJECT NO: 09-379

Start Date: 3-4-09

Finish Date: 3-5-09

Logged By: Seth Frank

Location: N 485698.27 E 1598947.58 NAD83

Ground Elevation: 690.72' NAVD88

Drilling Contractor: Horn and Associates

Driller: Tom Leininger

Helper: Jared and Bradley

Drill Type: Dietrick D50

Notes: Set piezometer to tip depth of 31.0'

Well dry at 31' on 3-5-09.

Piezometer Elevation: 690.59' NAVD88

Casing Elevation: 691.78' NAVD88

Thickness of Soil:

Depth Drilled In Rock:

Total Depth of Boring: 51.0'

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1 / 1.3'	SAND, brown, gravel, medium dense, moist	6-6-6
4.5	6.0	S-2 / 1.4'	SAND, brown, gravel, medium dense, moist	5-8-9
7.0	8.5	S-3 / 1.4'	SAND, silty, brown, gravel, very dense, damp	15-22-32
9.5	11.0	S-4 / 1.4'	SAND, silty, brown, gravel, very dense, moist	15-26-31
12.0	13.5	S-5 / 1.2'	SAND, clayey, silty, brown, gravel, medium dense, damp-moist	12-15-15
14.5	14.7	ST-1 / 0.2'	SAND, clayey, silty, brown, gravel, moist	
17.0	18.5	S-6 / 1.3'	CLAY, sandy, silty, brown mottled black, gravel, medium dense – very stiff (qu = 2.5tsf), moist	6-5-10
19.5	19.5	S-7 / 0.0'		NO RECOVERY
22.0	23.5	S-8 / 1.0'	SAND, brown, gravel, medium dense, damp (estimated original ground)	4-5-6
24.5	26.0	2-9 / 1.1'	SAND, brown, gravel, loose, damp – distinct 0.2' black, sandy layer at top of sample	4-5-4
29.0	30.5	S-10 / 1.2'	SAND, brown, clean, loose, damp	1-4-3
34.5	36.5	ST-2 / 1.7'	SAND, brown, light brown, damp	

Geo/Environmental Associates, Inc.

Project Name/ Job Number: **09-379**

Boring/Well Log No.: **B-2**

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
44.5	46.0	S-12 / 1.4'	SAND, brown, clean, loose, damp	3-3-4
49.5	51.0	S-13 / 1.5'	SAND, brown, clean, loose, moist – transition at 0.7' to clay, sandy, brown, firm (qu=1.0tsf), wet	3-2-2

TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 24.5
SET PIPE AT 31.0'

51.0	to	35.0	SAND CUTTINGS
35.0	to	32.0	BENTONITE
32.0	to	31.0	SAND
31.0	to	20.8	SCREEN
20.8	to	0.3	RISER
32.0	to	14.5	SAND
19.5	to	16.5	BENTONITE
16.5	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

W/L DRY @ 50.0'

Geo/Environmental Associates, Inc.

PROJECT: AEP Mitchell BAP | **PROJECT NO: 09-379**

Start Date: 3-3-09	Drilling Contractor: Horn and Associates
Finish Date: 3-5-09	Driller: Tom Leininger
Logged By: Seth Frank	Helper: Jared and Bradley
Location: N 485238.72 E1598811.08 NAD83	Drill Type: Dietrick D50
Ground Elevation: 691.80' NAVD88	
Notes: Set piezometer to tip depth of 31.0'	Thickness of Soil:
W/L at 23.3' below top of pipe on 3-5-09	Depth Drilled In Rock:
Casing Elevation: 691.85' NAVD88	Total Depth of Boring: 51.0'
Piezometer Elevation: 691.54' NAVD88	

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1 / 1.2'	SAND, brown, gravel, very dense, damp	12-27-39
4.5	6.0	S-2 / 1.3'	SAND, brown, gravel, very dense, damp	14-29-30
7.0	8.5	S-3 / 1.4'	SAND, brown, gravel, dense, moist	18-23-26
9.5	9.9	ST-1 / 0.4'	SAND, brown, gravel, moist	
12.0	13.5	S-4 / 1.0'	SAND, dark brown, gravel, very dense, moist	17-29-38
14.5	16.0	S-5 / 1.1'	SAND, brown mottled grey, gravel, dense, moist	8-14-23
17.0	18.5	S-6 / 1.5'	SAND , clayey, silty, brown mottled black and grey, gravel, medium dense, moist	9-9-10
19.5	21.0	S-7 / 1.4'	SAND - gravely , brown mottled grey, medium dense, damp-moist	21-21-23
22.0	23.5	S-8 / 1.4'	SAND, brown & black, gravel, dense, moist	15-21-20
24.5	26.0	S-9 / 1.3'	SAND brown mottled black, very dense, wet	15-24-23
27.0	28.5	S-10 / 1.3'	SAND, brown, gravel, dense, very wet	8-13-23

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-3

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-11 / 1.1'	SAND, silty, clayey, brown, medium dense - very stiff (qu = 3.25tsf), moist	12-15-35
32.0	33.5	S-12 / 0.2'	SAND, silty, clayey, brown, very dense, wet **split spoon blocked by rock*	19-29-29
34.5	35.5	ST-2 / 1.0'	CLAY, silty, sandy, brown, gravel, wet	
39.5	41.0	S-13 / 1.1'	SAND, brown, gravel, medium dense, wet	4-6-7
45.0	46.5	S-14 / 1.2'	SAND, brown, gravel, medium dense, wet	3-4-7
49.5	51.0	S-15 / 1.0'	SAND, brown, medium dense, wet	3-6-8

TRANSITION FROM DIKE TO ORIGINAL AT
APPROXIMATELY 29.5 - 30'
SET PIPE AT 31'

51.0	to	35.0	SAND CUTTINGS
35.0	to	32.0	BENTONITE
32.0	to	31.0	SAND
31.0	to	20.8	SCREEN
20.8	to	0.2	RISER
32.0	to	19.5	SAND
19.5	to	16.5	BENTONITE
16.5	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

Geo/Environmental Associates, Inc.

Boring No. B-4

PROJECT: AEP Mitchell BAP

PROJECT NO: 09-379

Start Date: 3-2-09

Finish Date: 3-3-09

Logged By: Seth Frank & Robby Reynolds

Location: N 484958.8 E 1599000.96 NAD83

Ground Elevation: 692.17' NAVD88

Drilling Contractor: Horn and Associates

Driller: Tom Leininger

Helper: Jared and Bradley

Drill Type: Dietrick D50

Notes: Set piezometer to tip depth of 30.0'

W/L at 24.6' below top of pipe on 3/5/09

Piezometer Elevation: 691.91' NAVD88

Casing Elevation: 692.20' NAVD88

Thickness of Soil:

Depth Drilled In Rock:

Total Depth of Boring: 51.0'

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1	SAND, brown, gravel, very dense, damp	25-41-26
4.5	6.0	S-2	SAND, brown, gravel, dense, damp	12-17-23
7.0	8.5	S-3	SAND, brown, gravel, very dense, damp	19-28-30
9.5	10.0	ST-1 / 0.5'	SAND, clayey, silty, brown, gravel, damp	
12.0	13.5	S-4	SAND, silty, black / brown, gravel, dense, damp	12-17-23
14.5	16.0	S-5	SAND, black / brown, gravel, dense, damp	12-20-21
17.0	18.5	S-6	SAND, clayey, silty, brown / black, gravel, dense, damp	11-12-19
19.5	21.0	S-7	SAND, gravely , brown mottled grey, medium dense, damp-moist	8-13-13
22.0	23.5	S-8	SAND, silty, clayey, dark brown / black, dense, moist	8-13-20
24.5	26.0	S-9	SAND, gravely, brown, medium dense, moist - wet	19-17-13
27.0	28.5	S-10	SAND, brown, gravel, dense, very wet	17-24-20

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-4

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-11	SAND, silty, clayey, black / dark brown, organic matter, medium dense, moist (qu = 3.25tsf)	8-11-14
34.5	36.5	ST-2 / 1.7'	SAND, brown, wet	
39.5	41.0	S-12	SAND, brown, loose, wet	2-3-4
45.0	46.5	S-13	SAND, brown, medium, wet	3-4-6
49.5	51.0	S-14	SAND, brown, medium, wet	3-6-7

TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 24.5'
SET PIPE AT 30.0'

51.0	to	34.0	SAND CUTTINGS
34.0	to	31.0	BENTONITE
31.0	to	30.0	SAND
30.0	to	19.8	SCREEN
19.8	to	0.2	RISER
31.0	to	18.0	SAND
18.0	to	15.0	BENTONITE
15.0	to	3.0	GROUT
3.0	to	0.0	CONCRETE WITH MAN HOLE

Geo/Environmental Associates, Inc.

Boring No. B-5

PROJECT: AEP Mitchell BAP	PROJECT NO: 09-379
Start Date: 3-2-09	Drilling Contractor: Horn and Associates
Finish Date: 3-3-09	Driller: Tom Leininger
Logged By: Seth Frank & Robby Reynolds	Helper: Jared and Bradley
Location: N 484664.32 E 1598966.05 NAD83	Drill Type: Dietrick D50
Ground Elevation: 674.82' NAVD88	
Notes: Set piezometer to tip depth of 17.0'	Thickness of Soil:
Well dry at 17.0' on 3-5-09	Depth Drilled In Rock:
Piezometer Elevation: 674.43' NAVD88	Total Depth of Boring: 36.0'
Casing Elevation: 674.86' NAVD88	

DEPTH (FEET)		SAMPLE NOS., & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
2.0	3.5	S-1	SAND, silty, brown, slightly gravely, medium, dense, damp	7-10-9
4.5	6.0	S-2	SAND, silty, grey to brown, slightly gravely medium dense, damp	3-5-7
7.0	8.5	S-3	SAND, silty, brown, slightly gravely, loose, damp	4-4-3
9.5	11.0	S-4	SAND, silty, brown, dark brown, gravel, loose damp	1-2-2
12.0	13.5	S-5	Transition: SAND, black, slightly gravely, damp To SAND clayey silty, dark brown, gravel, dense, damp	12-26-3
14.5	16.0	S-6	SAND, clayey, silty, brown, river rock, dense, damp	12-15-22
17.0	18.5	S-7	SILT, clayey, brown, very stiff, damp (qu=5tsf)	7-12-13
19.5	20.5	ST-1 / 0.8'	SAND, clayey, silty, brown, gravel, damp	
24.5	26.0	S-8	SAND, clayey, silty, dark brown, gravel, loose, damp	3-4-5

Geo/Environmental Associates, Inc.

Project Name/ Job Number: 09-379

Boring/Well Log No.: B-5

DEPTH (FEET)		SAMPLE NO., SAMPLE INTERVAL & SPLIT SPOON RECOVERY	SOIL/BEDROCK DESCRIPTION	BLOW COUNTS AND COMMENTS
FROM	TO			
29.5	31.0	S-9	SAND, dark brown, gravel, medium dense, damp	4-5-7
34.5	36.0	S-10	SAND, gravely, light brown, medium dense, damp	6-9-9

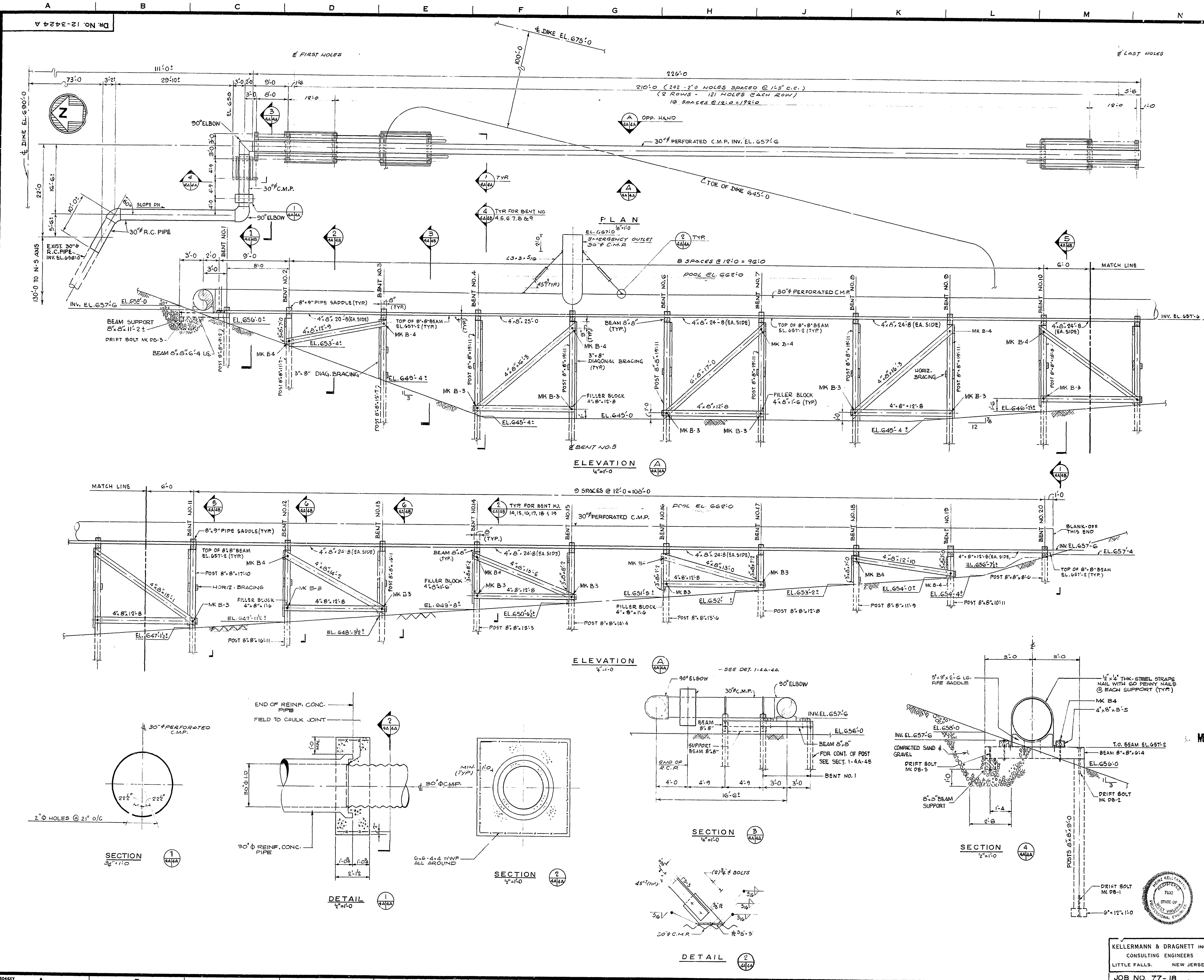
TRANSITION FROM DIKE TO ORIGINAL AT APPROXIMATELY 12.0'
SET PIPE AT 17.0'

36.0	to	21.0	SAND CUTTINGS
21.0	to	18.0	BENTONITE
18.0	to	17.0	SAND
17.0	to	7.0	SCREEN
7.0	to	0.6	RISER
18.0	to	5.0	SAND
5.0	to	2.5	BENTONITE
2.5	to	0.0	CONCRETE WITH MAN HOLE

W/L DRY @ 36.0'

ATTACHMENT C

DESIGN DRAWINGS



GENERAL NOTES

ALL TIMBER TO BE DOUGLAS FIR OR SOUTHERN YELLOW PINE, SELECT STRUCTURAL. SIZES IN ACCORDANCE WITH AMERICAN LUMBER STANDARDS.

ALL TIMBER TO BE CREOSOTED. CREOSOTING TO CONFORM TO SPEC. AWPA C-2. LATEST REVISION.

ALL STEEL INCLUDING BOLTS AND WASHERS TO BE A36 STEEL. AND ALL TO RECEIVE ONE FIELD COAT OF BITUMASTIC PAINT.

ALLOWABLE SOIL BEARING PRESSURE 1500 PSF BACKFILL AROUND POSTS AND BRACING SHALL BE WELL COMPACTED.

FOR CONCRETE NOTES SEE DWG. 12-3424E.

FOR STRUCTURAL STEEL NOTES SEE DWG. 12-3424-C.

FOR STRUCTURAL STEEL NOTES SEE DWG. 12-3424C.

MATERIALS

STEEL, GRATING & HANDRAIL
BY: WEST VIRGINIA STEEL CORP.
ORDER # 01403-841-8

BOLTS
BY: ESCO IRON WORKS
ORDER # 01404-841-8

TIMBER
BY: KOPPERS CO.
ORDER # 01405-841-8

CORRUGATED PIPE
BY: REPUBLIC STEEL CORP.
ORDER # 01406-841-8

CONCRETE PIPE
BY: PRICE BROTHERS COMPANY
ORDER # 01407-841-8

SAF-T-CLIMB DEVISE
BY: RESEARCH & TRADING CORP.
ORDER # 01413-071-8

FOR TIMBER & BOLT SCHEDULES SEE DWG. 12-3424 B.

REFERENCE DRAWINGS

12-3433	BOTTOM ASH STORAGE AREA - DIKES
12-3434	BOTTOM ASH STORAGE AREA - DIKES SECTIONS
12-3434A	BOTTOM ASH STORAGE AREA-SECTIONS
12-3434B	BOTTOM ASH STORAGE AREA MANHOLES "C", "D" & "E"
12-3424A & 12-3424B	CLEAR WATER POND-DISTRIBUTION PIPE AND SUPPORT TRESTLE
12-3424C, 12-3424D & 12-3424E	CLEARWATER POND-OVERFLOW DISCHARGE SYSTEM-COLLECTION TROUGH SUPPORTS AND SKIMMER BARRIER

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA

CLEARWATER POND DISTRIBUTION PIPE AND SUPPORT TRESTLE

DR. NO. 12-3424 A

ARCH. | ELEC | MECH. | STR.

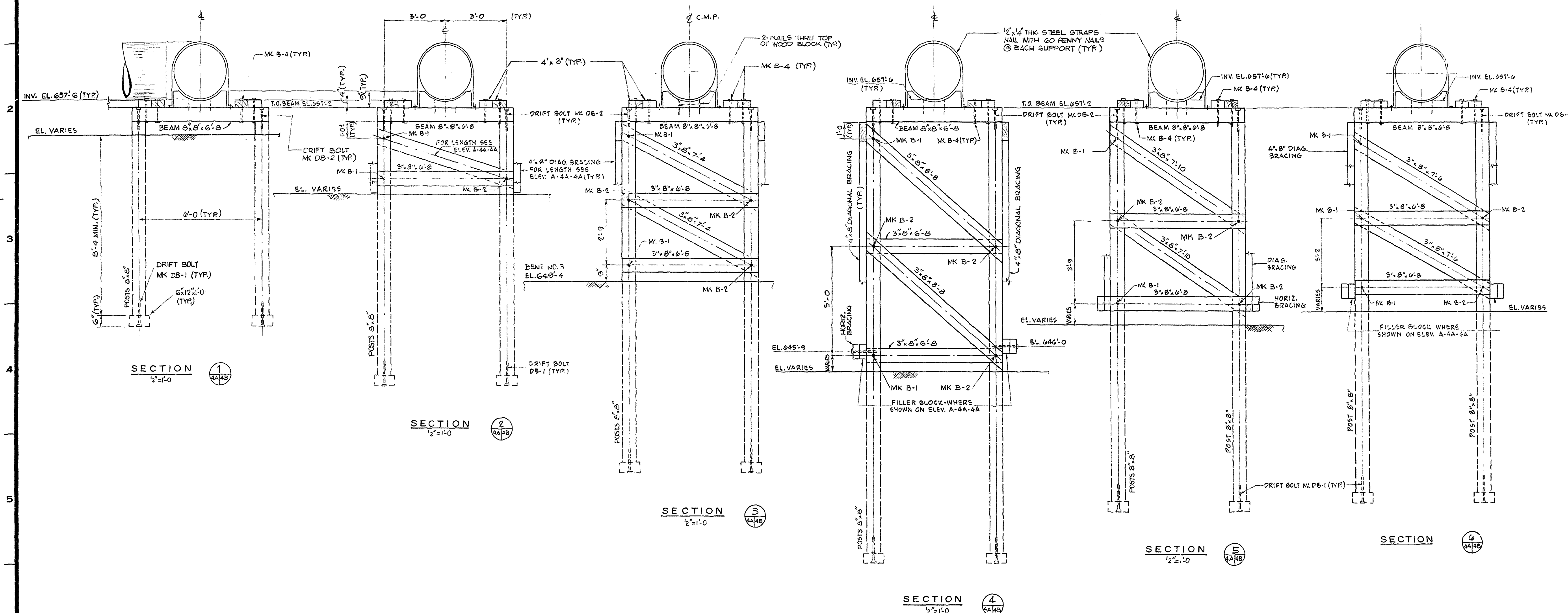
SCALE: AS NOTED
DR. F.W.
CH. JB
SQ. LDR.
DATE: 1/12/78
APPROVED BY: ENGINEERING DIV / DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

DR. NO. 12-3424 B

GENERAL NOTES

FOR TIMBER NOTES SEE DWG. 12-3424A



MATERIAL

REFERENCE DRAWING

FOR LIST OF REFERENCE DRAWINGS SEE DWG. 12-3424A

TIMBER SCHEDULE

QUANTITY	SIZE	LENGTH	TOTAL LENGTH	NO. OF BOARD FT.	REMARKS
12	8" X 8"	19'-11	239'-0	1,275	POST
2		18'-8	37'-4	199	
2		17'-10	35'-8	191	
2		16'-11	33'-10	181	
2		16'-1	32'-2	172	
2		15'-7	31'-2	166	
2		15'-3	30'-6	163	
2		14'-4	28'-8	153	
2		13'-6	27'-0	144	
2		12'-8	25'-4	135	
2		11'-9	23'-6	125	
2		11'-7	23'-2	124	
2		10'-11	21'-10	117	
2		9'-2	18'-4	98	
1		9'-0	9'-0	48	
2	8" X 8"	8'-6	17'-0	91	POST
41	6" X 12"	1'-0	41'-0	246	-
20	8" X 8"	6'-8	133'-4	711	BEAM
1		6'-4	6'-4	34	
		5'-8	5'-8	30	
1	8" X 8"	5'-6	5'-6	29	BEAM
6	4" X 8"	16'-3	97'-6	260	BRACING
2		15'-1	30'-2	81	
2		14'-2	28'-4	76	
2		13'-6	27'-0	72	
2		13'-0	26'-0	69	
4		12'-10	51'-4	137	
14	4" X 8"	12'-8	177'-4	473	BRACING
14	4" X 8"	1'-6	21'-0	56	FILLER BLOCK
12	3" X 8"	8'-8	104'-0	208	BRACING
2		8'-2	16'-4	33	
4		7'-10	31'-4	63	
4		7'-6	30'-0	60	
2		7'-4	14'-8	30	
2		7'-2	14'-4	29	
3		7'-0	21'-0	42	
29	3" X 8"	6'-8	193'-4	387	BRACING
16	4" X 8"	24'-8	394'-8	1,053	BENT TOP TIE
2		20'-8	41'-4	110	
2		12'-8	25'-4	68	
2	4" X 8"	5'-6	11'-0	29	BENT TOP TIE
22	8" X 9"	2'-6	55'-0	367	PIPE SADDLE CUT FROM 8" X 10"

TOTAL NO. OF BOARD FEET 8,135

BOLT SCHEDULE

MARK	QUANTITY	SIZE	LENGTH	TYPE	REMARKS
DB-1	41	7/8" ϕ	1'-6	DRIFT BOLT	WEDGE POINT BUTTON HEAD
DB-2	42	7/8" ϕ	1'-8	DRIFT BOLT	WEDGE POINT BUTTON HEAD
DB-3	2	7/8" ϕ	1'-2	DRIFT BOLT	WEDGE POINT BUTTON HEAD
B-1	36	7/8" ϕ	1'-0	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS
B-2	40	7/8" ϕ	1'-3	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS
B-3	28	7/8" ϕ	1'-5	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS
B-4	84	7/8" ϕ	1'-1	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS

LEGEND:

SECTION KEY

SECTION NUMBER

DWG. ON WHICH SECTION IS TAKEN

DWG. ON WHICH SECTION IS SHOWN

WRITTEN REFERENCE INDICATION, SECTION 1-2-3

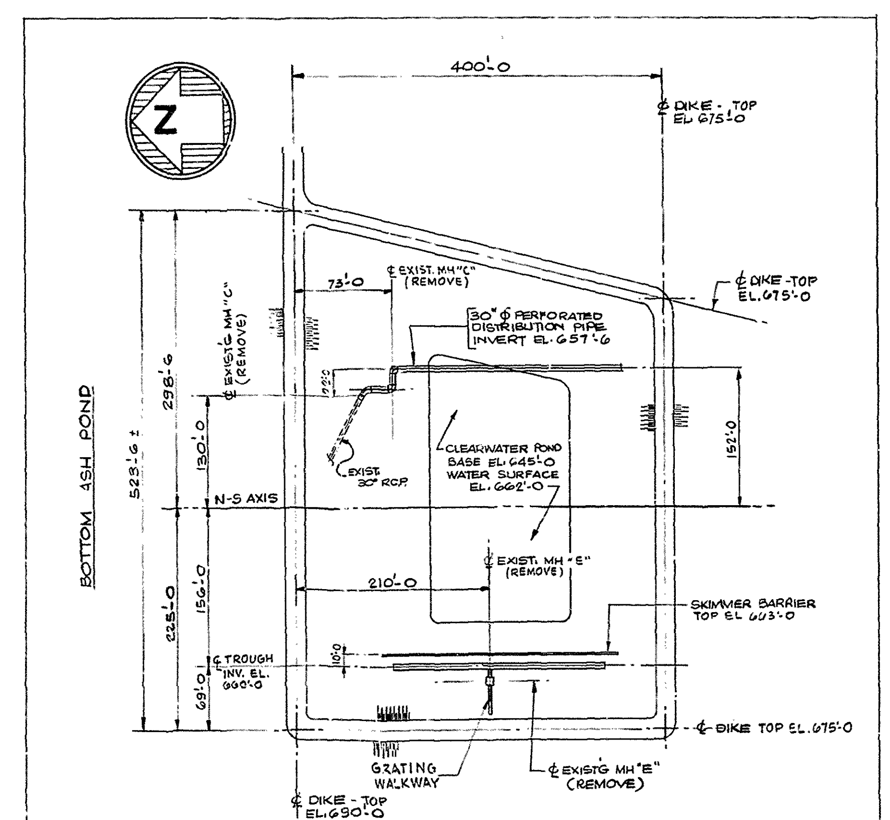
DETAIL KEY

DETAIL NUMBER

DWG. ON WHICH DETAIL IS TAKEN

DWG. ON WHICH DETAIL IS SHOWN

WRITTEN REFERENCE INDICATION, DETAIL 1-2-3



KEY PLAN
1"=100'-0

KELLERMANN & DRAGNETT INC.
CONSULTING ENGINEERS
LITTLE FALLS, NEW JERSEY

JOB NO: 77-18

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA

CLEARWATER POND DISTRIBUTION PIPE AND SUPPORT TRESTLE

DR. NO. 12-3424 B

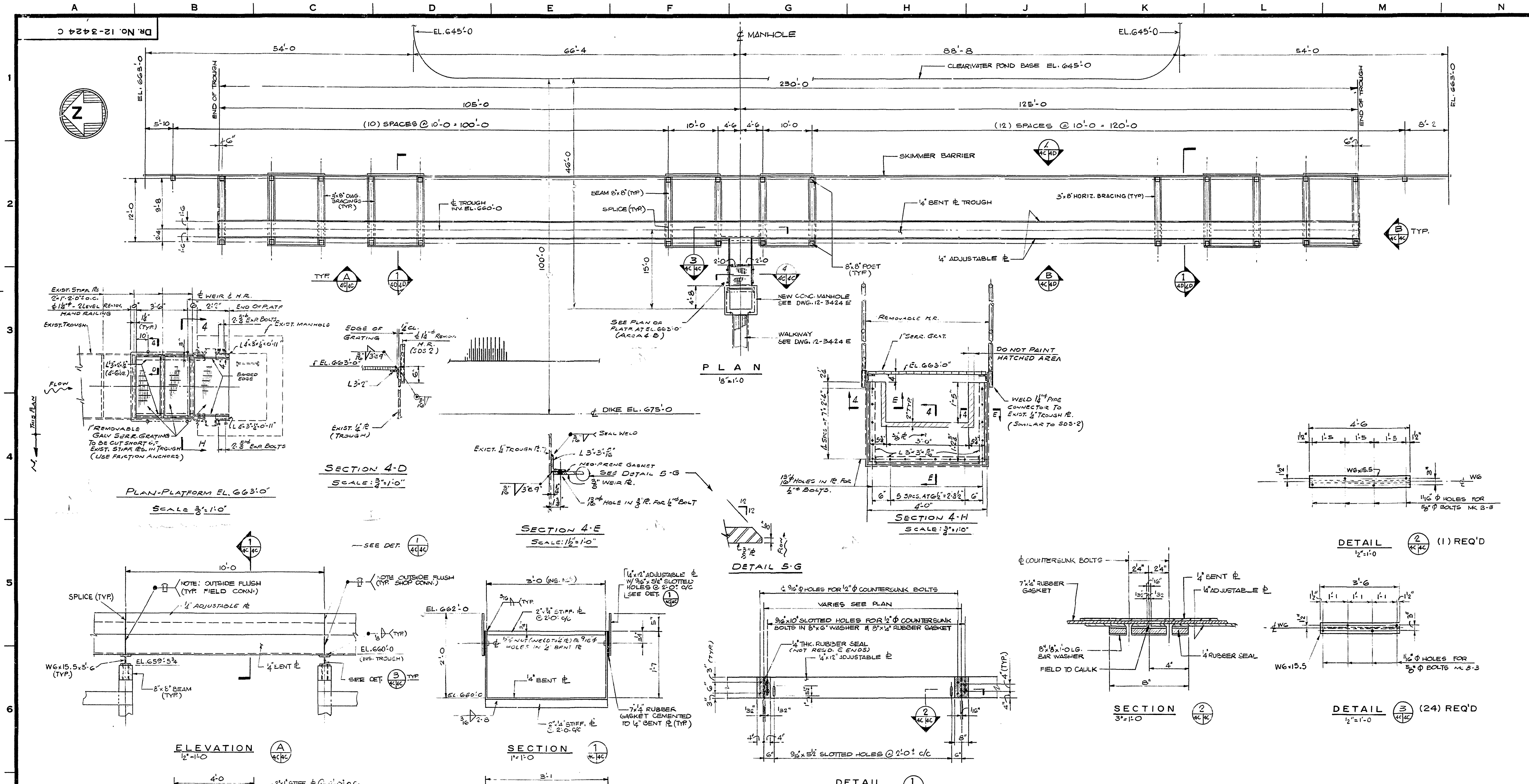
ARCH. | ELEC | MECH. | STR. W.B.

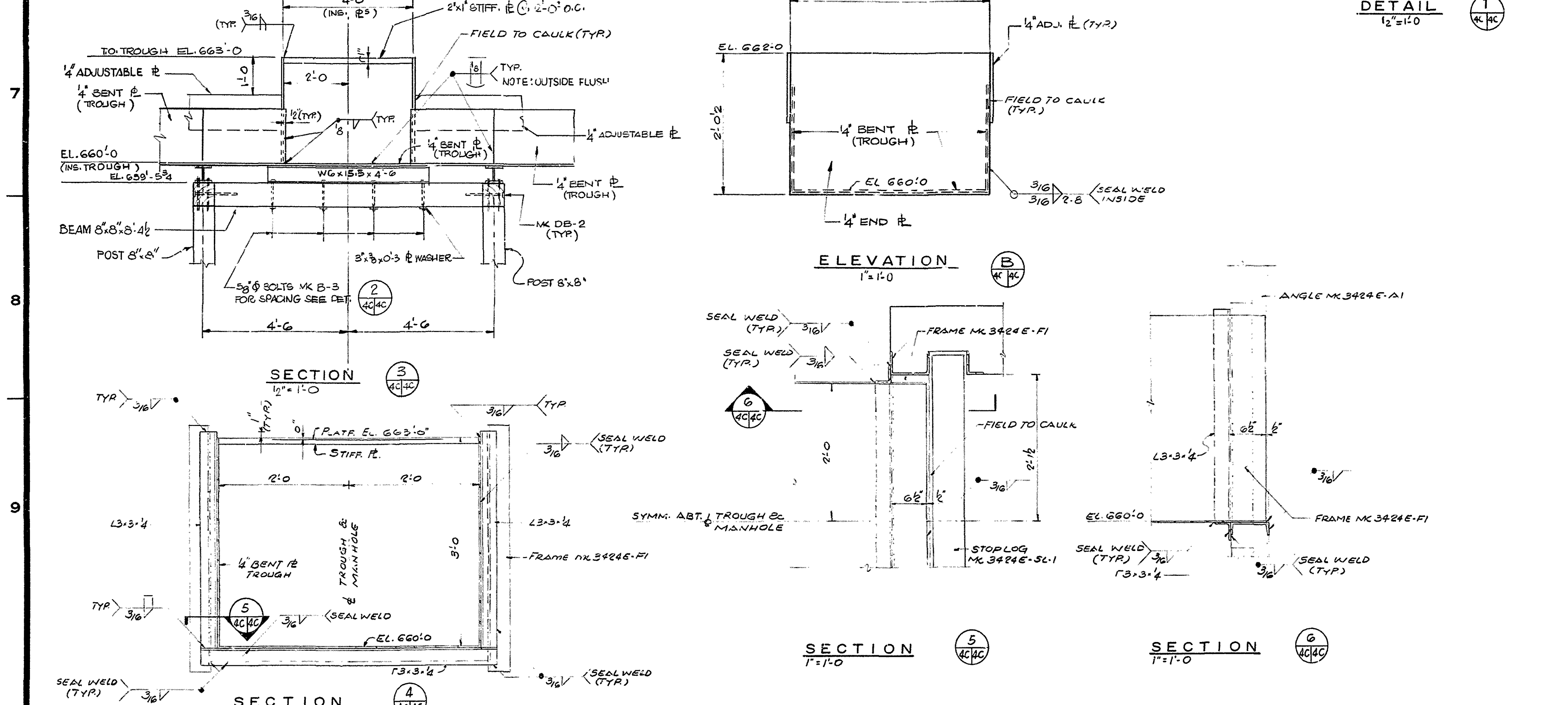
SCALE: AS NOTED
DR. F.W./S.M.
CH. J.B.
SQ. LDR
DATE: 1/12/78

APPROVED BY — ENGINEERING DIV — DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

AEP3046XY





GENERAL NOTES

FOR TIMBER NOTES SEE DWG. 12-34282.

STRUCTURAL STEEL

WHEREVER WELDED CONNECTIONS ARE CALLED FOR THE WORK IS TO BE DONE IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY'S "CODE FOR WELDING IN BUILDING CONSTRUCTION."

ALL WELDS SHALL BE 5/16" FILLET WELDS UNLESS NOTED.

THE STEEL ERECTOR SHALL FURNISH REQUIRED AMOUNT OF WELDING OF RODS IN PROPER SIZES AND LENGTHS FOR THE FIELD ERECTION ALSO SUFFICIENT NUMBER OF ERECTION BOLTS.

DO NOT PAINT STEEL IN CONTACT WITH CONCRETE

PAINTING SPECIFICATIONS
SHOP PROCEDURES

STRUCTURAL STEEL

A) SURFACE PREPARATION: STEEL SHALL BE PREPARED FOR PAINTING IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL NO. 3 POWER TOOL CLEANING, SPECIFICATION SSPC-SP-3-63 DATED OCTOBER 1, 1963 (OR LATEST REVISION) OR BY BLASTING BY MEANS OF WHEELABRATOR EQUIPMENT.

B) SHOP COAT SPECIFICATIONS: APPLY AT A SPREADING RATE OF 400-450 SQUARE FEET PER GALLON ONE SHOP COAT OF READY MIXED RED LEAD BASE PAINT, CONFORMING TO FEDERAL SPECIFICATION TTP 86 E, TYPE 2 OR LATEST REVISION. DRY FILM THICKNESS SHALL BE A MINIMUM OF 2.0 MILS. MANUFACTURER SHALL CERTIFY IN WRITING THAT HE CONFORMS TO THE SPECIFICATION.

C) SUPPLIERS: PAINT SHALL BE PURCHASED FROM ANY ONE OF THE FOLLOWING APPROVED SUPPLIERS:
1. CON LUX PAINT PRODUCTS - EDISON, NEW JERSEY
2. DEBEVOISE PAINT COMPANY - BROOKLYN, NEW YORK
3. E. I. DUPONT DE NEMOURS - WYNNEWOOD, PENNSYLVANIA
4. GLIDDEN PAINT COMPANY - CLEVELAND, OHIO
5. HARRISON PAINT & VARNISH - CANTON, OHIO
6. KEELER & LONG COMPANY - WATERBURY, CONNECTICUT
7. O'BRIEN CORPORATION - SOUTH BEND, INDIANA
8. PATTERSON SARGENT COMPANY - NEW BRUNSWICK, NEW JERSEY
9. PPG INDUSTRIES - PITTSBURGH, PENNSYLVANIA
10. SHERWIN WILLIAMS COMPANY - CLEVELAND, OHIO

D) PAINT SHALL BE APPLIED IN ACCORDANCE AND CONFORMING TO THE CURRENT FEDERAL (OSHA), STATE AND LOCAL HEALTH AND SAFETY REGULATIONS.

ALL STEEL INCLUDING BOLTS AND WASHERS TO BE A36 STEEL, AND ALL TO RECEIVE ONE FIELD COAT OF BITUMASTIC PAINT.

MATERIAL

REFERENCE DRAWINGS

FOR LIST OF REFERENCE DRAWINGS SEE DWG. 12-34264.

TIMBER SCHEDULE

QUANTITY	SIZE	LENGTH	TOTAL LENGTH	NO. OF BOARD FT.	REMARKS
20	8" X 8"	19'-6	390'-0	2.080	POST
1		17'-11	17'-11	96	
1		17'-2	17'-2	92	
1		14'-7	14'-7	78	
1		13'-10	13'-10	74	
22		11'-5	251'-2	1,340	
1		11'-3	11'-3	60	
1		10'-11	10'-11	58	
1		10'-6	10'-6	56	
1	8" X 8"	9'-3	9'-3	49	POST
50	6" X 16"	1'-4	66'-8	534	-
24	8" X 8"	12'-0	288'-0	1,536	BEAM
1	8" X 8"	8'-4 1/2	8'-4 1/2	45	BEAM
22	3" X 8"	13'-8	300'-8	602	BRACING
10		12'-0	120'-0	240	
1		11'-0	11'-0	22	
22		10'-8	234'-8	470	BRACING
10	3" X 8"	1'-0	10'-0	20	FILLER BLOCK
2	3" X 12"	270'-0	540'-0	1.620	SKIMMER BARRIER
1	3" X 14"	270'-0	270'-0	945	-DO-

TOTAL NO. OF BOARD FEET = 10,017

BOLT SCHEDULE

MARK	QUANTITY	SIZE	LENGTH	TYPE	REMARKS
DB-1	50	7/8" ⌀	1'-6	DRIFT BOLT	WEDGE POINT BUTTON HEAD
DB-2	50	7/8" ⌀	1'-8	DRIFT BOLT	WEDGE POINT BUTTON HEAD
B-1	80	7/8" ⌀	1'-0	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS
B-2	20	7/8" ⌀	1'-3	SQ. HEAD SQ. NUT	2 WASHERS 5" THREADS
B-3	100	5/8" ⌀	1'-0	HEX HEAD 2 HEX NUTS	1-3/8" X 3" X 0'-3 ℄ WASHER & 5" THREADS

REVISIONS

DATE	NO.	DESCRIPTION	APPD.
11/20/80	1	ALL WORK & MATERIAL BY FIELD. ADDED PLATF. AT EL. 663'-0, AND SECTS. AND DETAILS - PER R.DR-MI-12-072	S.F.

"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST."

OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA

CLEARWATER POND OVERFLOW DISCHARGE SYSTEM COLLECTION TROUGH SUPPORTS AND SKIMMER BARRIER

DR. NO. 12-3424 C -1

ARCH. | ELEC | MECH. | STR. W.B.

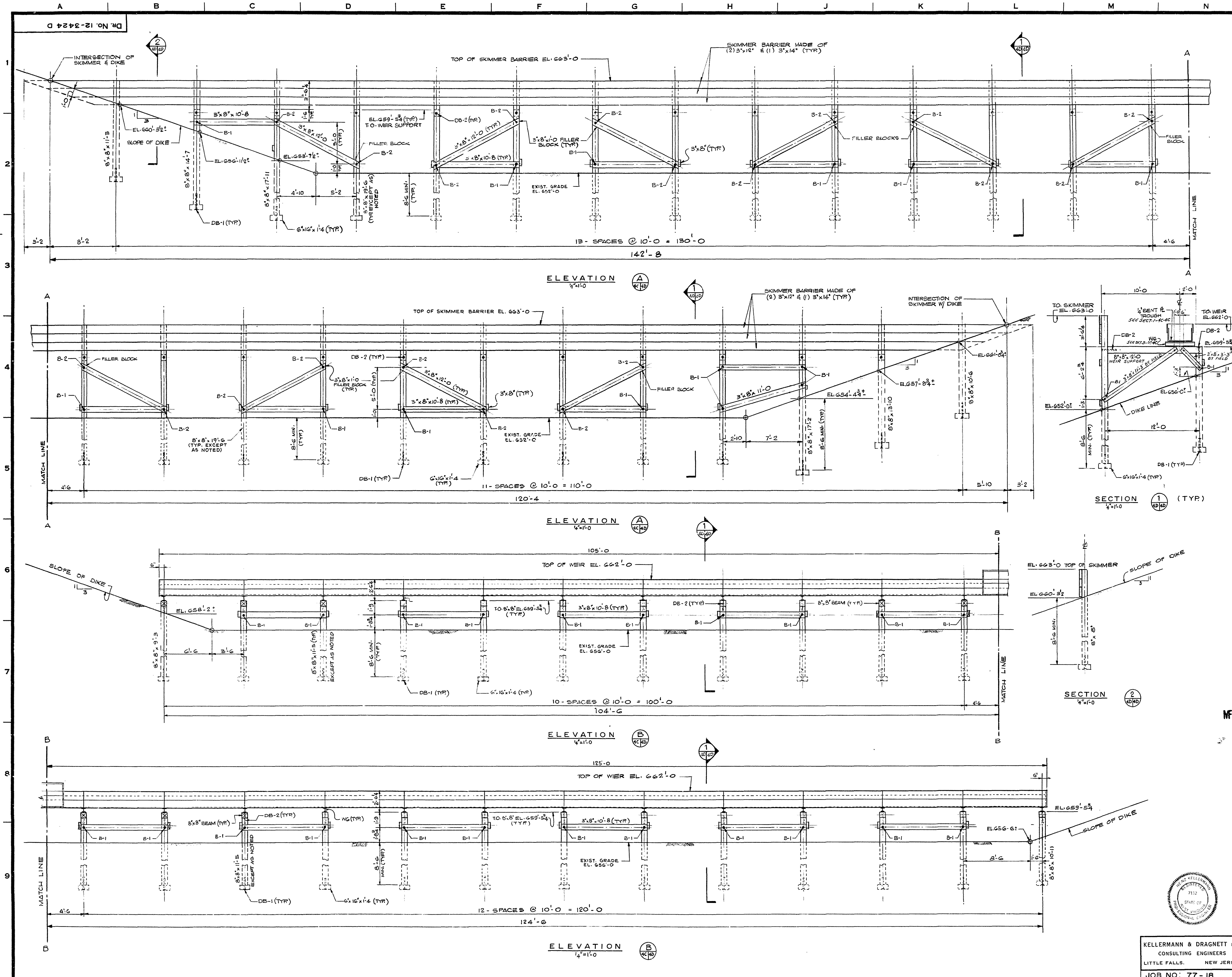
SCALE: AS NOTED
DR. FW/EM
CH. J.B.
SQ. LDR. [signature]
DATE: 1/12/78
APPROVED BY: ENGINEERING DIV; DESIGN DIV

KELLERMANN & DRAGNETT INC.
CONSULTING ENGINEERS
LITTLE FALLS, NEW JERSEY

JOB NO. 77-18

AMERICAN ELECTRIC POWER SERVICE CORP.

AEP 1046XY



GENERAL NOTES

FOR TIMBER NOTES SEE DWG. 12-3424A.
FOR STRUCTURAL STEEL NOTES SEE DWG. 12-3424C.

MATERIAL

FOR TIMBER AND BOLT SCHEDULES SEE DWG. 12-3424C.

REFERENCE DRAWINGS

FOR LIST OF REFERENCE DRAWINGS SEE DWG. 12-3424A.

REVISIONS

DATE	NO.	DESCRIPTION	APPD.
9/17/78	1	REVISED SECT 1/4D	HTS

"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST"

OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA

CLEARWATER POND OVERFLOW DISCHARGE SYSTEM COLLECTION TROUGH SUPPORTS AND SKIMMER BARRIER

DR. NO. 12-3424 D-1

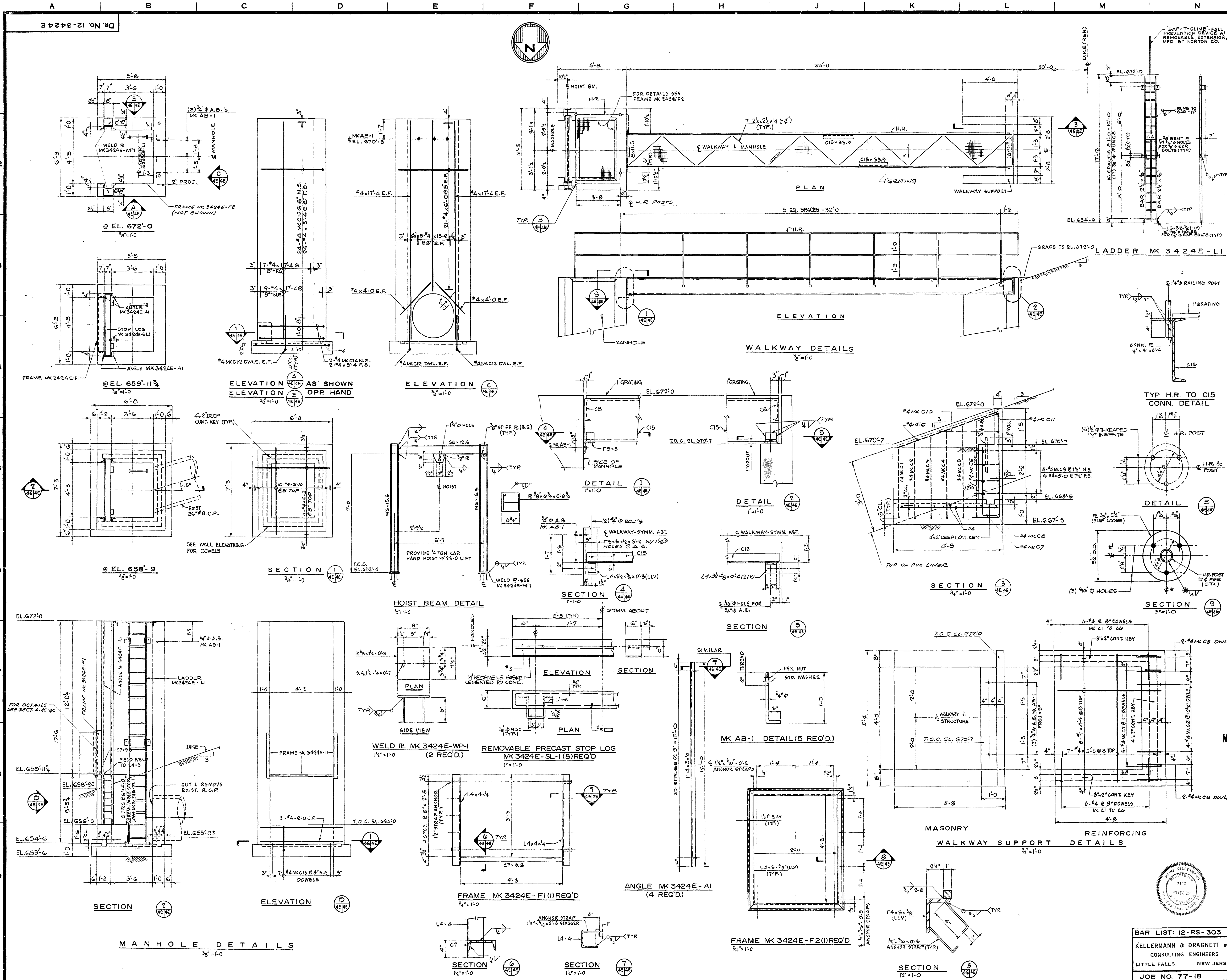
ARCH. | ELEC | MECH. | STR. | W.E.

SCALE: 1/4"=1'-0
DR. E.J. / EM
CH. J.B.
SQ. LDR.
DATE: 1/12/78
APPROVED BY: ENGINEERING DIV / DESIGN DIV

KELLERMANN & DRAGNETT INC.
CONSULTING ENGINEERS
LITTLE FALLS, NEW JERSEY
JOB NO: 77-18

AMERICAN ELECTRIC POWER SERVICE CORP.

AEP3046XY



GENERAL NOTES

FOR STRUCTURAL STEEL NOTES SEE DWG. 12-3424C.

CONCRETE NOTES

ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE A.E.P.S. CORP. SPECIFICATIONS #1000A.

DIMENSIONS GIVEN FOR REINFORCING STEEL ARE TO CENTER LINE OF BARS.

CONSTRUCTION JOINTS ARE NOT TO BE ADDED, OMITTED OR RELOCATED, EXCEPT WITH THE WRITTEN APPROVAL OF THE N.Y. OFFICE, AND FURTHER, PROVIDED THAT THE CONTRACTOR'S MIXING AND PLACING EQUIPMENT IS PROPERLY SIZED SO THAT NO COLD JOINTS WILL RESULT IN THE CONCRETE.

EXPANSION JOINTS MUST BE LOCATED AS SHOWN.

ALL EXPOSED EDGES SHALL HAVE A 3/4 INCH BEVEL.

FLOOR FINISH SHALL CONFORM TO THE A.E.P.S. CORP'S. SPEC. AND TYPE OF SAME WILL BE DECIDED UPON BY CONCRETE LABORATORY.

ALL EXPOSED VERTICAL EXTERIOR CONCRETE SURFACES TO HAVE RUBBED FINISH.

CONCRETE SHALL BE CAPABLE OF DEVELOPING A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.

REINFORCING BARS SHALL BE ASTM A615. GRADE 60. DEFORMED TYPE.

GRATING NOTES

GRATING SHALL BE RECTANGULAR TYPE WITH 3/16" BEARING BARS @ 1 3/16" CENTERS AND CROSS BARS @ 4" CENTERS. GRATING SHALL BE GALVANIZED.

GRATING SHALL BE SECURED BY FIELD WELDING TO SUPPORTING MEMBERS @ EVERY TENTH BEARING BAR & SHALL SPAN IN DIRECTION SHOWN ON PLAN THUS (⟵).

MATERIAL

CONCRETE	14.0 CU. YDS.
REINFORCING	0.8 TON

REFERENCE DRAWINGS

FOR LIST OF REFERENCE DRAWINGS SEE DWG. 12-3424A.

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA

CLEARWATER POND
OVERFLOW DISCHARGE SYSTEM
COLLECTION TROUGH SUPPORTS
AND SKIMMER BARRIER

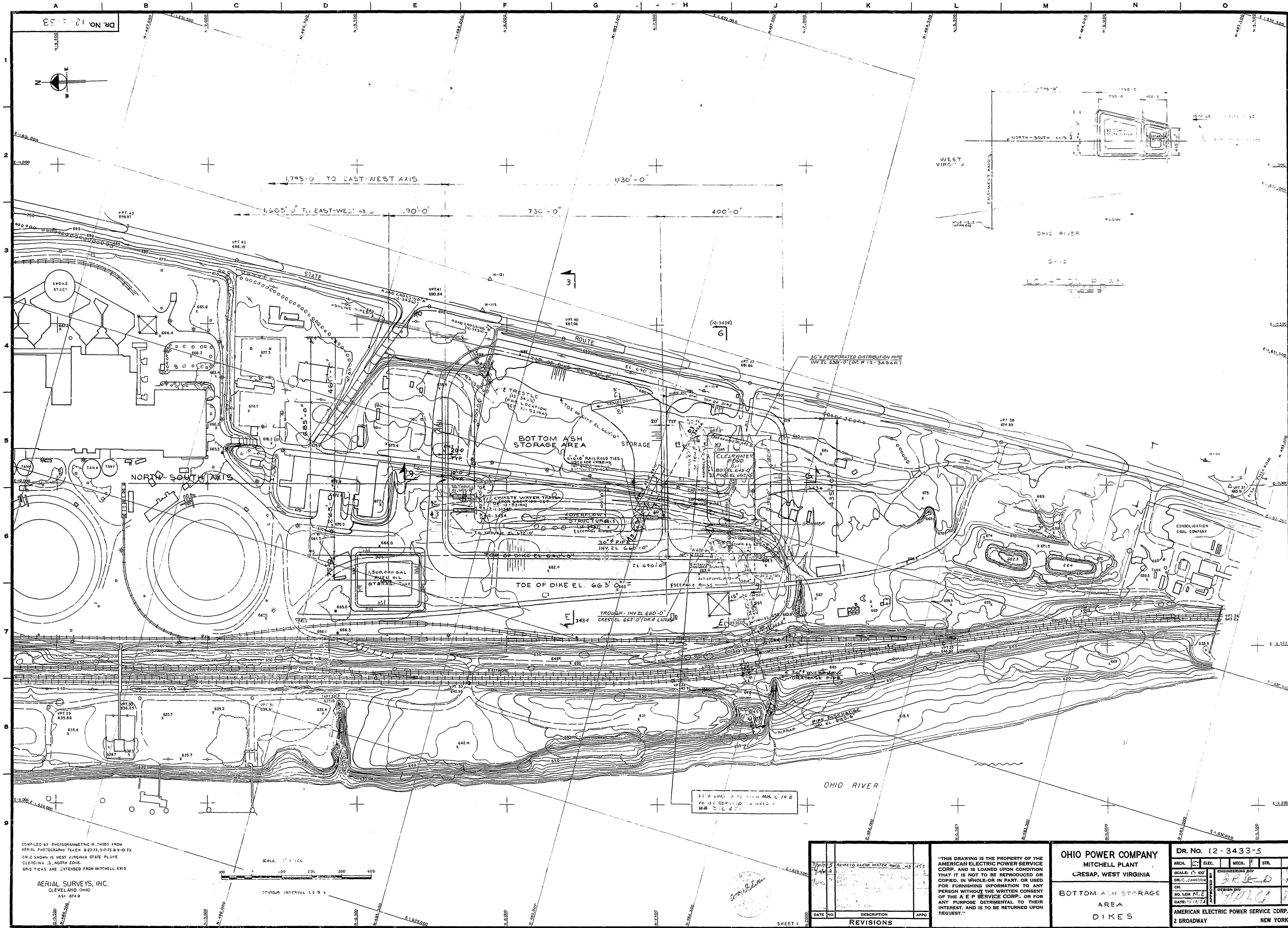
DR. NO. 12-3424 E

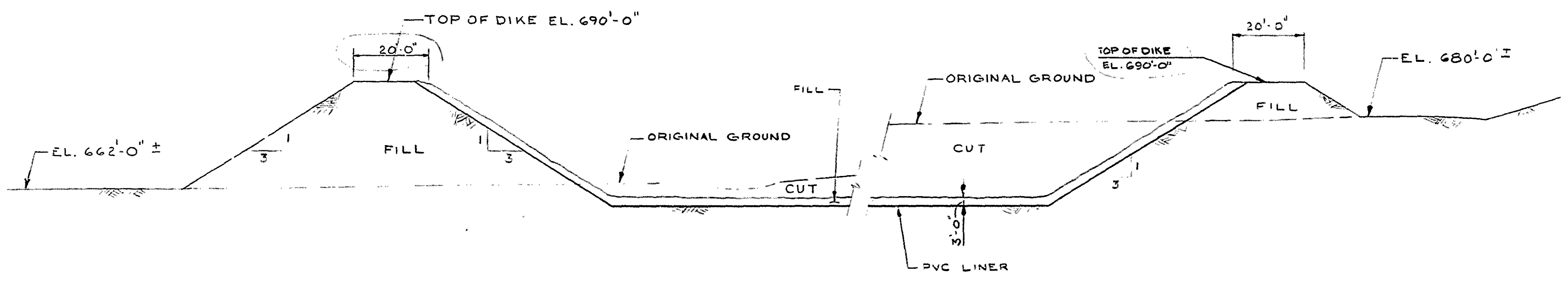
ARCH. | ELEC | MECH. | STR. W.B.

SCALE: AS NOTED
DR. EEM
CH. J.B.
SQ. LDR
DATE: 1/12/78

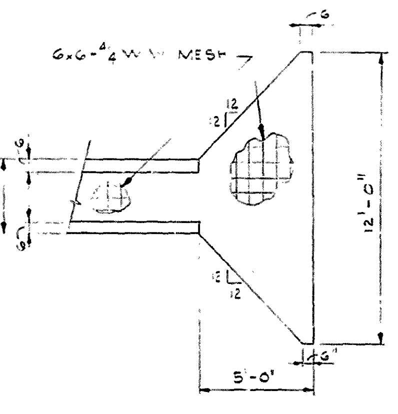
APPROVED BY — ENGINEERING DIV — DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

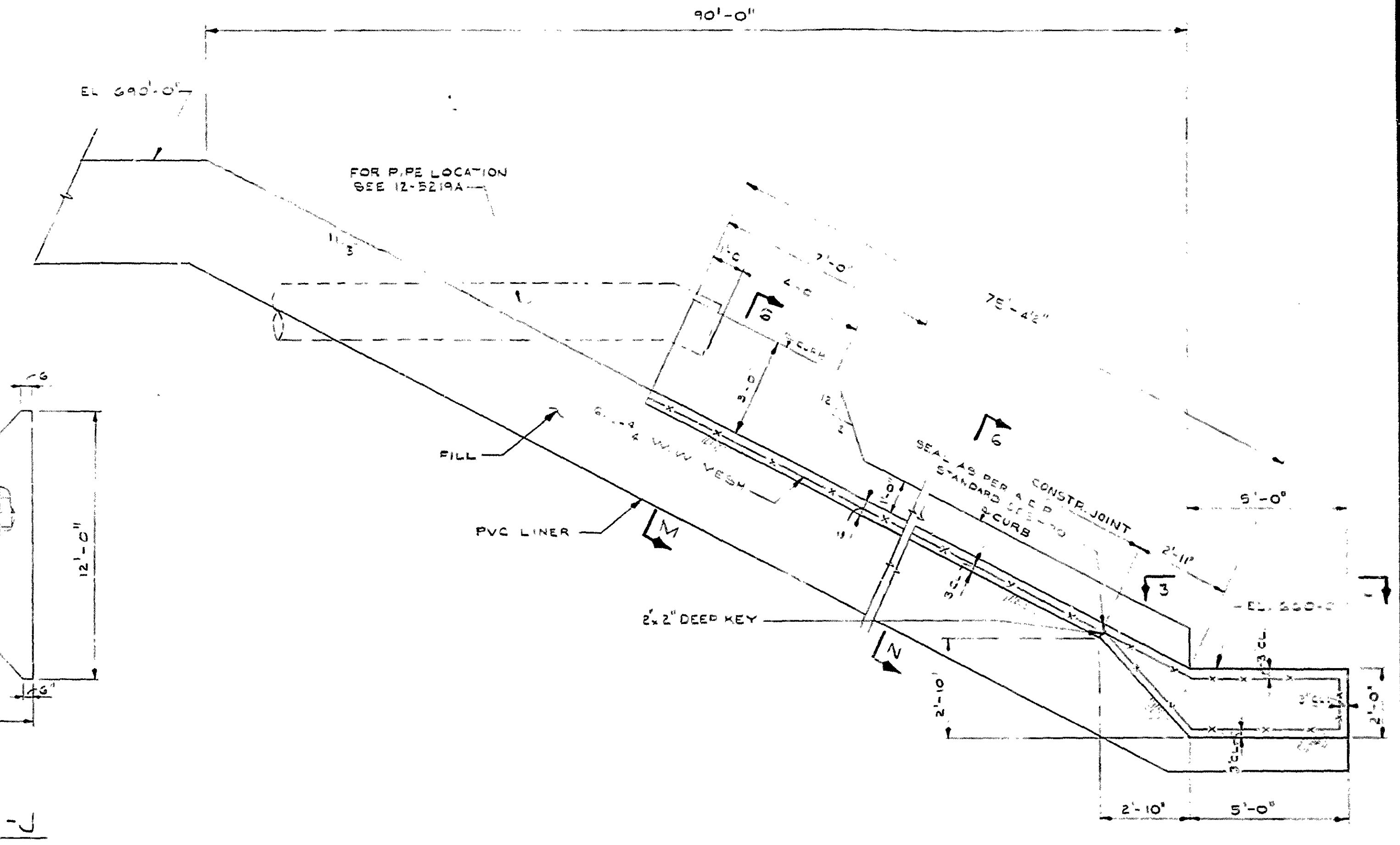

DR. NO. 12-3433-5
BOTTOM ASH STORAGE AREA
STORAGE
CLEARWATER POND
OVERFLOW STRUCTURE
WASTE WATER TROUGH
TOE OF DIKE EL. 663'-0"
TOP OF DIKE EL. 690'-0"
1,500,000 GAL FUEL OIL STORAGE TANK
SMOKE STACK
NORTH - SOUTH AXIS
STATE ROUTE 2
OHIO RIVER
SKIMMER
CONSOLIDATION COAL COMPANY
30"Ø PERFORATED DISTRIBUTION PIPE INV. EL. 650'-0" (DR. # 12-3434R)
TROUGH - INV. EL 660'-0"
PIPE DISCHARGE
RIPRAP
1,795'-0" TO EAST-WEST AXIS
1,605'-0" TO EAST-WEST AXIS
730'-0"
400'-0"
1,130'-0"
WEST VIRGINIA
OHIO RIVER
OHIO
LOCATION PLAN
FLOW
COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY TAKEN 8-23-73, 9-7-73 & 9-10-73.
GRID SHOWN IS WEST VIRGINIA STATE PLANE COORDINATES, NORTH ZONE.
GRID TICKS ARE EXTENDED FROM MITCHELL AXIS
AERIAL SURVEYS, INC.
CLEVELAND, OHIO
ASI 6748
SCALE 1" = 100'
CONTOUR INTERVAL 1, 2 & 5
3/30/75 5 REVISED CLEAR WATER POND
DATE
NO.
DESCRIPTION
APPD
REVISIONS
SHEET 1
"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE A E P SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST."
OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA
BOTTOM ASH STORAGE AREA
DIKES
DR. No. 12-3433-5
ARCH.
ELEC.
MECH.
STR.
SCALE: 1" = 100'
DR. C. JOHNSON
CH.
SQ. LDR N.E.
APPROVED BY
ENGINEERING DIV
DESIGN DIV
AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



SECTION 3-E
SCALE N.T.S.

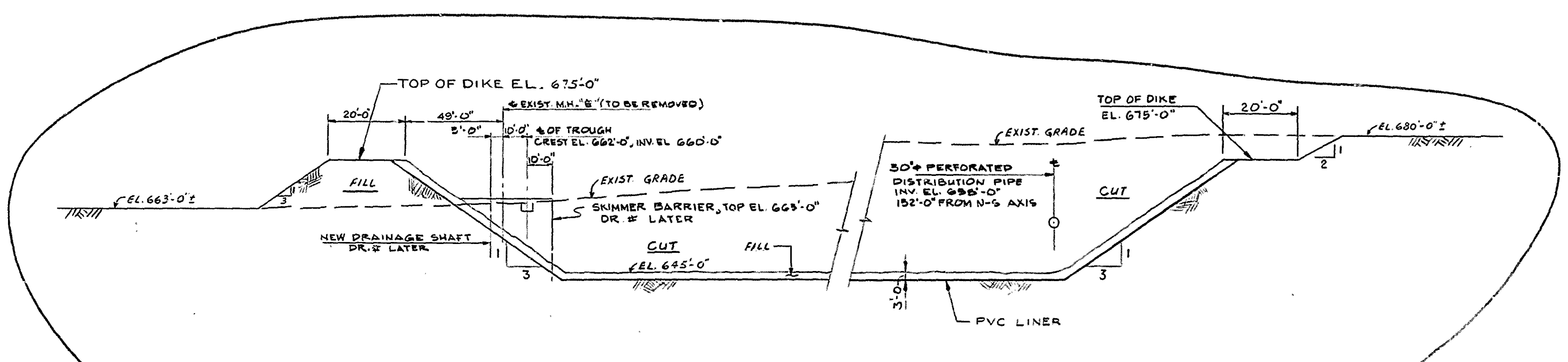


PLAN 3-J

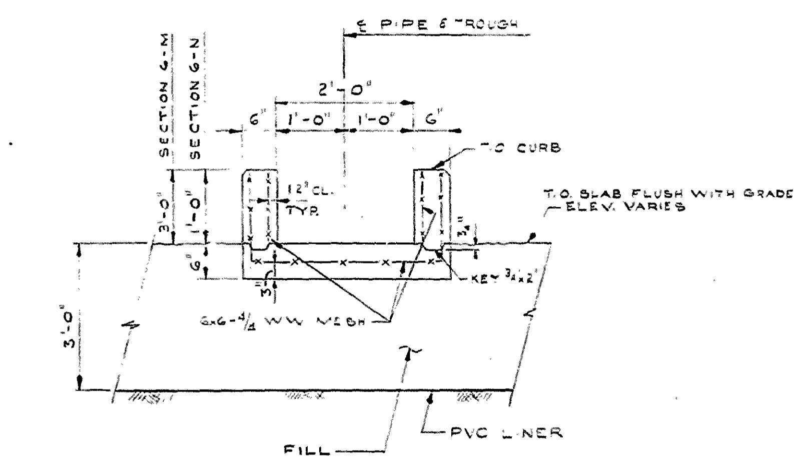


SECTION 3-K 12-3433

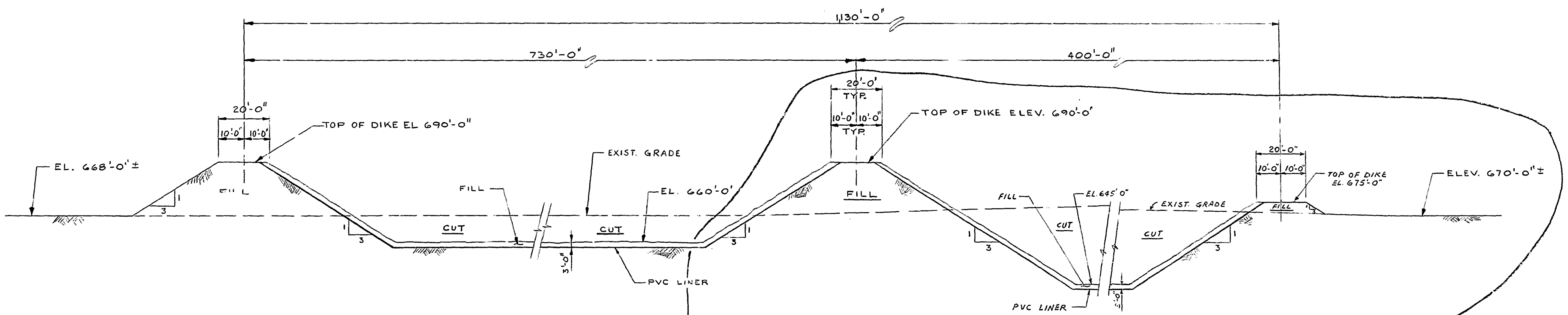
SCALE 3/8"=1'-0"



SECTION 6-E
SCALE N.T.S.



SECTION G-M (AS SHOWN & NOTED)
SECTION G-N (AS SHOWN & NOTED)



SECTION 9-G
SCALE N.T.S.

WORK THIS DWG WITH 12-3433

DATE	NO.	DESCRIPTION	APPD.
3/30/??	4	ADDED TOP OF DIKE DIM. & EL. SECT. 3-E REVISED SECT. 6-E & 9-G	HTS
1/6/76	3	SECTIONS FOR CONSTRUCTION OF CLEAR WATER POND RELEASED	W.I.
?/21/7?	2	GENERAL REVISION	W.S.
?/20/76	1	SECT. 3-J, 3-K & G-M ADDED	W.S.
10/10/7?	0	RELEASED FOR CONSTRUCTION	W.I.

REVISIONS

"THIS DRAWING IS THE PROPERTY OF THE AMERICAN ELECTRIC POWER SERVICE CORP. AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO ANY PERSON WITHOUT THE WRITTEN CONSENT OF THE AEP SERVICE CORP., OR FOR ANY PURPOSE DETRIMENTAL TO THEIR INTEREST, AND IS TO BE RETURNED UPON REQUEST"

OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM ASH STORAGE AREA - DIKES SECTIONS

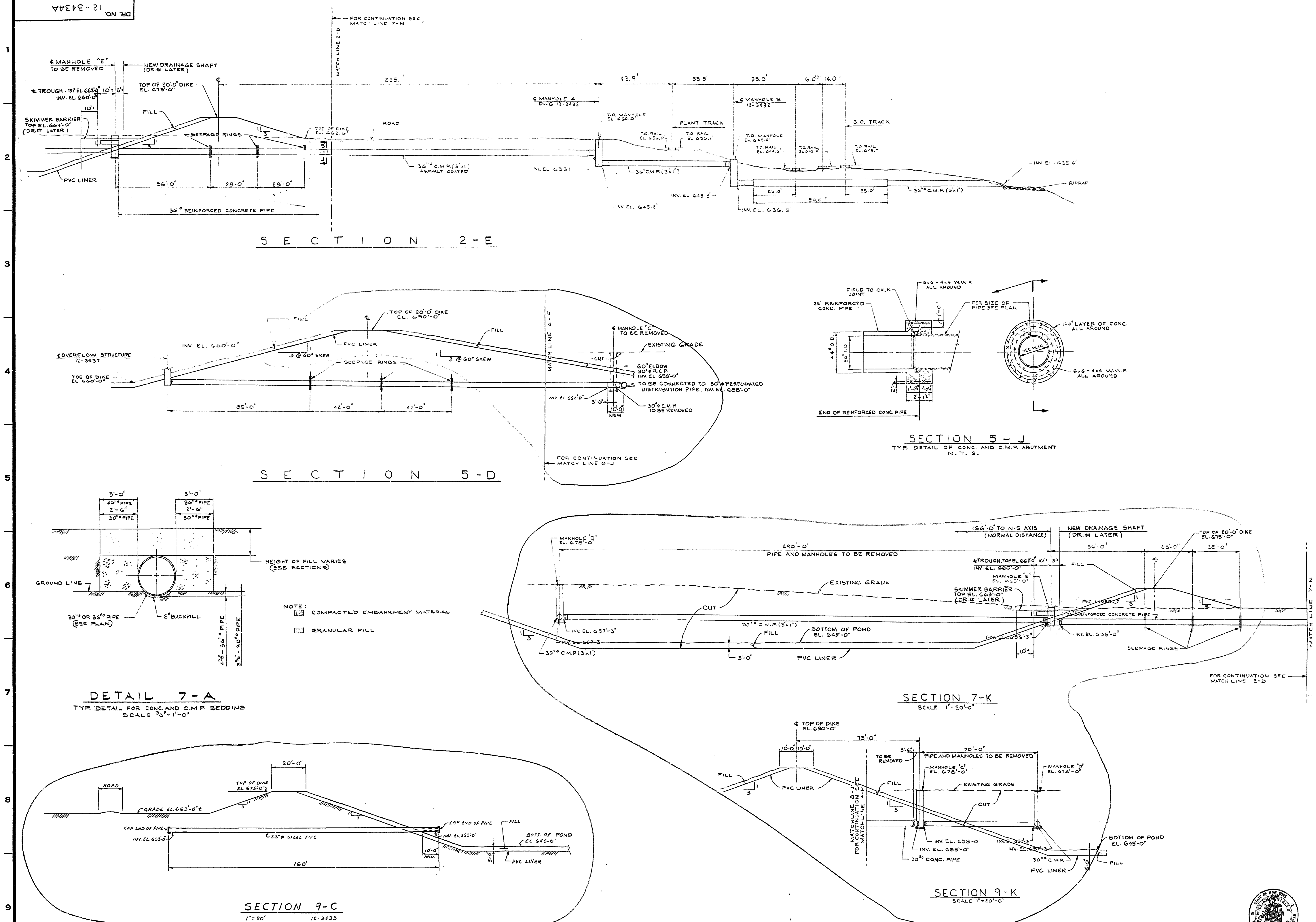
DR. NO. 12-3434-4

ARCH. | ELEC | MECH. | STR.

SCALE: AS NOTED
DR. C. JOHNSON
CH.
SQ. LDR M.E.
DATE: 6/19/76

APPROVED BY — ENGINEERING DIV — DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.



NOTE.
ALL TEMPORARY CORR. PIPES & MANHOLES
TO BE REMOVED FROM CLEAR WATER POND AREA

GENERAL NOTES

DO NOT SCALE THIS DWG

PIPE SPEC'S

1. FROM CLEAR WATER OVERFLOW STRUCTURE TO TEN (10) FEET BEYOND TOE OF DIKE – RCP – CLASS 5
   REMAINDER OF PIPE TO BE 36" CMP. ASPHALT COATED PAVED 40%
2. WHEN TWO PIPES ARE BANDED TO-GETHER, THE INVERT BETWEEN THE PIPES IN THE BANDED AREA IS TO BE PAVED TO THE SAME THICKNESS AS THE PAVED PIPE.

MATERIAL

30" ø DIA. CONC. PIPE	248 LIN FT.
36" ø DIA. CONC. PIPE	112 LIN FT.
36" ø DIA. CORR. M. PIPE ...	400 LIN FT.
30" ø DIA. CORR. M. PIPE ...	354 LIN FT.

REVISION # 3

36" ø STEEL PIPE 160 LIN FT

CORRUGATED PIPE & SEEP RINGS
BY: WHEELING CORR METALS
ORD.# 08522-841-4

CONCRETE PIPE
BY: PRICE BROS. CO.
ORD. # 08675-841-4

CORRUGATED PIPE (30" ø DIA)
BY: ARMCO STEEL CORP
ORD. # 02144-841-5

PIPE BACKFILL SPECIFICATIONS

SPECIALLY COMPACTED PERVIOUS BACKFILL AROUND PIPES

FOR SECTIONS OF PIPE SHOWN ON THE DRAWINGS, WHICH CALL FOR SPECIALLY COMPACTED PERVIOUS BACKFILL THE BACKFILL MATERIAL SHALL BE A CLEAN SAND OR A SAND AND GRAVEL. THE PERVIOUS MATERIAL SHALL BE SATURATED PRIOR TO COMPACTION COMPACTION SHALL CONSIST OF A MINIMUM OF FOUR (4) COMPLETE PASSES OF A HAND OPERATED RAMMER TYPE COMPACTOR A TYPE COMPARABLE TO THE WACKER MODEL 200 OR ITS EQUIVALENT. THREE (3) FEET OF SPECIALLY COMPACTED BACKFILL ABOVE THE THE PIPES IS REQUIRED BEFORE HEAVY EQUIPMENT IS PERMITTED TO PASS OVER THE SECTIONS.

STATE OF NEW YORK · WILLIAM H. STELLE · LIC. No. 27906 · LICENSED PROFESSIONAL ENGINEER

WORK THIS DWG WITH 12-3433

REVISIONS

DATE	NO.	DESCRIPTION	APPD.
3/30/78	3	REVISED SECTS. 2-E, 5-D, 7-K & 9-K ADDED SECT. 9-C	HTS
1/6/76	2	SECTIONS REVISED	W.S
3/19/75	1	SECTIONS REVISED & ADDED	W.S
[illegible]	0	RELEASED FOR CONSTRUCTION	W.S

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

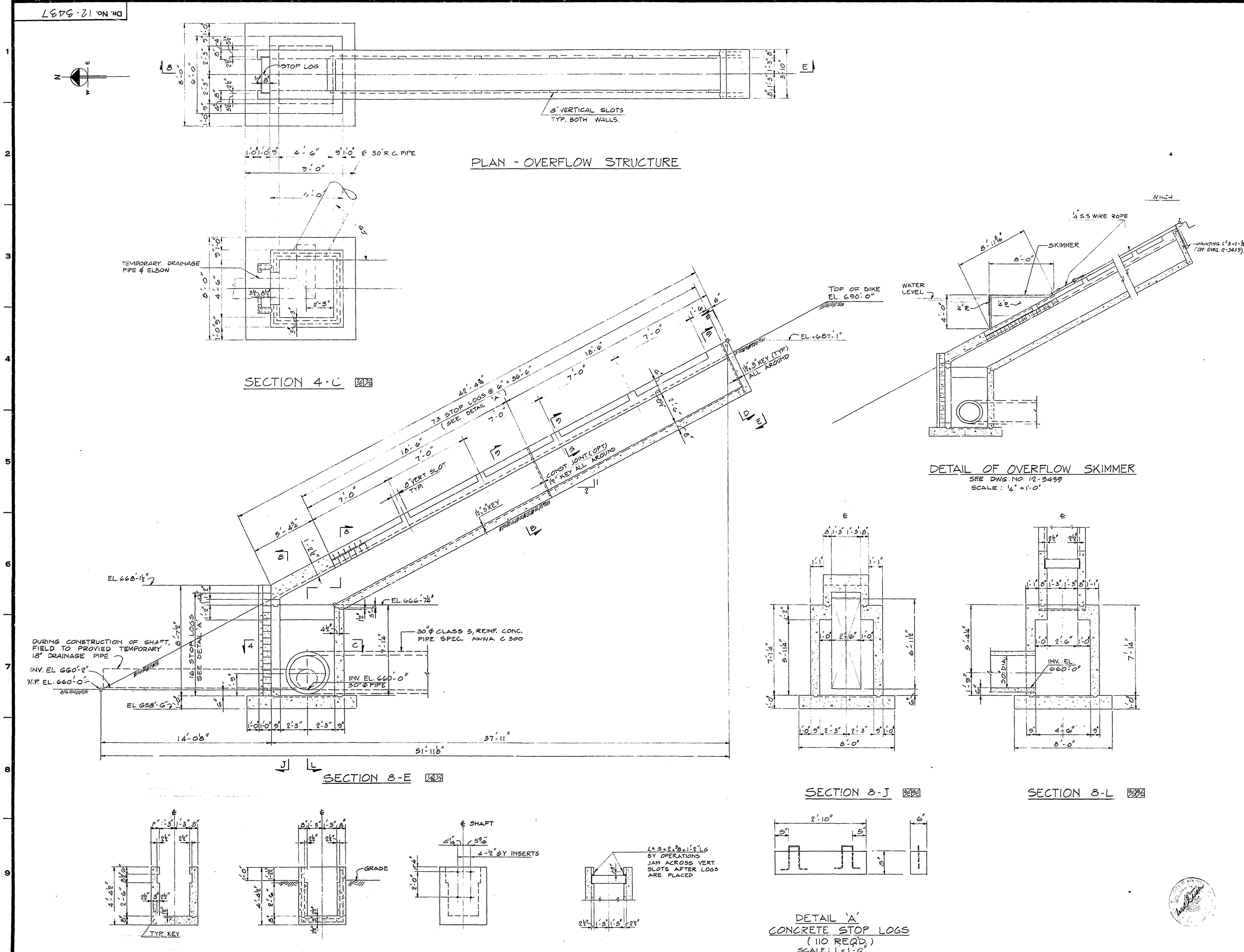
BOTTOM ASH STORAGE AREA SECTIONS

DR. NO. 12-3434A-3

ARCH. | ELEC | MECH. | STR.

SCALE: 1" = 20'
DR C.N.J.
CH
SQ. LDR M.E.
DATE: 8/19/74
APPROVED BY: ENGINEERING DIV [signature]; DESIGN DIV [signature]

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



WOLCHUK AND MAYRBAURL
CONSULTING ENGINEERS. NEW YORK. N. Y.

GENERAL NOTES

1. DO NOT SCALE THIS DWG.

CONCRETE

1. ALL CONCRETE MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE A.E.P.S CORP SPECIFICATION # 1000 A.
2. CONSTRUCTION JOINTS ARE NOT TO BE ADDED, OMITTED OR RELOCATED, EXCEPT WITH THE WRITTEN APPROVAL OF THE N.Y. OFFICE. AND FURTHER PROVIDED THAT THE CONTRACTOR'S MIXING AND PLACING EQUIPMENT IS PROPERLY SIZED SO THAT NO COLD JOINTS WILL RESULT IN THE CONCRETE.
3. ALL EXPOSED EDGES SHALL HAVE A 1" INCH BEVEL.
4. ALL EXPOSED VERTICAL EXTERIOR CONCRETE SURFACES TO HAVE RUBBED FINISH.
5. CONCRETE SHALL HAVE MINIMUM COMPRESSIVE STRENGTH (f'c) OF 3000 PSI AT 28 DAYS

FOUNDATION

1. SOIL PRESSURE = 2 KSF

MATERIAL

CONCRETE: APPROX. 22 YDS.
4 - ½" ϕ Y INSERTS BY: FIELD

REFERENCE DRAWINGS

12-3433 — BOTT. ASH STORAGE AREA DIKES
12-3434 — BOTT ASH STORAGE AREA DIKE SECTIONS
12-3437A — OVERFLOW STRUCTURE REINFORCEMENT
RS-48 — REINFORCEMENT SCHEDULE
12-3439 — OVERFLOW STRUCTURE SKIMMERS

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

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OHIO POWER COMPANY
MITCHELL PLANT
CRESAP, WEST VIRGINIA

BOTTOM-ASH STORAGE AREA
OVERFLOW STRUCTURE
MASONRY

DR. NO. 12-3437

ARCH. | ELEC | MECH. | STR.

SCALE: ⅜"=1'-0"
DR. D.V.
CH. R.M.M.
SQ. LDR. R.M.M.
DATE: 8/9/74
APPROVED BY: ENGINEERING DIV / DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

NOTES

1. PLAN ADAPTED FROM DRAWINGS PROVIDED BY AEPSC, DATED 11-10-10.
2. CTB DRAIN LINES AND SECTION LINES BASED ON DRAWINGS PROVIDED BY AEP SERVICE CORPORATION.

LEGEND

SP1 — SP1 SECTION LIMITS

0+00

SETH W. FRANK REGISTERED 20574 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

9-26-14

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

PLAN VIEW

MITCHELL BLOWDOWN WATER REROUTE
BOTTOM ASH COMPLEX

MARSHALL COUNTY, WEST VIRGINIA

SCALE: AS SHOWN | DR RAR | CHK RWC | REV SWF

PREPARED FOR:

AEP SERVICE CORPORATION

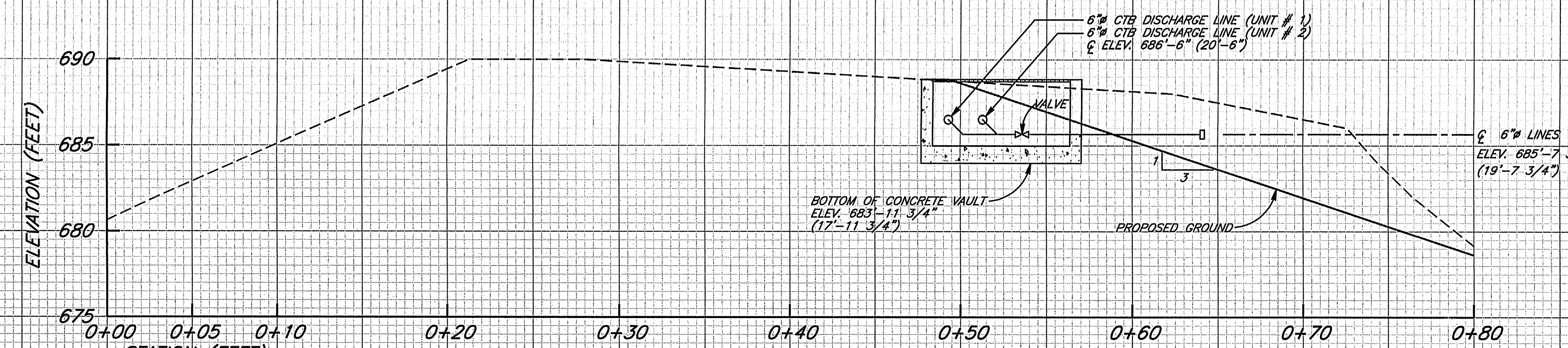
PREPARED BY:

GA Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

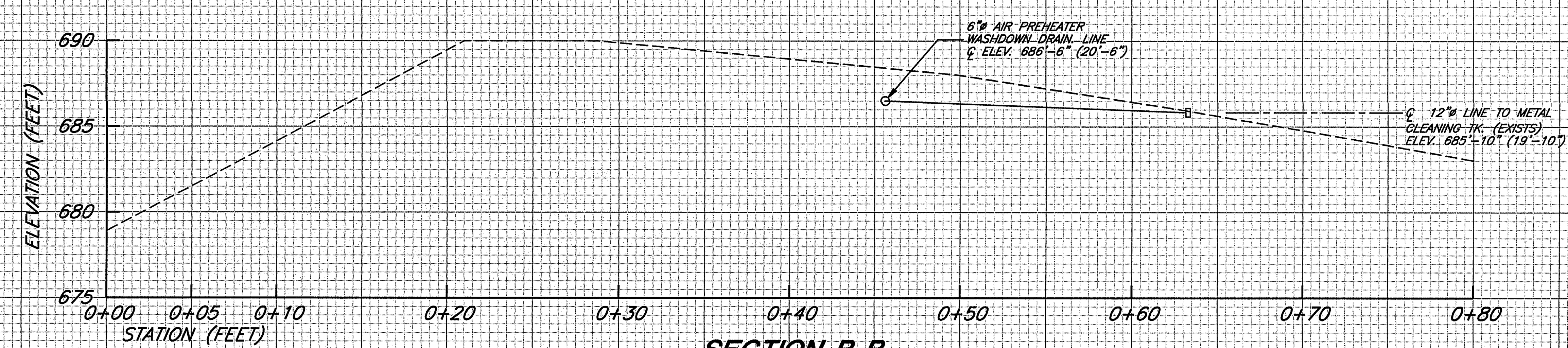
PROJ: 01-2698A | DATE: 9-26-14 | SHEET 1 OF 2

NOTE:

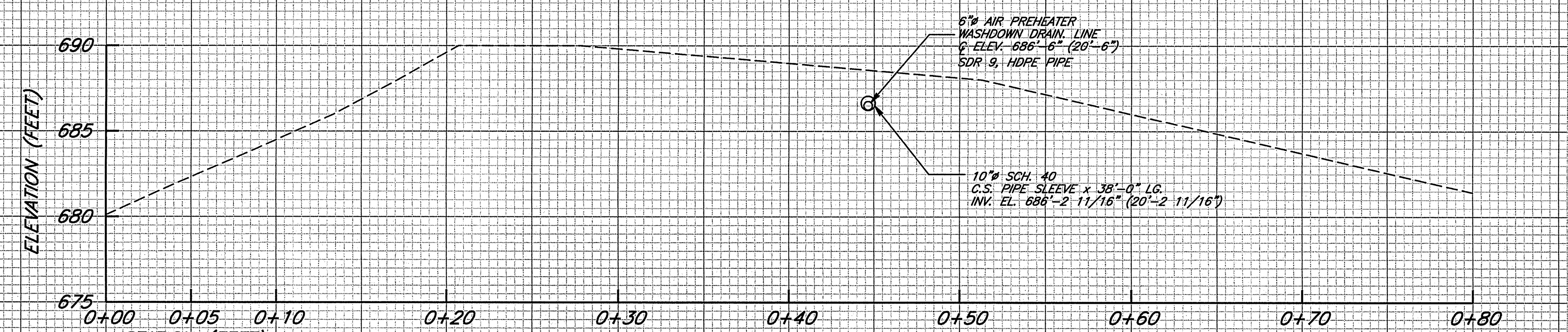
CTB DISCHARGE LINES AND APPURTENANCES LOCATED BASED ON DRAWINGS PROVIDED BY AEP SERVICE CORPORATION.



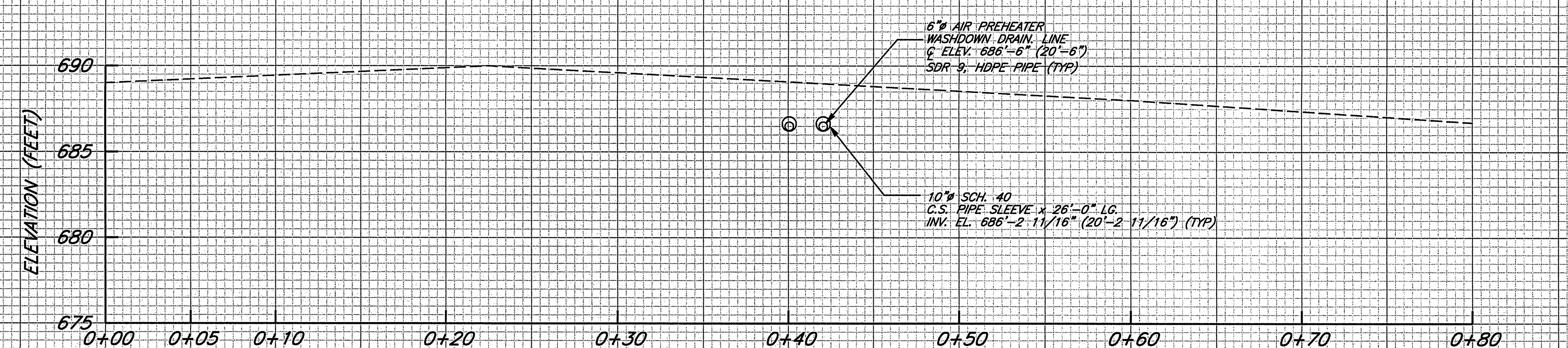
SECTION A-A



SECTION B-B



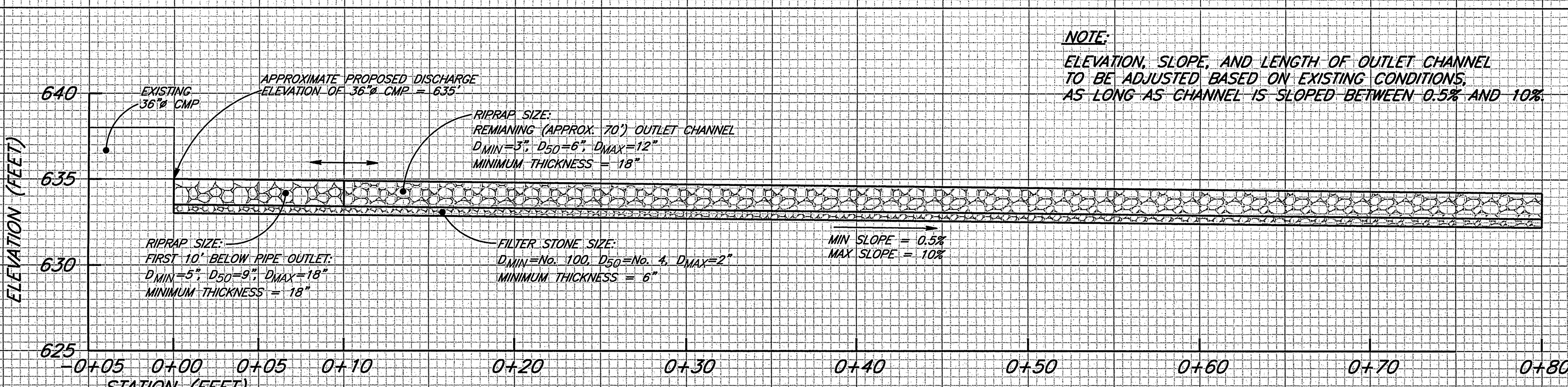
SECTION C-C



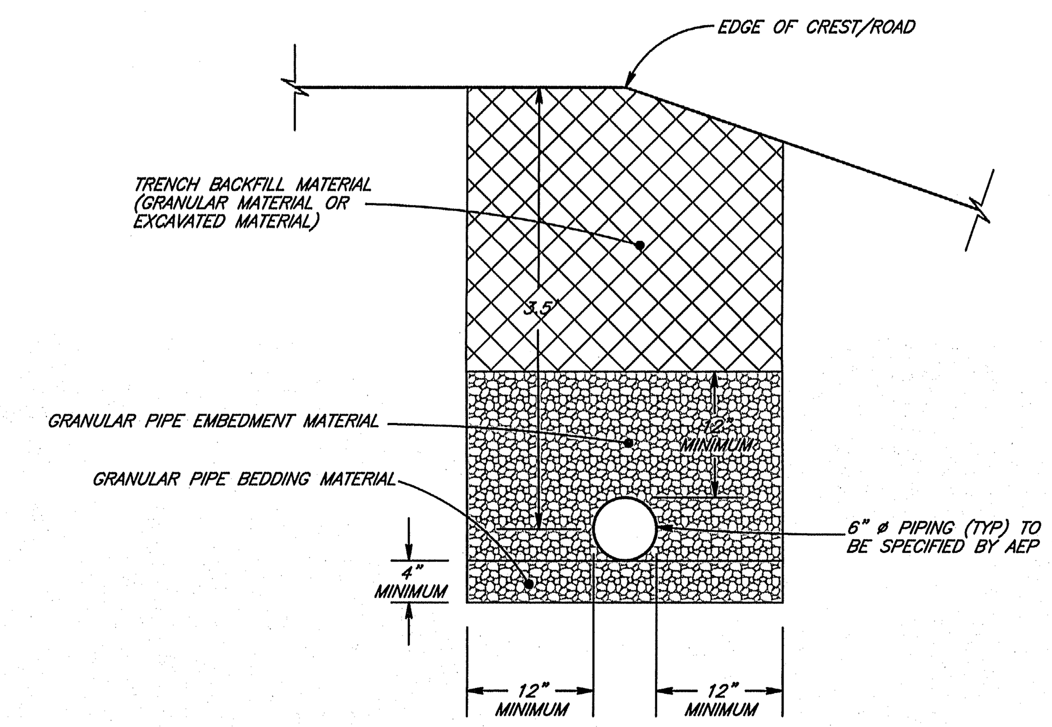
SECTION D-D

NOTE:

ELEVATION, SLOPE, AND LENGTH OF OUTLET CHANNEL TO BE ADJUSTED BASED ON EXISTING CONDITIONS, AS LONG AS CHANNEL IS SLOPED BETWEEN 0.5% AND 10%.

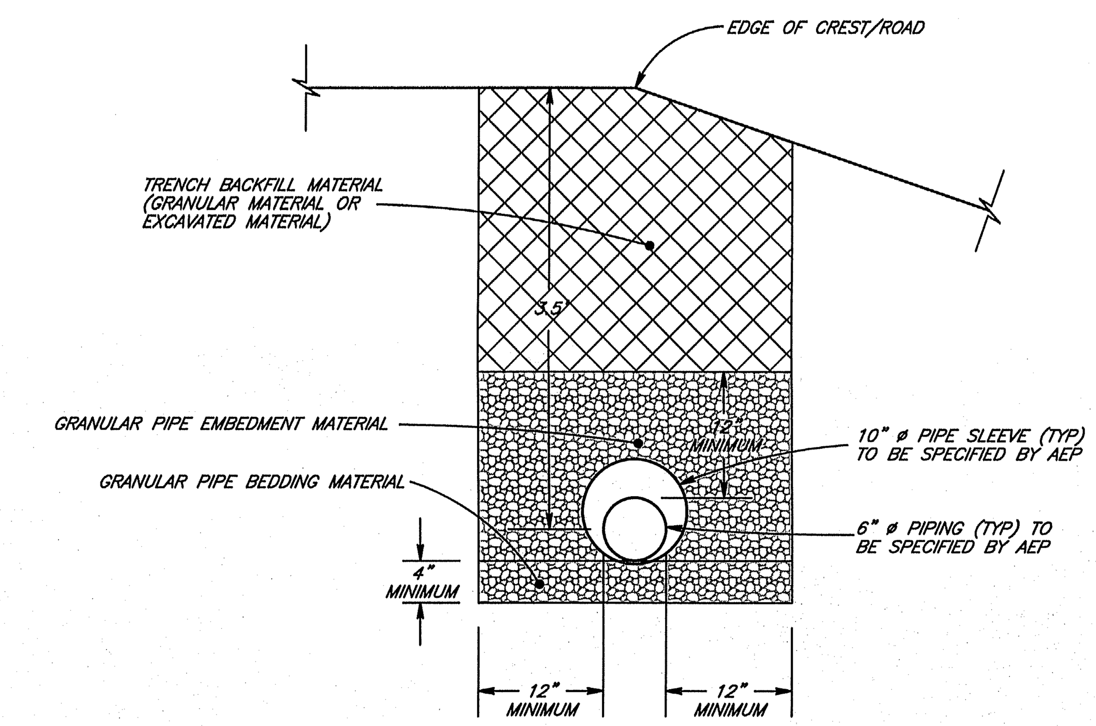


BOTTOM ASH POND OPEN CHANNEL OUTLET PROFILE



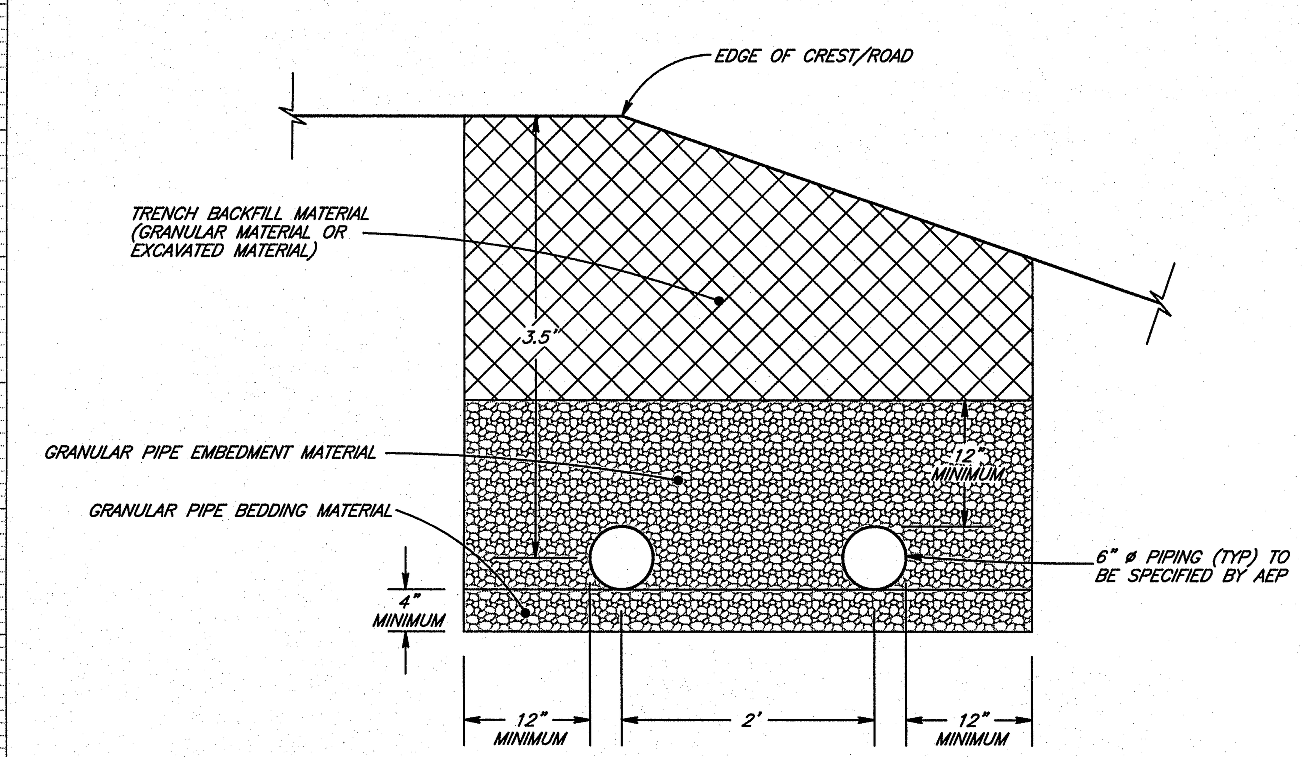
TYPICAL INSTALLATION DETAIL
(ONE 6-INCH PIPE)

SCALE: 1" = 1'



TYPICAL INSTALLATION DETAIL
(ONE 10-INCH PIPE SLEEVE)

SCALE: 1" = 1'



TYPICAL INSTALLATION DETAIL
(TWO 6-INCH PIPES)

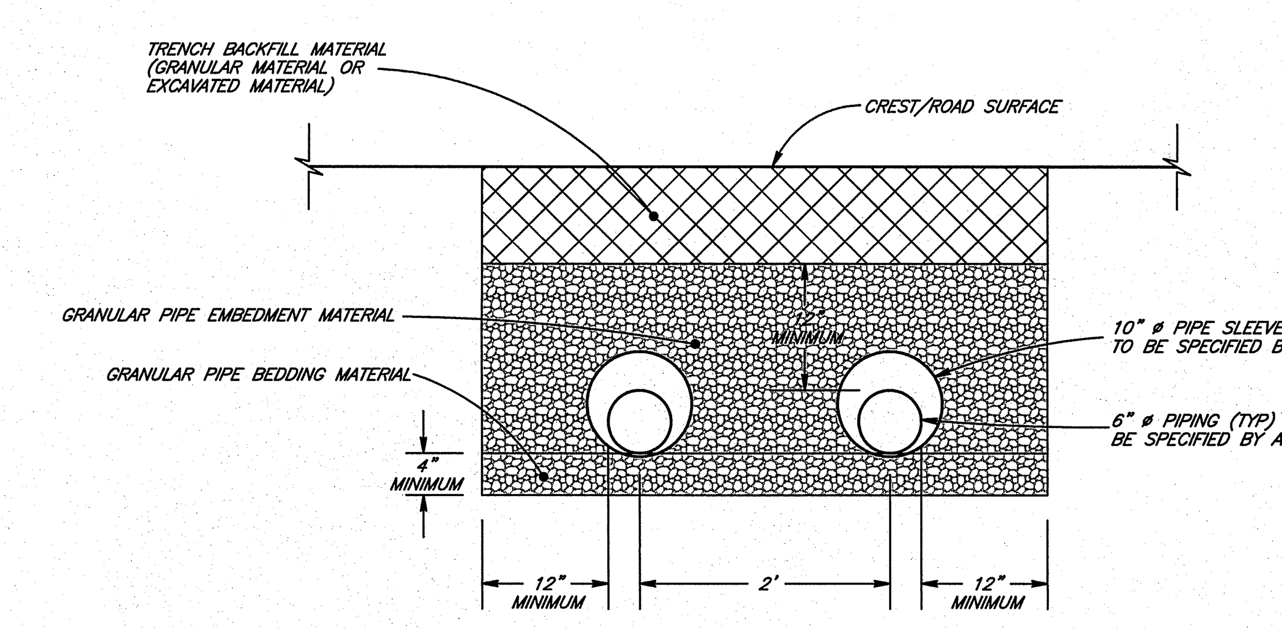
SCALE: 1" = 1'

MATERIAL PLACEMENT CRITERIA

MATERIAL	MAXIMUM LIFT THICKNESS	COMPACTION
GRANULAR PIPE BEDDING MATERIAL	4"	95 % (ASTM D 698)
GRANULAR PIPE EMBEDMENT MATERIAL	3"	95 % (ASTM D 698)
TRENCH BACKFILL MATERIAL	12"	95 % (ASTM D 698)

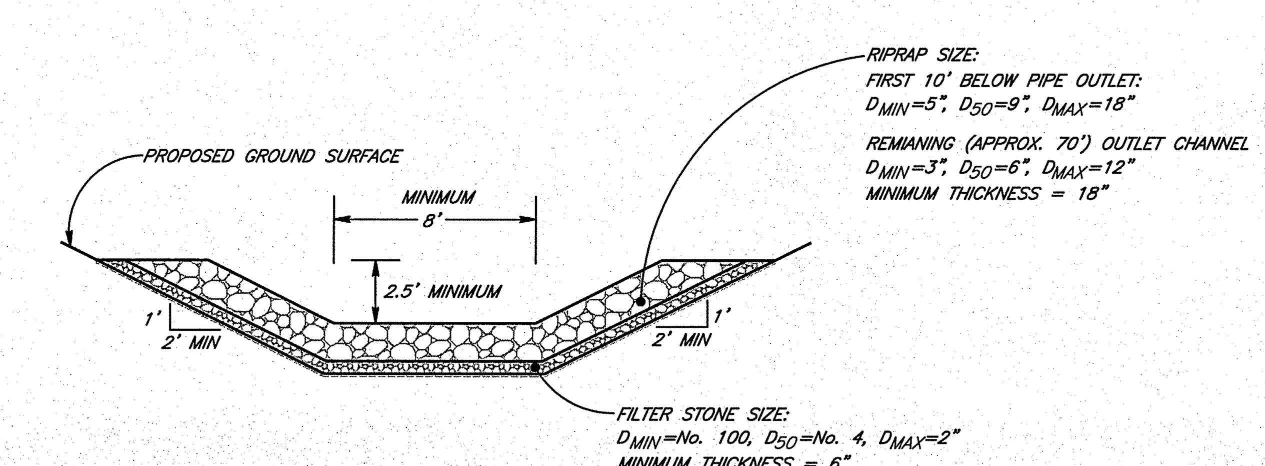
NOTE:

PIPE BEDDING MATERIAL, PIPE EMBEDMENT MATERIAL, AND TRENCH BACKFILL MATERIAL SHALL BE PLACED IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS AND COMPACTED TO AT LEAST 95 % OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D 698).



TYPICAL INSTALLATION DETAIL
(TWO 10-INCH PIPE SLEEVES)

SCALE: 1" = 1'



BOTTOM ASH POND OPEN CHANNEL OUTLET SECTION (TYP)

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

SETH W. FRANK, REGISTERED 20574, STATE OF WEST VIRGINIA, PROFESSIONAL ENGINEER — 9-26-14

DATE	REVISIONS	BY

SECTIONS AND DETAILS

MITCHELL BLOWDOWN WATER REROUTE
BOTTOM ASH COMPLEX
MARSHALL COUNTY, WEST VIRGINIA

SCALE: AS SHOWN | DR RAR | CHK RWC | REV SWF

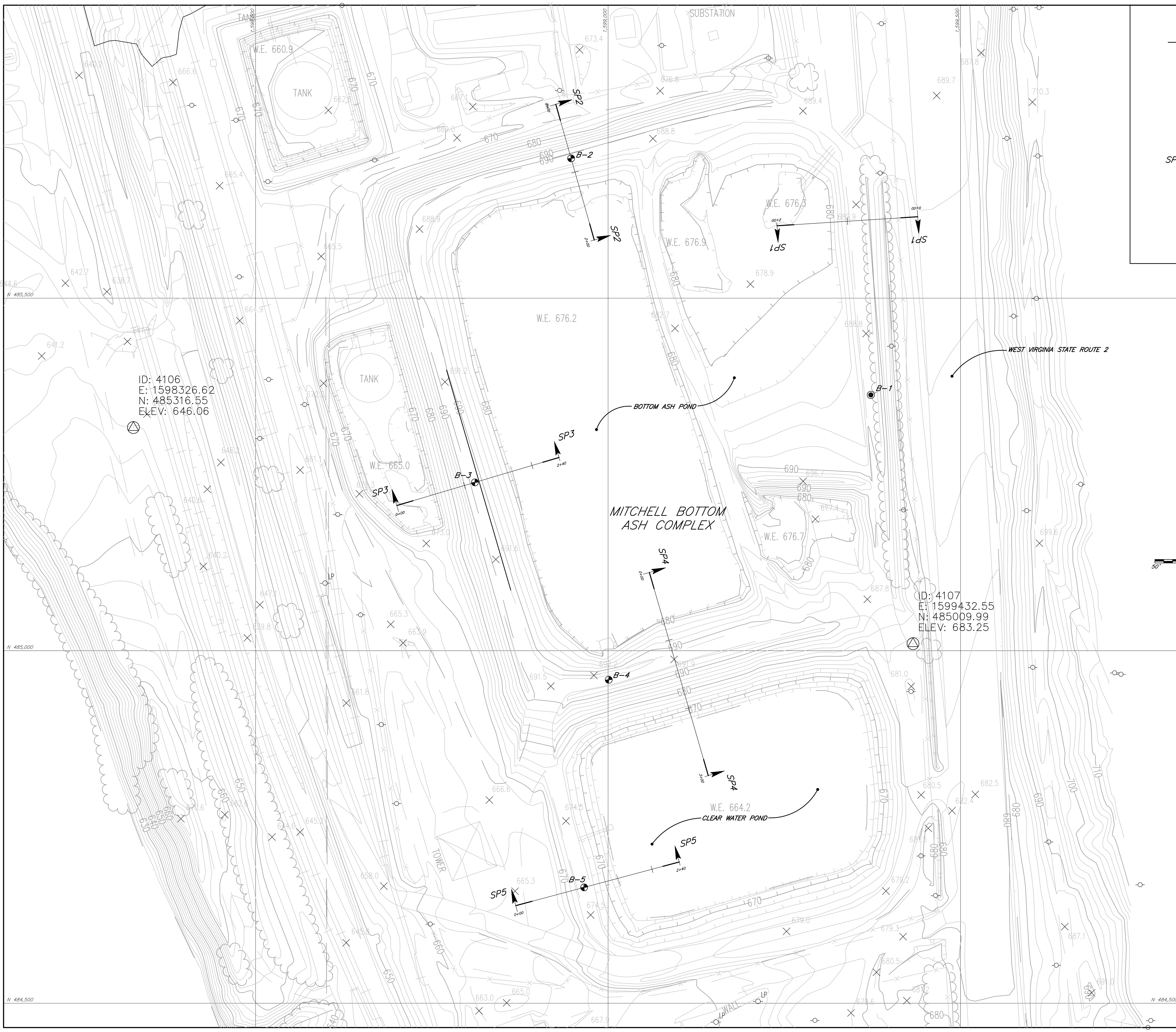
PREPARED FOR:
AEP SERVICE CORPORATION

PREPARED BY:
GA Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

PROJ: 01-269BA | DATE: 9-26-14 | SHEET 2 OF 2

<u>ATTACHMENT D</u>

INSTRUMENTATION LOCATION MAP



NOTES

1. PLAN ADAPTED FROM DRAWINGS PROVIDED BY AEPSC, DATED 4-13-01
2. BOREHOLE LOCATIONS AND ELEVATIONS PROVIDED BY AEPSC, SURVEYED 3-5-09.

LEGEND

SP1 — SP1 (0+00) PROFILE LIMITS

B-1 SAMPLED BOREHOLE LOCATION

B-2 SAMPLED BOREHOLE LOCATION WITH PIEZOMETER

"I, the undersigned, hereby certify that this map is correct and shows, to the best of my knowledge and belief, all the information required by the surface mining laws of the State of West Virginia."

ROGER W. CECIL, R.P.E. No. 14367

State of Tennessee, County of Knox, taken, subscribed, and sworn to before me this ________ day of __________________, __________.

Notary Public

My Commission Expires ________________

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

PLAN VIEW

WVDWWM ORDER RESPONSES (ITEM 2)
MITCHELL BOTTOM ASH COMPLEX

MARSHALL COUNTY, WEST VIRGINIA

SCALE: AS SHOWN | DR RWC | CHK SWF | REV RWC

PREPARED FOR:

AEP SERVICE CORPORATION

PREPARED BY:

Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

PROJ: 09-379 | DATE: 3-18-09 | SHEET 1 OF 3

ATTACHMENT E

HYDROLOGY AND HYDROLOGIC REPORT

We power life's possibilities

CCR RULES ASSESSMENT AND CERTIFICATION
MITCHELL PLANT BOTTOM ASH COMPLEX
KENTUCKY POWER COMPANY
AEP SERVICE CORPORATION

PREPARED BY:
GEO/ENVIRONMENTAL ASSOCIATES, INC.
A SCHNABEL ENGINEERING COMPANY
KNOXVILLE, TENNESSEE

PROJECT NUMBER 15055013.00
DECEMBER 22, 2015

GA

TABLE OF CONTENTS

APPENDICES

CCR RULES ASSESSMENT AND CERTIFICATION
MITCHELL POWER PLANT BOTTOM ASH COMPLEX
KENTUCKY POWER COMPANY
MARSHALL COUNTY, WEST VIRGINIA
DECEMBER 22, 2015

INTRODUCTION

Geo/Environmental Associates, Inc. (GA) has performed a site inspection, conducted an engineering assessment, and prepared a certification statement for the Mitchell Power Plant Bottom Ash Complex. These services were performed to meet specific requirements set forth in the Environmental Protection Agency's CCR Rules.(1) Provided in this report is a discussion of GA's findings and a certification statement pertaining to the facility. Field and laboratory data, engineering analyses, and a drawing are included in the appendices.

SITE DESCRIPTION

General

The Mitchell Bottom Ash Complex is equally owned by American Electric Power Generation Resources, Inc. and Kentucky Power Company (KPC) and it is operated by KPC to provide disposal capacity for bottom ash generated at the Mitchell Power Plant. AEPSC, based in Columbus, Ohio, provides engineering support for the Bottom Ash Complex. The Mitchell Bottom Ash Complex is located near Cresap in Marshall County, West Virginia at approximately latitude 39° 49' 30" and longitude 80° 48' 56".

The complex is surrounded by: (1) the Mitchell Power Plant on its north side, (2) West Virginia State Route 2 on its east side, (3) the adjacent wallboard facility and ancillary structures on its south side, and (4) the metal cleaning tank, railroad tracks, and the Ohio River on its west side. As shown on drawing sheet 1 in Appendix IV, the Mitchell Bottom Ash Complex consists of two impounding facilities: (1) the Bottom Ash Pond and (2) the Clear Water Pond. The Bottom Ash Pond comprises the north portion of the complex and the Clear Water Pond comprises the southern portion. The Mitchell Bottom Ash Complex is regulated by the West Virginia Division of Water and Waste Management (WVDWWM) as a Hazard Class "2" structure.

The Bottom Ash Pond is separated into ponding areas in its western and northeastern portions. In general, bottom ash is sluiced into the northeastern portion of the pond; where after, the sluice water is routed through an interior splitter dike to the western portion of the pond. Flow through the western portion of the pond is routed around three interior flow diversion dikes. The southeastern portion of the Bottom Ash Pond is above the normal operating pool (pond) level

(1) Environmental Protection Agency, 40 CFR Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal combustion Residuals from Electric Utilities; Final Rule," April 17, 2015

and is used as an excavation and loadout area for bottom ash. The Bottom Ash Pond was constructed partially as an incised pond and partially using raised dike construction. Specifically, the pool level on the east side of the pond is generally below the bottom elevation of the east dike (i.e., it is incised). The inside slopes of the Bottom Ash Pond are lined with a composite soil and PVC liner. The southern dike separates the Bottom Ash Pond and Clear Water Pond.

Overflow from the western portion of the Bottom Ash Pond is conveyed to the Clear Water Pond via a concrete overflow shaft and a 30-inch diameter reinforced concrete pipe to a 30-inch diameter perforated distribution pipe in the Clear Water Pond. The Clear Water Pond was constructed using both incised pond and diked pond construction methods. In general, the pool levels along the southern and eastern sides of the Clear Water Pond are primarily incised. Similar to the Bottom Ash Pond, the inside slopes of the Clear Water Pond are lined with a composite soil and PVC liner. Overflow from the Clear Water Pond is conveyed through an overflow tower into a 36-inch diameter reinforced concrete pipe through the embankment and then a series of 36-inch diameter corrugated metal pipes which discharge into a riprap-lined channel leading to the Ohio River.

Approximate Existing Conditions

A summary of the approximate existing conditions for the Mitchell Bottom Ash Complex is provided in List 1. A site plan view of the facility is included in Appendix IV.

LIST 1
SUMMARY OF APPROXIMATE EXISTING CONDITIONS
FOR MITCHELL BOTTOM ASH COMPLEX

Bottom Ash Pond Crest Elevation	690 feet, NAVD
Bottom Ash Pond Normal Operating Pool Level	681 feet, NAVD
Bottom Ash Pond Design Storm Level (1)	682.98 feet, NAVD
Bottom Ash Pond Bottom Level	660 feet, NAVD
Clear Water Pond Crest Elevation	675 feet, NAVD
Clear Water Pond Normal Operating Pool Level	664 feet, NAVD
Clear Water Pond Design Storm Level (2)	665.62 feet, NAVD
Clear Water Pond Bottom Level	645 feet, NAVD

Notes:

(1) The Bottom Ash Pond maximum design storm level is based on a normal operating pool elevation of 681 feet, NAVD and a pool increase of 1.98 feet during the 1/2 PMP 6-hour storm event.

(2) The Clear Water Pond maximum design storm level is based on a normal operating pool elevation of 664 feet, NAVD and a pool increase of 1.62 feet during the 1/2 PMP 6-hour storm event.

SITE INSPECTION

At the request of AEPSC, GA personnel performed a site inspection of the Bottom Ash Complex to observe and document the prevalent site conditions. Specifically, Seth W. Frank, P.E. (GA) performed a site inspection of the Bottom Ash Complex on July 14, 2015. It is GA's opinion that the Bottom Ash Complex is in good condition. Moreover, GA believes that the conditions observed, during the July 14, 2015, site inspection, are representative of the conditions modeled in the assessments and analyses provided in this report.

FIELD, LABORATORY, AND INSTRUMENTATION DATA

For reference, pertinent field and laboratory data for the Bottom Ash Complex is provided in Appendix I. The field and laboratory data were gathered during a subsurface investigation coordinated by GA in 2009. The field data includes detailed borehole logs and results of in-situ testing (i.e., standard penetration testing). Laboratory data provided in Appendix I includes: (1) grain size distributions, (2) Atterberg limits test results, (3) unconfined compressive strength test results, and (4) triaxial compressive strength test results.

AEP monitors four standpipe piezometers, at the Bottom Ash Complex facility, monthly. Results of instrumentation monitoring are collected and summarized in annual inspection reports.

Locations of the site boreholes/piezometers are shown on the Site Plan View drawing in Appendix IV.

HYDRAULICS AND HYDROLOGY

Flood routing analyses were developed for the existing conditions at the Bottom Ash Complex using the *HEC-1* computer program, developed by the U.S. Army Corps of Engineers. Flood routing parameters and the *HEC-1* output are provided in Appendix II. In accordance with the 40 CFR Parts 257 and 261 (CCR Rules), the flood routing analyses were performed using the 1/2 PMP 6-hour storm event. A summary of the flood routing results is provided in Table 1.

TABLE 1
SUMMARY OF FLOOD ROUTING ANALYSES
FOR EXISTING CONDITIONS

Pond	Crest Elevation (ft, NAVD)	Design Storm	Principal Spillway/Overflow Structure Invert Elevation/Pool at Start of storm (ft, NAVD)	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Stage (ft, NAVD)	Minimum Freeboard (ft)
Bottom Ash	690'	1/2 PMP6-hour	681'	111.08	23.83	683.51	6.49
Clearwater	675'	1/2 PMP6-hour	664'	71.44	44.76	666.50	8.50

As shown in Table 1, the as-built Bottom Ash Pond and Clearwater Pond are capable of storing/routing the 1/2 PMP 6-hour storm event, while providing at least 3 feet of freeboard for the minimum embankment crest elevations of 690 feet, NAVD and 675 feet, NAVD respectively. Note that the storm routing analyses assume a constant, peak inflow of 7.5 million gallons per day from plant processes, in addition to the storm runoff.

SLOPE STABILITY ANALYSES

General

The computer program *SLOPE/W*, developed by GEO-SLOPE International, Ltd., was used to perform slope stability analyses on two critical embankment profiles for the as-built Bottom Ash Complex. Specifically, the Morgenstern-Price limit equilibrium method was applied in the slope stability analyses. The slope stability analyses were conducted for the as-built Bottom Ash Complex Profiles SP1-SP1 and SP2-SP2. Locations of the critical profiles are shown on the

CERTIFICATION STATEMENT

Based on the site inspections, review of construction monitoring and periodic inspection data, the results of the field and laboratory testing of the materials used in the embankment construction, and our review of the as-built embankment geometry; it is our opinion that the embankments within the Bottom Ash Complex have slope stability factors of safety that meet or exceed the requirements in the CCR Rules. Furthermore, based on our review of the as-built embankment geometries, current operating pool levels, and the existing spillway and overflow system; we believe that the facility is capable of storing/routing the runoff from the 1/2 PMP 6-hour storm event.

Accordingly, I hereby certify that the Bottom Ash Complex is generally maintained in good condition and the facility generally meets the stability requirements in the CCR Rules. It should be clearly noted that this certification is not a legal guarantee. This certification is merely a statement by a registered professional engineer that, to the best of his knowledge, the facility was generally constructed according to the approved plan and that it meets the applicable stability requirements set forth in the CCR Rules. No warranties, expressed or implied, are provided. If you have any questions regarding the information provided, please contact me at 865-584-0344.

12-22-2015

Seth W. Frank, P.E.
West Virginia R.P.E. No. 20574

Date

SETH W. FRANK
REGISTERED
20574
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

Appendix II

Hydraulics and Hydrology

Bottom Ash Pond

SUMMARY OF INFLOW HYDROGRAPH
AND FLOOD ROUTING THROUGH
MITCHELL BOTTOM ASH POND
FOR ½ 6-HOUR PMP STORM EVENT

Starting Pool Elevation	=	681 ft, NAVD
Pipe Spillway Invert Elevation	=	681 ft, NAVD
Crest Elevation	=	690 ft, NAVD
Peak Inflow	=	111.08 cfs
Peak Outflow	=	23.83 cfs
Peak Storage	=	10.75 ac-ft
Maximum Impoundment Level During Storm	=	683.51 ft, NAVD
Minimum Freeboard During Storm	=	6.49 ft

```
1***************************************                                                                ***************************************
 *                                     *                                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *           SEPTEMBER 1990            *                                                                *    HYDROLOGIC ENGINEERING CENTER    *
 *             VERSION 4.0             *                                                                *          609 SECOND STREET          *
 *                                     *                                                                *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE  12/21/2015  TIME  10:40:34 *                                                              *           (916) 756-1104            *
 *                                     *                                                                *                                     *
 ***************************************                                                                ***************************************



                                     X     X  XXXXXXX   XXXXX           X
                                     X     X  X        X     X         XX
                                     X     X  X        X                X
                                     XXXXXXX  XXXX     X        XXXXX   X
                                     X     X  X        X                X
                                     X     X  X        X     X          X
                                     X     X  XXXXXXX   XXXXX          XXX




            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
          LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
            1         ID  ****************************************************************************
            2         ID  *      Mitchell Bottom Ash Pond       File: MBAP.inp                           *
            3         ID  *      GA Project No. 15055007.00                                              *
            4         ID  *      Storm Storage for 1/2 6-Hour PMP                                        *
            5         ID  *      Crest Elevation = 690'                                                  *
            6         ID  ****************************************************************************
            7         ID  *      Analyses by: Geo/Environmental Associates, Inc.                         *
            8         ID  *                   Knoxville, TN                                              *
            9         ID  *                   Seth W. Frank P.E.                                         *
           10         ID  *                   August 2014                                                *
           11         ID  ****************************************************************************
           12         IT      5       0       0     300
           13         IO      1
           14         JR  PRECIP     0.5
           15         VS   BASIN    BASE      IN     IMP     IMP     IMP
           16         VV    2.11    2.11    2.11    2.11    6.11    7.11
           17         IN      15

           18         KK   BASIN
           19         KM   COMPUTE INFLOW HYDROGRAPH FOR MITCHELL BOTTOM ASH POND USING SCS METHOD
           20         PB       0
           21         PI   0.258   0.347   0.420   0.478   0.520   0.546   0.624   0.804   0.790   0.939
           22         PI   2.264   4.483   4.834   3.277   1.215   0.797   0.831   0.735   0.553   0.535
           23         PI   0.501   0.451   0.386   0.305
           24         BA   0.016
           25         LU       0    0.05    44.8
           26         UD     0.0

           27         KK    BASE
           28         KM   BASE FLOW
           29         IN     360
           30         QI    11.6    11.6    11.6

           31         KK      IN
           32         KM   COMBINE BASIN INFLOW AND BASEFLOW
           33         KO       1
           34         HC       2

           35         KK     IMP
           36         KM   ROUTE COMPUTED HYDROGRAPH AND BASE FLOW THROUGH CLEAR WATER POND
           37         RS       1    ELEV     681
           38         SA    4.03    4.18    4.45    4.72    6.27    7.81    8.03    8.26    8.48    8.71
           39         SQ       0    6.90   17.82   29.62   40.80   50.31   57.32   61.12   61.12   61.12
           40         SE     681     682     683     684     685     686     687     688     689     690
           41         ZZ
```

```
1***************************************                                                        ***************************************
 *                                     *                                                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                      *   U.S. ARMY CORPS OF ENGINEERS      *
 *            SEPTEMBER 1990           *                                                        *   HYDROLOGIC ENGINEERING CENTER     *
 *              VERSION 4.0            *                                                        *        609 SECOND STREET            *
 *                                     *                                                        *     DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  12/21/2015  TIME  10:40:34 *                                                      *        (916) 756-1104               *
 *                                     *                                                        *                                     *
***************************************                                                        ***************************************




                         ***********************************************************************
                         *      Mitchell Bottom Ash Pond       File: MBAP.inp                  *
                         *      GA Project No. 15055007.00                                     *
                         *      Storm Storage for 1/2 6-Hour PMP                               *
                         *      Crest Elevation = 690'                                         *
                         ***********************************************************************
                         *      Analyses by: Geo/Environmental Associates, Inc.                *
                         *                   Knoxville, TN                                     *
                         *                   Seth W. Frank P.E.                                *
                         *                   August 2014                                       *
                         ***********************************************************************

  13 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME       0055  ENDING TIME
                      ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

              USER-DEFINED OUTPUT SPECIFICATIONS

          TABLE 1
     VS       STATION     BASIN      BASE        IN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      2.11      2.11      6.11      7.11       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    .50


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

           **************
           *            *
  18 KK    *    BASIN   *
           *            *
           **************
                          COMPUTE INFLOW HYDROGRAPH FOR MITCHELL BOTTOM ASH POND USING SCS METHOD

  17 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
                      JXTIME          0  STARTING TIME
```

```
             SUBBASIN RUNOFF DATA

   24 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .02  SUBBASIN AREA

                  PRECIPITATION DATA

   20 PB                STORM       26.89  BASIN TOTAL PRECIPITATION

   21 PI            INCREMENTAL PRECIPITATION PATTERN
                        .09       .09       .09       .12       .12       .12       .14       .14       .14       .16
                        .16       .16       .17       .17       .17       .18       .18       .18       .21       .21
                        .21       .27       .27       .27       .26       .26       .26       .31       .31       .31
                        .75       .75       .75      1.49      1.49      1.49      1.61      1.61      1.61      1.09
                       1.09      1.09       .41       .40       .41       .27       .27       .27       .28       .28
                        .28       .25       .24       .25       .18       .18       .18       .18       .18       .18
                        .17       .17       .17       .15       .15       .15       .13       .13       .13       .10
                        .10       .10

   25 LU          UNIFORM LOSS RATE
                        STRTL         .00  INITIAL LOSS
                        CNSTL         .05  UNIFORM LOSS RATE
                        RTIMP       44.80  PERCENT IMPERVIOUS AREA

   26 UD          SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .00  LAG

                                                                       ***


  PEAK FLOW     TIME                         MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                           (CFS)
+      24.      4.58                  21.         15.         14.          14.
                        (INCHES)     6.212      17.047      17.093       17.093
                         (AC-FT)       11.         29.         29.          29.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
       11.      4.58                  10.          7.          7.           7.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
    683.51      4.58                683.30      682.70      682.64       682.64

                         CUMULATIVE AREA =     .03 SQ MI
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .50
HYDROGRAPH AT					
+	BASIN	.02	1	FLOW	99.
				TIME	3.25
HYDROGRAPH AT					
+	BASE	.02	1	FLOW	12.
				TIME	.08
2 COMBINED AT					
+	IN	.03	1	FLOW	111.
				TIME	3.25
ROUTED TO					
+	IMP	.03	1	FLOW	24.
				TIME	4.58
			** PEAK STAGES IN FEET **		
			1	STAGE	683.51
				TIME	4.58

1TABLE 1		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
1	1	0000	.00	11.60	11.60	.00	.00	681.00
2	1	0005	3.75	11.60	15.35	.16	.09	681.02
3	1	0010	4.80	11.60	16.40	.34	.20	681.05
4	1	0015	5.00	11.60	16.60	.52	.31	681.08
5	1	0020	6.41	11.60	18.01	.72	.43	681.10
6	1	0025	6.79	11.60	18.39	.92	.55	681.13
7	1	0030	6.87	11.60	18.47	1.12	.67	681.16
8	1	0035	8.00	11.60	19.60	1.32	.79	681.19
9	1	0040	8.31	11.60	19.91	1.54	.91	681.22
10	1	0045	8.38	11.60	19.98	1.75	1.04	681.25
11	1	0050	9.28	11.60	20.88	1.96	1.17	681.28
12	1	0055	9.53	11.60	21.13	2.18	1.30	681.32
13	1	0100	9.58	11.60	21.18	2.40	1.43	681.35
14	1	0105	10.23	11.60	21.83	2.62	1.56	681.38
15	1	0110	10.41	11.60	22.01	2.84	1.69	681.41
16	1	0115	10.45	11.60	22.05	3.06	1.82	681.44
17	1	0120	10.85	11.60	22.45	3.28	1.95	681.48
18	1	0125	10.96	11.60	22.56	3.51	2.09	681.51
19	1	0130	10.99	11.60	22.59	3.73	2.22	681.54
20	1	0135	12.19	11.60	23.79	3.95	2.35	681.57
21	1	0140	12.52	11.60	24.12	4.18	2.49	681.61
22	1	0145	12.59	11.60	24.19	4.41	2.62	681.64
23	1	0150	15.36	11.60	26.96	4.65	2.77	681.67
24	1	0155	16.14	11.60	27.74	4.91	2.92	681.71
25	1	0200	16.29	11.60	27.89	5.18	3.08	681.75
26	1	0205	16.10	11.60	27.70	5.44	3.24	681.79
27	1	0210	16.04	11.60	27.64	5.69	3.39	681.83
28	1	0215	16.03	11.60	27.63	5.95	3.54	681.86
29	1	0220	18.32	11.60	29.92	6.21	3.69	681.90
30	1	0225	18.96	11.60	30.56	6.49	3.86	681.94
31	1	0230	19.08	11.60	30.68	6.76	4.02	681.98
32	1	0235	39.43	11.60	51.03	7.28	4.26	682.04
33	1	0240	45.13	11.60	56.73	8.09	4.57	682.11
34	1	0245	46.24	11.60	57.84	8.94	4.91	682.19
35	1	0250	80.51	11.60	92.11	10.08	5.36	682.29
36	1	0255	90.04	11.60	101.64	11.58	5.95	682.43
37	1	0300	91.92	11.60	103.52	13.15	6.58	682.57
38	1	0305	97.68	11.60	109.28	14.77	7.21	682.72
39	1	0310	99.18	11.60	110.78	16.41	7.86	682.87
40	1	0315	99.48	11.60	111.08	18.05	8.51	683.02
41	1	0320	75.65	11.60	87.25	19.47	9.06	683.14
42	1	0325	68.96	11.60	80.56	20.61	9.50	683.24
43	1	0330	67.65	11.60	79.25	21.65	9.91	683.32
44	1	0335	35.75	11.60	47.35	22.38	10.19	683.39
45	1	0340	26.89	11.60	38.49	22.74	10.33	683.42
46	1	0345	25.15	11.60	36.75	23.00	10.43	683.44
47	1	0350	18.39	11.60	29.99	23.18	10.50	683.45
48	1	0355	16.60	11.60	28.20	23.29	10.54	683.46
49	1	0400	16.24	11.60	27.84	23.37	10.58	683.47
50	1	0405	16.70	11.60	28.30	23.45	10.61	683.48

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
			PLAN	1	1	1	1	1	1	
			RATIO	.50	.50	.50	.50	.50	.50	
PER	DAY	MON	HRMN							
51	1		0410	16.84	11.60	28.44	23.54	10.64	683.48	
52	1		0415	16.87	11.60	28.47	23.63	10.68	683.49	
53	1		0420	15.40	11.60	27.00	23.70	10.70	683.50	
54	1		0425	14.99	11.60	26.59	23.75	10.72	683.50	
55	1		0430	14.91	11.60	26.51	23.80	10.74	683.51	
56	1		0435	12.10	11.60	23.70	23.83	**10.75**	**683.51**	**Maximum impoundment stage/storage**
57	1		0440	11.32	11.60	22.92	23.82	10.75	683.51	
58	1		0445	11.17	11.60	22.77	23.80	10.74	683.51	
59	1		0450	10.86	11.60	22.46	23.78	10.73	683.51	
60	1		0455	10.78	11.60	22.38	23.75	10.72	683.50	
61	1		0500	10.77	11.60	22.37	23.73	10.72	683.50	
62	1		0505	10.24	11.60	21.84	23.70	10.70	683.50	
63	1		0510	10.10	11.60	21.70	23.67	10.69	683.50	
64	1		0515	10.07	11.60	21.67	23.63	10.68	683.49	
65	1		0520	9.29	11.60	20.89	23.59	10.66	683.49	
66	1		0525	9.08	11.60	20.68	23.54	10.64	683.48	
67	1		0530	9.04	11.60	20.64	23.49	10.62	683.48	
68	1		0535	8.03	11.60	19.63	23.43	10.60	683.48	
69	1		0540	7.75	11.60	19.35	23.36	10.57	683.47	
70	1		0545	7.70	11.60	19.30	23.29	10.55	683.46	
71	1		0550	6.44	11.60	18.04	23.21	10.51	683.46	
72	1		0555	6.10	11.60	17.70	23.12	10.48	683.45	
73	1		0600	6.03	11.60	17.63	23.02	10.44	683.44	
74	1		0605	1.55	11.60	13.15	22.89	10.39	683.43	
75	1		0610	.29	11.60	11.89	22.71	10.32	683.41	
76	1		0615	.05	11.60	11.65	22.51	10.24	683.40	
77	1		0620	.00	11.60	11.60	22.32	10.17	683.38	
78	1		0625	.00	11.60	11.60	22.13	10.09	683.37	
79	1		0630	.00	11.60	11.60	21.95	10.02	683.35	
80	1		0635	.00	11.60	11.60	21.77	9.95	683.33	
81	1		0640	.00	11.60	11.60	21.59	9.88	683.32	
82	1		0645	.00	11.60	11.60	21.41	9.81	683.30	
83	1		0650	.00	11.60	11.60	21.24	9.75	683.29	
84	1		0655	.00	11.60	11.60	21.07	9.68	683.28	
85	1		0700	.00	11.60	11.60	20.90	9.62	683.26	
86	1		0705	.00	11.60	11.60	20.74	9.55	683.25	
87	1		0710	.00	11.60	11.60	20.58	9.49	683.23	
88	1		0715	.00	11.60	11.60	20.42	9.43	683.22	
89	1		0720	.00	11.60	11.60	20.27	9.37	683.21	
90	1		0725	.00	11.60	11.60	20.11	9.31	683.19	
91	1		0730	.00	11.60	11.60	19.97	9.25	683.18	
92	1		0735	.00	11.60	11.60	19.82	9.20	683.17	
93	1		0740	.00	11.60	11.60	19.67	9.14	683.16	
94	1		0745	.00	11.60	11.60	19.53	9.08	683.15	
95	1		0750	.00	11.60	11.60	19.39	9.03	683.13	
96	1		0755	.00	11.60	11.60	19.26	8.98	683.12	
97	1		0800	.00	11.60	11.60	19.12	8.92	683.11	
98	1		0805	.00	11.60	11.60	18.99	8.87	683.10	
99	1		0810	.00	11.60	11.60	18.86	8.82	683.09	
100	1		0815	.00	11.60	11.60	18.73	8.77	683.08	

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
101	1		0820	.00	11.60	11.60	18.61	8.72	683.07
102	1		0825	.00	11.60	11.60	18.48	8.68	683.06
103	1		0830	.00	11.60	11.60	18.36	8.63	683.05
104	1		0835	.00	11.60	11.60	18.24	8.58	683.04
105	1		0840	.00	11.60	11.60	18.13	8.54	683.03
106	1		0845	.00	11.60	11.60	18.01	8.49	683.02
107	1		0850	.00	11.60	11.60	17.90	8.45	683.01
108	1		0855	.00	11.60	11.60	17.79	8.41	683.00
109	1		0900	.00	11.60	11.60	17.68	8.36	682.99
110	1		0905	.00	11.60	11.60	17.58	8.32	682.98
111	1		0910	.00	11.60	11.60	17.47	8.28	682.97
112	1		0915	.00	11.60	11.60	17.37	8.24	682.96
113	1		0920	.00	11.60	11.60	17.27	8.20	682.95
114	1		0925	.00	11.60	11.60	17.17	8.16	682.94
115	1		0930	.00	11.60	11.60	17.08	8.13	682.93
116	1		0935	.00	11.60	11.60	16.98	8.09	682.92
117	1		0940	.00	11.60	11.60	16.89	8.05	682.91
118	1		0945	.00	11.60	11.60	16.80	8.02	682.91
119	1		0950	.00	11.60	11.60	16.71	7.98	682.90
120	1		0955	.00	11.60	11.60	16.62	7.95	682.89
121	1		1000	.00	11.60	11.60	16.53	7.91	682.88
122	1		1005	.00	11.60	11.60	16.45	7.88	682.87
123	1		1010	.00	11.60	11.60	16.37	7.84	682.87
124	1		1015	.00	11.60	11.60	16.28	7.81	682.86
125	1		1020	.00	11.60	11.60	16.20	7.78	682.85
126	1		1025	.00	11.60	11.60	16.12	7.75	682.84
127	1		1030	.00	11.60	11.60	16.04	7.72	682.84
128	1		1035	.00	11.60	11.60	15.97	7.69	682.83
129	1		1040	.00	11.60	11.60	15.89	7.66	682.82
130	1		1045	.00	11.60	11.60	15.82	7.63	682.82
131	1		1050	.00	11.60	11.60	15.74	7.60	682.81
132	1		1055	.00	11.60	11.60	15.67	7.57	682.80
133	1		1100	.00	11.60	11.60	15.60	7.54	682.80
134	1		1105	.00	11.60	11.60	15.53	7.52	682.79
135	1		1110	.00	11.60	11.60	15.47	7.49	682.78
136	1		1115	.00	11.60	11.60	15.40	7.46	682.78
137	1		1120	.00	11.60	11.60	15.33	7.44	682.77
138	1		1125	.00	11.60	11.60	15.27	7.41	682.77
139	1		1130	.00	11.60	11.60	15.21	7.39	682.76
140	1		1135	.00	11.60	11.60	15.14	7.36	682.75
141	1		1140	.00	11.60	11.60	15.08	7.34	682.75
142	1		1145	.00	11.60	11.60	15.02	7.31	682.74
143	1		1150	.00	11.60	11.60	14.96	7.29	682.74
144	1		1155	.00	11.60	11.60	14.90	7.27	682.73
145	1		1200	.00	11.60	11.60	14.85	7.24	682.73
146	1		1205	.00	11.60	11.60	14.79	7.22	682.72
147	1		1210	.00	11.60	11.60	14.74	7.20	682.72
148	1		1215	.00	11.60	11.60	14.68	7.18	682.71
149	1		1220	.00	11.60	11.60	14.63	7.16	682.71
150	1		1225	.00	11.60	11.60	14.58	7.14	682.70

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
151	1		1230	.00	11.60	11.60	14.52	7.12	682.70
152	1		1235	.00	11.60	11.60	14.47	7.10	682.69
153	1		1240	.00	11.60	11.60	14.42	7.08	682.69
154	1		1245	.00	11.60	11.60	14.38	7.06	682.68
155	1		1250	.00	11.60	11.60	14.33	7.04	682.68
156	1		1255	.00	11.60	11.60	14.28	7.02	682.68
157	1		1300	.00	11.60	11.60	14.23	7.00	682.67
158	1		1305	.00	11.60	11.60	14.19	6.98	682.67
159	1		1310	.00	11.60	11.60	14.14	6.97	682.66
160	1		1315	.00	11.60	11.60	14.10	6.95	682.66
161	1		1320	.00	11.60	11.60	14.06	6.93	682.66
162	1		1325	.00	11.60	11.60	14.01	6.92	682.65
163	1		1330	.00	11.60	11.60	13.97	6.90	682.65
164	1		1335	.00	11.60	11.60	13.93	6.88	682.64
165	1		1340	.00	11.60	11.60	13.89	6.87	682.64
166	1		1345	.00	11.60	11.60	13.85	6.85	682.64
167	1		1350	.00	11.60	11.60	13.81	6.84	682.63
168	1		1355	.00	11.60	11.60	13.77	6.82	682.63
169	1		1400	.00	11.60	11.60	13.74	6.81	682.63
170	1		1405	.00	11.60	11.60	13.70	6.79	682.62
171	1		1410	.00	11.60	11.60	13.66	6.78	682.62
172	1		1415	.00	11.60	11.60	13.63	6.76	682.62
173	1		1420	.00	11.60	11.60	13.59	6.75	682.61
174	1		1425	.00	11.60	11.60	13.56	6.74	682.61
175	1		1430	.00	11.60	11.60	13.52	6.72	682.61
176	1		1435	.00	11.60	11.60	13.49	6.71	682.60
177	1		1440	.00	11.60	11.60	13.46	6.70	682.60
178	1		1445	.00	11.60	11.60	13.43	6.68	682.60
179	1		1450	.00	11.60	11.60	13.40	6.67	682.59
180	1		1455	.00	11.60	11.60	13.36	6.66	682.59
181	1		1500	.00	11.60	11.60	13.33	6.65	682.59
182	1		1505	.00	11.60	11.60	13.30	6.63	682.59
183	1		1510	.00	11.60	11.60	13.27	6.62	682.58
184	1		1515	.00	11.60	11.60	13.25	6.61	682.58
185	1		1520	.00	11.60	11.60	13.22	6.60	682.58
186	1		1525	.00	11.60	11.60	13.19	6.59	682.58
187	1		1530	.00	11.60	11.60	13.16	6.58	682.57
188	1		1535	.00	11.60	11.60	13.13	6.57	682.57
189	1		1540	.00	11.60	11.60	13.11	6.56	682.57
190	1		1545	.00	11.60	11.60	13.08	6.55	682.57
191	1		1550	.00	11.60	11.60	13.06	6.54	682.56
192	1		1555	.00	11.60	11.60	13.03	6.53	682.56
193	1		1600	.00	11.60	11.60	13.01	6.52	682.56
194	1		1605	.00	11.60	11.60	12.98	6.51	682.56
195	1		1610	.00	11.60	11.60	12.96	6.50	682.55
196	1		1615	.00	11.60	11.60	12.93	6.49	682.55
197	1		1620	.00	11.60	11.60	12.91	6.48	682.55
198	1		1625	.00	11.60	11.60	12.89	6.47	682.55
199	1		1630	.00	11.60	11.60	12.87	6.46	682.55
200	1		1635	.00	11.60	11.60	12.84	6.45	682.54

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1	1	1
	RATIO	.50	.50	.50	.50	.50	.50
PER DAY MON	HRMN						
201 1	1640	.00	11.60	11.60	12.82	6.44	682.54
202 1	1645	.00	11.60	11.60	12.80	6.44	682.54
203 1	1650	.00	11.60	11.60	12.78	6.43	682.54
204 1	1655	.00	11.60	11.60	12.76	6.42	682.54
205 1	1700	.00	11.60	11.60	12.74	6.41	682.53
206 1	1705	.00	11.60	11.60	12.72	6.40	682.53
207 1	1710	.00	11.60	11.60	12.70	6.40	682.53
208 1	1715	.00	11.60	11.60	12.68	6.39	682.53
209 1	1720	.00	11.60	11.60	12.66	6.38	682.53
210 1	1725	.00	11.60	11.60	12.65	6.37	682.53
211 1	1730	.00	11.60	11.60	12.63	6.37	682.52
212 1	1735	.00	11.60	11.60	12.61	6.36	682.52
213 1	1740	.00	11.60	11.60	12.59	6.35	682.52
214 1	1745	.00	11.60	11.60	12.58	6.35	682.52
215 1	1750	.00	11.60	11.60	12.56	6.34	682.52
216 1	1755	.00	11.60	11.60	12.54	6.33	682.52
217 1	1800	.00	11.60	11.60	12.53	6.33	682.52
218 1	1805	.00	11.60	11.60	12.51	6.32	682.51
219 1	1810	.00	11.60	11.60	12.49	6.31	682.51
220 1	1815	.00	11.60	11.60	12.48	6.31	682.51
221 1	1820	.00	11.60	11.60	12.46	6.30	682.51
222 1	1825	.00	11.60	11.60	12.45	6.30	682.51
223 1	1830	.00	11.60	11.60	12.43	6.29	682.51
224 1	1835	.00	11.60	11.60	12.42	6.29	682.51
225 1	1840	.00	11.60	11.60	12.41	6.28	682.50
226 1	1845	.00	11.60	11.60	12.39	6.27	682.50
227 1	1850	.00	11.60	11.60	12.38	6.27	682.50
228 1	1855	.00	11.60	11.60	12.36	6.26	682.50
229 1	1900	.00	11.60	11.60	12.35	6.26	682.50
230 1	1905	.00	11.60	11.60	12.34	6.25	682.50
231 1	1910	.00	11.60	11.60	12.33	6.25	682.50
232 1	1915	.00	11.60	11.60	12.31	6.24	682.50
233 1	1920	.00	11.60	11.60	12.30	6.24	682.49
234 1	1925	.00	11.60	11.60	12.29	6.23	682.49
235 1	1930	.00	11.60	11.60	12.28	6.23	682.49
236 1	1935	.00	11.60	11.60	12.26	6.22	682.49
237 1	1940	.00	11.60	11.60	12.25	6.22	682.49
238 1	1945	.00	11.60	11.60	12.24	6.22	682.49
239 1	1950	.00	11.60	11.60	12.23	6.21	682.49
240 1	1955	.00	11.60	11.60	12.22	6.21	682.49
241 1	2000	.00	11.60	11.60	12.21	6.20	682.49
242 1	2005	.00	11.60	11.60	12.20	6.20	682.49
243 1	2010	.00	11.60	11.60	12.19	6.19	682.48
244 1	2015	.00	11.60	11.60	12.18	6.19	682.48
245 1	2020	.00	11.60	11.60	12.17	6.19	682.48
246 1	2025	.00	11.60	11.60	12.16	6.18	682.48
247 1	2030	.00	11.60	11.60	12.15	6.18	682.48
248 1	2035	.00	11.60	11.60	12.14	6.17	682.48
249 1	2040	.00	11.60	11.60	12.13	6.17	682.48
250 1	2045	.00	11.60	11.60	12.12	6.17	682.48

1TABLE 1 (CONT.)		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
251	1	2050	.00	11.60	11.60	12.11	6.16	682.48
252	1	2055	.00	11.60	11.60	12.10	6.16	682.48
253	1	2100	.00	11.60	11.60	12.09	6.16	682.48
254	1	2105	.00	11.60	11.60	12.09	6.15	682.47
255	1	2110	.00	11.60	11.60	12.08	6.15	682.47
256	1	2115	.00	11.60	11.60	12.07	6.15	682.47
257	1	2120	.00	11.60	11.60	12.06	6.14	682.47
258	1	2125	.00	11.60	11.60	12.05	6.14	682.47
259	1	2130	.00	11.60	11.60	12.05	6.14	682.47
260	1	2135	.00	11.60	11.60	12.04	6.13	682.47
261	1	2140	.00	11.60	11.60	12.03	6.13	682.47
262	1	2145	.00	11.60	11.60	12.02	6.13	682.47
263	1	2150	.00	11.60	11.60	12.02	6.13	682.47
264	1	2155	.00	11.60	11.60	12.01	6.12	682.47
265	1	2200	.00	11.60	11.60	12.00	6.12	682.47
266	1	2205	.00	11.60	11.60	11.99	6.12	682.47
267	1	2210	.00	11.60	11.60	11.99	6.11	682.47
268	1	2215	.00	11.60	11.60	11.98	6.11	682.47
269	1	2220	.00	11.60	11.60	11.97	6.11	682.46
270	1	2225	.00	11.60	11.60	11.97	6.11	682.46
271	1	2230	.00	11.60	11.60	11.96	6.10	682.46
272	1	2235	.00	11.60	11.60	11.95	6.10	682.46
273	1	2240	.00	11.60	11.60	11.95	6.10	682.46
274	1	2245	.00	11.60	11.60	11.94	6.10	682.46
275	1	2250	.00	11.60	11.60	11.94	6.09	682.46
276	1	2255	.00	11.60	11.60	11.93	6.09	682.46
277	1	2300	.00	11.60	11.60	11.93	6.09	682.46
278	1	2305	.00	11.60	11.60	11.92	6.09	682.46
279	1	2310	.00	11.60	11.60	11.91	6.09	682.46
280	1	2315	.00	11.60	11.60	11.91	6.08	682.46
281	1	2320	.00	11.60	11.60	11.90	6.08	682.46
282	1	2325	.00	11.60	11.60	11.90	6.08	682.46
283	1	2330	.00	11.60	11.60	11.89	6.08	682.46
284	1	2335	.00	11.60	11.60	11.89	6.08	682.46
285	1	2340	.00	11.60	11.60	11.88	6.07	682.46
286	1	2345	.00	11.60	11.60	11.88	6.07	682.46
287	1	2350	.00	11.60	11.60	11.87	6.07	682.46
288	1	2355	.00	11.60	11.60	11.87	6.07	682.46
289	2	0000	.00	11.60	11.60	11.86	6.07	682.45
290	2	0005	.00	11.60	11.60	11.86	6.06	682.45
291	2	0010	.00	11.60	11.60	11.85	6.06	682.45
292	2	0015	.00	11.60	11.60	11.85	6.06	682.45
293	2	0020	.00	11.60	11.60	11.85	6.06	682.45
294	2	0025	.00	11.60	11.60	11.84	6.06	682.45
295	2	0030	.00	11.60	11.60	11.84	6.06	682.45
296	2	0035	.00	11.60	11.60	11.83	6.05	682.45
297	2	0040	.00	11.60	11.60	11.83	6.05	682.45
298	2	0045	.00	11.60	11.60	11.83	6.05	682.45
299	2	0050	.00	11.60	11.60	11.82	6.05	682.45
300	2	0055	.00	11.60	11.60	11.82	6.05	682.45
		MAX	99.48	11.60	111.08	23.83	10.75	683.51
		MIN	.00	11.60	11.60	.00	.00	681.00
		AVE	5.49	11.60	17.09	14.14	6.88	682.64

*** NORMAL END OF HEC-1 ***

Clear Water Pond

**SUMMARY OF INFLOW HYDROGRAPH
AND FLOOD ROUTING THROUGH
MITCHELL CLEAR WATER POND
FOR ½ 6-HOUR PMP STORM EVENT**

Starting Pool Elevation	=	664 ft, NAVD
Pipe Spillway Invert Elevation	=	664 ft, NAVD
Crest Elevation	=	675 ft, NAVD
Peak Inflow	=	71.44 cfs
Peak Outflow	=	44.76 cfs
Peak Storage	=	5.65 ac-ft
Maximum Impoundment Level During Storm	=	666.50 ft, NAVD
Minimum Freeboard During Storm	=	8.50 ft

```
1***************************************                                                        **************************************
 *                                      *                                                        *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                        *    U.S. ARMY CORPS OF ENGINEERS    *
 *           SEPTEMBER 1990             *                                                        *    HYDROLOGIC ENGINEERING CENTER   *
 *             VERSION 4.0              *                                                        *          609 SECOND STREET         *
 *                                      *                                                        *       DAVIS, CALIFORNIA 95616      *
 *  RUN DATE  12/21/2015  TIME  11:05:16 *                                                       *          (916) 756-1104            *
 *                                      *                                                        *                                    *
 ***************************************                                                         **************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

*** FREE ***
          ID  ***************************************************************************
          ID  *      Mitchell Clear Water Pond       File: MCWP.inp                     *
          ID  *      GA Project No. 01-269BA                                            *
          ID  *      Storm Routing for 1/2 6-Hour PMP                                   *
          ID  *      Crest Elevation = 675'                                             *
          ID  ***************************************************************************
          ID  *      Analyses by: Geo/Environmental Associates, Inc.                    *
          ID  *                   Knoxville, TN                                         *
          ID  *                   Seth W. Frank P.E.                                    *
          ID  *                   August 2014                                           *
          ID  ***************************************************************************
          IT      15       0       0     300
          IO       1
          JR  PRECIP     0.5
          VS   BASIN    BASE      IN     IMP     IMP     IMP
          VV    2.11    2.11    2.11    2.11    6.11    7.11
          IN      15

          KK   BASIN
          KM   COMPUTE INFLOW HYDROGRAPH FOR MITCHELL CLEAR WATER POND USING SCS METHOD
          PB       0
          PI   0.258   0.347   0.420   0.478   0.520   0.546   0.624   0.804   0.790   0.939
          PI   2.264   4.483   4.834   3.277   1.215   0.797   0.831   0.735   0.553   0.535
          PI   0.501   0.451   0.386   0.305
          BA   0.008
          LU       0    0.05    45.5
          UD     0.0

          KK    BASE
          KM   BASE FLOW
          IN     360
          QI   23.83   23.83   23.83

          KK      IN
          KM   COMBINE BASIN INFLOW AND BASEFLOW
          KO       1
          HC       2

          KK     IMP
          KM   ROUTE COMPUTED HYDROGRAPH AND BASE FLOW THROUGH CLEAR WATER POND
          RS       1    ELEV     664
          SA    2.18    2.24    2.30    2.38    2.45    2.56    2.67    2.79    2.91    3.03
          SA    3.15    3.30
          SQ       0   12.15   32.67    56.9   68.98   71.79   74.50   77.12   79.65   82.10
          SQ   84.48   86.79
          SE     664     665     666     667     668     669     670     671     672     673
          SE     674     675
          ZZ
```

```
1***************************************                                                   **************************************
 *                                     *                                                   *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                 *   U.S. ARMY CORPS OF ENGINEERS     *
 *            SEPTEMBER 1990           *                                                   *   HYDROLOGIC ENGINEERING CENTER    *
 *             VERSION 4.0             *                                                   *        609 SECOND STREET           *
 *                                     *                                                   *      DAVIS, CALIFORNIA 95616       *
 *  RUN DATE  12/21/2015  TIME  11:05:16 *                                                 *          (916) 756-1104            *
 *                                     *                                                   *                                    *
 ***************************************                                                   **************************************




                          ****************************************************************************
                          *      Mitchell Clear Water Pond       File: MCWP.inp                      *
                          *      GA Project No. 01-269BA                                             *
                          *      Storm Routing for 1/2 6-Hour PMP                                    *
                          *      Crest Elevation = 675'                                              *
                          ****************************************************************************
                          *      Analyses by: Geo/Environmental Associates, Inc.                     *
                          *                   Knoxville, TN                                          *
                          *                   Seth W. Frank P.E.                                     *
                          *                   August 2014                                            *
                          ****************************************************************************

  13 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          1  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      4    0  ENDING DATE
                      NDTIME       0245  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .25 HOURS
                      TOTAL TIME BASE   74.75 HOURS

      ENGLISH UNITS
           DRAINAGE AREA         SQUARE MILES
           PRECIPITATION DEPTH   INCHES
           LENGTH, ELEVATION     FEET
           FLOW                  CUBIC FEET PER SECOND
           STORAGE VOLUME        ACRE-FEET
           SURFACE AREA          ACRES
           TEMPERATURE           DEGREES FAHRENHEIT

             USER-DEFINED OUTPUT SPECIFICATIONS

      TABLE 1
  VS       STATION     BASIN      BASE       IN       IMP       IMP       IMP
  VV VARIABLE CODE      2.11      2.11      2.11      2.11      6.11      7.11       .00       .00       .00       .00

  JP             MULTI-PLAN OPTION
                       NPLAN          1  NUMBER OF PLANS

  JR             MULTI-RATIO OPTION
                    RATIOS OF PRECIPITATION
                     .50


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  18 KK     *    BASIN   *
            *            *
            **************
                             COMPUTE INFLOW HYDROGRAPH FOR MITCHELL CLEAR WATER POND USING SCS METHOD

  17 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN         15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
                      JXTIME          0  STARTING TIME
```

SUBBASIN RUNOFF DATA

24 BA SUBBASIN CHARACTERISTICS
TAREA .01 SUBBASIN AREA

PRECIPITATION DATA

20 PB STORM 26.89 BASIN TOTAL PRECIPITATION

21 PI INCREMENTAL PRECIPITATION PATTERN

.26	.35	.42	.48	.52	.55	.62	.80	.79	.94
2.26	4.48	4.83	3.28	1.22	.80	.83	.74	.55	.53
.50	.45	.39	.31						

25 LU UNIFORM LOSS RATE
STRTL .00 INITIAL LOSS
CNSTL .05 UNIFORM LOSS RATE
RTIMP 45.50 PERCENT IMPERVIOUS AREA

26 UD SCS DIMENSIONLESS UNITGRAPH
TLAG .00 LAG

***

W

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	74.75-HR
+ 45.	3.75	(CFS)	33.	26.	25.	24.
		(INCHES)	19.054	60.757	171.538	175.055
		(AC-FT)	16.	52.	146.	149.

PEAK STORAGE (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	74.75-HR
6.	3.75	4.	4.	4.	4.

PEAK STAGE (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	74.75-HR
666.50	3.75	665.99	665.68	665.60	665.58

CUMULATIVE AREA = .02 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .50
HYDROGRAPH AT					
+	BASIN	.01	1	FLOW	48.
				TIME	3.25
HYDROGRAPH AT					
+	BASE	.01	1	FLOW	24.
				TIME	.25
2 COMBINED AT					
+	IN	.02	1	FLOW	71.
				TIME	3.25
ROUTED TO					
+	IMP	.02	1	FLOW	45.
				TIME	3.75
			** PEAK STAGES IN FEET **		
			1	STAGE	666.50
				TIME	3.75

1TABLE 1			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
			PLAN	1	1	1	1	1	1	
			RATIO	.50	.50	.50	.50	.50	.50	
PER	DAY	MON	HRMN							
1	1		0000	.00	23.83	23.83	.00	.00	664.00	
2	1		0015	1.87	23.83	25.70	2.66	.48	664.22	
3	1		0030	3.08	23.83	26.91	5.20	.95	664.43	
4	1		0045	3.94	23.83	27.77	7.58	1.38	664.62	
5	1		0100	4.60	23.83	28.43	9.79	1.78	664.81	
6	1		0115	5.08	23.83	28.91	11.82	2.15	664.97	
7	1		0130	5.40	23.83	29.23	14.57	2.48	665.12	
8	1		0145	6.08	23.83	29.91	17.13	2.76	665.24	
9	1		0200	7.64	23.83	31.47	19.45	3.02	665.36	
10	1		0215	7.96	23.83	31.79	21.53	3.25	665.46	
11	1		0230	9.15	23.83	32.98	23.38	3.45	665.55	
12	1		0245	19.64	23.83	43.47	25.92	3.73	665.67	
13	1		0300	39.57	23.83	63.40	30.62	4.25	665.90	
14	1		0315	47.61	23.83	71.44	37.46	4.94	666.20	
15	1		0330	37.46	23.83	61.29	43.05	5.48	666.43	
16	1		0345	18.64	23.83	42.47	44.76	**5.65**	**666.50**	**Maximum impoundment stage/storage**
17	1		0400	10.37	23.83	34.20	43.51	5.53	666.45	
18	1		0415	8.74	23.83	32.57	41.56	5.34	666.37	
19	1		0430	7.72	23.83	31.55	39.72	5.16	666.29	
20	1		0445	6.10	23.83	29.93	37.99	4.99	666.22	
21	1		0500	5.53	23.83	29.36	36.37	4.84	666.15	
22	1		0515	5.15	23.83	28.98	34.98	4.70	666.10	
23	1		0530	4.67	23.83	28.50	33.77	4.59	666.05	
24	1		0545	4.05	23.83	27.88	32.69	4.48	666.00	
25	1		0600	3.26	23.83	27.09	31.80	4.38	665.96	
26	1		0615	.82	23.83	24.65	30.79	4.27	665.91	
27	1		0630	.15	23.83	23.98	29.68	4.15	665.85	
28	1		0645	.02	23.83	23.85	28.70	4.04	665.81	
29	1		0700	.00	23.83	23.83	27.87	3.95	665.77	
30	1		0715	.00	23.83	23.83	27.18	3.87	665.73	
31	1		0730	.00	23.83	23.83	26.61	3.81	665.70	
32	1		0745	.00	23.83	23.83	26.13	3.76	665.68	
33	1		0800	.00	23.83	23.83	25.74	3.71	665.66	
34	1		0815	.00	23.83	23.83	25.41	3.68	665.65	
35	1		0830	.00	23.83	23.83	25.14	3.65	665.63	
36	1		0845	.00	23.83	23.83	24.92	3.62	665.62	
37	1		0900	.00	23.83	23.83	24.73	3.60	665.61	
38	1		0915	.00	23.83	23.83	24.58	3.58	665.61	
39	1		0930	.00	23.83	23.83	24.45	3.57	665.60	
40	1		0945	.00	23.83	23.83	24.34	3.56	665.59	
41	1		1000	.00	23.83	23.83	24.26	3.55	665.59	
42	1		1015	.00	23.83	23.83	24.18	3.54	665.59	
43	1		1030	.00	23.83	23.83	24.12	3.53	665.58	
44	1		1045	.00	23.83	23.83	24.07	3.53	665.58	
45	1		1100	.00	23.83	23.83	24.03	3.52	665.58	
46	1		1115	.00	23.83	23.83	24.00	3.52	665.58	
47	1		1130	.00	23.83	23.83	23.97	3.52	665.58	
48	1		1145	.00	23.83	23.83	23.94	3.51	665.57	
49	1		1200	.00	23.83	23.83	23.93	3.51	665.57	
50	1		1215	.00	23.83	23.83	23.91	3.51	665.57	

1TABLE 1 (CONT.)		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
51	1	1230	.00	23.83	23.83	23.90	3.51	665.57
52	1	1245	.00	23.83	23.83	23.88	3.51	665.57
53	1	1300	.00	23.83	23.83	23.88	3.51	665.57
54	1	1315	.00	23.83	23.83	23.87	3.51	665.57
55	1	1330	.00	23.83	23.83	23.86	3.51	665.57
56	1	1345	.00	23.83	23.83	23.86	3.50	665.57
57	1	1400	.00	23.83	23.83	23.85	3.50	665.57
58	1	1415	.00	23.83	23.83	23.85	3.50	665.57
59	1	1430	.00	23.83	23.83	23.84	3.50	665.57
60	1	1445	.00	23.83	23.83	23.84	3.50	665.57
61	1	1500	.00	23.83	23.83	23.84	3.50	665.57
62	1	1515	.00	23.83	23.83	23.84	3.50	665.57
63	1	1530	.00	23.83	23.83	23.84	3.50	665.57
64	1	1545	.00	23.83	23.83	23.84	3.50	665.57
65	1	1600	.00	23.83	23.83	23.83	3.50	665.57
66	1	1615	.00	23.83	23.83	23.83	3.50	665.57
67	1	1630	.00	23.83	23.83	23.83	3.50	665.57
68	1	1645	.00	23.83	23.83	23.83	3.50	665.57
69	1	1700	.00	23.83	23.83	23.83	3.50	665.57
70	1	1715	.00	23.83	23.83	23.83	3.50	665.57
71	1	1730	.00	23.83	23.83	23.83	3.50	665.57
72	1	1745	.00	23.83	23.83	23.83	3.50	665.57
73	1	1800	.00	23.83	23.83	23.83	3.50	665.57
74	1	1815	.00	23.83	23.83	23.83	3.50	665.57
75	1	1830	.00	23.83	23.83	23.83	3.50	665.57
76	1	1845	.00	23.83	23.83	23.83	3.50	665.57
77	1	1900	.00	23.83	23.83	23.83	3.50	665.57
78	1	1915	.00	23.83	23.83	23.83	3.50	665.57
79	1	1930	.00	23.83	23.83	23.83	3.50	665.57
80	1	1945	.00	23.83	23.83	23.83	3.50	665.57
81	1	2000	.00	23.83	23.83	23.83	3.50	665.57
82	1	2015	.00	23.83	23.83	23.83	3.50	665.57
83	1	2030	.00	23.83	23.83	23.83	3.50	665.57
84	1	2045	.00	23.83	23.83	23.83	3.50	665.57
85	1	2100	.00	23.83	23.83	23.83	3.50	665.57
86	1	2115	.00	23.83	23.83	23.83	3.50	665.57
87	1	2130	.00	23.83	23.83	23.83	3.50	665.57
88	1	2145	.00	23.83	23.83	23.83	3.50	665.57
89	1	2200	.00	23.83	23.83	23.83	3.50	665.57
90	1	2215	.00	23.83	23.83	23.83	3.50	665.57
91	1	2230	.00	23.83	23.83	23.83	3.50	665.57
92	1	2245	.00	23.83	23.83	23.83	3.50	665.57
93	1	2300	.00	23.83	23.83	23.83	3.50	665.57
94	1	2315	.00	23.83	23.83	23.83	3.50	665.57
95	1	2330	.00	23.83	23.83	23.83	3.50	665.57
96	1	2345	.00	23.83	23.83	23.83	3.50	665.57
97	2	0000	.00	23.83	23.83	23.83	3.50	665.57
98	2	0015	.00	23.83	23.83	23.83	3.50	665.57
99	2	0030	.00	23.83	23.83	23.83	3.50	665.57
100	2	0045	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)			STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1	1	1
			RATIO	.50	.50	.50	.50	.50	.50
PER	DAY	MON	HRMN						
101	2		0100	.00	23.83	23.83	23.83	3.50	665.57
102	2		0115	.00	23.83	23.83	23.83	3.50	665.57
103	2		0130	.00	23.83	23.83	23.83	3.50	665.57
104	2		0145	.00	23.83	23.83	23.83	3.50	665.57
105	2		0200	.00	23.83	23.83	23.83	3.50	665.57
106	2		0215	.00	23.83	23.83	23.83	3.50	665.57
107	2		0230	.00	23.83	23.83	23.83	3.50	665.57
108	2		0245	.00	23.83	23.83	23.83	3.50	665.57
109	2		0300	.00	23.83	23.83	23.83	3.50	665.57
110	2		0315	.00	23.83	23.83	23.83	3.50	665.57
111	2		0330	.00	23.83	23.83	23.83	3.50	665.57
112	2		0345	.00	23.83	23.83	23.83	3.50	665.57
113	2		0400	.00	23.83	23.83	23.83	3.50	665.57
114	2		0415	.00	23.83	23.83	23.83	3.50	665.57
115	2		0430	.00	23.83	23.83	23.83	3.50	665.57
116	2		0445	.00	23.83	23.83	23.83	3.50	665.57
117	2		0500	.00	23.83	23.83	23.83	3.50	665.57
118	2		0515	.00	23.83	23.83	23.83	3.50	665.57
119	2		0530	.00	23.83	23.83	23.83	3.50	665.57
120	2		0545	.00	23.83	23.83	23.83	3.50	665.57
121	2		0600	.00	23.83	23.83	23.83	3.50	665.57
122	2		0615	.00	23.83	23.83	23.83	3.50	665.57
123	2		0630	.00	23.83	23.83	23.83	3.50	665.57
124	2		0645	.00	23.83	23.83	23.83	3.50	665.57
125	2		0700	.00	23.83	23.83	23.83	3.50	665.57
126	2		0715	.00	23.83	23.83	23.83	3.50	665.57
127	2		0730	.00	23.83	23.83	23.83	3.50	665.57
128	2		0745	.00	23.83	23.83	23.83	3.50	665.57
129	2		0800	.00	23.83	23.83	23.83	3.50	665.57
130	2		0815	.00	23.83	23.83	23.83	3.50	665.57
131	2		0830	.00	23.83	23.83	23.83	3.50	665.57
132	2		0845	.00	23.83	23.83	23.83	3.50	665.57
133	2		0900	.00	23.83	23.83	23.83	3.50	665.57
134	2		0915	.00	23.83	23.83	23.83	3.50	665.57
135	2		0930	.00	23.83	23.83	23.83	3.50	665.57
136	2		0945	.00	23.83	23.83	23.83	3.50	665.57
137	2		1000	.00	23.83	23.83	23.83	3.50	665.57
138	2		1015	.00	23.83	23.83	23.83	3.50	665.57
139	2		1030	.00	23.83	23.83	23.83	3.50	665.57
140	2		1045	.00	23.83	23.83	23.83	3.50	665.57
141	2		1100	.00	23.83	23.83	23.83	3.50	665.57
142	2		1115	.00	23.83	23.83	23.83	3.50	665.57
143	2		1130	.00	23.83	23.83	23.83	3.50	665.57
144	2		1145	.00	23.83	23.83	23.83	3.50	665.57
145	2		1200	.00	23.83	23.83	23.83	3.50	665.57
146	2		1215	.00	23.83	23.83	23.83	3.50	665.57
147	2		1230	.00	23.83	23.83	23.83	3.50	665.57
148	2		1245	.00	23.83	23.83	23.83	3.50	665.57
149	2		1300	.00	23.83	23.83	23.83	3.50	665.57
150	2		1315	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
151	2	1330	.00	23.83	23.83	23.83	3.50	665.57
152	2	1345	.00	23.83	23.83	23.83	3.50	665.57
153	2	1400	.00	23.83	23.83	23.83	3.50	665.57
154	2	1415	.00	23.83	23.83	23.83	3.50	665.57
155	2	1430	.00	23.83	23.83	23.83	3.50	665.57
156	2	1445	.00	23.83	23.83	23.83	3.50	665.57
157	2	1500	.00	23.83	23.83	23.83	3.50	665.57
158	2	1515	.00	23.83	23.83	23.83	3.50	665.57
159	2	1530	.00	23.83	23.83	23.83	3.50	665.57
160	2	1545	.00	23.83	23.83	23.83	3.50	665.57
161	2	1600	.00	23.83	23.83	23.83	3.50	665.57
162	2	1615	.00	23.83	23.83	23.83	3.50	665.57
163	2	1630	.00	23.83	23.83	23.83	3.50	665.57
164	2	1645	.00	23.83	23.83	23.83	3.50	665.57
165	2	1700	.00	23.83	23.83	23.83	3.50	665.57
166	2	1715	.00	23.83	23.83	23.83	3.50	665.57
167	2	1730	.00	23.83	23.83	23.83	3.50	665.57
168	2	1745	.00	23.83	23.83	23.83	3.50	665.57
169	2	1800	.00	23.83	23.83	23.83	3.50	665.57
170	2	1815	.00	23.83	23.83	23.83	3.50	665.57
171	2	1830	.00	23.83	23.83	23.83	3.50	665.57
172	2	1845	.00	23.83	23.83	23.83	3.50	665.57
173	2	1900	.00	23.83	23.83	23.83	3.50	665.57
174	2	1915	.00	23.83	23.83	23.83	3.50	665.57
175	2	1930	.00	23.83	23.83	23.83	3.50	665.57
176	2	1945	.00	23.83	23.83	23.83	3.50	665.57
177	2	2000	.00	23.83	23.83	23.83	3.50	665.57
178	2	2015	.00	23.83	23.83	23.83	3.50	665.57
179	2	2030	.00	23.83	23.83	23.83	3.50	665.57
180	2	2045	.00	23.83	23.83	23.83	3.50	665.57
181	2	2100	.00	23.83	23.83	23.83	3.50	665.57
182	2	2115	.00	23.83	23.83	23.83	3.50	665.57
183	2	2130	.00	23.83	23.83	23.83	3.50	665.57
184	2	2145	.00	23.83	23.83	23.83	3.50	665.57
185	2	2200	.00	23.83	23.83	23.83	3.50	665.57
186	2	2215	.00	23.83	23.83	23.83	3.50	665.57
187	2	2230	.00	23.83	23.83	23.83	3.50	665.57
188	2	2245	.00	23.83	23.83	23.83	3.50	665.57
189	2	2300	.00	23.83	23.83	23.83	3.50	665.57
190	2	2315	.00	23.83	23.83	23.83	3.50	665.57
191	2	2330	.00	23.83	23.83	23.83	3.50	665.57
192	2	2345	.00	23.83	23.83	23.83	3.50	665.57
193	3	0000	.00	23.83	23.83	23.83	3.50	665.57
194	3	0015	.00	23.83	23.83	23.83	3.50	665.57
195	3	0030	.00	23.83	23.83	23.83	3.50	665.57
196	3	0045	.00	23.83	23.83	23.83	3.50	665.57
197	3	0100	.00	23.83	23.83	23.83	3.50	665.57
198	3	0115	.00	23.83	23.83	23.83	3.50	665.57
199	3	0130	.00	23.83	23.83	23.83	3.50	665.57
200	3	0145	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)		STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1	1	1
		RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON	HRMN						
201	3	0200	.00	23.83	23.83	23.83	3.50	665.57
202	3	0215	.00	23.83	23.83	23.83	3.50	665.57
203	3	0230	.00	23.83	23.83	23.83	3.50	665.57
204	3	0245	.00	23.83	23.83	23.83	3.50	665.57
205	3	0300	.00	23.83	23.83	23.83	3.50	665.57
206	3	0315	.00	23.83	23.83	23.83	3.50	665.57
207	3	0330	.00	23.83	23.83	23.83	3.50	665.57
208	3	0345	.00	23.83	23.83	23.83	3.50	665.57
209	3	0400	.00	23.83	23.83	23.83	3.50	665.57
210	3	0415	.00	23.83	23.83	23.83	3.50	665.57
211	3	0430	.00	23.83	23.83	23.83	3.50	665.57
212	3	0445	.00	23.83	23.83	23.83	3.50	665.57
213	3	0500	.00	23.83	23.83	23.83	3.50	665.57
214	3	0515	.00	23.83	23.83	23.83	3.50	665.57
215	3	0530	.00	23.83	23.83	23.83	3.50	665.57
216	3	0545	.00	23.83	23.83	23.83	3.50	665.57
217	3	0600	.00	23.83	23.83	23.83	3.50	665.57
218	3	0615	.00	23.83	23.83	23.83	3.50	665.57
219	3	0630	.00	23.83	23.83	23.83	3.50	665.57
220	3	0645	.00	23.83	23.83	23.83	3.50	665.57
221	3	0700	.00	23.83	23.83	23.83	3.50	665.57
222	3	0715	.00	23.83	23.83	23.83	3.50	665.57
223	3	0730	.00	23.83	23.83	23.83	3.50	665.57
224	3	0745	.00	23.83	23.83	23.83	3.50	665.57
225	3	0800	.00	23.83	23.83	23.83	3.50	665.57
226	3	0815	.00	23.83	23.83	23.83	3.50	665.57
227	3	0830	.00	23.83	23.83	23.83	3.50	665.57
228	3	0845	.00	23.83	23.83	23.83	3.50	665.57
229	3	0900	.00	23.83	23.83	23.83	3.50	665.57
230	3	0915	.00	23.83	23.83	23.83	3.50	665.57
231	3	0930	.00	23.83	23.83	23.83	3.50	665.57
232	3	0945	.00	23.83	23.83	23.83	3.50	665.57
233	3	1000	.00	23.83	23.83	23.83	3.50	665.57
234	3	1015	.00	23.83	23.83	23.83	3.50	665.57
235	3	1030	.00	23.83	23.83	23.83	3.50	665.57
236	3	1045	.00	23.83	23.83	23.83	3.50	665.57
237	3	1100	.00	23.83	23.83	23.83	3.50	665.57
238	3	1115	.00	23.83	23.83	23.83	3.50	665.57
239	3	1130	.00	23.83	23.83	23.83	3.50	665.57
240	3	1145	.00	23.83	23.83	23.83	3.50	665.57
241	3	1200	.00	23.83	23.83	23.83	3.50	665.57
242	3	1215	.00	23.83	23.83	23.83	3.50	665.57
243	3	1230	.00	23.83	23.83	23.83	3.50	665.57
244	3	1245	.00	23.83	23.83	23.83	3.50	665.57
245	3	1300	.00	23.83	23.83	23.83	3.50	665.57
246	3	1315	.00	23.83	23.83	23.83	3.50	665.57
247	3	1330	.00	23.83	23.83	23.83	3.50	665.57
248	3	1345	.00	23.83	23.83	23.83	3.50	665.57
249	3	1400	.00	23.83	23.83	23.83	3.50	665.57
250	3	1415	.00	23.83	23.83	23.83	3.50	665.57

1TABLE 1 (CONT.)	STATION	BASIN FLOW	BASE FLOW	IN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1	1	1
	RATIO	.50	.50	.50	.50	.50	.50
PER	DAY MON HRMN						
251	3 1430	.00	23.83	23.83	23.83	3.50	665.57
252	3 1445	.00	23.83	23.83	23.83	3.50	665.57
253	3 1500	.00	23.83	23.83	23.83	3.50	665.57
254	3 1515	.00	23.83	23.83	23.83	3.50	665.57
255	3 1530	.00	23.83	23.83	23.83	3.50	665.57
256	3 1545	.00	23.83	23.83	23.83	3.50	665.57
257	3 1600	.00	23.83	23.83	23.83	3.50	665.57
258	3 1615	.00	23.83	23.83	23.83	3.50	665.57
259	3 1630	.00	23.83	23.83	23.83	3.50	665.57
260	3 1645	.00	23.83	23.83	23.83	3.50	665.57
261	3 1700	.00	23.83	23.83	23.83	3.50	665.57
262	3 1715	.00	23.83	23.83	23.83	3.50	665.57
263	3 1730	.00	23.83	23.83	23.83	3.50	665.57
264	3 1745	.00	23.83	23.83	23.83	3.50	665.57
265	3 1800	.00	23.83	23.83	23.83	3.50	665.57
266	3 1815	.00	23.83	23.83	23.83	3.50	665.57
267	3 1830	.00	23.83	23.83	23.83	3.50	665.57
268	3 1845	.00	23.83	23.83	23.83	3.50	665.57
269	3 1900	.00	23.83	23.83	23.83	3.50	665.57
270	3 1915	.00	23.83	23.83	23.83	3.50	665.57
271	3 1930	.00	23.83	23.83	23.83	3.50	665.57
272	3 1945	.00	23.83	23.83	23.83	3.50	665.57
273	3 2000	.00	23.83	23.83	23.83	3.50	665.57
274	3 2015	.00	23.83	23.83	23.83	3.50	665.57
275	3 2030	.00	23.83	23.83	23.83	3.50	665.57
276	3 2045	.00	23.83	23.83	23.83	3.50	665.57
277	3 2100	.00	23.83	23.83	23.83	3.50	665.57
278	3 2115	.00	23.83	23.83	23.83	3.50	665.57
279	3 2130	.00	23.83	23.83	23.83	3.50	665.57
280	3 2145	.00	23.83	23.83	23.83	3.50	665.57
281	3 2200	.00	23.83	23.83	23.83	3.50	665.57
282	3 2215	.00	23.83	23.83	23.83	3.50	665.57
283	3 2230	.00	23.83	23.83	23.83	3.50	665.57
284	3 2245	.00	23.83	23.83	23.83	3.50	665.57
285	3 2300	.00	23.83	23.83	23.83	3.50	665.57
286	3 2315	.00	23.83	23.83	23.83	3.50	665.57
287	3 2330	.00	23.83	23.83	23.83	3.50	665.57
288	3 2345	.00	23.83	23.83	23.83	3.50	665.57
289	4 0000	.00	23.83	23.83	23.83	3.50	665.57
290	4 0015	.00	23.83	23.83	23.83	3.50	665.57
291	4 0030	.00	23.83	23.83	23.83	3.50	665.57
292	4 0045	.00	23.83	23.83	23.83	3.50	665.57
293	4 0100	.00	23.83	23.83	23.83	3.50	665.57
294	4 0115	.00	23.83	23.83	23.83	3.50	665.57
295	4 0130	.00	23.83	23.83	23.83	3.50	665.57
296	4 0145	.00	23.83	23.83	23.83	3.50	665.57
297	4 0200	.00	23.83	23.83	23.83	3.50	665.57
298	4 0215	.00	23.83	23.83	23.83	3.50	665.57
299	4 0230	.00	23.83	23.83	23.83	3.50	665.57
300	4 0245	.00	23.83	23.83	23.83	3.50	665.57
	MAX	47.61	23.83	71.44	44.76	5.65	666.50
	MIN	.00	23.83	23.83	.00	.00	664.00
	AVE	.91	23.83	24.74	24.14	3.52	665.58

*** NORMAL END OF HEC-1 ***