PERIODIC SAFETY FACTOR ASSESSMENT
391-3-4-.10(4) and 40 C.F.R. PART 257.73
PLANT WANSLEY ASH POND 1 (AP-1)
GEORGIA POWER COMPANY

The Federal CCR Rule, and, for Existing Surface Impoundments where applicable, the Georgia CCR Rule (391-3-4-.10) require the owner or operator of a CCR surface impoundment to conduct initial and periodic safety factor assessments. *See* 40 C.F.R. § 257.73(e); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b)[1]. The owner or operator must conduct an assessment of the CCR unit and document that the minimum safety factors outlined in § 257.73(e)(1)(i) through (iv) for the critical embankment section are achieved. In addition, the Rules require a subsequent assessment be performed within 5 years of the previous assessment. *See* 40 C.F.R. § 257.73(f)(3); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b) [1].

The CCR surface impoundment known as Plant Wansley AP-1 is located on Plant Wansley property, south of Carrollton, Georgia. AP-1 is formed by engineered cross-valley embankments, one a primary embankment (also known as the separator dike) on the northeast side of the impoundment and a smaller embankment on the west side of the impoundment. The foundations and abutments generally consist of Piedmont Physiographic Provence residual soils consisting of silt, silty sand, sandy clay, and silty clay. A transitional layer of partially weathered rock is present between the residual soils and the underlying bedrock. The bedrock consists primarily of graphitic schist, biotite schist, schist with interlayered mafic units, amphibolite/hornblende gneiss, granitic gneiss, and feldspathic quartzite. The critical cross-section of AP-1 was previously determined to be located on the southern third section of the northeastern primary embankment at the maximum height of fill. Under current conditions, the southern section of the embankment at the maximum height of fill remains the critical section. The Notification of Intent to Initiate Closure was placed in the Operating Record on 04/17/2019 and closure has been designed to have no negative impacts on the stability of the perimeter embankments.

The analyses used to determine the minimum safety factor for the critical section resulted in the following minimum safety factors:

[1] In a typographical error, 391.3-4.10(4)(b) references the “structural integrity criteria in 40 CFR 247.73,” when the reference to such criteria should be 40 CFR 257.73.

Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	1.6	1.5
Maximum Surcharge Pool (Static)	1.6	1.4
Seismic	2.0	1.0

The embankments of AP-1 are not constructed of soils that are susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required.

This assessment is supported by appropriate engineering calculations which are attached.

I hereby certify that the safety factor assessment was conducted in accordance with 40 C.F.R. § 257.73 (e)(1).

GEORGIA REGISTERED No. PE0017419 PROFESSIONAL ENGINEER JAMES C. PEGUES, JR.

/15/2021

James C. Pegues, P.E.
Licensed State of Georgia, PE No. 17419

Southern Company

Technical and Project Solutions Calculation

Calculation Number:
TV-WN- GPC1137595-001

Project/Plant: Plant Wansley Ash Pond	Unit(s): Units 1-2	Discipline/Area: Env. Solutions
Title/Subject: Periodic Factor of Safety Assessment for CCR Rule		
Purpose/Objective: Determine the Factor of Safety of the Ash Pond Dike		
System or Equipment Tag Numbers: n/a	**Originator:** Jacob A. Jordan, P.E.	

Contents

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	JAJ/08-19-21	JCP/08-19-21	JCP/08-19-21

Notes:

Purpose of Calculation

The Plant Wansley Ash Pond was commissioned in 1975, and the Separator Dike was constructed to a crest elevation of 805 ft. with 2.3 (H):1(V) and 3(H): 1(V) upstream and downstream slopes, intermediate berms at elevations 775 ft. and 745 ft. The maximum height of the Ash Pond Separator Dike is approximately 105 ft.

The stability of this structure was analyzed in 2016 for the CCR Rule. The purpose of this calculation is to update the stability analysis of the Ash Pond Separator Dike.

Summary of Conclusions

The following table lists the factors of safety for various slope stability failure conditions. All conditions are steady state except where noted. Construction cases were not considered. The analyses indicate that in all cases the factor of safety is above the require minimum.

Load Conditions	Computed Factor of Safety	Required Minimum Factor of Safety
Long-term Maximum Storage (Static)	1.6	1.5
Maximum Surcharge Pool (Static)	1.6	1.4
Seismic	2.0	1.0

Methodology

The calculation was performed using the following methods and software:

- GeoStudio 2021 R2 version 11.1.1.22085 Copyright 1991-2021, GEO-SLOPE International, Ltd.
- Strata (Version 0.8.0),University of Texas, Austin
- Morgenstern-Price analytical method

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- Seismic site response was determined using a one-dimensional equivalent linear site response analysis. The analysis was performed using Strata and utilizing random vibration theory. The input motion consisted of the USGS published 2014 Uniform Hazard Response Spectrum (UHRS) for Site Class B/C at a 2% Probability of Exceedance in 50 years. The UHRS was converted to a Fourier Amplitude Spectrum, and propagated through a representative one-dimensional soil column using linear wave propagation with strain-dependent dynamic soil properties. The input soil properties and layer thickness were randomized based on defined statistical distributions to perform Monte Carlo simulations for 100 realizations, which were used to generate a median estimate of the surface ground motions.
- The median surface ground motions were then used to calculate a pseudostatic seismic coefficient for utilization in the stability analysis using the approach suggested by Bray and

Tavasarou (2009). The procedure calculates the seismic coefficient for an allowable seismic displacement and a probability exceedance of the displacement. For this analysis, an allowable displacement of 0.5 ft, and a probability of exceedance of 16% were conservatively selected, providing a seismic coefficient of 0.026g for use as a horizontal acceleration in the stability analysis.

- The stability of the Plant Wansley Separator Dike is based on the safety factor requirements from EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (40 C.F.R. Part 257 and Part 261) subsection §257.73(e).
- The soil and CCR material properties for unit weight, phi angle, and cohesion were obtained from the summary table of material properties in the *Material Properties and Major Design Parameters* package in the detailed 90% design construction package submitted by Geosyntec for the closure project of AP-1.
- A surcharge load is applied to the sluiced ash due to the short-term gypsum cell berm located adjacent to the Separator Dike. The short-term gypsum cells were constructed on the ash delta in 2008.

<u>Ash Pond 1</u>

- The cross-section of the dike was obtained using the original design drawings H12399 and H12365, Section G-G.
- The cross-section of the sluiced CCR was obtained from the 2014 bathymetric survey of the Ash Pond.

Input Data

Based on Georgia Power's (GP) Land Department Drawing P355-6 (1), Plant Wansley Ash Pond 2014 Survey, top of the ash in the impoundment is at an elevation of approximately 800 ft.

Hydraulic Considerations

The normal pool elevation of the Ash Pond is 795 ft., based on plant operations. The maximum storage water elevation is based on the calculation package DC-WN-WAN16030-001 Hydrologic and Hydraulic Study for the Ash Pond dated 8/19/16 prepared by Southern Company Services, Inc. This calculation states the Plant Wansley Ash Pond is capable of handling the 100-year 24-hour storm event with a maximum surcharge pool elevation of 800 ft.

Loading Conditions

The Plant Wansley Ash Pond Dike was evaluated for the maximum storage, maximum surcharge, and seismic loading conditions.

Design Inputs/References

E&CS Calculation TV-WN-GPC603330-591-001
USGS Earthquake Hazards website, http://earthquake.usgs.gov/hazards/interactive
Bray, J. D. and Travasarou, T., *Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation*, Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, September 2009
Calculation package DC-WN-WAN16030-001 Hydrologic and Hydraulic Study for the Ash Pond prepared by Southern Company Services, Inc

GPC Land Department Drawing P355-6 (1), Plant Wansley Ash Pond 2014 Survey
GPC Drawing H10027 - Project Location Map
GPC Drawing H12363 - Plant Wansley Ash Pond Discharge Structure General Arrangement
GPC Drawing H12364 - Plant Wansley Separation Dike Construction
GPC Drawing H12365 - Plant Wansley Separation Dike section and Details
GPC Drawing H12366 - Plant Wansley Separation Dike Construction
GPC Drawing H12399 - Plant Wansley Separation Dike General Arrangement
GPC Drawing E1C11102 - Short Term Gypsum Disposal General Arrangement and Site Plan

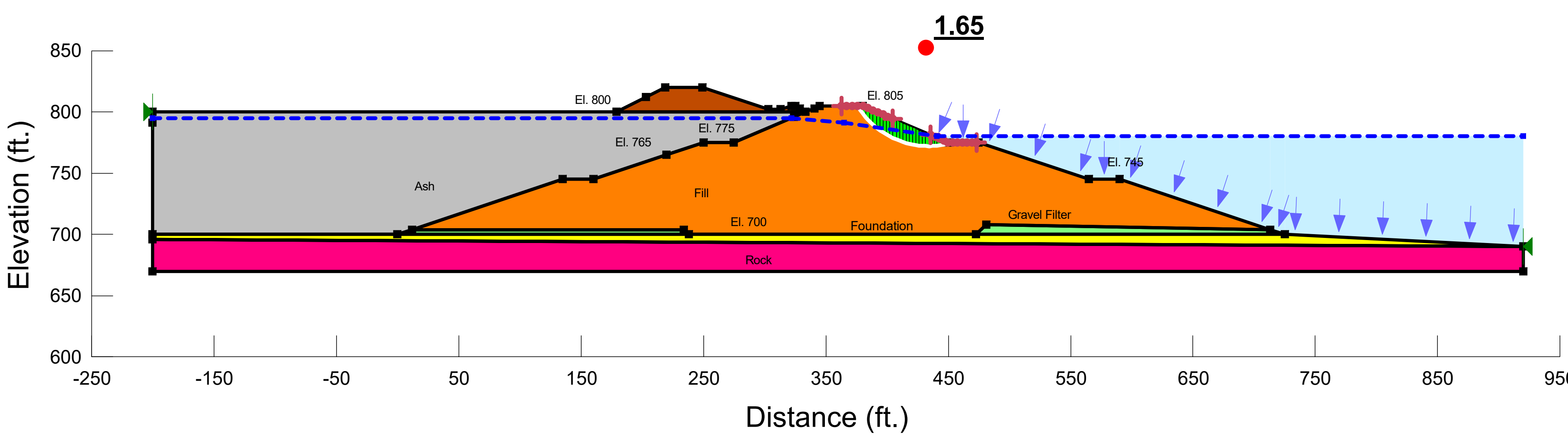
Body of Calculation

SLOPE/W modeling attached.

Plant Wansley Ash Pond Separation Dam Stability Analysis

Long-Term Maximum Storage Pool (Static)

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Embankment Fill	Mohr-Coulomb	125	100	32
	Foundation 2 (Filter Gravel)	Mohr-Coulomb	130	0	40
	Foundation Soil	Mohr-Coulomb	115	0	32
	Gypsum	Mohr-Coulomb	120	0	35
	Rock	Mohr-Coulomb	125	0	40
	Sluiced Ash	Mohr-Coulomb	105	0	32

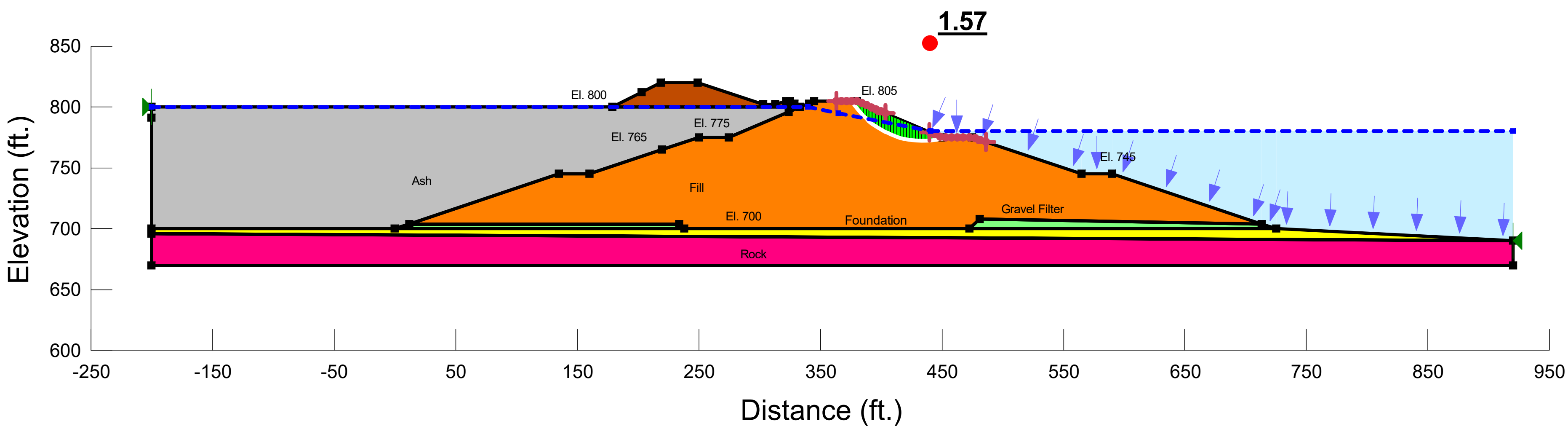


Method: Morgenstern-Price

Plant Wansley Ash Pond Separation Dam Stability Analysis

Maximum Surcharge Pool (Static)

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Embankment Fill	**Mohr-Coulomb**	**125**	**100**	**32**
	Foundation 2 (Filter Gravel)	**Mohr-Coulomb**	**130**	**0**	**40**
	Foundation Soil	**Mohr-Coulomb**	**115**	**0**	**32**
	Gypsum	**Mohr-Coulomb**	**120**	**0**	**35**
	Rock	**Mohr-Coulomb**	**125**	**0**	**40**
	Sluiced Ash	**Mohr-Coulomb**	**105**	**0**	**32**

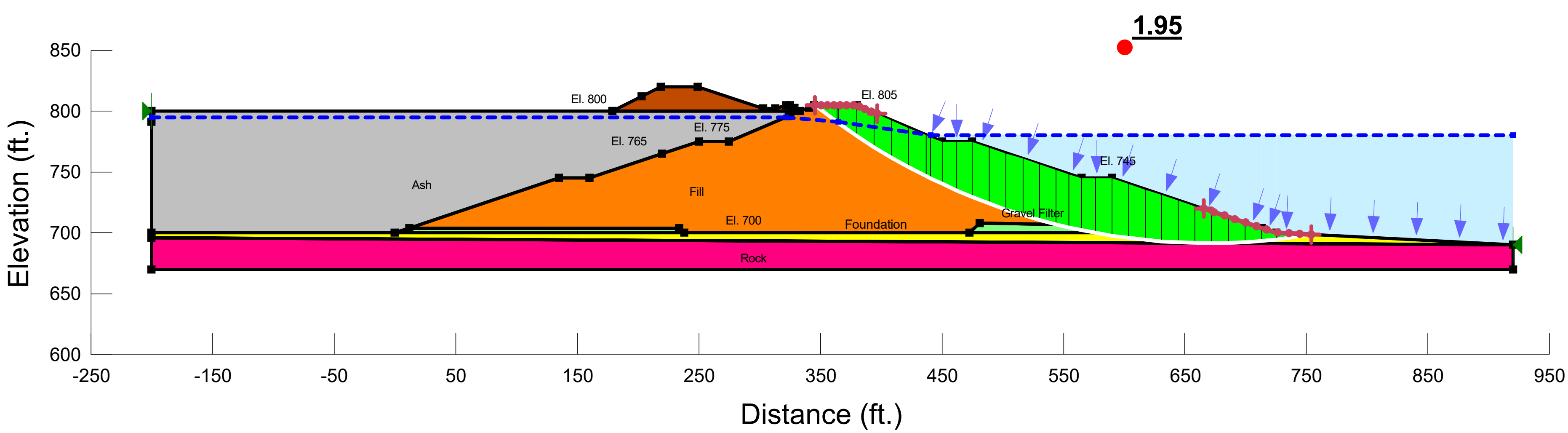


Method: Morgenstern-Price

Plant Wansley Ash Pond Separation Dam Stability Analysis

Seismic (0.5 ft max. displacement)

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Embankment Fill	Mohr-Coulomb	125	100	32
	Foundation 2 (Filter Gravel)	Mohr-Coulomb	130	0	40
	Foundation Soil	Mohr-Coulomb	115	0	32
	Gypsum	Mohr-Coulomb	120	0	35
	Rock	Mohr-Coulomb	125	0	40
	Sluiced Ash	Mohr-Coulomb	105	0	32



Method: Morgenstern-Price

Attachment A

Geosyntec Estimated Material Properties

Table 1. Summary of Geotechnical Parameters Used in Slope Stability Analyses (1)

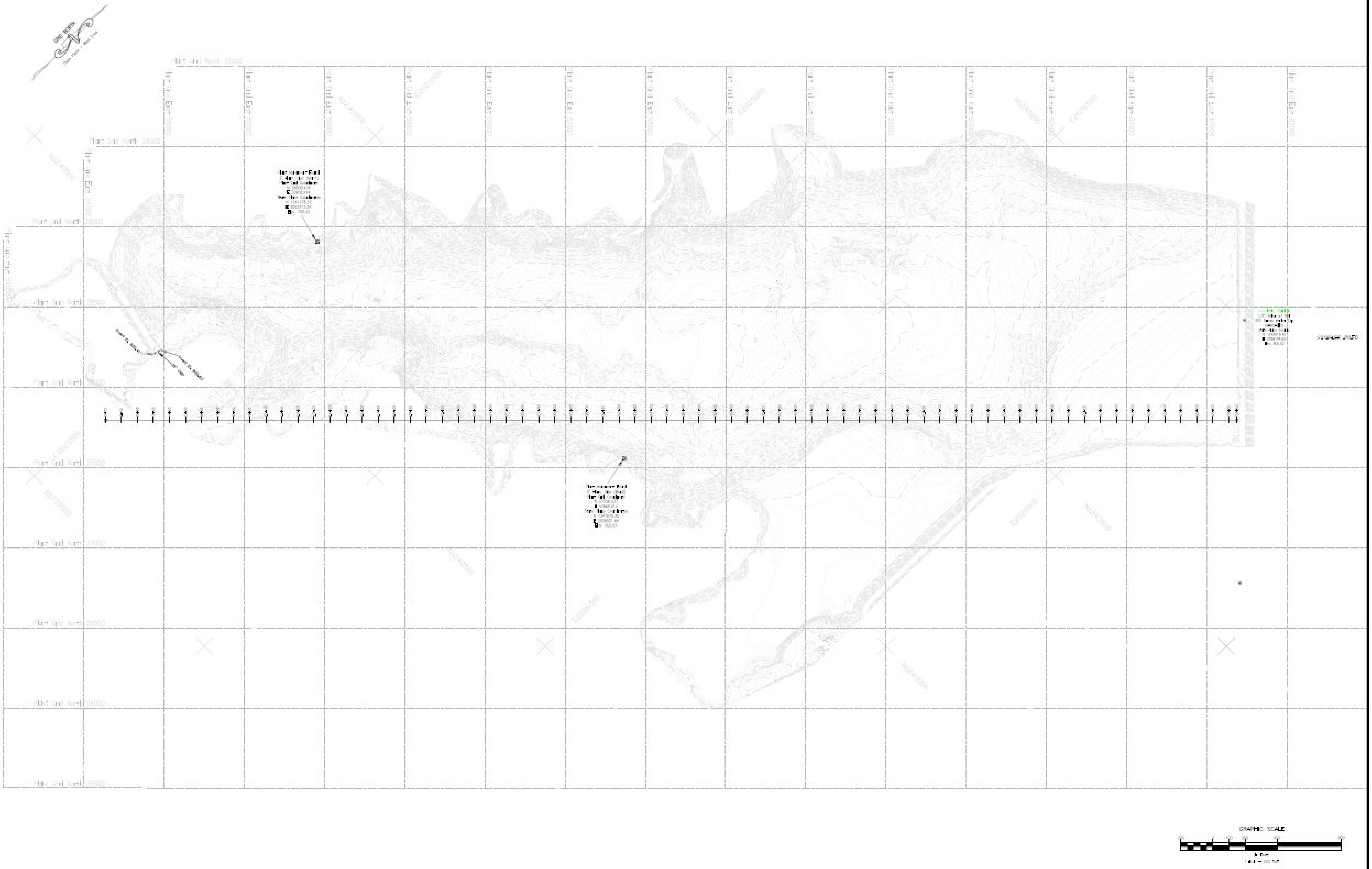
Material	Total Unit Weight (pcf)	Undrained Shear Strength Parameters	Drained Shear Strength Parameters	
		Undrained Shear Strength, s_u (psf) and/or Undrained Shear Strength Ratio, s_u/σ_v' (-)	Effective Friction Angle, ϕ' (°)	Effective Cohesion, c' (psf)
Coal Combustion Residuals (CCR)	105	-	32	0
Native Soil	115	$s_u/\sigma_v' = 0.4$ minimum s_u = 1,200 psf	32	0
Dike (Gypsum Cell Dikes and Separator Dike)	125	$s_u/\sigma_v' = 0.5$ minimum s_u = 1,000 psf	32	100
Gypsum	120	-	35	0
Partially Weathered Rock (PWR)	125	-	40	0
Riprap	130	-	40	0
Bedrock	125	-	40	0

Notes:

1. Geotechnical parameters shown in the table above are discussed in the *Material Properties and Major Design Parameters* calculation package submitted as part of the 90% design [Geosyntec, 2021b].

Attachment B

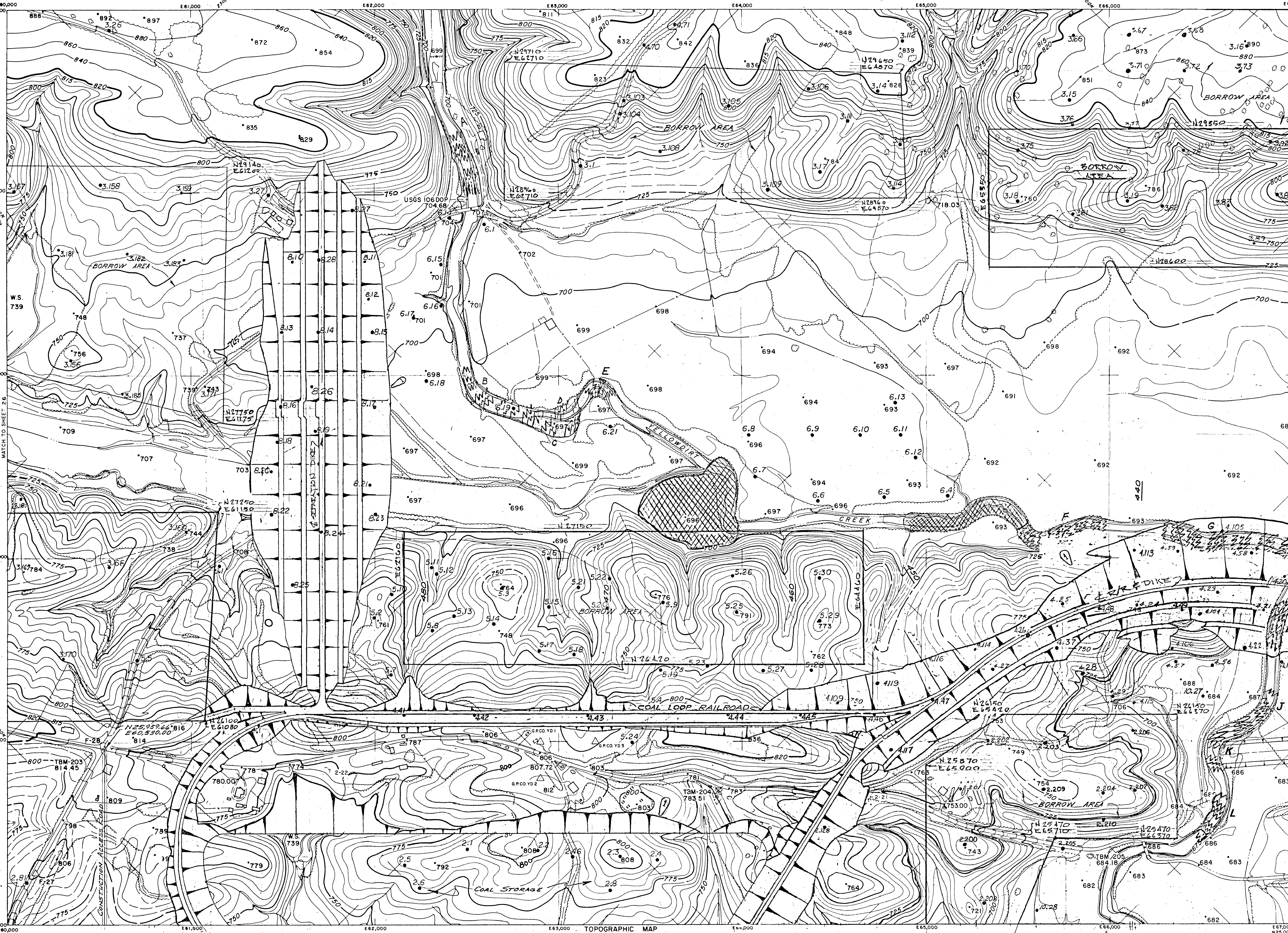
Reference Drawings



GEORGIA POWER CO., ATLANTA, GA.
Land Department

Plant Wansley
Ash Pond – June 2014 Survey

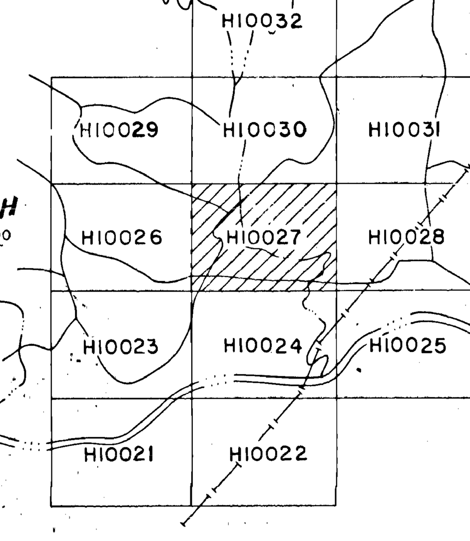
P355-6 (1)



AVAILABLE SANDS AND GRAVELS MATERIAL

Area of Investigation

Potential Area



INDEX TO MAP SHEETS

PLANT GRID
GN
TN
45°
0°28'56"

APPROXIMATE MAGNETIC DECLINATION
1971 = 1° EAST

COWETA - HEARD - CARROLL COUNTIES

SCALE 1" = 200' CONTOUR INTERVAL 5' & 20' NOTE CHANGE IN CONTOUR INTERVAL

CLYDE N ELDRIDGE AERIAL SURVEYS - BARNESVILLE, GEORGIA
FEB 25, 1971

Prepared By Stereophotogrammetric Methods
ALSTER & ASSOCIATES INC., MADISON, WIS.

No.	Date	By	Revisions
2	5-74	CED	Added Flume.
1	8-73	WKS	ADDED SEPARATION DIKE, R/R DIKE, ETC.

GEORGIA POWER CO., ATLANTA, GA.
GENERAL ENGINEERING DEPARTMENT

PLANT WANSLEY - UNIT NO. 1

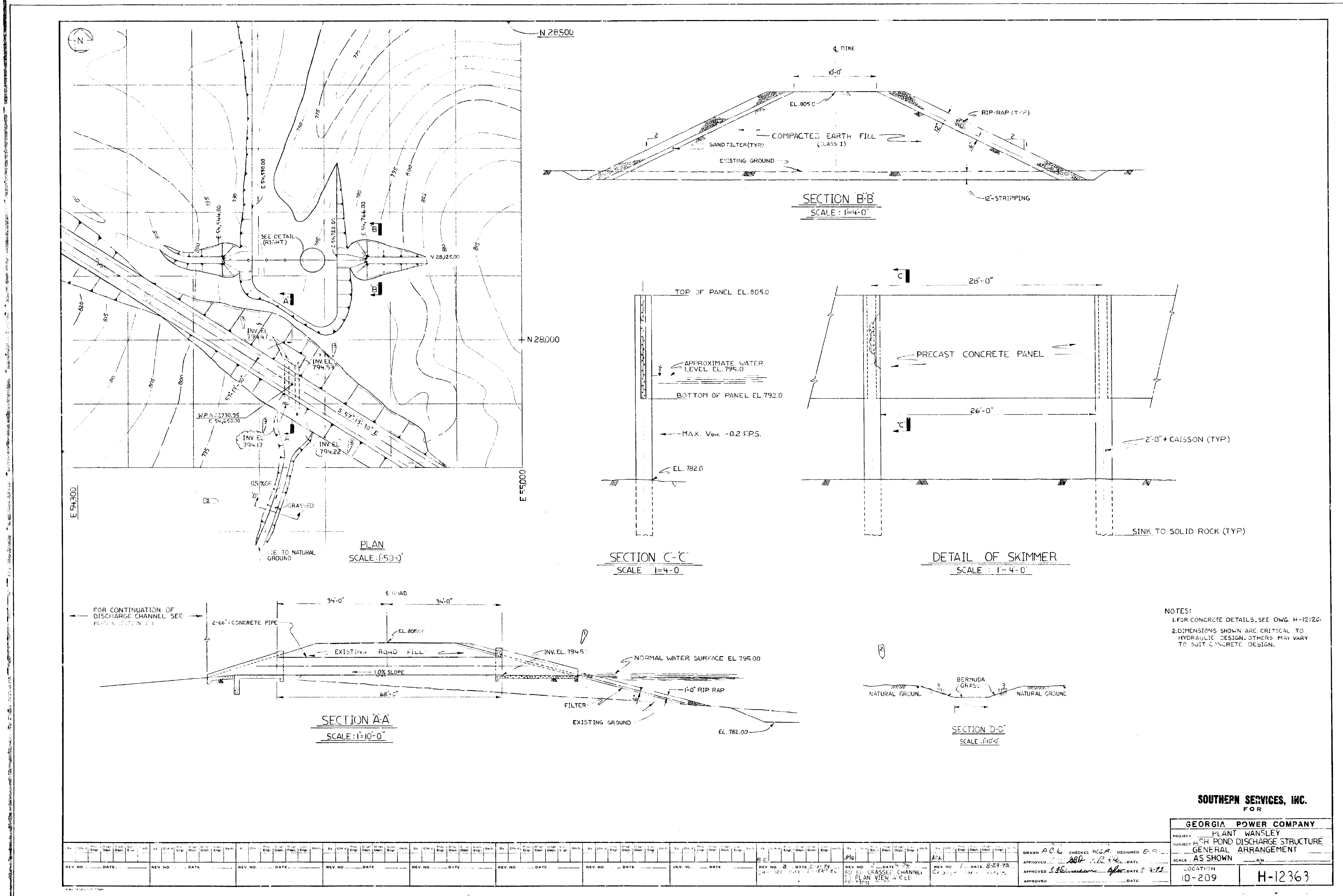
PROJECT LOCATION MAP

APPROVALS

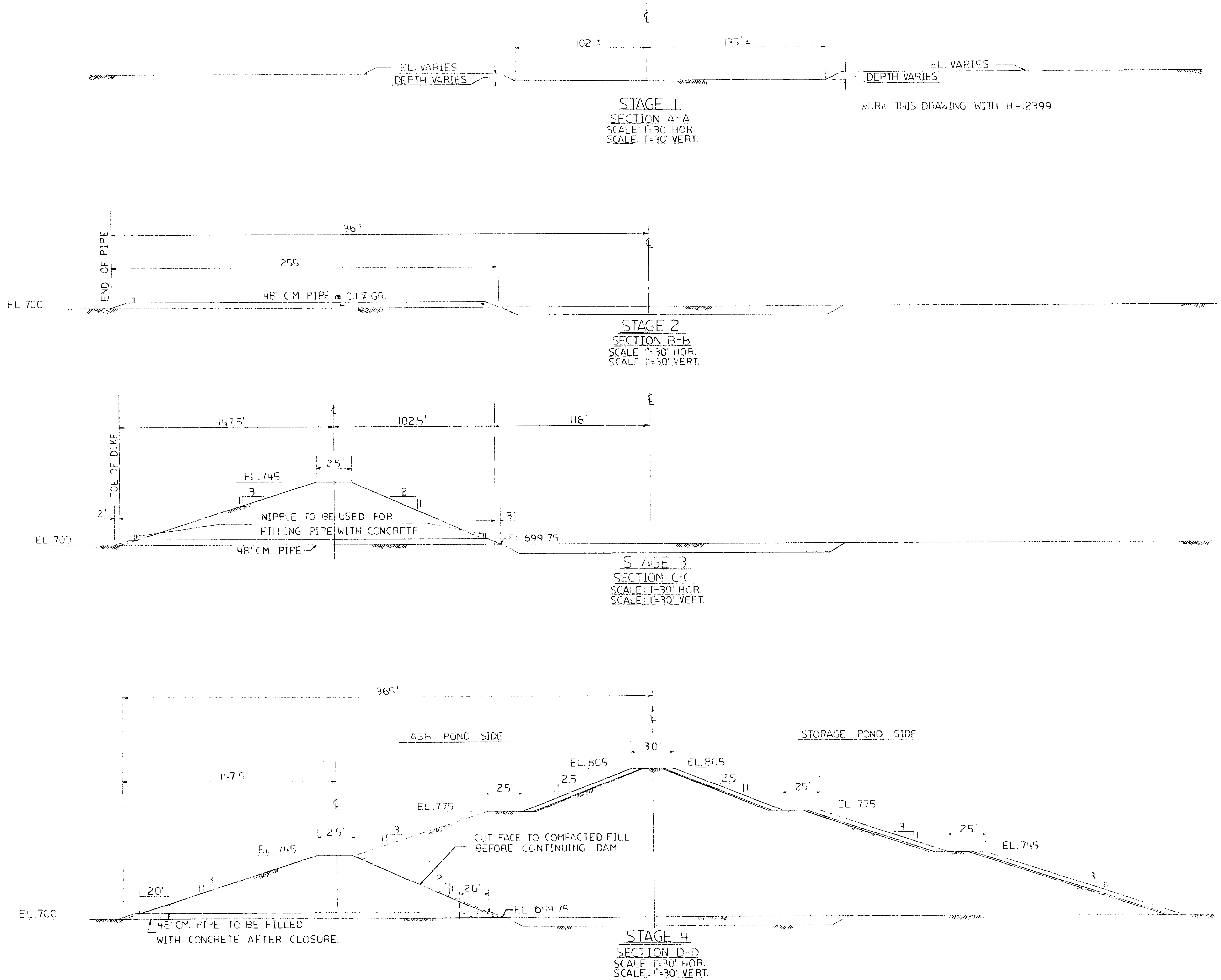
DSGN	DR	CH'K
SCALE AS SHOWN		DATE

DRAWING NUMBER

LOCATION	SHEET NO.
10-209	H10027



30X
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23



NOTES

(1.) USUAL STRIPPING AND ROLLING SHALL BE DONE AS NECESSARY BEFORE PLACING THE FILL WHERE EXCAVATION IS NOT MADE.
(2) THE LIMITS OF EXCAVATION ON THIS DRAWING ARE APPROX.
(3) THE DIVERSION PIPE IS TYPICAL 48" D, .109" THICK, 3"x1" CORRUGATIONS, ARMCO OR EQUIVALENT QUALITY STEEL PIPE.
(4) SPECIAL CARE SHALL BE TAKEN TO COMPACT SOIL AROUND THE PIPE TO ACHIEVE 100% STANDARD PROCTOR DENSITY.
(5) SUFFICIENTLY STRONG STOP LOGS SHALL BE PLACED AT BOTH ENDS OF THE DIVERSION PIPE BEFORE FORCING CONCRETE INTO IT.

REFERENCES

DWG. NO. H-12366 : SEPARATION DAM CONSTRUCTION DIVERSION SCHEME STAGE DRAWINGS, PLANS.
DWG. NO. H-12399 : SEPARATION DAM PLAN AND SECTIONS.

SOUTHERN SERVICES INC.
FOR
GEORGIA POWER CO. ATLANTA, GA.
GENERAL ENGINEERING DEPARTMENT

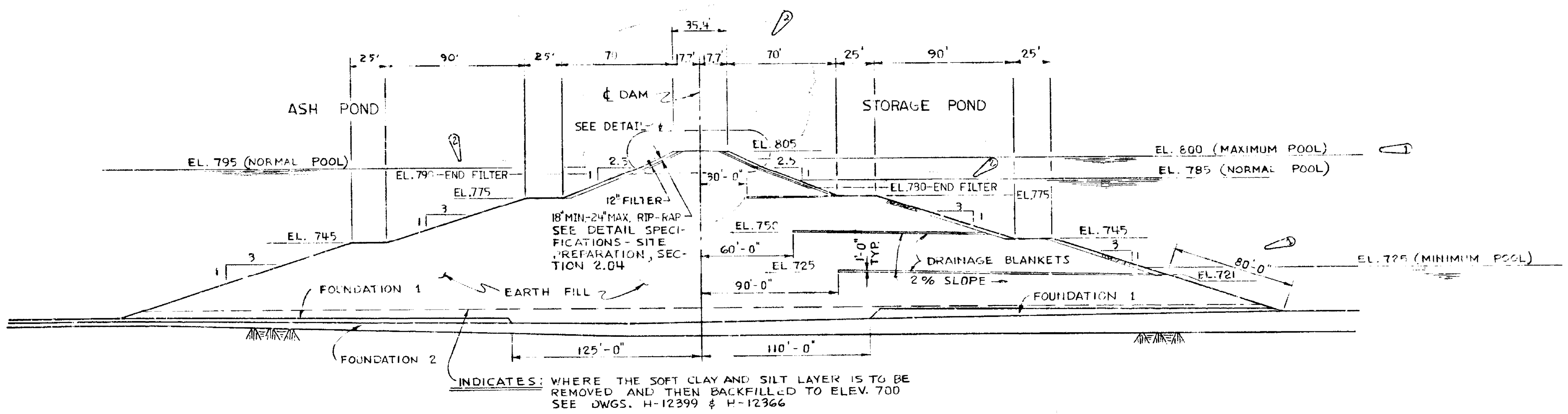
DRAWN CDL	CHECKED E.P. DESIGNED E.P.
APPROVED [illegible]	DATE 7-30-73
APPROVED F. Duncan	DATE 8-30-73
APPROVED	DATE

PROJECT
SUBJECT SEPARATION DAM - CONSTRUCTION DIVERSION SCHEME STAGE DWG'S, SECTIONS
SCALE 1"=30' HOR. & VERT. B/M

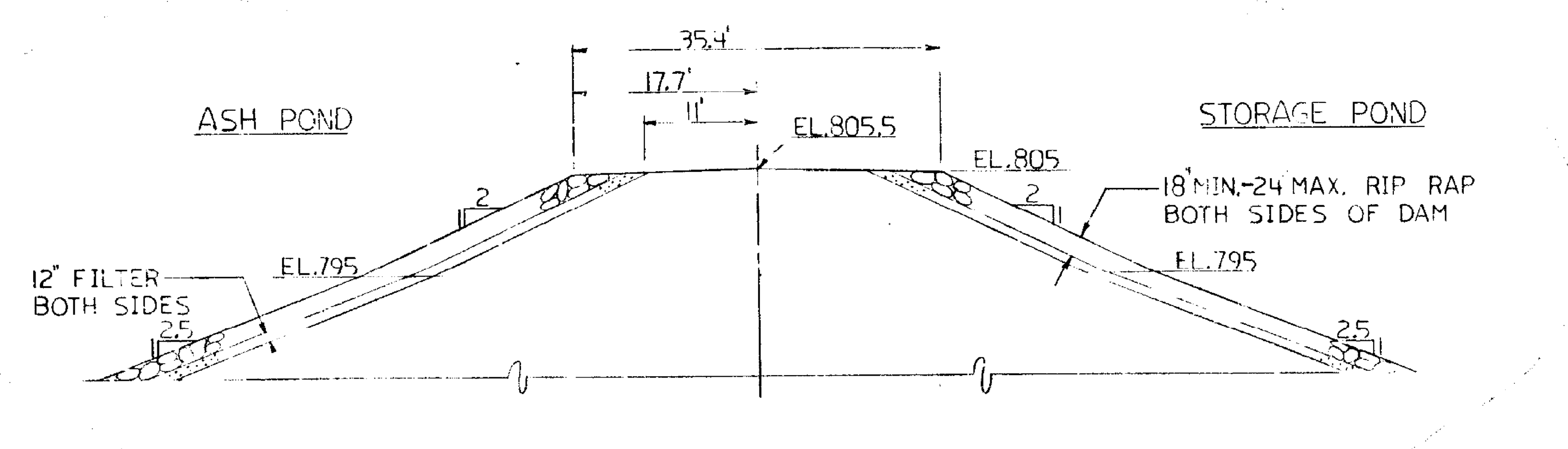
SHEET OF SHEETS	LOCATION	SHEET NO.
SUPERSEDES	10-209	H-12364

RETURN TO HYDRO

30X



SECTION G-G (H-12399)
1" = 40'-0"



TYPICAL TOP OF DAM DETAIL
SCALE: 1"=10'-0"

SOIL DESCRIPTION

EARTH FILL	CLAYEY SANDY SILT
RIP - RAP	ROCK AGGREGATE
DRAINAGE BLANKET	SAND AND GRAVEL FROM BORROW PIT LOCATIONS SELECTED FOR HIGH PERMEABILITY
FOUNDATION 1	SAND AND GRAVEL (ALLUVIUM)
FOUNDATION 2	SANDY MICACEOUS SILT (RESIDUAL)

NOTE:
1. FOR THE LOCATION OF THE SECTION SHOWN, PLEASE REFER TO DWG. H-12399.
2. THIS DESIGN IS BASED ON THE ASSUMPTION THAT THE WATER LEVEL IN STORAGE POND SIDE ONLY WILL FLUCTUATE FROM EL.785 TO EL.720.
3. FOR ADDITIONAL NOTES CONCERNING SOIL MATERIALS TO BE USED IN DAM SEE DWG. H-12396.

REFERENCES: SEPARATION DAM

H-12364 — DIVERSION SCHEME — STAGE DRAWINGS & SECTIONS
H-12366 — CONSTRUCTION DIVERSION SCHEME — STAGE DRAWINGS & PLANS
H-12396 — STABILITY ANALYSIS. SHEET 1 OF 3
H-12397 — " " , SHEET 2 OF 3
H-12398 — " " , SHEET 3 OF 3
H-12399 — GENERAL ARRANGEMENT WITH EXCAVATION LIMITS

SOUTHERN SERVICES, INC.
FOR
GEORGIA POWER CO., ATLANTA, GA.
GENERAL ENGINEERING DEPARTMENT

PLANT WANSLEY
SEPARATION DAM
SECTION & DETAILS

NO.	DATE	BY	REVISIONS
2	11-26-73	JMC	WIDEN TOP OF DAM, ADDED TYPICAL DAM DETAIL, AND SET LENGTH OF FILTER MATERIAL ON SIDE SLOPES
1	6-22-73	WDP	GENERAL

APPROVALS:
Blu- PR 4/6/73
EFDuncan 4-13-73

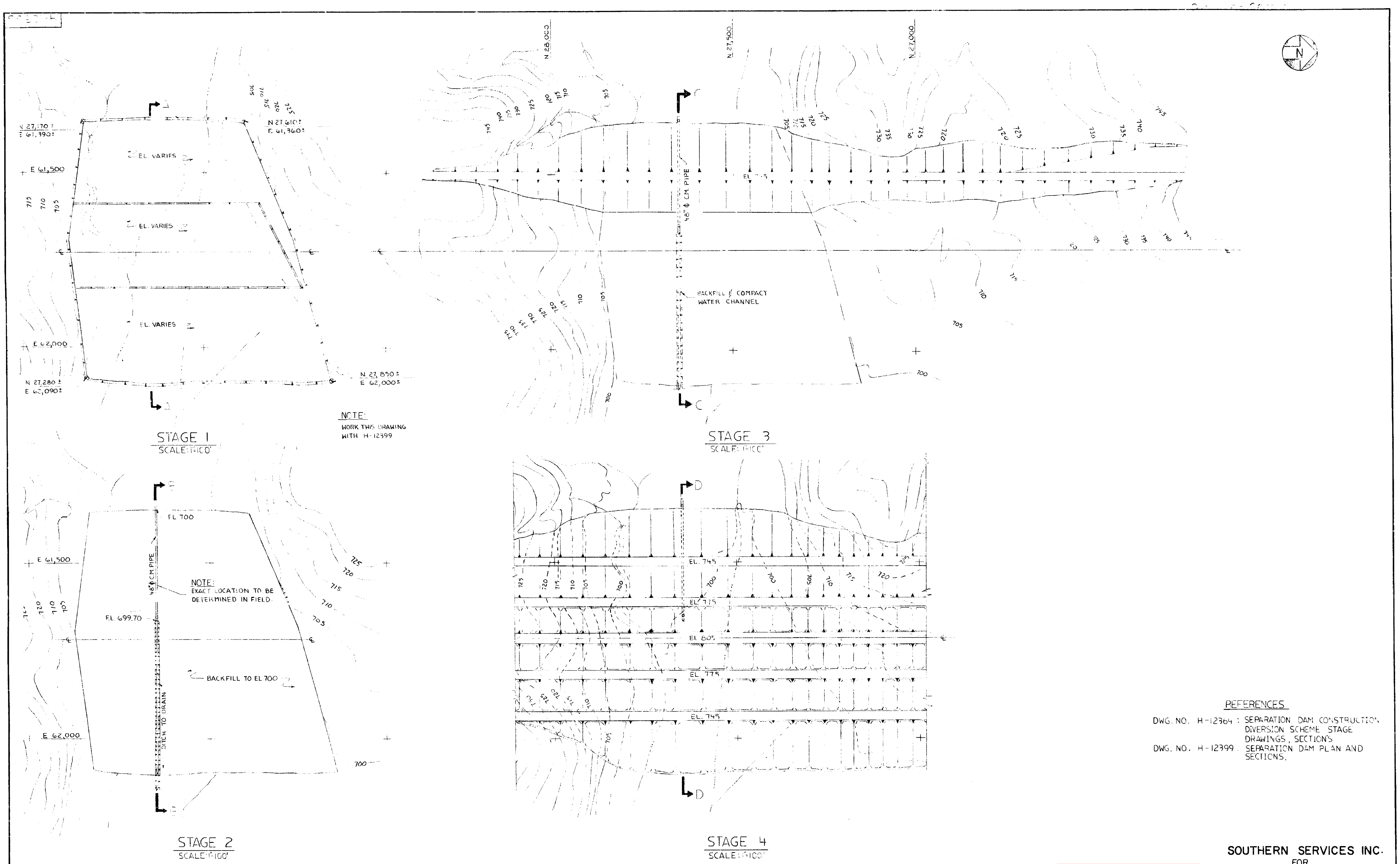
DSGN.	DR	CH'K
J.M.	W.D.F.	JM

SCALE	DATE
AS SHOWN	4 - 3 - 73

DRAWING NUMBER

LOCATION	SHEET NO.
10-209	H-12365

30X



CONFIDENTIAL BUSINESS INFORMATION
WAN-API 007

SOUTHERN SERVICES INC.
FOR

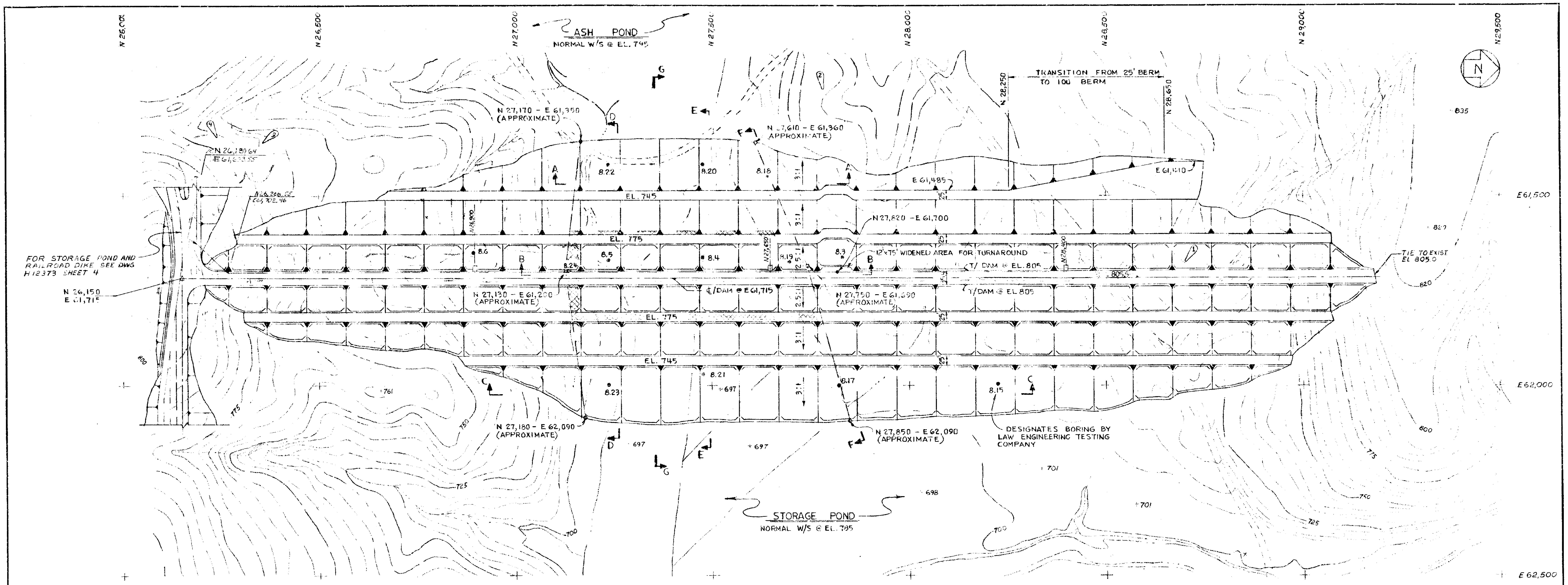
GEORGIA POWER CO. ATLANTA GA. GENERAL ENGINEERING DEPARTMENT		
PROJECT PLANT WANSLEY		
SUBJECT SEPARATION DAM - CONSTRUCTION DIVERSION SCHEME STAGE DWG'S, PLANS		
SCALE 1" = 100'		
SHEET OF SHEETS SUPERSEDES	LOCATION 10-209	SHEET NO H-12366

DRAWN CDL. CHECKED E.P. DESIGNED E.P.
APPROVED DATE 5-7-73
APPROVED DATE 5-7-73
APPROVED DATE

REV. NO. DATE

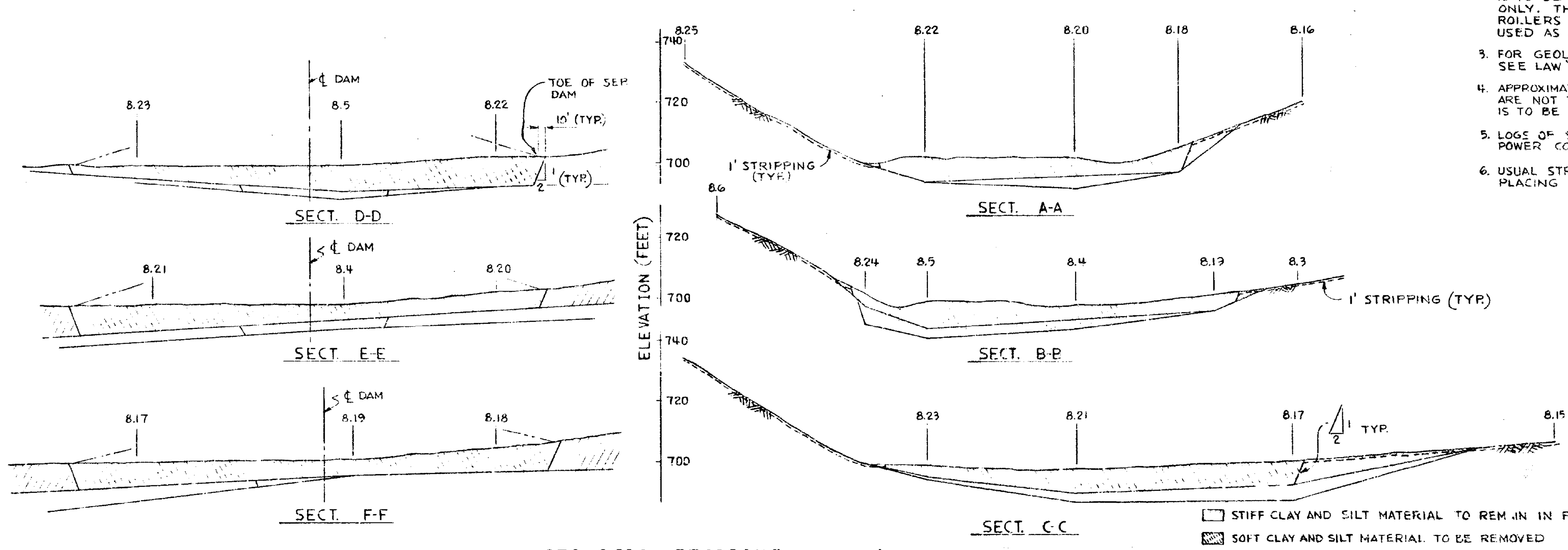
RETURN TO HYDRO

30X



PLAN OF SEPARATION DAM

1" = 100'-0"



GEOLOGIC SECTIONS

HORIZ. SCALE: 1" = 100'-0"
VERT. SCALE: 1" = 20'-0"

- STIFF CLAY AND SILT MATERIAL TO REMAIN IN PLACE
- SOFT CLAY AND SILT MATERIAL TO BE REMOVED
- SAND AND GRAVEL MATERIAL TO BE REMOVED
- SAND AND GRAVEL MATERIAL TO REMAIN IN PLACE

NOTE:

1. SOFT TO VERY SOFT ALLUVIUM (CLAY AND SILT) IS TO BE REMOVED UNDER THE SUPERVISION OF THE FIELD ENGINEER. THE APPROXIMATE BOUNDARY IS SHOWN BY THE SHADED AREA. LEAVE STIFF CLAY AND SILT IN PLACE.
2. SAND AND GRAVEL LAYER BELOW THE CLAY AND SILT IS TO BE REMOVED FROM THE HATCHED AREA ONLY. THE REST WILL BE CONSOLIDATED BY ROLLERS BEFORE PLACING EMBANKMENT FILL AND USED AS A DRAINAGE BLANKET.
3. FOR GEOLOGIC CROSS SECTIONS & OTHER RELATED DETAILS SEE LAW'S COMMUNICATION NO. 39; FIGURES 1-5,9.
4. APPROXIMATE LOCATION OF LIMITS OF MATERIAL TO BE REMOVED ARE NOT TO BE CONSTRUED AS EXACT. ACTUAL EXCAVATION IS TO BE DETERMINED BY NATURE OF THE MATERIAL.
5. LOGS OF SOIL BORINGS MAY BE OBTAINED FROM GEORGIA POWER COMPANY OR SOUTHERN SERVICES INC.
6. USUAL STRIPPING SHOULD BE DONE AS NECESSARY BEFORE PLACING THE FILL.

REFERENCES: SEPARATION DAM

H-12364 — DIVERSION SCHEME — STAGE DRAWINGS & SECTIONS
H-12365 — SECTION & DETAILS
H-12366 — CONSTRUCTION DIVERSION SCHEME — STAGE DRAWINGS & PLANS
H-12373 — STORAGE POND DAM, SHEET 4
H-12396 — STABILITY ANALYSIS, SHEET 1 OF 3
H-12397 — " " , SHEET 2 OF 3
H-12398 — " " , SHEET 3 OF 3
H 12237 — GEN. ARRANGEMENT, ASH PIPE ROUTING

SOUTHERN SERVICES, INC.
FOR
GEORGIA POWER CO., ATLANTA, GA.
GENERAL ENGINEERING DEPARTMENT

PLANT WANSLEY
SEPARATION DAM-GENERAL ARRANGEMENT WITH LIMITS OF EXCAVATION

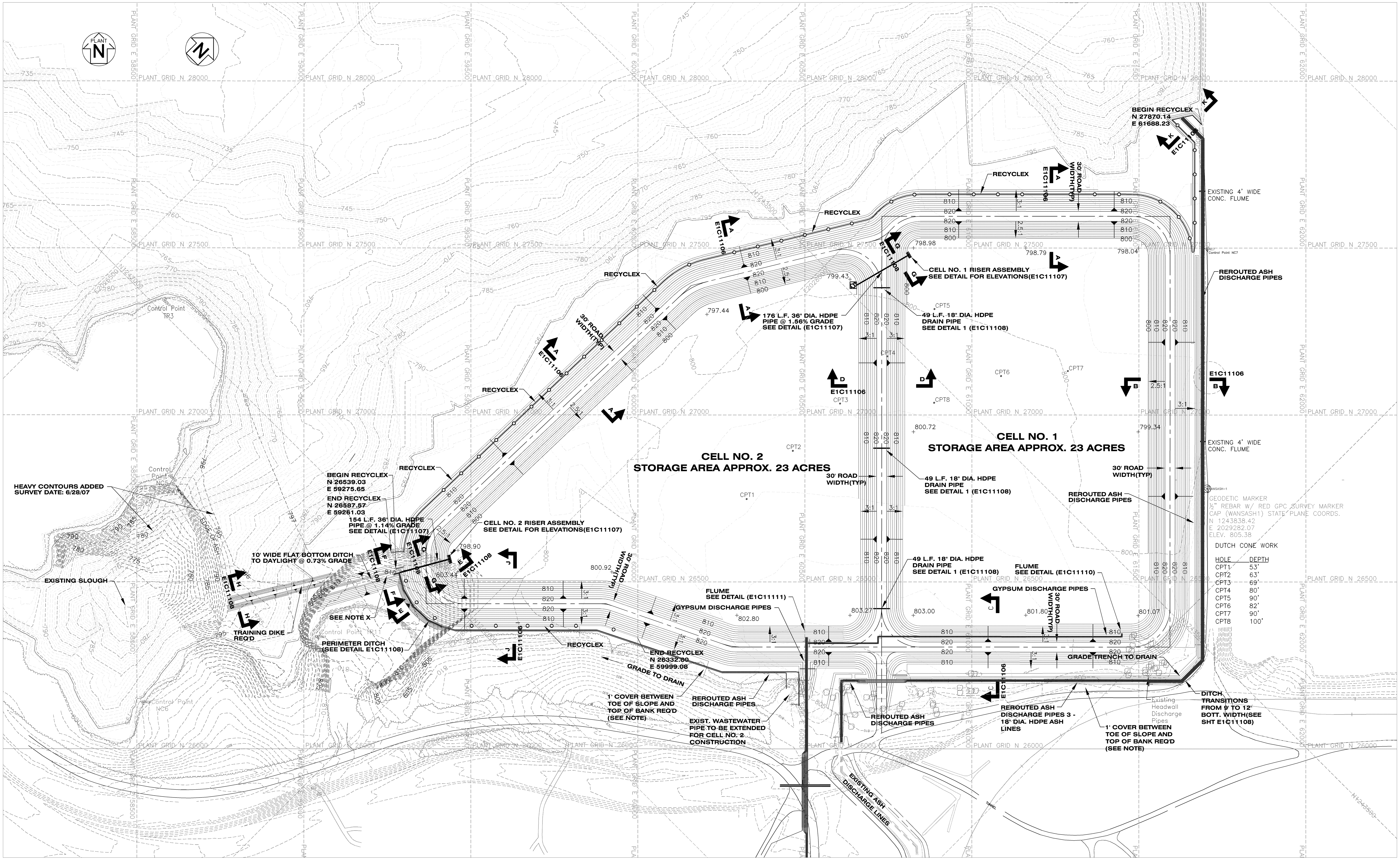
NO.	DATE	BY	REVISIONS
4	3-11-76	VAB	RELOCATED ℄ ASH PIPING
3	5-5-75	JM	RELOCATED ℄ ASH PIPING
2	3/20/75	CDL	ADDED ℄ ASH PIPING

DSGN.	DR.	CH'K
J.M.	WDP	JM

SCALE	DATE
AS SHOWN	4-3-73

APPROVALS: 4/4/73; F.F. Duncan 4-18-73

DRAWING NUMBER	
LOCATION	SHEET NO.
10-209	H-12399



GENERAL ARRANGEMENT AND SITE PLAN

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

CONFIDENTIAL BUSINESS INFORMATION
WAN-API 015

GENERAL NOTES

1. FOR DRAWING INDEX, NOTES, AND SPECIFICATIONS SEE E1C11100.
2. ALONG THE TOE OF DIKE, ALL EXPOSED ASH SHALL BE COVERED WITH 1 FOOT OF SOIL COVER. (SC/SM, MH/ML)
3. WASTE WATER DISCHARGE PIPES TO BE TEMPORARILY EXTENDED TO FACILITATE DIKE CONSTRUCTION. THESE PIPES WILL BE LATER REMOVED TO PERMANENTLY END IN THE DISCHARGE DITCH FROM CELL NO. 2.

Southern Company Generation
Engineering and Construction Services
FOR
Georgia Power Company

PLANT WANSLEY UNITS 1 & 2
FGD PROJECT

SHORT TERM GYPSUM DISPOSAL
GENERAL ARRANGEMENT AND SITE PLAN

REVISION	DATE	DESCRIPTION	JOB NO.	EWO	BY	CHK'D	CIVIL APPR	ELECT APPR	I/C APPR	MECH APPR	DISC MGR
1	8-10-07	GENERAL REVISION ISSUED FOR CONSTRUCTION	C07510	3059DE	JWM	PMG	DHF				CKT
0	7-27-07	ISSUED FOR CONSTRUCTION	C07510	3059DE	JWM	PMG	AMW	RKC	KAH	MTB	CKT

SCALE	PROJ I.D.	DRAWING NUMBER	SH	CONT'D	REV
1"=100'		E1C11102	1	FINAL	1

ANSI E- 44x34 Acod2004