Stantec Consulting Services Inc.
10509 Timberwood Circle, Suite 100, Louisville, KY 40223

October 6, 2016
File: rpt_001_let_175555021
Revision 0

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

RE: Liner Design Demonstration
Stilling Pond (including Retention Pond)
EPA Final Coal Combustion Residual (CCR) Rule
TVA Cumberland Fossil Plant
Stewart County, Tennessee

1.0 PURPOSE

This letter documents Stantec's certification of the existing liner assessment for the TVA Cumberland Fossil Plant's Stilling Pond (including Retention Pond). Based on the assessment, the Stilling Pond is considered an unlined CCR surface impoundment as described in the Final CCR Rule at 40 CFR 257.71(a)(3).

2.0 EXISTING LINER ASSESSMENT

An existing surface impoundment must be evaluated as to whether or not it was constructed with a liner as described in 40 CFR 257.71(a)(1)(i)-(iii).

3.0 SUMMARY OF FINDINGS

The attached report presents the analysis for the existing liner assessment. The report concludes that the Stilling Pond at the Cumberland Fossil Plant was not constructed with a liner that complies with the requirements of §257.71 of the EPA CCR Rule. Therefore, this unit is considered an unlined surface impoundment that is allowed to remain in operation in compliance with the requirements of §257.101(a).

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stephen H. Bickel, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

2. that the information contained herein is accurate as of the date of my signature below; and

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Stewart County, Tennessee

3. that the TVA Cumberland Fossil Plant's Stilling Pond is considered an unlined CCR surface impoundment as described in 40 CFR 257.71(a)(3).

SIGNATURE _____ DATE 10/6/2016

ADDRESS: Stantec Consulting Services Inc.
10509 Timberwood Circle, Suite 100
Louisville, KY 40223

TELEPHONE: (502) 212-5000

ATTACHMENTS: CUF Stilling Pond Liner Design Demonstration

Liner Design Demonstration

Cumberland Fossil Plant
Stilling Pond (including Retention Pond)
Stewart County, Tennessee

Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:
Stantec Consulting Services Inc.

October 6, 2016
Revision 0

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1.0 BACKGROUND

1.1 INTRODUCTION

On April 17, 2015, the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule (EPA Final CCR Rule) was published in the Federal Register. The Tennessee Valley Authority (TVA) contracted Stantec Consulting Services Inc. (Stantec) to determine whether the Stilling Pond (including Retention Pond) at Cumberland Fossil Plant (CUF) met the liner design criteria for existing CCR surface impoundments as defined in §257.71 of the EPA Final CCR Rule.

CUF is a coal-fired, electric generating plant located in Stewart County, Tennessee, on the southern bank of the Cumberland River (River Mile 103), which is approximately 60 miles northwest of Nashville, Tennessee. Wells Creek flows around the southwest perimeter of CUF. The Stilling Pond is an existing CCR surface impoundment as defined by the EPA Final CCR Rule consisting of approximately 56 acres (17 acres to the north comprising the Stilling Pond and 38 acres to the south comprising the Retention Pond) with a constructed perimeter dike system with a maximum height of 36 feet above Wells Creek.

This assessment concludes that while this unit is underlain by native clay soils, it is classified as an unlined CCR surface impoundment per the EPA Final CCR Rule. The Stilling Pond consists of the boundary area denoted in Figure 1.

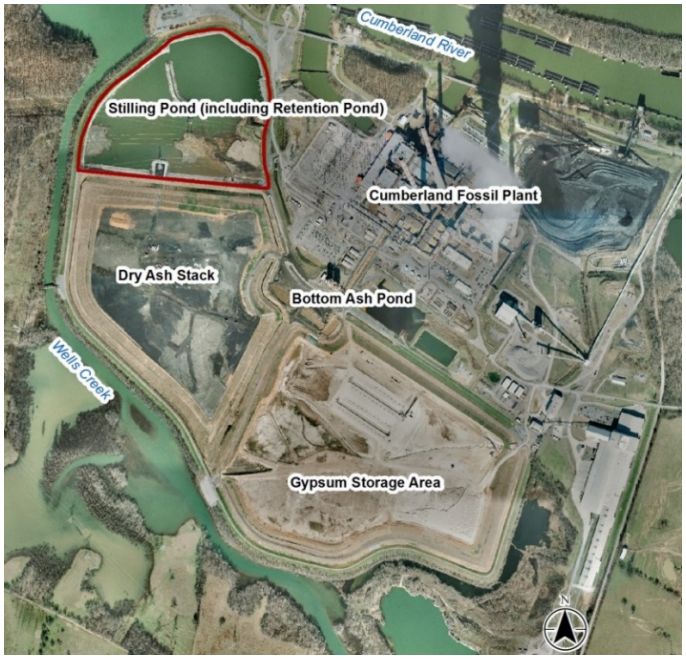


Figure 1 Stilling Pond Boundary

1.2 OBJECTIVE

The objective of this demonstration is to evaluate compliance related to §257.71, specifically whether the Stilling Pond (including Retention Pond) was constructed with one of the following:

- A liner consisting of a minimum of 2 feet of compacted soil with a hydraulic conductivity of no greater than 1 x 10^{-7} cm/sec;
- A composite liner that meets the requirements of § 257.70(b); or
- An alternative composite liner that meets the requirements of § 257.70(c).

Based on the EPA presentation dated April 15, 2015 and titled, "Top 20 Questions on EPA's CCR Final Rule", compacted soil means soil that is *mechanically* compacted in lifts.

1.3 SUMMARY OF HISTORICAL INFORMATION

The Stilling Pond, previously referred to as the Ash Disposal Area, was constructed in 1969. As part of this construction, Wells Creek was relocated in order to construct the Ash Disposal Area. As a result, portions of the Stilling Pond, Retention Pond, and Dry Stack were constructed "in the dry" over the original location of Wells Creek. In 1977, TVA constructed the interior divider dike separating the Stilling Pond and the Retention Pond. The perimeter dike around the entire Stilling Pond area (including the Retention Pond) was raised to Elevation 395 feet with clay in 1979. In 1986, approximately 300 feet of the west portion of the divider dike between the Stilling Pond and the Dry Ash Stack was constructed. Then the exterior divider dike between the Stilling Pond and the Dry Ash Stack was constructed in 1995 and 1996. Applicable Record Drawings are included in Appendix A.

The following geotechnical reports have been reviewed:

- Law Engineering. 1992. Report of Subsurface and Stability Analysis. Prepared for Tennessee Valley Authority. January 27, 1992.
- Stantec Consulting Services Inc. 2010. Report of Geotechnical Exploration and Slope Stability Evaluation – Ash Pond. Prepared for Tennessee Valley Authority. March 29, 2010.
- Stantec Consulting Services Inc. 2013. Instrument Installation and Update Seepage Analyses – Ash Pond. Prepared for Tennessee Valley Authority. January 9, 2013.

These reports include soil borings drilled along the perimeter dikes of the Stilling and Retention Ponds. Review of these reports could not conclude whether a mechanically compacted clay liner was placed across the extent of the Stilling Pond.

2.0 FIELD EXPLORATION

There have been no additional field explorations at this facility.

3.0 CONCLUSION

Based on a review of existing geotechnical reports, the Stilling Pond at Cumberland Fossil Plant was not constructed with a liner that complies with the requirements of §257.71 of the EPA Final CCR Rule. Therefore, this unit is considered an unlined surface impoundment in accordance to the EAP Final CCR Rule and is allowed to remain in operation in compliance with the requirements of §257.101(a).

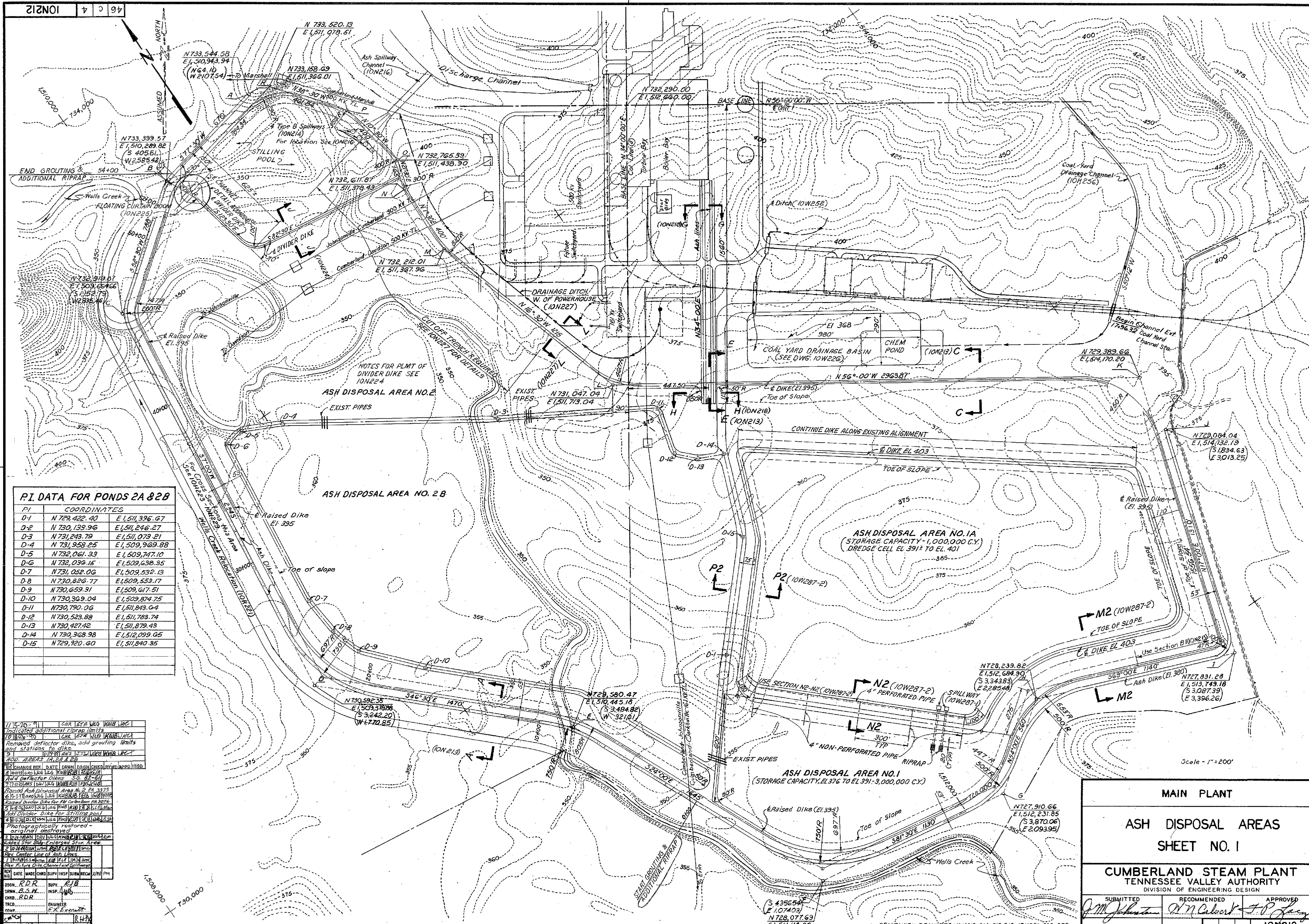
4.0 REFERENCES

Law Engineering. 1992. Report of Subsurface and Stability Analysis. Prepared for Tennessee Valley Authority. January 27, 1992.

Stantec Consulting Services Inc. 2010. Report of Geotechnical Exploration and Slope Stability Evaluation – Ash Pond. Prepared for Tennessee Valley Authority. March 29, 2010.

Stantec Consulting Services Inc. 2013. Instrument Installation and Update Seepage Analyses – Ash Pond. Prepared for Tennessee Valley Authority. January 9, 2013.

APPENDIX
HISTORICAL DRAWINGS



P.I. DATA FOR PONDS 2A & 2B

PI	COORDINATES	
D-1	N 729,422.40	E 1,511,396.67
D-2	N 730,133.96	E 1,511,246.27
D-3	N 731,243.79	E 1,511,073.21
D-4	N 731,958.25	E 1,509,969.88
D-5	N 732,061.33	E 1,509,747.10
D-6	N 732,036.15	E 1,509,638.35
D-7	N 731,052.06	E 1,509,532.13
D-8	N 730,826.77	E 1,509,553.17
D-9	N 730,659.31	E 1,509,617.51
D-10	N 730,369.04	E 1,509,874.75
D-11	N 730,790.06	E 1,511,843.64
D-12	N 730,523.88	E 1,511,783.74
D-13	N 730,427.42	E 1,511,879.43
D-14	N 730,368.98	E 1,512,099.65
D-15	N 729,920.60	E 1,511,840.35

MAIN PLANT

ASH DISPOSAL AREAS SHEET NO. 1

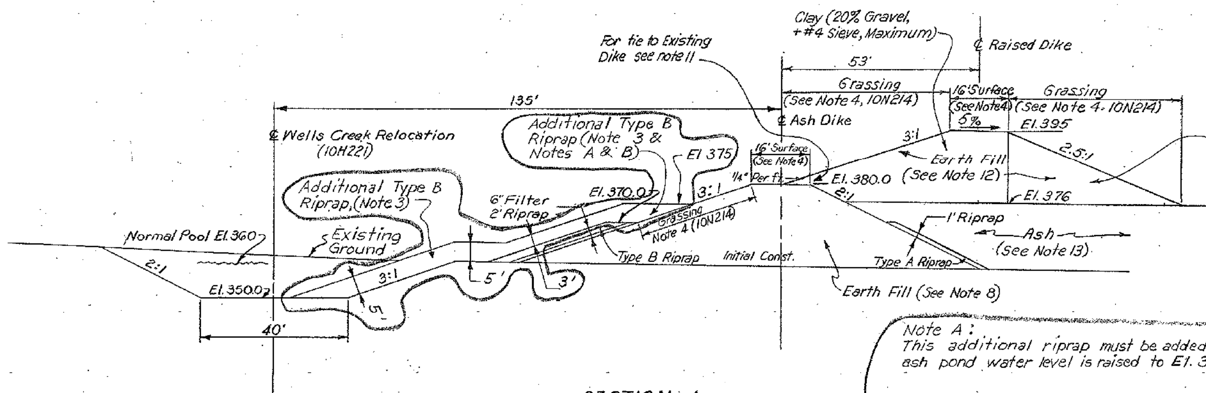
CUMBERLAND STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
J. M. Johnston	W. N. Calvert	F. P. Lacy

KNOXVILLE	1-13-69	46	C	4	10N212 R11

RECORD DRAWING AS CONSTRUCTED 7-24-74

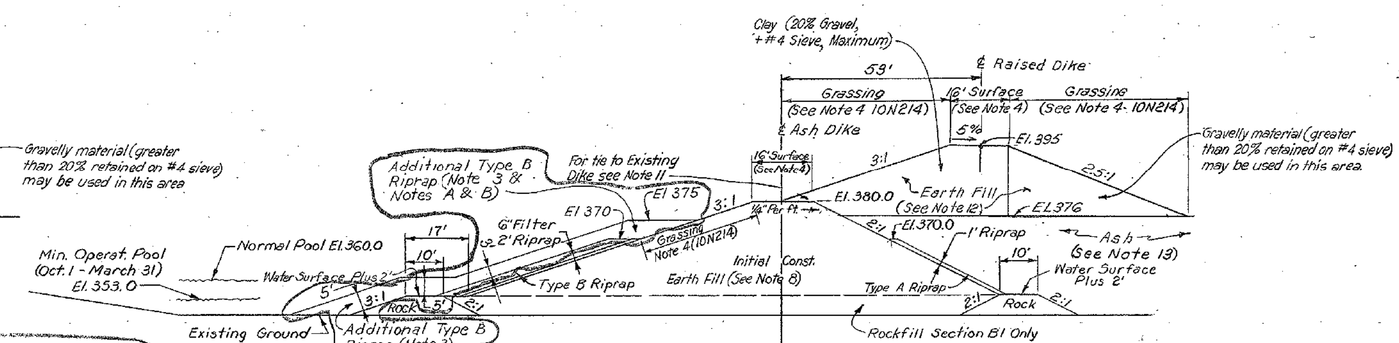
46 C 4 10N213



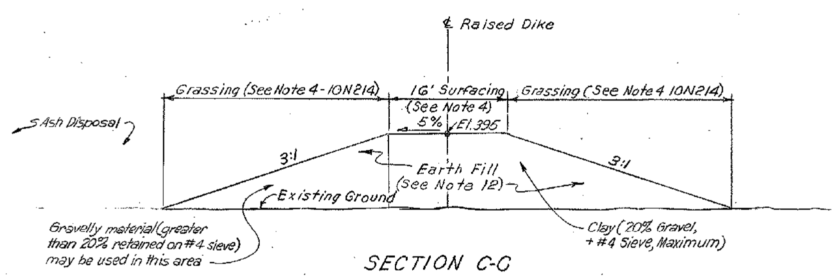
Note A:
This additional riprap must be added before the ash pond water level is raised to El. 376.

Note B:
This additional riprap is to be added only from Sta 0+00 to Sta 54+00 along Wells Creek as shown on dwg 10N212 R11

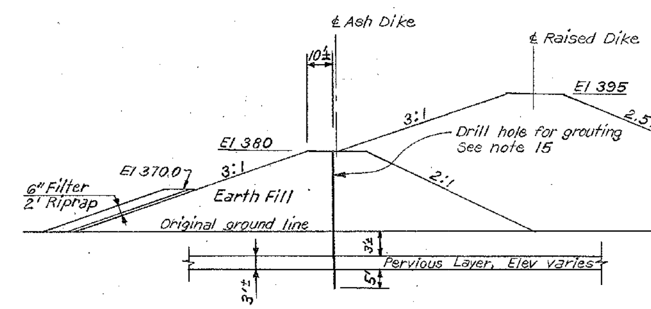
SECTION A
Dike where Exist. Ground is above water surface.
Scale: 1" = 20'



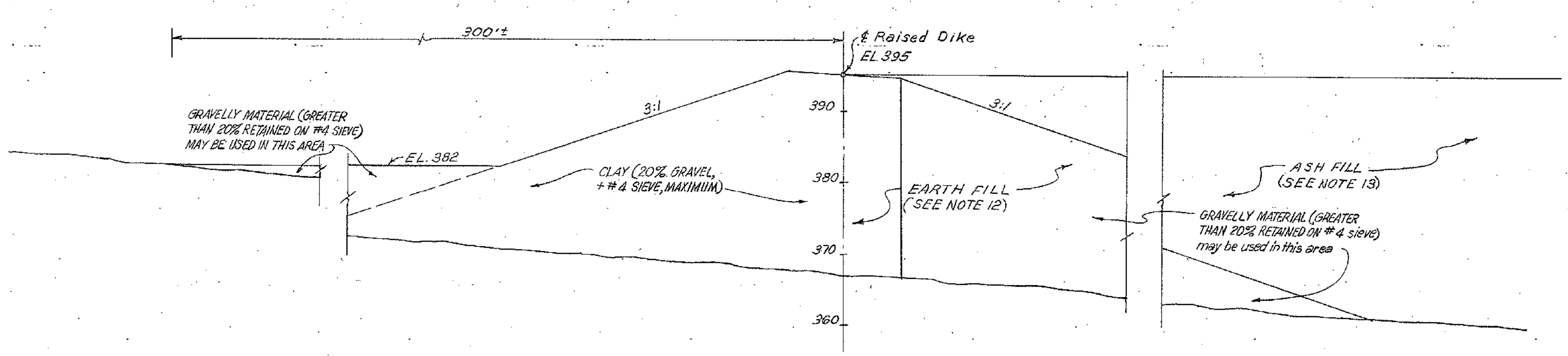
SECTION B & B1
Dike where Exist. Ground is below water surface.
Scale: 1" = 20'



SECTION C-C
Scale: 1" = 10'-0"
(10N212)



TYP. GROUTING SECTION
NTS



SECTION E-E
SCALE: 1" = 10'
(10N212)

NOTES:

1. All work on the construction of these dikes shall be in accordance with the T-1 Specifications unless otherwise noted.
2. Embankments shall be compacted with sheepsfoot rollers. Two density tests per day shall be made to insure achivement of 95% of standard Proctor maximum density. Fill moisture shall be controlled to obtain optimum compaction (Initial const).
3. Riprap shall consist of sound, durable limestone, section 575 Filter shall be crushed stone conforming to section 570
(a) Type A Riprap shall be 12 inches thick and at least 50% of the stone shall weigh 25 lb. or more. Riprap laid without filter.
(b) Type B Riprap shall be 24 inches thick and at least 50% of the stone shall weigh 150 lb. or more. Filter blanket shall be 6 inches thick.
4. Crushed stone surfacing, 4 inches thick, shall be applied for the full width of the top of the dike in accordance with section 305
5. Rockfill shall be sound, durable stone in accordance with section 124 and chocked with fines.
6. Where practical borrow shall be obtained from inside disposal areas.
7.
8. Initial ash dikes to be built by construction of earth to elevation shown on sections.
9. The results of the soil investigation for the raising of the dikes at the ash disposal area no.2 are reported in a memorandum from Gene Farmer to G.L. Buchanan dated Nov. 20, 1978 Cumberland Steam Plant Ash Disposal Area Dikes Soils Investigation.
10. The minimum factor of safety for all loading conditions on ash disposal area dikes is 1.60.
11. When connecting the new dike to the old dike extreme care shall be used to insure an impervious and stable connection. The existing dikes shall be stripped of all vegetation, riprap, gravel, crushed stone, course ash and other pervious material on top of dike and above elevation 376 on inside slope. Benched and scarified to a minimum depth of 6 inches and compacted so as to form a bond with the new earth fill. The utmost caution shall be used in benching the existing dike slopes so as not to create an unstable condition. Small benches of minimum depth shall be used.
12. Earth fill for raised dikes shall be placed in accordance with all applicable sections of general construction specification G-9 for Rolled Earth Fill for Dams and Power Plants. Earth fill shall be obtained from designated borrow areas. The earth fill moisture content shall not exceed 3.0% above optimum moisture content and shall be placed and compacted to be at least 95% maximum dry density as determined by the TVA Materials Laboratory. At least one moisture-density assurance test shall be made on each 5000 cu. yd. of fill placed.
13. Placement of the underwater ash fill shall be by end dumping along the length of the dike. The top surface of the underwater dike just above the water shall be thoroughly compacted and scarified before placing the overlaying ash fill. Bottom ash for that portion of the divider dike above water shall be placed in not more than 9 inch layers, and well compacted with rubber tired hauling equipment.
14. Dike foundation shall have all weak surface soils removed to material that will easily bear the weight of loaded rubber tired earth hauling equipment.
15. Refer to the memorandum J.H. Coulson to R.G. Haynes dated Nov. 20, 1990 (B65901120029), for specifications for grouting Ash Pond seep repair.

SUMMARY OF QUANTITIES													
Area	Item No. / Location	Ash Fill Cu. Yd.	123 Earth Bor. Cu. Yd.	305 Surfacing Ton	580 Seeding Sq. Yd.	582 Mulching Sq. Yd.	600 Class III Reinf. Conc. Pipe - Lin. Ft. 18"	36"	48"	570 Filter Blanket Ton	575 Riprap - Cu. Yd. Type A	Type B	Rockfill Cu. Yd.
Ash Disposal Dike	A-B		54,900	310						520	600	1540	1060
(Initial Const)	B-C		75,800	310						880	915	2600	4015
	C-D		149,500	920						2195	2340	6485	6280
	D-E		104,850	580						1425	1485	4215	4125
	E-F		140,150	640						2375	2480	7020	1690
	F-G		28,850	440						885	720	2625	345
	G-H		5,000	200							515		
	H-I		12,050	440							1235		
	I-J		40,450	840							615		
Ash Disposal Dikes (Raising to EL 395)		95,300	310,200	3000	47,300	47,300		272					
Total		95,300	921,750	8280	47,300	47,300		272		8280	10,905	24,485	17,515
Dike Stability												91,000	

CAPACITY OF DISPOSAL AREAS — ACCUMULATION OF UNIT YEARS			
AREA NO. 1 Elevations	Unit Yrs.*	AREA NO. 2 Elevations	Unit Yrs.*
345	0.2		
350	0.6		
355	1.5		
360	3.4	360	0.6
365	5.9	365	2.0
370	8.8	370	3.8
375	11.9	375	5.9
380	15.3	380	8.5
385	18.8	385	11.3
390	22.3	390	14.2

* Based on 1,300,000 KW unit. 80% Capacity.

REV NO.	DATE	DSGN/MADE	DRWN/CHKD	CHKD/SUPV	SUPV/INSP	RVWD/SUBM	APPD/RECM	ISSD/APPD		AS CONST
6	5-20-91	ETR	CHR	JLG	JLG	KWB		JHC		
Add riprap to sect A, B & B1; Add notes A & B; rev sum of quan										
5	11-26-90	ETR	CHR	JLG	JLG	KWB		JHC		
Rev. spec nos; add grouting section; add note 15										
4	9-20-81	VRL	JLG	JLG	KWB	RJB	FDS	GLB	SBJ	
Rev Sections to show area for clay fill PA.3375										
3	7-11-79	AHS	DW	JLG	KWB	RJB	FDS	GLB		
Raised Ash Disposal Area No.2 PA3375										
2	10-22-68	WTM	RDR	RJB	ELE	WWr	WAG			
Rev. Riprap and Filter Quantities										
1	9-17-68	B.S.W.	WTM	RJB	ELE	JMJ	WAG			
Add Hold and Notes.										

DSGN RDR — SUPV RJB
DRWN B.S.W. — INSP
CHKD RDR
TRCD
COMP — ENGINEER E.R. Everett

COMPANION DRAWINGS: 10N212, 214
10H221-229, 256

Scale: As Noted

MF R0 R1 R2 R3 R4 R5 R6

MAIN PLANT

ASH DISPOSAL AREAS
SHEET NO. 2

CUMBERLAND STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
J.M. Johnston	W.N. Calvert	T.P. Lacy

KNOXVILLE | 1-13-69 | 46 | C | 4 | 10N213 R6

RECORD DRAWING AS CONSTRUCTED