



Stantec Consulting Services Inc.
3052 Beaumont Centre Circle, Lexington, KY 40513

October 6, 2016
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Revision 0

Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

**RE: Liner Design Demonstration
Ash Pond 2
EPA Final Coal Combustion Residual (CCR) Rule
TVA Shawnee Fossil Plant
West Paducah, Kentucky**

1.0 PURPOSE

This letter documents Stantec's certification of the existing liner assessment for the TVA Shawnee Fossil Plant's Ash Pond 2. Based on the assessment, Ash Pond 2 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 Ash Pond 2 at the Shawnee 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, Don W. Fuller II, being a Professional Engineer in good standing in the State of Kentucky, 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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**RE: Liner Design Demonstration
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West Paducah, Kentucky**

3. that the TVA Shawnee Fossil Plant's Ash Pond 2 is considered an unlined CCR surface impoundment as described in 40 CFR 257.71(a)(3).

SIGNATURE

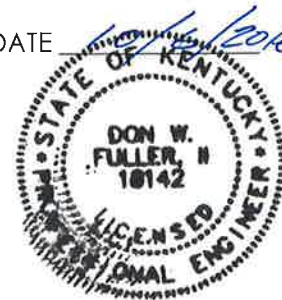
DATE

10/6/2016

ADDRESS: Stantec Consulting Services Inc.
3025 Beaumont Centre Circle
Lexington, Kentucky 40513

TELEPHONE: (859) 422-3000

ATTACHMENTS: SHF Ash Pond 2 Liner Design Demonstration



Liner Design Demonstration

Shawnee Fossil Plant
Ash Pond 2
West Paducah, Kentucky



Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:
Stantec Consulting Services Inc.

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LINER DESIGN DEMONSTRATION

Background
October 6, 2016

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 Ash Pond 2 at Shawnee Fossil Plant (SHF) met the liner design criteria described in §257.71 of the EPA Final CCR Rule.

SHF is a coal-fired, electric generating plant located on the south bank of the Ohio River in McCracken County, Kentucky, which is approximately 10 miles northwest of Paducah. Ash Pond 2 is an existing CCR surface impoundment as defined by the EPA Final CCR Rule consisting of approximately 103 acres with a constructed perimeter dike system varying in height from approximately 20 to 25 feet.

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. Ash Pond 2 consists of the boundary area denoted in Figure 1.



Figure 1 Ash Pond 2 Boundary

LINER DESIGN DEMONSTRATION

Background
October 6, 2016

1.2 OBJECTIVE

The objective of the demonstration is to evaluate compliance related to §257.71, specifically whether Ash Pond 2 was constructed with one of the following:

- A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no greater than 1×10^{-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).

Stantec understands based on an EPA presentation on April 15, 2015 titled, "Top 20 Questions on EPA's CCR Final Rule" that "compacted soil" means soil that is *mechanically* compacted in lifts.

1.3 SUMMARY OF HISTORICAL INFORMATION

Ash Pond 2's perimeter dikes were constructed to Elevation 340 feet and the pond was put into service in 1971. In 1979, the dikes were raised 10 feet using upstream construction methods (constructed inwardly over sluiced ash).

Applicable Record Drawings are included in Appendix A. TVA Drawing 10N271 (Ash Disposal Area No. 2: Plan, Sheet 1) includes instructions at the east end of the pond for mechanical compaction of subgrade in areas of "pervious surface material." This note directed the construction crew to place fine-grained soil fill over any isolated occurrences of relatively high permeability or "pervious" subgrade that might be encountered during construction.

"Report of Geotechnical Exploration and Slope Stability Evaluation" prepared for TVA by Stantec in July 2010 covers information on 58 soil borings along the perimeter dike and 5 borings on the interior of the pond. The boring logs for the borings on the interior of the pond indicated natural clay foundation soils were encountered ranging between 8.1 and 8.5 feet thick. Review of this geotechnical report and applicable Record Drawings could not conclude that a mechanically compacted liner was placed across the extent of Ash Pond 2.

LINER DESIGN DEMONSTRATION

Field Exploration
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2.0 FIELD EXPLORATION

There have been no additional field explorations at this facility. A new field exploration of Ash Pond 2 at the Shawnee Fossil Plant was not undertaken because there was not enough evidence of a mechanically compacted clay liner underneath Ash Pond 2 from the historical information to warrant additional study.

LINER DESIGN DEMONSTRATION

Conclusion
October 6, 2016

3.0 CONCLUSION

Historical construction documents were reviewed in order to evaluate status relative to the EPA Final CCR Rule criteria. Based on our review, it is Stantec's opinion that Ash Pond 2 at Shawnee 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 EPA Final CCR Rule and is allowed to remain in operation in compliance with the requirements of §257.101(a).

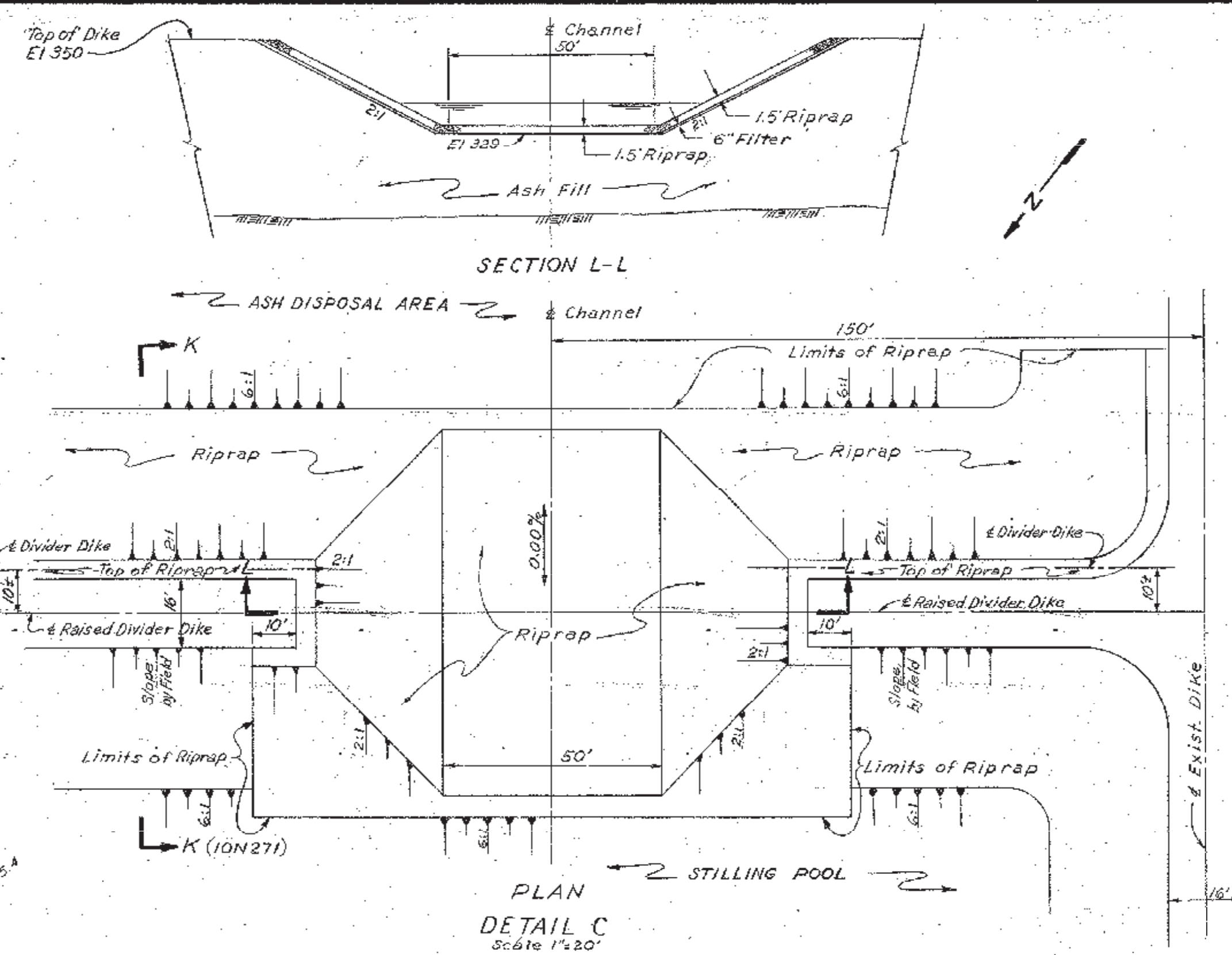
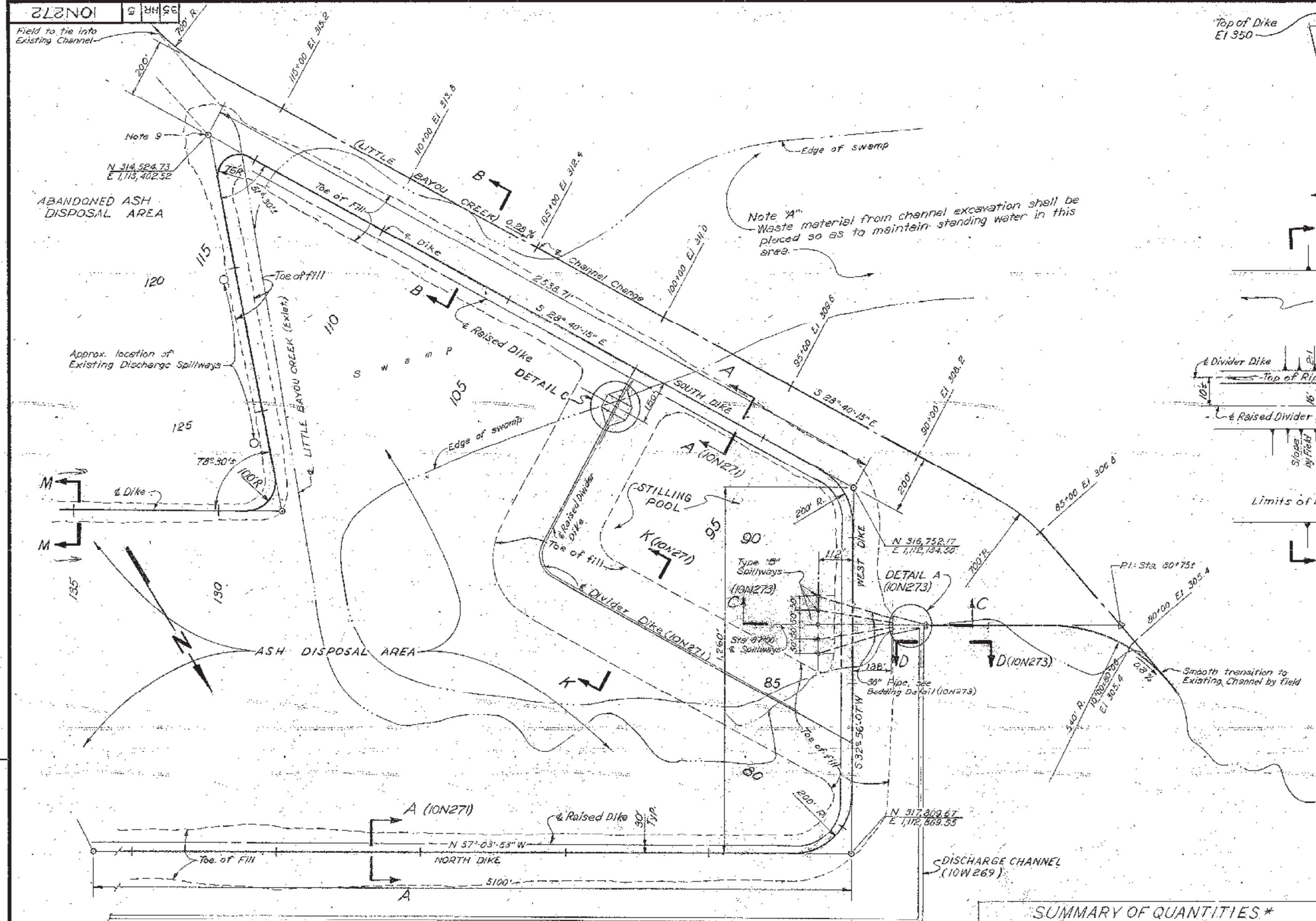
LINER DESIGN DEMONSTRATION

References
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4.0 REFERENCES

Stantec Consulting Services Inc. 2010. Report of Geotechnical Exploration and Slope Stability Evaluations – Ash Pond 1 & 2 and Consolidated Waste Dry Stack. Prepared for Tennessee Valley Authority. July 14, 2010.

APPENDIX HISTORICAL DRAWINGS



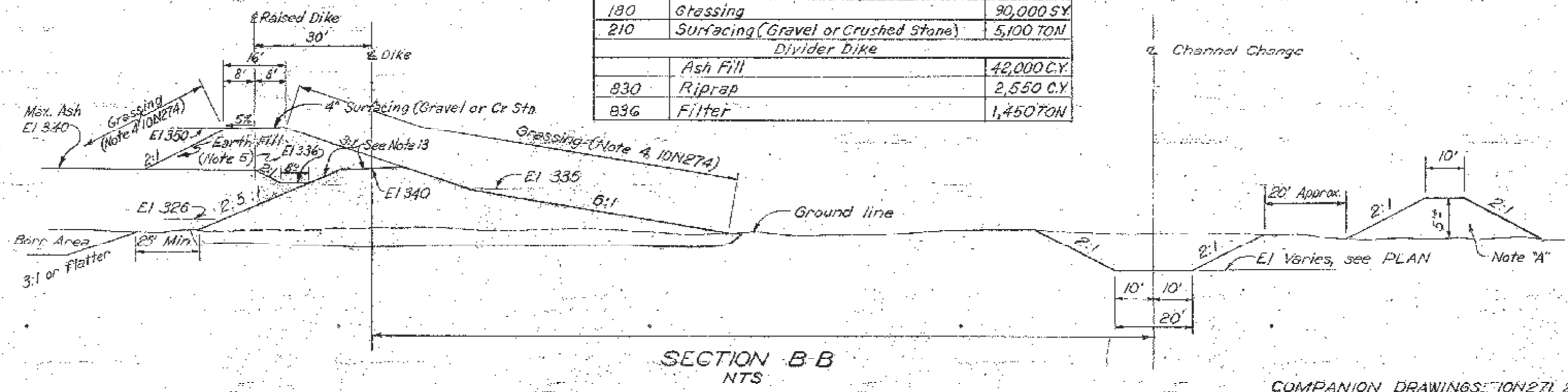
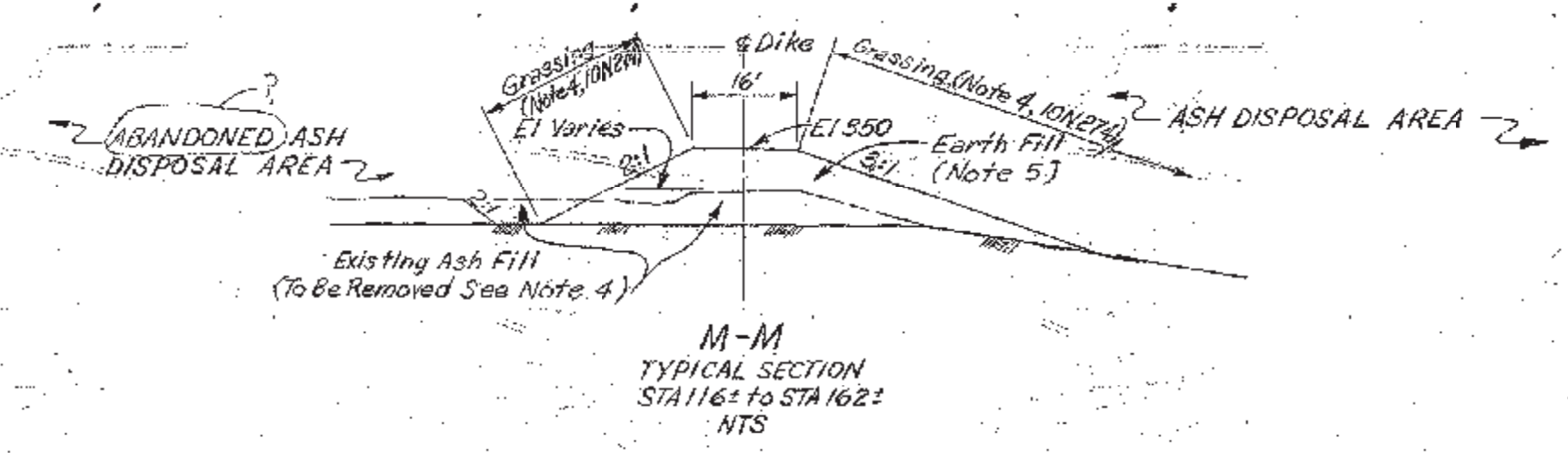
10. RIPRAP placed in Discharge Basin shall have at least 50% of the riprap consisting of stone of a weight equal to or greater than 200 lbs. Riprap placed on Divider Dike shall have at least 50% of the riprap consisting of stone of a weight equal to or greater than 100 lbs. Riprap shall conform to Section 830. FILTER BLANKET shall be 6" thick and in accordance with Section 836.
11. EXTERIOR DIKE: FACTOR OF SAFETY for all conditions is 1.5 or greater.
12. Extreme care shall be used to insure an impervious condition. All ash surfacing and vegetation on the interior slopes shall be removed. The surfaces shall then be scarified to a minimum depth of 8" and compacted so as to form a bond with the new fill.
13. For general soils information for Ash Disposal Area 2 dike raising see memorandums from Gene Farmer to G.L. Buchanan, dated August 20, 1976, May 23, 1978, and March 16, 1979, transmitting S.M.E. Laboratory soils exploration and testing reports.
14. Field should exercise care to exclude all pervious, granular soils (i.e. sandy or gravelly soils) from the borrow soils used for raising the Ash Disposal Area 2 dikes.

- NOTES:
- All work shall be in accordance with T-1 Specifications, except as noted.
 - Cut slopes adjacent to existing or proposed dikes shall not be excavated steeper than 3:1, except as shown for channel change, and top of cut shall be a minimum of 25' from the toe of the dike.
 - For general soils information see Soil and Foundation Exploration report in memorandum to C. McGraw to F.P. Lacy, dated August 25, 1989.
 - Dike foundation shall have all weak surface soils and riprap removed to material that will easily bear the weight of loaded rubber-tired earth hauling equipment.
 - Earth fill compaction shall be done with sheepsfoot rollers and shall be at least 95% of Standard maximum dry density (ASTM D 698) as established by the Materials Laboratory. Compaction shall be checked by at least one density moisture test per day. Fill moisture shall be controlled to achieve optimum compaction; maximum allowable moisture shall be 4% above optimum for initial dikes. For raised dikes moisture shall be 3% ± of optimum.
 - With the exception of the useable material from the channel change all borrow shall come from Borrow Area 'A' inside the Proposed Ash Area, providing enough material is available in Borrow Area 'A'. Borrow areas are outlined in the Soil Report.
 - Excavation within the bond areas shall not be below El. 305 and any pervious material exposed shall be blanketed with 2" of impervious soil, equipment compacted, and extended out to assure blanket on adjacent areas.
 - Sandy soils used for dike fill shall be placed in the center portion of the dike cross section.
 - When connecting the ends of the new dike to the old dike extreme care shall be used to insure an impervious and stable connection. The existing dikes shall be scarified to a minimum depth of 8" and compacted so as to form a bond with the new fill. Due to the steep side slopes and relatively narrow tops of the existing dikes, 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.
 - See above.

ITEM NO.	DESCRIPTION	QUANTITY
101	Clearing	205 AC.
120	Channel Excavation	78,700 C.Y.
123	Earth Borrow	776,000 C.Y.
129	Structural Excavation	1,700 C.Y.
180	Grassing	190,000 S.Y.
210	Surfacing (Gravel or Crushed Stone)	2,850 Ton
401	Class A Concrete (Endwall)	24 C.Y.
418	Reinforcing	240 lbs.
830	Riprap	630 C.Y.
836	Filter	120 Ton
602.64.68	18" Pipe Culvert	106 FT.

1978 CONSTRUCTION		
Perimeter Dike		
123	Earth Borrow	254,000 C.Y.
180	Grassing	90,000 S.Y.
210	Surfacing (Gravel or Crushed Stone)	5,100 TON
Divider Dike		
	Ash Fill	42,000 C.Y.
830	Riprap	2,550 C.Y.
836	Filter	1,450 TON

* Quantities are for Ash Disposal Area only.



Scale: 1" = 200'
Except as noted.

MAIN PLAN
PLAN
ASH DISPOSAL AREA NO. 2
SHEET 2

SHAWNEE STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED: 9/15/69
RECOMMENDED: 9/15/69
APPROVED: 9/15/69

KNOXVILLE 354815 10N272 R5
RECORD DRAWING AS CONSTRUCTED

NO.	DESCRIPTION
1	REVISED FOR Raising Dike
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