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SANTEE COOPER
CROSS GENERATING STATION

Bottom Ash Pond History of Construction

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CROSS GENERATING STATION
BOTTOM ASH POND HISTORY OF CONSTRUCTION

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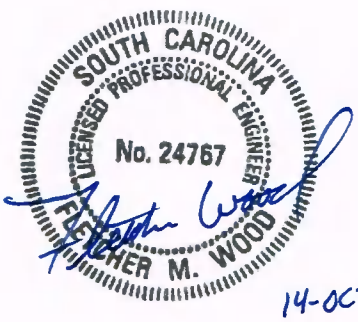

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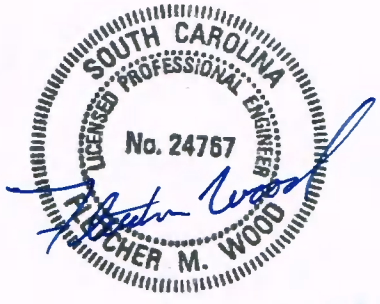

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1. INTRODUCTION

The United States Environmental Protection Agency (EPA) promulgated new regulations regarding Coal Combustion Residuals (CCRs). These regulations (40 CFR Part 257) were published in the Federal Register on April 17, 2015. One of the requirements of the new regulations (§257.73(c)(1)) is to compile a history of construction of the CCR unit. As indicated in the Preamble to the Rule, the compilation of this data is "only to the extent available." EPA does not expect owners or operators to generate new information or provide anecdotal or speculative information regarding the CCR surface impoundment's design and construction history. Therefore, the information presented herein is based on readily accessible data. The order of presentation is based on the order of the requirements listed in the regulations.

2. REQUIRED DATA

2.1 Owner's Information

2.1.1 Name and Address

South Carolina Public Service Authority (Santee Cooper)
Cross Generating Station
553 Cross Station Road
Pineville, SC 29468

2.1.2 CCR Unit Name

At the time of Dewberry & Davis' Dam Assessment Report [Ref. 1] in December 2011, there were two designated bottom ash ponds: Bottom Ash Pond 1 and Bottom Ash Pond 2. The ponds are connected via a trapezoidal notch through the northern embankment of Bottom Ash Pond 1. In 2015, all coal combustion residuals were removed from Bottom Ash Pond 1 and the pond was repurposed as a wastewater pond. Since this pond no longer impounds CCR, it is not subject to the requirements in the CCR rule. However, since (former) Bottom Ash Pond 1 functions as the discharge for Bottom Ash Pond 2, information for both ponds will be presented herein as necessary to develop a complete history of the impoundments.

The former Bottom Ash Pond 1 has been renamed the Wastewater Decant Pond. The former Bottom Ash Pond 2 is now referred to as the Bottom Ash Pond. For the purposes of this report, the CCR unit name is the Bottom Ash Pond.

2.1.3 CCR Unit Identification Number

Section 72-2.D of the South Carolina Dams and Reservoirs Safety Act specifically exempts dams owned by the South Carolina Public Service Authority. Therefore, the state has not assigned a unit identification number. However, signage at the pond identifies it as NPDES #SC0037401.

2.2 CCR Unit Location

The location of the Bottom Ash Pond is shown on the USGS Quadrangle Map in Appendix A. The Map is a compilation of the 2014 USGS Chicora, Cross, Eadytown, and Pineville 7.5 minute quadrangles.

2.3 CCR Unit Purpose

As its name implies, the Bottom Ash Pond is primarily used for storage of bottom ash and boiler slag from the four generating units at the station. Units 1 and 2 each have a dedicated pipeline for ash disposal to the pond, while Units 3 and 4 share a pipeline. Another pipeline conveys pyrites and economizer ash into the pond, as well as SCR ash from Units 3 and 4. The Bottom Ash Pond also receives water from the Gypsum Filtrate Pond (currently undergoing closure by removal), the Coal Pile Runoff Pond, the Landfill Leachate Collection Pond, the Unit 1 and 2 Stormwater Pond, the Unit 3 and 4 Stormwater Pond, and numerous station drainage sumps. After flowing from the Bottom Ash Pond to the Wastewater Decant Pond, water is recycled for use in the ash seal and ash sluice systems or undergoes pH treatment prior to discharge into the Diversion Canal.

2.4 Watershed Information

Cross Generating Station is located within the Lake Moultrie watershed (Watershed 03050201-01). This watershed covers approximately 79,000 acres of the Lower Coastal Plain region [Ref. 3]. Approximately 70 percent of the watershed is water, and another 22 percent is forested. A map of the Lake Moultrie Watershed is provided as Appendix B.

2.5 Foundation Properties

Cross Generating Station is situated on Pleistocene sediments overlying Santee Limestone, within the Atlantic Coastal Plain Physiographic Province. As indicated in the Law geotechnical report [Ref. 4], the Pleistocene soil profile generally can be characterized as a relatively "firm" layer overlying more compressible layers. This characterization is consistent with the results of the geotechnical exploration performed by Terracon in 2015 for the Bottom Ash Pond. The results of their exploration are presented in more detail in the safety factor assessment [Ref. 5]. The boring logs and CPT soundings from the Terracon exploration are provided in Appendix C for reference. Generally, soils encountered above an elevation of 80 feet are considered embankment soils.

Subsurface conditions encountered below the natural ground surface (80 feet) during the Terracon exploration are summarized in Table 1. Figure 1 is a plot of SPT N-value as a function of elevation.

Table 1: Summary of Terracon Exploration Data Below Elevation 80 Feet

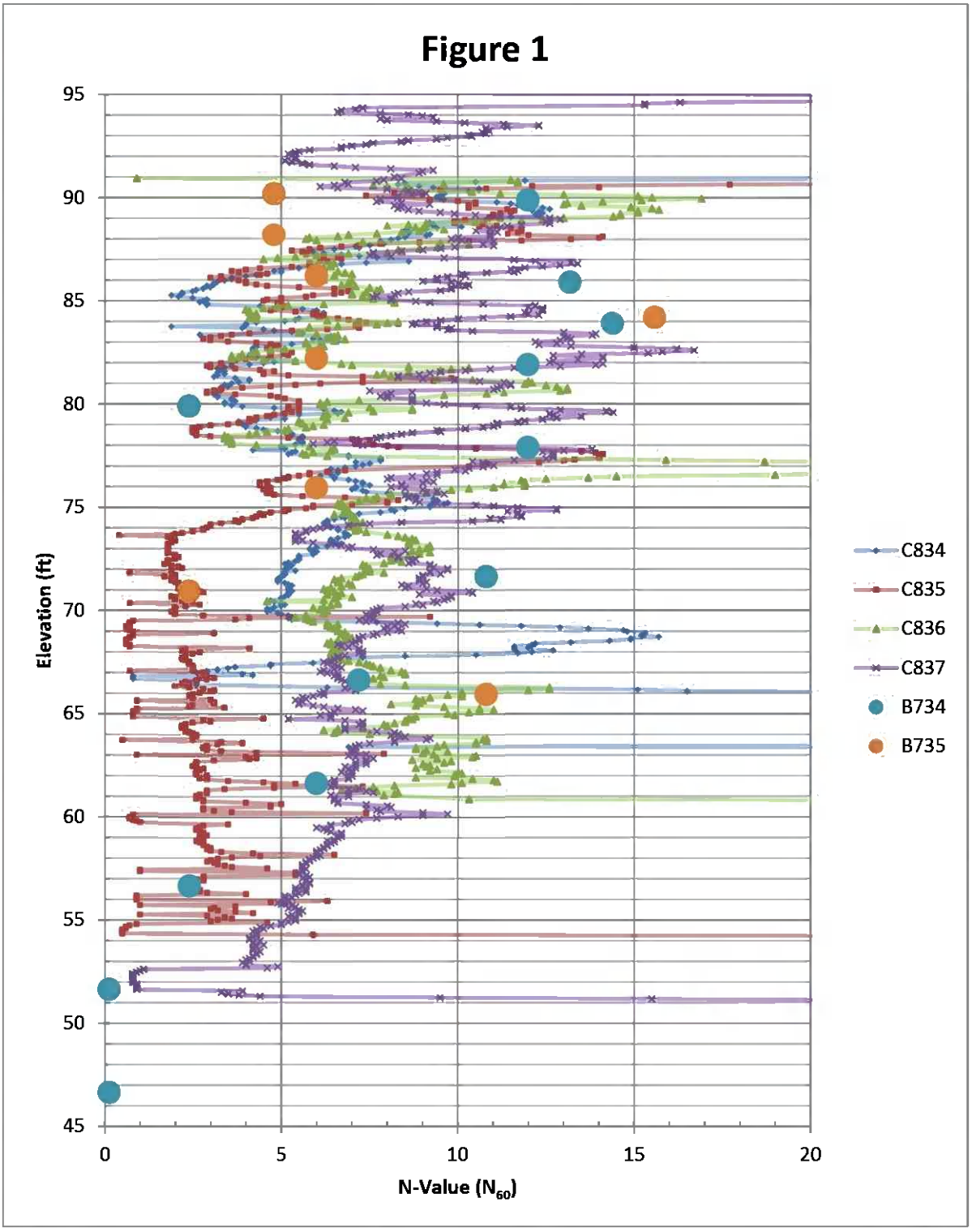
Boring or CPT	Layer 1			Layer 2			Layer 3			Elev. of Rock (ft)
	Elev. (ft)	Soil Type	N-Value	Elev. (ft)	Soil Type	N-Value	Elev. (ft)	Soil Type	N-Value	
B-734	79 – 70	Clay	9	70 – 59	Clay	5	59 – 47	Clay	1	43.9
B-735	80 – 73	Clay	5	73 – 67	Clay	2	67 – 62	Clay	9	62.2
C-834	80 – 69	Clay	7	69 – 66	Clay	10	66 – 63	Sand	40	62.9
C-835	80 – 74	Clay	5	74 – 55	Clay	3				54.1
C-836	80 – 78	Clay	7	78 – 76	Sand	20	76 – 61	Clay	7	60.4
C-837	80 – 75	Clay	10	75 – 60	Clay	7	60 – 51	Clay	5	51.0

As shown in Figure 1, there is a general decrease in N-value below an elevation of approximately 70 feet in Boring B-734 and Sounding C-837. In Sounding C-835, the decrease occurs at approximately elevation 74 feet. Boring B-735 and Soundings C-834 and C-836 show relatively consistent N-values as a function of elevation. Laboratory test data for soil samples from Borings B-734 and B-735 at depths below the natural ground surface is summarized in Table 2.

Table 2: Summary of Soil Classification Data Below Elevation 80 Feet

Boring	Elevation (ft)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Fines Content (%)	USCS Classification
B-734	78.9 - 76.9	15	36	23	--	CL
	72.4 - 70.9	17	29	15	--	CL
	67.4 - 65.9	31	57	40	--	CH
	62.4 - 60.9	44	74	52	81	CH
	57.4 - 55.9	50	44	26	69	CL
	52.4 - 50.9	64	84	64	67	CH
	47.4 - 45.9	42	43	32	35	SM
B-735	76.7 - 74.7	22	47	16	--	CL
	71.7 - 69.7	37	56	20	91	CH
	66.7 - 65.2	25	39	15	--	CL
	46.7 - 45.2	--	Nonplastic	Nonplastic	--	SM

Figure 1


95
90
85
80
75
70
65
60
55
50
45
Elevation (ft)
0
5
10
15
20
N-Value (N_{60})
C834
C835
C836
C837
B734
B735

The soil classification results in Table 2 indicate predominately sandy lean clay (CL) and fat clay with sand (CH) to elevations of approximately 47 feet. The fines contents of these soils are typically above 67 percent, and in many samples the moisture contents are closer to the liquid limit than the plastic limit. Laboratory shear strength testing was performed on the Terracon soil samples obtained above an elevation of approximately 80 feet in order to characterize the embankment soils. CPT soundings and laboratory data from the Law geotechnical report [Ref. 4] was used to characterize the subsoils below an elevation of approximately 80 feet. A summary of soil strength data for samples with similar soil classifications is presented in Table 3. For the safety factor assessment, the test results were re-interpreted using the assumption that cohesion is negligible for long-term drained conditions. This re-interpretation is presented in the right-most column of Table 3.

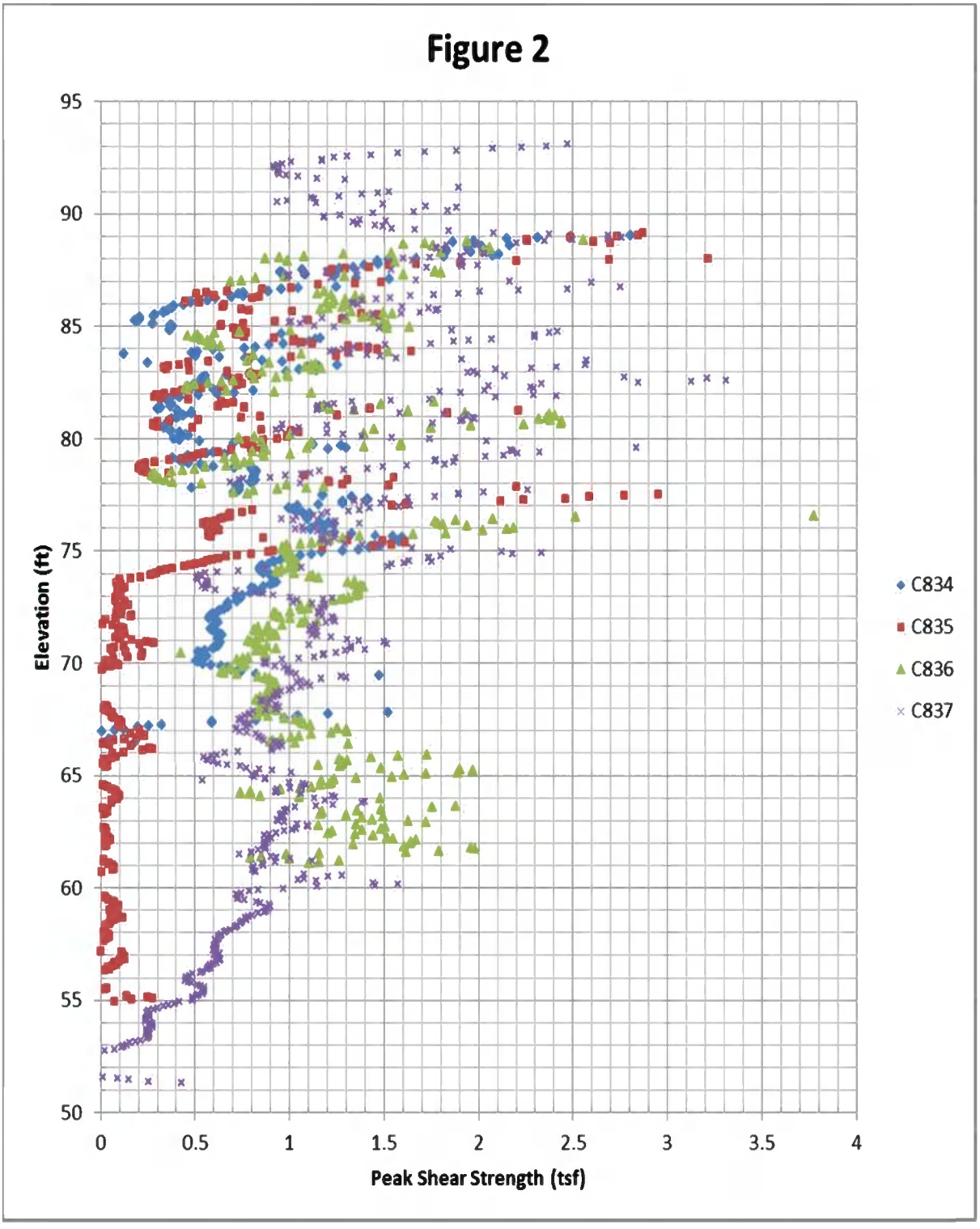
Table 3: Effective Stress Shear Strength

Boring	Elevation (ft)	Effective Cohesion (psf)	Friction Angle (degrees)	Equivalent Friction Angle (degrees)
221A	74.9 - 72.9	190	19.0	22.1
224	74.4 - 72.4	260	16.1	20.5
244	63.8 - 61.8	630	12.0	22.8

A plot of peak undrained shear strength as a function of elevation for the four CPT soundings performed by Terracon in 2015 is presented in Figure 2.

While there is more scatter in the data between the elevations of 80 and 75 feet, peak undrained shear strengths are generally less than 2.0 tsf, and average around 1.0 tsf. At the location of sounding C-835, the soils encountered were particularly soft, with peak shear strengths generally less than 0.1 tsf at depths below elevation 74 feet. Based on the analyses performed for the safety factor assessment [Ref. 5], the foundation soils are not considered liquefiable.

Figure 2


95
90
85
80
75
70
65
60
55
50
Elevation (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
Peak Shear Strength (tsf)
C834
C835
C836
C837

Beneath the typically clay-like soil deposits lies the Santee Limestone. In many locations the Santee Limestone is highly weathered and was able to be sampled with a spilt-spoon sampler. The recovered highly weathered rock samples typically classified as silty sand (SM). SPT N-values in the weathered limestone were greater than 40. The depths to the weathered limestone layer ranged from approximately 33 feet in Boring B-735 to 47 feet in Boring B-734. The depths to CPT tip refusal ranged from approximately 28 feet at sounding C-834 to 44 feet in sounding C-837. These depths are in general agreement with the boring data presented in Reference 4 and consistent with the understanding that the surface of the limestone bedrock varies due to relic solution weathering.

2.6 CCR Unit Stages

The CCR unit at Cross Generating Station was constructed in two major stages. The original impoundment was designed by Lockwood Greene Architects and Engineers, of Spartanburg, South Carolina. The first basin was constructed in 1982 and was approximately 600 feet wide and 1,200 feet long. The toe of the inside slope was constructed at elevation 75 feet with a flat pond bottom, and the top of the embankment extended up to elevation 95 feet. This basin was referred to as Bottom Ash Pond 1. As indicated previously, all coal combustion residuals were removed from this basin in 2015, and the basin is now referred to as the Wastewater Decant Pond.

In 1993, a much larger basin was constructed to the north and west of the Wastewater Decant Pond. This basin was designed by Gilbert/Commonwealth, Inc., of Reading, Pennsylvania. Construction was performed by Higgerson-Buchanan, Inc., of Chesapeake, Virginia. This basin was approximately 2,700 feet long and almost 2,000 feet wide at its widest point. The basin has a surface area of approximately 84 acres. The toe of the inside slope was constructed at elevation 76 feet, with the pond bottom gradually sloping down to elevation 73 feet near the center of the pond, and the top of the embankment extended up to elevation 91 feet. Originally referred to as Bottom Ash Pond 2, this basin is now known as the Bottom Ash Pond.

The ponds are connected via a trapezoidal spillway through the northern embankment of the Wastewater Decant Pond. The spillway is 10 feet wide with three horizontal to one vertical (3:1) sideslopes, and is covered with concrete revetment.

2.6.1 Embankment Properties

Information on the physical and engineering properties of the Bottom Ash Pond embankments was obtained as part of Terracon's 2015 geotechnical exploration. Two geotechnical borings and four CPT soundings were advanced through the embankments of both the Bottom Ash Pond and the Wastewater Decant Pond. For the purposes of this report, the embankment is considered to extend from the crest of the pond embankment (approximately Elevation 91 feet for the Bottom Ash Pond and Elevation 95 feet for the Wastewater Decant Pond) to the existing ground surface surrounding the ponds (approximate

Elevation 80 feet). Subsurface conditions below Elevation 80 feet were presented in the Foundation Properties section of this report.

Table 4 presents the results of the soil classifications performed by Terracon. Within the embankment, soil moisture contents are generally closer to the plastic limit of the soil than to its liquid limit. The fines percentages vary between approximately 40 and 60, resulting in typical soil classifications of clayey sand (SC) and sandy lean clay (CL).

Table 4: Summary of Soil Classification Data Above Elevation 80 Feet

Boring	Elevation (ft)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Fines Content (%)	USCS Classification
B-734	88.9 - 86.9	17	44	32	62	CL
	84.9 - 82.9	23	42	24	49	SC
	80.9 - 78.9	39	40	26	41	SC
B-735	93.2 - 91.2	17	44	29	--	CL
	91.2 - 89.2	27	50	31	45	SC
	87.2 - 85.2	18	37	22	46	SC
	83.2 - 81.2	22	30	19	55	CL

Soil strength data for the embankment soils is presented in Table 5. The effective friction angle varied from approximately 29 to 33 degrees and the apparent cohesion varied from 2.9 to 4.0 psi. Undrained shear strengths were approximately 9 psi at a consolidation stress of 5.2 psi and 12 psi at a consolidation stress of 10.4 psi. Average moist soil densities ranged from approximately 122 pounds per cubic foot (pcf) to 130 pcf.

Table 5: Embankment Soil Strength Summary

Boring	Elevation (ft)	Average Dry Sample Unit Wt. (pcf @ % moisture)	Test Type	Effective Stress		Undrained Shear Strength (psi)
				Friction Angle	Cohesion (psi)	
B-734	88.9 - 86.9	110.0 @ 16.4	Direct Shear	31.6	2.9	--
	84.9 - 82.9	111.3 @ 15.7	Consolidated Undrained Triaxial	29.9	3.5	8.5, 11.5
B-735	91.2 - 89.2	97.8 @ 25.1	Direct Shear	33.3	3.0	--
	87.2 - 85.2	107.7 @ 20.8	Consolidated Undrained Triaxial	29.2	4.0	9.0, 12.1

The properties of the soils comprising the embankment are generally uniform and similar to the upper portions of the foundation soils. Figures 1 and 2 demonstrate the similarity in SPT N-value and peak shear strength above elevation 74 feet. Laboratory test results show similar moisture contents, Atterberg Limits, and fines contents. These observations are consistent with the understanding that the embankments for the ash basin were constructed of soils obtained from on-site borrow areas. Soils comprising the embankment are not considered liquefiable [Ref 5].

2.6.2 Site Preparation and Construction

There are minimal records documenting the site preparation and construction of the Wastewater Decant Pond. The Law geotechnical report [Ref. 4] states that embankments should be compacted to densities of 95 percent of modified Proctor maximum dry density if sand is used for fill, and 90 percent if on-site clayey sands/silty sands are used. The Woodward-Clyde geotechnical report [Ref. 6] included the following statement, "We understand from Mr. R. Rohr that Lockwood Greene Architects and Engineers is considering excavating the interior of the pond to provide fill material for the construction of the embankment." Based on the construction drawings and similarity of the embankment soils to the top few feet of foundation soils, it seems likely that the materials excavated from the pond interior were used to construct the embankments. The Woodward-Clyde report recommended a compactive effort of 95 percent of Standard Proctor and that the soils have a moisture content at least one percent greater than the optimum moisture content.

In a letter dated January 29, 1993, from Higgerson-Buchanan, Inc., to Gilbert/Commonwealth, Inc., it is stated that "The source of suitable on-site fill material may be the spoil bank along the diversion canal, or any other temporary onsite stockpiles within the Santee Cooper Cross Site as determined by the Engineer." The earthwork specifications (included in Appendix F) for the Bottom Ash Pond confirm that the embankments were constructed of on-site excavated soil with the maximum particle size not exceeding 1/2 of the lift thickness (12 inches). The specifications required the subgrade to be compacted to a minimum density of 90 percent of modified Proctor (or 95 percent of standard Proctor) in areas receiving fill. Fill was to be placed in maximum 12-inch loose lifts and compacted to either 90 percent of modified Proctor or 95 percent of standard Proctor. Since part of the area of the Bottom Ash Pond was previously used as a borrow area, the specifications indicated that submerged portions of the borrow pit be filled by end-dumping sand to displace soft sediments that were subsequently removed. The specificatons also allowed for limestone cores and concrete pile cutoffs to be placed within the interior of the pond (not under embankments). These materials were to be placed so that no voids were created, and they had to be a minimum of one foot below the bottom of the bentonite liner.

Drawings for the Wastewater Decant Pond (included in Appendix D) indicate the berms were constructed of suitable compacted fill. Embankment sideslopes were three horizontal to one vertical (3:1) for both interior and exterior slopes. Most of the embankment had a crest width of 15 feet; however, the southwest corner from approximately the intake structure to the timber pipe support trestle had a width of

30 feet. The interior of the pond was lined with a four-inch thick layer of bentonite which was covered with six inches of crushed granite having a South Carolina DOT gradation of No. 4. Above the crushed stone was 18 inches of suitable backfill material compacted to 95 percent of standard Proctor. Within four feet of the normal water surface elevation, a layer of Mirafi 140S filter fabric was placed above the crushed stone, followed by six more inches of crushed stone. Riprap having a South Carolina DOT gradation of 12 inches was then placed on top of the crushed stone.

Drawings for the Bottom Ash Pond (included in Appendix D) indicate similar construction to the Wastewater Decant Pond. Embankments were constructed of compacted random fill to approximate Elevation 91 feet. Interior and exterior slopes were 3:1. The crest width was 15 feet, except for the southern segment of embankment, which was 24 feet wide. The bottom and interior pond slopes were covered with a bentonite geocomposite liner, covered by one foot of protective cover fill. Across the bottom of the pond, the protective cover was bottom ash, while the cover on the slopes was sand or onsite structural fill. A concrete revetment mat, three inches thick, extended from the crest of the embankment to four feet beyond the inside toe of the embankment.

An underdrain system was installed beneath the Bottom Ash Pond at the time of construction to aid with dewatering the subgrade soils in order to facilitate placement of the bentonite liner. Five-inch diameter perforated pipes bedded in sand were connected to 12-inch diameter perforated header pipes. The header pipes flowed into a junction box located in the center of the pond. The junction box was drained by two 12-inch diameter corrugated HDPE pipes that discharged into a 60-inch diameter concrete manhole located beyond the northern toe of the embankment in the vicinity of Monitoring Well CAP-8. A pair of 6-inch diameter pumps then conveyed the water from the manhole to the outfall. The manhole and the 12-inch diameter pipes were reportedly grouted shut once pond construction was completed. In the fall of 2014, the area around the manhole was excavated to confirm the integrity of the piping and evaluate the source of drainage in this area. It was confirmed that at least 10 feet of the outlet piping and the manhole was grouted, and the source of the drainage was water moving through the sand backfill around the outlet pipes. The area was then backfilled with flowable fill and a rock filter was installed to minimize the potential for piping of the sand backfill around the pipes.

When the Bottom Ash Pond was constructed, concrete revetment was added to the Wastewater Decant Pond. The existing riprap was choked with run of crusher (ROC) and revetment placed overtop existing grades. The revetment extended from the crest of the embankment to Elevation 85 feet.

Part of the construction of the Bottom Ash Pond included installation of a trapezoidal spillway connecting the two ponds, and modifications to the discharge structure in the Wastewater Decant Pond. The discharge structure was further modified in 2014. The extent of this work is presented in Section 2.10.

In 2004, additional piping and a pump structure was constructed to support Units 3 and 4. This work primarily affected the Wastewater Decant Pond. The configuration of the ash ponds and the embankment slope designs did not change.

In 2015, a new 16-inch diameter HDPE leachate collection pipe was installed through the southern berm, near the southwest corner of the ash pond. The pipe was installed above the elevation of the bentonite liner.

2.6.3 Dates of Construction

Drawings indicate the initial ash basin (Wastewater Decant Pond) went to construction on March 25, 1982. It appears construction was completed by September 11, 1984. Drawings for the expansion of the bottom ash pond (the creation of what is now known as the Bottom Ash Pond) indicate it went to construction on February 24, 1993. The construction schedule included in the contract indicated pond filling was to be complete by October 31, 1994.

2.7 CCR Unit Drawings

Construction drawings are included in Appendix D. The CV- series drawings pertain to the initial ash basin, which is now known as the Wastewater Decant Pond. The BA- series drawings are for the ash pond expansion, and cover the area now referred to as the Bottom Ash Pond.

- 2-CV-601: Layout, Grading and Drainage Plan (south end)
- 2-CV-602: Layout, Grading and Drainage Plan (north end)
- 2-CV-650: Miscellaneous Details and Sections
- 2-CV-651: Miscellaneous Details and Sections
- 2-C-684: Drawdown Structure Plans, Sections & Details
- BA-117-S0001: Bottom Ash Pond Expansion Plan
- BA-117-S0002: Sections and Details
- BA-117-S0003: Sections and Details
- BA-117-S0004: Monitoring Well Location Plan
- Underdrain Collection Box
- Underdrain System
- CR34-3-DW-SC-716-0503: Pipe Trench Plans and Details
- CR34-3-DW-SC-716-0505: Pipe Trench Plans and Details
- CR34-3-DW-SC-716-0506: Pipeline and Pipe Trench Sections
- CR34-3-DW-SC-716-0507: Ash Pond Piping Area
- Ash Pond Overflow Weir Elevation Modification
- Record Drawing - Bottom Ash Pond Underdrain Exploration and Closure

- CR34-0-DW-LF-719-0331: Leachate Collection Pond 1B/1D Pump Structure Bottom Ash Pond Outfall

2.8 Instrumentation

The only formal instrumentation for the Bottom Ash Pond is a staff gauge, located in the Wastewater Decant Pond. This gauge is used to measure water levels in the pond.

There are several groundwater monitoring wells located around the ponds. These wells are used primarily for water quality sampling, and are not formally considered instrumentation for the impoundments. The Wastewater Decant Pond originally had four piezometers surrounding it, P-1 through P-4. The piezometers were located beyond the toe of the exterior slope, one along each side of the pond. Construction drawings indicate the piezometers were constructed of minimum three-inch diameter PVC pipe with a gravel filter pack. It would appear the screened intervals extended from approximately 2.5 feet below the groundwater level to the top of the Santee Limestone.

When the Bottom Ash Pond was constructed, piezometers P-1 and P-4 were abandoned, as they were within the footprint of the new ash pond. Fourteen new monitoring wells, the CAP- series, were installed, as shown on Drawing BA-117-S0004, included in Appendix D. CAP-2 through CAP-12 were installed along the crest of the embankment in a clockwise direction, starting along the southern embankment of the Bottom Ash Pond. CAP-1 was installed in a groin area near the western embankment of the Wastewater Decant Pond and the southern embankment of the Bottom Ash Pond. Monitoring wells CAP-13 and CAP-14 are located north and west of the Bottom Ash Pond. The monitoring wells were constructed of 2.5-inch diameter PVC casing and a sand filter pack. The screened intervals are provided in Table 6.

Table 6: CAP- Monitoring Well Screen Intervals

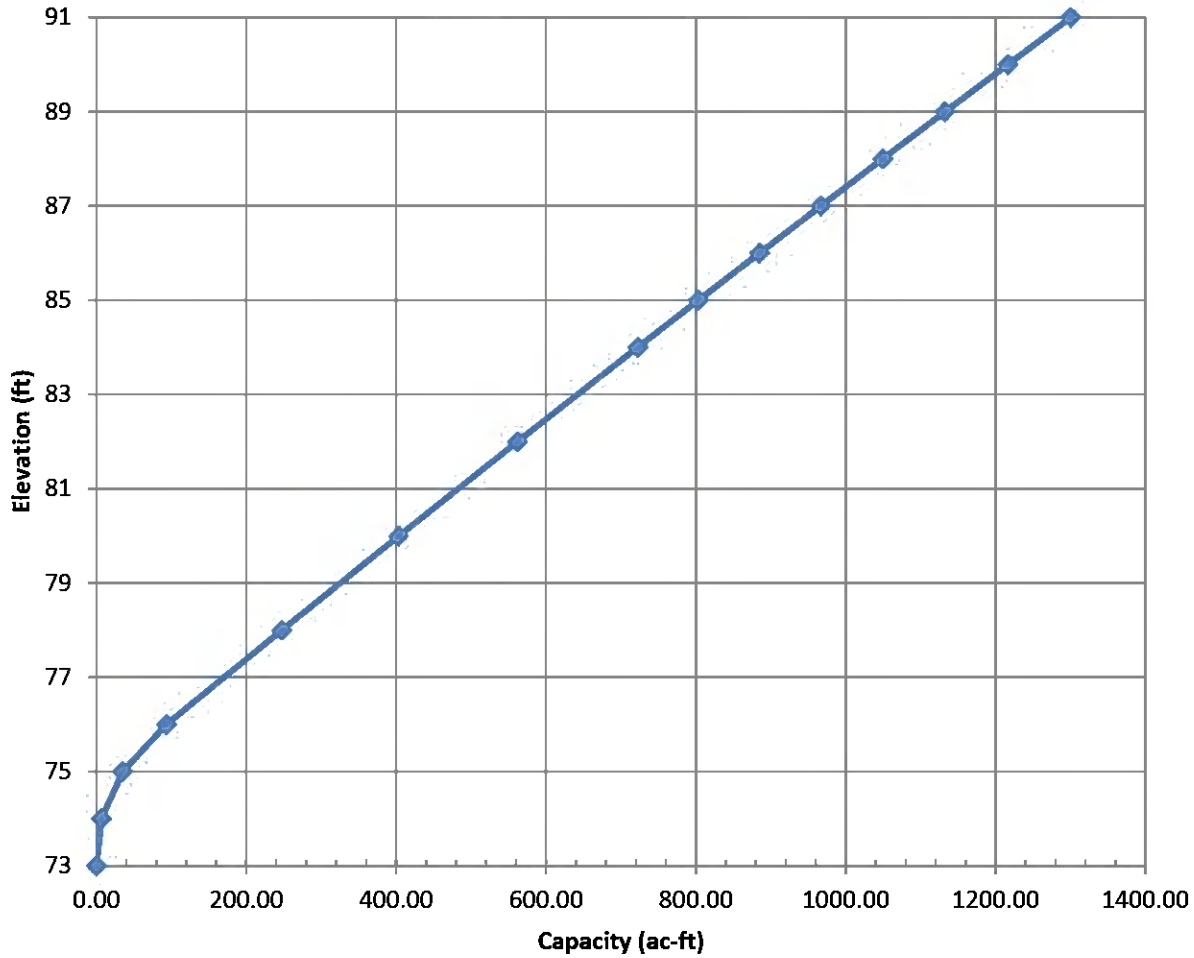
Monitoring Well	Screened Interval Elevation (ft)	Monitoring Well	Screened Interval Elevation (ft)
CAP 1	77.3 - 62.3	CAP 8	50.0 - 30.0
CAP 2	50.0 - 30.0	CAP 9	75.0 - 60.0
CAP 3	75.0 - 60.0	CAP 10	50.0 - 30.0
CAP 4	50.0 - 30.0	CAP 11	75.0 - 60.0
CAP 5	75.0 - 60.0	CAP 12	50.0 - 30.0
CAP 6	50.0 - 30.0	CAP 13	75.0 - 60.0
CAP 7	75.0 - 60.0	CAP 14	50.0 - 30.0

Water level readings are obtained from the CAP- series monitoring wells approximately twice per year. A graph of water level data is provided in Appendix E. The data reflects the expected seasonal variation in water levels. However, there is a general decrease in water levels from approximately 1995 to 2005.

2.9 Area-Capacity Curves

The area-capacity curve for the Bottom Ash Pond is presented in Figure 3. At Elevation 90 feet, the approximate capacity of the impoundment is 1200 acre-feet. At the time of the April 2016 inspection, the approximate volume of CCR in the Bottom Ash Pond was estimated as 750 acre-feet.

Figure 3



2.10 Spillway Data

Water from the Bottom Ash Pond is discharged into the Wastewater Decant Pond via a trapezoidal weir. The weir is 10 feet wide, with 3:1 sideslopes. The weir extends from the top of the Wastewater Decant

Pond embankment (elevation 95 feet) to elevation 85.0 feet. The weir is surfaced with concrete erosion control revetment. Beneath the revetment is a foot of structural fill or sand, followed by a bentonite geocomposite liner.

Water from the Bottom Ash Pond flows over the weir into the Wastewater Decant Pond where it is pumped back to the power block for use as ash sluice and ash seal water. The Wastewater Decant Pond also contains the emergency spillway. This spillway is a reinforced concrete box structure having a 4.25-foot wide overflow section at elevation 89.5 feet. The spillway elevation was originally set at elevation 94.0 feet. When the Bottom Ash Pond was constructed, the spillway elevation was lowered to 89.0 feet. In 2014, the spillway was raised to elevation 89.5 feet to allow for greater operational flexibility of the ponds. The overflow section discharges into an 18-inch diameter concrete pipe that extends through the embankment and outlets into a drainage ditch leading to stormwater outfall SW005, an unnamed tributary connected to Lake Moultrie.

2.11 Construction Specifications, Provisions for Surveillance, Maintenance, and Repair

Available specifications for the Bottom Ash Pond are provided in Appendix F. These specifications include:

- 02220: Excavation and Fill
- 02220-A: Excavation and Fill Attachment A - Modification to Modified Proctor Test
- 02246: Soil Testing
- 02246-A: Soil Testing Attachment A - Required Tests
- 02246-B: Soil Testing Attachment B - Modification to Modified Proctor Test
- 02500: Sitework
- 02644: Bentonite Geocomposite Liner
- 02645: Concrete Erosion Control Revetment

According to personnel involved with the design and construction of the Bottom Ash Pond, all work was verified by third party monitoring, testing, and inspection services.

Santee Cooper conducts periodic surveillance, maintenance, and repair of the Bottom Ash Pond. Santee Cooper engineers inspect the Bottom Ash Pond dikes in accordance with the dike inspection procedures presented in Appendix G. Site personnel conduct weekly and annual inspections of the ash pond embankments. Personnel performing inspections are required to undergo an initial inspector training as well as refresher training every three years. Qualified dam safety engineers accompanied by Site personnel conduct annual inspections. Routine inspections are documented on an Inspection Checklist (included in Appendix G).

2.12 Structural Instability Records

In the thirty plus years since the original basin was constructed, there has been no record of structural instability. Over the years, minor erosional features have formed and were subsequently repaired. Some drainage in the area of the dewatering manhole has been noted. This drainage is attributed to groundwater movement along the sand used to bed the dewatering piping.

3. SUMMARY

This document is intended to present the history of construction of the Bottom Ash Pond at Cross Generating Station. The document was prepared in accordance with 40 CFR §257.73(c)(1). The contents of this report are based on available drawings and reports. If there are any significant changes to the information presented herein, this document will be revised to present the updated information.

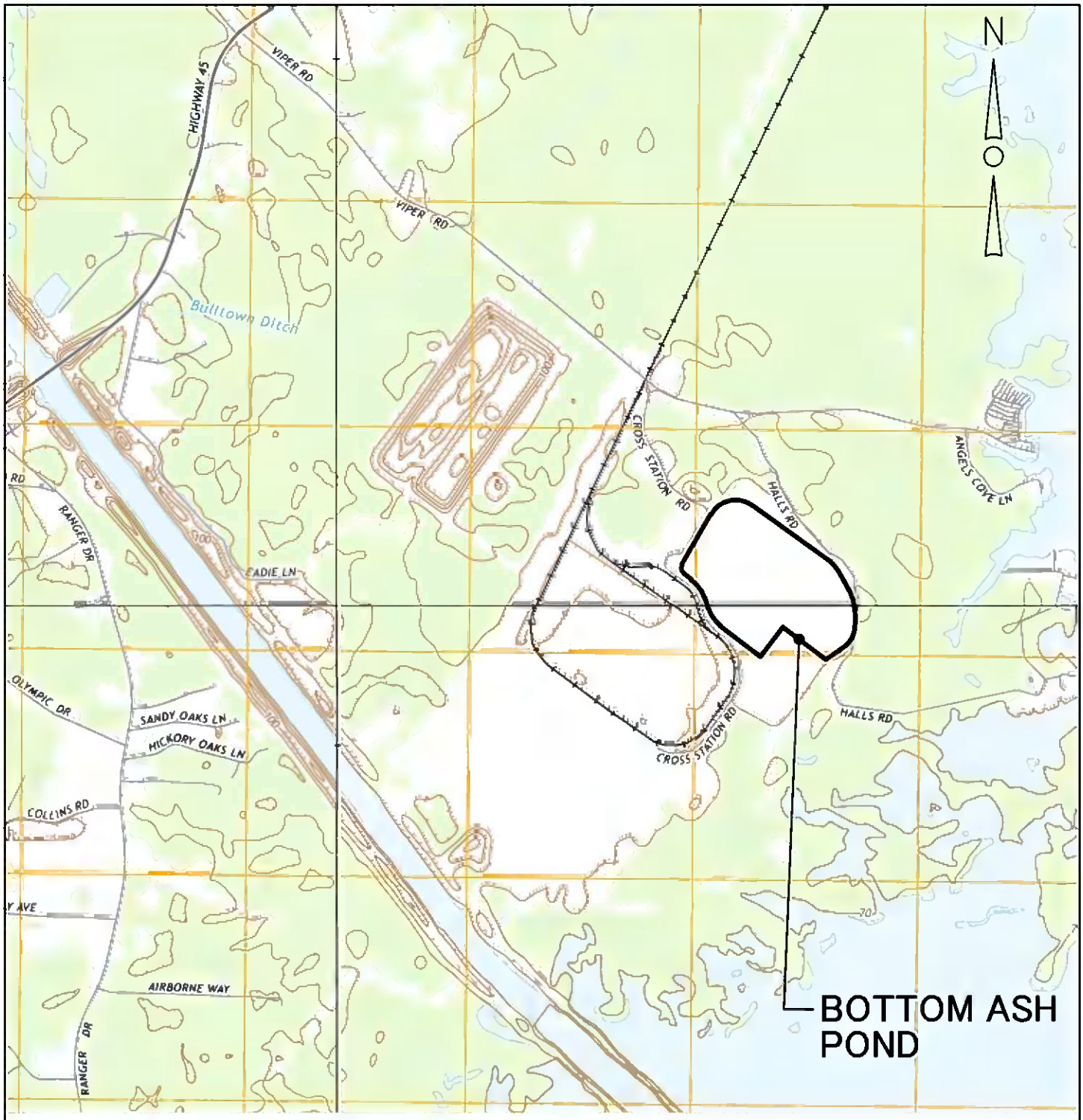
In general, the Bottom Ash Pond is an impoundment containing primarily bottom ash. It was constructed in the mid-1990's. The pond is partially incised, with the bottom of the pond approximately six feet lower than the surrounding ground surface. The embankments, constructed of on-site material, have slopes of three horizontal to one vertical, and extend to Elevation 91 feet. The crest width varies from approximately 15 to 24 feet. The pond is lined with a bentonite composite liner, and protected by concrete revetment. Discharge from the pond is through a trapezoidal weir into the Wastewater Decant Pond.

4. REFERENCES

1. Dewberry & Davis, LLC, Coal Combustion Residue Impoundment Round 9 - Dam Assessment Report Cross Generating Station, December 2011.
2. Santee Cooper, Coal Combustion Residual Impoundment Inspection - Cross Generating Station, January 2016.
3. SC Watershed Atlas, https://gis/dhec.sc.gov/watersheds/
4. Law Engineering Testing Company, Final Report Cross Generating Station, February 9, 1979.
5. WorleyParsons Calculation CROSS-0-LI-044-0010, Bottom Ash Pond Initial Safety Factor Assessment, October, 2016.
6. Woodward-Clyde Consultants, Final Report Unit 1 Generating Station, January 26, 1981.

Appendix A - CCR Unit Location Map

(2 total pages)



SOURCE: EADYTOWN, SC 2014
PINEVILLE, SC 2014
CROSS, SC 2014
CHICORA, SC 2014

VICINITY MAP

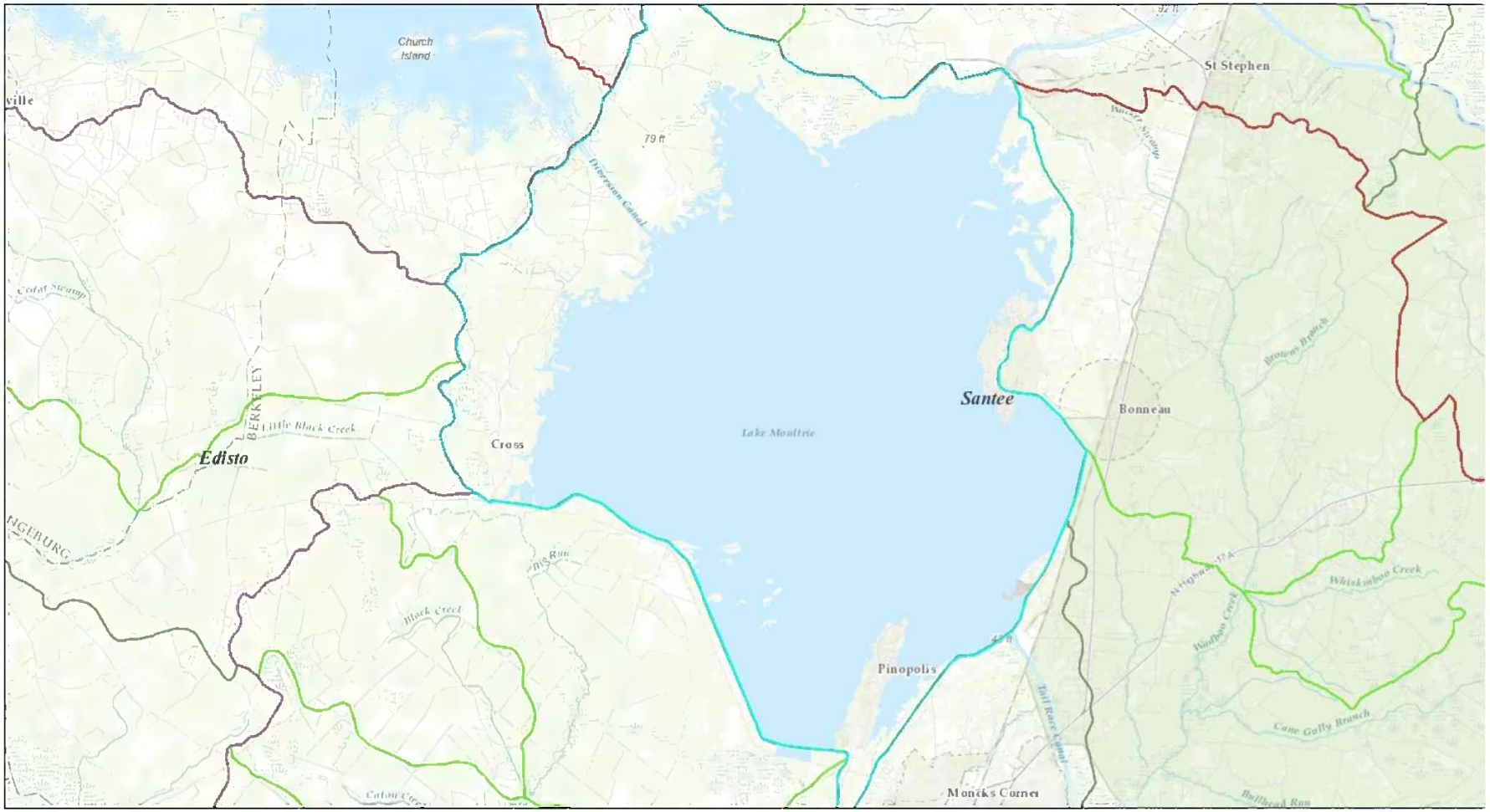
CROSS-0-DW-024-735-001.DWG

APPLICANT: SOUTH CAROLINA PUBLIC SERVICE AUTHORITY (SANTEE COOPER)				P/N:
PROJECT: CROSS STATION CCR/ELG COMPLIANCE			LOCATION: CROSS, BERKELEY COUNTY, SC	
PURPOSE: BOTTOM ASH POND				LAT: N 33° 22′ 65"
2	10/13/16	ISSUED FOR INFORMATION	SCALE: 1" = 2000′	LONG: E 80° 06′ 14"
REV	DATE	DESCRIPTION	DATE: 09/06/16	SHT. 1 OF 1

Appendix B - Watershed Map

(2 total pages)

Lake Moultrie Watershed



September 6, 2016

- Major River Basin (Outline)
- 8-Digit Watersheds
- 10-Digit Watersheds
- 12-Digit Watersheds

1:144,448

0 1.75 3.5 7

0 2.75 5.5 11 k

Sources: Esri, HERE, DeLorme, Intermap, increment P, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadast Ordnance Survey, Esri Japan, METI, Esri China (Hong K swisstopo, MapmyIndia, © OpenStreetMap contributors, and th User Community

B. Bureau of Water, SC

Appendix C - Boring Logs and CPT Soundings

(8 total pages)

BORING LOG NO. B-734

PROJECT: Cross Generating Station- Ash Pond Dikes

CLIENT: Santee Cooper
Moncks Corner

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons

LOCATION See Exhibit A-2

Latitude: 33.377012° Longitude: -80.10171°
Northing: 14692 Easting: 10701

Surface Elev.: 90.9 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION	FIELD TEST RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.0	90.9	**SANDY LEAN CLAY (CL)**, tan to brown, stiff to very stiff **-Shelby tube taken in offset boring between 2 to 4 feet**	3-4-6-8 N=10							
			8-9-10-10 N=19				17		44-12-32	62
6.0	85		2-2-9-10 N=11				20			
		CLAYEY SAND (SC), tan, soft **-Shelby tube taken in offset boring between 6 to 8 feet**	4-6-6-7 N=12				23		42-18-24	49
			2-4-6-7 N=10				22			
12.0	79		1-1-1-1 N=2				39		40-14-26	41
		SANDY LEAN CLAY (CL), reddish brown to gray, stiff	3-4-6-8 N=10				15		36-13-23	
21.0	70		3-3-6 N=9				17		29-14-15	
		FAT CLAY WITH SAND (CH), gray, medium stiff	2-2-4 N=6				31		57-17-40	
32.0	59		1-2-3 N=5				44		74-22-52	81
		SANDY LEAN CLAY (CL), gray to tan, soft to medium-stiff	1-1-1 N=2				50		44-18-26	69
38.0	53		WOH-WOH-WOH N=0				64		84-20-64	67
		SANDY FAT CLAY (CH), gray, soft	WOH-WOH-WOH N=0				42		43-32-11	35
44.0	47		13-28-15 N=43							
		SILTY SAND (SM), trace gravel, gray	26-50/2" N=100							
47.0	44									
		SILTY SAND (SM), gray, dense to very dense, strong cementation, (Weathered Santee Limestone)								
55.0	36									
		Boring Terminated at 55 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
SPT energy 71.9%

Advancement Method:
mud rottary

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *13.4 ft after casing removed*
- *18 ft at end of day*
- *after boring completion*

Terracon
1450 5th Street West
North Charleston, South Carolina

Boring Started: 10/8/2015 | Boring Completed: 10/8/2015
Drill Rig: CME-45 | Driller: J. Pawless
Project No.: EN131025 | Exhibit: A-2

BORING LOG NO. B-735

PROJECT: Cross Generating Station- Ash Pond Dikes

CLIENT: Santee Cooper
Moncks Corner

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons

LOCATION See Exhibit A-2

Latitude: 33.373027° Longitude: -80.101761°
Northing: 13447 Easting: 11565

Surface Elev.: 95.2 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
4.0	91				9-8-12-9 N=20							
					7-9-11-12 N=20				17		44-15-29	
		5			3-2-2-2 N=4				27		50-19-31	45
					2-2-2-2 N=4				32			
12.0	83	10			3-3-2-2 N=5				18		37-15-22	46
			▽		4-4-9-10 N=13				12			
		15	▽		2-2-3-3 N=5				22		30-11-19	55
22.0	73	20			2-2-3-3 N=5				22		47-16-31	
		25			1-1-1-1 N=2				37		56-20-36	91
28.0	67		▨									
		30			3-4-5 N=9				25		39-15-24	
33.0	62											
		35			5-19-27 N=46							
		40			16-20-26 N=46							
		45			8-15-26 N=41							
50.0	45	50			28-32-50/2" N=100						NP	

SANDY LEAN CLAY (CL), reddish brown, very stiff

CLAYEY SAND (SC), with silt, brown, soft to medium-stiff
-Shelby tube taken in offset boring between 4 to 6 feet
-Shelby tube taken in offset boring between 8 to 10 feet

SANDY LEAN CLAY (CL), gray to brown, medium stiff

FAT CLAY (CH), gray, whith to tan, loose

SANDY LEAN CLAY (CL), gray, whith to tan

SILTY SAND (SM), gray, dense to very dense, strong cementation, (Weathered Santee Limestone)

Boring Terminated at 50 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
SPT energy 71.9%

Advancement Method:
mud rottary

Abandonment Method:
Borings backfilled with cement-bentonite grout upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *13 ft after casing removed*

▽ *17.6 ft at end of day*

▨ *after boring completion*

Terracon
1450 5th Street West
North Charleston, South Carolina

Boring Started: 10/8/2015 | Boring Completed: 10/8/2015

Drill Rig: CME-45 | Driller: J. Pawless

Project No.: EN131025 | Exhibit: A-2

CPT LOG NO. C-834

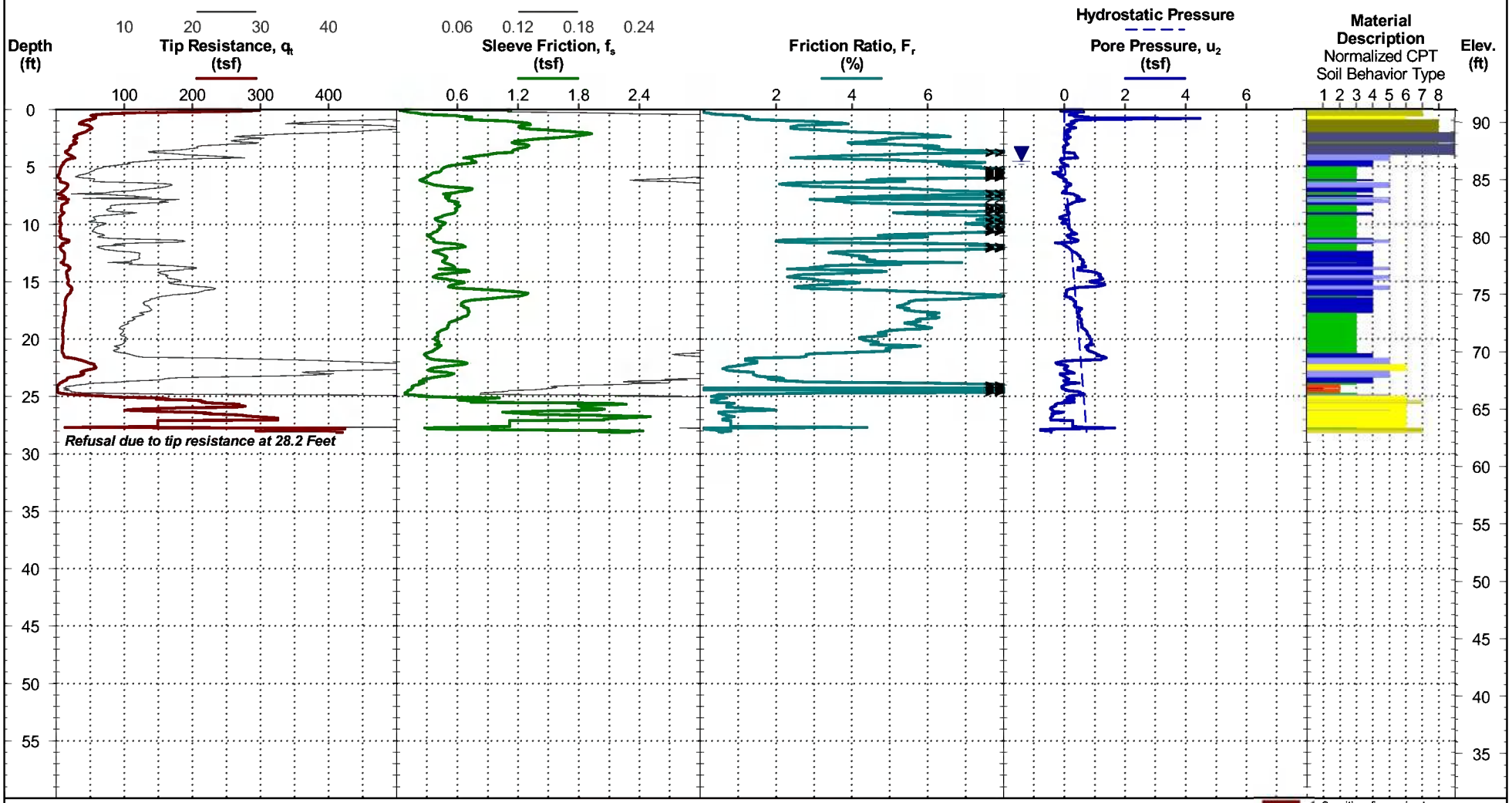
PROJECT: Cross Generating Station- Ash Pond Dikes

CLIENT: Santee Cooper
Moncks Corner

TEST LOCATION: See Exhibit A-2
Surface Elev.: 91.1 ft
LL: 33.3796°,-80.10488°
NE: 14899,9355

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons



See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION
▼ 4.5 ft estimated water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 10/22/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
1450 5th Street West
North Charleston, South Carolina

CPT Started: 10/9/2015	CPT Completed: 10/9/2015
Rig: Pagani TG73-200	Operator: J. Bandle
Project No.: EN131025	Exhibit: A-1

CPT LOG NO. C-835

PROJECT: Cross Generating Station- Ash Pond Dikes

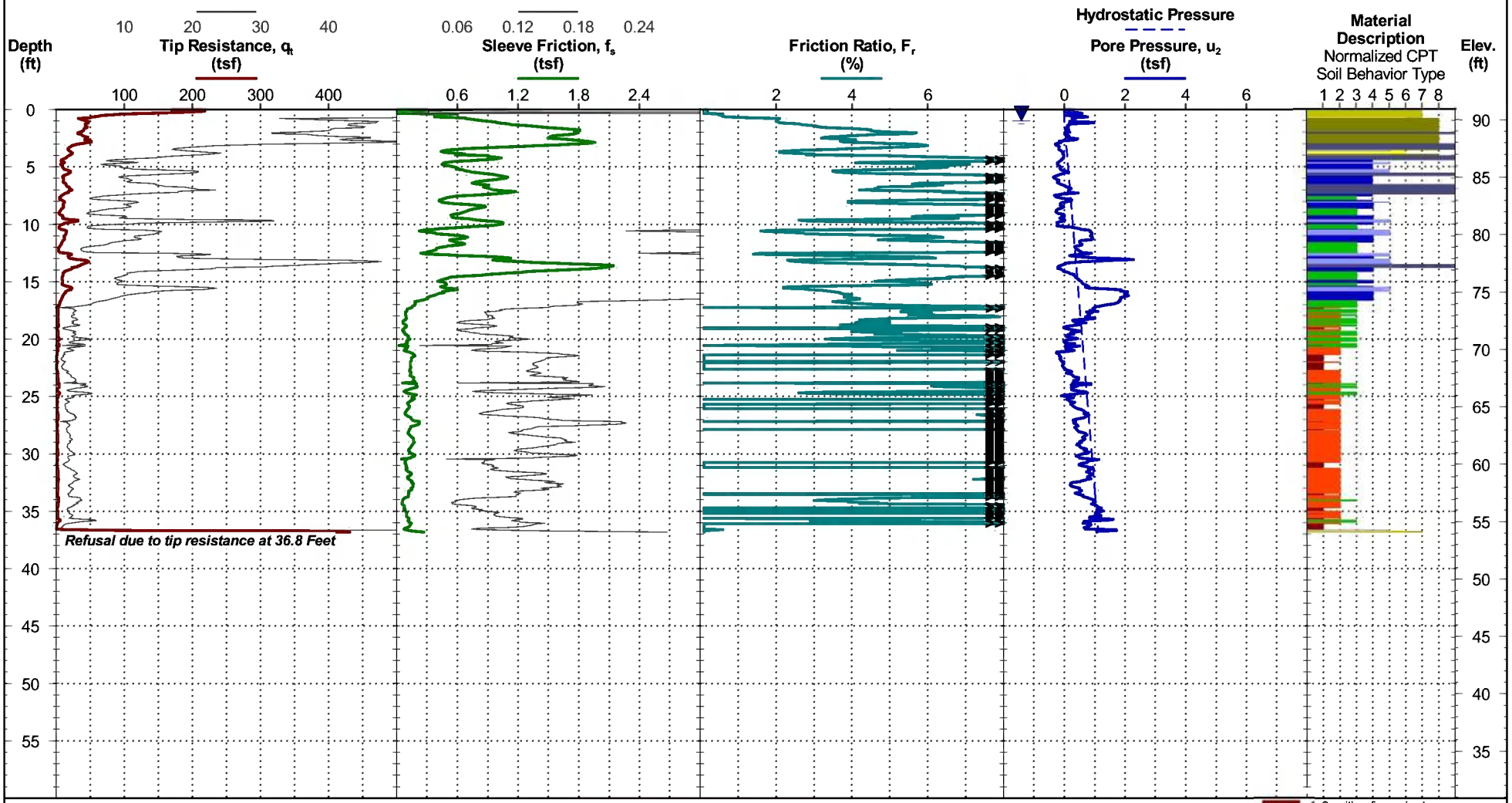
CLIENT: Santee Cooper
Moncks Corner

TEST LOCATION: See Exhibit A-2

Surface Elev.: 90.9 ft
LL: 33.37689°,-80.10157°
NE: 14692,10701

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons



See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 1 ft estimated water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 10/22/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
1450 5th Street West
North Charleston, South Carolina

CPT Started: 10/9/2015	CPT Completed: 10/9/2015
Rig: Pagani TG73-200	Operator: J. Bandle
Project No.: EN131025	Exhibit: A-2

CPT LOG NO. C-836

PROJECT: Cross Generating Station- Ash Pond Dikes

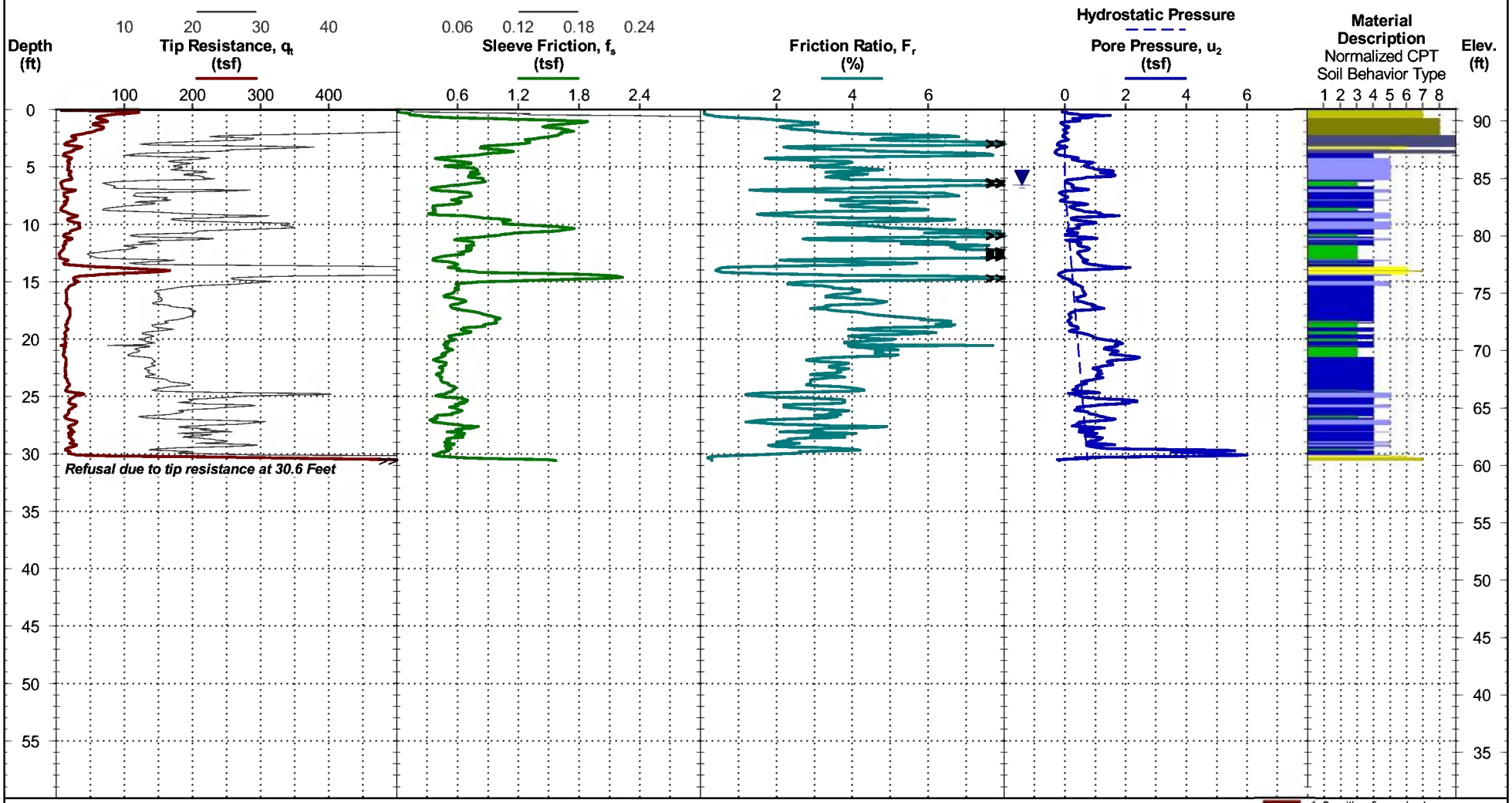
CLIENT: Santee Cooper
Moncks Corner

TEST LOCATION: See Exhibit A-2

Surface Elev.: 91.0 ft
LL: 33.374°,-80.10619°
NE: 12993,10212

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons



See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 6.6 ft estimated water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 10/22/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
1450 5th Street West
North Charleston, South Carolina

CPT Started: 10/9/2015	CPT Completed: 10/9/2015
Rig: Pagani TG73-200	Operator: J. Bandle
Project No.: EN131025	Exhibit: A-3

CPT LOG NO. C-837

PROJECT: Cross Generating Station- Ash Pond Dikes

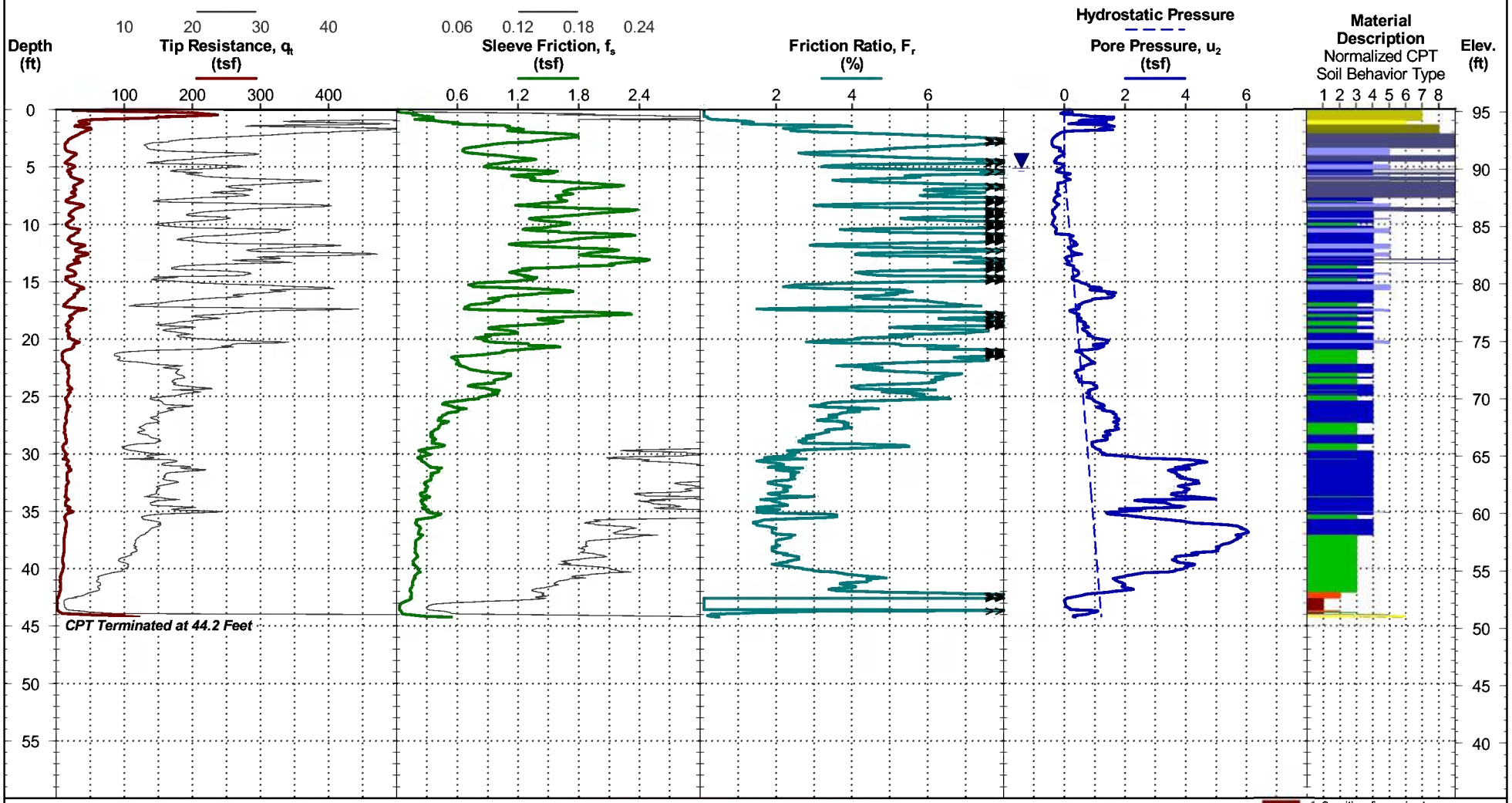
CLIENT: Santee Cooper
Moncks Corner

TEST LOCATION: See Exhibit A-2

Surface Elev.: 95.2 ft
LL: 33.37303°,-80.10186°
NE: 13447,11565

SITE: Cross Generating Station
Pineville, South Carolina

WorleyParsons



See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION

▼ 5.1 ft estimated water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 10/22/2015
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
1450 5th Street West
North Charleston, South Carolina

CPT Started: 10/9/2015	CPT Completed: 10/9/2015
Rig: Pagani TG73-200	Operator: J. Bandle
Project No.: EN131025	Exhibit: A-4

Appendix D - Construction Drawings

(19 total pages)

MATCH LINE, SEE DWG. NO. 2-CV-602
N 129+00
N 128+00
N 126+00
N 124+00
N 122+00
BOTTOM ASH POND
WATER SURFACE ELEV. 93.00
PLANT NORTH
PROPOSED TREE LINE
EXISTING TREE LINE
EXISTING ROAD
SEE DWG. 2-CV-519 FOR CONTINUATION OF ROAD
℄ DITCH-GRADE TO DRAIN & GRASS
℄ 24'-0" WIDE GRAVEL ROAD @ E 109+85.0
℄ 30'-0" WIDE DIKE @ E109+35.0 TOP EL. (95.63)
℄ 15'-0" WIDE DIKE @ E 115+67.0 TOP EL. (95.31)
℄ 15'-0" WIDE DIKE @ N123+50.0 TOP EL. (95.31)
TOE OF SLOPE @ EL. (75.0)
P.I.@ N127+56.89 E108+65.29
GUARD RAIL SEE DET. "20" DWG. 2-CV-562 END GUARD RAILS @ CURVE TANGENTS (TYP.)
ROADWAY SLOPES TO BE GRASSED (TYP. BOTH SIDES)
PROPOSED CONC. TRENCH (SEE DWG. 2-C-682)
PROPOSED INTAKE STRUCTURE SEE DWG. 2-C-680. DIKE AT STRUCTURE SHALL BE CONSTRUCTED FIRST & LEFT IN PLACE AS A SURCHARGE UNTIL ENTIRE DIKE IS COMPLETE, THEN STRUCTURE SHALL BE BUILT.
OIL SKIMMER BOOM (TYP.)
DRAWDOWN STRUCTURE (NO. 1 SEE DWG. 2-C-684
℄ DRAWDOWN & OVERFLOW STRUCT. @ E 112+75.0 = ℄ WALKWAY
END PIPE TRENCH @ N 124+67.50
END PIPE TRENCH @ N123+57.50
6" THK. CRUSHED STONE (TYP.)
18"Ø A.W.W.A. C-301 PRESTRESSED CONC. CYLINDER PIPE
P.I.@ N123+50.0 E115+67.0
CONC. TRENCH FOR DETAIL SEE DWG. 2-C-682
GRASS SIDE SLOPES (TYP)
6" THK. CRUSHED LIMESTONE
℄ BERM FOR PIPE SUPPORT SEE DWG. 2M0149
10'-0" WIDE FLAT BOTTOM DITCH W/3:1 SIDE SLOPES ROUTE TO EXIST. DITCH GRADE TO DRAIN & GRASS
24"Ø R.C.P. CLASS III (40 L.6)
SANDBAG RIP RAP SEE DETAIL "4" DWG. 2-CV-650
P.I.@ N122+50 E 112+75
P.I.@ N122+20 E 112+45
MATCH EXIST. DITCH ELEV.
E 108+00
E 110+00
E 112+00
E 114+00
E 116+00
E 118+00
E 119+00

1" = 30' 0 10' 20' 40' 60' 80' 100'

B & R #200-00-0424

PKG.	ISSUE	DATE	REV.
284	CONSTR.	3-25-82	1
284	BID	1-4-82	0

no	date	REVISION	by	ck.	appr.	no	date	REVISION	by	ck	appr.
2	5/12/82	REV. PIPE SIZE @ DRAWDOWN STRUCTURE	CEA	Tbk							
1	3-25-82	REVISED LOCATION OF POND DIKE, REV. TRANSFORMER PAD LAYOUT @ INTAKE STR. & ISSUED FOR CONSTRUCTION (CONTRACT 284)	CEA	Tbk		4	9/9/82	ADDED OIL SKIMMER BOOM & POLES	CEA	Tbk	
0	1-4-82	ISSUED FOR BIDS (CONT. 284)	SDO	Tbk		3	6/28/82	REV. EFFLUENT PIPE DIA. & REF. DWG. NO.	CEA	Tbk	

drawn by G.A.
dept. ck. Mc Intyre
dept. appr. P.R. Durilia
coord. ck.
p.m. appr. Glenn Kluttz
B & R appr. JWard 9/11/84

BURNS AND ROE, INC.
ENGINEERS AND CONSTRUCTORS
ORADELL, N. J. WOODBURY, N. Y. LOS ANGELES, CALIF. JACKSONVILLE, FLA.

ATLANTA DALLAS NEW YORK
LOCKWOOD GREENE
ARCHITECTS · ENGINEERS
SPARTANBURG, S.C.

job name: SANTEE COOPER
CROSS GENERATING STATION UNIT 2
CROSS, SOUTH CAROLINA

sheet title: LAYOUT, GRADING AND DRAINAGE PLAN

scale: 1" = 30'
date: 8-3-81
L-G JOB NO. 78271.01
B&R W.O. NO. 3446.02
dwg. no. 2-CV-601
rev. no. 4

AF 7495

PROPOSED TREE LINE

HIGH POINT

3
2-CV-650

℄ DITCH GRADE TO DRAIN ℄ GRASS

P.I. @ N 135+00.0
E 109+92.50

P.I. @ N 135+00.0
E 115+67.0

℄ 15'-0" WIDE DIKE @ N 135+00.0
TOP EL. (95.31)

3:1

60'-0"R

TOE OF SLOPE @ EL. (75.0)

200'
(MINIMUM)

PLANT NORTH

EXISTING TREE LINE

EXISTING ROAD

℄ DITCH - GRADE TO DRAIN ℄ GRASS

℄ 15'-0" WIDE DIKE @ E 109+92.50
TOP EL. (95.31)

END 30' WIDE DIKE @ N 132+00

EL. 95.63

(95.63)

5% SLOPE

℄ CONC. TRENCH
N 131+52.67
SEE DWG. 2-C-683

T/TRENCH @ EL. (97.25)

3:1 SIDE SLOPES (TYP. BOTH SIDES)

E 109+64.0

E 109+85.0

℄ 30'-0" WIDE DIKE @ E 109+85.0
TOP EL. (95.63)

24'-0"

PROPOSED TIMBER TRESTLE
PIPE SUPPORT - SEE DWG.
2-C-683

1

℄ TIMBER TRESTLE
@ N 131+50.0

END TRESTLE
E 111+50.0
END OF PIPE
E 111+52.0

7
2-CV-650

BOTTOM ASH POND
WATER SURFACE ELEV. 93.00

EXISTING TREE LINE

TOE OF SLOPE @ EL. (75.0)

TOE OF SLOPE @ EL. (75.0)

℄ 15'-0" WIDE DIKE @ E 115+67.0
TOP EL. (95.31)

PROPOSED TREE LINE

3
2-CV-650

MATCH LINE SEE DWG. 2-CV-601

N 136+00
N 134+00
N 132+00
N 130+00
N 129+00

E 108+00
E 110+00
E 112+00
E 114+00
E 116+00
E 118+00
E 119+00

30 0 30 60
SCALE IN FEET

S. CAROLINA
REGISTERED
5444
PROFESSIONAL ENGINEER

1 3258 VISE LOCATION OF BOND D E
ISSUED FOR CONSTRUCTION CONTRACT C
0 1-9 ISSUED FOR BIDS (CONT. 284) DR.
no date REVISION by ck. appr. no date

REVISION by ck. appr.

drawn by G.A.
dept. ck.
dept. appr.
coord. ck.
p.m. appr.
B&R appr.

BURNS AND ROE, INC.
ENGINEERS AND CONSTRUCTORS
ORADELL, N. J. WOODBURY, N. Y. LOS ANGELES, CALIF. JACKSONVILLE, FLA.
ATLANTA DALLAS NEW YORK
LOCKWOOD GREENE
ARCHITECTS · ENGINEERS
SPARTANBURG, S.C.

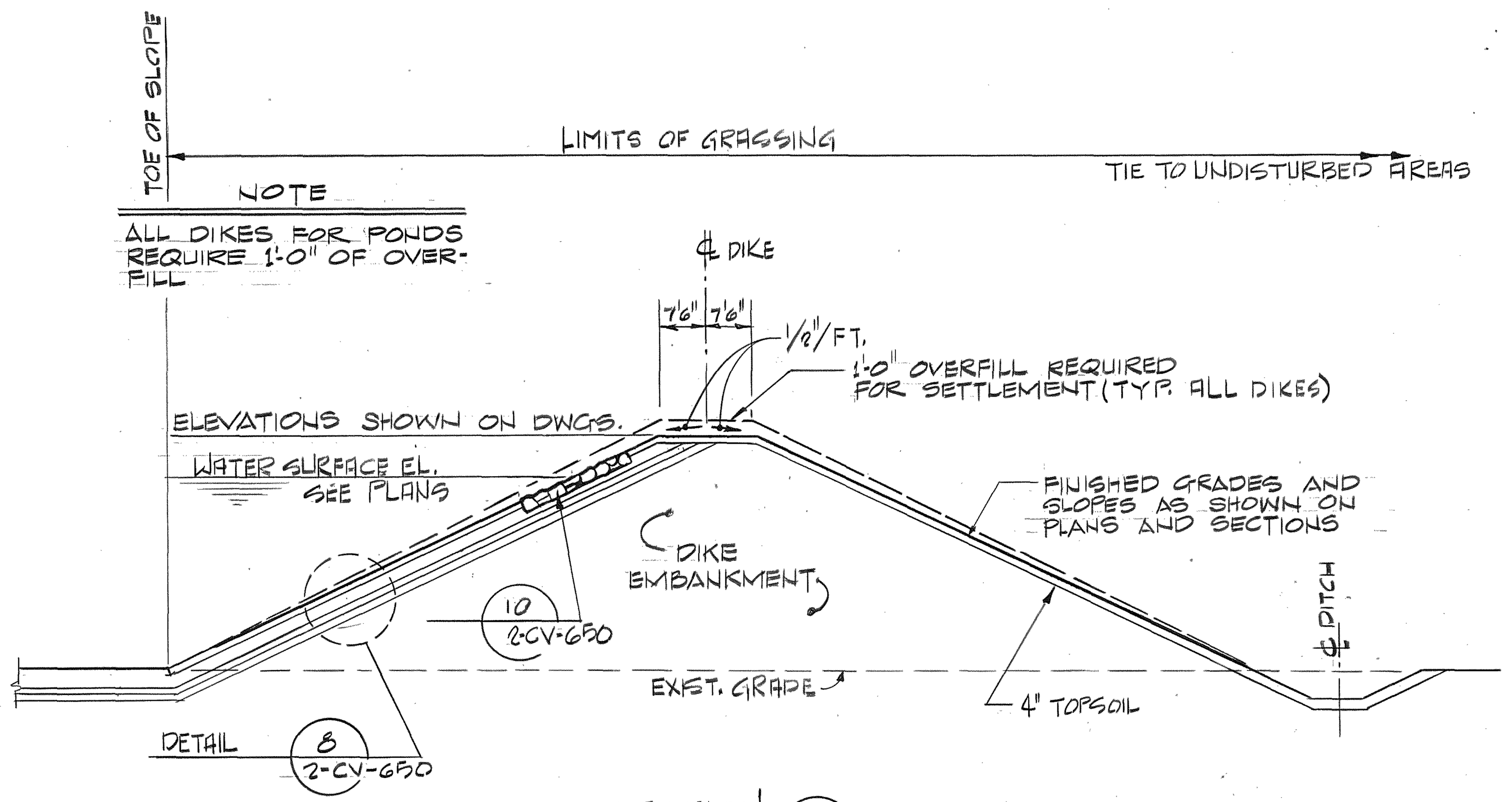
job name
SANTEE COOPER
CROSS GENERATING STATION UNIT 2
CROSS, SOUTH CAROLINA

B & R #200-00-0425

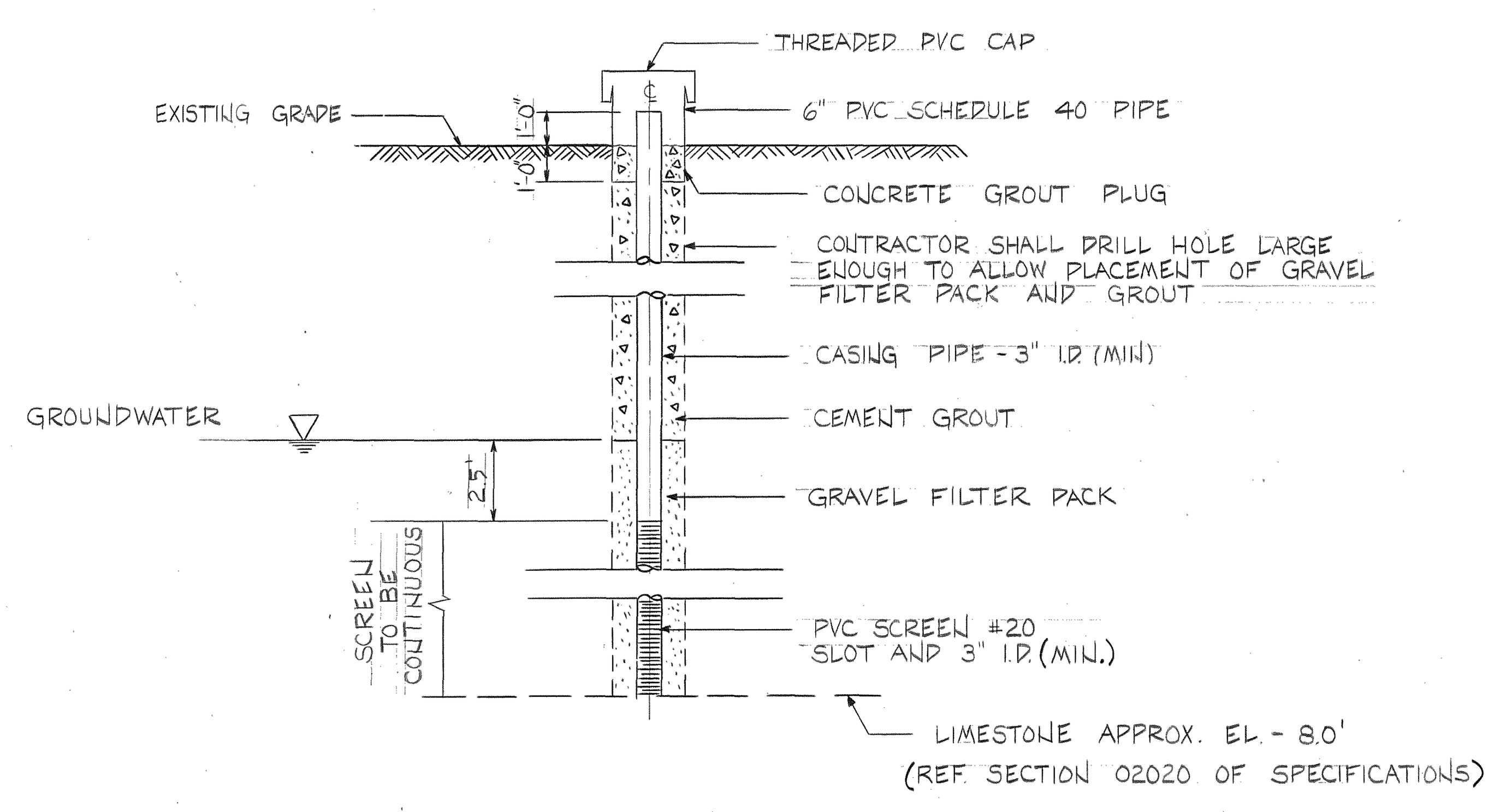
sheet title
LAYOUT, GRADING AND DRAINAGE PLAN

scale 1" = 30'
date 8-3-81
dwg. no 2-CV-602
rev. no. 1

284 CONSTR. 3-2582 1
284 BID 1-982 0
PKG. ISSUE DATE REV.
L-G JOB NO. 78271.01
B&R W.O. NO. 3446.02

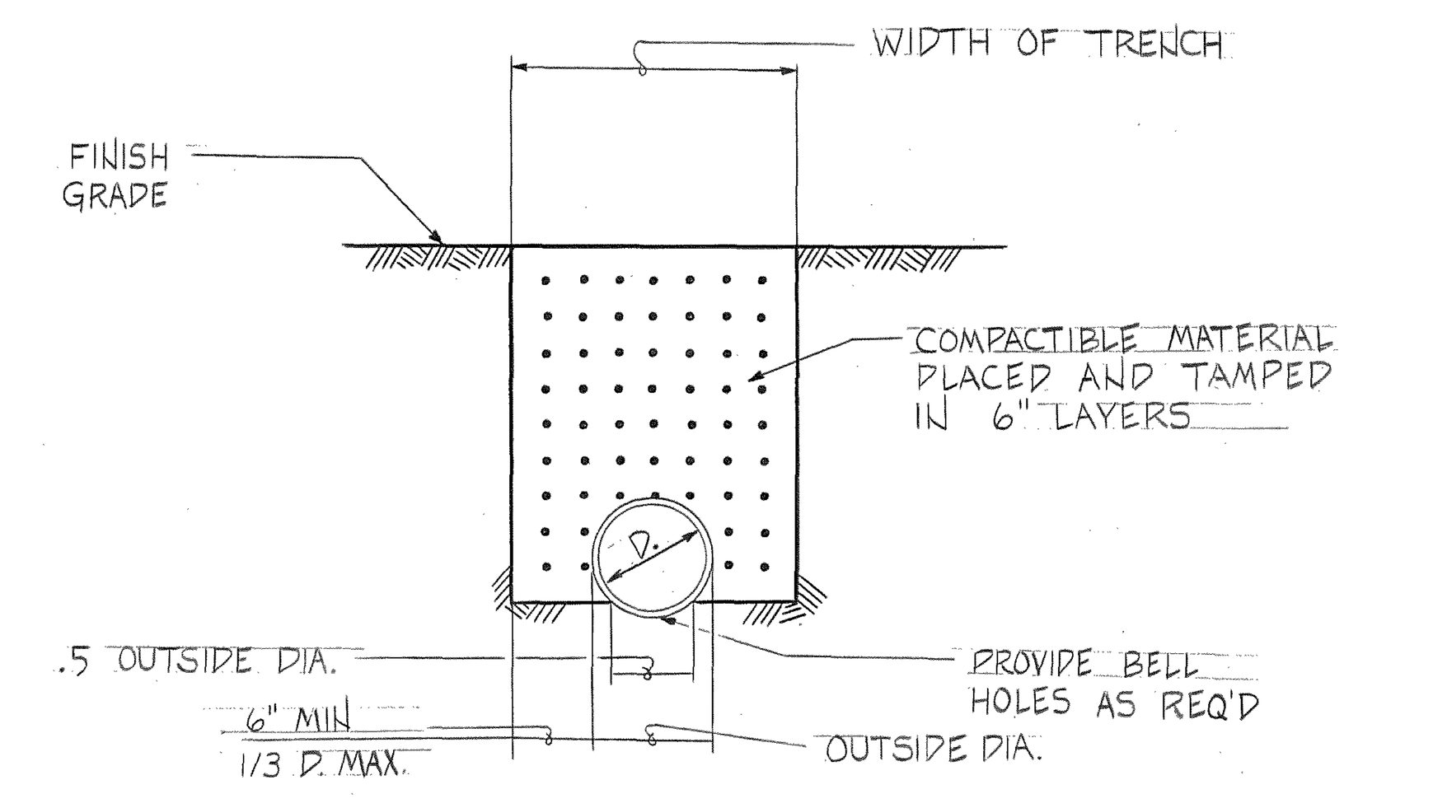


SECTION 1 2-CV-600
N.T.S. 2-CV-650



DETAIL 2 2-CV-650
N.T.S. 2-CV-650

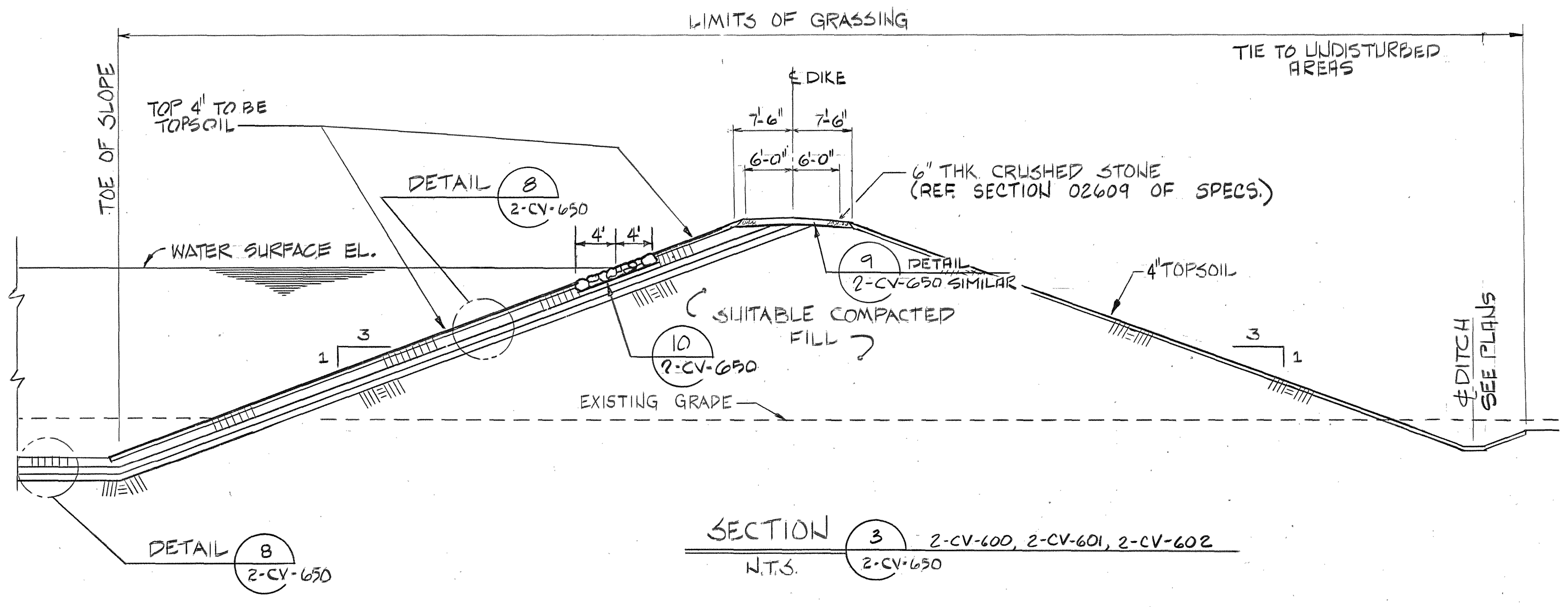
MONITORING WELL



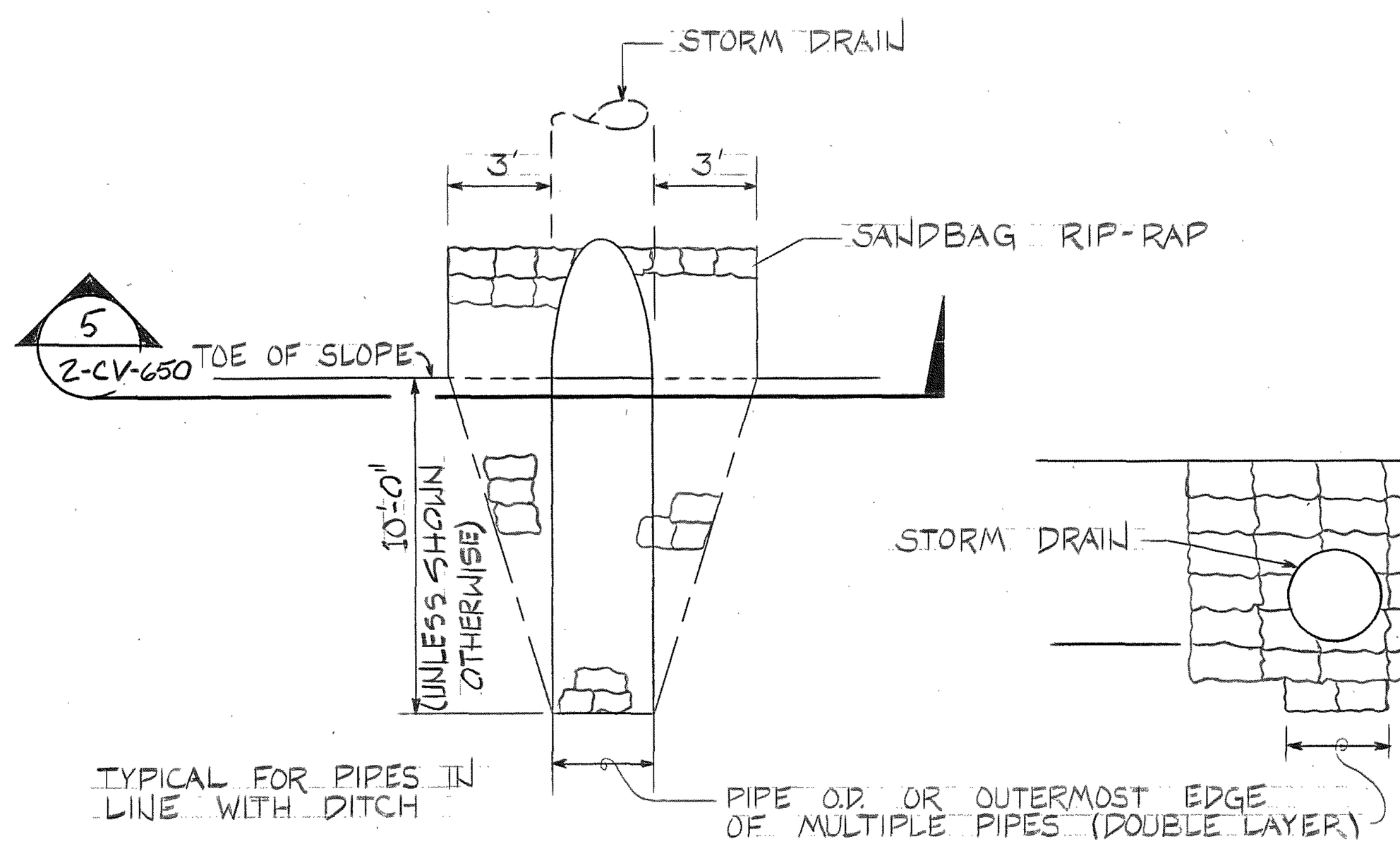
NOTE

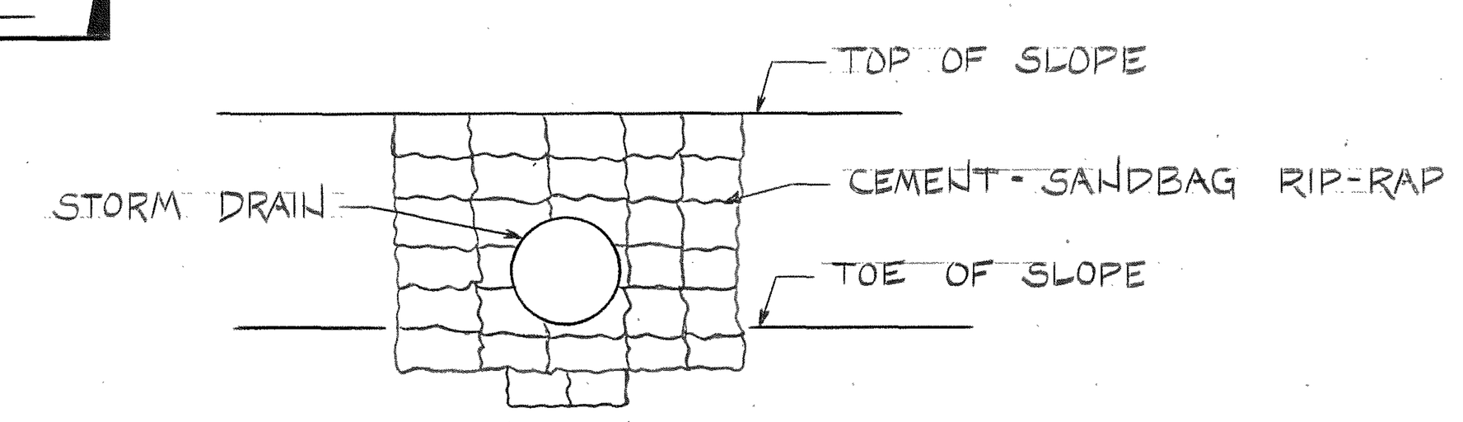
ABOVE DETAIL TO BE USED FOR ALL PIPING INSTALLATIONS EXCEPT DRAWDOWN PIPES. REFER TO DETAIL ON 2-C-684 FOR DRAWDOWN PIPE BEDDING.

TYPICAL PIPE BEDDING DETAIL
N.T.S



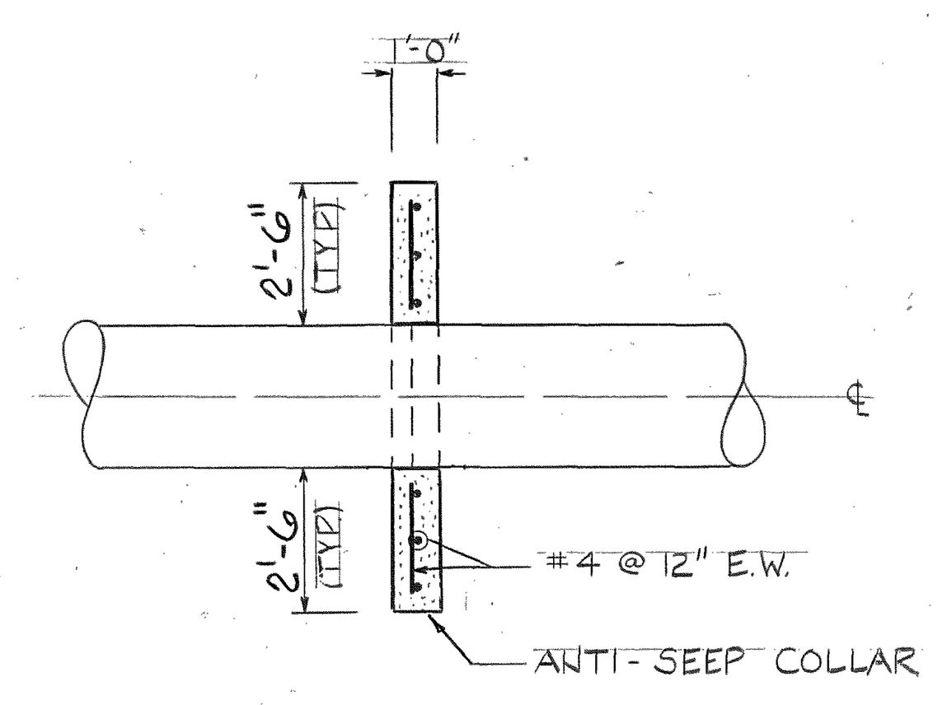
SECTION 3 2-CV-600, 2-CV-601, 2-CV-602
N.T.S. 2-CV-650



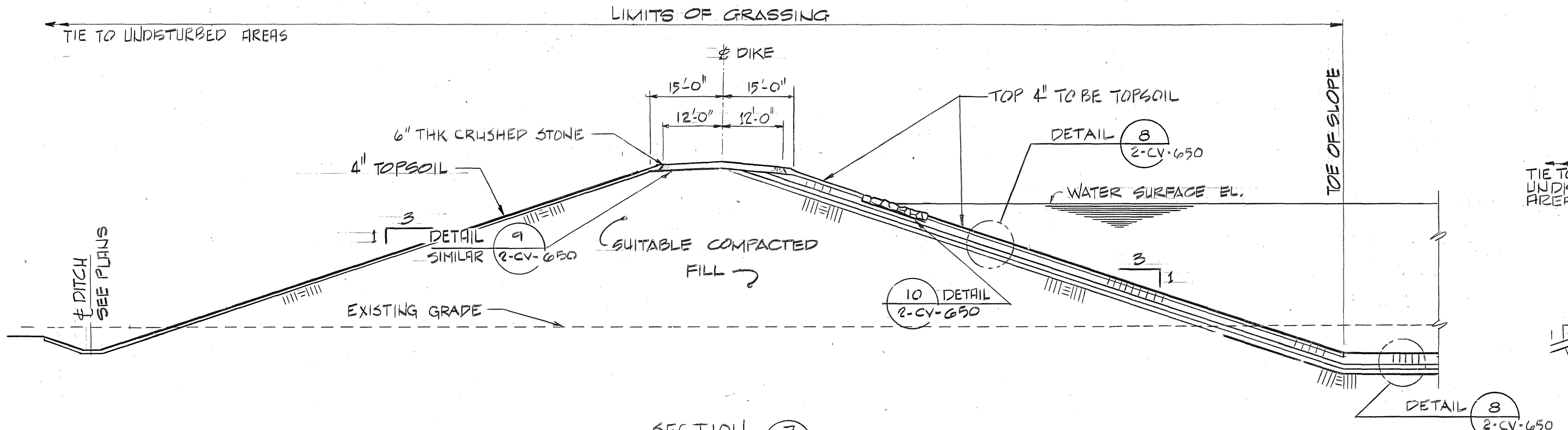


DETAIL 4 2-CV-600, 2-CV-601, 2-CV-919
N.T.S. 2-CV-650

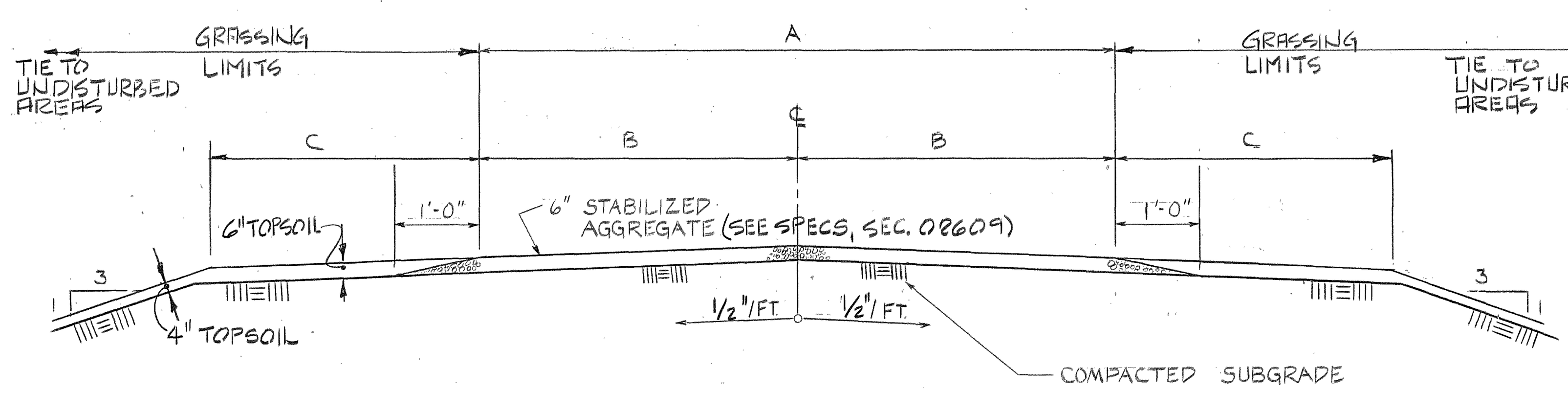
SECTION 5 2-CV-650
N.T.S. 2-CV-650



DETAIL 6 2-CV-651
N.T.S. 2-CV-650

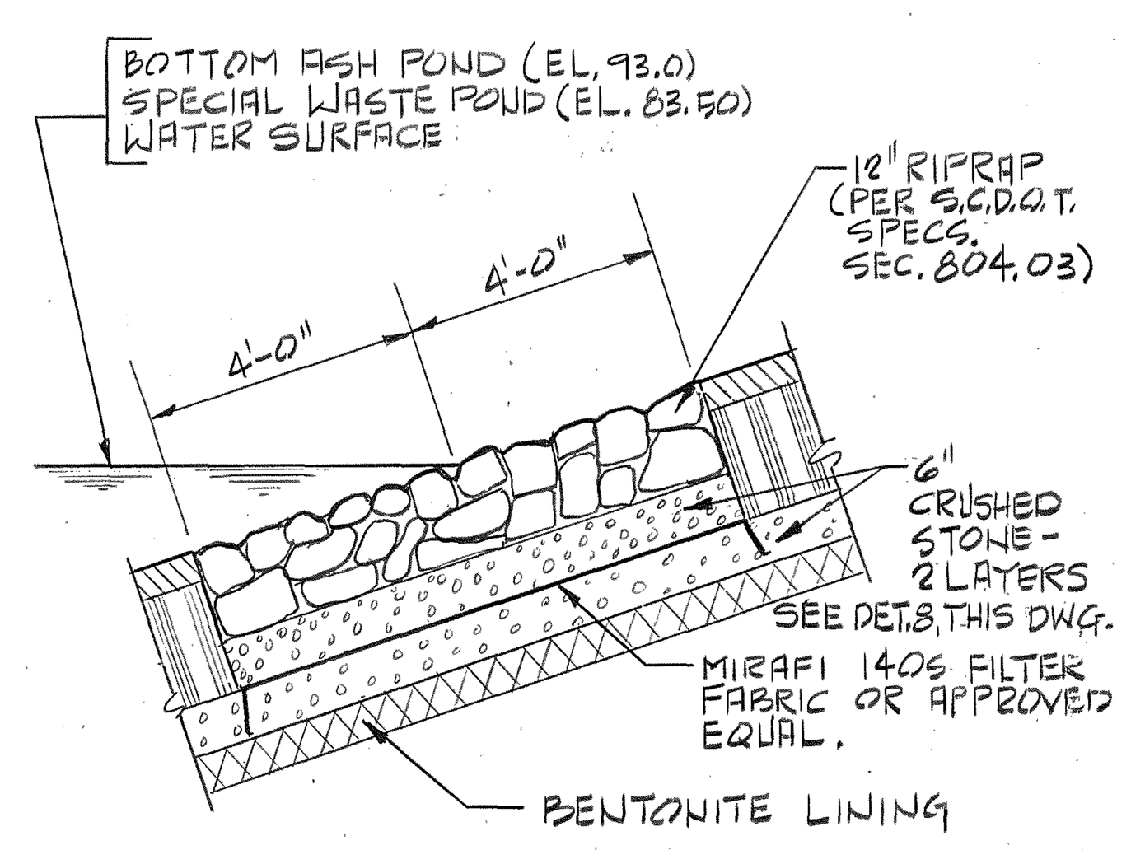


SECTION 7 2-CV-601, 2-CV-602
N.T.S 2-CV-650



DIMENSIONS		
A	B	C
12'-0"	6'-0"	4'-0"
24'-0"	12'-0"	8'-0"

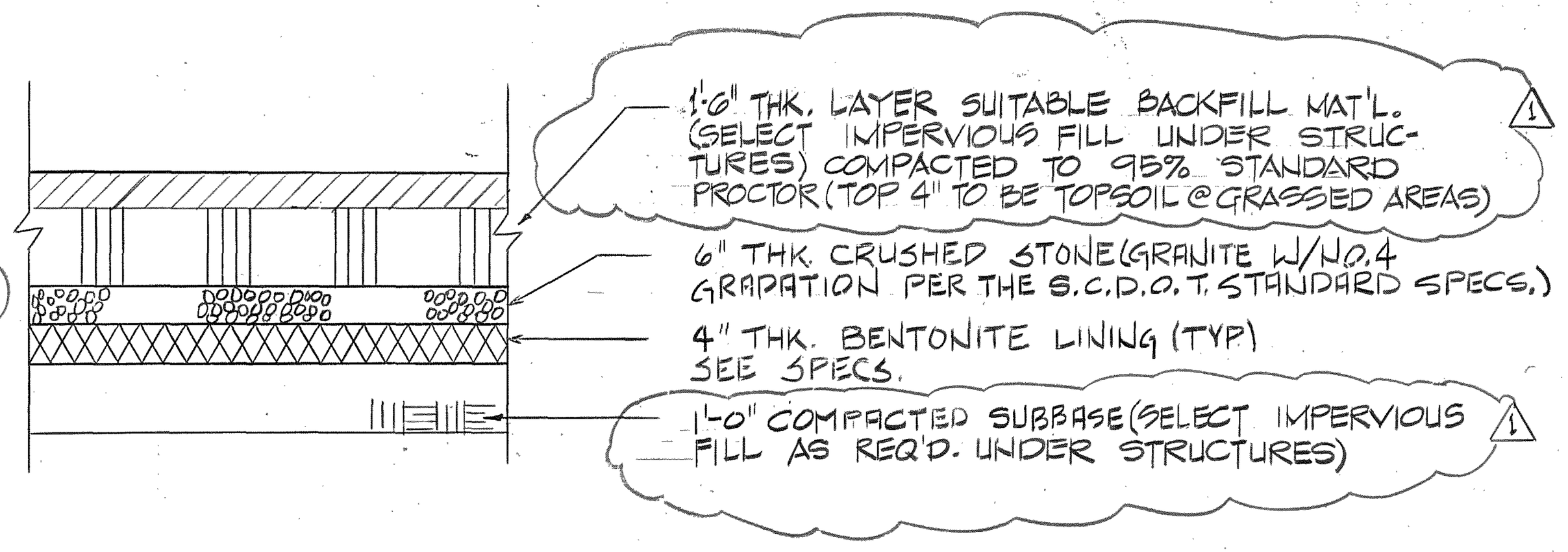
UNPAVED ROADWAY DETAIL 9 2-CV-650, 2-CV-651
N.T.S 2-CV-560



DETAIL 10 2-CV-650
N.T.S. 2-CV-650

NOTE

CONTRACTOR SHALL ENSURE THAT BENTONITE LINING IS PROPERLY PLACED IN AREA ADJACENT TO CONCRETE STRUCTURES, SHEET PILING, AND TIMBER PILING. BENTONITE LINING MUST EXTEND IN AN UNINTERRUPTED LAYER TO CONTACT SURFACES OF STRUCTURES AND PILING.



DETAIL 8 2-CV-650, 2-CV-651
N.T.S. 2-CV-650

no	date	REVISION	by	ck.	appr.
1	3/82	NOTES TO DETAIL 8 ISSUED ISSUED FOR CONSTRUCTION (CONTRAC 284			
0	1/82	ISSUED FOR BIDS (CONT. 284			

drawn by D OLSON
dept. ck.
dept. appr.
coord. ck.
p.m. appr.
B&R appr.

BURNS AND ROE, INC.
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ATLANTA DALLAS NEW YORK
LOCKWOOD GREENE
ARCHITECTS · ENGINEERS
SPARTANBURG, S.C.

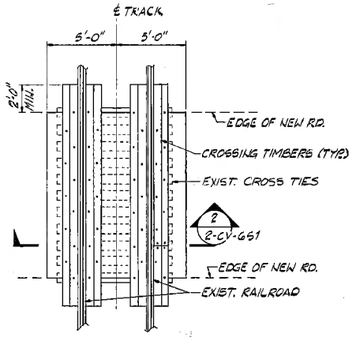
job name: SANTEE COOPER CROSS GENERATING STATION UNIT 2 CROSS, SOUTH CAROLINA

sheet title: MISCELLANEOUS DETAILS AND SECTIONS

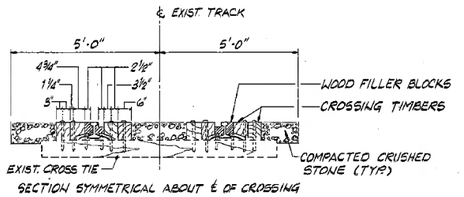
B&R #200-00-0427

284 CONSTR. 1
284 BID 0
PKG. ISSUE DATE REV

scale: AS NOTED
L-G JOB NO. 78271.01
B&R W.O. NO. 3446.02
date: 8-3-81
dwg. no. 2-CV-650
rev. no. 1

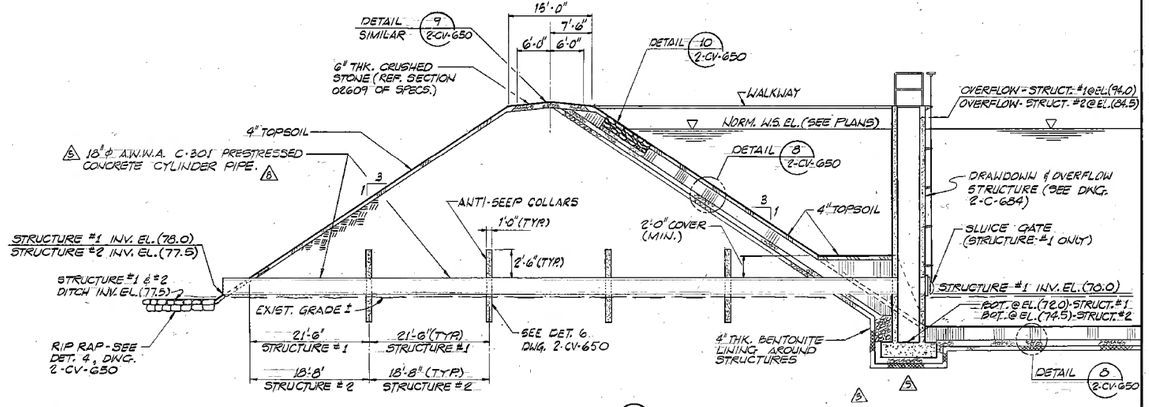


ROAD CROSSING DETAIL (1, 2-CV-600, 2-CV-651)
NO SCALE

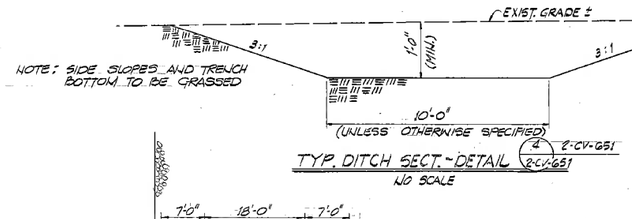


SECTION (2, 2-CV-651)
NO SCALE

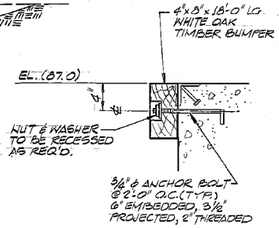
NOTE: ALL MATERIALS AND CONSTRUCTION TO BE IN ACCORDANCE WITH A.R.E.A. TRACKWORK PLANS AND SPECIFICATIONS AND SEABOARD COAST LINE STANDARD SPECIFICATIONS.

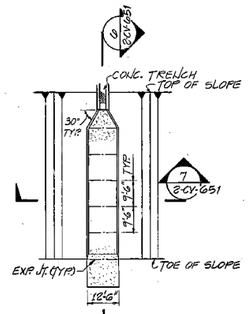


SECTION (3, 2-CV-600, 2-CV-601; 2-CV-651)
N.T.S.

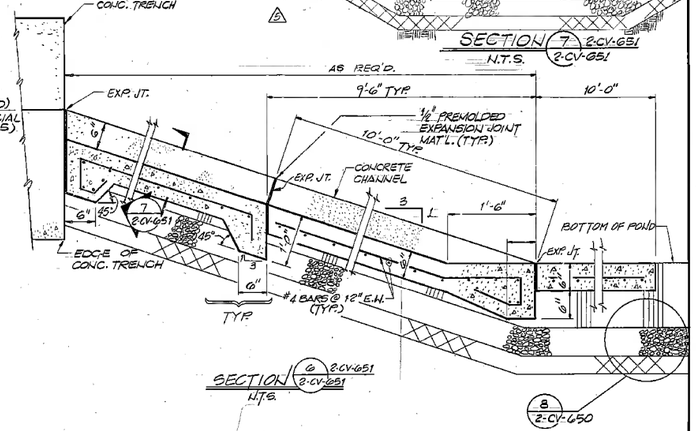


TYP. DITCH SECT. - DETAIL (4, 2-CV-651; 2-CV-651)
NO SCALE



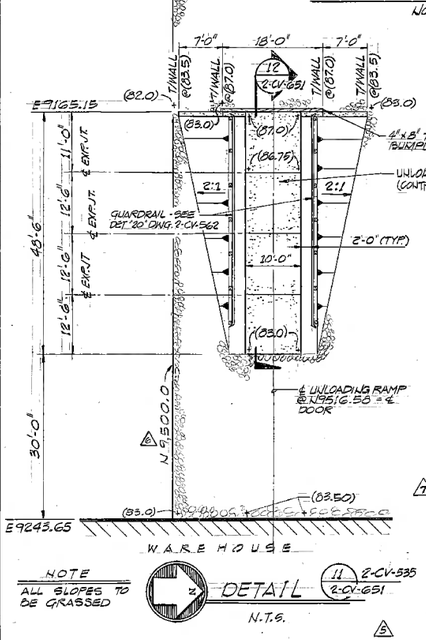


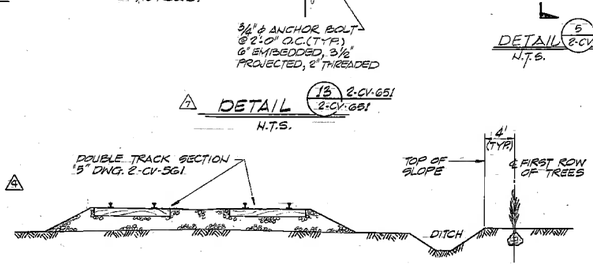
DETAIL (5, 2-CV-600, 2-CV-601; 2-CV-651)
N.T.S.



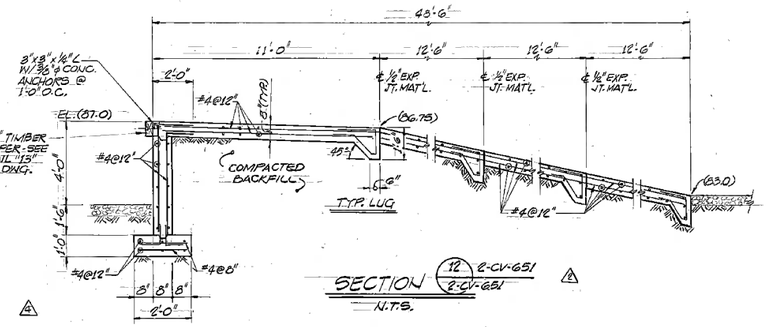
SECTION (4, 2-CV-651; 2-CV-651)
N.T.S.

SECTION (7, 2-CV-651; 2-CV-651)
N.T.S.

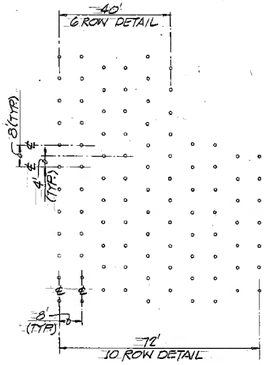




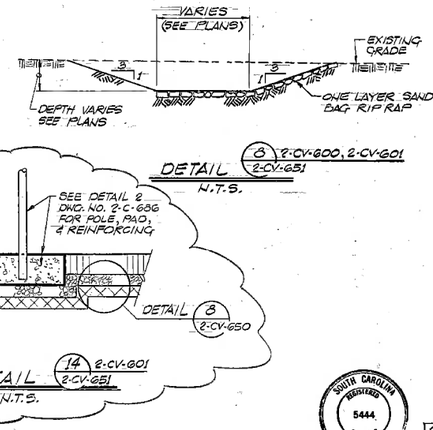
SECTION (10, 2-CV-516; 2-CV-651)
N.T.S.



SECTION (12, 2-CV-651; 2-CV-651)
N.T.S.



DETAIL (9, 2-CV-516; 2-CV-651)
N.T.S.



DETAIL (8, 2-CV-600, 2-CV-601; 2-CV-651)
N.T.S.

DETAIL (14, 2-CV-601; 2-CV-651)
N.T.S.

SOUTH CAROLINA REGISTERED 5444 ENGINEER E. R. DURALIA

B & R #200-00-0428

no	date	REVISION	by	ck.	appr.
4	11-6-81	REVISED DETAIL "9" & SECTION "10"	SDQ	TWM	
3	9-28-81	REVISED SECT. 3 "HOLD" DET. 11 & ISSUED FOR CONSTRUCTION (CONTRACT 284)	CBM	TWM	
2	7-16-81	ADDED DETAIL "11" & SECT. "N" "12"	CBM	TWM	
1	5-8-81	ADDED DETAIL "9" & SECT. "2N" "10"	CBM	TWM	
0	1-9-81	ISSUED FOR BIDS (CO. 284)	SDQ	TWM	

no	date	REVISION	by	ck.	appr.
9	11-19-81	ADDED DETAIL 14	CBM	TWM	
8	10-21-81	REVISED EARTHEN PIPE DIAMETER	CBM	TWM	
7	8-26-81	ADDED DETAIL 13	CBM	TWM	
6	8-19-81	REV. LIMITS OF GRAVEL SURFACING	CBM	TWM	
5	8-11-81	REV. DET. "11", SECT. "9" & REV. PIPE SIZE	CBM	TWM	

BURNS AND ROE, INC.
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ATLANTA DALLAS NEW YORK
LOCKWOOD GREENE
ARCHITECTS · ENGINEERS
SPARTANBURG, S.C.

drawn by CALAIS
dept. ck. [illegible]
dept. appr. [illegible]
coord. ck.
p.m. appr. [illegible]
B&R appr. [illegible] 9/10/81

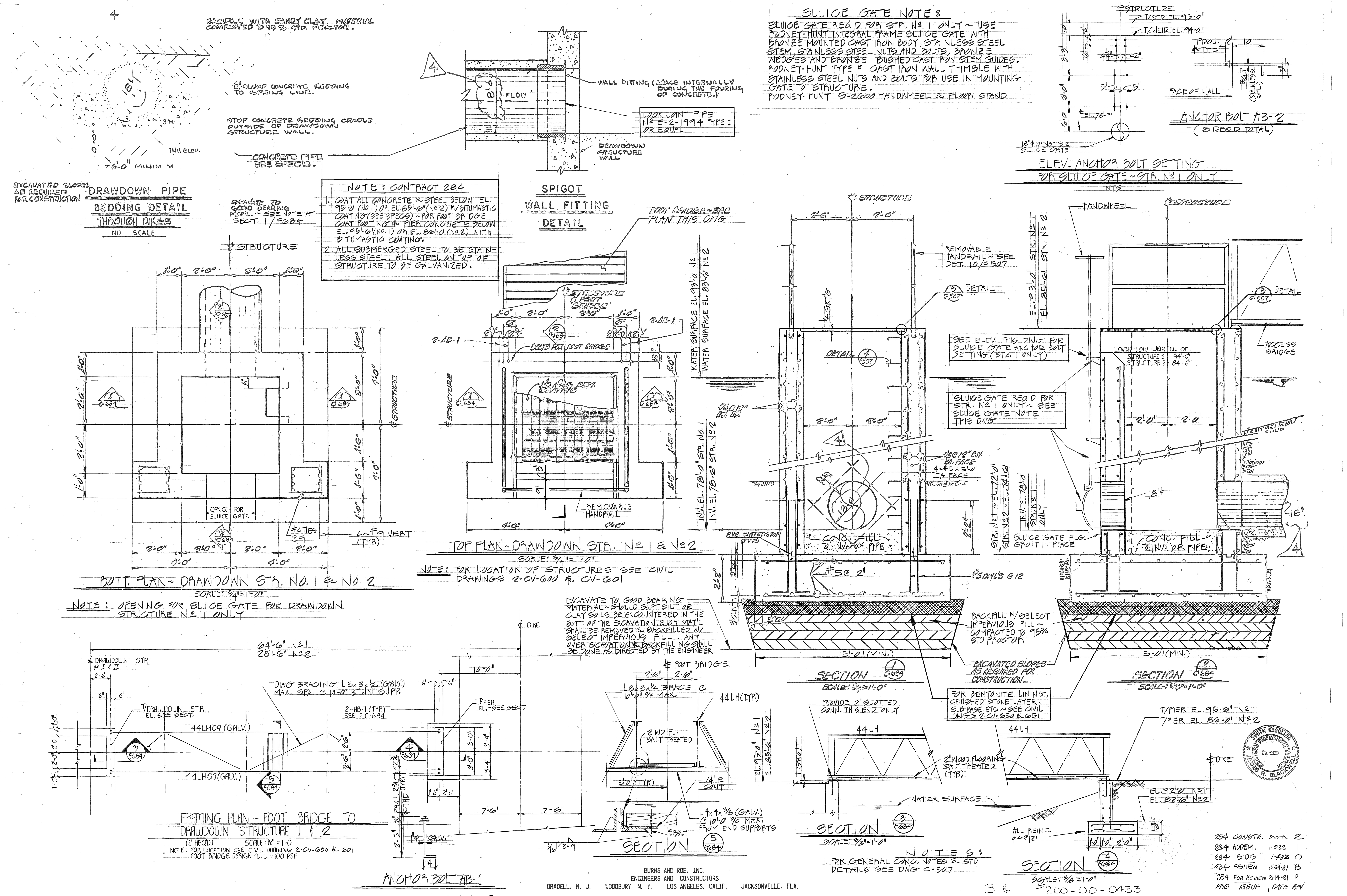
job name: SANTEE COOPER CROSS GENERATING STATION UNIT 2 CROSS, SOUTH CAROLINA

sheet title: MISCELLANEOUS DETAILS AND SECTIONS

scale: AS NOTED
date: 8-3-81

284	CONSTR.	3-2582	3
284	BID	1-482	0
PKG	ISSUE	DATE	REV.

L-G JOB NO. 78271.01
B&R W.O. NO. 3446.02
dwg. no. 2-CV-651
rev. no. 9



BACKFILL WITH SANDY CLAY MATERIAL COMPACTED TO 95% STD. PROCTOR.
6" SLUMP CONCRETE BEDDING TO SPRING LINE.
STOP CONCRETE BEDDING CRADLE OUTSIDE OF DRAWDOWN STRUCTURE WALL.
EXCAVATED SLOPES AS REQUIRED FOR CONSTRUCTION
DRAWDOWN PIPE BEDDING DETAIL THROUGH DIKES
NO SCALE
CONCRETE PIPE SEE SPEC'S.
WALL FITTING (PLACE INTEGRALLY DURING THE POURING OF CONCRETE.)
LOCK JOINT PIPE Nº E-2-1994 TYPE I OR EQUAL
DRAWDOWN STRUCTURE WALL
SPIGOT WALL FITTING DETAIL
NOTE: CONTRACT 284
1. COAT ALL CONCRETE & STEEL BELOW EL. 95'-0" (Nº 1) OR EL. 85'-6" (Nº 2) W/ BITUMASTIC COATING (SEE SPECS) ~ FOR FOOT BRIDGE COAT FOOTING & PIER CONCRETE BELOW EL. 95'-6" (No. 1) OR EL. 86'-0 (No 2) WITH BITUMASTIC COATING.
2. ALL SUBMERGED STEEL TO BE STAINLESS STEEL. ALL STEEL ON TOP OF STRUCTURE TO BE GALVANIZED.
SLUICE GATE NOTES
SLUICE GATE REQ'D FOR STR. Nº 1 ONLY ~ USE RODNEY-HUNT INTEGRAL FRAME SLUICE GATE WITH BRONZE MOUNTED CAST IRON BODY, STAINLESS STEEL STEM, STAINLESS STEEL NUTS AND BOLTS, BRONZE WEDGES AND BRONZE BUSHED CAST IRON STEM GUIDES. RODNEY-HUNT TYPE F CAST IRON WALL THIMBLE WITH STAINLESS STEEL NUTS AND BOLTS FOR USE IN MOUNTING GATE TO STRUCTURE.
RODNEY-HUNT S-2000 HANDWHEEL & FLOOR STAND
ANCHOR BOLT AB-2 (8 REQ'D TOTAL)
ELEV. ANCHOR BOLT SETTING FOR SLUICE GATE ~ STR. Nº 1 ONLY
NTS
BOTT. PLAN ~ DRAWDOWN STR. NO. 1 & NO. 2
SCALE: 3/4"=1'-0"
NOTE: OPENING FOR SLUICE GATE FOR DRAWDOWN STRUCTURE Nº 1 ONLY
TOP PLAN ~ DRAWDOWN STR. Nº 1 & Nº 2
SCALE: 3/4"=1'-0"
NOTE: FOR LOCATION OF STRUCTURES SEE CIVIL DRAWINGS 2-CV-600 & CV-601
FOOT BRIDGE ~ SEE PLAN THIS DWG
REMOVABLE HANDRAIL
REMOVABLE HANDRAIL ~ SEE DET. 10/C-507
WATER SURFACE EL. 93'-0" Nº 1
WATER SURFACE EL. 83'-6" Nº 2
INV. EL. 78'-0" STR. Nº 1
INV. EL. 70'-6" STR. Nº 2
EL. 95'-0" STR. Nº 1
EL. 85'-0" STR. Nº 2
SEE ELEV. THIS DWG FOR SLUICE GATE ANCHOR BOLT SETTING (STR. 1 ONLY)
OVERFLOW WEIR EL. OF: STRUCTURE 1 94'-0" STRUCTURE 2 84'-6"
SLUICE GATE REQ'D FOR STR. Nº 1 ONLY ~ SEE SLUICE GATE NOTE THIS DWG
ACCESS BRIDGE
CONC. FILL TO INV. OF PIPE
SLUICE GATE FLG. GROUT IN PLACE
P.V.C. WATERSTOP (TYP.)
EXCAVATE TO GOOD BEARING MATERIAL ~ SHOULD SOFT SILT OR CLAY SOILS BE ENCOUNTERED IN THE BOTT. OF THE EXCAVATION, SUCH MAT'L SHALL BE REMOVED & BACKFILLED W/ SELECT IMPERVIOUS FILL. ANY OVER EXCAVATION & BACKFILLING SHALL BE DONE AS DIRECTED BY THE ENGINEER
BACKFILL W/ SELECT IMPERVIOUS FILL ~ COMPACTED TO 95% STD PROCTOR
EXCAVATED SLOPES AS REQUIRED FOR CONSTRUCTION
FOR BENTONITE LINING, CRUSHED STONE LAYER, SUB-BASE, ETC ~ SEE CIVIL DWG'S 2-CV-650 & 651
15'-0" (MIN.)
SECTION 1/C-684 SCALE: 3/4"=1'-0"
SECTION 2/C-684 SCALE: 3/4"=1'-0"
FRAMING PLAN ~ FOOT BRIDGE TO DRAWDOWN STRUCTURE 1 & 2
(2 REQ'D) SCALE: 1/4"=1'-0"
NOTE: FOR LOCATION SEE CIVIL DRAWING 2-CV-600 & 601
FOOT BRIDGE DESIGN L.L. = 100 PSF
DIAG BRACING L3x3x1/4 (GALV.) MAX. SPA. @ 10'-0" BTWN SUPP.
44LH09 (GALV.)
64'-6" Nº 1
28'-6" Nº 2
ANCHOR BOLT AB-1
SECTION 5/C-684
SECTION 3/C-684 SCALE: 3/8"=1'-0"
PROVIDE 2" SLOTTED CONN. THIS END ONLY
2" WOOD FLOORING SALT TREATED (TYP.)
WATER SURFACE
T/PIER EL. 95'-6" Nº 1
T/PIER EL. 86'-0" Nº 2
EL. 92'-0" Nº 1
EL. 82'-6" Nº 2
ALL REINF. #4 @ 12"
SECTION 4/C-684 SCALE: 3/8"=1'-0"
NOTES:
1. FOR GENERAL CONC. NOTES & STD DETAILS SEE DWG C-507

REV.	ISSUE	DATE
2	284 CONSTR.	3-25-82
1	284 ADDEM.	1-1-82
0	284 BIDS	1-4-82
B	284 REVIEW	10-28-81
A	284 For Review	8-14-81

L-G JOB NO. 78271.01
B&R W.O. NO. 3446.02

BURNS AND ROE, INC.
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ATLANTA DALLAS NEW YORK
LOCKWOOD GREENE
ARCHITECTS · ENGINEERS
SPARTANBURG, S.C.

B & R #200-00-0433

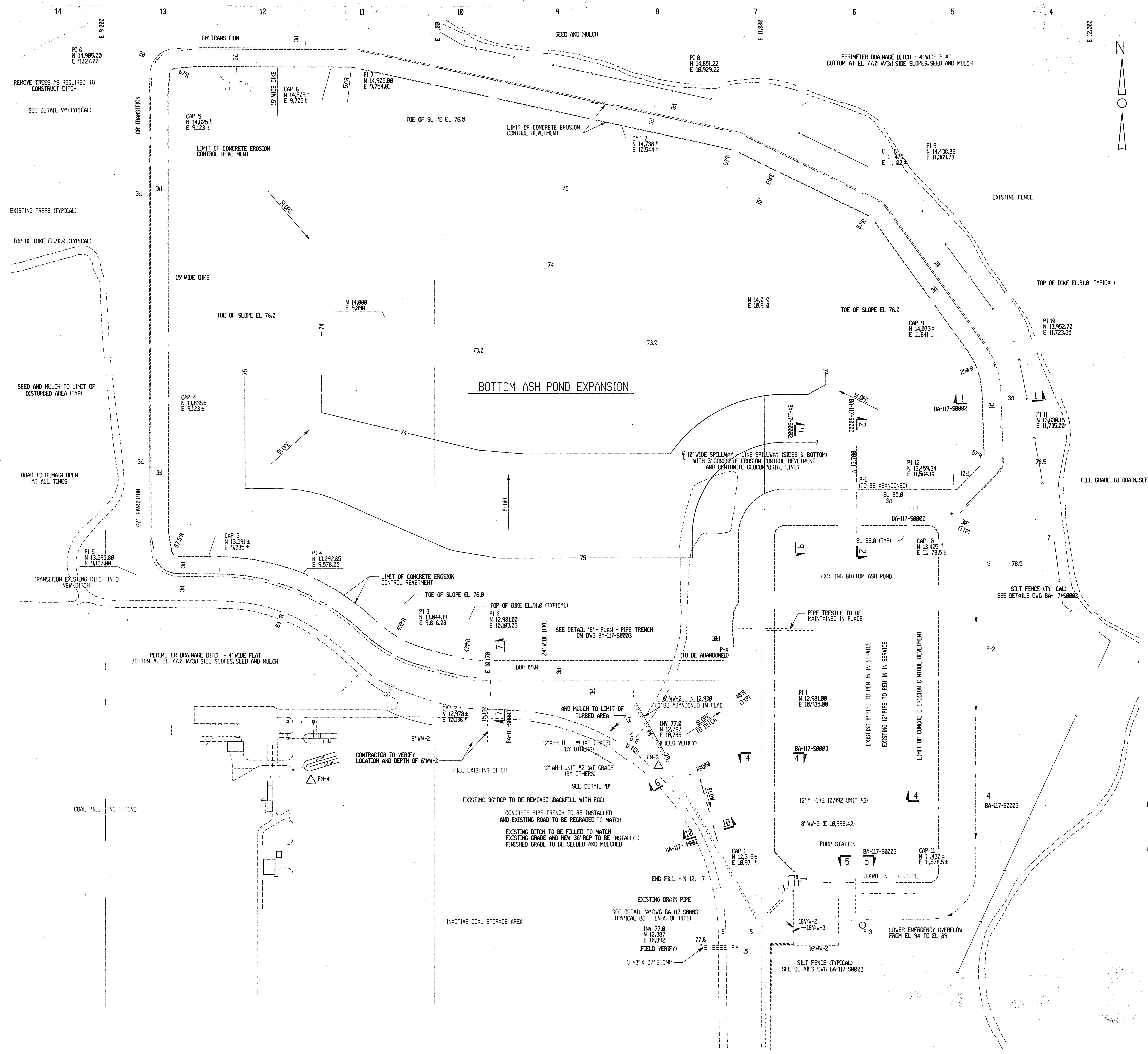
SANTEE COOPER
CROSS GENERATING STATION UNIT 2
CROSS, SOUTH CAROLINA

sheet title: DRAWDOWN STRUCTURE PLANS, SECTIONS, & DETAILS

dwg. no. 2-C-684 rev. no. 4

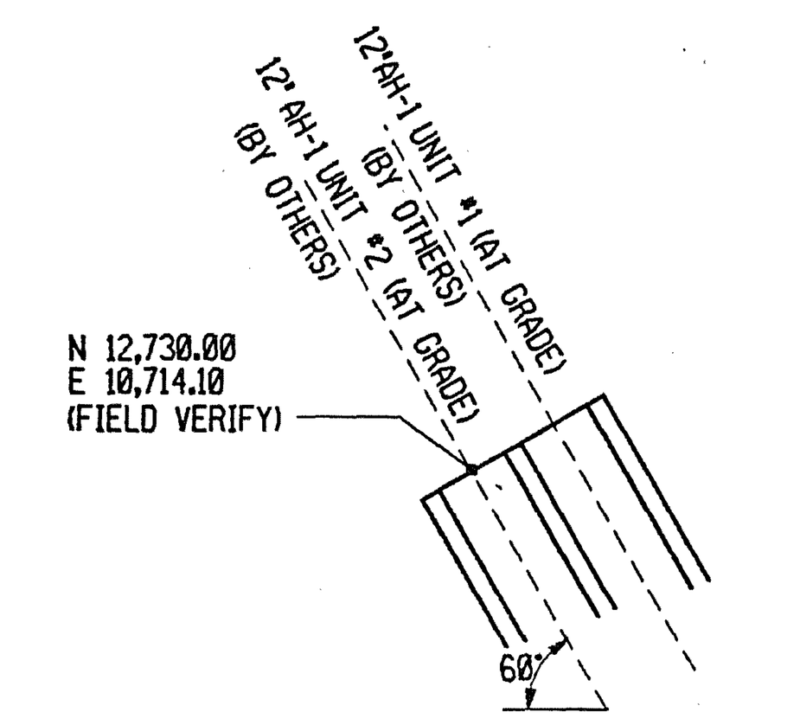
drawn by J. ORD

Revisions: 2 [illegible] PIPE TO 1 [illegible]; 1 REV. PIPE [illegible] SLUICE GATE AB3 [illegible]; B EV. BO [illegible] ADD [illegible] ADD OLD; A [illegible] CON. 284


BOTTOM ASH POND EXPANSION
60' TRANSITION
SEED AND MULCH
PERIMETER DRAINAGE DITCH - 4' WIDE FLAT BOTTOM AT EL 77.0 W/3:1 SIDE SLOPES, SEED AND MULCH
REMOVE TREES AS REQUIRED TO CONSTRUCT DITCH
SEE DETAIL 'A' (TYPICAL)
PI 6 N 14,905.00 E 9,127.00
PI 7 N 14,905.00 E 9,754.01
PI 8 N 14,651.22 E 10,929.22
PI 9 N 14,438.88 E 11,369.78
PI 10 N 13,952.70 E 11,723.85
PI 11 N 13,630.10 E 11,735.00
PI 12 N 13,459.34 E 11,564.16
PI 5 N 13,295.80 E 9,127.00
PI 4 N 13,292.65 E 9,578.25
PI 3 N 13,044.18 E 9,8 6.08
PI 2 N 12,981.00 E 10,103.03
PI 1 N 12,981.00 E 10,985.00
CAP 5 N 14,625 ± E 9,123 ±
CAP 6 N 14,909 ± E 9,705 ±
CAP 7 N 14,738 ± E 10,544 ±
CAP 4 N 13,835 ± E 9,123 ±
CAP 3 N 13,291 ± E 9,285 ±
CAP 9 N 14,073 ± E 11,641 ±
CAP 2 N 12,978 ± E 10,136 ±
CAP 1 N 12,3 5 ± E 12,97 ±
CAP 11 N 1 ,430 ± E 1 ,578.5 ±
LIMIT OF CONCRETE EROSION CONTROL REVETMENT
TOE OF SL PE EL 76.0
TOE OF SLOPE EL 76.0
15' WIDE DIKE
24' WIDE DIKE
EXISTING TREES (TYPICAL)
TOP OF DIKE EL.91.0 (TYPICAL)
SEED AND MULCH TO LIMIT OF DISTURBED AREA (TYP)
ROAD TO REMAIN OPEN AT ALL TIMES
TRANSITION EXISTING DITCH INTO NEW DITCH
PERIMETER DRAINAGE DITCH - 4' WIDE FLAT BOTTOM AT EL 77.0 W/3:1 SIDE SLOPES, SEED AND MULCH
COAL PILE RUNOFF POND
EXISTING FENCE
FILL GRADE TO DRAIN, SEED AND MULCH
10' WIDE SPILLWAY - LINE SPILLWAY (SIDES & BOTTOM) WITH 3" CONCRETE EROSION CONTROL REVETMENT AND BENTONITE GEOCOMPOSITE LINER
P-1 (TO BE ABANDONED)
P-4 (TO BE ABANDONED)
EXISTING BOTTOM ASH POND
PIPE TRESTLE TO BE MAINTAINED IN PLACE
EXISTING 8" PIPE TO REM IN IN SERVICE
EXISTING 12" PIPE TO REM IN IN SERVICE
LIMIT OF CONCRETE EROSION C NTROL REVETMENT
SILT FENCE (TY CAL) SEE DETAILS DWG BA- 7-S0002
SEE DETAIL 'B' - PLAN - PIPE TRENCH ON DWG BA-117-S0003
AND MULCH TO LIMIT OF TURBED AREA
6" WW-2 N 12,930 TO BE ABANDONED IN PLAC
CONTRACTOR TO VERIFY LOCATION AND DEPTH OF 6"WW-2
FILL EXISTING DITCH
12" AH-1 UNIT #1 (AT GRADE) (BY OTHERS)
12" AH-1 UNIT #2 (AT GRADE (BY OTHERS)
SEE DETAIL 'B'
EXISTING 36" RCP TO BE REMOVED (BACKFILL WITH ROC)
CONCRETE PIPE TRENCH TO BE INSTALLED AND EXISTING ROAD TO BE REGRADED TO MATCH
EXISTING DITCH TO BE FILLED TO MATCH EXISTING GRADE AND NEW 36" RCP TO BE INSTALLED FINISHED GRADE TO BE SEEDED AND MULCHED
INV 77.0 N 12,767 E 10,785 (FIELD VERIFY)
12" AH-1 (E 10,992 UNIT *2)
8" WW-5 (E 10,998.42)
PUMP STATION
END FILL - N 12, 7
EXISTING DRAIN PIPE
SEE DETAIL "A" DWG BA-117-S0003 (TYPICAL BOTH ENDS OF PIPE)
INV 77.0 N 12,387 E 10,892 (FIELD VERIFY)
3-43' X 27" BCCMP
INACTIVE COAL STORAGE AREA
18"AW-2
18"AW-3
16"WW-2
LOWER EMERGENCY OVERFLOW FROM EL 94 TO EL 89
SILT FENCE (TYPICAL) SEE DETAILS DWG BA-117-S0002
PM-3
PM-4
P-2
P-3
SLOPE

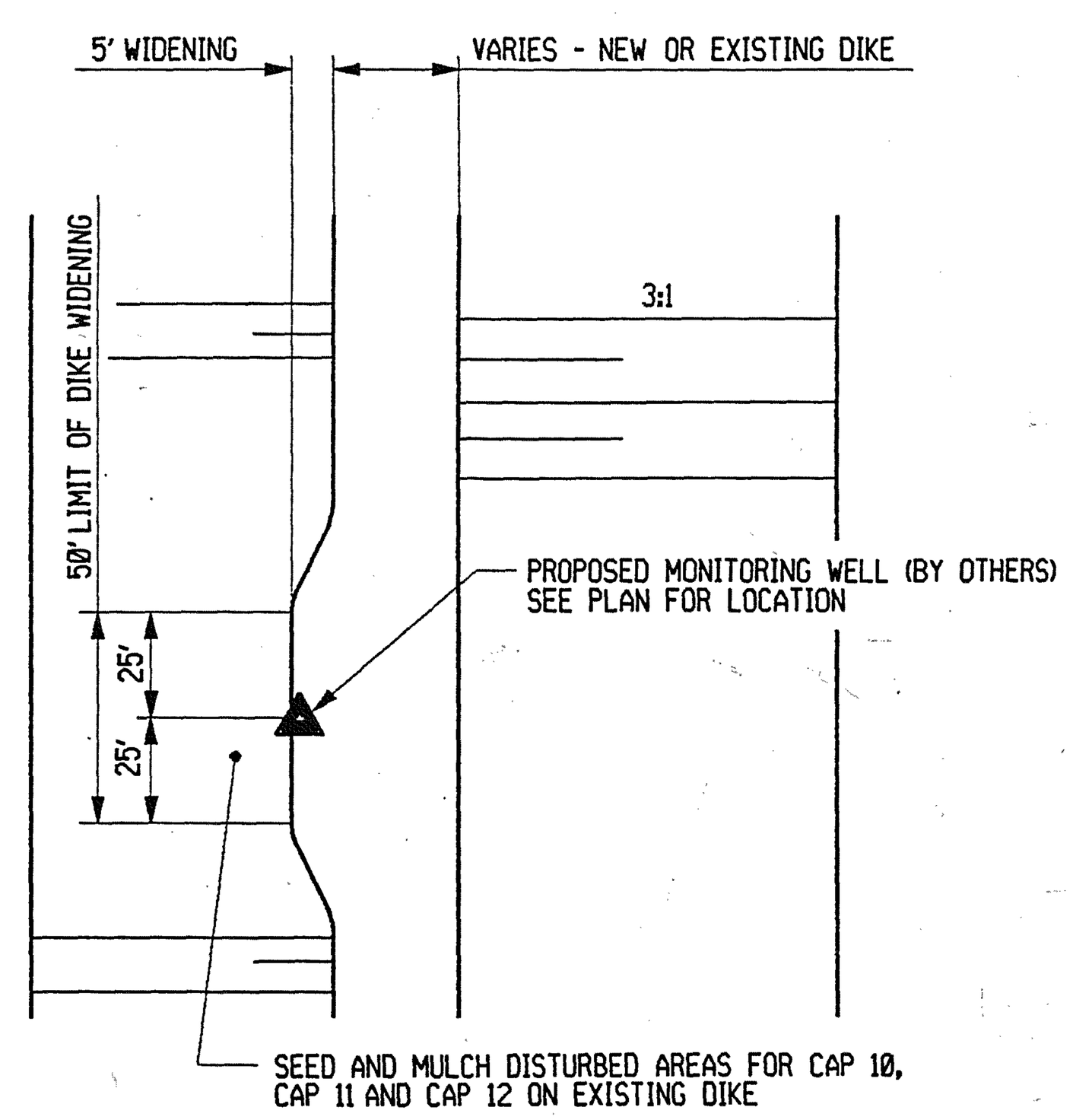
LEGEND

○	EXISTING PIEZOMETER LOCATION (APPROX)
△	EXISTING MONITORING WELL LOCATION (APPROX)
—74—	FINAL TOP OF LINER CONTOUR
• 72.0	FINAL GRADE ELEVATION
CAP 11 ▲	PROPOSED MONITORING WELL (BY OTHERS)



DETAIL "B"

SCALE: NONE



DETAIL "A"

WIDENING OF DIKE FOR MONITORING WELL INSTALLATION

SCALE : NONE

NOTES :

1. PI COORDINATES FOR THE BOTTOM ASH POND EXPANSION DIKE LOCATION WERE OBTAINED FROM TRICO ENGINEERING AND SURVEYING, INC DRAWING SL 091-009.

REFERENCES :

BA-117-S0002	BOTTOM ASH POND EXPANSION - SECTIONS AND DETAILS
BA-117-S0003	BOTTOM ASH POND EXPANSION - SECTIONS AND DETAILS

100 0 50 100 200
SCALE IN FEET

REV	REVISION	DATE	MADE	CHKD	LD	PE
3	CHANGED MW'S TO CAP'S. REVISED COORDINATE LOCATIONS OF CAPS. ADDED CAPS 2, 3, 4 AND 12. (CONTRACT 04085)	7/20/93	GHC	RE	VND	EFK
	ISSUE FOR INFORMATION ONLY (CONTRACT 04032)	2-4-94	WMH			EFK
0	ISSUE FOR CONSTRUCTION (CONTRACT 04085)	-	GHC	DRE	VND	EFK
1	REMOVED IRRELEVANT ELEVATION NUMBERS (CONTRACT 04085)	93	VND	DRE	VND	EFK
2	CHANGED BOTTOM ASH POND DIKE ALIGNMENT PER TRICO ENGINEERING & SURVEYING, INC MODIFICATIONS. INCREASED TOP OF SOUTH DIKE TO 24' WIDE FROM 15' WIDE AND RELOCATED PIPE TRENCH (CONTRACT 04085)	93	GHC	DRE	VND	EFK

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 14328 DAVID R. ERALI

DRAWN BY GHC CHECKED BY DRE DATE 7/20/93
Discipline Review: MECH, ELECT, CONTROLS, STRUCT D.R. Erali 7/20/93, PE 7/20/93
Approved For Use 20 Jul 9

Santee Cooper
CROSS GENERATING STATION
UNIT 1
BOTTOM ASH POND EXPANSION
PLAN

Scale: 1"=100' E
W.O. 046151
UNIT 2 DWG. NO.

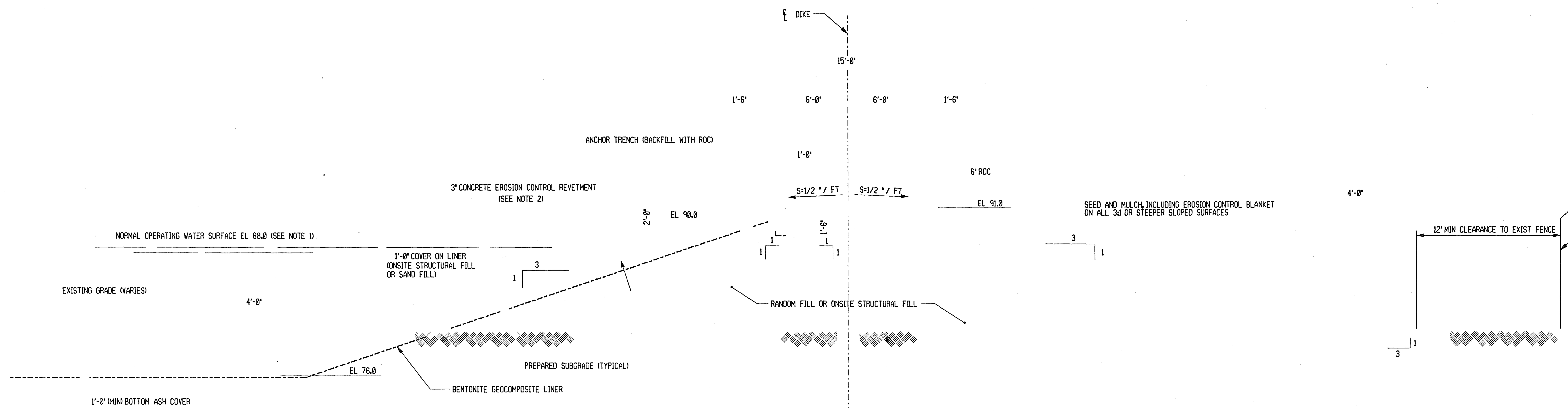
GILBERT/COMMONWEALTH, INC.
ENGINEERS AND CONSULTANTS READING, PA

BA-117-S0001 3
DRAWING NUMBER REV

PROPOSED BOTTOM ASH POND EXPANSION

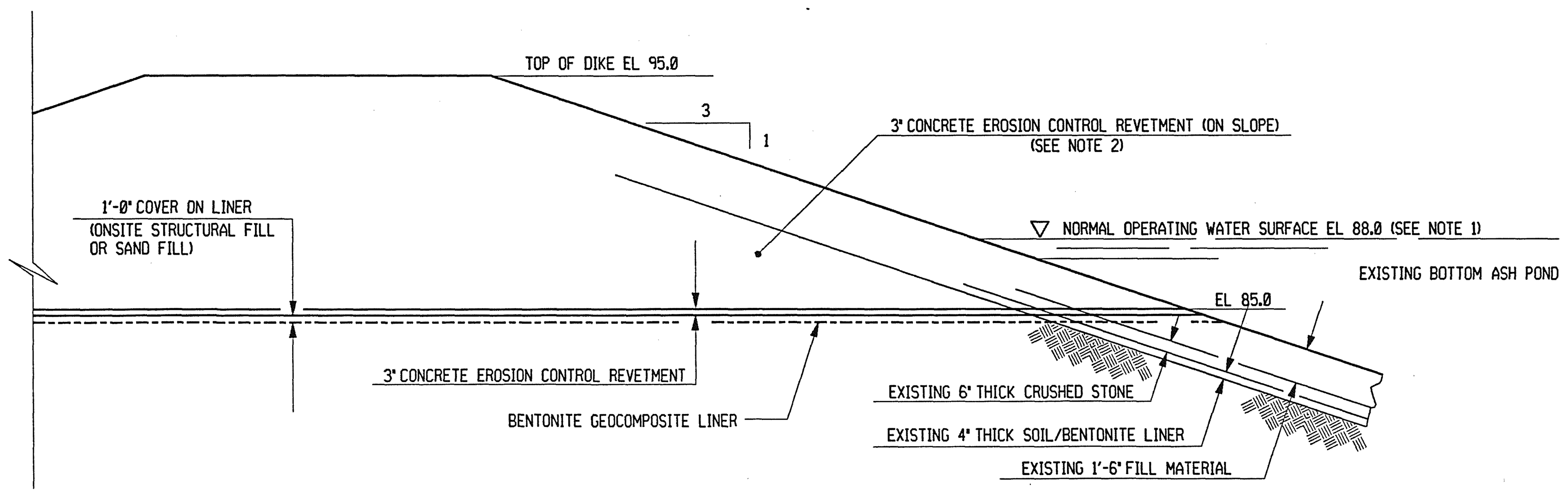
14 13 12 11 10 9 8 7 6 5 4 3 2 1

Wed Feb 24 10:51:17 1993
331001\117S0002.DGN



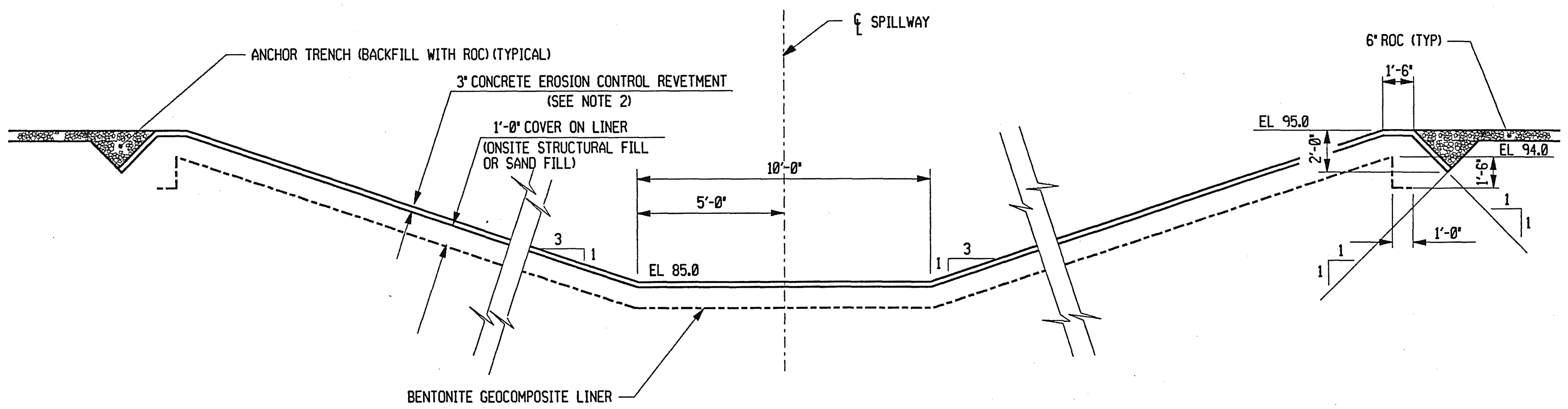
SECTION 1 - 1

SCALE : 1"=4'
(BA-117-S0001)



SECTION 2 - 2

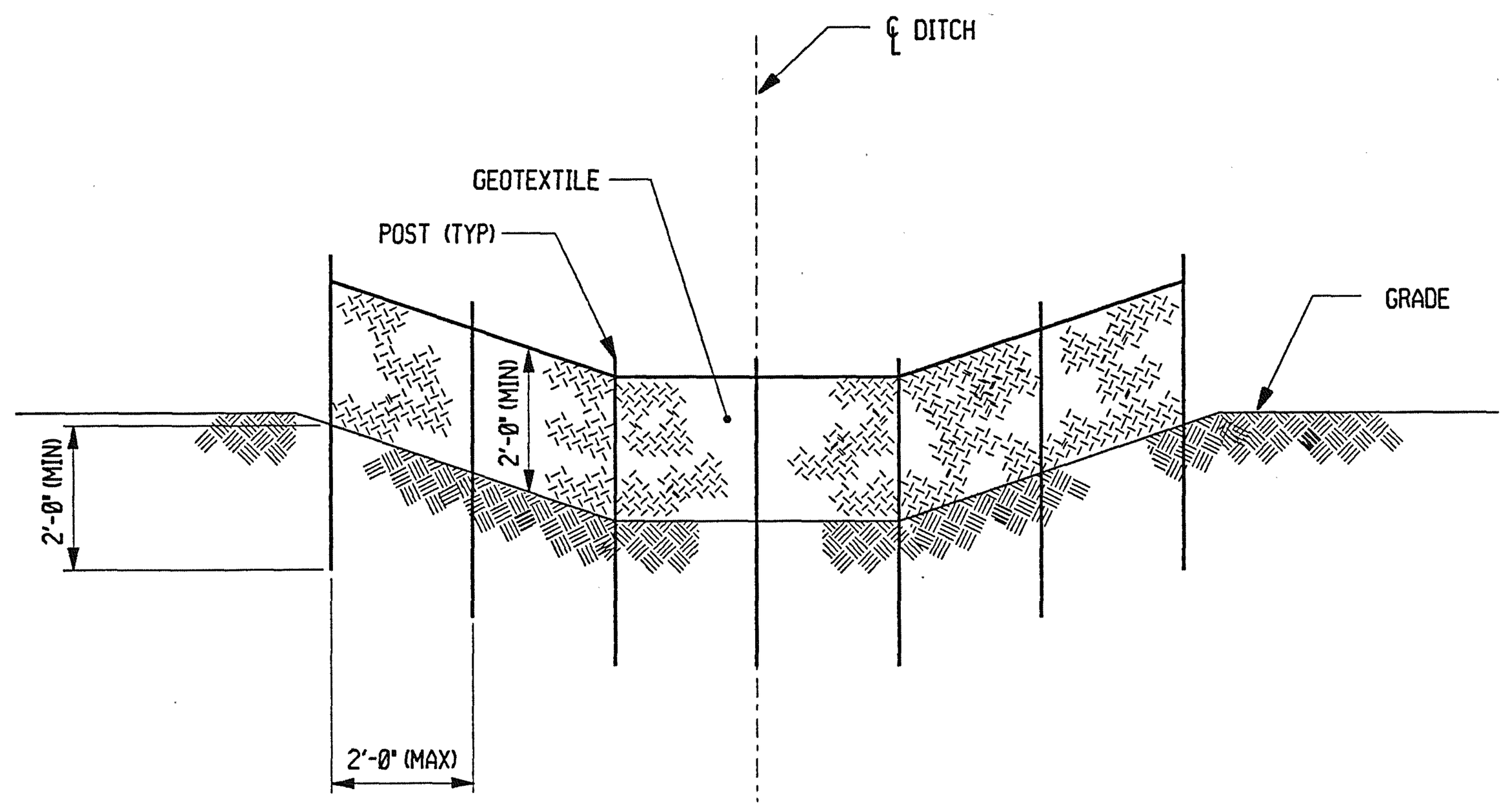
SCALE : 1"=4'
(BA-117-S0001)



SECTION 3 - 3

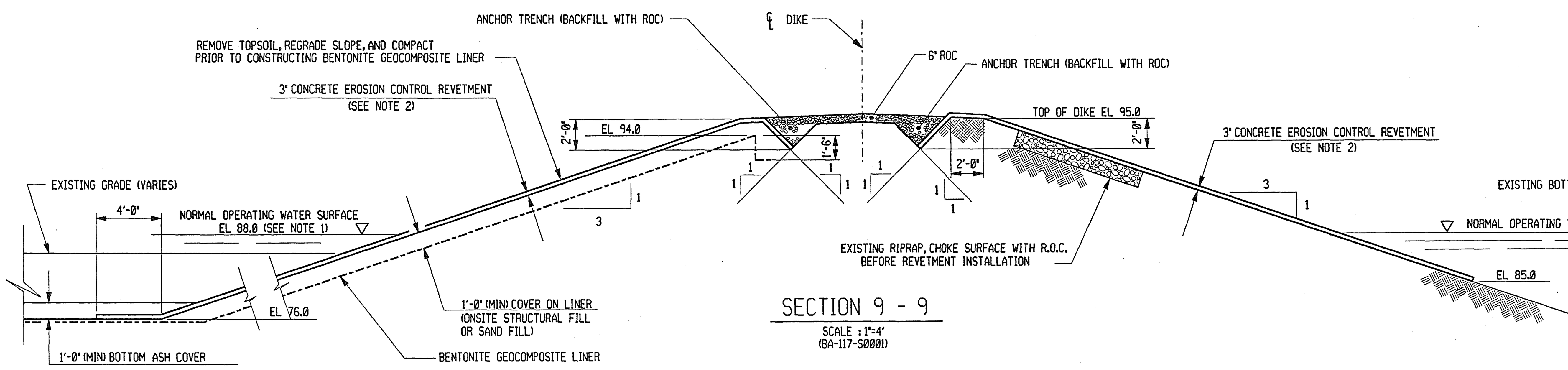
SPILLWAY SECTION ALONG ℄ OF DIKE

NO SCALE
(BA-117-S0001)



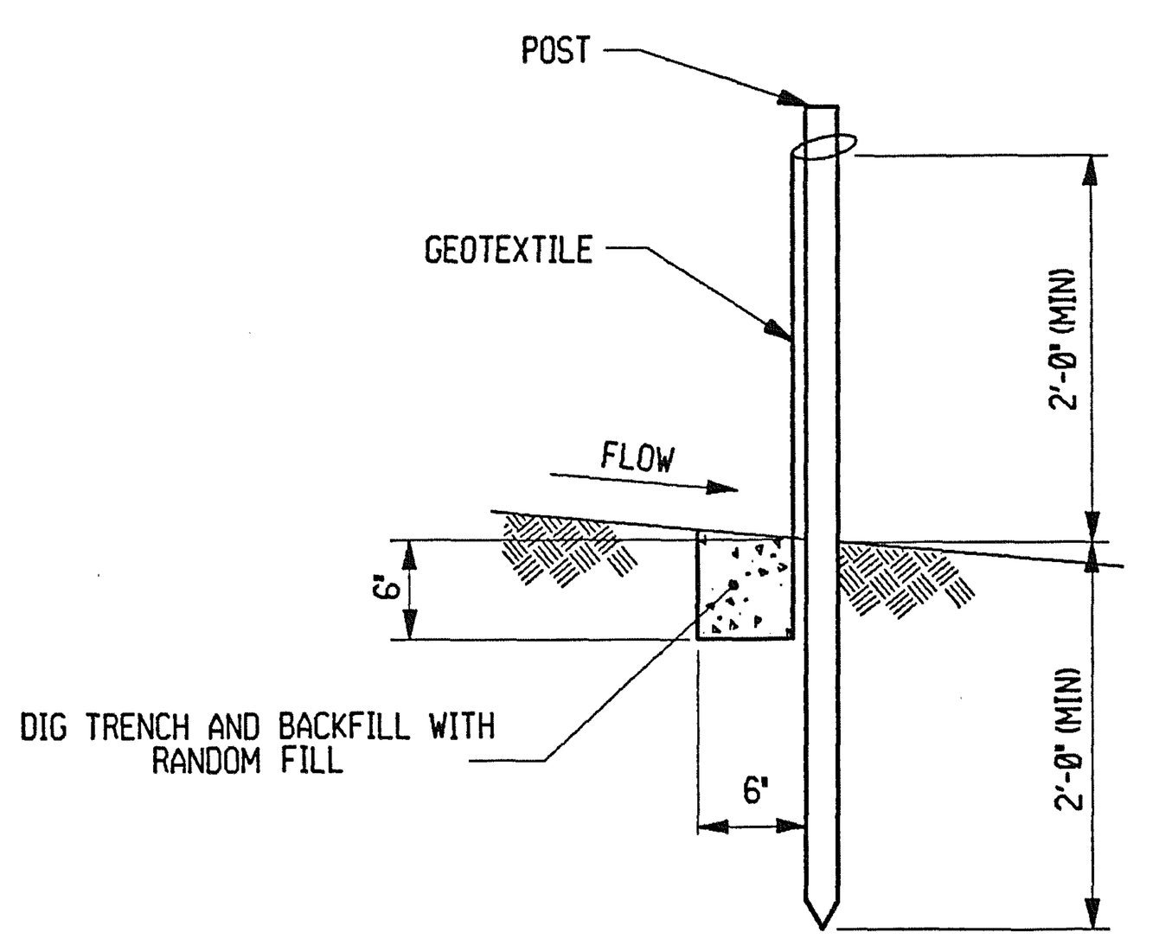
SILT FENCE SEDIMENT BARRIER PLACEMENT IN DRAINAGE WAY

SCALE 1/2" = 1'-0"



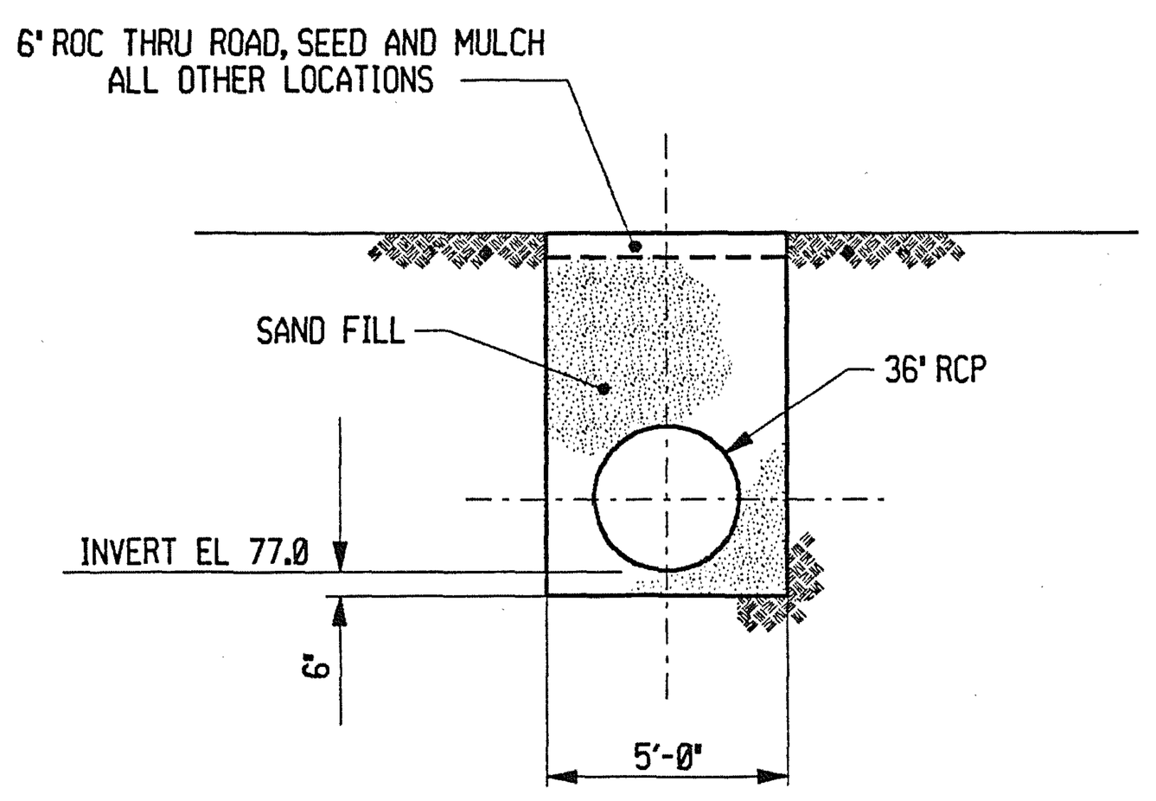
SECTION 9 - 9

SCALE : 1"=4'
(BA-117-S0001)



SILT FENCE SEDIMENT BARRIER INSTALLATION

NO SCALE



SECTION 10 - 10

NO SCALE
(BA-117-S0001)

NOTES :

1. WATER SURFACE IN THE EXISTING BOTTOM ASH POND WILL BE UP TO ELEVATION 93.0 UNTIL THE ASH IS DREDGED FROM THE POND.
2. CONCRETE EROSION CONTROL REVETMENT SHALL BE ARMORFORM OR FABRIFORM AS SPECIFIED IN SECTION 02645 OF THE TECHNICAL SPECIFICATIONS.

BA-117-S0001	BOTTOM ASH POND EXPANSION - PLAN
BA-117-S0003	BOTTOM ASH POND EXPANSION - SECTIONS AND DETAILS

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 14326 DAVID R. ERAL

David R. Eral

REV	REVISION	DATE	MADE	CHKD	LD	PE
0	ISSUE FOR CONSTRUCTION (CONTRACT 04085) ISSUE FOR INFORMATION ONLY (CONTRACT: 04032)					

DRAWN BY G.H.C. CHECKED BY DRL DATE

Discipline Review

Santee Cooper — CROSS GENERATING STATION UNIT 1

BOTTOM ASH POND EXPANSION SECTIONS AND DETAILS

Approved For Use

GILBERT/COMMONWEALTH, INC. ENGINEERS AND CONSULTANTS READING, PA

Scale: AS NOTED E

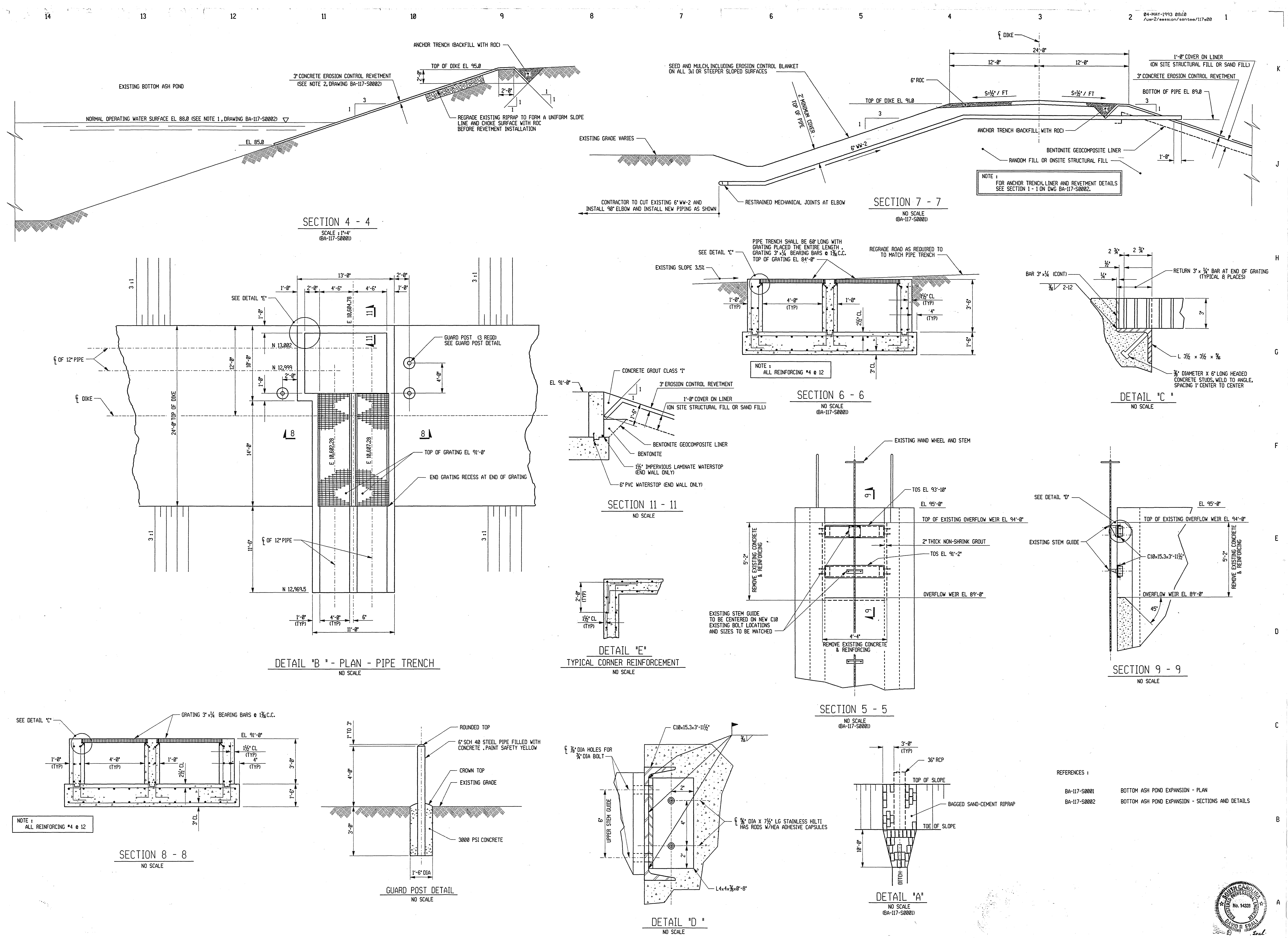
UNIT 2 DWG. NO.

W.O. 046151

BA-117-S0002 0

DRAWING NUMBER REV

SECTIONS AND DETAILS



REV	REVISION	DATE	MADE	CHKD	LD	PE
0	ISSUE FOR CONSTRUCTION (CONTRACT 04085)	2-24-93	GJC	DRE	RBD	EFK
1	CHANGED SECTION 7 - 7, INCREASED TOP OF DIKE TO 24' FROM 15'. CHANGED DETAIL "B", ALTERED SIZE AND SHAPE OF PIPE TRENCH ADDED GUARD POSTS AND GUARD POST DETAIL. (CONTRACT 04085)		GJC			
	ISSUE FOR INFORMATION ONLY (CONTRACT 04032)	2-4-94				EFK

SECTIONS AND DETAILS

Santee Cooper CROSS GENERATING STATION UNIT 1

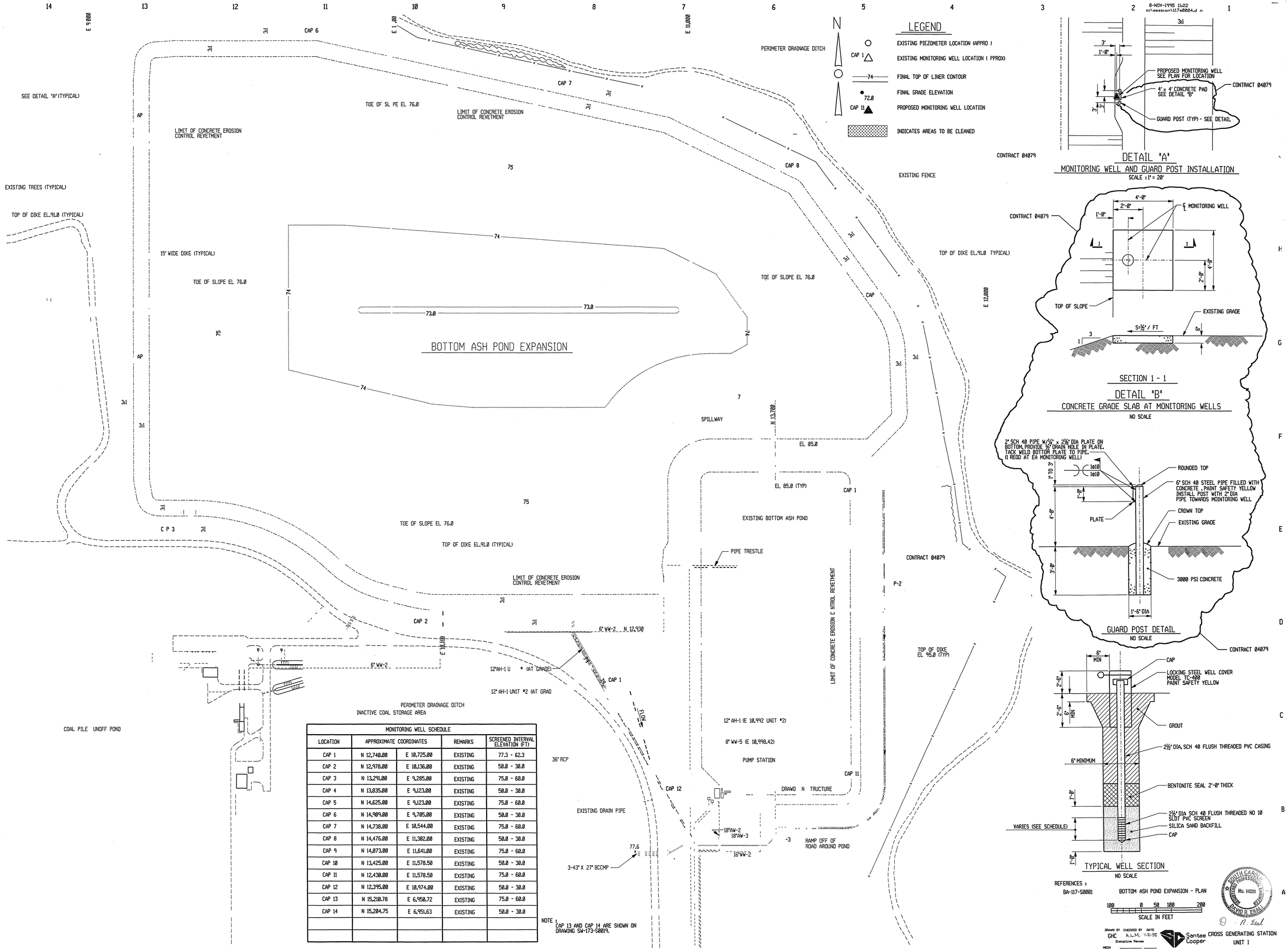
BOTTOM ASH POND EXPANSION
SECTIONS AND DETAILS

GILBERT/COMMONWEALTH, INC.
ENGINEERS AND CONSULTANTS READING, PA

Scale: AS NOTED E
W.O. 046151

BA-117-S0003 1
DRAWING NUMBER REV

8-NOV-1995 11:22
c:\session\117s0004.dgn



DETAIL "A"
MONITORING WELL AND GUARD POST INSTALLATION
SCALE : 1" = 20'

MONITORING WELL SCHEDULE				
LOCATION	APPROXIMATE COORDINATES		REMARKS	SCREENED INTERVAL ELEVATION (FT)
CAP 1	N 12,740.00	E 10,725.00	EXISTING	77.3 - 62.3
CAP 2	N 12,978.00	E 10,136.00	EXISTING	50.0 - 30.0
CAP 3	N 13,291.00	E 9,285.00	EXISTING	75.0 - 60.0
CAP 4	N 13,835.00	E 9,123.00	EXISTING	50.0 - 30.0
CAP 5	N 14,625.00	E 9,123.00	EXISTING	75.0 - 60.0
CAP 6	N 14,909.00	E 9,705.00	EXISTING	50.0 - 30.0
CAP 7	N 14,738.00	E 10,544.00	EXISTING	75.0 - 60.0
CAP 8	N 14,476.00	E 11,302.00	EXISTING	50.0 - 30.0
CAP 9	N 14,073.00	E 11,641.00	EXISTING	75.0 - 60.0
CAP 10	N 13,425.00	E 11,578.50	EXISTING	50.0 - 30.0
CAP 11	N 12,438.00	E 11,578.50	EXISTING	75.0 - 60.0
CAP 12	N 12,395.00	E 10,974.00	EXISTING	50.0 - 30.0
CAP 13	N 15,210.78	E 6,950.72	EXISTING	75.0 - 60.0
CAP 14	N 15,204.75	E 6,951.63	EXISTING	50.0 - 30.0

NOTE : CAP 13 AND CAP 14 ARE SHOWN ON DRAWING SW-173-S0019.

REFERENCES :
BA-117-S0021

BOTTOM ASH POND EXPANSION - PLAN
100 0 50 100 200
SCALE IN FEET

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 14328 DAVID R. ERAL
D. R. Eral

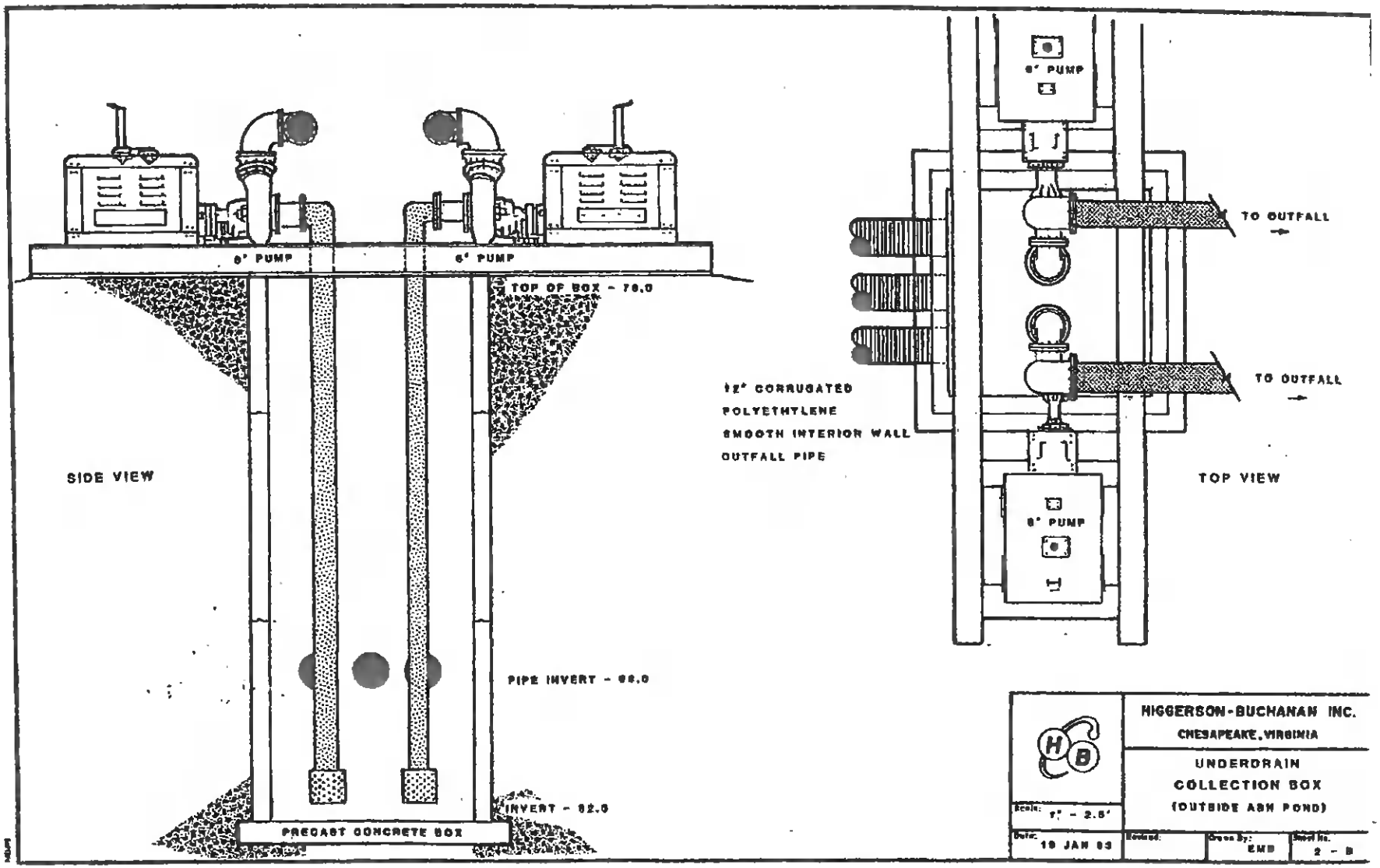
REV	REVISION	DATE	MADE	CHKD	LD	PE
0	ISSUE FOR CONSTRUCTION (CONTRACT 04079)	-	KPF	ALM	ALM	EFK
1	ISSUED FOR RECORD - INCORPORATED AS-BUILT MARK-UPS SUBMITTED BY CONTRACTOR	11/21/95	KPF	ALM	ALM	EFK

DRAWN BY GHC | CHECKED BY A.L.M. 11-21-95 | DATE
Discipline Review
MECH
ELECT
CONTROLS
STRUCT
PE
Approved For Use 11-21-95
Scale: 1"=100' E
W.O. 046151

Santee Cooper
CROSS GENERATING STATION
UNIT 1
BOTTOM ASH POND EXPANSION
MONITORING WELL LOCATION PLAN

GILBERT/COMMONWEALTH, INC.
ENGINEERS AND CONSULTANTS READING, PA
UNIT 2 DWG. NO.
BA-117-S0004 1
DRAWING NUMBER REV

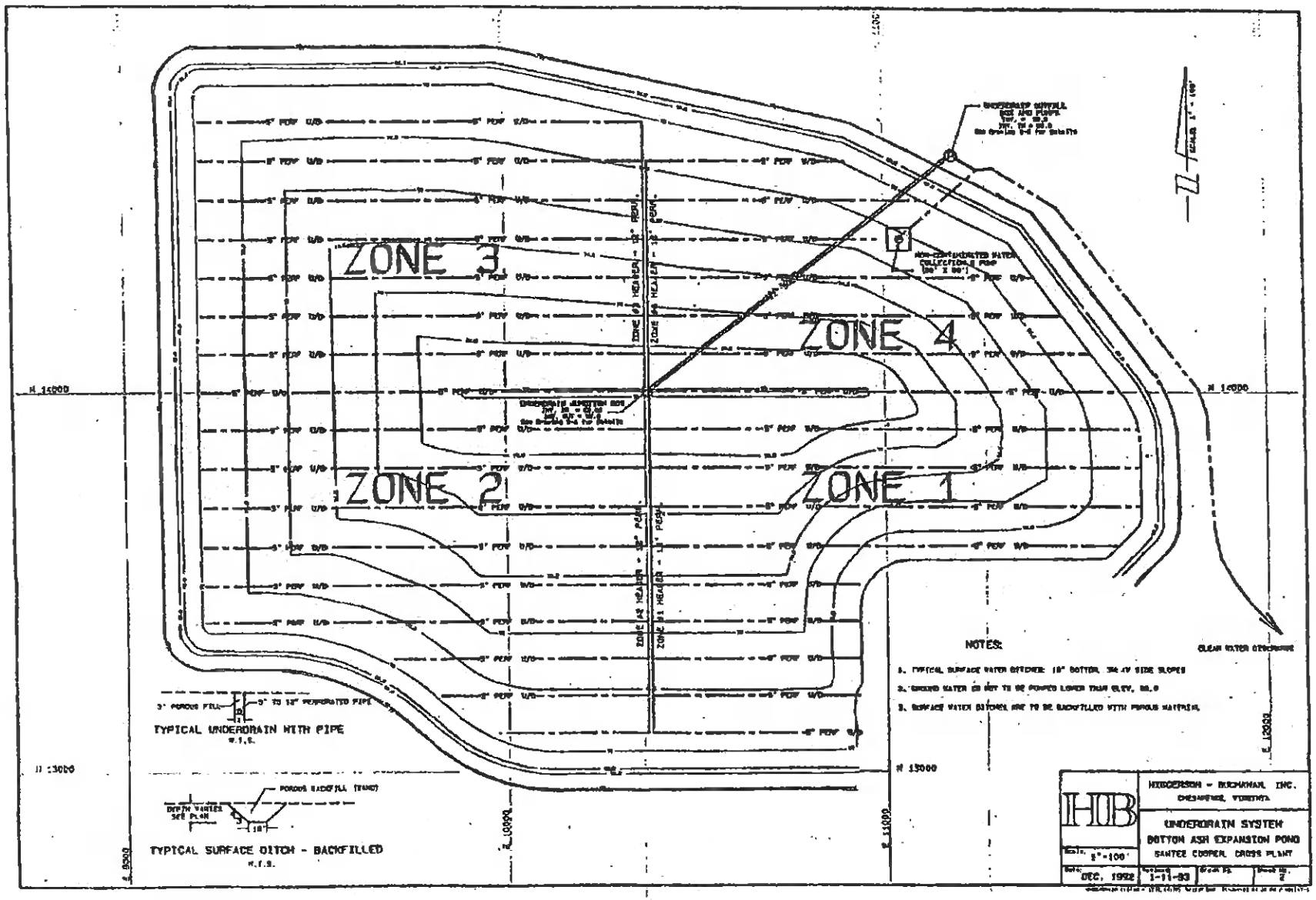
MONITORING WELL LOCATION PLAN

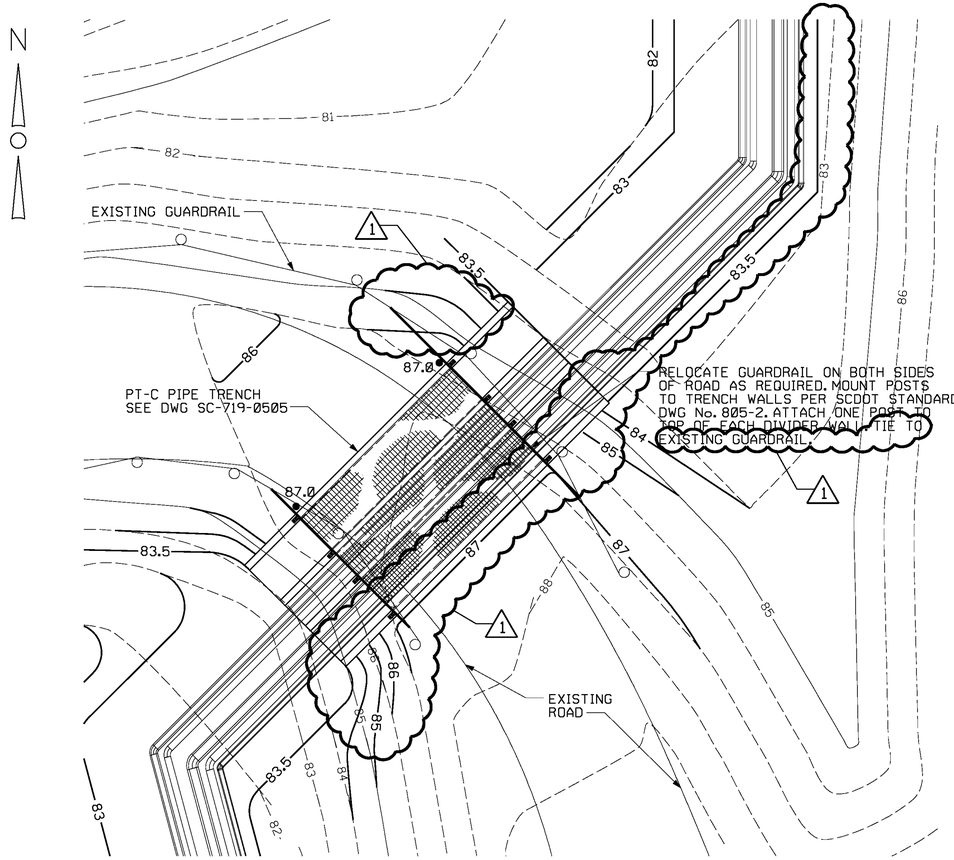


HIGGERSON-BUCHANAN INC.
CHESAPEAKE, VIRGINIA

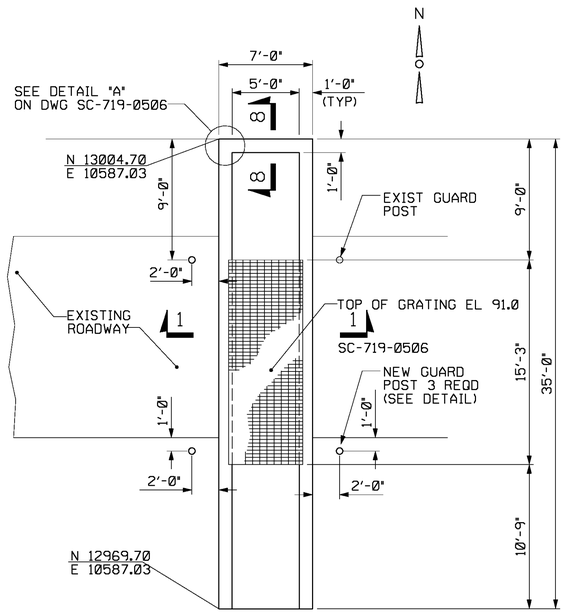
UNDERDRAIN
COLLECTION BOX
(OUTSIDE ASH POND)

Scale: 1" = 2.5'	Date: 19 JAN 83	Revised:	Drawn By: EMB	Sheet No. 2 - B

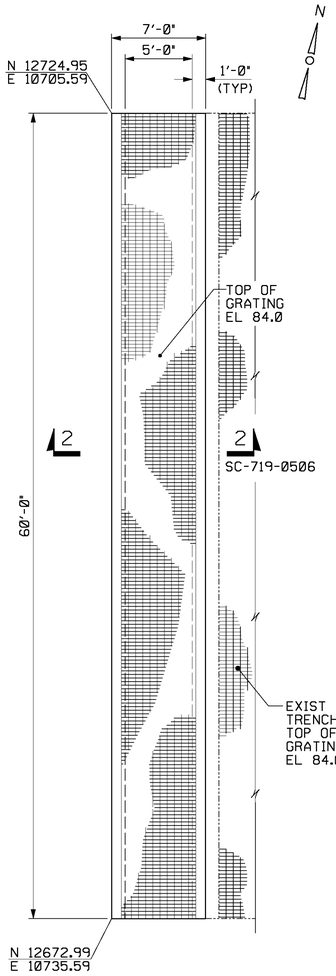

ZONE 3
ZONE 4
ZONE 2
ZONE 1
NOTES:
TYPICAL UNDERDRAIN WITH PIPE
TYPICAL SURFACE DITCH - BACKFILLED
HIB
HENDERSON - BUCHANAN, INC.
CHESAPEAKE, VIRGINIA
UNDERDRAIN SYSTEM
BOTTOM ASH EXPANSION POND
SANTEE COOPER, CROSS PLANT
DEC. 1992
1-11-93



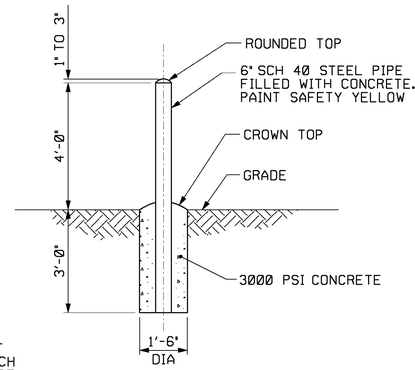
ENLARGED PLAN "A"
SCALE: 1"=10'
(SC-716-0507)



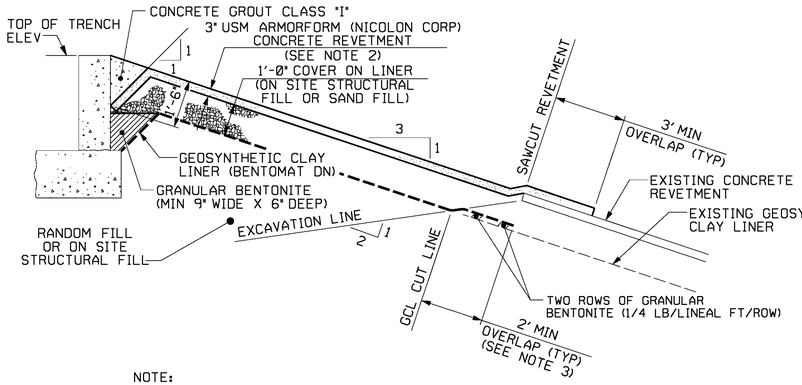
PLAN
PT-A PIPE TRENCH
SCALE: 3/16"=1'-0"
(SC-716-0507)



PLAN
PT-B PIPE TRENCH
SCALE: 3/16"=1'-0"
(SC-716-0507)



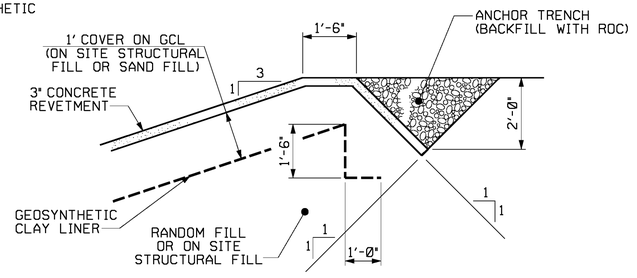
GUARD POST DETAIL
NO SCALE
(SC-716-0507)



NOTE:

1. CONCRETE REVETMENT AND GEOSYNTHETIC CLAY LINER SHALL BE INSTALLED PER MANUFACTURER'S REQUIREMENTS.
2. EQUIVALENT FABRIFORM CONCRETE REVETMENT MANUFACTURED BY CONSTRUCTION TECHNIQUES, INC. MAY BE USED AS ALTERNATE.
3. GCL OVERLAP SEAMS PARALLEL TO THE POND SLOPE SHALL BE MINIMUM 6" WITH ONE ROW OF GRANULAR BENTONITE APPLIED AT ¼ LB/LINEAR FT

SECTION 8-8
TYPICAL LINER ATTACHMENT DETAIL
NO SCALE
(SC-719-0503, SC-719-0505)



TYPICAL LINER ANCHOR TRENCH DETAIL
NO SCALE

REV	DATE	DESCRIPTION	DR CHK	LD ENGR	LDE
1	02/07/05	REV ENL PLAN "A" RELEASED HOLD	JKF ALM	KPF	DRE
0	09/20/04	ISSUED FOR CONSTR	KPF ALM	KPF	DRE

DRAWN BY: KPF	ENGINEER: D.R. ERALI
CHECKED BY: A.L. MERKEL	PROJECT ENGINEERING MANAGER: P.K. SHEWCHUK
LEAD DESIGNER: K.P. FEEG	PROJECT MANAGER: J.T. HICKSON
PRELIMINARY STATUS LDE — DATE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
APPROVED STATUS LDE D.R. ERALI — DATE 02/07/05	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA — PARSONS ENERGY & CHEMICALS GROUP INC. No. C01505 — CERTIFICATE OF AUTHORIZATION

PROFESSIONAL ENGINEER'S SEAL

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DAVID R. ERALI P.E. NO. 14328 ON 02/07/05 THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT.

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PROJECT ENGINEER D.R. ERALI — STATE: SOUTH CAROLINA — LIC. NO.: 14328 — DATE: 09/20/04

CROSS GENERATING STATION / UNIT 3

Santee Cooper — PE&C Parsons Energy & Chemicals Group Inc.

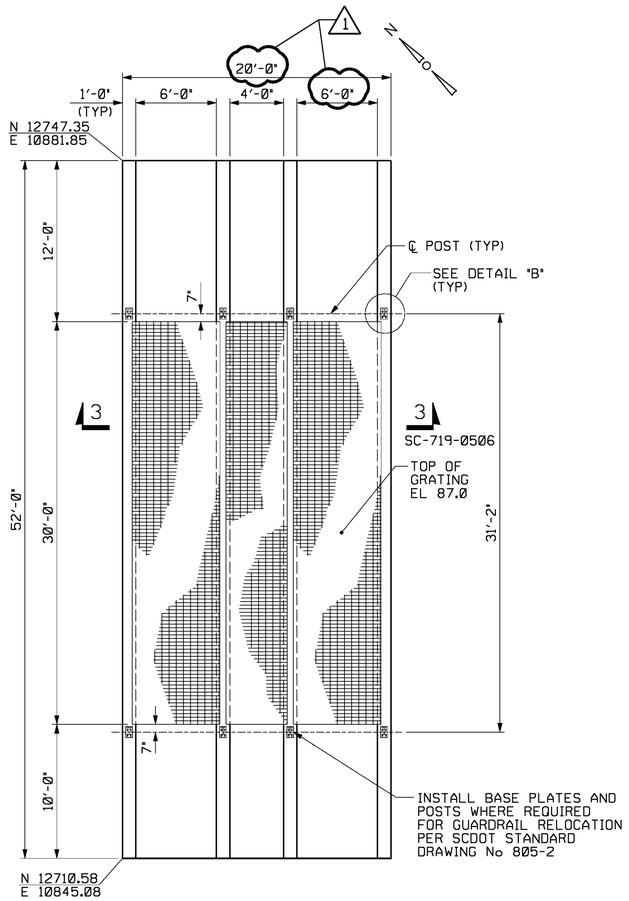
YARD AREA FOUNDATIONS
ASH POND SITE WORK
PIPE TRENCH PLANS AND DETAILS

SCALE: AS NOTED — JOB NO.: 537365

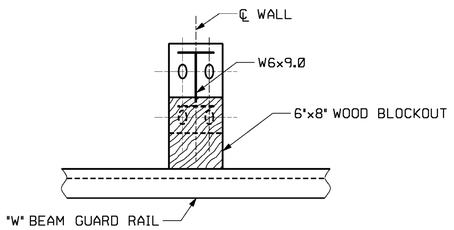
PE&C DWG. NO.: CR34-3-DW-SC-719-0503 — REV: 1

FAC	PIPING	I & C	ELECT	MECH	CIVIL	STRUC

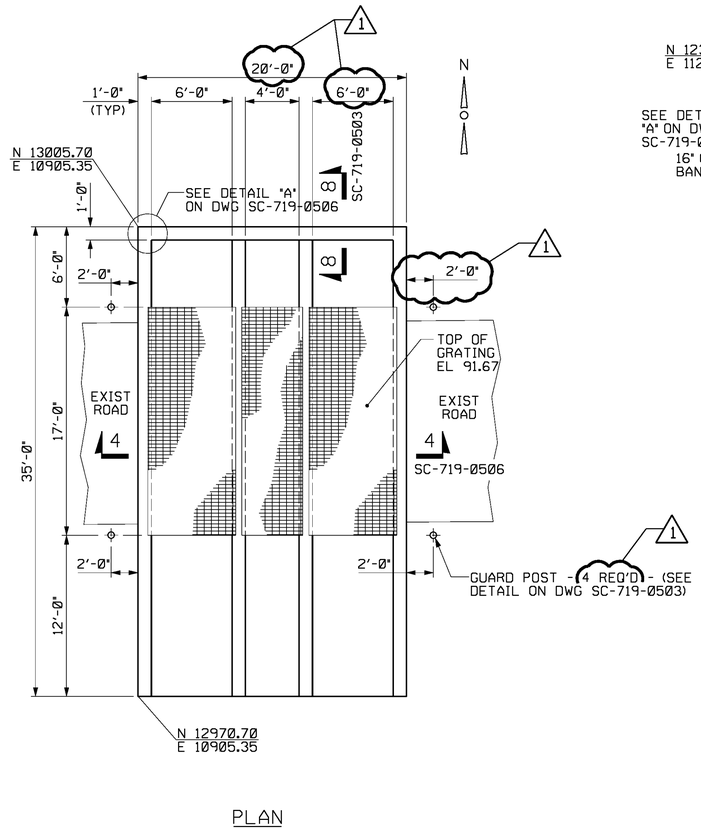
PE&C-FILE: cr-34-3-dw-sc-719-0503.dgn
PE&C-DATE: 06-Jan-05 10:31



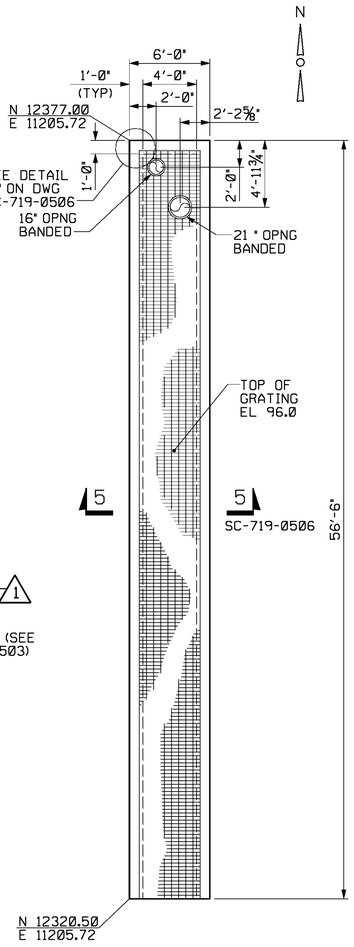
PLAN
PT-C PIPE TRENCH
SCALE: 3/16"=1'-0"
(SC-716-0507)



DETAIL "B"
SCALE: 1½"=1'-0"



PLAN
PT-D PIPE TRENCH
SCALE: 3/16"=1'-0"
(SC-716-0507)



PLAN
PT-E PIPE TRENCH
SCALE: 3/16"=1'-0"
(SC-716-0507)

DRAWN BY: GJU	ENGINEER: D.R. ERALI
CHECKED BY: A.L. MERKEL	PROJECT ENGINEERING MANAGER: P.K. SHEWCHUK
LEAD DESIGNER: K.P.FEEG	PROJECT MANAGER: J.T. HICKSON
PRELIMINARY STATUS LDE DATE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
APPROVED STATUS LDE D.R. ERALI 02/07/05	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
CERTIFICATE OF AUTHORIZATION	PROFESSIONAL ENGINEER'S SEAL

SOUTH CAROLINA — PARSONS ENERGY & CHEMICALS GROUP INC. No C01505 — CERTIFICATE OF AUTHORIZATION

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DAVID R. ERALI P.E. NO. 14328 ON 02/07/05 THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT.

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF: PE: DAVID R. ERALI STATE: SOUTH CAROLINA LIC. NO.: 14328 DATE: 02/07/05

CROSS GENERATING STATION / UNIT 3

Santee Cooper — PE&C Persons Energy & Chemicals Group Inc.

REV	DATE	DESCRIPTION	DR CHK	LD ENGR	LDE
1	02/07/05	REV PT-C & PT-D RELEASED HOLD	JKF ALM	KPF ALM	DRE DRE
0	09/20/04	ISSUED FOR CONSTR	GJU ALM	KPF DRE	DRE

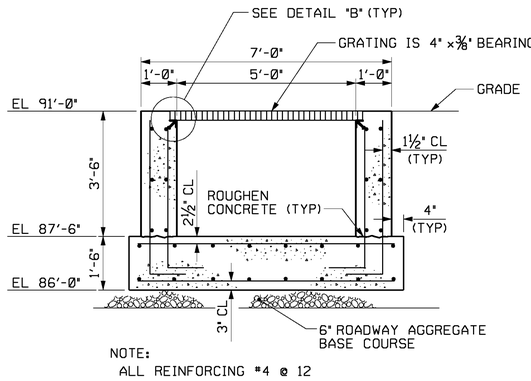
YARD AREA FOUNDATIONS
ASH POND SITE WORK
PIPE TRENCH PLANS AND DETAILS

SCALE: AS NOTED — JOB NO.: 537365

PE&C DWG. NO.: CR34-3-DW-SC-719-0505 — REV: 1

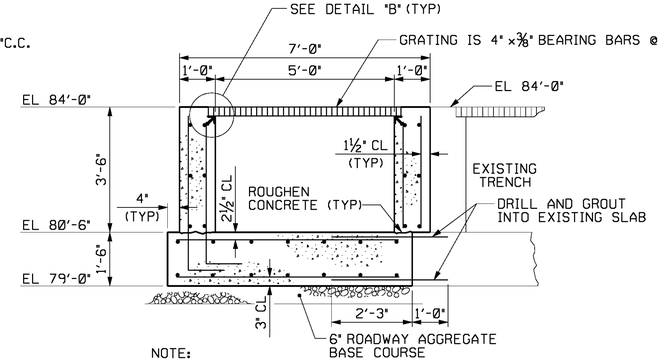
FAC | PIPING | I & C | ELECT | MECH | CIVIL | STRUC

PE&C-FILE: cr34-3-dw-sc-719-0505.dgn
PE&C-DATE: 06-Jan-05 08:28



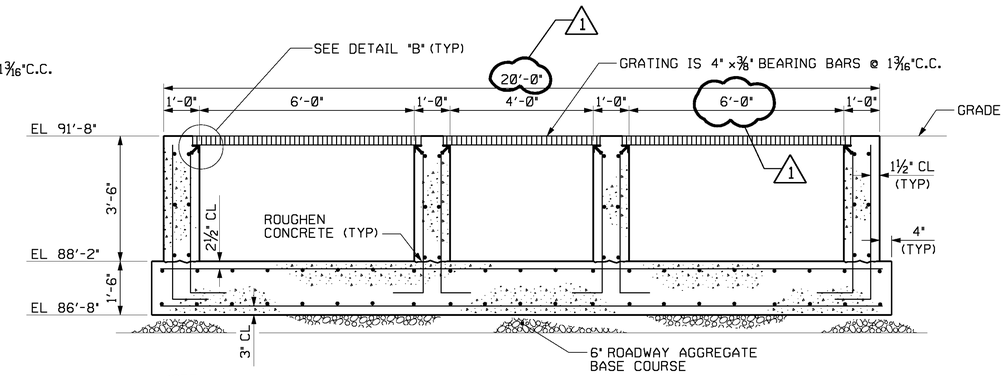
NOTE:
ALL REINFORCING #4 @ 12

SECTION 1-1
PT-A
(SC-719-0503)



NOTE:
ALL REINFORCING #4 @ 12

SECTION 2-2
PT-B
(SC-719-0503)



NOTE:
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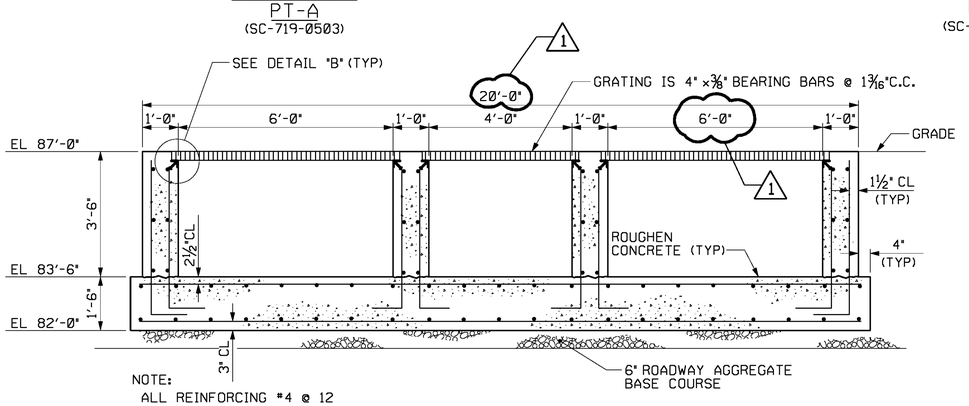
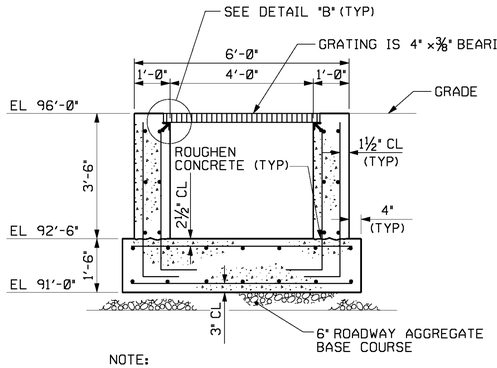
SECTION 4-4
PT-D
(SC-719-0504)



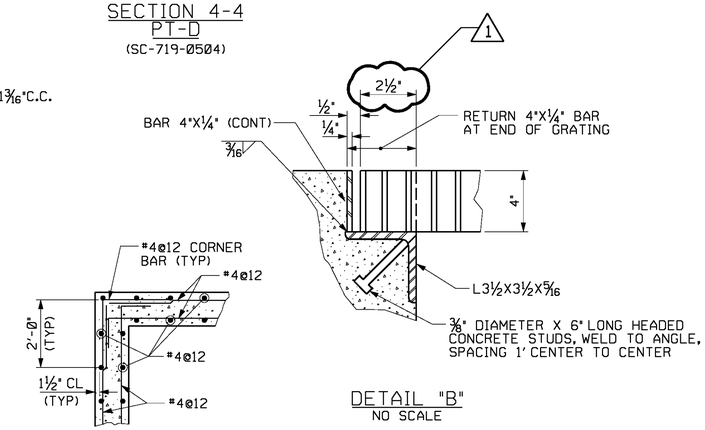
NOTE:
ALL REINFORCING #4 @ 12

SECTION 3-3
PT-C
(SC-719-0504)



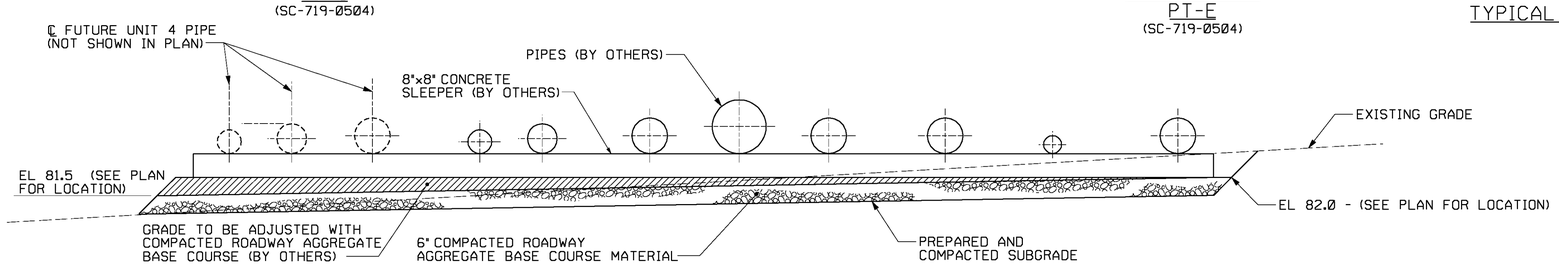
NOTE:
ALL REINFORCING #4 @ 12

SECTION 5-5
PT-E
(SC-719-0504)

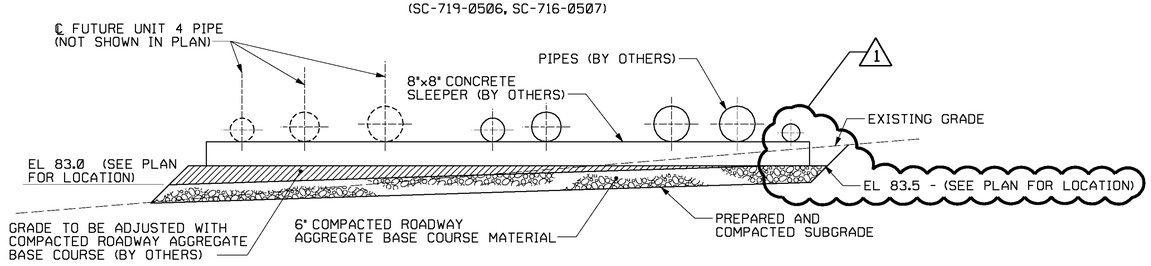


DETAIL "B"
NO SCALE

DETAIL "A"
TYPICAL CORNER REINFORCEMENT
NO SCALE



SECTION 6-6
(SC-719-0506, SC-716-0507)



SECTION 7-7
(SC-716-0507)

DRAWN BY: GJU	ENGINEER: D.R. ERALI
CHECKED BY: A.L. MERKEL	PROJECT ENGINEERING MANAGER: P.K. SHEWCHUK
LEAD DESIGNER: K.P.FEEG	PROJECT MANAGER: J.T. HICKSON
PRELIMINARY STATUS / DATE / LDE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
APPROVED STATUS / DATE / LDE: D.R. ERALI 02/07/05	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.

CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA CERTIFICATE OF AUTHORIZATION — PARSONS ENERGY & CHEMICALS GROUP INC. No. C01505

PROFESSIONAL ENGINEER'S SEAL

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY DAVID R. ERALI P.E. NO. 14328 ON 02/07/05 THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT.

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF: PE: DAVID R. ERALI STATE: SOUTH CAROLINA LIC. NO.: 14328 DATE: 02/28/04

CROSS GENERATING STATION / UNIT 3

Santee Cooper — PE&C Parsons Energy & Chemicals Group Inc.

REV	DATE	DESCRIPTION	DR CHK	LD ENGR	LDE
1	02/07/05	REV AS INDICATED RELEASED HOLD	JKF ALM	KPF DRE	DRE
Ø	09/20/04	ISSUED FOR CONSTR	GJU ALM	KPF DRE	DRE

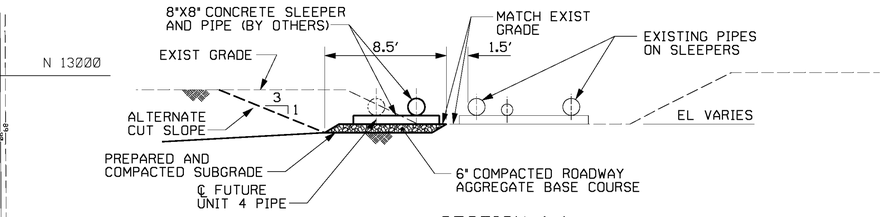
YARD AREA FOUNDATIONS
ASH POND SITE WORK
PIPELINE AND PIPE TRENCH SECTIONS

SCALE: NONE
JOB NO.: 537365
PE&C DWG. NO.: CR34-3-DW-SC-719-0506
REV: 1

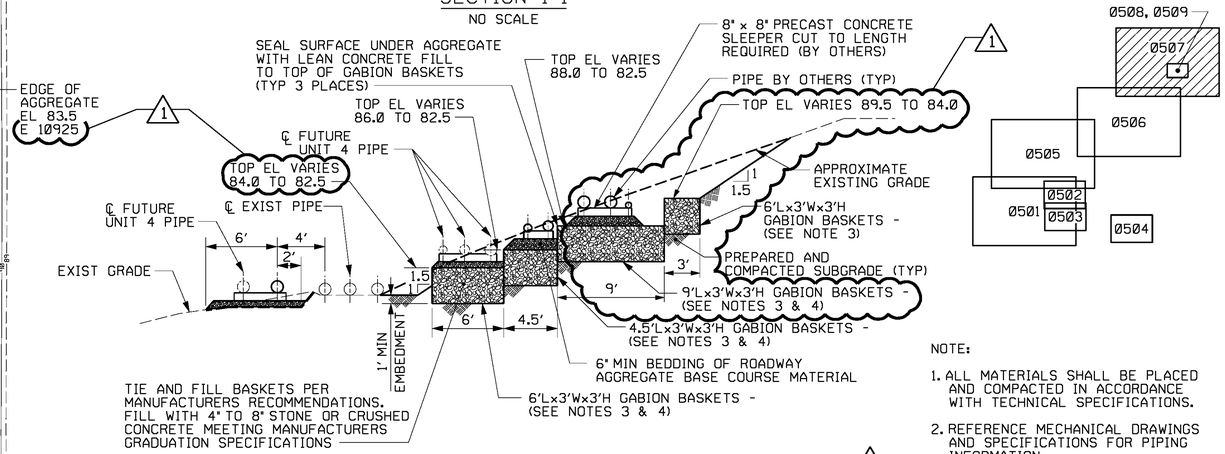
FAC | PIPING | I & C | ELECT | MECH | CIVIL | STRUC

PE&C-FILE: cr34-3-dw-sc-719-0506.dgn
PE&C-DATE: 06-Jan-05 08:28

MATCH LINE SC-716-0506
PLAN



SECTION 1-1
NO SCALE



SECTION 2-2
NO SCALE

NOTE:

1. ALL MATERIALS SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.
2. REFERENCE MECHANICAL DRAWINGS AND SPECIFICATIONS FOR PIPING INFORMATION.
3. USE 1.5' HIGH GABIONS OVER DUCT BANKS.
4. GALMAC COATED GABION BASKETS SHALL BE BY MACCAFERRI OR ENGINEER APPROVED EQUAL.

50 0 50 100 150
SCALE IN FEET

DRAWN BY KPF	ENGINEER D.R. ERALI
CHECKED BY A.L. MERKEL	PROJECT ENGINEERING MANAGER P.K. SHEWCHUK
LEAD DESIGNER K.P.FEEG	PROJECT MANAGER J.T. HICKSON
PRELIMINARY STATUS LDE DATE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
APPROVED STATUS LDE D.R. ERALI DATE 02/07/05	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
CERTIFICATE OF AUTHORIZATION	PROFESSIONAL ENGINEER'S SEAL

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ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PE: DAVID R. ERALI STATE: SOUTH CAROLINA LIC. NO.: L 14328 DATE: 02/28/05

CROSS GENERATING STATION / UNIT 3

Santee Cooper | PE&C Persons Energy & Chemicals Group Inc.

REV	DATE	DESCRIPTION	DR CHK	LD ENGR	LDE
1	02/07/05	REV GRD & SECT 2-2 RELEASED HOLD	JKF ALM	KPF DRE	DRE
0	09/20/04	ISSUED FOR CONSTR	KPF ALM	KPF DRE	DRE

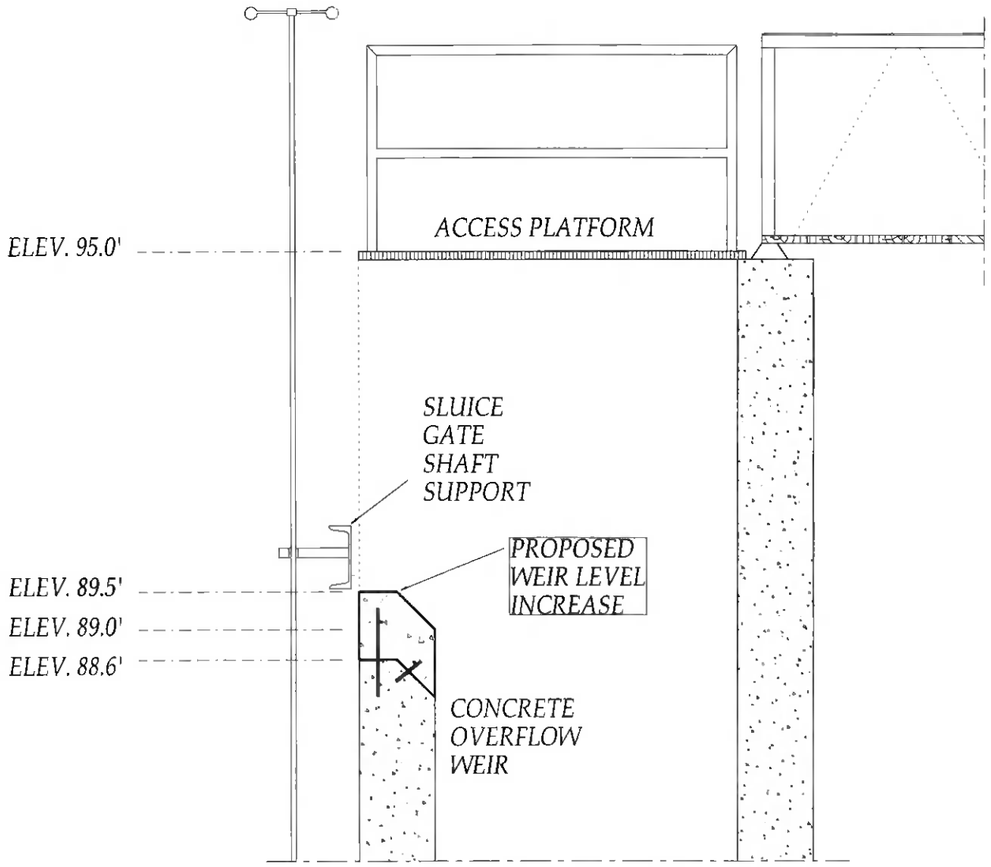
YARD AREA FOUNDATIONS
SITE WORK PLAN
ASH POND PIPING AREA

SCALE 1"=50' | JOB NO. 537365

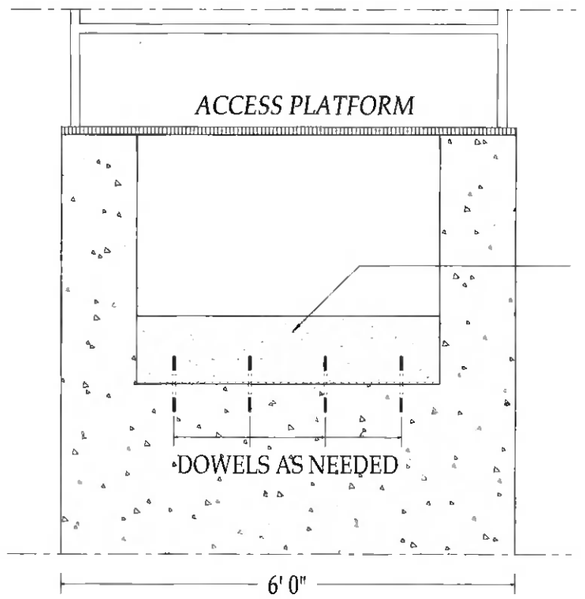
PE&C DWG. NO. CR34-3-DW-SC-716-0507 | REV 1

FAC	PIPING	I & C	ELECT	MECH	CIVIL	STRUC

PE&C-FILE: cr34-3-dw-sc-716-0507.dgn
PE&C-DATE: 06-Jan-05 10:02



SIDE ELEVATION (SECTION)



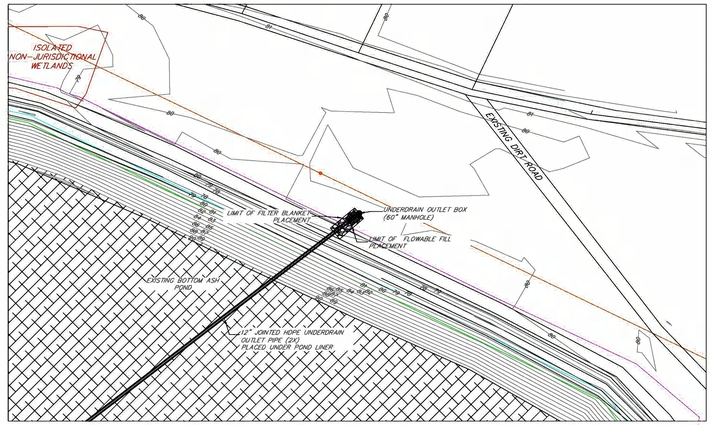
FRONT ELEVATION

DRAWN BY:	ENGINEER: Darby Gallagher, P.E., SCLLR 20925
CHECKED BY:	PROJECT ENGINEER:
APPROVED:	
SUBMITTED STATUS:	
9/[illegible]/2013	
CERTIFICATE OF AUTHORIZATION	PROFESSIONAL ENGINEER SEAL
NOT REQUIRED	11/7/13

CROSS GENERATING STATION

ASH POND OVERFLOW WEIR ELEVATION MODIFICATION

SCALE: NONE	PROJECT NO: 115889
DRAWING NUMBER: NONE	REV: B

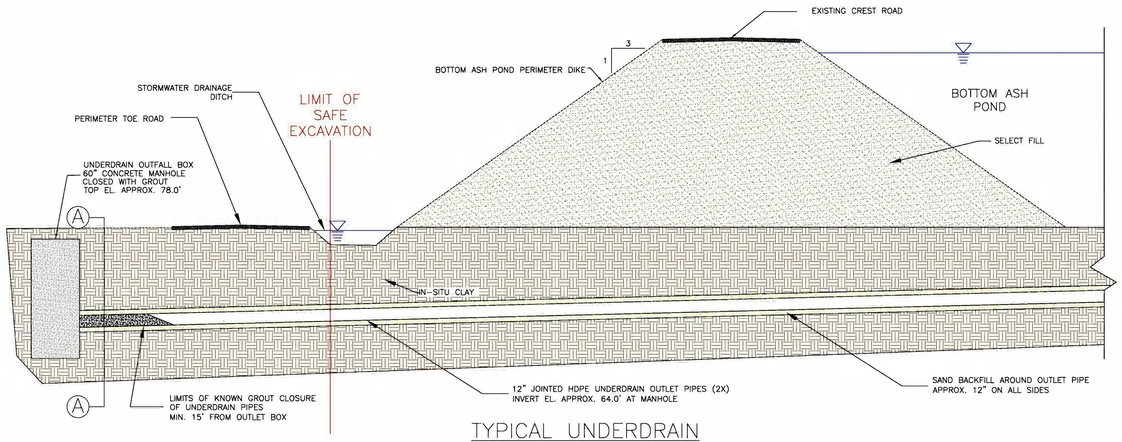


CROSS GENERATING STATION BOTTOM ASH POND – UNDERDRAIN CLOSURE
(PLAN VIEW)

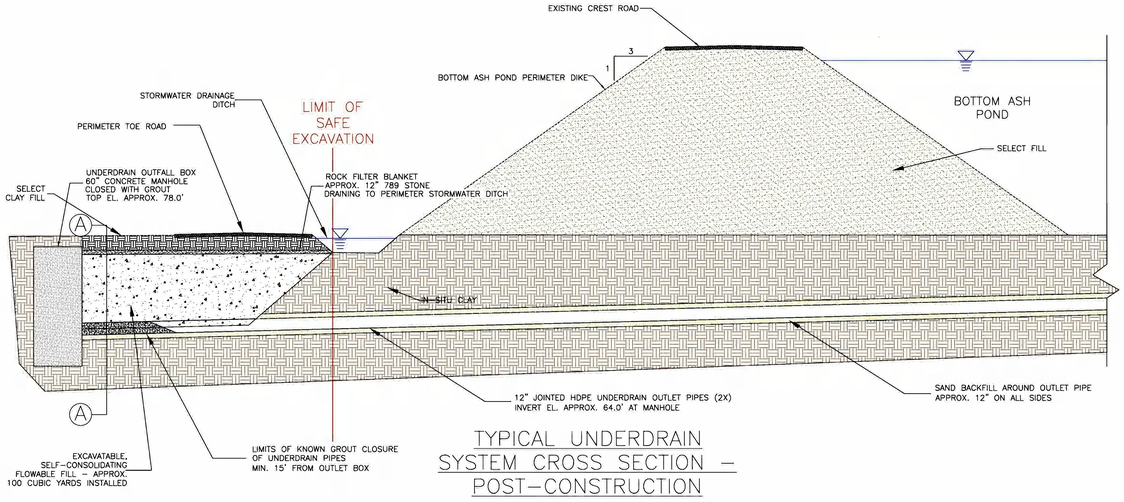
GENERAL NOTES:

1. Dike cross-section based on information obtained from Gilbert Commonwealth Inc. Drawing No. BA-117-50002.
2. Underdrain system layout taken from Higgerson Buchanan Inc. schematic dated Jan. 1993.
3. Elevation datum is NGVD 1929.
4. 12" jointed HDPE underdrain outlet pipe is approximately 13.0' below existing grade.
5. Approximately 100 cubic yards of excavatable flowable fill placed over existing underdrain outlet pipes to filter seepage from sand backfill layer around pipes.
6. Approximately 15 tons #789 granite stone placed as filter blanket above flowable fill to mitigate further soil particle transport by seepage.
7. Clay from West Dike Borrow Pit used to isolate filter blanket and ensure that seepage flowpath is filtered before discharging into perimeter stormwater ditch.

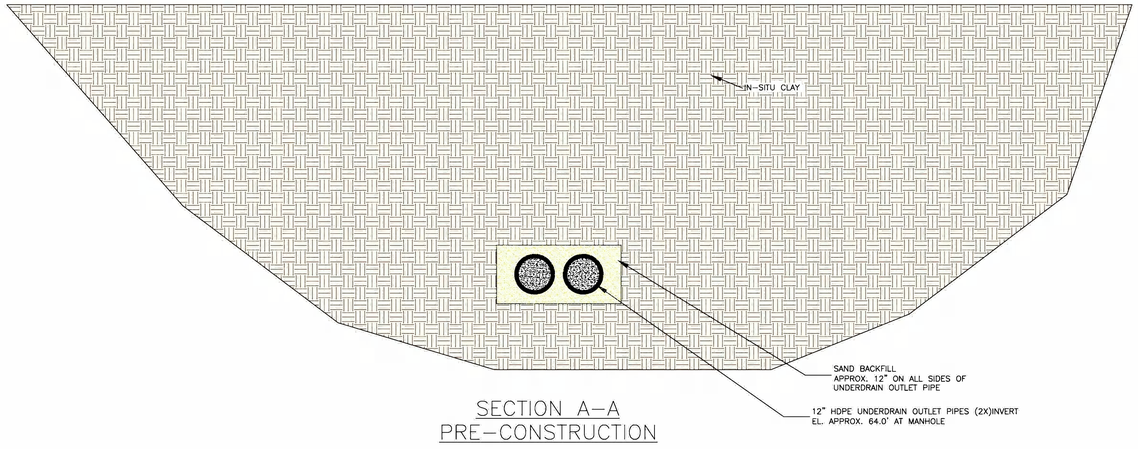
VICINITY MAP – CROSS GENERATING STATION
(NTS)



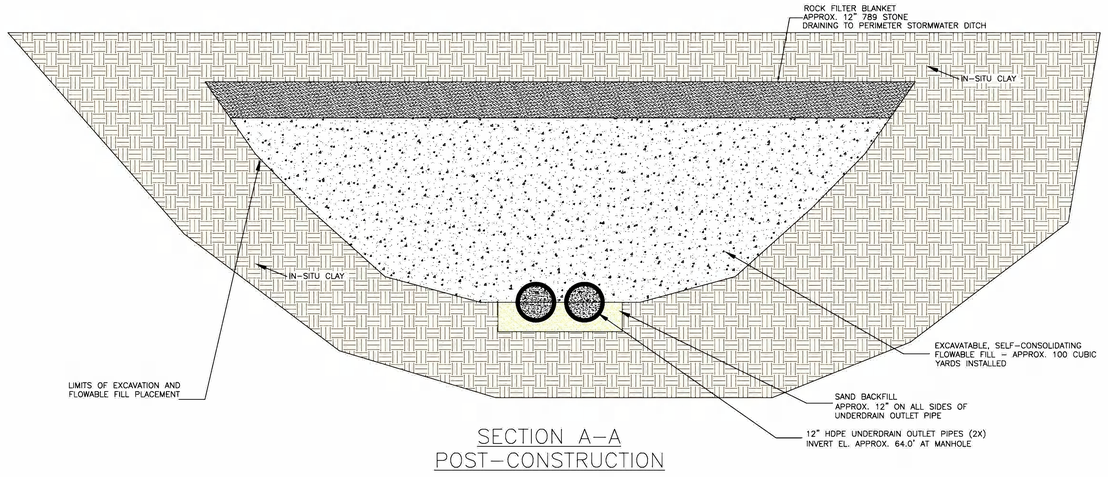
TYPICAL UNDERDRAIN
SYSTEM CROSS SECTION –
PRE-CONSTRUCTION



TYPICAL UNDERDRAIN
SYSTEM CROSS SECTION –
POST-CONSTRUCTION



SECTION A–A
PRE-CONSTRUCTION



SECTION A–A
POST-CONSTRUCTION

REVISIONS

Santee Cooper
One Riverwood Drive
P.O. Box 2946101
Moncks Corner, South Carolina 29461-2901
(843)761-8000

santee cooper®

CONSTRUCTION SERVICES
CIVIL PROJECTS
ENGINEER M. MELCHERS CHECKED S. MCMAHON
DATE 01/08/2015 PROJ. NO. 116087 SCALE AS NOTED
SHEET 1 OF 1 DWG NO.

CROSS GENERATING STATION
RECORD DRAWING -
BOTTOM ASH POND UNDERDRAIN EXPLORATION
AND CLOSURE

NOTES:

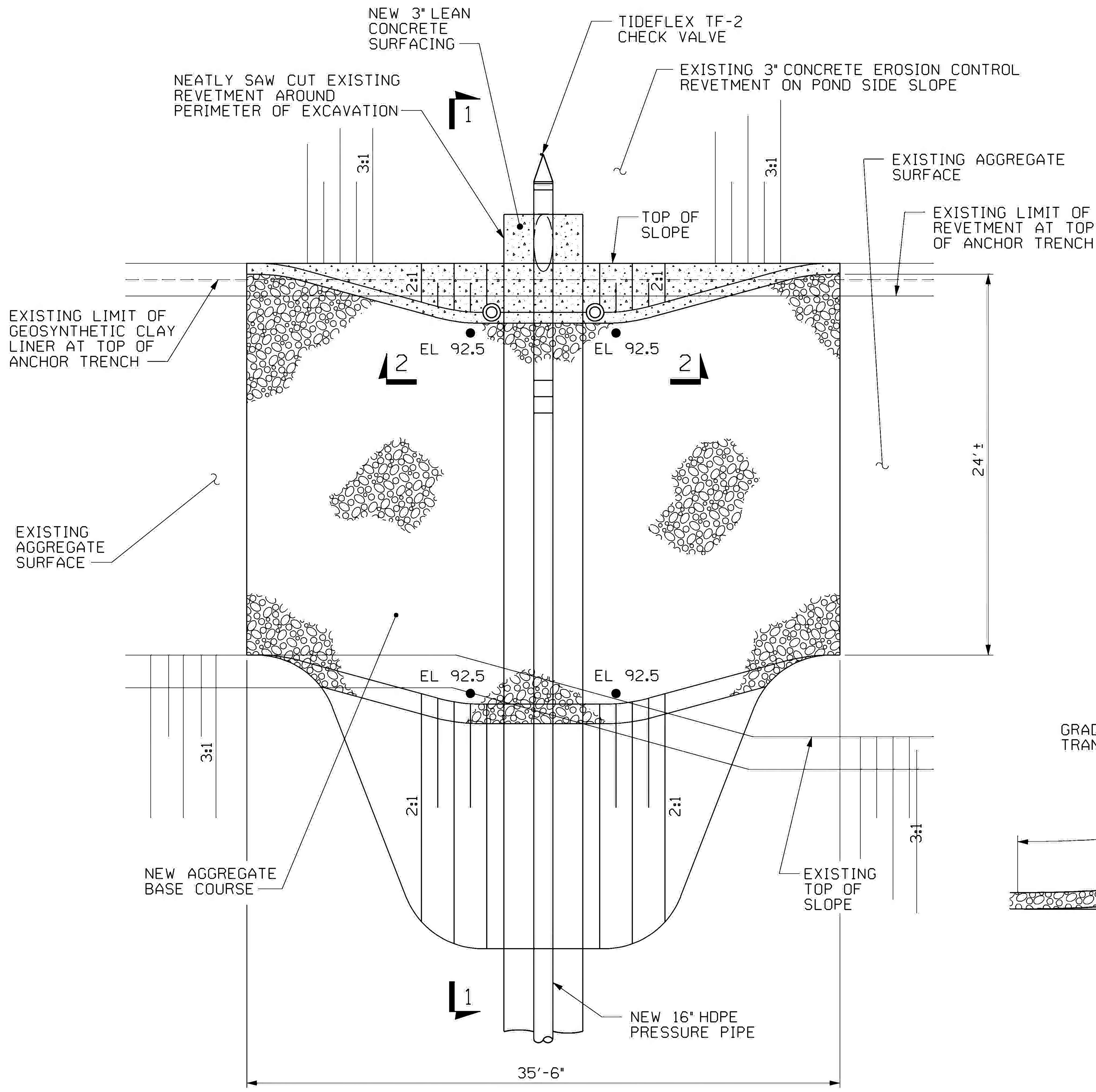
1. ELEVATIONS BASED ON NGVD 29 DATUM UNLESS OTHERWISE STATED.

LEGEND:

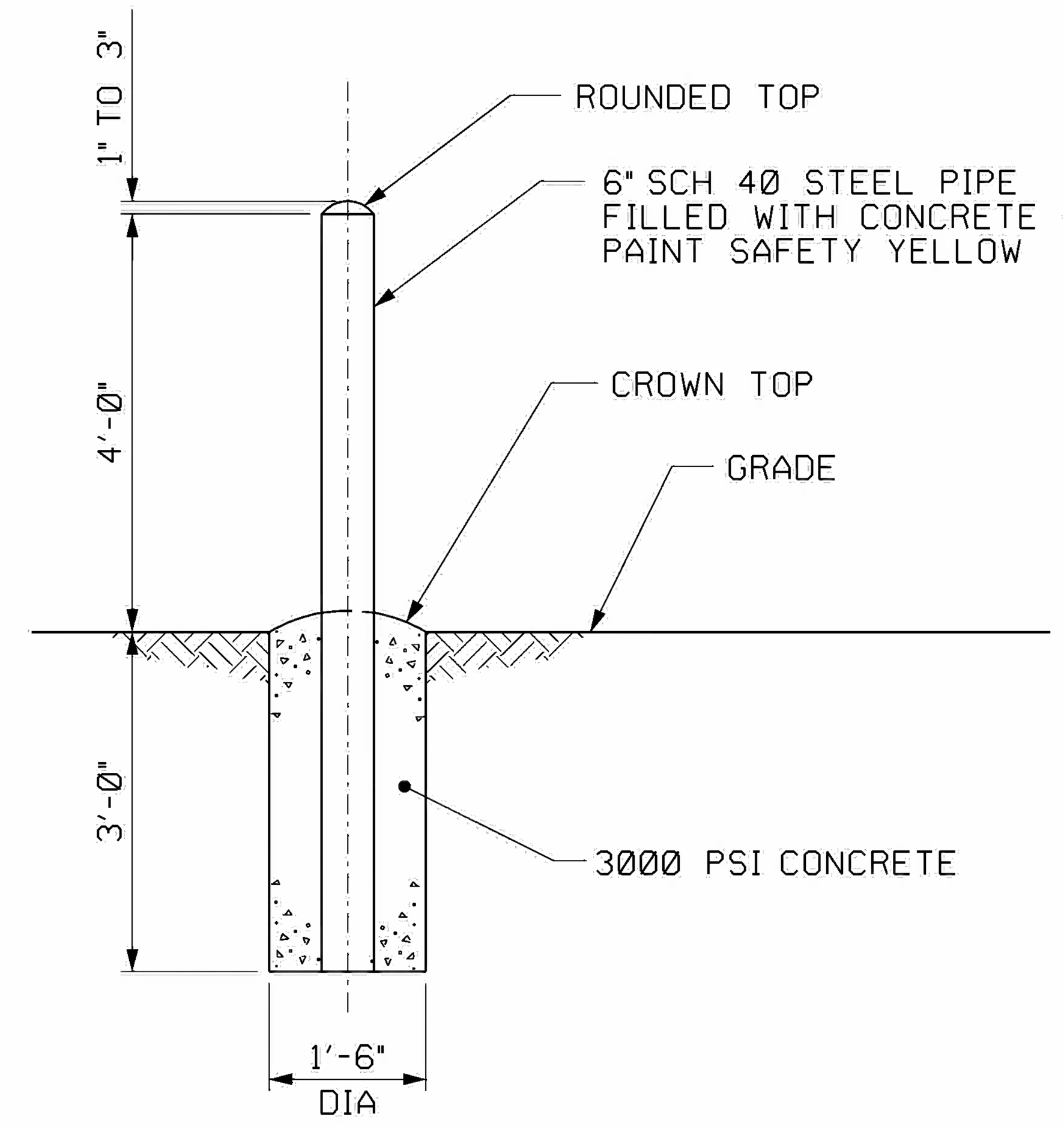
● EL 92.5 — NEW FINAL GRADE SPOT ELEVATION

REFERENCES:

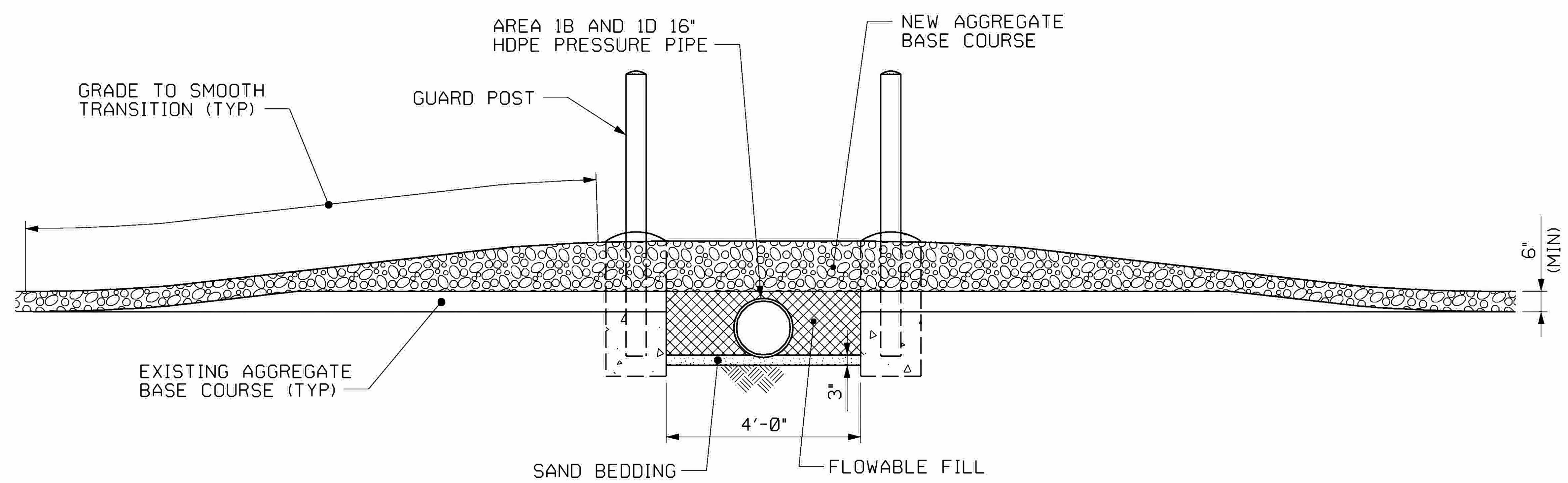
LF-716-0332	SITEWORK PLAN
LF-719-0330	DISCHARGE PIPE PROFILE
LF-719-0334	SITEWORK SECTION AND DETAILS



ENLARGED PLAN
NOT TO SCALE



GUARD POST DETAIL
NOT TO SCALE
(LF-719-0334)



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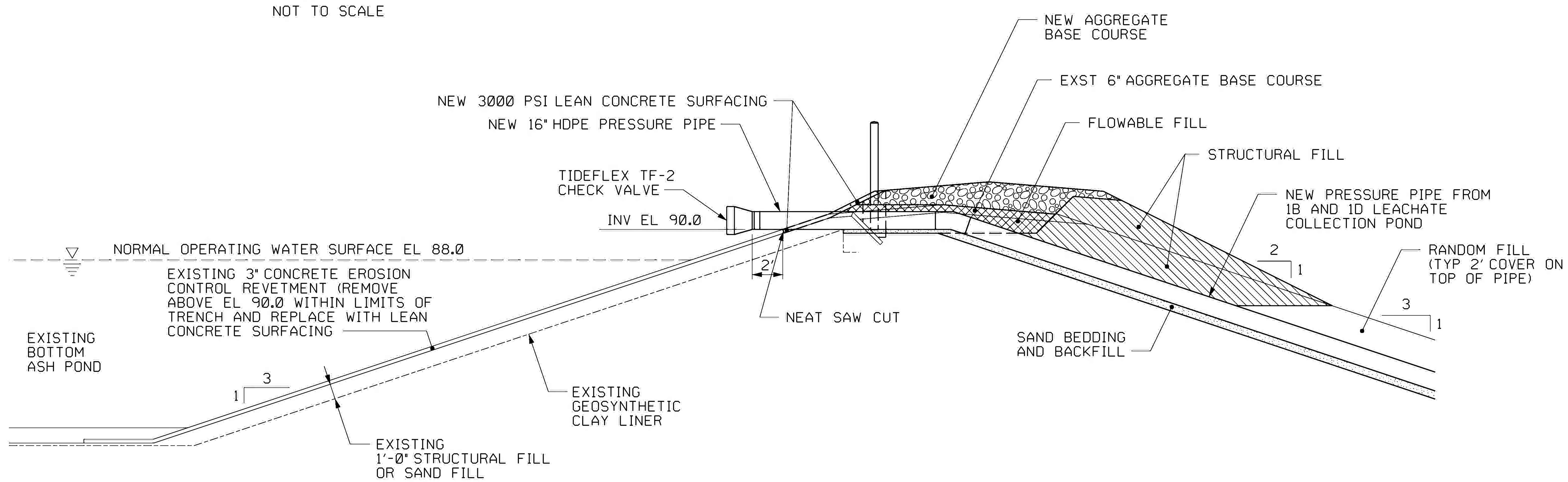
NOT TO SCALE



SECTION 1-1
NOT TO SCALE

DRAWN BY: KPF	ENGINEER: F.M. WOOD
CHECKED BY: R.E. STOUDT	PROJECT ENGINEERING MANAGER: R.E. SKIPTUNAS
LEAD DESIGNER: K.P. FEEG	PROJECT MANAGER: S.J. KRUMSKY
PRELIMINARY STATUS — DATE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
APPROVED STATUS — LDE F.M. WOOD — DATE 07/02/15	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
CERTIFICATE OF AUTHORIZATION	PROFESSIONAL ENGINEER'S SEAL

SOUTH CAROLINA — WORLEY PARSONS GROUP INC. No. 1505 — CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA — LICENSED PROFESSIONAL ENGINEER — No. 24767 — FLETCHER M. WOOD

OneWay to zero harm

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF PE: FLETCHER M. WOOD STATE: SOUTH CAROLINA LIC. NO.: 24767 DATE: 07/02/15

CROSS GENERATING STATION

Santee Cooper — SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

WorleyParsons resources & energy

REV	DATE	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH. SPEC.	LEAD DISC ENGINEER	
0	07/02/15	KPF	RES	KPF	FMW	FMW	ISSUED FOR CONSTRUCTION

LEACHATE COLLECTION POND 1B/1D
PUMP STRUCTURE
BOTTOM ASH POND OUTFALL

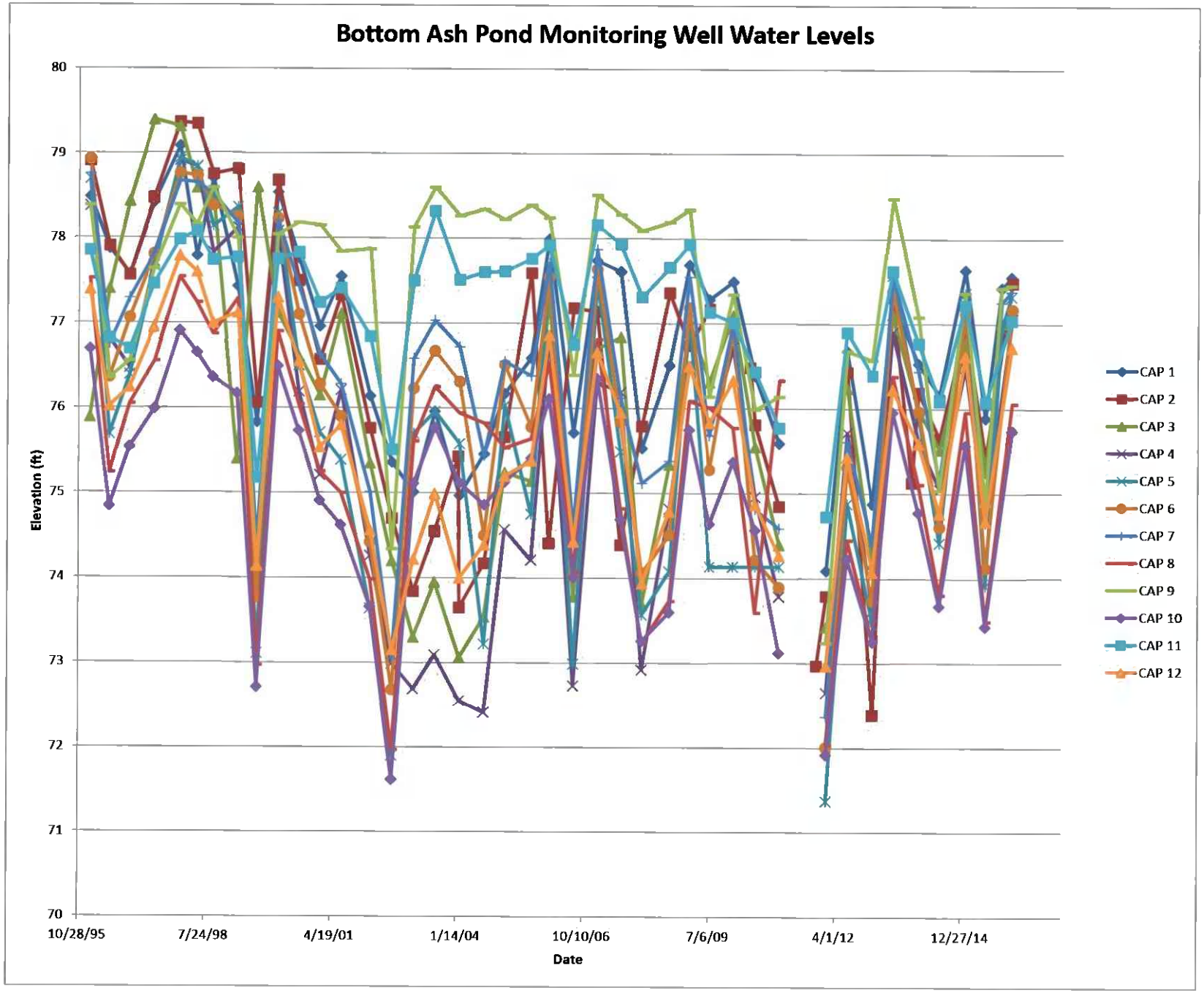
SCALE: 1"=40' — DRAWING SIZE: ARCH D (36" x 24") — JOB NO. 108008-01330

WORLEYPARSONS DWG. NO. CR34-0-DW-LF-719-0331 — REV 0

...\cr34-0-dw-lf-719-0331.dgn 1:36:38 PM 7/2/2015

Appendix E - Water Level Data

(2 total pages)


Bottom Ash Pond Monitoring Well Water Levels
80
79
78
77
76
75
74
73
72
71
70
Elevation (ft)
10/28/95
7/24/98
4/19/01
1/14/04
10/10/06
7/6/09
4/1/12
12/27/14
Date
CAP 1
CAP 2
CAP 3
CAP 4
CAP 5
CAP 6
CAP 7
CAP 8
CAP 9
CAP 10
CAP 11
CAP 12

Appendix F - Construction Specifications

(29 total pages)

SECTION 02220
EXCAVATION AND FILL
TABLE OF CONTENTS

EXCAVATION
AND FILL
CROSS-04085
02220-

1.0 SCOPE

1.1 This Section covers the technical requirements for performing excavation and fill operations.

1.2 This Section includes the requirements for the following:

1. Establishing lines and grades.
2. Performing soil erosion and sedimentation control.
3. Disposition of materials.
4. Excavating to the required lines and grades, including segregation of excavated materials and removal of unsuitable materials.
5. Dewatering of excavations and diversion of all surface water away from earthwork operations.
6. Subgrade preparation.
7. Furnishing, placing, and compacting of fill materials.
8. Excavating and filling of trenches.
9. Cleaning, repair, and maintenance of drainage ditches and culverts adjacent to the work area.

2.0 CODES AND STANDARDS

2.1 The latest edition and published addenda of the following publications in effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

1. American Society for Testing and Materials (ASTM):
   a. C 127, "Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate."
   b. D 422, "Standard Test Method for Particle-Size Analysis of Soils."
   c. D 698, "Standard Test Method for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 5.5 lb. (2.49 kg) Rammer and 12 in. (305 mm) Drop."
   d. D 1557, "Standard Test Method for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 kg) Rammer and 18 in. (457 mm) Drop."
2. South Carolina State Highway Department, "Standard Specifications for Highway Construction," (Standard Specifications).
3. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), "Construction Industry Standards and Interpretations," Volume III.
   a. Subpart P - Excavations, Trenching, and Shoring (OSHA Subpart P).

2.2 Where the above referenced codes and standards contain recommendations in addition to requirements, the recommendations shall be considered requirements and shall be followed unless stated otherwise by this technical specification Section.

2.3 In the event of any conflict between codes, or Technical Specifications and codes, the more stringent regulation shall apply.

3.0 SUBMITTALS

3.1 With Bid:

The Contractor shall submit a dewatering plan and pond filling plan as specified in Articles 5.2.2 and 5.3.4.

3.2 After Award:

1. The Contractor shall submit manufacturer's data for each piece of compaction equipment.

2. The Contractor shall lay out the bottom ash pond per the coordinates and determine the actual clearance distances from the existing fence, cleared areas and existing roads. This data shall be submitted to the Engineer for review prior to performing any embankment construction. The Engineer may modify the embankment location based on the new field survey data.

4.0 MATERIAL REQUIREMENTS

4.1 Random Fill:

Random fill shall consist of approved onsite excavated soil and rock, with the maximum particle size not exceeding one half the specified lift thickness and with more than 50 percent (by weight) passing the number 200 sieve. It shall not contain ash, organic matter, rubbish, ice, or frozen materials. Material having moisture content exceeding the limits specified in Article 5.5 of this Section (i.e., optimum moisture content +3%) shall not be approved unless brought to within the limits.

4.2 Onsite Structural Fill:

Onsite structural fill shall consist of approved onsite excavated soil and rock, with not more than 50 percent (by weight) passing the number 200 sieve. It shall not contain ash, organic matter, rubbish, ice, or frozen materials. Material having moisture content exceeding the limits specified in Article 5.5 of this Section (i.e., optimum moisture content +3%) shall not be approved unless brought to within the limits.

4.3 Run of Crusher (ROC):

Run of crusher (ROC) shall be in general accordance with Section 306 (Type 1) of the Standard Specifications.

4.4 Silt Fence:

Silt fence shall be No. 100X as manufactured by Mirafi, Inc. of Charlotte, North Carolina or Engineer-approved equal.

4.5 Drainage Aggregate:

Drainage aggregate shall be No. 789 in accordance with Section 801.02 of the Standard Specifications.

4.6 Sand Fill:

Sand fill shall be obtained from the onsite dredged sand stockpile area. All sand above Elevation 82.7 feet presently existing in the stockpile shall be used in the Work.

4.7 Bottom Ash:

Bottom ash used for covering the geocomposite bentonite liner shall be obtained from the existing onsite bottom ash pond. The existing bottom ash pond will be in use, with water level up to Elevation 93 feet, during dredging of the bottom ash. Turbidity curtains shall be provided, as required, to prevent suspended solids from entering the existing pump station. A two feet minimum buffer zone of bottom ash shall be maintained in the sides and bottom of the pond. In addition, the final dredging profile shall provide a minimum 30 feet wide channel with bottom no higher than Elevation 80 feet from the new spillway to the existing pump.

5.0 INSTALLATION REQUIREMENTS

5.1 Soil Erosion and Sedimentation Control:

1. Soil erosion and sedimentation control shall be implemented prior to the start of any construction activity.

2. Earthmoving operations shall be conducted in such a manner as to minimize accelerated soil erosion in accordance with applicable

Federal, State and local laws and regulations as specified herein, and as shown on the Drawings.

3. Silt barriers shall be installed downstream of construction, borrow, and stockpile areas to confine sediment that may be washed from all disturbed areas, including new cut and fill slopes.

4. Erosion and sediment control practices shall be inspected daily. Damage shall be repaired immediately. Sediment accumulations shall be removed and placed in the topsoil stockpile.

5. All facilities shall be maintained for the duration of the Contract.

5.2 Control of Water:

1. The Contractor shall design, furnish, install, and operate a dewatering system to collect and remove surface water and groundwater from the work areas. The dewatering system shall operate continuously during the performance of the work and shall maintain the groundwater level at least two feet below the bottom of the bentonite geocomposite liner or prepared subgrade, but no lower than Elevation 68 feet. Discharge from the dewatering system shall be routed as required by the Engineer and shall be in accordance with all South Carolina erosion control regulations. Regulations include "Storm Water Management Guidelines (South Carolina Coastal Council), and "Erosion and Sediment Control Practices for Developing Areas" (South Carolina Land Resources Conservation Commission, Erosion and Sediment Control Division). A level spreader having a minimum length of 30 feet shall be provided at the end of the discharge to prevent erosion of existing soils. All disturbed areas shall be regraded and revegetated at the conclusion of Work.

2. The Contractor shall submit a dewatering plan showing all system details including location and number of sumps, trenches, pipes, and road crossings. Pump sizes shall be noted and onsite backup pumps shall be available.

3. Upon completion of the bentonite geocomposite liner, cover material, and concrete erosion control revetment, the dewatering system shall be deactivated and the bottom ash pond expansion area filled with water to Elevation 78 feet. Source of water for filling shall be the discharge (diversion) canal at approximate coordinates N 7200 and E 10,600. The maximum intake velocity for water drawn from the canal shall be 0.5 feet per second. Pipe routing shall be proposed by the Contractor and approved by the Engineer. A supplementary source of water for pond filling may be the discharge from the dewatering system. The dewatering system deactivation and pond filling shall be performed in such a manner to prevent upward hydrostatic force on the bentonite geocomposite liner, and to prevent erosion or damage to completed work. In addition, all temporary sumps and liner penetrations shall be sealed as required by the Engineer.

4. The Contractor shall submit a pond filling plan showing all system details including location and size of pumps and pipelines, road crossings, inlet facilities, and capacity calculations.

5.3 Excavation:

1. Excavation shall conform to the lines, grades, and outlines as shown on the Drawings. Excavation side slopes, bottoms of excavations, and ditches shall be shaped to a smooth and uniform surface, free from bumps and hollows. A neat saw cut shall be used when the excavation extends into existing paving or a concrete slab.

2. The final excavation lines shall be within 0.1 foot of grades, as indicated on the Drawings, unless overexcavation is required.

3. Excavation operations shall be conducted so that material outside the excavation limits is not disturbed or loosened. Material disturbed or loosened shall be restored to at least its original condition. All excavation operations shall be conducted in accordance with OSHA Subpart P.

4. An excavation shall be classified as either earth excavation or rock excavation. Earth excavation shall consist of excavation in soil and other overburden materials not classified as rock.

5. Rock excavation shall consist of removal of material classified as rock. The material must be boulders of two cubic yard or more in volume, solid or ledge rock, or other hard material in place that cannot be excavated by power shovels or bulldozers equipped with ripping points. Material classified as rock shall be removed by drilling and feathering, bull point wedging, or other suitable means.

6. Blasting for excavation will not be permitted.

7. Excavation bottoms shall be approved by the Engineer prior to placement of backfill, structures, pipe, or utilities.

8. Material suitable for fill shall be stockpiled within the limits of the work area. The material shall be segregated into piles for random fill and onsite structural fill.

9. Excavated materials not meeting the requirements of random fill, onsite structural fill, or topsoil are defined as unsuitable. Unsuitable material, including excess suitable material, shall be placed onsite as required by the Engineer.

10. Temporary fill stockpiles, including fills of unsuitable and excess materials, shall be shaped and sloped to provide drainage. Silt barriers shall be installed down gradient of all stockpiles as required by the Engineer.

11. Debris such as wood or rebar that is discovered during excavation shall be disposed of in the onsite construction waste disposal area.

5.4 Subgrade Preparation:

1. Excavation bottoms for soil supported footings, concrete slabs, bentonite geocomposite liner, and embankment fill areas shall be proofrolled in the Engineer's presence with at least four passes of a large (greater than 10 tons) smooth wheeled roller or other approved heavy compaction equipment. Unless otherwise required on the Drawings, confined areas inaccessible to heavy compaction equipment shall be compacted with three to four passes of a largest practicable plate compactor or roller. Unless otherwise required on the Drawings, soft or organic areas detected during subgrade preparation shall be overexcavated as required by the Engineer and backfilled with compacted fill. The fill shall be the same material that is to be subsequently placed on the prepared subgrade. If a structure is to be placed directly on the subgrade, then the removed material shall be replaced with compacted ROC.

2. The subgrade shall be compacted to a minimum density equal to 90 percent of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557), for all areas to receive random fill, onsite structural fill, or bentonite geocomposite liner, and to 95 percent of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557), for all areas to receive ROC, on which a structure is to be

placed, or below roadways. ASTM D 698 may be used in lieu of ASTM D 1557 provided that the minimum densities are increased by five percent.

3. At least 48 hours notice shall be given to the Engineer prior to performing subgrade preparation.

5.5 Fill Placement:

1. General Requirements:

a. The surface of the fill shall be kept approximately horizontal during construction, but shall be provided with sufficient longitudinal and transverse slope to allow for runoff of surface water.

b. Hauling equipment shall not be permitted to follow a single track on the same layer, but shall be directed to spread out to provide uniform compaction and prevent rutting.

c. Fill materials shall not be placed against or upon an unstable grade. At junctions between fill and existing grade, the existing grade shall be cut back, if necessary, to expose compact, stable material. Rolling shall extend over this junction to provide a compact, stable mass. Similar care shall be taken at junctions between adjacent fills.

d. Fill shall not be placed while rain is falling. Prior to resuming fill operations after rain, all muddy material shall be bladed off the surface to a depth necessary to expose firm compacted material.

e. Fill shall not be placed on frozen ground, and frozen material shall not be used for fill.

f. At the end of the day's operation and when rain is threatening, the fill shall be sloped to provide drainage and shall be compacted over the entire cross section and length with a smooth wheeled roller to seal it against the entry of water.

g. When the top of the fill or subgrade has dried out, or become excessively wet, or been damaged by construction equipment, the surface on which additional fill or a structure is to be placed shall be scarified to a minimum depth of 6 inches, brought to the specified moisture content, and recompacted to the specified density prior to the placement of additional fill or a structure.

h. Fill which does not meet the requirements for moisture content at the time of compaction shall be dried or wetted to meet the specified requirements. If the fill material requires drying, this may be accomplished by reworking it under warm and dry atmospheric conditions. Water, if required, shall be added carefully by sprinkling and care shall be taken that no more than the amount needed is applied. Ponding or flooding will not be permitted.

i. Only compaction equipment weighing 200 pounds or less shall be allowed within three feet (measured horizontally) of structures or retaining walls. For backfilling retaining walls, the same height of fill shall be maintained on both sides of the wall until the front of the wall is at final grade. Fill shall not be placed against concrete walls until the concrete reaches at least two thirds of its design strength.

j. The final fill layer shall be placed within 0.1 foot of the grades as indicated on the Drawings.

k. The placing of fill shall cease in the areas being tested or sampled.

2. Underwater Sand Fill:

a. The existing borrow pit water elevation shall be maintained at Elevation 68 feet ±0.25 feet during placement of underwater sand fill.

b. Submerged areas of the existing borrow pit below Elevation 68 feet shall be filled by end dumping sand fill through water until the fill surface reaches Elevation 71 feet.

c. The below water filling shall proceed uniformly from the edges of the borrow pit towards the center of the bottom ash pond expansion.

d. Soft sediments displaced by the underwater fill shall be removed and placed onsite as required by the Engineer.

3. Limestone Core and Concrete Pile Cutoff Fill:

a. Random limestone cores discovered in the work area, along with up to 2,500 concrete pile cutoffs stockpiled in the work area, shall be incorporated into the fill as specified below.

b. The cores and cutoffs shall be used only within the pond interior (not under embankments). These materials shall be spread and worked into the subgrade in such a manner so that no voids are created. A minimum of one foot shall be maintained between the top of the cores or cutoffs and the bottom of the bentonite geocomposite liner.

4. Compaction Requirements:

a. Random Fill, Sand Fill, and Onsite Structural Fill:

Random fill, sand fill, and onsite structural fill shall be compacted in maximum 12 inch lifts (loose) to a minimum density of 90 percent of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557) and Appendix A (if applicable). For fill within 3 feet (measured vertically) of a road subgrade or structure, the minimum density shall be 92 percent. The moisture content at the time of compaction shall not vary from the optimum moisture content by more than three percentage points, unless otherwise approved by the Engineer. ASTM D 698 may be used in lieu of ASTM D 1557 provided that the minimum densities are increased by 5 percent.

b. ROC:

ROC shall be compacted in maximum 10 inch lifts (loose). The fill shall be compacted to a minimum density of 95 percent of the maximum dry density, as determined by the Modified Proctor Test (ASTM D 1557) and Appendix A (if applicable). The moisture content at the time of compaction shall not vary from the optimum moisture by more than three percentage points.

c. Drainage Aggregate:

Drainage aggregate shall be placed in maximum 10 inch lifts (loose) and compacted with a minimum of two passes of a vibratory drum compactor weighing a minimum of one ton.

d. In confined areas requiring hand held compaction equipment weighing 200 pounds or less, all fills shall be placed in maximum 6 inch lifts (loose).

5. Compaction Equipment Requirements:

a. Compaction equipment shall be of the type and size required to produce the specified compaction and as specified herein or on the Drawings. Compaction equipment shall be compatible with the types of materials being placed.

b. Sheepsfoot or rubber tired rollers and tampers shall be used to compact cohesive soils. Smooth wheel vibratory rollers and

vibrating plate compactors shall be used to compact granular materials, unless approved otherwise.

5.6 Trench Excavation and Backfill:

1. Trench excavations for buried pipes and utilities shall be performed to the lines and grades shown on the Drawings.

2. No damage shall occur to any structures, pipes, or utilities.

3. Sheeting, bracing, and shoring shall be installed, as required, to safely maintain excavations and protect existing structures, utilities, and personnel as required by Federal, State, and local laws and ordinances, including OSHA Subpart P.

4. Trenches for pipes or utilities shall be excavated through natural ground or as required within fills. For pipes or utilities to be installed within fills, the fill shall first be constructed to a minimum height of 4 feet above the required elevation of the top of the pipe or utility. The trench shall then be excavated into the fill, and the pipe or utility installed as required.

5. The minimum width of the trench shall be as shown on the Drawings and shall not be greater than that necessary to permit the work to proceed.

6. Soft or organic material encountered at the bottom of the trench shall be removed for the full width of the trench to the depths required by the Owner and replaced with compacted sand fill.

7. Trench bottoms shall be accurately shaped so that the pipe or utilities will be in continuous and uniform contact with either undisturbed soil, sand fill material, or bedding material as shown on the Drawings.

8. If stones larger than 3 inch diameter are encountered in the bottom of the trench, they shall be removed and the void shall be backfilled with compacted sand fill.

9. When rock is encountered, it shall be removed to a minimum depth of six inches below the bottom of the pipe or utilities for the full width of the trench, and replaced with compacted sand fill.

10. Trenches shall not be backfilled until all joints are made, required tests performed, pipe encased as necessary, and Owner approval is granted to proceed.

11. Bedding and backfill around the pipe shall be of the type and thickness indicated on the Drawings and compacted to the minimum density as specified in Article 5.5 of this Section.

12. When the Drawings indicate that compacted random fill or onsite structural fill shall be placed around the pipe or utilities, the fill shall have a maximum particle size of three inches.

13. Backfill around pipes and utilities shall be placed so that the elevation of the fill is the same on both sides. Rammer type compactors shall be used with caution adjacent to pipes or utilities to avoid damage or movement.

14. After backfilling, the disturbed areas shall be fine-graded to blend in with existing contours, left with puddle free drainage, and seeded or otherwise protected as shown on the Drawings.

5.7 Cleaning and Repair of Drainage Ditches and Culverts:

1. Existing drainage ditches and culverts adjacent to the work area shall be cleaned and repaired as required. The ditches shall be restored to their original cross sections, lines, and grades as shown on the Reference Drawings.

2. The ditches and culverts, including new ditches and culverts installed under this Contract, shall be maintained during the Contract. Sediment accumulations shall be removed and placed onsite as required by the Engineer. Fly ash removed from the ditches shall be placed in the special waste pond. Ditch damage or washouts shall be repaired as required.

6.0 TESTING

6.1 The Owner will provide testing and inspection of all items in this Section. Fill or subgrade not meeting the compaction requirements shall be reworked and recompacted as required until the specification requirements are met.

END

ATTACHMENT A

MODIFICATION TO MODIFIED PROCTOR TEST (ASTM D 1557)

For structural or random fills or stabilized aggregate base course having more than 30 but less than 50 percent (by weight) of material greater than ¾ inch, the maximum dry density of the fill shall be determined by the following formula:

$$W = \frac{ww'}{Ow' + Cw}$$

where:

W = maximum dry density (lb/cu ft).

w = density of the material coarser than ¾ inch, given by its bulk specific gravity (determined) by ASTM C 127) multiplied by 62.4 (lb/cu ft).

w' = maximum dry density for the material passing the ¾ inch sieve as determined by the Modified Proctor Test, Method C (ASTM D 1557) (lb/cu ft).

O = fraction by dry weight of the material coarser than the ¾ inch sieve.

C = fraction by dry weight of the material finer than the ¾ inch sieve.

SECTION 02246

SOIL TESTING

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SOIL TESTING
CROSS-SL093
02246-

1.0 SCOPE

1.1 This Section covers the technical requirements for performing soil testing operations.

1.2 This Section includes the requirements for the following:

1. Furnishing a testing laboratory and equipment.
2. Providing qualified personnel in the testing laboratory and at the jobsite.
3. Providing material and field testing.
4. Submitting test reports.

2.0 CODES AND STANDARDS

2.1 The latest edition and published addenda of the followings publications in effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

1. American Society for Testing and Materials (ASTM):
   a. C 127, "Test Method for Specific Gravity and Absorption of Coarse Aggregate."
   b. D 422, "Method for Particle-Size Analysis of Soils."
   c. D 698, "Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 5.5 lb. (2.49 kg) Rammer and 12 in. (305 mm) Drop."
   d. D 1140, "Test Method for the Amount of Material in Soils Finer Than the No. 200 (75 mm) Sieve."
   e. D 1556, "Test Method for Density of Soil in Place by the Sand Cone Method."
   f. D 1557, "Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 kg) Rammer and 18 in. (457 mm) Drop."
   g. D 2167, "Test Method for Density and Unit Weight of Soil In Place by the Rubber Balloon Method."
   h. D 2488, "Practice for Description and Identification of Soils (Visual-Manual Procedure)."
   i. D 2922, "Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)."
   j. D 3017, "Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)."
   k. D 4318, "Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."

2.2 Where the above referenced codes and standards contain recommendations in addition to requirements, the recommendations shall be considered requirements and shall be followed unless stated otherwise by this technical specification Section.

2.3 In the event of any conflict between codes, or Technical Specifications and codes, the more stringent regulation shall apply.

3.0 SUBMITTALS

3.1 With Bid:

1. The information and data below shall be submitted by the Bidder:
   a. Resumes of responsible personnel.
   b. Sample forms and documentation sheets.
   c. Test equipment data.

d. Location and testing certifications for off-site test laboratory.

e. Procedures for required tests.

2. After acceptance by the Owner, this data will become part of the Contract.

3.2 After Award:

The information and data below shall be submitted in accordance with Appendix D of the Special Conditions:

1. Test results.

4.0 FACILITY AND PERSONNEL REQUIREMENTS

4.1 An onsite laboratory shall be provided. This facility shall be equipped with all items required to perform specified tests.

4.2 The test laboratory shall have its procedures approved by the Engineer and its equipment inspected not more than three years prior to beginning the Work by a qualified national authority. A copy of the certification shall be submitted. The Material Reference Laboratories of the National Bureau of Standards are such qualified national authorities. The equipment shall be maintained for achieving the level of accuracy during the work similar to that achieved at the time of the certification.

4.3 The testing services shall be under the direction of a person charged with an engineering-managerial responsibility. The person shall be a registered engineer and a full time employee. He or she shall have at least five years experience in the testing of construction and materials.

4.4 The testing laboratory shall be supervised by a laboratory technician who shall have at least five years experience performing tests on soil and rock and be able to demonstrate the ability to perform the tests required in the manner stipulated by ASTM or other governing procedure.

4.5 Testing personnel shall be qualified to a Level I technician (in accordance with Article 4.6 below), unless performing tests or preparing samples under the direct supervision of a Level II technician (in accordance with Article 4.7 below).

4.6 A Level I technician shall be capable of performing the tests that are required to be performed in accordance with documented procedures and/or industry practices. The individual shall be familiar with the tools and equipment to be employed and shall have demonstrated proficiency in their use. The individual shall also be capable of determining that the calibration status of inspection and measuring equipment is current, that the measuring and test equipment is in proper condition for use, and that the test procedures are approved. The educational and experience requirements shall be as follows:

1. Two years of related experience in equivalent testing activities, or

2. High school graduation and six months of related experience in equivalent testing activities, or

3. Completion of college level work leading to an Associate Degree in a related discipline plus three months of related experience in the equivalent testing activities.

4.7 A Level II technician shall have all of the capabilities of a Level I technician for the test category or class in question. Additionally, a Level II technician shall have demonstrated capabilities in planning tests; in setting up tests including preparation and set up of related

equipment, as appropriate; in supervising or maintaining surveillance over the tests; in supervising and certifying lower level personnel; in reporting testing results; and in evaluating the validity and acceptability of test results. The educational and experience requirements shall be as follows:

1. One year of satisfactory performance as Level I technician in the corresponding test category or class, or
2. High school graduation plus three years of related experience in equivalent testing activities, or
3. Completion of college level work leading to an Associate Degree in a related discipline plus one year related experience in equivalent testing activities, or
4. Four year college graduation plus six months of related experience in equivalent testing activities.

4.8 All necessary sampling, sample making, and testing equipment shall be provided in sufficient quantities to support the work.

5.0 TESTING REQUIREMENTS

5.1 The number of personnel maintained at the site office per working shift shall be sufficient for the construction operation.

5.2 Tests shall be conducted in accordance with the methods indicated in Attachment A, and submitted in accordance with Appendix D of the Special Conditions. The frequency of the testing shall be determined by the Engineer. Tests which do not meet specification requirements shall be reported immediately to the Engineer.

5.3 The test reports shall include the following information, as a minimum:

1. Project description and Job No.
2. Sample or Test No.
3. Description of material.
4. Location of sample or test (horizontal-within 5.0 feet, elevation-within 0.5 feet).
5. Tested by.
6. Date of testing.
7. Temperature and weather conditions.
8. References to any other tests used in the analysis.
9. Results of the test.
10. Any deviations from specified testing procedure.
11. Any difficulties in performing test.
12. Whether material or test passes or fails, if applicable.

5.4 All samples shall be transported to the onsite or offsite laboratory and stored prior to testing in accordance with the applicable codes and standards.

END

SOIL TESTING
AND INSPECTION
CROSS-SL093
Rev. 0
8/23/91 02246-A-
ATTACHMENT A
ATTACHMENT A (Cont'd)
REQUIRED TESTS

Item	Requirement	Test Method
1	Subgrade Testing:	
	Proctor Test	ASTM D 1557 or D 698
	Field Density Test	Sand Cone Method ASTM D 1556, or Nuclear Method ASTM D 2922, D 3017, or Rubber Balloon Method ASTM D 2167
	Soil Description	ASTM D 2488
2	Random Fill:	
	Proctor Test	ASTM D 1557 or D 698 modification to this standard per Attachment B, if required.
	Specific Gravity	ASTM Cÿ127
	Field Density Test	Sand Cone Method ASTM D 1556, or Nuclear Method ASTM D 2922, D 3017, or Rubber Balloon Method ASTM D 2167
	Soil Description	ASTM D 2488
3	Structural Fill and Stabilized Aggregate Base Course:	
	Gradation	ASTM D 422 (w/o Hydrometer) ASTM D 1140 (onsite structural fill)
	Proctor Test	ASTM D 1557 modification to this standard per Attachment B, if required.
	Specific Gravity	ASTM C 127
	Field Density Test	Sand Cone Method ASTM Dÿ1556, or Nuclear Method ASTM D 2922, D 3017, or Rubber Balloon Method ASTM D 2167
4	Sand Fill:	
	Gradation	ASTM D 422 (w/o Hydrometer)
	Proctor Test	ASTM D 1557

	Field Density Test	Sand Cone Method ASTM D 1556, or Nuclear Method ASTM D 2922, D 3017, or Rubber Balloon Method ASTM D 2167
5	Uniformly Graded Coarse Aggregate:	
	Gradation	ASTM D 422 (w/o Hydrometer)

SOIL TESTING
AND INSPECTION
CROSS-SL093
Rev. 0
8/23/91 02246-B-
ATTACHMENT B
MODIFICATION TO MODIFIED PROCTOR TEST (ASTM D 1557)
For structural and random fills and stabilized aggregate base course having more than 30 but less than 50 percent (by weight) of material greater than 3/4-inch, the maximum dry density of the fill shall be determined by the following formula:

$$W = \frac{ww'}{Ow' + Cw}$$

W = maximum dry density (lb/cu ft)
w = density of the material coarser than 3/4-inch, given by its bulk specific gravity (determined by ASTM C 127) multiplied by 62.4 (lb/cu ft)
w' = maximum dry density for the material passing the ¾ inch sieve as determined by the Modified Proctor Test, Method C (ASTM D 1557) (lb/cu ft)
O = fraction by dry weight of the material coarser than the ¾ inch sieve
C = fraction by dry weight of the material finer than the ¾ inch sieve

SECTION 02500
SITEWORK
TABLE OF CONTENTS

SITEWORK
CROSS-04085
02500-

1.0 SCOPE

1.1 This Section covers the technical requirements for the furnishing and installation of civil sitework facilities.

1.2 This Section covers:

1. Soil erosion and sedimentation control practices.
2. Bagged sand-cement riprap.
3. Reinforced concrete pipe culvert.
4. Pipe trench with grating.
5. Perforated corrugated polyethylene underdrain.
6. Drawdown structure modifications.
7. Relocation of 6 inch WW-2 pipe.

2.0 CODES AND STANDARDS

2.1 The latest edition and published addenda of the following publications in effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

1. American Society for Testing and Materials (ASTM):
   a. A36, "Standard Specification for Structural Steel."
   b. A123, "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."
   c. A153, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware."
   d. A307, "Standard Specification for Carbon Steel Externally Threaded Standard Fasteners."
   e. A563, "Standard Specification for Carbon and Alloy Steel Nuts."
   f. A569, "Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality."
   g. C76, "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe."
   h. C150, "Specification for Portland Cement."
   i. C443, "Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets."
   j. F436, "Standard Specification for Hardened Steel Washers."
2. American Welding Society (AWS):
   a. D1.1, "Structural Welding Code."
3. "Erosion and Sediment Control Practices for Developing Areas" (E&SC Practices), South Carolina Land Resources, Conservation Commission, Erosion and Sediment Control Division.
4. South Carolina State Highway Department, "Standard Specifications for Highway Construction", (Standard Specifications).

2.2 Where the above referenced codes and standards contain recommendations in addition to requirements, the recommendations shall be considered requirements and shall be followed unless stated otherwise by this technical specification Section.

2.3 In the event of any conflict between codes, or Technical Specifications and codes, the more stringent regulation shall apply.

3.0 SUBMITTALS

3.1 With Bid:

None.

3.2 After Award:

1. The Contractor shall submit material certifications and shop drawings in accordance with Appendix E to the Special Conditions for the following:

   a. Reinforced concrete pipe.

   b. Pipe trench grating.

4.0 DETAILED REQUIREMENTS

4.1 Material Requirements:

1. Reinforced Concrete Pipe (RCP):

   RCP shall be Class IV strength in accordance with Section 714.03 of the Standard Specifications and ASTM C76. Joints shall be in accordance with ASTM C443.

2. Bagged Sand-Cement Riprap:

   The riprap shall be bagged sand-cement in accordance with Section 804.07 of the Standard Specifications. Paper bags constructed of 3-ply heavy-duty kraft paper are acceptable.

3. Grout:

   Grout shall be an approved grout consisting of premixed, prepackaged Portland cement grout which requires only the addition of water. Cement used in the grout shall conform to ASTM C150. Masterflow 928, manufactured by Masterbuilders Co., is an approved grout.

4. Structural and Miscellaneous Steel:

   a. Rolled shapes and plates shall conform to ASTM A36.

   b. Bolts for connecting structural and miscellaneous steel shall conform to ASTM A307.

   c. Nuts for bolts shall conform to ASTM A563, Grade C.

   d. Washers shall conform to ASTM F436.

   e. Steel studs shall conform to Sectionÿ7 of AWS D1.1.

   f. Steel for grating shall conform to ASTM A569.

   g. Grating shall be welded grating of the size shown on the Drawings.

5. Coatings:

   a. All structural steel rolled shapes and plates including steel grating and embedded angles and plates shall be hot-dipped galvanized in accordance with ASTM A123.

   b. All bolts, nuts, and washers shall be hot-dipped galvanized in accordance with ASTM A153.

5.0 INSTALLATION

5.1 Soil Erosion and Sedimentation Control:

Erosion and sediment control practices shall be implemented as required by the E&SC Practices and shall be inspected daily. Damage shall be repaired immediately.

5.2 Riprap:

Bagged sand-cement riprap shall be installed in accordance with Section 804.15 of the Standard Specifications and as shown on the Drawings.

5.3 Reinforced Concrete Pipe (RCP):

RCP shall be installed in accordance with Section 714 of the Standard Specifications. Trenching and fill shall be in accordance with Section 02220 and the Drawings.

5.4 Pipe Trench with Grating:

1. Reinforcing steel placement shall be in accordance with Section 03211 and as shown on the Drawings.

2. Concrete placement shall be in accordance with Section 03311 and as shown on the Drawings.

5.5 Drawdown Structure Modifications:

1. Concrete wall shall be removed in accordance with Section 02210, Article 3.1, and as shown on the Drawings.

2. Existing handwheel stem guides shall be attached to structural steel supports as shown on the Drawings.

5.6 6" WW-2 Pipe:

The 6" WW-2 pipe shall be installed in accordance with Section 15060 and as shown on the Drawings.

END

SECTION 02644

BENTONITE GEOCOMPOSITE LINER

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BENTONITE
GEOCOMPOSITE LINER
CROSS-04085
02644-

1.0 SCOPE

1.1 This Section covers the technical requirements for the furnishing and installation of the bentonite geocomposite liner.

1.2 This Section covers the requirements for the following:

1. Subgrade preparation.
2. Furnishing and installation of bentonite geocomposite liner.
3. Placement of cover material.

2.0 CODES AND STANDARDS

2.1 The latest edition and published addenda of the following publications in effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

None.

2.2 Where the above referenced codes and standards contain recommendations in addition to requirements, the recommendations shall be considered requirements and shall be followed unless stated otherwise by this technical specification Section.

2.3 In the event of any conflict between codes, or Technical Specifications and codes, the more stringent regulation shall apply.

3.0 SUBMITTALS

3.1 With Bid:

1. The Contractor shall submit the following information:
   a. Conceptual scheme showing a plan of the liner panel arrangement and typical sections and elevations.
2. After acceptance by the Owner, this data will become part of the Contract.

3.2 After Award:

1. The following drawings, information and data shall be submitted in accordance with Appendices B, C, and E to the Special Conditions:
   a. Drawings showing the layout, size, and direction of the liner panels.
   b. Material certification and test results.
   c. A material and workmanship warranty shall be provided by the Contractor for the bentonite geocomposite liner. The warranty shall be a 25 year warranty.

4.0 DETAILED REQUIREMENTS

4.1 The bentonite geocomposite liner shall be BENTOMAT, as manufactured by Colloid Environmental Technologies Company (CETCO), or Engineer-approved equal.

4.2 The bentonite geocomposite liner shall be formulated and manufactured from polypropylene geotextiles and a minimum of one pound per square foot of Volclay PLS-50, medium contaminant resistant sodium bentonite and shall be approximately ¼ inch thick in the unhydrated state.

4.3 The liner shall be manufactured by the mechanical bonding of the needlepunch process. No glues or adhesives shall be used in lieu of this process. The needlepunch process for manufacture shall be:

1. A uniform layer of sodium bentonite shall be spread at a rate of one pound per square foot over the layer of woven geotextile. The

nonwoven geotextile shall then be placed on top of the layer of bentonite. These three components shall be needlepunched together by a board of barbed needles to push fibers from the layer of nonwoven geotextiles through the bentonite into the bottom layer of woven geotextile.

4.4 The encapsulating geotextiles shall be polypropylene. The bottom layer of geotextile shall be a minimum 6 oz. per square yard nonwoven polypropylene needlepunched fabric. The top layer of geotextile shall be a minimum 5 oz. per square yard woven polypropylene fabric.

5.0 INSTALLATION

5.1 All roll materials shall be labeled and bagged in ultraviolet resistant packaging. Stored rolls shall be on a flat dry surface and tarped to avoid any unnecessary stress on the packaging.

5.2 The surface upon which the liner will be installed shall be graded in accordance with the Drawings. Any debris, roots, and angular or sharp rocks larger than one inch in diameter shall be removed as well as any other organic or deleterious materials. The subgrade shall be compacted as specified in Article 5.4 of Section 02220. Prior to the deployment of the liner, the subgrade shall be final graded as required to fill any voids, cracks, or abrupt changes such as windrows and grooves from construction traffic.

5.3 Work on the slopes shall be undertaken before the bottom to prevent erosion in the event of rainfall. Seams shall be perpendicular to the toe of the slope at all times. Seams at the base of the slope shall be a minimum of five feet from the toe of slope.

5.4 Work on the bottom of the pond shall be performed in a sequence and manner so as to prevent erosion or damage to completed work. Dewatering of the bottom of the pond shall be maintained so the projected work area has been free of standing water for a minimum of 24 hours.

5.5 Lap joints shall be formed by lapping the edges of the panels a minimum of 9 inches. All edges shall be pulled tight to maximize contact and to smooth out any wrinkles or creases between adjacent panels. A bead of pure bentonite shall be hand applied at a minimum rate of ¼ pound per lineal foot continuously along all seams, centered in the lap joint, after the panels have been anchored in place.

5.6 For any penetrations or structures the liner will contact, a 4 inch deep by 12 inch wide notch shall be cut along the edge of the area. The liner shall be brought up to the appurtenance and trimmed to fit snugly. A pure bead of bentonite shall be hand applied and compacted into half of the notch. The liner shall then be inserted. The remaining area of the notch shall be filled with pure bentonite and compacted.

5.7 Liner cover material shall be placed on the liner on the same day that the liner is installed. Light ground pressure equipment (less than 6 psi contact pressure) shall be used and shall be operated on a minimum of 12 inches of cover. The liner anchor trenches shall be filled prior to placement of cover. The cover material shall be placed so as not to cause any ripples or folds in the liner.

5.8 When covering the side slopes with onsite structural fill or sand fill, the cover material shall be placed up the slope from the bottom. The material shall be within the moisture content range specified in Article 5.5 of Section 02220; however, there will be no specified minimum density. Instead, compaction shall be by a minimum of four uniform passes of the spreading equipment.

5.9 Bottom ash used for liner cover on the pond bottom shall be dewatered such that no free water is present in the ash at the time of placement. Water that drains from the ash prior to placement as liner cover shall be directed into the existing bottom ash pond. Compaction shall be by a minimum of four uniform passes of the spreading equipment.

5.10 The primary area for temporary storage of dewatered bottom ash shall be within the existing bottom ash pond. If the Contractor desires to temporarily store dewatered bottom ash outside of the existing bottom ash pond, the following procedures shall be implemented.

1. An area shall be prepared that confines the bottom ash and storm water runoff within approximately two feet high berms.

2. The temporary storage area within the berms shall be lined with a minimum 6 mil thick polyethylene liner, or Engineer-approved equal.

3. All water within the berms shall be immediately pumped to the existing bottom ash pond.

5.11 Liner areas that have been completed and covered with bottom ash shall not be used for the temporary storage of bottom ash. Construction traffic also shall not be allowed on the completed and covered lined areas.

END

SECTION 02645

CONCRETE EROSION CONTROL REVETMENT

TABLE OF CONTENTS

CONCRETE EROSION
CONTROL REVETMENT
CROSS-04085
02645-

1.0 SCOPE

1.1 This Section covers the technical requirements for the furnishing and installation of concrete erosion control revetment.

2.0 CODES AND STANDARDS

2.1 The latest edition and published addenda of the following publications in effect on the date of Contract Award are a part of this Section and, where referred to by title or by basic designation only, are applicable to the extent indicated by the specific reference:

None.

2.2 Where the above referenced codes and standards contain recommendations in addition to requirements, the recommendations shall be considered requirements and shall be followed unless stated otherwise by this technical specification Section.

2.3 In the event of any conflict between codes, or Technical Specifications and codes, the more stringent regulation shall apply.

3.0 SUBMITTALS

3.1 With Bid:

1. The Contractor shall submit the following information:
   a. Proposed supplier of fabric form material.
   b. Grout mix design.
   c. Conceptual panel layout drawing.

3.2 After Award:

1. The following drawings, information, and data shall be submitted in accordance with Appendices B, C, and E to the Special Conditions:
   a. Material certification for fabric form material.
   b. A drawing showing installation details, panel layout, sizes, and direction of panels.

4.0 DETAILED REQUIREMENTS

4.1 The fabric form shall be ARMORFORM, as manufactured by Nicolon Corporation; FABRIFORM, as manufactured by Construction Techniques, Inc., or Engineer-approved equal.

4.2 Fabric form material shall consist of double-layer woven fabric joined together by spacer cords, of uniform length, to produce a mat with a minimum finished nominal thickness of three inches, and a minimum nominal weight after grout placement of 35 lb/ft2 Points of connection shall be staggered to provide a bonded cobbled surface appearance.

4.3 Mill width rolls shall be cut to the length required, and the two layers of fabric separately joined bottom edge to bottom edge and top edge to top edge by means of sewing thread to form multiple width panels. All factory sewn seams shall be downward facing.

4.4 Grout stops shall be installed at predetermined, mill width, intervals to regulate the flow of grout.

4.5 Immediately following receipt of the fabric forms at the Job Site, forms shall be inspected and stored in a clean dry area where they will not be subject to mechanical damage, exposure to moisture, or direct sunlight.

4.6 Grout shall consist of a mixture of Portland cement, fly ash, fine aggregate (sand), and water so proportioned and mixed as to provide a pumpable grout. Grout fluidizer conforming to these specifications may

be used at the option of the Contractor. The mix shall be Class "I" and shall exhibit a compressive strength of 2500 psi at 28 days when made and tested in accordance with Section 03310.

5.0 INSTALLATION

5.1 The concrete erosion control revetment shall be placed over the bentonite geocomposite liner cover material within five days of cover material placement. Any damage to the cover material shall be repaired prior to placing the fabric forms.

5.2 Site Preparation:

1. Areas on which fabric forms are to be placed shall be constructed to the lines and grades shown on the Drawings.

2. No fabric forms shall be placed over the subgrade material until the subgrade surface has been approved by the Engineer.

5.3 Fabric Form Placement:

1. Fabric form panels shall be placed within the limits shown on the Drawings.

2. Adjacent fabric form shall be joined before grout injection by field sewing or zippering the two bottom layers of fabric together and the two top layers of fabric together. All sewn seams shall be downward facing.

3. When conventional joining of panels is impractical, adjacent panels may be overlapped a minimum of 3 feet. Simple butt joints between panels shall not be permitted.

4. Expansion joints shall be provided at maximum 400 feet intervals. Each expansion joint shall be a minimum 3 feet overlap with six mil polyethylene bond break between panels.

5.4 Grout Placement:

1. Grout shall be injected in such a way that excessive pressure on the fabric and cold joints are avoided.

2. Foot traffic on the filled mat shall be prohibited for one hour after pumping.

3. All anchor trenches shall be backfilled and compacted within three days of completing grout placement.

5.5 The Contractor shall only work on an area that can be completed in one working day. Completion shall be defined as the placement of the liner and placement of the protective layer of 12 inches of cover material. During the cover material placement, a minimum of 12 inches of material shall be kept between the liner and any machinery or equipment at all times.

END

Appendix G - Provisions for Surveillance, Maintenance, and Repair of the CCR Unit

(6 total pages)

4.10. Impoundment and Landfill Inspection Procedure

4.10.1. Inspections are to be performed on the following schedule:

Cross	Inspection by Plant Personnel (Personnel must complete: Initial Inspector Training and 3-yr Refresher Training)	Inspection by a Qualified Dam Safety Engineer (contact Civil Projects Supervisor)
Wastewater Decant Pond	Weekly	Every 5 years
Bottom Ash Pond	Weekly	Annuallyw/ internal inspection of decant structure every 5 years
Gypsum Pond	Weekly	Annually
Stormwater Pond (Units 1&2)	Annually	Not required
Stormwater Pond (Units 3&4)	Annually	Not required
Coal Pile Runoff Pond	Annually	Not required
Leachate Collection Pond	Annually	Not required
Landfill Non-Contact Stormwater Pond	Annually	Not required
Sediment Pond	Annually	Not required
Class 2 Landfill	Weekly	Annually
Class 3 Landfill	Weekly	Annually
Grainger		
Ash Pond 1	Monthly	Annually
Ash Pond 2	Monthly	Annually
Cooling Pond	Annually	Every 5 years
Jefferies		
Ash Pond A	Weekly	Annually
Ash Pond B	Weekly	Annually w/internal inspection of outlet structure every 5 years
Spoil Bank – Exterior Inspection (Boat or Walking)	Weekly	Annually
Winyah		
Ash Pond A	Weekly Annually – walking inspection	Annually
Ash Pond B	Weekly Annually – walking inspection	Annually w/internal inspection of outlet structure every 5 years
South Ash Pond	Weekly Annually – walking inspection	Annually w/internal inspection of outlet structure every 5 years
West Ash Pond	Weekly Annually – walking inspection	Annually
Slurry Pond 2	Weekly Annually – walking inspection	Annually
Slurry Pond 3&4	Weekly Annually – walking inspection	Annually

Cooling Pond	Annually	Every 5 years
Intake Canal	Annually	Every 5 years
Discharge Canal	Annually	Every 5 years

Rainey

Process Water Retention Pond	Quarterly	Every 5 years
Stormwater Pond 01	Annually	Every 5 years
Stormwater Pond 02	Annually	Every 5 years
Stormwater Pond 03	Annually	Every 5 years
Stormwater Pond 04	Annually	Every 5 years

Document inspections on the Impoundment Inspection Reports, in Appendix E - FORMS.

4.10.2. The individual inspecting the dike(s) should inspect the crest, the slopes, and the area downstream, and complete the form, noting issues as follows:

Leaks

Any leaks on the dry side of the dike should be described such as the approximate quantity of flow, whether the water is discolored and the exact location of the leak. If a leak is found, Generation Technical Services should be notified immediately so that the appropriate steps to control the situation, and notify agencies if necessary, can be taken.

Seepage

Seepage on the dry side of the dike can be an indication of changes or shifts in the dike structure and possible future leaks. Any seepage should be described in the report.

Wet Spots

The dikes should be inspected when it has been dry for a period of time. Any areas on the dikes where the soil appears damp compared to the surrounding soil should be noted. This could be evidence of seepage.

Aquatic Weed Growth

Any aquatic weeds or wetland weeds, such as cattails, mosses, and algae, seen around the dry side of dikes could signify seepage from the ponds. If wetlands are downstream of the toe on the dry side of the dike, then the aquatic weed growth will not necessarily be a sign of dike seepage and does not need to be included in the report.

Trees and Woody Vegetation

Trees and woody vegetation can obscure problems, provide habitat for burrowing animals, and prevent growth of a protective grass cover. Trees growing along the downstream slope and near the toe of the downstream slope are a special concern and should be noted so maintenance or repair can be made.

Erosion

Any signs of erosion should be included in the report.

Depressions or Ruts

Depressions and ruts can hold water and make maintenance mowing more difficult or can weaken the soil and cause localized sloughing of the slope. These should be filled and graded to drain. Re-establish vegetation if needed.

Water Level in the Pond
Pond levels should be inspected and recorded to be sure freeboard is adequate and the dikes will not be overtopped.

Overall Condition
The overall condition of the dike should be described. The back of the report form can be used to continue any comments or descriptions.

Excessive Sediment Buildup
Stormwater ponds shall be inspected for excessive sediment buildup. Buildup shall be periodically cleaned out of stormwater ponds and properly disposed of.

Discharges and Pipe Crossings
All outlets of hydraulic structures which pass through a dike or abutment or underneath the base of a surface impoundment should be inspected for abnormal discoloration, flow, or discharge of debris or sediment which could indicate a leak. In addition, all pipe crossings, whether through, under, or over a dike, should be inspected.

4.10.3. Driving Inspections should involve a view of both sides of the dike and around the toe of the dike exterior looking up whenever possible. The inspector should walk to evaluate pipe crossings, the area around discharge structures, wet areas, or areas demonstrating erosion.

4.10.4. Inspections by Qualified Dam Safety Engineer shall include participation by station personnel. Documentation shall be as appropriate and shall be provided for station files. When noted, inspections should include internal inspections of principal outlet structures. Consideration should be given to performing the annual walking inspection coincidentally with the Dam Safety Engineer's inspection when required annually.

4.10.5. If any issues are noted, a map or drawing of the dike/pond(s) inspected should be attached to the report form. Sketches of the ponds at each station are available in Appendix E, FORMS. Significant issues shall be immediately communicated to supervision.

4.10.6. Work orders should be written to address any problems noted on the reports. The person performing the inspections is responsible for the writing and follow-up on the work request.

4.10.7. The completed report forms should be reviewed by management, and reviewed and approved by the Station Manager. Copies should be kept in the station's files and sent to Generation Technical Services.

GENERATION - TECHNICAL SERVICES **DATE:** _____

IMPOUNDMENT INSPECTION REPORT: CCR UNIT **INSPECTOR:** _____ **SIGNATURE:** _____

CROSS STATION **REVIEWED BY:** Station Manager **SIGNATURE:** _____

BOTTOM ASH POND

FEATURE	OK √	LOCATION & COMMENTS
1. Crest		
Alignment (H)		
Settlement (V)		
Cracks (Measure Dimensions)		
Excessive Vegetation		
Burrows or Ruts		
2. Slopes		
Seepage (Flow, lush grass, clarity)		
Erosion gullies		
Slides (cracks, bulges, scarps)		
Vegetation (trees present, no grass)		
Animal burrows		
Rip-rap displacement		
Freeboard Adequate		
Settlement/Depression		
3. Area Downstream		
Seepage (Flow, lush grass, clarity)		
Boils		
Drainage Ditches		
Drainage Pipes		
Vegetation (trees present, no grass)		
4. Outlet Works		
Inspect Outlet Weir to Decant Pond		
Flowing as expected from outlet?		
No abnormal flow, discoloration, debris, or sediment?		
5. Crossings		
No flow, settlement, erosion, voids, or sediment loss visible at pipe crossings (both sides of dike and crest)		Main pipe entry point: Coal Pile Runoff Pond pipe entry point (current): Coal Pile Runoff Pond pipe entry point (abandoned): Leachate Collection Pond entry point: Abandoned underdrain: Note other:
6. Overall Condition		
Note any other issues		New pipes?
7. Instrumentation		
Staff gauge reading as expected?		Record reading if applicable.

NOTE: SHOW LOCATION OF PROBLEM AREAS ON AN ATTACHED DRAWING and DESCRIBE DEFICIENCY
S I M P L E - Sketch, Inspect, Measure, Photograph, Locate, Engage a Qualified Engineer if necessary

Copies: Station Files (original)
Operating Record - ECM
Generation Technical Services - Tim Swicord