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Coal Combustion Residue Impoundment

Round 9 - Dam Assessment Report

L.V. Sutton Steam Electric Plant

Ash Ponds

Progress Energy

Wilmington, North Carolina

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response, the U.S. EPA is assessing the stability and functionality of coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of the L.V. Sutton Steam Electric Plant Ash Ponds is based on a review of available documents and on the site assessment conducted by Dewberry personnel on February 17, 2011. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2.5, there are six recommendations based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the Sutton Ash Ponds are **FAIR** for continued safe and reliable operation, with no recognized existing or potential management unit safety deficiencies.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety.)

In early 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

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EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. Also, after the field visit, additional information was received by Dewberry & Davis LLC about the Sutton Ash Ponds that were reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management unit(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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APPENDIX A

Doc 01:	Ash Handling System Overview
Doc 02:	Ash Pond Summary
Doc 03:	Five-Year Independent Consultant Inspection
Doc 04:	Sutton 5-mile Map
Doc 05:	Sutton Dam Inspection Procedure
Doc 06:	2009 Annual Inspection
Doc 07:	2010 Annual Inspection
Doc 08:	2010 Annual Inspection (Supplemental)
Doc 09:	NCDENR Inspection
Doc 10:	NPDES
Doc 11:	Sutton – Slope Stability Analysis
Doc 12:	71 Ash Pond Inundation Report
Doc 13:	84 Ash Pond Inundation Report
Doc 14:	Repair Completion Package
Doc 15:	NCDENR Repair Approval

APPENDIX B

Doc 14:	Dam Inspection Checklist Form (1971 Ash Pond)
Doc 15:	Dam Inspection Checklist Form (1984 Ash Pond)

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit on February 17, 2011, and review of technical documentation provided by Progress Energy.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The dike embankments and spillway appear to be structurally sound based on a review of the engineering data provided by the owner's technical staff and Dewberry engineers' observations during the site visit; however, one area along the 1971 ash pond embankment did have a factor of safety slightly below the acceptable standard.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

Adequate capacity and freeboard exists to safely pass the design storm.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is adequate. Engineering documentation reviewed is referenced in Appendix A.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the management unit provided by the owner was an accurate representation of what Dewberry observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Overall, the visual assessment of the ash pond embankment system is satisfactory; however, up to 12-inch diameter trees and numerous shrubs were found on the outer slope of the south embankment of the 1971 Ash Pond (State ID No. NEWHA-004) adjacent to the canal. The 1971 Ash Pond is inactive. The management or removal of these trees is being coordinated with the North Carolina Department of Environment Natural Resources (NCDENR). Within the 1984 Ash Pond (State ID No. NEWHA-005) there were also a few areas of minor depressions, non-structural surface erosion, and multiple burrows that require remediation. These areas are reportedly being addressed on a regular maintenance schedule.

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In September 2010, there was an overflow of the interior dike that caused a minor overflow and erosion along the primary dike. The dike was temporarily repaired under observation and approval of NCDENR and permanent repair is schedule to be implemented in 2011 (Appendix A: Doc 02 – Ash Pond Summary). Embankments appear structurally sound.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the ash ponds.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. The management unit dikes are instrumented. Piezometers were installed in February of 2009 so there is limited data from the instrumentation.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is rated FAIR for continued safe and reliable operation due to lack of sufficient engineering data. Implementation of the following recommendations would help improve the rating. It is anticipated that both ponds would be considered satisfactory for continued safe and reliable operation upon satisfactorily addressing recommendations in sections 1.2.1 and 1.2.2.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

A liquefaction potential analysis should be performed and a plan of action to further evaluate and address the factor of safety that does not meet the applicable minimum factor of safety should be developed.

1.2.2 Recommendations Regarding the Field Observations

The following issues need to be addressed with routine maintenance:

- Continue coordinating with NCDENR about trees on downstream slope to determine a resolution.

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- Re-vegetate downstream embankment where necessary.
- Re-vegetate interior embankment where recent work has taken place.
- Address burrows along downstream slope.
- Address rill erosion at locations along downstream embankment.
- Address undercutting and erosion around outfall.

1.2.3 Recommendations Regarding Continued Safe and Reliable Operation

Develop a plan of action to address the insufficient factor of safety along the 1971 ash pond embankment.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Robert Miller, Progress Energy
Bill Forster, Progress Energy
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Michael Hanson, Dewberry
Justin Story, Dewberry

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1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on February 17, 2011.

Michael Hanson, P.E., LEED AP BD+C

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2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The L.V. Sutton Steam Electric Plant and ash ponds are located approximately 3 miles from Wilmington, NC off of U.S. 421. Figure 2.1a depicts a vicinity map around the plant while Figure 2.1b depicts an aerial view of the facility.

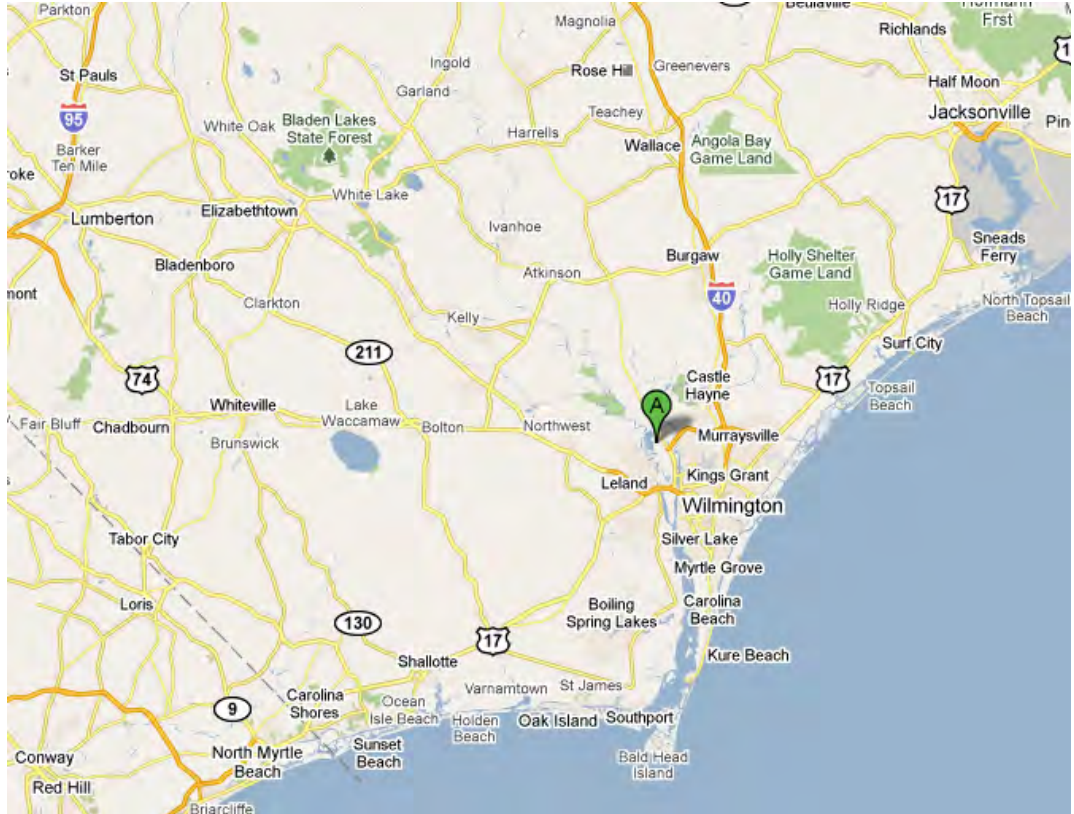


Figure 2.1a: L.V. Sutton Steam Electric Plant Vicinity Map

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Figure 2.1b: L.V. Sutton Steam Electric Plant Aerial View

	1984 Ash Pond	1971 Ash Pond
Dam Height (ft)	32	24
Crest Width (ft)	12	12
Length (ft)	10,000	7,000
Side Slopes (upstream) H:V	3:1	3:1
Side Slopes (downstream) H:V	3:1	3:1

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

Fly ash is collected at the base of the stack by an electrostatic precipitator. The collected ash is stored in hoppers and conveyed pneumatically to a silo (see photo below). From the silo it is conveyed hydraulically in a pipe to the ash pond. The discharge into the ash pond is continuous. A flowchart for handling the fly ash is shown in Appendix A (Doc 01 – Ash Handling System Overview).

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Hopper and fly ash sluice line

2.2.2 Bottom Ash

Bottom ash is collected from the furnace and conveyed through the same pipe as the fly ash into the ash pond.

2.2.3 Boiler Slag

Boiler slag is collected from the boiler and is sluiced into the same pipe that conveys fly and bottom ash into the ash pond.

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Location from where boiler slag is piped

2.2.4 Flue Gas Desulfurization Sludge

No scrubbers are used in this plant so there is no flue gas desulfurization (FGD) process or related waste products produced or handled.

2.3 SIZE AND HAZARD CLASSIFICATION

The ash pond is impounded by an earthen embankment system consisting of a dike configuration. There are two main ponds, one of which is inactive (1971 Ash Pond) and the other active (1984 Ash Pond) with an internal dike separating the two. Reference Table 2.1 for dam height, crest width, length and side slopes. The storage capacity corresponding to the top of the embankment for the 1971 Pond is 248 acre-feet and the 1984 Pond is 1,364 acre-feet based on the Dam Information Summary dated January 25, 2011 provided by Progress Energy (See Appendix A: Doc 02 – Ash Pond Summary).

Category	1984 Ash pond	
	Storage (Ac-ft)	Height (ft)
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

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Table 2.3b: USACE ER 1110-2-106 Size Classification		
Category	1971 Ash Pond	
	Storage (Ac-ft)	Height (ft)
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

Per the Federal Guidelines for Dam Safety dated April 2004, a Low Hazard Potential classification applies to those dams where failure or misoperation results in no probable loss of human life and/or environmental losses. Losses are principally limited to the owner's property.

Table 2.3c: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Considering the low probability of loss of life and low economic/environmental losses should the fly ash dam system fail, a Federal Hazard Classification of **Low** appears to be appropriate for this facility.

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

Per a response to questions asked by the EPA, the following materials are temporarily or permanently contained in the units: 1971 Pond contains fly ash, bottom ash, boiler slag, storm water, ash sluice water, coal pile runoff, and categorical low volume wastewater; the 1984 Pond contains fly ash, bottom ash, boiler slag, and ash sluice water. The drainage area is assumed to be the surface area of the ponds.

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	1984 Pond	1971 Pond
Surface Area (acre)	82	54
Current Storage Capacity (cubic yards)	2,200,587	400,107
Current Storage Capacity (acre-feet)	1,364	248
Total Storage Capacity (cubic yards)	2,463,560	1,092,227
Total Storage Capacity (acre-feet)	1,527	677
Crest Elevation (feet)	34	28
Normal Pond Level (feet)	26	24

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

Per a geotechnical report from Law Engineering, the 1971 Ash Pond was added by constructing a sand fill dike along the north side of the discharging canal. In 1983, the north ash pond dike was modified by placing fill on the sides of the existing dike or constructing a new dike. The 1984 Ash Pond was constructed of sand fill with one-foot thick clay lining the interior face. The clay lining was covered with a two-foot thick protective sand fill. (See Appendix A: Doc 03: Appendix A – Five-Year Independent Consultant Inspection, October 29, 1987.)

2.5.2 Outlet Structures

1971 Pond – The outlet consists of a 4’ diameter concrete vertical riser connected to a 3’ diameter concrete pipe that would discharge into the cooling lake.

1984 Pond – The outlet consists of a 4’ diameter concrete vertical riser connected to a 3’ diameter concrete pipe that discharges into the cooling lake. A gated diversion structure also allows flow to be piped to the Cape Fear River.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

All critical infrastructures were located using aerial photography and might not accurately represent what currently exists down-gradient of the site. Progress Energy provided a 5-mile downstream map showing L.V. Sutton Electric Steam Plant and associated critical infrastructure that can be found in Appendix A (Doc 04: Sutton 5-mile Map). There are numerous roads, businesses, schools, places of worship, and other critical areas within the 5-mile radius of the plant. Not all critical infrastructures are labeled for clarity purposes.

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3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

Summary of Reports on the Safety of the Management Unit

Progress Energy has provided their dam inspection procedures which can be found in Appendix A (Doc 05: Sutton Dam Inspection Procedure). Additional annual inspections can be found in Appendix A as well.

The recommendations from the Five-Year Independent Consultant Inspection Report, dated December 20, 2007 (Appendix A, Doc 03: Five-Year Independent Consultant Inspection):

1971 Ash Pond

- Large bushes and brushy vegetation needed to be trimmed before summer 2008;
- Progress Energy should continue their tree cutting program;
- If operation is resumed on this pond, the exterior slope adjacent to the cooling pond and discharge canal should be checked during monthly inspections for signs of seepage;

1984 Ash Pond

- Briars and small brush on interior slope need to be removed;
- Progress Energy should continue their tree cutting program;
- The east dike repair area should be monitored to verify vegetative growth has properly occurred.

Recommendations from the 2010 Limited (Annual) Field Inspection Report, dated December 16, 2010 (Appendix A: Doc 07 – 2010 Annual Inspection):

- 1971 Ash Pond – Plant personnel shall follow up and confirm that water level was lowered to meet the recommendation of NCDENR Dam Safety;
- 1971 Ash Pond – A survey was recommended to check the crest elevation and then provide any necessary fill to bring the crest back to its original elevation of 28.0’;
- 1984 Ash Pond – Locate and fill the animal burrows identified;

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- 1984 Ash Pond – A survey was recommended to check the crest elevation and then provide any necessary fill to bring the crest back to its original elevation of 34.0'. It was also recommended to survey the crest of the interior storage dike and restore that elevation to 42.0'.

3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

The dam is inspected by NCDENR Dam Safety and Division of Water Quality. An example of their inspection can be found in Appendix A (Doc 09 – NCDENR Inspection).

Discharge from the impoundment is regulated by the Federal National Pollutant Discharge Elimination Program and the impoundment has been issued a National Pollutant Discharge Elimination System (NPDES) Permit, No. NC0001422, dated December 14, 2006 (See Appendix A: Doc 10 – NPDES).

3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

In September of 2010 there was an overflow of the interior dike during an intense local rainfall of approximately 20 inches. This event caused minor overflow of the 1984 Ash Pond primary dike leading to down cut erosion along the dike exterior. All ash was contained on site. The dike was temporarily repaired under observation and approval of NCDENR and permanent repair is scheduled to be implemented in 2011 (Appendix A: Doc 02 – Ash Pond Summary).

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4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The 1971 Ash Pond was constructed in 1971 under the direction of Brown & Root. The original crest elevation was 18.0’.

The 1984 Pond was constructed by Lindsay and Associates under the direction of Carolina Power & Light.

4.1.2 Significant Changes/Modifications in Design since Original Construction

In 1983, the 1971 Ash Pond dikes were raised 8’ to a new crest elevation of 26.0’ to provide additional storage capacity.

In 2006, additional storage capacity was generated within the 1984 Ash Pond by the addition of an interior dike with a crest at 42 feet.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No significant repairs/rehabilitation documentation was provided for the 1971 Pond.

The 1984 Pond had some outlet pipe modifications in 2000 when a pipe joint opened up under the upstream slope and seepage through the slope caused a sinkhole. In 2001, interior slope repairs were made on the east dike to fill areas of wave-action erosion. Repairs were made in 2007 to the interior slope and clay liner on the east side of the pond. The most current repair was the breach due to the 20” rainfall event in September 2010. (See Doc 14 – Repair Completion Package and Doc 15 – NCDENR Repair Approval in Appendix A.)

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The ash pond was designed and operated for reservoir sedimentation and sediment storage of fly ash. Plant process waste water, coal combustion waste, coal pile stormwater runoff, and stormwater runoff around the Ash Pond facility are discharged into the reservoir. Inflow water is treated through gravity settling and deposition, and the treated process water and stormwater runoff are discharged through an unregulated type of overflow outlet structure.

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4.2.2 Significant Changes in Operational Procedures and Original Startup

No documentation was provided describing any significant changes in Operating Procedures.

4.2.3 Current Operational Procedures

To the best of our knowledge, original operational procedures are in effect.

4.2.4 Other Notable Events since Original Startup

No additional information was provided.

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5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Michael Hanson, P.E., and Justin Story, EIT, performed a site visit on Thursday, February 17, 2011, with the participants listed in Section 1.3.

The site visit began at 10:00 AM. The weather was windy, cool and partly cloudy. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix B for additional information from the site visit. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the dam was that it was in fair condition and only minor findings were noted.

5.2 1971 ASH POND (INACTIVE)

5.2.1 Crest

The crest had no signs of depressions, tension cracking, or other indications of settlement or shear failure and appeared to be in satisfactory condition; however, there were signs of minor rutting, most likely from vehicular traffic.



Vehicular rutting along crest

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5.2.2 Upstream/Inside Slope

The upstream/inside slopes were not vegetated in many areas. Progress Energy had performed some work within the pond and stated they would be seeding when the weather was appropriate.



Upstream slopes to be vegetated, Spring 2011

5.2.3 Downstream/Outside Slope and Toe

There were no signs of surficial sloughing along the downstream slope. Rill erosion and animal burrows were found in multiple places along the embankment. There were also areas that were bare from recent repairs and needed to be seeded. Up to 12-inch diameter trees and numerous shrubs were found on the downstream slope of the south embankment of the 1971 Ash Pond adjacent to the canal. The management or removal of these trees is being coordinated with the North Carolina Department of Environment Natural Resources (NCDENR).

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Repair along downstream east slope



Trees along downstream south slope

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5.2.4 Abutments and Groin Areas

The ash pond embankment consists of a dike system completely surrounding the 1971 Ash Pond; therefore, the earthen embankment does not abut existing hillsides, rock outcrops or other raised topographic features.

5.3 1984 ASH POND

5.3.1 Crest

The crest had no signs of depressions, tension cracking, or other indications of settlement or shear failure, and appeared to be in satisfactory condition; however, there were signs of minor rutting, most likely from vehicular traffic.

5.3.2 Upstream/Inside Slope

The upstream slopes were mostly vegetated with tall grasses and other wetland vegetation. No scarps, sloughs, depressions, bulging, or other indications of slope instability or signs of erosion were observed.

5.3.3 Downstream/Outside Slope and Toe

There were no signs of surficial sloughing along the downstream slope. Rill erosion and animal burrows were found in multiple places along the embankment. There were also areas that were bare and need to be seeded.

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Rill erosion along downstream slope, 1984 Ash Pond



Animal burrows along downstream slope, 1984 Ash Pond

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5.3.4 Abutments and Groin Areas

The 1984 Ash Pond embankment consists of a dike system completely surrounding the pond; therefore, the earthen embankment does not abut existing hillsides, rock outcrops or other raised topographic features.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

The risers for both ponds are described in Section 2.5.2.

5.4.2 Outlet Conduit

The visual portion of the outlet conduit was functioning properly with no apparent deterioration. There was minor undercutting around the concrete outfall caused by splashing from the raised outfall weir.



Concrete outfall of 1984 Ash Pond where undercutting is present

5.4.3 Emergency Spillway

No emergency spillway is present.

5.4.4 Low Level Outlet

No low level outlet is present.

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6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No documentation has been provided about the flood of record. The Ash Pond system is a diked embankment facility having a contributing drainage area equal to the surface area of the impoundments; therefore the impounded pool would not be anticipated to experience significant flood stages. It was noted that a 20" rain in September of 2010 did cause a breach in the 1984 Ash Pond dike. It was also reported that impounded water levels are being maintained at lower elevations since the incident.

6.1.2 Inflow Design Flood

According to FEMA Federal Guidelines for Dam Safety, the current practice in the design of dams is to use the Inflow Design Flood (IDF) that is deemed appropriate for the hazard potential of the dam and reservoir, and to design spillways and outlet works that are capable of safely accommodating the floodflow without risking the loss of the dam or endangering areas downstream from the dam to flows greater than the inflow. The recommended IDF or spillway design flood for a low-hazard, intermediate-size structure (See section 2.2), in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria, is the 100-year to ½ PMF (See Table 6.1.2).

Hazard	Size	Spillway Design Flood
Low	Small	50 to 100-yr frequency
	Intermediate	100-yr to ½ PMF
	Large	½ PMF to PMF
Significant	Small	100-yr to ½ PMF
	Intermediate	½ PMF to PMF
	Large	PMF
High	Small	½ PMF to PMF
	Intermediate	PMF
	Large	PMF

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The Probable Maximum Precipitation (PMP) is defined by the American Meteorological Society as the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area at a certain time of year. The National Weather Service (NWS) further states that in consideration of our limited knowledge of the complicated processes and interrelationships in storms, PMP values are identified as estimates. The NWS has published application procedures that can be used with PMP estimates to develop spatial and temporal characteristics of a Probable Maximum Storm (PMS). A PMS thus developed can be used with a precipitation-runoff simulation model to calculate a probable maximum flood (PMF) hydrograph.

The 24-hour, 10-sq mi PMP depth is 43 inches. Since the facility has a contributing drainage area equal to the surface area of the impoundment, it is anticipated adequate freeboard exists so the facility would not experience significant flood states. The reported maximum discharge from the riser into the cooling pond during a 100-year event is 86.69 cfs. No other flow values or predicted maximum elevations were provided.

6.1.3 Spillway Rating

No spillway rating was provided. The Ash Ponds are a diked embankment facility having a contributing drainage area equal to the surface area of the impoundment; therefore, the impounded pool would not be anticipated to experience significant changes in elevation. The outlet structure type is unregulated and, given little change in the normal pool elevation, the resulting discharge rate is expected to be relatively constant.

6.1.4 Downstream Flood Analysis

A dam breach analysis and inundation map development was performed for the site and the result was that there could potentially be commercial properties affected if a breach occurred on the east side of the ash ponds. It was determined that a breach along the western side would result in a discharge into the cooling lake, which would have very little effect on the water level of the lake (Appendix A: Doc 11 – 71 Ash Pond Inundation Report and Doc 13 – 84 Ash Pond Inundation Report).

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Supporting documentation reviewed by Dewberry is adequate.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Adequate capacity and freeboard exists to safely pass the design storm.

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7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

A stability analysis report for both the 1971 Ash Pond and the 1984 Ash Pond, dated March 8, 2011, by MACTEC provides information on the structural stability of the dikes. Steady state (normal) and seismic loading conditions were analyzed. (See Appendix A – Doc 11: Slope Stability Analysis for the complete report.) The analysis results are presented in Section 7.1.4, Factors of Safety and Base Stresses.

7.1.2 Design Parameters and Dam Materials

The 2011 MACTEC report includes documentation of the shear strength design properties for the ash pond embankments, which is included in this report and is presented in the following section. (See Appendix A – Doc 11: Slope Stability Analysis for the complete report.)

Test results showing the strength parameters of the embankments are presented below. The results present generally acceptable values for these types of materials.

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Table 4a				
Soil Properties for Stability Analysis (1971/1983 Ash Pond)				
Soil Description (USCS Classification)	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (degrees)
<u>Section at B-1</u>				
Dike Fill: (SM, SP-SM)	120	125	10*	33
Dike Fill: (SP)	125	130	10*	38
Dike Fill: (SP)	120	125	0	33
Foundation: (SP)	120	125	0	32
<u>Section at B-2</u>				
Dike Fill: (SM)	120	120	0	33
Dike Fill: (SP)	125	130	0	38
Dike Fill: (SM,SP-SM)	115	120	0	30
Possible Ash (Silt): (MH)	100	105	0	25
Possible Ash (Silt): (MH)	100	105	0	30
Foundation: (SM)	120	125	0	31
<u>Section at B-3</u>				
Sedimented Ash	100	105	0	30
Dike Fill	125	130	0	38
Dike Fill: (SM)	120	125	0	31
Dike Fill: (SM)	115	120	0	29
Possible Ash (Silt): (ML)	100	105	0	29
Foundation: (SM)	120	125	0	33

*A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surface along the face of the slope.

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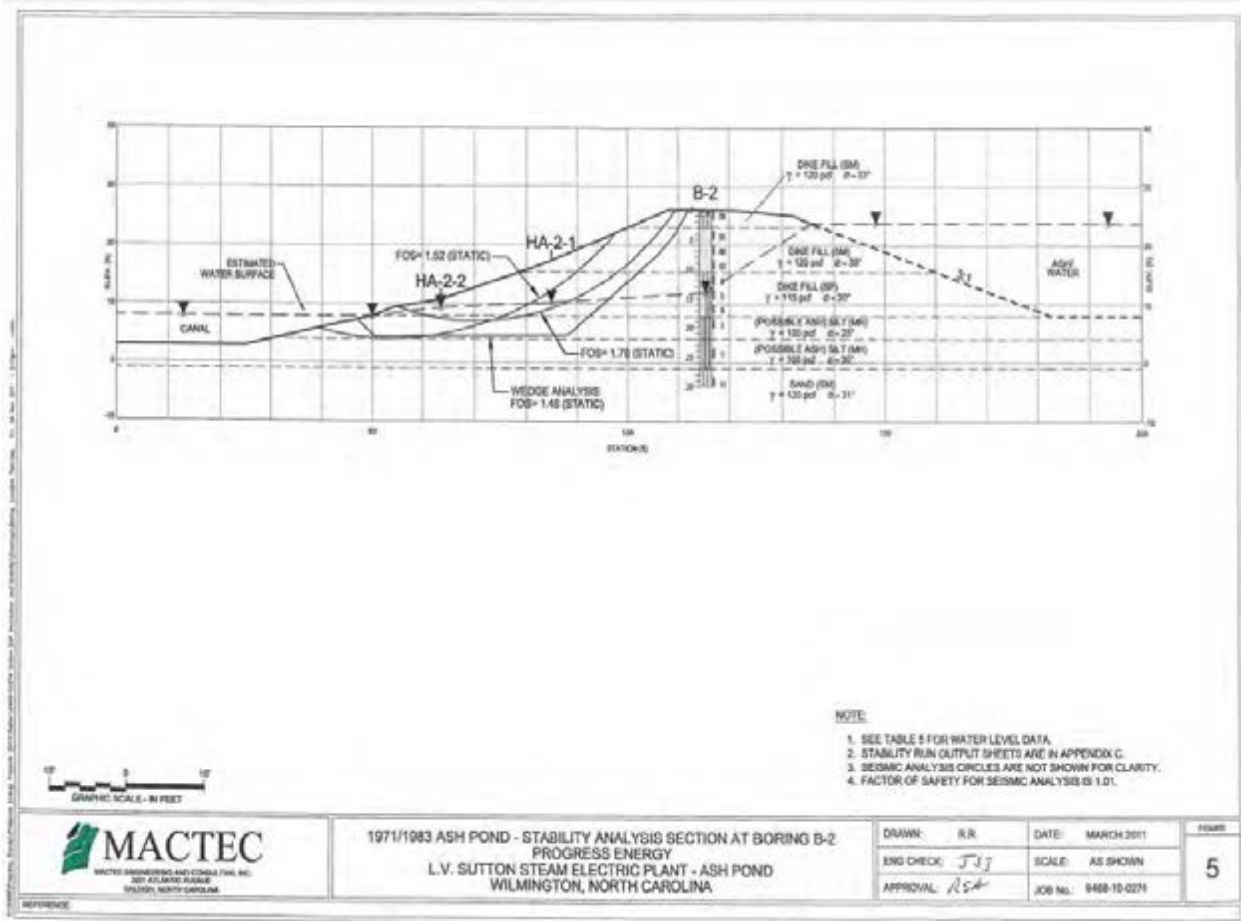


Figure 7.1.2a: 1971 Ash Pond – Typical Stability Analysis Section (B-2)

Table 4a Soil Properties for Stability Analysis (1984 Ash Pond)				
Soil Description (USCS Classification)	Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (degrees)
<u>Section at B-1</u>				
Dike Fill: (Sand)	120	125	10*	35
Protective Sand Cover	120	125	0	32
Clay Lining	120	125	150	22
Foundation: Sand	120	125	0	32

*A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surface along the face of the slope.

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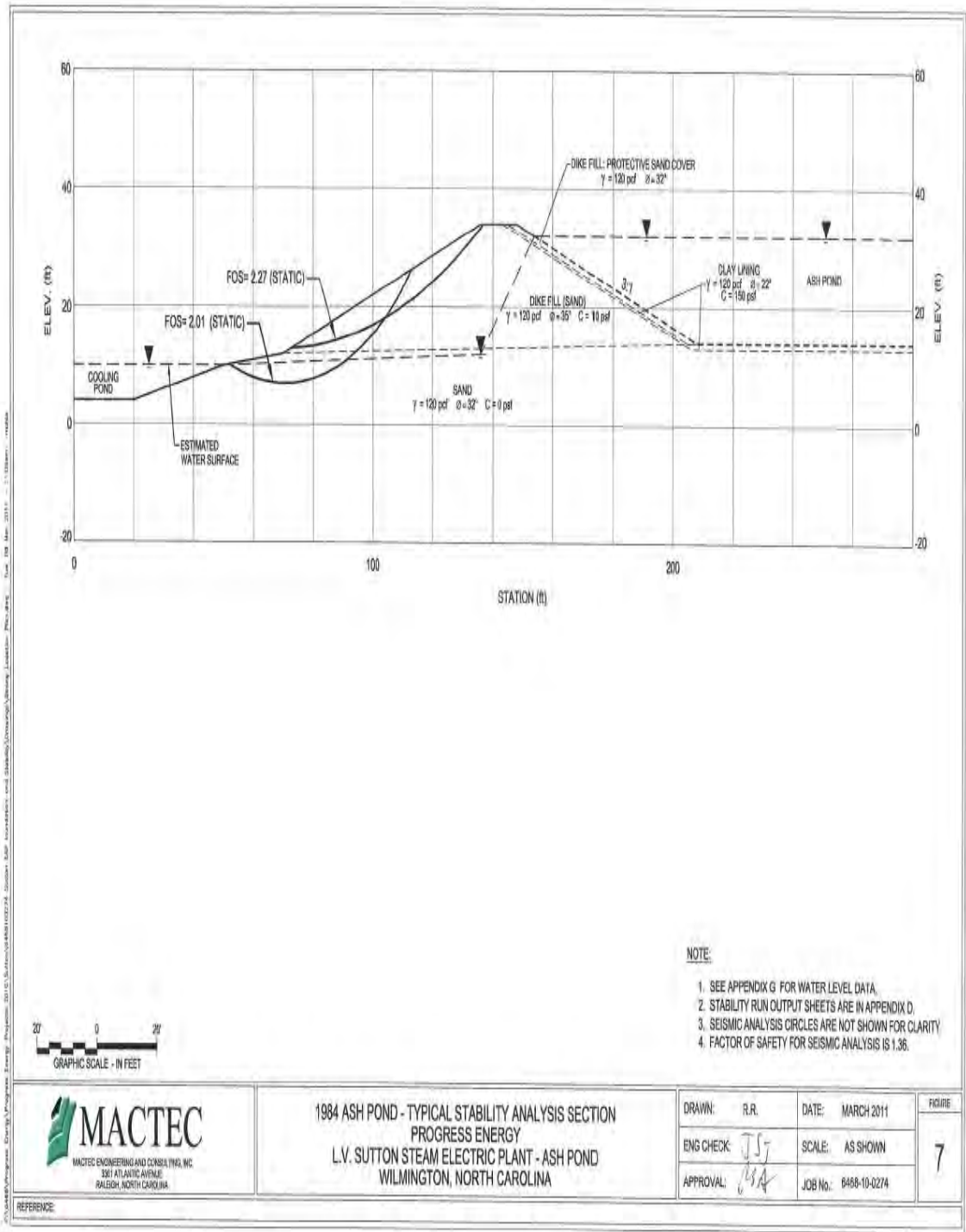


Figure 7.1.2b: 1984 Ash Pond – Typical Stability Analysis Section

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7.1.3 Uplift and/or Phreatic Surface Assumptions

Piezometers were installed in 2009 on the 1984 Ash Pond so data is limited. A location map of the piezometer locations can be found in Figure 7.1.3a. Piezometer readings are shown in the Figure 7.1.3b and more can be found in Appendix A (Doc 11: Slope Stability Analysis)

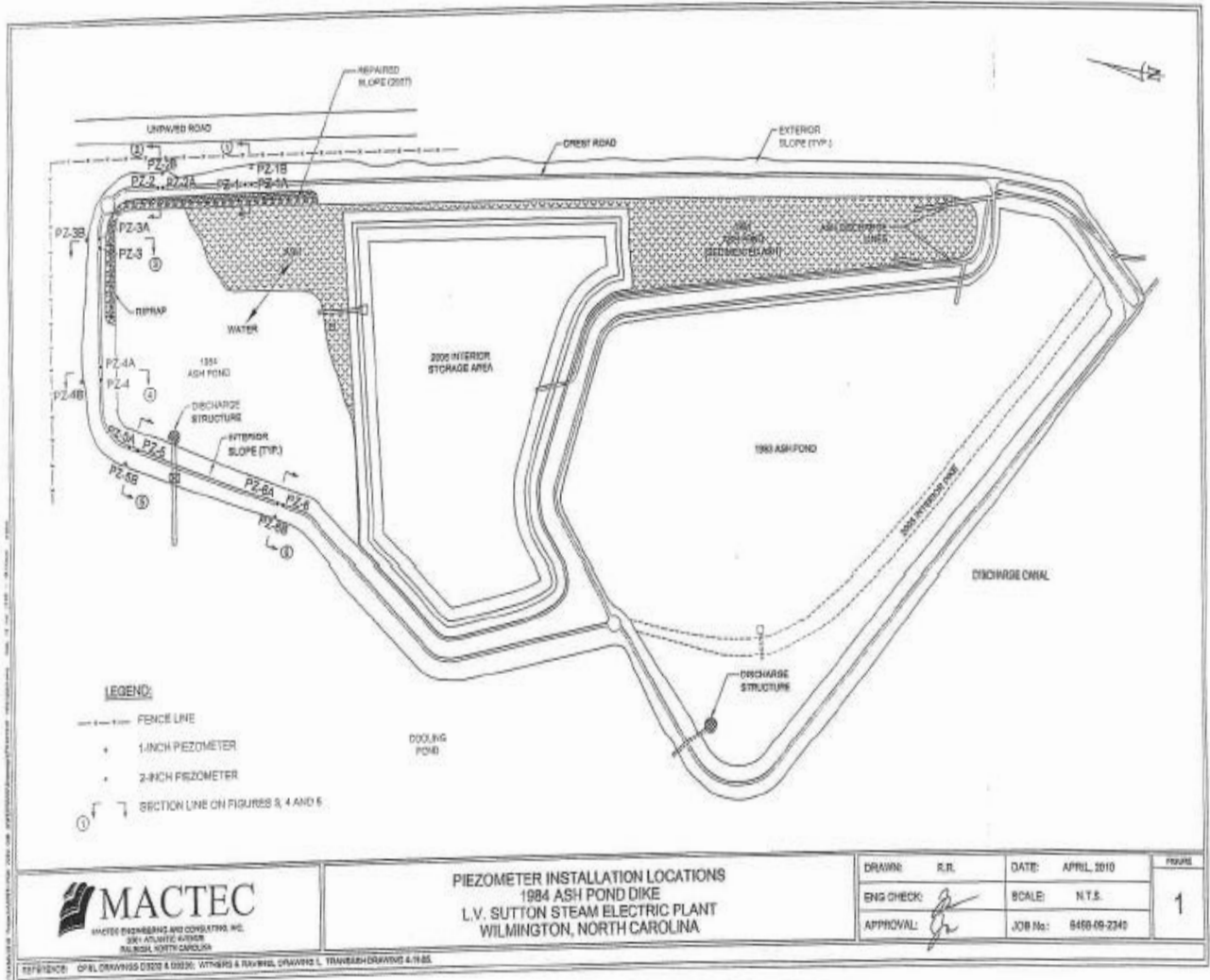


Figure 7.1.3a: 1984 Ash Pond Piezometer Locations

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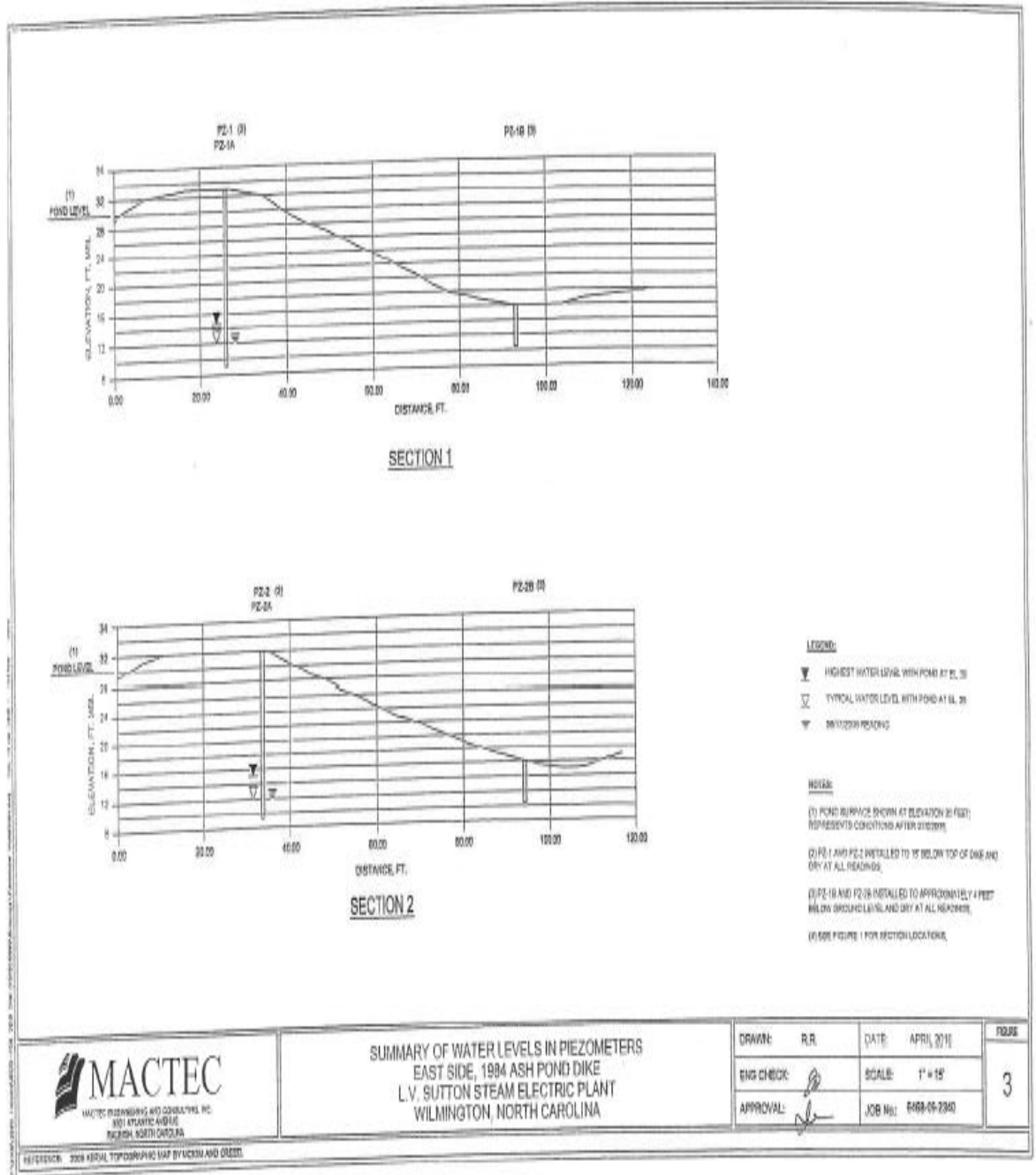


Figure 7.1.3b: 1984 Ash Pond – Summary of Water Levels in Piezometers

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7.1.4 Factors of Safety and Base Stresses

Table 7.1.4 – FACTORS OF SAFETY AGAINST SLOPE FAILURE		
	Factor of Safety	
	Static	Seismic
1971 Pond – Section B-1	1.64	1.18
1971 Pond – Section B-1	1.85	1.40
1971 Pond – Section B-2	1.52	1.03
1971 Pond – Section B-2	1.78	1.25
1971 Pond – Section B-2	1.46*	1.01
1971 Pond – Section B-3	2.51	1.56
1971 Pond – Section B-3	2.51	1.68
1984 Pond	2.51	1.56
1984 Pond	2.51	1.68
1984 Pond – Original Slope Stability Analysis	1.583	NA
1984 Pond – MACTEC Slope Stability Analysis with Original phreatic surface	1.57	NA

*A factor of safety of 1.46 does not meet the minimum requirement of 1.5. MACTEC did note this in the Slope Stability Analysis (Doc 11, Appendix A), but stated they consider this factor of safety acceptable based on the performance of the dike and the expectation of closure in the near future.

7.1.5 Liquefaction Potential

No liquefaction potential documentation was provided.

7.1.6 Critical Geological Conditions

The site is located in the Coastal Plain Province and is underlain by Castle Hayne Limestone which is eroded through in places to expose the PeeDee Formation. The site falls in the Zone 1 seismic zone according to Corps of Engineers with a design earthquake: $a_h=0.05g$. (Appendix A: Doc 02 – Ash Pond Summary)

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7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is adequate; however, we would recommend further evaluating 1971 Pond - Section B-2 and developing a plan of action to increase factors of safety to meet or exceed minimum applicable standards.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall, the structural stability of the dam appears to be satisfactory.

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8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

Operational procedures are described in Section 4.2.1.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Maintenance of the dam and project facilities is adequate, although a few maintenance items should be addressed.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Based on the assessments of this report, operating procedures appear to be adequate.

8.3.2 Adequacy of Maintenance

Based on the assessments of this report, maintenance procedures appear to be adequate.

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9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Surveillance procedures include monthly, annual, and five-year inspections.

Annual Inspections:

Annual inspections were provided by Progress Energy and can be found in Appendix A: Doc 06-08.

Five-Year Inspections:

Five-Year inspections reports were provided by Progress Energy and can be found in Appendix A: Doc 03 - Five-Year Independent Consultant Inspection.

9.2 INSTRUMENTATION MONITORING

The 1984 Ash Pond's piezometer program is described in Section 7.1.3. The piezometers were installed in 2009 and the number and location of the instruments is adequate for monitoring the phreatic surface.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

Based on the data reviewed by Dewberry, including observations during the site visit, the instrumentation program is adequate.

System Purpose

The ash handling system consists of two major components: the bottom ash conveyor and the fly-ash conveyor. Because the characteristics of ash are very different from the front to the back of the boiler, the collection and transport are separate for the furnace bottom ash and collection points downstream. Both systems are essential in complying with air emission permits and eliminating river water pollution. Without effective ongoing removal of ash, the boiler unit would require outages to remove the ash. A wet bottom ash system collects and removes ash from the furnace. Bottom ash is a mixture of slag, clinkers and coarse granular ash. Bottom ash is produced during combustion by impurities contained within coal. The system uses water impounding for the following reasons:

- To break up large pieces of slag by thermal shock as they fall into the pool of ambient temperature water.
- To keep the ash and slag submerged so that they do not fuse into large unmanageable masses that would result if they were exposed to furnace heat

The fly-ash system collects ash particles that drop out of the flue gas when the gas changes direction abruptly in the back pass and air heater ducts and is collected in hoppers along the flue gas outlet passage and precipitator. If this ash were allowed to exit at the stack, opacity readings would be out of compliance.

System Flow Path

Bottom Ash Removal : The bottom ash system begins in the furnace. Ash continuously falls into a water impounded ash hopper from the furnace above. The bottom ash hopper, which is designed with sloped sides for gravity flow, collects the ash. Water jets assist the removal of ash deposits from the ash hopper. The ash is changed to slurry form during the ash removal process. A manually operated vertical lifting door (inner door) in the dog house is opened to allow removal of bottom ash. During ash removal operations, the inner door and a pneumatically operated bottom ash supply valve are opened and the ash slurry is drawn from the hopper through the clinker grinder using a jetpulsion pump. High-pressure water from the ash pumps flows through the jetpulsion pump. The jet pump acts as a nozzle, increasing the velocity and creating a vacuum inside the jet pump nozzle. The vacuum draws the bottom ash slurry from the clinker grinder through the jet pump and discharges to the ash pond. The clinker grinder reduces any lumps or clinkers to a size, which will pass through the jetpulsion pump, and into the ash sluice line. The ash sluice line, located in a concrete trench below plant grade level, transports the ash away from the plant to the ash pond area.

Fly Ash Removal - This system consists of precipitator hoppers, economizer hoppers and air heater hoppers. The economizer hoppers are set directly beneath the economizer where the flue gas is exiting the boiler. They are located in a space where the flue gases change direction. This change in direction of the gas flow causes large particulates to fall out of the gas and accumulate in the hoppers. The air heater hoppers beneath the air pre-heaters have been disconnected from the fly ash system. The discharge from the air heater hoppers is piped to the bottom ash and is only set-up when washing the air heaters. The precipitator collects ash on the electrically charged plates and electrodes. Rappers and vibrators knock the dust off the plates and electrodes where it is collected in the hoppers. Fly ash is pneumatically conveyed from each hopper. The airflow necessary for conveying the ash is created by a hydroveyor

exhauster and air intake valves on each of the lines serving the dust hoppers. The fly ash and conveying air mix with water in the inlet section of the hydroveyor exhauster and are discharged into an air separator tank. Conveying air after being separated from the fly ash is vented to the atmosphere. The ash-water slurry discharges by gravity from the air separator to a common header with Unit 2. The ash-slurry mixture is pumped through a jet pump to the ash pond. Figure 1 below is an illustration of the fly ash removal system.

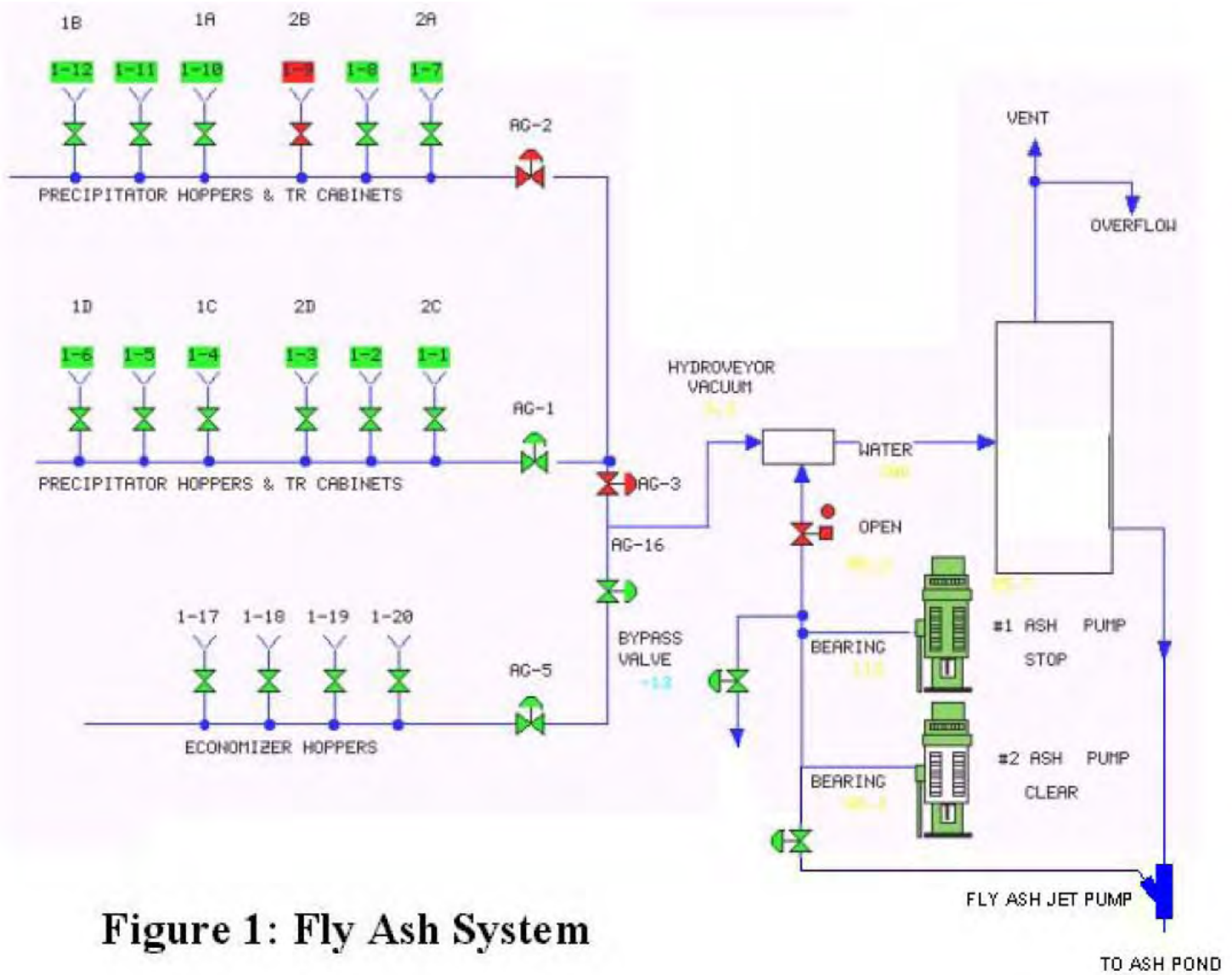


Figure 1: Fly Ash System

DAM INFORMATION SUMMARY
L.V. Sutton Steam Electric Plant
Ash Ponds
New Hanover County, North Carolina

1. Location

Located 3 miles northwest of Wilmington, NC

Latitude: N34.2931° (1983 Pond) N34.2991° (1984 Pond)

Longitude: W77.9928° (1983 Pond) W77.9924° (1984 Pond)

Latitudes and longitudes taken from NC Dam Safety Inventory listing

NC Dam Identification Numbers: NEWHA-004 (1983 Pond); NEWHA-005 (1984 Pond)

2. Size and Dimensions

	<u>1984 Pond</u>	<u>1983 Pond*</u>
Length:	10,000 feet	7,000 feet
Maximum Structural Height:	32 feet	24 feet
Surface Area (acres):	82	
Storage capacity (acre-feet):	1,364	248
Size Classification:	Medium	Small
Hazard Classification:	Low	Low
(Classifications based on NC Dam Safety Regulations and Dam Safety Inventory)		
Regulatory Design Storm	100 yr **	50 yr**
US Slope:	3 (H):1(V)	3 (H):1(V)
DS Slope:	3 (H):1(V)	3 (H):1(V)
Crest Width:	12 feet	12 feet
Crest Elevation:	34 feet	28 feet
Design maximum operating level:	32 feet	26 feet
Current Operating Level	26 feet	24 feet
Instrumentation	18 piezometers***	None

* The 1983 pond is listed as the 1971 ash pond in the NC Dam Inventory.

** 100-year storm is 10 inches over 12 hours. 50-year storm is 9 inches.

*** Installed in 2009.

3. Geology and Seismicity

Located in Coastal Plain Province. Underlain by Castle Hayne Limestone which is eroded through in places to expose the PeeDee Formation

Zone 1 seismic zone according to Corps of Engineers with
 Design Earthquake: $a_h = 0.05 g$

4. Design Information

1983 Pond: Originally designed by Brown & Root in 1971, raised to present elevation under CP&L design with assistance from William Wells. Limited subsurface exploration. No information on stability or seepage analyses. No internal drainage.

Outlet works consist of a 4' diameter concrete vertical riser connected to a 3' diameter concrete pipe through the dike that would discharge to the Cooling Lake. There are no seepage collars.



3301 Atlantic Avenue, Raleigh, NC 27604

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

1984 Pond: Designed by CP&L with assistance from William Wells. Subsurface exploration was performed. Stability was re-evaluated by CP&L in 1987, FS = 1.58. Seepage analysis performed as part of design assuming $k = 1 \times 10^{-7}$ cm/sec for 1-foot thick clay liner with calculated seepage rate of 108 gpm. No internal drainage provided.

Outlet works consist of a 4' diameter concrete vertical riser connected to a 3' diameter concrete pipe through the dike that is connected to piping leading to the Cape Fear River. There are two seepage collars.

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

5. Construction History

1983 Pond

Original construction of north Ash Pond dike done in 1971 under direction of Brown & Root to crest elevation of 18.0 feet. In 1983, Dickerson raised north Ash Pond to operating level to elevation 26.0 feet. Testing was conducted.

1984 Pond

- Constructed by Lindsay and Associates under direction of CP&L. Testing was performed.
- Outlet pipe modifications were provided in 1999 to connect discharge to a pipe leading to the Cape Fear River. A pipe joint opened under the upstream slope and seepage through the slope created start of sinkhole. Grouting of slope conducted in 2000 along with slip-lining of the pipe for long-term protection.
- Interior slope repairs on east dike provided in summer, 2001 to fill areas of beaching erosion and reseed.
- Additional storage capacity was constructed within the pond area and placed in service during 2006. Engineering and design was provided by Withers & Ravenel, and construction by Trans-Ash. This area is not included in the NC Dam Safety Inventory.
- Repairs were made in 2007 to the interior slope and clay liner on the east side of the pond, north end.

6. Inspection History

The dam is inspected on 5-year intervals. Since 2002, site visits have been made on a generally yearly basis for limited visual observations.

LAW: 1987, 1997, 2002, 2003, 2004, 2005, 2007, 2008, 2009, 2010
S&ME: 1992

7. Current Issues

No significant issues based on the 2010 limited field inspection by MACTEC. Vegetation was cut in 2010. Subsequent to the 2010 inspection, a breach due to localized runoff from very heavy rains overtopped a very small portion of the 1984 pond dike occurred in an area containing only sedimented ash. No ash release occurred. Temporary repairs were made and permanent repairs are to be implemented in 2011.

8. Overall Condition

The 2010 inspection indicated the dikes are in good condition. No items requiring emergency actions by the plant were noted.



MACTEC

engineering and constructing a better tomorrow

December 20, 2007

Progress Energy
1420 Walpat Road
Smithfield, North Carolina 27577

Attention: Mr. Bill Forster

**SUBJECT: REPORT OF INDEPENDENT CONSULTANT INSPECTION
ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC PROJECT NO. 6468-07-1686 (02)**

Dear Mr. Forster:

MACTEC Engineering and Consulting, Inc. (MACTEC), is pleased to submit the attached report of our five-year independent consultant inspection for the ash pond dikes at the Sutton Plant. This report has been prepared in accordance with Work Authorization No. 2720-33 under our contract 2720.

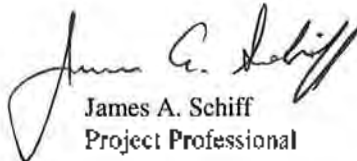
During the 1997 inspection, a Historical Volume was prepared which contained historical information regarding the site geology, design and construction, inspection history and exhibits related to these items. That volume is not updated for subsequent inspections. The attached report contains the field inspection observations and recommendations, photographs, and pertinent exhibits specifically related to current dike conditions.


In general, our inspection noted no external, presently visible signs of serious conditions requiring emergency repairs for public safety. Other than routine maintenance, scheduled Progress Energy inspections, and some minor repairs, no major repairs appear warranted at this time. Overall, the ash pond dikes appear to be in good condition.

We appreciate the opportunity to provide our professional services to you on this project. Please contact us if you have any questions.

Respectfully yours,

MACTEC ENGINEERING AND CONSULTING, INC.


James A. Schiff
Project Professional


J. Allan Tice, P.E.
Senior Principal Geotechnical Engineer
Assistant Vice-President
Registered, North Carolina 6428

JS/JAT/js

**FIVE-YEAR INDEPENDENT CONSULTANT INSPECTION
ASH POND DIKES
L. V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA**

Prepared For:

Progress Energy
Smithfield, North Carolina

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.
Raleigh, North Carolina

December 20, 2007

MACTEC Project No. 6468-07-1686 (02)



PROGRESS ENERGY
L.V. SUTTON STEAM ELECTRIC PLANT
ASH POND DIKES
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC JOB NO. 6468-07-1686 (02)

FIVE-YEAR INDEPENDENT CONSULTANT INSPECTION


AS REQUIRED BY

NORTH CAROLINA UTILITIES COMMISSION

December 20, 2007

BY MACTEC ENGINEERING AND CONSULTING, INC.
RALEIGH, NORTH CAROLINA

REPORT PREPARED BY



J. Allan Tice, P.E.
Senior Principal Geotechnical Engineer
Assistant Vice-President
Registered, North Carolina 6428



**L.V. SUTTON STEAM ELECTRIC PLANT
2007 INDEPENDENT CONSULTANT INSPECTION
ASH POND DIKES**

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APPENDIX A Information Summary

APPENDIX B Photograph Location Map and Photographs

1.0 SUMMARY

1.1 General

This report presents the results of an independent consultant inspection of the 1983 and 1984 Ash Pond dikes at Progress Energy's L.V. Sutton Steam Electric Plant in Wilmington, North Carolina. The independent inspection is performed at five-year intervals as required by the North Carolina Utilities Commission (NCUC) for facilities owned by Progress Energy in North Carolina and not licensed by the Federal Energy Regulatory Commission (FERC). The inspection was performed in accordance with U.S. Army Corps of Engineers (USACE) guidelines⁽¹⁾.

The last five-year independent inspection was made in 2002 by Law Engineering and Environmental Services, Inc. (LAW) now MACTEC Engineering and Consulting, Inc. (MACTEC). MACTEC acquired LAW in February 2002. The results of that inspection were presented in a report dated October 18, 2002⁽²⁾.

A review of the historical information about the site geology, engineering data, design and construction of the dikes and operations was prepared for the 1997 inspection⁽³⁾ and is only summarized briefly in this document.

A field inspection was performed on December 4, 2007 to observe the condition of the earth dike and appurtenant structures of the ash ponds. Photographs were obtained to document existing conditions and significant features. Inspection reports prepared by Progress Energy plant personnel were also reviewed.

Overall, the ash pond dikes inspected and their appurtenant structures are judged to be adequately designed, constructed and maintained, and in satisfactory condition.

1.2 Purpose and Scope

The purpose of this dam safety inspection and report is to identify, within the limitations of surface field inspection and office review of available data, records and operating history, any actual or potential deficiencies related to the maintenance, operation, or surveillance of the dams, dikes and other water control structures of the plant in order to protect the public's safety and property. The objective is to recommend immediate action for public protection where necessary, further studies and analysis where required, and acceptance of the present condition of the dikes if justified by the engineering data and inspections.

This report, prepared for Progress Energy, is concerned with a safety evaluation of the 1983 and 1984 Ash Pond dikes for the L.V. Sutton Steam Electric Plant. These water retaining structures were constructed to their present configurations in 1983 and 1984-1985. Interior work in both ponds was done since the last five-year independent inspection; however these interior works are not considered new dikes subject to

¹Number in parentheses refers to reference listed in Reference List Section 5.0.

inspection, because the original pond exterior dikes remain as the primary ash impoundments. The interior works were briefly inspected for the purpose of confirming absence of conditions that would affect the original exterior dikes.

This inspection has been conducted in general conformity with the guidelines outlined in the USACOE publication, "Recommended Guidelines for Safety Inspection of Dams", Phase I⁽¹⁾. It encompassed a review of the 2002 safety inspection report including a description of the geologic and engineering data relative to site conditions as well as the design, construction, and operational features of the dikes and appurtenant structures. Activities since the 2002 inspection, maintenance history and plans for future maintenance activities were reviewed in consultation with maintenance and operations personnel at the L.V. Sutton Plant.

A site visit was made on December 4, 2007 by MACTEC personnel for the purpose of inspecting features relating to the safety and integrity of the ash pond dikes and appurtenant structures. These features included evidence of leakage, erosion, seepage, slope instability, settlement, and conditions of protective vegetation. Photographs were obtained to document the general condition of the dike and significant features observed during the field inspection.

1.3 Conclusions

Based on a review of pertinent data in the manner described above, the following conclusions were reached:

1. There was no evidence of excessive seepage, erosion, instability or settlement of the dikes. In general, the ash pond dikes appear to be in good condition and are adequately maintained. The discharge structures are generally in good condition; however, the 1983 Ash Pond outlet pipe was not visible for inspection.
2. A good procedure is in place for plant personnel conducting regular safety inspections.
3. The recommended remedial activities/repairs fall under the category of normal maintenance and are not considered emergency actions.

1.4 Recommendations

Based on the field inspection and review of available data, the following recommendations are made. Most of these were reviewed with plant personnel at the completion of the field inspection.

1983 Ash Pond Dike

1. The large bushes and brushy vegetation on the west dike should be trimmed before summer, 2008 to allow better slope visibility.
2. Progress Energy's program of cutting trees on the exterior slopes should continue.
3. If operation of the 1983 pond is resumed, the exterior slope adjacent to the Cooling Pond and discharge canal should be checked during the monthly inspections for signs of seepage.

1984 Ash Pond Dike

1. Patches of briars and small brush on the interior slope should be controlled by spraying or cutting so the slope can be observed during routine inspections.
2. Progress Energy's program of cutting trees on the exterior slopes should continue.
3. The east dike interior repair area should be monitored for progress of vegetative growth the rip rap sprayed as needed to control vegetation.

2.0 ASH POND DESCRIPTIONS

A brief description of the dikes at the ash ponds is given in this section and on the information sheets attached in Appendix A. Further details about the design and construction of the ash ponds are contained in the Historical Volume prepared for the 1997 inspection⁽⁵⁾.

2.1 Location

The subject ash ponds are located about 3,000 feet north of the generating area of the L.V. Sutton Plant and on the east side of the plant cooling pond. The L.V. Sutton Plant is located along the east side of the Cape Fear River in New Hanover County, North Carolina, about four miles north of the confluence of the Cape Fear and Northeast Cape Fear Rivers. The site coordinates are 34°17'50" north latitude and 77°59'30" west longitude. Exhibit 1 shows the site location on the Castle Hayne USGS 7.5-minute quadrangle map. Exhibit 2 shows the locations of the ash ponds relative to the plant.

2.2 1983 Ash Pond

2.2.1 General Description

The 1983 Ash Pond dikes were constructed by raising original dikes constructed in 1971. The 1971 design and construction was by Brown and Root. The 1983 modifications were designed by CP&L (now Progress Energy) and constructed by Dickerson Inc. under the administration of CP&L. Law Engineering provided field density testing. Exhibit 3 shows general design information for the 1971 dikes. Exhibits 4 through 8 show plan and sections for the 1983 modifications. The present dikes have a crest elevation varying from elevation 28 feet MSL to 34 feet MSL. The higher elevation is at the common dike with the 1984 Ash Pond. The crest width is 12 feet and side slopes are 3(H):1(V). Including the common dike, the dike length is about 3,800 feet. This ash pond was taken out of service in 1985, but opened in 2001 to allow temporary use during various repair work and ash removal activities in the 1983 and 1984 ponds. Currently, no ash is being discharged into the 1983 Ash Pond. Some free water was present in parts of the pond at the time of our inspection. However most of this pond, including the interior storage area, was dry.

The 1983 pond main discharge structure consists of a 48-inch diameter vertical concrete riser connected to a 12-inch diameter concrete outlet pipe, and is located in the northwest corner of the pond. At the time

of our field inspection there was minimal free water around the structure. No water was flowing into the vertical riser. The outlet of the discharge pipe is submerged in the cooling pond and not visible. The design top of the discharge riser was elevation 26 feet MSL. MACTEC recommended in 2005 that the maximum water level, based on a survey of the dike crest be established at elevation 23.5 feet. At the time of our inspection, the water level was at approximately elevation 22 feet.

There are no piezometers or movement monuments in the dikes.

In 2005, an interior storage area was constructed as described in Section 3.1.1. Exhibits 10 and 11 show plan and sections. The dike for this storage area is not considered as a dike requiring NCUC inspections; however it is described in this report for reference and documentation purposes.

2.2.2 Size and Hazard Classification

The 1983 Ash Pond dikes are classified as small size dams under both guidelines of the US Army Corps of Engineers⁽¹⁾ and the North Carolina Dam Safety Regulations⁽⁴⁾. A low hazard classification is appropriate for the dikes due to the lack of potential for loss of life or significant property damage if failure were to occur. The historical volume⁽³⁾ provides additional discussion.

2.3 1984 Ash Pond

2.3.1 General Description

The 1984 Ash Pond was constructed during 1984/1985. The design was done by CP&L (now Progress Energy). Construction was by Lindsay and Associates under administration of CP&L. Soil and Materials Engineers, Inc. provided field density testing. Exhibits 4 through 9 show plan, section and design details.

The crest of the dikes is at elevation 34 feet MSL, the crest width is 12 feet and the interior and exterior slopes are 3H:1V. The maximum dike height is about 32 feet. The length, including the common dike with the 1983 pond is about 10,000 feet. In 2006, an interior storage area was constructed in the south portion of the pond as discussed in Section 3.YY. The planned maximum operating level for the 1984 pond is elevation 32 feet MSL.

The discharge structure for the 1984 pond is located at the west side, near the northern end. It consists of a 48 inch concrete vertical riser connected to a 36 inch diameter concrete outlet pipe. The vertical riser is constructed of approximate 2-foot tall segments that can be added or removed as needed to allow adjustment of the pond level. At the time of the field visit, the pond level was at about elevation 24, and water was flowing into the riser.

There are no piezometers or movement monuments in the dikes.

In 2001, CP&L contracted with Triangle Grading and Paving for removal of sedimented ash from the south portion of the pond. To accommodate the work, entry and exit ramps were constructed up the exterior side slopes on the east dike. These ramps remain in place and are maintained to facilitate access as needed for ash removal activities.

In 2006, an interior storage area was constructed as described in Section 3.1.2. Exhibits 12 and 13 show plan and sections. The dikes for this storage area are not considered as dikes requiring NCUC inspections; however they are described in this report for reference and documentation purposes.

2.3.2 Size and Hazard Classification

The 1984 Ash Pond dikes are classified as intermediate size dams under both the guidelines of the U.S. Army Corps of Engineers¹¹ and the North Carolina Dam Safety Regulations¹². A low hazard classification is appropriate for the dikes due to the lack of potential for loss of life or significant property damage if failure were to occur. The historical volume¹³ provides additional discussion.

3.0 ACTIVITIES SINCE 2002 INSPECTION

The following actions related to the performance of the dikes, some in response to the 2002 inspection, were taken since the 2002 field inspection by an independent consultant.

3.1 Interior Dike Construction

Two projects have been conducted to increase ash storage capacity since the 2002 inspection. Neither project modified the original perimeter dikes of either pond, and these interior projects are not considered modifications to the dikes subject to the NCUC inspection requirements. Both projects are described briefly for information and reference by future inspectors.

3.1.1 1983 Ash Pond Interior Construction

In 2005, TransAsh constructed low-height (approximately 6 feet high) dikes that tied in to the 1983-1984 common dike and formed an approximate 34-acre area. The initial outfall construction experienced a washout around the pipe that was repaired. Exhibit 10 shows the general plan, and Exhibit 11 shows a section at the repaired outfall structure. The dikes were constructed by excavating ash from within the pond and using it to form dikes. A vertical HDPE riser with stoplog capability was connected to an HDPE outlet pipe that released water into the 1983 pond near its discharge facility. This interior area was taken out of service in 2006, after the 1984 interior area was placed in service. Progress Energy plans to alternate use of this area with the 1984 area to extend the overall ash storage capacity.

3.1.2 1984 Ash Pond Interior Construction

In 2006, Withers & Ravenel designed an interior ash storage area for the southern end of the 1984 Ash Pond. Exhibit No. 12 shows the general plan and section. The design crest elevation is 42.0 ft MSL, and the planned operating level is elevation 40.0 feet. The maximum dike height above the original ash level is about 14 feet. The crest width is 25 feet wide with a gravel road in the center. The interior slope is at a ratio of 2H:1V and the exterior slope on the east, west and south sides is 4H:1V. Where the new dikes are adjacent to the 1984 pond perimeter dikes, the toe of the slope is set back eight feet and the space is graded to promote flow of water toward the north. On the north side, where the dike is adjacent to the impounded water of the 1984 pond, a stability berm with a 25-foot wide crest is added to the main slope.

Withers and Ravenel conducted geotechnical analyses to check the impact of the new dike and retained ash on the existing 1984 pond dikes. Their analyses for static slope stability showed a factor of safety greater than 2 for the existing dikes, which is acceptable. Because the 1984 pond dikes have a clay liner, seepage through the 1984 dikes is not expected.

The discharge facility for this interior pond (Exhibit 13) consists of a concrete riser structure six feet square connected to a 36-inch diameter HDPE pipe with an outlet invert elevation of 24.0 feet. The plans show that the 36-inch diameter HDPE pipe has a flowable fill bedding coupled with a filter diaphragm and seepage drain.

The interior pond dikes were constructed by TransAsh in 2006 under observation by Progress Energy personnel.

3.1 1984 Ash Pond Interior Slope Repairs

The interior slopes on the north and east dikes have a history of erosion and local loss of cover over the clay liner. Repairs were made in 2001, but subsequent storms and pond level fluctuations created additional erosion. In 2006 Progress Energy made additional repairs to these slopes. The repairs were constructed by TransAsh using details selected by Progress Energy from recommended options prepared by Law Engineering in 2000 (Exhibit 14) with addition of rip rap.

3.2 Maintenance Activities

Routine maintenance consists of occasional mowing the crest of the 1983 and 1984 Ash Pond dikes and the exterior slopes of the 1984 Ash Pond dikes by Progress Energy personnel. Additional vegetation control by application of herbicides is conducted by Progress Energy. A program of marking trees for cutting has been initiated, and marked trees are removed as personnel schedules and weather conditions allow.

3.3 Inspection Activities

Progress Energy plant personnel conduct monthly visual inspections of the ash ponds and prepare reports using a checklist. Over the past 5 years, MACTEC has performed limited field inspections of the cooling pond dike in 2003, 2004 and 2005. These limited field inspections consisted of a walking reconnaissance of the dams with representatives of Progress Energy and a review of inspection reports and maintenance activities for the past year. No significant concerns were noted during the field reconnaissance and records review during these limited inspections.

4.0 FIELD INSPECTION OBSERVATIONS

4.1 Method of Inspection

The field inspection for the Five-Year Independent Consultant Inspection of the Ash Pond Dikes was conducted on December 4, 2007 by Mr. Al Tice and Mr. James Schiff of MACTEC. At the plant, we interviewed Mr. Bruce Moorefield, and Mr. Issac Alderman, both chemistry technicians. Mr. Alderman conducts monthly visual inspections of the ash pond dikes.

A visual inspection was made of the dikes and appurtenant structures by observations from a slowly moving vehicle and on foot. Observations were made of the condition of the crest, interior and exterior slopes and structures where foot-accessible. Photographs were taken to document existing conditions and are contained in Appendix D. The location and orientation of each photograph is shown on the Photograph Location Map also contained in Appendix D. In general, comparison of 2007 photographs with comparable 2002 photographs showed no significant change in conditions (except for the repairs made to the northern and eastern interior slopes of the 1984 Ash Pond dike and the addition of the interior storage areas).

4.2 1983 Ash Pond

4.2.1 Dikes

Although no ash is presently being placed into the 1983 pond, there was a small area of water impounded around the discharge structure (Photograph 1). Most of the pond surface is dry ash, and there is tree and brush growth on most of the pond. Progress Energy has cut most of the larger tree growth observed in the 2002 inspection.

The water level at the discharge structure was estimated at about six inches below the base of the skimmer structure (Photograph 1). No apparent overflow was occurring. The discharge structure could not be accessed from the dike. We estimate the water elevation is about 22 feet.

The crest is generally level and shows no signs of unusual settlement or tension cracks. A thin layer of gravel is present on most of the crest.

The exterior slope of the west dike, from the intersection with the 1984 Ash Pond dike to about 300 feet south of the discharge structure, is moderately to thickly covered with tall grass. Some trees and brush are present at the toe area, and occasional larger trees are growing on the slope. The larger trees have markers identifying them to be cut during the next maintenance cutting. The slope in this area shows no seepage indications. Where the ash discharge pipe to the Cape Fear River was installed, there are minor local slumps upslope from the pipe, probably remnants of the pipe excavation work. In spots, the HDPE pipe was partly exposed.

The ash line along the exterior slope crosses the Cooling Pond discharge canal about 1000 feet south of the discharge structure. From this point south, the slope of the dike and the toe area are heavily vegetated with tall grass, small brush and small trees. Due to the season, the vegetation had little foliage, and the slope and toe area could be seen with minimal difficulty. However, in the growing season, it is unlikely the lower slope and toe will be visible from the crest. Progress Energy has been conducting maintenance cutting of trees and brush during the past five years as personnel schedules and weather permit. These maintenance operations are planned to continue. The present program is adequate and should continue.

The exterior slope in the area where water is impounded around the discharge structure did not show evidence of seepage from the slope or the toe.

Most of the old tree growth on the interior slope along the junction with the old ash surface was removed as part of the 2005 interior ash storage area construction.

Along the common dike with the 1984 pond, the interior slopes were in good visual condition, with acceptable levels of vegetation. These conditions may change in the spring when vegetation is more visible. We recommend if vegetation is observed in the interior slopes that it be maintained and kept at a minimum.

4.2.2 Discharge Structure

The discharge structure could not be accessed from the dike. The skimmer structure appears in good condition (Photograph 1). Water did not appear to be entering the riser as no sound of flowing water could be heard. The outlet of the discharge pipe is normally submerged below the cooling pond water surface. In 2003, at a time of low water level in the cooling pond, Progress Energy inspected the outlet pipe and found it to be intact, but only 12 inches in diameter, not the 36 inches expected from the original plans. The hydrologic discharge capacity was estimated in 2003 by MACTEC to require up to 83 hours to remove the water from the design storm of 8 inches. Because the 1983 Ash Pond is not regularly used, and even when used is not filled to its maximum capacity, the outlet system is considered adequate.

4.3 1984 Ash Pond

4.3.1 Dikes

The dikes for the 1994 pond were constructed of sand with an interior clay liner. The clay liner extends across the pond bottom as well. The design crest of the dikes is at elevation 34 feet msl, the crest width is 12 feet and the interior and exterior slopes are 3H:1V. The maximum dike height is about 32 feet. The length including the common dike with the 1983 pond is about 10,000 feet. At the time of our inspection, the pond level was about two to three inches above the riser. The riser top was at about elevation 24 feet MSL.

The field reconnaissance found the dike crest to be good visual condition with no signs of unusual settlement or cracking (Photographs 2, 3 and 4). A few small pine trees are present on the west dike. These have been marked for cutting by Progress Energy.

The exterior slopes of the dikes are moderately to well vegetated with grass and some briars and small bushes and weeds (Photographs 2, 3 and 4). Patches of briars are beginning to establish themselves on the slopes; we recommend these be controlled by spraying or cutting so the slope can be observed during routine inspections. No signs of instability or unusual erosion were seen. Even in sparsely vegetated areas, the sand appears to have formed a thin crust which resists surface erosion. A fence has been constructed along the toe that appears to be preventing access by 4-wheelers and horses which previously disrupted the thin crust and caused local erosion. The ash removal contractor has constructed ramps beyond the exterior dike slope. These do not appear to represent any hazard to the dike.

The exterior toe was dry on the west, north and east sides of the pond with no indication of seepage.

The interior slopes are well grassed, and there is a good growth of vegetation along the water line that reduces wave energy in most areas (Photographs 4 and 5). Patches of briars are beginning to establish themselves on the slopes; we recommend these be controlled by spraying or cutting so the slope can be observed during routine inspections.

The areas recently repaired on the north and east interior slopes were in good visual condition (Photograph 6). Vegetation is taking hold in the new rip rap. We recommend that spraying be done to control growth of vegetation in the rip rap. Vegetation that grows in the ash at the water line is acceptable as this vegetation reduces wave energy.

The interior slope around the outlet pipe showed no signs of settlement or loss of ground.

4.3.2 Discharge Structure

The vertical riser was submerged. The skimmer structure and interior surfaces that could be seen were in good visual condition. There is a concrete junction structure on the exterior slope where the ash line diversion to the Cape Fear River intersects the discharge line to the Cooling Pond. Several hairline

cracks were seen on the west side of this structure, near the base, with minor efflorescence (Photograph 7). These have been observed previously, are not unusual and pose no concern.

4.3.3 Ash Inlet Lines

The ash inlet lines are supported on the ground surface as they come up the exterior slope at the south end of the 1984 Ash Pond. Valves have been installed to allow directing ash either west to the 1983 Ash Pond or north or east to the 1984 Ash Pond or its interior storage area. The ash is presently being discharged into the south end of the interior storage area in the 1984 Ash Pond. The ash is allowed to flow out directly onto the sedimented ash. No significant concerns for erosion threats to the dikes were observed.

4.4 2006 Interior Ash Pond Dike Project

4.4.1 Interior Dike in 1984 Ash Pond

At the time of our inspections, the water level in the interior storage area was slightly above elevation 40.0 feet MSL, and was flowing over the top of the riser (Photograph 8) and out into the 1984 ash pond (Photograph 9). A slight discharge of seepage water from the seepage drain pipe alongside the discharge pipe was observed on the west side of the pipe.

The interior slopes have rip rap above the water level, and there is a good growth of vegetation along the water line that reduces wave energy in most areas.

The exterior slope has exposed fly ash with sparse to good grass cover (Photographs 3 and 10). Erosion control netting is present on the slope. MACTEC observed several areas along the top of the stability berm on the north dike where circular depressions about one to four inches deep and about one to three feet in diameter were present (Photograph 11). Discussions with Mr. Alderman indicate these areas are the result of filling in erosion rills that developed in the fly ash slope. These areas are filled by Progress Energy as they are noted. We recommend such areas be checked during each monthly inspection and their positions marked with flags so they can continue to be filled. We interpret these depressions as due to infiltration of surface water and not due to subsurface piping. Also, along the toe of the stability berm slope in the general vicinity of the discharge structure, several local slumps with minor seepage or wet areas were observed (Photograph 12). Due to the width of the stability berm and the gentle slope, these local slumps do not represent an immediate concern. They should be marked and observed during monthly inspections for signs of increasing size or seepage flow.

4.5 Plant Inspection/Operation Procedures

Progress Energy has established a procedure for plant personnel to follow for safety-related inspections of the dikes⁵¹. The procedure provides a list of items that the plant staff is to inspect. The procedure indicates the inspection frequency should be monthly at a minimum with less frequent inspection for underwater structures and inspections after major storm events. The procedure also contains a description of recommended inspection practices and a checklist for inspection. Plant inspection records of inspections under the procedure were reviewed and found to be documented in accordance with the procedure. As written, the procedure appears to be satisfactory. We recommend that notes be taken of changes observed in the dams including noting any physical changes (depressions or erosion). Places where there is erosion or depressions should be noted on a copy of the Photograph Location Plan (Figure 2 in Appendix B).

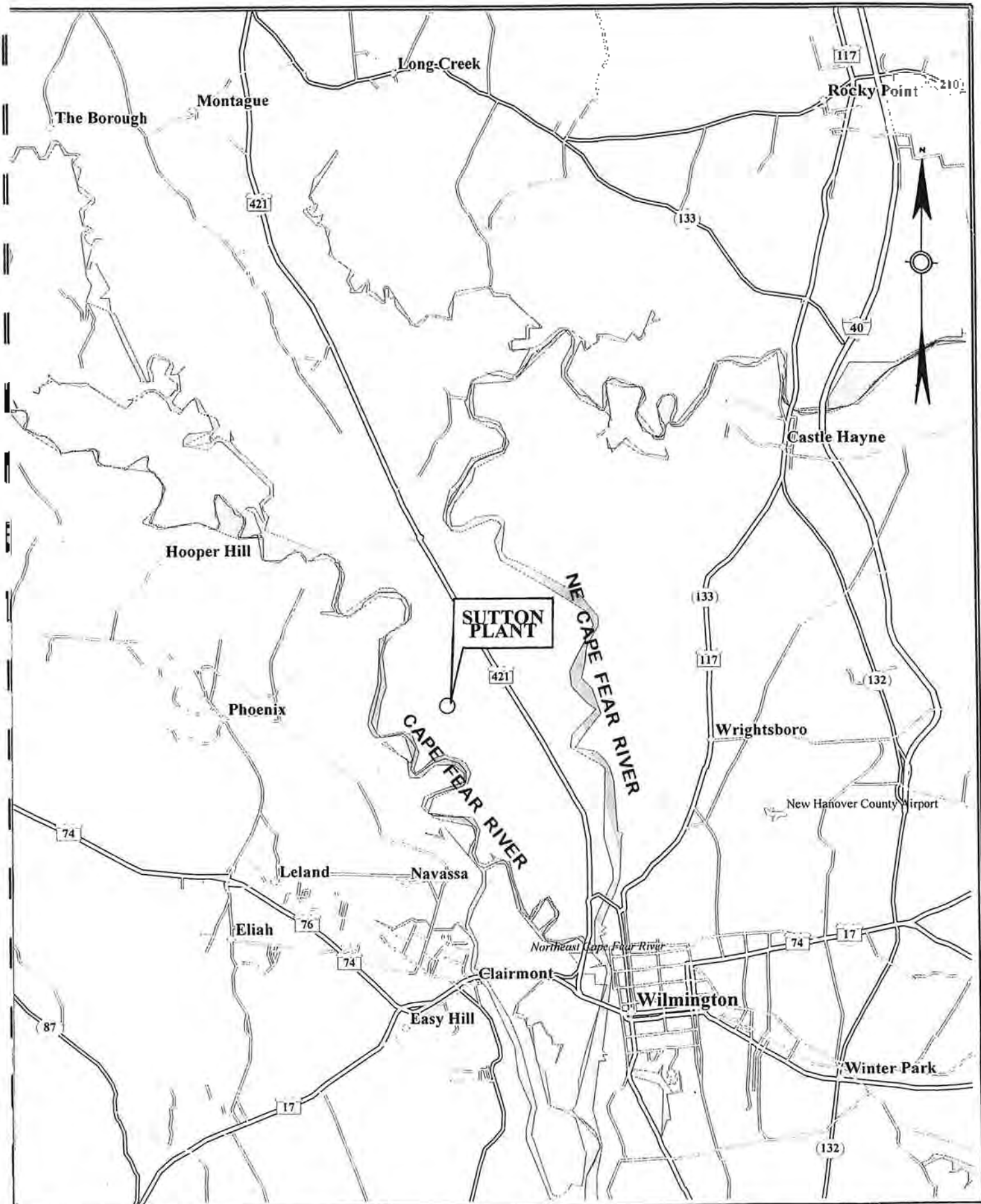
5.0 REFERENCES

1. U.S. Army Corps of Engineers, "Recommended Guidelines for Safety Inspection of Dams," Department of Army, Office of the Chief of Engineers, Washington, D.C., 1976.
2. Law Engineering and Environmental Services, Inc., "Five-Year Independent Consultant Inspection Ash Pond Dikes, L.V. Sutton Steam Electric Plant, Wilmington, N.C.," October 18, 2002.
3. Law Engineering and Environmental Services, Inc., "Five-Year Independent Consultant Inspection Ash Pond Dikes, L.V. Sutton Steam Electric Plant, Historical Volume, Wilmington, N.C.," December 15, 1997.
4. North Carolina Department of Environment, Health, and Natural Resources, "North Carolina Administrative Code, Title 15A, Subchapter 2K, Dam Safety, "as amended April 1, 1995".
5. Carolina Power & Light, Sutton Plant Procedures Manual, "Guidelines for Inspection of Dams, Dikes, and Appurtenant Hydraulic Structure", SUT 1.142(Rev.1), February 11, 1997.

EXHIBITS

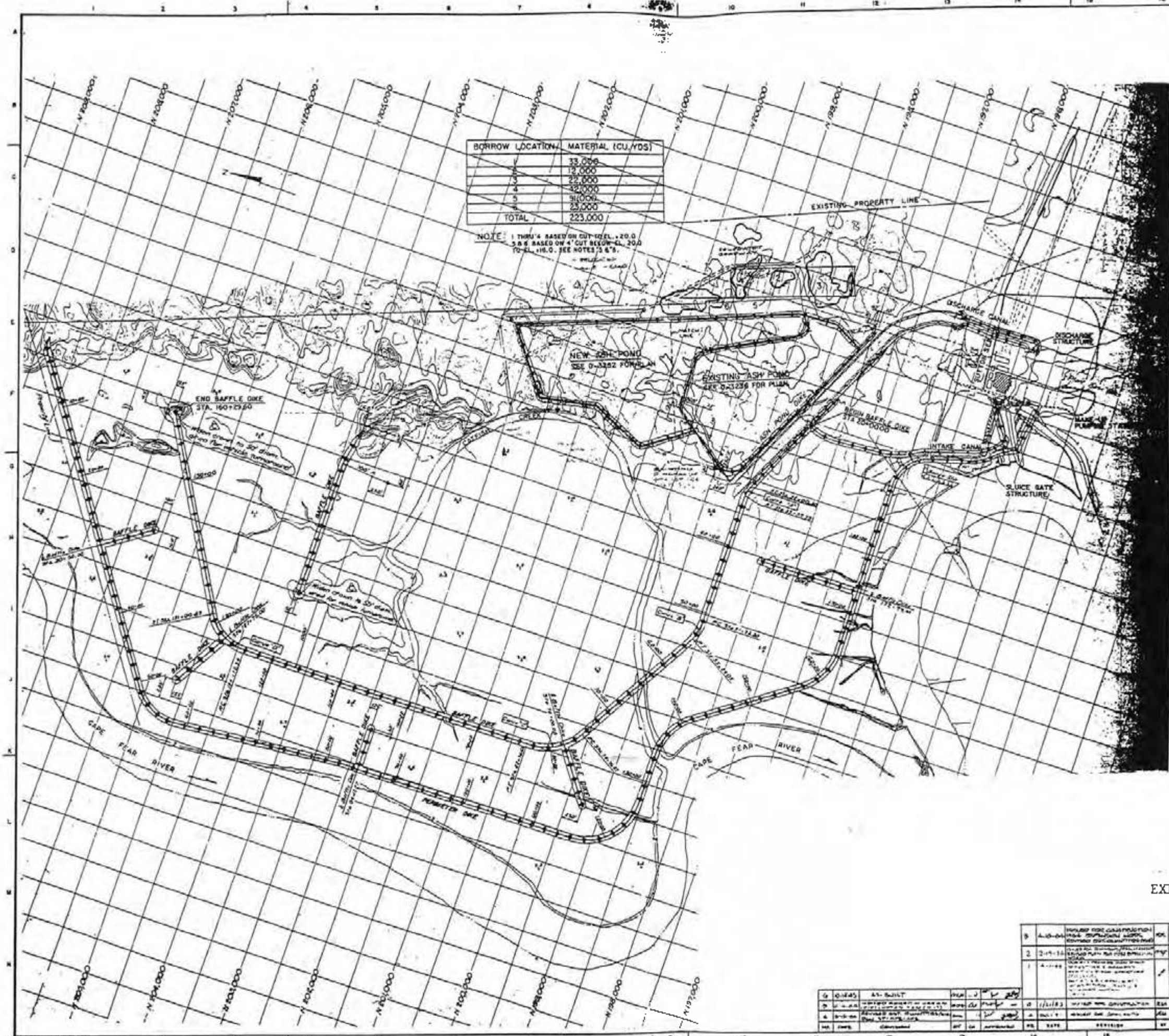
LIST OF EXHIBITS

1. Site Location Plan
2. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Site Plan, Carolina Power & Light Company Drawing No. D-3235, As-Built, Dated 10/14/85.
3. Civil, Ash Disposal Ponds, North Pond-Discharge Structure, Sheet 1 of 2, Brown and Root Drawing No. G-3177B, Dated 9/7/71.
4. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Plan-Sheet 1, Carolina Power & Light Company Drawing No. D-3236, As-Built, Dated 10/14/85.
5. Sutton Steam Electric Plant, Ash Pond Expansion (1985-1984), Plan-Sheet 2, Carolina Power & Light Company Drawing No. 3252, As-Built, Dated 10/14/85.
6. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Dike Sections (Sheet 1), Carolina Power & Light Company Drawing No. D-3237, As-Built, Dated 10/14/85.
7. Sutton Steam Electric Plant, Ash Pond Expansion, Dike Sections (Sheet 2), Carolina Power & Light Company, Drawing No. D-3239, As-Built, Dated 10/14/85.
8. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Sections and Details (Sheet 1), Carolina Power & Light Company Drawing No. D-3238, As-Built, Dated 10/14/85.
9. Sutton Steam Electric Plant, Ash Pond Expansion, (1983-1984), Sections and Details (Sheet 2), Carolina Power & Light Company Drawing No. D-3253, As-Built, Dated 10/14/85.
10. Sutton Plant 4-19-05 Survey. Drawing prepared by TransAsh dated 4-27-05.
11. Sutton Plant Outfall, Drawing prepared by TransAsh dated 9-30-05.
12. Site Plan, Interior Ash Pond Dike Project, Progress Energy-Sutton Plant, Withers & Ravenel; Sheet No. 1, Dated May 2006.
13. New Outfall Structure, Interior Ash Pond Dike Project, Progress Energy-Sutton Plant, Withers & Ravenel, Sheet No. 2, Dated May 2006.
14. Clay Liner Repair Plan, Ash Dike Interior Slope, Sutton Plant-CP&L, Law Engineering and Environmental Services, Inc., Drawing No. 1, Dated September 2000.



SITE LOCATION PLAN
L.V. SUTTON STEAM ELECTRIC PLANT
NEW HANOVER COUNTY, NORTH CAROLINA

EXHIBIT 1



ESTIMATED QUANTITIES
(NET OF LOSS)

ITEM	UNIT	1983	1984	TOTAL
1 CLEARING	SQUARE FEET			
2 EXCAVATION	CUBIC YARDS			
3 FILL	CUBIC YARDS			
4 CONCRETE	CUBIC YARDS			
5 REBAR	TONS			
6 STEEL	TONS			
7 TIMBER	CUBIC FEET			
8 GRAVEL	CUBIC YARDS			
9 SAND	CUBIC YARDS			
10 ASPHALT	SQUARE YARDS			
11 PAINT	GALLONS			
12 ELECTRICAL	AMPERES			

1. HOLD THESE QUANTITIES UNTIL THE DESIGN IS COMPLETE. THE QUANTITIES ARE ESTIMATED AND SUBJECT TO CHANGE AS THE DESIGN DEVELOPS.
2. THE QUANTITIES FOR EXCAVATION AND FILL ARE BASED ON THE DESIGN AND THE QUANTITIES FOR CONCRETE, REBAR, STEEL, TIMBER, GRAVEL, SAND, ASPHALT, PAINT, AND ELECTRICAL ARE BASED ON THE DESIGN.
3. THE QUANTITIES FOR EXCAVATION AND FILL ARE BASED ON THE DESIGN AND THE QUANTITIES FOR CONCRETE, REBAR, STEEL, TIMBER, GRAVEL, SAND, ASPHALT, PAINT, AND ELECTRICAL ARE BASED ON THE DESIGN.
4. ALL QUANTITIES ARE NET OF LOSS.
5. ADDITIONAL QUANTITIES FOR EXCAVATION AND FILL ARE BASED ON THE DESIGN AND THE QUANTITIES FOR CONCRETE, REBAR, STEEL, TIMBER, GRAVEL, SAND, ASPHALT, PAINT, AND ELECTRICAL ARE BASED ON THE DESIGN.
6. LOCATE QUANTITIES AS SHOWN ON THE PLAN. THE QUANTITIES FOR EXCAVATION AND FILL ARE BASED ON THE DESIGN AND THE QUANTITIES FOR CONCRETE, REBAR, STEEL, TIMBER, GRAVEL, SAND, ASPHALT, PAINT, AND ELECTRICAL ARE BASED ON THE DESIGN.

- LIST OF DRAWINGS
- D-3200 MAIN SHEET
 - D-3201 ONE SECTION
 - D-3202 SECTIONS & DETAILS
 - D-3203 ONE SECTION
 - D-3204 ONE SECTION
 - D-3205 SECTIONS
- REFERENCE DRAWINGS
- D-3117 INTAKE AND DISCHARGE STRUCTURE
 - D-3210 INTAKE AND DISCHARGE STRUCTURE
- SPECIFICATIONS
- SEE CD - D-3-207 FOR INTAKE AND DISCHARGE STRUCTURE
 - SEE CD - D-3-208 FOR INTAKE AND DISCHARGE STRUCTURE

EXHIBIT 2

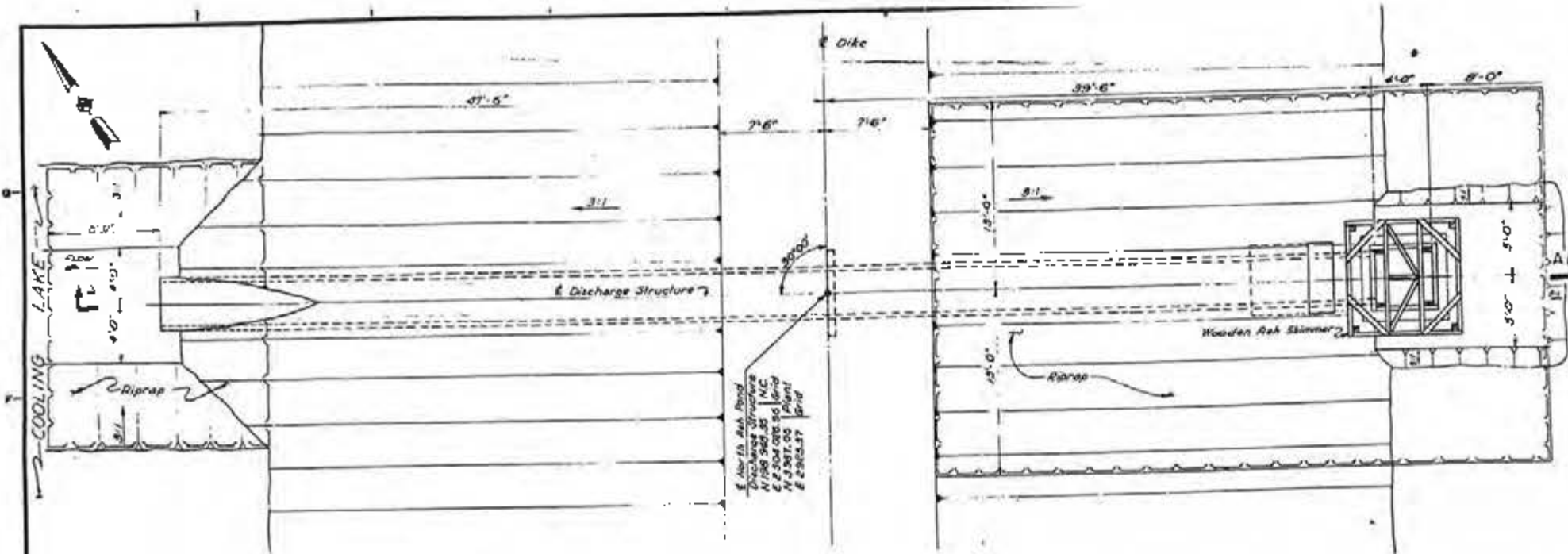
3	4-10-83	REVISED FOR CONSTRUCTION	OK		
2	3-17-83	REVISED FOR DESIGN	OK		
1	4-1-83	REVISED FOR DESIGN	OK		

DESIGNED BY	DATE	SCALE	PROJECT
DRWN BY			
CHECKED BY			
APPROVED BY			

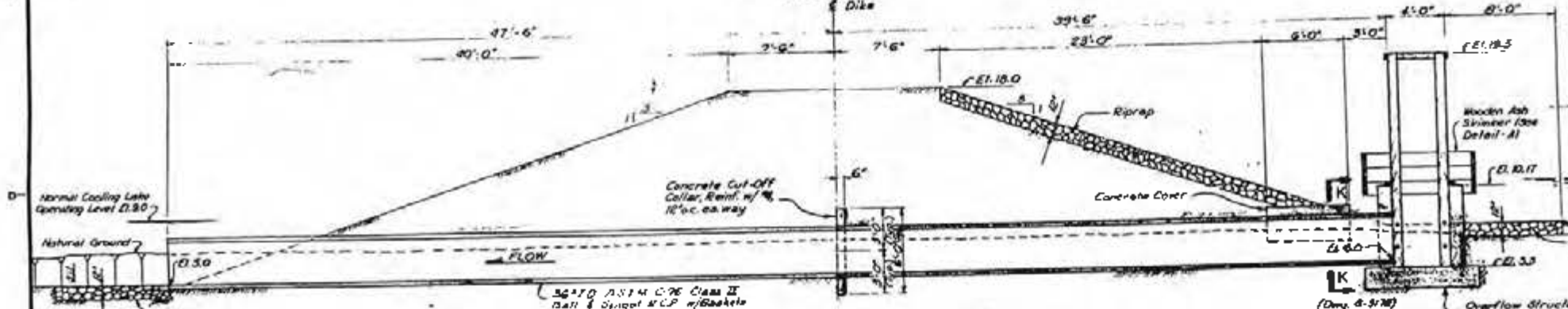
CAROLINA POWER & LIGHT COMPANY
FOSSIL PLANT ENGINEERING & CONSTRUCTION CO. INC.

L.V. SUTTON STEAM ELECTRIC PLANT
ASH POND EXPANSION (1983-1984)
SITE PLAN

0-3235

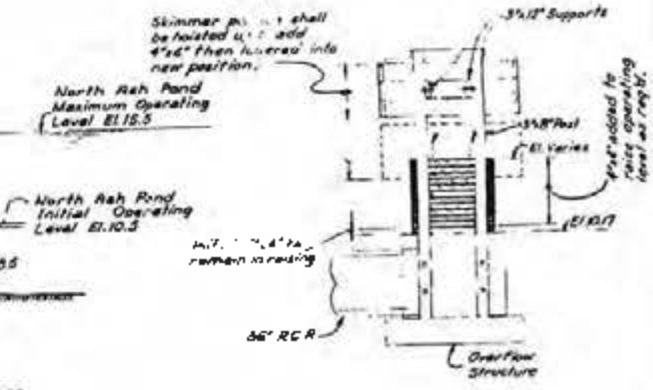


PLAN
Scale 1/4"=1'-0"

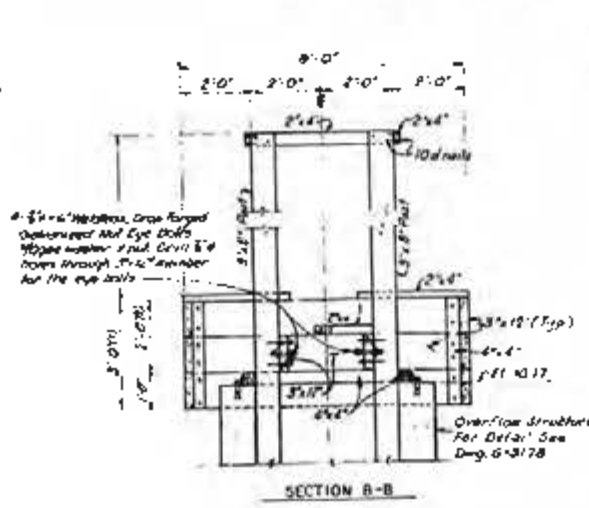
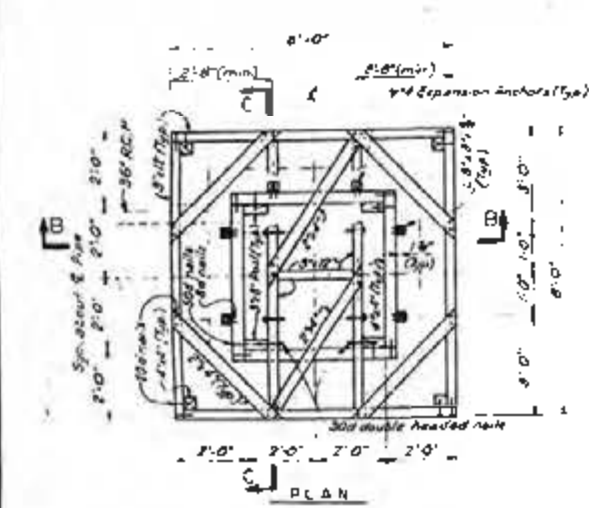


SECTION A-A
Scale 1/4"=1'-0"

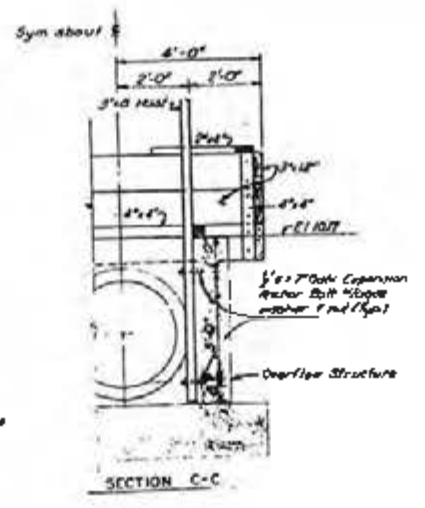
Note: To raise the operating level of the Ash Pond: Raise the skimmer portion, place additional 4"x4" sections on the initial 4"x4" section and nail to the 3"x8" posts, lower the skimmer portion back into position, and renail the 3"x12" supports to the 3"x8" post.



SKIMMER ADJUSTMENT DETAIL
(Future additions of steel by CP&L)
No Scale



DETAIL - A
(Wooden Ash Skimmer)
Scale 1/4"=1'-0"



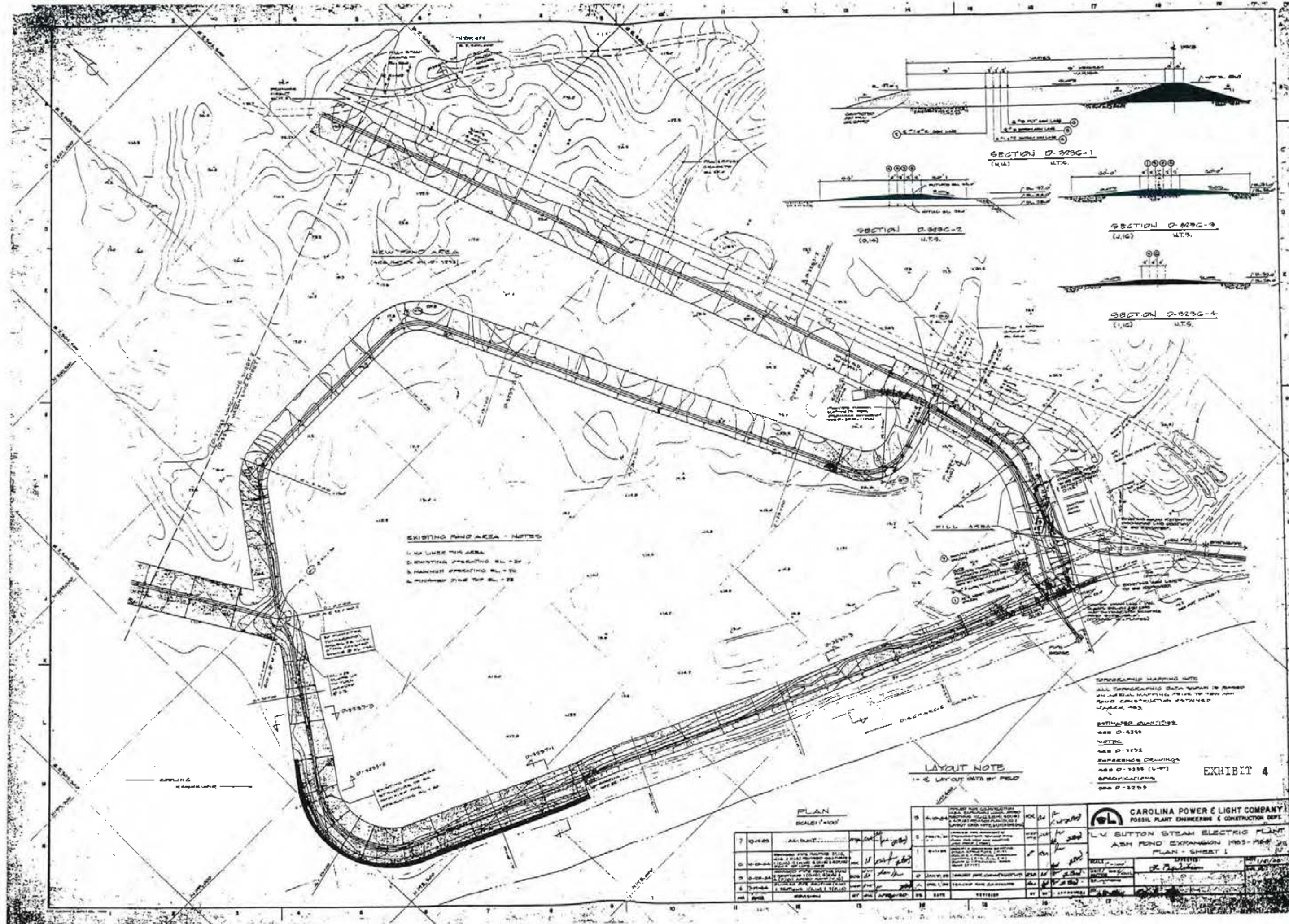
SECTION C-C

- GENERAL NOTES:**
- All concrete shall be Class "B" in accordance with Specification Item C-310.
 - All exposed concrete shall have a 3" chamfer unless otherwise noted.
 - All dimensions referring to reinforcing bars are to the centerline of the bars unless otherwise noted.
 - All reinforcing bars shall conform to ASTM Designation A-615 Grade 60.
 - Concrete cover for reinforcement shall be as follows unless otherwise noted:
 - 3" Clear for surfaces directly exposed to weather or deposited against the ground.
 - 3" Clear for all other surfaces.
 - Details of reinforcement not otherwise shown or indicated shall conform to the provisions of A.C.I. Standard 318 latest edition.
 - All structural steel shapes shall conform to ASTM Designation A-36 and shall be hot-dip galvanized after fabrication.
 - All expansion anchors and nails shall be hot-dip galvanized.
 - All lumber shall be 78 crescented Dense Select Structural, Southern Yellow Pine.
 - All field cutting, abrasions or borings shall receive three coats of concrete seal each coat being brushed on in sufficient quantity to fill all spalls and thoroughly penetrate the cut or abraded surface.
 - All riprap shall conform to the North Carolina State Highway Commission Specifications for Class 2 Riprap.

- REFERENCE DRAWINGS:**
- 6-3178 Ash Disposal Ponds - General Layout
 - 6-3178 Ash Disposal Ponds - North Pond Discharge Structure Steel Part 2.

EXHIBIT 3

DRAWN J. Gregory CHECKED J. Bates APPROVED J. Bates DATE 10/1/72	PROJECT L. V. SUTTON STEAM ELECTRIC PLANT NORTH POND-DISCHARGE STRUCTURE	SHEET NO. 6-3177B-3	TOTAL SHEETS 3	DRAWING TITLE CIVIL ASH DISPOSAL PONDS NORTH POND-DISCHARGE STRUCTURE SHEET 1 OF 2	DRAWING NO. CR-44	DATE 08-7-72
				CAROLINA POWER & LIGHT COMPANY L. V. SUTTON STEAM ELECTRIC PLANT 1972-428 MW EXTENSION-UNIT NO. 3	BROWN & ROOT, INC. ENGINEERS AND CONSULTANTS HOUSTON, TEXAS	EXHIBIT NO. G-3000-3	SHEET NO. G-3177B



EXISTING POND AREA - NOTES
 1. IN LINE WITH AREA
 2. EXISTING SPACING 20' - 25'
 3. MAXIMUM SPACING 20' - 25'
 4. MINIMUM SPACING 20' - 25'

TOPOGRAPHIC MAPPING NOTE
 ALL TOPOGRAPHIC DATA SHOWN IS BASED ON AERIAL MAPPING MADE TO 1953 AND POND CONSTRUCTION PATENTED APRIL, 1953.
ESTIMATED QUANTITIES
 SEE D-4255
NOTES
 SEE D-1752
REFERENCE DRAWINGS
 SEE D-1235 (L-1)
SPECIFICATIONS
 SEE D-3225

LAYOUT NOTE
 1 - 6 LAYOUT DATA BY FIELD

PLAN
 SCALE 1" = 100'

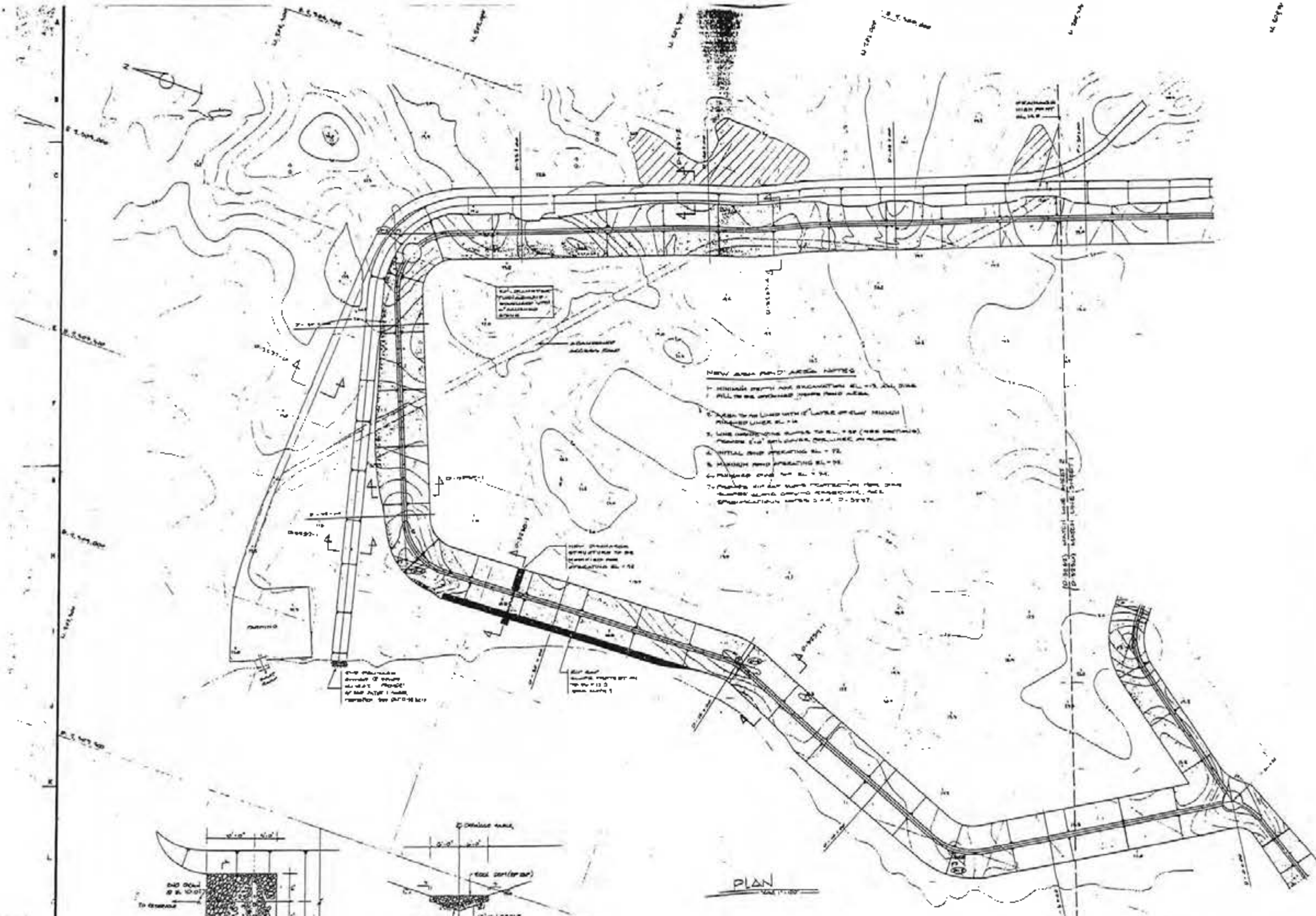
NO.	DESCRIPTION	DATE	BY	CHECKED	REVISION
1	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	1
2	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	2
3	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	3
4	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	4
5	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	5
6	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	6
7	DESIGNED BY	1/15/54	J. W. BROWN	J. W. BROWN	7

CAROLINA POWER & LIGHT COMPANY
 FOSSIL PLANT ENGINEERING & CONSTRUCTION DEPT.

LV SUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION 1953-1954
 PLAN - SHEET 1

DATE: 1/15/54
 DRAWN BY: J. W. BROWN
 CHECKED BY: J. W. BROWN

EXHIBIT 4



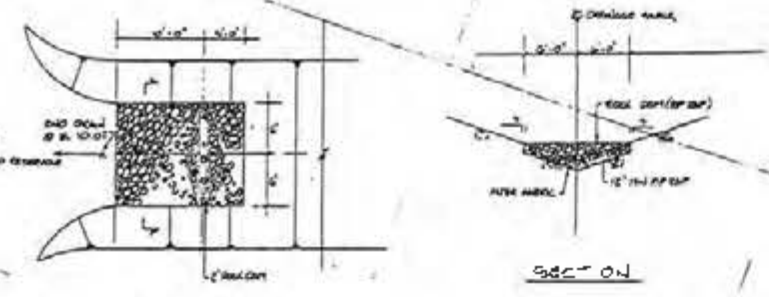
NEW ASH POND AREA NOTED

1. MINOR DITCH AND EXCAVATION AT THE END OF THE POND WILL BE OBTAINED FROM ROAD AREA.
2. ASH TO BE LINED WITH 12" LAYER OF CEMENT CONCRETE UNDER EL. 72.
3. LINE INDICATING DITCH TO EL. 72 (SEE SECTION). PONDING IS TO BE OBTAINED FROM ROAD AREA.
4. INITIAL DITCH OPERATING EL. 72.
5. DRAINAGE POND OPERATING EL. 72.
6. PONDING DITCH AT EL. 72.
7. PONDING DITCH WITH PROTECTION FOR DITCH NUMBER ALONG DRAINAGE STRUCTURE. SEE SPECIFICATIONS SHEET D-3252.

SEE SHEET D-3252
SEE D-3252
GENERAL NOTES
SEE D-3252
REFERENCE DRAWINGS
SEE D-3252
SPECIFICATIONS
SEE D-3252

TEMPORARY MARKING NOTE

ALL TEMPORARY MARKING SHALL BE REMOVED BY CONTRACTOR PRIOR TO NEW ASH POND CONSTRUCTION. DATE: MARCH 1964.



PLAN

SECTION

DETAIL D-3252-1

SECTION D-3252-1

LAYOUT NOTE
 & LAYOUT DATA BY FIELD.

EXHIBIT 5

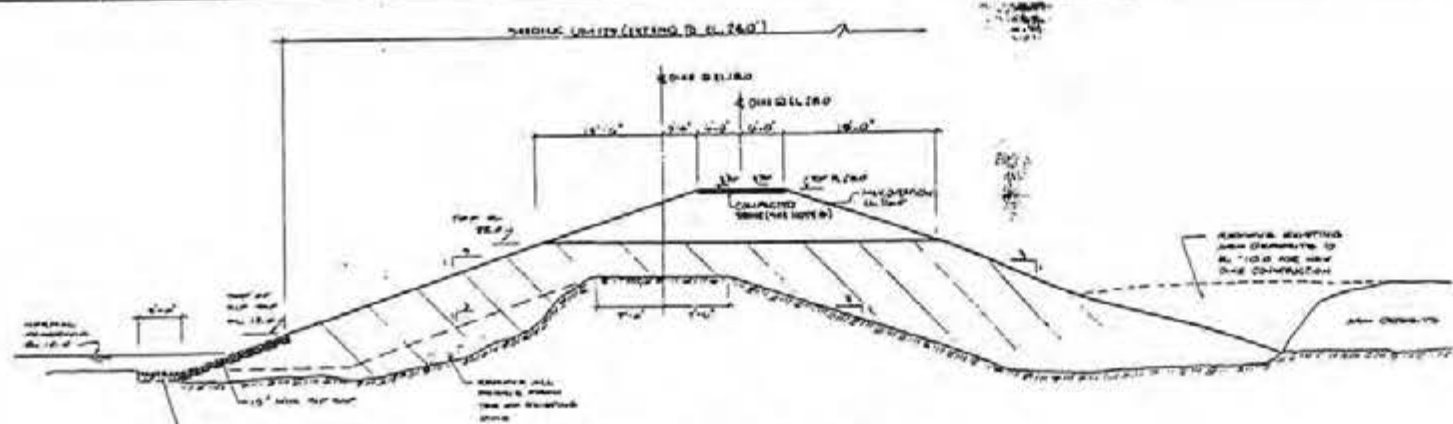
NO.	DATE	REVISION	BY	APPROVED
1	1/11/64	ISSUED FOR CONSTRUCTION	WJ	[Signature]
2	1/17/64	REVISION	WJ	[Signature]

CAROLINA POWER & LIGHT COMPANY
 POWER PLANT ENGINEERING & CONSTRUCTION DEPT.

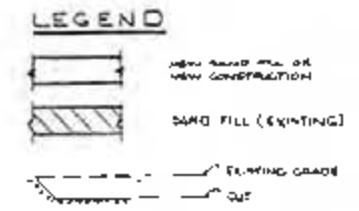
LY SUTTON STEAM ELECTRIC PLANT
ASH POND EXPANSION 195-PM4
PLAN - SHEET 2

DATE: 1/11/64
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]

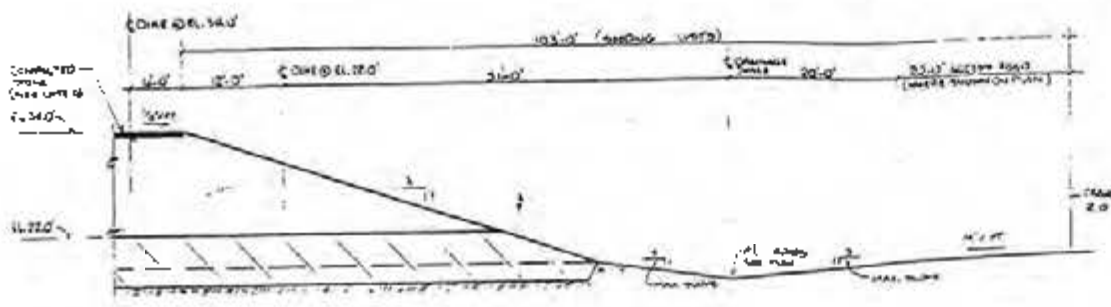
NO. 0-3252



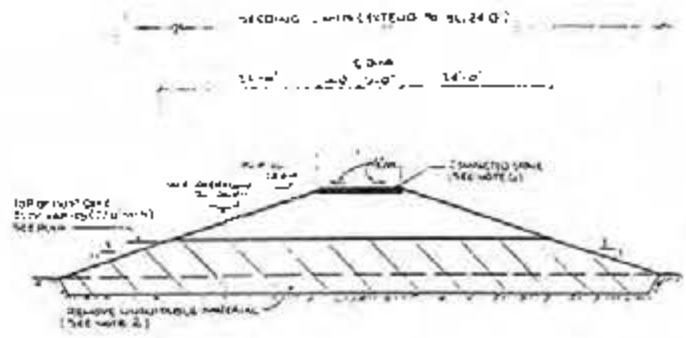
SECTION O-3237-1
TYPICAL FOR RAISING DIKE FROM EL. 18.0 TO EL. 22.0 (1983)
TYPICAL FOR RAISING DIKE FROM EL. 22.0 TO EL. 28.0



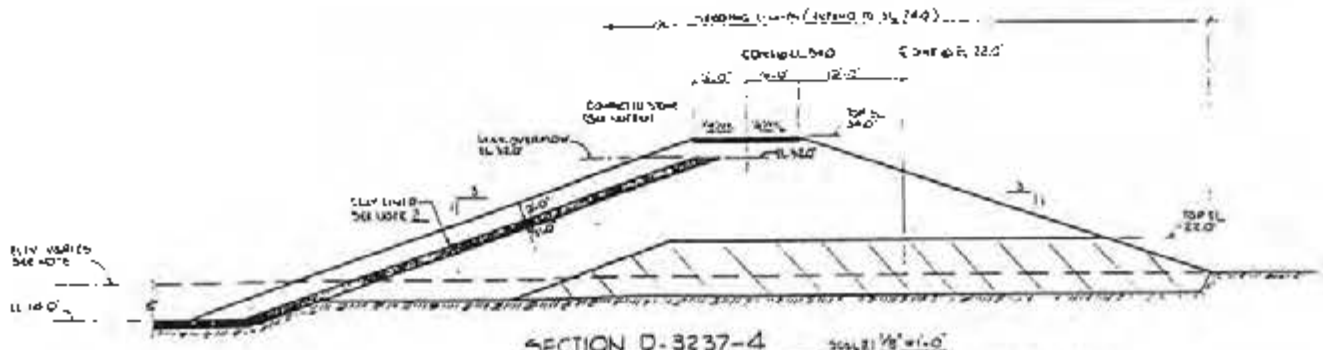
- NOTES**
- SEE SPEC SECTION 02000 FOR CLEARING REQUIREMENTS.
 - SEE SPEC SECTION 02000 FOR EROSION CONTROL REQUIREMENTS.
 - SEE SPEC SECTION 02000 FOR CONSTRUCTION METHODS.
 - SEE SPEC SECTION 02000 FOR CONSTRUCTION METHODS.
 - SEE SPEC SECTION 02000 FOR CONSTRUCTION METHODS.
 - SEE SPEC SECTION 02000 FOR CONSTRUCTION METHODS.



SECTION O-3237-2
TYPICAL SECTION OF DRAINAGE SWALE

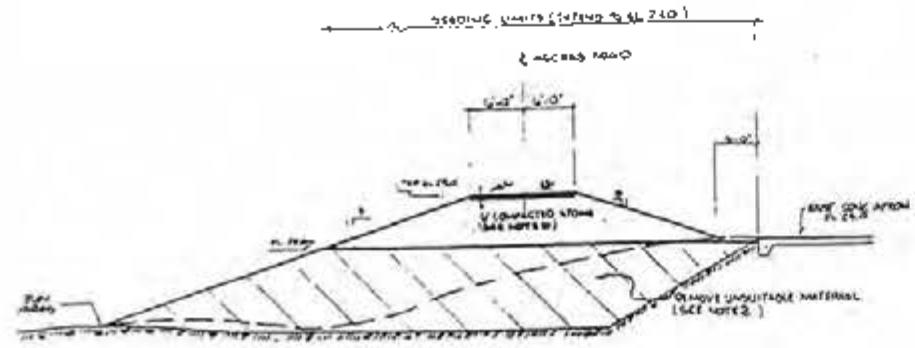


SECTION O-3237-3
TYPICAL FOR RAISING DIKE TO ELEV. 28.0

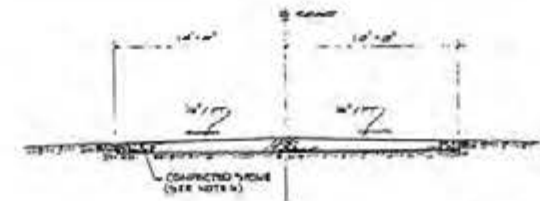


SECTION O-3237-4
TYPICAL FOR RAISING DIKES TO EL. 34.0 (TO THE INSIDE)
TYPICAL FOR CLAY LINER

REVISIONS AND SPECIFICATIONS
NO. 1-11-85



SECTION O-3237-5
TYPICAL OF CONCRETE BASIN

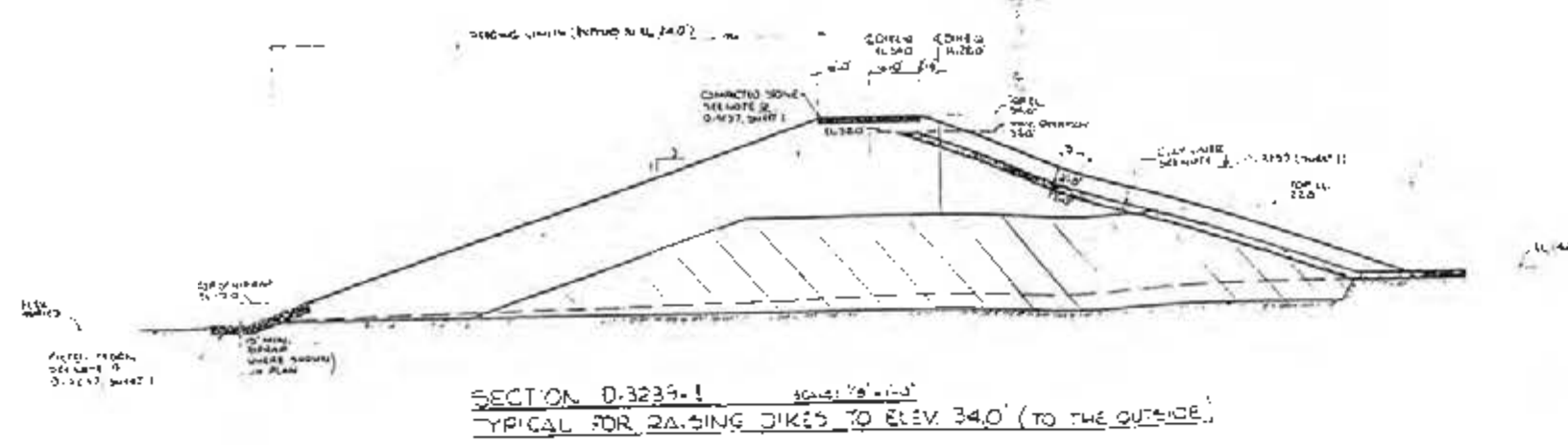


SECTION O-3237-6
TYPICAL FOR RELOCATION OF ACCESS ROAD
TO COOLING RESERVOIR & BOAT RAMP

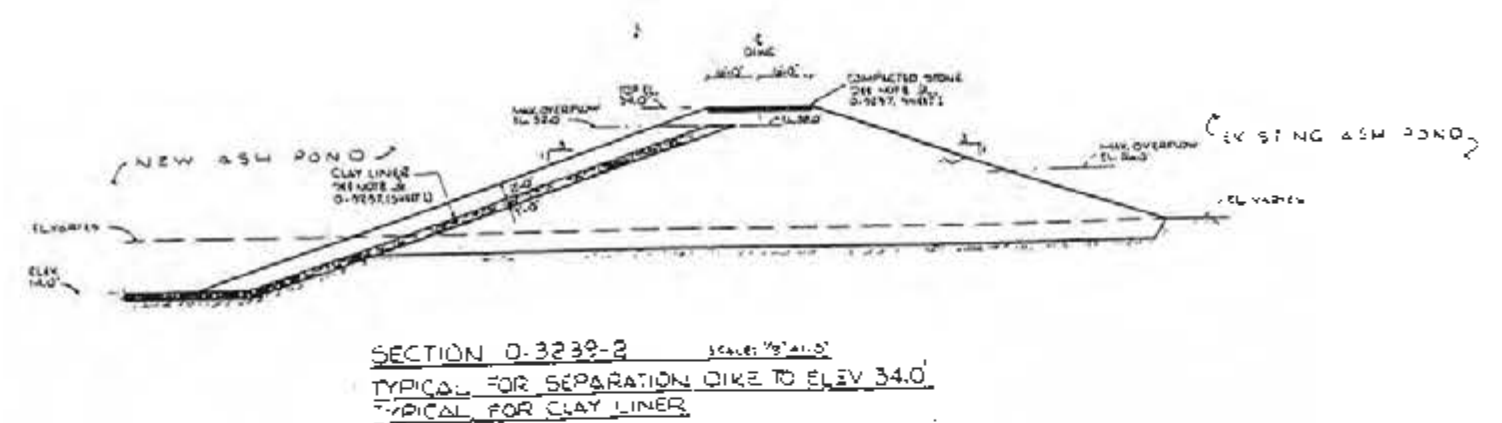
EXHIBIT 6

NO.	DATE	REVISION	BY	APPROVED
1	6-1-85	ISSUE FOR CONSTRUCTION	...	...
2	8-15-84	...	...	...
3	10-10-84	...	...	...
4	11-1-84	...	...	...

CAROLINA POWER & LIGHT COMPANY
FORSYTH PLANT ENGINEERING & CONSTRUCTION DEPT.
LY SUTTON STEAM ELECTRIC PLANT
ASH POND EXPANSION (1983-1984)
DIKE SECTIONS (SHEET 7)
D-3237



SECTION D-3239-1 SCALE: 1/2"=1'-0"
 TYPICAL FOR RAISING DIKES TO ELEV. 34.0' (TO THE OUTSIDE)



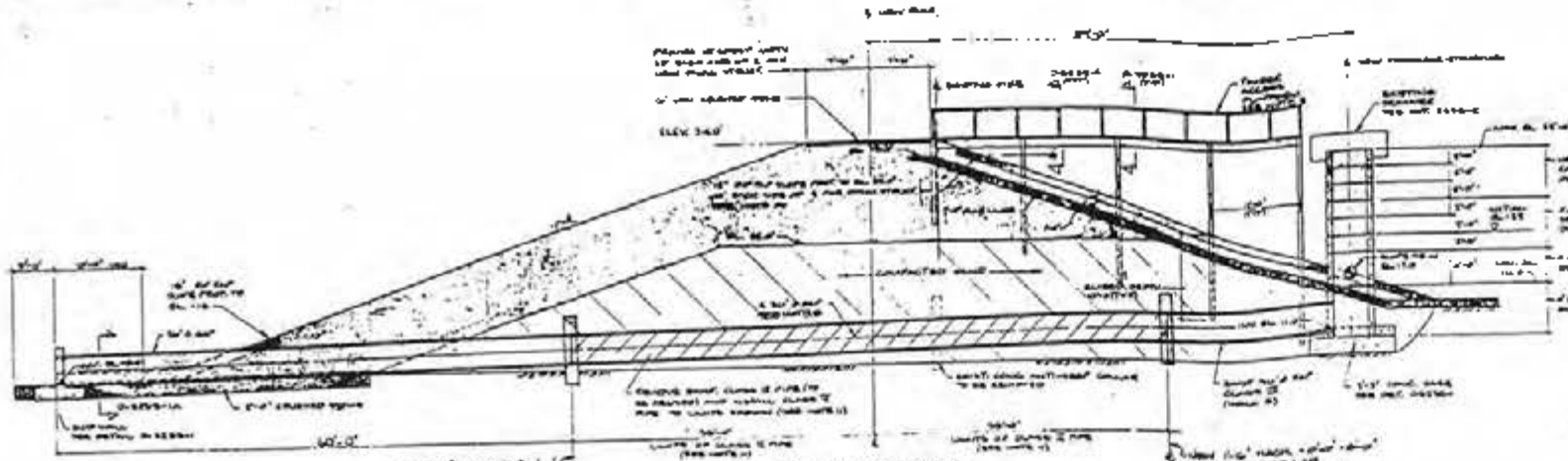
SECTION D-3239-2 SCALE: 1/2"=1'-0"
 TYPICAL FOR SEPARATION DIKE TO ELEV. 34.0'
 TYPICAL FOR CLAY LINER

NOTES
 1. FOR GENERAL NOTES SEE SHEET D-3239-1

REVISIONS AND APPROVALS
 10-1-1979

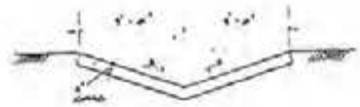
EXHIBIT 7

CAROLINA POWER & LIGHT COMPANY FOSSIL PLANT ENGINEERING & CONSTRUCTION DEPT.			
L.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION DIKE SECTIONS (SHEET 2)			
1 10-1-79 AS-BUILT APPROVED FOR CONSTRUCTION WORK COMPLETED WORK APPROVED FOR FINAL DRAWING FOR HIGH CONSTRUCTION	J. B. Lister J. B. Lister J. B. Lister	DATE 10-1-79 BY J. B. Lister APPROVED J. B. Lister	SHEET NO. 0-3239

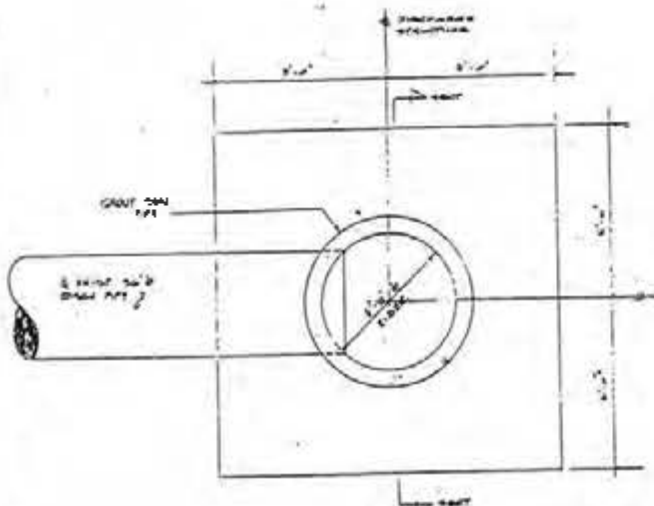


SECTION 0-3838-1
SCALE: 1/4" = 1'-0"

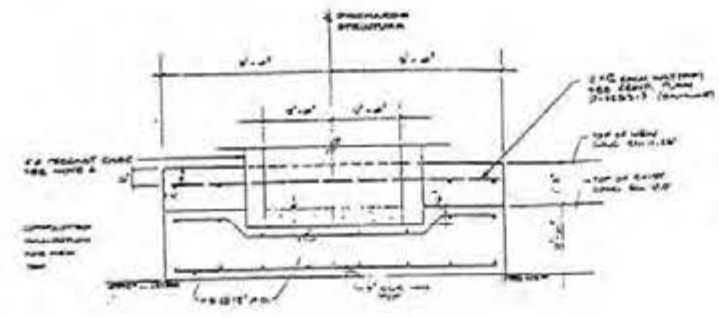
NOTE: PROVIDE THREE ACCESS PLATFORMS AT 25' TO 50' HIGHS OVER THE DAM STRUCTURE INCLUDING THE ROAD AREA. SEE NOTE ON CH 3838-1 (4.0)



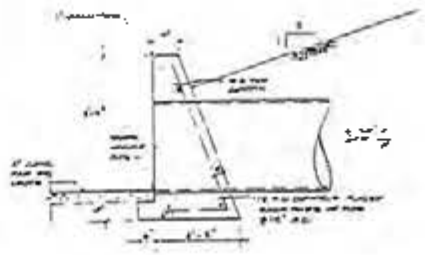
TOP SECTION 3.2
CONC. DAM WALL
SCALE: 1/4" = 1'-0"



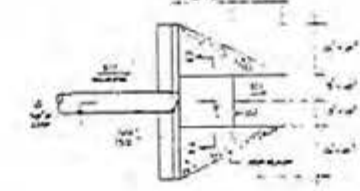
TOP PLAN (0-3838-1)
SCALE: 1/4" = 1'-0"



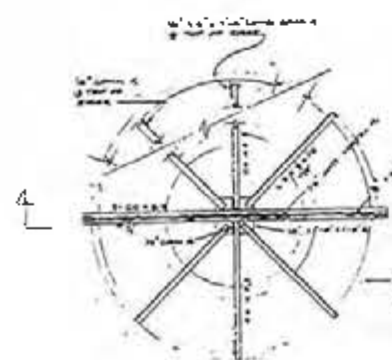
SECTION 0-3838-2
SCALE: 1/4" = 1'-0"



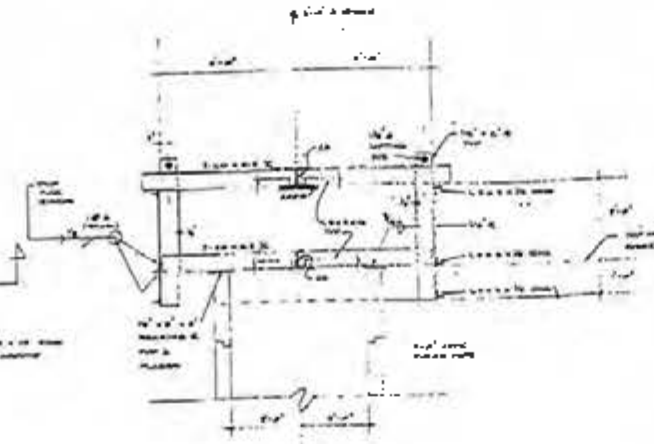
TOP SECTION 3.1
CONC. DAM WALL
SCALE: 1/4" = 1'-0"



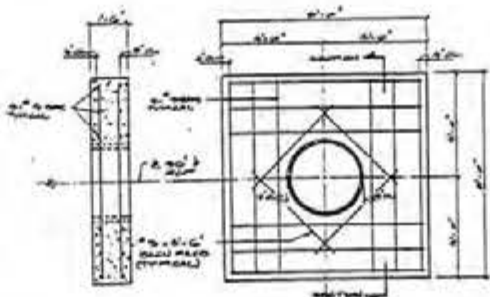
OUTLET PLAN
SCALE: 1/4" = 1'-0"



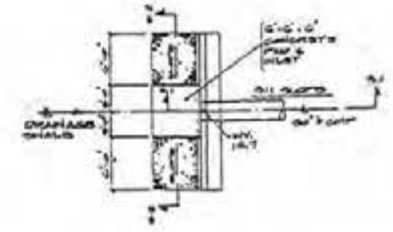
TOP PLAN (0-3838-2)
SCALE: 1/4" = 1'-0"



SECTION 0-3838-3
SCALE: 1/4" = 1'-0"



SECTION 0-3838-4
ANTI-SEEP COLLAR
SCALE: 1/4" = 1'-0"



INLET PLAN
SCALE: 1/4" = 1'-0"



TOP PLAN (0-3838-3)
SCALE: 1/4" = 1'-0"

GENERAL NOTES:
1. CONCRETE SHALL BE TYPE III WITH A 28-DAY COMPRESSIVE STRENGTH OF NOT LESS THAN 4000 PSI.
2. ALL CONCRETE SHALL BE PLACED AND FINISHED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
3. ALL REINFORCEMENT SHALL BE PLACED AND TIED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.

- NOTES
1. THE DAM STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES. THE DAM SHALL BE FINISHED TO A FINISH GRADE OF 100.00 FEET AS SHOWN ON CH 3838-1 (4.0).
 2. THE DAM STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES. THE DAM SHALL BE FINISHED TO A FINISH GRADE OF 100.00 FEET AS SHOWN ON CH 3838-1 (4.0).
 3. ALL CONCRETE SHALL BE TYPE III WITH A 28-DAY COMPRESSIVE STRENGTH OF NOT LESS THAN 4000 PSI.
 4. ALL REINFORCEMENT SHALL BE PLACED AND TIED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 5. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 6. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 7. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 8. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 9. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 10. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.
 11. ALL DAM STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR CONCRETE DAMS AND RELATED STRUCTURES.

EXHIBIT 8

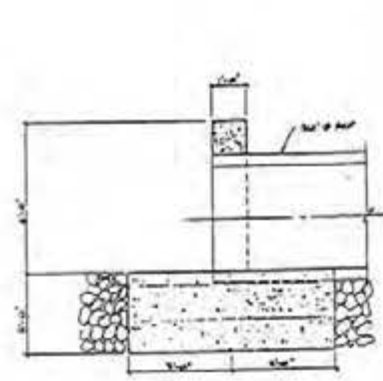
NO.	DATE	DESCRIPTION	BY	CHKD	APP'D
1	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
2	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
3	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
4	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
5	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
6	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
7	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
8	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
9	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
10	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
11	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
12	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
13	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
14	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
15	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
16	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
17	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
18	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
19	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
20	5-15-64	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS

CAROLINA POWER & LIGHT COMPANY
FOSSIL PLANT ENGINEERING & CONSTRUCTION DEPT.

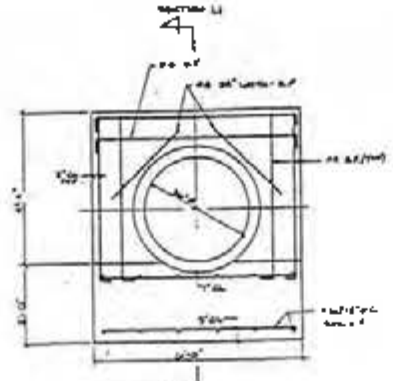
LV SUTTON STEAM ELECTRIC PLANT
ASH POND EXPANSION 1963-1964
SECTION 0-3838-1 & 0-3838-2

DATE: 5/15/64
BY: J. H. HARRIS
CHKD: J. H. HARRIS
APP'D: J. H. HARRIS

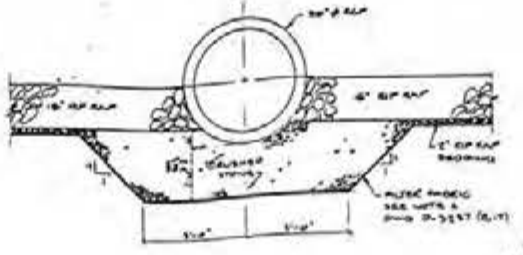
0-3838



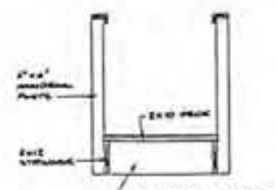
SECTION 1.1
1/4\"/>



ELEVATION 1.1
(WITH SHIP DETAILS)

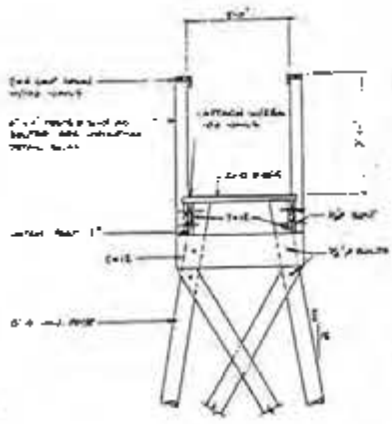


SECTION 2-222-1A

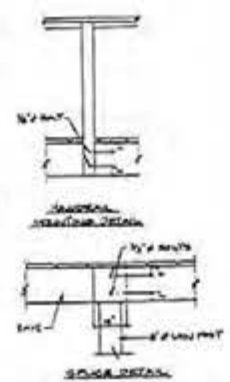


SECTION 2-222-1

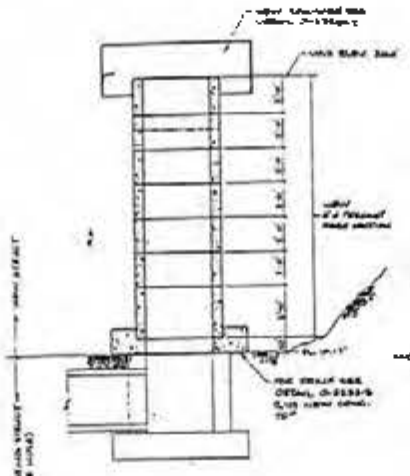
DETAIL 2-222-1



SECTION 2-222-2

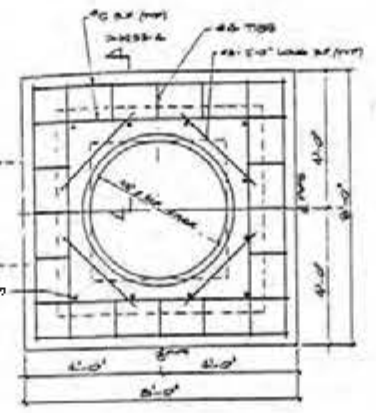


SHIP DETAIL

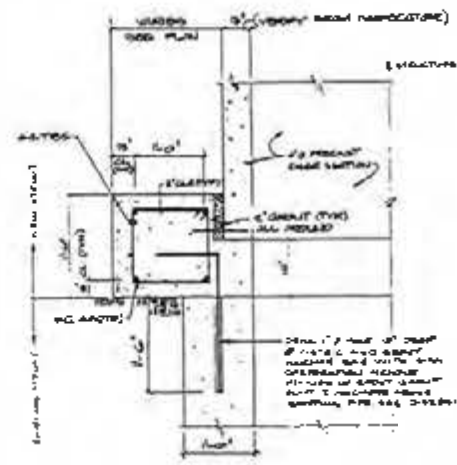


SECTION 2-222-3

EXAMPLE SURFACE FINISH SHALL BE TO MATCH THE CONCRETE SURFACE FINISH TO BE USED IN THE ADJACENT STRUCTURES.
1. SHALL BE TO MATCH THE ADJACENT STRUCTURES TO MATCH THE CONCRETE SURFACE FINISH.



DETAIL 2-222-3




SECTION 2-222-4

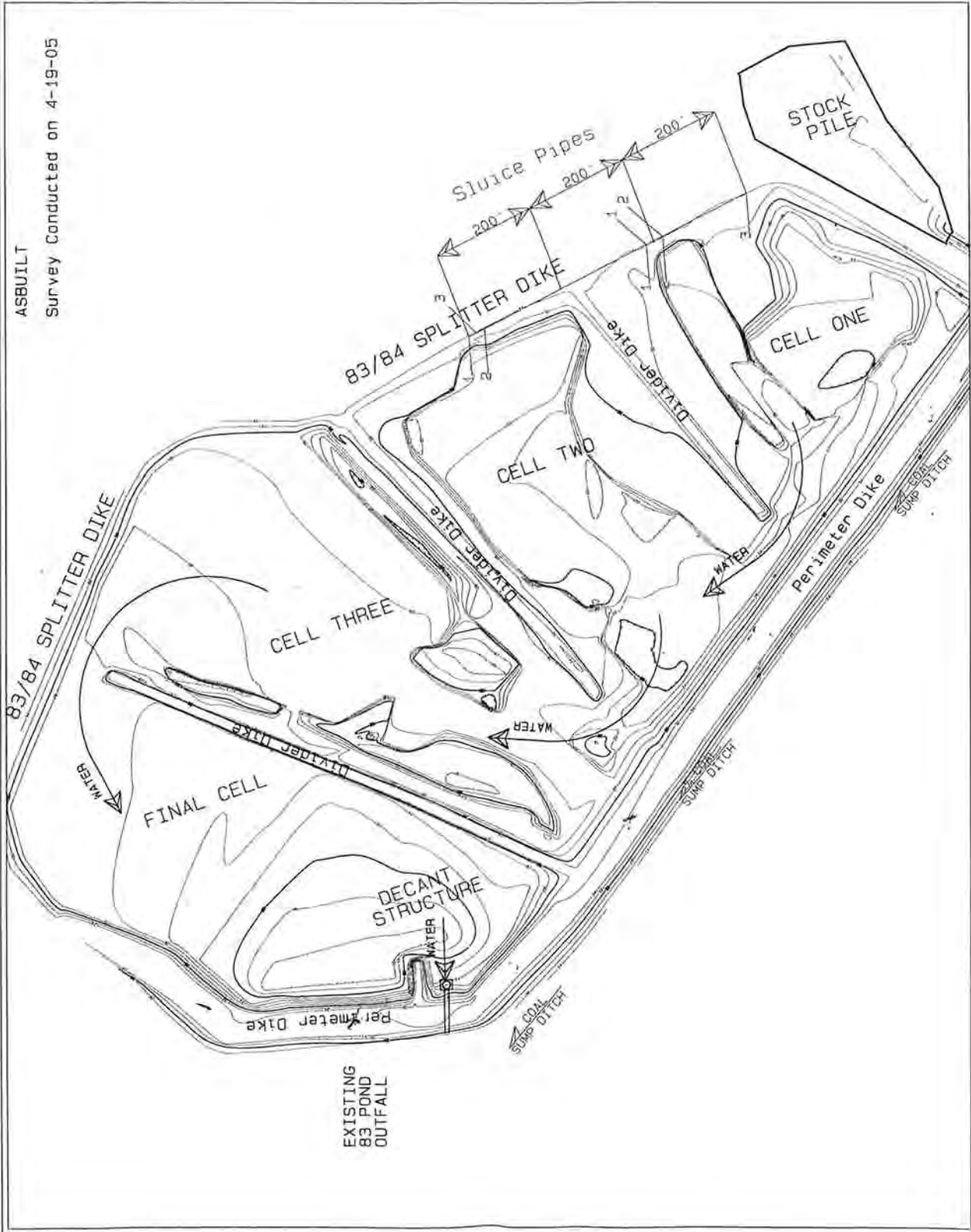
NOTES
1. SEE 2-222-1

REFERENCE DRAWINGS & SPECIFICATIONS
SEE 2-222-1

EXHIBIT 9

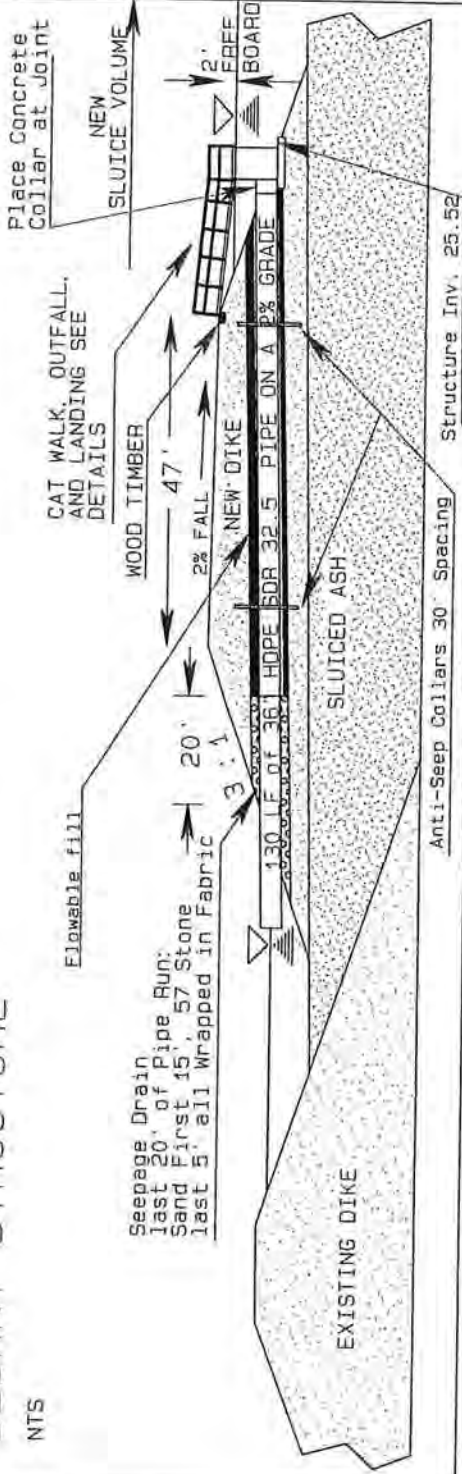
		CAROLINA POWER & LIGHT COMPANY Fossil Plant Engineering & Construction Dept.	
L.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION 1983-1984 SECTIONS AND DETAILS (SHEET 2)			
NO.	DATE	REVISION	BY
1	5-17-84	ISSUE FOR CONSTRUCTION	W. J. [Signature]
2	4-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
3	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
4	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
5	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
6	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
7	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
8	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
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17	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
18	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
19	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]
20	1-18-84	REVISED FOR CONSTRUCTION	W. J. [Signature]

Save Location	Date 4 27 05	Drawn By: David Stenger Checked By: REG Approved By:	TRANS ASH 617 SHEPHERD DR. CINCINNATI, OHIO 45215 Phone 513-733-4770 Fax 513-954-8147	7-19-06 SURVEY	Contents plan view		Scale 1" = 200'	Sheet 1 of 1	Plan View



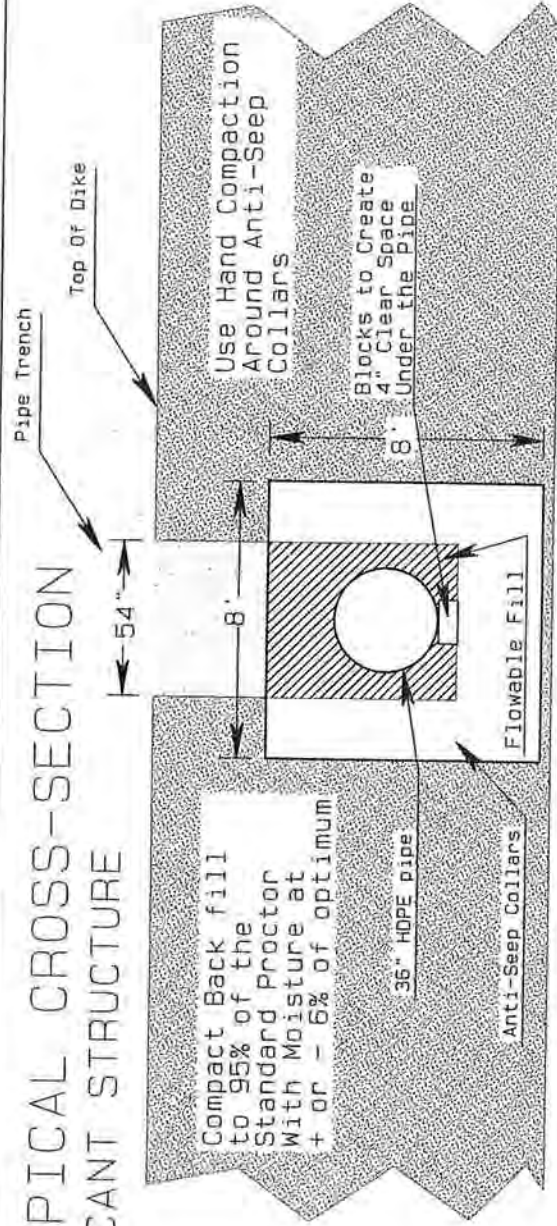
TYPICAL CROSS-SECTION DECANT STRUCTURE

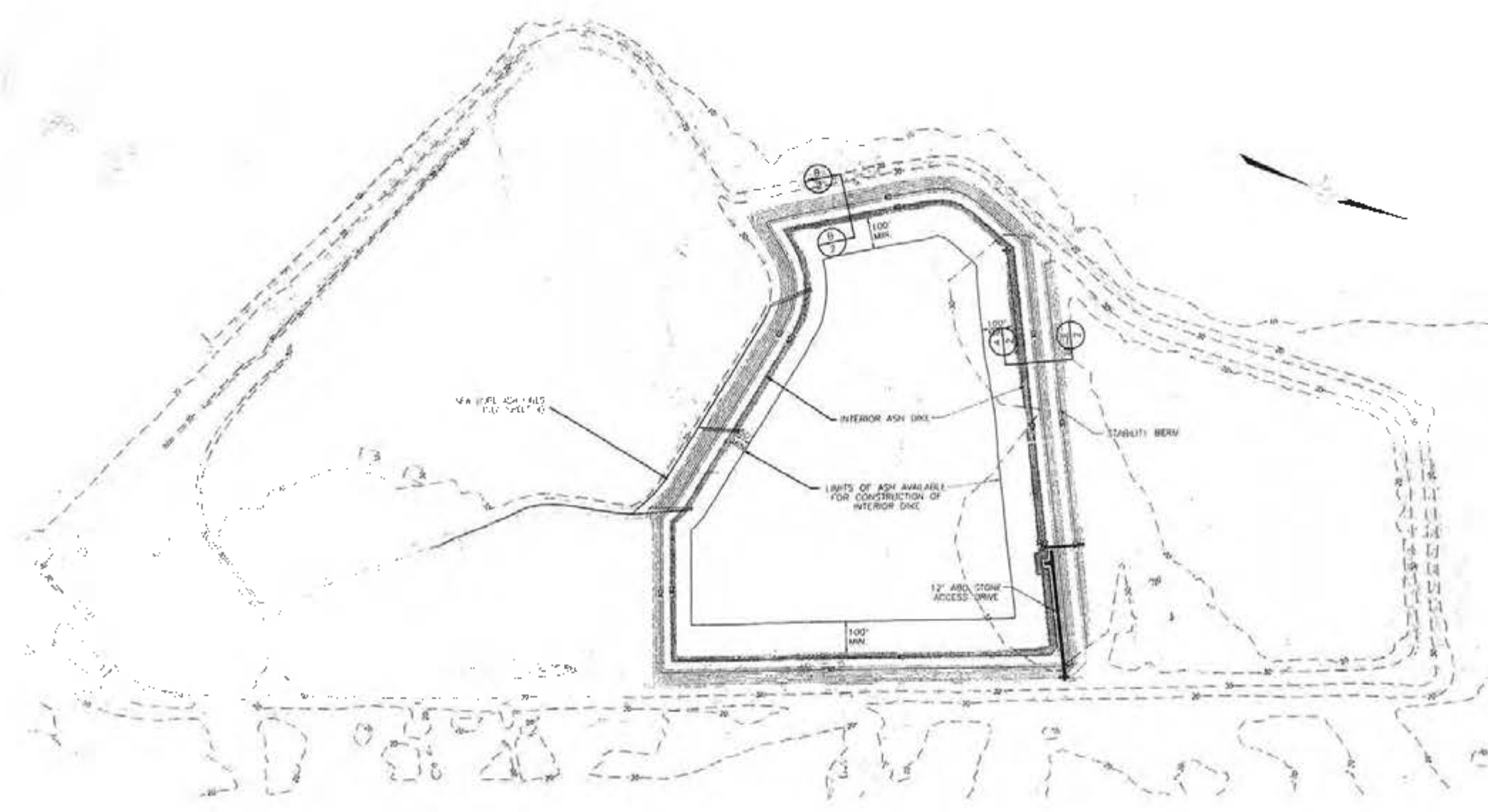
NTS



TYPICAL CROSS-SECTION DECANT STRUCTURE

NTS





LEGEND	
	EXISTING 2" CONTOUR
	PROPOSED 2" CONTOUR
	PROPOSED 10' CONTOUR
	EXISTING ASH CONTOUR
	EXISTING ASPHALT ACCESS DRIVE

NOTE: EXCAVATION LIMITS ARE TO BE DETERMINED BY FIELD SURVEY.

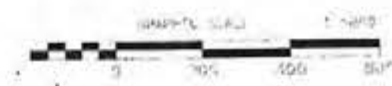
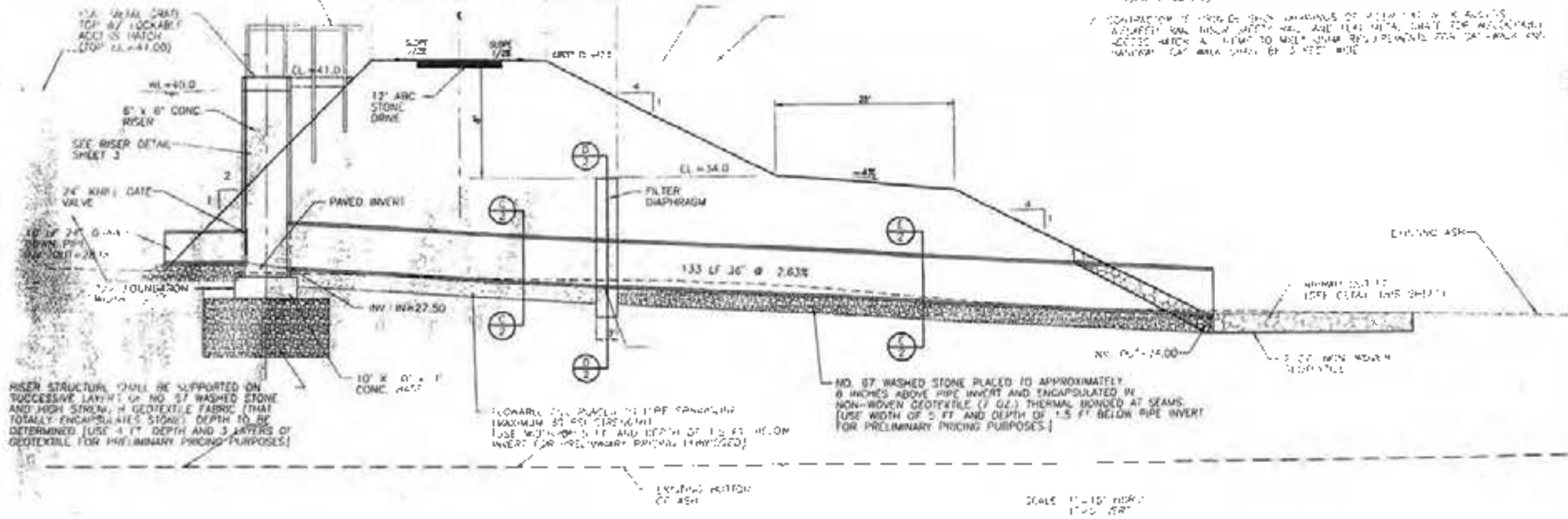


EXHIBIT 12



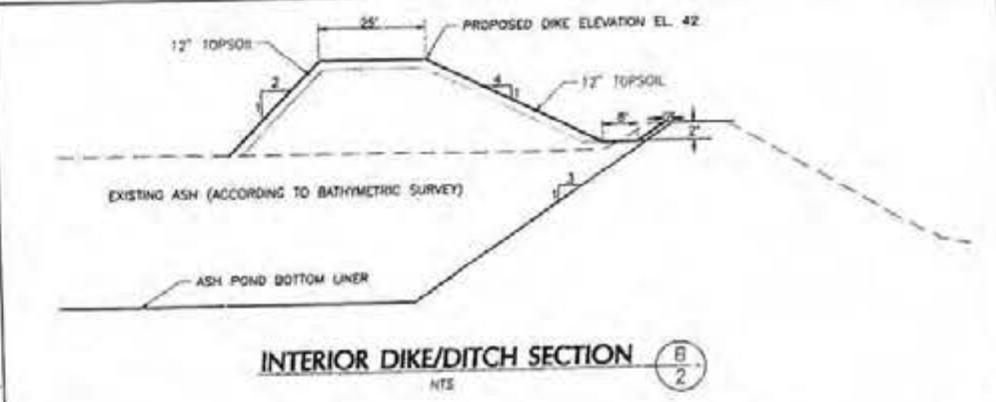
No. 10-15101		Date	By	Design	BY	DATE	AS NOTED	INTERIOR ASH POND DIKE PROJECT PROGRESS ENERGY SUTTON PLANT	SITE PLAN	WITHERS & RAVENEL ENGINEERS | PLANNERS | SURVEYORS <small>111 Market One, Cary, North Carolina 27511 | 919-489-2100 | 919-489-1500 | www.witthers.com</small>	Sheet No. 1
				Checked by	DATE	3/28/06					
				Checked by	DATE	06/04/07					



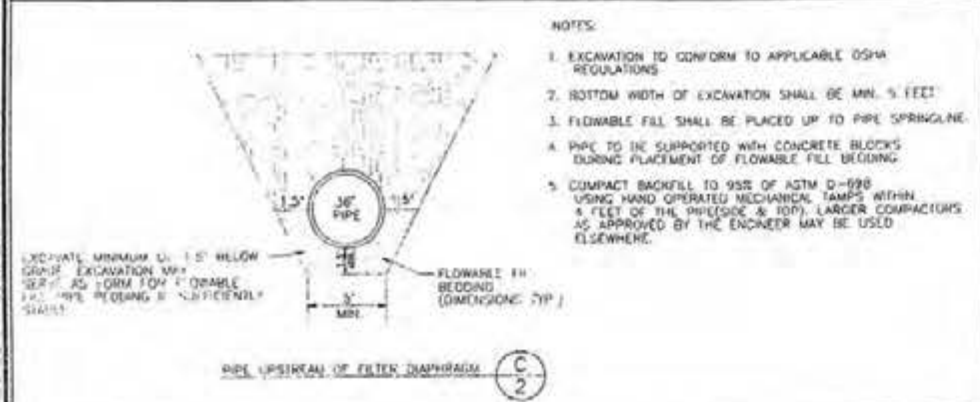
RISER/BARREL PROFILE
SCALE: 1" = 10' HORZ
1" = 5' VERT



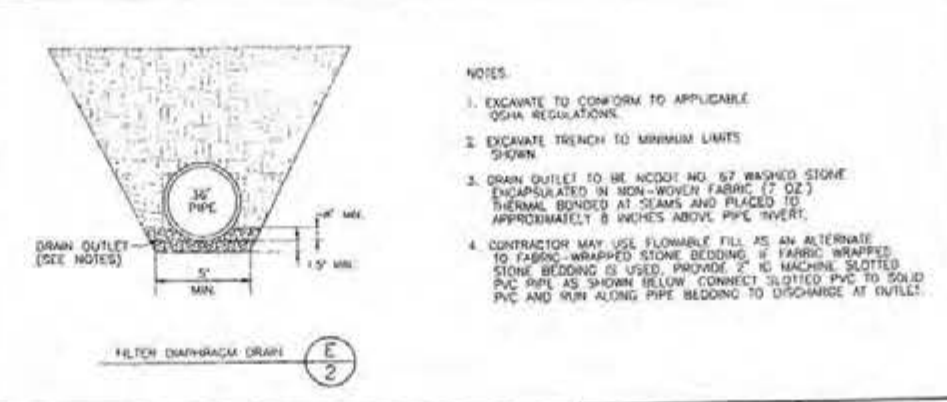
TYPICAL DIKE COVER DETAIL
NTS



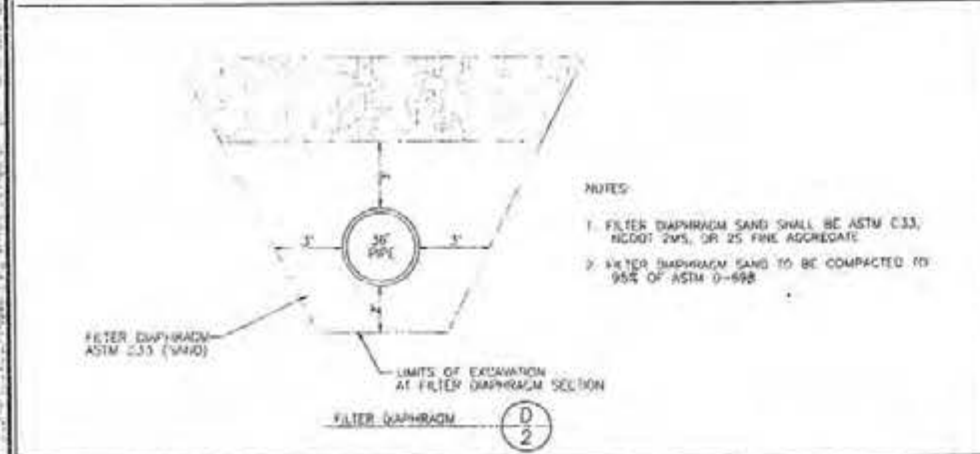
INTERIOR DIKE/DITCH SECTION
NTS



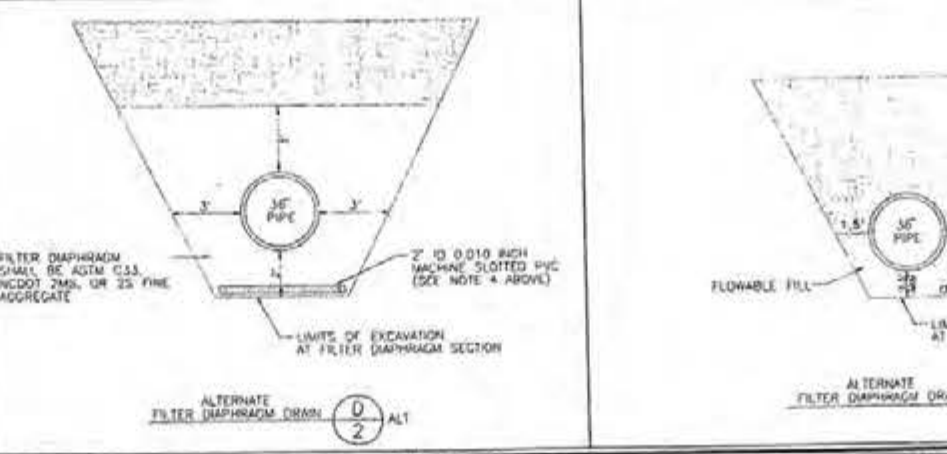
- NOTES:
1. EXCAVATION TO CONFORM TO APPLICABLE OSHA REGULATIONS.
 2. BOTTOM WIDTH OF EXCAVATION SHALL BE MIN. 5 FEET.
 3. FLOWABLE FILL SHALL BE PLACED UP TO PIPE SPRINGLINE.
 4. PIPE TO BE SUPPORTED WITH CONCRETE BLOCKS DURING PLACEMENT OF FLOWABLE FILL BEDDING.
 5. COMPACT BACKFILL TO 95% OF ASTM D-998 USING HAND OPERATED MECHANICAL TAMPERS WITHIN 4 FEET OF THE PIPE(S) & 100% LARGER COMPACTORS AS APPROVED BY THE ENGINEER MAY BE USED ELSEWHERE.



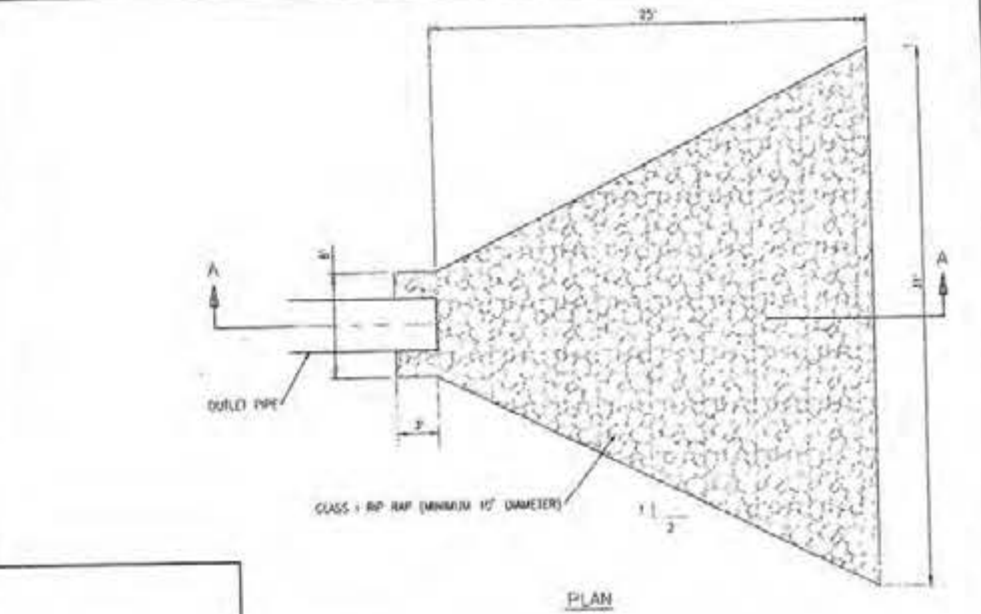
- NOTES:
1. EXCAVATE TO CONFORM TO APPLICABLE OSHA REGULATIONS.
 2. EXCAVATE TRENCH TO MINIMUM LIMITS SHOWN.
 3. DRAIN OUTLET TO BE NCDOT NO. 57 WASHED STONE ENCAPSULATED IN NON-WOVEN FABRIC (7 OZ.) THERMALLY BONDED AT SEAMS AND PLACED TO APPROXIMATELY 8 INCHES ABOVE PVC INVERT.
 4. CONTRACTOR MAY USE FLOWABLE FILL AS AN ALTERNATE TO FABRIC-WRAPPED STONE BEDDING IF FABRIC WRAPPED STONE BEDDING IS USED, PROVIDE 2" NO. 10 MACHINE SLOTTED PVC PIPE AS SHOWN BELOW, CONNECT SLOTTED PVC TO SOLID PVC AND RUN ALONG PIPE BEDDING TO DISCHARGE AT OUTLET.



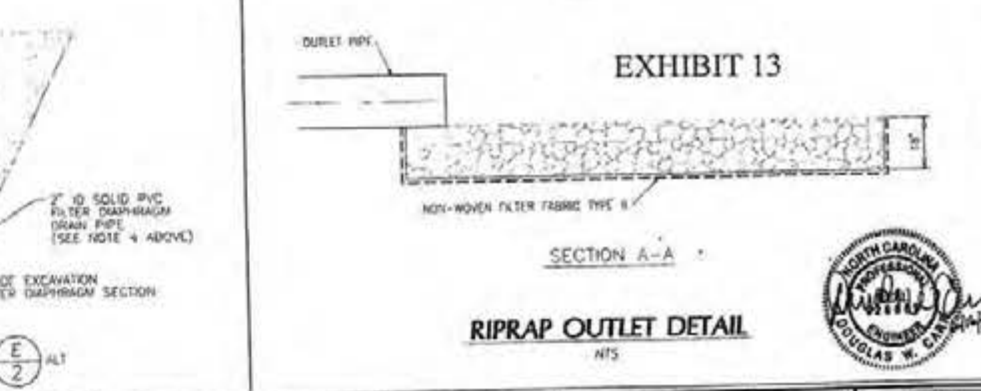
- NOTES:
1. FILTER DIAPHRAGM SAND SHALL BE ASTM C33, NCDOT 2M5, OR 25 FINE AGGREGATE.
 2. FILTER DIAPHRAGM SAND TO BE COMPACTED TO 95% OF ASTM D-998.



- NOTES:
1. FILTER DIAPHRAGM SAND SHALL BE ASTM C33, NCDOT 2M5, OR 25 FINE AGGREGATE.
 2. 2" NO. 10 MACHINE SLOTTED PVC (SEE NOTE 4 ABOVE).



PLAN



SECTION A-A

RIPRAP OUTLET DETAIL
NTS

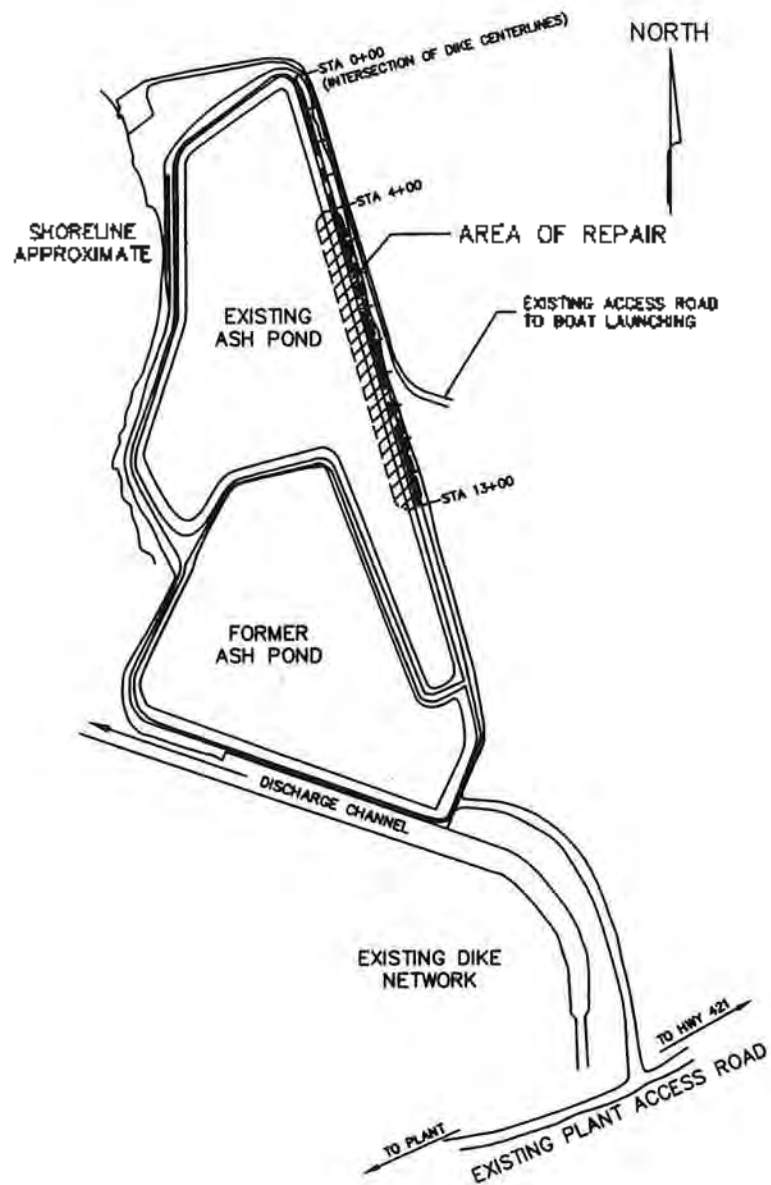


NO.	REVISION	DATE	BY	DESIGNER	SCALE
					AS NOTED

INTERIOR ASH POND DIKE PROJECT
PROGRESS ENERGY
SUTTON PLANT

NEW OUTFALL STRUCTURE

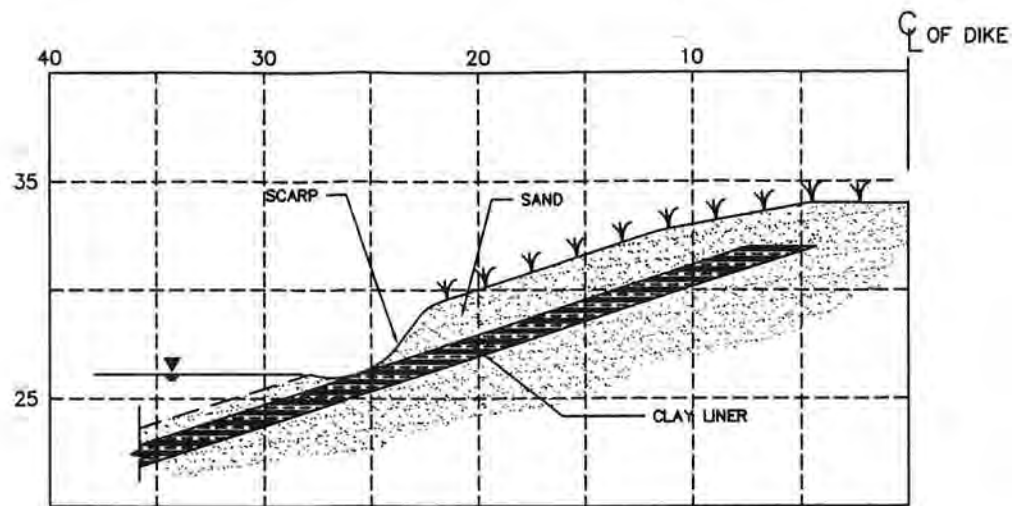
WITHERS & RAVENEL
ENGINEERS | PLANNERS | SURVEYORS
101 S. DuSable Ave., Cary, North Carolina 27511 | Tel: 919-469-1340 | Fax: 919-535-4545 | www.wr-engineers.com



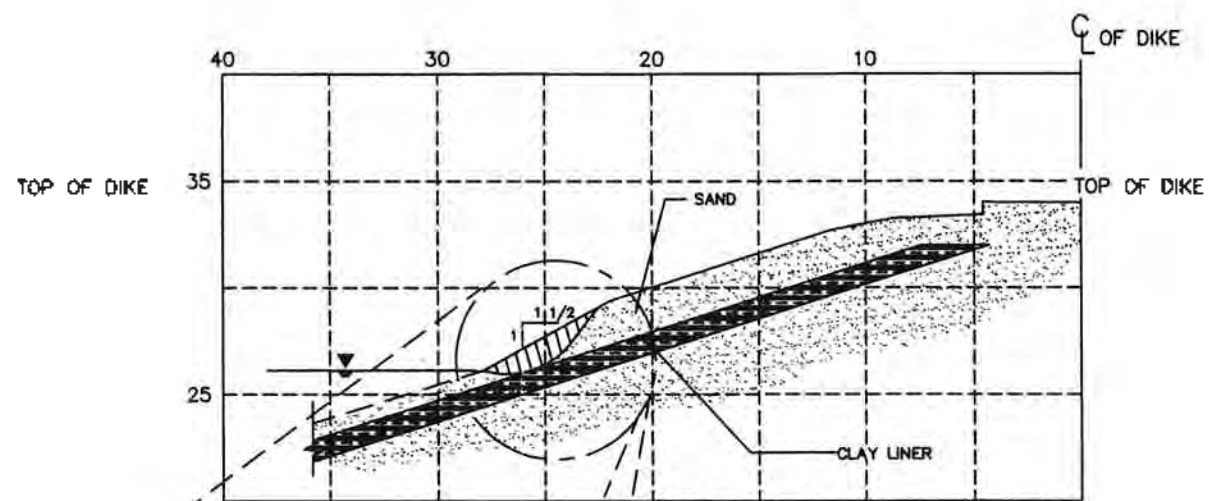
REPAIR LOCATION PLAN
NOT TO SCALE

REPAIR LOCATIONS TABLE	
STATION	
5+45 TO 5+90	
6+30* TO 11+10*	
11+35 TO 11+70	

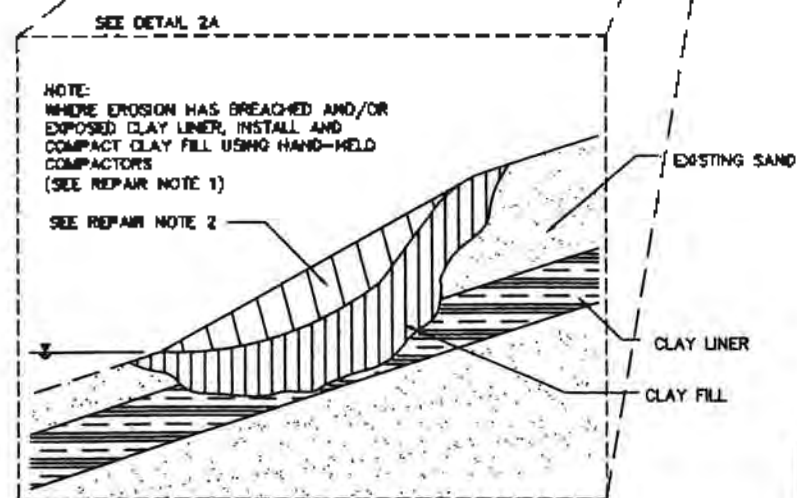
*WITHIN THIS SECTION THERE ARE SEVERAL SMALL AREAS TO BE REPAIRED. ACTUAL LOCATIONS MARKED IN FIELD BY LAW REPRESENTATIVE 7/18/01



TYPICAL EXISTING SECTION
SCALE: 1"=5'



PROPOSED REPAIR SECTION
SCALE: 1"=5'



DETAIL-CLAY LINER REPAIR
SCALE: 1/2"=1'-0"

GUIDE SPECIFICATIONS

SCOPE

Scope of work consists of preparation for and spot repairs to clay liner erosion of the west face of the east dike in the area shown.

GENERAL

- 1) The project site is the CP&L Sutton Plant located near Wilmington, North Carolina.
- 2) The work shall be performed in accordance with and shall comply with all applicable sections of governing building codes and Federal, State of North Carolina and local regulatory requirements.
- 3) OSHA requirements regarding general construction, excavation and other applicable sections shall apply.
- 4) Deviation from drawings and guide specifications shall be pre-approved by the owner or owner's representative.
- 5) Contractor shall submit to owner, prior to construction, for approval, a complete construction schedule, proposed material staging locations and anticipated work hours.
- 6) All necessary precautions for maintaining a safe work environment shall be the responsibility of the contractor.
- 7) Contractor shall clear utilities with CP&L prior to any and all excavation or subsurface work.
- 8) Contractor shall notify owner and engineer (LAW) one week prior to initiating construction activities for purposes of coordinating quality control testing and construction observations.

REPAIR PROCEDURES

- 1) Repair clay liner at locations where erosion has exposed clay. Scarify existing clay material and compact additional clay soil (USCS classification CL or CH) using hand-held compactors to at least 83 percent of standard Proctor maximum dry density, to achieve a minimum thickness of 12 inches (measured perpendicular to slope).
- 2) Use additional compacted clay to restore approximate original slope in repair areas.
- 3) Seeding of upper part of slope and repaired areas will be done by others after repairs are completed.

PROJECT CLOSURE

- 1) Contractor shall remove from the site all construction debris and other materials associated with construction activities upon completion of the proposed scope of work.
- 2) Contractor shall maintain the access and egress roads and return roads to CP&L use in equal or improved condition as before construction.



EXHIBIT 14

CLAY LINER REPAIR PLAN ASH POND DIKE INTERIOR SLOPE SUTTON PLANT - CP&L WILMINGTON, NORTH CAROLINA			
DRAWN: KRT	<div style="text-align: right;"> <h2>LAW</h2> <p>LAWGIBB Group Member</p> <p>LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC. RALEIGH, NORTH CAROLINA</p> </div>		
DFT CHECK: EJA			
ENG CHECK: EJA			
APPROVAL: [Signature]			
DATE: SEPTEMBER 2000	JOB NO.	DWG NO.	
SCALE: AS SHOWN	30720-0-3953	1	
REFERENCE DWGS:			

REV.	DATE	BY	APPR	DESCRIPTION
D				
C				
B				
A	8/3/01	CM	JAT	MODIFY REPAIR SCOPE

APPENDIX A

DAM INFORMATION SUMMARY
L.V. Sutton Steam Electric Plant
Ash Pond
New Hanover County, North Carolina

1. Location

Located 3 miles northwest of Wilmington, NC

Latitude: N34° 17' 50"

Longitude: W77° 59' 30"

2. Size and Dimensions

	<u>1984 Pond</u>	<u>1983 Pond*</u>
Length:	10,000 feet	7,000 feet
Maximum Structural Height:	32 feet	
Surface Area (acres):	82	
Storage capacity (acre-feet):	1,364	248
Size Classification:	Intermediate	Small
Hazard Classification:	Low	Low
Regulatory Design Storm	100 yr to ½ PMP **	
US Slope:	3.0(H):1(V)	
DS Slope:	3.0(H):1(V)	
Crest Width:	12 feet	
Crest Elevation:	34.0 feet	
Design maximum operating level:	32.0 feet	
Current Operating Level	26.0 feet	
Instrumentation	None	None

* The 1983 pond is not currently in service, but it is able to receive ash on a temporary basis as needed for ash management..

** 100-year storm is 9.5 inches over 24 hours. Probable Maximum Precipitation (PMP) is 38.1 inches over 48 hours. ½ PMP is 19". The long duration is due to potential for tropical storms.

3. Geology and Seismicity

Located in Coastal Plain Province. Underlain by Castle Hayne Limestone which is eroded through in places to expose the PeeDee Formation

Zone 1 seismic zone according to Corps of Engineers with
 Design Earthquake: $a_u = 0.05$ g

4. Design Information

1983 Pond: Originally designed by Brown & Root in 1971, raised to present elevation under CP&I design with assistance from William Wells. Limited subsurface exploration. No information on stability or seepage analyses. No internal drainage.

Outlet works consist of a 4" diameter concrete vertical riser connected to a 12" diameter concrete pipe through the dike that would discharge to the Cooling Pond. There are no seepage collars.

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

An interior storage area constructed in 2005 using compacted ash dikes provides additional storage capability.

1984 Pond: Designed by CP&I, with assistance from William Wells. Subsurface exploration was performed. Stability was re-evaluated by CP&I in 1987, FS = 1.58. Seepage analysis performed as part of design assuming $k = 1 \times 10^{-7}$ cm/sec for 1-foot thick clay liner with calculated seepage rate of 108 gpm. No internal drainage provided.

Outlet works consist of a 4' diameter concrete vertical riser connected to a 3' diameter concrete pipe through the dike that is connected to piping leading to the Cape Fear River. There are two seepage collars.

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

An interior storage area constructed in 2006 using compacted ash dikes provides additional storage capability.

5. Construction History

1983 Pond

Original construction of north Ash Pond dike done in 1971 under direction of Brown & Root to crest elevation of 18.0 feet. In 1983, Dickerson raised north Ash Pond to operating level to elevation 26.0 feet. Testing was conducted. The 2005 interior storage area was constructed by TransAsh. The interior storage is not currently in use and the area is dry.

1984 Pond

- Constructed by Lindsay and Associates under direction of CP&I. Testing was performed.
- Outlet pipe modifications were provided in 1999 to connect discharge to a pipe leading to the Cape Fear River. A pipe joint opened under the upstream slope and seepage through the slope created start of sinkhole. Grouting of slope was conducted in 2000 along with slip-lining of the pipe for long-term protection.
- Interior slope repairs on east dike were done 2001 to fill areas of beaching erosion and reseed.
- Additional interior slope repairs, including the 2001 areas, were made to the north and east dike in 2006 to address continued problems with beaching erosion.
- Additional storage capacity was constructed and placed in service during 2006. Engineering and design was provided by Withers & Ravenel, and construction was by TransAsh.

6. Inspection History

The dam is inspected on 5-year intervals. Since 2002, yearly site visits have been made for limited visual observations.

LAW/MACTEC:	1987, 1997, 2002, 2003, 2004, 2005
S&ME:	1992

7. Current Issues

MACTEC did not perform the limited annual inspection during 2006 because of construction in progress for new ash storage capacity. The current issues reported by the 2007 5-year inspection are as follows:

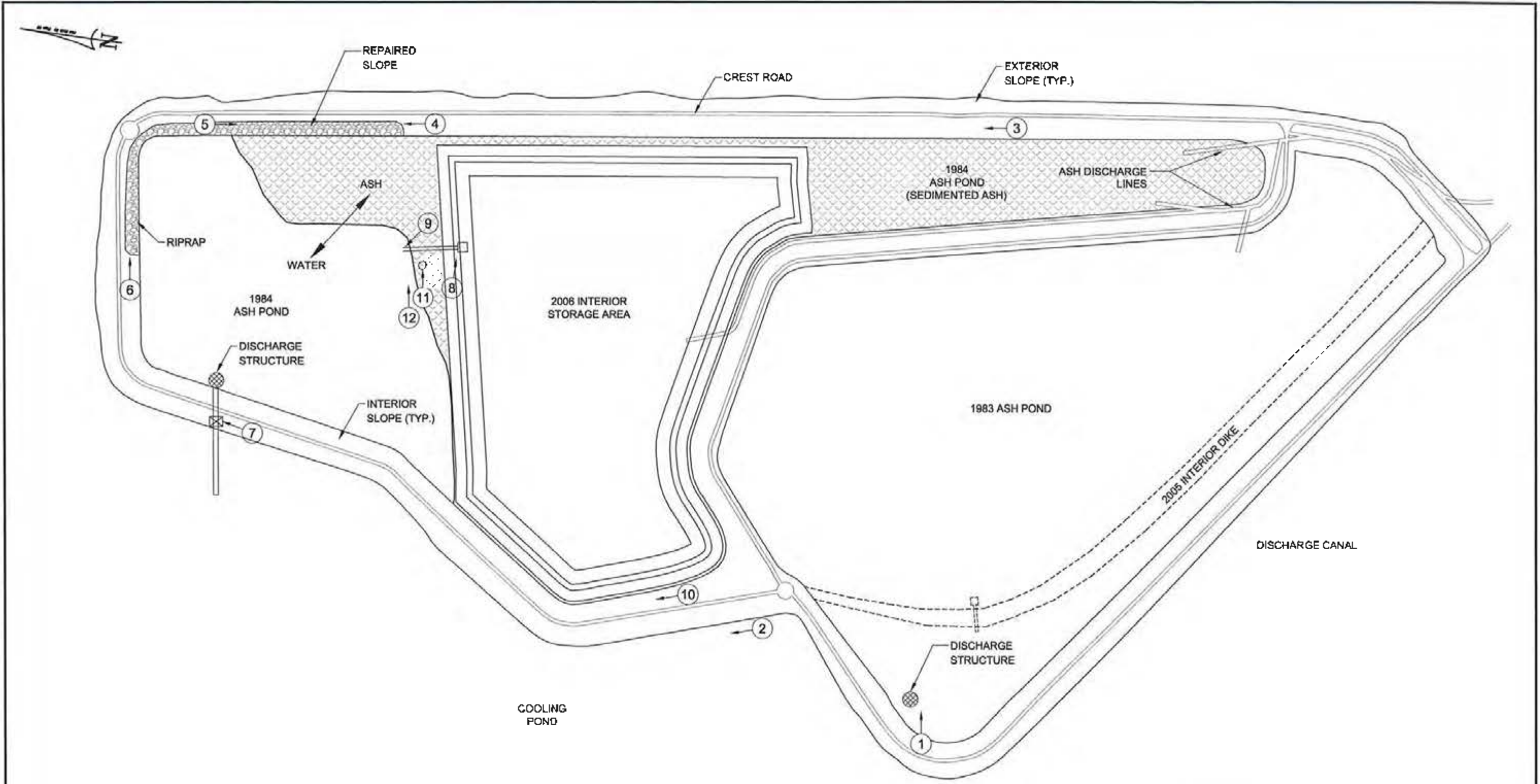
- Continue vegetation maintenance.

8. Overall Condition

The overall condition reported for 2007 was that the dikes are in good condition.

APPENDIX B

P:\64861\CP&L Projects\Sutton_1686 - 5L110N 2007.dwg (1-02)\Drawings\Ash Pond Dikes 12-2007.dwg Mon, 17 Dec 2007 11:43:30 AM



LEGEND:

① PHOTOGRAPH NUMBER AND DIRECTION
(PHOTOGRAPHS TAKEN DECEMBER 4, 2007)

 MACTEC ENGINEERING & CONSULTING, INC. RALEIGH, NORTH CAROLINA			
PHOTOGRAPH LOCATION PLAN ASH POND DIKES L.V. SUTTON STEAM ELECTRIC PLANT WILMINGTON, NORTH CAROLINA			
PREPARED BY	R.R.	SCALE	N.T.S.
CHECKED	<i>jc</i>	DATE	DEC. 2007
JOB NO.	6486-07-1686(02)	FIGURE	1

REFERENCE: CP&L DRAWINGS D3232 & D3230; WITHERS & RAVENEL DRAWING 1, TRANSASH DRAWING 4-19-05.



Photo 1. 1983 Ash Pond – Outlet riser and pond water.



Photo 2. 1984 Ash Pond – Exterior Slope looking northwest.



Photo 3. 1984 Ash Pond – Crest of 1984 dike and exterior slope of 2006 dike.



Photo 4. 1984 Ash Pond – Crest and interior slope looking north.



Photo 5. 1984 Ash Pond – Typical interior slope looking south. Note minor grass growth.



Photo 6. 1984 Ash Pond – Interior slope newly repaired with rip rap. Typical of section with good rip rap.



Photo 7. Ash Pond – Outlet drainage Structure looking northwest.



Photo 8. 2006 Interior Ash Pond Inlet looking east.



Photo 9. 2006 Outlet Pipe draining into 1984 pond.



Photo 10. Ash Pond –Typical exterior slopes of 2006 dike.

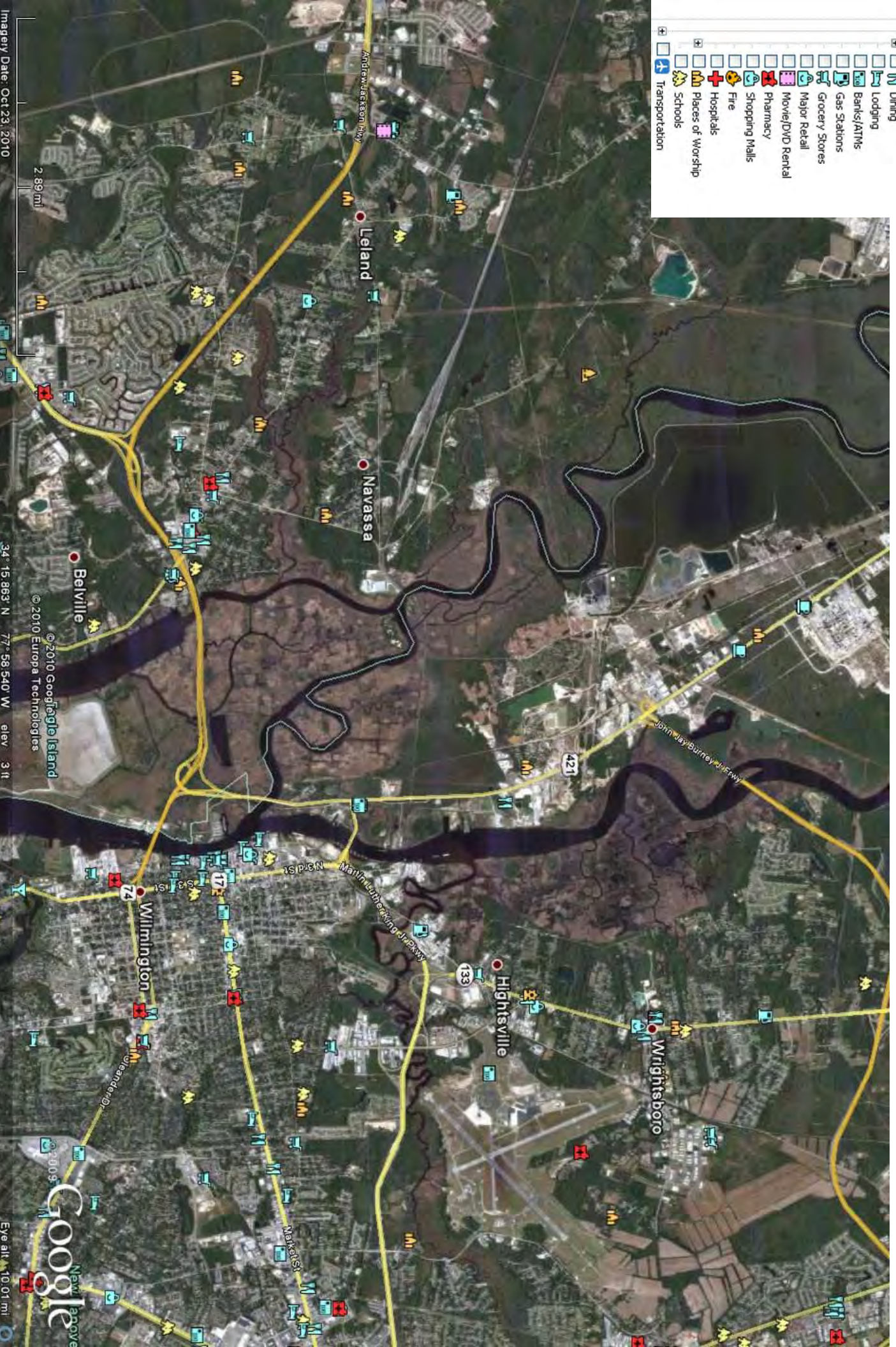


Photo 11. 2006 interior Ash Dike –Exterior Slope looking a sink hole.



Photo 12. 2006 interior Ash Dike – Area of erosion of ash along exterior slope of dike.

- Place Categories
- Bars/Clubs
- Coffee Shops
- Dining
- Lodging
- Banks/ATMs
- Gas Stations
- Grocery Stores
- Major Retail
- Movie/DVD Rental
- Pharmacy
- Shopping Malls
- Fire
- Hospitals
- Places of Worship
- Schools
- Transportation



Imagery Date: Oct 23, 2010

2.89 mi

34° 15.863' N 77° 58.540' W elev 311

© 2010 Google/Map Data
© 2010 Europe Technologies

Google
New! Overview
Eye alt: 10.01 mi

Document title

Sutton Plant Dam and Dike Inspection Procedure

Document number

EVC-SUTC-00038

Applies to: Sutton Fossil Plant - Carolinas

Keywords: environmental; inspection, dam, dike

Legend:

- OPS Operations
- ENG Engineering
- WMT Work Management
- TRN Training
- ENV Environmental
- FIN Financial
- ICT Combustion Turbine
- ADM Administrative

Organizational Applicability							
OPS	ENG	WMT	TRN	ENV	FIN	ICT	ADM
X	X			X			X

1.0 PURPOSE

- 1.1 The purpose of this program is to implement a dam and dike inspection procedure that effectively identifies any signs of potential problems that may require a repair or special attention.
- 1.2 This procedure is also intended to comply with the requirements specified in corporate document - Non-Hydroelectric Facility Dam and Dike Inspection Program Manual.
- 1.3 Dam safety issues at Sutton Plant fall under the regulatory jurisdiction of the North Carolina Utilities Commission (NCUC). This procedure specifies how Sutton Plant completes and documents dam and dike inspections.
- 1.4 IF there is a dam or dike release, THEN IMPLEMENT [EMG-SUTC-00003](#), Sutton Plant Dam Emergency Notification Procedure.

2.0 TERMS AND DEFINITIONS

- 2.1 Breach: An opening or a breakthrough of a dam sometimes caused by rapid erosion of a section of earth or ash embankment by water.
- 2.2 Dam: An artificial barrier constructed to impound or divert water or liquefied material.
- 2.3 Dam Emergency Notification: A document that identifies potential emergency conditions at a dam or dike and specifies preplanned actions to be followed to minimize impacts to the environment.

- 2.4 Dike/levee: Any artificial barrier that will divert or restrain the flow of a stream or other body of water for the purpose of protecting an area from flooding by flow waters.
- 2.5 Distress: A condition of severe stress, strain, or deterioration indicating possible or potential failure.
- 2.6 Embankment: Fill material placed with sloping sides and usually with a length greater than its height. An "embankment" is a part of a dam.
- 2.7 Freeboard: The vertical dimension between the crest of the dam at its lowest point and the reservoir water surface.
- 2.8 Riprap: A layer of large stones, broken rock, or precast blocks placed in random fashion on the upstream slope of an embankment dam. The purpose of riprap is to aid in the prevention of degradation of the structural fill portion of the dam.
- 2.9 Seepage: The slow oozing of a fluid through a permeable material. A small amount of seepage will normally occur in any dam or embankment that retains water. The rate will depend on the relative permeability of the material in and under the structure, the depth of water behind the structure, and the length of the path the water must travel through or under the structure.
- 2.10 Spillway/weir: A passage to conduct excess water or other liquid safely through, over, or around a dam or other artificial barrier that impounds the liquid.

3.0 RESPONSIBILITIES

3.1 Plant Manager

- 3.1.1 **IMPLEMENT** this ash pond dam inspection procedure.
 - 1. **ENSURE** inspections are completed on the specified frequency.
 - 2. **IDENTIFY** funding to correct problems or deficiencies.
- 3.1.2 **REVIEW** and **SIGN** inspection reports.
- 3.1.3 **RETURN** signed inspection report to plant environmental coordinator.

3.2 Plant Environmental Coordinator

- 3.2.1 **REVISE** the dam and dike inspection procedure.
 - 1. **UPDATE** every two years, OR
 - 2. **UPDATE** when inspection procedures and/or practices need to be modified.
- 3.2.2 **ASSIST** in ensuring the dam and dike inspections are completed by the specified frequency.

- 3.2.3 **REVIEW** inspection reports.
- 3.2.4 **OBTAIN** plant manager's signature on inspection report.
- 3.2.5 **FILE** inspection report in Sutton file point location of 13580-C.
- 3.2.6 **ENSURE** recommendation and deficiencies are addressed in a timely manner.
- 3.2.7 **NOTIFY** the Dam and Dike Program Manager – Field Engineering of conditions found during inspection (including construction on or in close proximity to dams) and if inspection results indicate any significant problem(s).
- 3.2.8 **ASSIST** in scheduling annual inspection training.

3.3 Plant Chemistry Technicians

- 3.3.1 **CONDUCT** the dam and dike inspection.
 - 1. Should **RECEIVE** annual inspection training.
 - 2. Sutton Dam Inspection Training Materials
- 3.3.2 **COMPLETE** FRM-SUTC-00011, Ash Pond Dam and Dike Inspection Form or FRM-SUTC-00012, Sutton Lake Dam and Dike Inspection Form while conducting these inspections.
- 3.3.3 **GIVE** the dam and dike inspection form(s) to the plant environmental coordinator.
- 3.3.4 **DISCUSS** appropriate findings with the plant environmental coordinator.
- 3.3.5 **INITIATE** work request to address any observed issues or problems.

3.4 Field Engineering POG

- 3.4.1 **VISIT** the site at least once per year.
- 3.4.2 **REVIEW** Sutton Plant's dam safety inspection status.
- 3.4.3 **IDENTIFY** any concerns or potential follow-up items.
- 3.4.4 **ASSIST** with identifying funding to correct problems or deficiencies.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Detailed inspections have the potential for injury to plant personnel due to the traffic volume on the constricted dike roads, crossing the train track rails, and uneven terrain that can cause foot travel hazards.

5.0 PREREQUISITES

- 5.1 **ATTEND** annual dam and dike inspection training by a third party contractor or qualified individual.
- 5.2 **MAINTAIN** inspection consistency by using the same person(s) for observations and condition assessment.
- 5.3 **REVIEW** this procedure and most recent previous inspection report PRIOR to performing routine inspection.
- 5.4 **RECEIVE** any special training required to address safety concerns (such as: boating safety).

6.0 MATERIAL AND SPECIAL EQUIPMENT

- 6.1 There is currently no monitoring instrumentation installed for the dikes at Sutton Plant.
- 6.2 Suggested items to facilitate the inspection include:
 - 6.2.1 Copy of previous inspection report for reference,
 - 6.2.2 Copy of last 5-year NCUC inspection report for reference,
 - 6.2.3 Camera to photograph areas of concern,
 - 6.2.4 Cell phone or radio to maintain communication with plant for safety,
 - 6.2.5 25 foot tape measure,
 - 6.2.6 Steel rod or stiff wooden pole to probe areas of concern,
 - 6.2.7 Bush axe,
 - 6.2.8 Surveyors marking tape,
 - 6.2.9 Surveyors wooden stakes and marking pen, and
 - 6.2.10 Plant vehicle or other motorized mode of transportation.

7.0 PROCEDURE

7.1 Scope

7.1.1 REVIEW the latest 5-Year NCUC Dam Safety Inspection Report to best describe the dams, dikes, and appurtenant structures covered by this inspection procedure.

1. The cooling pond is exempted from North Carolina dam safety regulations because the dikes are less than fifteen (15) feet in height.

7.1.2 INCLUDE the following key site features in the inspection scope:

1. Active (New) Ash Pond

- a. Overall integrity of approximately 10,000 linear feet of enclosure dike that surrounds the active ash pond area.
- b. Condition of interior and exterior slopes for the dikes including vegetation provided for stabilization.
- c. Stability of crest of dikes and service road conditions.
- d. Condition of discharge skimmer and overflow standpipe.
- e. Condition of outlet for pond discharge into cooling reservoir.
- f. Condition of warning signs and other site features provided for public safety.

2. Cooling Pond

- a. Overall integrity of approximately 19,000 linear feet of perimeter dike placed adjacent to the Cape Fear River.
- b. Condition of interior and exterior slopes for the dikes including vegetation provided for stabilization, soil-cement interior liner and riprap erosion protection material.
- c. Stability of crest of dikes and service road conditions.
- d. Condition of river discharge structure.
- e. Condition of makeup water pumping station.
- f. Condition of warning signs and other site features provided for public safety and recreation.

- g. Condition of baffle dikes. (Detailed inspection needed only once/year)
- h. Condition of intake and discharge canals including soil-cement lining for slopes.
- i. Condition of bridges and skimmer structure.

7.2 Inspection Frequency

7.2.1 **PERFORM**, at a minimum, monthly routine inspections of ash pond dams, dikes, and appurtenant hydraulic structures.

- 1. **INSPECT** during periods of dry weather, if possible.

7.2.2 **PERFORM**, at a minimum, quarterly routine inspections of lake dams, dikes, and appurtenant hydraulic structures.

- 1. **INSPECT** during periods of dry weather, if possible.

7.2.3 **SCHEDULE** supplemental inspection as follows:

- 1. **INSPECT** underwater inspection for bridges, river discharge structure and canals every five (5) years preferably to coincide with the NCUC inspection schedule.
- 2. **INSPECT** of entire perimeter of the baffle dikes at least once per year.
- 3. **INSPECT** immediately following any major storm event to identify obvious damage or public safety hazards.

7.3 Recommended Inspection Practices

7.3.1 **IDENTIFY** any changes in the condition of dams, dikes and appurtenant hydraulic structures that might indicate a problem that could potentially threaten the integrity or safety of those features.

- 1. **MAINTAIN** accurate record of condition changes to allow consideration of developing trend.
- 2. **USE** factually quantified words with objective parameters when describing changes such as size (length, width and depth), flow rate (gpm, cfs) and location (upstream/downstream slope, location on dike by stationing, toe of slope, etc.).



engineering and constructing a better tomorrow

June 30, 2009

Mr. Bill Forster
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27613

Subject: **REPORT OF 2009 LIMITED (ANNUAL) FIELD INSPECTION
ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC PROJECT NO. 6468-09-2351 (02)**

Dear Mr. Forster:

On March 25, 2009, Mr. Scott Auger and Mr. James Schiff of MACTEC Engineering and Consulting, Inc. (MACTEC) visited the L.V. Sutton Steam Electric Plant to perform a limited field inspection of the Ash Pond Dikes. Prior to the inspection, we reviewed the 2008 Annual Inspection Report to confirm observations from previous inspections. The primary plant contacts for Progress Energy during this inspection were Mr. Bruce Moorefield and Mr. Isaac Alderman.

The field inspection included a discussion of activities since the last inspection visit, review of available records and a driving/walking reconnaissance of the Ash Pond dikes. The weather conditions during the inspection were generally partly cloudy, cool and dry. There was no significant rainfall within 24 hours prior to the inspection. This letter report summarizes the observations during the current inspection and provides recommendations for any follow-up actions. Photographs of selected conditions and updated Progress Energy condition assessment forms are also included with this report by attachment.

MACTEC conducted a dam safety training exercise for Mr. Moorefield and Mr. Alderman in conjunction with the current inspection.

The last 5-year independent consultant inspection was performed by MACTEC in December, 2007 and the next is scheduled in 2012.

SUMMARY

Based on the field observations noted in this report, the ash pond dikes generally appear to be stable and in satisfactory condition. For this inspection, we generally observed improvement in maintenance of vegetation on the slopes. We continue to emphasize the importance of controlling vegetation, brush and tree growth for slopes. The primary objective is to maintain the vegetation in a condition that will facilitate safe and effective routine inspection activities by plant personnel. In addition, trees should be cut on the slopes before reaching a size that would allow roots to deeply penetrate the dikes.

For the current inspection, the new recommendations for follow-up action include:

MACTEC Engineering and Consulting, Inc. NC Engineering License No. F-0653
3301 Atlantic Avenue • Raleigh, NC 27604 • Phone: 919-876-0416 • Fax: 919-831-8136

- (AP-2009-1) 2006 Interior Storage Area - Riprap material on the inside slope was observed to have slipped down the slope on the north side of the dike near the discharge structure. This appears to be a localized conditions affecting about 15-20 linear feet along slope. There was no significant slope damage observed at the time of inspection. We recommend routinely checking this area for slope damage and providing riprap repairs as soon as possible.
- (AP-2009-2) 1983 Ash Pond Area – There appears to be more standing water for the pond area near the discharge structure compared with previous inspections. This area has generally been reported to be inactive for previous inspections. The condition of the dikes and adequacy of the discharge structure should be further evaluated in consideration of the current utilization for this area.
- (AP-2009-3) 1984 Ash Pond Prior to the current inspection, MACTEC provided support for investigation of possible increased seepage for the 1984 Ash Pond area associated with raising the pond operating level. This condition was identified as a concern by the plant based on comparison of inflow and outflow estimates. MACTEC performed field inspections and installed piezometers for the dike to support the seepage investigation. The investigation results to date and the current inspection activities do not appear to indicate that seepage represents an immediate concern for dike stability. The plant has lowered the water level to the elevation before observation of the possible increased seepage. Further review of this condition may be warranted if the plant considers raising the water level in the future.

RECORDS

As authorized by Progress Energy under Work Authorization No. 2720-161, dated January 26, 2009, MACTEC installed new piezometers for the 1984 Ash Pond area to support seepage investigations. The new piezometers were installed at 6 locations, with 3 piezometers at each location, for a total of 18 new piezometers. Water level readings were obtained for the piezometers during the current inspection and compared to initial readings. The piezometer data does not appear to indicate that the water level in the dikes is increasing or represents a concern for dike stability.

There are currently no other active piezometers or monitoring instrumentation for the Ash Pond Dikes.

Mr. Alderman confirmed that the routine monthly inspections were being performed by the plant staff.

ASH POND INSPECTION

1983 Ash Pond

The 1983 Ash Pond dikes were constructed by raising the original dikes constructed in 1971. The present dikes have a crest elevation varying from Elevation 28 feet (MSL) to Elevation 34 feet (MSL). The higher elevation is at the common dike with the 1984 Ash Pond. The crest width is 12 feet and side slopes are 3(H):1(V). Including the common dike, the dike length is about 3,800 feet. This ash pond area was taken out of service following completion of the 1984 Ash Pond. It

has been reported that the 1983 Ash Pond area was temporarily returned to service in 2001. We have generally represented this ash pond area as inactive for recent inspection reports.

For the current inspection, we observed more standing water for the pond area near the discharge structure compared with previous inspections (Photographs 1). We also observed standing water adjacent to the dike along the discharge canal on the south side of the pond area (Photograph 3). We understand that this area currently receives storm water inflow from plant sources including retention ponds, coal pile runoff, and tank farm drainage. In addition, we understand that an interior containment area is actively used for Unit 1 & 2 bottom ash disposal operations.

The 1983 Ash Pond discharge structure consists of a 48-inch diameter vertical concrete riser connected to a 12-inch diameter concrete outlet pipe, and is located in the northwest corner of the pond. The outlet of the discharge pipe is submerged in the cooling pond and not visible. The discharge riser crest was checked by field survey in 2003, and was reported to be around Elevation 23.81 feet (MSL). The 2003 survey indicated that the minimum crest elevation for the dikes was around Elevation 27.6 feet (MSL). In follow-up to the field inspection, Mr. Moorefield reported that a 2 foot extension piece was added to the riser since the 2003 survey, which would place the current riser crest at Elevation 25.81 (MSL). Mr. Moorefield further reported that the water level near the discharge structure generally seems to stay below the crest of the riser except during periods of heavy rainfall. It should be noted that previous inspection reports have recommended maintaining the operating water level around Elevation 23.5 (MSL).

In follow-up to the current inspection, the condition of the dikes and adequacy of the discharge structure should be further evaluated in consideration of the current utilization for this area.

There are no piezometers or movement monuments in the dikes.

In 2006, a temporary interior storage area was constructed within the pond area. The containment dikes for this temporary storage area are not included in this inspection scope. The temporary containment area did not appear to be retaining any significant amount of standing water at the time of inspection.

The dike crest is generally level and shows no signs of unusual settlement or displacement.

The exterior slope of the west dike, from the intersection with the 1984 Ash Pond dike to about 300 feet south of the discharge structure appears to have a fair grass cover for surface stabilization (Photograph 2).

The exterior slope along the discharge canal continues to be heavily overgrown with trees and brush. Inspection of the exterior slopes in this area was limited because of the heavy growth (Photograph 4).

The upper portion of the dike slopes near the crest appeared to have been mowed prior to the inspection. Progress Energy should continue with maintenance cutting of trees and brush to facilitate inspection.

The available reference drawings showing dike sections are included in Appendix C – Exhibits. This reference information was obtained from the 2007 5-Year Independent Consultant Inspection Report.

1984 Ash Pond Area

The dikes for the 1984 pond were constructed of sand with an interior clay liner. The clay liner extends across the pond bottom as well. The crest width is 12 feet and slopes (interior and exterior) are 3(H):1(V). The maximum dike height is about 32 feet above original grade, and the design crest of the dikes is at Elevation 34 feet (MSL). The length including the common dike with the 1983 pond is about 10,000 feet. At the time of our inspection, the pond level was about two to three inches above the riser.

Prior to the current inspection, MACTEC provided support for investigation of possible increased seepage associated with the 1984 Ash Pond area associated with raising the pond operating level. This condition was identified as a concern by the plant based on comparison of inflow and outflow estimates. MACTEC performed field inspections and installed piezometers for the dikes to support the seepage investigation. The investigation results to date and the current inspection activities do not appear to indicate that seepage represents an immediate concern for dike stability. The plant has lowered the water level to the elevation before observation of the possible increased seepage. Further review of this condition may be warranted if the plant considers raising the water level in the future.

Mr. Moorefield reported that the pond level was raised to Elevation 30.0 (MSL) in November, 2008, which was the level where the plant observed possible increased seepage. The plant lowered the pond level to Elevation 28.0 (MSL) in January, 2009, which is the current normal water level.

The dike crest appeared to generally be good condition with no signs of unusual settlement or displacement. (Photographs 5 and 6)

The interior slopes were heavily overgrown with tall grass along with patches of briars which limited inspection. Grass and briars are also becoming established in the riprap slope protection on the interior slope along the east side of the pond area (Photograph 7).

The exterior slopes of the dikes are moderately to well vegetated with grass along with some briars and small bushes (Photograph 8). For this inspection, most of the toe area was checked for seepage. All locations inspected along the toe appeared to be dry with no indication of seepage or slope stability problems. The upper portion of the dike slope near the crest appeared to have been mowed prior to the inspection.

The vertical riser for the discharge structure was observed from the access platform. The skimmer structure and interior surfaces appeared to be in good visual condition (Photograph 11). The downstream outlet structure appeared to be structurally sound with no obvious signs of leakage or displacement (Photograph 12). The discharge from the structure appeared to be free flowing at the time of inspection. Representative photographs of the dike slopes looking toward the discharge structure are included with Appendix B (Photographs 9 and 10).

The available reference drawings showing dike sections are included in Appendix C – Exhibits. This reference information was obtained from the 2007 5-Year Independent Consultant Inspection Report.

1984 Ash Pond Interior Storage Capacity Addition

In 2006, Progress Energy constructed an interior ash storage area for the southern end of the 1984 Ash Pond. The storage capacity addition was designed by Withers & Ravenel and constructed by Trans Ash. The design crest elevation is 42.0 ft (MSL), and the planned operating level is Elevation 40.0 feet (MSL). The maximum dike height above the original ash level is about 14 feet. The crest width is 25 feet wide with a gravel road in the center. The interior slope is 2(H):1(V) and the exterior slope on the east, west and south sides is 4(H):1(V). Where the new dikes are adjacent to the 1984 pond perimeter dikes, the toe of the slope is set back eight feet and the space is graded to promote flow of water toward the north. On the north side, where the dike is adjacent to the impounded water of the 1984 pond, a stability berm with a 25-foot wide crest is added to the main slope. (Photograph 16)

The crest generally appeared to be stable with no signs of unusual settlement or displacement.

The interior slope has rip rap placed for erosion protection above the water level which generally appeared to be intact. However, riprap material on the inside slope was observed to have slipped down the slope on the north side of the dike near the discharge structure. This appears to be a localized conditions affecting about 15-20 linear feet along slope. There was no significant slope damage observed at the time of inspection. We recommend routinely checking this area for slope damage and providing riprap repairs as soon as possible. (Photograph 17)

There is a fairly heavy growth of tall grass in the rip rap above the water line that limited inspection. Progress Energy should consider maintenance cutting or spraying of vegetation that is growing in the riprap to facilitate inspection. (Photographs 15)

The exterior slopes generally appeared to be stable. However, the vegetation on the exterior slopes continued to appear sparse and should be routinely checked for erosion. The toe of slope along the east and west sides appeared to be dry at the time of inspection. Previous inspections have noted depressions and erosion for the stability berm on the north side of the ash storage area. Repairs to the toe berm appear to have been effective. Progress Energy should continue to monitor the toe area for erosion and provide repairs. (Photograph 18)

The discharge structure for this interior storage area consists of a concrete riser structure six feet square connected to a 36-inch diameter HDPE pipe with an outlet invert set at Elevation 24.0 feet (MSL). The plans show that the 36-inch diameter HDPE discharge pipe. The discharge structure appeared to be structurally sound with no indications of displacement. (Photographs 13 and 14))

At the time of our inspections, the water level in the interior storage area was slightly above Elevation 40.0 feet (MSL), and was flowing over the crest of the riser.

The outlet for the discharge appeared to be free flowing at the time of inspection. The area around the discharge pipe is becoming very heavily overgrown, which may limit access for inspection. The plant should routinely check the seepage drain piping for indications of change in flow.

The available reference drawings showing dike sections are included in Appendix C - Exhibits. This reference information was obtained from the 2007 5-Year Independent Consultant Inspection Report.

SUMMARY OF RECOMMENDATIONS

Based on the current inspection results, the status for addressing recommendations for previous annual reports and the 2007 5-year Inspection Report are summarized as follows:

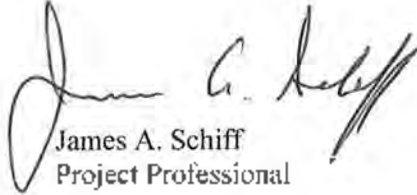
Ref No.	Recommendations	Recomm Time for Impl	Current Status
AP-2007-1 (1983Ash Pond)	The large brushy vegetation on the west dike should be trimmed to allow better slope visibility.	Routine Maintenance	Improvement noted during 2009 inspection. Plant should continue maintenance cutting.
AP-2007-2 (1983Ash Pond)	Progress Energy's program of cutting trees on the exterior slopes should continue.	Routine maintenance	Large trees still present on downstream slope along discharge canal.
AP-2007-3 (1983Ash Pond)	If operation of the 1983 pond is resumed, the exterior slope adjacent to the Cooling Pond and discharge canal should be checked during the monthly inspections for signs of seepage.	Routine inspection	See comments on observed pond utilization for 2009 inspection report.
AP-2007-4 (1984Ash Pond)	Patches of briars and small brush on the interior slope should be controlled by spraying or cutting so the slope can be observed during routine inspections.	Routine maintenance.	Improvement noted for 2009 inspection. Plant should continue with maintenance cutting.
AP-2007-5 (1984Ash Pond)	Progress Energy's program of cutting trees on the exterior slopes should continue.	Routine maintenance	Recommend cutting brush to facilitate inspection.
AP-2007-6 (1984Ash Pond)	The east dike interior repair area should be monitored for progress of vegetative growth. The rip rap should be sprayed as needed to control vegetation.	Routine maintenance	Plant should continue to monitor and provide appropriate maintenance.

CLOSING

MACTEC is pleased to continue assisting Progress Energy with inspections of the dams at the L.V. Sutton Steam Electric Plant. Please contact us if you have any questions about this report.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.


James A. Schiff
Project Professional


Richard S. Auger
Principal Engineer
Registered, North Carolina 8169



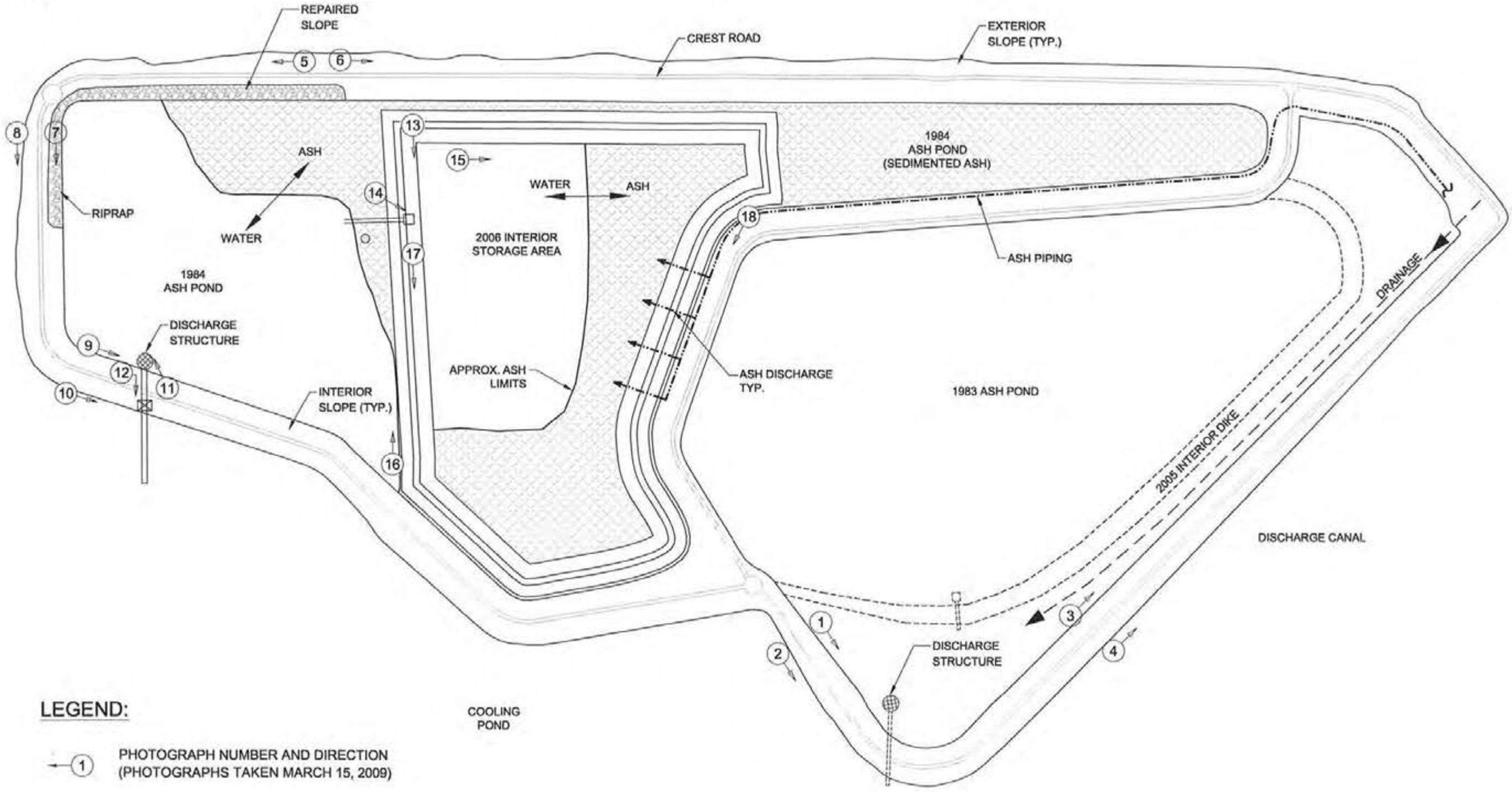
RSA/jas

Appendices:

- Appendix A - Photograph Location Drawings (1 drawing)
- Appendix B - Photographs
- Appendix C - Exhibits
- Appendix D - Dam Information Summary Sheets
- Appendix E - Dam Assessment Forms

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
I. V. Sutton Steam Electric Plant
Report Appendices

Appendix A – Photograph Location Drawing



LEGEND:

① PHOTOGRAPH NUMBER AND DIRECTION
(PHOTOGRAPHS TAKEN MARCH 15, 2009)

P:\9466_Progress_Energy_Sutton_2009_Inspection_Drainings\Ash_Pond\18x11x8 - 9:11am.mxd



**PHOTOGRAPH LOCATION PLAN
ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA**

DRAWN:	R.R.	DATE:	JUNE 2009
ENG CHECK:		SCALE:	N.T.S.
APPROVAL:		JOB No.:	6468-09-2351 (02)

DRAWING
1

REFERENCE: CP&L DRAWINGS D3232 & D3230; WITHERS & RAVENEL DRAWING 1, TRANSASH DRAWING 4-19-05.

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
L.V. Sutton Steam Electric Plant
Report Appendices

Appendix B – Photographs

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



1. 1983 Ash Pond – View of interior slope, outlet riser and standing water near riser.



2. 1983 Ash Pond - View of dike exterior slope near outlet riser

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



3. 1983 Ash Pond – View of crest, interior slope and standing water adjacent to discharge canal.



4. 1983 Ash Pond – View of crest and exterior slope adjacent to discharge canal.

Appendix B – Photographs
2009 L. V. Sutton – Ash Pond Dike Annual Dam Inspection



5. 1984 Ash Pond – View of dike crest and exterior slope east side of pond



6. 1984 Ash Pond -- View of dike crest and exterior slope on east side of pond

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



7. 1984 Ash Pond - View of riprap placed for interior slope on north side of pond.



8. 1984 Ash Pond – View of exterior slope on north side of pond.

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



9. 1984 Ash Pond – View of interior slope of dike on west side of pond looking toward discharge riser.



10. 1984 Ash Pond – View of exterior slope of dike on west side of pond looking toward outlet structure.

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



11. 1984 Ash Pond – View of top for discharge riser.



12. 1984 Ash Pond – View of top for discharge structure looking toward cooling pond.

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



13. 1984 Ash Pond (Interior Storage Area) – View of dike crest looking toward discharge structure on north side of pond.



14. 1984 Ash Pond (Interior Storage Area) – View of discharge structure.

Appendix B – Photographs
2009 L. V. Sutton –Ash Pond Dike Annual Dam Inspection



15. 1984 Ash Pond (Interior Storage Area) – View of crest of dike and interior slope along east side of pond.



16. 1984 Ash Pond (Interior Storage Area) – View of along toe of north dike.

Appendix B – Photographs
2009 L. V. Sutton – Ash Pond Dike Annual Dam Inspection



17. 1984 Ash Pond (Interior Storage Area) – View of riprap along interior slope on north side of pond.



18. 1984 Ash Pond (Interior Storage Area) – View of exterior slope on south side of pond.

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
L.V. Sutton Steam Electric Plant
Report Appendices

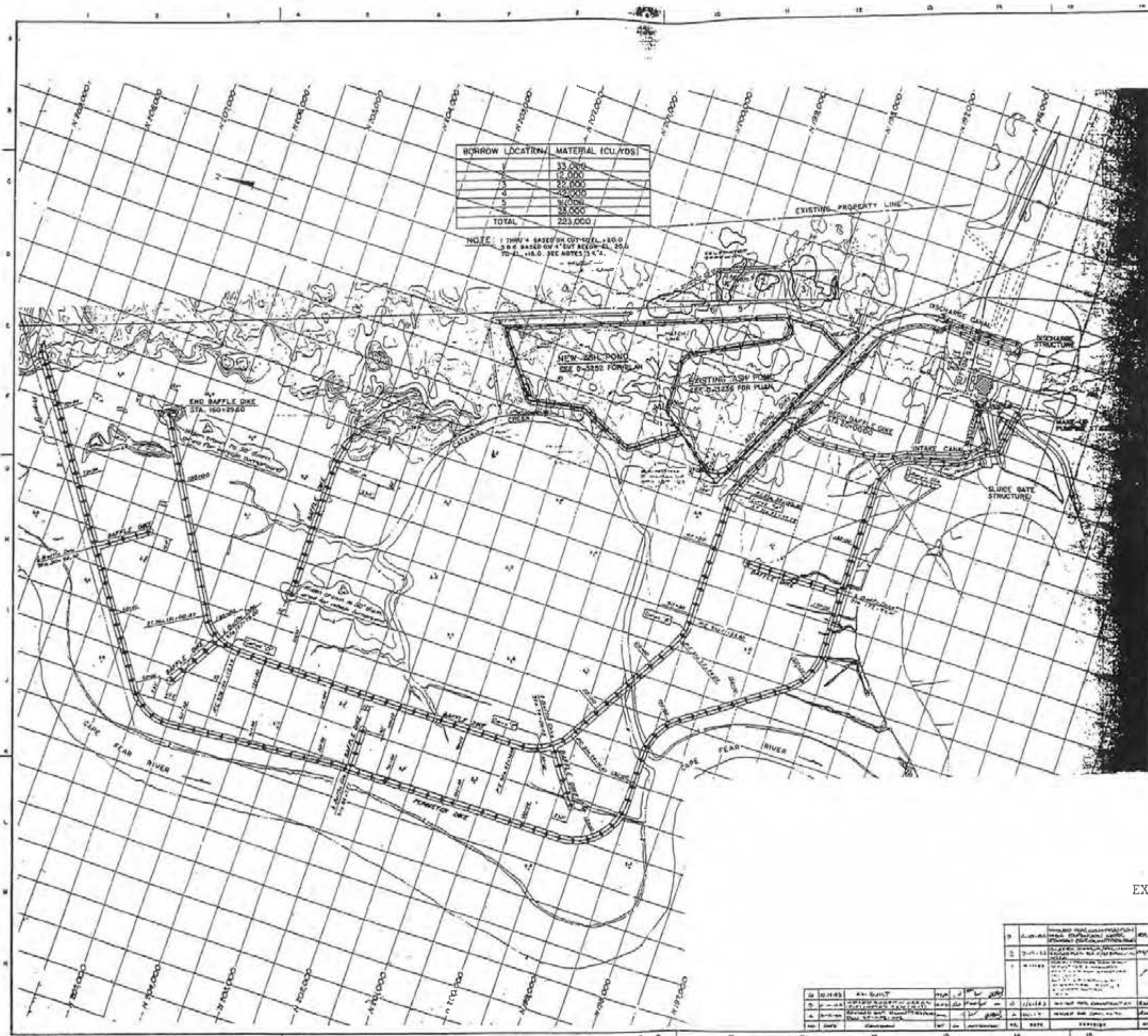
Appendix C - Exhibits

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
L. V. Sutton Steam Electric Plant
Report Appendices

LIST OF EXHIBITS

The exhibit drawings included with this report were obtained from the 2007 5-Year Independent Consultant Report as follows:

1. Not included
2. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Site Plan, Carolina Power & Light Company Drawing No. D-3235, As-Built, Dated 10/14/85.
3. Civil, Ash Disposal Ponds, North Pond-Discharge Structure, Sheet 1 of 2, Brown and Root Drawing No. G-3177B, Dated 9/7/71.
4. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Plan-Sheet 1, Carolina Power & Light Company Drawing No. D-3236, As-Built, Dated 10/14/85.
5. Sutton Steam Electric Plant, Ash Pond Expansion (1985-1984), Plan-Sheet 2, Carolina Power & Light Company Drawing No. 3252, As-Built, Dated 10/14/85.
6. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Dike Sections (Sheet 1), Carolina Power & Light Company Drawing No. D-3237, As-Built, Dated 10/14/85.
7. Sutton Steam Electric Plant, Ash Pond Expansion, Dike Sections (Sheet 2), Carolina Power & Light Company, Drawing No. D-3239, As-Built, Dated 10/14/85.
8. Sutton Steam Electric Plant, Ash Pond Expansion (1983-1984), Sections and Details (Sheet 1), Carolina Power & Light Company Drawing No. D-3238, As-Built, Dated 10/14/85.
9. Sutton Steam Electric Plant, Ash Pond Expansion, (1983-1984), Sections and Details (Sheet 2), Carolina Power & Light Company Drawing No. D-3253, As-Built, Dated
10. Not included.
11. Not included
12. Site Plan, Interior Ash Pond Dike Project, Progress Energy-Sutton Plant, Withers & Ravenel, Sheet No. 1, Dated May 2006.
13. New Outfall Structure, Interior Ash Pond Dike Project, Progress Energy-Sutton Plant, Withers & Ravenel, Sheet No. 2, Dated May 2006.



BORROW LOCATION	MATERIAL (CU.YDS)
1	33,000
2	15,000
3	20,000
4	12,000
5	10,000
6	15,000
7	18,000
8	10,000
9	12,000
TOTAL	223,000

NOTE: 1 THRU 9 BASED ON CUT-LEVEL 180.0
 5 & 6 BASED ON 1' CUT BELOW EL. 204.0
 TOTAL 18.0 SEE NOTES 1 & 2.

ESTIMATED QUANTITIES

ITEM	QUANTITY	UNIT
1. EXCAVATION	150,000	CY
2. FILL	200,000	CY
3. CONCRETE	100,000	CU YD
4. REBAR	100,000	LB
5. STEEL	100,000	LB
6. PIPE	100,000	LB
7. WOOD	100,000	CU YD
8. GRAVEL	100,000	CY
9. SAND	100,000	CY
10. SOIL	100,000	CY
11. WATER	100,000	CU YD
12. FUEL	100,000	CU YD
13. OIL	100,000	CU YD
14. GASES	100,000	CU YD
15. SOLIDS	100,000	CU YD
16. LIQUIDS	100,000	CU YD
17. AIR	100,000	CU YD
18. SOLID	100,000	CU YD
19. LIQUID	100,000	CU YD
20. GAS	100,000	CU YD

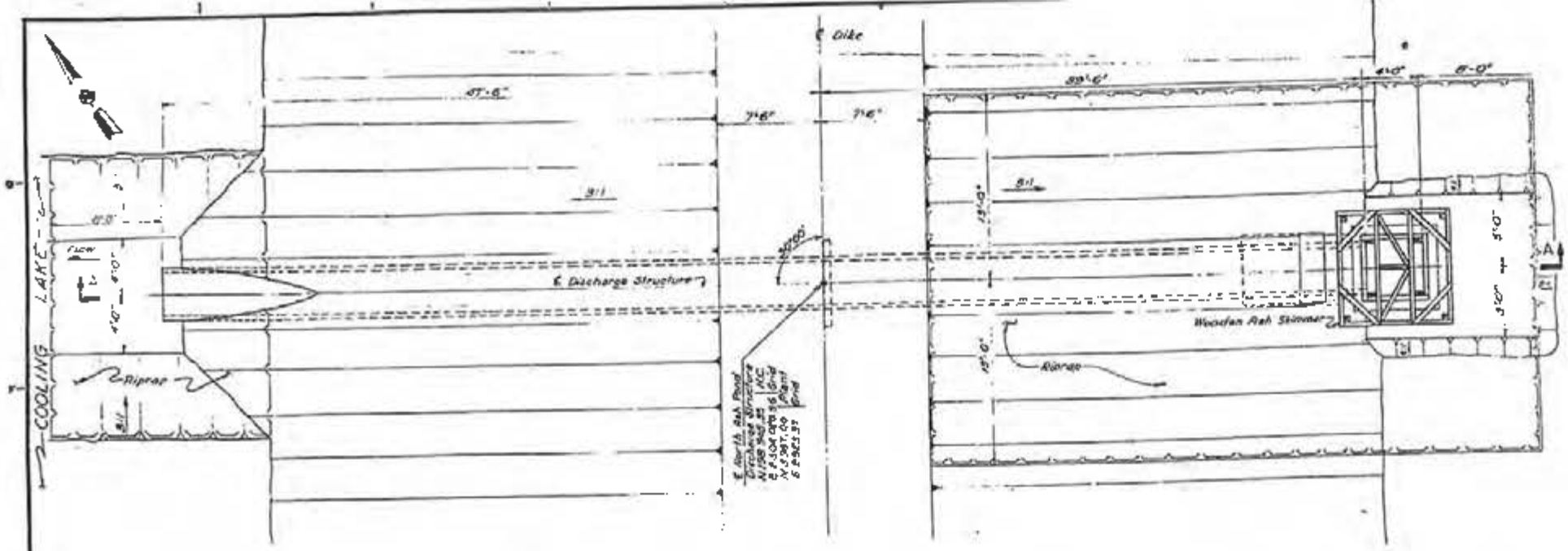
1. THE END BAFFLE DIKE SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.
2. THE MIDDLE BAFFLE DIKE SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.
3. THE PERIMETER BAFFLE DIKE SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.
4. THE SLUDGE GATE STRUCTURE SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.
5. THE INTAKE CANAL SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.
6. THE DISCHARGE CANAL SHALL BE 12' HIGH WITH A 2:1 SLOPE ON BOTH SIDES AND A 10' TOP WIDTH.

- LIST OF DRAWINGS
- D-3000 PLAN-CASE 1
 - D-3001 DIME DRAWING (1:1)
 - D-3002 GAUGING & DATA LOG(Sheet 1)
 - D-3003 GAGE STATION PLAN
 - D-3004 PLAN-CASE 2
 - D-3005 DIME DRAWING (1:1)
 - D-3006 DIME DRAWING (1:1)
 - D-3007 PLAN-CASE 3
 - D-3008 DIME DRAWING (1:1)
 - D-3009 DIME DRAWING (1:1)

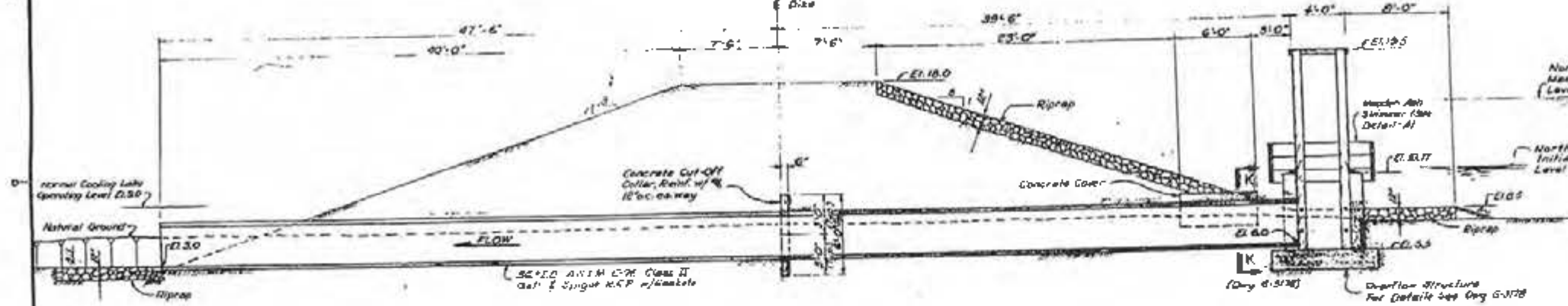
EXHIBIT 2

DATE	DESCRIPTION	BY	CHECKED	APPROVED
11-18-83	DESIGN	J.M.	J.M.	J.M.
12-1-83	CONSTRUCTION	J.M.	J.M.	J.M.
12-15-83	COMPLETION	J.M.	J.M.	J.M.

CAROLINA POWER & LIGHT COMPANY POWER PLANT ENGINEERING & CONSTRUCTION DEPT.	
C.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION (1983-1984) SITE PLAN	
DRAWN BY <i>[Signature]</i>	CHECKED BY <i>[Signature]</i>
0-3235	

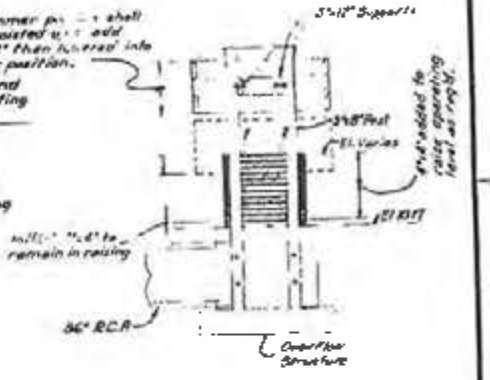


PLAN
Scale 1/4"=1'-0"

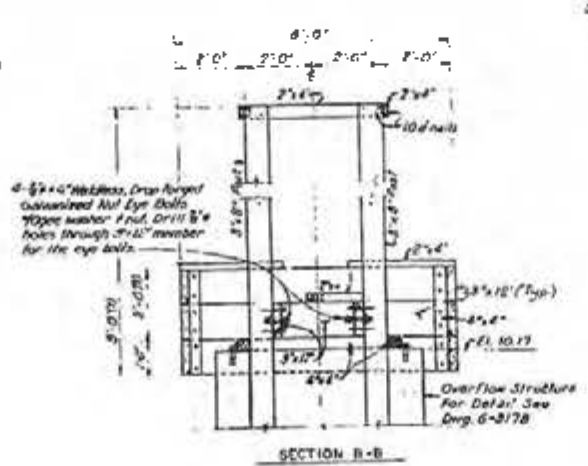
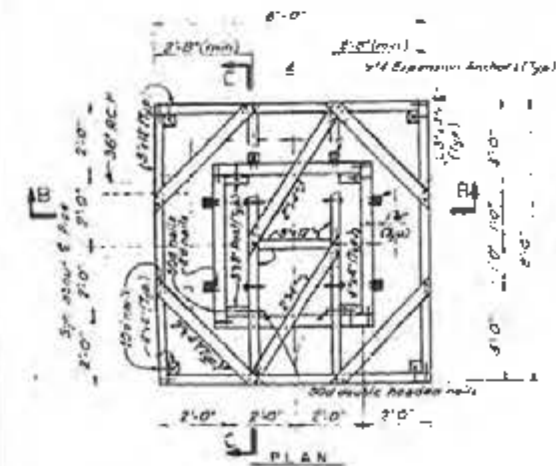


SECTION A - A
Scale 1/4"=1'-0"

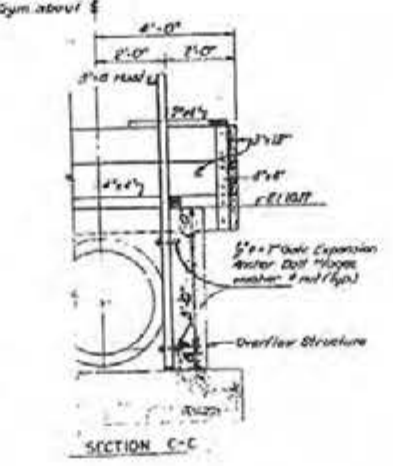
Note: To raise the operating level of the Ash Pond: raise the skimmer portion, place additional 4"x4" sections on the initial 4'-4" section and nail to the 8"x8" posts, lower the skimmer portion back into position, and reset the 3"x12" supports to the 3'-0" post.



SKIMMER ADJUSTMENT DETAIL
(Future addition of 2' by CP&L)
No. 2046



DETAIL - A
(Wooden Ash Skimmer)
Scale 1/4"=1'-0"



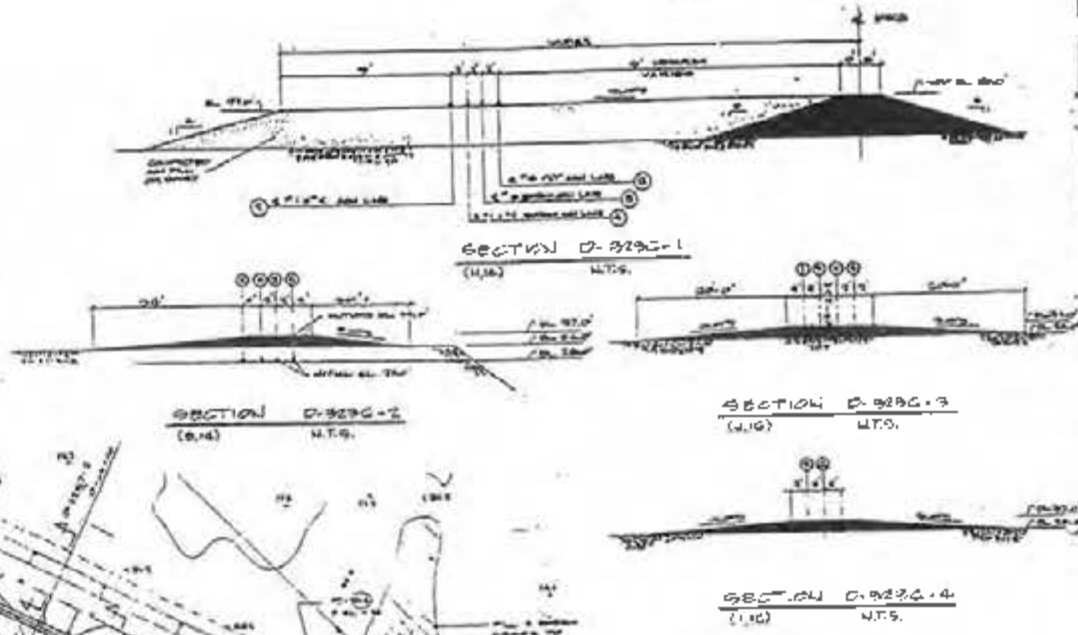
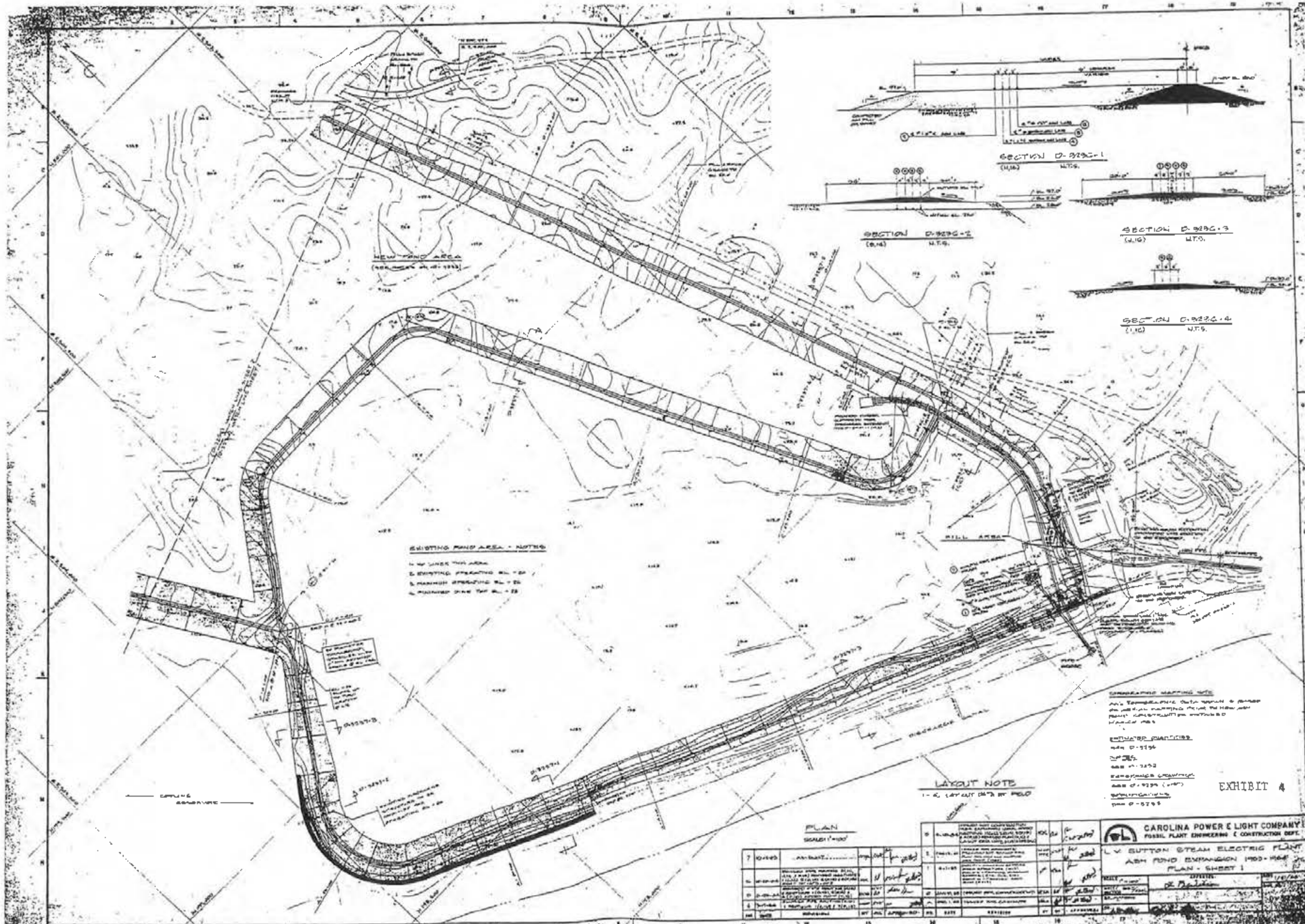
SECTION C - C

- GENERAL NOTES:**
- All concrete shall be Class "B" in accordance with Specification Item C-210.
 - All exposed concrete shall have a 2" chamfer unless otherwise noted.
 - All dimensions referring to reinforcing bars are to the centerline of bars unless otherwise noted.
 - All reinforcing bars shall conform to A.S.T.M. Designation A-615 Grade 60.
 - Concrete cover for reinforcement shall be as follows unless otherwise noted:
 - Clear for surfaces directly exposed to weather or deposited against the ground.
 - 3" Clear for all other surfaces.
 - Details of reinforcement not otherwise shown or indicated shall conform to the provisions of A.C.I. Standard 318 latest edition.
 - All structural steel shapes shall conform to A.S.T.M. Designation A-36 and shall be hot-dip galvanized after fabrication.
 - All expansion anchors and nails shall be hot-dip galvanized.
 - 3"x12" lumber shall be "B" creosoted Dense Select Structural, Southern Yellow Pine.
 - All field cutting, abrasives or borings shall receive three coats of concrete oil, each coat being brushed on in sufficient quantity to fill all joints and thoroughly penetrate the cut or bored surface.
 - All riprap shall conform to the North Carolina State Highway Commission Specifications for Class I Riprap.

- REFERENCE DRAWINGS:**
- G-273 Ash Disposal Ponds - General Layout
 - G-278 Ash Disposal Ponds - North Pond Discharge Structure Sheet 2 of 2

EXHIBIT 3

B. 1000 Construction Lease - North Ash Pond A. 1001 Construction Lease - South Ash Pond	DRAWN F. Gregory		BROWN & BOOI, INC. ENGINEERS AND CONSULTANTS HOUSTON, TEXAS	CAROLINA POWER & LIGHT COMPANY L. V. SUTTON STEAM ELECTRIC PLANT 1972-428 NW EXTENSION-WHITE NO. 3	DRAWING TITLE CIVIL	DRAWING NO. CR-44	DATE 03-27-77
	CHECKED J. Bates				ASH DISPOSAL PONDS NORTH POND-DISCHARGE STRUCTURE		S & G NUMBER NO. G-3001-3
	APPROVED J. C. [Signature]				SHEET 1 OF 2		G-3177B



EXISTING POND AREA - NOTES
 1. ALL LINES THIS AREA
 2. EXISTING SPACING 50' - 75'
 3. MARKED SPACING 50' - 75'
 4. MARKED ONE TO TWO - 25'

LAYOUT NOTE
 1 - 2. LAYOUT (20' BY FIELD)

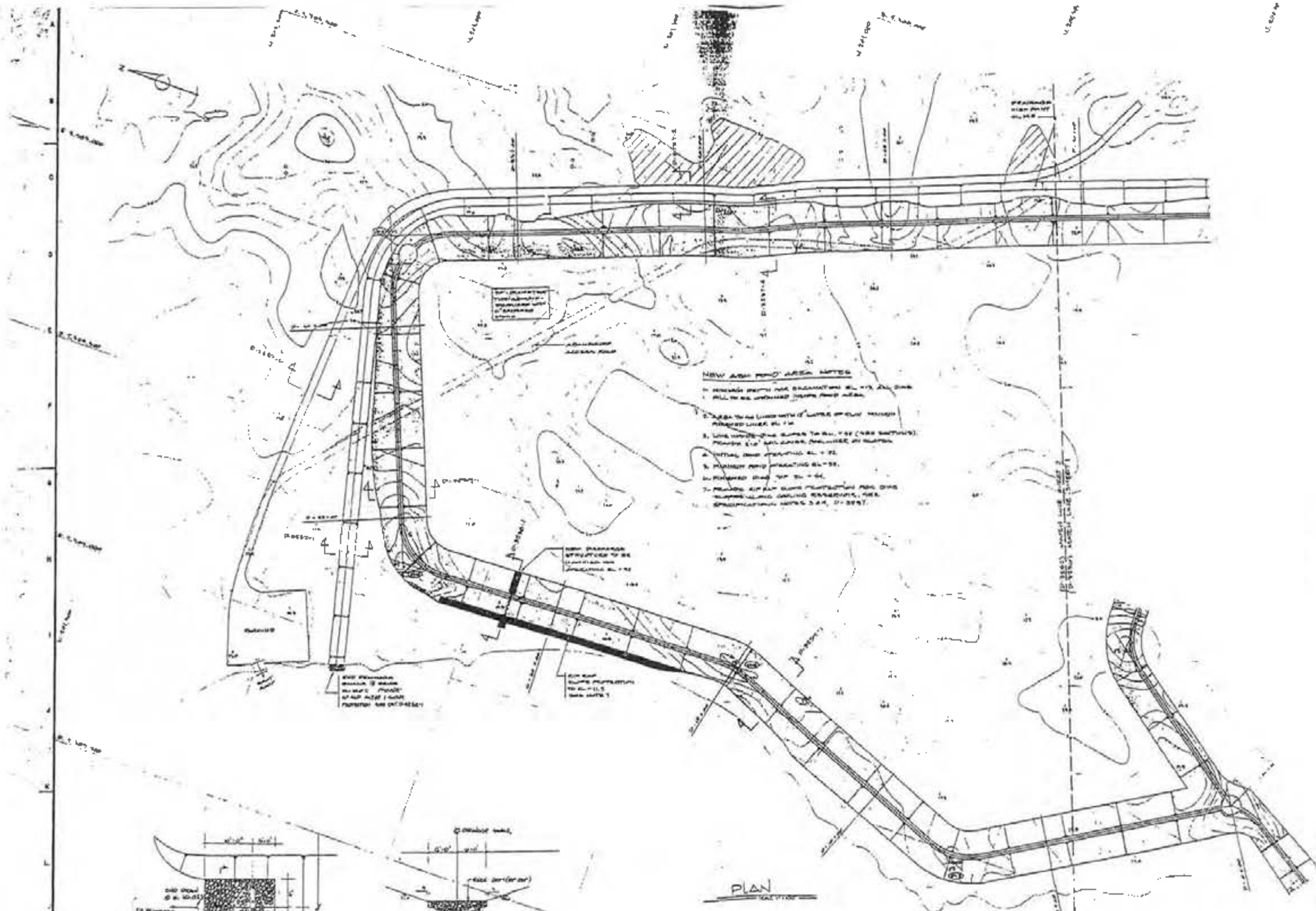
COMPARISON MAPS
 ALL TOPOGRAPHIC DATA FROM 0 - 1950
 ALL SURVEYING DATA FROM 1950 - 1960
 ALL CONSTRUCTION DATA FROM 1960 - 1964
 ALL DATA FROM 1964 - 1965

ENGINEER QUANTITIES
 SEE D-3296
 SEE D-3297
 SEE D-3298 (REV)
 SEE D-3299 (REV)
 SEE D-3300

EXHIBIT 4

PLAN		SCALE 1"=100'	
7	10-1965	AS BUILT	
8	11-1965	REVISED	
9	12-1965	REVISED	
10	1-1966	REVISED	
11	2-1966	REVISED	
12	3-1966	REVISED	
13	4-1966	REVISED	
14	5-1966	REVISED	
15	6-1966	REVISED	

CAROLINA POWER & LIGHT COMPANY Fossil Plant Engineering & Construction Dept.	
L.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION 1965-1966 PLAN - SHEET 1	
DESIGNED BY 	CHECKED BY
DRAWN BY 	APPROVED BY



NEW ASH POND AREA NOTES

1. ALL EXISTING AND PROPOSED STRUCTURES SHALL BE CONSTRUCTED ON THE PROPOSED GRADE SURFACE.
2. ALL EXISTING AND PROPOSED STRUCTURES SHALL BE CONSTRUCTED ON THE PROPOSED GRADE SURFACE.
3. THE PROPOSED GRADE SURFACE SHALL BE CONSTRUCTED ON THE PROPOSED GRADE SURFACE.
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7. THE PROPOSED GRADE SURFACE SHALL BE CONSTRUCTED ON THE PROPOSED GRADE SURFACE.

ESTIMATED QUANTITIES
SEE D-3251

GENERAL NOTES
SEE D-3257

ESTIMATED QUANTITIES
SEE D-3258

EXPLANATIONS
SEE D-3259

EXPLANATIONS
SEE D-3260

EXPLANATIONS
SEE D-3261

EXPLANATIONS
SEE D-3262

EXPLANATIONS
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EXPLANATIONS
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EXPLANATIONS
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EXPLANATIONS
SEE D-3294

EXPLANATIONS
SEE D-3295

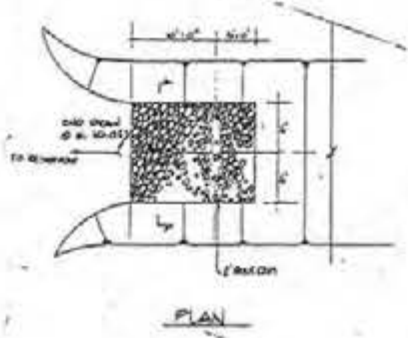
EXPLANATIONS
SEE D-3296

EXPLANATIONS
SEE D-3297

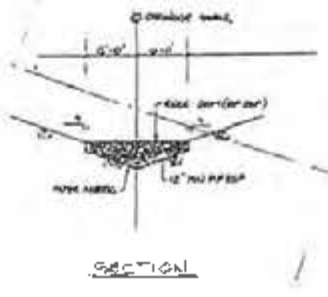
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SEE D-3298

EXPLANATIONS
SEE D-3299

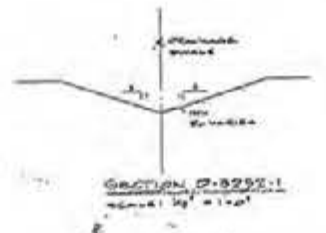
EXPLANATIONS
SEE D-3300



DETAIL D-3252-1



PLAN



LAYOUT NOTE
SEE LAYOUT DATA SHEET

EXHIBIT 5

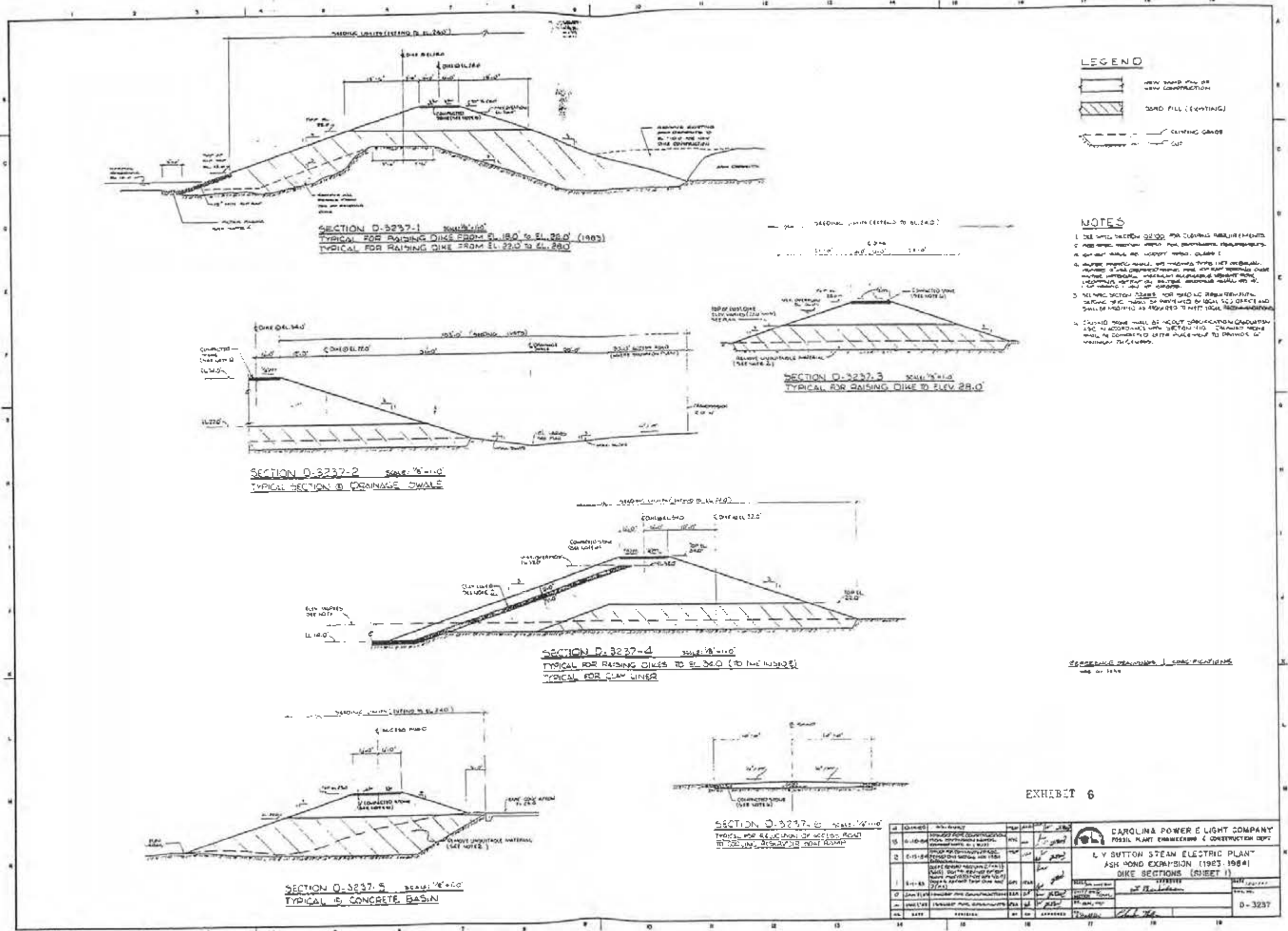
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3	1-15-54	REVISED AND CHECKED	J. H. [Signature]	[Signature]	[Signature]
4	1-15-54	REVISED AND CHECKED	J. H. [Signature]	[Signature]	[Signature]
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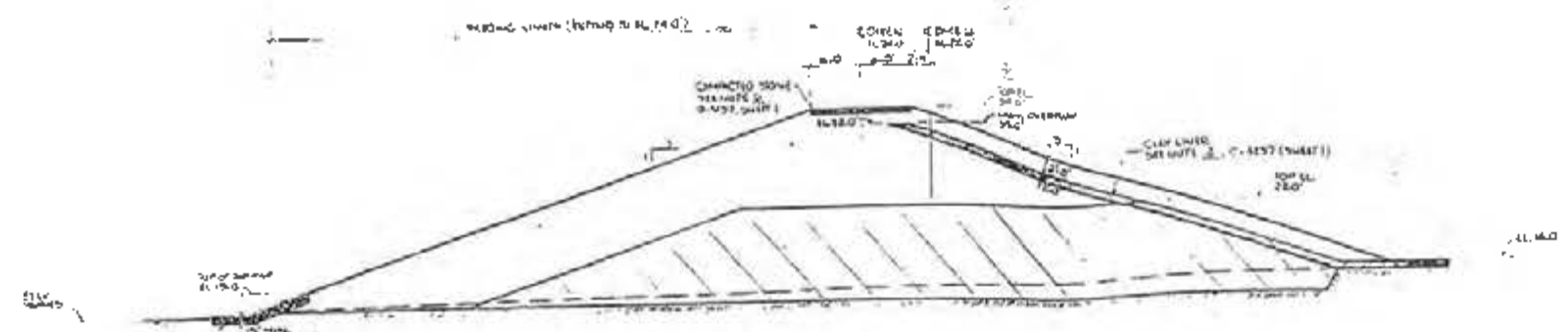
CAROLINA POWER & LIGHT COMPANY
POWER PLANT ENGINEERING & CONSTRUCTION DEPT.

LV SUTTON STEAM ELECTRIC PLANT
ASH POND EXPANSION PROJECT
PLAN - SHEET 2

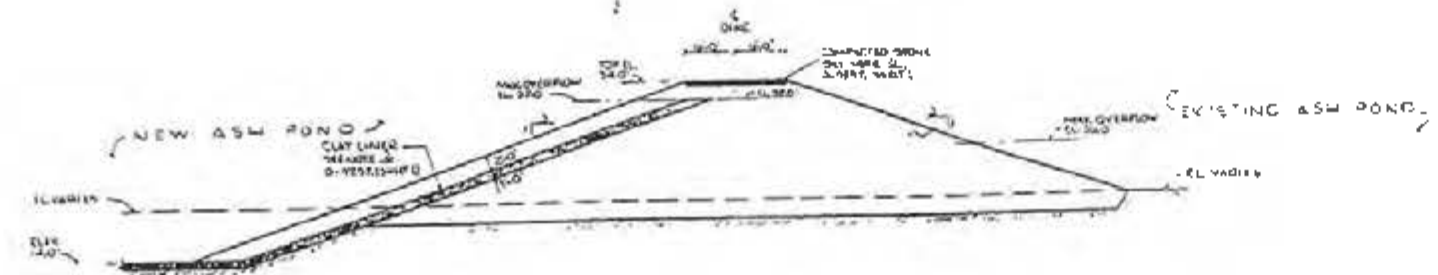
DATE: 1-15-54
DRAWN BY: J. H. [Signature]
CHECKED BY: [Signature]
APPROVED BY: [Signature]

D-3252





SECTION D-3239-1 scale: 1/4" = 1'-0"
 TYPICAL FOR RAISING DIKES TO ELEV. 34.0' (TO THE OUTSIDE)



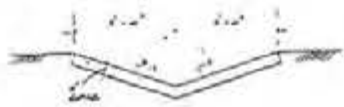
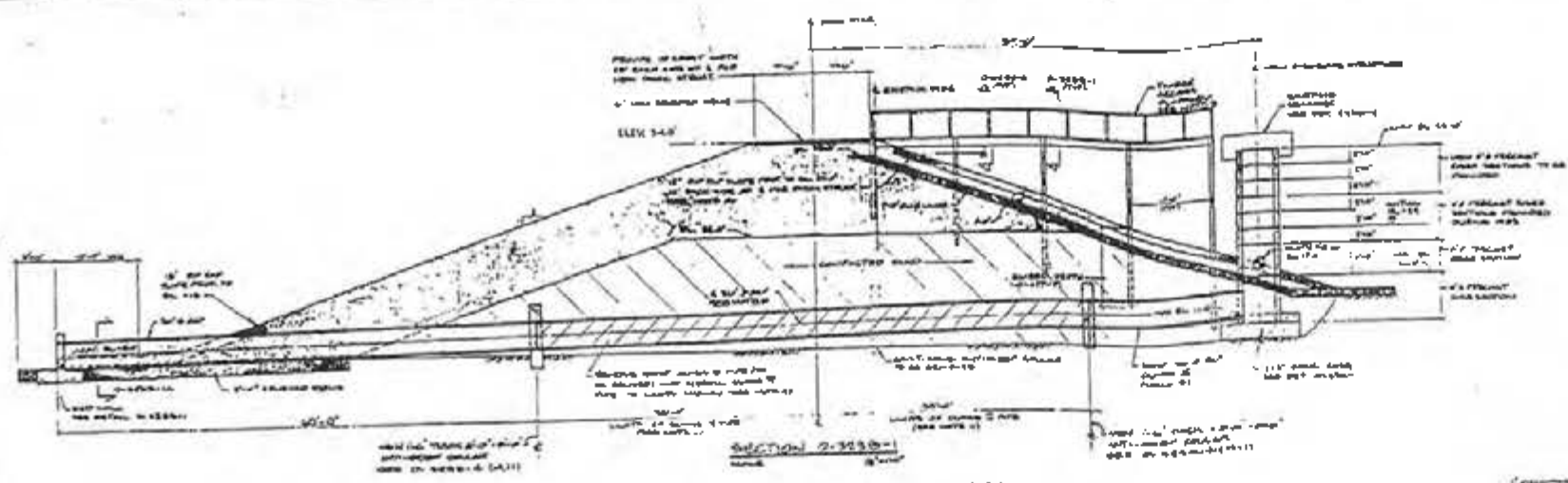
SECTION D-3239-2 scale: 1/4" = 1'-0"
 TYPICAL FOR SEPARATION DIKE TO ELEV. 34.0'
 TYPICAL FOR CLAY LINER

NOTES
 1. FOR DESIGN, NOTES & LEGEND SEE SHEET 1

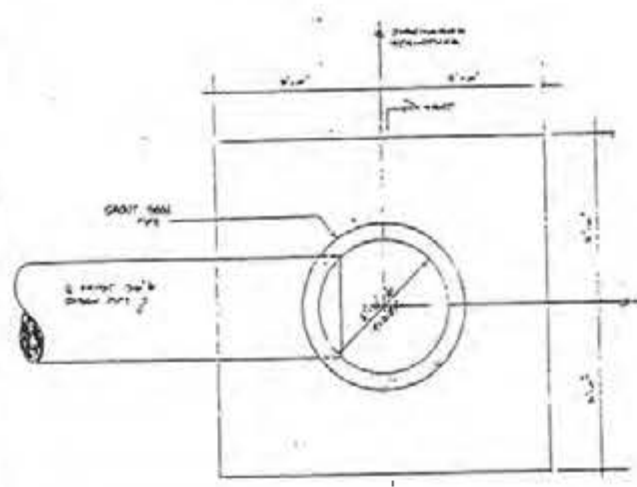
SEE SHEET 1 FOR DIMENSIONS & SPECIFICATIONS
 DATE 4-1-59

EXHIBIT 7

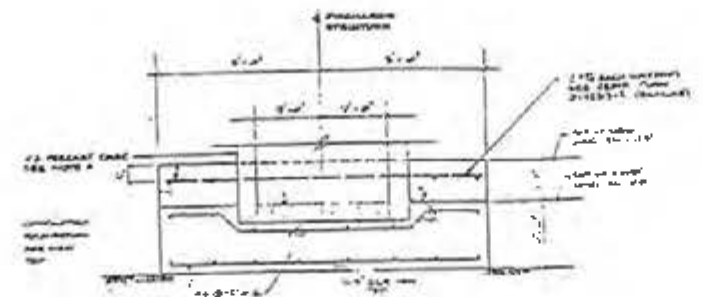
CAROLINA POWER & LIGHT COMPANY FOSB. PLANT ENGINEERING & CONSTRUCTION DEPT.		L.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION DIKE SECTIONS (SHEET 2)	
1 10-14-58 AS-BUILT 2 1-15-59 REVISION 3 2-15-59 REVISION 4 3-15-59 REVISION	5 4-1-59 REVISION 6 5-1-59 REVISION 7 6-1-59 REVISION 8 7-1-59 REVISION	9 8-1-59 REVISION 10 9-1-59 REVISION 11 10-1-59 REVISION 12 11-1-59 REVISION	13 12-1-59 REVISION 14 1-1-60 REVISION 15 2-1-60 REVISION 16 3-1-60 REVISION 17 4-1-60 REVISION 18 5-1-60 REVISION 19 6-1-60 REVISION 20 7-1-60 REVISION
DESIGNED BY: [Signature] CHECKED BY: [Signature]		DATE: [Date] SHEET NO.: D-3239	



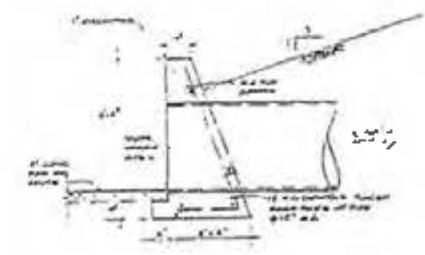
SECTION 0-3250-1
CONC. RAYING
SCALE 1/4" = 1'-0"



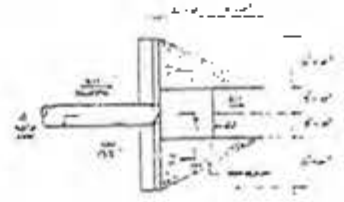
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SCALE 1/4" = 1'-0"



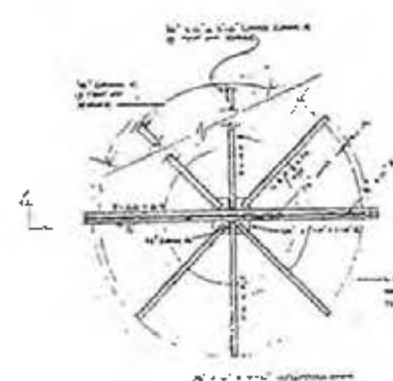
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SCALE 1/4" = 1'-0"



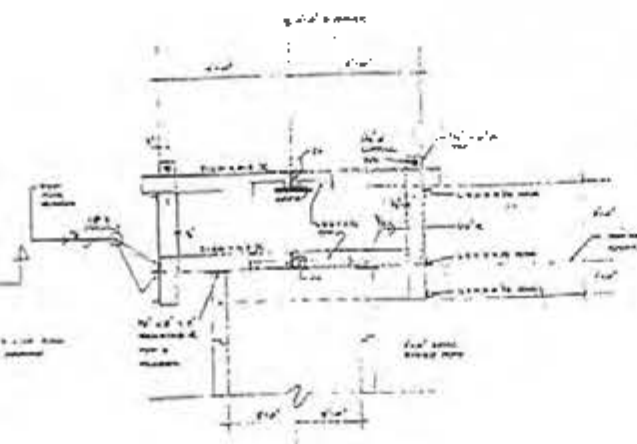
SECTION 0-3250-4
CONC. RAYING
SCALE 1/4" = 1'-0"



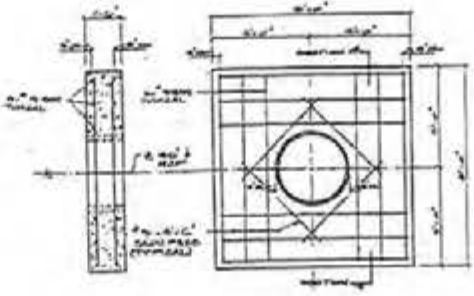
SECTION 0-3250-5
SCALE 1/4" = 1'-0"



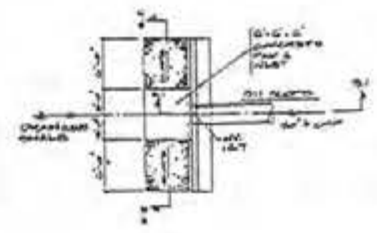
TOP PLAN (AS SHOWN IN NOTES)



SECTION 0-3250-6
SCALE 1/4" = 1'-0"



SECTION 0-3250-4 (REVISED)
ANTI-SHOCK COLLAR



INSET PLAN
DETAIL 0-3250-3
30' DRAIN

NOTES

1. THE STRUCTURE SHOWN IN THIS DRAWING IS TO BE CONSIDERED AS A PART OF THE MAIN STRUCTURE AND SHALL BE CONSIDERED AS SUCH IN ALL CONNECTIONS WITH THE MAIN STRUCTURE.
2. THE STRUCTURE SHOWN IN THIS DRAWING IS TO BE CONSIDERED AS A PART OF THE MAIN STRUCTURE AND SHALL BE CONSIDERED AS SUCH IN ALL CONNECTIONS WITH THE MAIN STRUCTURE.
3. ALL CONCRETE SHALL BE OF THE TYPE AND GRADE SPECIFIED IN THE SPECIFICATIONS AND SHALL BE PLACED AND CONSOLIDATED AS SHOWN ON THE DRAWINGS.
4. PRECAST MANUFACTURED WALL PANELS SHALL BE USED WHERE SHOWN ON THE DRAWINGS AND SHALL BE INSTALLED AND JOINTED AS SHOWN ON THE DRAWINGS.
5. ALL REINFORCEMENT SHALL BE OF THE TYPE AND GRADE SPECIFIED IN THE SPECIFICATIONS AND SHALL BE PLACED AND TIED AS SHOWN ON THE DRAWINGS.
6. ALL JOINTS SHALL BE MADE AS SHOWN ON THE DRAWINGS AND SHALL BE CONSIDERED AS PART OF THE MAIN STRUCTURE.
7. ALL DIMENSIONS SHALL BE AS SHOWN ON THE DRAWINGS UNLESS OTHERWISE SPECIFIED.
8. THE STRUCTURE SHALL BE CONSIDERED AS A PART OF THE MAIN STRUCTURE AND SHALL BE CONSIDERED AS SUCH IN ALL CONNECTIONS WITH THE MAIN STRUCTURE.
9. ALL DIMENSIONS SHALL BE AS SHOWN ON THE DRAWINGS UNLESS OTHERWISE SPECIFIED.
10. THE STRUCTURE SHALL BE CONSIDERED AS A PART OF THE MAIN STRUCTURE AND SHALL BE CONSIDERED AS SUCH IN ALL CONNECTIONS WITH THE MAIN STRUCTURE.

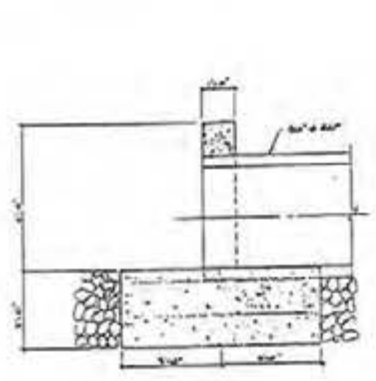
EXHIBIT 8

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3	REVISED FOR [Description]	11/01/54	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]
4	REVISED FOR [Description]	11/15/54	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]	J. H. [Signature]
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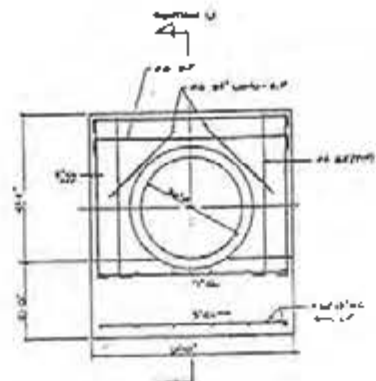
CAROLINA POWER & LIGHT COMPANY
 L.V. BUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION 1953-1954
 SECTION 0-3250-1 (REVISED)

DATE: 10/15/54
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]

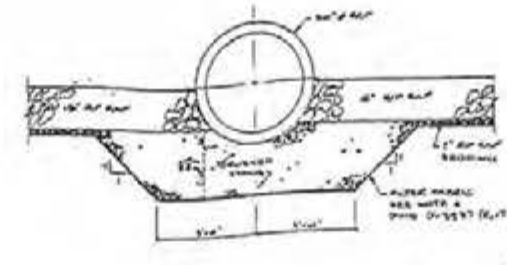
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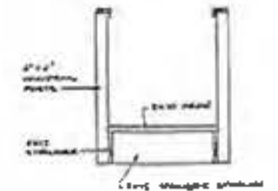
SECTION 1
Scale 1/4" = 1'-0"



ELEVATION 1:1
Scale 1/4" = 1'-0"

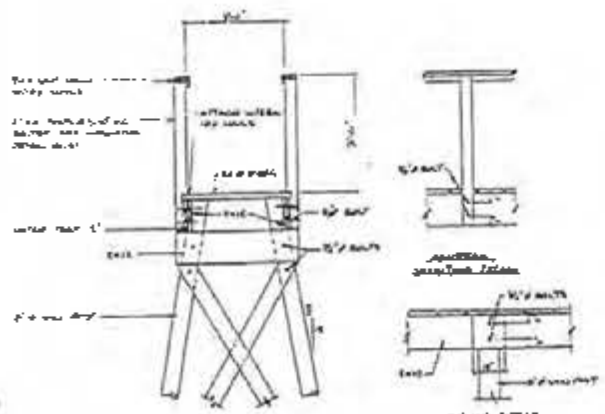


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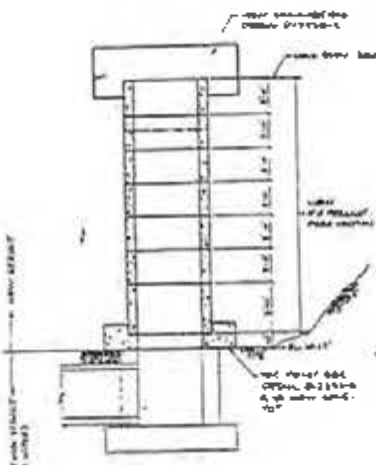


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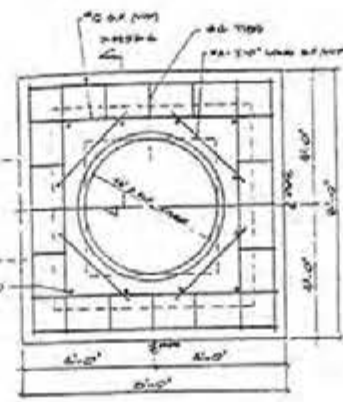
DETAIL D-3253-1
Scale 1/4" = 1'-0"



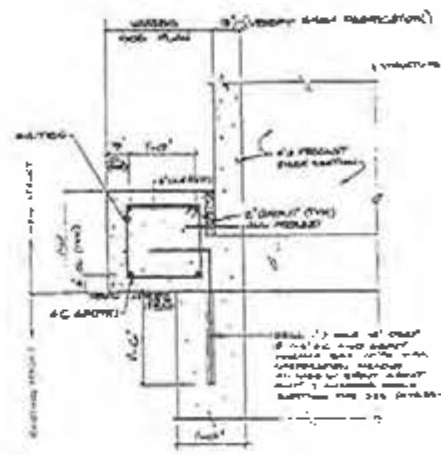
SECTION 4
Scale 1/4" = 1'-0"



SECTION 5
Scale 1/4" = 1'-0"



DETAIL D-3253-2
Scale 1/4" = 1'-0"



SECTION 6
Scale 1/4" = 1'-0"

NOTES:
1. DRAWING CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND CONDITIONS OF EXISTING STRUCTURE.
2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.

SLURRY
See D-3253

REFERENCE DRAWINGS & SPECIFICATIONS
See D-3253

EXHIBIT 9

REVISIONS		DATE	BY	APP'D
1	AS SHOWN			
2	AS SHOWN			
3	AS SHOWN			
4	AS SHOWN			
5	AS SHOWN			
6	AS SHOWN			
7	AS SHOWN			
8	AS SHOWN			
9	AS SHOWN			
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12	AS SHOWN			
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14	AS SHOWN			
15	AS SHOWN			
16	AS SHOWN			
17	AS SHOWN			
18	AS SHOWN			
19	AS SHOWN			
20	AS SHOWN			

CAROLINA POWER & LIGHT COMPANY
 FOSBIL PLANT ENGINEERING & CONSTRUCTION DEPT.
 L V SUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION 1983-1984
 SECTIONS AND DETAILS (SHEET 2)
 DATE: 10/1/83
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 SCALE: 1/4" = 1'-0"
 SHEET NO. 0-3253



LEGEND	
	EXISTING BOUNDARY
	PROPOSED BOUNDARY
	PROPOSED DIKE
	PROPOSED 12\"/>

SCALE: 1\"/>



EXHIBIT 12



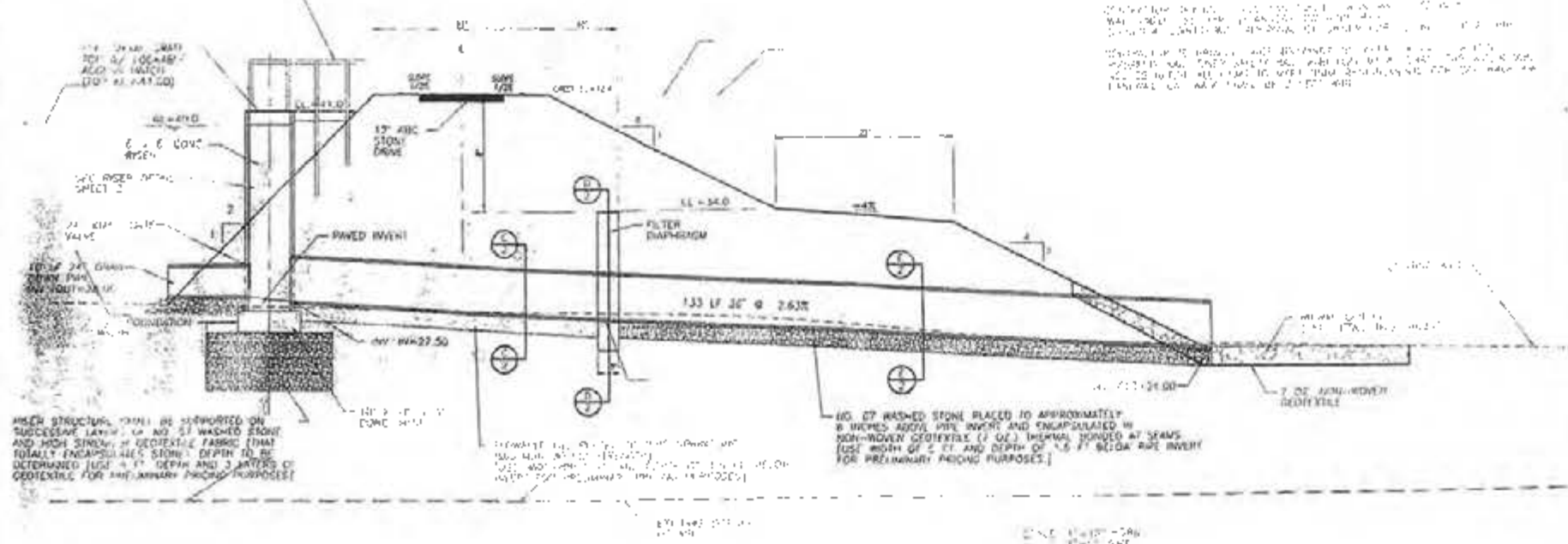
NO.	15,100	DATE	05/01/01
BY		BY	
CHKD		CHKD	
APP'D		APP'D	

INTERIOR ASH POND DIKE PROJECT
PROGRESS ENERGY
SUTTON PLANT

SITE PLAN

WITHERS & RAVENEL
 ENGINEERS | PLANNERS | SURVEYORS
 100 W. Hargett Street, Suite 1000, Charlotte, NC 28201 | Tel: 704.375.4500 | www.wr-engineers.com

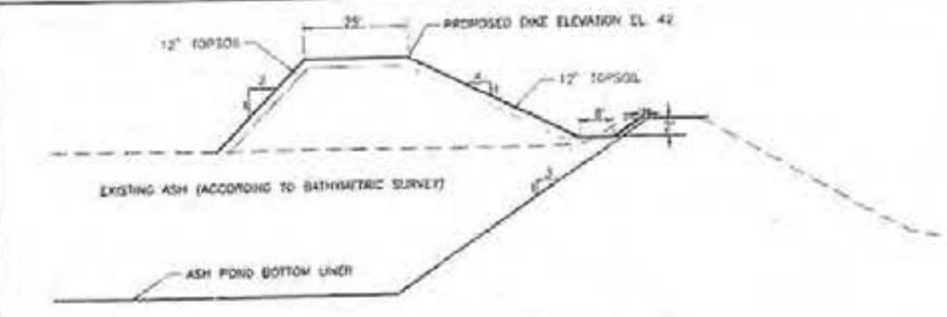
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1



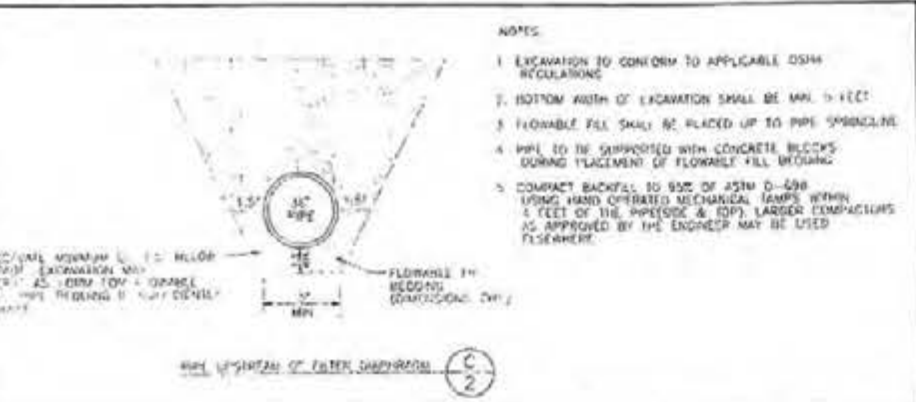
RISER/BARREL PROFILE (A)
SCALE: 1" = 12' HORIZ
1" = 2' VERT



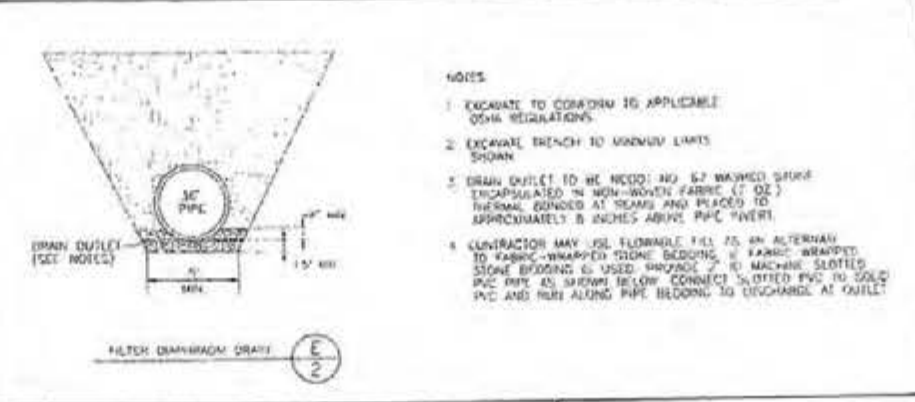
TYPICAL DIKE COVER DETAIL (B)
NTS



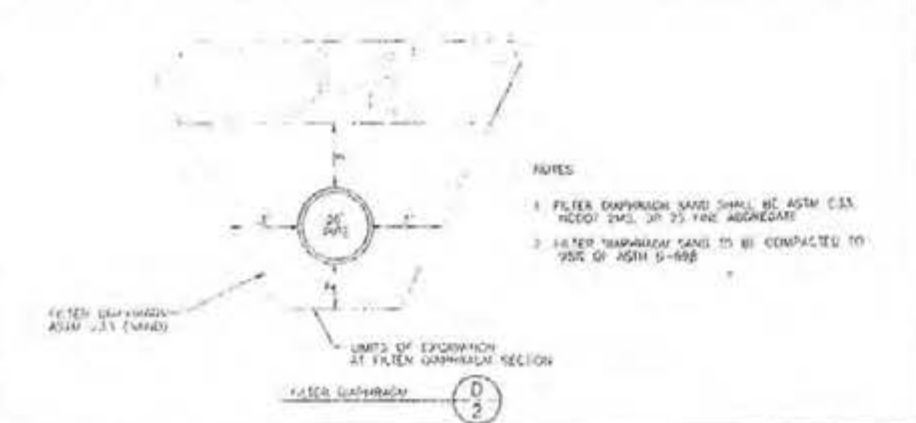
INTERIOR DIKE/DITCH SECTION (B)
NTS



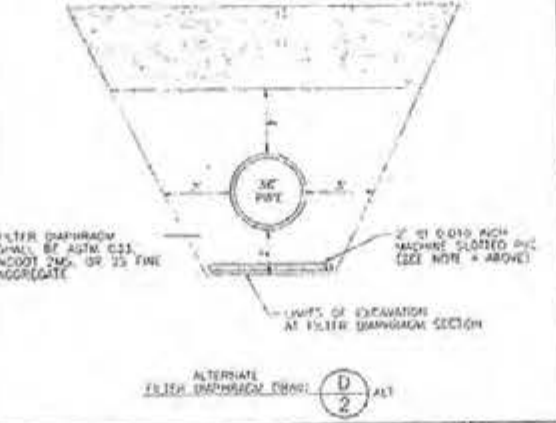
Filter Diaphragm Detail (C)
NTS



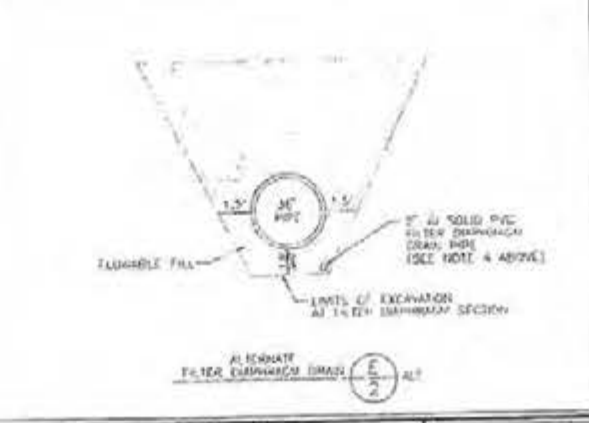
Filter Diaphragm Detail (E)
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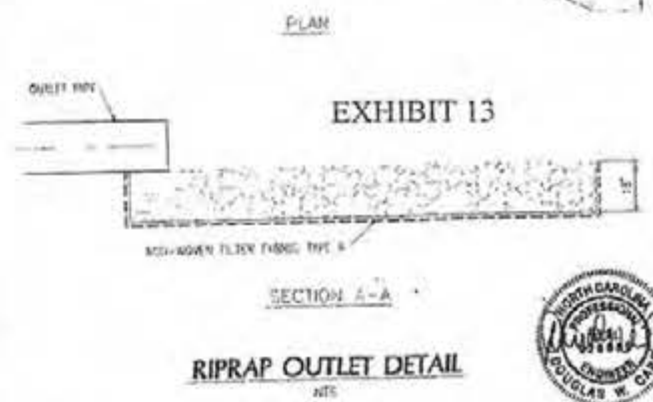
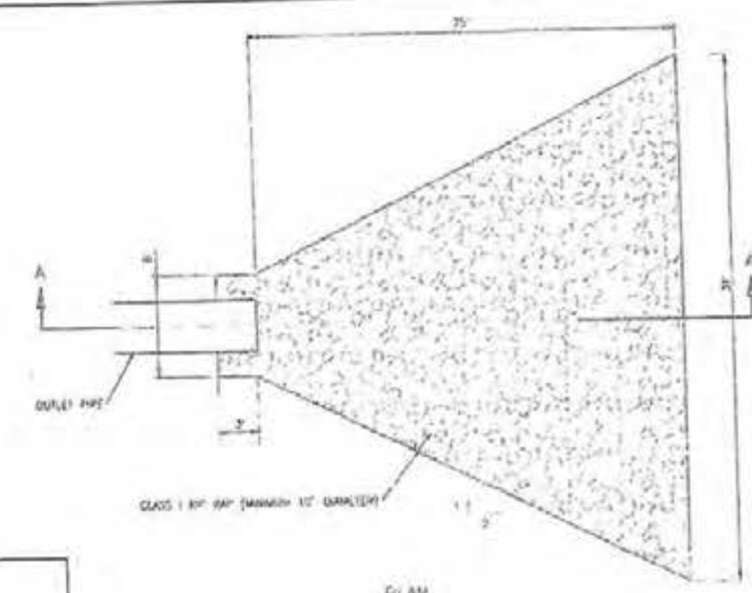
Filter Diaphragm Detail (D)
NTS



Alternate Filter Diaphragm Detail (D)
NTS



Alternate Filter Diaphragm Detail (E)
NTS



RIPRAP OUTLET DETAIL (A)
NTS



DESIGNED BY	DATE	BY
CHECKED BY	DATE	BY
APPROVED BY	DATE	BY

INTERIOR ASH POND DIKE PROJECT
PROGRESS ENERGY
SUTTON PLANT

NEW OUTFALL STRUCTURE

WITHERS & RAVENEL
ENGINEERS | PLANNERS | SURVEYORS
111 Jackson Drive, Cary, North Carolina 27513 | 919-653-1500 | 919-653-4505 | www.wr-engineers.com

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
L.V. Sutton Steam Electric Plant
Report Appendices

Appendix D – Dam Information Summary Sheets

DAM INFORMATION SUMMARY
L.V. Sutton Steam Electric Plant
Ash Pond
New Hanover County, North Carolina

1. Location

Located 3 miles northwest of Wilmington, NC

Latitude: N34° 17' 50"

Longitude: W77° 59' 30"

2. Size and Dimensions

	<u>1984 Pond</u>	<u>1983 Pond*</u>
Length:	10,000 feet	7,000 feet
Maximum Structural Height:	32 feet	
Surface Area (acres):	82	
Storage capacity (acre-feet):	1,364	248
Size Classification:	Intermediate	Small
Hazard Classification:	Low	Low
Regulatory Design Storm	100 yr to ½ PMP **	
US Slope:	3.0(H):1(V)	
DS Slope:	3.0(H):1(V)	
Crest Width:	12 feet	
Crest Elevation:	34.0 feet	
Design maximum operating level:	32.0 feet	
Current Operating Level	26.0 feet	
Instrumentation	None	None

* The 1983 pond has been put back into use for short term ash storage.

** 100-year storm is 9.5 inches over 24 hours. Probable Maximum Precipitation (PMP) is 38.1 inches over 48 hours. ½ PMP is 19". The long duration is due to potential for tropical storms.

3. Geology and Seismicity

Located in Coastal Plain Province. Underlain by Castle Hayne Limestone which is eroded through in places to expose the PeeDee Formation

Zone 1 seismic zone according to Corps of Engineers with
 Design Earthquake: $a_g = 0.05 g$

4. Design Information

1983 Pond: Originally designed by Brown & Root in 1971, raised to present elevation under CP&I design with assistance from William Wells. Limited subsurface exploration. No information on stability or seepage analyses. No internal drainage.

Outlet works consist of a 4' diameter concrete vertical riser connected to a 3' diameter concrete pipe through the dike that would discharge to the Cooling Lake. There are no seepage collars.



1101 Atlantic Avenue, Raleigh, NC 27604

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

1984 Pond: Designed by CP&I, with assistance from William Wells. Subsurface exploration was performed. Stability was re-evaluated by CP&I, in 1987, FS – 1.58. Seepage analysis performed as part of design assuming $k = 1 \times 10^{-7}$ cm/sec for 1-foot thick clay liner with calculated seepage rate of 108 gpm. No internal drainage provided.

Outlet works consist of a 4' diameter concrete vertical riser connected to a 3' diameter concrete pipe through the dike that is connected to piping leading to the Cape Fear River. There are two seepage collars.

The capacity of the pond and outlet works is sufficient for a 100-yr storm without overtopping the dike.

5. Construction History

1983 Pond

Original construction of north Ash Pond dike done in 1971 under direction of Brown & Root to crest elevation of 18.0 feet. In 1983, Dickerson raised north Ash Pond to operating level to elevation 26.0 feet. Testing was conducted.

1984 Pond

- Constructed by Lindsay and Associates under direction of CP&L. Testing was performed.
- Outlet pipe modifications were provided in 1999 to connect discharge to a pipe leading to the Cape Fear River. A pipe joint opened under the upstream slope and seepage through the slope created start of sinkhole. Grouting of slope conducted in 2000 along with slip-lining of the pipe for long-term protection.
- Interior slope repairs on east dike provided in summer, 2001 to fill areas of beaching erosion and reseed.
- Additional storage capacity was constructed and placed in service during 2006. Engineering and design was provided by Withers & Ravenel, and construction by Trans-Ash.
- Repairs were made in 2007 to the interior slope and clay liner on the east side of the pond, north end.

6. Inspection History

The dam is inspected on 5-year intervals. Since 2002, site visits have been made on a generally yearly basis for limited visual observations.

LAW/MACTEC: 1987, 1997, 2002, 2003, 2004, 2005, 2007, 2008
S&ME: 1992

7. Current Issues

MACTEC performed a limited field visit inspection in 2008. The current issues reported from the 2008 inspection are as follows:

- Continue vegetation maintenance.

8. Overall Condition

The 2008 inspection indicated the dikes are in good condition. No items requiring emergency actions by the plant were noted.

Report of 2009 Limited (Annual) Field Inspection
Ash Pond Dikes
I. V. Sutton Steam Electric Plant
Report Appendices

Appendix E- Dam Assessment Forms

FOSSIL GENERATION ASH POND DAM ASSESSMENT FORM

VER. 3.074 Last Rev. 9/8/4 06/22/09

MACTEC Engineering and Consulting, Inc. Copyrights
 1984 Ash Pond (Active) Electrical Area

L.V. Sutton Steam Electric Plant
 1984 Ash Pond (Active) Electrical Area

Based on site visit March 15, 2009 and previous inspection reports

CONCRETE STRUCTURES	RED	YEL	GRN	HEQ	YEL	GRN	Date Reviewed	Initials	RSA
CONCRETE SURFACES							NA		
STRUCTURAL CRACKING							NA		
MOVEMENT							NA		
JUNCTIONS							NA		
WALP PASSAGES							NA		
SEEPAGE							NA		
JOINTS							NA		
FOUNDATION							NA		
ABUTMENTS							NA		

SAFETY PERFORMANCE
 INSTRUMENTATION
 HEADWATER-AIR-WATER GAGES
 ALIGNMENT INSTRUMENTATION
 MOVEMENT INSTRUMENTATION
 UPLIFT INSTRUMENTATION
 DRAINAGE INSTRUMENTATION
 SEISMIC INSTRUMENTATION

EMBANKMENT STRUCTURES	RED	YEL	GRN	RED	YEL	GRN	Date Reviewed	Initials	RSA
SPLIT FEMAL							NA		
SLOPE STABILITY							NA		
SEEPAGE							NA		
DRAINAGE SYSTEM							NA		
SLOPE PROTECTION							NA		

RESERVOIR
 SHOULDER
 SEDIMENTATION
 HAZARDOUS AREAS
 WATER-ICE RUNOFF

SOILWAY STRUCTURES	RED	YEL	GRN	RED	YEL	GRN	Date Reviewed	Initials	RSA
CONTROL GATES							NA		
DRAINAGE CHANNEL							NA		
CUTTING CHANNEL							NA		
STILLING BASIN							NA		

OPER & MAINT PRACTICES
 RESERVOIR P. PLAN
 MAINTENANCE
 DOWNSTREAM CHANNEL
 DOWNSTREAM CHANNEL

OUTLET WORKS	RED	YEL	GRN	RED	YEL	GRN	Date Reviewed	Initials	RSA
IN-AXIS STRUCTURE							NA		
GATES							NA		
SLICES WATER PASSAGES							NA		
STILLING BASIN							NA		
APPROACH CHANNEL							NA		
OUTLET CHANNEL							NA		
DRAINAGE FACILITIES							NA		

Outlet works
 Possible increased seepage when WL raised

CONCRETE STRUCTURES	All concrete structures related to the dam, slopes, or spillway	Date Revised: 06/22/09	Initials: IRSA
OVERALL RATING >>>			
RED	Problems likely in < 2 yrs	YEL	Problems likely in 2 - 5yrs
GRN	Problems likely in > 5yrs	Comments:	
			NA
CONCRETE SURFACES	Evaluate the deterioration and continuing serviceability of the concrete. Conductions should conform to "Guide for Making a Condition Survey of Concrete in Service," ACI Journal, proceedings Vol. 65, No. 11, 11-68 pp. 905-914.		Comments: NA
STRUCTURAL CRACKING	Examine for cracking resulting from overstress due to applied loads, shrinkage and temperature effects or differential movements.		Comments: NA
HORIZONTAL & VERTICAL MOVEMENT	Look for evidence of settlement, heaving, deflections or lateral movements.		Comments: NA
JUNCTIONS	Examine junctions of the structure with embankments or embankments. Note any abnormalities.		Comments: NA
DRAINS	Ensure any drains are free flowing and capable of performing their function.		Comments: NA
WATER PASSAGES	All surfaces in which water passes should be examined for erosion, cavitation, obstructions, sea cage, and significant structural cracks.		Comments: NA
SEEPAGE	Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.		Comments: NA
JOINTS (Monolith and Construction)	Determine condition of joint and filler material, any movement of joints, or any indication of distress.		Comments: NA
FOUNDATION	Examine for damage of possible undermining of the downstream toe.		Comments: NA
ABUTMENTS	Examine for signs of instability or excessive weathering.		Comments: NA

EMBANKMENT STRUCTURES		RED Problems likely in < 2yrs <input type="checkbox"/>	YEL Problems likely in 2 - 5yrs <input checked="" type="checkbox"/>	GRN Problems likely in > 5yrs <input type="checkbox"/>	Date Revised: 06/22/09	Initials: RSA
OVERALL RATING >>>						
SETTLEMENT Embankment and downstream toe area need to be checked for localized settlement, depressions, or sink holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Comments: No concern for settlement noted	
SLOPE STABILITY Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: No concern for slope stability noted for 1984 Ash Pond Area. Riprap protection for inside slope of 200B Interior Area has slipped down slope in one location.	
SEEPAGE The downstream face of abutments, embankment slopes and toes, embankment structure contacts, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Flag identified concern for possible increased seepage for 1984 Pond Area when water level raised. Piezometers installed to monitor water level in dike to support seepage investigation. No concerns for seepage or related slope stability identified from inspection.	
DRAINAGE SYSTEMS All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments: No concern for drainage identified.	
SLOPE PROTECTION The slope protection should be examined for erosion-formed gullies and wave-formed notches and benches that have reduced the embankment cross-section or expose less wave resistant materials. The adequacy of slope protection against waves, currents, and surface runoff that may occur at the site should be evaluated. The condition of vegetation cover should be evaluated where pertinent.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Grass appeared to be sparse in some areas. Slope repair has been required in past to address erosion on interior slope. No significant concern observed for current inspection.	

SPILLWAY STRUCTURES	RED in ~ 2yrs	YEL in 2-5yrs	G/HN Problems likely in > 5yrs	Date Revised: 06/22/09	Initials: RSA
<p>Examination should be made of the structures and features including bulkheads, flashboards, and fuse plugs of all service and auxiliary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway</p> <p style="text-align: center;">OVERALL RATING >>></p> <p>CONTROL GATES & OPERATIONAL MACHINERY</p> <p>Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, surplussing water alarms and drainage pump should be investigated.</p> <p>UNLINED SADDLE SPILLWAYS</p> <p>Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation and the potential hazard to the safety of the dam.</p> <p>OUTLET CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p> <p>APPROACH CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p> <p>STILLING BASIN</p> <p>Basin and energy dissipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Comments:</p> <p>NA</p>	<p>Comments:</p> <p>NA</p>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Comments:</p> <p>NA</p>	<p>Comments:</p> <p>NA</p>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Comments:</p> <p>NA</p>	<p>Comments:</p> <p>NA</p>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Comments:</p> <p>NA</p>	<p>Comments:</p> <p>NA</p>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>Comments:</p> <p>NA</p>	<p>Comments:</p> <p>NA</p>

OUTLET WORKS	All structures and features designed to release reservoir water below the spillway crest through or around the dam.	OVERALL RATING >>>	RED Problems likely in < 2yrs	YEL Problems likely in 2-5yrs	GRN Problems likely in > 5yrs	Date Revised: 06/22/09	Initials: RSA
INTAKE STRUCTURE	Examine for any conditions which may impose operational constraints on the outlet works. Entrances to intake structure should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works.		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Comments: Possible increased seepage observed by plant with water level at Elevation 301.0. Water level reported as lowered to Elevation 28 in January, 2009.	
OPERATING AND EMERGENCY CONTROL GATES	Structural members, connections, guides, hoists, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	
CONDUITS, SLUICES, WATTH PASSAGES, ETC.	Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at cracks or joints.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments: No concerns noted with current inspection.	
STILLING BASIN	Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined by surfoundings.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	
APPROACH CHANNELS	Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
OUTLET CHANNELS	Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments: No concern noted for current inspection.	
DRAWDOWN FACILITIES	Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	

SAFETY & PERFORMANCE INSTRUMENTATION		RED	YEL	GRN	Date Revised:	Initials:	
Available records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined.		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	06/22/09		RSA
OVERALL RATING: >>>							
HEADWATER AND TAILWATER GAGES	Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumentation measurements such as stream flow, uplift pressures, alignment, and drainage system discharge with the upper and lower water surface elevations.				Comments:	NA	
HORIZONTAL & VERTICAL ALIGNMENT INSTRUMENTATION (CONCRETE STRUCTURES)	The existing records of alignment and elevation surveys and measurements from inclinometers, inverted plumb bobs, gage points across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.				Comments:	NA	
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES)	The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the embankment and foundation would impact the safety of the dam, under given conditions.				Comments:	NA	
UPLIFT INSTRUMENTATION	Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam				Comments:	NA	
DRAINAGE SYSTEM INSTRUMENTATION	Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in this relationship during the history of the dam.			X	Comments:	Continue to monitor toe drain outlet pipes for increase in seepage flow.	
SEISMIC INSTRUMENTATION	The existing records of seismic instrumentation should be examined to determine if the seismic activity in the area and the response of the structures to past earthquakes.				Comments:	NA	

RESERVOIR	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised:	RSA
OVERALL RATING >>>					
<p>SHORE LINE</p> <p>The land forms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of existing structures to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might over-top the dam.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
<p>SEDIMENTATION</p> <p>The reservoir and drainage area should be examined for excessive sedimentation or siltation developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increase in maximum outflow and maximum pool elevation.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
<p>POTENTIAL UPSTREAM HAZARD AREAS</p> <p>The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
<p>WATERSHED RUNOFF POTENTIAL</p> <p>The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changes in agriculture practices, timber clearing, railroad or highway construction or real estate developments that might extensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	

OPERATION AND MAINTENANCE FEATURES		Date Revised: 06/22/09	Initials: RSA
OVERALL RATING >>>		<input type="checkbox"/> RED Problems likely in < 2yrs	<input type="checkbox"/> YEL Problems likely in 2 - 5yrs
		<input type="checkbox"/> GRN Problems likely in > 5yrs	<input type="checkbox"/> Comments:
RESERVOIR REGULATION PLAN The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.		<input type="checkbox"/>	<input type="checkbox"/> Comments: NA
MAINTENANCE The maintenance of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.		<input type="checkbox"/>	<input type="checkbox"/> Comments: NA

DOWNSTREAM CHANNEL	RED	YEL	GRN	Date Revised: 06/22/09	Initials: RSA
The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification.	Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs		
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
DOWNSTREAM CHANNEL	OVERALL RATING >>>				
	Comments: NA				



engineering and constructing a better tomorrow

December 16, 2010

Mr. Bill Forster
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27613

Subject: **REPORT OF 2010 LIMITED (ANNUAL) FIELD INSPECTION
COOLING POND AND ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC PROJECT NO. 6468-10-0025 (04)
SUTTON 1972 COOLING POND – STATE ID NO. NEWHA-003
SUTTON 1971 ASH POND – STATE ID NO. NEWHA-004
SUTTON 1984 ASH POND – STATE ID NO. NEWHA-005**

Dear Mr. Forster:

On May 19, 2010, Mr. Scott Auger of MACTEC Engineering and Consulting, Inc. (MACTEC) visited the L.V. Sutton Steam Electric Plant to perform a limited field inspection of the Cooling Pond and the Ash Pond Dikes. Prior to the inspection, we reviewed the 2009 Limited (Annual) Ash Pond and Cooling Pond Dikes to confirm observations from previous inspections. The plant contacts for Progress Energy during this inspection included Mr. Bruce Moorefield, Mr. Kent Tyndall, and Mr. Isaac Alderman.

Effective January 1, 2010, regulatory oversight was transferred from the North Carolina Utilities Commission (NCUC) to the North Carolina Department of Environment and Natural Resources, Division of Land Quality, Land Quality Section, Dam Safety Program (NCDENR Dam Safety). The dams and dikes covered by this inspection report are included in the NCDENR Dam Safety inventory as follows:

State ID No.	State Dam Name	State Hazard Potential Description
NEWHA-003	Sutton 1972 Cooling Pond	Low
NEWHA-004	Sutton 1971 Ash Pond	Low
NEWHA-005	Sutton 1984 Ash Pond	Low

The field inspection included a discussion of maintenance activities since the last inspection visit, review of available records and a driving/walking reconnaissance of the Ash Pond and Cooling Pond dikes. The weather conditions during the inspection were clear, warm and dry. Mr. Alderman reported that about 0.7 inches of rainfall had been recorded on site within the past 48 hours prior to the inspection. This letter report summarizes the observations during the current inspection and provides recommendations for any follow-up actions. Photographs of selected conditions and updated Progress Energy condition assessment forms are also included with this report by attachment.

US EPA ARCHIVE DOCUMENT

The last 5-year independent consultant inspection was performed by MACTEC in December, 2007 and the next will be in 2012.

To finalize of this report, MACTEC has checked on current status for plant response to the conditions noted for follow-up action. In addition, Mr. Scott Auger of MACTEC performed a site visit for field review of conditions noted for follow-up action on December 15, 2010. The results for our review of follow-up actions are appropriately noted in this report.

SUMMARY

Ash Pond Inspection Summary

Based on the field observations noted in this report, the ash pond dikes generally appear to be stable and in satisfactory condition.

The new recommendations for follow-up noted in the current inspection are as follows:

- (AP-2010-1) 1983/1971 Ash Pond - Follow-up should be provided to confirm that the water level has been lowered consistent with recommendations by NCDENR Dam Safety. *(Follow-up Note: Plant personnel reported that the water level was lowered 1 foot during 2010. This was confirmed during the MACTEC site visit on 12/15/10.)*
- (AP-2010-2) 1983/1971 Ash Pond - We recommend providing a field survey to check the elevation of the crest and then provide fill as needed to restore the crest to the design Elevation 28.0.
- (AP-2010-3) 1984 Ash Pond - Locate and fill animal burrows identified during the current inspection. *(Follow-up Note: Plant personnel reported that no maintenance work was provided for animal burrows during 2010. However, the animal burrows could not be located during the MACTEC site visit on 12/15/10 and may have been covered over by wheel tracks from mowing equipment. No new animal burrows were located.)*
- (AP-2010-4) 1984 Ash Pond - We recommend providing a field survey to check the elevation of the crest and then provide fill as needed to restore the crest to the design Elevation 34.0. We also recommend providing a field survey to check the elevation of the crest for the interior storage area dike and then providing fill as needed to restore the crest to the design Elevation 42.0.

Cooling Pond Inspection Summary

Based on the field observations noted in this report, the cooling pond dikes generally appear to be stable and in satisfactory condition.

There are no new follow-up recommendations for this inspection.

RECORDS

During 2009, MACTEC installed 18 new piezometers for the 1984 Ash Pond area to support seepage investigations. The results for the seepage investigations are summarized in the MACTEC report dated April 20, 2010 (included as Appendix B). The piezometer data does not appear to indicate that the water level in the dikes is increasing or represents a concern for dike stability.

There are currently no other active piezometers or monitoring instrumentation for the Ash Pond dikes or Cooling Pond dikes.

We confirmed with plant personnel that routine inspections are being performed consistent with the Sutton Plant Dam and Dike Inspection Procedure, EVC-SUTC-00038, Revision 1, dated September, 2009. We confirmed that the routine inspections are continuing to be performed by the plant staff. We understand that Mr. Alderman is performing a documented routine inspection for the Ash Pond area on a monthly basis, and Mr. Moorefield is performing weekly documented inspections for the Cooling Pond.

ACTIVITIES SINCE 2009 INSPECTION

Routine maintenance activities are covered under the following discussion of Field Observations.

On September 27, 2010, a small breach occurred through a section of the 1984 Ash Pond dike on the east side associated with heavy rainfall. As requested by Progress Energy, Mr. J. Allan Tice of MACTEC visited the site to provide engineering support for the initial damage assessment and emergency response plan development. MACTEC is providing support to Progress Energy for development and implementation of a repair plan. *(Follow-up Note: This condition was checked during the MACTEC site visit on 12/15/10. Permanent repairs have not yet been implemented for the breach location because Progress Energy has not received approval of the repair plan from NCDENR Dam Safety. The temporary repair provided for the breach location appears to be stable and a suitable vehicle travel path has been provided. We observed that Progress Energy has implemented drainage improvements in the area of the breach.)*

Prior to issuing this report, Progress Energy authorized MACTEC to perform field investigations and engineering analysis to review the stability of the 1983/1971 Ash Pond dikes.

ASH POND FIELD OBSERVATIONS

1983/1971 Ash Pond

The 1983 Ash Pond dikes were formed by raising the original dikes constructed in 1971. The present dikes have a design crest elevation varying from Elevation 28.0 to Elevation 34 (assumed as feet MSL where Elevation is noted). The higher elevation is at the common dike with the 1984 Ash Pond. The area of standing water near the discharge structure on west side of the pond appeared to be similar in extent to previous inspections. We also observed standing water adjacent to the dike along the discharge canal on the south side of the pond area. We understand that this area currently receives storm water inflow from plant sources including retention ponds, coal pile runoff, and tank farm drainage.

In 2006, a temporary interior storage area was constructed by placement of a containment berm within the pond area. The containment berm has an outlet structure which directs flow to the area of standing water on the west side of the pond. We understand the interior storage area was taken out of service in 1985, but then returned to service in 2001 for temporary use during maintenance work and ash removal activities in the 1983 and 1984 ponds. We also understand that the interior

storage area is now actively used for bottom ash disposal operations along with temporary use for fly ash disposal operations. The containment berm for this temporary interior storage area is not included in the independent consultant dam inspection scope.

MACTEC has previously recommended engineering review of the dike stability if the 1983/1971 Ash Pond area is returned to active service for ash disposal operations (see previous recommendation AP-2009-2 updated for this report). In consideration of the current active service for the 1983/1971 Ash Pond described with this report, MACTEC has been authorized by Progress Energy to perform field investigations and engineering analysis to review the stability of the dikes.

The discharge structure is located in the northwest corner of the pond at the area of standing water. The discharge structure consists of a 48-inch diameter vertical concrete riser connected to a 12-inch diameter concrete outlet pipe. The end of the discharge pipe is submerged in the cooling pond and is not visible for inspection. At the time of our inspection, the discharge riser crest was set at about Elevation 25.8. Based on follow-up discussions with the plant, we understand that the discharge riser crest has been lowered by 1 foot to Elevation 24.8. This action was reported to have occurred on September 8, 2010 in response to comments from NCDENR Dam Safety. (*Follow-up Note: MACTEC confirmed that the water level was lowered during the site visit on 12/15/10. We also observed that the skimmer mounted on the discharge riser had a noticeable tilt toward the access walkway from the dike. Plant personnel reported that the tilt was noticed after removal of a section of the riser to lower the water level.*)

The dike crest generally appeared to be stable with no indications of unusual settlement or displacement. The crest does appear to have ruts developing along the vehicle wheel path. Previous reports have indicated that the minimum crest level for the dike is around Elevation 27.6 (compared to the design crest Elevation 28.0). We recommend providing a field survey to check the elevation of the crest and then providing fill as needed to restore the crest to the design Elevation 28.0.

The dike slopes generally appeared to be stable. The exterior slope of the west dike, from the intersection with the 1984 Ash Pond dike to about 300 feet south of the discharge structure has sparse grass cover for surface stabilization. The exterior slope along the discharge canal has a relatively thick growth of trees and brush. Progress Energy should consider maintenance cutting of trees and brush to facilitate inspection. (*Follow-up Note: This condition was checked during the MACTEC site visit on 12/15/10. Maintenance cutting of brush and trees has been provided for upper portion of exterior slope along canal. The lower portion of the exterior slope still has a thick growth of trees and brush.*)

Photographs 1-4 are included in Appendix A to represent conditions observed for the 1983/1971 Ash Pond dike.

1984 Ash Pond Area

The dikes for the 1984 pond are constructed of sand with an interior clay liner. The clay liner extends across the pond bottom as well. The crest width is 12 feet and slopes (interior and exterior) are 3(H):1(V). The maximum developed dike height is about 32 feet above original grade, and the

design crest level for the dikes is at Elevation 34.0 (assumed as feet MSL where Elevation is noted). The length including the common dike with the 1983 pond is about 10,000 feet.

At the time of this inspection, the riser crest was reported to be at Elevation 30.0. It was also reported Progress Energy that the water level was raised to the current elevation on June 25, 2009 (from Elevation 28.0). The MACTEC report dated April 20, 2010 included in Appendix B, along with current inspection activities, indicates that seepage is not emerging on the exterior slope and seepage does not represent an immediate concern for dike stability.

The dike crest generally appeared to be stable with no indications of unusual settlement or significant displacement. We recommend providing a field survey to check the elevation of the crest and then providing fill as needed to restore the crest to the design Elevation 34.0.

The interior slopes generally appeared to be stable. The interior slopes have a thick growth of Phragmites along with patches of briars. Grass and briars are also present in the riprap slope protection on the interior slope along the east side of the pond area. From our review, the thick growth of Phragmites is beneficial for slope stabilization and protection from wave action along the water line. However, we recommend continuing to cut the vegetation on upper portion of the interior slope to facilitate inspection.

Photographs 5-16 are included in Appendix A to represent conditions observed for the 1984 Ash Pond dike.

A walking inspection was performed with Mr. Alderman along the outside slope of the dike on the east, north and west sides of the Ash Pond. Mr. Alderman was checking for areas that required maintenance work. During this walking inspection, we observed areas where the sand has shifted or washed down slope. We understand that the plant is planning to mulch and seed these areas to provide surface stabilization. Mr. Alderman also pointed out two locations that appeared to be animal burrows. There is a fairly large burrow located near the top of the exterior slope on the east side of the Ash Pond (Photograph 17). The burrow has an opening of about 1 foot in diameter and was over 4 feet in depth when probed. We also observed a small burrow located on the north exterior slope of the dike (Photograph 18). We understand the plant intends to locate and fill these holes as a routine maintenance activity. *(Follow-up Note: Plant personnel reported that no maintenance work was provided for animal burrows during 2010. However, the animal burrows could not be located during the MACTEC site visit on 12/15/10 and may have been covered over by wheel tracks from mowing equipment. No additional animal burrows were located.)*

The exterior slopes generally appeared to be stable but are sparsely vegetated with grass along with some briars and small bushes. Because of the sparse vegetation, we are noticing some surface erosion and shifting of loose sand on the exterior slopes. This condition is especially noticeable for exterior slopes along the north dike. This condition should be monitored during routine inspections for development of erosion gullies that could potentially undermine the crest.

The vertical riser for the discharge structure was observed from the access platform (Photograph 19). The skimmer structure and interior surfaces appeared to be in good visual condition. The downstream outlet/diversion structure appeared to be structurally sound with no obvious signs of

leakage or significant cracking (Photograph 20). The discharge from the outlet structure appeared to be free flowing at the time of inspection.

There were no surface depressions or seepage observed on the dike above the diversion pipe. *(Follow-up Note: This condition was checked during the MACTEC site visit on 12/15/10. A walking inspection was performed to check for surface depressions and seepage along the toe of the dike for the buried pipe. No concerns were identified from this follow-up inspection.)*

1984 Ash Pond Interior Storage Area

In 2006, Progress Energy constructed an interior ash storage area (also referred to as the interior containment area) for the south end of the 1984 Ash Pond. The storage capacity addition was designed by Withers & Ravenel and constructed by Trans Ash. The design crest is at Elevation 42.0, and the planned normal water level is Elevation 40.0. The maximum dike height above the original ash level is about 14 feet, and the crest width is 25 feet. The interior slope is 2(H):1(V) and the exterior slope slope is 4(H):1(V). Where the new dikes are adjacent to the 1984 pond perimeter dikes, the toe of the slope is set back eight feet and graded to drain toward the north. A stability berm is provided on the north side where the dike is adjacent to the impounded water of the 1984 pond.

The water level for the interior containment area appeared to be the same as the last inspection at about Elevation 40.0.

The crest generally appeared to be stable with no indications of unusual settlement or displacement. The crest is becoming somewhat uneven and rutted from vehicle traffic. Gravel stabilization for vehicle access is provided only from the access ramp at the northeast corner to the discharge structure. We recommend providing a field survey to check the elevation of the crest and then providing fill as needed to restore the crest to the design Elevation 42.0.

The exterior slopes generally appeared to be in good condition with no indications of stability concerns. The vegetation on the exterior slopes appears to be sparse, and the slope should be routinely checked for erosion. We did not observe any significant surface erosion during the current inspection. Photographs 21 and 22 provide representative views of the condition of the containment dike from the northeast corner.

Previous inspections have noted depressions and erosion in the stability berm on the north side of the interior containment area. The plant reports that all depressions have been filled. No new depressions were noted during this inspection. Photograph 23 provides a representative view of the stability berm. *(Follow-up Note: This condition was checked during the MACTEC site visit on 12/15/10. With vegetation cut and seasonally dormant, we were able to more carefully check for surface depressions. One small surface depression and an area of localized settlement were observed along the toe. This localized condition appeared to be stable and does not require immediate repair.)*

Some localized riprap loss was noted on the interior slope on the north side of interior storage area for follow-up in the 2009 inspection report. This riprap loss was confirmed as satisfactorily

repaired during the current inspection. We did not observe new locations with displacement or loss of riprap slope protection.

The discharge structure for this interior storage area consists of a concrete riser structure six feet square connected to a 36-inch diameter HDPE pipe with an outlet invert set at Elevation 24.0 feet. The discharge structure appeared to be structurally sound with no indications of displacement. The outlet pipe for the discharge structure could not be inspected because the water level at the toe of the stability berm covered the end of the pipe. (Photographs 24 & 25) (Follow-up Note: The condition of the area where the outlet pipe discharges into the 1984 Ash Pond was checked during the MACTEC site visit on 12/15/10. Flow could be observed emerging into the standing water in the vicinity of the outlet pipe.)

Ash Pond Summary of Recommendation

Based on the current inspection results, the status for addressing recommendations from the 2007 5-year Inspection Report and recent annual inspections are summarized as follows:

Ref No.	Recommendations	Recommended Time for Implementation	Current Status (See note below table)
AP-2009-1 (2006 Interior Containment Area)	Riprap material on the inside slope was observed to have slipped down the slope on the north side of the dike near the discharge structure (localized condition).	Repair Complete (2010)	Repairs have been provided by the plant.
AP-2009-2 (1983/1971 Ash Pond Area)	We recommend providing an updated engineering review of dike stability and adequacy of the discharge structure in consideration for the current active utilization of the 1983/1971 Ash Pond area. (Recommendation updated for 2010 Report)	Provide updated review during 2011.	Inspection of this area provided by MACTEC for 2010. Follow-up review authorized by Progress Energy in December, 2010.
AP-2009-3 (1984 Ash Pond)	MACTEC provided support for investigation of possible increased seepage for the 1984 Ash Pond area associated with raising the pond operating level. Further review of this condition may be warranted if the plant considers raising the water level in the future.	Complete (2010)	MACTEC report issued on 4/20/10.
AP-2007-1 (1983/1971 Ash Pond)	The large brushy vegetation on the west dike should be trimmed to allow better slope visibility	Routine Maintenance	Maintenance cutting provided for slope in vicinity of discharge structure during 2010.
AP-2007-2 (1983/1971 Ash Pond)	Progress Energy's program of cutting trees on the exterior slopes should continue.	Routine maintenance	Large trees still present on downstream slope along discharge canal (no change for 2010)

AP-2007-3 (1983/1971 Ash Pond)	If operation of the 1983 pond is resumed, the exterior slope adjacent to the Cooling Pond and discharge canal should be checked during the monthly inspections for signs of seepage.	Routine inspection	Inspection provided by plant in 2010 consistent with current procedure.
AP-2007-4 (1984 Ash Pond)	Patches of briars and small brush on the interior slope should be controlled by spraying or cutting so the slope can be observed during routine inspections.	Routine maintenance.	Plant is cutting upper portion of dike slope that can be reached by mowing equipment from crest. Thick growth along the toe is beneficial for slope stabilization and protection from wave action.
AP-2007-5 (1984 Ash Pond)	Progress Energy's program of cutting trees on the exterior slopes should continue.	Routine maintenance	Slopes have been cleared of brush and trees to the toe of slope.
AP-2007-6 (1984 Ash Pond)	The east dike interior repair area should be monitored for progress of vegetative growth. The rip rap should be sprayed as needed to control vegetation.	Routine maintenance	No spraying or clearing provided during 2010.

Note: The status for action items was reviewed with plant personnel prior to issuing this report.

COOLING POND FIELD OBSERVATIONS

The observations for the current inspection are generally consistent with the conditions noted for the 2009 Annual Inspection Report.

The Cooling Pond has an estimated surface area of 1,100 acres and storage capacity at normal pool level estimated at 6,900 acre-feet. Water from the plant enters the pond from a discharge canal at the southeast end of the pond. Circulation of the water through the pond is controlled by a central main baffle dike and a series of "wing" dikes. After cooling, water is taken back into the plant through an intake canal at the south end of the pond.

The water level in the pond is normally maintained around Elevation 9.5. Water can be introduced from the Cape Fear River to the pond area using makeup pumps located as indicated on the attached Photograph Location Plan. The water level can also be lowered to Elevation 2.5 by two sluice gates located near the end of the of the intake canal. The water level at the time of inspection was reported to be between Elevation 9.5 and 9.7. The plant also reported that water was being repeatedly released and subsequently replaced (refilled by make-up pumping) in an effort to control algae growth in the pond. Water was being released at the time of the inspection.

Other than makeup water, inflow into the pond is limited to direct rainfall, surface water runoff from land adjacent to the northeast portion of the pond, and discharge water from the ash pond east



of the cooling pond. As a result of a 1998 modification, Ash Pond discharge can be routed either to the Cape Fear River or to the Cooling Pond.

The crest of the dike has a soil cement layer that is badly cracked and, in some places, missing. Gravel has been placed in areas where the soil cement has deteriorated to the point of not being intact. Local low areas were present along the crest. Previous inspections have recommended that a survey should be conducted to confirm the crest elevation; the survey has not been performed as of the date of the current inspection. There was no significant change in this condition noted for the current inspection.

At several locations, cracks parallel to the dike and about three to four feet back of the interior edge have been observed. Previous inspections have recommended monitoring for appearance of open cracks and providing appropriate maintenance by filling with fine gravel (No. 78M Stone for example). There was no significant change in the condition of the crest noted for the current inspection.

The entire interior slope has a liner formed with near horizontal layers of soil-cement. The individual layers are designed to be about six inches thick and six feet wide perpendicular to the dike. Collectively, the soil-cement forms a series of steps along the interior face. Previous inspections have generally indicated a progressive deterioration of the soil-cement liner. A shoreline inspection should be performed to evaluate the progress of erosion and undermining for the soil-cement liner. The results for this inspection should be considered in developing repair plans for the soil-cement liner.

In areas with the most deterioration of the soil-cement liner, riprap material has been placed on top of a geotextile along the toe of slope to reduce erosive effects of lake level fluctuations and wave action. As noted for the current inspection, we observed displacement of the riprap from wave action in many locations. In conjunction with the shoreline inspection, we recommend a more detailed review of the extent of riprap repair required along the toe of the interior slope.

Consistent with the last 5-year inspection report, maintenance spraying to remove vegetation in the rip rap should be continued. We also recommend that cutting of trees that take root along the interior slope should continue.

For the current inspection, observations for the condition of the interior slope are summarized for each bay as follows:

- Bay 1 – Trees are present on the inside slope of the soil-cement liner that should be removed. Pavement on the crest is mostly intact with some broken areas. The toe of slope and riprap material is generally in satisfactory condition (Photographs 26 & 27).
- Bay 2 - Trees are present on the inside slope of the soil-cement liner that should be removed. Pavement on the crest is broken up, uneven, and has experienced some rutting. Deterioration along the toe of slope and loss of riprap material is fairly extensive (Photographs 28 & 29).
- Bay 3 - Pavement on the crest is missing, broken up and uneven. The toe of slope is generally in satisfactory condition with limited loss of riprap material (Photographs 30 & 31).

- Bay 4 – No concerns for slope damage or settlement along the crest were noted in the vicinity of the makeup pumping station. Pavement on the crest is broken and uneven, but mostly intact. Erosion along the toe was noted and should be further evaluated by shoreline inspection. There does not appear to be riprap provided along the toe in this bay (Photographs 32, 33, & 34).
- Bay 5 – The crest is mostly intact, cracked, and uneven with some missing sections of pavement. There is a longitudinal crack with 2-3 inches of vertical displacement toward the north end of the bay. Erosion along the toe was noted and should be further evaluated by shoreline inspection. There does not appear to be riprap provided along the toe in this bay (Photographs 35 & 36).
- Bay 6 – The crest is mostly intact, cracked, and uneven with some missing sections of pavement. Erosion along the toe was noted and should be further evaluated by shoreline inspection. There does not appear to be riprap provided along the toe in this bay. The barricade at the end of the bay was intact. (Photographs 37 & 38)

The plant should continue to monitor cracking and damage to the soil-cement slope protection at the pipe crossing for the canal near the skimmer structure (Photograph 39)

The exterior slope generally appeared to be in stable and in good condition. Consistent with previous recommendations, maintenance cutting of trees and brush should be provided to clear the slope down to the toe. On December 8, 2010, the plant reported that there has been no cutting or maintenance performed for the vegetation on the exterior slopes during 2010.

The concrete walls of the sluice gate structure continue to appear structurally sound and serviceable. There did not appear to be any significant change in the open joints previously observed where the interior slope wing walls and the headwall come together on both sides of the structure. Concrete cracking at the north gate hoist support also appeared to be consistent with previous inspections (Photograph 40).

As noted in the last 5-year inspection report, the ability to operate the sluice gates is an important design safety feature. Emergency operation procedures require lowering the pond level in anticipation of a hurricane. We understand from discussions with the plant personnel that both gates are currently operable. We observed satisfactory operation of one gate during this site visit.

During the 2009 inspection, we noticed what appears to be a submerged concrete floor slab on the downstream side of the sluice gate structure that appeared to be broken up. From follow-up discussions with plant personnel, we understand that this condition has been present for many years. We also understand that the broken slab is probably more visible because discharge flow from the ash pond bypass could be removing silt buildup in the area. We recommend further review and evaluation of this condition to determine if there is potential for undermining of the structure.

The status for addressing previous recommendations from the 2007 Independent Consultant Inspection Report and recent annual inspections are summarized as follows:

Ref No.	Recommendations	Recommended Time for Implementation	Current Status (See note below table)
CP-2009-1	The extent of riprap displacement and loss for the toe of dike should be reviewed by a shoreline inspection from a boat. The shoreline inspection should also evaluate the progress of erosion and undermining for the soil-cement liner. The results for this inspection should be considered in developing repair plans for the liner.	Recommend inspection by boat annually to monitor progress.	Plant is performing inspection by boat annually. No areas of concern identified for 2010.
CP-2009-2	We recommend further review of what appears to be a broken concrete slab observed on the downstream side of the sluice gate structure to determine if there is any potential for undermining of the structure.	Recommend follow-up before the next 5-year Independent Consultant Inspection in 2012.	No activity for 2010.
CP-2007-1	A crest elevation survey should be conducted to identify locations that are below design elevation. Provide fill to raise the crest elevation to design requirements as indicated by survey (updated recommendation for 2010)	Recommend survey before the next 5-year Independent Consultant Inspection in 2012.	No activity for 2010
CP-2007-2	Implement a maintenance repair program for the soil-cement slope protection based on progress of erosion observed during inspection by boat. (Updated recommendation for 2010)	Provide engineering review of need for repair before next 5-year Independent Consultant Inspection in 2012.	No activity for 2010
CP-2007-3	Monitor the crest for new open areas and fill with concrete or gravel.	Routine maintenance activity	No significant change observed for 2010
CP-2007-4	Continue with maintenance activity for removal of vegetation growing in the soil-cement.	Routine maintenance activity	Trees should be removed from soil-cement along interior slope.
CP-2007-5	Erosion and damage for the soil-cement surrounding the piles supporting the gas line should be repaired.	Develop plan and implement repair before next 5-year Independent Consultant Inspection in 2012.	No activity for 2010

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CP-2007-6	Continue monitoring the open joints and cracking for the sluice gate structure for indications of further movement.	Routine plant inspection activity	No significant change observed for 2010
CP-2007-7	Provide a means to prevent damage to the gate hoisting support structure from "over closing" operations. Implement maintenance repairs for existing cracking and damage to the hoist support structure.	Complete	This appears to have been addressed by plant based on observation during current inspection.

Note: The status for action items was reviewed with plant personnel prior to issuing this report.

CLOSING

MACTEC is pleased to continue assisting Progress Energy with inspections of the dams at the L.V. Sutton Steam Electric Plant. Please contact us if you have any questions about this report.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.



J. Allan Tice, P.E.
Senior Principal Engineer
Registered, North Carolina 6428



Richard S. Auger
Principal Engineer
Registered, North Carolina 8169



RSA/rsa

APPENDICES

APPENDIX A

- Photograph Location (2 drawings)
- Photographs

APPENDIX B

- MACTEC Report of Piezometer Installation and Observations, 1984 Ash Pond, April 20, 2010.

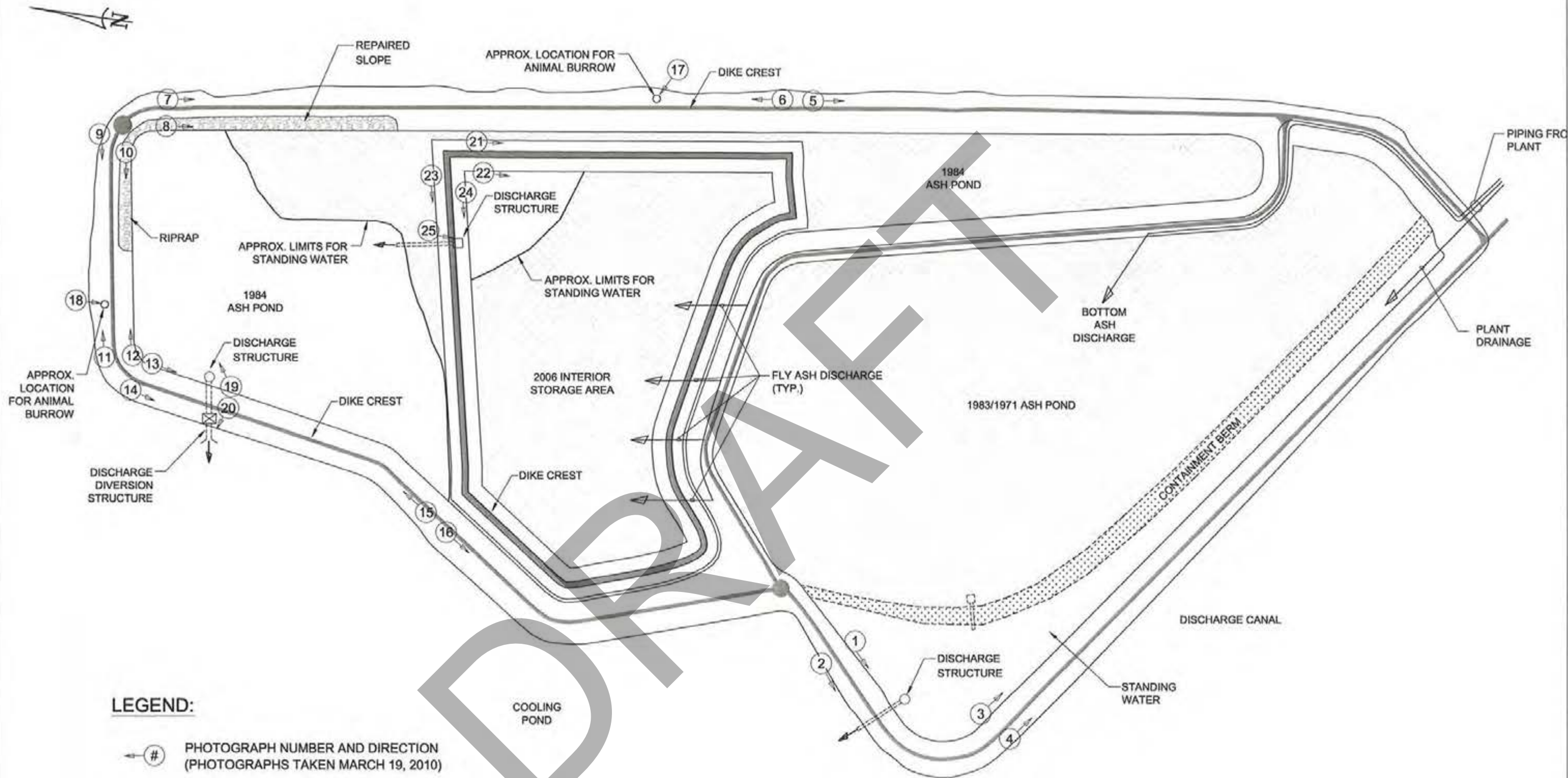
US EPA ARCHIVE DOCUMENT

APPENDIX A

- **Photograph Location (2 drawings)**
- **Photographs**

DRAFT

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➔ # PHOTOGRAPH NUMBER AND DIRECTION
(PHOTOGRAPHS TAKEN MARCH 19, 2010)

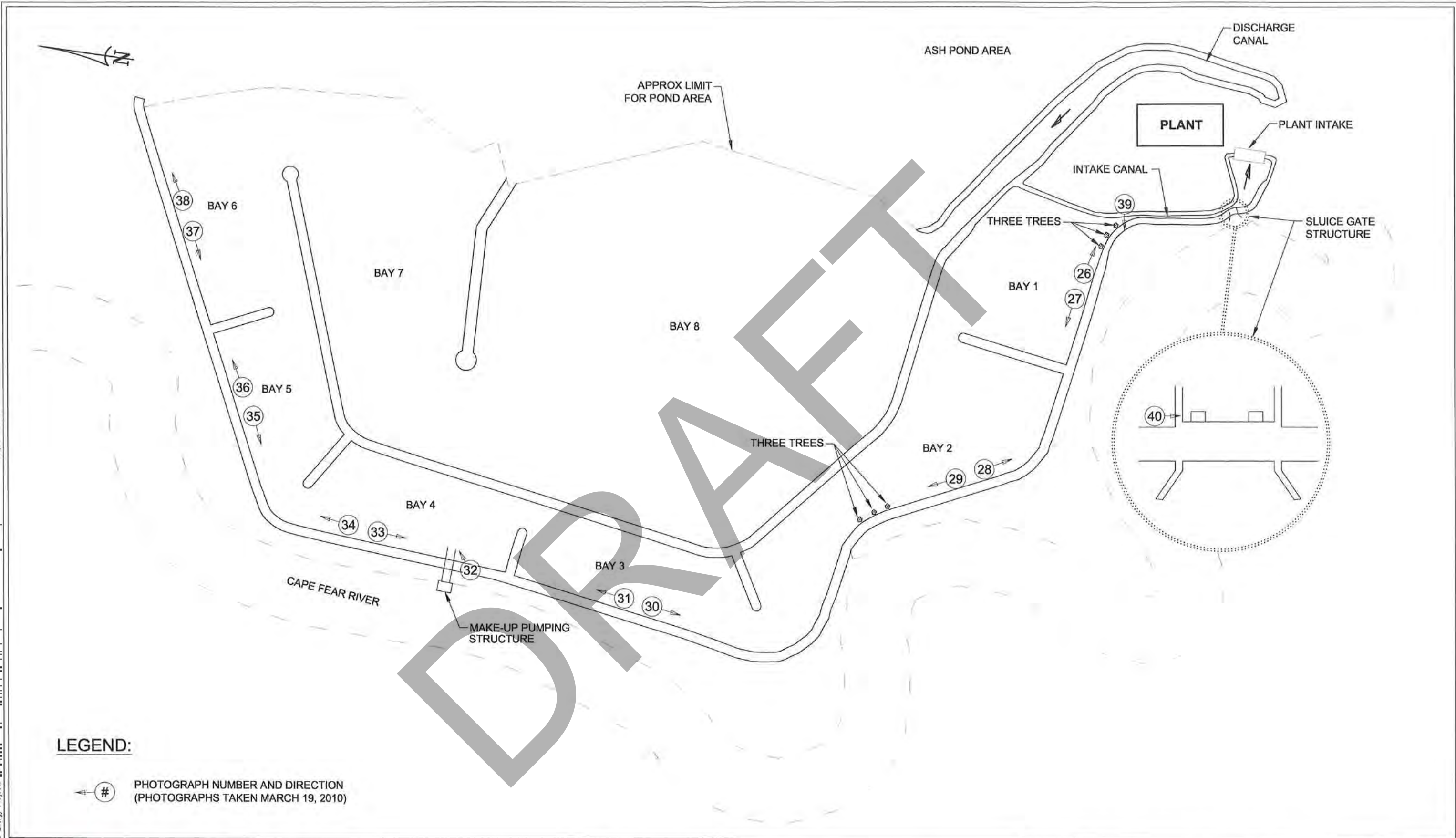


**PHOTOGRAPH LOCATION PLAN
ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA**


DRAWN:	R.R.	DATE:	DECEMBER 2010
ENG CHECK:	<i>JH2</i>	SCALE:	N.T.S.
APPROVAL:	<i>USA</i>	JOB No.:	6468-10-0025(04)

DRAWING
1

REFERENCE: CP&L DRAWINGS D3232 & D3230; WITHERS & RAVENEL DRAWING 1, TRANSASH DRAWING 4-19-05.

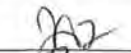
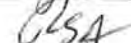


LEGEND:

 PHOTOGRAPH NUMBER AND DIRECTION
(PHOTOGRAPHS TAKEN MARCH 19, 2010)

 **MACTEC**
MACTEC ENGINEERING AND CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA

PHOTOGRAPH LOCATION PLAN
COOLING POND
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA

DRAWN:	R.R.	DATE:	DECEMBER 2010
ENG CHECK:		SCALE:	N.T.S.
APPROVAL:		JOB No.:	6468-10-0025(04)

DRAWING

2

Appendix B – Photographs
2010 L. V. Sutton Annual Dam Inspection



1. 1983/1971 Ash Pond – View of interior slope for west dike looking toward discharge structure.



2. 1983/1971 Ash Pond – View of exterior slope for west dike looking toward discharge structure.



3. 1983/1971 Ash Pond – View of interior slope for south dike.



4. 1983/1971 Ash Pond – View of exterior slope for south dike.



5. 1984 Ash Pond - View of exterior slope for east dike looking south.



6. 1984 Ash Pond - View of exterior slope for east dike looking north.



7. 1984 Ash Pond – View of exterior slope for east dike looking south (at northeast corner).



8. 1984 Ash Pond – View of interior slope for east dike looking south (at northeast corner).



9. 1984 Ash Pond – View of exterior slope for south dike looking west (at northeast corner).



10. 1984 Ash Pond – View of interior slope for south dike looking west (at northeast corner).

Appendix B – Photographs
2010 I. V. Sutton Annual Dam Inspection



11. 1984 Ash Pond – View of exterior slope for south dike looking toward east (at northwest corner).



12. 1984 Ash Pond – View of exterior slope for south dike looking east (at northwest corner).



13. 1984 Ash Pond – View of interior slope for west dike looking toward discharge structure.



14. 1984 Ash Pond – View of exterior slope for west dike looking toward discharge structure.



15. 1984 Ash Pond – View of exterior slope for west dike looking north.



16. 1984 Ash Pond – View of exterior slope for west dike looking south.



17. 1984 Ash Pond – View of animal burrow on the exterior slope for east dike (12 inch tape extension shown for scale).



18. 1984 Ash Pond – View of animal burrow on the exterior slope for north dike (4" x 7" field book shown for scale).



19. 1984 Ash Pond – View at top of platform mounted on skimmer for discharge structure.



20. 1984 Ash Pond – View of discharge diversion structure at toe of west dike.



21. 1984 Ash Pond/Interior Storage – View of exterior slope for containment dike looking south.



22. 1984 Ash Pond/Interior Storage – View of interior slope for containment dike looking south.



23. 1984 Ash Pond/Interior Storage – View of stability berm for containment dike looking west.



24. 1984 Ash Pond/Interior Storage – View of interior slope for containment dike and discharge structure looking west.

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25. 1984 Ash Pond/Interior Storage – View of discharge structure from access platform.



26. Cooling Pond – (Bay #1) View of crest and interior slope showing small trees growing at toe.



27. Cooling Pond – (Bay #1) View of crest and interior slope looking west.



28. Cooling Pond – (Bay #2) View of crest and interior slope looking south.



29. Cooling Pond – (Bay #2) View of crest and interior slope looking north.



30. Cooling Pond – (Bay #3) View of crest and interior slope looking south.



31. Cooling Pond – (Bay #3) View of crest and interior slope looking north.



32. Cooling Pond – (Bay #4) View of makeup discharge pipes on upstream side of dike.



33. Cooling Pond – (Bay #4) View of crest and interior slope looking south.



34. Cooling Pond – (Bay #4) View of crest and interior slope looking north.



35. Cooling Pond – (Bay #5) View of crest and interior slope looking east.



36. Cooling Pond – (Bay #5) View of crest and interior slope looking west.



37. Cooling Pond – (Bay #6) View of crest and interior slope looking east.



38. Cooling Pond – (Bay #6) View of crest and interior slope looking west.

Appendix B – Photographs
2010 L. V. Sutton Annual Dam Inspection



39. Cooling Pond – View of slope protection damage at pipe support on interior slope near the sluice gate structure.



40. Cooling Pond – View of concrete cracking at sluice gate support on north side of discharge structure.

APPENDIX B

- **MACTEC Report of Piezometer Installation and Observations, 1984 Ash Pond, April 20, 2010.**

DRAFT



engineering and constructing a better tomorrow

April 20, 2010

Mr. Bill Forster
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27614

**SUBJECT: REPORT-OF PIEZOMETER INSTALLATION AND OBSERVATIONS
1984 ASH POND - SUTTON PLANT
WILLMINGTON, NORTH CAROLINA
MACTEC PROJECT NUMBER: 6468-09-2340**

Dear Mr. Forster:

MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit our report of installation of piezometers, observation of water levels and interpretation of the results for the 1984 Ash Pond at the Sutton Plant. In February, 2009, MACTEC installed 18 water level observation casings (piezometers) in the dike crest and exterior slopes. Additionally, MACTEC advanced six continuous sampling probes at the dike crest piezometer locations to check the material types used to construct the dikes. This report describes the piezometer installation methods, presents logs of the installations, summarizes the water level readings taken through September, 2009 and provides our assessment of the results relative to the stability of the dikes. The Appendices contain tables, figures, soil description logs, and the well installation logs.

REPORT SUMMARY

Progress Energy raised the water level in the 1984 Ash Pond from elevation 26 feet to elevation 30 feet in November, 2008. After initial observations and comparisons of inflow and outflow records showed the 1985 Ash Pond water level was decreasing, Progress Energy reduced the water level to elevation 28 feet where conditions appeared to stabilize. In February, 2009, MACTEC installed 18 piezometers at six section locations around the 1984 Ash Pond dike to assist in evaluating conditions and if potential pond leakage impacted the stability of the dikes. Water was found only in the six piezometers installed into the natural ground from the crest of the dikes and in one toe piezometer on the north dike. Piezometer readings found water levels in the dikes below those used for original design analyses. The water levels found do not reduce the dike stability.

MACTEC evaluated the dike slopes and toe areas for signs of seepage. No seepage was seen.

MACTEC reviewed piezometer readings and pond water level changes. An increase in the pond water level made in late June, 2009 (raising from elevation 28 to elevation 30 feet) was reflected in an increase in water level elevations in those piezometers that had measureable water present. The increase was similar to the height of pond water level increase. Over the span of about three months the piezometer water level elevations dropped back down to near levels prior to the pond water level increase, while the pond water level remained steady and inflows to the pond were similar to outflows.

MACTEC concludes that the original observations by Progress Energy of possible pond leakage were caused by re-hydration of the original clay liner that was above the pond water level for several years.

prior to the increase in pond water elevation in November, 2008. Currently, there are no indications of unexplained water level changes in the 1984 Ash Pond, and the pond inflows are similar to the pond outflows.

PROJECT INFORMATION

The dikes for the 1984 Ash Pond were constructed of compacted sandy soils according to Progress Energy construction records. The interior slopes of the dikes and the bottom of the pond were lined with a clay layer designed for 12 inch thickness. An approximate 12-inch thick sand layer was to be placed on top of the clay on the sides to reduce potential drying shrinkage effects and to protect the clay from erosion. Past dike inspections have generally found the dike slopes in good condition. Wave erosion, particularly on the east dike, had caused removal of the sand over the liner in several areas. Repairs to these areas were made in 2001 and again in 2008. The last dam safety inspection by MACTEC in 2009 found no areas of significant concern.

The clay liner is intended to reduce water flow from the pond into the sand dikes and natural ground, thus creating a low water flow line (phreatic surface) within the dike. The low phreatic surface is important to the stability of the dike.

In November, 2008, Progress Energy raised the operating level of the 1984 Ash Pond to approximately elevation 30 feet from its previous elevation of approximately 26 feet by adding sections to the discharge riser pipe. Monitoring of estimated inflows into the pond and outflows from the discharge riser indicated less water being discharged than was entering, and a decrease in the water surface elevation of the pond, even when there was no outflow into the discharge pipe riser. This behavior suggested possible leakage out of the pond, either from the bottom or through the sides. MACTEC was asked to evaluate the possible leakage with respect to potential for impact on stability of the dikes, possible cause of the leakage and possible remedial actions.

FIELD RECONNAISSANCE

A field reconnaissance of the dike was performed on January 8, 2009 by Mr. Al Tice, P. E. of MACTEC and coordinated with Mr. Bruce Moorefield from the Sutton Plant. The pond water surface was observed to be at about elevation 27.7 feet. The exterior slope areas and natural ground adjacent to the base of the dike slopes were visually checked for signs of emerging water or unusual wetness. No indications of seepage from the dike slopes were seen. The drainage swale along the east dike was dry. Some standing water was observed in a low area between the north end of the west dike and the Cooling Lake. This is a natural condition observed in the past. There were no signs of boils or similar disturbances in the standing water that would suggest water is emerging under pressure. Dike toe areas were inspected and appeared to be dry with no indication of seepage.

Several hand auger borings were made near the base of the slope and at points on the slope to check for presence of water. The soils from the hand auger borings at slope midpoints were dry to moist (near the bottom) to depths of about 9 feet. Soils from the hand auger borings made near the dike toe generally became wet to saturated at depths of about 4 feet. At this depth, the boring was below the level of the adjacent natural ground. On the west side, water was encountered about 2 feet below the dike toe, a level consistent with the adjacent Cooling Lake. One hand auger boring was made on the interior slope of the east dike, in an area where the clay liner repairs had been made in 2008. Clay soils were encountered at a depth of about 5 feet and appeared to be in a moist condition. The soils below the clay were damp, indicating water was not leaking through the clay liner at this point.

The interior slopes of the dike had some sparse vegetation on the east side where dike slope repairs to local erosion areas had been made in 2008. No obvious scarps or erosion cuts deep enough to penetrate the clay liner were observed above the pond water level. No visual signs of animal tunnels or borrowing were observed along the interior slopes.

FIELD EXPLORATION

The field reconnaissance work did not find evidence of seepage emerging from the dike slopes and areas adjacent to the dike toe. MACTEC recommended that piezometers be installed to provide a means of checking for conditions at greater depths than could be reached with hand augers and a means of checking water level changes over time as related to pond level changes. The field exploration consisted of six penetrometer soundings along the crest of the dike with soil samples obtained using a lined tube sampler, six hand auger borings near the base of the dike, installation of six pairs of piezometers on the crest and six piezometers along the base at the boring locations. Two exploration points were located on each of the north, east and western portions of the dike. The boring locations were located in the field by MACTEC. Figure 1 in the Appendix shows the approximate boring and piezometer locations.

Soil Exploration Methods

Six probes were pushed from the crest of the dike at the approximate locations shown on Figure 1 in Appendix A using a GeoProbe drill. The GeoProbe has a hollow interior lined with a clear plastic sleeve. Samples of soil were collected in five-foot long increments. The probes were pushed to approximately 30 feet. Based on the dike design drawings, these depths would result in the probes entering the original ground. The soil samples were visually classified in the field using the Unified Soil Classification System (USCS) and representative portions of soil were collected at two-foot intervals from the liners and placed in a sealed plastic bag for possible testing. No further testing was performed on the collected soil samples.

A hand auger was used to advance shallow borings near the toe of the dike slope at the locations shown on Figure 1 in Appendix A. The soils were visually described, and typical materials were placed in sealed plastic bags for later examination.

MACTEC will store the collected soil samples for a period of 90 days. The samples will be discarded after this period unless requested otherwise. Records for the probes and hand auger borings are included in Appendices B and C, respectively. A sheet defining the terms and symbols used on the boring records is also included in Appendix B.

Piezometer Installation Methods

Twelve piezometers for water level observations were installed along the dike crest near the probe locations. At each location, two piezometers were installed. One (PA-series) consisted of a 5-foot length of mechanically slotted well screen set from 10 to 15 feet below the dike crest surface and 10 feet of solid riser. The second piezometer (PZA-series) at each location was set with its screen at 20 to 25 feet below the dike crest. All piezometers included a sand pack around the well screen, a bentonite seal and then cement/bentonite grout up to the ground surface. Each piezometer was completed using a locking PVC cap and a steel roadbox cemented at the ground surface. The locking roadboxes were placed flush with the dike crest. As requested by Mr. Moorefield, 4-inch pipe protective posts were installed near the piezometers.

At the toe of the dike slope, piezometers were installed in the hand auger boreholes at locations shown on Figure 1 in Appendix A. The termination depth was approximately 4 feet below the existing ground surface at the toe of the dike. The piezometers consisted of 2.5 feet of one-inch diameter PVC hand slotted well screen and 2.5 feet of solid riser pipe. Sand was placed to approximately one-foot above the top of the well screen and the hole was backfilled with bentonite chips to the ground surface. Figure 2 in Appendix A shows a typical dike cross section and the piezometer installations in a typical section. Appendix D contains individual records for the piezometers installed on the dike crest, and Appendix C contains installation notes for the piezometers installed in the hand auger borings near the dike toe.

SUBSURFACE CONDITIONS

Dikes

As noted previously, historical records indicate the dike was constructed of sandy soil placed over a natural sandy foundation. The soil samples collected from the probes and hand auger borings were brown, gray and white sand with estimated Unified Soil Classification of SW (well graded sand). Based on color changes and traces of small roots, an approximate boundary between the dike fill and the natural ground was estimated at between 18 to 20 feet below the dike crest. All six probes were terminated in the natural soils at a depth of 30 feet below the crest of the dike.

The hand auger borings drilled for the piezometers at the toe of the slope soils similar to those seen in the probes. Soils near the bottom of the hand auger borings were often very moist or wet.

Water Level Readings

The depth to water was checked in all piezometers at the time of installation and on multiple dates following the installation. Readings were referenced to the top of the piezometer casing. Elevations for the tops of the casings were estimated as 34 feet for all piezometers in the dike crest. For the piezometers at the dike toe, elevations of the top of casing and adjacent ground surface were surveyed by MACTEC personnel using an assumed top of dike elevation of 34 feet. Table 1 in Appendix A summarizes the water elevations from the installation in February, 2009 through September 17, 2009. Figures 3, 4 and 5 illustrate the range of water level elevations for dike cross sections.

DISCUSSION

Figures 6, 7 and 8 show changes in the water level elevations over time. The piezometers were installed and initial readings taken about 25 days after the pond water level had been lowered from elevation 30 feet to elevation 28 feet, too late to observe changes related to the water lowering. Water levels observed in piezometers between February 18, 2009 through June 24, 2009, with the pond level at elevation 28 feet, showed a slight declining trend. During this time frame, the outflows from the upper pond and the outflows from the 1985 pond (clear pond) were similar. No water was found in the shallower piezometers installed on the dike crest. All but one of the piezometers installed at the dike toe had no measureable water. The single piezometer at the dike toe where water was found (on the north dike) was installed at a lower elevation than all other toe piezometers. The water level in that piezometer was below the ground surface elevation.

After the pond level was raised to elevation 30 feet on June 24, 2009, all piezometers that had measureable water showed a rapid water level increase comparable to the pond level increase over a span of 10 days, then a declining trend to values close to those recorded before the pond was raised. Flow records show

outflows from both the upper and clear ponds being similar. By September, 2009, water levels were close to levels prior to the pond water level raise, except on the east dike where the levels were still about a foot higher than those before the raise.

MACTEC interprets the changes in piezometer water levels as indicating a pressure connection between the water in the pond and the groundwater below the clay liner in the pond bottom. A pressure connection indicates that the clay liner is saturated, as would be expected due to its long period of submergence. The increase in pond water level causes a pressure increase at the top of the clay liner that is transmitted to the water below the liner. The natural soils below the clay liner are sands and these are continuous under the dikes. The sands have a relatively high permeability and can transmit the pressure increase out to the piezometer locations in the dike, causing their water levels to rise. The pressure increase does not indicate leakage in the clay liner, and the decrease in piezometer water levels over time indicates an adjustment of natural groundwater levels as the local pressure increase under the pond is dissipated out into the surrounding groundwater system.

The clay liner will experience an increase in water flow through it because the pressure gradient changes when the pond water level rises. However, the low permeability of the clay in the liner results in an estimated flow volume through the clay on the order of 10,000 gallons per day, well below a volume that would account for the water level drops observed in December, 2008. Thus, the source of the water level drops is not clearly understood. The flow data show the water level outflows stabilized quickly after the water level in the pond was raised from elevation 28 feet to elevation 30 feet in June, 2009, and the flows have remained comparable since that time. Figure 9 shows the flow data as recorded by Progress Energy covering the period from October, 2008 through October, 2009.

The initial observations of differences between the outflow from the upper pond and clear pond when the pond level was raised in late 2008 from elevation 26 feet to elevation 30 feet were interpreted as possible indications of water loss through the clay liner. The clay liner extends up to approximately elevation 32 feet on the slopes and covers the bottom of the 1985 pond. It is possible the portion of the clay liner above the previous pond level had dried and developed shrinkage cracks that initially allowed water to permeate through the liner. As the clay re-hydrated, the cracks closed due to clay expansion. This, combined with a lowering of the pond water level to elevation 28 feet likely explains why the outflow differences were minimal after the pond was lowered. When the pond level was raised again to elevation 30 feet, the clay liner portion between elevations 28 feet and 30 feet did not have time to dry and reform shrinkage cracks before it was again inundated by the pond raise; thus no further loss of water occurred.

Figure 10 shows a slope stability analysis cross section from the original dike design report. The water surface through the dike is shown. The maximum water level elevations from the piezometers were used to draw a current water surface through the dike (red line on Figure 10). The piezometer data show that the water level within the dike is lower than the water level used when the dike stability analyses were performed during the dike design. No seepage out of the dike at the toe or from the natural ground adjacent to the toe was indicated by the piezometers or by visual reconnaissance on several site visits. The recorded water levels, therefore, do not indicate that possible leakage through the clay liner on the dike slopes or through the clay liner on the pond bottom, if any, is causing a reduction in the dike stability.

CONCLUSIONS AND RECOMMENDATIONS

Based on the information discussed above, MACTEC concludes the following:

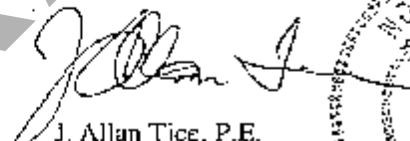
- The original apparent leakage was most likely due to re-hydration of the clay liner on the upper dike slopes after a long period of drying. No indications of continuing loss of water from the 1984 Ash Pond are evident.
- Water levels within the dikes of the 1984 Ash Pond are well below those used in the design, and no concerns exist relative to the safety of the dikes against a structural failure.
- No indications of seepage through the dikes are present from visual reconnaissances or from the piezometer readings.
- The dikes were constructed of sandy soils; borings found no fly ash and construction records report no fly ash use.

MACTEC recommends that the piezometers be checked for water levels during regular dam safety inspections by independent inspectors. Additional readings should be made by plant personnel if unusual inflow/outflow patterns are seen or if the pond water level drops for no apparent reasons. If the level of the pond is to be changed by adding or removing a section of the discharge riser pipe, we recommend that piezometer readings be made at least twice in the week prior to the height change, daily for a week after the height change and monthly for three months. A similar pattern of water level changes in the piezometers as observed during the past water level increase would be expected.

Respectfully submitted,

MACTEC ENGINEERING AND CONSULTING, INC.


James A. Schiff
Project Professional


J. Allan Tice, P.E.
Senior Principal
Registered, North Carolina 428



Attachments: Appendix A - Table 1 and Figures 1-10
Appendix A - Boring Logs (PZ-1A to PZ-6A)
Appendix B - Auger Boring Well Logs (PZ-1B to PZ-6B)
Appendix C - Type II Monitoring Well Installation Records - All twelve piezometers
Appendix D - Carolina Well Construction Record Logs sent to the State of NC

DRAFT

APPENDIX A

**TABLE 1
FIGURES 1-10**

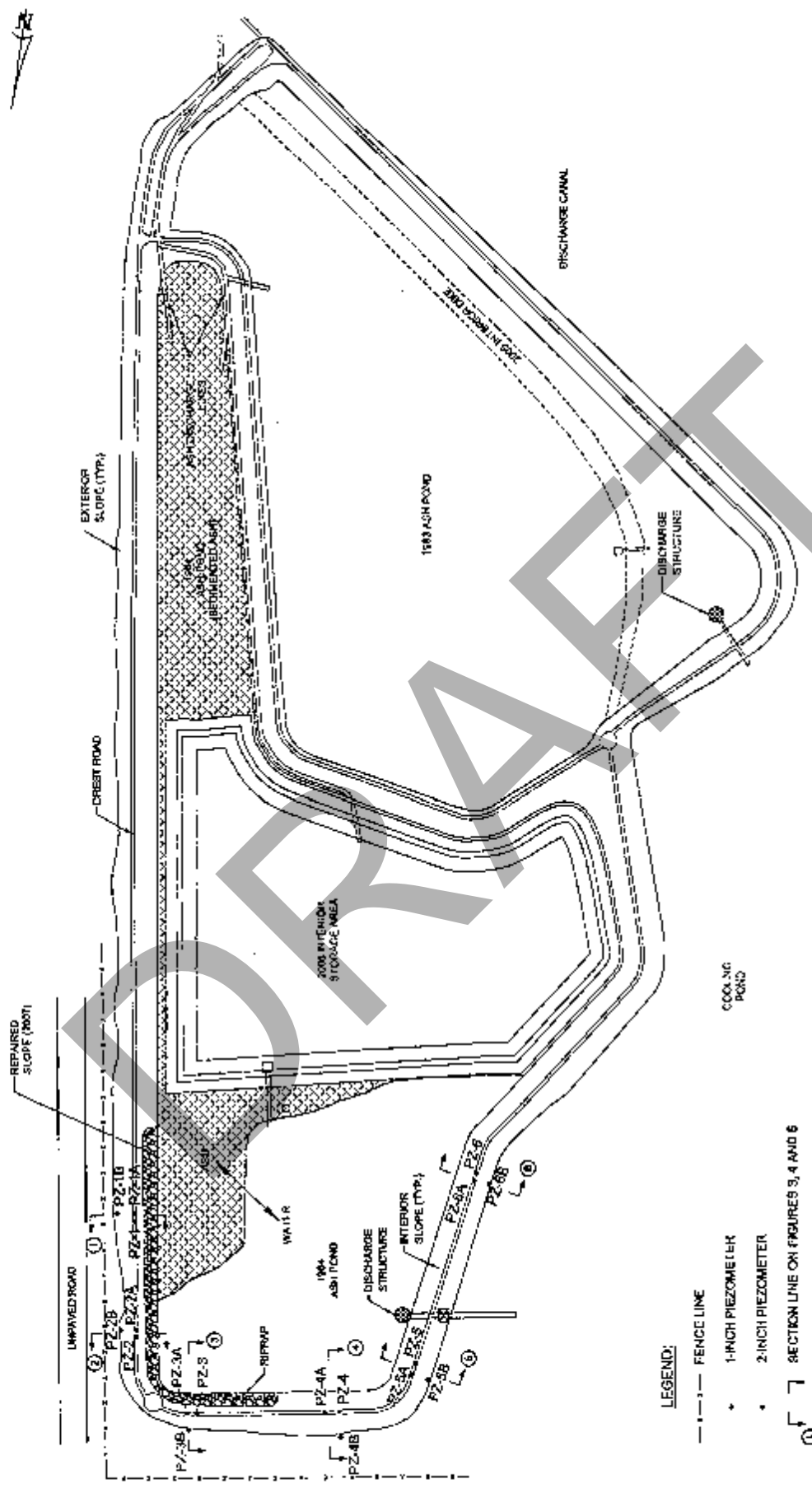
TABUL 1
SUMMARY OF GROUNDWATER INFORMATION IN SHALLOW PIEZOMETERS
 UPDATED 8-17-09
PROGRESS ENERGY-SITT ON B4 ASH POND-SUTTON PLANT
MACTEC PROJECT No. 6465-09-2340

Location	Approx. Grousel Elevation, ft (1)	Top of casing elevation for B piezometers, ft	Depth to Bottom of Screen, below top of casing, ft	Groundwater Elevations - Date (2, 3)												
				2/13/2009	3/11/2009	3/25/2009	6/24/2009	6/28/2009	7/1/2009	7/8/2009	7/15/2009	7/30/2009	8/17/2009	9/17/2009		
PZ-1	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-1A	34		25	12.10	11.76	11.6	12.59	13.56	14.1	14.8	14.36	13.6	13.7	13.1	13.7	13.1
PZ-1B	18.0	19.36	5	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7
PZ-2	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-2A	34		25	12.32	12.0	11.76	12.61	14.77	15.2	14.85	13.5	12.5	14.1	13.5	14.1	13.5
PZ-2B	18.7	19.57	5	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2
PZ-3	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-3A	34		25	11.85	11.82	11.75	11.52	13.05	13.88	14.16	14.01	13.36	13.5	12.9	13.5	12.9
PZ-3B	19.87	20.79	5	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4
PZ-4	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-4A	34		25	11.13	10.98	10.86	10.71	11.64	12.11	12.46	12.26	11.89	12.1	11.6	12.1	11.6
PZ-4B	13.8	14.54	5	10.94	10.89	10.83	10.67	11.38	11.84	11.40	11.30	10.90	11.09	10.8	11.09	10.8
PZ-5	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-5A	34		25	11.29	11.16	11.12	10.95	11.50	12.1	12.4	12.6	12.35	11.96	12	11.7	11.7
PZ-5B	16.08	17.29	5	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25
PZ-6	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-6A	34		25	10.69	10.51	10.49	10.45	10.74	11.5	11.75	11.48	11.10	11.2	10.9	11.2	10.9
PZ-6B	18.27	17.25	5	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4

Notes
 1. Approximate ground elevations as reported from the design top of dike elevation of 34 feet or by MACTEC approximate survey for B piezometers
 2. Riser top elevation approximately 28 ft through 6/24/2009 with pond water level at top of riser
 3. Riser elevation raised to approximately 30 feet on 7/1/2009 and subsequent readlinks unless noted below.

Piezometer Installation notes
 Piezometers installed on February 12 and 13, 2009 by MACTEC
 Piezometers consist of 5 foot of slotted 1" and 2" diameter PVC pipe with solid riser. Backfill with sand around slotted section and bentonite chip/cement/bentonite grout above sand to ground surface.

Prepared By: JAS
 Checked By: 

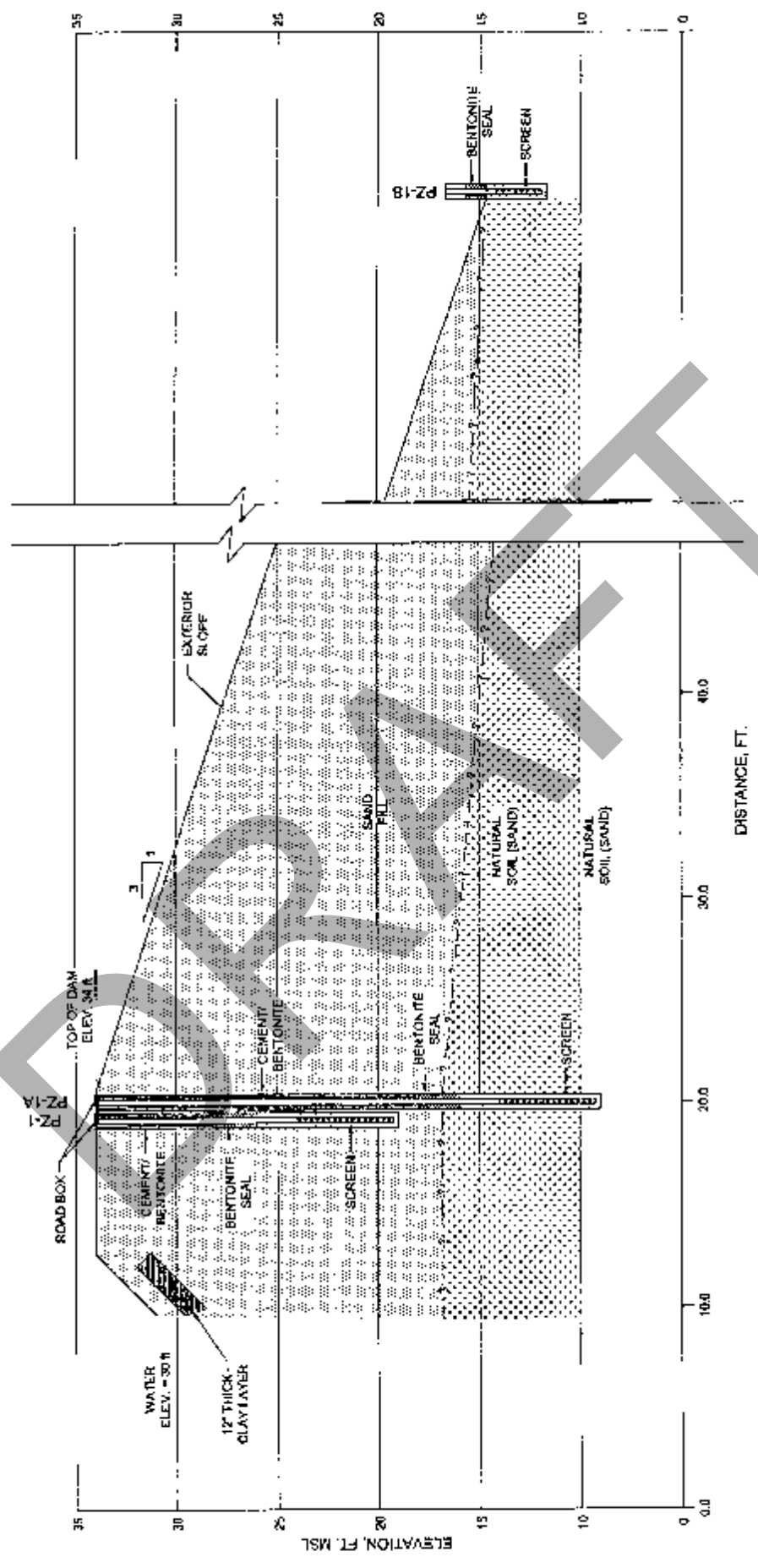


LEGEND:

- - - - - FENCE LINE
- 1-INCH PIEZOMETER
- 2-INCH PIEZOMETER

① SECTION LINE ON FIGURES 3, 4 AND 5

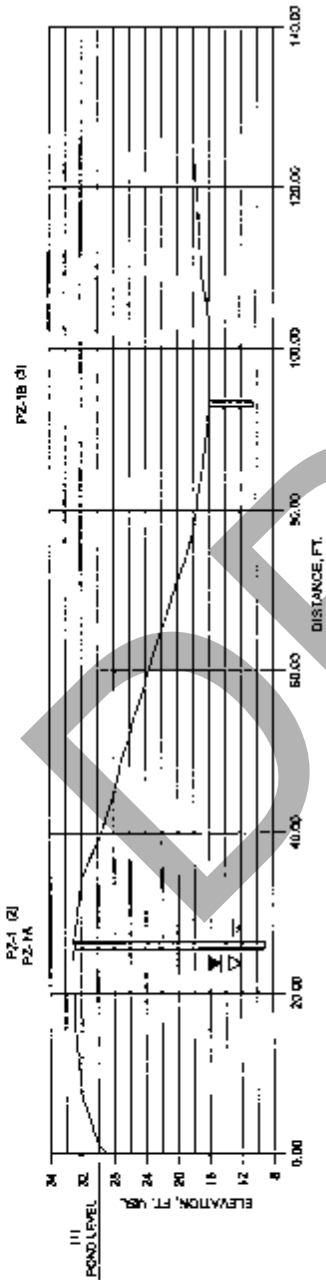
MACTEC MACTEC ENGINEERING AND CONSULTING, INC. 200 ATLANTIC AVENUE BALDWIN, NORTH CAROLINA		DRAWN: P.R. DATE: APRIL, 2010	FIGURE 1
		ENG CHECK: [Signature] SCALE: N.T.S.	JOB NO.: 6488-00-2340
PIEZOMETER INSTALLATION LOCATIONS 1884 ASH POND DIKE L.V. SUTTON STEAM ELECTRIC PLANT WILMINGTON, NORTH CAROLINA			
REFERENCE: CIVIL ENGINEERING DESIGN & CONSTRUCTION, INTERIOR & EXTERIOR, FIGURE 1, 1884 ASH POND, APRIL 2, 2008			



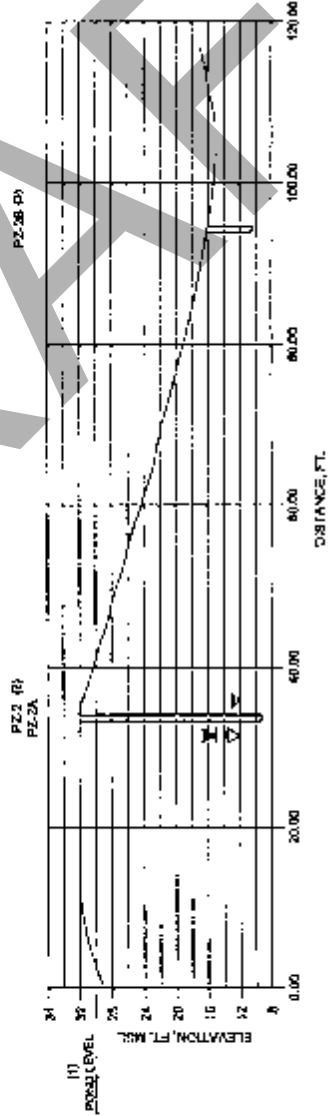
DRAWN:	R.A.	DATE:	APRIL, 2010
ENG CHECK:	<i>JA</i>	SCALE:	1" = 5'
APPROVAL:	<i>[Signature]</i>	JOB No.:	0468-09-2340

TYPICAL CROSS SECTION OF DIKE SHOWING PIEZOMETER INSTALLATION
 SUTTON 1984 ASH POND
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

MACTEC
 GEOTECHNICAL ENGINEERING
 WILMINGTON, NORTH CAROLINA



SECTION 1



SECTION 2

LEGEND:

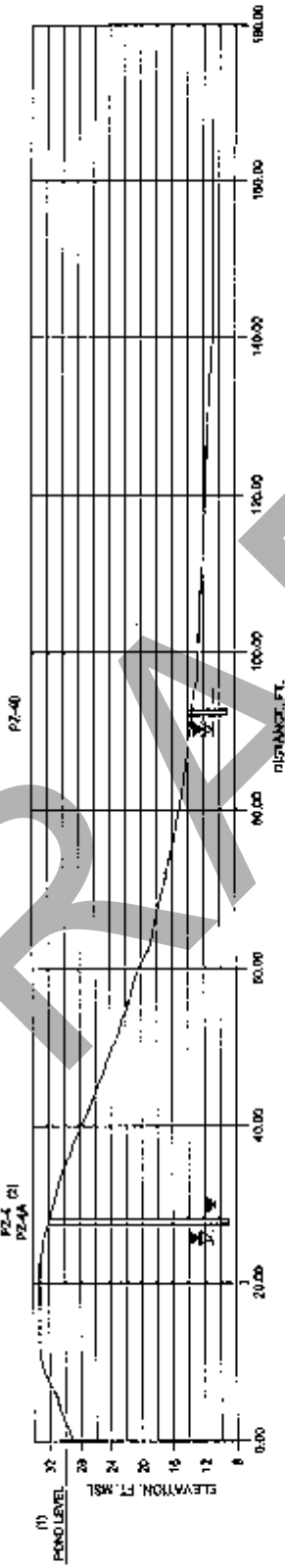
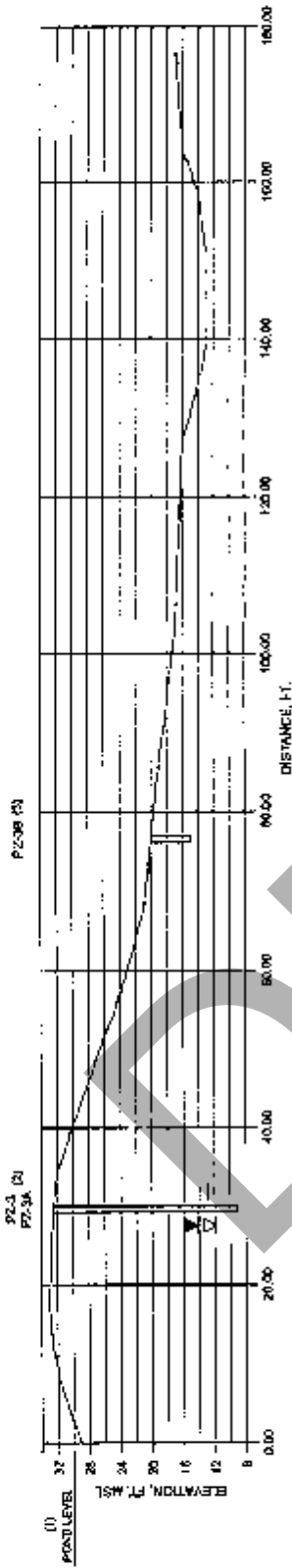
- ▼ HIGHEST WATER LEVEL WITH POND AT EL. 30
- ▽ TYPICAL WATER LEVEL WITH POND AT EL. 28
- GROUND SURFACE ELEVATION

NOTES:

- (1) POND SURFACE HIGHWAY INSTALLATION: 30 FEET ABOVE DRYING CONDITIONS AFTER OVERFLOW.
- (2) PZ-1 AND PZ-2 INSTALLED TO 15' BELOW TOP OF DIKE AND DRY AT ALL READINGS.
- (3) PZ-1B AND PZ-2B INSTALLED TO APPROXIMATELY 4 FEET BELOW GROUND LEVEL AND DRY AT ALL READINGS.
- (4) SEE FIGURE 1 FOR SECTION LOCATIONS.

MACTEC MACTEC ENGINEERING AND CONSULTING, INC. 301 S. FLORISS AVENUE WILMINGTON, NORTH CAROLINA 28401	SUMMARY OF WATER LEVELS IN PIEZOMETERS EAST SIDE, 1984 ASH POND DIKE L.V. SUTTON STEAM ELECTRIC PLANT WILMINGTON, NORTH CAROLINA	DRAWN: R.R. ENG. CHECK: <i>[Signature]</i> APPROVAL: <i>[Signature]</i>	DATE: APRIL 2010 SCALE: 1" = 15' JOB NO.: E468-D9-2340
			3

REFERENCE: 2007 ASPHALT TOPOGRAPHIC MAP (TYPICAL) AND CRETCH.



- LEGEND:
- ▼ HIGHEST WATER LEVEL WITH POND AT LL 30
 - ▽ TYPICAL WATER LEVEL WITH POND AT EL. 28
 - GROUNDWATER READINGS

NOTES:

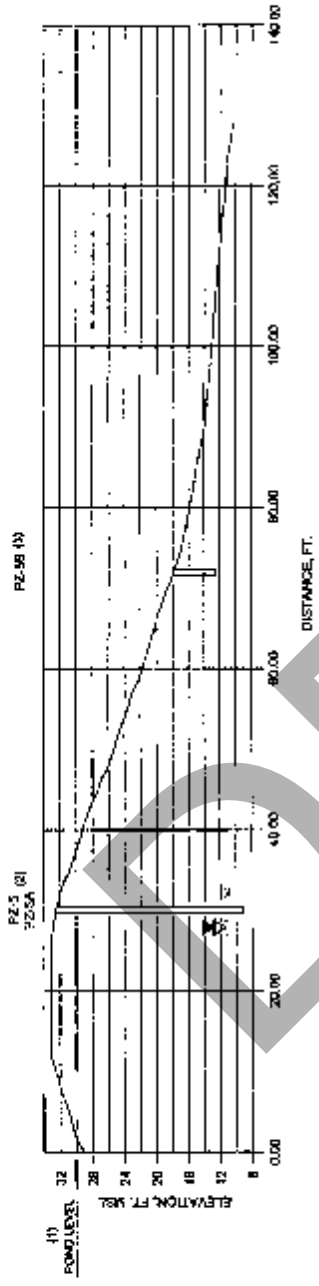
- (1) POND RISES UP SHOWN AT ELEVATION 30 FEET; REPRESENTS CONDITIONS AFTER CONCRETE.
- (2) PZ-3 AND PZ-4 INSTALLED TO 15' BELOW TOP OF DIKE AND DRY AT ALL READINGS.
- (3) PZ-3B INSTALLED TO APPROXIMATELY 4 FEET BELOW GROUND LEVEL AND DRY AT ALL READINGS.
- (4) SEE FIGURE 1 FOR SECTION LOCATIONS.

DRAWN: R.R.	DATE: APRIL 2010	FIGURE
ENG. CHECK: [Signature]	SCALE: 1" = 10'	4
APPROVAL: [Signature]	JOB NO.: 64188-05-2340	

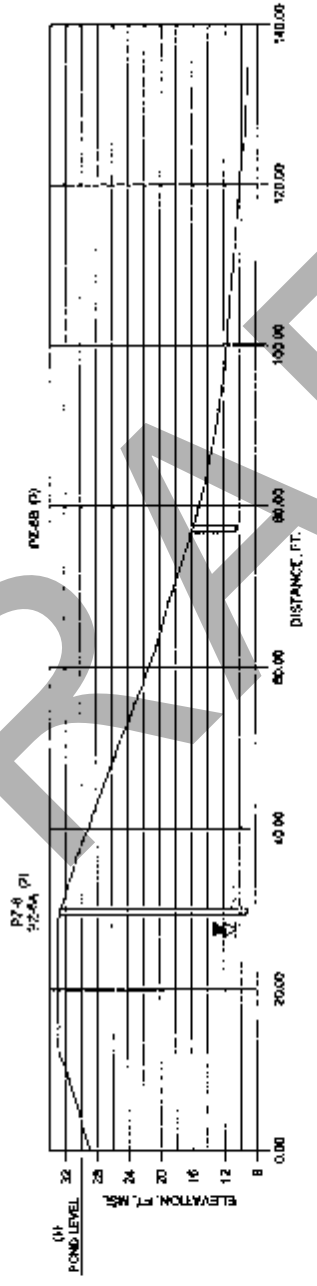
SUMMARY OF WATER LEVELS IN PIEZOMETERS
 NORTH SIDE, 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

MACTEC
 MACTEC ENGINEERING AND CONSULTING, INC.
 3001 WILMINGTON AVENUE
 RALEIGH, NORTH CAROLINA

REFERENCE: 2009 AERIAL TOPOGRAPHIC MAP BY MCDERMID AND CREED.



SECTION 5



LEGEND:

- POND WATER LEVEL WITH POND AT EL. 30
- - - TYPICAL WATER LEVEL WITH POND AT EL. 20
- ▬ 0#128028 ROADWAY

NOTES:

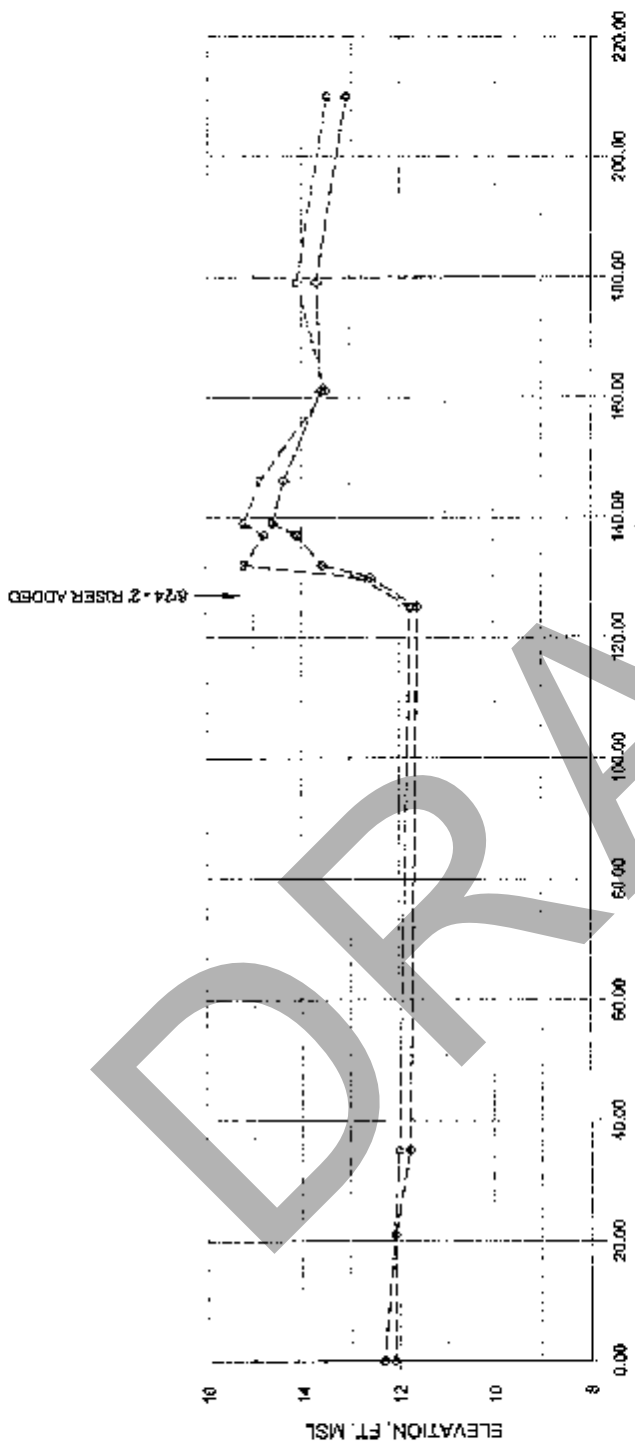
- (1) POND SURFACE SHOWN AT ELEVATION 30 FEET; REPRESENTS CONDITIONS AT (R) 01/04/2008
- (2) PZ-98 AND PZ-98-1 INSTALLED TO 18" BELOW TOP OF CASE AND DRY AT ALL READINGS
- (3) PZ-98 AND PZ-98-1 INSTALLED TO APPROXIMATELY 4 FT FT BELOW GROUND LEVEL AND DRY AT ALL READINGS
- (4) SEE FIGURE 1 FOR SECTION LOCATIONS.

DRAWN:	R. R.	DATE:	APRIL 2010
ENG CHECK:	<i>[Signature]</i>	SCALE:	1" = 15'
APPROVAL:	<i>[Signature]</i>	JOB No.:	6468-00-0340

**SUMMARY OF WATER LEVELS IN PIEZOMETERS
WEST SIDE, 1994 ASH POND DIKE
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA**

MACTEC
WORLD ENGINEERING AND DESIGN, INC.
100 ATLANTIC AVENUE
RALEIGH, NORTH CAROLINA

REFERENCE: 2007 AERIAL TOPOGRAPHIC MAP BY MCKIM AND CRISP



DAYS FROM INSTALLATION (2/18/09)
EAST DIKE (PZ-1A, PZ-2A)



LEGEND:
 - - - - - PZ-1A
 - - - - - PZ-2A

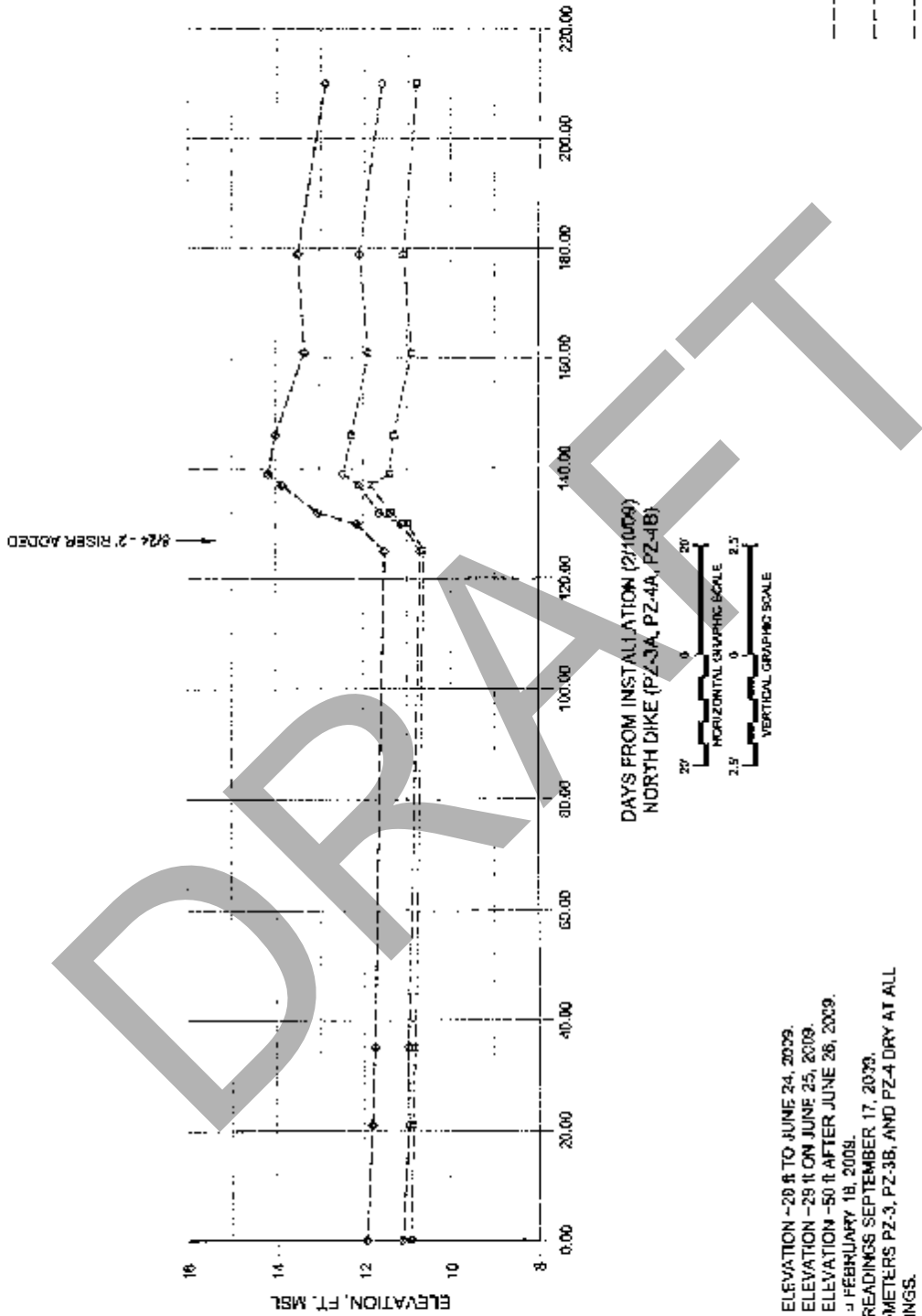
- NOTES:
1. POND ELEVATION ~28 R TO JUNE 24, 2009.
 2. POND ELEVATION ~29 R ON JUNE 25, 2009.
 3. POND ELEVATION ~60 R AFTER JUNE '26, 2009.
 4. DAY 0 = FEBRUARY 18, 2009.
 5. LAST READINGS SEPTEMBER 17, 2009.
 6. PIEZOMETERS PZ-1, PZ-1B, PZ-2 AND PZ-2B DRY AT ALL READINGS.

DRAWN:	R.R.	DATE:	APRIL 2010
ENG CHECK:	<i>RR</i>	SCALE:	AS SHOWN
APPROVAL:	<i>RR</i>	JOB No.:	6488-09-230

PIEZOMETER READINGS - EAST DIKE
 1884 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA



REFERENCE



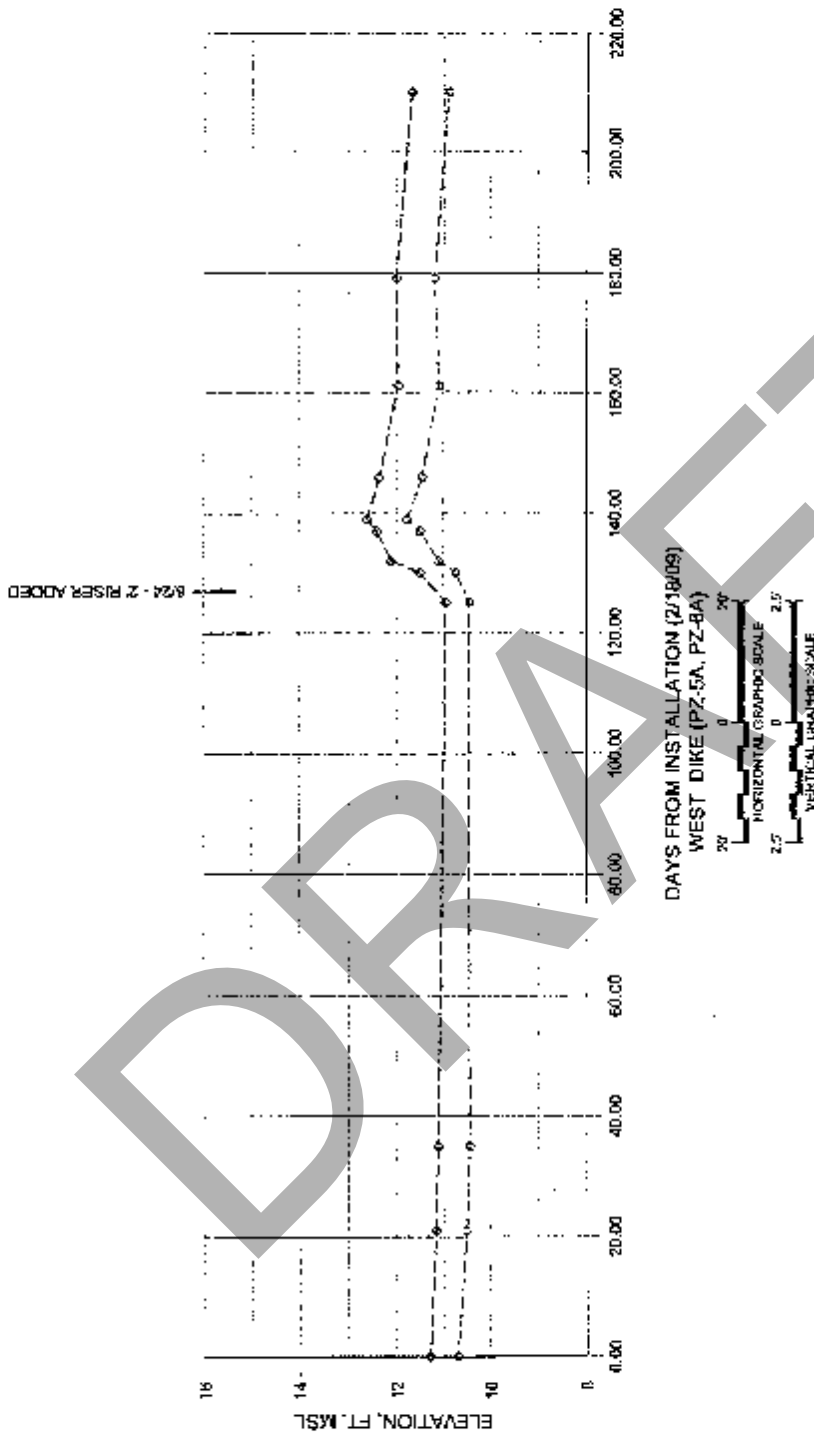
NOTES:

1. POND ELEVATION ~29 ft. TO JUNE 24, 2009.
2. POND ELEVATION ~29 ft. ON JUNE 25, 2009.
3. POND ELEVATION ~50 ft. AFTER JUNE 26, 2009.
4. DAY 0 = FEBRUARY 18, 2009.
5. LAST READINGS SEPTEMBER 17, 2009.
6. PIEZOMETERS PZ-3, PZ-3B, AND PZ-4 DRY AT ALL READINGS.



PIEZOMETER READINGS - NORTH DIKE
 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

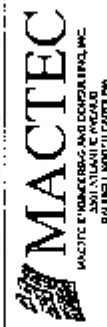
DRAWN: [Signature]	A.P.	DATE: APRIL 2010	FIGURE: 7
ENG CHECK: [Signature]	[Signature]	SCALE: AS SHOWN	
APPROVAL: [Signature]	[Signature]	JOB NO. E469-06-2340	



NOTES:

1. POND ELEVATION ~28 ft TO JUNE 24, 2009.
2. POND ELEVATION ~29 ft ON JUNE 25, 2009.
3. POND ELEVATION ~50 ft AFTER JUNE 26, 2009.
4. DAY 0 - FEBRUARY 18, 2009.
5. LAST READINGS SEPTEMBER 17, 2009.
6. PIEZOMETERS PZ-5A, PZ-5B, PZ-5C AND PZ-5D DRY AT ALL READINGS.

LEGEND:
 ---◇--- PZ-5A
 ---□--- PZ-5B



PIEZOMETER READINGS - WEST DIKE
 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

DRAWN: R.R.	DATE: APRIL 2010	FIGURE: 8
ENG. CHECK: [Signature]	SCALE: AS SHOWN	
APPROVAL: [Signature]	IDB No.: 6468-00-2340	

New Ash Pond Flows

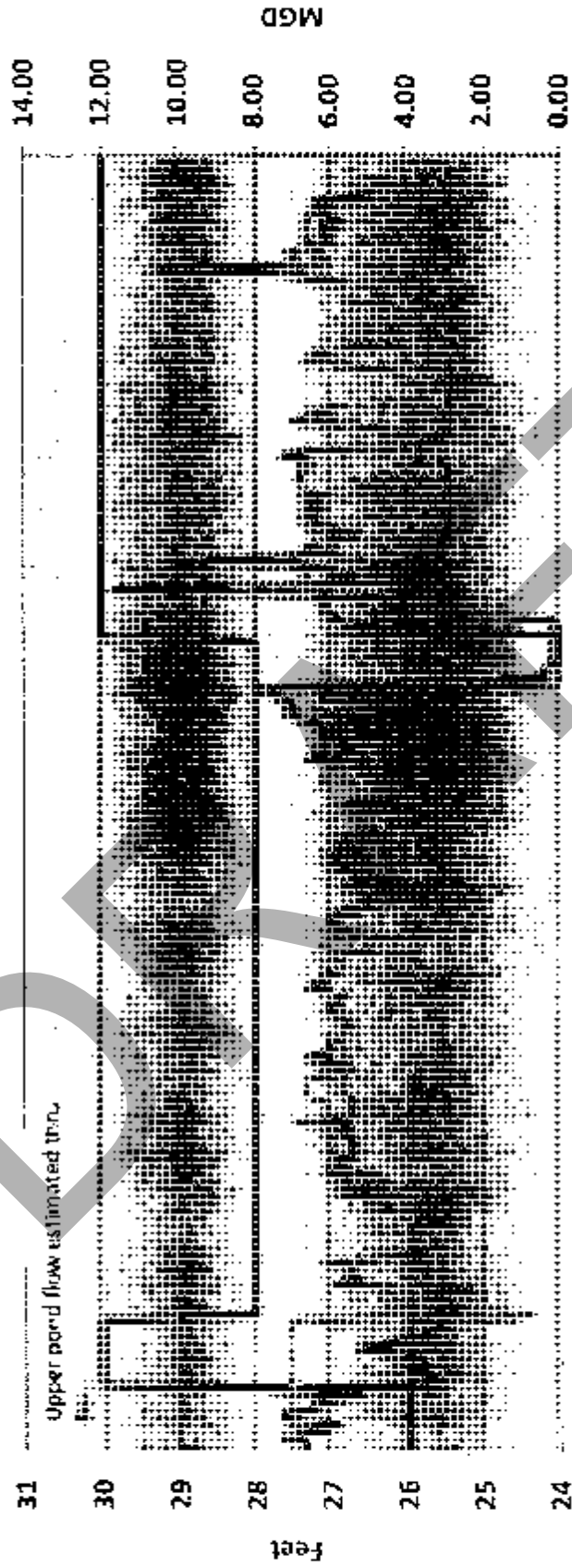


Figure 9. Ash Flow Comparisons

— Weir Height (ft) - - - Clear Pond Flow (MGD) . . . Upper Pond Flow (MGD)

Carolina Power & Light Co.
Raleigh, NC (s/n 5093)

SUTTON ASH POND GEOSLOPE ANALYSIS

100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.583

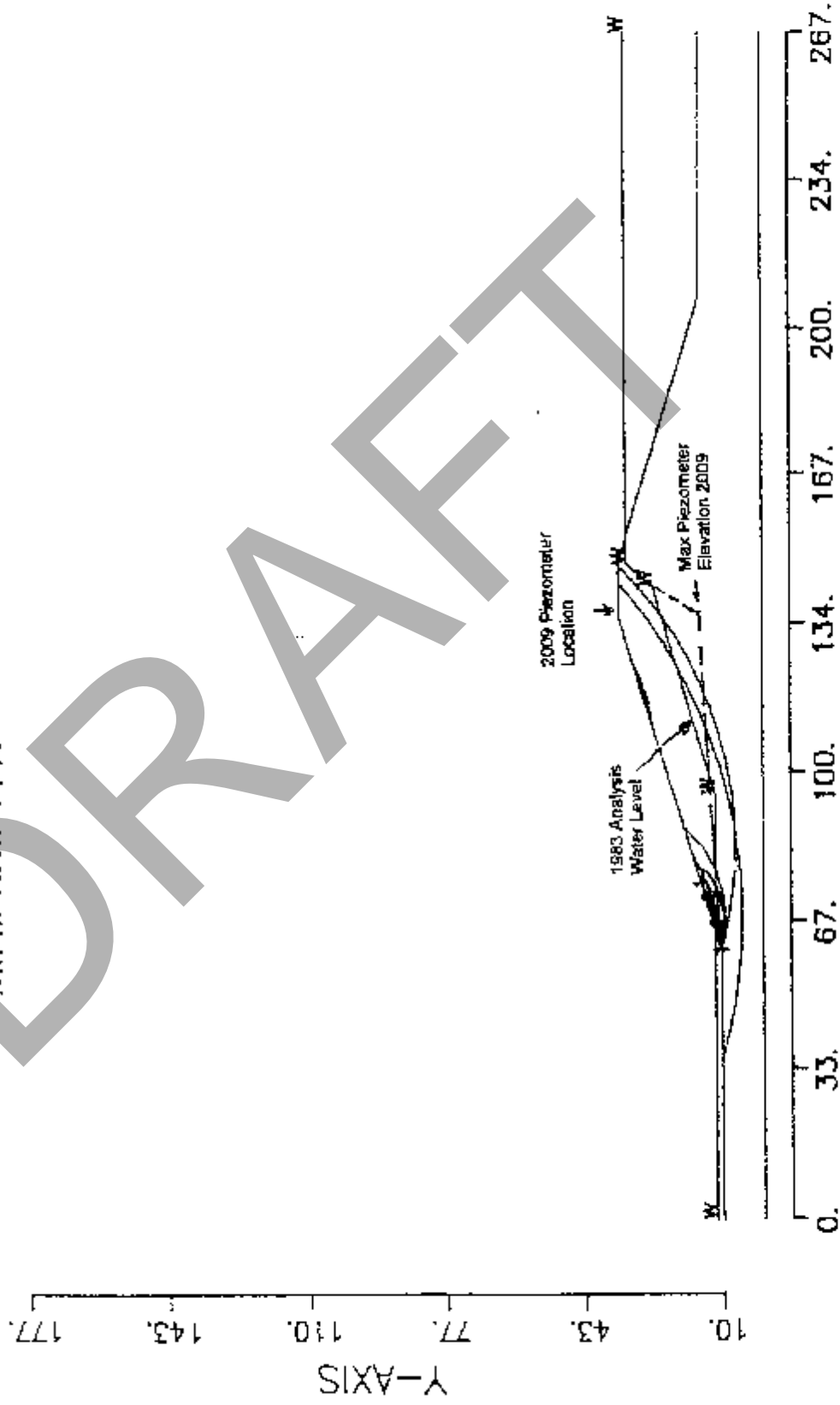


Figure 10. Comparison of Water Levels with Stability Analysis

DRAFT

ATTACHMENT B

**BORING RECORDS
(PZ-1A TO PZ-6A)**

SOIL CLASSIFICATION

NON-SOIL CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	Undisturbed Sample	Auger Cuttings																
GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.	Split Spoon Sample	Bulk Sample																
	GRAVELS WITH FINES (Appreciable amount of fines)	GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.	Rock Core	Crankfall Sampler																
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	CLEAN SANDS (Little or no fines)	GM	Silty gravels, gravel - sand - silt mixtures.	Dilatometer	Pressure Meter																
	SANDS WITH FINES (Appreciable amount of fines)	GC	Clayey gravels, gravel - sand - clay mixtures.	Packer	No Recovery																
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.	Water Table at time of drilling	Water Table after 24 hours																
	SANDS WITH FINES (Appreciable amount of fines)	SP	Poorly graded sands or gravelly sands, little or no fines.	Grab Bag Sample	Caved-in Depth																
SILTS AND CLAYS (Liquid limit LESS than 50)	SANDS	SM	Silty sands, sand - silt mixtures																		
	CLAYS	SC	Clayey sands, sand - clay mixtures.																		
SILTS AND CLAYS (Liquid limit GREATER than 50)	SILTS	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.																		
	CLAYS	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																		
HIGHLY ORGANIC SOILS	SANDS	OL	Organic silts and organic silty clays of low plasticity.																		
	CLAYS	MH, CH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, elastic silts. Inorganic clays of high plasticity, fat clays																		
		OH	Organic clays of medium to high plasticity, organic silts.																		
		PT	Peat and other tightly organic soils.																		
<p>BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.</p>																					
SILT OR CLAY		<table border="1"> <thead> <tr> <th colspan="2">SAND</th> <th colspan="2">GRAVEL</th> </tr> <tr> <th>Fine</th> <th>Coarse</th> <th>Fine</th> <th>Coarse</th> </tr> </thead> <tbody> <tr> <td>No. 40</td> <td>No. 10</td> <td>No. 40</td> <td>No. 10</td> </tr> <tr> <td>3/4"</td> <td>3/4"</td> <td>3/4"</td> <td>3/4"</td> </tr> </tbody> </table>		SAND		GRAVEL		Fine	Coarse	Fine	Coarse	No. 40	No. 10	No. 40	No. 10	3/4"	3/4"	3/4"	3/4"	<p>KEY TO SYMBOLS AND DESCRIPTIONS</p>	
SAND		GRAVEL																			
Fine	Coarse	Fine	Coarse																		
No. 40	No. 10	No. 40	No. 10																		
3/4"	3/4"	3/4"	3/4"																		
<p>Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. I, March, 1953 (Revised April, 1960)</p>																					

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very Stiff
		> 30	Hard

Sample Moisture Description

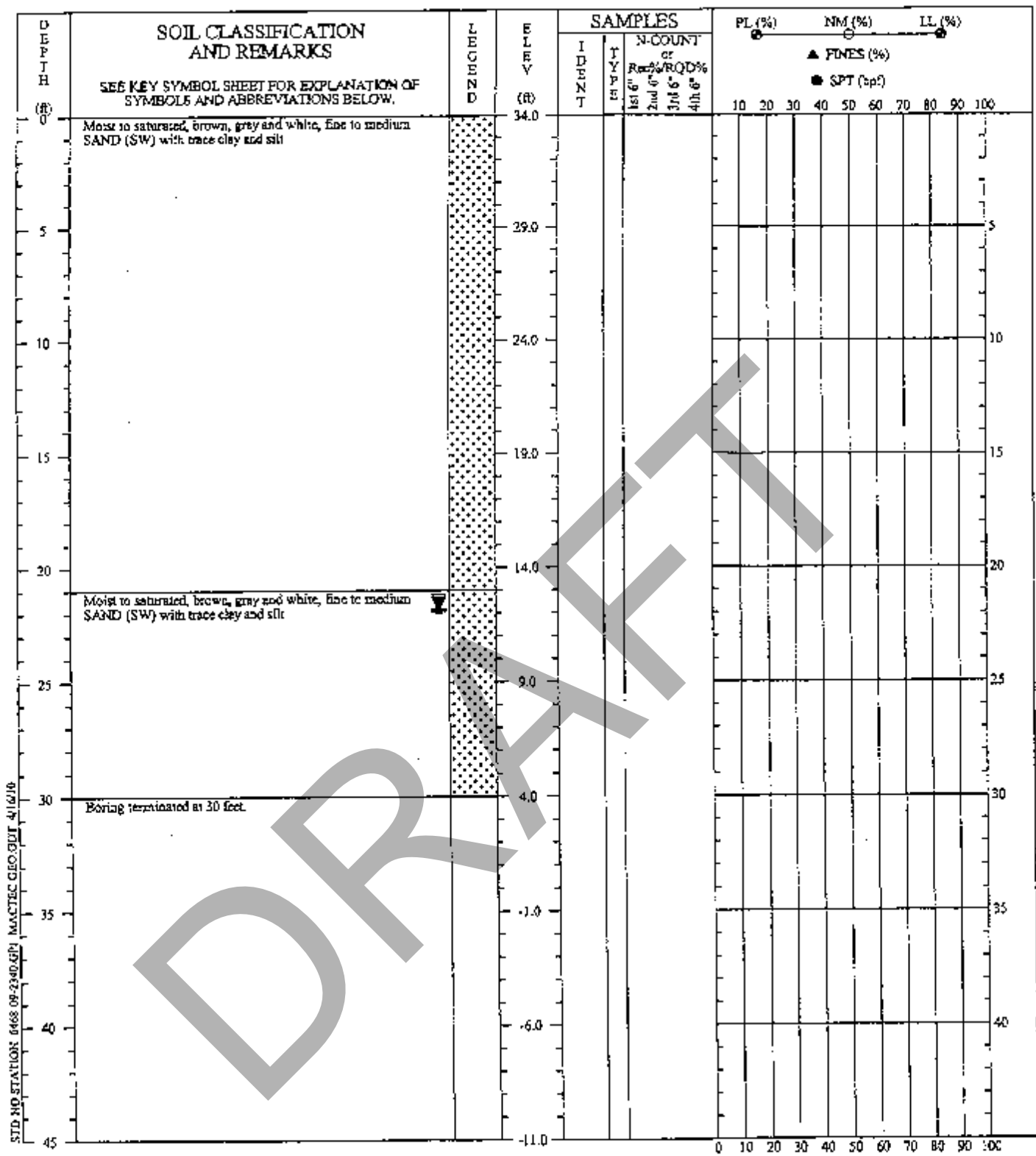
Saturated: Usually liquid, very wet, usually from below the ground water table

Wet: Semisolid; required drying to obtain optimum moisture

Moist: Solid; at or near optimum moisture

Dry: Requires additional water to attain optimum moisture





DRILLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT-Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

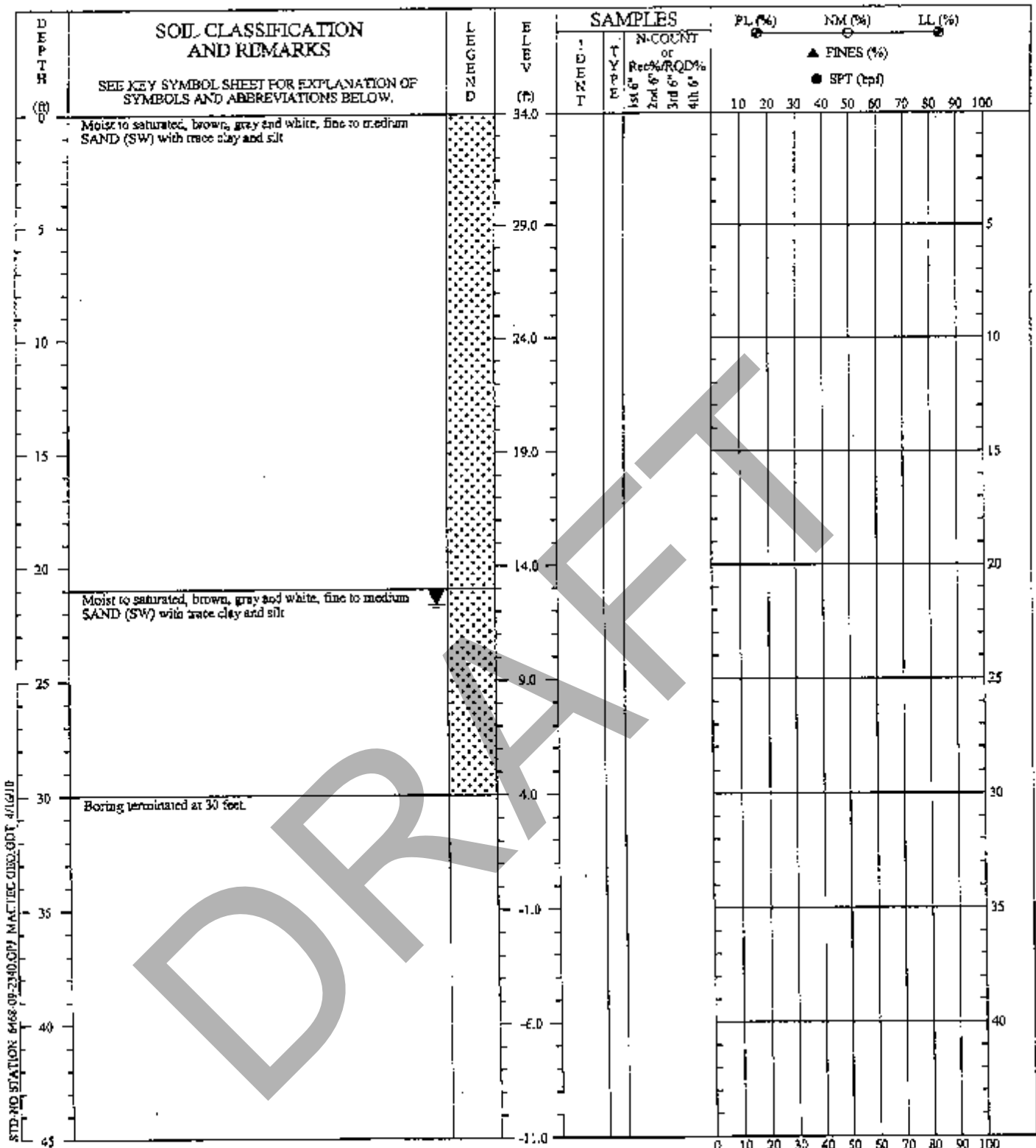
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
Location: Wilmington, NC
Drilled: February 11, 2009
Project #: 6468-09-2340

Boring No.: PZ-1A
 Page 1 of 1





DRILLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT-Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

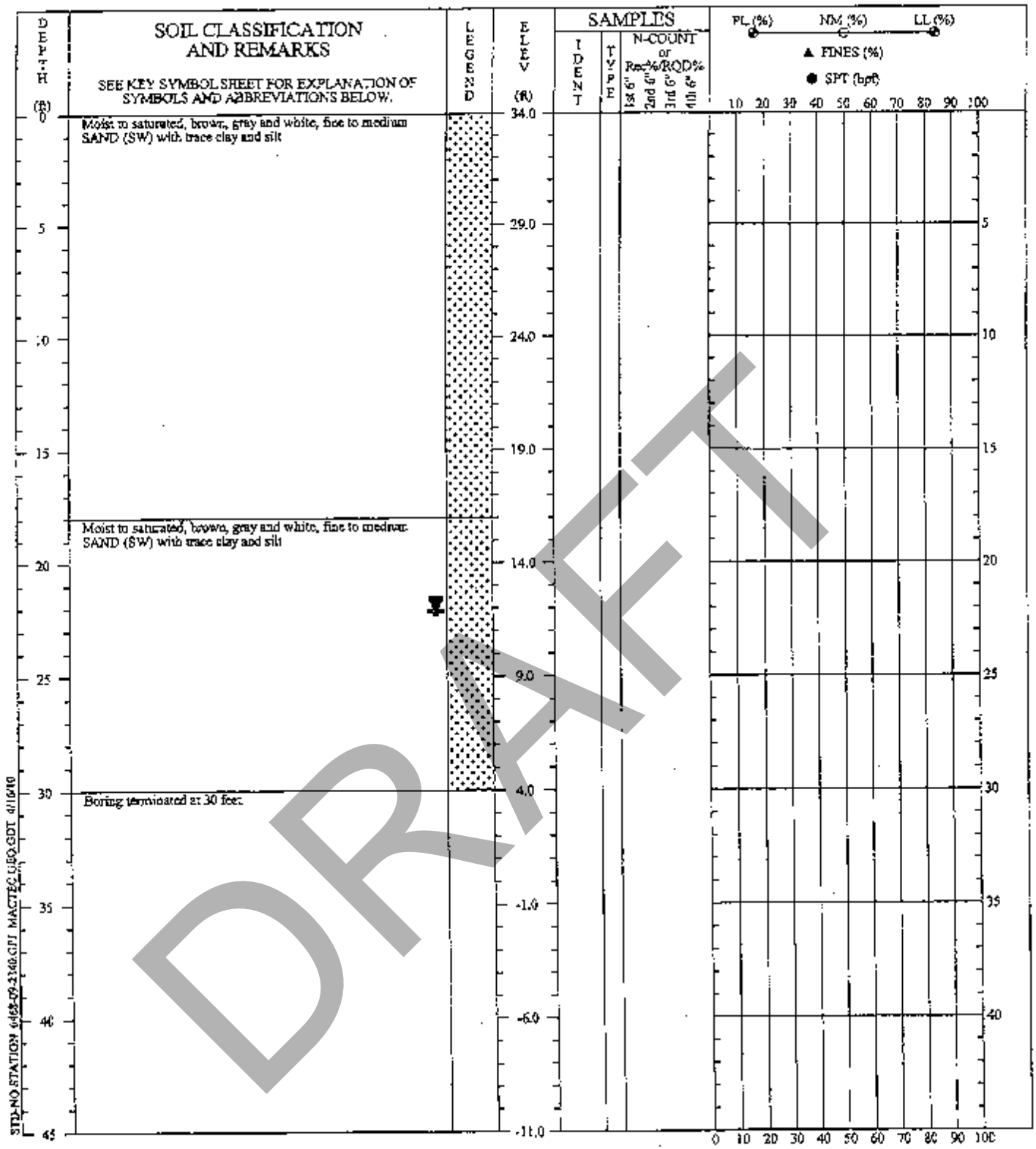
SOIL TEST BOREING RECORD

Project: Progress Energy-Sutton Dike
Location: Wilmington, NC
Drilled: February 11, 2009
Project #: 6468-09-2340

Boring No.: PZ-2A

Page 1 of 1

MACTEC



DRILLER: Caroline Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT-Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *AS2*

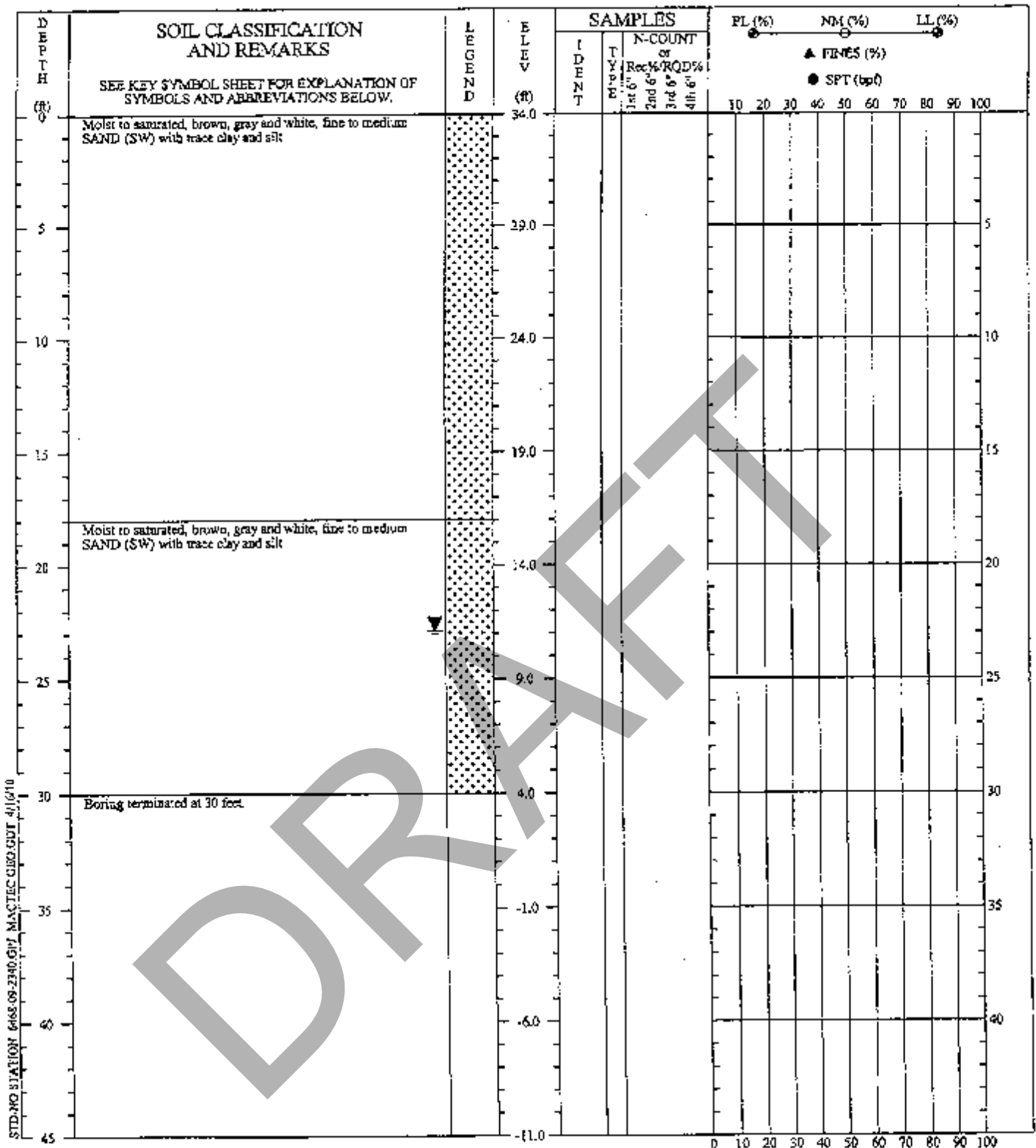
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
Location: Wilmington, NC
Drilled: February 11, 2009
Project #: 6468-09-2340

Boring No.: PZ-3A
Page 1 of 1

MACTEC



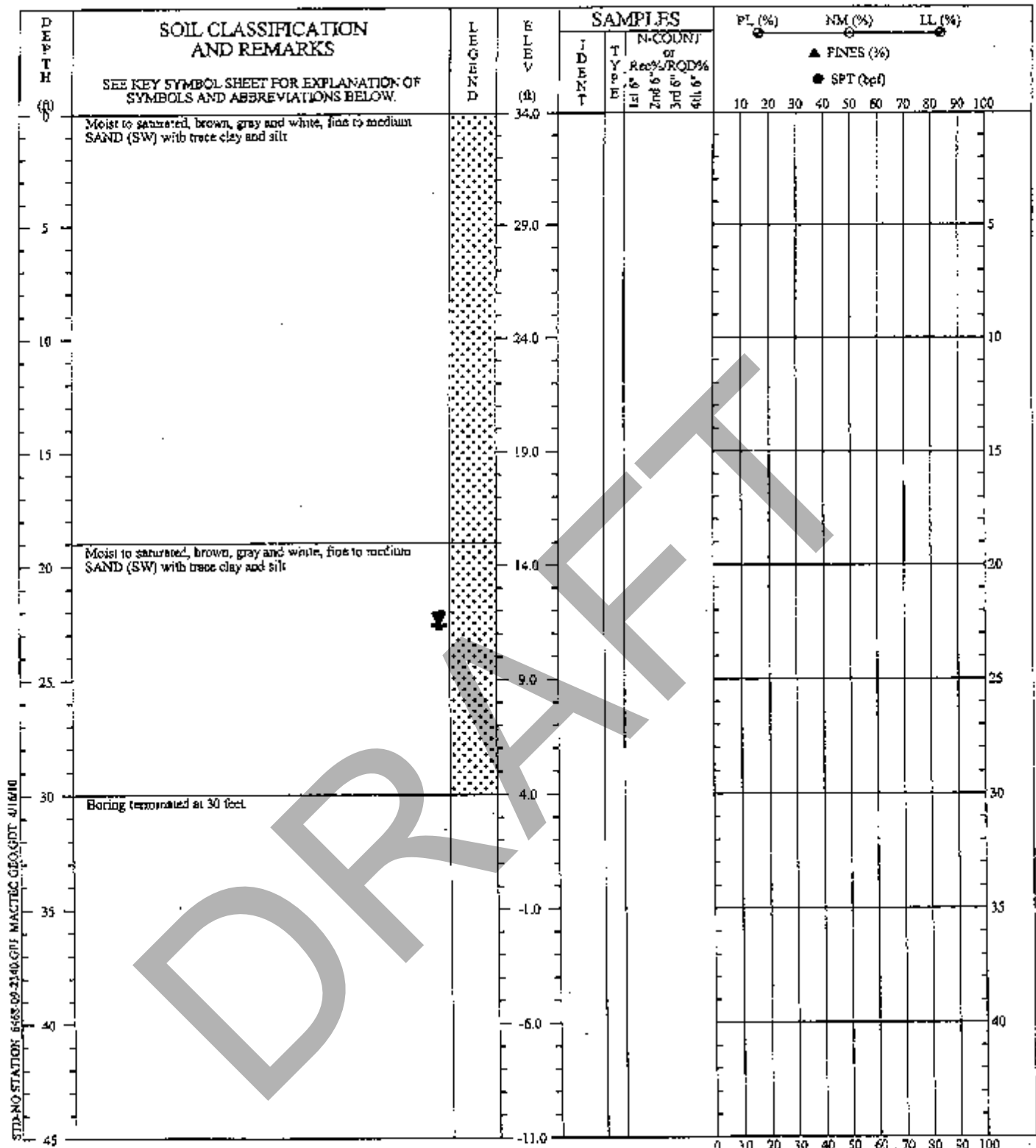
DRILLER: Carolina Drilling Co.
 EQUIPMENT: Geoprobe Rig
 METHOD: CPT-Direct Push
 HOLE DIA.: 2 inch
 REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0'-5', 5'-10', 10'-15' etc. to 30 feet)

REVIEWED BY: *ASD*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project: Progress Energy-Surton Dike	Boring No.: PZ-4A
Location: Wilmington, NC	
Drilled: February 11, 2009	
Project #: 6468-09-2340	Page 1 of 1

MACTEC



DRILLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT - Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil. (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

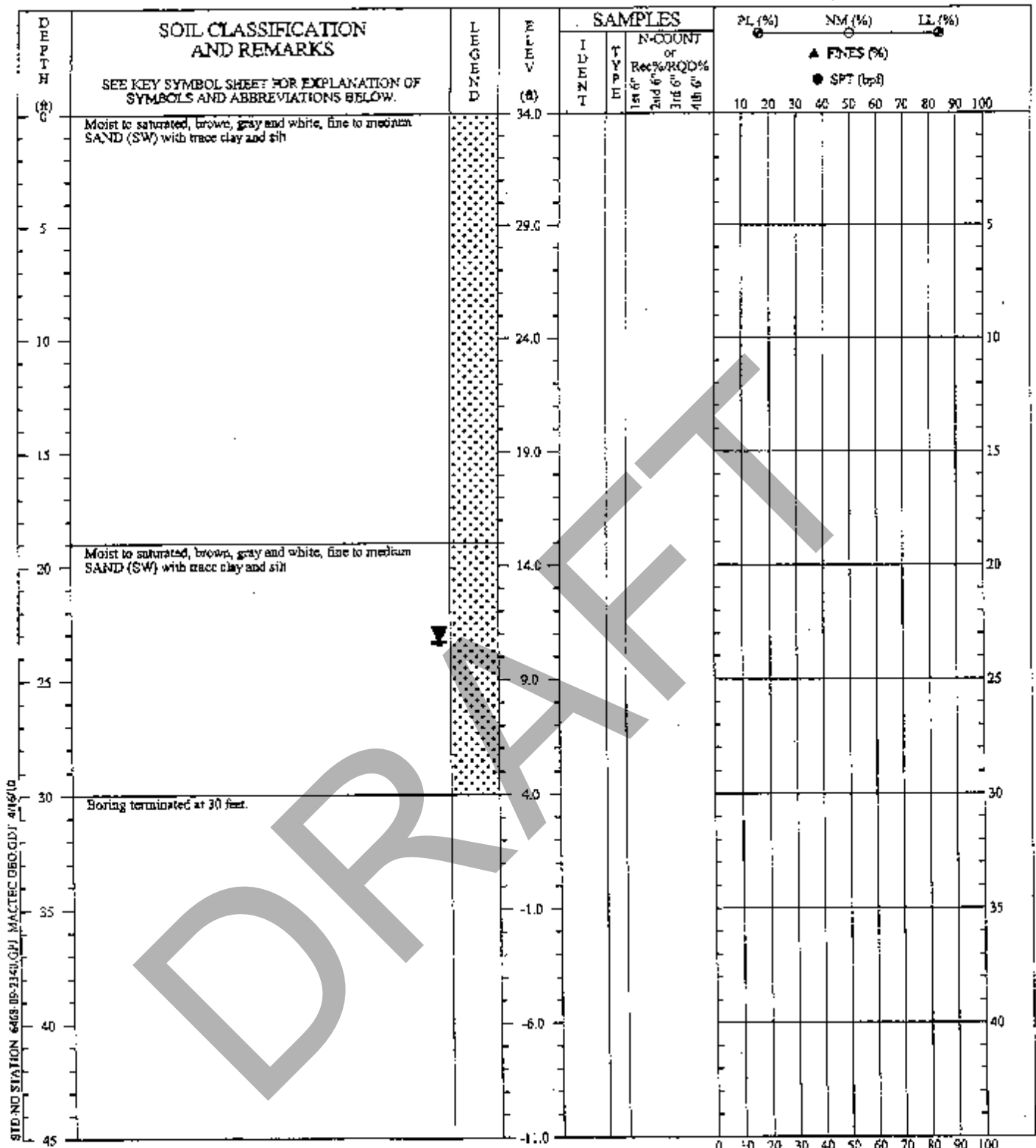
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
Location: Wilmington, NC
Drilled: February 12, 2009
Project #: 6468-09-2340

Boring No.: PZ-5A
 Page 1 of 1





STD. NO. STATION 6468-09-2340, CPT, MACTEC DRILLING 4/16/10

DRILLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT -Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
Location: Wilmington, NC
Drilled: February 12, 2009
Project #: 6468-09-2340

Boring No.: PZ-6A
 Page 1 of 1



DRAFT

ATTACHMENT C

**HAND AUGER BORING/ PIEZOMETER LOGS
(PZ-1B TO PZ-6B)**

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 1B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 0.2		Dry Light brown/gray silty fine SAND with root fibers
0.2 to 4.5		Moist to wet, light brown and gray fine to medium sand, trace (-) silt (SW)
		Bottom of auger boring at 4.5 feet
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 2B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan slightly silty fine SAND (SW), trace (-) clay
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

Prepared by: James A. Schell Reviewed by: JAS



Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 3B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW), trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 4B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan slightly fine to medium SAND (SW), trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Groundwater noted at 3.6 feet below top of casing on February 18, 2009.
Hand Auger Boring /Well Log		

Prepared by: James A. Schaff Reviewed by: JAS



Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ-5B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW) with trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ-6B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW), with trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009

Prepared by: James A. Schiff Reviewed by: JAS



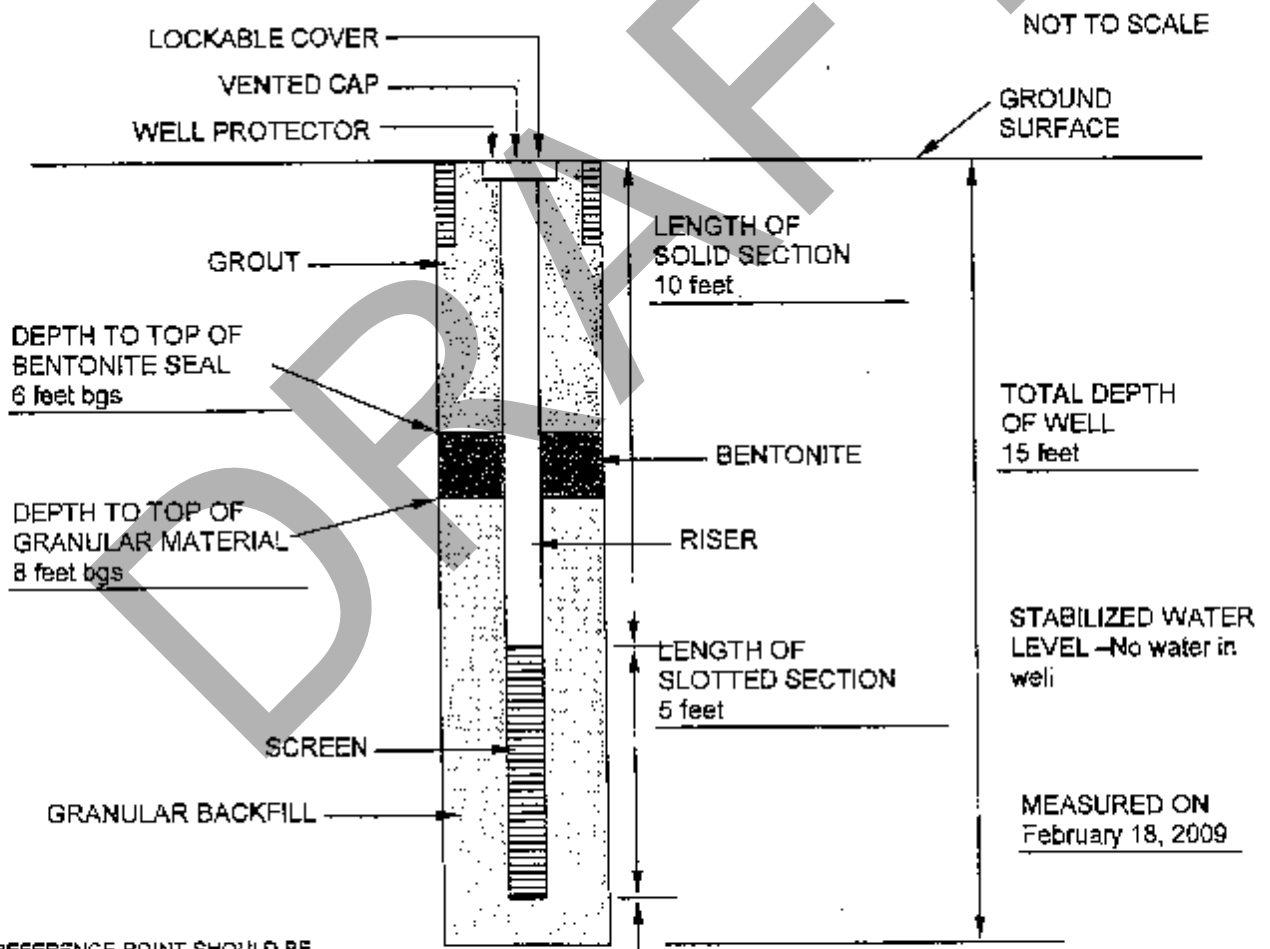
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ATTACHMENT D

**PIEZOMETER INSTALLATION RECORDS
PZ-1 TO PZ-6 and PZ-1A TO PZ-6A**

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-1</u>	INSTALLATION DATE <u>February 11, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BORSHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

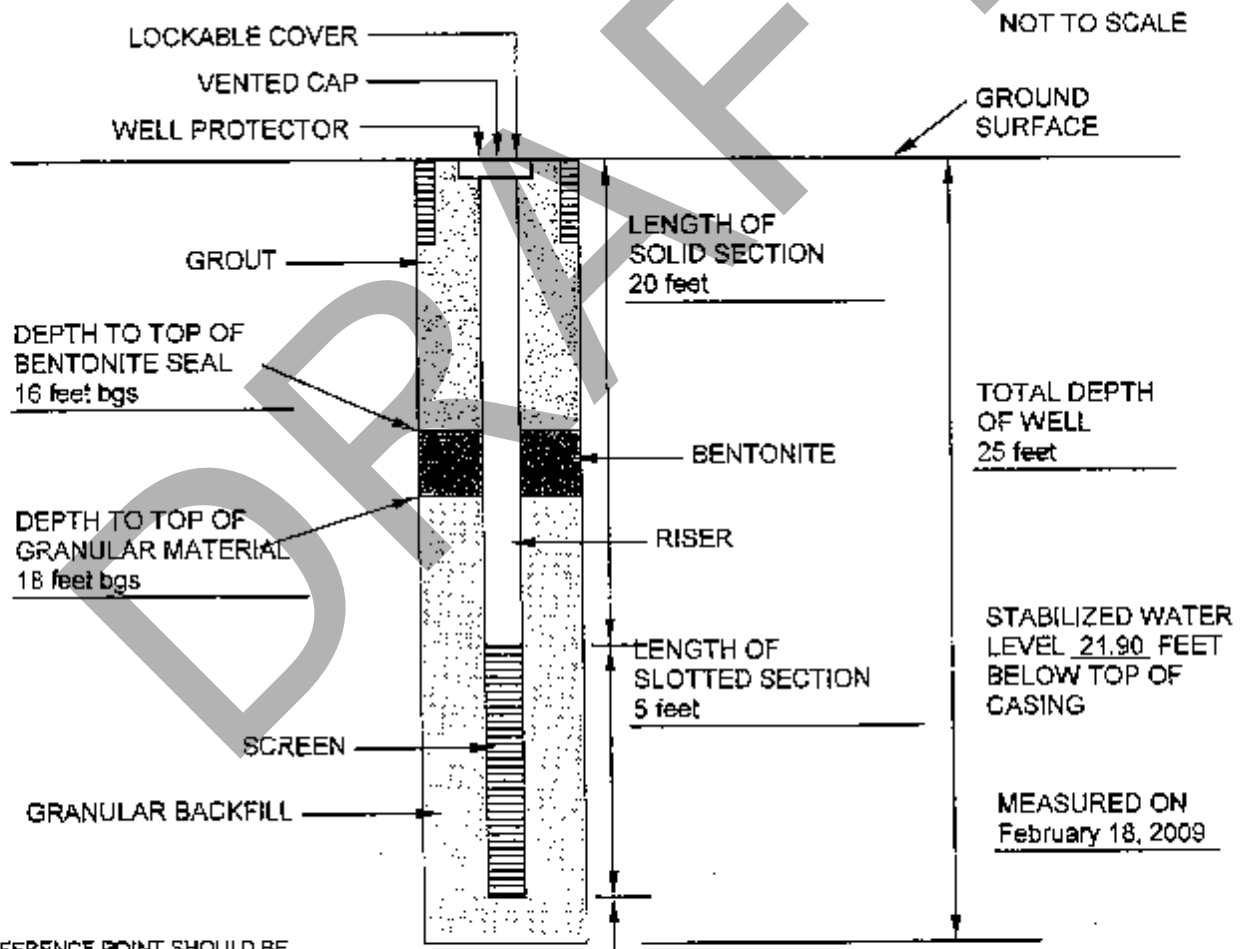
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-1A</u>	INSTALLATION DATE <u>February 11, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



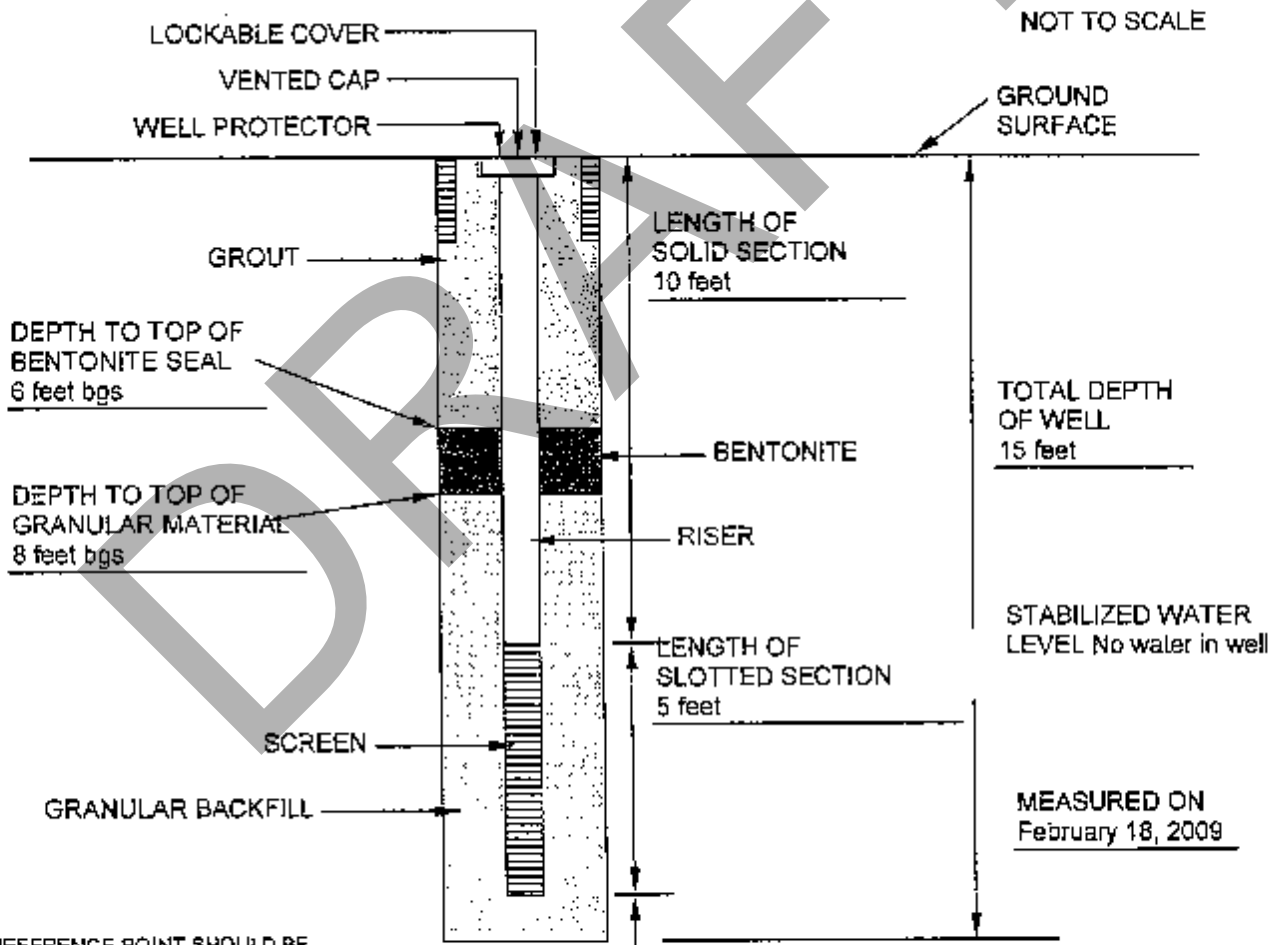
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-2</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

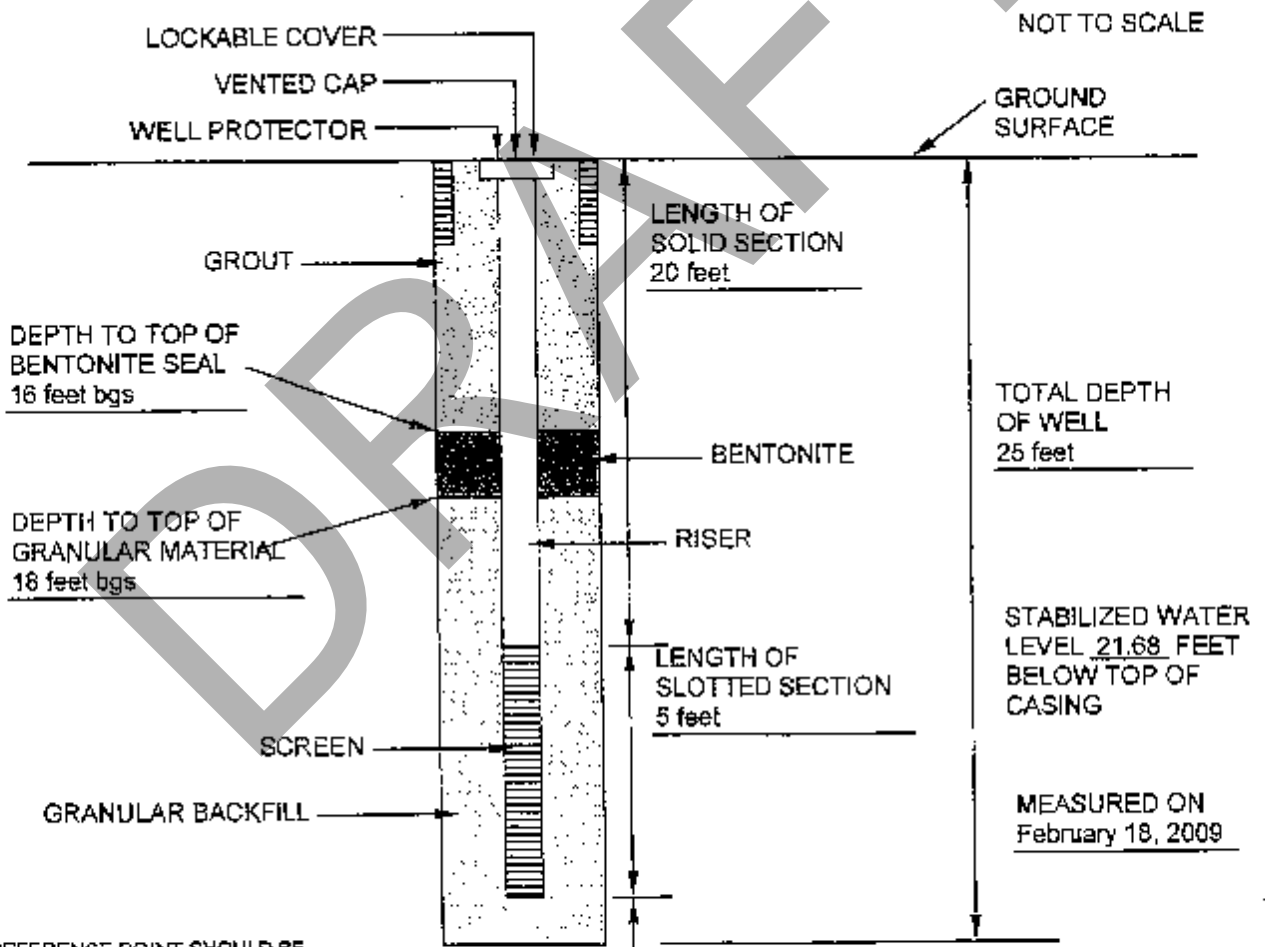
Progress Energy – Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ- 2A</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

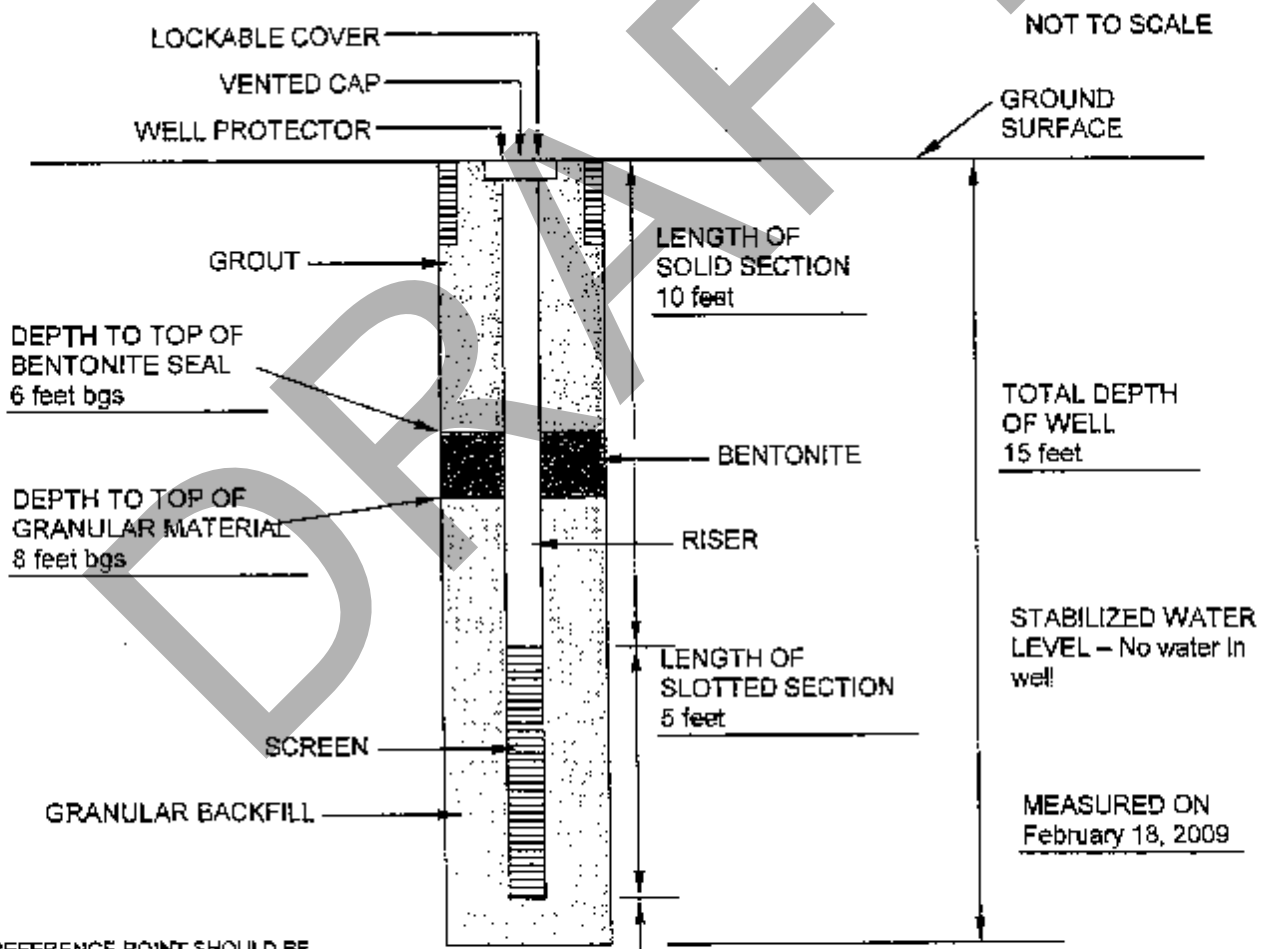
Progress Energy – Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ- 3</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	SIZE/MODEL _____
KEY CODE/COMBINATION <u>0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

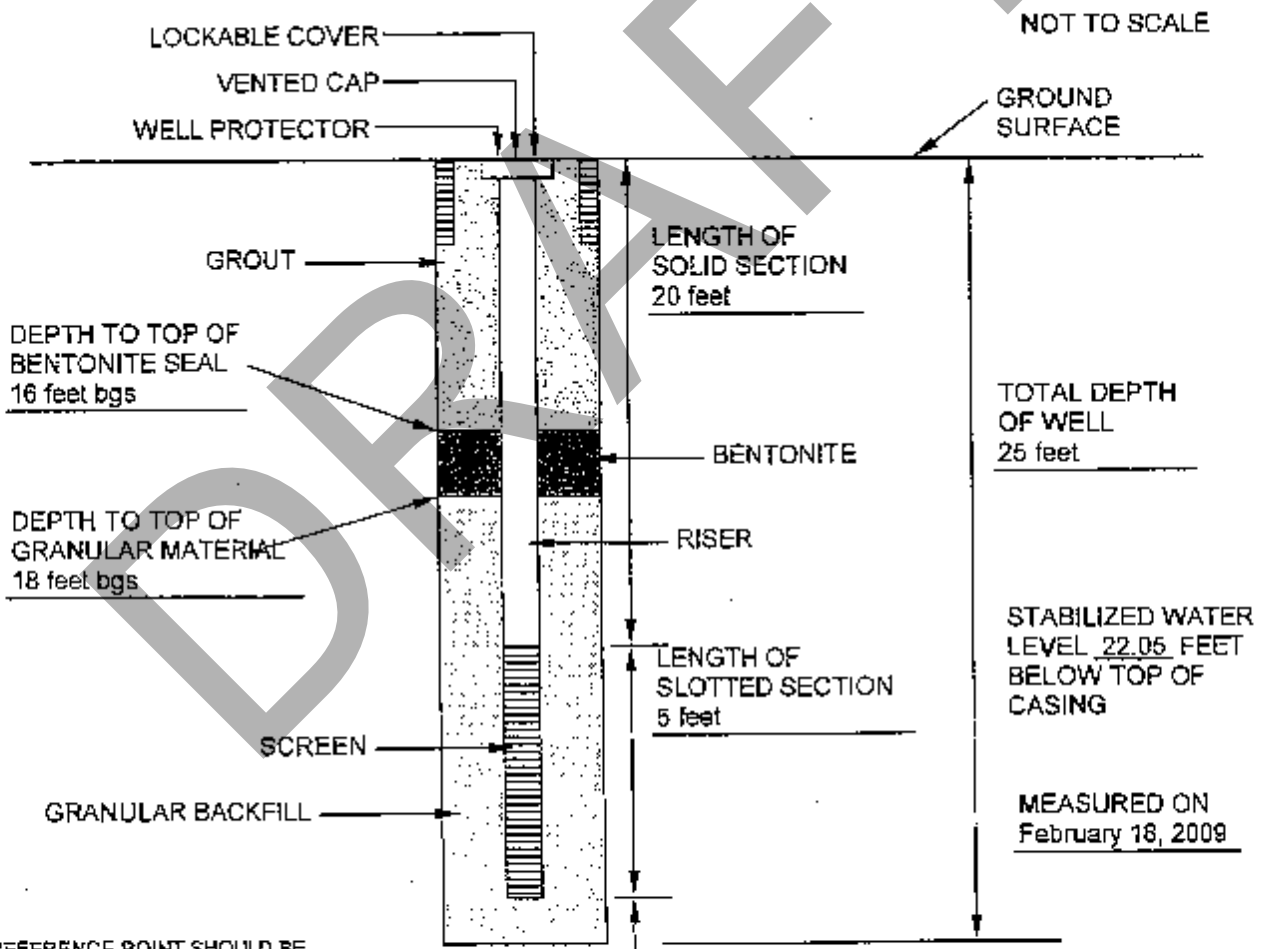
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-3A</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

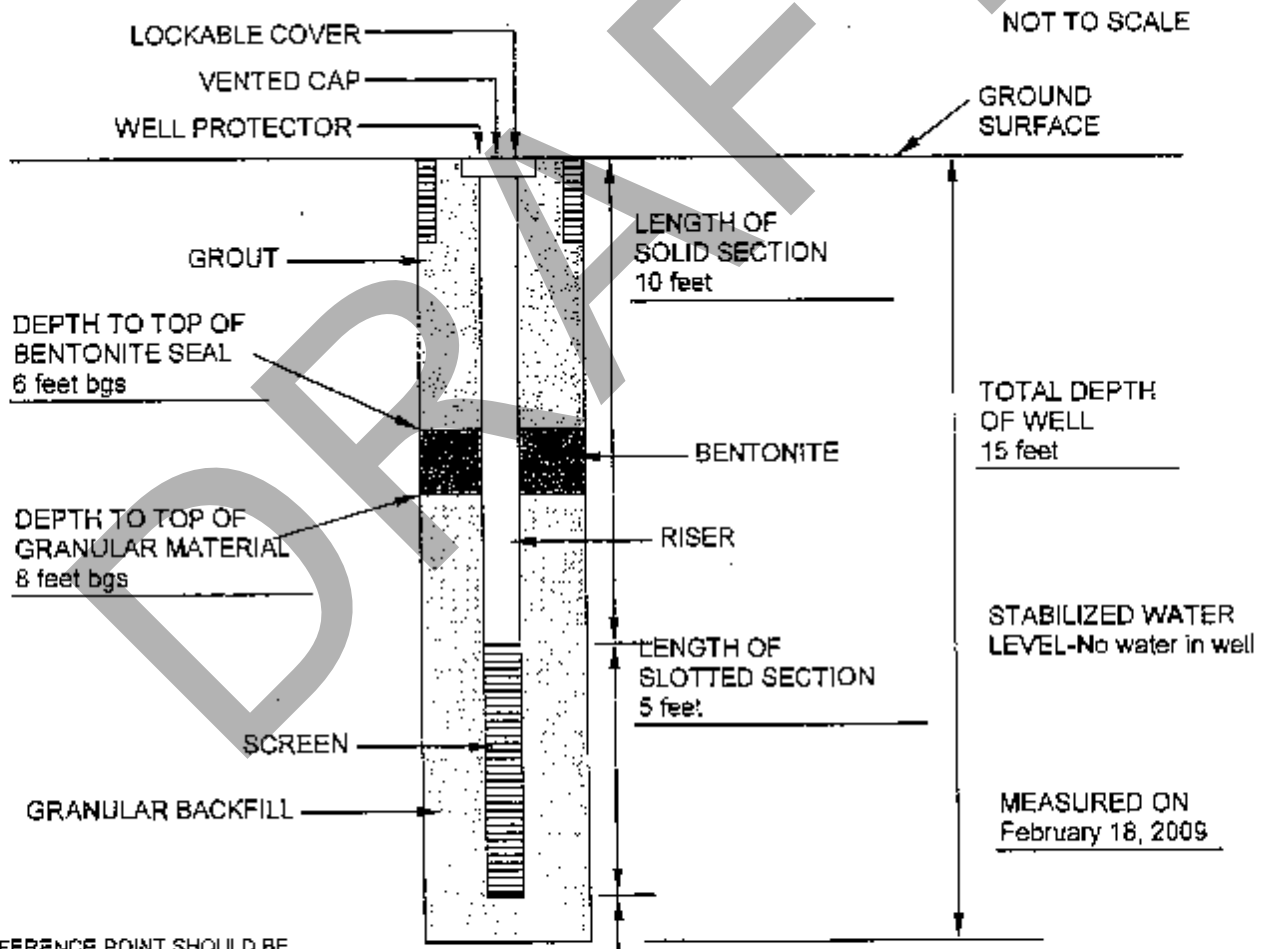
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-4</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



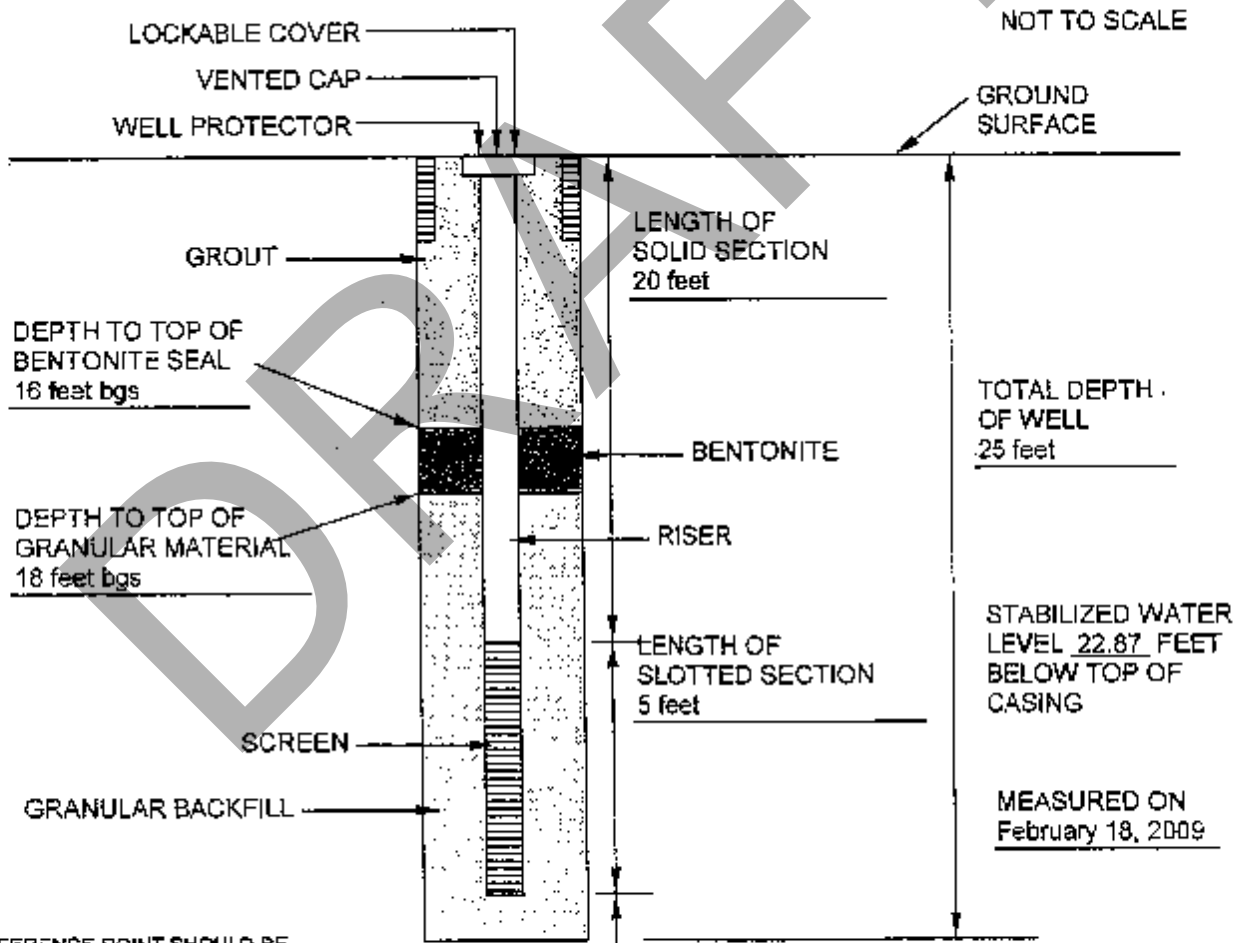
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Surton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-4A</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

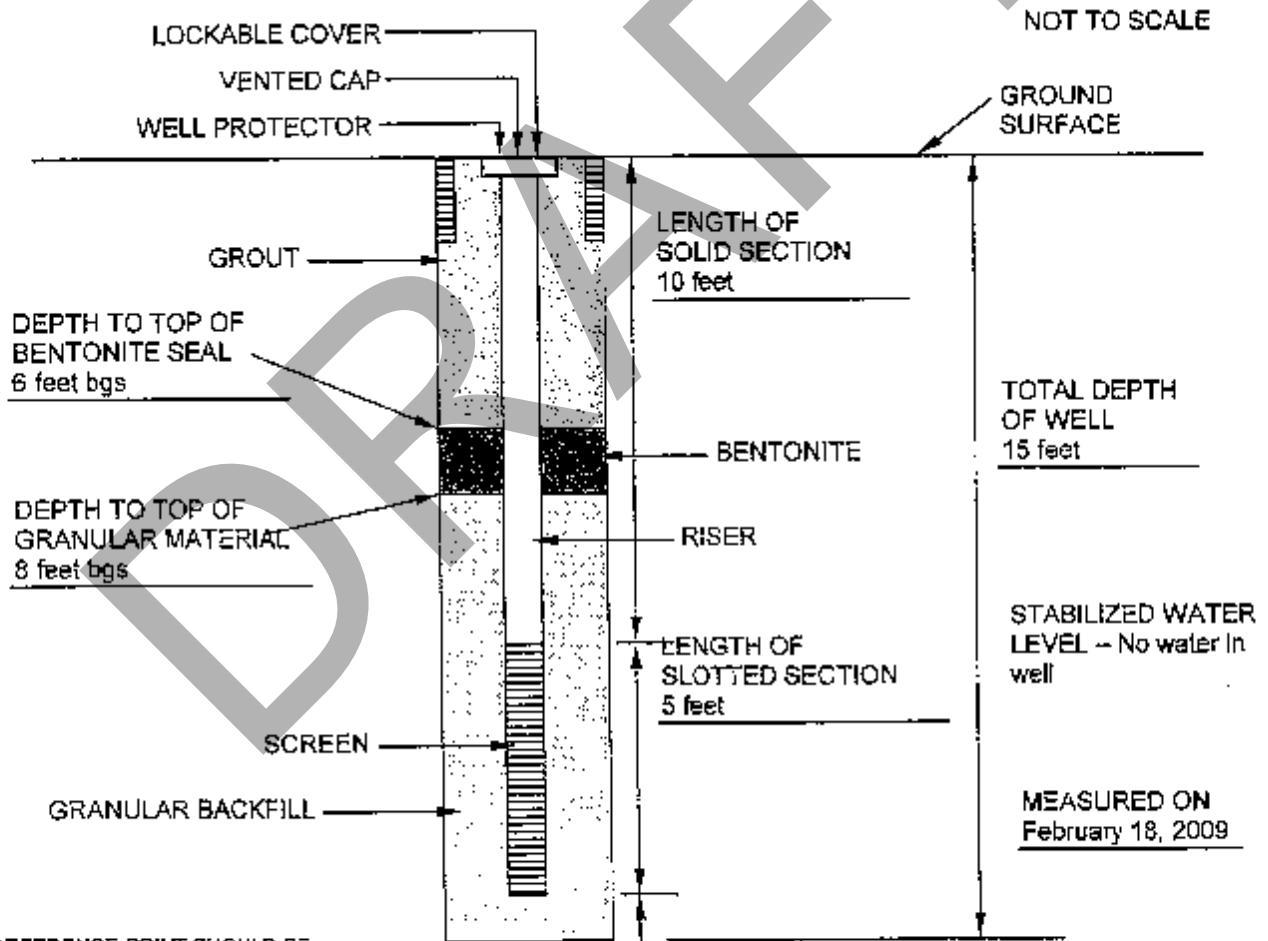
Progress Energy – Surton Plant
 Wilmington, North Carolina
 Project No. 6468-09-2340



TYPE II MONITORING WELL
 INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-5</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



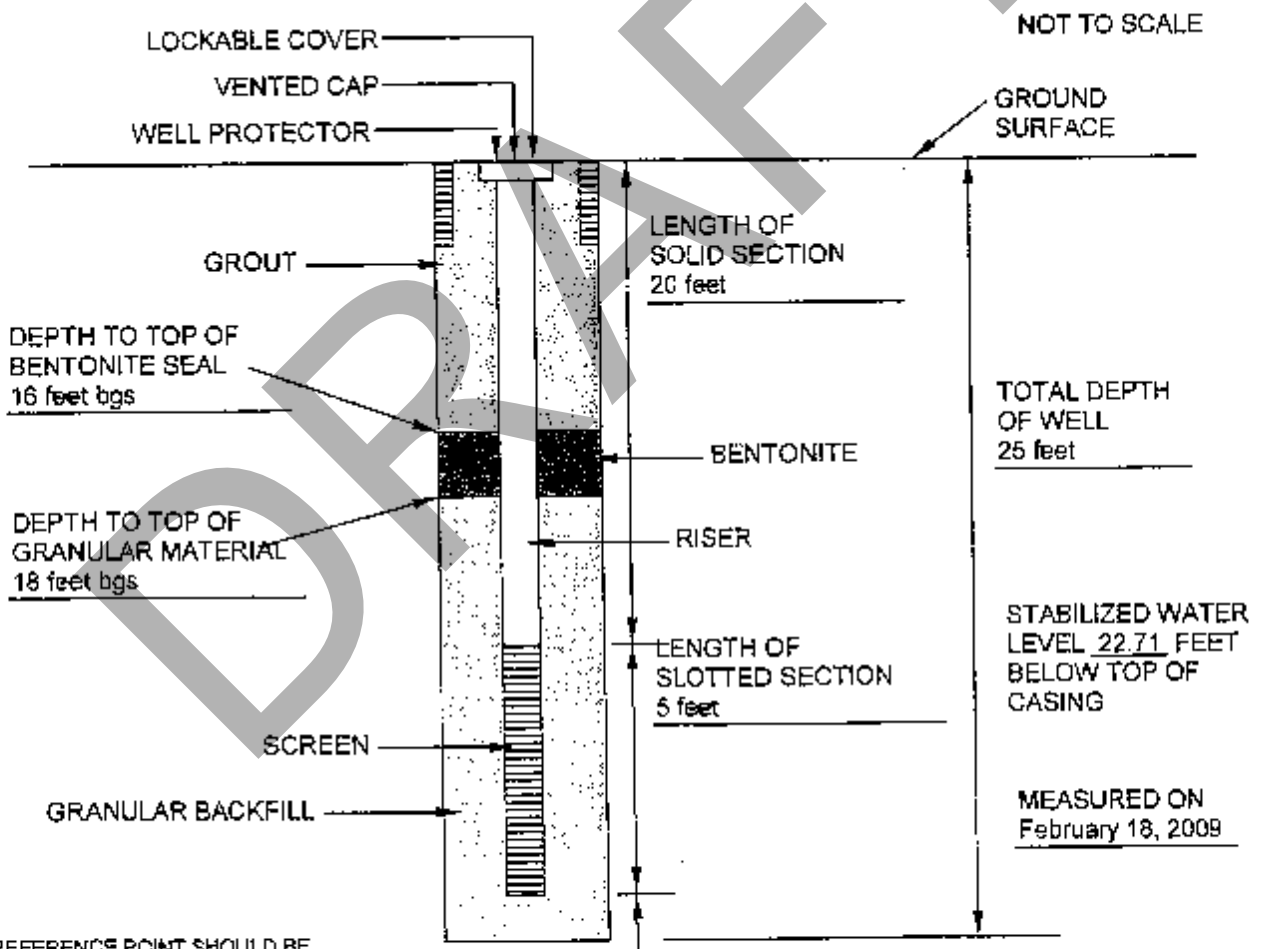
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340

MACTEC

TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-5A</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

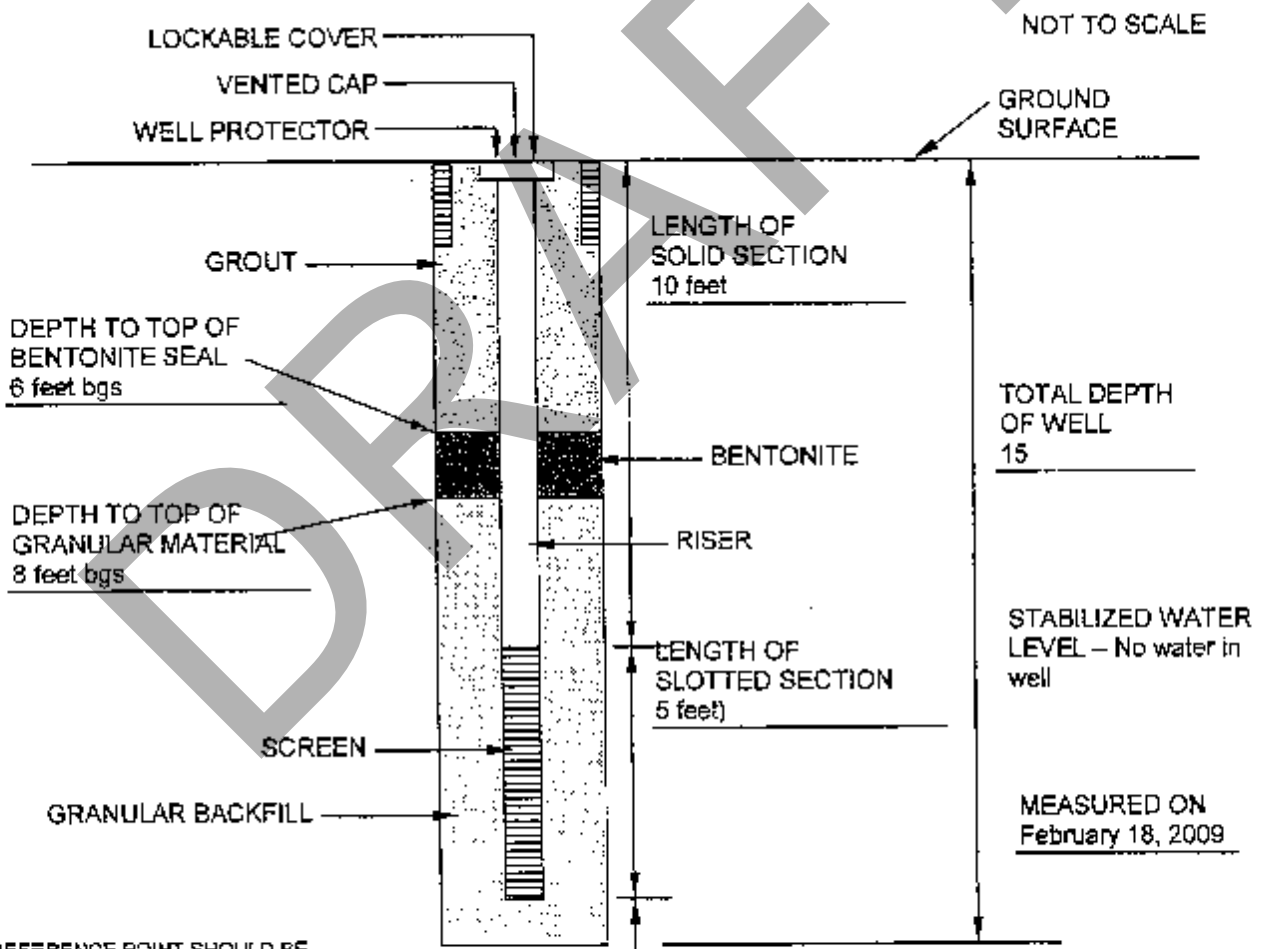
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-5</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION: <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 14 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

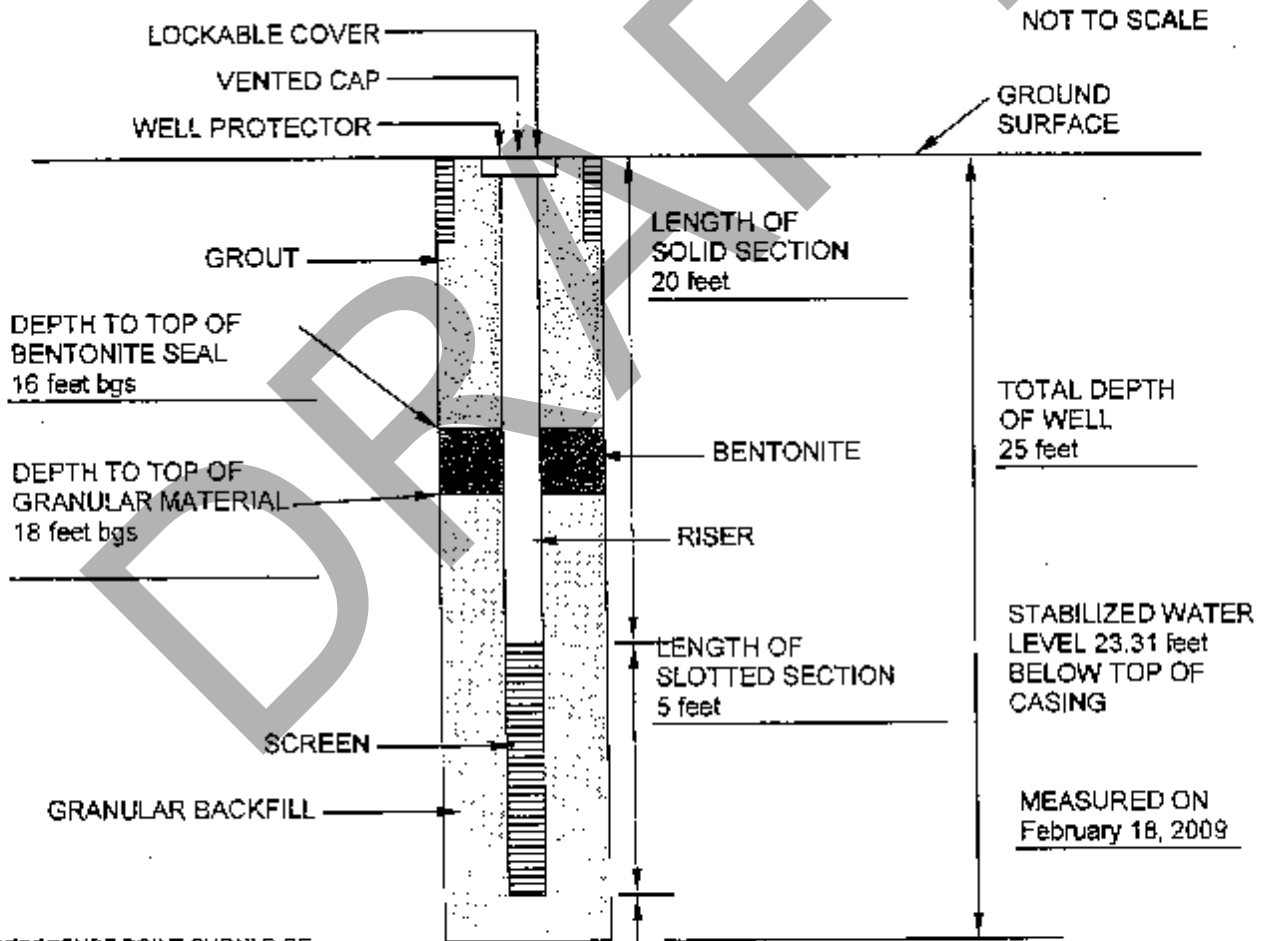
Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340



TYPE II MONITORING WELL
INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME <u>Progress Energy- Sutton Plant</u>	JOB NUMBER <u>6468-09-2340</u>
WELL NUMBER <u>PZ-6A</u>	INSTALLATION DATE <u>February 12, 2009</u>
LOCATION <u>Wilmington, North Carolina</u>	
GROUND SURFACE ELEVATION <u>Approx. 34 feet</u>	REFERENCE POINT ELEVATION * <u>Top of PVC</u>
GRANULAR BACKFILL MATERIAL <u>Sand</u>	SLOT SIZE <u>0.01</u>
SCREEN MATERIAL <u>Schedule 40 PVC</u>	SCREEN DIAMETER <u>2 inch</u>
RISER MATERIAL <u>Schedule 40 PVC</u>	RISER DIAMETER <u>2 inch</u>
DRILLING TECHNIQUE <u>Hollow Stem Auger</u>	DRILLING CONTRACTOR <u>Carolina Drilling</u>
BOREHOLE DIAMETER <u>7 inch</u>	MACTEC ENGINEERING FIELD REPRESENTATIVE <u>Peter Worth</u>
LOCK BRAND <u>Master Lock</u>	
KEY CODE/COMBINATION <u>No. 0536</u>	



* REFERENCE POINT SHOULD BE TOP OF INNER CASING IF POSSIBLE

Progress Energy - Sutton Plant
Wilmington, North Carolina
Project No. 6468-09-2340

MACTEC

TYPE II MONITORING WELL
INSTALLATION RECORD

DRAFT

APPENDIX E

**CAROLINA DRILLING CONSTRUCTION RECORDS
(SENT TO THE STATE OF NC)**



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality
WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
Gerald Eister
 Well Contractor (Individual) Name
Bridger Drilling Enterprises, inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 114 Chimney Lane
Wilmington NC 28457
 City or Town State Zip Code
(910) 799-0394
 Area code- Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) PZ-1
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AM PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY New Hanover
Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 17 931 May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE 77 59 323
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY: is the name of the business where the well is located.
 FACILITY ID #(if applicable)
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
Wilmington NC 28401
 City or Town State Zip Code
(910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0116.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 10 Ft. 2" sch40 pvc
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0.10 in. pvc
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From 8 To 15 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
 0 15 tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
Gerald Eister 2/10/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:

Gerald Elster

Well Contractor (Individual) Name

Bridger Drilling Enterprises, Inc. dba Carolina Drilling

Well Contractor Company Name

STREET ADDRESS 114 Chimney Lane

Wilmington NC 28457
City or Town State Zip Code

(910) 799-0394
Area code - Phone number

2. WELL INFORMATION:

SITE WELL ID #(if applicable) PZ-1A

WELL CONSTRUCTION PERMIT #(if applicable)

OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
Industrial/Commercial Agricultural Recovery Injection
irrigation Other (list use)

DATE DRILLED 2/12/09

TIME COMPLETED 3:00 AM/ PM

4. WELL LOCATION:

CITY: Wilmington COUNTY: New Hanover
Hwy 421 N

(Brief Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)

TOPOGRAPHIC / LAND SETTING:

Slope Valley Flat Ridge Other
(check appropriate box)

LATITUDE 34 17 931

May be in degrees, minutes, seconds or in a decimal format

LONGITUDE 77 58 322

Latitude/longitude source: GPS Topographic map
(location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY: Is the name of the business where the well is located.

FACILITY ID #(if applicable)

NAME OF FACILITY Progress Energy Sutton Plant

STREET ADDRESS 801 Sutton Stream Plant Rd

Wilmington NC 28401
City or Town State Zip Code

CONTACT PERSON Bruce Moorefield

MAILING ADDRESS 801 Sutton Stream Plant Rd

Wilmington NC 28401
City or Town State Zip Code

(910) 343-3208

Area code - Phone number

6. WELL DETAILS:

a. TOTAL DEPTH: 25'

b. DOES WELL REPLACE EXISTING WELL? YES NO

c. WATER LEVEL Below Top of Casing: 21.8 FT.
(Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*

*Top of casing terminated at or below land surface may require a variance in accordance with 15A NCAC 2C .0116.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTON: Type _____ Amount _____

g. WATER ZONES (depth):

From _____ To _____ From _____ To _____
From _____ To _____ From _____ To _____
From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material

From 0 To 20 Ft. 2" sch40 pvc
From _____ To _____ Ft. _____
From _____ To _____ Ft. _____

8. GROUT: Depth Material Method

From 0 To 16 Ft. neat lime
From _____ To _____ Ft. _____
From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material

From 20 To 25 Ft. 2 in. 0.10 in. pvc
From _____ To _____ Ft. _____ in. _____ in. _____
From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:

Depth Size Material
From 18 To 25 Ft. med sand
From _____ To _____ Ft. _____
From _____ To _____ Ft. _____

11. DRILLING LOG

From _____ To _____ Formation Description
0 25 tan, gray and dark gray sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Gerald A. Elster 2/12/09
SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE

Gerald Elster
PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgr.,
1817 Mail Service Center - Raleigh, NC 27699-1517 Phone No. (919) 733-7015 ext 568.

Form GW-1b
Rev.12/07



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
 Gerald Eister
 Well Contractor (Individual) Name
 Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 114 Chimney Lane
 Wilmington NC 28457
 City or Town State Zip Code
 (910) 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) PZ-2
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (first use) _____
 DATE DILLED 2/12/09
 TIME COMPLETED 3:00 AM/ PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
 Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 17 996 May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE 77 59 353
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS top map and attached to this form if not using GPS)

5. FACILITY: Is the name of the business where the well is located.
 FACILITY ID #(if applicable)
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 (910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 10 Ft. 2" sch40 pvc
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0.10 in. pvc
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From 8 To 15 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
 0 15 tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
 Signature of Certified Well Contractor: Gerald Eister DATE: 2/12/09
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL: Gerald Eister



NON RESIDENTIAL WELL CONSTRUCTION RECORD
 North Carolina Department of Environment and Natural Resources - Division of Water Quality
WELL CONTRACTOR CERTIFICATION # 2394

<p>1. WELL CONTRACTOR: <u>Gerald Eister</u> Well Contractor (Individual) Name <u>Bridger Drilling Enterprises, Inc. dba Carolina Drilling</u> Well Contractor Company Name <u>114 Chimney Lane</u> STREET ADDRESS <u>Wilmington NC 28457</u> City or Town State Zip Code <u>910 799-0394</u> Area code - Phone number</p> <p>2. WELL INFORMATION: SITE WELL ID # (if applicable): <u>PZ-2A</u> WELL CONSTRUCTION PERMIT # (if applicable): _____ OTHER ASSOCIATED PERMIT # (if applicable): _____</p> <p>3. WELL USE (Check Applicable Box) Monitoring <input type="checkbox"/> Municipal/Public <input type="checkbox"/> Industrial/Commercial <input type="checkbox"/> Agricultural <input type="checkbox"/> Recovery <input type="checkbox"/> Injection <input type="checkbox"/> Irrigation <input type="checkbox"/> Other <input type="checkbox"/> (list use) _____ DATE DRILLED: <u>2/12/09</u> TIME COMPLETED <u>3:00</u> AM/ PM</p> <p>4. WELL LOCATION: CITY: <u>Wilmington</u> COUNTY: <u>New Hanover</u> <u>Hwy 421 N</u> <small>(Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)</small> TOPOGRAPHIC / LAND SETTING: <input type="checkbox"/> Slope <input type="checkbox"/> Valley <input type="checkbox"/> Flat <input type="checkbox"/> Ridge <input type="checkbox"/> Other _____ <small>(check appropriate box)</small> LATITUDE <u>34 17 887</u> May be in degrees, minutes, seconds or in a decimal format. LONGITUDE <u>77 58 352</u> Latitude/Longitude source: <input type="checkbox"/> GPS <input type="checkbox"/> Topographic map <small>(location of well must be shown on a USGS topo map and attached to this form if not using GPS)</small></p> <p>5. FACILITY: Is the name of the business where the well is located. FACILITY ID # (if applicable): _____ NAME OF FACILITY <u>Progress Energy Sutton Plant</u> STREET ADDRESS <u>801 Sutton Stream Plant Rd</u> <u>Wilmington NC 28401</u> City or Town State Zip Code CONTACT PERSON <u>Bruce Moorefield</u> MAILING ADDRESS <u>801 Sutton Stream Plant Rd</u> <u>Wilmington NC 28401</u> City or Town State Zip Code <u>910 343-3208</u> Area code - Phone number</p> <p>6. WELL DETAILS: a. TOTAL DEPTH: <u>25'</u> b. DOES WELL REPLACE EXISTING WELL? YES <input type="checkbox"/> NO <input type="checkbox"/> c. WATER LEVEL Below Top of Casing: <u>21.7</u> FT. <small>(Use "+" if Above Top of Casing)</small></p>	<p>d. TOP OF CASING IS <u>-0.2</u> FT. Above Land Surface* <small>*Top of casing terminated at or below land surface may require a variance in accordance with 15A NCAC 2C .0116.</small></p> <p>e. YIELD (gpm): _____ METHOD OF TEST _____</p> <p>f. DISINFECTION: Type _____ Amount _____</p> <p>g. WATER ZONES (depth): From _____ To _____ From _____ To _____ From _____ To _____ From _____ To _____ From _____ To _____ From _____ To _____</p> <p>7. CASING: Depth Diameter Thickness/Weight Material: From <u>0</u> To <u>20</u> Ft. <u>2"</u> <u>sch40</u> <u>pvc</u> From _____ To _____ Ft. _____ _____ From _____ To _____ Ft. _____ _____</p> <p>8. GROUT: Depth Material Method From <u>0</u> To <u>16</u> Ft. <u>neat</u> <u>tremie</u> From _____ To _____ Ft. _____ _____ From _____ To _____ Ft. _____ _____</p> <p>9. SCREEN: Depth Diameter Slot-Size Material From <u>20</u> To <u>25</u> Ft. <u>2</u> in. <u>0.10</u> in. <u>pvc</u> From _____ To _____ Ft. _____ in. _____ in. _____ From _____ To _____ Ft. _____ in. _____ in. _____</p> <p>10. SAND/GRAVEL PACK: Depth Size Material From <u>18</u> To <u>25</u> Ft. <u>med</u> <u>sand</u> From _____ To _____ Ft. _____ _____ From _____ To _____ Ft. _____ _____</p> <p>11. DRILLING LOG From _____ To _____ <u>0 25</u> Formation Description <u>tan, gray and dark gray sand</u> _____ _____ _____ _____ _____ _____ _____ _____ _____ _____</p> <p>12. REMARKS: _____ _____ _____ _____ _____ _____ _____ _____ _____ _____</p> <p>I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER. <u>Gerald Eister</u> <u>2/12/09</u> SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE <u>Gerald Eister</u> PRINTED NAME OF PERSON CONSTRUCTING THE WELL</p>
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NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
 Gerald Eister
 Well Contractor (Individual) Name
 Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 114 Chimney Lane
 Wilmington NC 28457
 City or Town State Zip Code
 (910) 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) PZ-3
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box): Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AM PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
 Hwy 421 N
 (Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate and)
 LATITUDE 34 18 053 May be in degrees, minutes, seconds or in a decimal format.
 LONGITUDE 77 59 420
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS top map and attached to this form if not using GPS)

5. FACILITY: - the name of the business where the well is located.
 FACILITY ID #(if applicable)
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 (910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "-" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .011B.

e. YIELD (gpm): _____ **METHOD OF TEST** _____

f. DISINFECTION: Type _____ **Amount** _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 10 Ft. 2" sch40 PVC
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0.10 in. PVC
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From 0 To 15 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
 0 15 tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
 Gerald Eister 2/19/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
 Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center - Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b Rev.12/07



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
Gerald Eister
 Well Contractor (Individual) Name
Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS **114 Chimney Lane**
Wilmington NC 28457
 City or Town State Zip Code
(910) 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID # (if applicable) **PZ-1A**
 WELL CONSTRUCTION PERMIT # (if applicable)
 OTHER ASSOCIATED PERMIT # (if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED **2/12/09**
 TIME COMPLETED **3:00** AM PM

4. WELL LOCATION:
 CITY: **Wilmington** COUNTY: **New Hanover**
Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other:
 (check appropriate box)
 LATITUDE **34 18 053** May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE **77 59 422**
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS top map and attached to this form if not using GPS)

5. FACILITY: Is the name of the business where the well is located.
 FACILITY ID # (if applicable)
 NAME OF FACILITY **Progress Energy Sution Plant**
 STREET ADDRESS **801 Sution Stream Plant Rd**
Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON **Bruce Moorefield**
 MAILING ADDRESS **801 Sution Stream Plant Rd**
Wilmington NC 28401
 City or Town State Zip Code
(910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: **25'**
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: **22.2** FT.
 (Use "*" if Above Top of Casing)

d. TOP OF CASING IS **-0.2** FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .011b.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To **20** Ft. **2"** **sch40** **pvc**
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To **16** Ft. **neat** **tremie**
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From **20** To **25** Ft. **2** in. **0.10** in. **pvc**
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From **18** To **25** Ft. **med** **sand**
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
 0 25 tan, gray and dark gray sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
Gerald Eister **2/12/09**
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



Non Residential Well Construction Record

North Carolina Department of Environment and Natural Resources - Division of Water Quality
WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
Gerald Eister
 Well Contractor (Individual) Name
Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
114 Chimney Lane
 STREET ADDRESS
Wilmington NC 28457
 City or Town State Zip Code
910 799-0394
 Area code - Phone number

2. WELL INFORMATION:
PZ-4
 SITE WELL ID # (if applicable)
 WELL CONSTRUCTION PERMIT# (if applicable)
 OTHER ASSOCIATED PERMIT # (if applicable)

3. WELL USE (Check Applicable Box) Monitoring **Municipal/Public**
Industrial/Commercial **Agricultural** **Recovery** **Injection**
Irrigation **Other** (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AM PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 18 029 May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE 77 59 502
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS map and attached to this form if not using GPS)

5. FACILITY - is the name of the business where the well is located.
 FACILITY ID # (if applicable):
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
Wilmington NC 28401
 City or Town State Zip Code
910 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness Weight Material
 From 0 To 10 Ft. 2" sch40 pvc
 From _____ To _____ Ft. _____ _____
 From _____ To _____ Ft. _____ _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. nsat remie
 From _____ To _____ Ft. _____ _____
 From _____ To _____ Ft. _____ _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0.10 in. DVC
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK: Depth Size Material
 From 8 To 15 Ft. med sand
 From _____ To _____ Ft. _____ _____
 From _____ To _____ Ft. _____ _____

11. DRILLING LOG
 From _____ To _____
0 15
 Formation Description
tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
Gerald Eister 2/19/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
 Gerald Eister
 Well Contractor (Individual) Name
 Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 114 Chimney Lane
 Wilmington NC 28457
 City or Town State Zip Code
 (910) 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID # (if applicable) PZ-4A
 WELL CONSTRUCTION PERMIT # (if applicable)
 OTHER ASSOCIATED PERMIT # (if applicable)

3. WELL USE (Check Applicable Box): Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AM PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
 Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 18 027
 LONGITUDE 77 59 503
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)
 May be in degrees, minutes, seconds or in a decimal format

5. FACILITY: is the name of the business where the well is located.
 FACILITY ID # (if applicable)
 NAME OF FACILITY: Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON: Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 (910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 25'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 22.9 FT.
 (Use "*" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ **METHOD OF TEST** _____

f. DISINFECTION: Type _____ **Amount** _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 20 Ft. 2" sch40 PVC
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 16 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 20 To 25 Ft. 2 in. .010 in. PVC
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK: Depth Size Material
 From 18 To 25 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From 0 To 25
 Formation Description
 tan, gray and dark gray sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
 Gerald Eister
 SIGNATURE OF CERTIFIED WELL CONTRACTOR 2/12/09 DATE
 Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center - Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 588.

Form GW-10 Rev.12/07



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
 Gerald Elster
 Well Contractor (Individual) Name
 Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 154 Chimney Lane
 Wilmington NC 28457
 City or Town State Zip Code
 910 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) PZ-5
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AMO PMO

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
 Hwy 421 N
 (Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 17 980 May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE 77 59 544
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY: is the name of the business where the well is located.
 FACILITY ID #(if applicable)
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 910 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 10 Ft. 2" sch40 pvc
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0:10 in. pvc
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From 8 To 15 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
 0 15 tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C. WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
 Gerald Elster 2/12/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
 Gerald Elster
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources - Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
Gerald Elster
 Well Contractor (Individual) Name
Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS **114 Chimney Lane**
Wilmington NC 28457
 City or Town State Zip Code
 (910) 798-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID # (if applicable) **PZ-5A**
 WELL CONSTRUCTION PERMIT # (if applicable)
 OTHER ASSOCIATED PERMIT # (if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED **2/12/09**
 TIME COMPLETED **3:00** AM PM

4. WELL LOCATION:
 CITY: **Wilmington** COUNTY **New Hanover**
Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridges Other
 (check appropriate box)
 LATITUDE **34 17 980** May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE **77 59 545**
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS top map and attached to this form if not using GPS)

5. FACILITY - is the name of the business where the well is located.
 FACILITY ID # (if applicable)
 NAME OF FACILITY: **Progress Energy Sutton Plant**
 STREET ADDRESS **801 Sutton Stream Plant Rd**
Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON **Bruce Moorefield**
 MAILING ADDRESS **801 Sutton Stream Plant Rd**
Wilmington NC 28401
 City or Town State Zip Code
 (910) 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: **25'**
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: **22.6** FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS **-0.2** FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From **0** To **20** Ft. **2"** sch40 pvc
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From **0** To **16** Ft. nsat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From **20** To **25** Ft. **2** in. **0.10** in. pvc
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK:
 Depth Size Material
 From **18** To **25** Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From To Formation Description
0 25 tan, gray and dark gray sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
Gerald Elster **2/12/09**
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Gerald Elster
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center - Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 968.

Form GW-1b Rev.12/07



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:

Gerald Eister
 Well Contractor (Individual) Name
Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
114 Chimney Lane
 STREET ADDRESS
Wilmington NC 28457
 City or Town State Zip Code
(910) 799-0394
 Area code - Phone number

2. WELL INFORMATION:

PZ-6
 SITE WELL ID #(if applicable)
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public

Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
2/12/09
 DATE DRILLED
3:00 AM PM

4. WELL LOCATION:

Wilmington COUNTY New Hanover
Hwy 421 N
 (Street Name, Numbers, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
34 17 883 LATITUDE
77 58 541 LONGITUDE
 (May be in degrees, minutes, seconds, or in a decimal format)

GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY- is the name of the business where the well is located.

Progress Energy Sutton Plant
 NAME OF FACILITY
801 Sutton Stream Plant Rd
 STREET ADDRESS
Wilmington NC 28401
 City or Town State Zip Code
Bruce Moorefield
 CONTACT PERSON
801 Sutton Stream Plant Rd
 MAILING ADDRESS
Wilmington NC 28401
 City or Town State Zip Code
(910) 343-3208
 Area code - Phone number

6. WELL DETAILS:

a. TOTAL DEPTH: 15'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 0 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at/or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ METHOD OF TEST _____

f. DISINFECTION: Type _____ Amount _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 10 Ft. 2" sch40 pvc
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 6 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 10 To 15 Ft. 2 in. 0.10 in. pvc
 From _____ To _____ Ft. _____ in. _____ in. _____
 From _____ To _____ Ft. _____ in. _____ in. _____

10. SAND/GRAVEL PACK: Depth Size Material
 From 8 To 15 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From 0 To 15
 Formation Description
tan, gray and dark sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Gerald Eister 2/19/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL



NON RESIDENTIAL WELL CONSTRUCTION RECORD

North Carolina Department of Environment and Natural Resources- Division of Water Quality

WELL CONTRACTOR CERTIFICATION # 2394

1. WELL CONTRACTOR:
 Gerald Eister
 Well Contractor (individual) Name
 Bridger Drilling Enterprises, Inc. dba Carolina Drilling
 Well Contractor Company Name
 STREET ADDRESS 114 Chimney Lane
 Wilmington NC 28457
 City or Town State Zip Code
 910 799-0394
 Area code - Phone number

2. WELL INFORMATION:
 SITE WELL ID #(if applicable) PZ-6A
 WELL CONSTRUCTION PERMIT #(if applicable)
 OTHER ASSOCIATED PERMIT #(if applicable)

3. WELL USE (Check Applicable Box) Monitoring Municipal/Public
 Industrial/Commercial Agricultural Recovery Injection
 Irrigation Other (list use)
 DATE DRILLED 2/12/09
 TIME COMPLETED 3:00 AM/ PM

4. WELL LOCATION:
 CITY: Wilmington COUNTY: New Hanover
 Hwy 421 N
 (Street Name, Number, Community, Subdivision, Lot No., Parcel, Zip Code)
 TOPOGRAPHIC / LAND SETTING:
 Slope Valley Flat Ridge Other
 (check appropriate box)
 LATITUDE 34 17 881 May be in degrees, minutes, seconds or in a decimal format
 LONGITUDE 77 59 540
 Latitude/longitude source: GPS Topographic map
 (location of well must be shown on a USGS topo map and attached to this form if not using GPS)

5. FACILITY: is the name of the business where the well is located.
 FACILITY ID #(if applicable)
 NAME OF FACILITY Progress Energy Sutton Plant
 STREET ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 CONTACT PERSON Bruce Moorefield
 MAILING ADDRESS 801 Sutton Stream Plant Rd
 Wilmington NC 28401
 City or Town State Zip Code
 910 343-3208
 Area code - Phone number

6. WELL DETAILS:
 a. TOTAL DEPTH: 25'
 b. DOES WELL REPLACE EXISTING WELL? YES NO
 c. WATER LEVEL Below Top of Casing: 23.4 FT.
 (Use "+" if Above Top of Casing)

d. TOP OF CASING IS -0.2 FT. Above Land Surface*
 *Top of casing terminated at or below land surface may require a variance in accordance with 15A NCAC 2C .0118.

e. YIELD (gpm): _____ **METHOD OF TEST** _____

f. DISINFECTION: Type _____ **Amount** _____

g. WATER ZONES (depth):
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____
 From _____ To _____ From _____ To _____

7. CASING: Depth Diameter Thickness/Weight Material
 From 0 To 20 Ft. 2" sch40 PVC
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

8. GROUT: Depth Material Method
 From 0 To 16 Ft. neat tremie
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

9. SCREEN: Depth Diameter Slot Size Material
 From 20 To 25 Ft. 2 in. 0.10 in. PVC
 From _____ To _____ Ft. _____ in. _____ in.
 From _____ To _____ Ft. _____ in. _____ in.

10. SAND/GRAVEL PACK: Depth Size Material
 From 18 To 25 Ft. med sand
 From _____ To _____ Ft. _____
 From _____ To _____ Ft. _____

11. DRILLING LOG
 From 0 To 25
 Formation Description
 tan, gray and dark gray sand

12. REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.
 Gerald Eister 2/19/09
 SIGNATURE OF CERTIFIED WELL CONTRACTOR DATE
 Gerald Eister
 PRINTED NAME OF PERSON CONSTRUCTING THE WELL

Submit the original to the Division of Water Quality within 30 days. Attn: Information Mgt., 1617 Mail Service Center - Raleigh, NC 27699-1617 Phone No. (919) 733-7015 ext 568.

Form GW-1b Rev.12/07



engineering and constructing a better tomorrow

December 16, 2010

Mr. Bill Forster
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27613

Subject: **SUPPLEMENTAL REPORT OF LIMITED FIELD INSPECTION (2010)
COOLING POND AND ASH POND DIKES
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC PROJECT NO. 6468-10-0025 (04)**

Dear Mr. Forster:

On May 19, 2010, Mr. Scott Auger of MACTEC Engineering and Consulting, Inc. (MACTEC) visited the L.V. Sutton Steam Electric Plant to perform a limited field inspection of the Cooling Pond and the Ash Pond Dikes. MACTEC has completed and submitted a report to cover all dams and dikes currently considered to be under the jurisdiction of the North Carolina DENR, Land Quality Section, Dam Safety (NCDENR Dam Safety). This supplemental report is provided to cover observations for features of dams and dikes that are not under the jurisdiction of NCDENR Dam Safety. For this inspection, the supplement is intended to cover observations concerning the interior storage area within the 1983/1971 Ash Pond.

We have also included with this report the Progress Energy Dam Assessment Forms to cover all inspection activities for 2010 in Appendix A.

1983/1971 ASH POND - INTERIOR STORAGE AREA

In 2006, a temporary interior storage area was constructed by placement of a containment berm within the pond area. The containment berm has an outlet structure which directs flow to the area of standing water on the west side of the pond. We understand the interior storage area was taken out of service in 1985, but then returned to service in 2001 for temporary use during maintenance work and ash removal activities in the 1983 and 1984 ponds. We also understand that the interior storage area is now actively used for bottom ash disposal operations along with temporary use for fly ash disposal operations. The containment berm for this temporary interior storage area is not currently included in the independent consultant dam inspection scope.

In consideration of the current active service for the interior storage area, MACTEC recommends providing field investigations and engineering analysis to review the stability of the containment berm. We also recommend providing an engineering analysis to determine if the existing discharge structure for the interior storage area along with the discharge structure for the 1983/1971 Ash Pond can safely pass the required design storm without overtopping the dikes. As requested by Progress Energy, this engineering review will be performed in conjunction with the 2011 Annual Dam Inspection.

The current field inspection of the interior storage area indicated that the containment berm and discharge structure were generally in satisfactory condition. During a follow-up site visit by MACTEC on 12/15/10, we observed that the interior storage area was actively impounding water. We also observed that the containment berm slopes have been cut and cleared of brush to facilitate inspection. The following photograph showing the containment berm and impounded water (to left of photo) was taken during the site visit on 12/15/10. The area of standing water to right of photograph is near the discharge structure on the west side of the 1983/1971 Ash Pond area.



1983/1971 Ash Pond – View of containment berm for interior storage area (12/15/10)

CLOSING

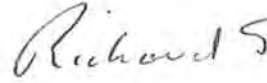
MACTEC is pleased to continue assisting Progress Energy with inspections of the dams at the L.V. Sutton Steam Electric Plant. Please contact us if you have any questions about this report.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.



J. Allan Tice, P.E.
Senior Principal Engineer
Registered, North Carolina 6428



Richard S. Auger
Principal Engineer
Registered, North Carolina 8169



RSA/rsa

APPENDIX A – Progress Energy Dam Assessment Forms

- Sutton Cooling Pond
- Sutton 1983/1971 Ash Pond
- Sutton 1984 Ash Pond

DRAFT

US EPA ARCHIVE DOCUMENT

APPENDIX A – Progress Energy Dam Assessment Forms

- Sutton Cooling Pond
- Sutton 1983/1971 Ash Pond
- Sutton 1984 Ash Pond

DRAFT

APPENDIX A – Progress Energy Dam Assessment Forms

- Sutton Cooling Pond

DRAFT

US EPA ARCHIVE DOCUMENT

PLANT & UNIT: L.V. SUTTON

MACTES Engineering and Consulting

12/10/10

Comments:

Based on current status inspection in 2010

COC - NG POND Surion Cooling Pond

CONCRETE STRUCTURES

	RED	YEL	GRN	Date Inspected: 12/10/10	Initials: RSA	RSR	SAFETY PERFORMANCE INSTRUMENTATION	HEU	YEL	GRN	Date Inspected: 12/10/10	Initials: RSA
CONCRETE SURFACES							HEADWATER TAILWATER GAGES					
STRUCTURAL CRACKING							ALIGNMENT INSTRUMENTATION					
MOVEMENT							UPLIFT INSTRUMENTATION					
REINFORCEMENT							DRAINAGE INSTRUMENTATION					
SPALLS							SEISMIC INSTRUMENTATION					
WATER PASSAGES												
SEEPAGE												
JOINTS												
FUNCTION												
ABUTMENTS												

EMBANKMENT STRUCTURES

	RED	YEL	GRN	Date Inspected: 12/10/10	Initials: RSA	RESERVOIR	SHORE LINE	HAZARD AREAS	WATERSHED RUNOFF
SETTLEMENT									
SOIL STABILITY									
SEEPAGE									
DRAINAGE SYSTEM									
SLOPE PROTECTION									

SPILLWAY STRUCTURES

	RED	YEL	GRN	Date Inspected: 12/10/10	Initials: RSA	OPERATIONAL FEATURES	RESERVOIR MAINTENANCE	DOWNSTREAM CHANNEL	DOWNSTREAM CHANNEL
CONTROL GATES									
UPPER AND SPILLWAYS									
OUTLET CHANNEL									
APPROACH CHANNEL									
STILLING BASIN									

OUTLET WORKS

	RED	YEL	GRN	Date Inspected: 12/10/10	Initials: RSA
INTAKE STRUCTURE					
GATES					
SILGES/WATER PASSAGES					
STILLING BASIN					
APPROACH CHANNEL					
OUTLET CHANNEL					
DRAWDOWN FACILITIES					

CONCRETE STRUCTURES		RED	YEL	GRN	Date Revised:	Initials:
All concrete structures related to the dam, slopes, or spillway		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	12/10/2010	RSA
OVERALL RATING >>>						
<p>CONCRETE SURFACES Evaluate the deterioration and continuing serviceability of the concrete. Conditions should conform to "Guide for Making a Condition Survey of Concrete Structures," ACI Journal, proceedings Vol. 65, No. 11, 11-66 pp. 903-918</p>						
STRUCTURAL CRACKING Examine for cracking resulting from over stress due to applied loads, shrinkage and temperature effects or differential movements.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Concrete cracking observed for concrete gate hoist support structure. Damage observed concrete slope protection at eas pipeline crossing.	
HORIZONTAL & VERTICAL MOVEMENT Look for evidence of settlement, heaving, deflections, or lateral movements	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Open joints are being monitored between upstream retaining walls and main deck of sluice gate structure.	
JUNCTIONS Examine junctions of the structure with abutments or embankments. Note any abnormalities.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
DRAINS Ensure any drains are free flowing and capable of performing their function.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
WATER PASSAGES All surfaces in which water passes should be examined for erosion, cavitation, obstructions, leakage, and significant structural cracks.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Concrete spalling on downstream side of discharge structure appears to be broken up. Plant reports this condition has been present for many years and does not affect sluice gate operations. Follow-up has been recommended to check for erosion and undermining of the structure.	
SEEPAGE Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments: No concerns noted for current inspection.	
JOINTS (Monolith and Construction) Determine location of joint and filler material, any movement of joints, or any indication of distress.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: Open joints are being monitored between upstream retaining walls and main deck of sluice gate structure.	
FOUNDATION Examine for damage or possible undermining of the downstream toe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments: As noted, follow-up recommended to check for erosion and undermining downstream from sluice gate structure.	
ABUTMENTS Examine for signs of instability or excessive widening.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	

EMBANKMENT STRUCTURES		RED	YEL	GRN	Date Revised:	Initials:
		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	12/10/2010	RSA
OVERALL RATING: >>>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
SETTLEMENT			X		Comments:	Deterioration and cracking reported for soil content on crest of dam. Recommendation: provided for survey to confirm crest elevation and maintenance repair.
Embankment 3rd downstream toe area need to be checked for localized settlement, depressions, or sink holes.					Comments:	No concerns for slope stability noted for current
SLOPE STABILITY				X	Comments:	Standing water and slowly flowing water present adjacent to toe in many places, but does not appear to be seepage. Area receives flooding from river
Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest, alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.					Comments:	
SEEPAGE				X	Comments:	
The downstream face of abutments, embankment slopes and toes, embankment - structure contacts, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined.					Comments:	
DRAINAGE SYSTEMS					Comments:	
All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.					Comments:	NA
SLOPE PROTECTION			X		Comments:	Extensive deterioration and erosion of the soil-cement slope protection has been observed. Riprap material placed along toe has been displaced. Implementation of repair plan recommended.
The slope protection should be examined for erosion-formed gullies and wave-formed notches and benches that have reduced the embankment cross section or exposed less wave resistant materials. The adequacy of slope protection against waves, currents, and surface runoff that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent					Comments:	

SPILLWAY STRUCTURES	RED Problems likely in < 2 yrs	YEL Problems likely in 2 - 5 yrs	GRN Problems likely in > 5 yrs	Date Revised: 12/10/2010	Initials: RSA
<p>Examination should be made of the structures and features including bulkheads, flashboards, and fusc plugs of all service and auxiliary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway.</p> <p>OVERALL RATING >>></p> <p>CONTROL GATES & OPERATIONAL MACHINERY</p> <p>Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, surrp high water alarms and drainage pump should be investigated.</p> <p>UNLINED SADDLE SPILLWAYS</p> <p>Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation, and the potential hazard to the safety of the dam.</p> <p>OUTLET CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p> <p>APPROACH CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p> <p>STILLING BASIN</p> <p>Basin and energy dissipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<p>Comments: Over operation during closing of the north sluice gate has caused damage to the concrete structure (block) supporting the gate. Repair of the damaged concrete has been recommended. Plant reports that both gates are operable in current condition.</p>					
<p>Comments: NA</p>					
<p>Comments: Concrete apron on downstream side of discharge structure appears to be extensively broken up. Plant reports this condition has been present for many years and does not affect sluice gate operations. Follow-up has been recommended to check for erosion and uncracking of the structure. Also noted under concrete structures.</p>		<input checked="" type="checkbox"/>			
<p>Comments: NA</p>					
<p>Comments: NA</p>					

OUTLET WORKS		RED	YEL	GRN	Date Revised:	Initials:
All structures and features designed to release reservoir water below the spillway crest through or around the dam.		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	12/10/2010	RSA
OVERALL RATING >>>						
INTAKE STRUCTURE						
Examining for any conditions which may impose operational constraints on the outlet works. Entrances to intake structure should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works.						
				X		Comments: Makrap structure was not observed during this inspection.
OPERATING AND EMERGENCY CONTROL GATES						
Structural members, communication guides, noisls, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.						
				X		Comments: Operation of sluice one sluice gate was observed for current inspection. Plant reports that both gates are currently operable. No change in previously reported structural damage to the north sluice gate support noted.
CONDUITS, SLUICES, WATER PASSAGES, ETC.						
Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at cracks or joints						
						Comments: NA
STILLING BASIN						
Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined by surroundings.						
						Comments: NA
APPROACH CHANNELS						
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.						
						Comments: NA
OUTLET CHANNELS						
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.						
						Comments: NA
DRAWDOWN FACILITIES						
Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.						
						Comments: NA

OPERATION AND MAINTENANCE FEATURES		Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>		<input type="checkbox"/> RED Problems likely in < 2yrs	<input type="checkbox"/> YEL Problems likely in 2 - 5yrs
		<input type="checkbox"/> GRN Problems likely in > 5yrs	<input checked="" type="checkbox"/> X
RESERVOIR REGULATION PLAN		Comments:	
<p>The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.</p>		<p>Plant procedures call for lowering pond level to elevation 8.7 feet if a hurricane warning is issued. This was not reviewed during current inspection.</p>	
MAINTENANCE		Comments:	
<p>The maintenance of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.</p>		<p>NA</p>	

DOWNSTREAM CHANNEL		Date Revised: 12/10/2010	Initials: RSA
<p>The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification.</p>		<p>RED Problems likely in < 2yrs</p> <p>YEL Problems likely in 2 - 5yrs</p> <p>GRN Problems likely in > 5yrs</p>	
<p>OVERALL RATING >>></p>		<p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	
DOWNSTREAM CHANNEL		Comments: NA	

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SAFETY & PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Initials:	RSA
Available records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined.	Problems likely in < 2yrs <input type="checkbox"/>	Problems likely in 2 - 5yrs <input type="checkbox"/>	Problems likely in > 5yrs <input type="checkbox"/>		
OVERALL RATING >>>					
HEADWATER AND TAILWATER GAGES Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumentation measurements such as stream flow, uplift pressures, alignment, and ultrasonic system discharge with the upper and lower water surface elevations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
HORIZONTAL & VERTICAL ALIGNMENT INSTRUMENTATION (CONCRETE STRUCTURES) The existing records of alignment and elevation surveys and measurements from inclinometers, inverted plumb levels, slope points, across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES) The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the embankment and foundation would impair the safety of the dam, under given conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
UPLIFT INSTRUMENTATION Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
DRAINAGE SYSTEM INSTRUMENTATION Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in this relationship during the history of the dam.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
SEISMIC INSTRUMENTATION The existing records of seismic instrumentation should be examined to determine the seismic activity in the area and the response of the structures to past earthquakes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA

RESERVOIR The following features of the reservoir should be examined to determine to what extent the water impounded by the dam would constitute a danger to the safety of the dam or a hazard to human life or property.	RED Frequently likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>					
SHORE LINE The land forms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of bedrock strata to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might overtop the dam.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
SEDIMENTATION The reservoir and drainage area should be examined for excessive sedimentation or recent developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increase in maximum surge and maximum pool elevation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
POTENTIAL UPSTREAM HAZARD AREAS The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
WATERSHED RUNOFF POTENTIAL The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changed agricultural practices, timber clearing, railroad or highway construction or real estate developments that might extensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	

APPENDIX A – Progress Energy Dam Assessment Forms

- **Sutton 1983/1971 Ash Pond**

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US EPA ARCHIVE DOCUMENT

PLANT & UNIT: SUELF POND
 ASH POND: 1983/1971 Ash Pond

VENUE: MACTEC Engineering and Consulting
 PROJECT INFORMATION: 12/13/10

Based on 2010 Dam Inspection

Comments

CONCRETE STRUCTURES	RED	YEL	GRN	Date Revised: 12/10/10	Initials: PSA	SAFETY PERFORMANCE INSTRUMENTATION	RED	YEL	GRN	Date Revised	Initials	PSA
CONCRETE SURFACES				NA		HEADWATER LA WATER GAGES				NA		
STRUCTURAL CRACKING				NA		ALIGNMENT INSTRUMENTATION				NA		
MOVEMENT				NA		MOVEMENT INSTRUMENTATION				NA		
JUNCTIONS				NA		LIFT INSTRUMENTATION				NA		
DRAINS				NA		DRAINAGE INSTRUMENTATION				NA		
WATER PASSAGES				NA		SEISMIC INSTRUMENTATION				NA		
SEEPAGE				NA								
JUNCTIONS				NA								
FOUNDATIONS				NA								
ABUTMENTS				NA								

EMBANKMENT STRUCTURES	RED	YEL	GRN	Date Revised: 12/10/10	Initials: PSA	RESERVOIR	RED	YEL	GRN	Date Revised	Initials	PSA
SKELTON				NA		SHOULDER				NA		
SLOPE STABILITY				NA		SEDIMENTATION				NA		
SEEPAGE				NA		HAZARD AREAS				NA		
DRAINAGE SYSTEM				NA		WATERSHED RUNOFF				NA		
SLOPE PROTECTION				NA						NA		

SEALWAY STRUCTURES	RED	YEL	GRN	Date Revised: 12/10/10	Initials: PSA	OPERATIONAL FEATURES	RED	YEL	GRN	Date Revised	Initials	PSA
CONTROL GATES				NA		RESERVOIR FPG PLAN				NA		
UNIMPROVED SILLWAYS				NA		MAIN TUNNEL				NA		
APPROACH CHANNEL				NA		DOWNSTREAM CHANNEL				NA		
OUTLET CHANNEL				NA		DOWNSTREAM CHANNEL				NA		
STILLING BASIN				NA						NA		

SOILT WORKS	RED	YEL	GRN	Date Revised: 12/13/10	Initials: PSA	CONCERN FOR HEAVY GROWTH ALONG EXCHANGE CANAL	RED	YEL	GRN	Date Revised	Initials	PSA
WAKE STRUCTURE				NA						NA		
GATES				NA						NA		
SLOICES WATER PASSAGES				NA						NA		
STILLING BASIN				NA						NA		
APPROACH CHANNEL				NA						NA		
OUTLET CHANNEL				NA						NA		
DRAWDOWN FACILITIES				NA						NA		

CONCRETE STRUCTURES		RED	YEL	GRN	Date Revised:	Initials:
All concrete structures related to the dam, slopes, or spillway.		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	12/10/2010	RSA
OVERALL RATING >>>						
CONCRETE SURFACES	Evaluate the deterioration and continuing serviceability of the concrete. Conditions should conform to "Guide for Making a Condition Survey of Concrete in Service," ACI Journal, proceedings Vol. 65, No.11, 11/68 pp. 905-918.				Comments:	NA
STRUCTURAL CRACKING	Examine for cracking resulting from over-stress due to applied loads, shrinkage and temperature effects or differential movements.				Comments:	NA
HORIZONTAL & VERTICAL MOVEMENT	Look for evidence of settlement, heaving, distortions, or lateral movements.				Comments:	NA
JUNCTIONS	Examine junctions of the structure with abutments or embankments. Note any abnormalities.				Comments:	NA
DRAINS	Ensure any drains are free flowing and capable of performing their function.				Comments:	NA
WATER PASSAGES	All surfaces in which water passes should be examined for erosion, cavitation, obstructions, leakage, and significant structural cracks.				Comments:	NA
SEEPAGE	Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.				Comments:	NA
JOINTS (Monolith and Construction)	Determine condition of joint and filler material, any movement of joints, or any indication of distress.				Comments:	NA
FOUNDATION	Examine for damage or possible undermining of the downstream toe.				Comments:	NA
ABUTMENTS	Examine for signs of instability or excessive wear/damage.				Comments:	NA

EMBANKMENT STRUCTURES	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>					
SETTLEMENT Embankment and downstream toe area need to be checked for localized settlement depressions, or sink holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Comments: No concerns for settlement noted for current inspection.
SLOPE STABILITY Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Comments: No concerns for slope stability noted for current inspection. However, engineering review of dike stability should be provided in consideration of active utilization for the 1983/1971 Ash Pond area.
SEEPAGE The downstream face of abutments, embankment slopes and toes, embankment structure corners, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Comments: No concerns for seepage noted for current inspection.
DRAINAGE SYSTEMS All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Comments: No concerns for internal drainage noted.
SLOPE PROTECTION The slope protection should be examined for erosion-formed gullies and wave-formed notches and benches that have reduced the embankment cross-section or expose less wave resistant materials. The adequacy of slope protection against waves, currents, and surface runoff that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Comments: Dike appear to have sparse vegetation for slope protection near discharge structure. Clearing of slopes adjacent to discharge canal recommended to facilitate inspection as active pond area.

SPILLWAY STRUCTURES		RED	YEL	GRN	Date Revised:	Initials:
Examination should be made of the structures and features including bulkheads, flashboards, and fuse plugs of all service and auxiliary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs	12/10/2010	RSA
OVERALL RATING >>>						
CONTROL GATES & OPERATIONAL MACHINERY						
Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, sump high water alarms and drainage pump should be investigated.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
UNLINED SADDLE SPILLWAYS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation and the potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
OUTLET CHANNELS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
APPROACH CHANNELS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
STILLING BASIN		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	
Basin and energy dissipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments: NA	

	RED Problems likely in < 2yrs	YEL Problems likely in 2-5yrs	ORNG Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>					
OUTLET WORKS All structures and features designed to release reservoir water below the spillway crest through or around the dam.					
INTAKE STRUCTURE Examine for any conditions which may impose operational constraints on the outlet works. Entrances to intake structure should be examined for conditions such as S-1 or debris accumulation which may reduce the discharge capability of the outlet works.			X		Water level lowered by 1 foot during 2010 as recommended by NCDENR Dam Safety.
OPERATING AND EMERGENCY CONTROL GATES Structural members, connections, guides, hoists, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.					Comments:
CONDUITS, SLUICES, WATER PASSAGES, ETC. Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at stacks or joints.			X		Comments: Discharge pipe may become block by sand and should be periodically checked.
STILLING BASIN Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stalling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stalling basin should be determined by surroundings.					Comments: NA
APPROACH CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.					Comments: NA
OUTLET CHANNELS Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.					Comments: NA
DRAWDOWN FACILITIES Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.					Comments: NA

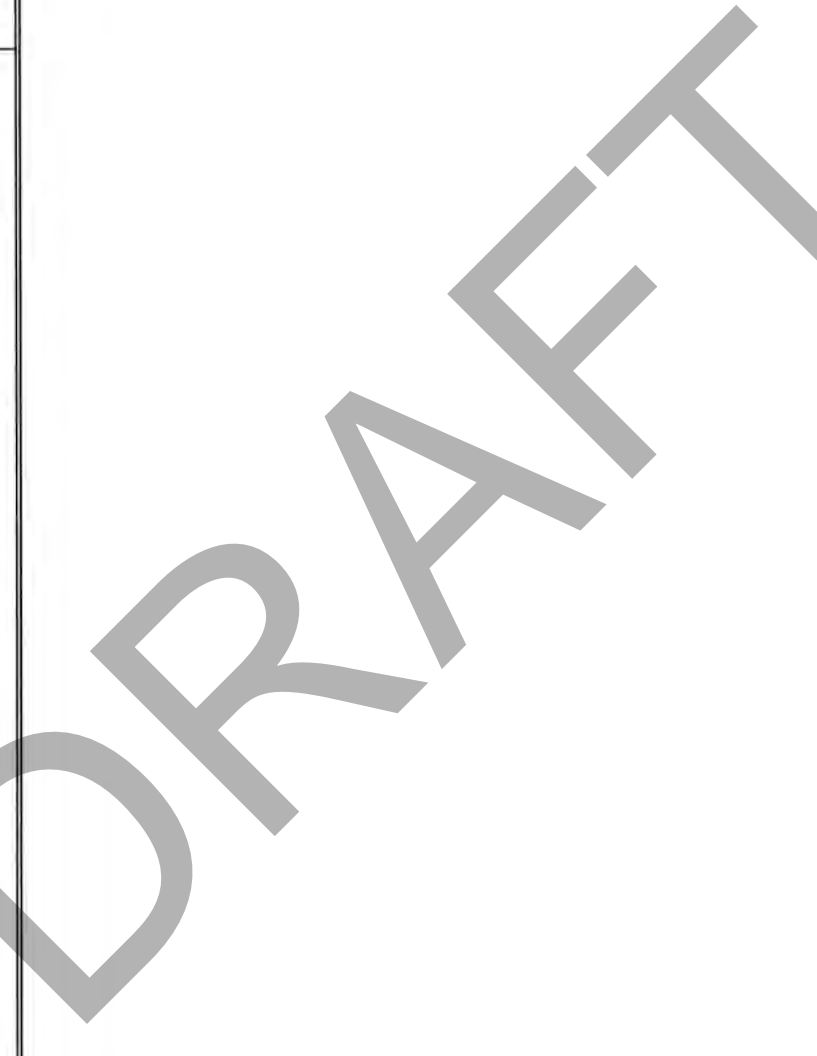
SAFETY & PERFORMANCE INSTRUMENTATION		RED	YEL	ORANGE	GREEN	Date Revised:	Initials:	RSA
Available records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined.		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in 5 - 10yrs	Problems likely in > 10yrs	12/10/2010		
OVERALL RATING >>>								
HEADWATER AND TAIL WATER GAGES								
Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumentation measurements such as stream flow, uplift pressures, alignment, and drainage system discharge with the upper and lower water surface elevations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA
HORIZONTAL & VERTICAL ALIGNMENT INSTRUMENTATION (CONCRETE STRUCTURES)								
The existing records of alignment and elevation surveys and measurements from inclinometers, inverted plumb bobs, spirit points across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES)								
The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the unbankment and foundation would impair the safety of the dam, under given conditions.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA
UPLIFT INSTRUMENTATION								
Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA
DRAINAGE SYSTEM INSTRUMENTATION								
Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in this relationship during the history of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA
SEISMIC INSTRUMENTATION								
The existing records of seismic instrumentation should be examined to determine the seismic activity in the area and the response of the structures to past earthquakes		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			Comments:
NA								NA

RESERVOIR	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
<p>The following features of the reservoir should be examined to determine to what extent the water impounded by the dam would constitute a danger to the safety of the dam or a hazard to human life or property.</p>					
OVERALL RATING >>>					
<p>SHORE LINE The land forms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of bedrock stratigraphy to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might overtop the dam</p>	[]	[x]	[]	Comments: NA	
<p>SEDIMENTATION The reservoir and drainage area should be examined for excessive sedimentation or recent developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increases in maximum outflow and maximum pool elevation.</p>	[]	[x]	[]	Comments: A containment berm has been placed within the 1983/1971 Ash Pond and is actively used for bottom ash and occasionally for fly ash storage. The containment dike and internal discharge structure have not previously been included in the independent consultant dam inspection scope. Engineering inspection is recommended for these features in consideration of the active use of the 1983/1971 Ash Pond for ash storage.	
<p>POTENTIAL UPSTREAM HAZARD AREAS The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage</p>	[]	[]	[]	Comments: NA	
<p>WATERSHED RUNOFF POTENTIAL The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changed agricultural practices, timber clearing, railroad or highway construction or real estate developments that might extensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified.</p>	[]	[]	[]	Comments: NA	

OPERATION AND MAINTENANCE FEATURES		Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>		<input type="checkbox"/> RED Problems likely in < 2yrs	<input type="checkbox"/> YEL Problems likely in 2 - 5yrs
		<input type="checkbox"/> GRN Problems likely in > 5yrs	<input type="checkbox"/> F F
RESERVOIR REGULATION PLAN The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.		Comments:	NA
MAINTENANCE The minimum of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.		Comments:	NA

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DOWNSTREAM CHANNEL	Date Revised: 11/30/2010	Initials: RSA
<p>The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification.</p>	<p>RED Problems likely in < 2yrs</p> <p>YEL Problems likely in 2 - 5yrs</p> <p>GRN Problems likely in > 5yrs</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
DOWNSTREAM CHANNEL	Comments: NA	
OVERALL RATING >>>		



APPENDIX A - Progress Energy Dam Assessment Forms

- Sutton 1984 Ash Pond

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US EPA ARCHIVE DOCUMENT

PLAN & UNIT: Sutton Plant
 ASH POND: 1984 Ash Pond & Interior Containment

VEH. CO. #: MACTEC Engineering and Consulting
 OTHER INFORMATION: 12/10/10

Comments: Based on 2010 Dam Inspection

CONCRETE STRUCTURES	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA	SAFETY/PERFORMANCE/INSPECTION	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA
CONCRETE SURFACES				NA		LEADWATER/TAILWATER GAGES				NA	
STRUCTURAL CRACKING				NA		ALIGNMENT INSTRUMENTATION				NA	
MOVEMENT				NA		MOVEMENT INSTRUMENTATION				No concerns for current inspection.	
JUNCTIONS				NA		UPLET INSTRUMENTATION				NA	
ORAINS				NA		DRAINAGE INSTRUMENTATION				No concerns for current inspection.	
WATER PASSAGES				NA		SEISMIC INSTRUMENTATION				NA	
SEEPAGE				NA							
JOINTS				NA							
FOUNDATION				NA							
ABUTMENTS				NA							

EMBANKMENT STRUCTURES	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA	RESERVOIR	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA
SETTLEMENT				No concerns for current inspection.		SHOULDER				NA	
SLOPE STABILITY				No concerns for current inspection.		SEGMENTATION				Asking for interior Containment & Sept and Ash Pond	
SEEPAGE				No concerns for current inspection.		HAZARD AREAS				NA	
DRAINAGE SYSTEM				Impervious drainage for bottom end of 1984 Ash Pond		MAINTENANCE				NA	
SLOPE PROTECTION				Sparse vegetation for slope protection.							

SFILLWAY STRUCTURES	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA	OPS & MAINT FEATURES	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA
CONTROL GATES				NA		HS SERVICE REG PLAN				NA	
UNLINED SPILLWAYS				NA		MAINTENANCE				NA	
APPROACH CHANNEL				NA							
OUTLET CHANNEL				NA		DOWNSTREAM CHANNEL				Code Div seg	
STILLING BASIN				NA		DOWNSTREAM CHANNEL				NA	

OUTLET WORKS	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA	DOWNSTREAM CHANNEL	RED	YEL	GRN	Date Revisited: 12/10/10	Initials: RSA
INTAKE STRUCTURE				No concerns for current inspection.							
GATES				NA							
SULLY WATER PASSAGES				No concerns for current inspection.							
STILLING BASIN				NA							
APPROACH CHANNEL				NA							
CUT-TO CHANNEL				NA							
DIAPHRAGM FACILITIES				NA							

	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
OVERALL RATING >>>					
CONCRETE STRUCTURES All concrete structures related to the dam, slopes, or spillway.					
CONCRETE SURFACES Evaluate the deterioration and continuing serviceability of the concrete. Conditions should conform to "Guide for Making a Condition Survey of Concrete in Service," ACI Journal, proceedings Vol. 65, No. 11, 11:66 pp. 905-918.				Comments: NA	
STRUCTURAL CRACKING Examine for cracking resulting from overstress due to applied loads; shrinkage and temperature effects or differential movements.				Comments: NA	
HORIZONTAL & VERTICAL MOVEMENT Look for evidence of settlement, heaving, distortions, or lateral movements				Comments: NA	
JUNCTIONS Examine junctions of the structure with abutments or embankments. Note any abnormalities.				Comments: NA	
DRAINS Ensure any drains are free flowing and capable of performing their function.				Comments: NA	
WATER PASSAGES All surfaces in which water passes should be examined for erosion, cavitation, obstructions, leakage, and significant structural cracks.				Comments: NA	
SEEPAGE Faces, abutments, and toes should be examined for evidence of abnormal leakage. Records of flow of downstream springs should be reviewed for variation with reservoir pool level.				Comments: NA	
JOINTS (Monolith and Construction) Determine condition of joint and filler material, any movement of joints, or any indication of distress.				Comments: NA	
FOUNDATION Examine for damage of possible undermining of the downstream toe				Comments: NA	
ABUTMENTS Examine for signs of instability or excessive weathering.				Comments: NA	

EMBAKMENT STRUCTURES		Date Revised:	12/10/2010	Initials:	RSA
OVERALL RATING >>>					
SETTLEMENT Embankment and downstream toe area need to be checked for localized settlement, depressions, or sink holes	<input checked="" type="checkbox"/> Problems likely in < 2yrs	<input type="checkbox"/> Problems likely in 2 - 5yrs	<input type="checkbox"/> Problems likely in > 5yrs	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SLOPE STABILITY Examine for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond toe, and surface cracks which indicate movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SEEPAGE The downstream face of abutments, embankment slopes and toes, embankment - structure contacts, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. The presence of animal burrows and tree growth on slopes which might cause detrimental seepage should be examined.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRAINAGE SYSTEMS All drainage systems should be examined to determine whether the systems can freely pass discharge and that the discharge water is not carrying embankment or foundation material. Systems used to monitor drainage should be examined to assure they are operational and functioning properly.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SLOPE PROTECTION The slope protection should be examined for erosion-formed gullies and wave-formed notches at benches that have reduced the embankment cross-section or exposed loss wave resistant materials. The adequacy of slope protection against waves, currents, and surface runoff that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments: No concerns for settlement noted for current inspection.					
Comments: No concerns for slope stability noted for current inspection.					
Comments: During 2009, the plant identified concern for possible increased seepage when the water level was raised in the 1984 Ash Pond. Piezometers were installed to monitor water level in the dike during 2009. MACTEC issued a report on 4/20/10 summarizing results of seepage review. The report concludes that seepage does not appear to represent a concern for dike stability. No concerns for seepage were noted from current inspection. The plant should continue to monitor seepage with routine inspections.					
Comments: Internal drainage for north end of 1984 Ash Pond. On 9/27/20, a small breach occurred through a section of the 1984 Ash Pond dike on the east side associated with heavy rainfall. Follow-up investigation of the root cause is in progress. Also, MACTEC is supporting Progress Energy in development and implementation of a repair plan.					
Comments: Improvement in maintenance of vegetation observed during current inspection. Dikes appear to have sparse vegetation for slope protection.					

SPILLWAY STRUCTURES		RED	YEL	GRN	Date Revised:	12/10/2010	Initials:	RSA
Examination should be made of the structures and features including bulkheads, flashboards, and fuse plugs of all service and auxiliary spillways which serve as principal or emergency spillways for any condition which may impose operational constraints on the functioning of the spillway.		Problems likely in < 2yrs	Problems likely in 2 - 5yrs	Problems likely in > 5yrs				
OVERALL RATING >>>								
CONTROL GATES & OPERATIONAL MACHINERY								
Structural members, connections, hoists, cables and operating machinery and the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify the operational adequacy of the equipment. Where cranes are intended to be used for handling gates and bulkheads, the availability, capacity and condition of the cranes and lifting beams should be investigated. Operation of control systems and protective and alarm devices such as limit switches, sump high water alarms and drainage pump should be investigated.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
UNLINED SADDLE SPILLWAYS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
Examine for evidence of erosion and any conditions which may impose constraints on the function of the spillway. The ability of the spillway to resist erosion due to operation and the potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
OUTLET CHANNELS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
APPROACH CHANNELS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
STILLING BASIN		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA
Basin and energy dissipators should be examined for any conditions which may pose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				Comments: NA

OUTLET WORKS	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	ORANGE Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
<p>All structures and features designed to release reservoir water below the spillway crest through or around the dam.</p> <p>OVERALL RATING >>></p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
<p>INTAKE STRUCTURE</p> <p>Examine for any conditions which may impose operational constraints on the outlet works. Examine for intake structure should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments:	Water level is currently at Elevation 30. No concerns for seepage were identified from the current inspection.
<p>OPERATING AND EMERGENCY CONTROL GATES</p> <p>Structural members, connections, guides, nozzles, cables and operating machinery including the adequacy of normal and emergency power supplies should be examined and tested to determine the structural integrity and verify it is operational. Adequacy of the operating and emergency gates, valves, bulkheads, and other equipment.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	NA
<p>CONDUITS, SLUICES, WAIFR PASSAGES, ETC.</p> <p>Interior surfaces of conduits should be examined for erosion, corrosion, cavitation, cracks, joint separation and leakage at cracks or joints.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Comments:	No concerns noted for current inspection.
<p>STILLING BASIN</p> <p>Basin and energy dissipaters should be examined for any conditions which may impose constraints on the ability of the stilling basin to prevent downstream scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined by soundings.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	NA
<p>APPROACH CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	NA
<p>OUTLET CHANNELS</p> <p>Examine for any condition that may impose constraints on the functioning of the spillway and present a potential hazard to the safety of the dam.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	NA
<p>DRAWDOWN FACILITIES</p> <p>Facilities provided for drawdown of the reservoir to avert impending failure to the dam or to facilitate repairs in the event of stability or foundation problems should be examined for any conditions which may impose constraints on their functioning as planned.</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Comments:	NA

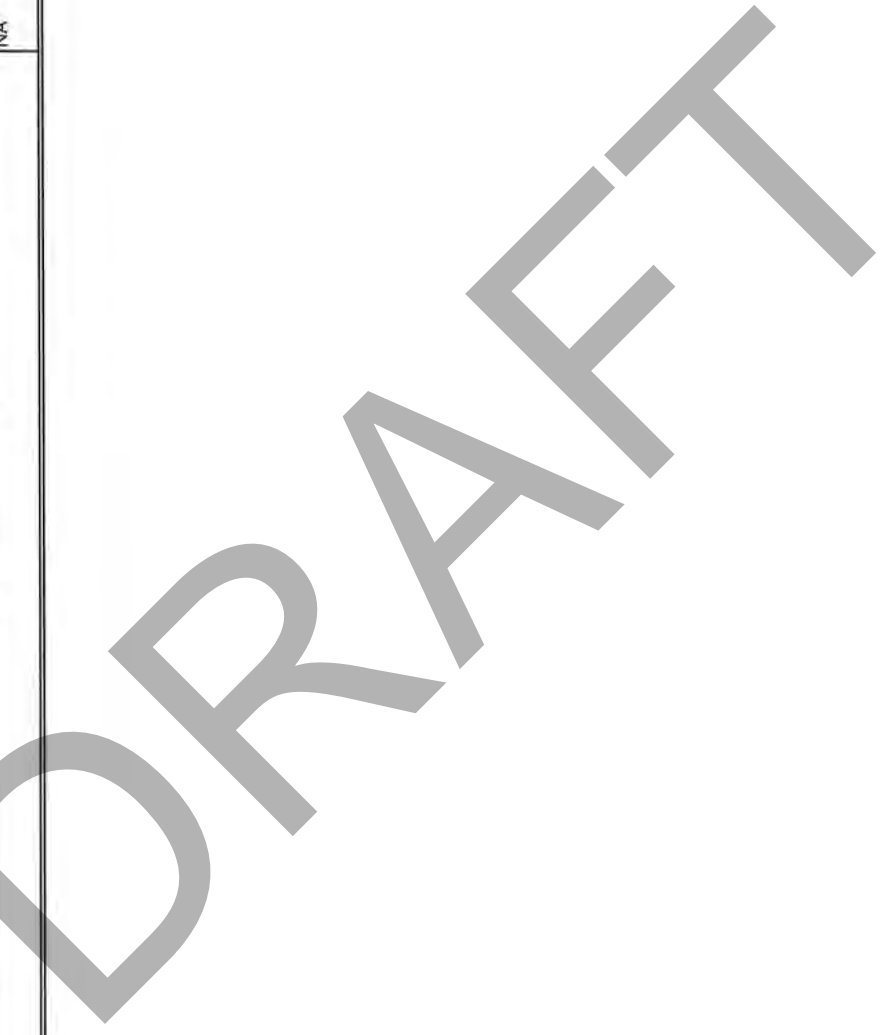
SAFETY & PERFORMANCE INSTRUMENTATION Existing records and readings of installed instruments should be reviewed to detect any unusual performance of the instruments or evidence of unusual performance of the structure. The adequacy of the installed instrumentation to measure the performance and safety of the dam should be determined.	OVERALL RATING >>>			Date Revised: 12/10/2010	Initials: RSA
	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs		
HEADWATER AND TAILWATER GAGES Existing records of the headwater and tailwater gages should be examined to determine the relationship between other instrumental measurements such as stream flow, uplift pressures, alignment, and drainage system discharge with the upper and lower water surface elevations.					Comments: NA
HORIZONTAL & VERTICAL ALIGNMENT (CONCRETE STRUCTURES) The existing records of alignment and elevation surveys and measurements from inclinometers, inverted plumb bobs, gage points across cracks and joints, or other devices should be examined to determine any change from the original position of the structures.					Comments: NA
HORIZONTAL & VERTICAL MOVEMENT, CONSOLIDATION, AND PORE-WATER PRESSURE INSTRUMENTATION (EMBANKMENT STRUCTURES) The existing records of measurements from settlement plates or gages, surface reference marks, slope indicators and other devices should be examined to determine the movement history of the embankment. Existing piezometer measurements should be examined to determine if the pore-water pressures in the embankment and foundation would impair the safety of the dam, under given conditions.			X		Comments: Piezometers installed in secondary settling pond are being monitored - no concerns noted.
UPLIFT INSTRUMENTATION Records of uplift measurements should be examined to determine if the uplift pressures for the maximum pool would impair the safety of the dam.					Comments: NA
DRAINAGE SYSTEM INSTRUMENTATION Records of measurements of the drainage system flow should be examined to establish the normal relationship between elevations and discharge quantities and any changes that have occurred in the relationship during the history of the dam.			X		Comments: Interim drain provided for discharge pipe for interior containment area. This feature could not be checked during the current inspection.
SEISMIC INSTRUMENTATION The existing records of seismic instrumentation should be examined to determine the seismic activity in the area and the response of the structures to past earthquakes.					Comments: NA

RESERVOIR The following features of the reservoir should be examined to determine to what extent the water impounded by the dam would constitute a danger to the safety of the dam or a hazard to human life or property.	RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	Date Revised: 12/10/2010	Initials: RSA
SHORE LINE The level terms around the reservoir should be examined for indications of major active or inactive landslide areas and to determine susceptibility of bedrock strata to massive landslides of sufficient magnitude to significantly reduce reservoir capacity or create waves that might overtop the dam.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
SEDIMENTATION The reservoir and drainage area should be examined for excessive sedimentation or recent developments in the drainage basin which could cause a sudden increase in sediment load thereby reducing the reservoir capacity with attendant increase in maximum in-bulkflow and maximum pool elevation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: The interior Containment area appears to be active to limit of useful storage capacity. Also, ash 11 in the "neck" area at the north end of the 1984 Ash Pond may have contributed to the dike breaching event.
POTENTIAL UPSTREAM HAZARD AREAS The reservoir area should be examined for features subject to potential backwater flooding resulting in loss of human life or property at reservoir levels up to the maximum water storage capacity including any surcharge storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA
WATER-SEDIMENT RUNOFF POTENTIAL The drainage basin should be examined for any extensive alterations to the surface of the drainage basin such as changed agriculture practices, minor clearing, railroad or highway construction or real estate developments that might extensively affect the runoff characteristics. Upstream projects that could have impact on the safety of the dam should be identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Comments: NA

OPERATION AND MAINTENANCE FEATURES		Date Revisited: 12/10/2010	Initials: RSA
CYFRAL1 RATING ???			
RED Problems likely in < 2yrs	YEL Problems likely in 2 - 5yrs	GRN Problems likely in > 5yrs	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
RESERVOIR REGULATION PLAN			
The actual practices in regulating the reservoir and discharges under normal and emergency conditions should be examined to determine if they comply with the designed reservoir regulation plan and to assure that they do not constitute a danger to the safety of the dam or to human life or property.			
MAINTENANCE			
The maintenance of the operating facilities and features that pertain to the safety of the dam should be examined to determine the adequacy and quality of the maintenance procedures followed in maintaining the dam and facilities in safe operating condition.			
		Comments:	NA
		Comments:	NA

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<p>DOWNSTREAM CHANNEL</p> <p>The channel immediately downstream of the dam should be examined for conditions which might impose any constraints on the operation of the dam or present any hazards to the safety of the dam. Development of the potential flooded area downstream of the dam should be assessed for the compatibility with the hazard classification.</p>	<p>RED Problems likely in < 2yrs</p>	<p>YEL Problems likely in 2 - 5yrs</p>	<p>GRN Problems likely in > 5yrs</p>	<p>Date Revised: 11/30/2010</p>	<p>Initials: RSA</p>
<p>OVERALL RATING >>></p>					
<p>DOWNSTREAM CHANNEL</p>	<p>Comments: NA</p>				





North Carolina Department of Environment and Natural Resources
Division of Land Resources
Land Quality Section

James D. Simons, PG, PE
Director and State Geologist

Beverly Eaves Perdue, Governor
Dee Freeman, Secretary

January 22, 2010

NOTICE OF INSPECTION

Progress Energy Carolinas, Inc. – L.V. Sutton Electric Plant
Mr. R. Kent Tyndall, Environmental Specialist
801 Sutton Steam Plant Road
Wilmington, NC 28401-8357

RE: Sutton Plant 1972 Cooling Pond Dam – NEWHA-003
Sutton Plant 1971 Ash Pond Dam – NEWHA-004
Sutton Plant 1984 Ash Pond Dam – NEWHA-005
New Hanover County, North Carolina
Cape Fear River Basin

Dear Mr. Tyndall:

The Dam Safety Law of 1967, as amended, provides for the certification and inspection of dams in the interest of public health, safety and welfare, in order to reduce the risk of failure of such dams; to prevent injuries to persons, damage to property, and to insure that maintenance of stream flows.

On January 14 and 15, 2010, staff of our office met with you, Mr. Mark Frederick, Plant Manager, and staff of the L.V. Sutton Electric Plant in New Hanover County to conduct an inspection of three dams on the Progress Energy facility. These inspections revealed no apparent problems with the three dams. The following items are recommended items pertinent to continuous maintenance and operations of the dams:

Sutton Plant 1972 Cooling Pond Dam

1. Both woody and brush vegetation is heavy on the downstream slope and needs to be culled to the extent feasible. Bush hogging and mowing from the top of the slope is needed, as is tree removal of all evergreens and deciduous trees smaller than 6 inches in diameter. This will serve to prevent the formation of a root system which might significantly increase seepage through the dam which could ultimately result in failure of the structure. It would also reduce the possibility of damage to the dam due to the uprooting of trees by wind or other natural causes, and facilitate ease of inspection and increase the likelihood of early detection more serious problems connected with the dam.
2. There are steep slopes of note along the curve of the north and west facing slopes. Please monitor this area for any potential erosion or seepage problems that might occur due to that slope.

Mr. R. Kent Tyndall
January 12, 2009
Page 2 of 2

3. The toe of the north face of the downstream slope has flowing watercourses apparent fed by groundwater. Beaver dams have been constructed along at least five locations of the north toe. The elimination of those dams and removal of the northern slope trees might facilitate the relocation of the beavers.

Sutton Plant 1971 Ash Pond Dam

1. The southwestern downstream slope has heavy vegetation. Please consider the removal of all evergreens and deciduous trees smaller than 6 inches in diameter.
2. Freeboard at the pond area was very small. Please lower the water surface if possible, in order to avoid overtopping in an emergency situation.

Sutton Plant 1984 Ash Pond Dam

1. The back of the pond's dike, the eastern face had a number of animal burrows that need to be eliminated. Some pines saplings are beginning to grow and should be mowed before getting larger.
2. Areas on the north and west slopes where vegetation is sparse have signs of either erosion or slides. Most were already marked and being monitored. Please continue to monitor these areas and provide vegetation where possible.

During these inspections, we also investigated the potential for property damage and loss of life in the event that any of these dams fail. This investigation determined that failure of any of the three would result in minor property damage downstream. Therefore, we are listing all dams at this facility in the "Low Hazard" category. A copy of the Hazard Classification Data Form for each dam is enclosed.

Please be advised that though we make every reasonable effort to determine the safety of these dams, our resources limit us the surficial inspections. There is no certainty regarding the internal stability of the dam. Dams, and especially their spillways and conduits, deteriorate with age. Therefore, you are advised to keep a close watch on your dam and to notify us if you detect any changes, especially cracks, ground movements, or changes in seepage rate or color.

Your cooperation and consideration in maintaining a safe dam is appreciated. If ownership of the dams change, or if your company is not responsible for these dams, please notify us so that we can update our records. Should you have questions concerning our inspection, please contact me at (910) 796-7215.

Sincerely,



Daniel Sams, PE
Wilmington Office Regional Engineer
Land Quality Section

cc: State Dam Safety Engineer
Wilmington Regional Office File

DAM SAFETY INSPECTION REPORT

NAME SUTTON STEAM PLANT 1972 COOLING POND DAM		COUNTY NEW HAMPSHIRE	NO. 003	INSPECTED BY SAMS, JAMES, WORTHINGTON, MILLS	DATE 1/15/2010
OWNER PROGRESS ENERGY		ADDRESS 801 SUTTON STEAM PLANT ROAD, WILMINGTON 28401			PHONE 910-343-3244
TYPE DAM: <input type="checkbox"/> Concrete gravity <input type="checkbox"/> Concrete arch <input type="checkbox"/> Other <input checked="" type="checkbox"/> Embankment <input type="checkbox"/> Concrete buttress <input type="checkbox"/> Stone masonry		TYPE INSPECTION: <input checked="" type="checkbox"/> Initial <input type="checkbox"/> Followup <input type="checkbox"/> Other <input type="checkbox"/> Periodic		SITE CONDITIONS: <input checked="" type="checkbox"/> Dry <input type="checkbox"/> Snowcover <input type="checkbox"/> Other <input type="checkbox"/> Wet	
HAZARD DESCRIPTION A BREACH WOULD BE ABSORBED IN THE FLOW OF THE CAPE FEAR RIVER				HAZARD CLASS: <input checked="" type="checkbox"/> Low (A) <input type="checkbox"/> Intermediate (B) <input type="checkbox"/> High (C)	
REMARKS OVERALL THE DAM IS IN GOOD CONDITION, BUT WOODY AND WEEDY VEGETATION IS VERY THICK AND NEEDS TO BE CULLED TO MAKE INSPECTION EASIER AND MORE COMPREHENSIVE.			ACTION: <input type="checkbox"/> None <input checked="" type="checkbox"/> Maintenance <input type="checkbox"/> Monitoring <input type="checkbox"/> Minor repair <input type="checkbox"/> Engineering		RECOMMENDATIONS: <input checked="" type="checkbox"/> Inspection letter <input type="checkbox"/> Deficiency letter <input type="checkbox"/> RE notice <input type="checkbox"/> Engineering study <input type="checkbox"/> Inspection by RE <input type="checkbox"/> Inspection by DSE <input type="checkbox"/> Dam safety order <input type="checkbox"/> Enforcement <input type="checkbox"/> Periodic reinspection <input type="checkbox"/> Other reinspection
AREA	PROBLEMS		COMMENTS		
UPSTREAM SLOPE / FACE	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Displaced rip rap <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Cracks <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Undermining <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Wave erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Spans rip rap		COVER: <input type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input checked="" type="checkbox"/> Concrete <input type="checkbox"/> Asphalt <input type="checkbox"/> Other The stepped concrete slope was in good shape.		
	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Cracks <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Spalling <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Deteriorated joints <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Displaced joints <input type="checkbox"/> 5. Ruts <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Other <input type="checkbox"/> 7. Depressions <input type="checkbox"/> 8. Unlevel <input type="checkbox"/> 9. Misalignment <input type="checkbox"/> 10. Has overtopped		COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Gravel <input type="checkbox"/> Concrete <input checked="" type="checkbox"/> Asphalt <input type="checkbox"/> Other The paved access road ^{has} weathered but is overall in good shape. Its shoulders on the downstream side needs to be bushhogged.		
DOWNSTREAM SLOPE / FACE	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input checked="" type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Boils <input checked="" type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Wetness		COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other THE SLOPE IS IN GOOD SHAPE. THE CLAY LINER OPERATED WELL. WOODY AND WEEDY VEGETATION IS THICK AND NEEDS CULLING AND CLEANING. GIVEN THE LOW HAZARD CLASSIFICATION MOWING AND CLEANING CAN BE CONDUCTED FROM THE TOP AND ALLOW THE TOE VEGETATION TO REMAIN.		
	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Boils <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 10. Wetness <input checked="" type="checkbox"/> 20. Other Beaver dams		COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input checked="" type="checkbox"/> Other Standing and flowing water MOST OF THE SLOPE TOE HAS A DEPRESSION (PROBABLY THE ORIGINAL CONSTRUCTION DIP) THAT BREACHES THE HIGH WATER TABLE. AT LOCATIONS WHERE NATURAL RELIEF CREATES FLOW BEAVER DAMS HAVE BEEN CONSTRUCTED ALONG THE NORTH SLOPE AT FIVE LOCATIONS.		
TOE CONTACT					

AREA	PROBLEMS	COM' TS
ABUTMENT CONTACTS	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bells <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Damaged joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bumps <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 10. Wetness <input type="checkbox"/> 20. Other	COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input checked="" type="checkbox"/> Concrete <input type="checkbox"/> Other THE ABUTMENT IS IN GOOD SHAPE.
	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 2. No trashguard <input type="checkbox"/> 12. Undermined <input type="checkbox"/> 3. Obstructed <input type="checkbox"/> 13. Voids <input type="checkbox"/> 4. Plugged <input type="checkbox"/> 14. Erosion <input type="checkbox"/> 5. Rusted <input type="checkbox"/> 15. Holes <input type="checkbox"/> 6. Damaged <input type="checkbox"/> 16. Conduit collapsed <input type="checkbox"/> 7. Gates leaking <input type="checkbox"/> 17. Spalling <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 18. Outlet undercutting <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 19. Misalignment <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 20. Other	TYPE/SIZE: SPILLWAY AND WEIR THE SPILLWAY IS IN GOOD SHAPE.
EMERGENCY SPILLWAY	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 2. No ES <input type="checkbox"/> 12. Undermining <input type="checkbox"/> 3. Same as PS <input type="checkbox"/> 13. Voids <input type="checkbox"/> 4. Obstructed <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 6. Damaged rip rap <input type="checkbox"/> 16. Spalling <input type="checkbox"/> 7. Spares rip rap <input type="checkbox"/> 17. Outlet erosion <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 18. Misalignment <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 19. Inadequate capacity <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 20. Other	TYPE/SIZE: NONE
DRAINS / OTHER OUTLETS	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. No bottom drain <input type="checkbox"/> 3. Bottom drain inoperable <input type="checkbox"/> 4. Subsurface drain dry <input type="checkbox"/> 5. Subsurface drain muddy flow <input type="checkbox"/> 6. Subsurface drain obstructed <input type="checkbox"/> 7. No animal guard <input type="checkbox"/> 8. Other	TYPE: NONE

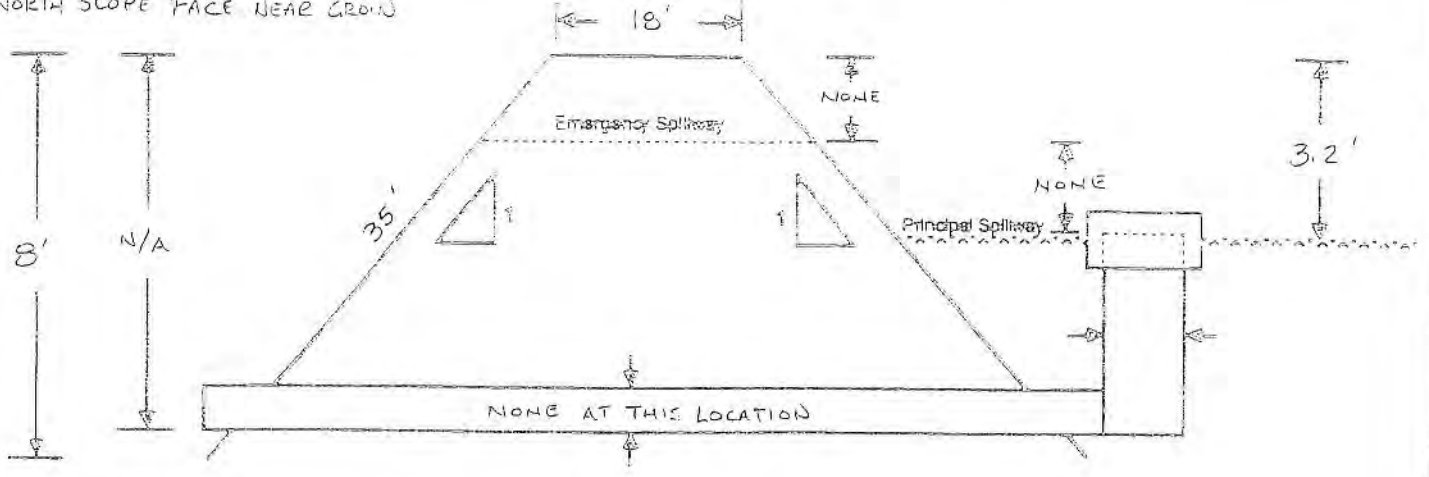
SKETCHES/COMMENTS

EMBANKMENT DAM SKETCHES AND MEASUREMENTS

NAME SUTTON STEAM PLANT 1972 COOLING POND DAM	COUNTY NEW HAMPSHIRE	NO. 003	INSPECTED BY SAMS, JAMES, MILLS, DW	DATE 1/15/2010
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EMBANKMENT CROSS SECTION

NORTH SLOPE FACE NEAR CROWN

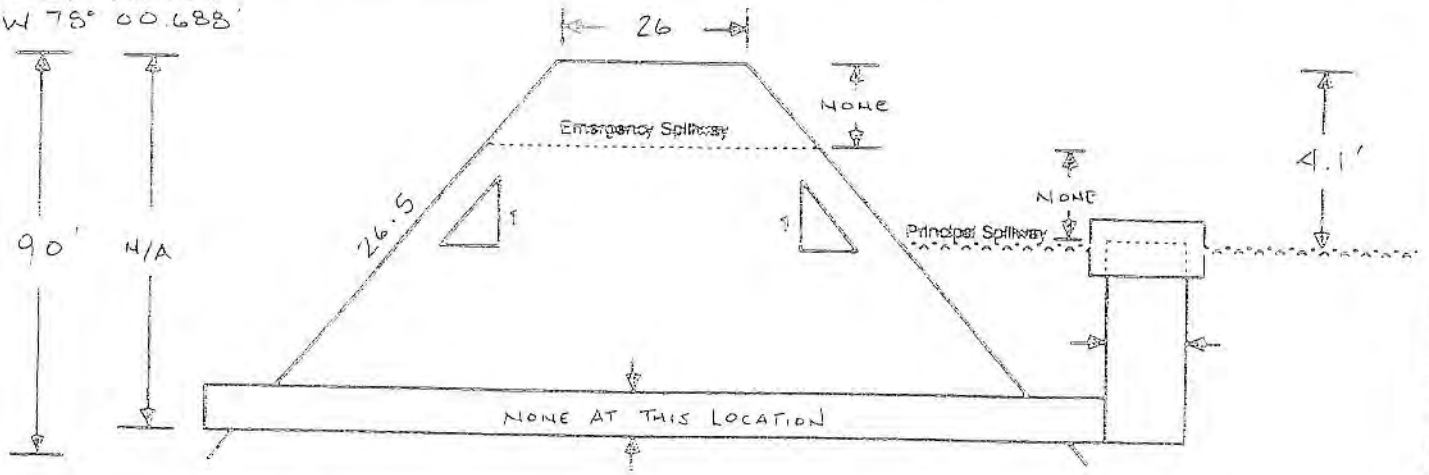


EMBANKMENT DAM SKETCHES AND MEASUREMENTS

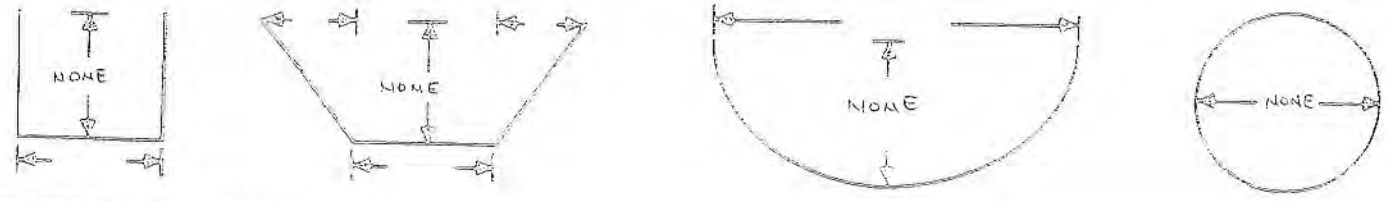
NAME SUTTON STEAM PLANT 1972 COOLING POND WEST SLOPE	COUNTY NEW HAMPSHIRE	NO. 003	INSPECTED BY SAMS, JAMES, WORTHINGTON	DATE 1/15/2010
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EMBANKMENT CROSS SECTION

N 34° 18' 16.4"
W 78° 00' 6.88"

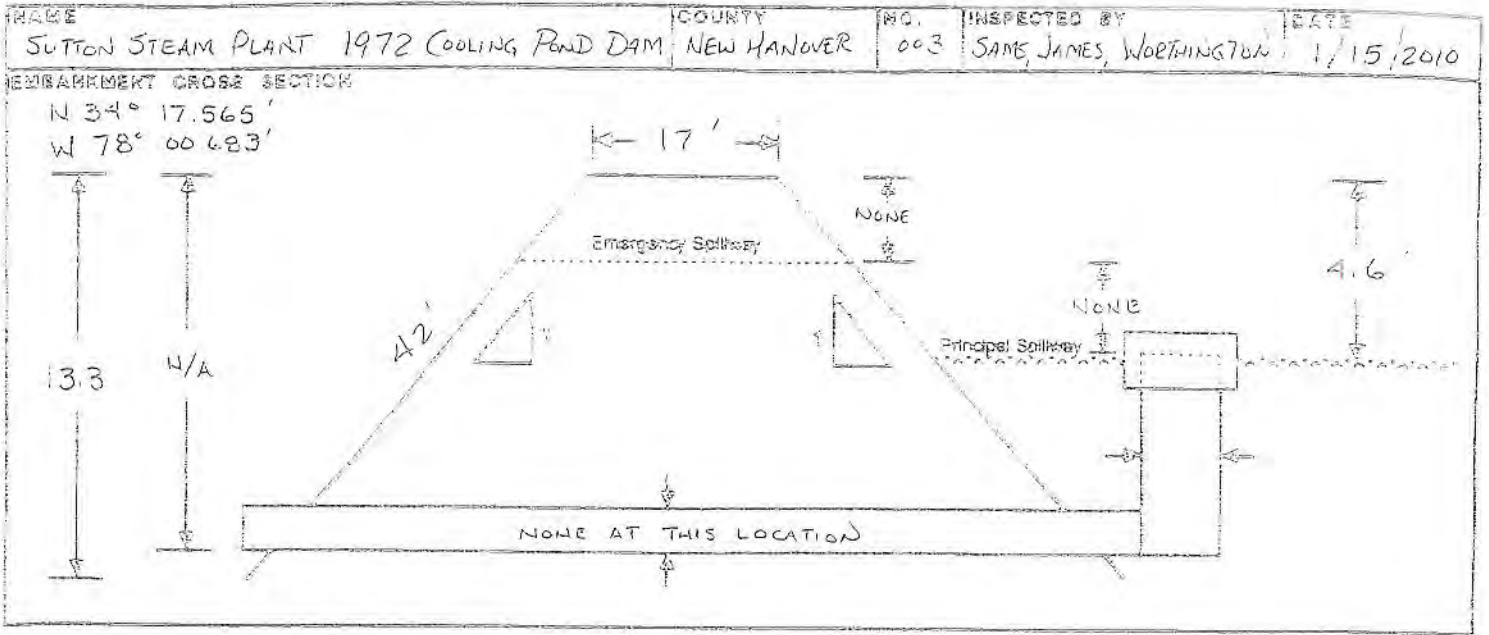


EMERGENCY SPILLWAY CROSS SECTION

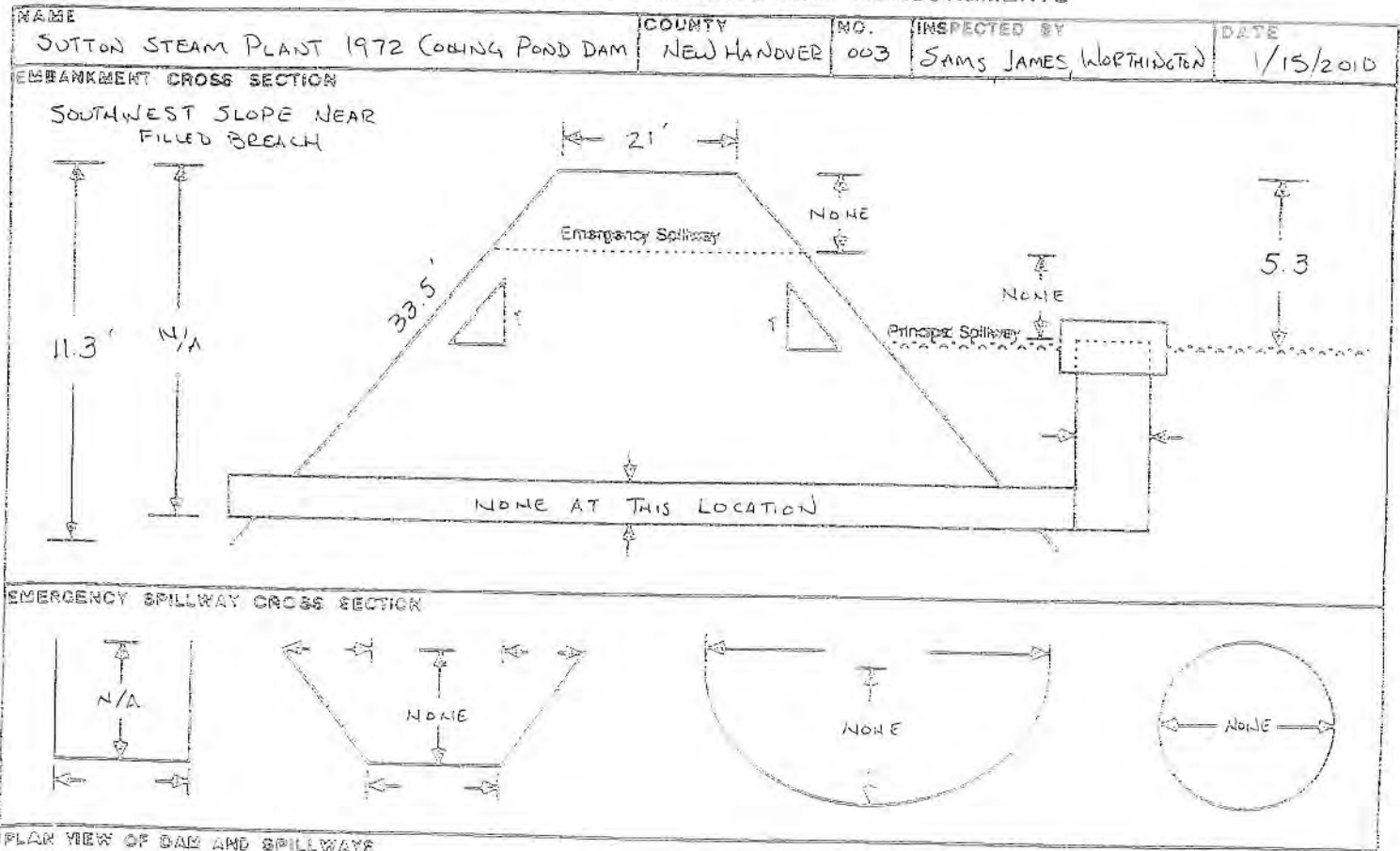


PLAN VIEW OF DAM AND SPILLWAYS

EMBANKMENT DAM SKETCHES AND MEASUREMENTS

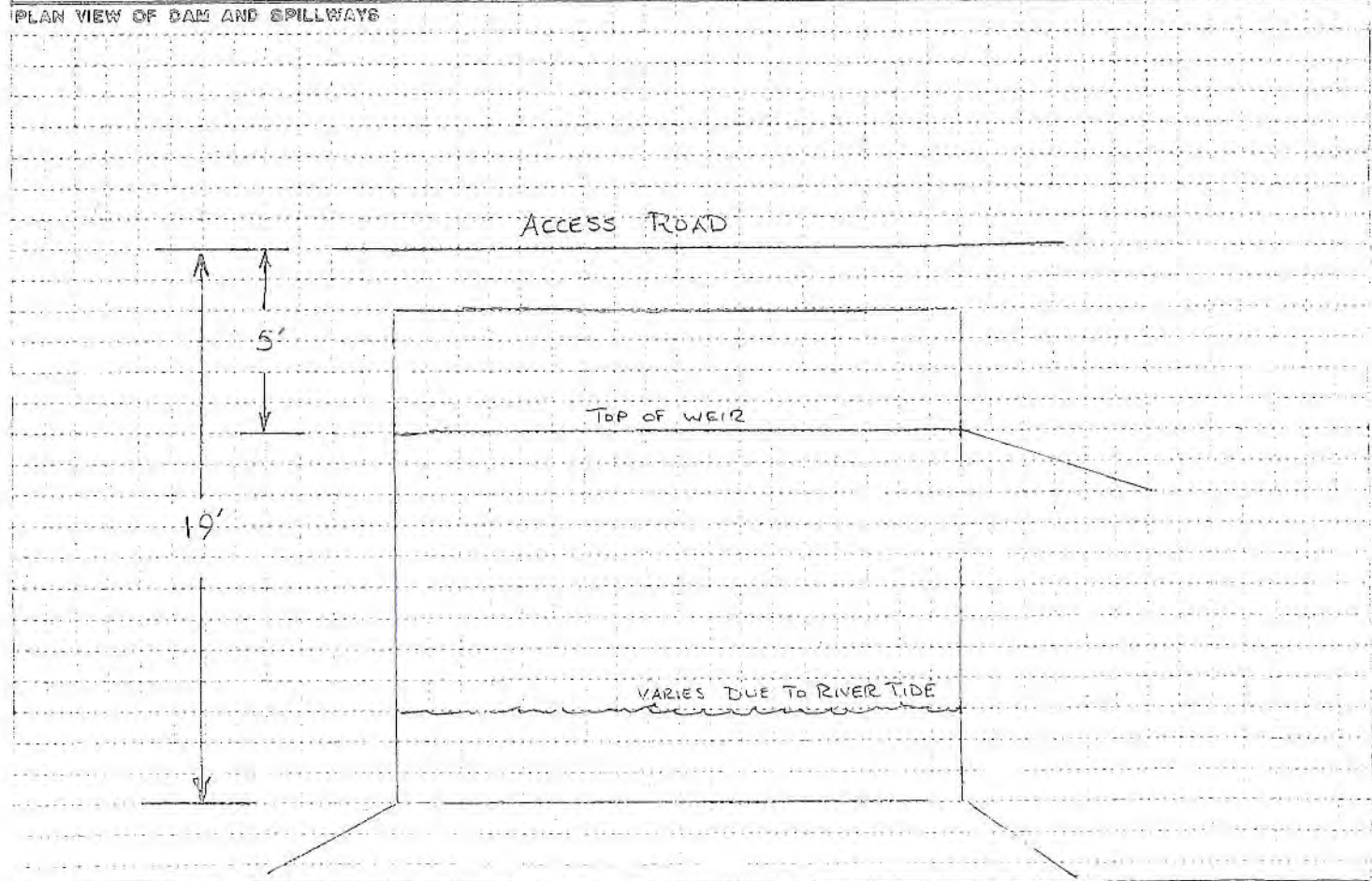
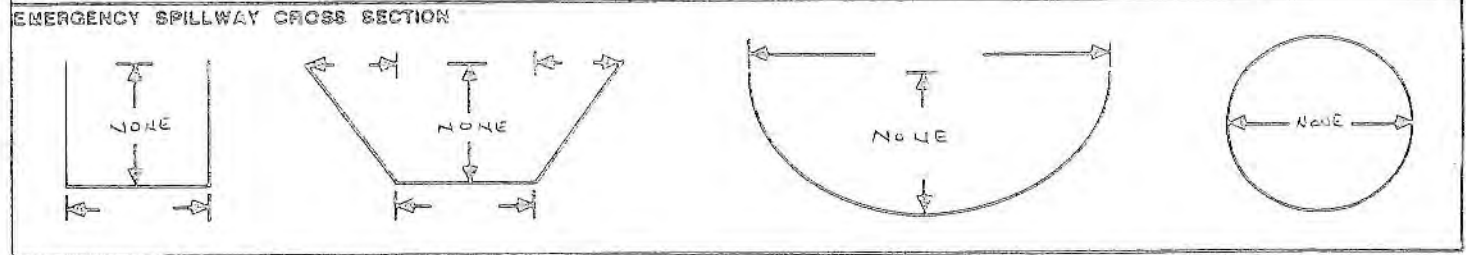
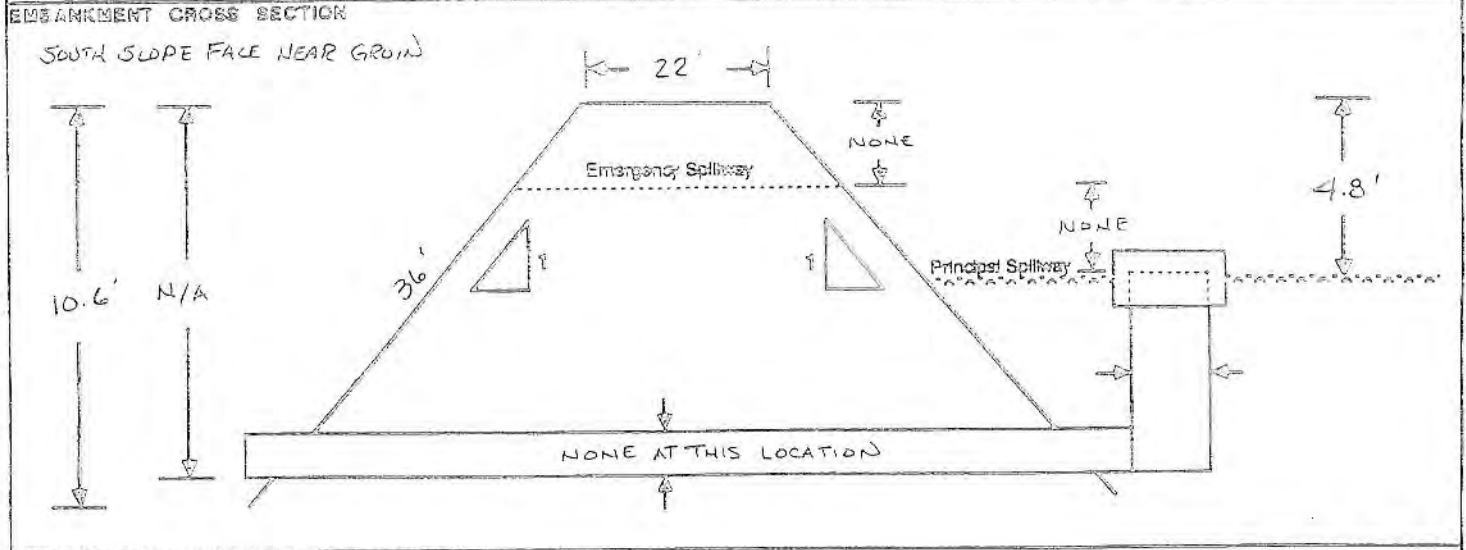


EMBANKMENT DAM SKETCHES AND MEASUREMENTS



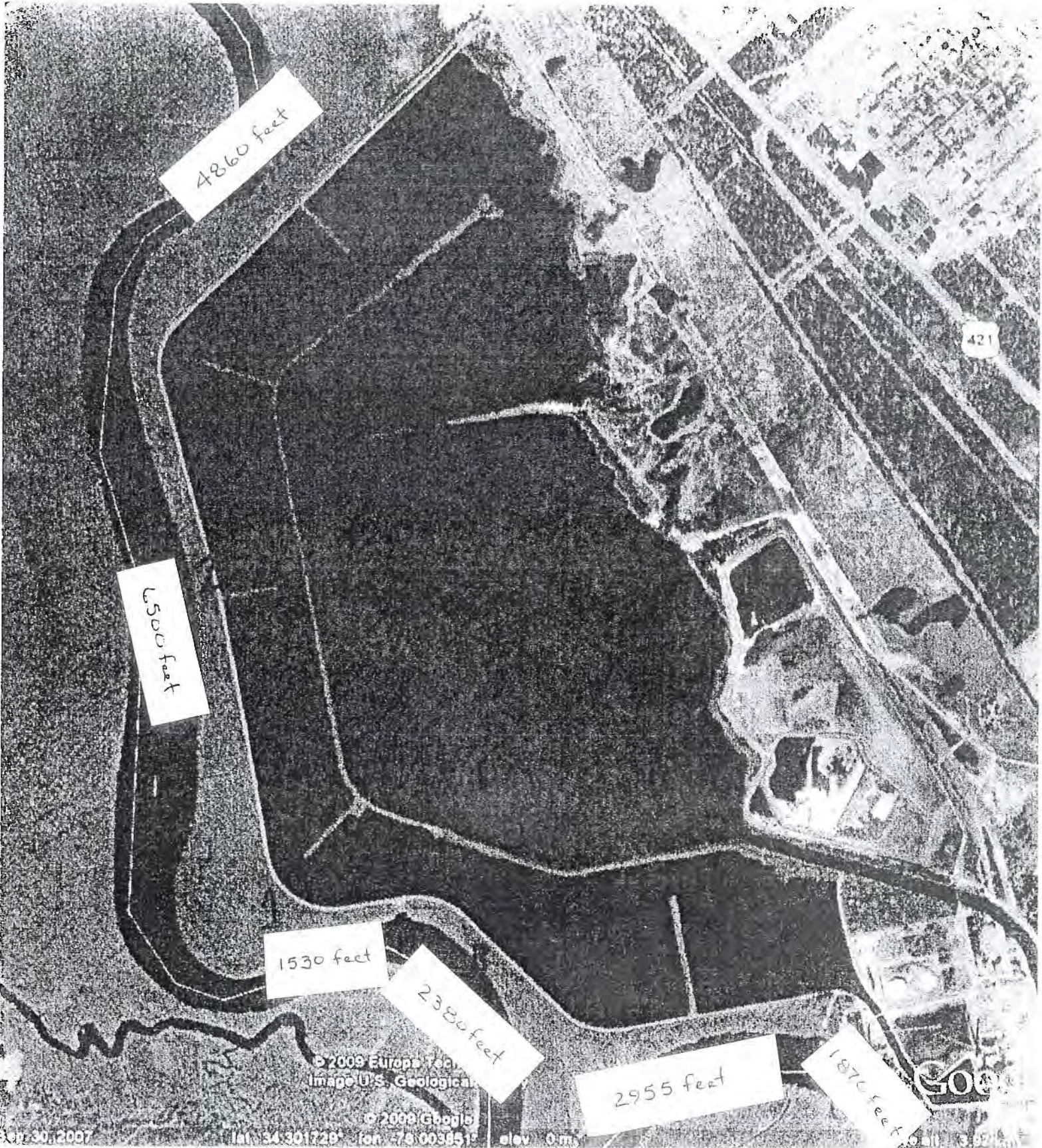
EMBANKMENT DAM SKETCHES AND MEASUREMENTS

NAME SUTTON STEAM PLANT 1972 COOLING POND DAM	COUNTY NEW HANOVER	NO. 003	INSPECTED BY SAMS, JAMES, WORTHINGTON, MISS	DATE 1/15/2010
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EMBANKMENT DAM SKETCHES AND MEASUREMENTS

NAME	COUNTY	NO.	INSPECTED BY	DATE
SUTTON PLANT 1972 COOLING POND DAM	NEW HANOVER	003	SAMS, JAMES, MILLS, et al	1/15/2010



REPORT DEVELOPED BY DATA FROM THE YEAR

DAM NAME: SUTTON PLANT ¹⁹⁷² COOLING POND DAM COUNTY: NEW HAMPSHIRE PROJECT: NEW HA-003
 POWER STREAM: CAPE FEAR RIVER TOWN: LELAND
 DAM HEIGHT: 19 feet IMPACT AREA AFFECTED: 1100 acres STORAGE CAPACITY: 6,900 ACRES FT.

PRIMARY DOWNSTREAM DAM TYPE:

W/ DAMS RESIDENTIAL ACCIDENTAL INDUSTRIAL / COMMERCIAL

DOWNSTREAM IMPROVEMENT:

SWELLING BUILDINGS FLOOD UTILITIES

DOWNSTREAM IMPROVEMENT DATA:

Type Improvement	Distance Downstream	Floodplain Width	Channel slope	Elevation Above Floodplain	Breach Wave Elevation	Culvert Bridge Dimensions	Coefficient Count	Wight Distance
NONE, RECEIVING WATER COURSE CAPE FEAR RIVER	PRIMARY DISCHARGE IN RIVER	VARIABLES	VARIABLES	4 to 12 feet dependent upon tide	NOT KNOWN	NOT APPLICABLE	NONE	N/A

DESCRIBE POTENTIAL FOR LOSS OF LIFE AND STRUCTURAL OR ENVIRONMENTAL DAMAGE TO EXISTING OR POTENTIAL FUTURE DOWNSTREAM IMPROVEMENTS: THE COOLING POND WATER SURFACE HEIGHT IS BETWEEN 9 TO 12 FEET HIGHER THAN THE WATER SURFACE OF THE CAPE FEAR RIVER, DEPENDING UPON THE TIDE OF THE RIVER. THE WATER OF THE COOLING POND MUST CONTINUALLY MEET NPDES REQUIREMENTS AS AUTHORIZED BY N.C. DENR DIVISION OF WATER QUALITY. GIVEN THAT THE POND INTAKE FROM THE CAPE FEAR RIVER BALANCES BOTH WATER TEMPERATURE AND NUTRIENT LEVELS OF THE COOLING POND TO THAT OF THE SURROUNDING SYSTEM, A BREACH WOULD NOT APPEAR TO POSE AN ENVIRONMENTAL RISK. THE RIVER CAN ABSORB THE DIFFERENTIAL VOLUME OF THE POND.

RECOMMENDED HAZARD CLASSIFICATION: LOW INTERMEDIATE HIGH
 BY: Daniel J. Jones TITLE: WILMINGTON REG. ENGR. DATE: 1/15/2010
 CHECKED BY: A. R. [Signature] TITLE: STATE DAM SAFETY ENGR. DATE: 1/15/2010

DAM SAFETY INSPECTION REPORT

NAME SUTTON STEAM PLANT 1984 ASH POND	1971	COUNTY NEW HANOVER	NO. 004	INSPECTED BY SAMS, MCEVOY, JAMES, etc	DATE 1/14/15/2010
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OWNER PROGRESS ENERGY	ADDRESS 801 SUTTON STEAM PLANT ROAD, WILMINGTON NC	PHONE 910-343-3244
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TYPE DAM <input type="checkbox"/> Concrete gravity <input type="checkbox"/> Concrete arch <input type="checkbox"/> Oms: <input checked="" type="checkbox"/> Embankment <input type="checkbox"/> Concrete buttress <input type="checkbox"/> Stone masonry	TYPE INSPECTION <input checked="" type="checkbox"/> Initial <input type="checkbox"/> Followup <input type="checkbox"/> Other	SITE CONDITIONS <input checked="" type="checkbox"/> Dry <input type="checkbox"/> Snowcover <input type="checkbox"/> Wet <input type="checkbox"/> Other
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HAZARD DESCRIPTION ALL FLOW IN THE EVENT OF A BREACH GOES TO THE COOLING POND	HAZARD CLASS <input checked="" type="checkbox"/> Low (A) <input type="checkbox"/> Intermediate (B) <input type="checkbox"/> High (C)
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REMARKS THE DIKE IS IN GOOD SHAPE WE WERE UNABLE TO INSPECT THE OUTFALL CULVERT BECAUSE IT IS SUBMERGED IN THE COOLING POND. ALL WOODY VEGETATION LESS THAN 6 INCHES ALONG THE SOUTHWEST FACE OF THE DIKE SHOULD BE REMOVED.	ACTION <input type="checkbox"/> None <input checked="" type="checkbox"/> Maintenance <input type="checkbox"/> Monitoring <input type="checkbox"/> Minor repair <input type="checkbox"/> Engineering	RECOMMENDATIONS <input checked="" type="checkbox"/> Inspection letter <input type="checkbox"/> Deficiency letter <input type="checkbox"/> RE notice <input type="checkbox"/> Engineering study <input type="checkbox"/> Inspection by RE <input type="checkbox"/> Inspection by DSE <input type="checkbox"/> Dam safety order <input type="checkbox"/> Enforcement <input type="checkbox"/> Periodic reinspection <input type="checkbox"/> Other reinspection
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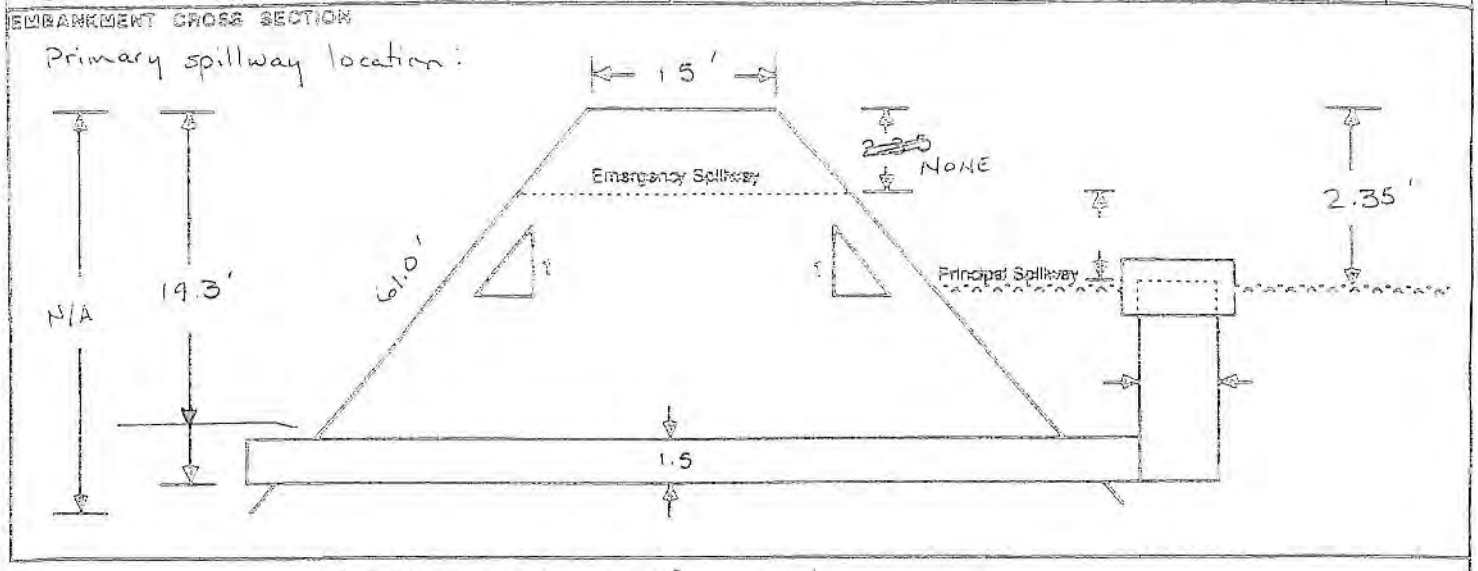
AREA	PROBLEMS	COMMENTS
UPSTREAM SLOPE / FACE	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Displaced rip rap <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Cracks <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Undermining <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Wave erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Sparse rip rap	COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Asphalt <input type="checkbox"/> Other ASH STORAGE HAS DISPLACED MOST OF THE PONDING AREA BUT A SMALL AREA FOR TANK FARM STORM WATER RETENTION REMAINED. FREE BOARD HEIGHT IS LOW. IF STORMWATER RUNOFF TO THE POND CAN BE REDUCED, IT WOULD BE DESIRABLE TO INCREASE FREEBOARD (NOT REQUIRED).
TOP OF DAM	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Cracks <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Spalling <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Deteriorated joints <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Displaced joints <input type="checkbox"/> 5. Ruts <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Other <input type="checkbox"/> 7. Depressions <input type="checkbox"/> 8. Unlevel <input type="checkbox"/> 9. Misalignment <input type="checkbox"/> 10. Has overtopped	COVER: <input checked="" type="checkbox"/> Vegetation <input checked="" type="checkbox"/> Gravel <input type="checkbox"/> Concrete <input type="checkbox"/> Asphalt <input type="checkbox"/> Other THE ACCESS ROAD ALONG THE TOP IS IN GOOD SHAPE.
DOWNSTREAM SLOPE / FACE	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input checked="" type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bolls <input checked="" type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Wetness	COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other THE OPEN SLOPES DOWNSTREAM ARE IN GOOD SHAPE. ANY EFFORTS TO INCREASE THE DENSITY OF GRASS ENVIRONMENT, TOPDRESSING, ADDITIONAL SOIL AMENDMENTS, VARIATION OF GRASS TYPES, WOULD BE APPRECIATED. THE SOUTHWEST SLOPE SECTION HAS EXCESSIVE WOODY AND BRUSH VEGETATION THAT SHOULD BE REMOVED FOR BOTH STRUCTURAL SECURITY OF THE DAM AND FOR BETTER INSPECTIONS. PLEASE REMOVE ALL WOODY VEGETATION UNDER 6" IN DIAMETER, AND LARGER EVERGREENS.
TOP CONTACT	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input checked="" type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bolls <input checked="" type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 10. Wetness <input type="checkbox"/> 20. Othrs	COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other WHERE THE TOE CAN BE INSPECTED IT IS IN GOOD SHAPE. THE EAST SLOPE (SHARED WITH THE 1984 ASH POND) HAS SOME BURROW ACTIVITY (MOST IS ON THE 1984 SECTION). THE VEGETATION NOTED ON THE SOUTHWEST SLOPE ABOVE EXTENDS ONTO THE SLOPE. BRUSH VEGETATION SHOULD BE REMOVED TO PROVIDE BETTER INSPECTIONS.

AREA	PROBLEMS	COR	TS
ABUTMENT CONTACTS	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. Trees <input type="checkbox"/> 3. High brush <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 7. Slides <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 9. Buttes <input type="checkbox"/> 10. Wetness <input type="checkbox"/> 11. Seepage <input type="checkbox"/> 12. Bolls <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 14. Holes <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 20. Other	COVER: <input type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other	<p>THE IMPOUNDMENT IS A COMPREHENSIVE PERIMETER, THERE IS NO ABUTMENT.</p>
	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. No trashguard <input type="checkbox"/> 3. Obstructed <input type="checkbox"/> 4. Plugged <input type="checkbox"/> 5. Rusted <input type="checkbox"/> 6. Damaged <input type="checkbox"/> 7. Gates leaking <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 12. Undermined <input type="checkbox"/> 13. Voids <input type="checkbox"/> 14. Erosion <input type="checkbox"/> 15. Holes <input type="checkbox"/> 16. Conduit collapsed <input type="checkbox"/> 17. Spalling <input type="checkbox"/> 18. Outlet undercutting <input type="checkbox"/> 19. Misalignment <input type="checkbox"/> 20. Other	TYPE/SIZE: RISER / BARREL STRUCTURE	<p>NO PROBLEMS WITH THE RISER, INTAKE. THE OUTFALL COULD NOT BE INSPECTED BECAUSE IT IS LOCATED UNDERWATER OF THE RECEIVING COOLING POND.</p>
EMERGENCY SPILLWAY	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. No ES <input type="checkbox"/> 3. Same as PS <input type="checkbox"/> 4. Obstructed <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 6. Displaced rip rap <input type="checkbox"/> 7. Spared rip rap <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 12. Undermining <input type="checkbox"/> 13. Voids <input type="checkbox"/> 14. Holes <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 16. Spalling <input type="checkbox"/> 17. Outlet erosion <input type="checkbox"/> 18. Misalignment <input type="checkbox"/> 19. Insufficient capacity <input type="checkbox"/> 20. Other	TYPE/SIZE: NONE	
	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. No bottom drain <input type="checkbox"/> 3. Bottom drain inoperable <input type="checkbox"/> 4. Subsurface drain dry <input type="checkbox"/> 5. Subsurface drain muddy flow <input type="checkbox"/> 6. Subsurface drain obstructed <input type="checkbox"/> 7. No animal guard <input type="checkbox"/> 8. Other	TYPE: NONE	

SKETCHES/COMMENTS

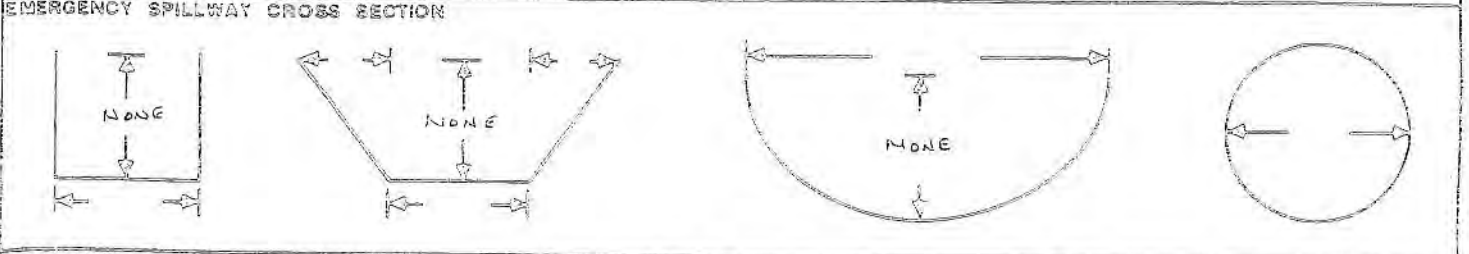
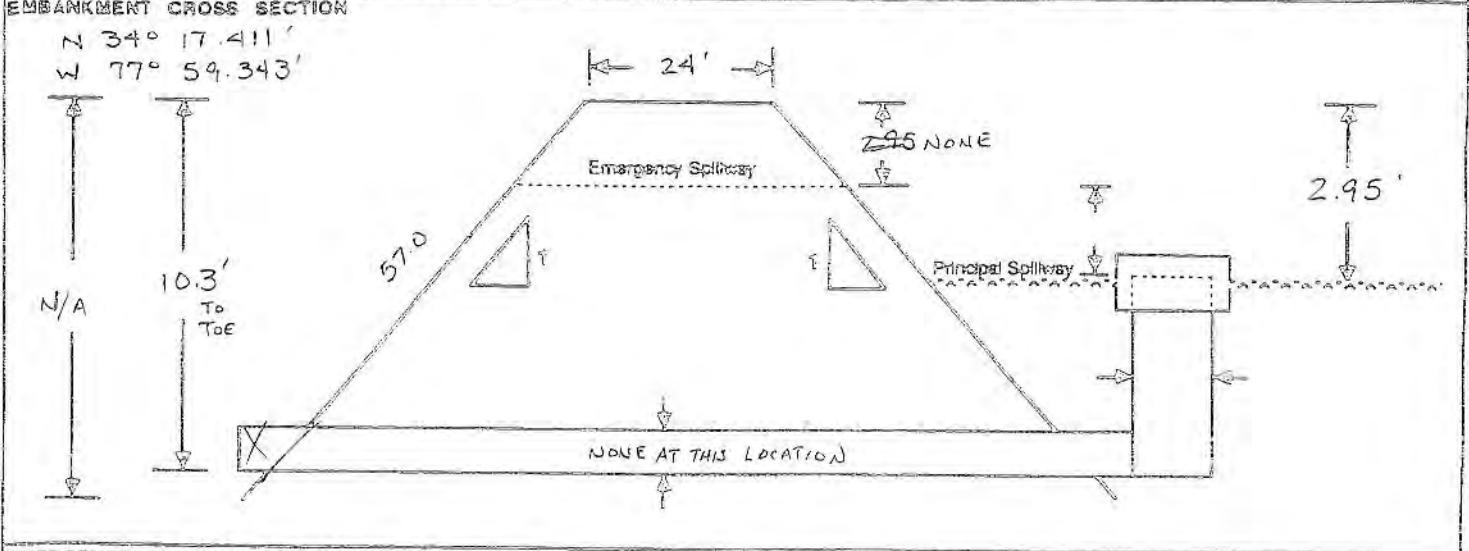
EMBANKMENT DAM SKETCHES AND MEASUREMENTS

NAME SUTTON PLANT 1971 ASH POND DAM	COUNTY NEW HAMPSHIRE	NO. 004	INSPECTED BY JAMES WORTHINGTON	DATE 1/15/2010
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EMBANKMENT DAM SKETCHES AND MEASUREMENTS

NAME SOUTHWEST SLOPE LOCATION (1971 Ash Pond)	COUNTY NEW HAMPSHIRE	NO. 004	INSPECTED BY JAMES WORTHINGTON	DATE 1/15/2010
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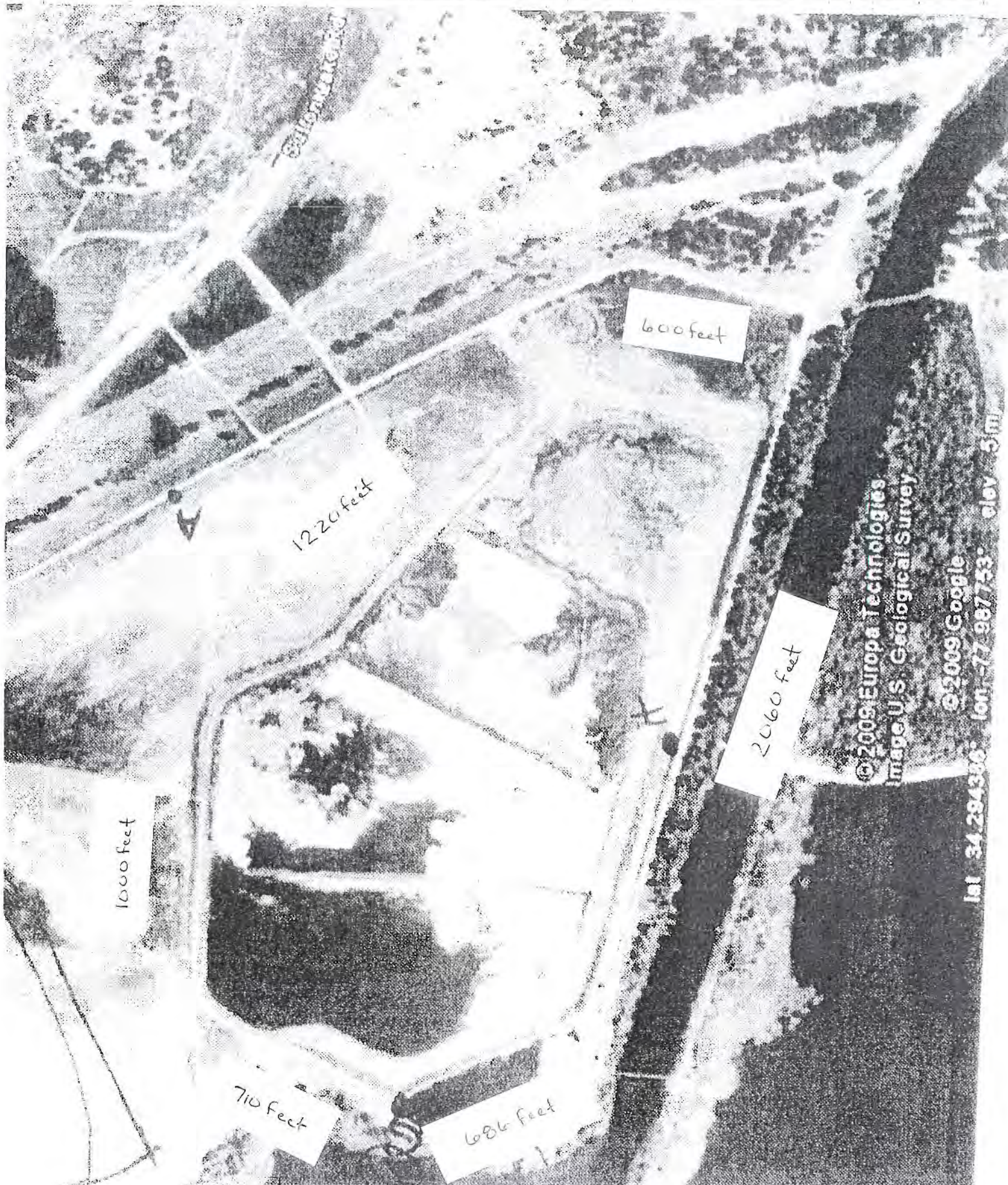


PLAN VIEW OF DAM AND SPILLWAYS

James Worthington

SKETCHES AND MEASUREMENTS

NAME	COUNTY	NO.	INSPECTED BY	DATE
SUTTON STEAM PLANT 1971 ASH POND	NEW HANOVER	004	SAMS, JAMES, WORTHINGTON	1/14/15/2010



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©2009 Google

lat 34.294388 lon -77.987753 elev 5m

HAZARD CLASSIFICATION DATA FORM FOR DAMS

DAM NAME SUTTON PLANT 1971 ASH POND DAM COUNTY NEW HAMPSHIRE NUMBER NA04A-004
 RIVER/STREAM SUTTON PLANT 1972 COOLING POND QUADRANGLE CASTLE WAYNE
 DAM HEIGHT 19 feet SURFACE AREA (ACRES) 28 acres STORAGE CAPACITY (ACR. FT.) 248

PRIMARY DOWNSTREAM LAND USE:

WOODLAND AGRICULTURAL RESIDENTIAL INDUSTRIAL/COMMERCIAL

DOWNSTREAM IMPROVEMENTS:

DWELLINGS BUILDINGS ROADS UTILITIES

DOWNSTREAM IMPROVEMENT DATA:

Type Improvement	Distance Downstream	Floodplain Width	Channel Slope	Elevation Above Floodplain	Breach Wave Elevation	Culvert/Bridge Dimensions	Traffic Count	Sight Distance
ON-SITE COOLING POND	PRIMARY DISCHARGE IN POND	INDETERMINATE POND SURFACE AREA 6,900 ACRES	NOT APPLICABLE	N/A	N/A	NONE	NONE	N/A

DESCRIBE POTENTIAL FOR LOSS OF LIFE AND STRUCTURAL OR ENVIRONMENTAL DAMAGE TO EXISTING OR POTENTIAL FUTURE DOWNSTREAM IMPROVEMENTS: THE ASH POND DISCHARGE MUST MEET NCDENR DIVISION OF WATER QUALITY NPDES REQUIREMENTS AND IS CONTINUALLY MONITORED. A CATASTROPHIC BREACH WOULD APPEAR TO BE CONFINED TO THE RECEIVING SUTTON PLANT 1972 COOLING POND. A BREACH AND RESULTING NECESSARY CLEAN UP ~~WOULD~~ MAY SUSPEND OPERATIONS OF THE SUTTON PLANT, BUT WOULD NOT AFFECT ELECTRICAL SERVICE BECAUSE THE EXISTING POWER GRID SHOULD COMPENSATE. IF THE COMPOSITION OF THE POND'S COAL ASH IS NOT DESIGNATED HAZARDOUS, A DAM FAILURE HERE DOES NOT PRESENT AN ENVIRONMENTAL OR LIFE THREATENING CIRCUMSTANCE.

RECOMMENDED HAZARD CLASSIFICATION: LOW INTERMEDIATE HIGH
 BY Daniel Jones TITLE WINNINGTON REG. ENGR. DATE 1/15/2010
 CONCURRED BY [Signature] TITLE STATE DAM SAFETY ENGR. DATE 1/15/2010

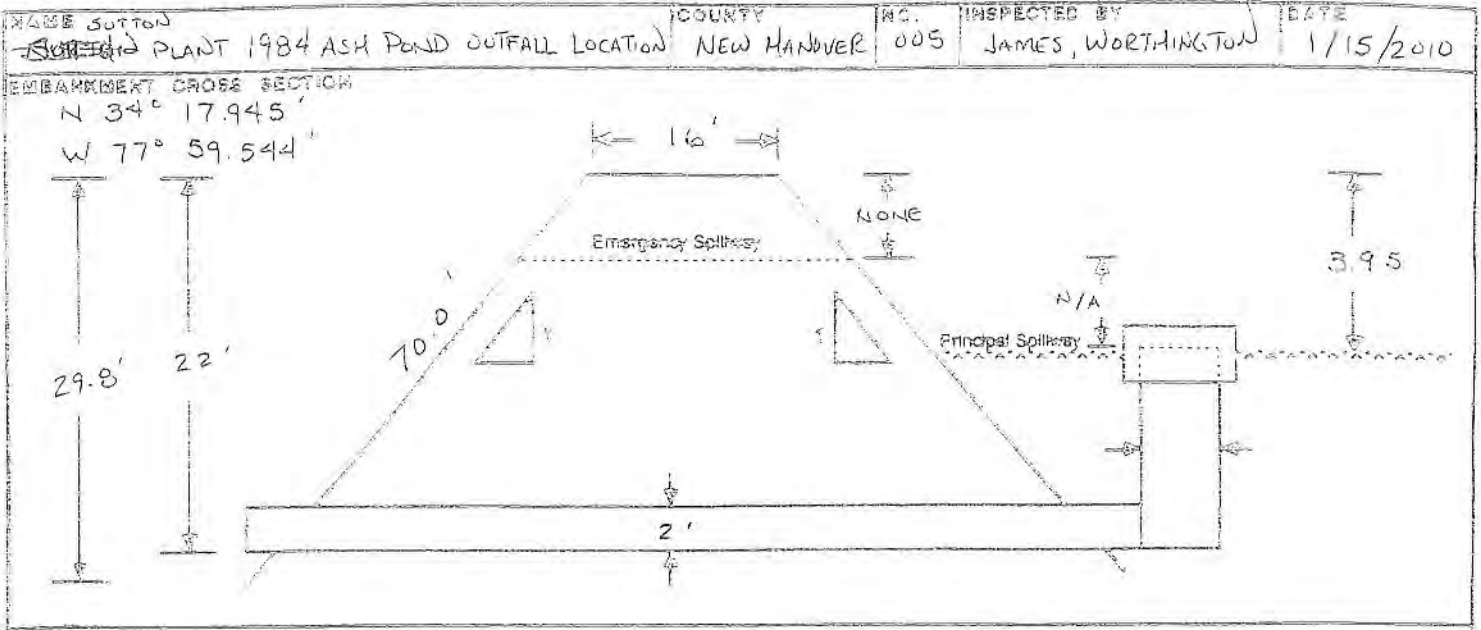
DAM SAFETY INSPECTION REPORT

NAME SUTTON STEAM PLANT 1984 ASH POND		COUNTY NEW HANOVER	NO. 005	INSPECTED BY SAMS MCEVOY, JAMES etd	DATE 1/14/15/2010
OWNER PROGRESS ENERGY		ADDRESS 801 SUTTON STEAM PLANT ROAD, WILMINGTON, NC			PHONE 910-343-3244
TYPE DAM <input checked="" type="checkbox"/> Embankment <input type="checkbox"/> Concrete gravity <input type="checkbox"/> Concrete arch <input type="checkbox"/> Other <input type="checkbox"/> Concrete buttress <input type="checkbox"/> Stone masonry		TYPE INSPECTION <input checked="" type="checkbox"/> Initial <input type="checkbox"/> Follow-up <input type="checkbox"/> Periodic <input type="checkbox"/> Other		SITE CONDITIONS <input checked="" type="checkbox"/> Dry <input type="checkbox"/> Snowcover <input type="checkbox"/> Wet <input type="checkbox"/> Other	
HAZARD DESCRIPTION ALL FLOW IN THE EVENT OF A BREACH GOES TO THE COOLING POND				HAZARD CLASS <input checked="" type="checkbox"/> Low (A) <input type="checkbox"/> Intermediate (B) <input type="checkbox"/> High (C)	
REMARKS THE DIKE IS IN GOOD SHAPE THE BACK SIDE (THE EAST FACING SLOPE) HAS A NUMBER OF BURROWS THAT NEEDS TO BE ELIMINATED. THE NORTH AND WEST SLOPES HAS SPARSE VEGETATION AND POSSIBLY A SMALL BULGE THAT NEEDS ADDITIONAL COVER.			ACTION <input type="checkbox"/> None <input checked="" type="checkbox"/> Maintenance <input type="checkbox"/> Monitoring <input type="checkbox"/> Minor repair <input type="checkbox"/> Engineering	RECOMMENDATIONS <input checked="" type="checkbox"/> Inspection letter <input type="checkbox"/> Deficiency letter <input type="checkbox"/> RE notice <input type="checkbox"/> Engineering study <input type="checkbox"/> Inspection by RE <input type="checkbox"/> Inspection by DSE <input type="checkbox"/> Dam safety order <input type="checkbox"/> Enforcement <input type="checkbox"/> Periodic reinspection <input type="checkbox"/> Other reinspection	
AREA	PROBLEMS		COMMENTS		
UPSTREAM SLOPE / FACE	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Displaced rip rap <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Cracks <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Undermining <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Wave erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Sparse rip rap		COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Asphalt <input type="checkbox"/> Other THE UPSTREAM IS IN GOOD SHAPE. THE FREEBOARD IS A REASONABLE HEIGHT.		
TOP OF DAM	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Cracks <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Spalling <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Deteriorated joints <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Displaced joints <input type="checkbox"/> 5. Ruts <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Other <input type="checkbox"/> 7. Depressions <input type="checkbox"/> 8. Unlevel <input type="checkbox"/> 9. Misalignment <input type="checkbox"/> 10. Has overlapped		COVER: <input checked="" type="checkbox"/> Vegetation <input checked="" type="checkbox"/> Gravel <input type="checkbox"/> Concrete <input type="checkbox"/> Asphalt <input type="checkbox"/> Other THE ACCESS ROAD ALONG THE TOP IS IN GOOD SHAPE.		
DOWNSTREAM SLOPE / FACE	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bolls <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input checked="" type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input checked="" type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input checked="" type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Other <input type="checkbox"/> 10. Wet areas		COVER: <input checked="" type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other THE EAST WALL OF DIKE HAS A NUMBER OF BURROW LOCATIONS: 1. N 34° 17' 49.86" W 77° 59' 19.63" 2. N 34° 17' 49.69" W 77° 59' 16.48" 3. N 34° 17' 50.07" W 77° 59' 16.76" 4. N 34° 17' 51.89" W 77° 59' 17.27" 5. N 34° 17' 52.15" W 77° 59' 17.40" PLEASE ADDRESS THESE BURROWS. AREAS ALONG THE NORTH AND WEST SLOPES NEED ADDITIONAL VEGETATION. A POSSIBLE SLIDE AND BULGE BETWEEN THE RISER/BARREL AND THE INTERSECT WITH THE 1971 DAM SHOULD BE MONITORED.		
TOE CONTACT	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input checked="" type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bolls <input checked="" type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bulges <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 10. Wet areas <input type="checkbox"/> 20. Other		COVER: <input type="checkbox"/> Vegetation <input type="checkbox"/> Rip rap <input type="checkbox"/> Concrete <input type="checkbox"/> Other THE EAST SLOPE IS EASILY ACCESSIBLE AND IN GOOD SHAPE. THE NORTH SLOPE HAS TREES BUT IS STILL EASILY ACCESSIBLE. THE WEST SLOPE (THE COOLING POND SIDE) HAS HEAVY BRUSH, THICKETS AND SMALL TREES THAT HAMPER THE INSPECTION. PLEASE REMOVE ALL VINE-LIKE VEGETATION AND THICKETS, REMOVE BRUSH, BUSHES AND TREES THAT HAMPER ACCESSIBILITY.		

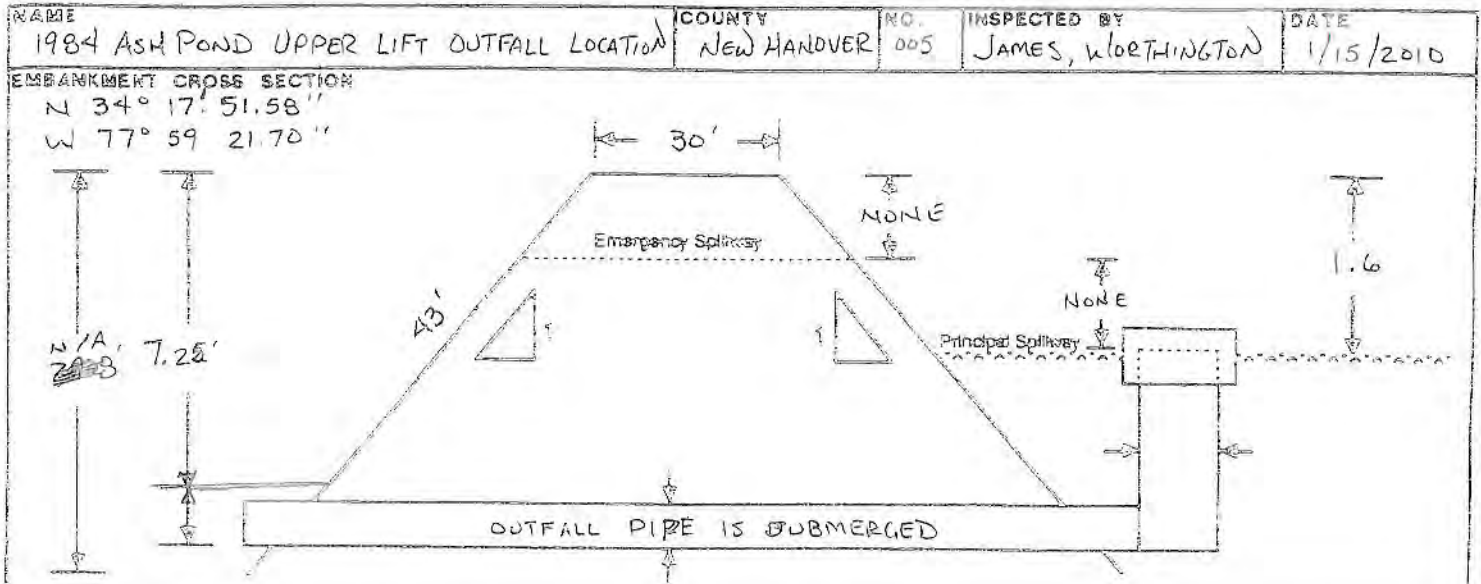
AREA	PROBLEMS	CONCRETE
ABUTMENT CONTACTS	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Seepage <input type="checkbox"/> 2. Trees <input type="checkbox"/> 12. Bolts <input type="checkbox"/> 3. High bushes <input type="checkbox"/> 13. Cracks <input type="checkbox"/> 4. Burrows <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Spalling <input type="checkbox"/> 6. Livestock damage <input type="checkbox"/> 16. Displaced joints <input type="checkbox"/> 7. Slides <input type="checkbox"/> 17. Deteriorated joints <input type="checkbox"/> 8. Depressions <input type="checkbox"/> 18. Exposed reinforcement <input type="checkbox"/> 9. Bumps <input type="checkbox"/> 19. Undermining <input type="checkbox"/> 10. Wetness <input type="checkbox"/> 20. Other	COVER: <input type="checkbox"/> Vegetation <input type="checkbox"/> Riprap <input type="checkbox"/> Concrete <input type="checkbox"/> Other THE IMPOUNDMENT IS A COMPREHENSIVE PERIMETER; THERE ARE NO ABUTMENTS
PRINCIPAL SPILLWAY	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 2. No trashguard <input type="checkbox"/> 12. Undermined <input type="checkbox"/> 3. Obstructed <input type="checkbox"/> 13. Voids <input type="checkbox"/> 4. Plugged <input type="checkbox"/> 14. Erosion <input type="checkbox"/> 5. Rusted <input type="checkbox"/> 15. Holes <input type="checkbox"/> 6. Damaged <input type="checkbox"/> 16. Conduit collapsed <input type="checkbox"/> 7. Gates leaking <input type="checkbox"/> 17. Spalling <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 18. Outlet undercutting <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 19. Misalignment <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 20. Other	TYPE/SIZE: RISER/BARREL WITH A SUSPENDED WEIR AS AN OUTFALL THE WATERFALL DISCHARGE OVER THE WEIR COULD PRESENT A LONG TERM STABILITY PROBLEM FOR THE OPEN CONCRETE TROUGH THAT DISCHARGES THE WATER INTO THE COOLING POND. PLEASE CONTINUE TO MONITOR.
EMERGENCY SPILLWAY	<input type="checkbox"/> 1. None <input type="checkbox"/> 11. Joint displacement <input type="checkbox"/> 2. No ES <input type="checkbox"/> 12. Undermining <input type="checkbox"/> 3. Same as PS <input type="checkbox"/> 13. Voids <input type="checkbox"/> 4. Obstructed <input type="checkbox"/> 14. Holes <input type="checkbox"/> 5. Erosion <input type="checkbox"/> 15. Exposed reinforcement <input type="checkbox"/> 6. Displaced rip rap <input type="checkbox"/> 16. Spalling <input type="checkbox"/> 7. Spares rip rap <input type="checkbox"/> 17. Outlet erosion <input type="checkbox"/> 8. Joints leaking <input type="checkbox"/> 18. Misalignment <input type="checkbox"/> 9. Cracks <input type="checkbox"/> 19. Insufficient capacity <input type="checkbox"/> 10. Joint deterioration <input type="checkbox"/> 20. Other	TYPE/SIZE: NONE
DRAINS / OTHER OUTLETS	<input checked="" type="checkbox"/> 1. None <input type="checkbox"/> 2. No bottom drain <input type="checkbox"/> 3. Bottom drain inoperative <input type="checkbox"/> 4. Subsurface drain dry <input type="checkbox"/> 5. Subsurface drain muddy flow <input type="checkbox"/> 6. Subsurface drain obstructed <input type="checkbox"/> 7. No animal guard <input type="checkbox"/> 8. Other	TYPE: NONE

SKETCHES/COMMENTS

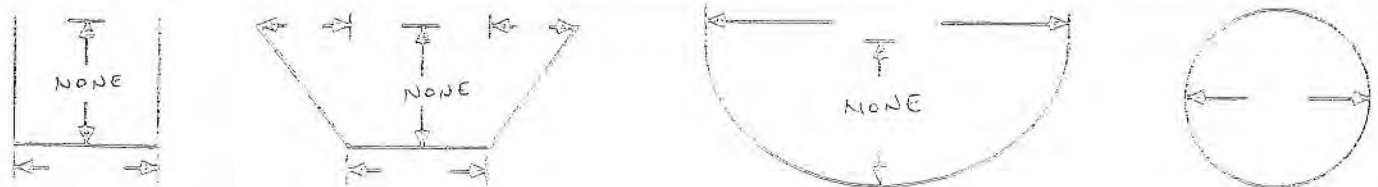
EMBANKMENT DAM SKETCHES AND MEASUREMENTS



EMBANKMENT DAM SKETCHES AND MEASUREMENTS

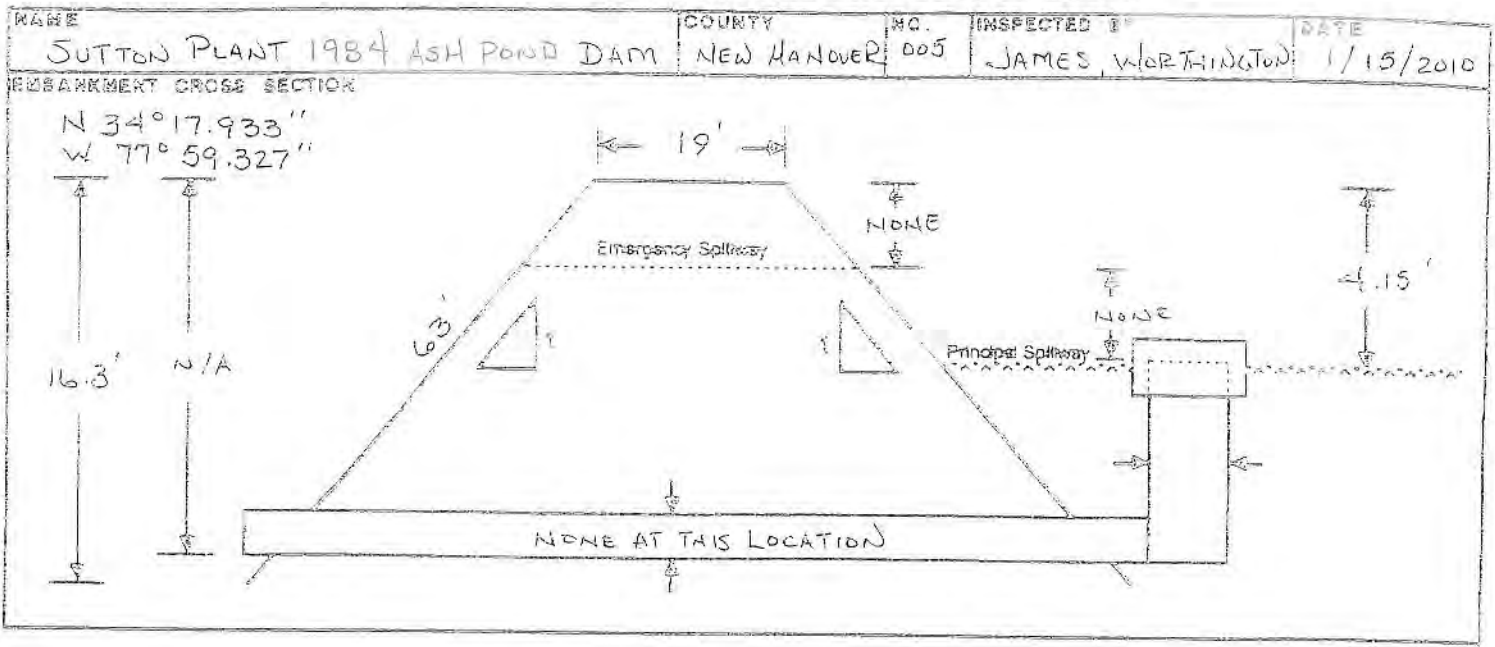


EMERGENCY SPILLWAY CROSS SECTION

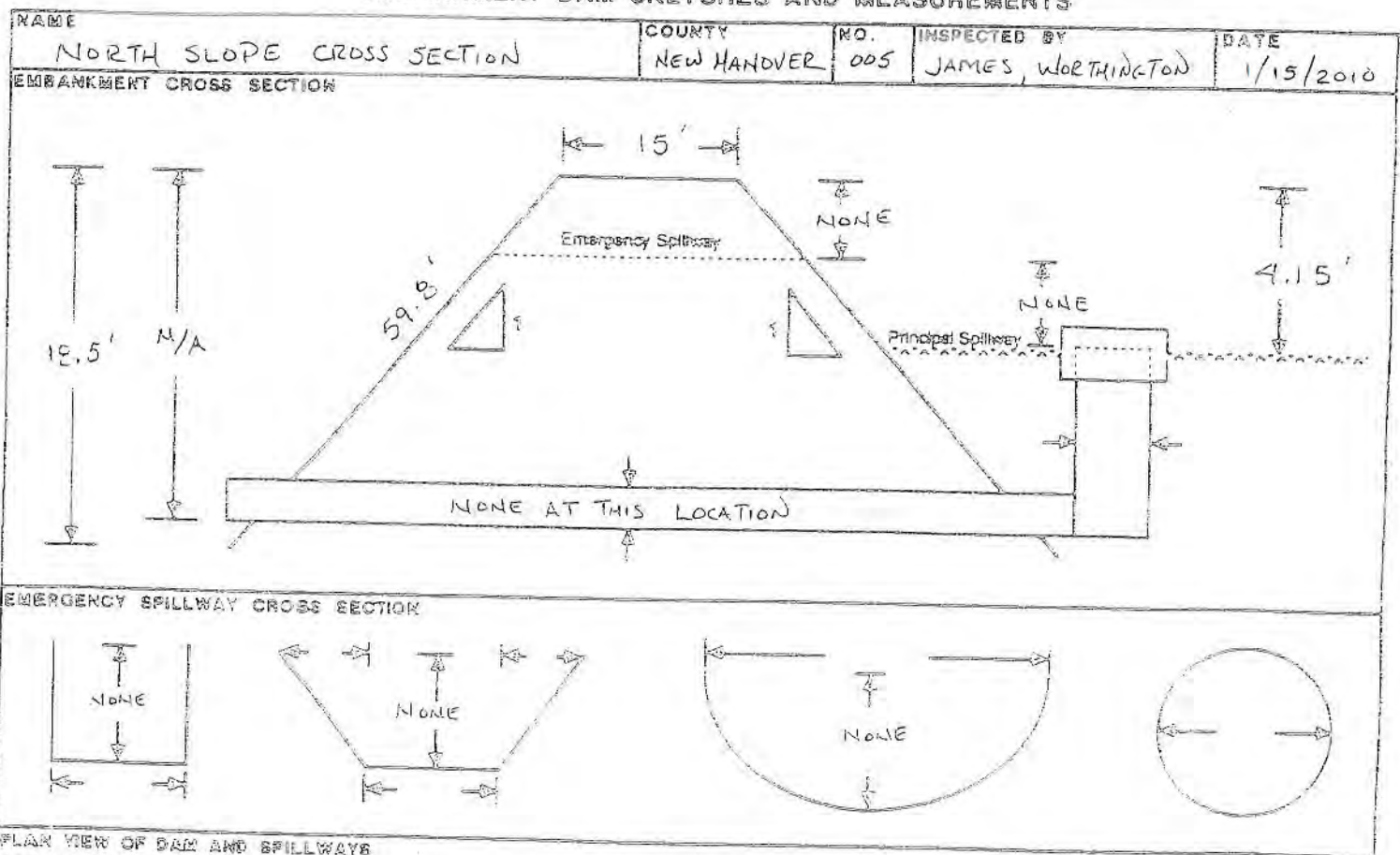


PLAN VIEW OF DAM AND SPILLWAYS

EMBANKMENT DAM SKETCHES AND MEASUREMENTS

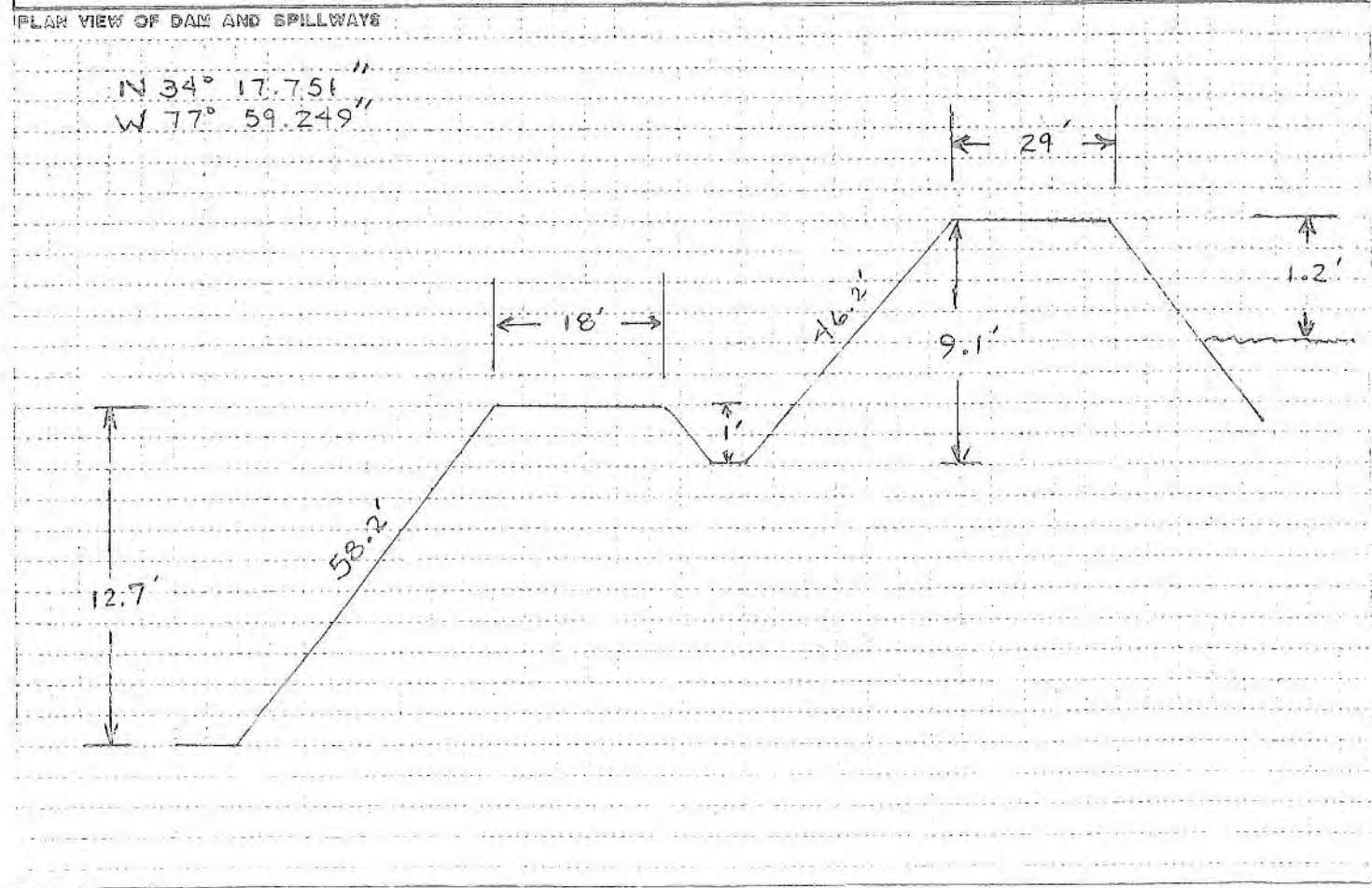
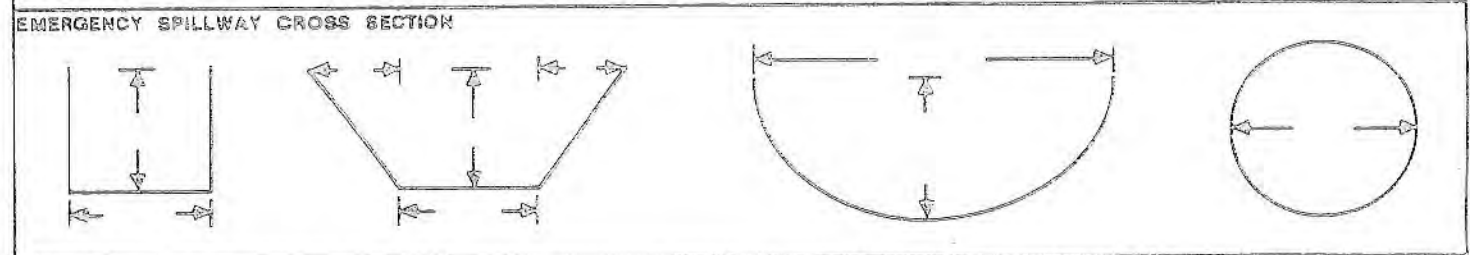
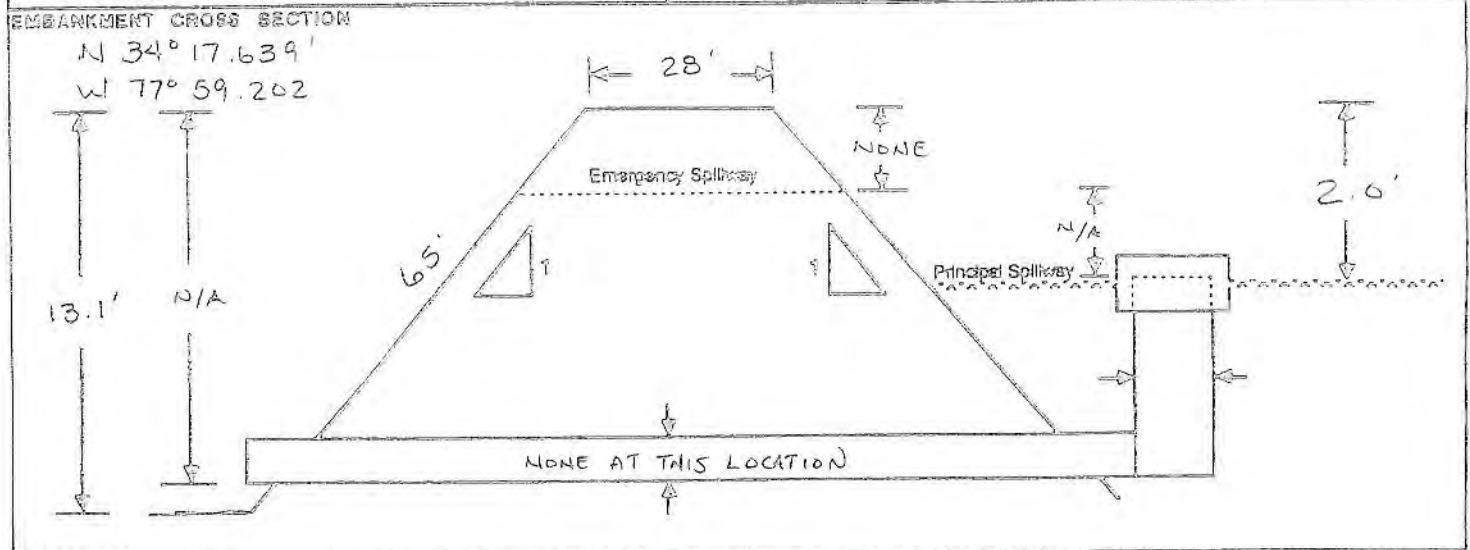


EMBANKMENT DAM SKETCHES AND MEASUREMENTS



EMBANKMENT DAM SKETCHES AND MEASUREMENTS

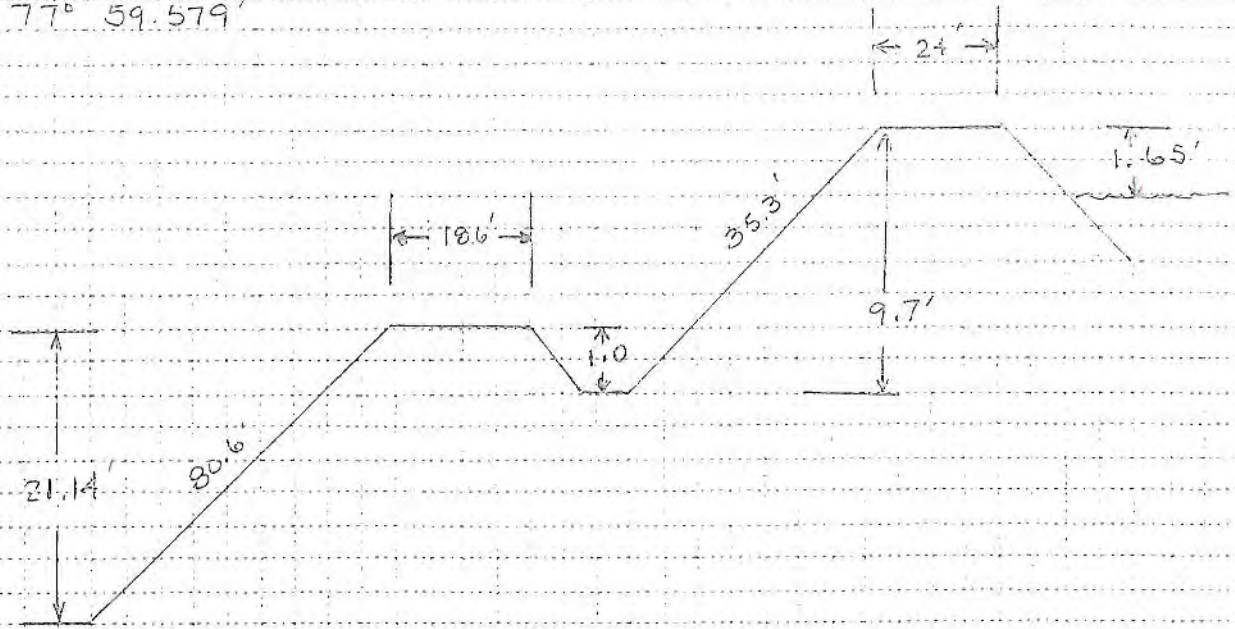
NAME SUTTON PLANT 1984 ASH POND DAM	COUNTY NEW HAMPSHIRE	NO. 005	INSPECTED BY JAMES WORTHINGTON	DATE 1/15/2010
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SKETCHES AND MEASUREMENTS

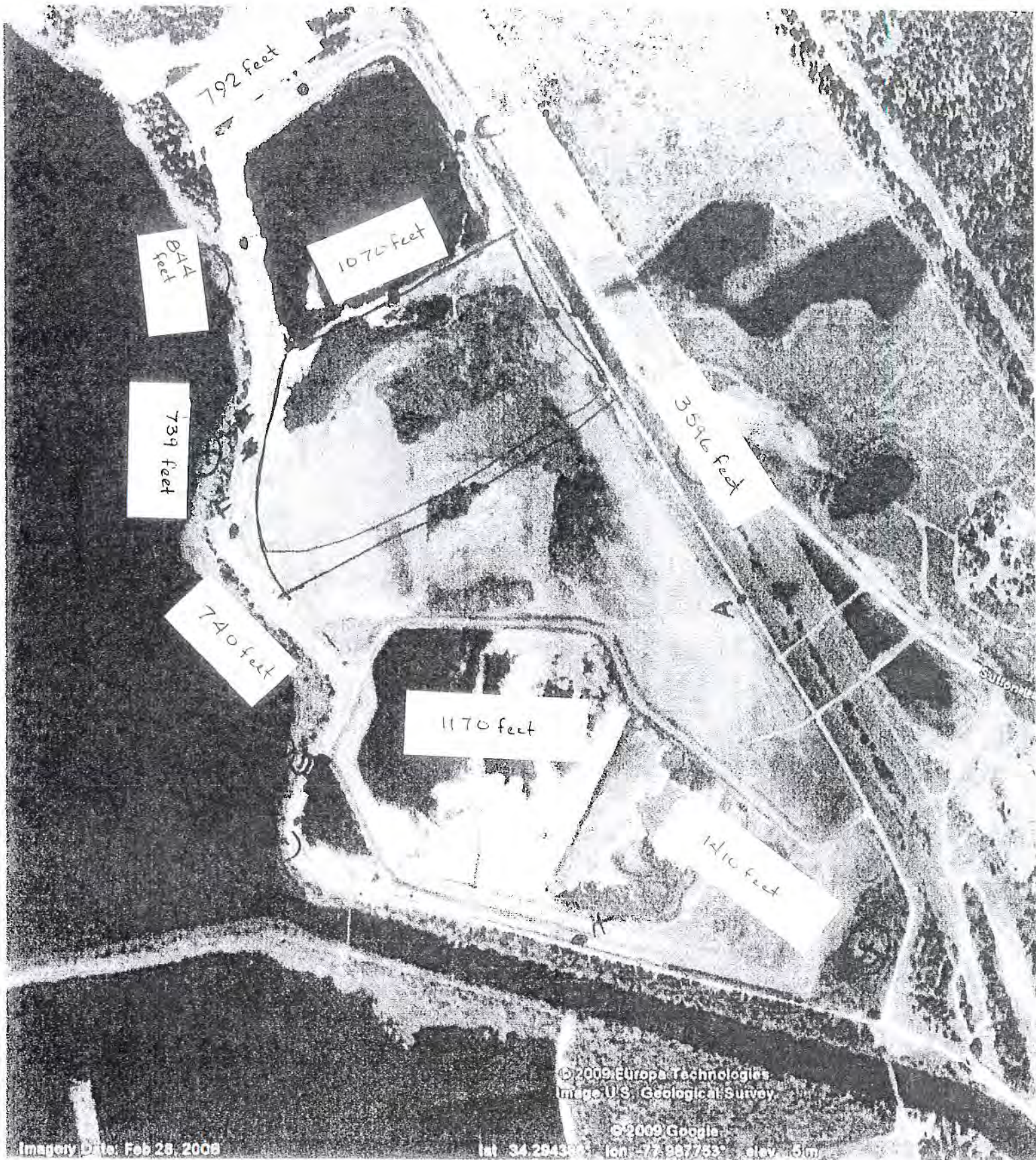
NAME	COUNTY	NO.	INSPECTED BY	DATE
SUTTON PLANT 1984 ASH POND DAM	NEW HAMPSHIRE	005	JAMES, WORTHINGTON	1/15/2010

N $34^{\circ} 17.712'$
 W $77^{\circ} 59.579'$



SKETCHES AND MEASUREMENTS

NAME	COUNTY	NO.	INSPECTED BY	DATE
SUTTON STEAM PLANT 1984 ASH POND	NEW HANOVER	005	SAMS, JAMES, WORTHINGTON	1/15/2010



WILMINGTON REGIONAL DAM SAFETY PROGRAM

DAM NAME: SUTTON PLANT 1984 ASH POND DAM COUNTY: NEW HANOVER DISTRICT: NEWHA-005
 POWER SOURCE: SUTTON PLANT 1972 COOLING POND LOCATION: CASTLE HAYNE
 DAM HEIGHT: 32 feet STORAGE AREA A (FEET): 82 acres STORAGE CAPACITY: ACRES FT. 1364

NEAREST DOWNSTREAM LAND USE:

WOODLAND AGRICULTURAL RESIDENTIAL URBAN/INDUSTRIAL/COMMERCIAL

DOWNSTREAM IMPROVEMENTS:

DWELLINGS BRIDGES RAILS HIGHWAYS

DOWNSTREAM IMPROVEMENT DATA:

Type Improvement	Distance Downstream	Floodplain Width	Channel Slope	Elevation Above Floodplain	Breach Wave Elevation	Culvert Bridge Dimensions	Traffic Count	Sight Distance
ON-SITE COOLING POND	PRIMARY DISCHARGE IN POND	INDETERMINATE POND SURFACE AREA 6900 ACRES- FEET	NOT APPLICABLE	N/A	N/A	NONE	NONE	N/A

DESCRIBE POTENTIAL LIFE LOSS OF LIFE AND STRUCTURAL OR ENVIRONMENTAL DAMAGE TO EXISTING OR POTENTIAL FUTURE DOWNSTREAM IMPROVEMENTS: THE ASH POND DISCHARGE MUST MEET DENR DIVISION OF WATER QUALITY NPDES REQUIREMENTS AND IS CONTINUALLY MONITORED. A CATASTROPHIC BREACH WOULD BE CONFINED TO THE RECEIVING SUTTON PLANT 1972 COOLING POND. A RESULTING BREACH AND NECESSARY CLEANUP ~~WOULD~~ MAY SUSPEND OPERATIONS OF THE SUTTON PLANT, BUT WOULD NOT EFFECT POWER SERVICE BECAUSE THE EXISTING ELECTRICAL GRID CAN COMPENSATE. IF THE COMPOSITION OF COAL ASH IS NOT DESIGNATED A HAZARD A DAM FAILURE HERE DOES NOT PRESENT AN ENVIRONMENTAL OR LIFE THREATENING CIRCUMSTANCE.

RECOMMENDED HAZARD CLASSIFICATION: LOW INTERMEDIATE HIGH
 BY: Daniel Jones TITLE: WILMINGTON REG. ENGR. DATE: 1/15/2010
 APPROVED BY: [Signature] TITLE: STATE DAM SAFETY ENGR. DATE: 1/15/2010

Requested Item

Number:	RITM0031706	Stage:	Delivery
Request:	REQ0028919	Approval:	Approved
Item:	Audio Conferencing (Meeting Exchange)	Due date:	09/12/2010 06:43:08
Short description:	Audio Conferencing (Meeting Exchange)		

Variables

Requested For	Corp ID
TYNDALL,R. KENT	115384

Location
SUTTON FOS PLT

Preferred contact method	Other contact number
More information Work	

Which service are you requesting

- Request Meeting Exchange audio conference account
- Request AT&T TeleConference account
- Terminate an audio conference account

What is the client's desk phone number for the account disconnect

More information

Provide details for services requested in Additional Comments

Additional Comments

this request is for audio conference line for Kent Tyndall, Sutton Plant, Wilmington NC

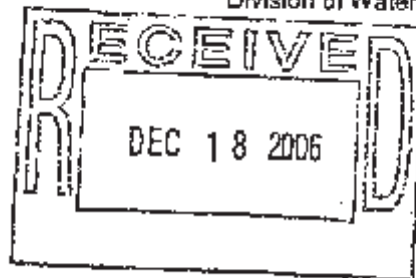


Michael F. Easley
Governor

William G. Ross, Jr., Secretary
North Carolina Department of Environment and Natural Resources

Alan W. Klimek, P.E., Director
Division of Water Quality

December 14, 2006



Mr. Harry Sideris, Plant Manager
Carolina Power and Light d/b/a/ Progress Energy Carolinas, Inc.
Sutton Steam Plant
801 Sutton Steam Plant Road
Wilmington, North Carolina 28401

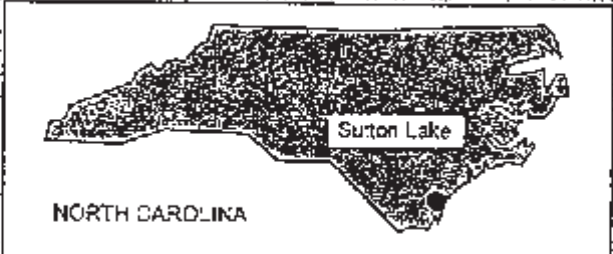
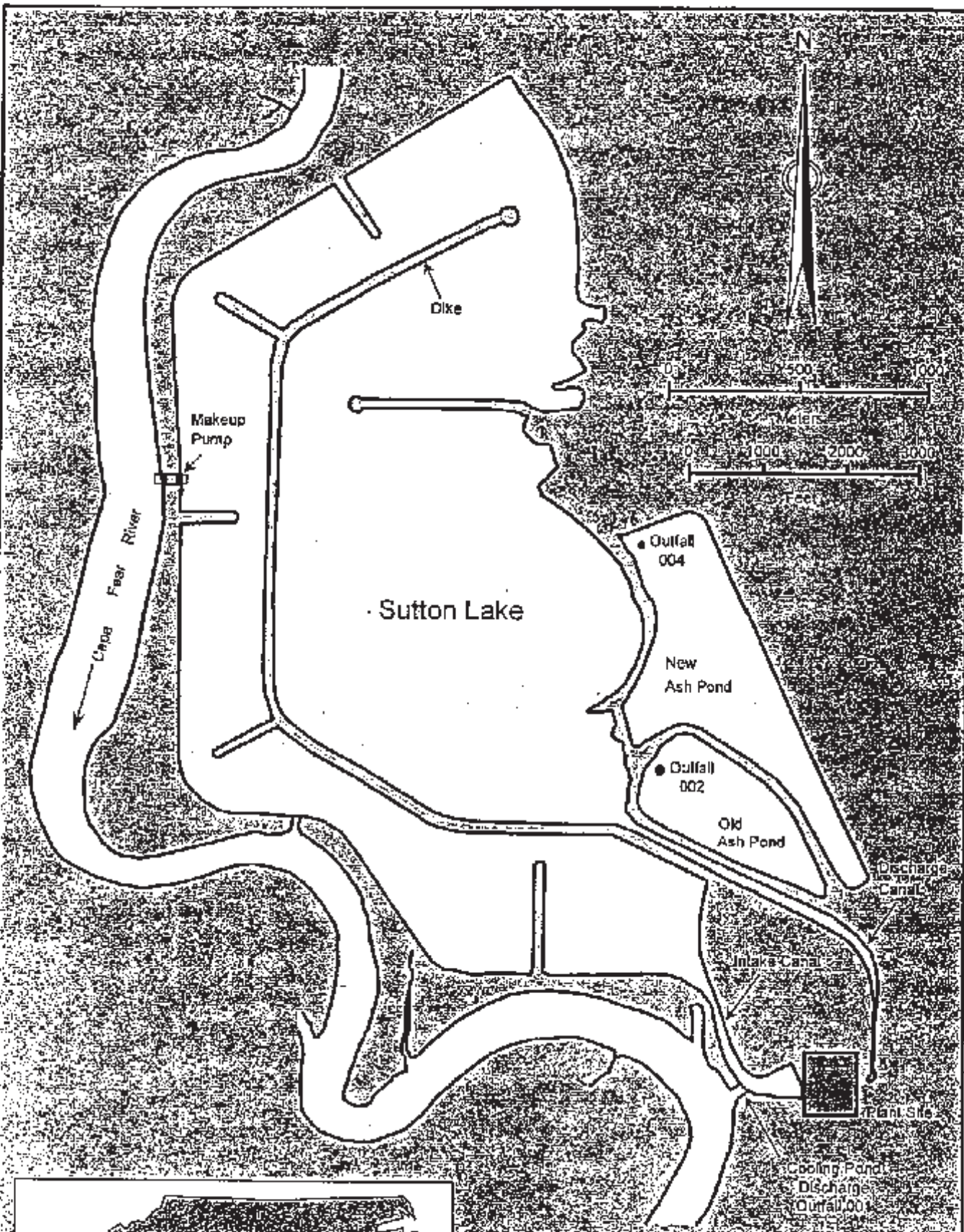
Subject: Issuance of NPDES Permit
Permit NC0001422
L.V. Sutton Electric Plant
New Hanover County

Dear Mr. Sideris:

Division personnel have reviewed and approved your application for renewal of the subject permit. Accordingly, we are forwarding the attached NPDES discharge permit. This permit is issued pursuant to the requirements of North Carolina General Statute 143-215.1 and the Memorandum of Agreement between North Carolina and the U.S. Environmental Protection Agency dated May 9, 1994 (or as subsequently amended).

This final permit includes the following major changes from the draft permit sent to you on October 11, 2006.

- Monitoring for TN and TP has been increased to Monthly for Outfall 001 in response to EPA comment and to be consistent with the new Cape Fear Permitting Strategy. The Division cannot grant your request to reduce monitoring to Quarterly. This segment of the Cape Fear River is impaired and additional monitoring is necessary to support water quality modeling efforts within the Cape Fear River Basin.
- Monthly monitoring for DO has been added in response to EPA's comment and to evaluate the impact of the facility's discharge on the receiving stream. The Division cannot grant your request to remove this monitoring from the permit. This segment of Cape Fear River is impaired due to low DO concentrations and the Division has to evaluate the impact of individual dischargers. In addition, the DO analysis is very simple, quick, and inexpensive.
- Selenium Monitoring for Outfall 004 has been reduced to Quarterly in response to your request and to be consistent with the requirements for Outfall 002.
- The following text was added to Section A. (12) to reflect new requirements of the Environmental Sciences Section: "Fish tissue monitoring will only be completed if the ash pond discharges to the river for 120 days in a calendar year". The Division will also allow you to submit fish monitoring data 4 month after the calendar year in which the samples are taken.
- Groundwater monitoring wells 17, 18, and 19 were added to the list of monitoring wells in response to your request.



Attachment 1 - Form 1 - Item XI - Map

Sutton Steam Electric Plant
 New Hanover County
 Page 2 of 2

A. (1) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (001)

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge from Outfall 001 (Cooling pond blowdown, recirculation cooling water, non-contact cooling water, and treated wastewater from internal outfalls 002, 003, and 004). Such discharges shall be limited and monitored by the Permittee as specified below:

EFFLUENT CHARACTERISTICS	LIMITS		MONITORING REQUIREMENTS		
	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location
Flow			Daily	Estimate	Effluent
Temperature ^{1,2}			Daily	Grab	Effluent, U, D
Total Residual Chlorine ³		200 µg/L	Weekly	Grab	Effluent
Time of Chlorine Addition (min/day/unit)		120	Daily	Logs	Effluent
Total Copper		NL (µg/L)	Quarterly	Grab	Effluent
Total Selenium		56 µg/L	Weekly	Grab	Effluent
Total Nitrogen (NO ₂ + NO ₃ - TKN)		NL (mg/L)	Monthly	Grab	Effluent
Total Phosphorus		NL (mg/L)	Monthly	Grab	Effluent
Dissolved Oxygen			Monthly	Grab	Effluent
Acute Toxicity ⁴			Quarterly	Grab	Effluent
Total Arsenic ⁵	50 µg/L		Weekly	Grab	Effluent
pH		6 ≤ pH ≤ 9	Daily	Grab	Effluent

NL = No limit

Notes:

1. U: Upstream, 2700 feet above outfall. D: Downstream, 1.25 miles below outfall. Instream monitoring is provisionally waived in light of the permittee's participation in the Lower Cape Fear River Basin Association. Instream monitoring shall be conducted as stated in this permit should the permittee end its participation in the Association.
2. The receiving water's temperature shall not be increased by more than 2.8°C above ambient water temperature and in no case exceed 32°C, except in the mixing zone described as follows: Extending from the eastern shore to the centerline of the river and extending not more than 1.25 miles downstream nor more than 2700 feet from the point of discharge. The cross-sectional area of the mixing zone shall not exceed 9% of the total cross sectional area of the river at the point of discharge nor 2.5% at the mouth of Toomer's Creek.
3. Total residual chlorine may not be discharged from any single generating unit for more than two hours per day, unless the Permittee can demonstrate to the Division of Water Quality that discharge for more than two hours is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted.
4. Acute Toxicity Monitoring (Fathead Minnow, 24 hour); Part I, Condition A. (5).
5. The limit becomes effective January 1, 2008.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

A. (2) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (002)

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge to the Cooling Pond from Outfall 002 (Old Ash Pond - coal pile runoff, low volume wastes, ash sluice water, chemical metal cleaning wastes (Outfall 003), and stormwater runoff). Such discharges shall be limited and monitored by the Permittee as specified below:

EFFLUENT CHARACTERISTICS	LIMITS		MONITORING REQUIREMENTS		
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location
Flow			Weekly	Pump Logs or similar	Effluent
Oil and Grease	15 mg/L	20 mg/L	Monthly	Grab	Effluent
Total Suspended Solids	30 mg/L	100 mg/L	Monthly	Grab	Effluent
Total Arsenic		NL (µg/L)	Quarterly	Grab	Effluent
Total Selenium		NL (µg/L)	Quarterly	Grab	Effluent
Ammonia-Nitrogen ¹			Weekly	Grab	Effluent

1. Monitoring is only required when ash sluicing occurs.

Samples taken in compliance with the monitoring requirements specified above shall be taken prior to mixing with other waste streams.

A. (3) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (003)

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge to the Old Ash Pond from Outfall 003 (Chemical metal cleaning wastes). Such discharges shall be limited and monitored by the Permittee as specified below*:

EFFLUENT CHARACTERISTICS	LIMITS		MONITORING REQUIREMENTS		
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location
Flow			Weekly	Pump Logs or similar	Effluent
Total Copper	1 mg/L	1 mg/L	2/Month	Grab	Effluent
Total Iron	1 mg/L	1 mg/L	2/Month	Grab	Effluent

* Effluent requirements for Outfall 003 have been suspended due to the changes in disposal method for chemical metal cleaning wastes. If the plant needs to discharge these wastes through Outfall 003, you shall notify the Division 1 week in advance of such discharge. Upon commencement of the discharge, all the requirements for this outfall become active. Following the discharge of metal cleaning waste, effluent requirements

A. (4) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (004)

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge to the Cooling Pond and/or to Outfall 001 from **Outfall 004 (New Ash Pond - ash sluice water, coal pile runoff, low volume wastes, chemical metal cleaning wastes (Outfall 003), and stormwater runoff)**. Such discharges shall be limited and monitored by the Permittee as specified below:

EFFLUENT CHARACTERISTICS	LIMITS		MONITORING REQUIREMENTS		
	Monthly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location
Flow			Weekly	Pump Logs or similar	Effluent
Oil and Grease	15 mg/L	20 mg/L	Monthly	Grab	Effluent
Total Suspended Solids	30 mg/L	100 mg/L	Monthly	Grab	Effluent
Total Arsenic		NL (µg/L)	Quarterly	Grab	Effluent
Total Selenium		NL (µg/L)	Quarterly	Grab	Effluent
Ammonia-Nitrogen			Weekly	Grab	Effluent

Samples taken in compliance with the monitoring requirements specified above shall be taken prior to mixing with other waste streams.

A. (5) ACUTE TOXICITY MONITORING (QTRLY)

The permittee shall conduct acute toxicity tests on a *quarterly* basis using protocols defined in the North Carolina Procedure Document entitled "Pass/Fail Methodology For Determining Acute Toxicity In A Single Effluent Concentration" (Revised-July, 1992 or subsequent versions). The monitoring shall be performed as a Fathead Minnow (*Pimephales promelas*) 24 hour static test. The effluent concentration at which there may be at no time significant acute mortality is 90% (defined as treatment two in the procedure document). Effluent samples for self-monitoring purposes must be obtained during representative effluent discharge below all waste treatment. The tests will be performed during the months of February, May, August and November.

All toxicity testing results required as part of this permit condition will be entered on the Effluent Discharge Monitoring Form (MR-1) for the month in which it was performed, using the parameter code TGE6C. Additionally, DWQ Form AT-2 (original) is to be sent to the following address:

Attention: North Carolina Division of Water Quality
Environmental Sciences Section
1621 Mail Service Center
Raleigh, North Carolina 27699-1621

Completed Aquatic Toxicity Test Forms shall be filed with the Environmental Sciences Section no later than 30 days after the end of the reporting period for which the report is made.

Test data shall be complete and accurate and include all supporting chemical/physical measurements performed in association with the toxicity tests, as well as all dose/response data. Total residual chlorine of the effluent toxicity sample must be measured and reported if chlorine is employed for disinfection of the waste stream.

Should there be no discharge of flow from the facility during a month in which toxicity monitoring is required, the permittee will complete the information located at the top of the aquatic toxicity (AT) test form indicating the facility name, permit number, pipe number, county, and the month/year of the report with the notation of "No Flow" in the comment area of the form. The report shall be submitted to the Environmental Sciences Section at the address cited above.

**ASH POND DIKE STABILITY ANALYSIS
PROGRESS ENERGY – SUTTON PLANT
NEW HANOVER COUNTY, NORTH CAROLINA**

**Sutton 1971/1983 Ash Pond (State ID No. NEWHA-004)
Sutton 1984 Ash Pond (State ID No. NEWHA-005)**

Prepared for:



**MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604**

March 8, 2011

MACTEC Project No. 6468-10-0274



engineering and constructing a better tomorrow

March 8, 2011

Mr. Rob Miller
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27613

**SUBJECT: REPORT OF ASH POND DIKE STABILITY ANALYSIS
PROGRESS ENERGY - SUTTON PLANT
SUTTON 1971/1983 ASH POND (STATE ID NO. NEWHA-004)
SUTTON 1984 ASH POND (STATE ID NO. NEWHA-005)
MACTEC PROJECT NO. 6468-10-0181**

Dear Mr. Miller:

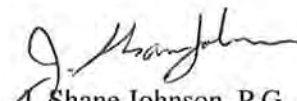
MACTEC Engineering and Consulting, Inc. (MACTEC) is pleased to submit the attached report of our Ash Pond dike stability analysis for Progress Energy's Sutton Plant located near Wilmington, North Carolina. The work was authorized by Progress Energy under Work Authorization No. 2720-220, effective December 8, 2010.


The results of stability analysis indicate that the dikes meet the appropriate standards for factor of safety. Based on the results, we have not identified the need for remedial work for the dikes. However, routine inspections should continue on the frequency outlined in the plant procedure.

MACTEC is pleased to have performed this work for Progress Energy. Please contact Scott Auger (919-831-8033) or Shane Johnson (919-831-8017) if you have questions.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, Inc.


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RSA/rsa

Enclosures

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1.0 INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) was retained by Progress Energy to provide an assessment of structural stability for the Ash Pond dikes located at the L. V. Sutton Steam Electric Plant (Sutton Plant) in New Hanover County, North Carolina. The location of the plant and associated pond areas is shown on Figure 1. The scope of services covered by this report is consistent with Progress Energy Work Authorization No. 2720-220, effective December 8, 2010.

There are two ash ponds at the Sutton Plant - the 1971/1983 Ash Pond and the 1984 Ash Pond. Previous results of stability analyses for the 1984 Ash Pond dike were located in plant file records. For this evaluation, these previous reports were reviewed and supplemented with additional analyses incorporating updated water level information. No records of stability analyses for the 1971/1983 Ash Pond dikes were available. Therefore, field and laboratory investigations were performed on the 1971/1983 Ash Pond dikes and stability analyses were conducted.

This report presents the results of MACTEC's field investigations, laboratory testing, stability analyses, and engineering review for the Ash Pond dikes.

2.0 SUMMARY OF RESULTS

This report presents results of a geotechnical study of the stability of existing dikes at the Sutton Plant Ash Ponds. The study included review of past dam inspection reports and existing geotechnical information. Additional geotechnical borings and laboratory testing were also performed for the 1971/1983 Ash Pond. Topographic information was obtained from available aerial topographic mapping prepared as part of other recent plant studies.

Slope stability analyses were performed for cross sections considered representative of the existing dike conditions. Results of the stability analyses indicate that the factors of safety for slope stability of the Ash Pond dikes are acceptable.

Seepage conditions were reviewed. Neither past dam inspections nor observations from the present study indicate seepage is emerging on the exterior slopes of the dikes. Water level readings in piezometers and temporary water level observation casings do not indicate presence of water exiting the slope or toe of the dikes.

On the basis of the current study and past information, MACTEC concludes the Sutton Plant Ash Pond dikes are in satisfactory condition and that no structural repairs are necessary. Inspection for changes in conditions combined with maintenance of vegetation should continue.

3.0 DESCRIPTION

3.1 SUTTON PLANT

The Sutton Plant includes three operating coal fired steam electric generating units identified as Sutton Units 1, 2, & 3. Coal combustion by-products from operation of the plant are disposed of in two active ash pond areas located north of the plant as shown in Figure 2. The ash pond areas are identified as the 1971/1983 Ash Pond (State Dam ID No. NEWHA-004) and the 1984 Ash Pond (STATE ID No. NEWHA-005). The coal combustion by-products primarily consist of fly ash and bottom ash material. The ash material is conveyed to the ash pond areas by sluicing methods.

3.2 REGULATORY JURISDICTION

Effective January 1, 2010, regulatory oversight was transferred from the North Carolina Utilities Commission (NCUC) to the North Carolina Department of Environment and Natural Resources, Division of Land Quality, Land Quality Section, Dam Safety Program (NCDENR Dam Safety). The dikes covered by this report are included in the NCDENR Dam Safety inventory listing with descriptions as follows:

State ID No.	State Dam Name	State Hazard Potential Description
NEWHA-004	Sutton 1971 Ash Pond*	Low
NEWHA-005	Sutton 1984 Ash Pond	Low

*It should be noted that the 1971 Ash Pond is also referred to in this report as the 1971/1983 Ash Pond.

3.3 SUTTON 1971/1983 ASH POND (STATE ID NO. NEWHA-004)

The current configuration of the 1971/1983 Ash Pond dikes was constructed by raising the original 1971 Ash Pond dike. Design and construction of the 1971 Ash Pond dike was provided by Brown and Root. The 1983 modifications were designed by CP&L (now Progress Energy) and constructed by Dickerson Inc. under the administration of CP&L. Law Engineering provided field density testing during construction of the 1983 dike. The general design information for the 1971 dike is included in the attached Appendix F, Exhibit 3. Appendix F, Exhibits 4 through 8 provide design details for the 1983 dike modifications. The present dikes have a crest elevation varying from Elevation 28 feet MSL to 34 feet MSL. The higher elevation is at the common dike with the 1984 Ash Pond. The crest width is 12 feet and side slopes are 3(H):1(V). Including the common dike, the dike length is about 3,800 feet. This ash pond area was taken out of service in 1985, but then returned to service in 2001.

In 2005, an interior ash storage area was constructed by placement of a containment berm within the pond area. Design and construction was performed by Trans Ash. The containment berm has an outlet structure which directs flow to the area near the discharge structure on the west side of the ash pond area. The interior storage area is not considered to be jurisdictional under NCDENR Dam Safety regulations.

The 1971/1983 Ash Pond discharge structure, located in the northwest corner of the pond, consists of a 48-inch diameter vertical concrete riser connected to a 12-inch diameter concrete outlet pipe. The exit point of the outlet pipe is submerged by the adjacent Cooling Lake.

The design features for the current configuration of the 1971/1983 Ash Pond dike are summarized as follows:

- Length: 7,000 feet
- Maximum Structural Height: 24 feet
- Surface Area (acres): 49.5
- Storage capacity (acre-feet): 1200 (estimated based on average depth of 24 feet)
- Size Classification: Small*
- Hazard Classification: Low*
- Regulatory Design Storm: 50 year**
- US Slope: 3 (H):1(V)
- DS Slope: 3 (H):1(V)
- Crest Width: 12 feet
- Crest Elevation: 28 feet
- Design maximum operating level: Elevation 26 feet***
- Current Operating Level: Elevation 24.8 feet (from 2010 Inspection Report)
- Instrumentation: 3 piezometers (installed 2010)

*Classifications based on NCDENR Dam Safety regulations and inventory description.

** Rainfall for 50-year storm event is 9 inches.

***The maximum water level is now set at the current operating level of Elevation 24.8.

3.4 SUTTON 1984 ASH POND (STATE ID NO. NEWHA-005)

The 1984 Ash Pond dike was constructed of sand fill with a one foot thick clay liner for the interior slope and bottom of the ash pond area. The clay liner was covered with a 2-foot protective layer of sand fill on the slopes. The top of the liner on the interior slope is at Elevation 32 feet (where Elevation noted), and the top of the bottom liner is set at Elevation 14.0. The dike crest width is 12 feet and slopes (interior and exterior) are 3(H):1(V). The design crest for the dikes is at Elevation 34.0, and the length including the common dike with the 1983 Ash Pond is about 10,000 feet. The maximum developed dike height is estimated to be about 24 feet above the original minimum grade at Elevation 10.0 (Elevation 34.0 - Elevation 10.0 = 24 feet).

The 1984 Ash Pond discharge structure consists of a 48-inch diameter vertical concrete riser connected to a 3 foot diameter concrete outlet pipe, located in the northwest corner of the pond. The outlet pipe is connected to a concrete outlet structure provided for diversion of discharge flow to the Cape Fear River. The outlet structure is equipped with a gate valve for flow control. Flow can be diverted to the Cape Fear River or allowed to discharge directly into the Cooling Pond at the outlet structure.

At the time of the 2010 inspection, the riser crest was reported to be at Elevation 30.0 feet. It was also reported by Progress Energy that the water level was raised to the current elevation on June 25, 2009 (from Elevation 28.0).

The MACTEC report dated April 20, 2010, indicates that seepage does not represent a concern for dike stability.

In 2006, Progress Energy constructed an interior ash storage area (also referred to as the interior containment area) in the south end of the 1984 Ash Pond. The storage capacity addition was designed by Withers & Ravenel and constructed by Trans Ash. The design crest is at Elevation 42.0, and the design

normal water level is at Elevation 40.0. The maximum dike height above the original ash level is about 14 feet, and the crest width is 25 feet. The interior slope is 2(H):1(V) and the exterior slope is 4(H):1(V). Where the interior containment area dikes are adjacent to the 1984 Ash Pond dikes, the toe of the slope is set back eight feet and graded to drain toward the north. A stability berm is provided on the north side where the dike is adjacent to the impounded water within the 1984 Ash Pond. The interior containment area is not considered to be jurisdictional under NCDENR Dam Safety regulations.

The design features for the current configuration of the 1984 Ash Pond dike are summarized as follows:

- Length: 10,000 feet
 - Maximum Structural Height: 32 feet
 - Surface Area (acres): 82
 - Storage capacity (acre-feet): 1,364
 - Size Classification: Medium*
 - Hazard Classification: Low*
 - Regulatory Design Storm: 100 yr **
 - US Slope: 3 (H):1(V)
 - DS Slope: 3 (H):1(V)
 - Crest Width: 12 feet
 - Crest Elevation: 34 feet
 - Design maximum operating level: Elevation 32 feet
 - Current Operating Level: Elevation 30 feet (from 2010 Inspection Report)
 - Instrumentation : 18 piezometers (installed in 2009)
- *Classifications based on NCDENR Dam Safety regulations and inventory description.
** 100-year storm is 10 inches over 12 hours. 50-year storm is 9 inches.

4.0 FIELD INVESTIGATIONS

4.1 1971/1983 ASH POND

The field investigation program was performed from December 15, 2010 through February 11, 2011. The scope of field investigations included:

- Advancing three soil test borings with standard penetration sampling from the crest of the existing dikes. A temporary water level observation casing was installed within the dike portion of the borehole to allow checks of water levels over time. The lower portion of the borehole was sealed with bentonite pellets prior to installing the observation casing.
- Performing six shallow-depth hand auger borings along the dike toe and on the dike slopes to check for shallow water or soft soils.
- Installing temporary water level observation casings in hand auger boreholes to allow for checks of water levels over time.
- Determining slope geometry by collecting elevations with a level and grade rod at selected points. The crest of the dike was used as a temporary benchmark with the elevations taken from an aerial topographic survey performed in 2006.

The boring locations were identified in the field by MACTEC personnel utilizing a Trimble GPS unit. The soil borings were performed by a CME-55LC drill rig mounted on a track carrier. Mud-rotary drilling procedures were used. Standard penetration testing (SPT) was performed at 2.5 to 5-foot intervals by driving a 1-3/8 inch ID split-spoon sampler in general accordance with ASTM D 1586. The split-spoon sampler is driven into the soil a distance of 18 inches by an automatic hammer weighing 140-pounds from a free fall height of 30 inches. The number of blows required to drive each 6-inches of the sampler were noted, and the number of blows from the last two increments are added to obtain the Standard Penetration Resistance (N-Value).

Samples were taken from the split-spoon sampler, described and identified based on visual-manual procedures. A representative portion of each sample was sealed in a glass jar with a moisture tight lid, labeled and returned to MACTEC's laboratory for further visual-manual identification and/or laboratory testing.

Hand auger borings were advanced at locations shown on Figure 2 to supplement the machine-drilled borings. The hand auger borings were advanced to depths of approximately three to ten feet below the ground surface and were stopped just beneath the depth groundwater was encountered. To allow checks for water levels over time along the slope and at the toe of the slope, 1-inch diameter PVC pipes with slotted sections were installed in the hand auger boreholes. The PVC pipes were set in the open hole, a sand pack placed to within 1 foot of the ground surface and a bentonite seal was used to fill the remainder of the borehole. After a period of stabilized water levels were measured, the well casings were removed and the boreholes were sealed with bentonite.

A field geologist observed the drilling operations, logged the recovered soil samples, recorded SPT blow counts and measured groundwater levels if encountered. Each of the soil samples was described in general accordance with the Unified Soil Classification System (USCS). Detailed descriptions of the soil samples recovered from the borings are presented on the boring logs in Appendix A. The stratification lines indicated on the boring logs represent the approximate boundaries between soil types; in-situ, the transitions may be gradual. Variations in soil conditions between borings can also occur.

To allow checks for water levels over time, 1-inch diameter PVC pipes with slotted sections were installed within the dike portion of the borehole. The lower portion of the borehole was sealed with bentonite pellets prior to installing the temporary casing. The PVC pipes were set in the open hole, a sand pack placed to within 2 feet of the ground surface and a bentonite seal was used to fill the remainder of the borehole. Steel protective covers were installed flush with the dike crest.

4.2 1984 ASH POND

No geotechnical borings have been performed on the 1984 Ash Pond dikes. However, in February 2009, MACTEC installed 18 water level observation casings (piezometers) in the dike crest and exterior slopes. Additionally, MACTEC advanced six continuous sampling probes at the dike crest piezometer locations to check the materials types used to construct the dikes. The probes were advanced from the crest of the dike using a GeoProbe direct push method. The GeoProbe has a hollow interior liner with a clear plastic sleeve. Continuous samples of soil were collected in five foot increments. The probes were pushed to approximately 30 feet below the crest of dike. Based on the original design drawings, these depths would result in the probes entering the dike foundation soils. The soil samples were visually classified in the field using the USCS and representative portions of soil were collected at two-foot intervals from the liners and placed in a sealed bag for possible testing.

A hand auger was used to advance shallow borings near the toe of the dike slope at the soil probe locations. The soils were visually described, and typical materials were placed in sealed bags for later examination.

Twelve piezometers for water level observations were installed along the dike crest near the probe locations. At each location, two piezometers were installed. One (PA-series) consisted of a 5-foot length of mechanically slotted well screen set from 10 to 15 feet below the dike crest surface and 10 feet of solid riser. The second piezometer (PZA-series) at each location was set with its screen at 20 to 25 feet below the dike crest. All piezometers included a sand pack around the well screen, a bentonite seal and then cement/bentonite grout up to the ground surface. Each piezometer was completed using a locking PVC cap and a steel roadbox cemented at the ground surface. The locking roadboxes were placed flush with the dike crest. Pipe protective posts were installed near the piezometers.

At the toe of the dike slope, piezometers were installed in the hand auger boreholes. The termination depth was approximately 4 feet below the existing ground surface at the toe of the dike. The piezometers consisted of 2.5 feet of one-inch diameter PVC hand slotted well screen and 2.5 feet of solid riser pipe. Sand was placed to approximately one-foot above the top of the well screen and the hole was backfilled with bentonite chips to the ground surface.

Appendix G includes piezometer data and boring records for reference information from the MACTEC Report of Piezometer Installation and Observation, dated April 20, 2010.

5.0 LABORATORY TESTING

5.1 1971/1983 ASH POND

Soil samples were re-examined in the laboratory by an experienced engineer/geologist to confirm field classifications and were revised where necessary. Soil samples were grouped into major strata based on visual-manual identification procedures. Laboratory testing was conducted on representative soil samples to aid in classification. Laboratory tests performed included natural moisture contents, particle size analysis and Atterberg Limits. All testing was done in general accordance with applicable ASTM specifications. A summary of laboratory test results is included in Appendix B.

5.2 1984 ASH POND

No laboratory tests were performed for this exploration.

6.0 SUBSURFACE CONDITIONS

6.1 1971/1983 ASH POND

Subsurface conditions are illustrated on Figures 4 through 6; a legend for the symbols used is on Figure 3. Based on borings performed for this exploration a 6 to 12-inch layer of gravel was encountered along the crest of the dike. Beneath the gravel layer, the dike fill materials typically consist of layers of very loose to very dense slightly silty fine to medium sand (SP, SP-SM) and silty fine to medium sand (SM). The dike fill materials were encountered to depths ranging from approximately 15.5 to 18.5 feet beneath the crest of the dike. In the location of boring B-3, possible ash materials were encountered in the silty

sands from depths of approximately 8 to 15.5 feet beneath the crest of the dike. Possible ash material with sandy silt and silty sand texture was encountered in HA-3-1 at the ground surface and extended to a depth of approximately 5.5 feet below the ground surface. Approximately 1.5 feet of ash material (silt texture) was encountered in hand auger boring HA-3-2 performed at the toe of the slope.

N-values within the dike fill range from 2 blows per foot (bpf) to 50 blows with 4 inches of penetration with results further summarized as follows:

- Boring B-1 - The average N-value for the upper 15 feet of the dike at the location of boring B-1 is 54 bpf. The average N-value in the lower portion of the dike in the location of boring B-1 is 28 bpf.
- Boring B-2 - The average N-value for the upper 11 feet of the dike at the location of boring B-2 is 52 bpf. The average N-value in the lower portion of the dike in the location of boring B-2 is 7 bpf.
- Boring B-3 - The average N-value for the upper 8 feet of the dike at the location of boring B-3 is 65 bpf. The average N-value in the lower portion of the dike in the location of boring B-3 is 8 bpf.

N-values recorded in the upper portion of the dike are indicative of fills that have received a reasonable amount of compaction. N-values recorded in the lower portion of the dike at boring B-1 are indicative of fills that have received a reasonable amount of compaction. N-values recorded in the lower portion of the dike located at borings B-2 and B-3 are indicative of fills that have received marginal compaction. Material properties of the fill are discussed further in Section 7.

Beneath the dike fill, possible ash deposits and Coastal Plain soils were encountered to the termination depth of the borings. Based on the borings, a layer of possible ash was encountered beneath the dike fill from a depth of approximately 18 to 27 feet beneath the crest of the dike in boring B-2 and from a depth of approximately 15.5 to 22 feet beneath the crest of the dike in boring B-3. The possible ash material has a consistency of very soft to medium stiff fine sandy silt (ML, MH). N-values in the possible ash deposits range from 1 to 7 bpf.

The original ground as encountered in the borings consists of Coastal Plain sands, further described as slightly silty fine to medium sand (SP) and silty fine to coarse sand (SM). N-values within the Coastal Plain sands range from 11 to 25 bpf indicating a medium dense relative density. The average N-values in the foundation soils are 5 bpf in the possible ash deposits and 17 bpf in the Coastal Plain sands. Material properties of these soils are discussed further in Section 7.

6.2 1984 ASH POND

The dikes for the 1984 Ash Pond were constructed of compacted sandy soils placed on a sandy foundation according to Progress Energy construction records. Field compaction testing was performed by Law Engineering during construction. The interior slopes of the dikes and the bottom of the pond were lined with a clay layer designed for 12 inch thickness. An approximate 24-inch thick sand layer was to be placed on top of the clay for the slopes to reduce potential drying shrinkage effects and to protect the clay from erosion. Past dike inspections have generally found the dike slopes in good condition. Wave erosion, particularly on the east dike, has caused removal of the sand over the liner in several areas. The eroded areas have been repaired using clay soils.

The clay liner is intended to reduce water flow from the pond into the sand dikes and natural ground, thus creating a low water flow line (phreatic surface) within the dike. The low phreatic surface is important to the stability of the dike.

The soil samples collected from the probes and hand auger borings were brown, gray and white sand with estimated Unified Soil Classification of SW (well graded sand). Based on color changes and traces of small roots, an approximate boundary between the dike fill and the natural ground was estimated at between 18 to 20 feet below the dike crest. All six probes were terminated in the natural soils at a depth of 30 feet below the crest of the dike. Boring records are included in Appendix G (referenced as Attachment B).

The hand auger borings advanced for the piezometers at the toe of the slope indicate soils similar to those observed in the probes. Soils near the bottom of the hand auger borings were often very moist or wet.

7.0 1971/1983 ASH POND MATERIALS PROPERTIES

7.1 DIKE FILL

Based on previous information, borrow material for the ash pond dikes was obtained by excavating natural soils located in the vicinity of the ash pond area. The strength properties for the dike fill consisting of relatively “clean” sands and silty sands are based on N-values obtained from this exploration. Correlations of N-values with friction angle were used to estimate a friction angle for the sand portion of the dike fill. The 1971/1983 Ash Pond dike has been in place for over 39 years; therefore, pore water pressures are stabilized. Thus, effective stress (drained) parameters were used in the analysis to assess the static stability. The parameters used in the analysis are summarized in Table 1.

In dikes containing cohesionless soil at the slope surface, the lowest factor of safety determined by analysis is generally associated with very shallow slip surfaces coincident with the face of the slope. However, very shallow sloughing of the slope surface is considered to be essentially a maintenance concern and not a condition that will affect the overall stability of the dike. To address this condition, we have assigned a nominal value of effective cohesion (10 psf) for analysis (where noted) to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.

7.2 FOUNDATION SOILS

This layer typically extends from the dike-natural soil interface to a depth of 30 feet below the dike crest and is comprised of a possible ash deposit in the location of borings B-2 and B-3 and relatively “clean” sand and silty sand. The SPT data indicate very soft to medium stiff consistencies and medium dense relative densities for the foundation soils. As previously noted, the pore water pressures are assumed to be stabilized in the foundation soils. Thus, effective stress (drained) parameters were used in the analysis to assess the static stability. The parameters used in the analysis are summarized in Table 1.

Strength parameters for the foundation soils are based on the N-values recorded during this exploration. Correlations of N-values with friction angles were used to estimate a friction angle for the possible ash deposits and the Coastal Plain sand foundation soils.

TABLE 1: 1971/1983 ASH POND SUMMARY OF MATERIAL PROPERTIES FOR ANALYSIS

ID	Description	Moist Unit Weight	Saturated Unit Weight	Effective Cohesion	Effective Friction Angle
#		pcf	pcf	psf	Deg
<u>Section at B-1</u>					
1	Dike Fill (SM,SP-SM)	120	125	10*	33
2	Dike Fill: (SP)	125	130	10*	38
3	Dike Fill: (SP)	120	125	0	33
4	Foundation: (SP)	120	125	0	32
<u>Section at B-2</u>					
1	Dike Fill: (SM)	120	125	0	33
2	Dike Fill: (SP)	125	130	0	38
3	Dike Fill: (SM,SP-SM)	115	120	0	30
4	Possible Ash (Silt): (MH)	100	105	0	25
5	Possible Ash (Silt): (MH)	100	105	0	30
6	Foundation: (SM)	120	125	0	31
<u>Section at B-3</u>					
1	Sedimented Ash	100	105	0	30
2	Dike Fill	125	130	0	38
3	Dike Fill: ((SM)	120	125	0	31
4	Dike Fill: (SM)	115	120	0	29
5	Possible Ash (Silt): (ML)	100	105	0	29
6	Foundation: (SM)	120	125	0	33

*A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.

8.0 1984 ASH POND MATERIALS PROPERTIES

8.1 DIKE FILL

Based on the GeoProbe borings and information provided Appendix G, the dike consists of a relatively "clean" to silty sand. The strength properties for the dike fill are based on typical values assigned for compacted sandy soils and soil parameters assigned by CP&L in the original dike design. Because the dike has been in place for over 25 years, pore water pressures are assumed to be stabilized. Thus, effective stress (drained) parameters were used in the analysis to assess the static stability. Strength parameters for the clay liner were assigned based on experience. The parameters used in the analysis are summarized in Table 2.

In dikes containing cohesionless soil at the slope surface, the lowest factor of safety determined by analysis is generally associated with very shallow slip surfaces coincident with the face of the slope. However, very shallow sloughing of the slope surface is considered to be essentially a maintenance concern and not a condition that will affect the overall stability of the dike. To address this condition, we have assigned a nominal value of effective cohesion (10 psf) for analysis (where noted) to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.

8.2 FOUNDATION SOILS

This layer typically extends from the dike-natural soil interface to a depth of 30 feet below the dike crest and is comprised of a sandy material. Because the dike has been in place for more than 25 years, pore water pressures are stabilized in the foundation soils. Thus, effective stress (drained) parameters were used in the analysis to assess the static stability. Strength parameters for the foundation soils are based on typical strength values assigned to sandy soils.

TABLE 2: 1984 ASH POND – SUMMARY OF MATERIAL PROPERTIES FOR ANALYSIS

ID	Description	Moist Unit Weight	Saturated Unit Weight	Effective Cohesion	Effective Friction Angle
#		pcf	pcf	psf	Deg
<u>Section at B-1</u>					
1	Dike Fill (Sand)	120	125	10*	35
2	Protective Sand Cover	120	125	0	32
3	Clay Lining	120	125	150	22
4	Foundation: Sand	120	125	0	32

*A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.

9.0 PHREATIC SURFACES

9.1 1971/1983 ASH POND

The normal water level in the Ash Pond is controlled by the top of the vertical riser which is currently set at Elevation 24.8 feet. We understand that the plant intends to maintain the current level as the maximum operating level for the 1971/1983 Ash Pond. The pond level used for analysis was based on the observed water level at the time of field investigation.

As shown in Table 5, water levels at the dike crest are 13 to 14 feet below the crest. Water levels at the toe of the dike range from approximately 1.4 to 5.4 feet below the ground surface. Only one of the three casings installed on the slope itself encountered water (at location B-2) at a depth of approximately 7.2 feet below ground surface. The measured water levels in the installed casings are summarized in Table 5 (placed at end of text).

For analysis purposes, a phreatic surface passing from the pond water or saturated ash level at its intersection with the dike interior slope, through the measured water level in the observation casings and at the measured water level in the hand auger borings performed along the slope and at the toe was used to represent the static conditions. Short-term rises in the pond level due to occurrence of the design storm could affect the phreatic surface within the interior portion of the dike cross-section due to the sandy composition of dike fill material. The assumed phreatic lines for each geotechnical section are shown on Figures 4 through 6.

As indicated under Section 12.1, the exterior slope and toe of the 1971/1983 Ash Pond dike have been observed during regular inspections by plant personnel and by MACTEC during the 5-year and annual inspections since 1987. Seepage has not been noted as a concern in the reports of those inspections.

9.2 1984 ASH POND

The phreatic surface used in the slope stability analysis was determined from the MACTEC Report of Piezometer Installation and Observations, dated April 20, 2010. Data from this report that was used for determination of phreatic water level is included in Appendix G.

It should be noted that much of the pond area is now filled with ash material with no standing water present. For analysis purposes, a phreatic surface passing from the exposed pond water level at its intersection with the dike interior slope, through the measured water level in the observation casings at the crest of the dike to the cooling pond water level elevation was used to represent the static conditions.

No seepage was noted along the slopes or toe during the time of piezometer installation, nor have dam inspections performed since 1987 noted the presence of seepage.

10.0 SEISMIC LOADS

The determination of the seismic Site Class for Ash Pond dikes is based on the North Carolina Building Code, 2006 Edition, which incorporates the 2003 International Building Code. The basis of the Site Class is the average shear wave velocity in the top 100 feet of the profile; however, the code also presents a conservative estimation procedure using N-values. Using the N-value methodology outlined in the building code and only considering the materials within the dike a Site Class D is applicable before considering liquefaction potential. To confirm the site class in the absence of deeper subsoil information at the dike location, MACTEC used past Refraction Microtremor (ReMi) test data obtained within 2 miles of the project site. The test data showed an average shear wave velocity of approximately 1030 ft/s which corresponds to a seismic Site Class D.

For an earthquake analysis, seismic design parameters were obtained adhering to 2006 North Carolina Building Code Amendments and the spectral acceleration maps developed by the United States Geological Survey (USGS) in 2002. Code provisions require that the higher of deterministic seismic hazard analysis (DSHA) and probabilistic seismic hazard analysis (PSHA) be used in the design. Due to the proximity of the site to Charleston, South Carolina, a DSHA was performed using the Charleston source zone and a moment magnitude of 7.3 for the earthquake. A PSHA was performed using background and regional source zones. The PSHA was performed for a maximum considered earthquake ground motion having 2 percent probability of exceedance within a 50-year period. The Peak Ground Acceleration (PGA) is calculated in accordance with section 1802.2.7 of International Building Code 2006 and is included in Appendix E of this report. A PGA of 0.105g is applicable to structures in this

zone. Therefore, for a pseudo-static representation of earthquake effects, a seismic coefficient of 0.105g (rounded to 0.11 for analysis) is used to scale the horizontal component of earthquake force relative to the sliding mass. It is also assumed that earthquake force does not change the pre-earthquake static pore pressure in the slope.

Liquefaction is a phenomenon that can occur during an earthquake when loose sands are present below the groundwater table. MACTEC limited the liquefaction analysis to 30 feet below the top of the dikes due to limited boring depths. The liquefaction potential was evaluated using a Site Class D with a PGA 0.105g. The N-values indicate that the dike material is very dense to medium dense with some loose silty sand layers. The results of analysis indicate that the liquefaction is not possible within the dike and upper foundation material. The lowest factor of safety of 1.8 against liquefaction is obtained in boring B-2 at a depth of 13.5 feet. The results of liquefaction analysis are included in Appendix E of the report.

The previous discussion of liquefaction potential is primarily associated with dike and upper foundations material for the 1971/1983 Ash Pond dikes. The dike and upper foundation material for the 1984 Ash Pond dikes is believed to be at least comparable to or better than for the 1971/1983 Ash Pond dikes. Therefore, we believe that the factor of safety for liquefaction associated with the 1984 Ash Pond dikes should be at least comparable to the 1971/1983 Ash Pond dikes.

11.0 SLOPE STABILITY ANALYSIS

11.1 REGULATORY REQUIREMENTS

Under the agreement between the North Carolina Utilities Commission and Progress Energy, the guidelines of the United States Army Corps of Engineers (USACOE) were applicable to evaluations of the dam safety. Effective January 1, 2010, state regulation of utility company dams was transferred to the North Carolina Department of Environment and Natural Resources (NCDENR), Land Quality Section, Dam Safety Program. For this study, the requirements from both agencies pertaining to slope stability factors of safety have been considered:

NCDENR

Based on North Carolina Administrative Code (NCAC) - Title 15A Department of Environment and Natural Resources of Subchapter 2K - Dam Safety

- Minimum factor of safety for steady state conditions at current pool or design flood elevation is 1.5.
- Minimum factor of safety for rapid draw-down conditions from current pool elevation is 1.25.

USACOE

Based on USACOE Engineering Manual (EM) 1110-2-1902⁽³⁾

- Minimum factor of safety for maximum surcharge pool (design flood) is 1.4
- Minimum factor of safety for seismic conditions from current pool elevation is 1.0

11.2 1971/1983 ASH POND

Slope stability analysis performed for the exterior slopes of the 1971/1983 Ash Pond dikes considered both static and seismic loading conditions. The analyses were conducted for the normal operating level of

the pond. Rapid drawdown conditions were not evaluated because in order to have a rapid drawdown condition, a breach of the dam would be needed.

Examination of the geotechnical cross sections at the boring locations performed for this exploration indicates very similar embankment configurations, soil characteristics and phreatic levels. Three sections were selected for slope stability analyses - at boring B-1 (Figure 4), at boring B-2 (Figure 5), and at B-3 (Figure 6). These three sections represent the highest dike fill areas and spots where groundwater is nearest the ground surface at the dike toe or where the phreatic surface is at a higher elevation within the dike.

The computer program PCSTABL5M with Windows based interactive STEDwin software was used for analysis. The Modified Bishop's method was used in calculating the factor of safety for circular arc failure surfaces. For each section, separate analyses were performed to consider two cases - circular arcs constrained to be within the dike and circular arcs penetrating into the foundation. The minimum factors of safety are provided in the Table 3 below. Analyses were performed for exterior slopes. Plots of critical surfaces with factors of safety and the summary of input data are included in Appendix C.

TABLE 3: 1971/1983 ASH POND - FACTORS OF SAFETY AGAINST SLOPE FAILURE

Description of Analysis	Factor of Safety	
	Static	Seismic
<u>1971/1983 Ash Pond - Analysis Section B-1</u>		
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface extending into the foundation.	1.64	1.18
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface constrained to be within the dike. Result shown is for shallow depth surface near face of slope. A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.	1.85	1.40
<u>1971/1983 Ash Pond - Analysis Section B-2</u>		
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface extending into the foundation.	1.52	1.03
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface constrained to be within the dike. Result shown is for shallow depth surface near face of slope.	1.78	1.25
Exterior Slope (Wedge Analysis), Phreatic Surface developed from measured water level. Failure surface extending into the foundation.	1.46	1.01
<u>1971/1983 Ash Pond - Analysis Section B-3</u>		
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface extending into the foundation.	2.51	1.56
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface constrained to be within the dike. Result shown is for shallow depth surface near face of slope.	2.51	1.68

Two of the borings along the west dike (B-2 and B-3) of the 1971/1983 Ash Pond encountered apparent fly ash below the sandy fill soils. The consistency of the fly ash varied from very soft to medium stiff. No records indicate placement of fly ash as part of the dike construction, but anecdotal indications are that ash was once sluiced out in some of the area now occupied by the 1971/1983 Ash Pond (near the southern section). Our stability analyses at boring location B-2 included the ash as a separate layer with low strength properties, and both circular arc and sliding wedge failure mechanisms were analyzed. The lowest factor of safety result was for a sliding wedge mode of failure with a value of 1.46. Considering the successful history of performance of the dike and the expectation of closure in the near term, MACTEC considers the factor of safety acceptable. However, no vertical extension of the dike should be performed without further detailed analyses. Development of the closure plans for the Ash Pond should include further evaluation of the stability of the west dike under the load of potential capping approaches. Providing a stability berm along the toe would be one approach to improve the stability if future loads were to be added on the crest of the dike or the interior of the pond near the dike.

11.3 1984 ASH POND

Slope stability analysis performed for the exterior slopes of the 1984 Ash Pond dikes considered both static and seismic loading conditions. The analyses were conducted for the maximum normal operating level of the pond at Elevation 32 feet. Rapid drawdown was not evaluated because in order to have a rapid drawdown condition, a breach of the dam would be needed.

A representative cross section of the western perimeter dike adjacent to the cooling pond was evaluated for this study. The design geometry of the dike was obtained from the design drawings included in Appendix F. A stability analysis performed by Carolina Power & Light for the original dike design indicates a factor of safety against slope stability of 1.583. For the CP&L analysis, a phreatic surface was assumed to be as indicated on Figure 8.

MACTEC installed piezometers in the crest, slope and toe of the dike at six locations along the 1984 ash pond dike to measure water levels within the dike. The recorded water levels resulted in a lower phreatic surface than assumed in the original design. A water level at Elevation 12 feet was assumed at the crest for analysis. Analysis for this study included using the same dike geometry and soil properties from the original dike design, but with the phreatic surface determined from the piezometers installed in the dike. The MACTEC analysis shows a higher factor of safety for slope stability than determined in the original CP&L analysis because of the lower phreatic surface. The stability analysis section as performed by MACTEC based on current piezometer data is shown as Figure 7.

In addition, an analysis using the same slope geometry, soil properties and phreatic surface as the original CP&L analysis was performed for comparison purposes. The factor of safety determined the comparison analysis was consistent with the factor of safety determined by CP&L. The slope stability analysis section originally performed by CP&L is illustrated in Figure 8.

The computer program PCSTABL5M with Windows based interactive STEDwin software was used for analysis. The Modified Bishop's method was used in calculating the factor of safety for circular arc failure surfaces. For each section, separate analyses were performed to consider two cases - circular arcs constrained to be within the dike and circular arcs penetrating into the foundation. The minimum factors of safety are provided in the Table 4 below. Analyses were performed for exterior slopes. Plots of critical surfaces with factors of safety and the summary of input data are included in Appendix D.

TABLE 4: 1984 ASH POND - FACTORS OF SAFETY AGAINST SLOPE FAILURE

Description of Analysis	Factor of Safety	
	Static	Seismic
<u>1984 Ash Pond</u>		
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface extending into the foundation.	2.51	1.56
Exterior Slope, Phreatic Surface developed from measured water level. Failure surface constrained to be within the dike. Result shown is for shallow depth surface near face of slope. A nominal value of effective cohesion (10 psf) is assigned for analysis to avoid low factors of safety associated with shallow slip surfaces along the face of the slope.	2.51	1.68
CP&L Original Slope Stability Analysis (reference Figure 8)	1.583	NA
MACTEC Slope Stability Analysis with same phreatic surface as CP&L analysis for comparison. This analysis is included in Appendix D as "Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Deep) Run 2"	1.57	NA

12.0 SEEPAGE CONDITIONS

12.1 1971/1983ASH POND

The exterior slope and toe of the 1971/1983 Ash Pond dike have been observed during regular inspections by plant personnel and by MACTEC during the 5-year and annual inspections since 1987. Seepage has not been noted in the reports of those inspections. Seepage was not observed along the toe during the field work conducted for the present evaluation. Water levels in hand augers at the toe generally encountered water at depths corresponding to the water level elevation of the adjacent Cooling Lake and discharge canal.

12.2 1984 ASH POND

The exterior slopes of the 1984 Ash Pond dike have been observed during regular inspections by plant personnel and by MACTEC during the 5-year and annual inspections since 1987. Seepage has not been noted as a concern in the reports of those inspections. Records of water level readings in piezometers is discussed under Section 9.2 and reference data is included in Appendix G. The piezometer readings do not appear to indicate seepage close to the existing dike slope or toe surface.

13.0 CONCLUSIONS

The analysis results for the 1971/1983 and 1984 Ash Pond dikes indicate the factors of safety for slope stability are acceptable. Observations made from recent field inspections have not indicated signs of slope or foundation distress that would suggest potential failure concerns.

Inspections and observations of conditions on the slopes and the exterior toes of the dikes should be continued. The planned placement of additional riprap along the secondary settlement pond dike will assist in protecting that section from surficial soil movement related to seepage. No structural remedial activities are recommended.

14.0 REFERENCES

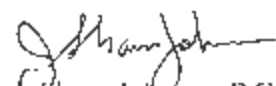
1. U.S. Army Corps of Engineers, "Recommended Guidelines for Safety Inspection of Dams," Department of Army, Office of the Chief Engineers, Washington, D.C., 1976
2. MACTEC Engineering and Consulting, Inc., Five-Year Independent Consultant Inspection, Ash Pond Dikes, L. V. Sutton Steam Electric Generating Plant, New Hanover County, North Carolina, December 20, 2007.
3. MACTEC Engineering and Consulting, Inc., Report of Piezometer Installation and Observations, 1984 Ash Pond, Sutton Plant, April 20, 2010.
4. AASHTO Ground Motion Software Program, Version 2.1 "Seismic Design Parameters for 2007 AASHTO Seismic Design Guidelines" downloaded from USGS Earthquakes Hazards Program.
5. "International Building Code" (2006), International Code Council, Inc., USA
6. "Slope Stability" Engineering Manual, EM 1110-2-1902, Department of Army, U.S. Army Corps of Engineers., Washington, D.C., October 2003

15.0 CLOSING

MACTEC appreciates the continued opportunity to provide engineering and consulting services to Progress Energy. If you have any questions or need any additional information, please do not hesitate to contact us.

Sincerely,

MACTEC Engineering and Consulting, Inc.



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TABLE 5: 1971/1983 ASH POND – WATER LEVEL SUMMARY

Table 5: 1971/1983 Ash Pond - Water Level Summary

1971/1983 Ash Pond Dike Stability Evaluation
L.V. Sutton Steam Plant
Wilmington, North Carolina
MACTEC Job No.: 6468-10-0274

Location	Ground Surface Elevation	Casing Depth	Screen Interval	Depth to Groundwater				Groundwater Elevation					
				12/15/2010	12/16/2010	1/7/2011	2/11/2011	12/15/2010	12/16/2010	1/7/2011	2/11/2011		
B-1	26.00	15.0	5-15	-	-	13.4	13.2	-	-	12.60	12.80	-	-
HA-1-1	20.36	9.90	-	Dry @ 9.9	Dry @ 9.9	Dry @ 9.9	Dry @ 9.9	-	-	Dry	Dry	-	-
HA-1-2	11.73	4.85	-	3.40	3.40	1.90	3.20	8.45	8.33	7.83	8.53	-	-
B-2	26.00	17.00	7-17	-	12.9*	14.50	14.05	-	-	13.1*	11.30	11.95	-
HA-2-1	17.39	8.85	-	7.25	7.2	7.70	7.25	10.14	10.19	9.59	10.14	-	-
HA-2-2	10.89	3.30	-	1.50	1.40	1.80	1.40	9.19	9.20	8.89	9.29	-	-
B-3	26.00	15.00	5-15	-	13.8*	14.70	14.52	-	-	12.2*	11.30	11.48	-
HA-3-1	18.02	9.95	-	Dry @ 9.95	Dry @ 9.95	Dry @ 9.95	Dry @ 9.95	-	-	Dry	Dry	-	-
HA-3-2	12.56	6.95	-	4.90	4.80	5.4	4.8	7.66	7.76	7.16	7.76	-	-

*Water level measured at end of day.

Prepared By: J.S.J. Date: 3/14/11
 Checked By: J.S.A. Date: 3/14/11

FIGURES

FIGURE 1: SITE LOCATION MAP

FIGURE 2: BORING LOCATION MAP

FIGURE 3: LEGEND FOR SECTIONS

FIGURE 4: 1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-1

FIGURE 5: 1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-2

FIGURE 6: 1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-3

FIGURE 7 - 1984 ASH POND - TYPICAL STABILITY ANALYSIS SECTION

FIGURE 8 - 1984 ASH POND - CP&L ORIGINAL STABILITY ANALYSIS

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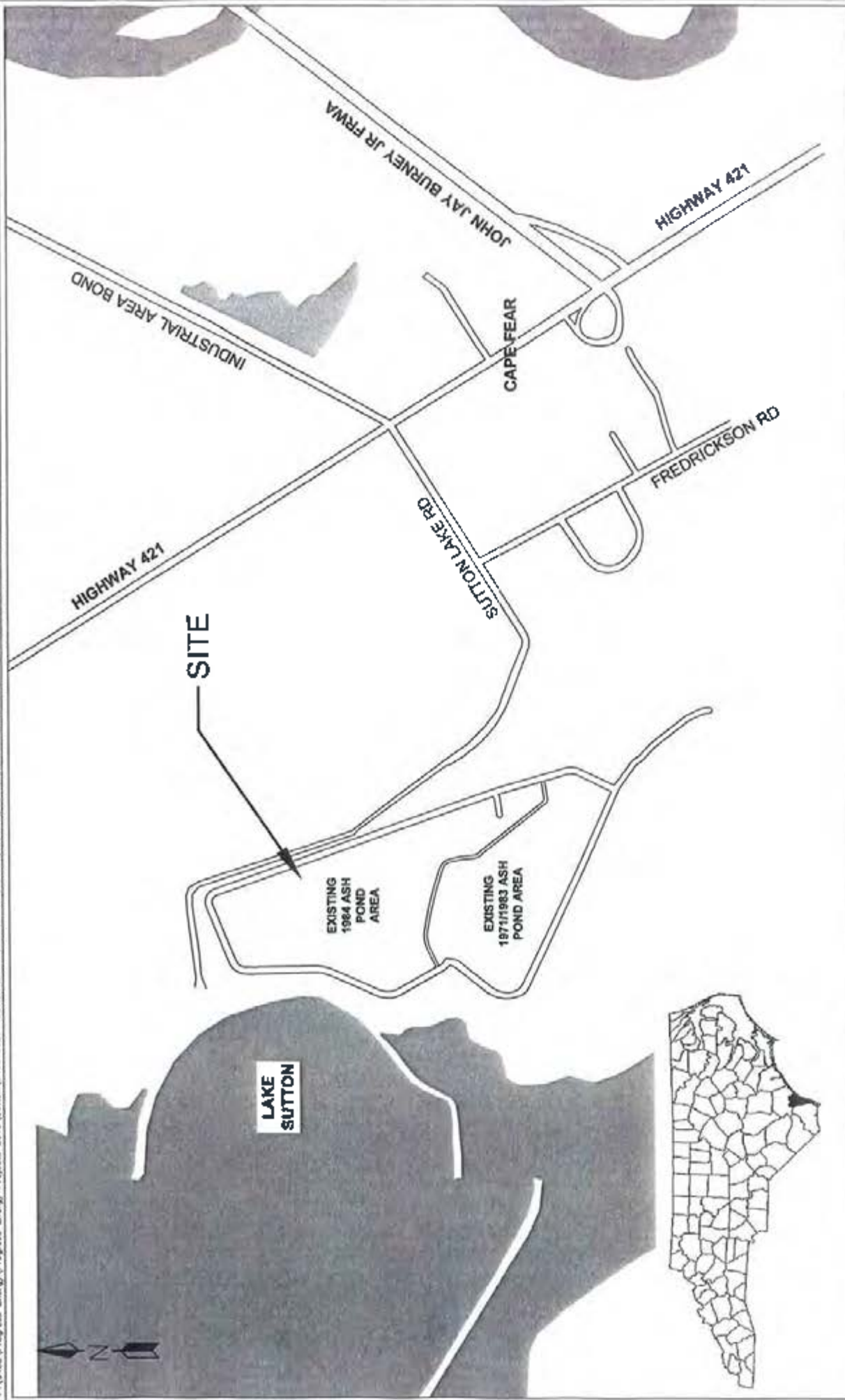


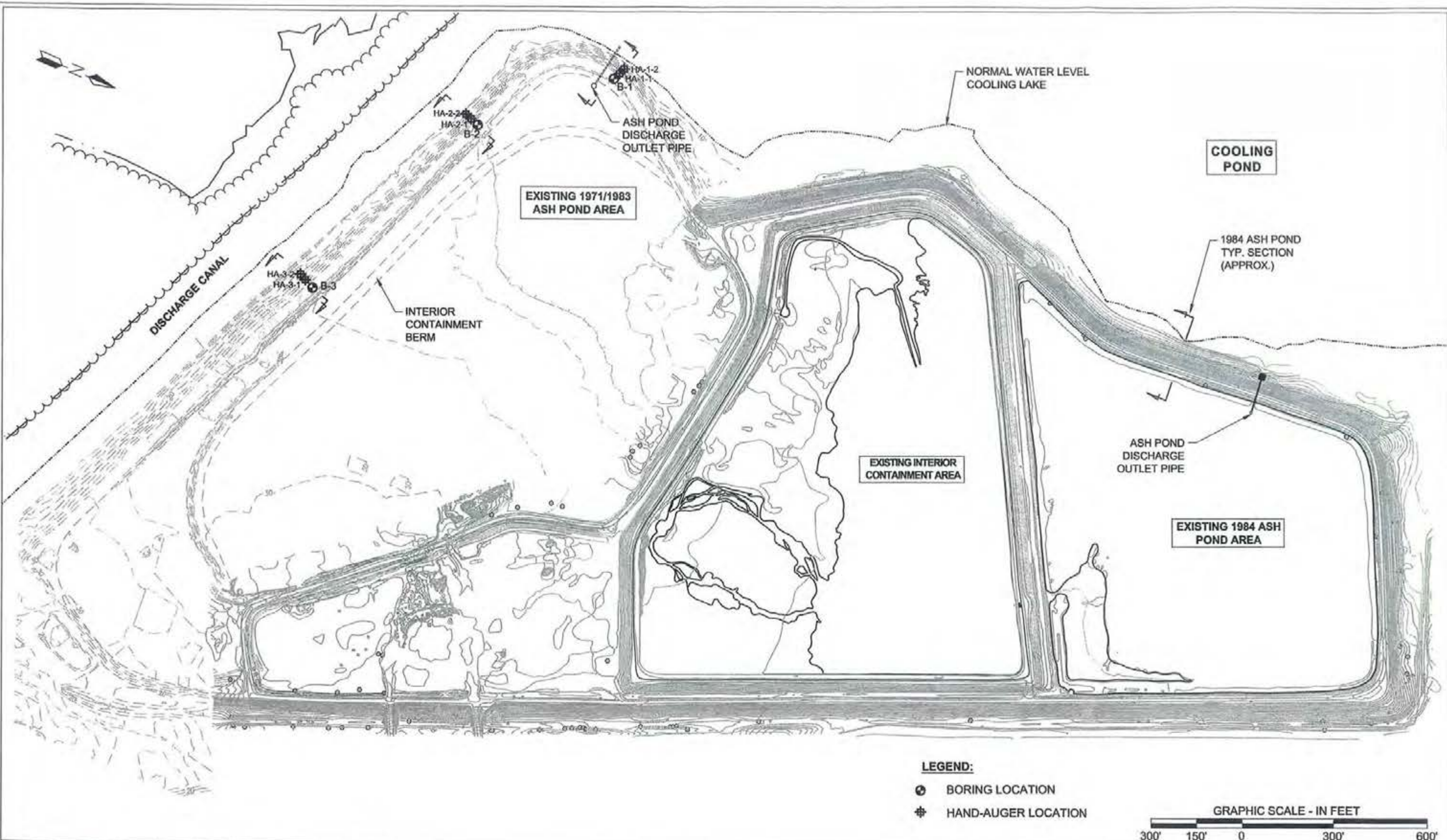
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ENG CHECK:	JST	SCALE:	N.T.S.
APPROVAL:	ASA	JOB No.:	6468-10-0274

SITE LOCATION MAP
PROGRESS ENERGY
L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
WILMINGTON, NORTH CAROLINA

MACTEC
 MACTEC ENGINEERING AND CONSULTING, INC.
 3301 ATLANTIC AVENUE
 RALEIGH, NORTH CAROLINA

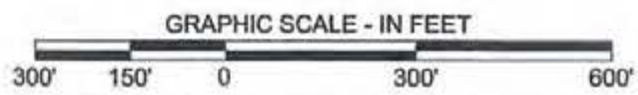
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LEGEND:

- ⊙ BORING LOCATION
- ⊕ HAND-AUGER LOCATION







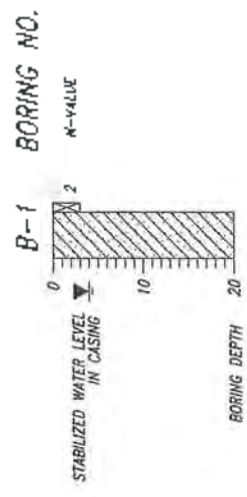
BORING LOCATION PLAN
PROGRESS ENERGY
L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
WILMINGTON, NORTH CAROLINA

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ENG CHECK: JJJ	SCALE: AS SHOWN	
APPROVAL: RSA	JOB No.: 6468-10-0274	

REFERENCE: TOPO FOR 1984 ASH POND WAS PREPARED BY MCKIM & CREED BASED ON AERIAL IMAGERY COLLECTED JULY 15, 2009. TOPO FOR 1971/1983 ASH POND OBTAINED FROM WITHERS & RAVENEL, SITE PLAN DATED 5/25/08.

MATERIAL LAYERING CODES

			
Topsoil	Poorly Graded Sand with Clay (SP-SC)	Poorly Graded Sand (SP)	Poorly Graded Sand with Silt (SP-SM)
MU	Poorly Graded Sand (SP)	Well Graded Sand (SW)	Silty Clayey Sand (SC-SM)
Low Plasticity Inorganic Clays (CL)	Silty Sand (SM)	Silty Sand (SM)	Low Plasticity Organic Soils (OL)
High Plasticity Inorganic Clays (CH)	Clayey Sand (SC)	Clayey Sand (SC)	High Plasticity Organic Soils (OH)
Low Plasticity Inorganic Silts (ML)	Moderate to high Plasticity Clay (CL-CH)	Pavement section	
High Plasticity Inorganic Silts (MH)			
Peaf/Organic Muck			



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APPROVAL:	Asst	FOR No. F-46R-10-0774	

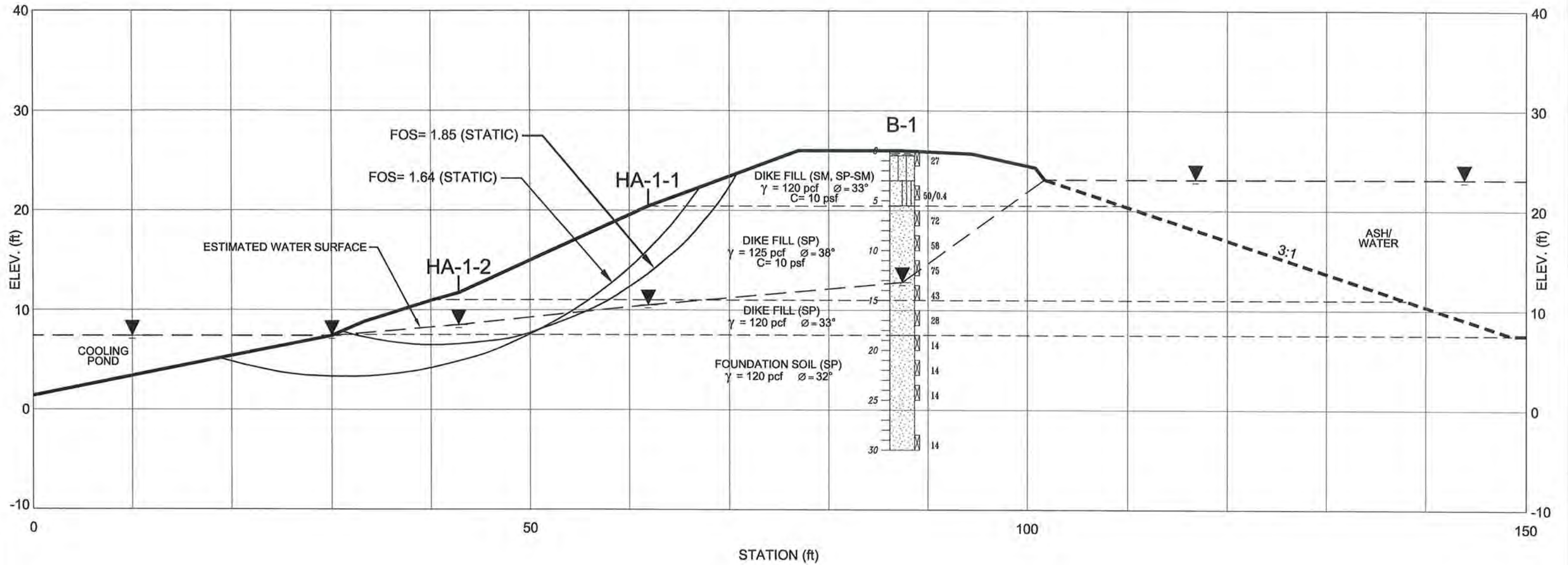
LEGEND FOR SECTIONS
 PROGRESS ENERGY
 L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
 WILMINGTON, NORTH CAROLINA



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 RALEIGH, NORTH CAROLINA

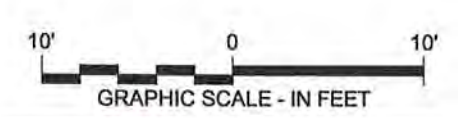
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NOTE:

1. SEE TABLE 5 FOR WATER LEVEL DATA.
2. STABILITY RUN OUTPUT SHEETS ARE IN APPENDIX C.
3. SEISMIC ANALYSIS CIRCLES ARE NOT SHOWN FOR CLARITY.
4. FACTOR OF SAFETY FOR SEISMIC ANALYSIS IS 1.18.



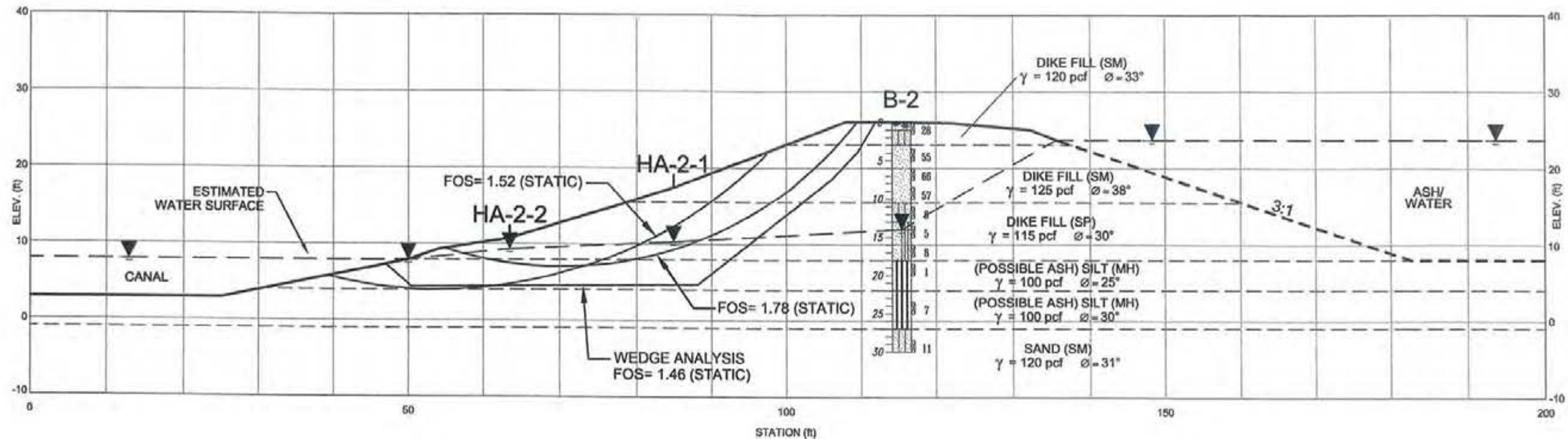
1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-1
 PROGRESS ENERGY
 L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
 WILMINGTON, NORTH CAROLINA

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APPROVAL: [Signature]	JOB No.: 6468-10-0274

FIGURE
4

REFERENCE:

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NOTE:

1. SEE TABLE 5 FOR WATER LEVEL DATA.
2. STABILITY RUN OUTPUT SHEETS ARE IN APPENDIX C.
3. SEISMIC ANALYSIS CIRCLES ARE NOT SHOWN FOR CLARITY.
4. FACTOR OF SAFETY FOR SEISMIC ANALYSIS IS 1.01.



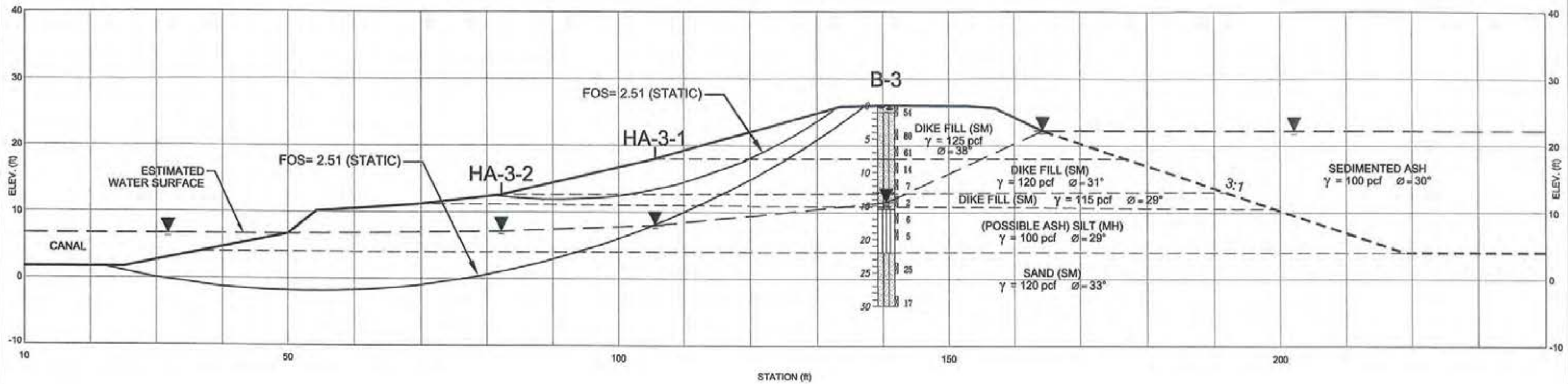
1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-2
 PROGRESS ENERGY
 L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
 WILMINGTON, NORTH CAROLINA

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APPROVAL: RSA	JOB No.: 6468-10-0274

FIGURE

5

REFERENCE:



NOTE:

1. SEE TABLE 5 FOR WATER LEVEL DATA.
2. STABILITY RUN OUTPUT SHEETS ARE IN APPENDIX C.
3. SEISMIC ANALYSIS CIRCLES ARE NOT SHOWN FOR CLARITY.
4. FACTOR OF SAFETY FOR SEISMIC ANALYSIS IS 1.56.



1971/1983 ASH POND - STABILITY ANALYSIS SECTION AT BORING B-3
 PROGRESS ENERGY
 L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
 WILMINGTON, NORTH CAROLINA

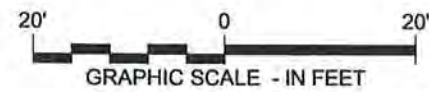
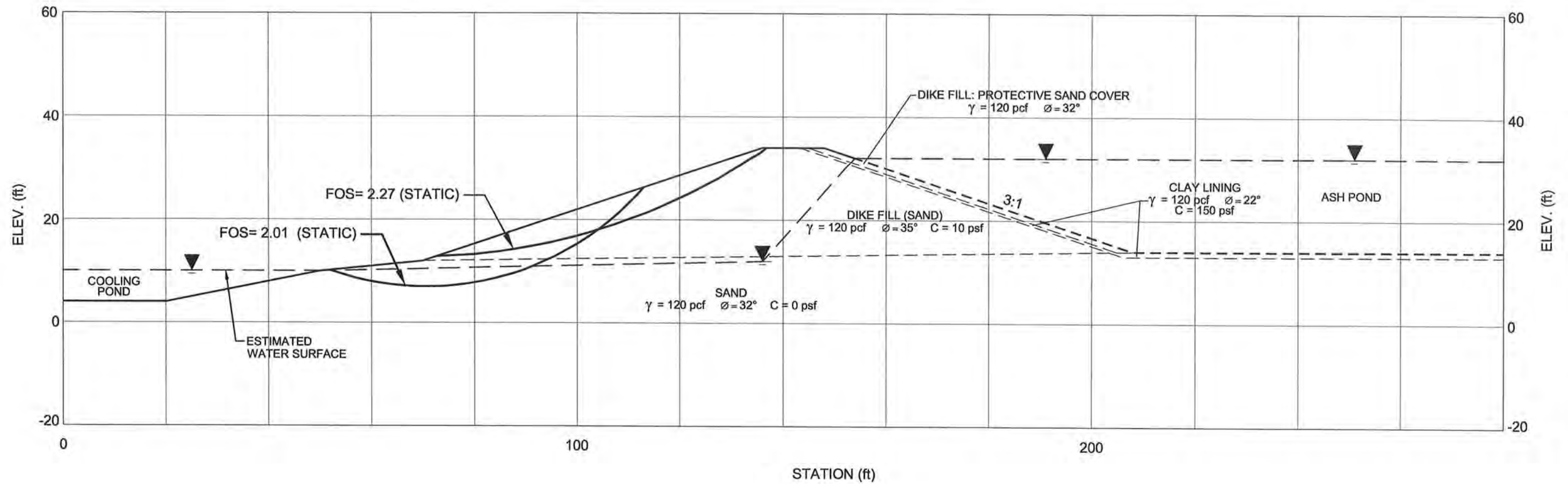
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FIGURE

6

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NOTE:

1. SEE APPENDIX G FOR WATER LEVEL DATA.
2. STABILITY RUN OUTPUT SHEETS ARE IN APPENDIX D.
3. SEISMIC ANALYSIS CIRCLES ARE NOT SHOWN FOR CLARITY.
4. FACTOR OF SAFETY FOR SEISMIC ANALYSIS IS 1.36.



1984 ASH POND - TYPICAL STABILITY ANALYSIS SECTION
PROGRESS ENERGY
L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
WILMINGTON, NORTH CAROLINA

DRAWN:	R.R.	DATE:	MARCH 2011
ENG CHECK:	JSJ	SCALE:	AS SHOWN
APPROVAL:	USA	JOB No.:	6468-10-0274

FIGURE

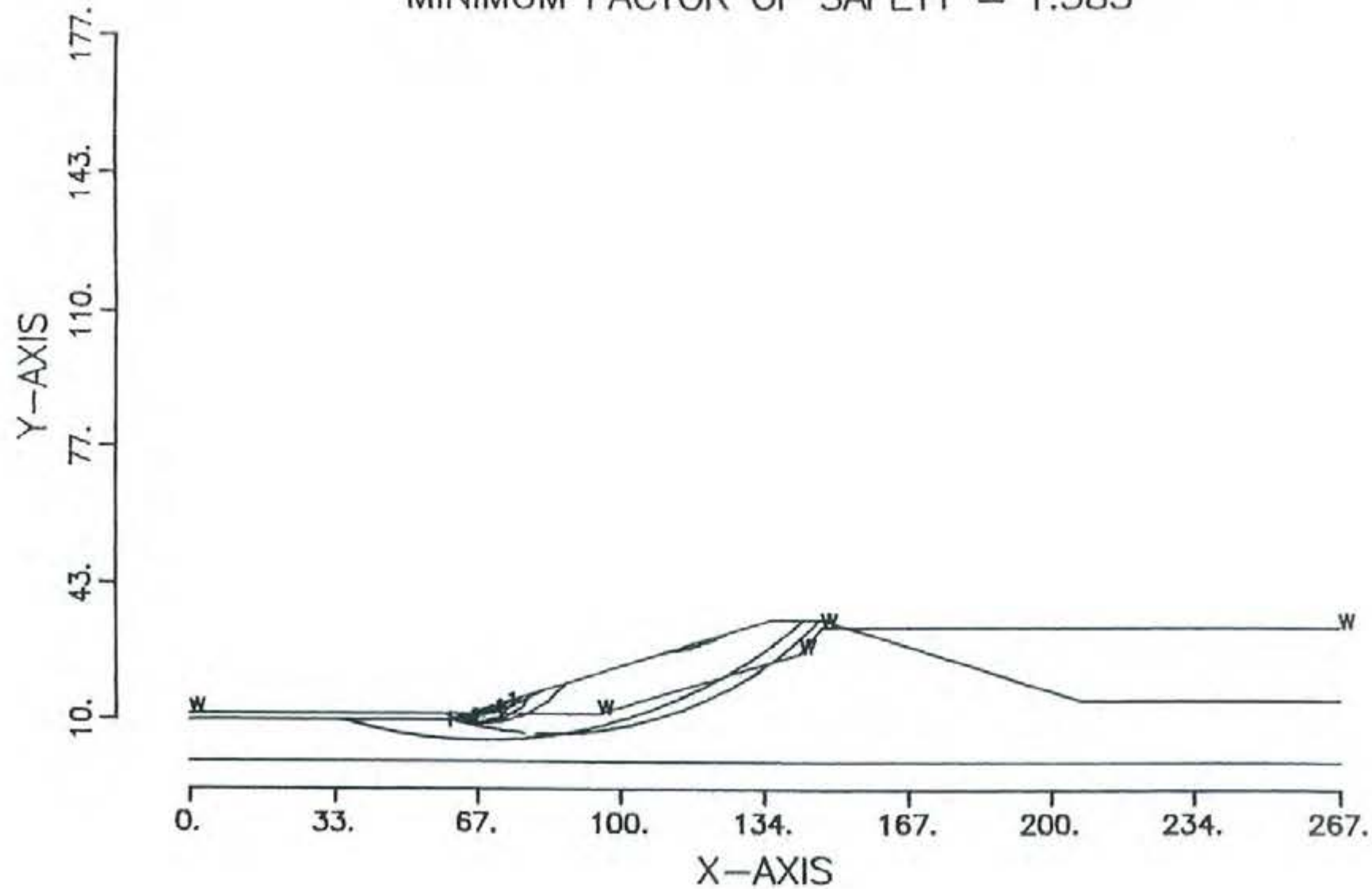
7

REFERENCE:

Carolina Power & Light Co.
 Raleigh, NC (s/n 5093)

SUTTON ASH POND GEOSLOPE ANALYSIS

100 SURFACES HAVE BEEN GENERATED
 10 MOST CRITICAL OF SURFACES GENERATED
 MINIMUM FACTOR OF SAFETY = 1.583



P:\6468\Progress Energy\Progress Energy Projects\2010\Sutton\646810274 Sutton SAP Production and Stability Drawings\Boring Location Plan.dwg Thu, 03 Mar 2011 10:01am maha



1984 ASH POND- CP&L ORIGINAL STABILITY ANALYSIS
 PROGRESS ENERGY
 L.V. SUTTON STEAM ELECTRIC PLANT - ASH POND
 WILMINGTON, NORTH CAROLINA

DRAWN: R.R.	DATE: MARCH 2011
ENG CHECK: <i>JST</i>	SCALE: N.T.S.
APPROVAL: <i>ABA</i>	JOB No.: 6468-10-0274

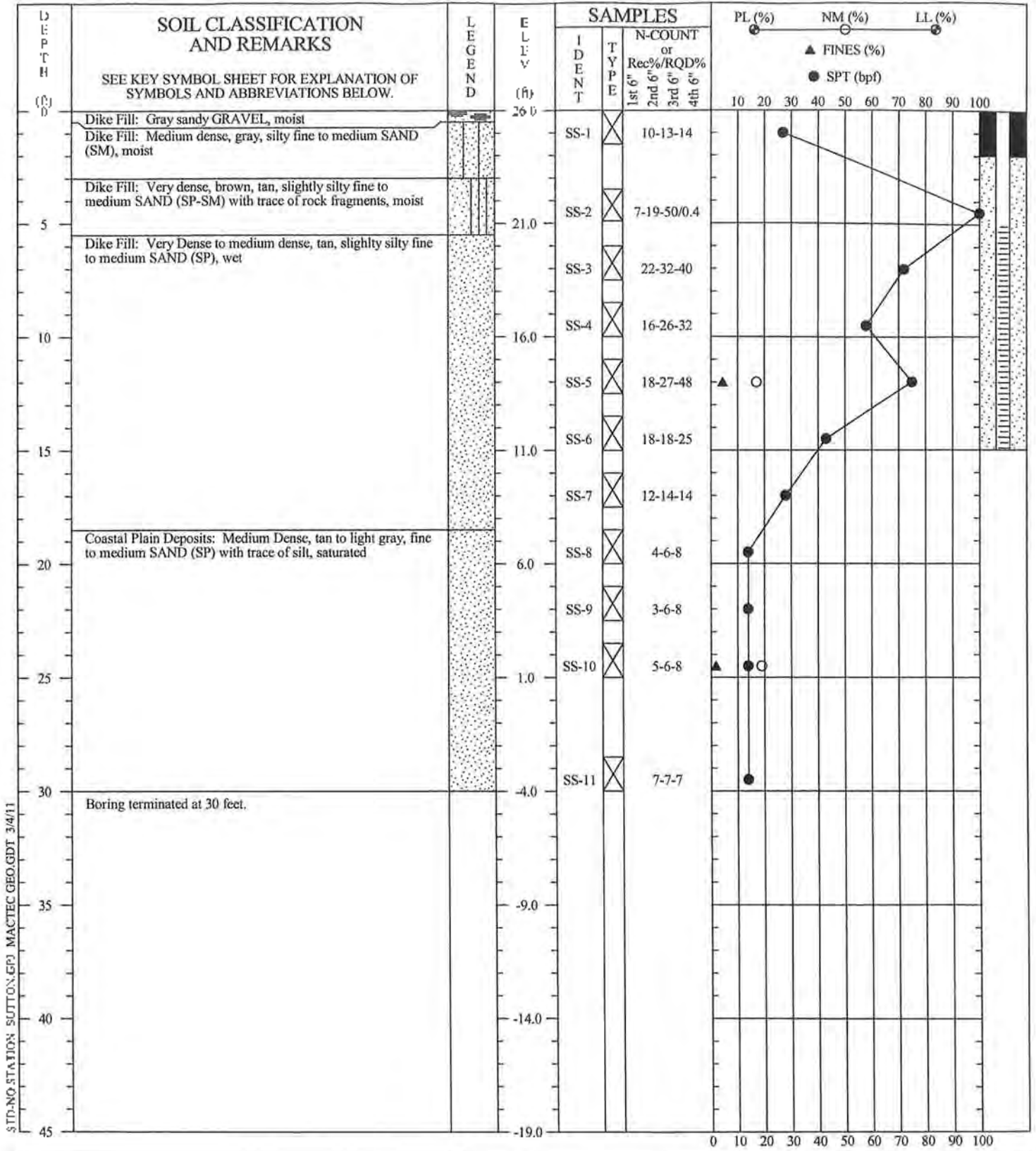
FIGURE

8

REFERENCE:

APPENDICES

APPENDIX A: 1971/1983 ASH POND - TEST BORING AND HAND AUGER BORING RECORDS



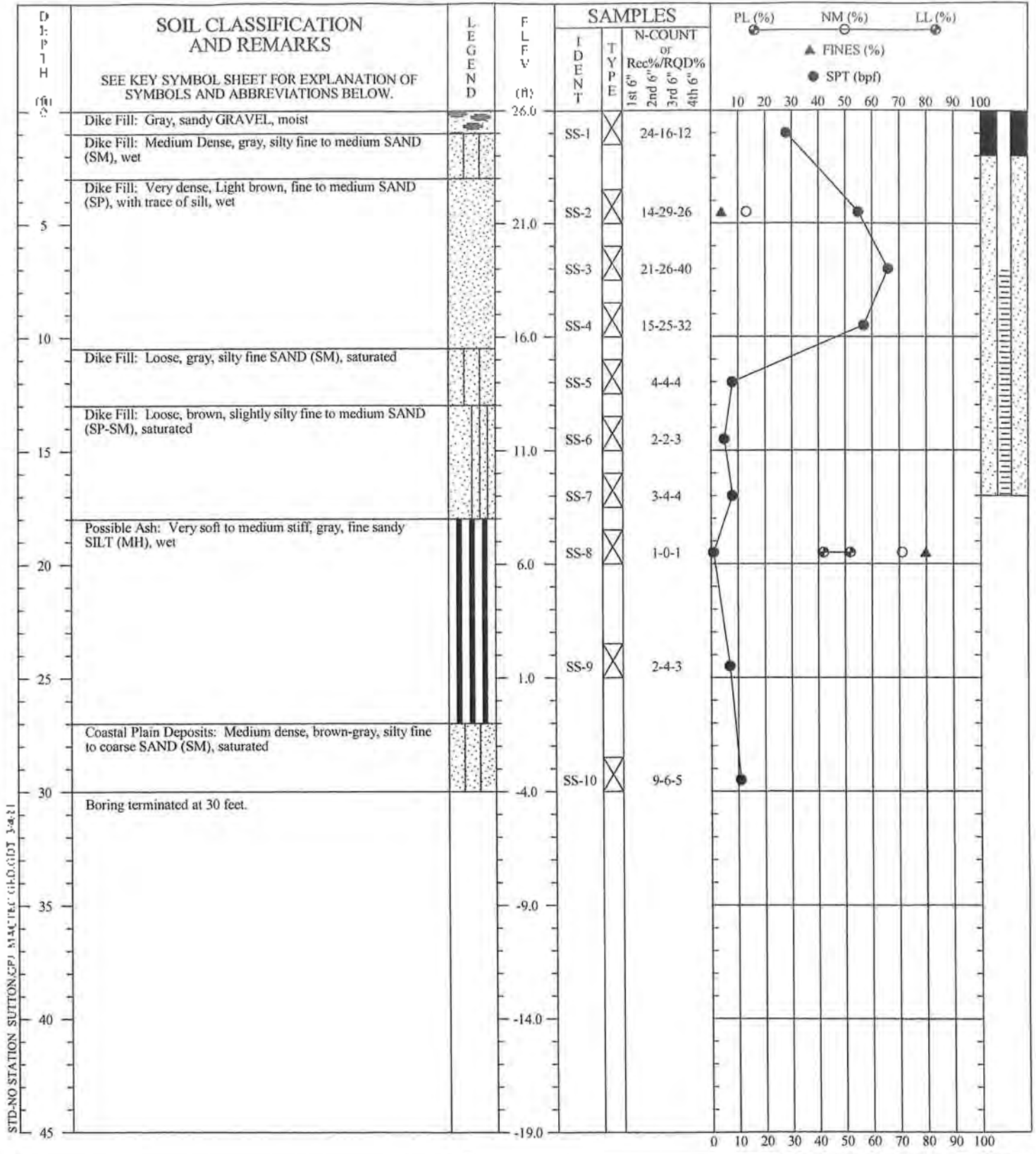
STD. NO. STATION: SUTTON.GP MACTEC GEO.GDT 3/4/11

DRILLER: D White
 EQUIPMENT: CME-45 LC
 METHOD: Mud Rotary
 HOLE DIA.: 3"
 REMARKS: Groundwater level upon completion of boring not measured since drilling slurry was used. A casing was installed in the borehole. A Groundwater level of 13.2 feet was measured in the casing on 2/11/2011.

REVIEWED BY: *JSS/PSA*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project:	Sutton Plant Ash Pond Dike Stability
Location:	Wilmington, North Carolina
Drilled:	December 16, 2010
Project #:	6468-10-0274
Boring No.:	B-1
Page 1 of 1	



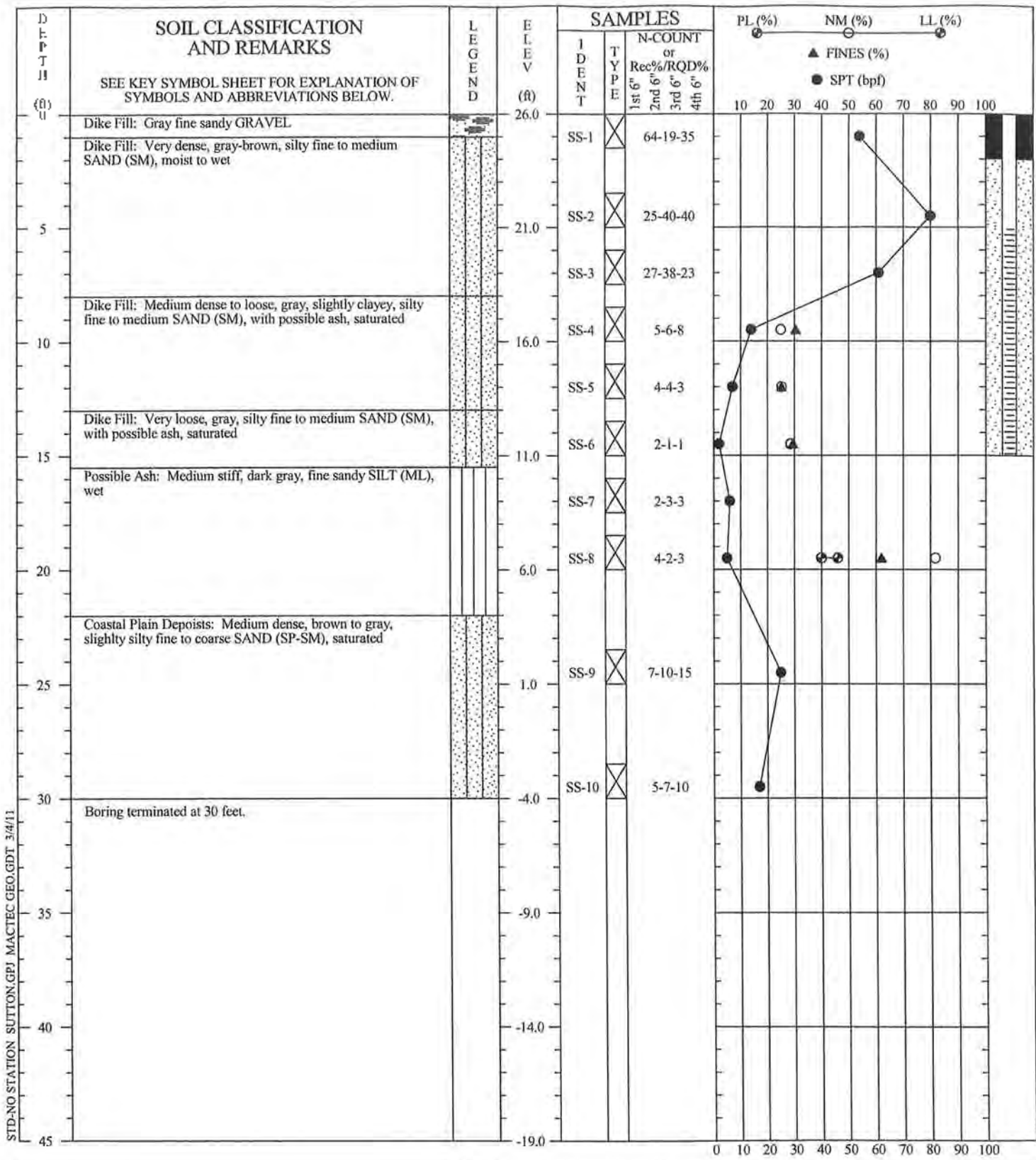
STD. NO. STATION SUTTON (GPI) MACTEC G.E.D. G.D.T. 3-4-21

DRILLER: D. White
 EQUIPMENT: CMF-45 LC
 METHOD: Mud Rotary
 HOLE DIA.: 4"
 REMARKS: Groundwater level upon completion of boring not measured since drilling slurry was used. A casing was installed in the borehole. A Groundwater level of 14.1 feet was measured in the casing on 2/11/2011.

REVIEWED BY: *J.S. / R.S.A.*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project: Sutton Plant Ash Pond Dike Stability	Boring No.: B-2
Location: Wilmington, North Carolina	
Drilled: December 16, 2010	
Project #: 6468-10-0274	Page 1 of 1



STD-NO STATION SUTTON.GPJ MACTEC GEO.GDT 3/4/11

DRILLER: D. White
 EQUIPMENT: CMF-45 LC
 METHOD: Mud Rotary
 HOLE DIA.: 3"
 REMARKS: Groundwater level upon completion of boring not measured since drilling slurry was used. A casing was installed in the borehole. A Groundwater level of 14.5 feet was measured in the casing on 2/11/2011.

REVIEWED BY: *JSS/RSR*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project: Sutton Plant Ash Pond Dike Stability	Boring No.: B-3
Location: Wilmington, North Carolina	
Drilled: December 16, 2010	
Project #: 6468-10-0274	Page 1 of 1

MACTEC

Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/2010
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-1-1	Boring Location: On slope at B-1	
Depth (feet)	Blow Counts	Visual Soil Description
0 - 4	NA	Tan Slightly Silty Fine to Coarse SAND (SP-SM), Moist
4-10	NA	Gray Slightly Silty Fine to Coarse SAND (SP-SM), Moist
		Boring dry at completion of hand auger.
		Dry on 12/16/10, 1/7/11 and 2/11/11

Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/10
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-1-2	Boring Location: Near Toe of slope at B-1	
Depth (feet)	Blow Counts	Visual Soil Description
0-5	NA	Tan Slightly Silty Fine to Medium SAND (SP-SM), Moist to wet
		Groundwater at 4.0 feet at hand auger completion.
		Groundwater at 3.3 feet on 12/15/10 (evening)
		Groundwater at 3.4 feet on 12/16/10
		Groundwater at 3.9 feet on 1/7/11
		Groundwater at 3.2 feet on 2/11/11

Prepared by: JSJ Reviewed by: ASA



Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/2010
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-2-1	Boring Location: On slope at B-2	
Depth (feet)	Blow Counts	Visual Soil Description
0-4	NA	Tan Slightly Silty Fine to Coarse SAND (SP), dry to moist
4-5	NA	Tan to Brown Slightly Silty Fine to Coarse SAND (SP), moist
5-9	NA	Gray Silty Fine to Medium SAND (SM), moist to wet
		Boring dry at completion of hand auger.
		Groundwater at 7.3 feet on 12/15/10 (evening)
		Groundwater at 7.2 feet on 12/16/10
		Groundwater at 7.7 feet on 1/7/11
		Groundwater at 7.3 feet on 2/11/11

Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/2010
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-2-2	Boring Location: Near Toe of Slope at B-2	
Depth (feet)	Blow Counts	Visual Soil Description
0-1.5	NA	Brown-tan to Gray Silty Fine to Coarse SAND (SP-SM), moist to wet
1.5-3	NA	Gray Silty Fine SAND (SM), with trace organic matter, wet
		Groundwater at 1.5 feet at hand auger completion.
		Groundwater at 1.5 feet on 12/15/10 (evening)
		Groundwater at 1.4 feet on 12/16/10
		Groundwater at 1.8 feet on 1/7/11
		Groundwater at 1.4 feet on 2/11/11

Prepared by: JJJ

Reviewed by: ASA



Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/2010
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-3-1	Boring Location: On Slope Near B-3	
Depth (feet)	Blow Counts	Visual Soil Description
0-2	NA	Possible Ash: Gray Silty Fine SAND, (SM), moist
2-5.5	NA	Possible Ash: Gray fine Sandy SILT (ML), moist
5.5-8	NA	Gray and Tan Slightly Silty Fine to Coarse SAND (SP-SM), moist
8-10	NA	Gray Silty Fine Sand (SM), with Silt Seams, wet
		Boring dry at completion of hand auger.
		Dry on 12/16/10, 1/7/11 and 2/11/11

Hand Auger Log		
Job Name: Sutton Ash Pond Stability		Date: 12/15/2010
Client: Progress Energy		MACTEC Job No. 6468-10-0274
Boring No. HA-3-2	Boring Location: Near Toe of slope at AB-3	
Depth (feet)	Blow Counts	Visual Soil Description
0-1.5	NA	Possible Ash: Gray Fine Sandy SILT (ML), moist
1.5-5.5	NA	Gray Silty Fine to Medium Sand (SM), moist
5.5-7	NA	Gray Fine Sandy SILT (ML), wet
		Groundwater at 5.5 feet at hand auger completion
		Groundwater at 4.9 feet on 12/15/10 (evening)
		Groundwater at 4.8 feet on 12/16/10
		Groundwater at 5.4 feet on 1/7/11
		Groundwater at 4.8 feet on 2/11/11

Prepared by: JJT Reviewed by: RS4



APPENDIX B: 1971/1983 ASH POND - LABORATORY TEST RESULTS

**Summary of Laboratory Test Results-Seepage and Stability Evaluation-Ash Pond Dikes-Sutton Plant,
Wilmington, North Carolina**

Boring No.	Sample No.	Sample Depth (ft)		Natural Moisture Content (%)	Grain Size # 200	Atterberg Limits			USCS	Visual Description/Comments
		From	To			PL	LL	PI		
B-1	SS-5	11.0	12.5	17.1	4.5	-	-	-	SP*	Tan slightly silty fine to medium SAND
B-1	SS-10	23.5	25.0	19.0	1.8	-	-	-	SP*	Tan slightly silty fine to medium SAND
B-2	SS-2	3.5	5.0	13.2	4.1	-	-	-	SP*	Light Brown fine to medium SAND with trace of silt
B-2	SS-8	18.5	20.0	71.1	79.8	42	52	10	MH	Gray fine sandy SILT
B-3	SS-4	8.5	10.0	25.0	30.6	NP	NV	NP	SM	Gray slightly clayey silty fine to medium SAND
B-3	SS-5	11.0	12.5	25.3	25.3	NP	NV	NP	SM	Gray slightly clayey silty fine to medium SAND
B-3	SS-6	13.5	15.0	28.7	29.5	NP	NV	NP	SM	Gray silty fine to medium SAND
B-3	SS-8	18.5	20.0	62.1	81.8	40	46	6	MI	Dark gray fine sandy SILT

USCS - Unified Soil Classification System Group Symbol

PL = Plastic Limit

LL = Liquid Limit

P.I. = Plasticity Index

NP = Non Plastic

NU = Not Determined

*Visual Classification

Prepared By: J.J.T

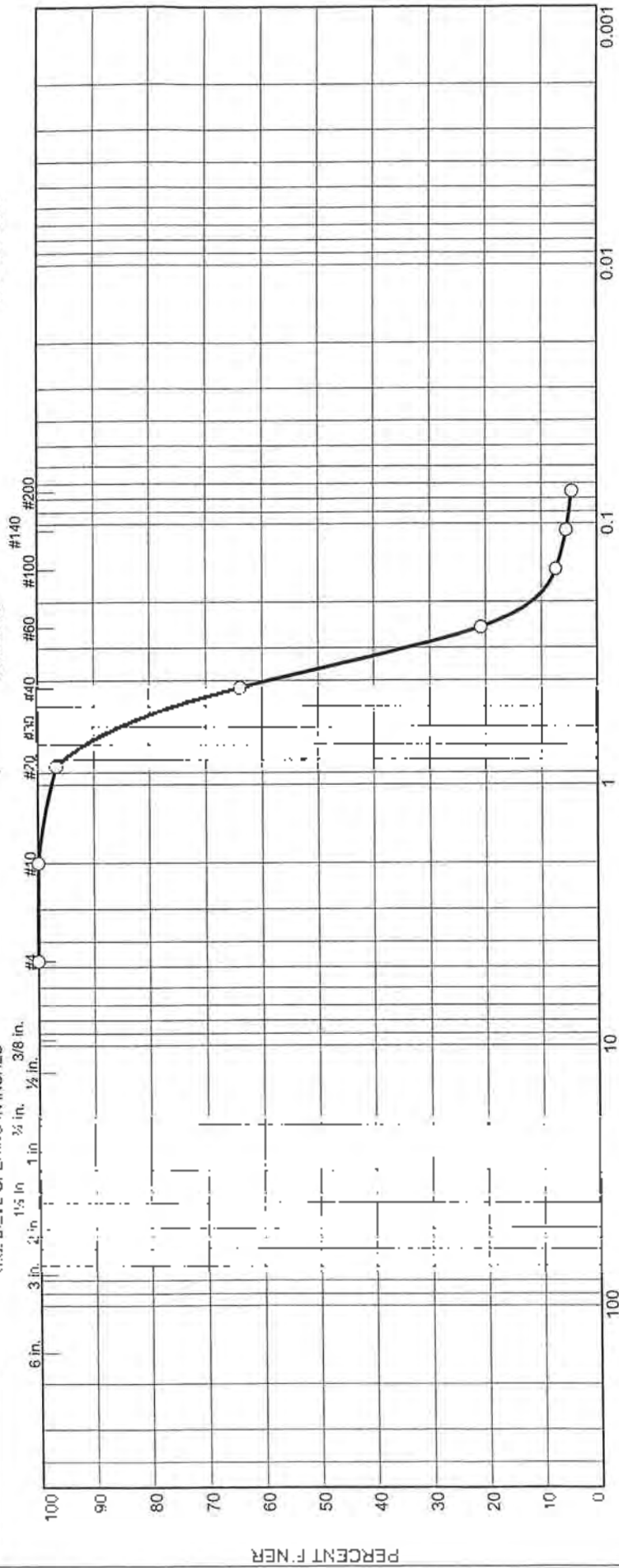
Checked By: _____

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



GRAIN SIZE - mm.

% +3"		% Gravel		% Sand			% Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Coarse	Silt	Clay
0.0	0.0	0.1	36.0	59.4				4.5	

Source	Sample #	Depth/Elev	Date Sampled	USCS	Material Description	NM %	LL	PL
Boring B-1	SS-5	11.0	12/22/10	SP (visual)	Tan slightly Silty fine to medium SAND (visual)	17.1	ND	ND

Client Progress Energy		MACTEC Engineering and Consulting, Inc.	
Project Sutton Plant Ash Pond Dike Stability		Raleigh, North Carolina	
Project No. 6468100274	Figure	0 ND = Not Determined	

Tested By: CS

Checked By: IAM

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-1

Depth: 11.0

Sample Number: SS-5

Material Description: Tan slightly Silty fine to medium SAND (visual)

Date: 12/22/10

Natural Moisture: 17.1

USCS Class.: SP

Testing Remarks: ND - Not Determined

Tested by: CS

Checked by: IAM

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 575.12
 Tare Wt. = 0.00
 Minus #200 from wash = 0.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
575.12	0.00	0.00	#4	0.00	100.0
			#10	0.38	99.9
			#20	19.09	96.7
			#40	207.40	63.9
			#60	454.90	20.9
			#100	533.00	7.3
			#140	544.00	5.4
			#200	549.50	4.5

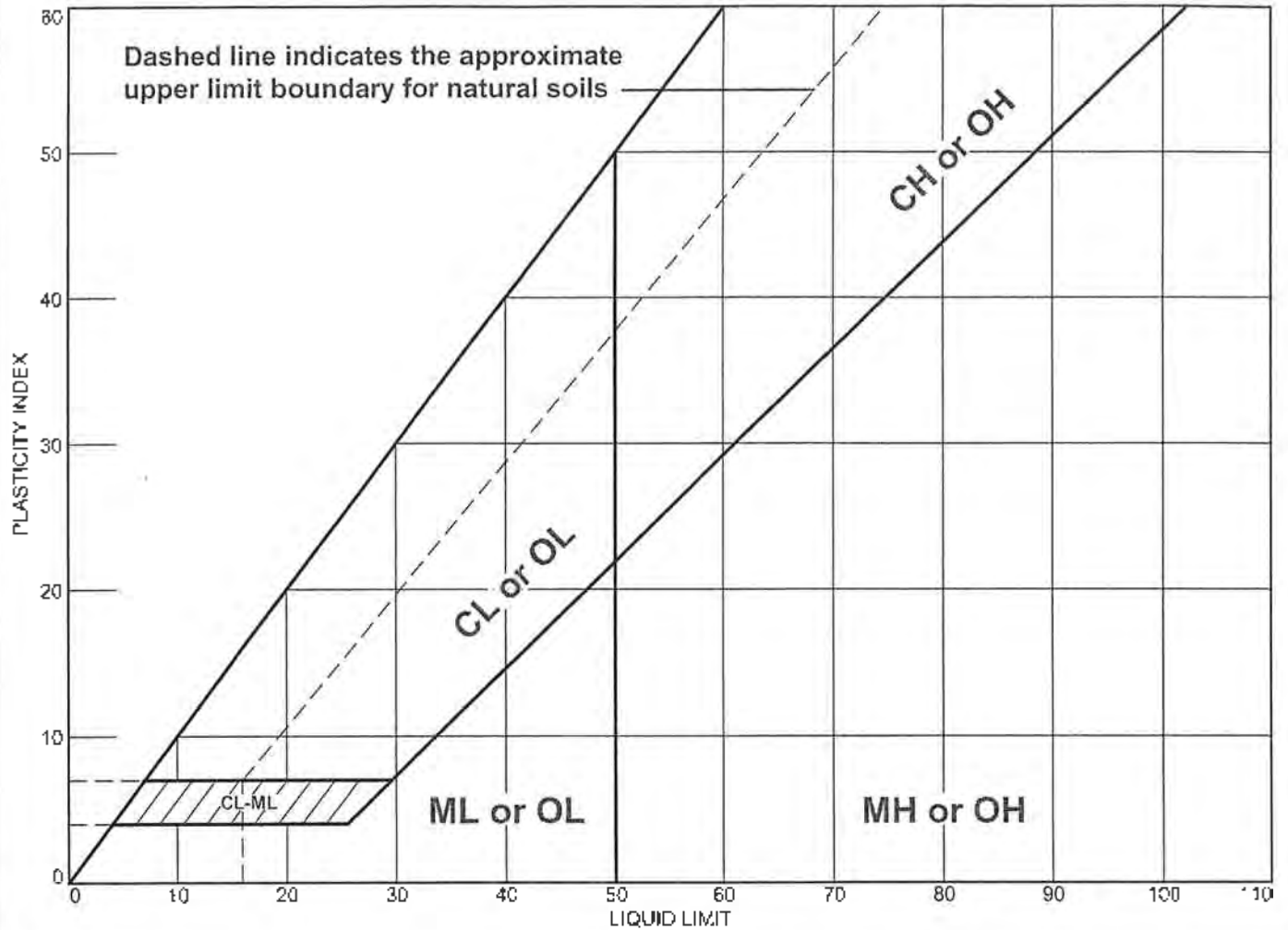
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	36.0	59.4	95.5			4.5

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.1857	0.2214	0.2461	0.2853	0.3605	0.4048	0.5409	0.5967	0.6726	0.7900

Fineness Modulus	C _u	C _c
1.75	2.18	1.08

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Tan slightly Silty fine to medium SAND (visual)				63.9	4.5	SP

<p>Project No. 6468100274 Client: Progress Energy</p> <p>Project: Sutton Plant Ash Pond Dike Stability</p> <p>• Source of Sample: Boring B-1 Depth: 11.0 Sample Number: SS-5</p>	<p>Remarks:</p>
<p>MACTEC Engineering and Consulting, Inc.</p> <p>Raleigh, North Carolina</p>	
<p>Figure</p>	

Tested By: CS **Checked By:** IAM

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-1

Depth: 11.0

Sample Number: SS-5

Material Description: Tan slightly Silty fine to medium SAND (visual)

%<#40: 63.9

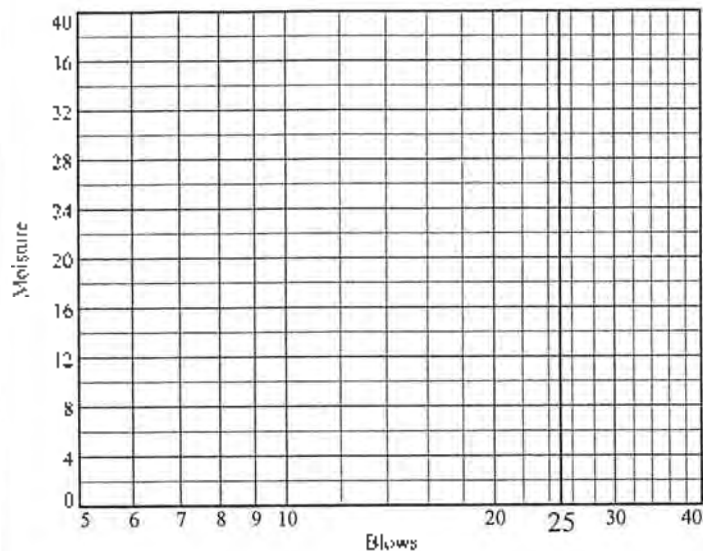
%<#200: 4.5

USCS: SP

AASHTO: ND

Tested by: CS

Checked by: JAM



Liquid Limit= _____
 Plastic Limit= _____
 Plasticity Index= _____
 Natural Moisture= 17.1

Natural Moisture Data

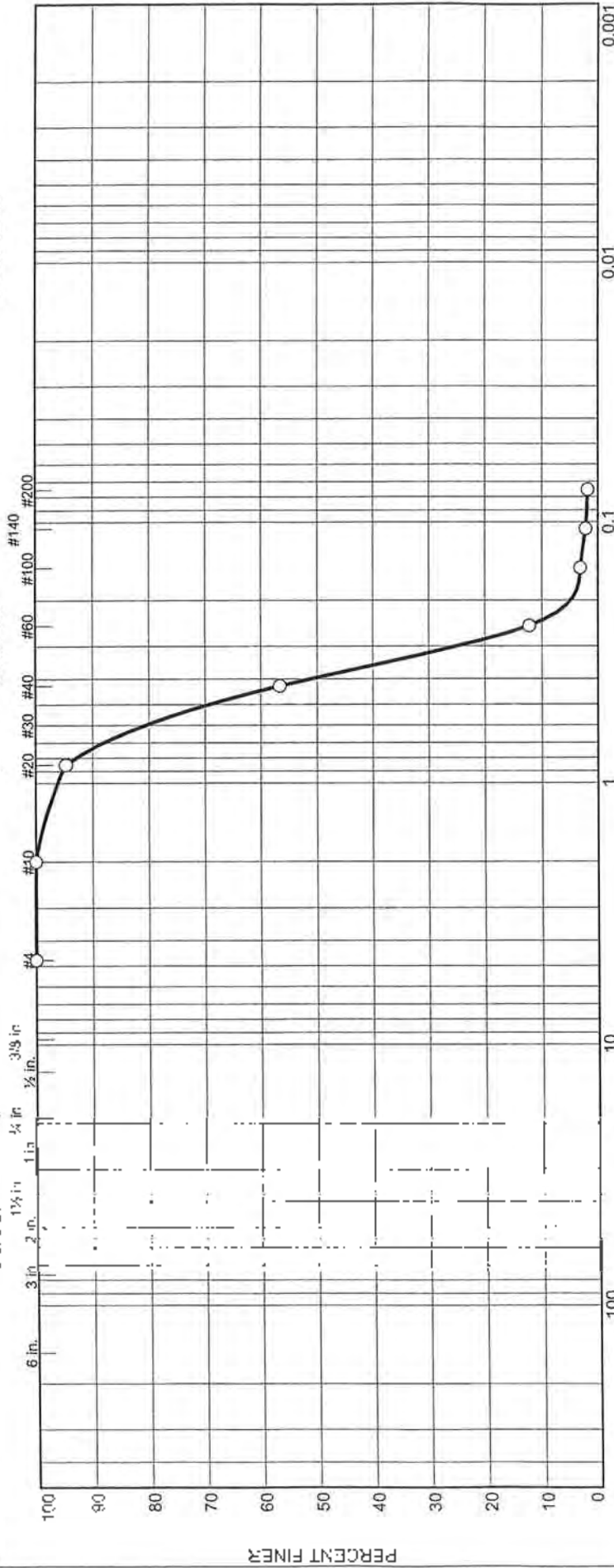
Wet+Tare	Dry+Tare	Tare	Moisture
818.15	719.79	144.67	17.1

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	43.4	54.8		1.5

Source	Sample #	Dens/Elev.	Date Sampled	USCS	Material Description	NM %	L.I.	PL
○	Boring B-1	23.5	12/22/10	SP (visual)	tan slightly silty fine to medium SAND (visual)	19.0	ND	ND

Client: Progress Energy		© ND - Not Determined	
Project: Sutton Plant Ash Pond Dike Stability			
Project No. 6468100274	Figure	Raleigh, North Carolina	

Tested By: CS _____ Checked By: IAM _____

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-1

Depth: 23.5

Sample Number: SS-10

Material Description: Tan slightly Silty fine to medium SAND (visual)

Date: 12/22/10

Natural Moisture: 19.0

USCS Class.: SP

Testing Remarks: ND = Not Determined

Tested by: CS

Checked by: IAM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
526.50	0.00	0.00	#4	0.00	100.0
			#10	0.06	100.0
			#20	28.11	94.7
			#40	228.70	56.6
			#60	462.10	12.2
			#100	510.00	3.1
			#140	514.80	2.2
			#200	516.80	1.8

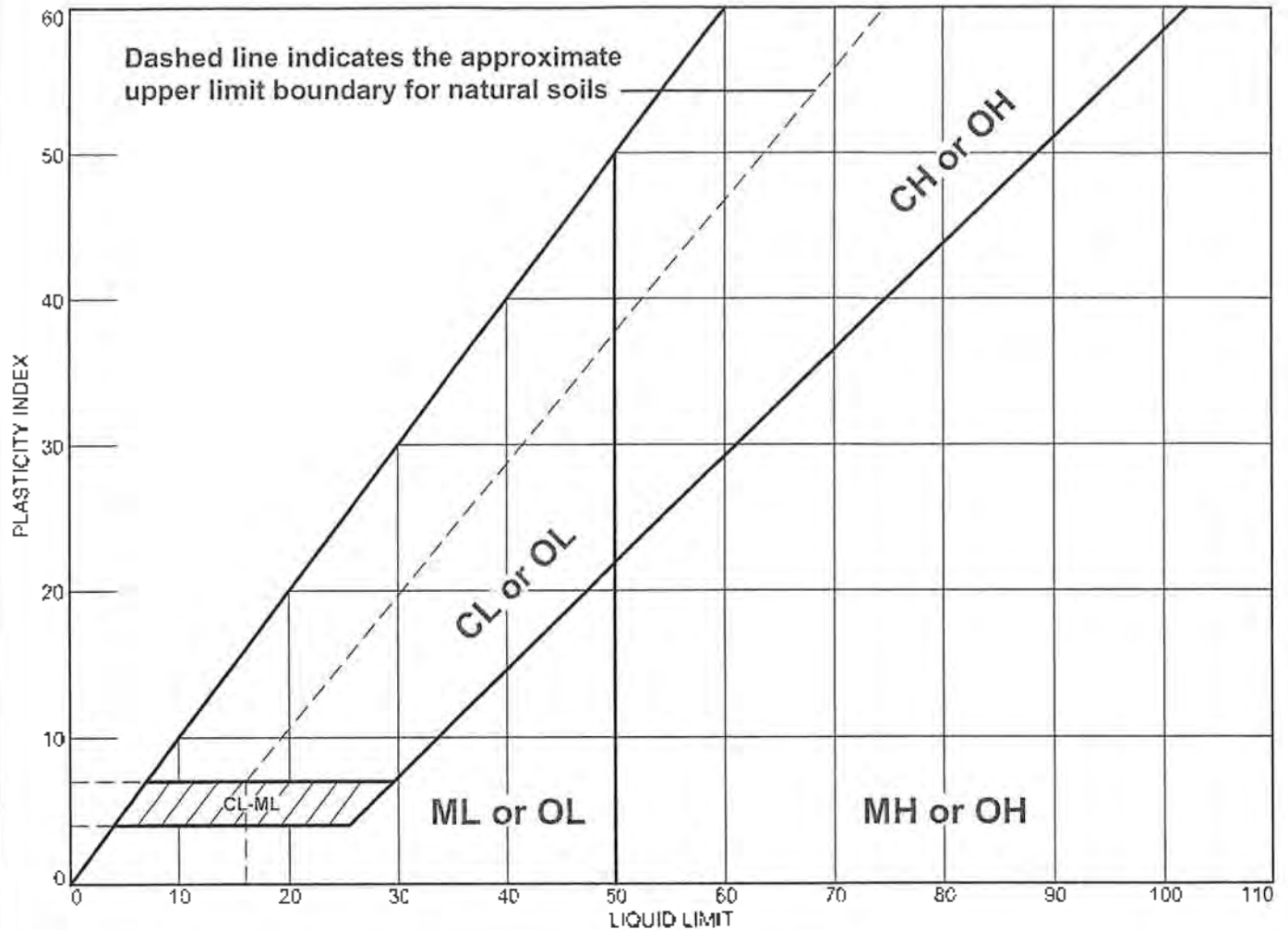
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	43.4	54.8	98.2			1.8

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.2388	0.2621	0.2817	0.3178	0.3947	0.4428	0.5929	0.6535	0.7351	0.8820

Fineness Modulus	C _u	C _c
1.94	1.85	0.96

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Tan slightly Silty fine to medium SAND (visual)				56.6	1.8	SP

Project No. 6468100274 Client: Progress Energy
 Project: Sutor Plant Ash Pond Dike Stability

• Source of Sample: Boring B-1 Depth: 23.5 Sample Number: SS-10

MACTEC Engineering and Consulting, Inc.
 Raleigh, North Carolina

Remarks:

Figure

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-1

Depth: 23.5

Sample Number: SS-10

Material Description: Tan slightly Silty fine to medium SAND (visual)

%<#40: 56.6

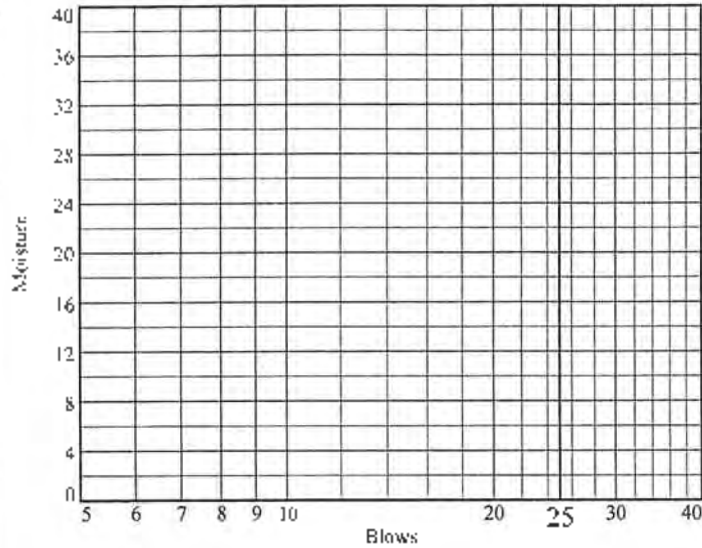
%<#200: 1.8

USCS: SP

AASHTO: ND

Tested by: CS

Checked by: IAM



Liquid Limit= _____
 Plastic Limit= . . .
 Plasticity Index= _____
 Natural Moisture= 19.0

Natural Moisture Data

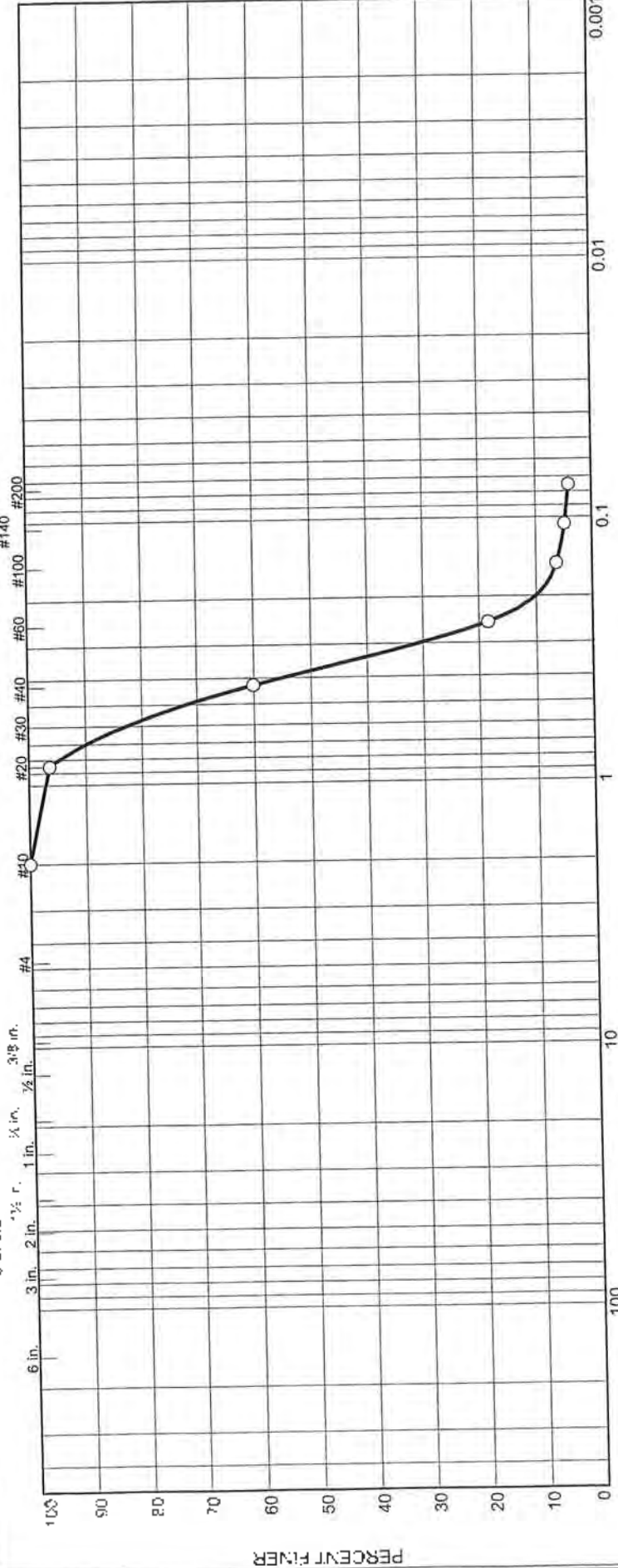
Wet+Tare	Dry+Tare	Tare	Moisture
723.37	623.57	97.07	19.0

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



GRAIN SIZE - mm.

%	% Sand				% Fines				Material Description	NM %	LL	PL	
	Coarse	Fine	Medium	Fine	Silt	Clay	Clay						
0.0	0.0	0.0	39.9	56.0				4.1					
Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description								
Boring B-2	SS-2	3.5-5.0'	12/22/10	SP (visual)	Light Brown fine to medium SAND with trace of silt (visual)								
Client Progress Energy													
Project Sutton Plant Ash Pond Dike Stability													
Project No. 6468100274 Figure													
MACTEC Engineering and Consulting, Inc.													
Raleigh, North Carolina													
O ND = Not Determined													

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-2

Depth: 3.5-5.0'

Sample Number: SS-2

Material Description: Light Brown fine to medium SAND with trace of silt (visual)

Date: 12/22/10

Natural Moisture: 13.2

USCS Class.: SP

Testing Remarks: ND Not Determined

Tested by: CS

Checked by: IAM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
629.63	0.00	0.00	#10	0.00	100.0
			#20	23.20	96.3
			#40	251.20	60.1
			#60	513.20	18.4
			#100	589.00	6.4
			#140	598.40	4.9
			#200	603.30	4.1

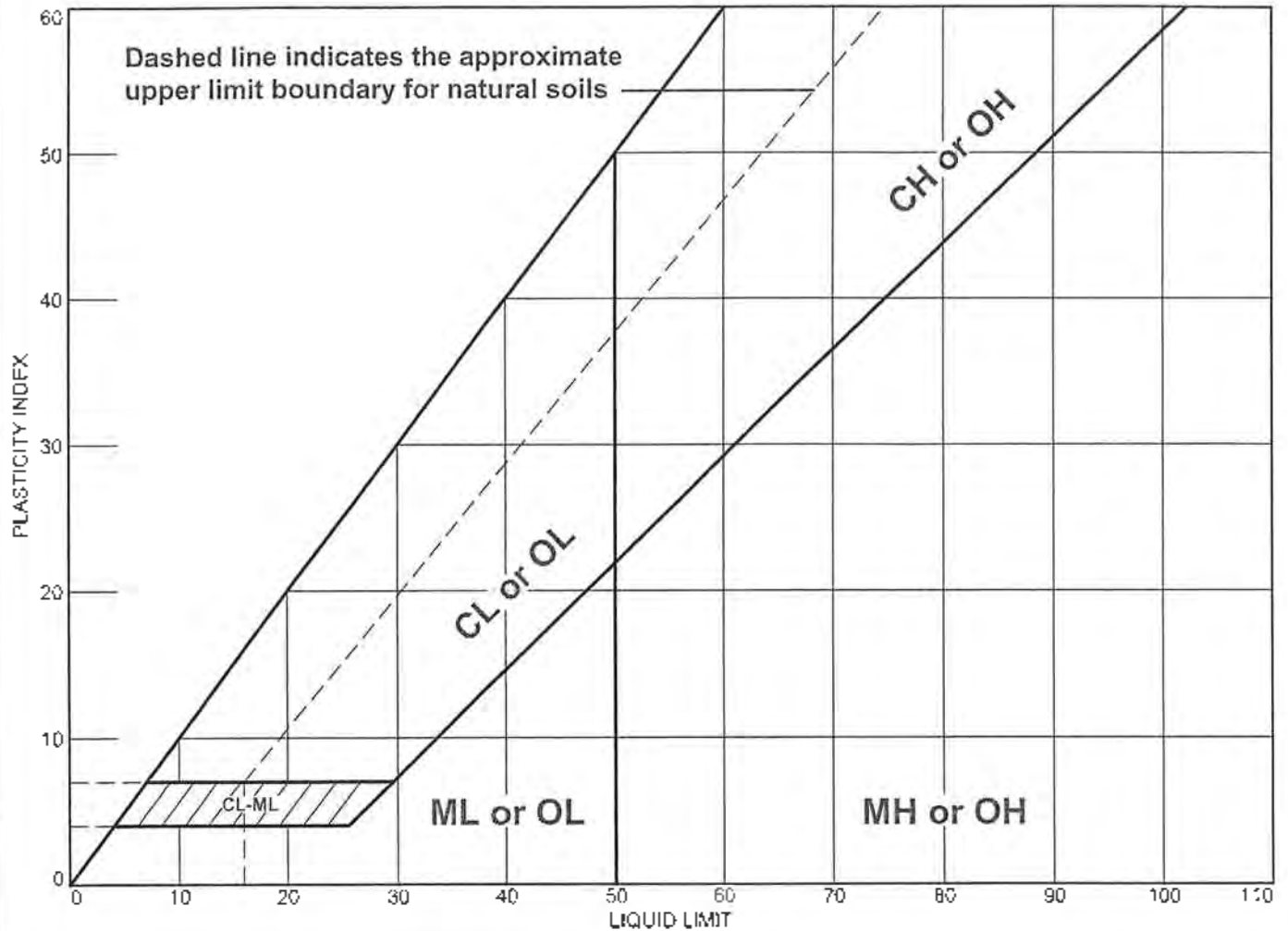
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	39.9	56.0	95.9			4.1

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.2000	0.2331	0.2571	0.2969	0.3767	0.4247	0.5700	0.6270	0.7015	0.8103

Fineness Modulus	C _u	C _c
1.82	2.12	1.04

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Light Brown fine to medium SAND with trace of silt (visual)				60.1	4.1	SP

Project No. 6468100274 Client: Progress Energy
 Project: Sutton Plant Ash Pond Dike Stability

• Source of Sample: Boring B-2 Depth: 3.5-5.0' Sample Number: SS-2

Remarks:

Figure

MACTEC Engineering and Consulting, Inc.
 Raleigh, North Carolina

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Station Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Borug B-2

Depth: 3.5-5.0'

Sample Number: SS-2

Material Description: Light Brown fine to medium SAND with trace of silt (visual)

%<#40: 60.1

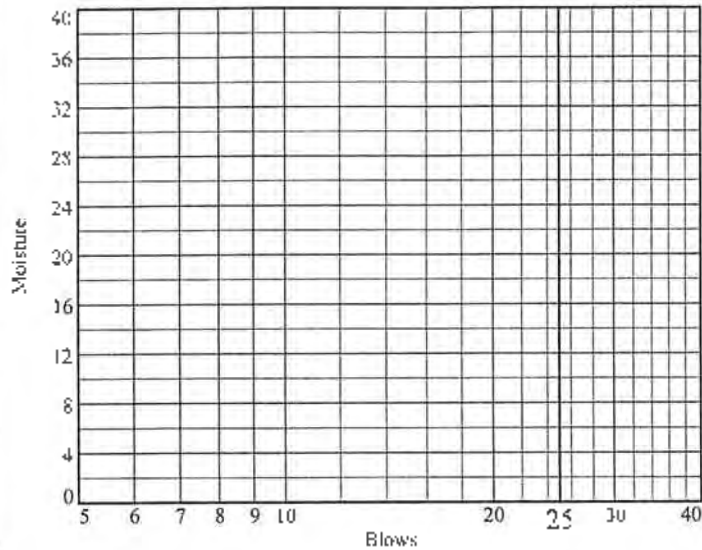
%<#200: 4.1

USCS: SP

AASHTO: NTD

Tested by: CS

Checked by: IAM



Liquid Limit= _____
 Plastic Limit= _____
 Plasticity Index= _____
 Natural Moisture= 13.2

Natural Moisture Data

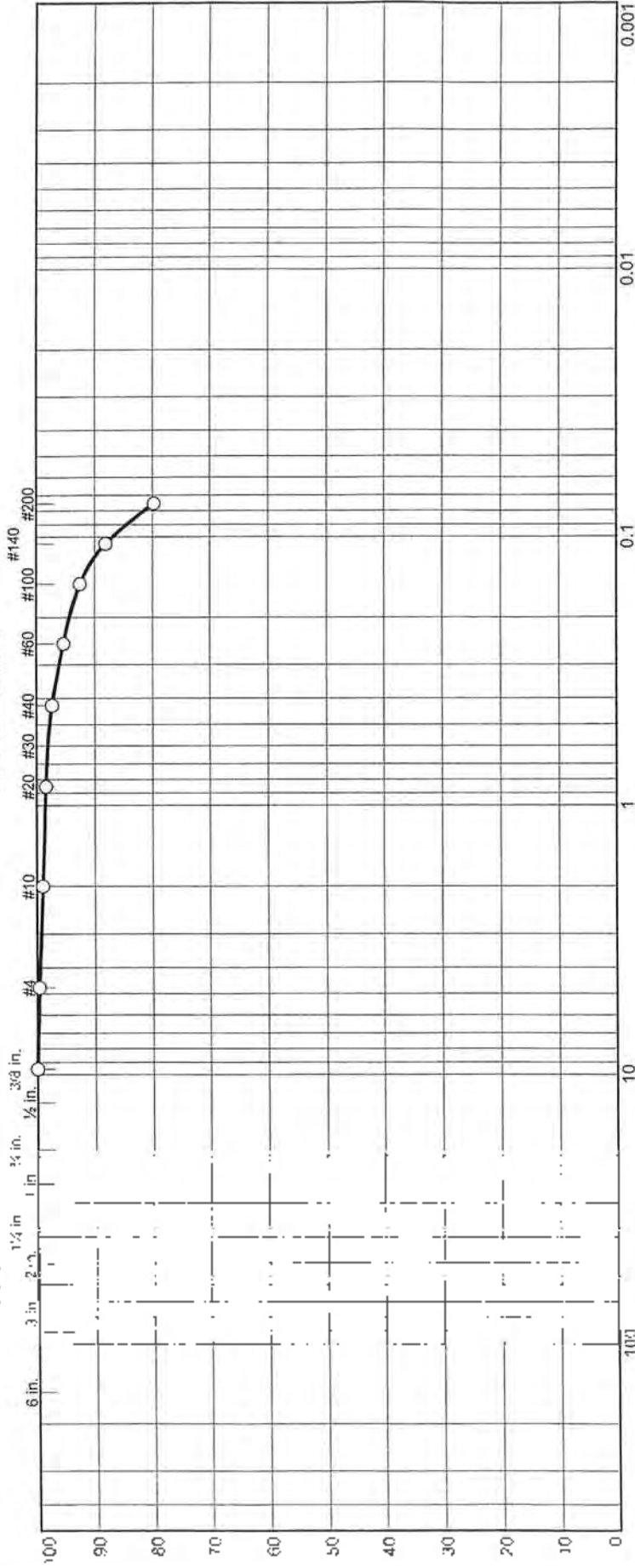
Wet+Tare	Dry+Tare	Tare	Moisture
855.04	771.94	142.91	13.2

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



Source	Sample #	Depth/Ev.	Date Sampled	USCS	Material Description			NM %	LL	PL
					Coarse	Medium	Fine			
Boring B-2	SS-8	18.5-20.0	12/22/10	MH	0.6	1.7	17.5	79.8	52	42
Gray fine Sandy SILT (MH)										

Client		Project	
Progress Energy	Sutton Plant Ash Pond Dike Stability	MACTEC Engineering and Consulting, Inc.	Raleigh, North Carolina
Project No. 6468100274	Figure		

Tested By: CS Checked By: IAM

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-2

Depth: 18.5-20.0

Sample Number: SS-8

Material Description: Gray fine Sandy SILT (MH)

Date: 12/22/10

Natural Moisture: 71.1

Liquid Limit: 52

Plastic Limit: 42

USCS Class.: MH

Tested by: CS

Checked by: IAM

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 62.26
 Tare Wt. = 0.00
 Minus #200 from wash = 0.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
62.26	0.00	0.00	3/8"	0.00	100.0
			#4	0.25	99.6
			#10	0.65	99.0
			#20	1.01	98.4
			#40	1.66	97.3
			#60	2.92	95.3
			#100	4.65	92.5
			#140	7.39	88.1
			#200	12.60	79.8

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.4	0.4	0.6	1.7	17.5	19.8			79.8

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
						0.0757	0.0918	0.1187	0.2322

Fineness Modulus
0.16

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-2

Depth: 18.5-20.0

Sample Number: SS-8

Material Description: Gray fine Sandy SILT (MH)

%<#40: 97.3

%<#200: 79.8

USCS: MH

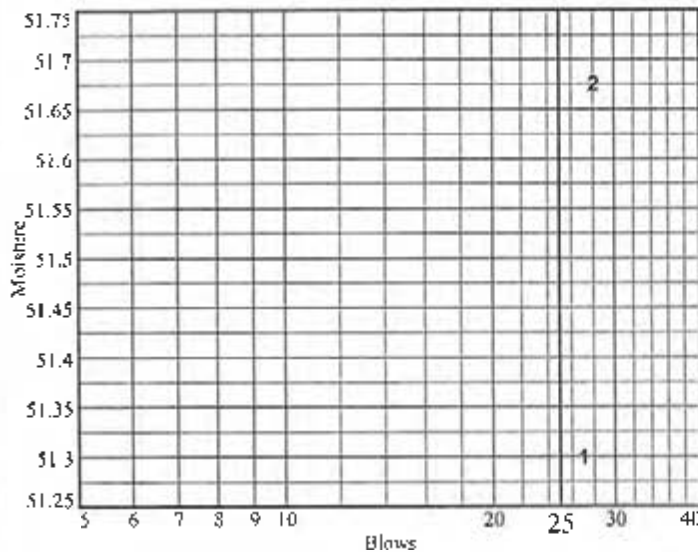
AASHTO: A-5(12)

Tested by: CS

Checked by: IAM

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	22.14	20.98				
Dry+Tare	19.97	19.13				
Tare	15.74	15.55				
# Blows	27	28				
Moisture	51.3	51.7				



Liquid Limit= 52
Plastic Limit= 42
Plasticity Index= 10
Natural Moisture= 71.1
Liquidity Index= 2.9

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	22.12	21.84		
Dry+Tare	20.23	19.97		
Tare	15.67	15.47		
Moisture	41.4	41.6		

Natural Moisture Data

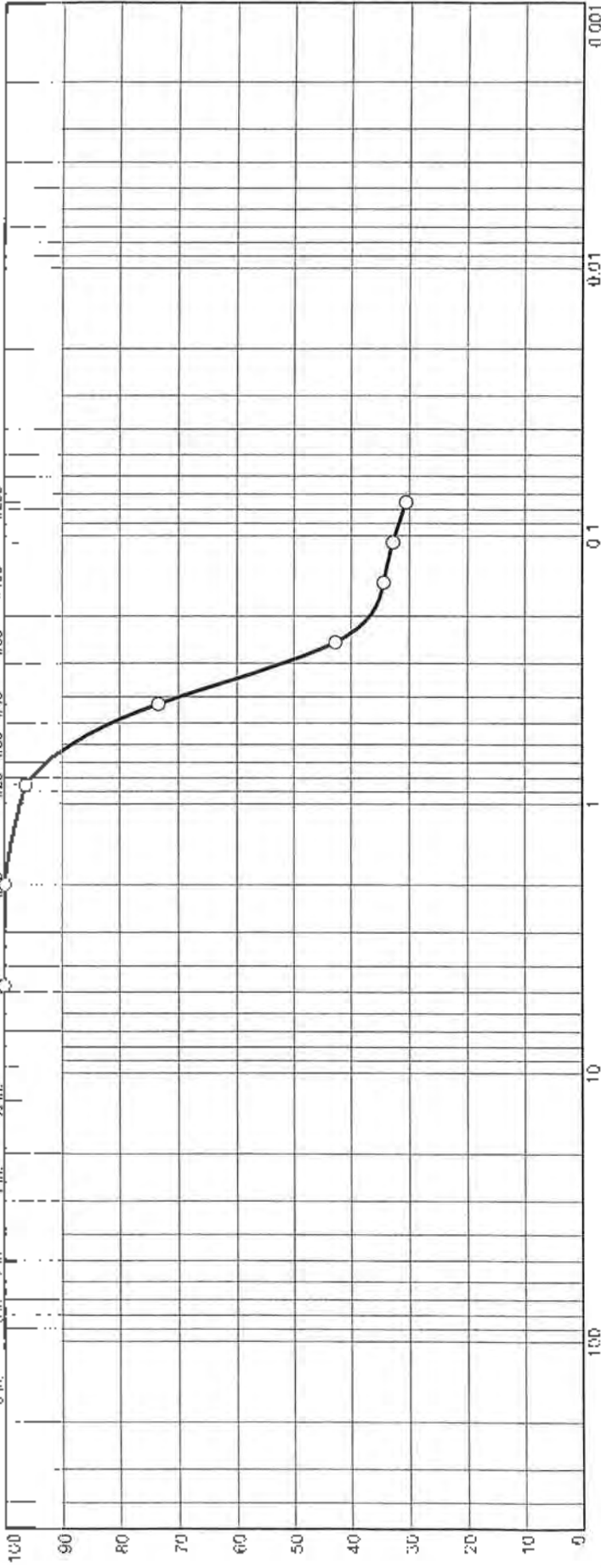
Wet+Tare	Dry+Tare	Tare	Moisture
185.10	140.81	78.55	71.1

Particle Size Distribution Report

U.S. SIEVE OPENING IN INCHES
 6 in. 3 in. 2 in. 1 1/2 in. 1 in. 3/4 in. 3/8 in.

U.S. STANDARD SIEVE NUMBERS
 #4 #10 #20 #30 #40 #60 #100 #200

HYDROMETER



GRAIN SIZE - mm.

	% Gravel		% Sand			% Fines		Material Description	USCS	NM %	I L	PL
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay					
○	0.0	0.0	0.2	26.4	42.8		30.6	Gray slightly Clayey Silty fine to medium SAND	SM	25.0	NV	NP

Source	Sample #	Depth/Elev.	Date Sampled
Boring B-3	SS-4	8.5-10.0	12/22/10

Client	MACTEC Engineering and Consulting, Inc.		
Project	Sutton Plant Ash Pond Dike Stability		
Project No.	6468100274	Figure	
			Raleigh, North Carolina

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 8.5-10.0

Sample Number: SS-4

Material Description: Gray slightly Clayey Silty fine to medium SAND

Date: 12/22/10

Natural Moisture: 25.0

Liquid Limit: NV

Plastic Limit: NP

USCS Class.: SM

Tested by: CS

Checked by: IAM

Sieve Test Data

Post #200 Wash Test Weights (grams): Dry Sample and Tare = 166.87
 Tare Wt. = 0.00
 Minus #200 from wash = 0.0%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
166.87	0.00	0.00	#4	0.00	100.0
			#10	0.26	99.8
			#20	6.31	96.2
			#40	44.38	73.4
			#60	95.53	42.8
			#100	109.47	34.4
			#140	112.12	32.8
			#200	115.80	30.6

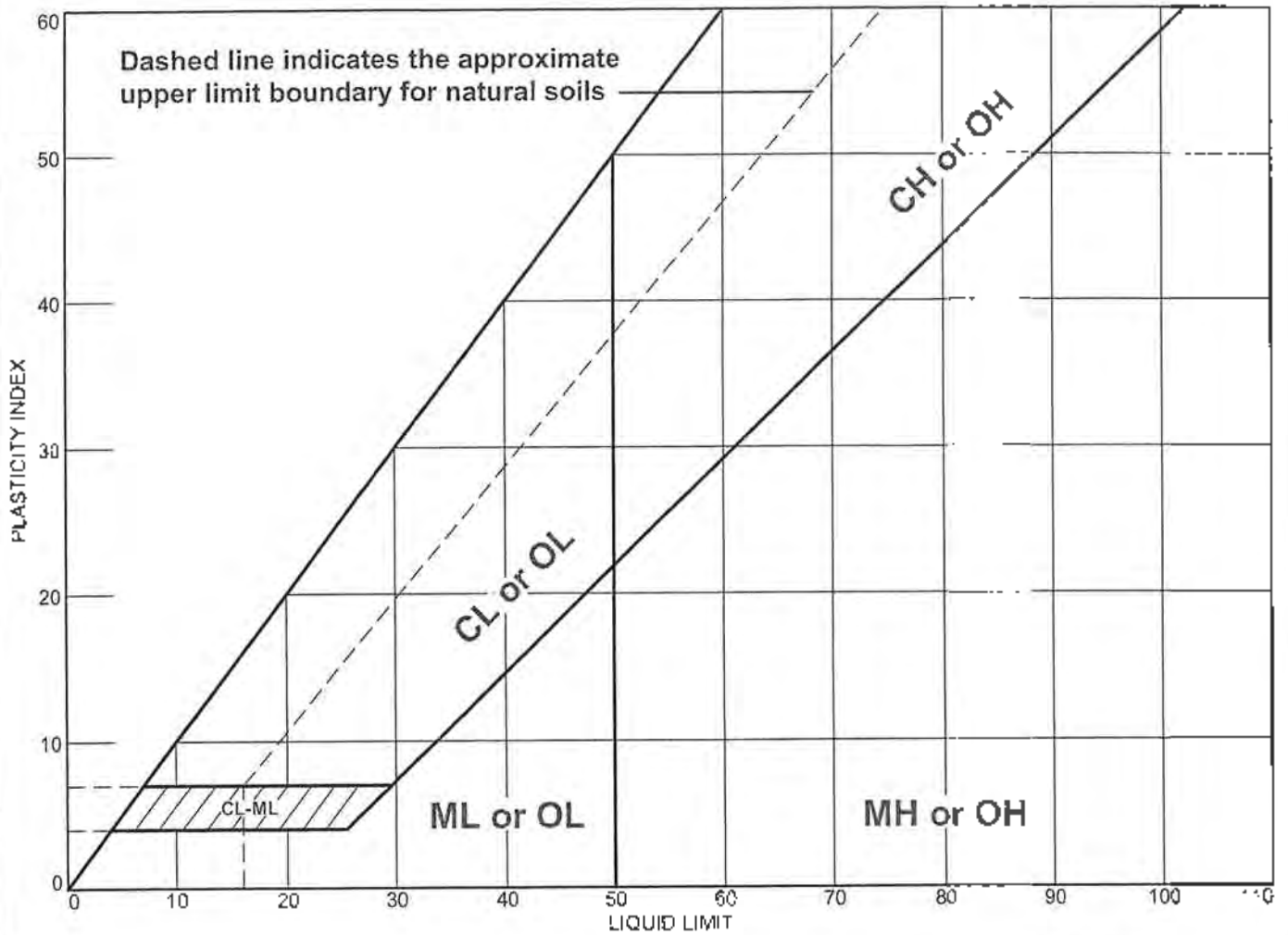
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.2	26.4	42.8	69.4			30.6

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
				0.2898	0.3416	0.4839	0.5453	0.6344	0.7887

Fineness Modulus
1.27

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Gray slightly Clayey Silty fine to medium SAND	NV	NP	NP	73.4	30.6	SM

Project No. 6468100274 Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

• Source of Sample: Boring B-3 Depth: 8.5-10.0 Sample Number: SS-4

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina

Remarks:

Figure

Tested By: CS Checked By: IAM

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 8.5-10.0

Sample Number: SS-4

Material Description: Gray slightly Clayey Silty fine to medium SAND

%<#40: 73.4

%<#200: 30.6

USCS: SM

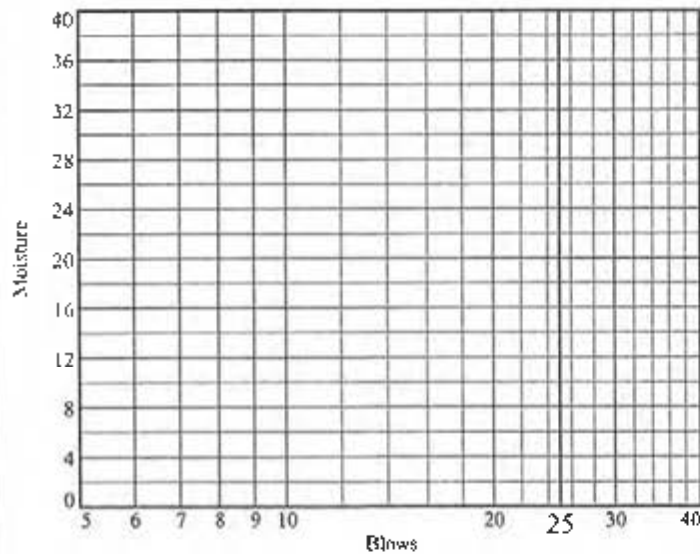
AASHTO: A-2-4(0)

Tested by: CS

Checked by: IAM

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare						
Dry+Tare						
Tare						
# Blows						
Moisture						



Liquid Limit= NV
 Plastic Limit= NP
 Plasticity Index= NP
 Natural Moisture= 25.0

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare				
Dry+Tare				
Tare				
Moisture				

Natural Moisture Data

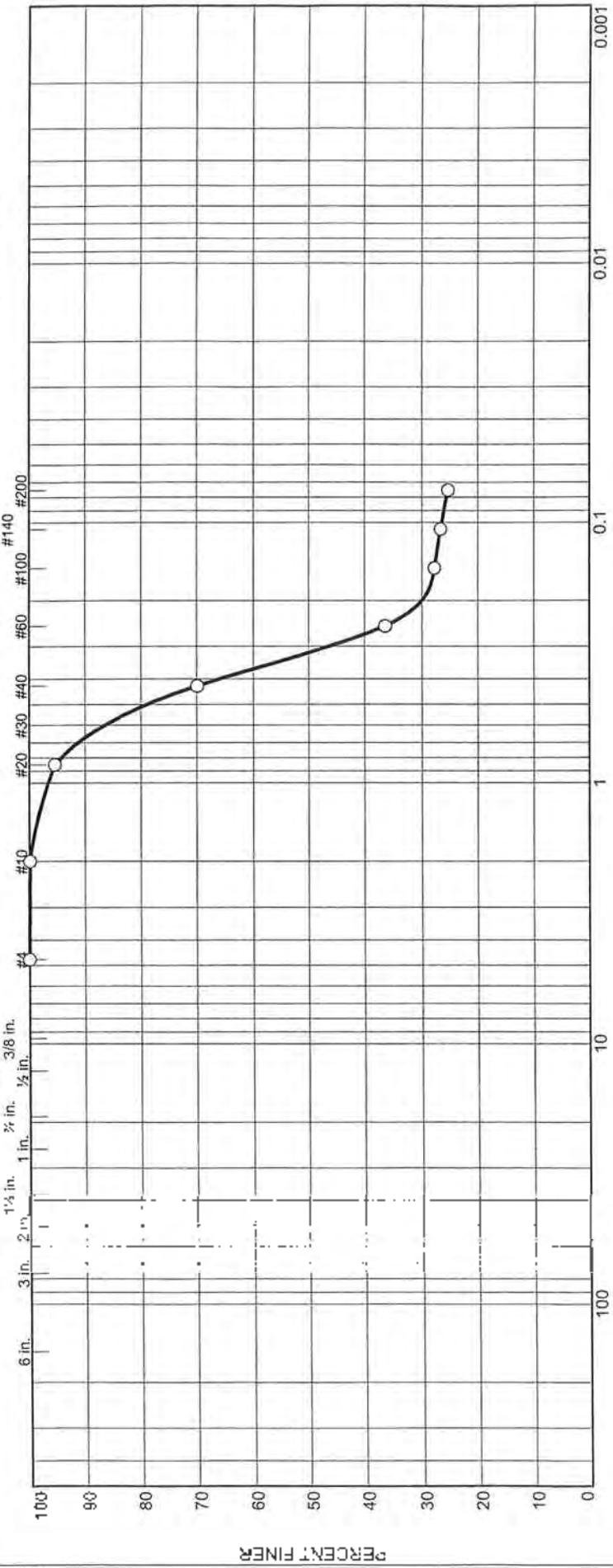
Wet+Tare	Dry+Tare	Tare	Moisture
285.17	243.48	76.61	25.0

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



		% Gravel			% Sand			% Fines			
		Coarse	Fine		Coarse	Medium	Fine	Silt	Clay		
C		0.0	0.0		0.1	30.0	44.6		25.3		
Source		Sample #		Depth/Elev.	Date Sampled		USCS		Material Description		
Boring B-3		SS-5		11.0-12.5	12/22/10		SM		Gray slightly Clayey Silty fine to medium SAND		
									NM %	LL	PL
									25.3	NV	NP
Client		MACTEC Engineering and Consulting, Inc.									
Project		Sutton Plant Ash Pond Dike Stability									
Project No.		6468100274									
Figure		Raleigh, North Carolina									

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 11.0-12.5

Sample Number: SS-5

Material Description: Gray slightly Clayey Silty fine to medium SAND

Date: 12/22/10

Natural Moisture: 25.3

Liquid Limit: NV

Plastic Limit: NP

USCS Class.: SM

Tested by: CS

Checked by: IAM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
131.18	0.00	0.00	#4	0.00	100.0
			#10	0.14	99.9
			#20	5.98	95.4
			#40	39.46	69.9
			#60	83.45	36.4
			#100	94.77	27.8
			#140	96.25	26.6
			#200	97.99	25.3

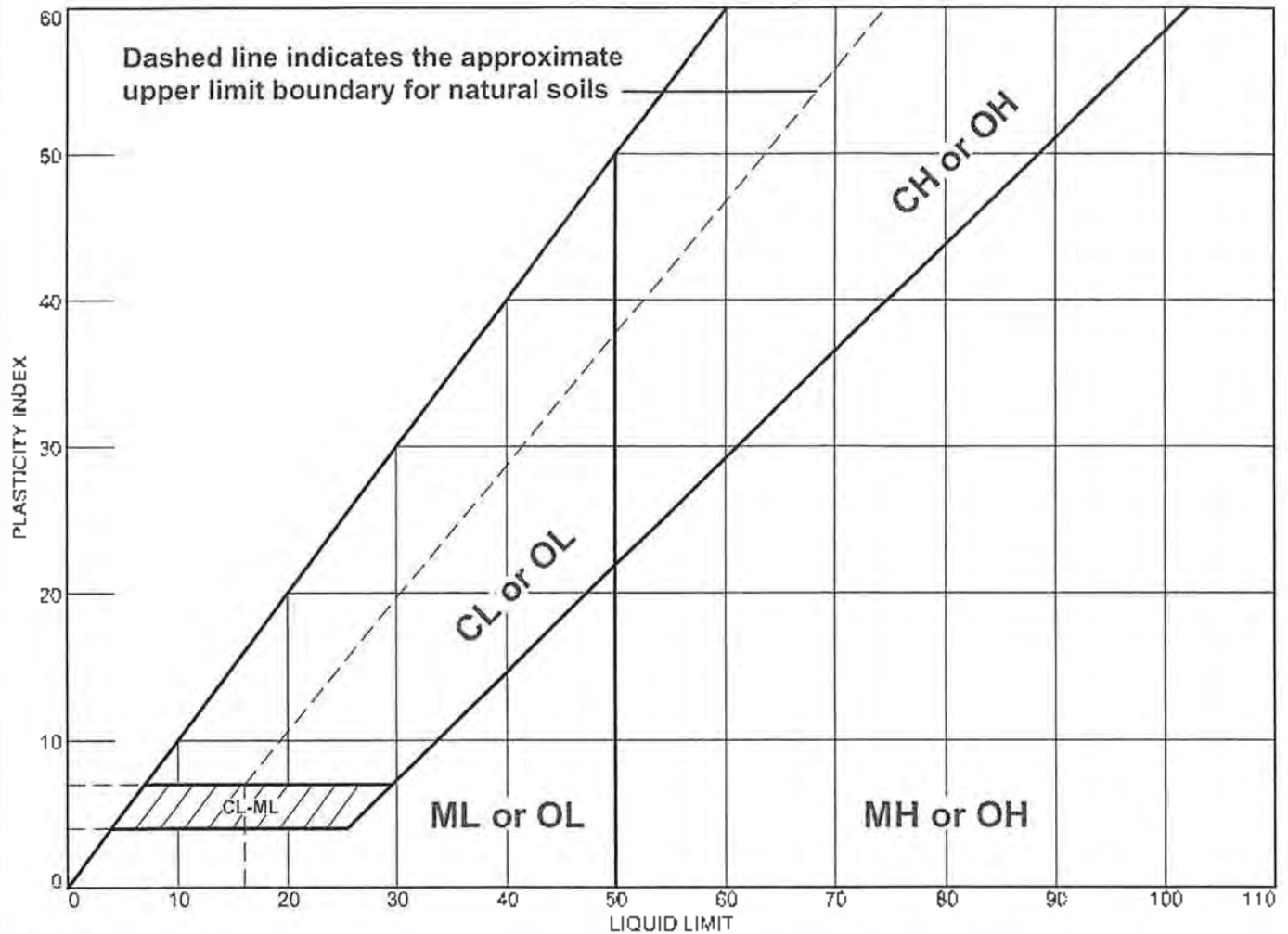
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	30.0	44.6	74.7			25.3

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
			0.2001	0.3168	0.3660	0.5123	0.5764	0.6691	0.8289

Fineness Modulus
1.42

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
• Gray slightly Clayey Silty fine to medium SAND	NV	NP	NP	69.9	25.3	SM

Project No. 6468100274 Client: Progress Energy
 Project: Sutton Plant Ash Pond Dike Stability

• Source of Sample: Boring B-3 Depth: 11.0-12.5 Sample Number: SS-5

Remarks:

Figure

MACTEC Engineering and Consulting, Inc.
 Raleigh, North Carolina

Tested By: CS

Checked By: IAM

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 11.0-12.5

Sample Number: SS-5

Material Description: Gray slightly Clayey Silty fine to medium SAND

%<#40: 69.9

%<#200: 25.3

USCS: SM

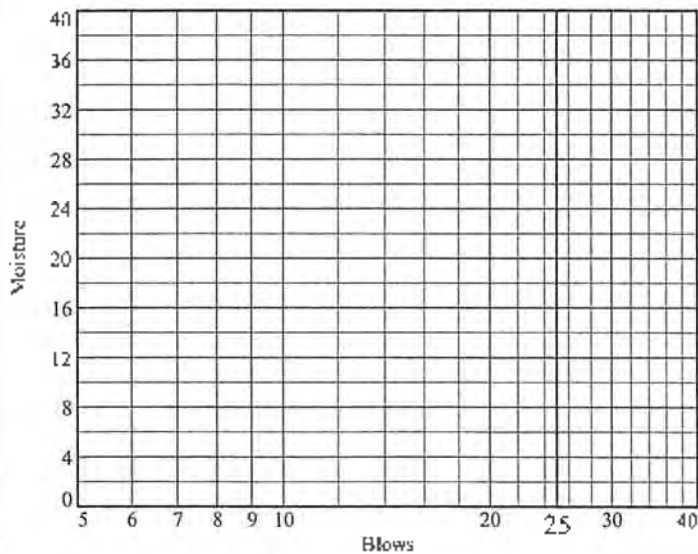
AASHTO: A-2-4(0)

Tested by: CS

Checked by: IAM

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare						
Dry+Tare						
Tare						
# Blows						
Moisture						



Liquid Limit= NV
 Plastic Limit= NP
 Plasticity Index= NP
 Natural Moisture= 25.3

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare				
Dry+Tare				
Tare				
Moisture				

Natural Moisture Data

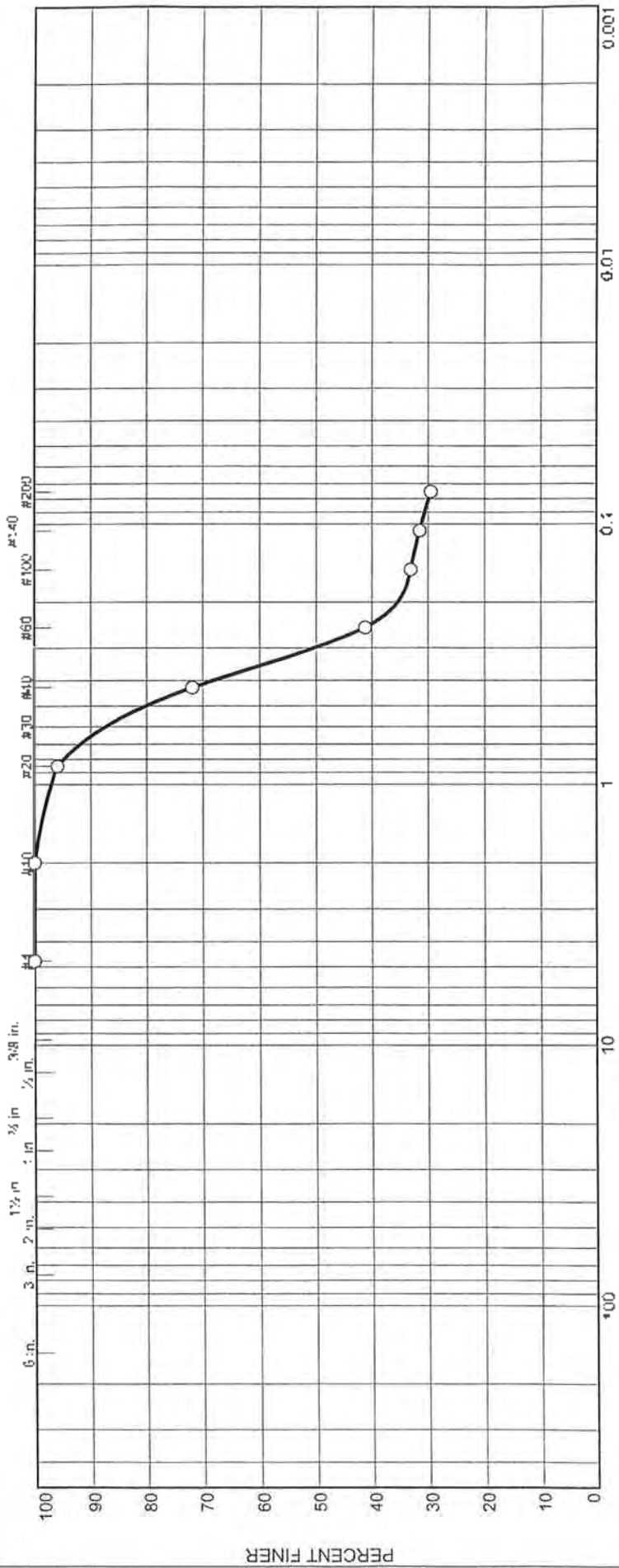
Wet+Tare	Dry+Tare	Tare	Moisture
246.89	213.73	82.55	25.3

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



GRAIN SIZE - mm		% Sand		% Gravel		% Fines	
		Coarse	Medium	Fine	Coarse	Silt	Clay
0		0.0	28.1	42.3	0.0	29.5	
10		0.1					
1							
0.1							
0.01							
0.001							

Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
Boring B-3	SS-6	13.5-15.0	12/22/10	SM	Gray Silty fine to medium SAND	28.7	NV	NP

Client	Progress Energy	MACTEC Engineering and Consulting, Inc.
Project	Sutton Plaw Ash Pond Dike Stability	
Project No.	6468100274	Raleigh, North Carolina

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 13.5-15.0

Sample Number: SS-6

Material Description: Gray Silty fine to medium SAND

Date: 12/22/10

Natural Moisture: 28.7

Liquid Limit: NV

Plastic Limit: NP

USCS Class.: SM

Tested by: CS

Checked by: IAM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
121.14	0.00	0.00	#4	0.00	100.0
			#10	0.09	99.9
			#20	4.92	95.9
			#40	34.11	71.8
			#60	71.20	41.2
			#100	81.05	33.1
			#140	82.97	31.5
			#200	85.39	29.5

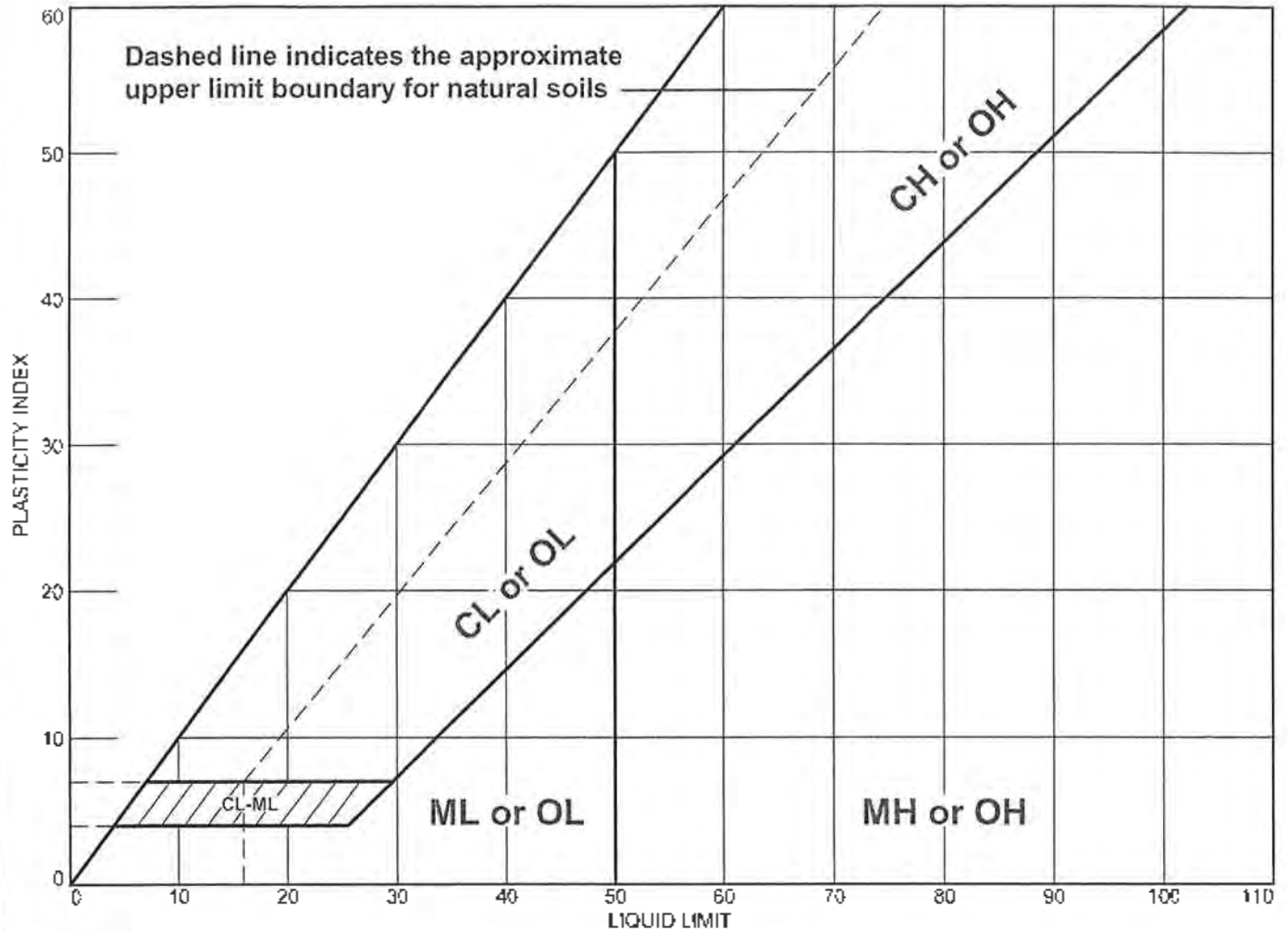
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	28.1	42.3	70.5			29.5

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
			0.0813	0.2982	0.3506	0.4985	0.5621	0.6528	0.8057

Fineness Modulus
1.31

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D4318 (05)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
•	Gray Silty fine to medium SAND	NV	NP	NP	71.8	29.5	SM

Project No. 6468100274 Client: Progress Energy
 Project: Sutton Plant Ash Pond Dike Stability

• Source of Sample: Boring B-3 Depth: 13.5-15.0 Sample Number: SS-6

MACTEC Engineering and Consulting, Inc.
 Raleigh, North Carolina

Remarks:

Figure

Tested By: CS _____ Checked By: JAM _____

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 13.5-15.0

Sample Number: SS-6

Material Description: Gray Silty fine to medium SAND

%<#40: 71.8

%<#200: 29.5

USCS: SM

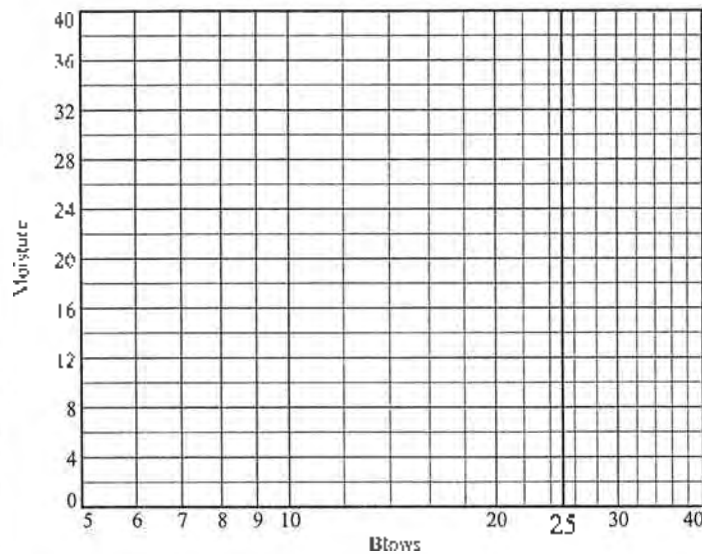
AASHTO: A-2-4(0)

Tested by: CS

Checked by: IAM

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare						
Dry+Tare						
Tare						
# Blows						
Moisture						



Liquid Limit= NV
 Plastic Limit= NP
 Plasticity Index= NP
 Natural Moisture= 28.7

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare				
Dry+Tare				
Tare				
Moisture				

Natural Moisture Data

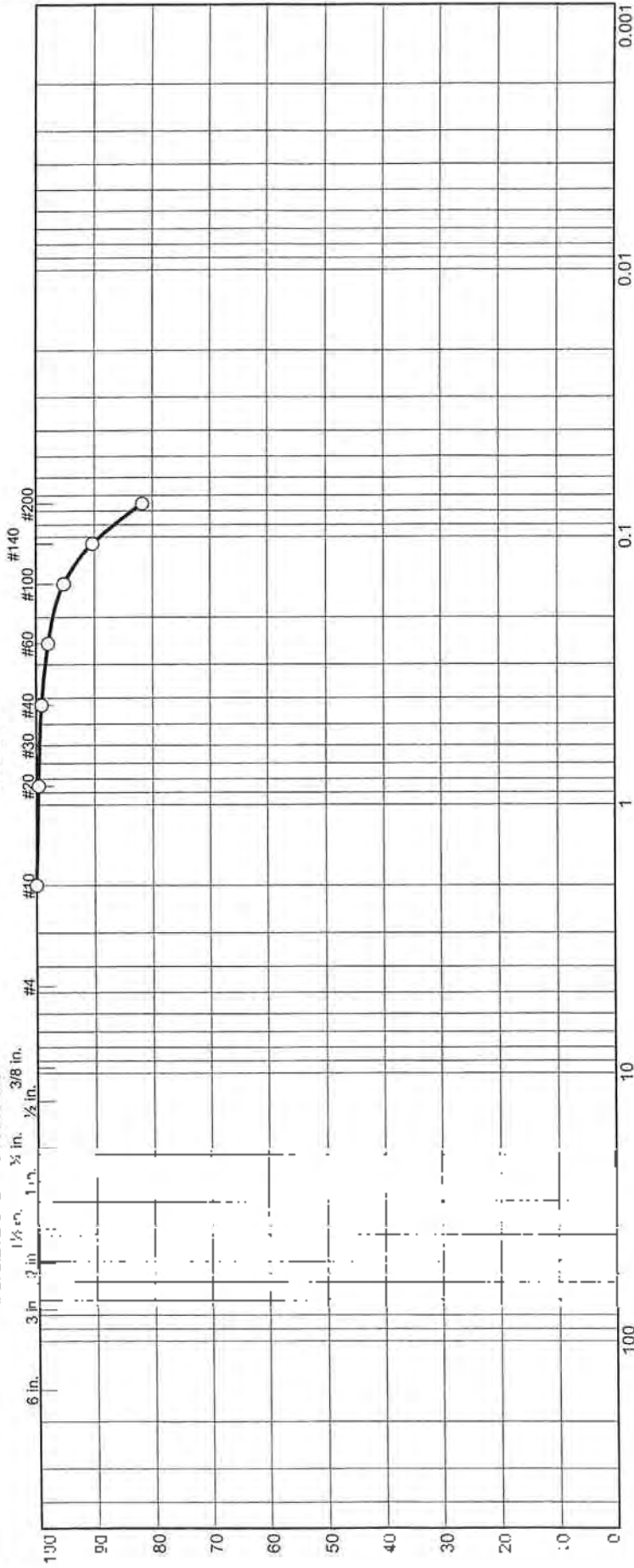
Wet+Tare	Dry+Tare	Tare	Moisture
234.01	199.19	78.05	28.7

Particle Size Distribution Report

HYDROMETER

U.S. STANDARD SIEVE NUMBERS

U.S. SIEVE OPENING IN INCHES



U.S. Sieve No.	U.S. Sieve Opening (in)	% Sand			Silt	% Fines																		
		Coarse	Medium	Fine																				
0	0.075	0.0	0.9	17.3		81.8																		
<table border="1"> <thead> <tr> <th>Source</th> <th>Sample #</th> <th>Depth/Elev</th> <th>Date Sampled</th> <th>USCS</th> <th>Material Description</th> <th>NM %</th> <th>LL</th> <th>PL</th> </tr> </thead> <tbody> <tr> <td>Boring B-3</td> <td>SS-8</td> <td>18.5-29.0</td> <td>12/22/10</td> <td>M1</td> <td>Dark Gray Fine Sandy SILT</td> <td>62.1</td> <td>46</td> <td>40</td> </tr> </tbody> </table>							Source	Sample #	Depth/Elev	Date Sampled	USCS	Material Description	NM %	LL	PL	Boring B-3	SS-8	18.5-29.0	12/22/10	M1	Dark Gray Fine Sandy SILT	62.1	46	40
Source	Sample #	Depth/Elev	Date Sampled	USCS	Material Description	NM %	LL	PL																
Boring B-3	SS-8	18.5-29.0	12/22/10	M1	Dark Gray Fine Sandy SILT	62.1	46	40																
<table border="1"> <thead> <tr> <th colspan="2">Client</th> <th colspan="2">MACTEC Engineering and Consulting, Inc.</th> </tr> <tr> <th colspan="2">Project</th> <th colspan="2">Sutton Plant Ash Pond Dike Stability</th> </tr> <tr> <th>Project No.</th> <th>6468100274</th> <th>Figure</th> <th></th> </tr> </thead> </table>							Client		MACTEC Engineering and Consulting, Inc.		Project		Sutton Plant Ash Pond Dike Stability		Project No.	6468100274	Figure							
Client		MACTEC Engineering and Consulting, Inc.																						
Project		Sutton Plant Ash Pond Dike Stability																						
Project No.	6468100274	Figure																						

GRAIN SIZE DISTRIBUTION TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 18.5-20.0

Sample Number: SS-8

Material Description: Dark Gray Fine Sandy SILT

Date: 12/22/10

Natural Moisture: 62.1

Liquid Limit: 46

Plastic Limit: 40

USCS Class.: ML

Tested by: CS

Checked by: IAM

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
106.68	0.00	0.00	#10	0.00	100.0
			#20	0.44	99.6
			#40	1.00	99.1
			#60	2.26	97.9
			#100	5.08	95.2
			#140	10.31	90.3
			#200	19.45	81.8

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	0.9	17.3	18.2			81.8

D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
							0.0846	0.1043	0.1463

Fineness Modulus
0.07

LIQUID AND PLASTIC LIMIT TEST DATA

2/23/2011

Client: Progress Energy

Project: Sutton Plant Ash Pond Dike Stability

Project Number: 6468100274

Location: Boring B-3

Depth: 18.5-20.0

Sample Number: SS-8

Material Description: Dark Gray Fine Sandy SILT

%<#40: 99.1

%<#200: 81.8

USCS: ML

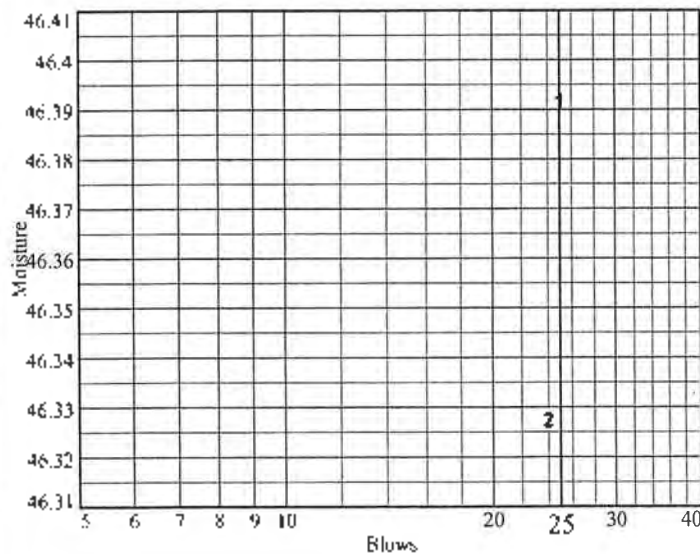
AASHTO: A-5(8)

Tested by: CS

Checked by: IAM

Liquid Limit Data

Run No.	1	2	3	4	5	6
Wet+Tare	23.91	25.84				
Dry+Tare	21.21	22.56				
Tare	15.39	15.48				
# Blows	25	24				
Moisture	46.4	46.3				



Liquid Limit= 46
 Plastic Limit= 40
 Plasticity Index= 6
 Natural Moisture= 62.1
 Liquidity Index= 3.7

Plastic Limit Data

Run No.	1	2	3	4
Wet+Tare	21.80	22.01		
Dry+Tare	19.99	20.15		
Tare	15.47	15.54		
Moisture	40.0	40.3		

Natural Moisture Data

Wet+Tare	Dry+Tare	Tare	Moisture
257.45	191.25	84.57	62.1

APPENDIX C: 1971/1983 ASH POND - STABILITY ANALYSIS PLOTS

Sutton Plant Ash Pond Stability Section B-1 (Deep)

D:\6468\progress energy\projects\6468\10174_sutton map inundation and stability\slope stability\b-1deep.p12 Run By: J. Shane Johnson, MACTEC, Inc 5/8/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
a	1.64	Dike SM	1	120.0	125.0	33.0	W1
b	1.64	Dike SP	2	125.0	130.0	38.0	W1
c	1.64	Dike SP	3	120.0	125.0	33.0	W1
d	1.65	Sand SP	4	120.0	125.0	32.0	W1
e	1.65						
f	1.65						
g	1.65						
h	1.65						
i	1.66						
j	1.66						



PCSTABL5M/si FSmin=1.64

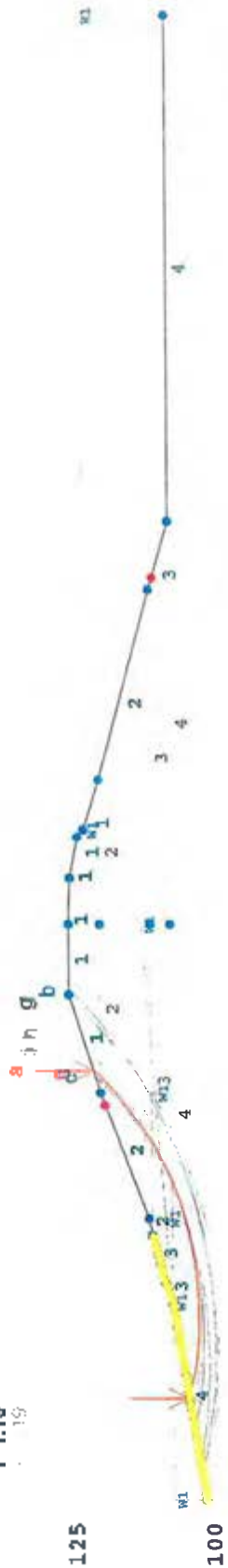
Safety Factors Are Calculated By The Modified Bishop Method



Sutton Plant Ash Pond Stability Section B-1 (Deep) (Seismic)

p:\5469\progress energy\program energy projects 2010\aut\m\646810274 sub\load cap\stability\shape stability\sh-1.dgn-612 Run By: J. Shane Johnson, MACI/C, Inc 1/14/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt (pcf)	Saturated Unit Wt (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.18								0.110 g<
b	1.18	Dike SM	1	120.0	125.0	33.0	W1		
c	1.18	Dike SP	2	125.0	130.0	38.0	W1		
d	1.18	Dike SP	3	120.0	125.0	33.0	W1		
e	1.18	Sand SP	4	120.0	125.0	32.0	W1		
f	1.19								
g	1.19								
h	1.19								
i	1.19								
j	1.19								



75
50
25

0 25 50 75 100 125 150 175 200 225

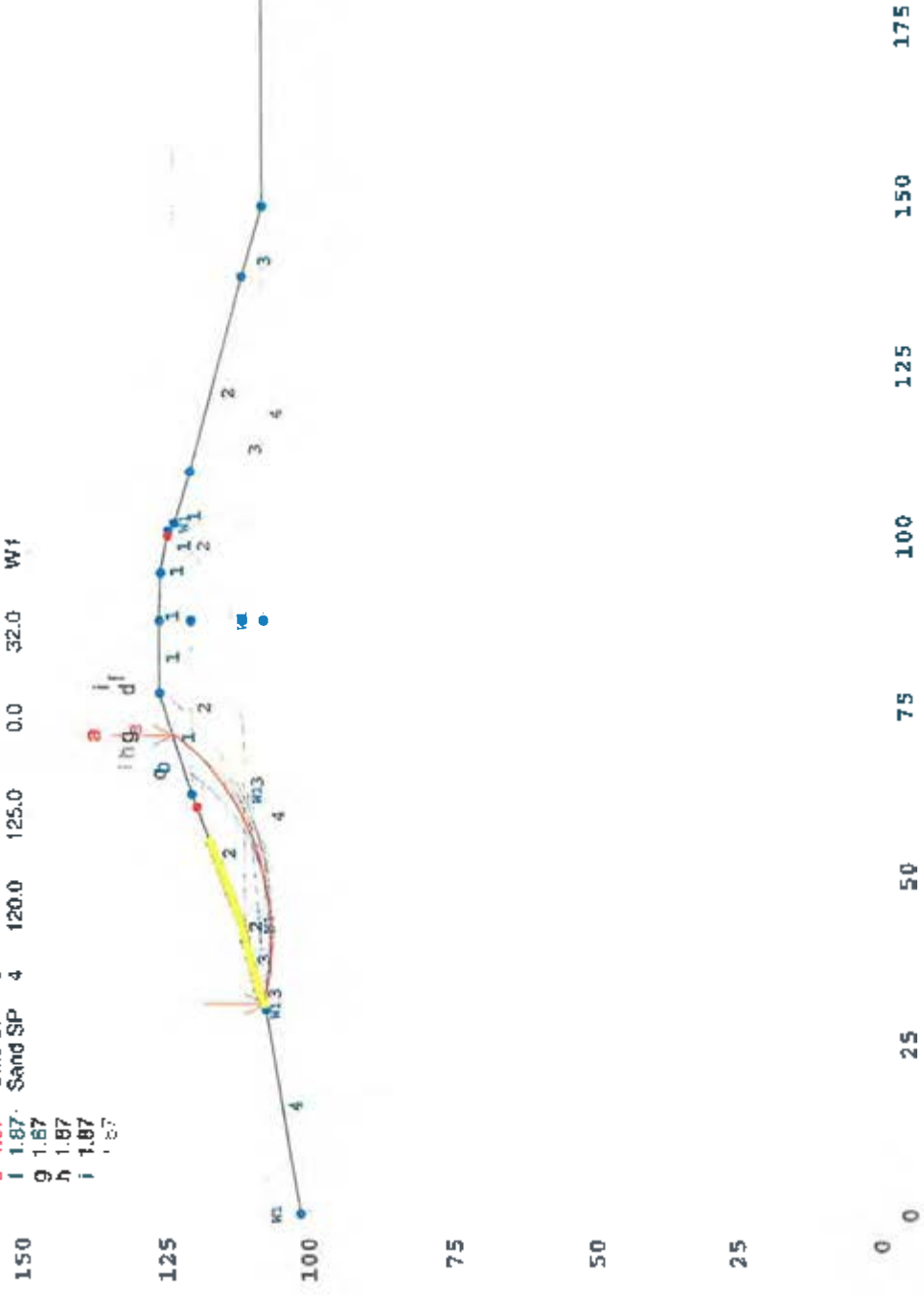
PCSTABL5M/si FSmin=1.18
Safety Factors Are Calculated By The Modified Bishop Method



Sutton Plant Ash Pond Stability Section B-1 (Shallow)

p:\6459\progress energy projects\2010\substation\assessment\section cep inundation and stability\stabilityAB-1shallow.plt Run By: J. Shane Johnson, MACTEC, Inc 3/9/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Intercept (psf)	Cohesion (psf)	Fricton Angle (deg)	Piez Surface No.
a	1.85	Dike SM	1	120.0	125.0	10.0	10.0	33.0	W1
b	1.85	Dike SP	2	125.0	130.0	10.0	10.0	38.0	W1
c	1.86	Dike SP	3	120.0	125.0	0.0	0.0	33.0	W1
d	1.86	Dike SP	4	120.0	125.0	0.0	0.0	32.0	W1
e	1.87	Sand SP							
g	1.87								
h	1.87								
i	1.87								



PCSTABL5M/si FSmin=1.85
Safety Factors Are Calculated By The Modified Bishop Method



Sutton Plant Ash Pond Stability Section B-1 (Shallow) (Seismic)

p:\64681\progress energy projects 2010\autcon\64681\0274 sutton esp inundation and stability\slope stability\shals-flz RUC By: J Sharr Johnson. MACTEC, Inc 3/17/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Interocept (psf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.40	Dike SM	1	120.0	125.0	10.0	33.0	W1		
b	1.40	Dike SP	2	125.0	130.0	10.0	38.0	W1		
c	1.41	Dike SP	3	120.0	125.0	0.0	33.0	W1		
d	1.41	Sand SP	4	120.0	125.0	0.0	32.0	W1		
e	1.41									
f	1.41									
g	1.41									
h	1.41									
i	1.42									
j	1.42									



PCSTABL5W/s| FSmin=1.40
Safety Factors Are Calculated By The Modified Bishop Method



STED

Sutton Plant Ash Pond Stability Section B-2 (Deep) Run 2

p:\6669\progress energy\projects 2010\sutton\468100274 sutton esp inundation and stability\stope stability\5-212.plt Run BY: J. Shane Johnson, FACTEC, Inc 3/2/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	cohesion (pcf)	Piez. Surface No.
a	1.52	Fill	1	120.0	125.0	33.0	0.0	W1
b	1.53	Fill	2	125.0	130.0	38.0	0.0	W1
c	1.54	Fill	3	115.0	120.0	30.0	0.0	W1
d	1.55	Silt	4	100.0	105.0	25.0	0.0	W1
e	1.55	Silt	5	100.0	105.0	30.0	0.0	W1
f	1.55	Sand	6	120.0	125.0	31.0	0.0	W1

150

125

100

75

50

25

0



PCSTABL5M/s1 FSmin=1.52
Safety Factors Are Calculated By The Modified Bishop Method



0 25 50 75 100 125 150 175 200 225

Sutton Plant Ash Pond Stability Section B-2 (Deep) (Seismic) Run 2

p:\6468\progress energy\projects 20\0\subton\6468\00274 section cap inundation and stability\slope stability\B-288-0-2 Run By: D. Shane Johnson, MACEC. Inc 2/7/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.03	Fill	1	120.0	125.0	33.0	W1		0.110 g<
b	1.04	Fill	2	125.0	130.0	38.0	W1		
c	1.05	Fill	3	115.0	120.0	30.0	W1		
d	1.05	Silt	4	100.0	105.0	25.0	W1		
e	1.05	Silt	5	100.0	105.0	30.0	W1		
f	1.05	Sand	6	120.0	125.0	31.0	W1		
g	1.05								
h	1.05								



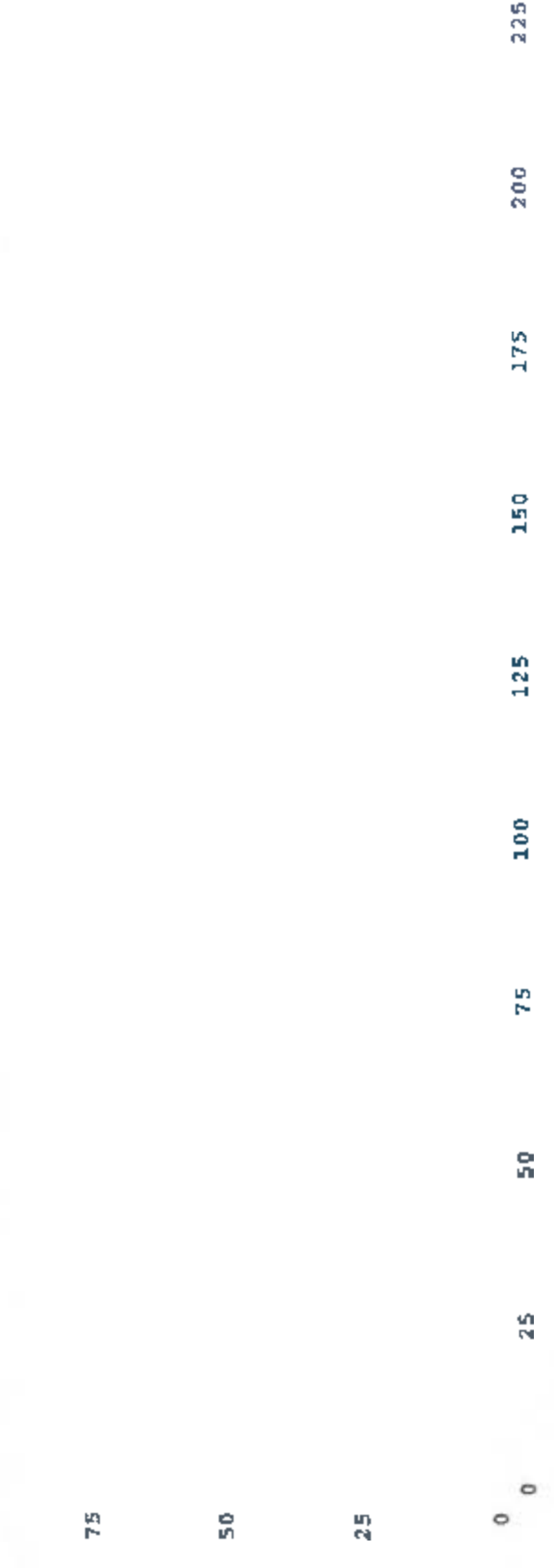
PCSTABL5W/s| FSmin=1.03
Safety Factors Are Calculated By The Modified Bishop Method



Sutton Plant Ash Pond Stability Section B-2 (Shallow)

p:\5468\progcase energy\progress 2010\sutton\468100774 surcom sup inundation and stability\slpuzr stablity\10 125a2.pl2 Run By: J. Shane Johnson, PACTEC, Inc. 11/20/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
a	1.78	Fill	1	120.0	125.0	33.0	W1
b	1.79	Fill	2	125.0	130.0	38.0	W1
c	1.79	Fill	3	115.0	120.0	30.0	W1
d	1.79	Fill	4	100.0	105.0	25.0	W1
e	1.80	Silt	5	100.0	105.0	30.0	W1
f	1.80	Sand	6	120.0	125.0	31.0	W1



PCSTABL5M/si FSmin=1.78
Safety Factors Are Calculated By The Modified Bishop Method

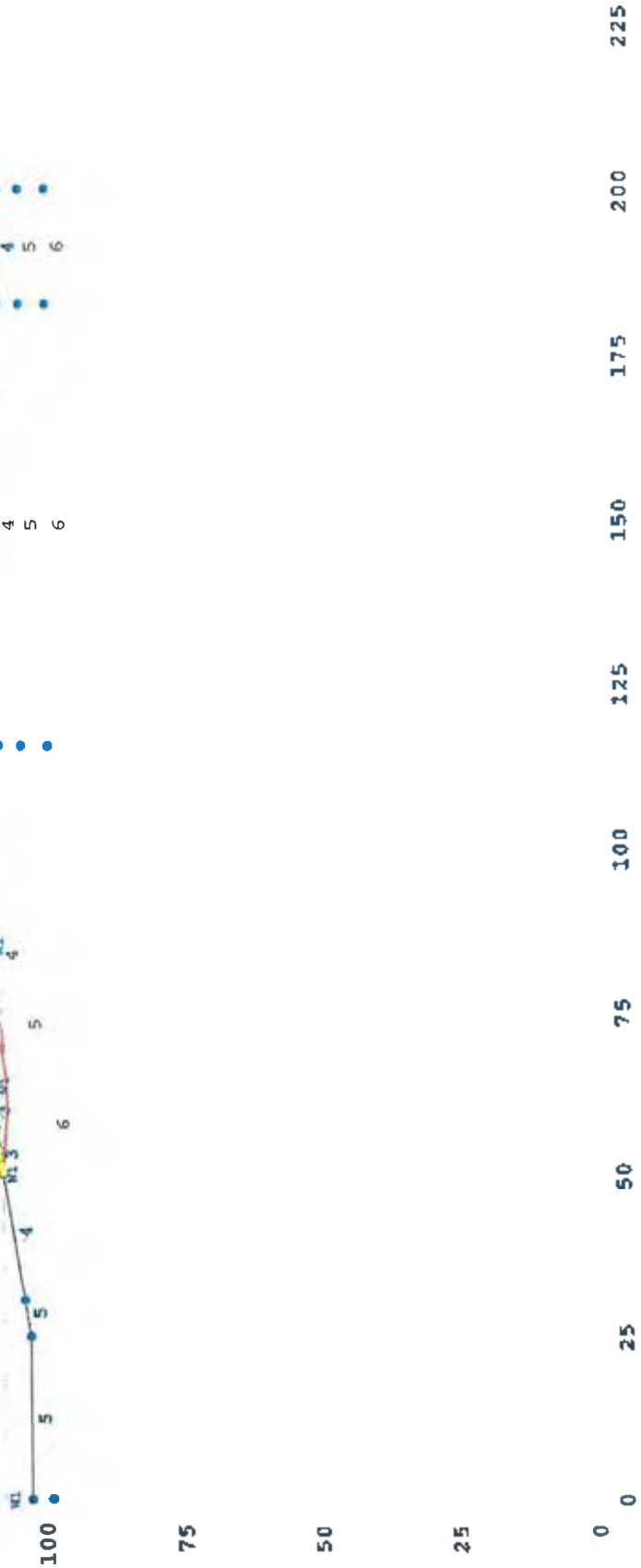
STED



Sutton Plant Ash Pond Stability Section B-2 (Shallow) (Seismic)

p:\6468\progress energy projects\2014\20140416\408110774_sutton_esp_monodation_and_stability\stope stability\b-2shale.plt Run By: J. Shane Johnson, MACTEC, Inc 2/23/2011

#	FS	Soil Desc.	Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.25	Fill	1	120.0	125.0	33.0	W1		0.110 g _s
b	1.25	Fill	2	125.0	130.0	38.0	W1		
c	1.28	Fill	3	115.0	120.0	30.0	W1		
d	1.28	Silt	4	100.0	105.0	25.0	W1		
e	1.26	Silt	5	100.0	105.0	30.0	W1		
f	1.27	Sand	6	120.0	125.0	31.0	W1		



PCSTABL5M/si FSmIn=1.25

Safety Factors Are Calculated By The Modified Bishop Method



Sutton Plant Ash Pond Stability Section B-2 (Wedge Analysis)

p:\5468\progress energy\projects 2010\subham\44500274 sutton map foundation and stability\slip stability\b-2wedge.pl2 Run By: J. Shane Johnson, NACTSC, Inc 1/11/2011

150

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
a	1.46	Fill	1	120.0	125.0	33.0	W1
b	1.46	Fill	2	125.0	130.0	38.0	W1
c	1.47	Fill	3	115.0	120.0	30.0	W1
d	1.48	Silt	4	100.0	105.0	25.0	W1
e	1.48	Silt	5	100.0	105.0	30.0	W1
f	1.50	Sand	6	120.0	125.0	31.0	W1
g	1.51						
h	1.51						
i	1.51						



75

50

25

0

STED



PC-STABL5M/si FSmin=1.46
Safety Factors Are Calculated By The Modified Janbu Method

0 25 50 75 100 125 150 175 200 225

Sutton Plant Ash Pond Stability Section B-2 (Wedge Analysis-Seismic)

p:\6465\progress\energy\projects\20\01\surcon\6465\00274 surcon esp inundation and stability\analysis\stability\wedge\wedge2\wedge2.p12 Run by: J. Shane Johnson, MCFEC, Inc 2/1/2011

150

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.01	Fill	1	120.0	125.0	33.0	W1		0.110 g<
b	1.02	Fill	2	125.0	130.0	38.0	W1		
c	1.03	Fill	3	115.0	120.0	30.0	W1		
d	1.04	Fill	4	100.0	105.0	25.0	W1		
e	1.04	Silt	5	100.0	105.0	30.0	W1		
f	1.06	Sand	6	120.0	125.0	31.0	W1		
g	1.07								
h	1.07								



75

50

25

0

0 25 50 75 100 125 150 175 200 225

PCSTABL5M/si FSmin=1.01

Safety Factors Are Calculated By The Modified Janbu Method

STED



Sutton Plant Ash Pond Stability Section B-3 (Deep)

p:\4468\progress energy projects 2010\sub\cont\668190274 sutton.asp inundation and stability\slope stability\ab 7.pl2 Run By: J. Stacey Johnson, MACTEC, Inc 7/20/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
b	2.51	Ash	1	100.0	105.0	30.0	W1
c	2.52	Fill	2	125.0	130.0	38.0	W1
d	2.52	Fill	3	120.0	125.0	31.0	W1
e	2.53	Fill	4	115.0	120.0	29.0	W1
f	2.53	Silt	5	100.0	105.0	29.0	W1
g	2.53	Sand	6	120.0	125.0	33.0	W1
i	2.53						

150



50

0 0

50

100

150

200

250

PCSTABL5M/s| FSmin=2.51

Safety Factors Are Calculated By The Modified Bishop Method

STED



Sutton Plant Ash Pond Stability Section B-3 (Deep) (Seismic)

p:\6468\progress energy\projects\2010\autcom\6468\0274\stutter\cap inundation and stability\lope stability\0-3\asia.plt Run by: J. Shane Johnson, HACT&C, Inc 1/23/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surfaces No.	Load Horiz Eqk	Value
a	1.56	Ash	1	100.0	105.0	30.0	W1		0.110 g<
b	1.56	Fill	2	125.0	130.0	38.0	W1		
c	1.56	Fill	3	120.0	125.0	31.0	W1		
d	1.56	Fill	4	115.0	120.0	29.0	W1		
e	1.56	Silt	5	100.0	105.0	29.0	W1		
f	1.56	Sand	6	120.0	125.0	33.0	W1		
g	1.56								
h	1.56								
i	1.56								

200

150



50

0 0

150

200

250

PCSTABLSM/si FSmin=1.56

Safety Factors Are Calculated By The Modified Bishop Method

STED



Sutton Plant Ash Pond Stability Section B-3 (Shallow)

p:\cases\progress energy\projects\2010\sutton\666100274\sutton esp introduction and stability\slope stability\B-3sh31.p12 Run By: J. Shure Johnson, MACTEC, Inc 2/27/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	cohesion (pcf)	Piez. Surface No.
a	2.51	Ash	1	100.0	105.0	30.0	0.0	W1
b	2.51	Fill	2	125.0	130.0	38.0	0.0	W1
c	2.51	Fill	3	120.0	125.0	31.0	0.0	W1
d	2.52	Fill	4	115.0	120.0	29.0	0.0	W1
e	2.52	Silt	5	100.0	105.0	29.0	0.0	W1
f	2.52	Sand	6	120.0	125.0	33.0	0.0	W1

200

150



50

0 0

50

100

150

200

250

PCSTABL5M/s1 FSmin=2.51

Safety Factors Are Calculated By The Modified Bishop Method

STED



Sutton Plant Ash Pond Stability Section B-3 (Shallow) (Seismic)

d:\44689\progress energy\projects 2010\macton\5464100274 sutton esp inundation and stability\B-3shsm1.plt Plot by J. Shane Johnson, RA-EEC, Inc 2/7/2012

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.68	Ash	1	100.0	105.0	30.0	W1		0.110 g<
b	1.71	Fill	2	125.0	130.0	38.0	W1		
c	1.71	Fill	3	120.0	125.0	31.0	W1		
d	1.71	Fill	4	115.0	120.0	29.0	W1		
e	1.71	Silt	5	100.0	105.0	29.0	W1		
f	1.71	Sand	6	120.0	125.0	33.0	W1		

200

150

50



0

50

100

150

200

250

PCSTABL5M/si FSmin=1.68

Safety Factors Are Calculated By The Modified Bishop Method

STED



APPENDIX D: 1984 ASH POND – STABILITY ANALYSIS PLOTS

Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Deep)

p:\5466\progress energy\progress energy\2010\mactec\5466\2074 sutton eap inundation and stability\klope stability\1984deep.plz Run By: J. Shane Johnson, MACTEC, Inc 3/1/2011

# FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
2.01	Fill	1	120.0	125.0	0.0	35.0	W1
2.01	Fill	2	120.0	125.0	0.0	32.0	W1
2.01	Clay lin	3	120.0	125.0	150.0	22.0	W1
2.01	Sand	4	120.0	125.0	0.0	32.0	W1



0 50 100 150 200 250 300

PCSTABL5M/si FSmin=2.01

Safety Factors Are Calculated By The Modified Bishop Method



STED

Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Deep) (Seismic)

p:\6068\programs\energy\projects\2010\sutton\6068\90274\sutton\asp\inundation\and\stability\slope\stability\1984\deep.pl2 Run By: J. Shane Johnson, MAC276, Inc 3/2/2011

200

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psf)	Friction Angle (deg)	Piez. Surfs. No.	Load Horiz Espk	Value
a	1.36	Fill	1	120.0	125.0	0.0	35.0	W1		0.110 g<
b	1.36	Fill	2	120.0	125.0	0.0	32.0	W1		
c	1.36	Clay lin	3	120.0	125.0	150.0	22.0	W1		
d	1.36	Sand	4	120.0	125.0	0.0	32.0	W1		
e	1.36									
f	1.36									
g	1.36									
h	1.36									
i	1.36									
j	1.37									

150



50

0

50

100

150

200

300

PCSTABL5M/si FSmin=1.36

Safety Factors Are Calculated By The Modified Bishop Method

STED



Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Shallow)

p:\6466\progress energy\projects 2010\auton\6466\02\4 succor cap inundation and stability\slope stability\1984shad.plz Run By: J. Shane Johnson, MCTDEC, Inc 3/2/7311

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion (psf)	Friction Angle (deg)	Failure Surface No.
a	2.27	Fill	1	120.0	125.0	10.0	36.0	W1
b	2.27	Fill	2	120.0	125.0	0.0	32.0	W1
c	2.28	Clay fin	3	120.0	125.0	150.0	22.0	W1
d	2.28	Sand	4	120.0	125.0	0.0	32.0	W1
e	2.28							
f	2.28							
g	2.28							
h	2.28							
i	2.28							



0 0 50 100 150 200 250 300

PCSTABL5M/si FSmin=2.27
Safety Factors Are Calculated By The Modified Bishop Method

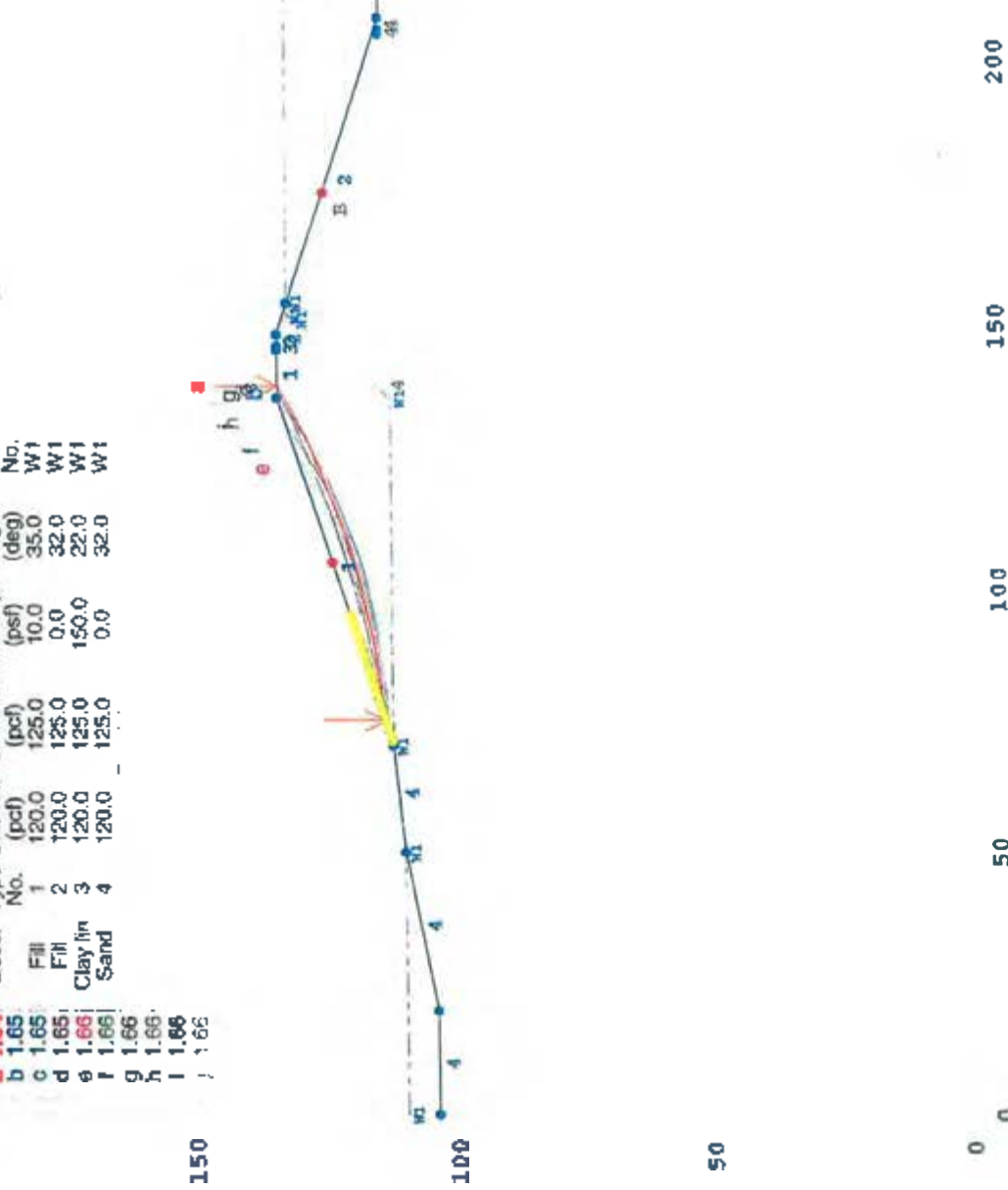
STED



Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Shallow) (Seismic)

p:\6463\progress\energy projects 2010\auton\6463\0274 auton esp inundation and stability\slope stability\1984shas.p12 Run by: J. Shane Johnson, KACREC, Inc 1/2/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Intercept (pcf)	Friction Angle (deg)	Piez. Surface No.	Load Horiz Eqk	Value
a	1.64	Fill	1	120.0	125.0	10.0	35.0	W1		
b	1.65	Fill	2	120.0	125.0	0.0	32.0	W1		
c	1.65	Clay fm	3	120.0	125.0	150.0	22.0	W1		
d	1.66	Sand	4	120.0	125.0	0.0	32.0	W1		
e	1.66									
f	1.66									
g	1.66									
h	1.66									
i	1.66									
j	1.66									



PCSTABL5M/si FSmin=1.64

Safety Factors Are Calculated By The Modified Bishop Method

STED



Sutton Plant Ash Pond Stability 1984 Ash Pond Dike (Deep) Run 2

P:\6468\progress\energy\projects\2010\subson\64681002\4_sutton_eap_inundation_and_stability\slope_stability\1984dee2.pl2 Run By: J. Shane Johnson, MACTEC, Inc 2/21/2011

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Surface No.	Piez. W1
a	1.57	Fill	1	120.0	125.0	35.0	W1	
b	1.57	Sand	2	120.0	125.0	32.0	W1	

- a 1.57
- f 1.57
- g 1.57
- h 1.58
- i 1.58

200

150



100

50

0

0

50

100

150

200

250

300

PCSTABL5M/si FSmin=1.57

Safety Factors Are Calculated By The Modified Bishop Method

STED



**APPENDIX E: SEISMIC SITE CLASS AND PEAK GROUND ACCELERATION CALCULATIONS -
FOR STABILITY AND LIQUEFACTION POTENTIAL EVALUATION**

6468-10-0274

J Va. H.

Sutton Ash Pond Ligustation

2/18/4

LAT 34.292040

Lon -77.993119

	<u>DSHA</u>	<u>PSHA</u>	<u>Recommended</u>	<u>M_w</u>	<u>a_{max}</u>
Wilburua 1.98	PGA 0.095	0.118	0.118		
mit NE	S_s 0.218	0.247	0.247		
	S_1 0.070	0.078	0.078		
Sitellass			D		
M_w			7.3		
a_{max}			0.105		

0.11 used for Seismic Stability Analysis

GLE 4.06

	<u>DSHA</u>	<u>PSHA</u>	<u>Recommended</u>	<u>JSS</u>
mit NE	PGA 0.106	0.111	0.111	3/4/11
	S_s 0.225	0.240	0.240	
	S_1 0.071	0.093	0.093	
Sitellass			D	
M_w			7.3	
a_{max}			0.102	

Column No.

- 1 Sample depth
- 2 depth to N-value
- 3 Field N-value, blows per foot
- 4 CUSCS designation, input for intermediate purposes only
- 4A "ASTM" for SC, SM, SP, GW, GM or combinations. "CLASS" for ML, CL, MH, CH or combinations. or PWR or Rock.
- 5 Total soil unit weight at N-value depth, pounds per cubic foot
- 6 FC - fines content, percent, passing the number 200 sieve.
- 7 P_2 - total overburden pressure, pounds per square foot
- 7A Porewater pressure, based on depth to water at time of test, pounds per square foot
- 8 P_2' - effective overburden pressure at N-value depth, pounds per square foot
- 9 C_N - N-value correction factor for fine depth. Max $C_N = 1.7$, $C_N = 421.6(FC)^{0.5}$
- 10 C_L - N-value correction factor for rod weight based on sample depth. Assumptions: 2 ft rod depth,
 - 0.75 for Rod Length ≤ 10 ft.
 - = 0.80 for Rod Length < 13 ft.
 - = 0.85 for Rod Length < 20 ft.
 - ≈ 0.95 for Rod Length < 33 ft.
 - = 1.0 for Rod Length > 33 ft.
- 11 C_1 - N-value correction factor for hammer type. $C_1 = 1$ for safety hammer, $C_1 = 0.75$ for automatic hammer
- 12 C_2 - N-value correction factor for borehole size. $C_2 = 1$ for H.S.A. borehole diameter or rod/ratier between 2.5 and 4.5
- 13 C_3 - N-value correction factor for sampler type. $C_3 = 1$ for standard 4-3/8" diameter, $C_3 = 2.2$ for 1-1/2" ID sampler without liners
- 14 $(N)_{60}$ - N-value, blows per foot for depth corrected for fines content
- 15 Alpha - correction factor constant for fines content
- 16 Beta - correction factor constant for fines content
- 17 $(N)_{60cs}$ - $(N)_{60}$ value corrected for fines content, blows per foot
- 18 r_f - stress reduction factor based on depth
- 18A f_1 - function of soil conditions used in calculating K_{sp}

N(60)	f_1
0	0.8
7.1	0.8
16	0.7
28.4	0.6
625	0.6
- 19 K_{sp} - overburden correction factor
- 19A Porewater pressure based on analysis depth in water, psf
- 20 P_{av} - effective overburden pressure at groundwater analysis depth, pounds per cubic foot
- 21 CSR - cyclic stress ratio
- 22 CRR_{75} - cyclic resistance ratio for magnitude 7.5 earthquake
- 23 MSF - magnitude scaling factor, for $M_w < 7.5$ MSF = $(M_w/7.5)^{1.1}$, for $M_w > 7.5$ MSF = $10^{-0.23(M_w - 7.5)}$
- 24 $CS = (CSR)_{75} * K_{sp} * MSF^{1.4}$

Project Name: Sutton Ash Dam
 Plot No: 10/273
 Location: Wilmington, NC
 Blot No: B-2
 Depth of Groundwater (ft.): 15
 Analysis Code and Date (N-3, ft.): 10
 Date: 09/25/09
 Block Diagram: 4
 Horizontal Type: 2 LR = 85 %
 Sampler Type: C_u = 1 for standard 1.5" sampler
 : : 2 for 1.5" sampler w. liners. C_u = 1

State Class: D
 S_u: 0.247
 S_u: 0.0098
 S_u: 1
 S_u: 7.3
 S_u: 0.105 used in calculation #105

2006 IBC a_{max} : 0.000 = 0.4 S_u/S_u
 VA Tech a_{max} : #3V/01 = [0.0606 * (4 + S_u)] / (1 + S_u) + 0.267 * a_{max}

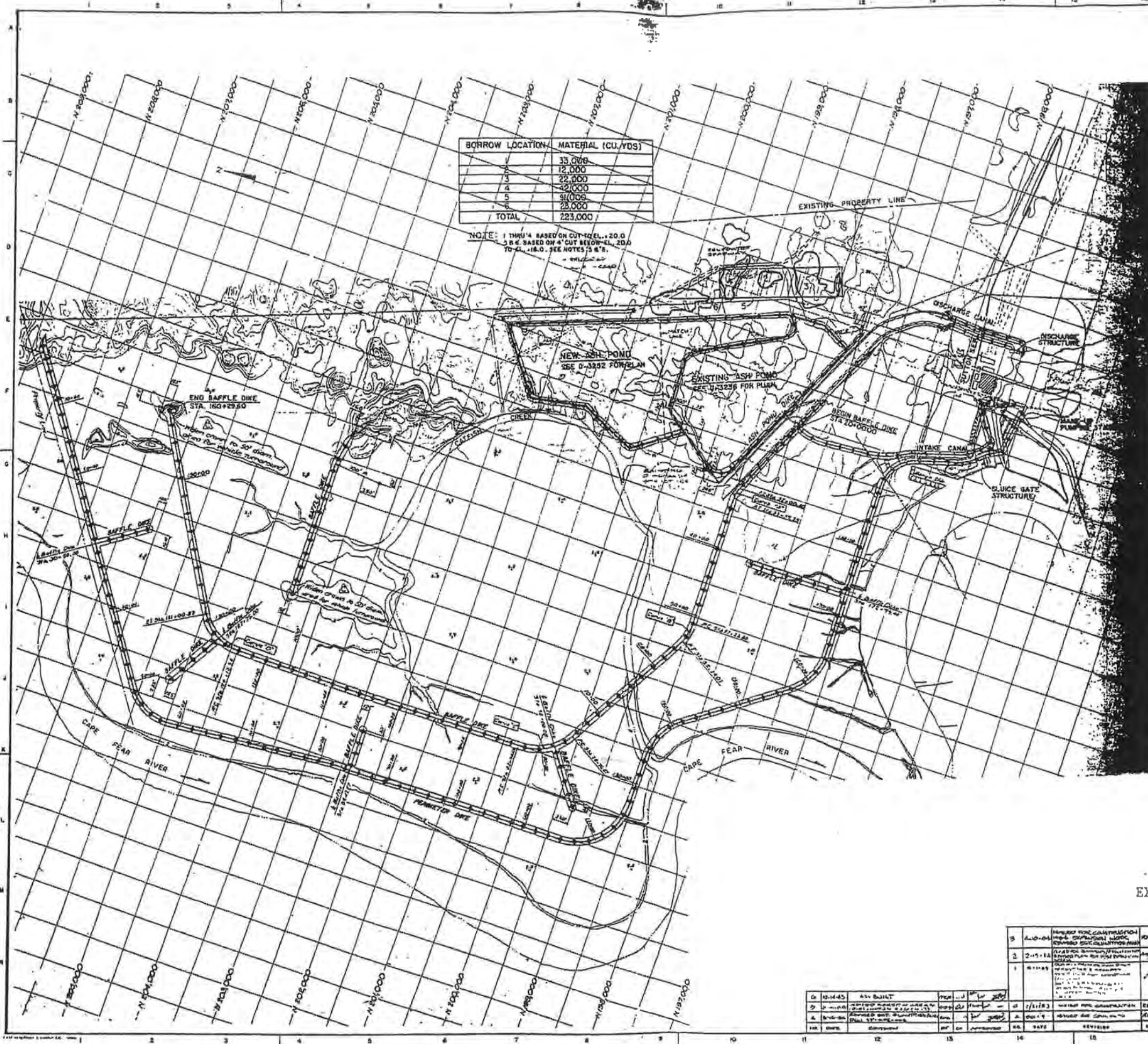
Input by: Yash Date: 2/18/2011
 Checked by: Yash Date:

Sample Depth (ft)	N-Value (bpf)	USCS	SAND or CLAY (%)	FC (°)	P _v (psf)	U _v (psf)	P _v ' (psf)	C _u	C _l	C _s	(N ₁) ₆₀ (bpf)	Alpha	Beta	(N ₁) ₆₀ (bpf)	f _d	K _{max}	U _v (psf)	P _v ' _{obs} (psf)	CSR	CRR _{7.5}	MSF	FS		
0-1.5	1	SM	SAND	120	120	120	120	1.0	1.42	1.00	50.6	-	1.00	50.6	0.998	0.600	-	120	0.068	1.370	1.093	N.I.		
3.5-5	4.5	SM	SAND	140	610	610	610	1.0	1.42	1.00	99.3	-	1.00	99.3	0.990	0.600	-	610	0.068	1.731	1.093	N.I.		
6.7-8	7	SM	SAND	140	960	960	960	1.0	1.42	1.00	103.8	-	1.00	103.8	0.984	0.600	-	960	0.067	1.764	1.093	N.I.		
8.5-10	9.5	SM	SAND	140	1310	1310	1310	1.0	1.42	1.00	82.0	-	1.00	82.0	0.978	0.600	-	1310	0.067	1.602	1.093	N.I.		
11-12.5	12	SM	SAND	110	1585	1585	1585	1.0	1.42	1.00	11.2	4.29	1.12	16.8	0.972	0.754	1.00	125	0.072	0.179	1.093	2.7		
13.5-15	14.5	SM	SAND	110	1860	1860	1860	1.0	1.42	1.00	6.4	4.29	1.12	11.4	0.966	0.800	1.00	281	0.078	0.126	1.093	1.8		
16-17.5	17	SM	SAND	110	2135	2135	2135	1.0	1.42	1.00	9.9	4.29	1.12	15.3	0.960	0.769	1.00	437	0.082	0.163	1.093	2.2		
18.5-20	19.5	1	MH	CLAY	90	2360	2079	1.0	0.95	1.42	1.0	5.00	1.20	6.7	0.955	0.800	1.00	593	0.087	0.085	1.093	N.I.		
23.5-25	24.5	7	MH	CLAY	110	2910	2317	1.0	0.95	1.42	1.0	9.0	5.00	1.20	15.8	0.943	0.779	1.00	905	0.093	0.168	1.093	N.I.	
28.5-30	29.5	15	SM	SAND	120	3510	2605	1.0	0.95	1.42	1.0	18.2	-	1.00	18.2	0.931	0.682	0.97	2293	0.097	0.194	1.093	2.1	

Column 15 - U_v is corrected for SM, SM SP, GW GM or consolidation. Use U_v for MH, CL, MH, CL or consolidation, or P_v' or R_u.
 Column 24 - N.I. = non liquidable because soil has CLAY designation or sample is below the water table.
 # = data not collected

APPENDIX F: ASH POND REFERENCE DRAWING INFORMATION (from 2007 5-Year Inspection Report)

- Exhibit 2 – CP&L, Ash Pond Expansion (1983-1984), Site Plan, Drawing D-3235
- Exhibit 3 – B&R, Ash Disposal Ponds, North Pond-Discharge Structure, Drawing G-3177B
- Exhibit 4 - CP&L, Ash Pond Expansion (1983-1984), Plan - Sheet 1, Drawing No. obscured
- Exhibit 5 - CP&L, Ash Pond Expansion (1983-1984), Plan - Sheet 2, Drawing No. obscured
- Exhibit 6 - CP&L, Ash Pond Expansion (1983-1984), Dike Sections (Sheet 1), Drawing D-3237
- Exhibit 7 - CP&L, Ash Pond Expansion (1983-1984), Dike Sections (Sheet 2), Drawing D-3239
- Exhibit 8 - CP&L, Ash Pond Expansion (1983-1984), Sections & Details (Sheet 1), Drawing D-3238



BORROW LOCATION	MATERIAL (CU.YDS)
1	35,000
2	12,000
3	22,000
4	42,000
5	91,000
6	23,000
TOTAL	225,000

NOTE: 1 THRU 4 BASED ON CUT SLOPE 1:20.0
5 & 6 BASED ON 4' CUT BELOW EL. 20.0
TO EL. 18.0. SEE NOTES 3 & 4.

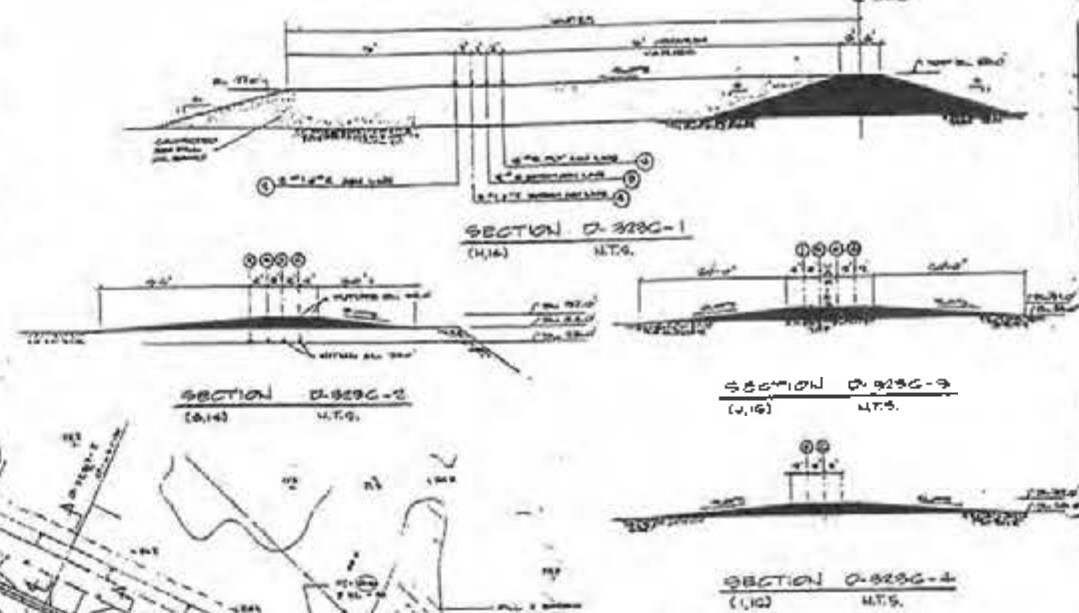
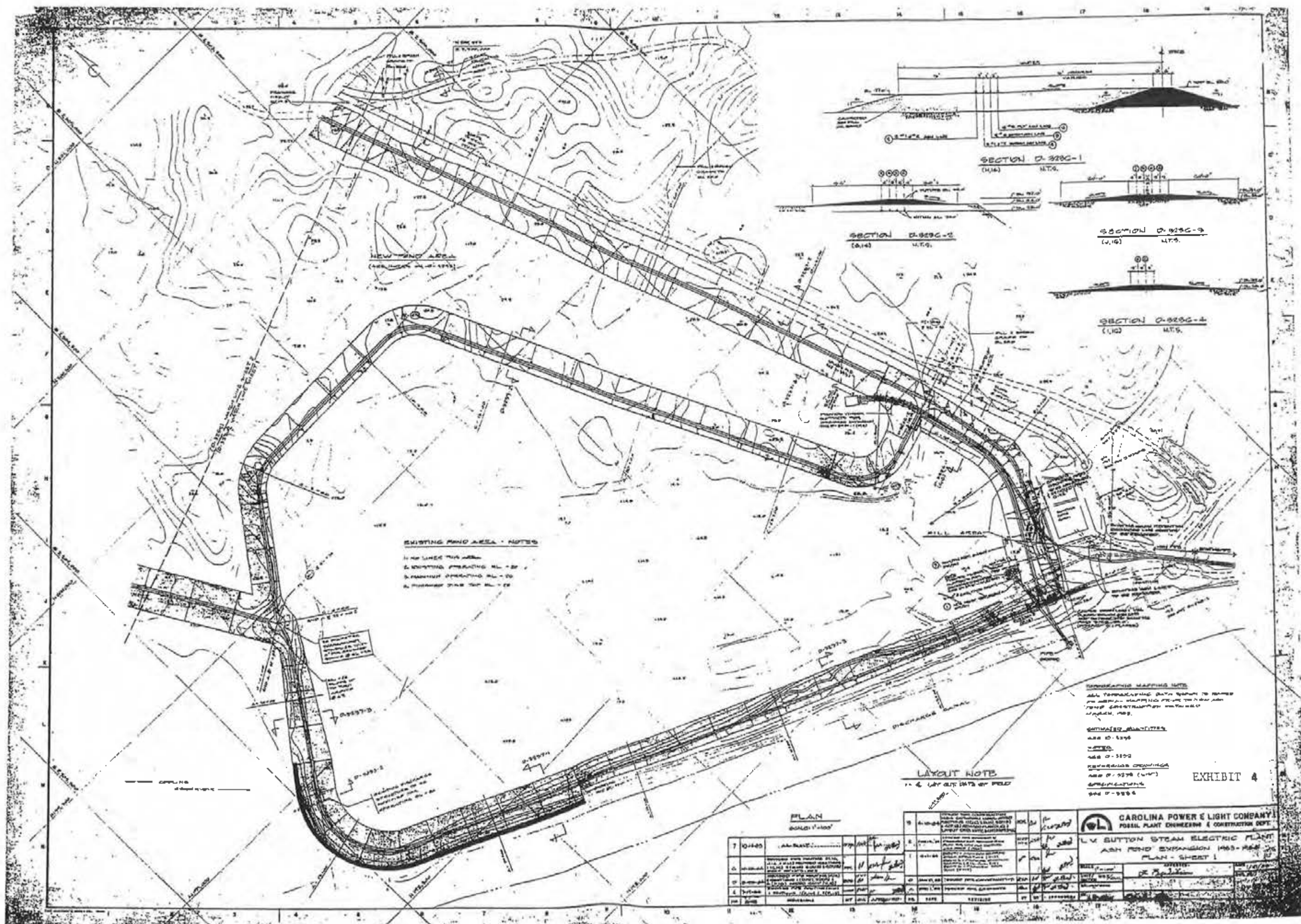
ESTIMATED QUANTITIES (NET OF FILL)			
ITEM	UNIT	AMOUNT	REMARKS
1. EXCAVATION	CU. YD.	225,000	
2. EXCAVATION	CU. YD.	18,000	
3. FILL	CU. YD.	10,000	
4. EXCAVATED FILL	CU. YD.	10,000	
5. EXCAVATION	CU. YD.	10,000	
6. EXCAVATION	CU. YD.	10,000	
7. EXCAVATION	CU. YD.	10,000	
8. EXCAVATION	CU. YD.	10,000	
9. EXCAVATION	CU. YD.	10,000	
10. EXCAVATION	CU. YD.	10,000	
11. EXCAVATION	CU. YD.	10,000	
12. EXCAVATION	CU. YD.	10,000	

1. DREDGE... (text describing dredging operations)
2. THE... (text describing construction details)
3. THE... (text describing structural requirements)
4. THE... (text describing material specifications)

- LIST OF DRAWINGS
- D-3230 POND PLAN (1)
 - D-3231 DREDGE CHANNEL (1)
 - D-3232 SECTION & DETAILS (1)
 - D-3233 END Baffle DIKE (1)
 - D-3234 INTAKE CANAL (1)
 - D-3235 DISCHARGE CANAL (1)
 - D-3236 SLUICE GATE STRUCTURE (1)
 - D-3237 Baffle DIKE (1)
 - D-3238 PERIMETER DIKE (1)
 - D-3239 Baffle DIKE (1)
 - D-3240 Baffle DIKE (1)
 - D-3241 Baffle DIKE (1)
 - D-3242 Baffle DIKE (1)
 - D-3243 Baffle DIKE (1)
 - D-3244 Baffle DIKE (1)
 - D-3245 Baffle DIKE (1)
 - D-3246 Baffle DIKE (1)
 - D-3247 Baffle DIKE (1)
 - D-3248 Baffle DIKE (1)
 - D-3249 Baffle DIKE (1)
 - D-3250 Baffle DIKE (1)

EXHIBIT 2

CAROLINA POWER & LIGHT COMPANY POWER PLANT ENGINEERING & CONSTRUCTION DEPT.	
L.V. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION (1983-1984) SITE PLAN	
DATE: 1/11/83 DRAWN BY: J. D. BULLOCK CHECKED BY: J. D. BULLOCK APPROVED BY: J. D. BULLOCK	DATE: 1/11/83 PAGE NO.: 1 OF: 1
D-3235	



EXISTING POND AREA - NOTES

1. NEW LINE 100' WIDE
 2. EXISTING STRUCTURE 10' WIDE
 3. EXISTING STRUCTURE 10' WIDE
 4. EXISTING STRUCTURE 10' WIDE

LAYOUT NOTE

1. SEE LAYOUT SHEET OF POND

CONSTRUCTION MAPS NOTE

ALL TERRAINING DATA OBTAINED FROM
 THE FOLLOWING MAPS AND SURVEYS:
 1. 100' CONTOUR MAP, 1954
 2. 100' CONTOUR MAP, 1954
 3. 100' CONTOUR MAP, 1954

CONSTRUCTION MAPS

1. 100' CONTOUR MAP, 1954
 2. 100' CONTOUR MAP, 1954
 3. 100' CONTOUR MAP, 1954

EXHIBIT 4

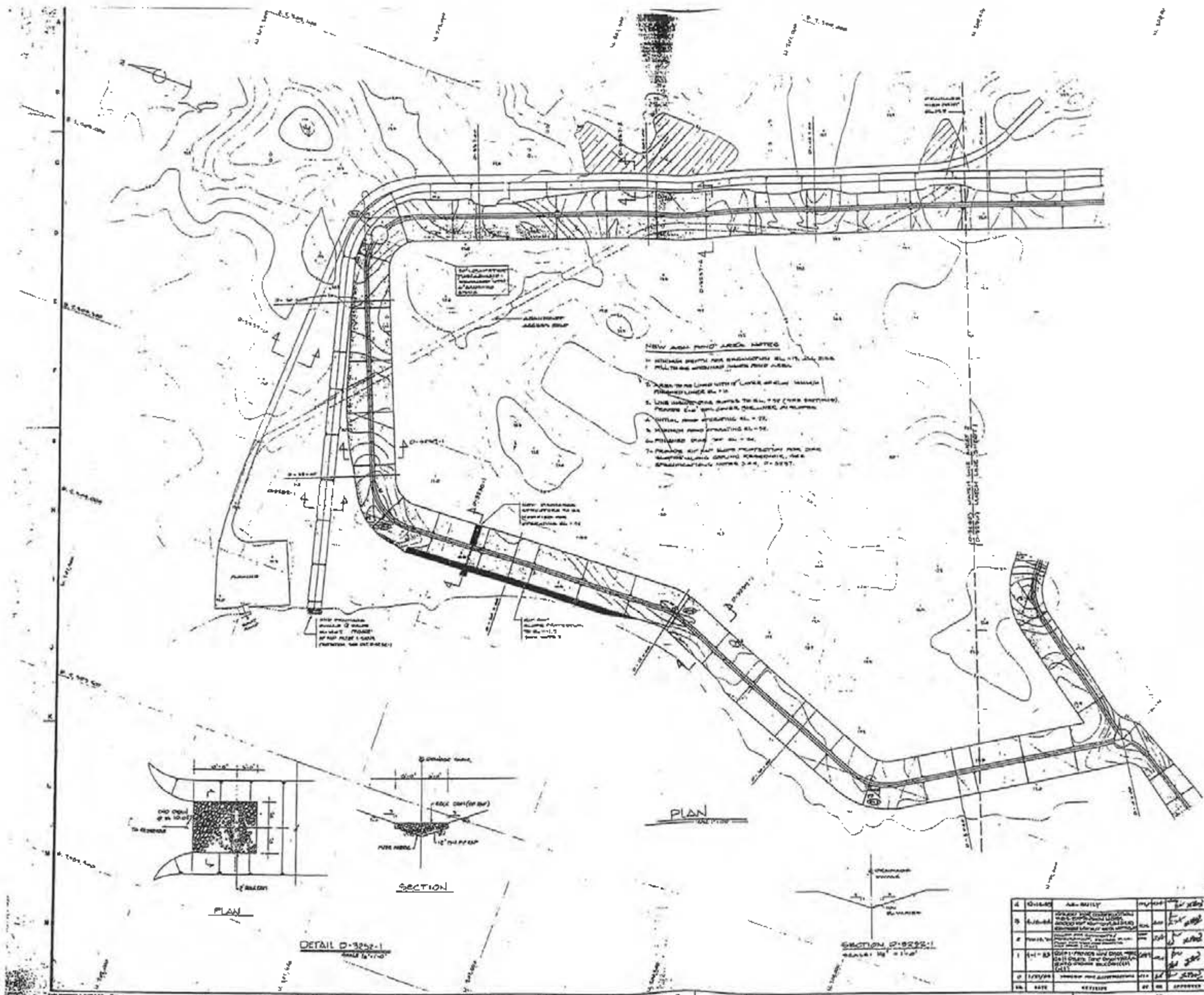
PLAN		SCALE 1"=100'		DATE		BY		CHECKED		APPROVED	
7	10-10-54	AS BUILT		10-10-54							
8	10-10-54			10-10-54							
9	10-10-54			10-10-54							
10	10-10-54			10-10-54							
11	10-10-54			10-10-54							
12	10-10-54			10-10-54							
13	10-10-54			10-10-54							
14	10-10-54			10-10-54							
15	10-10-54			10-10-54							
16	10-10-54			10-10-54							
17	10-10-54			10-10-54							
18	10-10-54			10-10-54							
19	10-10-54			10-10-54							
20	10-10-54			10-10-54							

CAROLINA POWER & LIGHT COMPANY
 Fossil Plant Engineering & Construction Dept.

LV SUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION 1953-1954

PLAN - SHEET 1

DATE: 10-10-54
 BY: [Signature]
 CHECKED: [Signature]
 APPROVED: [Signature]

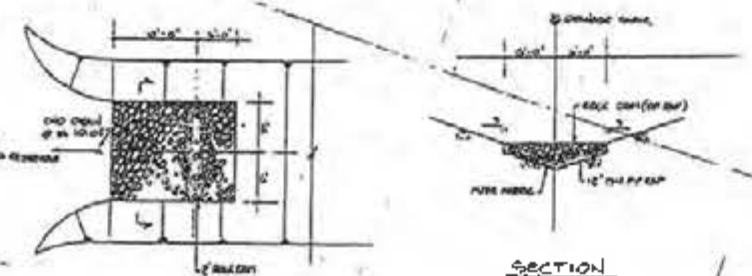


NEW ASK POND AREA LAYED

1. ALL EXISTING POND AND SURROUNDING AREAS TO BE FILL TO BE UNIFORM GRADE AND AREA.
2. AREA TO BE LINED WITH 12" LAYER OF GRAVEL UNDER LAYER OF 12" SAND.
3. LINE CONSTRUCTION MARKS TO BE 1/2" (FOR EXISTING) FROM 1/2" TO 1" (FOR NEW) FROM CENTERLINE.
4. INITIAL GRADE ELEVATION EL. = 22.
5. SURFACE GRADE ELEVATION EL. = 22.
6. FINISHED GRADE EL. = 24.
7. FINISH SURFACE GRADE PROTECTION FROM DAM SURROUNDING GRADE CONSTRUCTION, FOR SPECIFIC GRADE NOTES 3.04, 3.05, 3.07.

APPROVED DRAWING
 DATE 11-1959
CONTROL NUMBER
 104-0-1007
EXPERIENCE DRAWING
 DATE 11-1959
APPROVALS
 DATE 11-1959

TOPOGRAPHIC MAPPING NOTE
 ALL TOPOGRAPHIC DATA SHOWN IS BASED ON AERIAL PHOTOGRAPHIC SURVEY TO WHICH POINT CORRELATIONS AND ADJUSTMENTS WERE MADE.



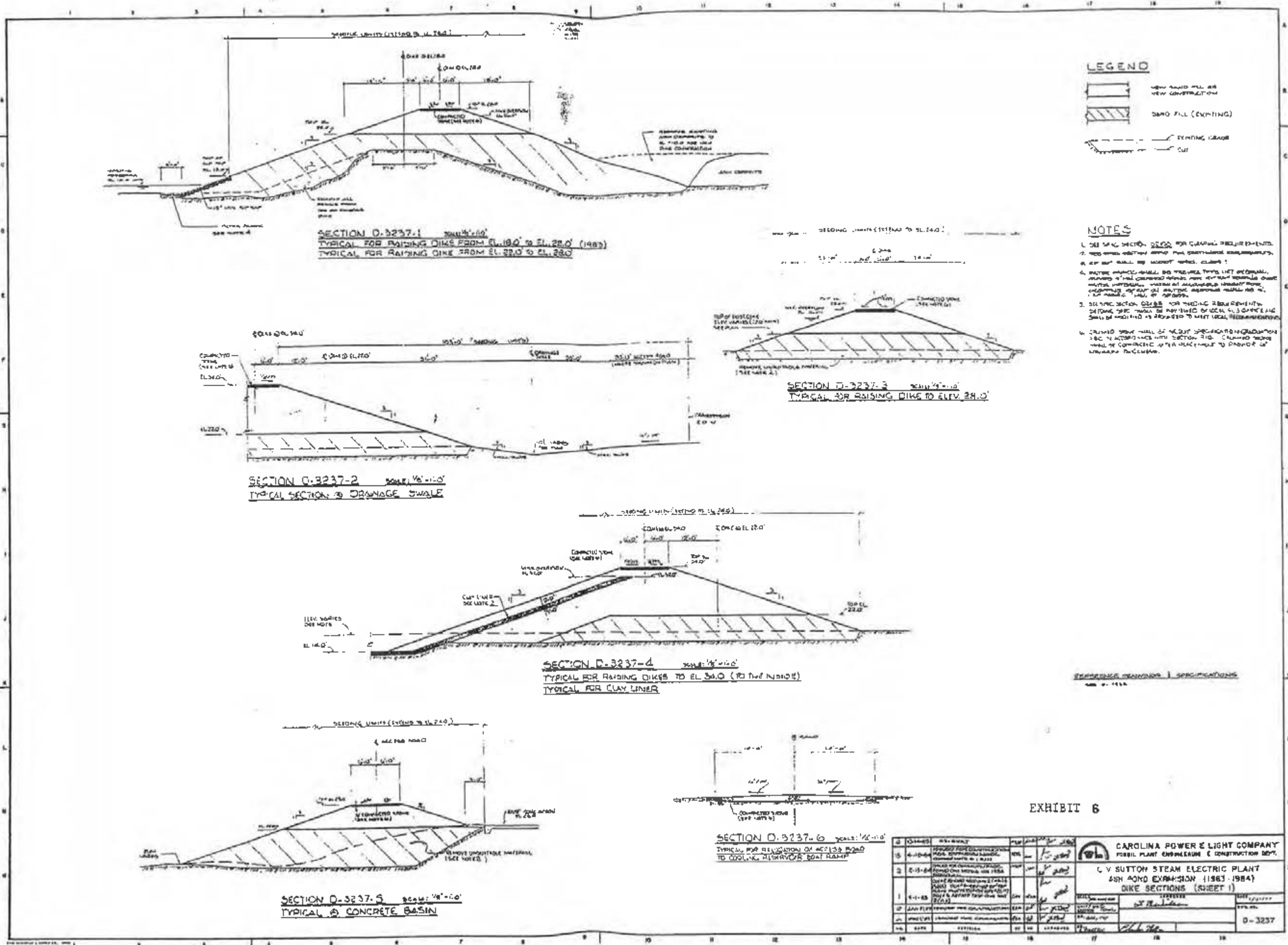
DETAIL D-3252-1
 SCALE 1/4" = 1'-0"

LAYOUT NOTE
 6. LAYOUT WITH SET POINTS.

EXHIBIT 5

NO.	DATE	REVISION	BY	APPROVED
1	11-1-59	DESIGN	...	...
2	11-1-59	CONSTRUCTION	...	...
3	11-1-59	...	...	...

CAROLINA POWER & LIGHT COMPANY POWER PLANT ENGINEERING & CONSTRUCTION DEPT.	
LY SUTTON STEAM ELECTRIC PLANT ASK POND EXPANSION 1959-1964 PLAN - SHEET 2	
TITLE: ... DATE: 11-1-59 DRAWN BY: ... CHECKED BY: ...	DATE: 11-1-59 SHEET NO.: 0-3252



LEGEND

- NEW SAND FILL OR NEW CONSTRUCTION
- SAND FILL (EXISTING)
- FINISH GRADE
- CUT

- NOTES**
1. SEE SPEC. SECTION 2500 FOR GENERAL REQUIREMENTS.
 2. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN FEET AND INCHES.
 3. ALL DIMENSIONS SHALL BE TO CENTER UNLESS OTHERWISE SPECIFIED.
 4. ALL DIMENSIONS SHALL BE TO CENTER UNLESS OTHERWISE SPECIFIED.
 5. ALL DIMENSIONS SHALL BE TO CENTER UNLESS OTHERWISE SPECIFIED.
 6. ALL DIMENSIONS SHALL BE TO CENTER UNLESS OTHERWISE SPECIFIED.

SECTION D-3237-1 SCALE: 1/8"=1'-0"
 TYPICAL FOR RAISING DIKE FROM EL. 19.0 TO EL. 28.0 (1983)
 TYPICAL FOR RAISING DIKE FROM EL. 22.0 TO EL. 28.0

SECTION D-3237-3 SCALE: 1/8"=1'-0"
 TYPICAL FOR RAISING DIKE TO ELEV. 28.0

SECTION D-3237-2 SCALE: 1/8"=1'-0"
 TYPICAL SECTION OF DRAINAGE SWALE

SECTION D-3237-4 SCALE: 1/8"=1'-0"
 TYPICAL FOR RAISING DIKES TO EL. 28.0 (TO THE INSIDE)
 TYPICAL FOR CLAY LINER

SECTION D-3237-5 SCALE: 1/8"=1'-0"
 TYPICAL OF CONCRETE BASIN

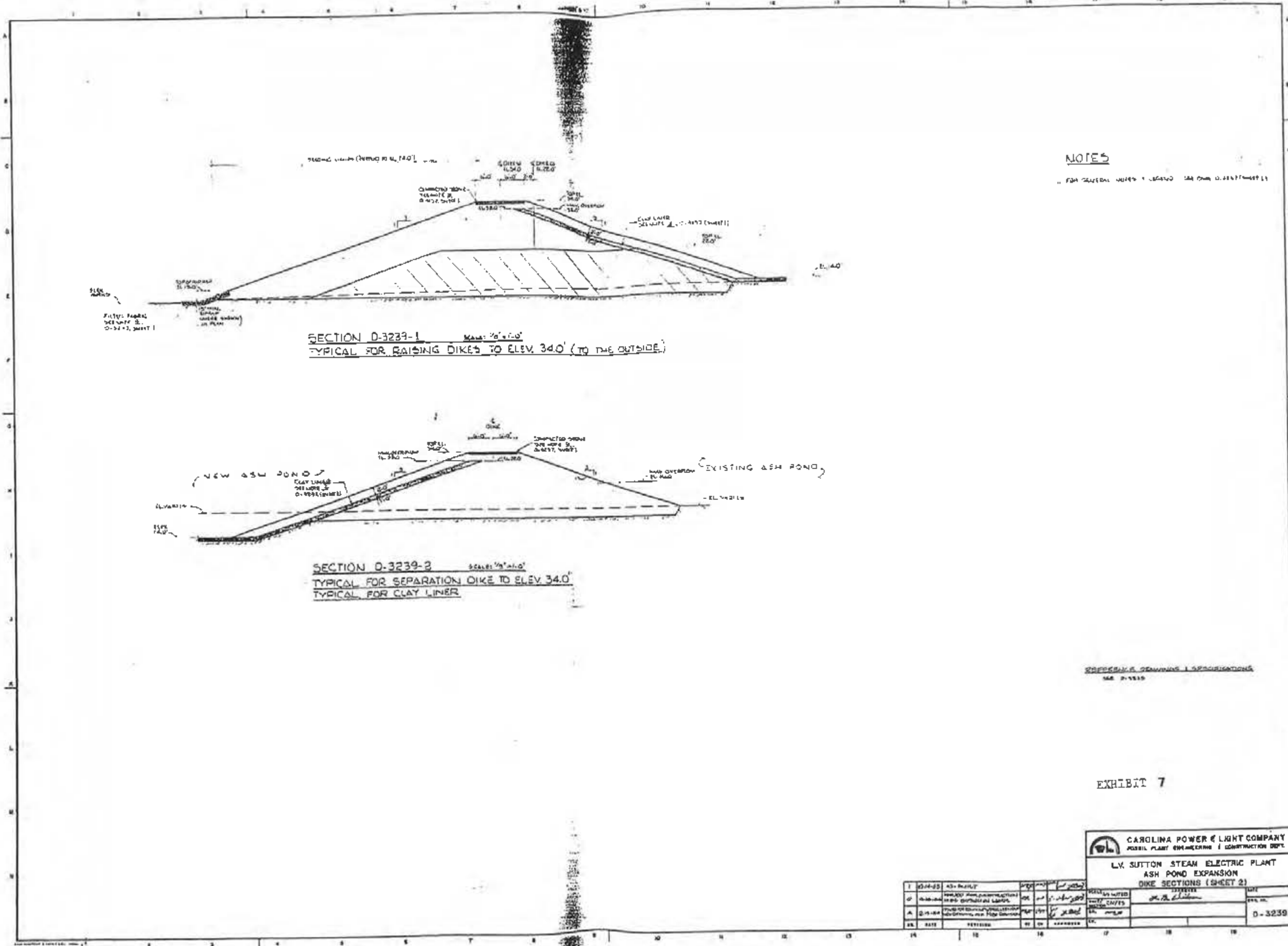
SECTION D-3237-6 SCALE: 1/8"=1'-0"
 TYPICAL FOR RELIEF OF ACCESS ROAD
 TO COOLING HIGHWAY OR BOAT RAMP

EXHIBIT 6

NO.	DATE	BY	DESCRIPTION	APP'D.	REV.
1	1-1-83	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	1
2	2-15-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	2
3	4-10-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	3
4	6-1-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	4
5	8-1-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	5
6	10-1-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	6
7	12-1-84	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	7
8	2-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	8
9	4-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	9
10	6-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	10
11	8-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	11
12	10-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	12
13	12-1-85	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	13
14	2-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	14
15	4-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	15
16	6-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	16
17	8-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	17
18	10-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	18
19	12-1-86	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	19
20	2-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	20
21	4-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	21
22	6-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	22
23	8-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	23
24	10-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	24
25	12-1-87	J. H. HARRIS	DESIGNED FOR CONSTRUCTION	J. H. HARRIS	25

CAROLINA POWER & LIGHT COMPANY
 Fossil Plant Engineering & Construction Dept.
 C. V. SUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION (1983-1984)
 DIKE SECTIONS (SHEET 1)

DATE: 12/1/87
 BY: J. H. HARRIS
 CHECKED: J. H. HARRIS
 TITLE: D-3237



NOTES
 FOR GENERAL NOTES & DETAILS SEE DRAWING D-3239-1

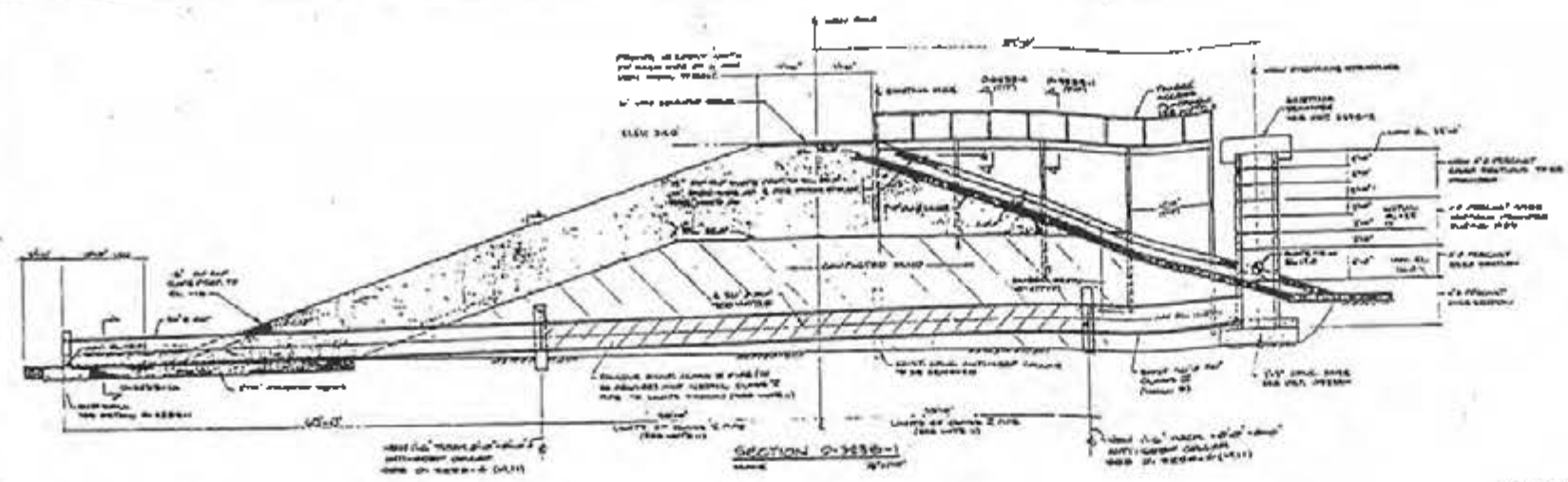
SECTION D-3239-1 SCALE: 1/8" = 1'-0"
 TYPICAL FOR RAISING DIKES TO ELEV. 34.0' (TO THE OUTSIDE)

SECTION D-3239-2 SCALE: 1/8" = 1'-0"
 TYPICAL FOR SEPARATION DIKE TO ELEV. 34.0'
 TYPICAL FOR CLAY LINER

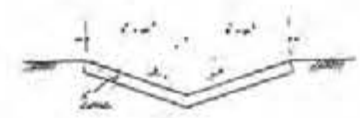
EXHIBIT DRAWINGS & SPECIFICATIONS
 MAY 2, 1955

EXHIBIT 7

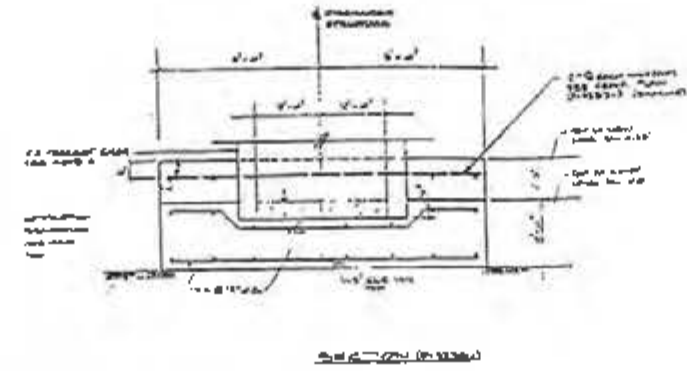
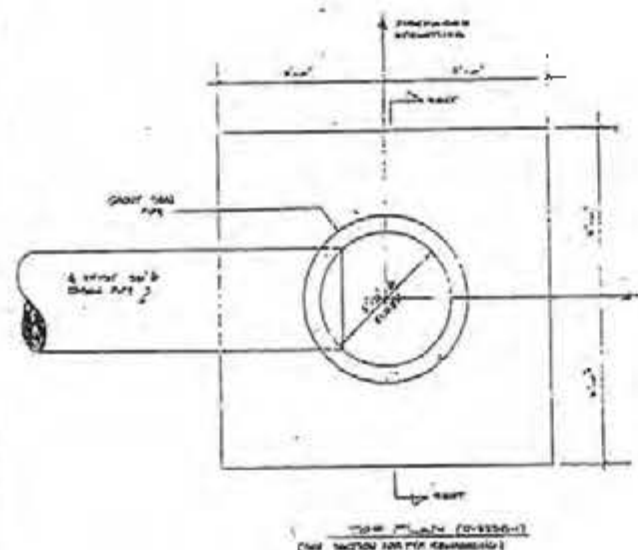
CAROLINA POWER & LIGHT COMPANY POWER PLANT ENGINEERING & CONSTRUCTION DEPT.			
LY. SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION DIKE SECTIONS (SHEET 2)			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20



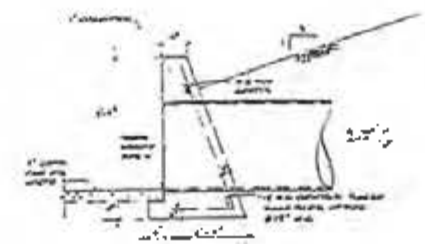
NOTE: PROVIDE TENSILE ANCHORS AT APPROX. 10' ON UP AND DOWN SLOPES OF DAM. ANCHORS SHALL BE 1" DIA. BARS, (A.C.I.)



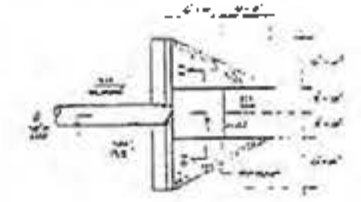
TYP SECTION 3.2
CONC. PAVING
GRADE 1'-0"



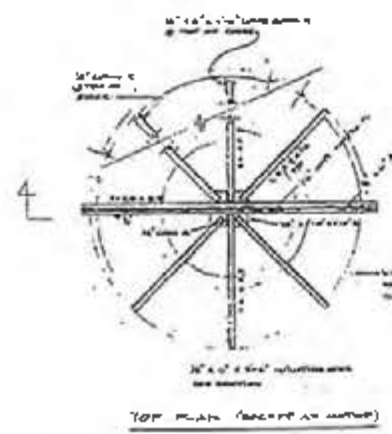
SECTION 0-3230-2
CHAMBER



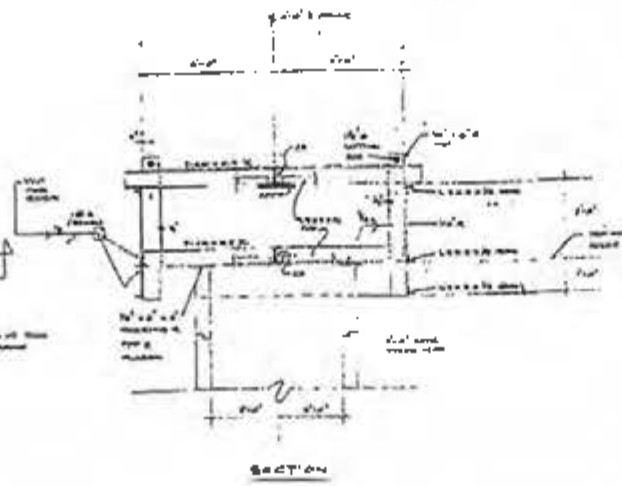
TYP SECTION 3.1
CONC. END WALL
GRADE 1'-0"



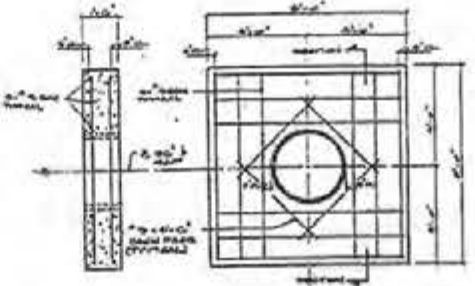
OUTLET PLAN



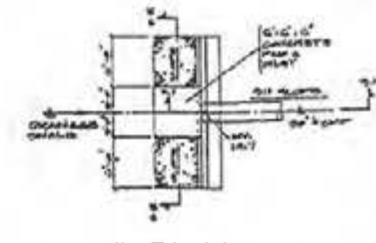
TOP PLAN (SECTION 0-3230-2)



SECTION 0-3230-3



SECTION 0-3230-4
ANTI-SUCK COLLAR



INLET PLAN

DETAIL 0-3230-3
30" DRAIN

NOTES

1. THE DAM AND STRUCTURE IN THIS SECTION SHALL BE CONSTRUCTED AS SHOWN TO OPERATE WITH A MAXIMUM OVERFLOW SLICE OF 10.0' FROM THE TOP OF THE DAM. INITIAL STABILIZATION SHALL BE PROVIDED FOR THE DAM AND STRUCTURE AS SHOWN.
2. THE STRUCTURE SHOWN FOR THIS SECTION SHALL BE CONSTRUCTED AS SHOWN TO OPERATE WITH A MAXIMUM SLICE OF 10.0' FROM THE TOP OF THE DAM AND STRUCTURE AS SHOWN.
3. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI. AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
4. REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
5. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
6. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
7. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
8. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
9. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
10. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.
11. ALL REINFORCEMENT SHALL BE PROVIDED AS SHOWN FOR ALL STRUCTURES AND SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE NOTES HEREON.

EXHIBIT 8

DETAILS: 1. TO BE CONSTRUCTED AS SHOWN UNLESS OTHERWISE NOTED. 2. TO BE CONSTRUCTED AS SHOWN UNLESS OTHERWISE NOTED. 3. TO BE CONSTRUCTED AS SHOWN UNLESS OTHERWISE NOTED.

NO.	DATE	DESCRIPTION	BY	CHECKED	APPROVED
1	10-1-58	ISSUED FOR CONSTRUCTION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
2	10-1-58	REVISION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
3	10-1-58	REVISION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
4	10-1-58	REVISION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS
5	10-1-58	REVISION	J. H. HARRIS	J. H. HARRIS	J. H. HARRIS

CAROLINA POWER & LIGHT COMPANY
 L.V. SUTTON STEAM ELECTRIC PLANT
 ASH POND EXPANSION 1953-1958
 SECTIONS & DETAILS NO. 8

**APPENDIX G: REFERENCE INFORMATION FROM MACTEC REPORT OF PIEZOMETER
INSTALLATION AND OBSERVATIONS, APRIL 20, 2010**

- **Table 1 – Summary of Groundwater Information in Shallow Piezometers I – Piezometer Installation Locations**
- **Figure 1 – Piezometer Installation Locations**
- **Figure 2 – Typical Cross Section of Dike Showing Piezometer Installation (PZ-1, PZ-1A, PZ-1B)**
- **Figure 3 – Summary of Water Levels in Piezometers (Section 1 & 2)**
- **Figure 4 – Summary of Water Levels in Piezometers (Section 3 & 4)**
- **Figure 5 – Summary of Water Levels in Piezometers (Section 5 & 6)**
- **Figure 10 – Comparison of Water Levels with Stability Analysis**
- **Attachment B – Boring Records**

TABLE 1
 SUMMARY OF GROUNDWATER INFORMATION IN SHALLOW PIEZOMETERS
 UPDATED 8-17-09
 PROGRESS ENERGY-SUTTON BASIN POND SUTTON PLANT
 MACTEC PROJECT No. 6468-09 2340

Location	Approx. Ground Elevation, ft (1)	Top of casing elevation for B piezometers, ft	Depth to Bottom of Screen, below top of casing, ft	Groundwater Elevations - Date (2, 3)													
				2/18/2009	3/11/2009	3/25/2009	6/24/2009	6/29/2009	7/1/2009	7/6/2009	7/8/2009	7/15/2009	7/30/2009	8/17/2009	9/17/2009		
PZ-1	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-1A	34		25	12.10	11.76	11.6	11.6	12.58	13.56	14.1	14.6	14.36	13.6	13.7	13.7	13.1	13.1
PZ-1B	18.0	19.38	5	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7	<11.7
PZ-2	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-2A	34		25	12.32	12.0	11.76	11.76	12.81	14.77	15.2	15.2	14.85	13.5	14.1	14.1	13.5	13.5
PZ-2B	18.7	19.57	5	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2	<10.2
PZ-3	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-3A	34		25	11.95	11.82	11.75	11.52	12.17	13.05	13.86	14.18	14.01	13.35	13.5	13.5	12.9	12.9
PZ-3B	19.97	20.79	5	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4	<15.4
PZ-4	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-4A	34		25	11.13	10.98	10.98	10.71	11.13	11.64	12.11	12.46	12.26	11.89	12.1	11.6	11.6	11.6
PZ-4B	13.8	14.54	5	10.94	10.89	10.83	10.62	10.99	11.38	11.84	11.40	11.30	10.90	11.09	10.9	10.9	10.9
PZ-5	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-5A	34		25	11.29	11.16	11.12	10.95	11.50	12.1	12.4	12.6	12.35	11.96	12	11.7	11.7	11.7
PZ-5B	16.08	17.29	5	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25	<12.25
PZ-6	34		15	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
PZ-6A	34		25	10.69	10.51	10.48	10.45	10.74	11.11	11.5	11.78	11.46	11.10	11.2	10.9	10.9	10.9
PZ-6B	16.27	17.25	5	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4	<11.4

Note: Piezometer elevations estimated from the design top of pipe elevation of 34 feet by MACTEC approximate survey for 6 piezometers

1. Approximate ground elevations estimated from the design top of pipe elevation of 34 feet by MACTEC approximate survey for 6 piezometers
2. Piezometer elevations estimated from the design top of pipe elevation of 34 feet by MACTEC approximate survey for 6 piezometers
3. Piezometer elevations estimated from the design top of pipe elevation of 34 feet by MACTEC approximate survey for 6 piezometers

Piezometers installed on February 12 and 13, 2009 by MACTEC.

Piezometers consist of 5 feet of slotted 1 and 2' diameter PVC pipe with sand riser. Backfill with sand around slotted section and bentonite chip-resistant bentonite gravel above sand to ground surface.

Prepared By: JAS
 Checked By: [Signature]

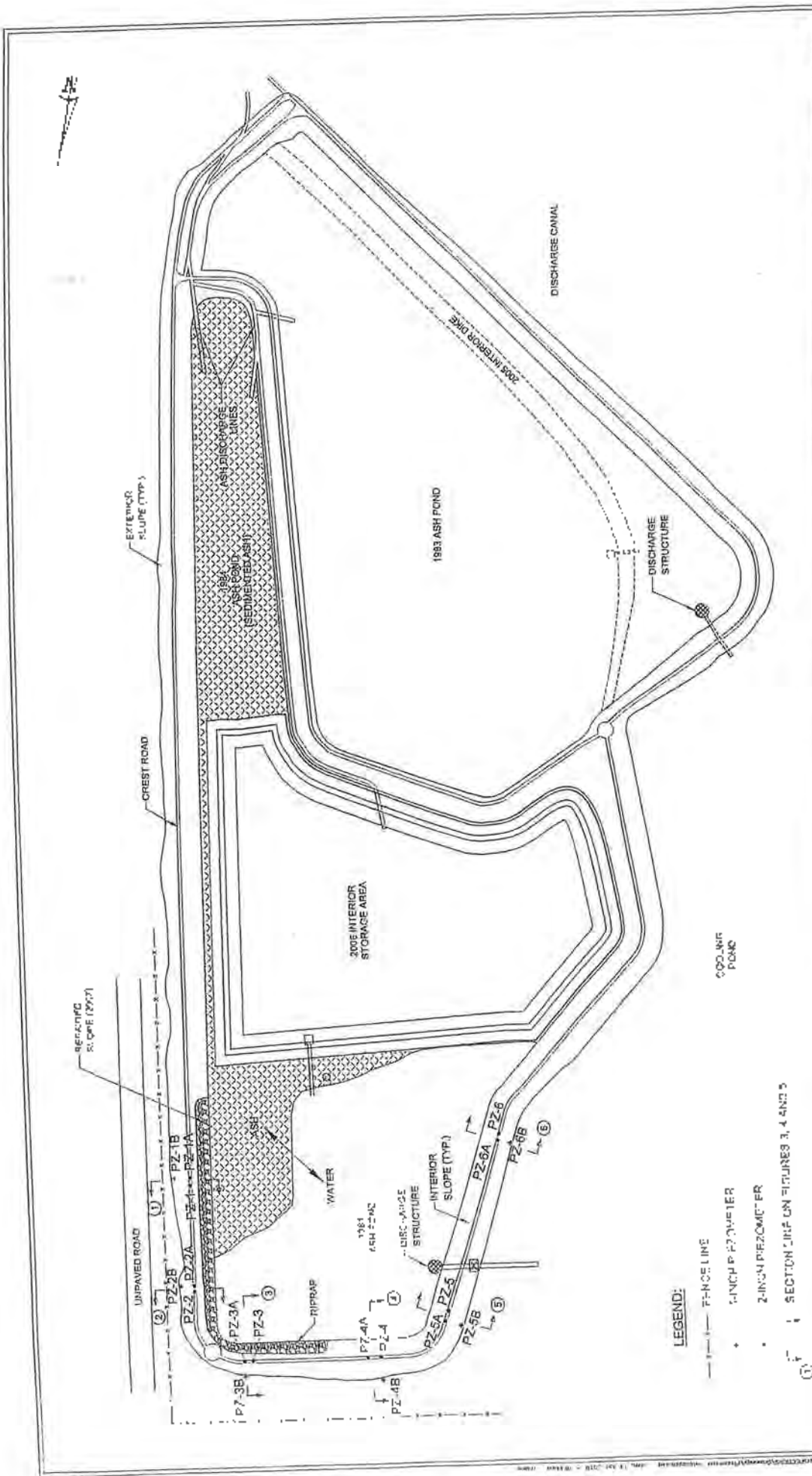
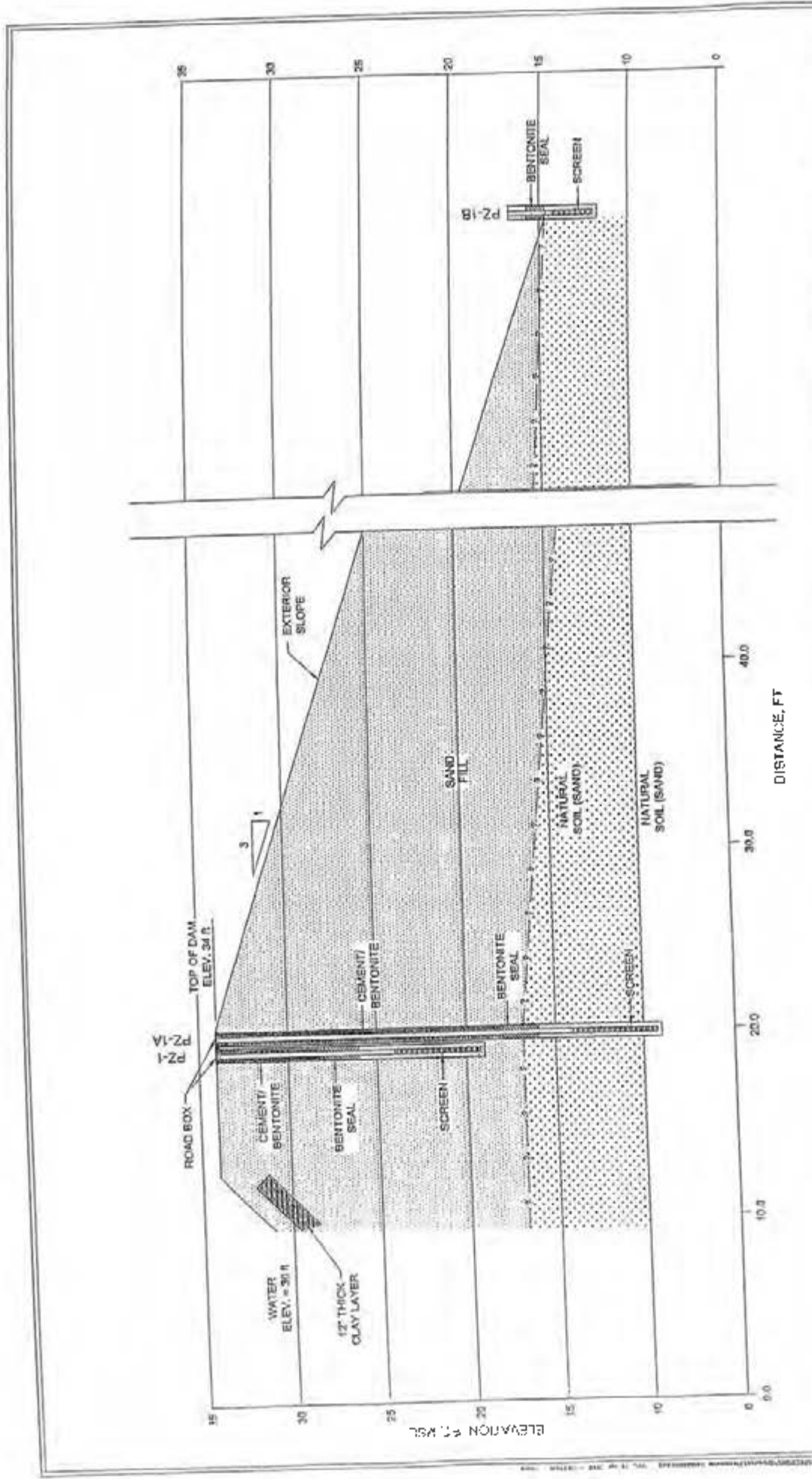


FIGURE	1		
DRAWN: R.R.	DATE: APRIL 2010	SCALE: N.T.S.	JOB No.: 6468-05-2340
ENG CHECK:	APPROVAL:		

PIEZOMETER INSTALLATION LOCATIONS
 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

MACTEC
 MACTEC ENGINEERING AND CONSULTING, INC.
 4001 ATLANTIC AVENUE
 RALEIGH, NORTH CAROLINA

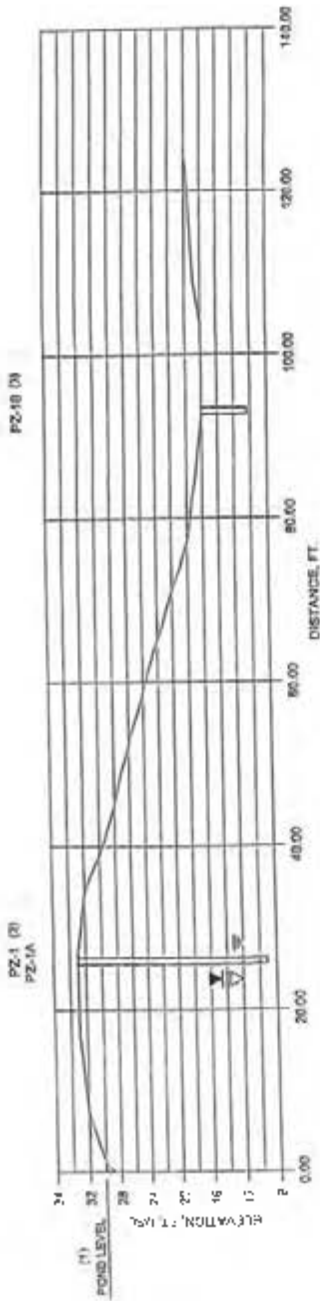
REFERENCE: CP&L DRAWINGS D3322 & D3230; WITHERS & RAVENEL DRAWINGS 1, TRANSMASH DRAWING 419-05.



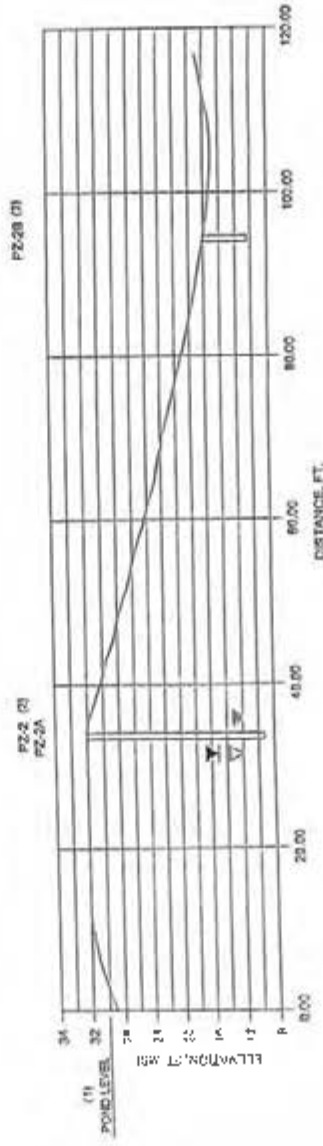
DRAWN:	R.P.	DATE:	APRIL, 2010
ENG CHECK:	<i>PA</i>	SCALE:	1" = 5'
APPROVAL:	<i>PA</i>	JOB No.:	8468-00-2510

TYPICAL CROSS SECTION OF DIKE SHOWING PIEZOMETER INSTALLATION
 SUTTON 1984 ASH POND
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA

MACTEC
 CITY ENGINEERING AND CONSTRUCTION, INC.
 301 W. LANTANA STREET
 WILMINGTON, NORTH CAROLINA



SECTION 1



SECTION 2

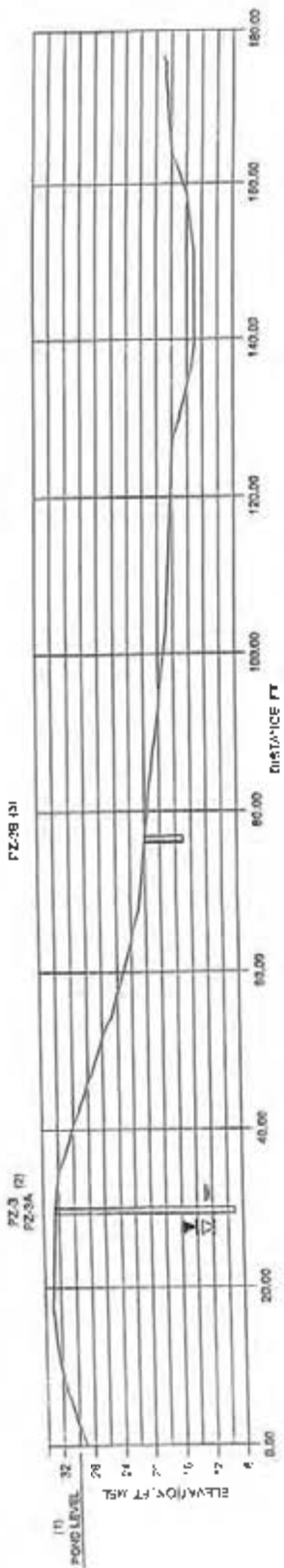
- LEGEND:**
- HIGHEST WATER LEVEL WITH POND A - FT. MSL
 - - - - - LOWEST WATER LEVEL WITH POND A - FT. MSL
 - ▽ OBSERVED READINGS
- NOTES:**
- (1) POND SURFACE ELEVATIONS AT ELEVATION 30 FEET WERE OBTAINED AFTER 02/20/2022
 - (2) PZ-18 AND PZ-28 INSTALLED TO BE BELOW TOP OF DAM AND BELOW GROUND LEVEL AND DRY AT ALL READINGS
 - (3) PZ-18 AND PZ-28 INSTALLED TO APPROXIMATELY 4 FEET BELOW GROUND LEVEL AND DRY AT ALL READINGS
 - (4) SEE APPENDIX FOR SECTION LOCATIONS.

DRAWN:	R.R.	DATE:	APRIL 2010
ENG. CHECK:	<i>[Signature]</i>	SCALE:	1" = 15'
APPROVAL:	<i>[Signature]</i>	JOB NO.:	6468-05-2340

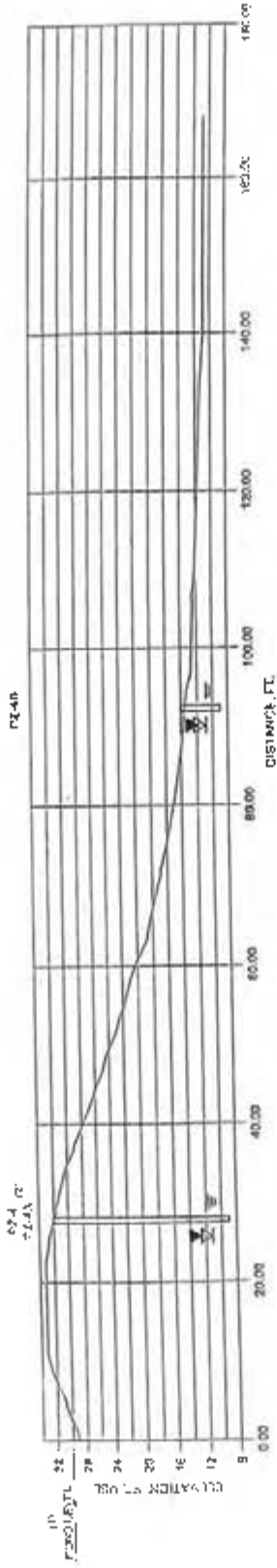
SUMMARY OF WATER LEVELS IN PIEZOMETERS
 EAST SIDE, 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILMINGTON, NORTH CAROLINA



REFERENCE: 2009 AERIAL TOPOGRAPHIC MAP BY MORM AND DEEBER.



SECTION 3



SECTION 4

LEGEND:

- ▼ THEORETICAL WATER LEVEL WITH POND A - 1
- ACTUAL WATER LEVEL WITH POND A - 1
- GROUND ELEVATION

NOTES:

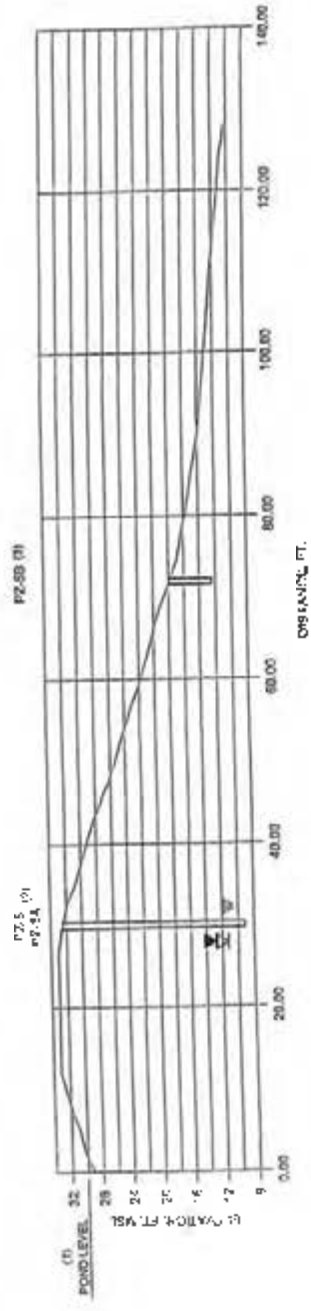
- (1) POND SURFACE SHOWN IN ELEVATION IN FEET. REPRESENTS CONDITIONS AT THE DATE OF SURVEY.
- (2) POND SURFACE CALCULATED TO 15' BELOW TOP OF DIKE AND 15' BY ALL RELATIONS.
- (3) POND SURFACE IS APPROXIMATELY 4 FEET BELOW GROUND LEVEL AND 15' AT ALL LOCATIONS.
- (4) SEE FIGURE 1 FOR POND LOCATIONS.

SUMMARY OF WATER LEVELS IN PIEZOMETERS
 NORTH SIDE, 1984 ASH POND DIKE
 L.V. SUTTON STEAM ELECTRIC PLANT
 WILKINSON, NORTH CAROLINA

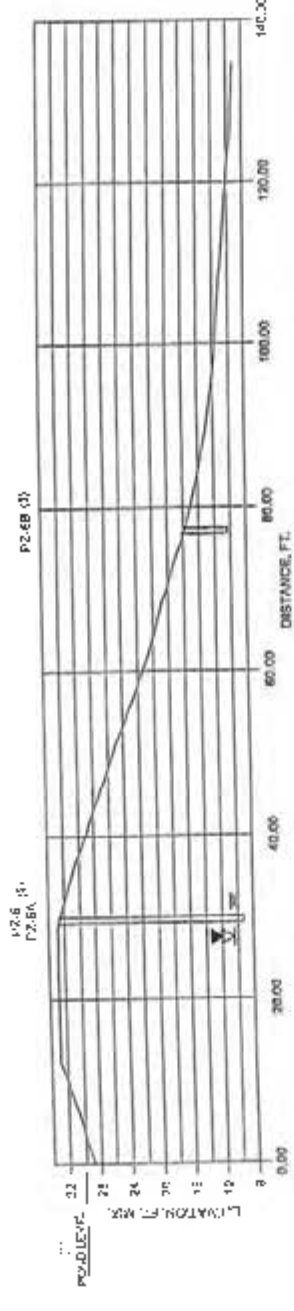


REFERENCE: 2009 AERIAL PHOTOGRAPHIC MAP BY MOORE AND CREED

DRAWN: R.R.	DATE: APRIL 2010	FIGURE
ENG CHECK: <i>RR</i>	SCALE: 1" = 15'	4
APPROVAL: <i>RR</i>	JOB No.: 0468-09-2040	



SECTION 5



SECTION 6

- LEGEND:
- ▲ HIGHEST WATER LEVEL WITH CORRECTION
 - TYPICAL WATER LEVEL WITH CORRECTION
 - ▼ ORIGINAL READINGS

NOTES:

- (1) DATA COURTESY OF THE STATE OF NORTH CAROLINA
- (2) PZ-5A AND PZ-6A INSTALLED TO BE 4 FEET BELOW TOP OF DIKE AND AT ALL READINGS
- (3) PZ-5B AND PZ-6B INSTALLED TO BE APPROXIMATELY 4 FEET ABOVE GROUND LEVEL AND ONLY AT ALL READINGS

DATE:	APRIL 2010
SCALE:	1" = 15'
JOB NO.:	8488-09-2350

**SUMMARY OF WATER LEVELS IN PIEZOMETERS
WEST SIDE, 1984 ASH POND DIKE
L.V. SUTTON STEAM ELECTRIC PLANT
WILMINGTON, NORTH CAROLINA**

MACTEC
INCORPORATED
 2009 AERIAL TECHNOLOGIC WAY ST. MICHAEL AND CRESS
 WILMINGTON, NORTH CAROLINA

Carolina Power & Light Co.
Raleigh, NC (s/n 5093)

SUTTON ASH POND GEOSLOPE ANALYSIS

100 SURFACES HAVE BEEN GENERATED
10 MOST CRITICAL OF SURFACES GENERATED
MINIMUM FACTOR OF SAFETY = 1.583

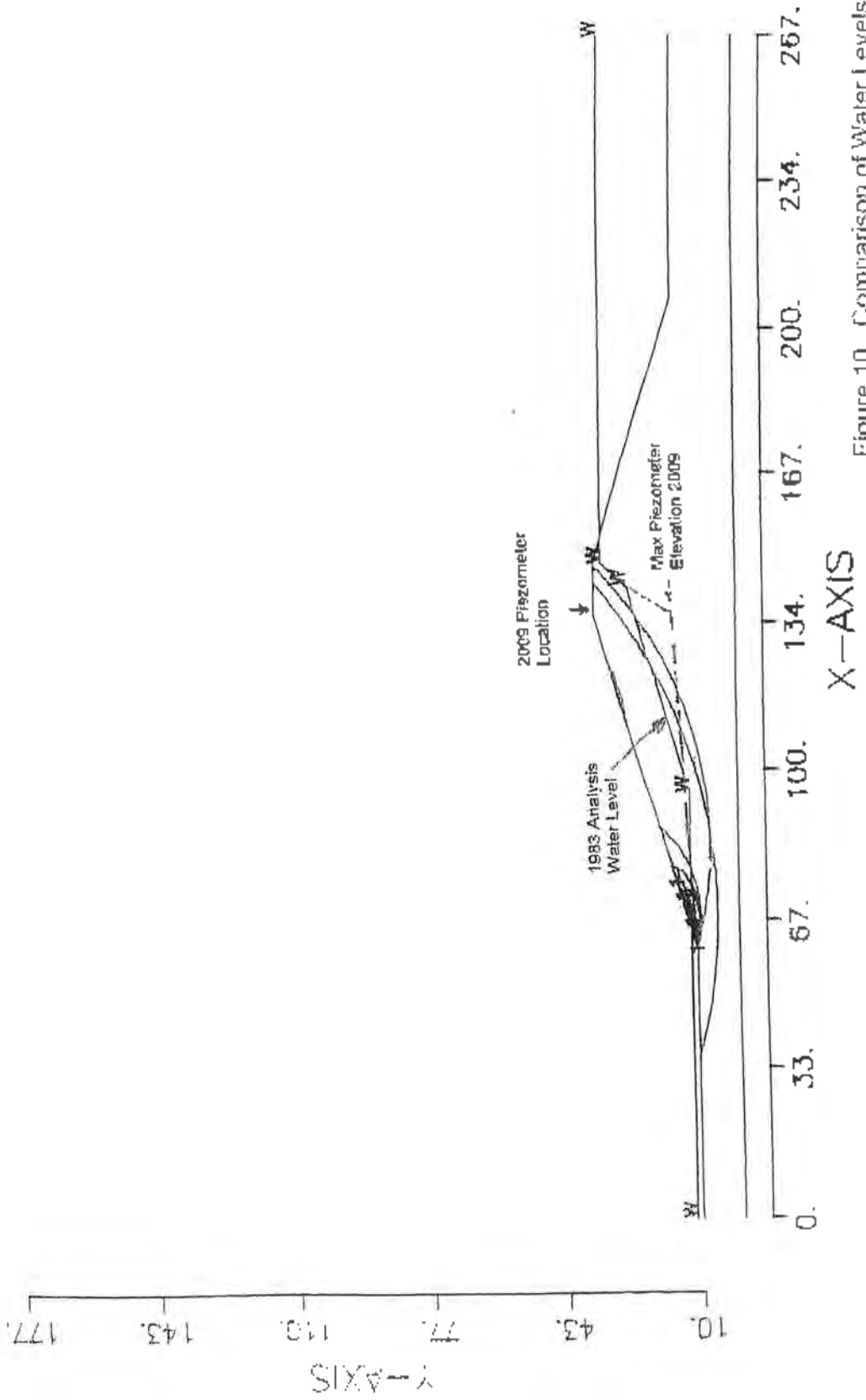


Figure 10. Comparison of Water Levels with Stability Analysis

ATTACHMENT B
BORING RECORDS
(PZ-1A TO PZ-6A)

SOIL CLASSIFICATION

NON-SOIL CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES
GRAVELS (More than 50% of coarse fraction is larger than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
SANDS (More than 50% of coarse fraction is smaller than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	GM	Silty gravels, gravel - sand - silt mixtures.
	SANDS WITH FINES (Appreciable amount of fines)	GC	Clayey gravels, gravel - sand - clay mixtures
FINE GRAINED SOILS (More than 50% of material is larger than No. 200 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines
	SANDS WITH FINES (Appreciable amount of fines)	SP	Poorly graded sands or gravelly sands, little or no fines
FINE GRAINED SOILS (More than 50% of material is smaller than No. 200 sieve size)	SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand silt mixtures
	SANDS WITH FINES (Appreciable amount of fines)	SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (More than 50% of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
HIGHLY ORGANIC SOILS	SILTS AND CLAYS (Liquid limit GREATER than 50)	OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
HIGHLY ORGANIC SOILS	SILTS AND CLAYS (Liquid limit GREATER than 50)	CH	Inorganic clays of high plasticity, fat clays
	SILTS AND CLAYS (Liquid limit GREATER than 50)	OH	Organic clays of medium to high plasticity, organic silt
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles Boulders
	Fine	Medium	Coarse	Fine	Coarse	
No. 200	No. 40	No. 10	No. 4	3/4"	3"	12"

U.S. STANDARD SIEVE SIZE

Undisturbed Sample	Auger Cuttings
Split Spoon Sample	Bulk Sample
Rock Core	Crandall Sampler
Dilatometer	Pressure Meter
Packer	No Recovery
Water Table at time of drilling	Water Table after 24 hours
Grab Bag Sample	Caved-in Depth

Correlation of Penetration Resistance with Relative Density and Consistency

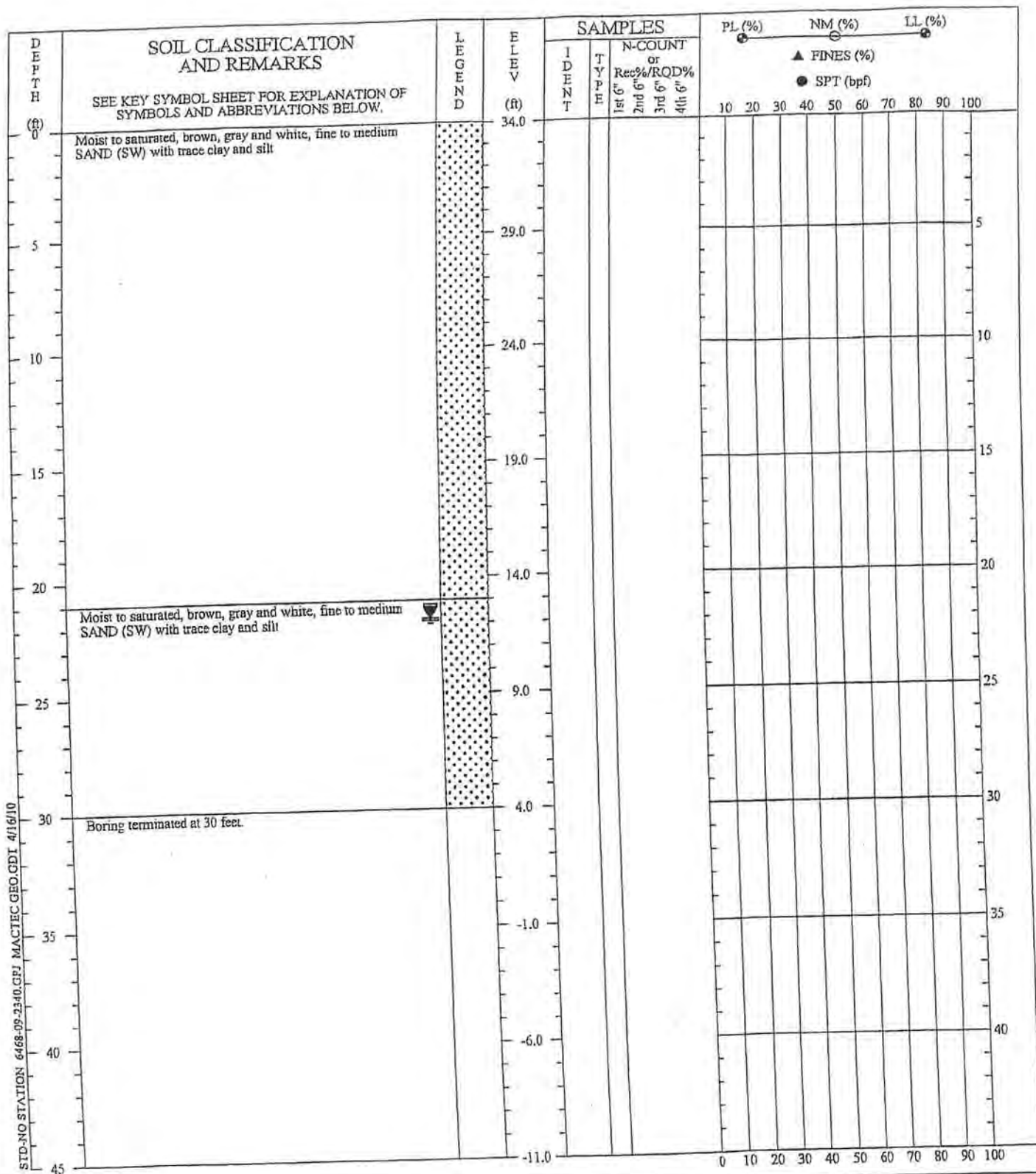
SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium Dense	4 - 8	Medium Stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very Stiff
		> 30	Hard

Sample Moisture Description

Saturated: Usually liquid; very wet, usually from below the groundwater table
Wet: Semisolid; required drying to attain optimum moisture
Moist: Solid; at or near optimum moisture
Dry: Requires additional water to attain optimum moisture

KEY TO SYMBOLS AND DESCRIPTIONS





STD. NO. STATION 6468-09-2340.GPJ MACTEC GEO.CDI 4/16/10

DRILLER: Carolina Drilling Co.
 EQUIPMENT: Geoprobe Rig
 METHOD: CPT-Direct Push
 HOLE DIA.: 2 inch
 REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 1-10', 0-15' etc. to 30' feet)

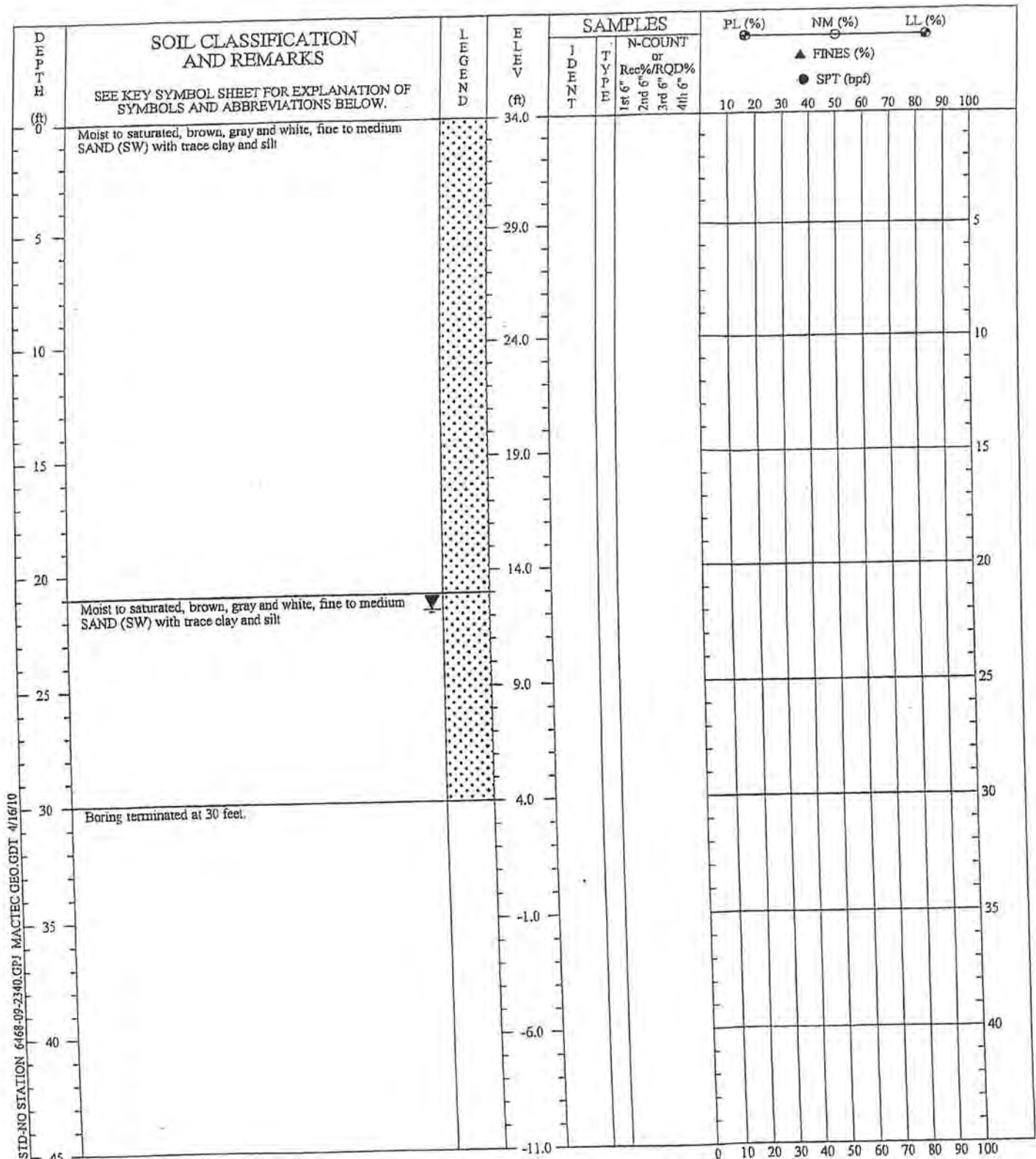
REVIEWED BY:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
 Location: Wilmington, NC
 Drilled: February 11, 2009
 Project #: 6468-09-2340
 Boring No.: PZ-1A
 Page 1 of 1





STD-NO STATION 6468-09-2340.CPI MACTEC GEO GDT 4/16/10

DRILLER: Carolina Drilling Co
EQUIPMENT: Geoprobe Rig
METHOD: OPT-Direct Push
HOLE DIA: 2 inch
REMARKS: Used Direct Push Method, filling a 5 foot long plastic sleeve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

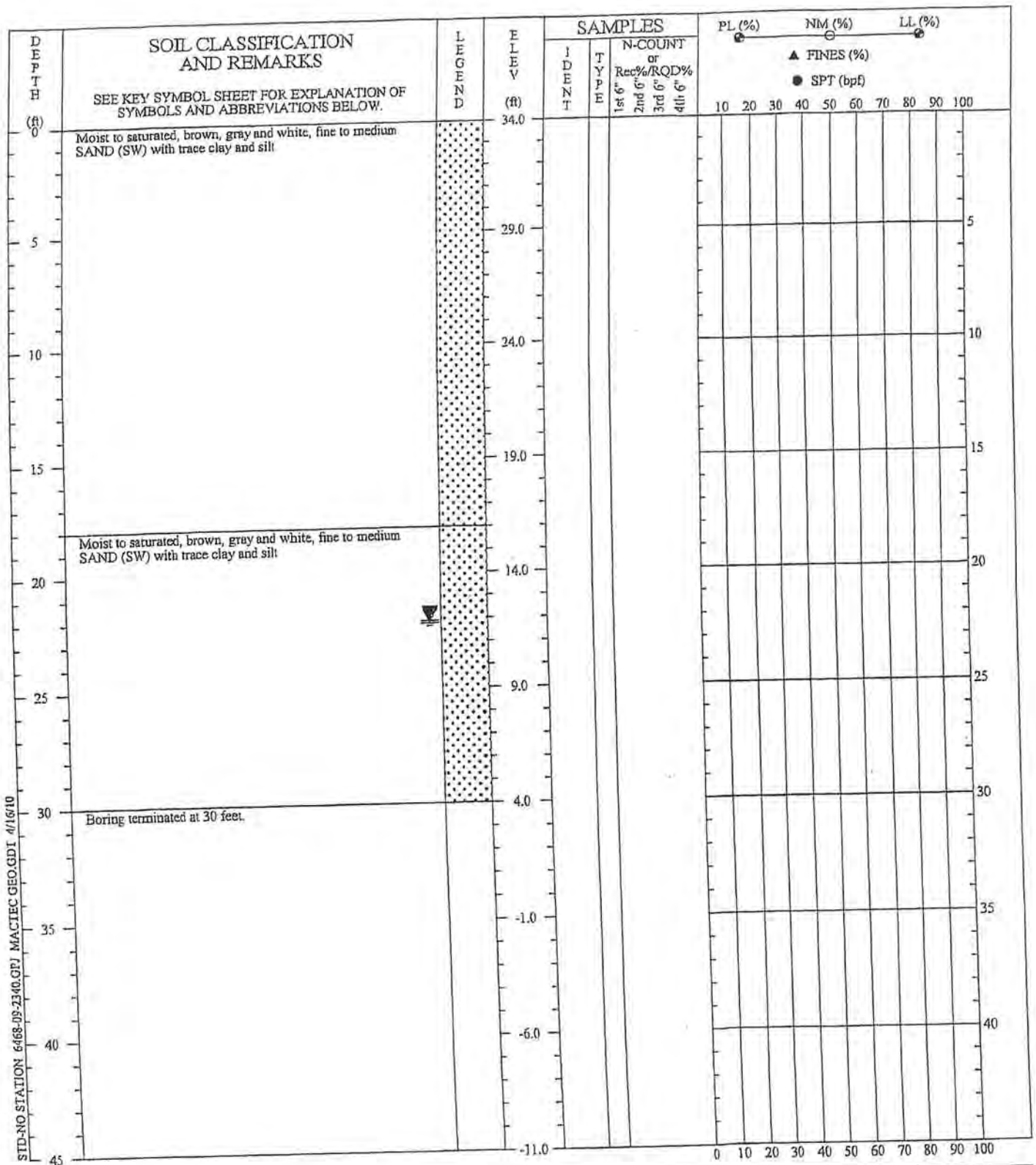
REVIEWED BY: *[Signature]*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
Boring No.: PZ-2A
Location: Wilmington, NC
Drilled: February 11, 2009
Project #: 6468-09-2340
Page 1 of 1





STD-NO STATION 6468-09-2340.GPJ MACTEC GEO.GDI 4/16/10

DRELLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT-Direct Push
HOLE DIA.: 2 inch
REMARKS: Used Direct Push Method-Filhrig ± 5 foot long plastic sleeve with soil. (Sample intervals 0-5, 5-10, 10-15 etc. to 30 feet)

REVIEWED BY: *AS2*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike

Boring No.: PZ-3A

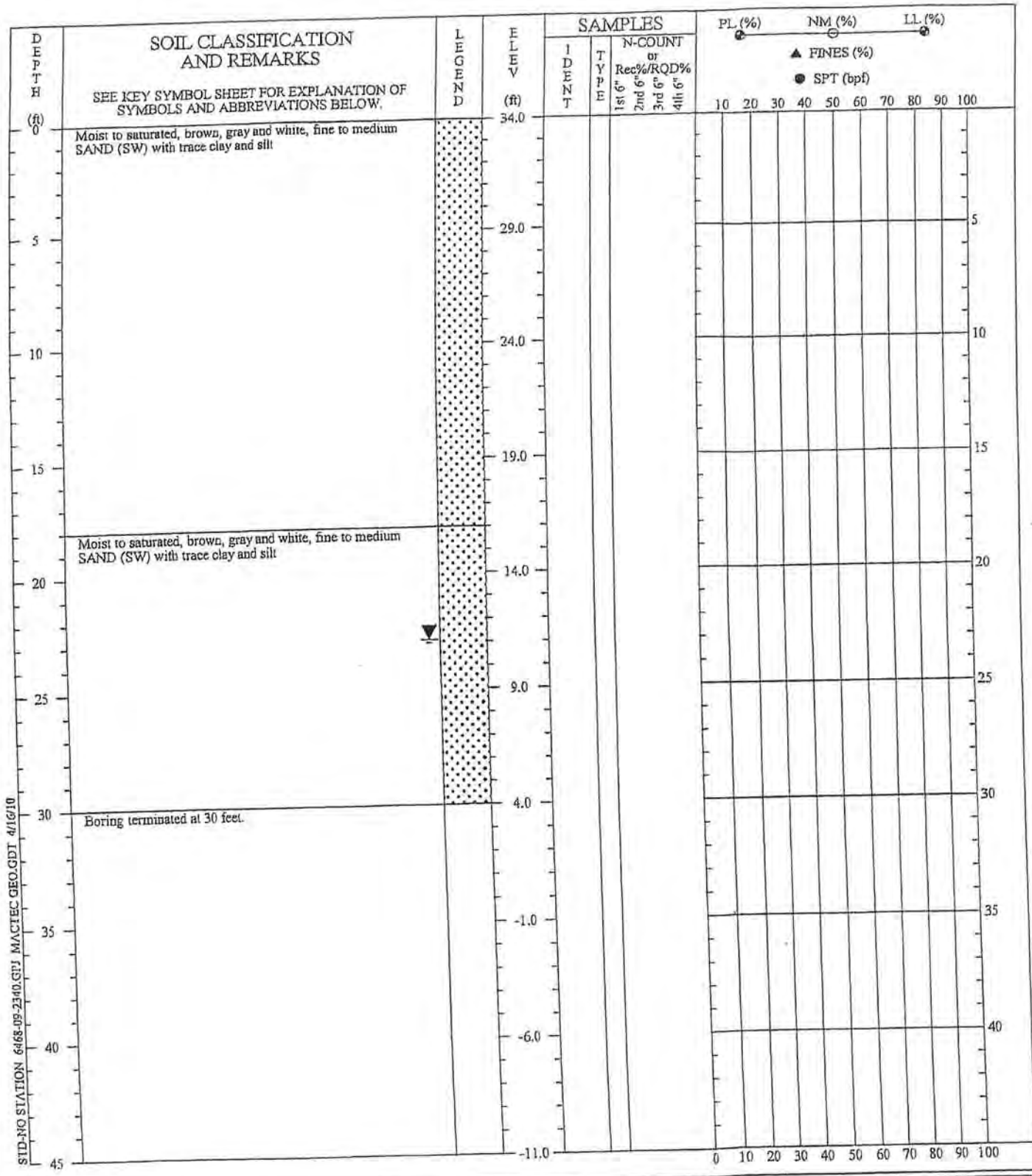
Location: Wilmington, NC

Drilled: February 11, 2009

Project #: 6468-09-2340

Page 1 of 1

MACTEC



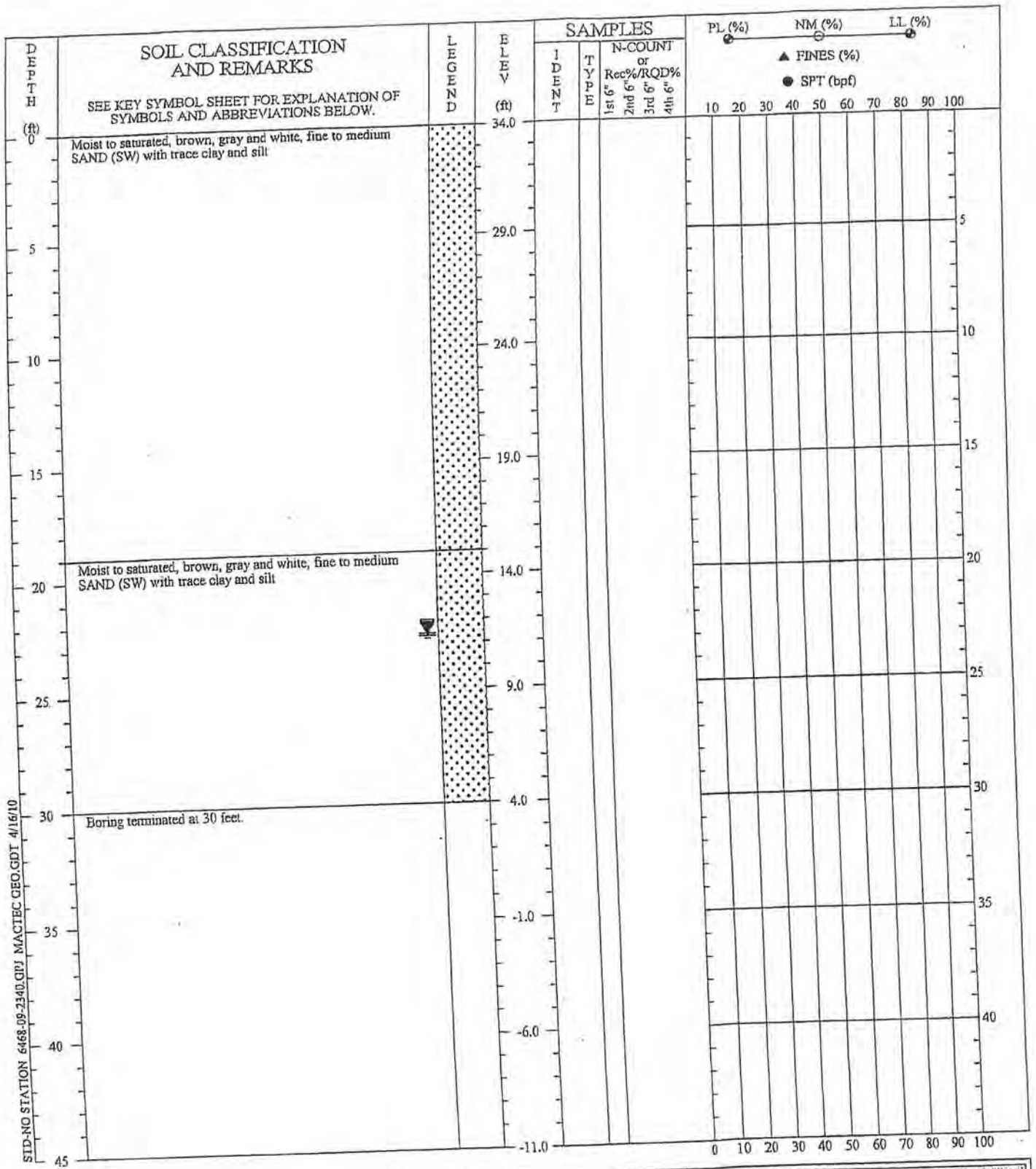
STD-NO STATION 6468-09-2340.GPJ MACTEC GEO.GDT 4/16/10

DRILLER: Carolina Drilling Co.
EQUIPMENT: Geoprobe Rig
METHOD: CPT-Direct Push
HOLE DIA: 2 inch
REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil. (Sample intervals @ 5', 5'-10', 10'-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

THIS RECORD IS A REASONABLE INTERPRETATION OF THE SURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project: Progress Energy-Sutton Dike	Boring No.: PZ-4A
Location: Wilmington, NC	
Drilled: February 11, 2009	
Project #: 6468-09-2340	Page 1 of 1



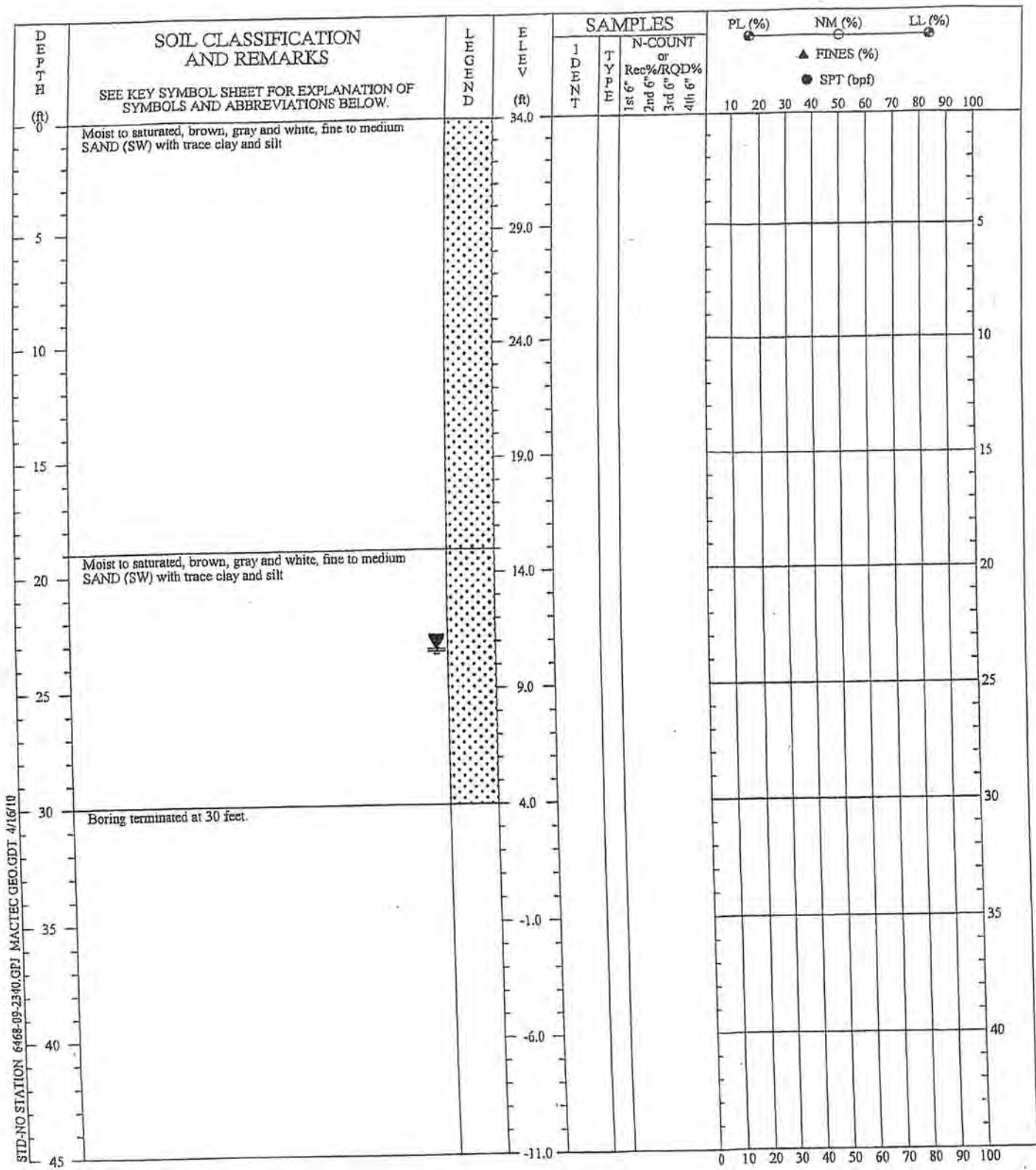
STD-NO STATION 6468-09-2340 QP1 MACTEC GEO.GDT 4/16/10

DRILLER: Carolina Drilling Co.
 EQUIPMENT: Geoprobe Rig
 METHOD: CPT - Direct Push
 HOLE DIA: 2 inch
 REMARKS: Used Direct Push Method-Filling a 5' foot long plastic sieve with soil (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: JLJ

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE
 CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE
 CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY
 DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE.
 TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD	
Project: Progress Energy-Sutton Dike	Boring No.: PZ-5A
Location: Wilmington, NC	
Drilled: February 12, 2009	
Project #: 6468-09-2340	Page 1 of 1



STD-NO STATION 6468-05-2340.GPJ MACTEC GEO.GDT 4/16/10

DRILLER: Carolina Drilling Co
 EQUIPMENT: Geoprobe Rig
 METHOD: CPT - Direct Push
 HOLE DIA.: 2 inch
 REMARKS: Used Direct Push Method-Filling a 5 foot long plastic sleeve with soil. (Sample intervals 0-5', 5-10', 10-15' etc. to 30 feet)

REVIEWED BY: *[Signature]*

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Progress Energy-Sutton Dike
 Boring No.: PZ-6A
 Location: Wilmington, NC
 Drilled: February 12, 2009
 Project #: 6468-05-2340
 Page 1 of 1



ATTACHMENT C

HAND AUGER BORING/ PIEZOMETER LOGS
(PZ-1B TO PZ-6B)

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 1B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 0.2		Dry Light brown/gray silty fine SAND with root fibers
0.2 to 4.5		Moist to wet, light brown and gray fine to medium sand, trace (-) silt (SW)
		Bottom of auger boring at 4.5 feet
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 2B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan slightly silty fine SAND (SW), trace (-) clay
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

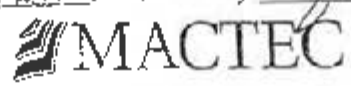
Prepared by: James A. Schell Reviewed by: JAS



Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 3B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW), trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009.

Hand Auger Boring/ Well Log		
Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 4B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan slightly fine to medium SAND (SW), trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Groundwater noted at 3.6 feet below top of casing on February 18, 2009.

Prepared by: James A. Schiff Reviewed by: JAS

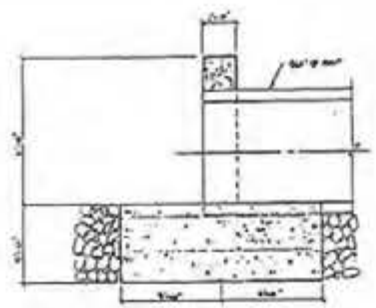


Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ- 5B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW) with trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009

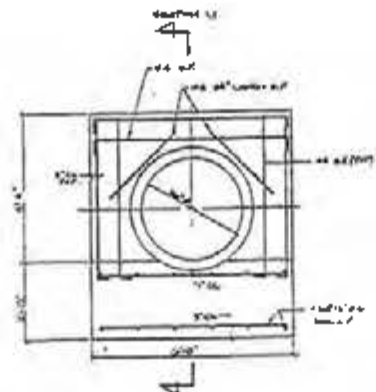
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Job Name: Progress Energy-Sutton Plant		Date: February 11, 2009
Client: Progress Energy		MACTEC Job No. 6468-09-2340
Piezometer No. PZ-6B	Boring Location: See boring location plan-toe of the dike slope	
Depth (feet)	Blow Counts (None Taken)	Visual Soil Description
0 to 4		Dry to slightly moist light brown/tan slightly silty fine SAND (SW)
4 to 4.5		Moist to wet brown/tan fine to medium SAND (SW) with trace clay and silt
		Note: Installed 1 inch PVC piezometer at 4 feet, 2.5 feet of slotted wellscreen and 2.5 feet solid riser. Bentonite chips placed at top of piezometer. No groundwater encountered after installing piezometer.
		Piezometer dry to bottom on February 18, 2009

Prepared by: James A. Schiff Reviewed by: GA

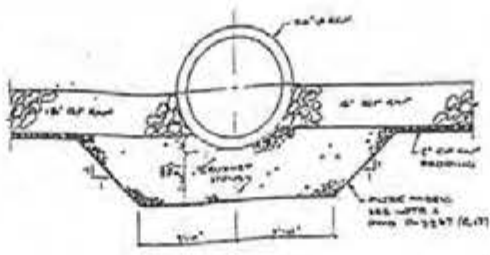
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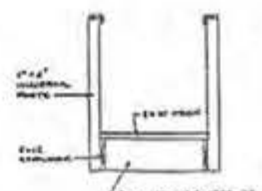
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1964 PUMP AND MOTOR



ELEVATION 1
1964 PUMP OPTION

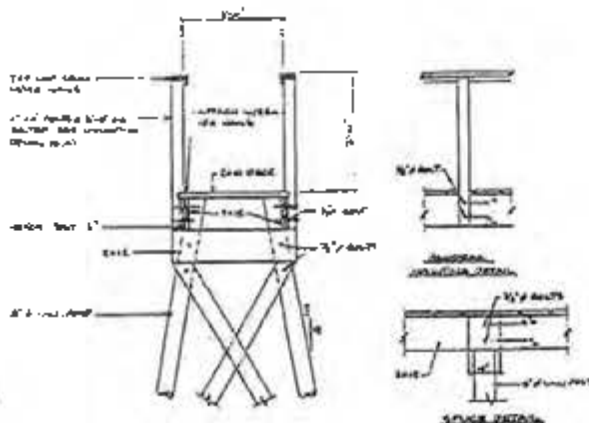


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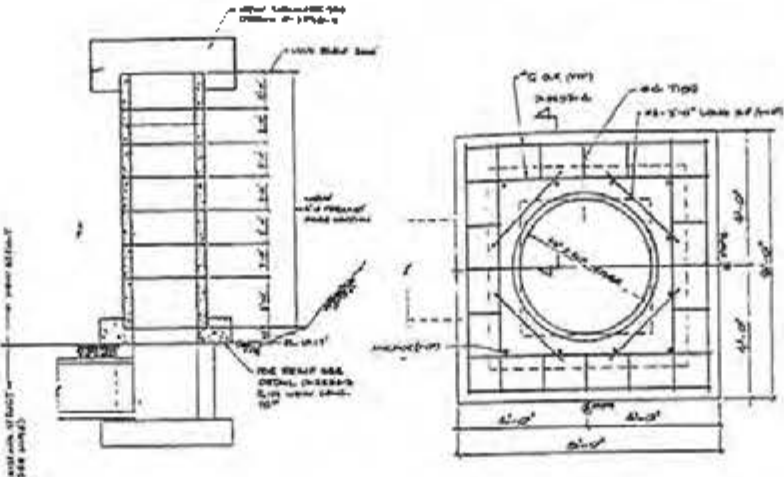


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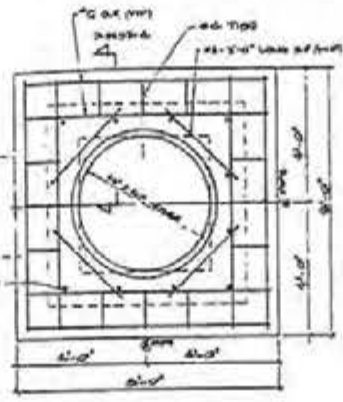
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SCALE 1/2" = 1'-0"



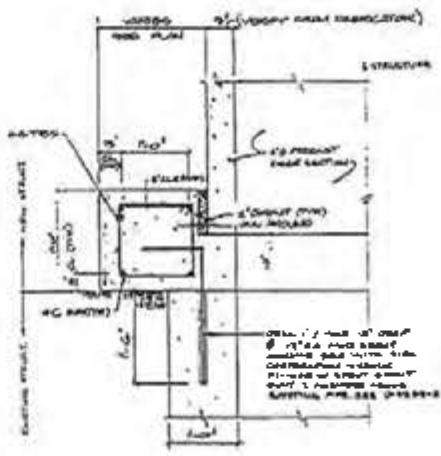
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SECTION 5: 1964-2
SCALE 1/2" = 1'-0"



DETAIL D-3253-2
SCALE 1/2" = 1'-0"



SECTION 6: 1964-4
SCALE 1/2" = 1'-0"

- NOTES
1. DRAWINGS FOR THIS PUMP SHALL BE TO ACCORDANCE WITH THE PUMP AND MOTOR SPECIFICATIONS LISTED ON SHEET D-3253-1.
 2. PUMP TO BE DESIGNED FOR OPERATION BY EXISTING ELECTRICAL STRUCTURE.

SLOTTED
SCALE 1/2" = 1'-0"

EXPERIMENTAL DRAWINGS & SPECIFICATIONS
SCALE 1/2" = 1'-0"

EXHIBIT 9

NO.	DATE	BY	CHKD.	APPROVED	REVISION
1	5-14-65	AS-4212			
2	5-14-65				
3	5-14-65				
4	5-14-65				
5	5-14-65				

CAROLINA POWER & LIGHT COMPANY POWER PLANT ENGINEERING & CONSTRUCTION DEPT.	
L V SUTTON STEAM ELECTRIC PLANT ASH POND EXPANSION 1963-1964 SECTIONS AND DETAILS (SHEET 2)	
SCALE	DATE
1/2" = 1'-0"	5-14-65
DESIGNED BY	CHKD. BY
AS-4212	AS-4212
APPROVED BY	DATE
	5-14-65
SHEET NO. 0-3203	



**DAM BREACH ANALYSES AND
INUNDATION MAP DEVELOPMENT**

for

83 Ash Pond Dam

at

**Progress Energy L.V. Sutton Plant
New Hanover County, North Carolina**

**Prepared for
Progress Energy**

Prepared by

MACTEC Engineering and Consulting, Inc.

Project 6468-10-0274

February 18, 2011

Stephen J. Hanks
Project Engineer

D. Wayne Ingram
Principal Engineer

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- 83 Ash Pond Dam – Aerial Inundation Map
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1.0 Executive Summary

The Progress Energy L.V. Sutton Plant 83 Ash Pond is a storage area for coal combustion byproducts. The 83 Ash Pond Dam is an approximately 24-foot high earthen dam. The impoundment has a normal surface area of approximately 54 acres and a maximum storage capacity of approximately 677 acre-feet. This report summarizes the dam breach and breach inundation analyses completed for the 83 Ash Pond Dam. The analyses were completed for a wet weather failure and a dry weather failure. The breach flood wave was routed overland to the east of the impoundment towards the Northeast Cape Fear River. Analysis of a breach into the cooling reservoir adjacent to the west was not completed since the available storage within the cooling reservoir above normal pool elevation is approximately 4,700 acre-feet. The breach flood wave was routed along the flowpath using Hydrologic Engineering Center – River Analysis System (HEC-RAS) version 4.1 (US Army Corps of Engineers, 2010).

These analyses are intended to be conservative, using worst case assumptions related to failure events, for use in an Emergency Action Plan for the facility. Data for the hydraulic analyses were obtained from readily available information. The HEC-RAS model was developed using 3 meter resolution elevation data published by the USGS, and the inundation extent of the breach wave was determined from the USGS elevation data as well.

Available information indicates that the constructed top width of the embankment is 12 feet and the crest elevation is 28 feet North American Vertical Datum of 1988 (NAVD 1988). The design side slopes are 3.0 foot horizontal to 1 foot vertical (3H:1V) on the exterior and interior. The maximum height of the dam is 15 feet from crest low point to the downstream toe at an existing ditch, and 24 feet above the bottom of the cooling reservoir. The hydrologic design criterion for the storage area is a 50-year event.

The routing of the flood wave was accomplished using HEC-RAS. The breach discharge was routed overland towards the Northeast Cape Fear River. The flood wave was retained by US Highway 421.

The breach parameters were developed pursuant to the empirical equations presented by Froehlich (1995) following the evaluation of 63 dam breaches. The breach width estimates were based on a storage volume equal to 40 percent of the total capacity of the impoundment. The bottom width of a trapezoidal-shaped breach was estimated to be approximately 13 feet. The bottom elevation of the breach was assumed to be at 14 feet NAVD. Breach section side slopes of 1H:1V were chosen as they represent the upper limit of the typical range of values. The breach development time was estimated to be 0.6 hour.

The breach analyses indicate that the breach of the 83 Ash Pond is not likely to overtop US 421. The majority of flood attenuation occurs in low lying areas adjacent to the embankment, and west of US 421. However, it is apparent that a breach of the 83 Ash Pond could potentially affect commercial properties adjacent to the eastern side of the embankment. The location of the potentially affected properties is depicted on the inundation maps provided in the Appendix.

2.0 Introduction

This report summarizes dam breach analyses completed for the 83 Ash Pond at the Progress Energy L.V. Sutton Plant to determine the extent of the inundation resulting from a dam breach. Analyses were completed using HEC-RAS, version 4.1 (US Army Corps of Engineers, 2010). Basic pertinent information regarding the impoundment and dam is summarized in Table 1.

Table 1. 83 Ash Pond Structure Information

Impoundment Name	83 Ash Pond
State Dam ID No	NEWHA-004
Current Size Classification	Small
Current Hazard Classification	Low
Location	Latitude: 34.2931° Longitude: -77.9928°
County	New Hanover
Receiving Stream(s)	N/A
Impoundment Area	54 acres
Maximum Dam Height	24 feet (4 ft to 28 ft)
Normal Water Elevation	24 feet NAVD
Maximum Operating Elevation	26 feet NAVD
Maximum Depth	12 feet
Maximum Hydraulic Storage Volume	677 acre-feet (as designed) (29,490,000 cubic yards)
Material(s) Stored	Coal combustion product
Storage status	Unknown
Principal Spillway	Riser/Barrel
Emergency Spillway	N/A
Dam Minimum Section	Top width: 12 feet, Interior Slope: 3H:1V, Exterior Slope: 3H:1V
Embankment Materials	Earthen

3.0 Description of Facilities and Potentially Impacted Area

3.1 General

The 83 Ash Pond Dam is used for storage of coal combustion byproducts produced at the L.V. Sutton Plant. The reservoir has a designed storage capacity of 587 acre-feet (AF) below the maximum operating elevation of 26 feet NAVD, and a maximum storage capacity of 677 acre-feet below the the embankment crest elevation of 28 feet NAVD. Information describing the characteristics of the impoundment, spillway facilities and maximum dam section are provided in Table 1.

The breach flood wave was routed overland approximately 7,000 feet to a borrow pit located within the floodplain of the Northeast Cape Fear River. US Highway 421 intersects the breach flowpath approximately 4,500 feet from the embankment. The analyses included an assessment of the sensitivity of the model predictions to various breach parameters and flowable impoundment storage volumes.

Other potential 83 Ash Pond dam breach locations were considered. However, it was determined that potential locations along the western side of the embankment would drain into the cooling reservoir which would accommodate the breach without significant rise in water level, since the available storage within the cooling reservoir above normal pool elevation is approximately 4,700 acre-feet. Consequently, the single breach location along the east side of the embankment was analyzed.

Based on available information there appears to be four commercial properties located along the breach flowpath between the embankment and US 421.

3.2 Impoundment and Embankment Characteristics

The impoundment and embankment characteristics were based on design information presented in the 1983-1984 Ash Pond Expansion Plan, and aerial imagery. The interior crest of the embankment was digitized from aerial imagery, and then off-set the appropriate distance based on the specified slope and bottom elevation. The digitized features of the pond design were utilized in HEC-GeoRAS to develop an elevation-storage volume curve for the pond. HEC-GeoRAS is an extension of ArcGIS capable of analyzing a terrain model for hydraulic analysis. The elevation – volume curve for the 83 Ash Pond is presented in Figure 1.

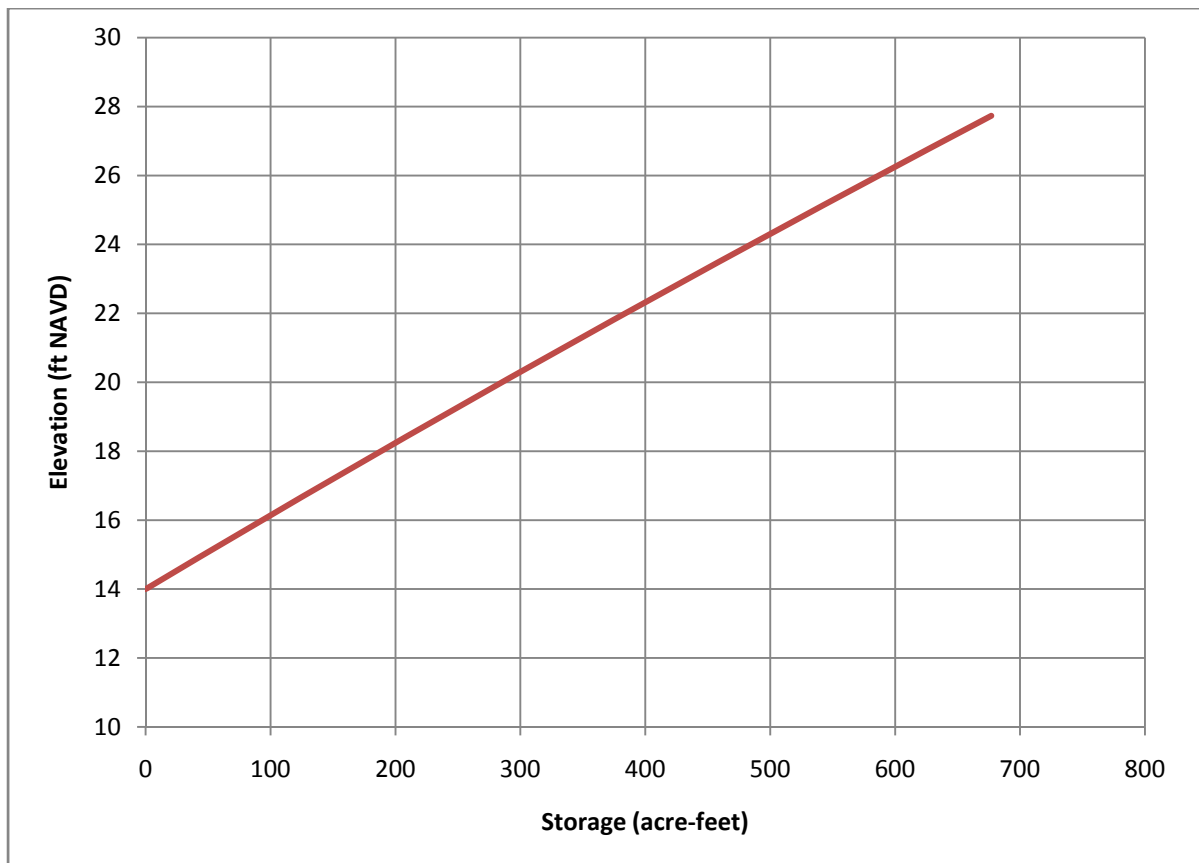


Figure 1. 83 Ash Pond Elevation – Storage Volume Curve

The design top width of the embankment is 12 feet. The design side slopes are 3H:1V on the interior and exterior. The dam crest is approximately 24 feet above surrounding grade. Excess water in the reservoir is discharged into the cooling water reservoir through a riser and barrel spillway with an maximum overflow elevation of 26 ft NAVD. The hydrologic design criterion for the storage area is a 50-year event. There is no drainage area to the 83 Ash Pond except the 83 Ash Pond dike.

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4.0 Scope of Investigation

This report summarizes the results of analyses completed to determine the extent of the inundation resulting from a breach of the 83 Ash Pond dam. The analyses extended as far downstream from the impoundment structure in question as significant impacts of a reasonable worst case scenario were determined to propagate. The extent of significant impacts was a site-specific determination, considering factors such as:

- sensitivity of impacted features to high water level (human safety, property damage, emergency services demands, transportation systems, etc.), and
- maximum water level relative to naturally occurring high water levels and fluctuations from precipitation events.

Assessment of the risk of a dam breach occurrence was not part of this work; nor was detailed investigation of the most probable breach location or breach characteristics such as rate of growth, dimensions, and other information that would require more detailed geotechnical information including site-specific materials investigations, testing and analyses. The detailed considerations and analyses required to develop a quantitative descriptive model of the fluidization of the coal combustion products (CCP) stored in this impoundment, the transport and settlement at downstream locations was also not included in the scope of this investigation. Rather, it was assumed that the volume of fluid discharged as a result of a breach behaves as water, a Newtonian fluid in hydraulics terminology. This is a conservative assumption because entrainment of solids in the fluids discharged would cause increased energy losses in the fluid, resulting in slower velocities, quicker flood wave dissipation due to loss of volume due to solids settling and other fluid mechanics considerations.

Recognizing that conservative assumptions regarding breach formation characteristics, conditions at time of breach, along with an assumption that the entire impoundment volume is water would create an unrealistically conservative prediction, the analyses did include an assumption regarding the fraction of the total impoundment volume that would become fluidized and discharged. Also recognizing that this is an assumption, a sensitivity assessment was completed to characterize resultant critical predictions of water levels and timing as a function of the assumed storage volume fluidized.

Data for hydraulic model development came from readily available sources including 3 meter elevation data from the USGS National Elevation Dataset.

5.0 Summary of Methods and Approach

5.1 Hydraulic Analysis

The hydraulic analyses completed for this study were based predominantly on application of the hydraulic model Hydraulic Engineering Center – River Analysis System (HEC-RAS), version 4.1 (USACE HEC, January 2010). HEC-RAS is a general application, one-dimensional model that can perform unsteady flow routing through an open channel system that may also include culverts, bridges, levees, tributaries, storage areas and traversing dams. Unsteady flow analyses deals with flow conditions that vary temporally and spatially.

For this study, the general approach was to define the impoundment as a HEC-RAS storage area and analyze a dam breach using the inline structure option to model the embankment to be breached. An inline structure in HEC-RAS is a structure located perpendicular to the flow direction of the river with flow over the structure being analyzed as a weir; for which a breach scenario can be prescribed.

5.2 Boundary Conditions

The inundation resulting from a breach of the embankment was analyzed for two separate weather conditions. For both weather conditions, the boundaries of the hydraulic model were described using a specified initial pool elevation in the impoundment and a constant stage at the tailwater of the model. The initial pool elevation for the dry weather scenario was set to the maximum operating elevation of 26 feet NAVD. The initial pool elevation for the wet weather scenario was set to the crest elevation of 28 feet NAVD. The tailwater stage for both conditions was set to 9 feet NAVD. The tailwater stage was assumed to be 2 feet below the bank of the borrow pit located in the floodplain of the Northeast Cape Fear River.

5.3 Embankment Breach

The breach parameters were developed pursuant to the empirical equations presented by Froehlich (1995) following the evaluation of 63 dam breaches. The breach width estimates were based on a storage volume equal to 40 percent of the total capacity of the impoundment. It was assumed that 40 percent of the total water and solids volume of the 83 Ash Pond would flow out of the pond. The trapezoidal-shaped breach bottom width was estimated to be 14 feet for the wet weather failure scenario. The breach bottom width was estimated to be 13 feet for the dry weather failure scenario. The bottom elevation of the breach was assumed to be the elevation of the reservoir bottom, which is approximately 14 feet NAVD. Side slopes of 1H:1V were chosen as they represent the upper limit of the typical range of values. The breach development time was estimated at 0.6 hour.

5.4 Flood Wave Routing

The routing of the flood wave from the breach location to the borrow pit located within the floodplain of the Northeast Cape Fear River was accomplished by extracting topographical information from elevation data available in a 3 meter resolution from the USGS National Elevation Dataset. The GIS dataset was converted into a continuous Triangulated Irregular Network (TIN) for the area along the flow paths of the flood wave. The flow path centerline was inferred from the TIN. The cross section lines were then drawn orthogonal to the inferred direction of flow. The topology of the flow path centerlines and geometry of the cross section lines were extracted from the TIN using HEC-GeoRAS version 4.1.1 (USACE HEC, September 2005). HEC-GeoRAS is an extension of ArcGIS developed by the USACE to perform spatial analysis of TINs, and extract geometric information from the TIN for direct import into a HEC-RAS geometry model.

Following the import of the HEC-GeoRAS output file, a storage area element and in-line structure element were incorporated into the model to simulate the impoundment and embankment, respectively. Additionally, a lateral structure and storage area was added to the model to replicate flow that would exit the flowpath and collect within the low lying area located along the eastern portion of the embankment. Also US 421 was incorporated into the model as an inline structure. It was assumed that no culverts would allow flow of the breach wave across US 421. The Manning roughness values for the cross sections located along the flow paths were set to 0.08.

6.0 Model Stability

Hydraulic models of unsteady flows inherently experience problems with stability of the model calculations. HEC-RAS provides a limited number a means to control instability through input parameter selection and model operation control parameters. The breach model was run for a range of inputs related not only to the breach size and rate of development, but other model inputs as well. Doing so provides for

development of a more robust model with regard to stability, as well as providing an assessment of sensitivity of the model to the varied inputs.

To increase the stability of the routing model, a pilot channel was added along the entire breach flow path. Pilot channels are one of the available options to prevent the model from going unstable at low flows (USACE HEC, March 2008). The pilot channels were given a width of 4 feet and a Manning roughness value of 0.2. The high Manning value was chosen to restrict flow through the pilot channel during routing of the flood wave. Additionally, a pilot flow of 1 cfs was incorporated to provide baseflow within the model. The magnitude of the baseflow was determined as 0.1 percent of the peak discharge, since increases in flow conditions greater than a 1,000 times the baseflow conditions cause instability. Also, additional cross sections were interpolated along the flowpath so that the maximum distance between cross sections was reduced to 50 feet. This was required due the numerous steep drops along the flowpath, resulting in an overestimation of the water surface elevations in the upper portion of the model.

7.0 Sensitivity Assessment

There are several parameters that can be identified as potentially important to determining the prediction of results of a dam breach. Not all, but most, of these are typically inputs to available dam breach models. These parameters have a significant amount of uncertainty in what a representative value might be. In addition to these normal uncertainties, modeling of discharges from impoundments that contain material such as ash or gypsum that may be fluidized by a breach presents additional uncertainties.

It is unlikely that all the contents of the 12-ft deep, 54-acre impoundment would become fluidized in the event of even an extremely large and rapid embankment breach. To assess the impacts of the assumption regarding the fraction of total volume (solids and pore space water) that would be mobilized, various fractions of the total storage volume were assumed to be discharged. The results of four simulations with various fractions of the total storage volume are presented below. Additionally, model sensitivity to breach bottom width, breach development time, and breach side slopes were evaluated. The results of the sensitivity analysis are presented in Tables 2 and 3.

Table 2. Results of Sensitivity Analysis for a Dry Weather Breach

Modification	Peak Discharge Rate (cubic feet per second)	Peak Tailwater Stage (feet NAVD 1988)	Time to Initial Impact 0.4 Miles from Embankment (minutes)
None	1,638	21.4	50
Increased Breach Bottom Width by 50%	2,047	22.0	50
Reduced Manning's n Coefficient by 50%	1,637	20.9	45
Increased Manning's n Coefficient by 50%	1,636	22.2	55
Reduced Breach Development Time to 0.25 hr	1,814	21.7	35
Increased Breach Development Time to 0.75 hr	1,571	21.6	60

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Table 3. Peak Breach Discharge versus Discharge Volume for a Dry Weather Breach

Percent of Total Volume	Peak Discharge Rate (cubic feet per second)	Discharge Volume (acre-feet)
100%	2,235	310.2
80%	1,938	234.9
60%	1,867	185.2
40%	1,638	134.6

8.0 Summary of Selected Final Analyses

8.1 Assumptions and Selected Inputs

The sensitivity assessment indicates that minor changes in the maximum inundation will result from the modification of the selected parameters, with the most significant alteration in the breach hydrograph resulting from the increase in breach bottom width. Increasing the breach bottom width by 50 percent results in a peak discharge rate increase of 601 cfs (24.0 percent). The selected HEC-RAS model inputs for the final breach analyses are presented in Table 4.

Table 4. HEC-RAS Model Inputs for Wet Weather Conditions

Input	Value
Breach Development Time (minutes)	36
Breach Bottom Width (feet)	14 feet *
Breach Side Slopes (H:1V)	1
Breach Bottom Elevation (feet NAVD)	14 feet
Breach Progression Rate	Linear
Computation time increment (seconds)	60

* Breach bottom width was estimated to be 16 feet for the dry weather condition.

8.2 Flood Wave Travel Time and Route of Travel

It is important for emergency responders to have an estimate of how much time is available in the event of a dam failure to take action at various downstream locations. The available time is not necessarily dependent on the time of arrival of the maximum water level, but the critical time is often dependent rather on a condition that is typically less clear – when impacts become critical. Perhaps the most apparent example of this is when access to an area becomes inundated, affecting the safety of movement of the public and emergency service workers. A default initial impact of 1 foot of inundation was chosen since this is a value where egress by automobile becomes difficult.

The flood wave travel time was determined for two initial conditions. The first initial condition is representative of typical dry weather conditions where the pool elevation is set to the maximum operating elevation of 26 feet NAVD. The second initial condition is representative of wet weather conditions where the pool elevation is at 28 feet NAVD and failure of the embankment occurs as a result of overtopping from high inflow. Flood wave travel time for dry weather and wet weather conditions are presented in Tables 4a and 4b.

Table 4a. Flood Wave Travel Time (Dry Weather Conditions)

Location	Distance Downstream (miles)	Peak Inundation Depth (feet)	Time from Start of Breach (minutes)	
			At Initial Impacts	At Peak Elevation
Vacant Lot Adjacent to Embankment	0.1	4.4	35	130
Near Entrance to First Commercial Property	0.4	4.2	50	160
Near US 421	0.9	3.0	490	615

Table 4b. Flood Wave Travel Time (Wet Weather Conditions)

Location	Distance Downstream (miles)	Peak Inundation Depth (feet)	Time from Start of Breach (minutes)	
			At Initial Impacts	At Peak Elevation
Vacant Lot Adjacent to Embankment	0.1	4.7	35	160
Near Entrance to First Commercial Property	0.4	4.6	55	180
Near US 421	0.9	3.4	230	335

Due to storage volume of the low lying areas between the breach location and US 421, overtopping of US 421 is not observed for either scenario. Discharge and stage hydrographs at the embankment are presented for the dry weather condition and the wet weather condition in Figures 2 and 3, respectively. In the dry weather condition, the initial breach flood wave of 6 feet attenuates to 3 feet by the time it reaches US 421. In the wet weather condition, the initial breach flood wave of 6 feet attenuates to 3.4 feet by the time it reaches US 421. Neither condition overtops US 421.

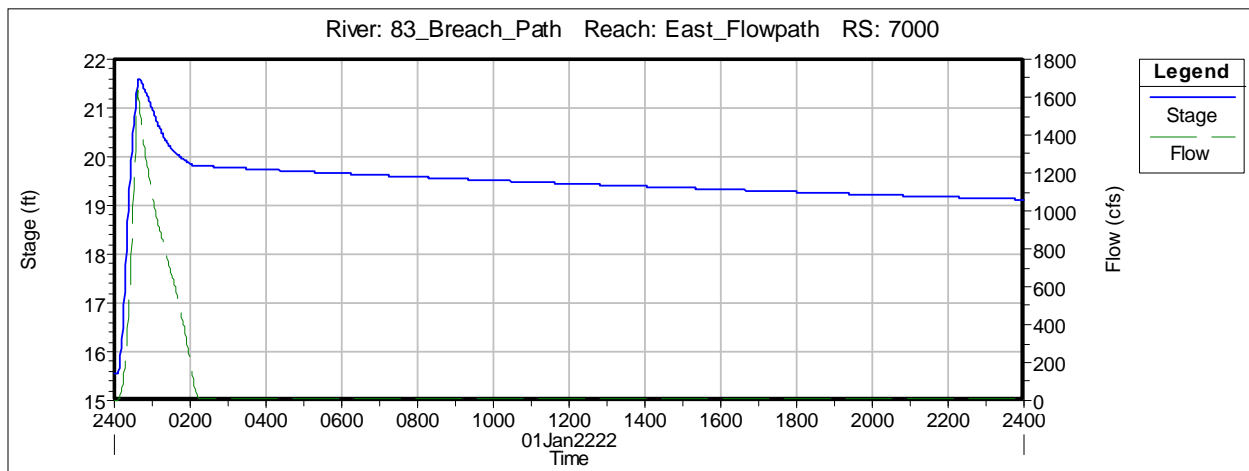


Figure 2. Discharge and Stage Hydrographs at embankment, Dry Weather Breach

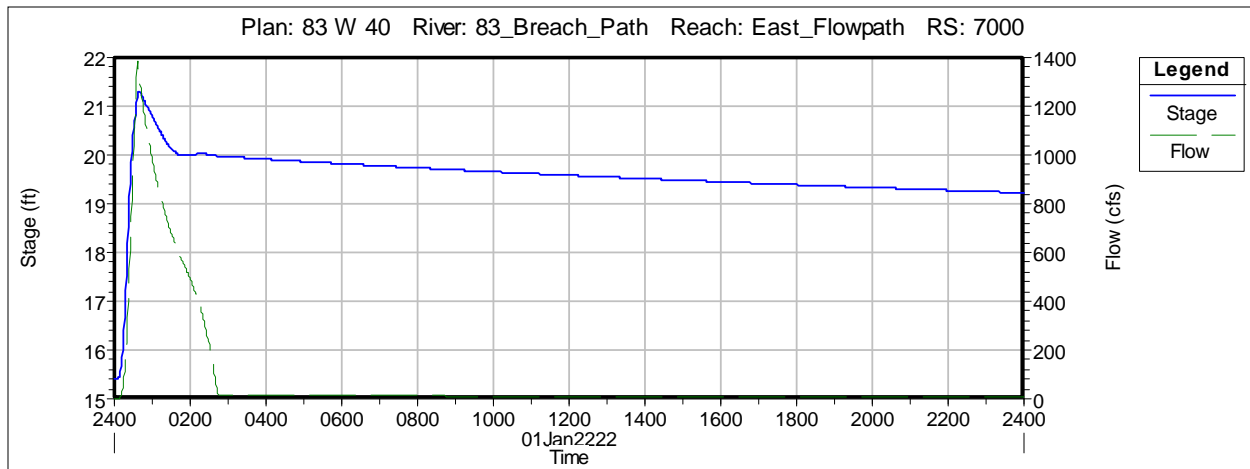


Figure 3. Discharge and Stage Hydrographs at embankment, Wet Weather Breach

Stream profiles depicting the effects along the flowpath from the embankment breach for the dry and wet weather scenarios are provided in Figures 4 and 5. The baseline stream profile is shown as well.

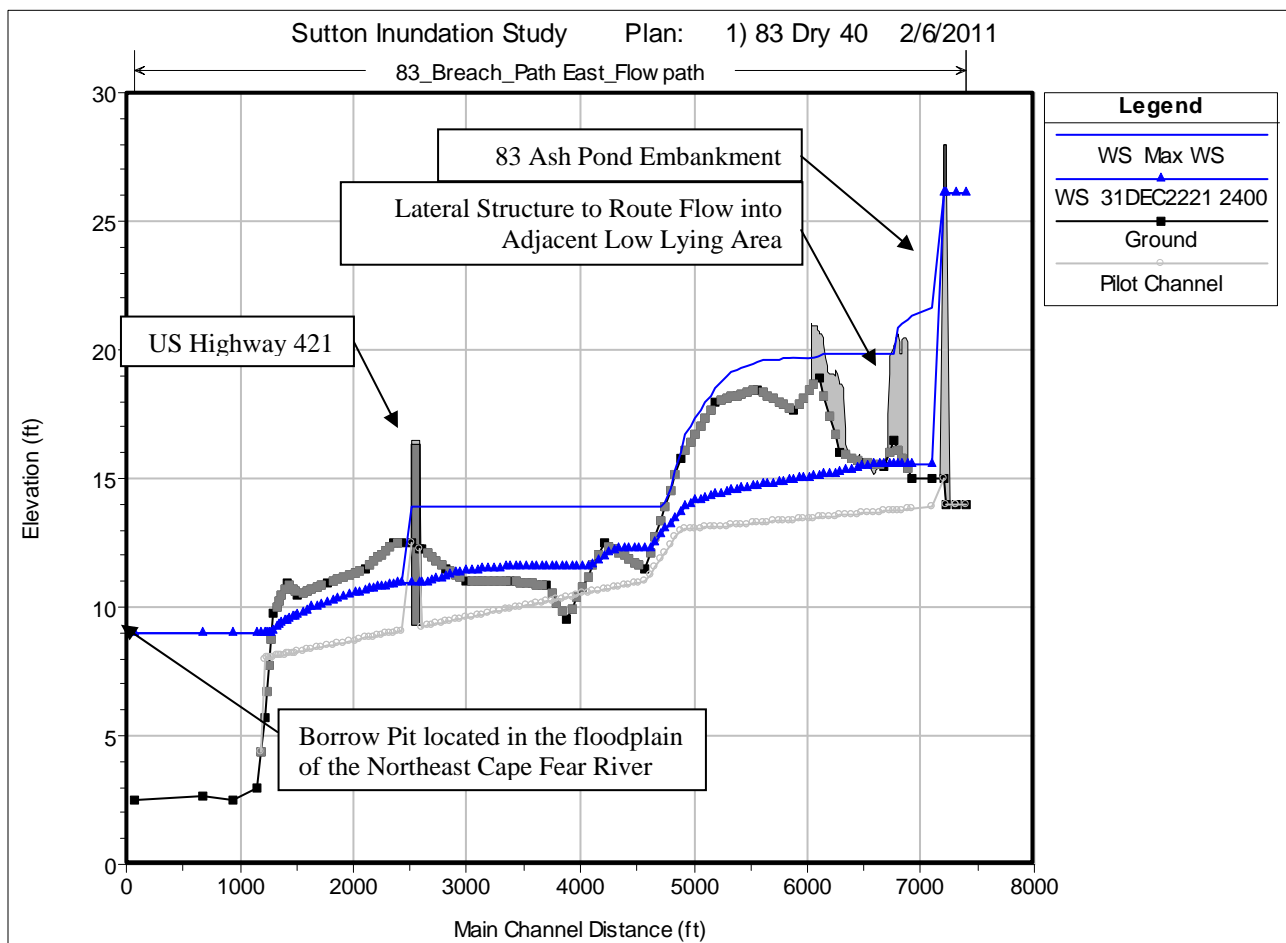


Figure 4. Breach Profile along Flowpath, Dry Weather Breach

US EPA ARCHIVE DOCUMENT

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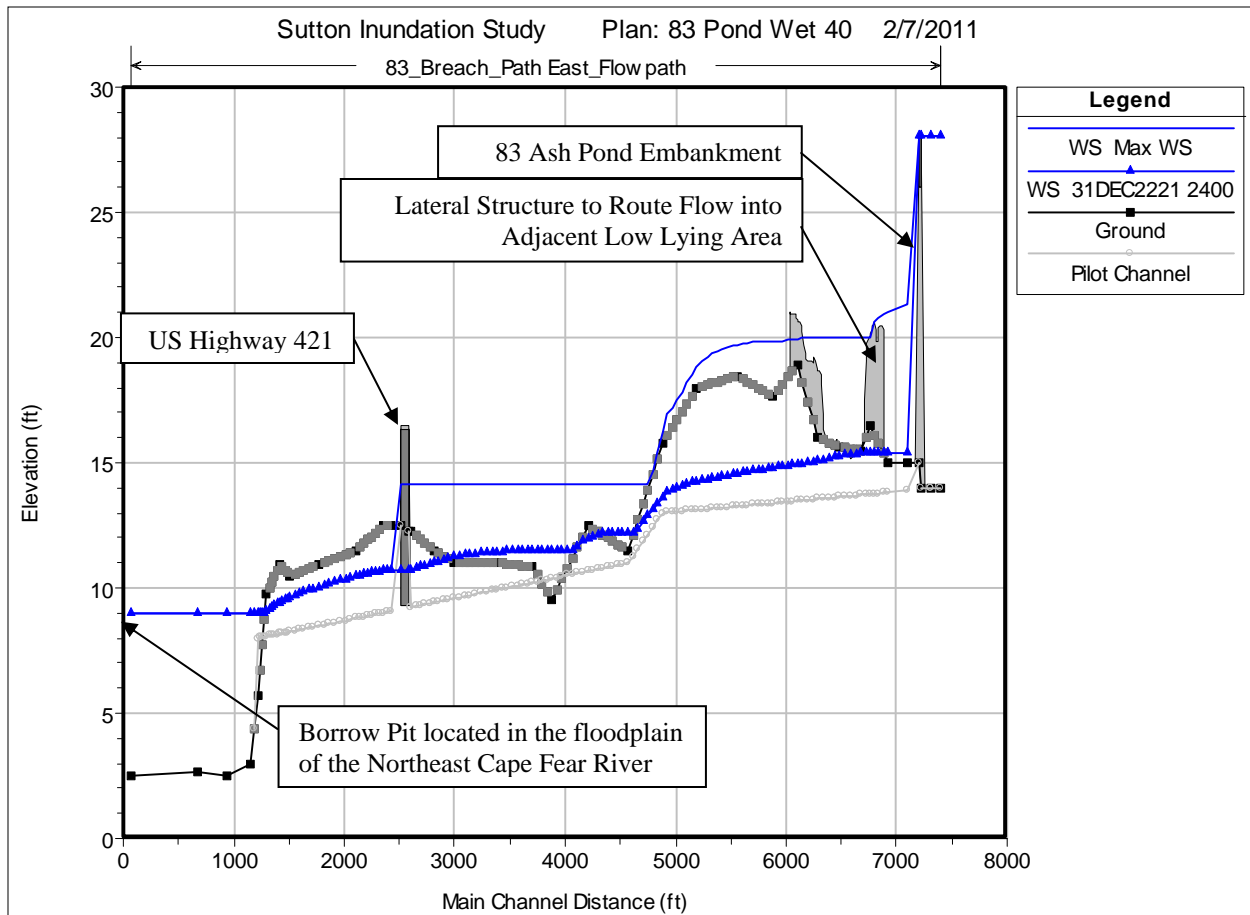


Figure 5. Breach Profile along Flowpath, Wet Weather Breach

8.3 Summary of Breach Analysis

The breach analyses indicate that the breach of the 83 Ash Pond is not likely to overtop US 421. The majority of flood attenuation occurs in low lying areas adjacent to the embankment, and west of US 421. However, it is apparent that a breach of the 83 Ash Pond could potentially affect commercial properties adjacent to the east of the embankment. The location of the potentially affected properties is depicted on the inundation maps provided in the Appendix.

9.0 References

CPL, 1983. Ash Pond Expansion Plan.

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Froehlich, David C., 1995a, "Peak Outflow from Breached Embankment Dam," Journal of Water Resources Planning and Management, vol.121, no.1.

USACE HEC, September 2005. HEC-GeoRAS GIS Tools for Support of HEC-RAS Using ArcGIS User's Manual. Davis, CA.

USACE HEC, March 2008. HEC-RAS River Analysis System User's Manual. Davis, CA.

Wahl, Tony L., 1998. Predication of Embankment Dam Breach Parameters – A Literature Review and Needs Assessment, U.S. Bureau of Reclamation Dam Safety Report DSO-980004, July 1998.

10.0 Abbreviations

AF	acre-feet
cfs	cubic feet per second
FEMA	Federal Emergency Management Agency
ft	feet
GIS	geographic information system
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HW	headwater (HEC-RAS)
NAVD	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Agency
PMP	Probable Maximum Precipitation
RS	River Station (HEC-RAS)
TW	tailwater (HEC-RAS)
USGS	United States Geological Survey
WS	water surface (HEC-RAS)

APPENDIX

83 Ash Pond – Aerial Inundation Map

83 Ash Pond – Topographical Inundation Map

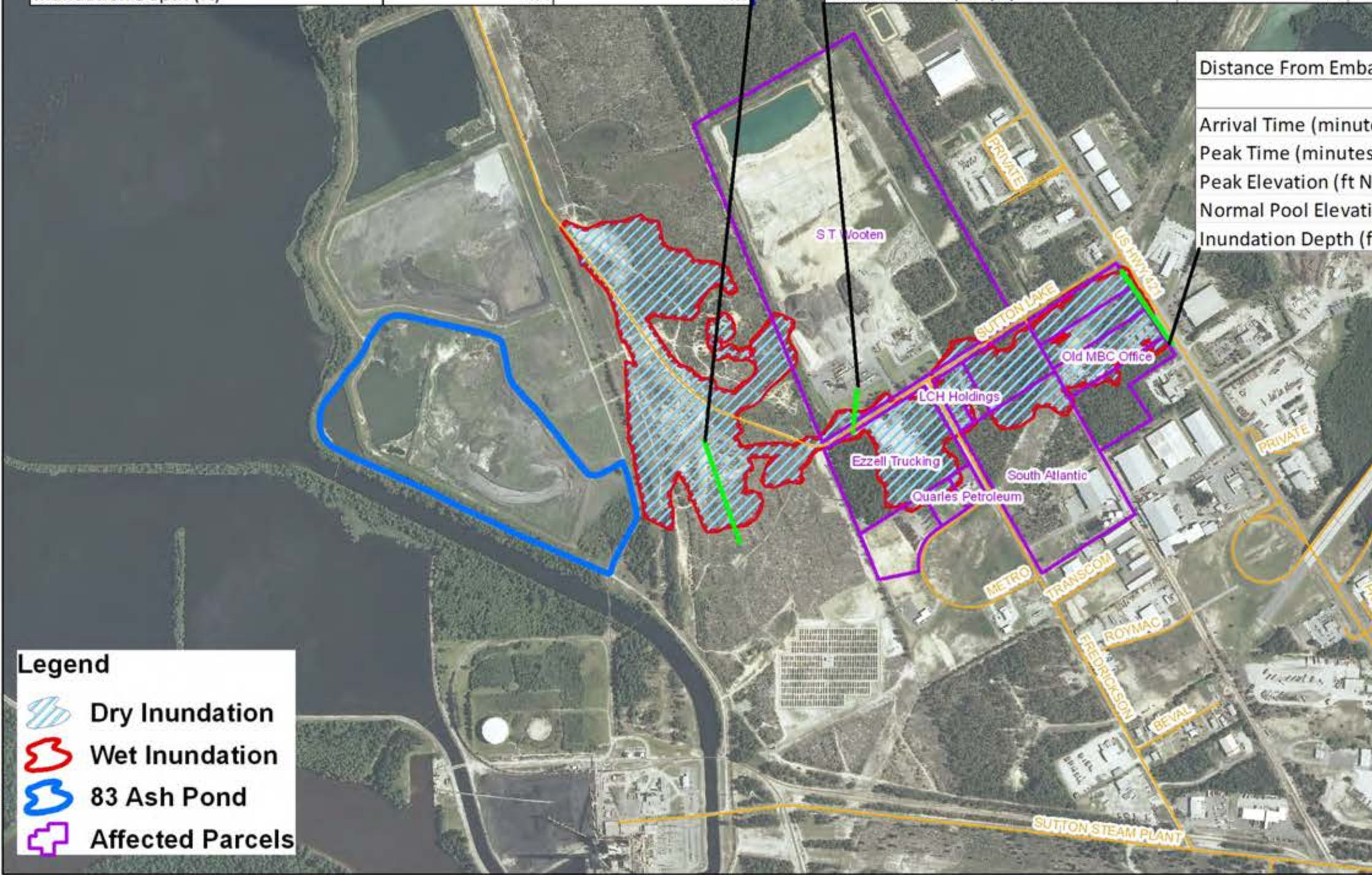
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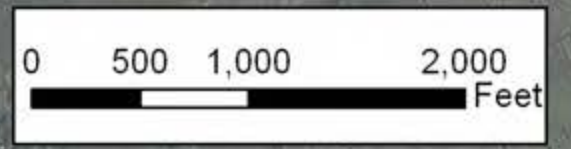
Distance From Embankment	0.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	35	35
Peak Time (minutes)	130	160
Peak Elevation (ft NAVD)	19.8	20.0
Normal Pool Elevation (ft NAVD)	15.4	15.3
Inundation Depth (ft)	4.4	4.7

Distance From Embankment	0.4 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	50	55
Peak Time (minutes)	160	180
Peak Elevation (ft NAVD)	18.5	18.8
Normal Pool Elevation (ft NAVD)	14.4	14.2
Inundation Depth (ft)	4.2	4.6

Distance From Embankment	0.9 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	490	230
Peak Time (minutes)	615	335
Peak Elevation (ft NAVD)	13.9	14.1
Normal Pool Elevation (ft NAVD)	10.9	10.7
Inundation Depth (ft)	3.0	3.4



Legend	
	Dry Inundation
	Wet Inundation
	83 Ash Pond
	Affected Parcels



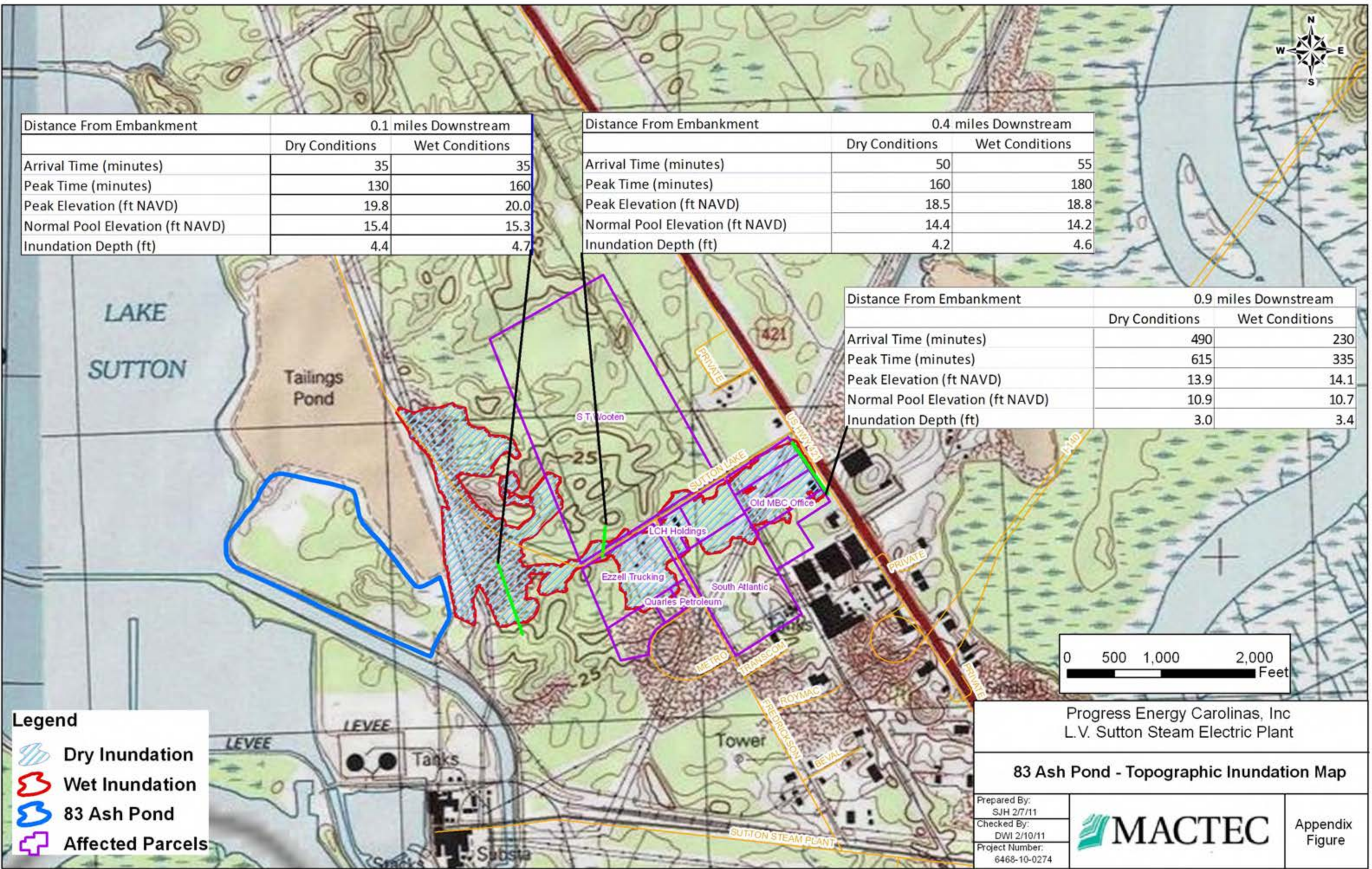
Progress Energy Carolinas, Inc L.V. Sutton Steam Electric Plant		
83 Ash Pond - Aerial Inundation Map		
Prepared By: SJH 2/7/11		Appendix Figure
Checked By: DWI 2/10/11		
Project Number: 6468-10-0274		



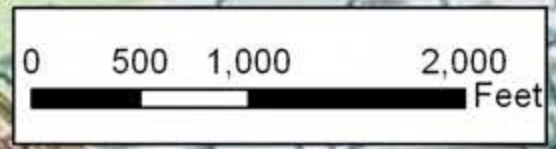
Distance From Embankment	0.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	35	35
Peak Time (minutes)	130	160
Peak Elevation (ft NAVD)	19.8	20.0
Normal Pool Elevation (ft NAVD)	15.4	15.3
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Arrival Time (minutes)	490	230
Peak Time (minutes)	615	335
Peak Elevation (ft NAVD)	13.9	14.1
Normal Pool Elevation (ft NAVD)	10.9	10.7
Inundation Depth (ft)	3.0	3.4



- Legend**
- Dry Inundation
 - Wet Inundation
 - 83 Ash Pond
 - Affected Parcels



Progress Energy Carolinas, Inc
L.V. Sutton Steam Electric Plant

83 Ash Pond - Topographic Inundation Map

Prepared By:
SJH 2/7/11
Checked By:
DWI 2/10/11
Project Number:
6468-10-0274



Appendix
Figure



**DAM BREACH ANALYSES AND
INUNDATION MAP DEVELOPMENT**

for

84 Ash Pond Dam

at

**Progress Energy L.V. Sutton Plant
New Hanover County, North Carolina**

**Prepared for
Progress Energy**

Prepared by

MACTEC Engineering and Consulting, Inc.

Project 6468-10-0274

February 18, 2011

Stephen J. Hanks
Project Engineer

D. Wayne Ingram
Principal Engineer

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- 84 Ash Pond Dam – Aerial Inundation Map
- 84 Ash Pond Dam – Topographic Inundation Map

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1.0 Executive Summary

The Progress Energy L.V. Sutton Plant 84 Ash Pond is a storage area for coal combustion byproducts. The 84 Ash Pond Dam is an approximately 32-foot high earthen dam. The impoundment has a normal surface area of approximately 82 acres and a maximum storage capacity of approximately 1,527 acre-feet. This report summarizes the dam breach and breach inundation analyses completed for the 84 Ash Pond Dam. The analyses were completed for a wet weather failure and a dry weather failure. The breach flood wave was routed overland to the east of the impoundment towards the Northeast Cape Fear River. Analysis of a breach into the cooling reservoir adjacent to the west was not completed since the storage within the cooling reservoir above normal pool elevation is approximately 4,700 acre-feet. The breach flood wave was routed along the flowpath using Hydrologic Engineering Center – River Analysis System (HEC-RAS) version 4.1 (US Army Corps of Engineers, 2010).

These analyses are intended to be conservative, using worst case assumptions related to failure events, for use in an Emergency Action Plan for the facility. Data for the hydraulic analyses were obtained from readily available information. The HEC-RAS model was developed using 3 meter resolution elevation data published by the USGS, and the inundation extent of the breach wave was determined from the USGS elevation data as well.

Available information indicates that the constructed top width of the embankment is 12 feet and the crest elevation is 34 feet North American Vertical Datum of 1988 (NAVD 1988). The design side slopes are 3.0 foot horizontal to 1 foot vertical (3H:1V) on the exterior and interior. The maximum height of the dam is 20 feet from crest low point to the downstream toe at an existing ditch, and 32 feet above the bottom of the cooling reservoir. The hydrologic design criterion for the storage area is a 100-year event.

The routing of the flood wave was accomplished using HEC-RAS. The breach discharge was routed overland towards the Northeast Cape Fear River.

The breach parameters were developed pursuant to the empirical equations presented by Froehlich (1995) following the evaluation of 63 dam breaches. The breach width estimates were based on a storage volume equal to 60 percent of the total capacity of the impoundment. The bottom width of a trapezoidal-shaped breach was estimated to be approximately 19 feet. The bottom elevation of the breach was assumed to be at 14 feet NAVD. Breach section side slopes of 1H:1V were chosen as they represent the upper limit of the typical range of values. The breach development time was estimated to be 0.9 hour.

The breach analyses indicate that the breach of the 84 Ash Pond would likely overtop US 421 by approximately 2 feet. Additionally, it is apparent that a breach of the 84 Ash Pond could potentially affect commercial properties located along the flowpath to the east of the embankment. The locations of the properties that could be affected by a potential breach are depicted in the inundation maps provided in the Appendix.

2.0 Introduction

This report summarizes dam breach analyses completed for the 84 Ash Pond at the Progress Energy L.V. Sutton Plant to determine the extent of the inundation resulting from a dam breach. Analyses were completed using HEC-RAS, version 4.1 (US Army Corps of Engineers, 2010). Basic pertinent information regarding the impoundment and dam is summarized in Table 1.

Table 1. 84 Ash Pond Structure Information

Impoundment Name	84 Ash Pond
State Dam ID No	NEWHA-005
Current Size Classification	Medium
Current Hazard Classification	Low
Location	Latitude: 34.2991° Longitude: -77.9924°
County	New Hanover
Receiving Stream(s)	N/A
Impoundment Area	82 acres
Maximum Dam Height	32 feet (2 ft to 34 ft)
Normal Water Elevation	26 feet NAVD
Maximum Operating Elevation	32 feet NAVD
Maximum Depth	20 feet
Maximum Hydraulic Storage Volume	1,527 acre-feet (as designed) (66,520,000 cubic yards)
Material(s) Stored	Coal combustion product
Storage status	Unknown
Principal Spillway	Riser/Barrel
Emergency Spillway	N/A
Dam Minimum Section	Top width: 12 feet, Interior Slope: 3H:1V, Exterior Slope: 3H:1V
Embankment Materials	Earthen

3.0 Description of Facilities and Potentially Impacted Area

3.1 General

The 84 Ash Pond Dam is used for storage of coal combustion byproducts produced at the L.V. Sutton Plant. The impoundment has a designed storage capacity of 1,364 acre-feet (AF) below maximum operating elevation of 32 feet NAVD, and a maximum storage capacity of 1,527 acre-feet below the embankment crest elevation of 34 feet NAVD. Information describing the characteristics of the impoundment, spillway facilities and maximum dam section are provided in Table 1.

The breach flood wave was routed overland approximately 6,500 feet to a borrow pit located within the floodplain of the Northeast Cape Fear River. US Highway 421 intersects the breach flowpath approximately 4,500 feet from the embankment. The analyses included an assessment of the sensitivity of the model predictions to various breach parameters and flowable impoundment storage volumes.

Other potential 84 Ash Pond dam breach locations were considered. However, it was determined that potential locations along the western side of the embankment would drain into the cooling reservoir which would accommodate the breach without significant rise in water level, since the available storage within the cooling reservoir above normal pool elevation is approximately 4,700 acre-feet. Consequently, the single breach location along the east side of the embankment was analyzed.

Based on available information there appears to be four commercial properties located along the breach flowpath between the embankment and the borrow pit located within the floodplain of the Northeast Cape Fear River.

3.2 Impoundment and Embankment Characteristics

The impoundment and embankment characteristics were based on design information presented in the 1983-1984 Ash Pond Expansion Plan, and aerial imagery. The interior crest of the embankment was digitized from aerial imagery, and then off-set the appropriate distance based on the specified slope and bottom elevation. The digitized features of the pond design were utilized in HEC-GeoRAS to develop an elevation-storage volume curve for the pond. HEC-GeoRAS is an extension of ArcGIS capable of analyzing a terrain model for hydraulic analysis. The elevation – volume curve for the 84 Ash Pond is presented in Figure 1.

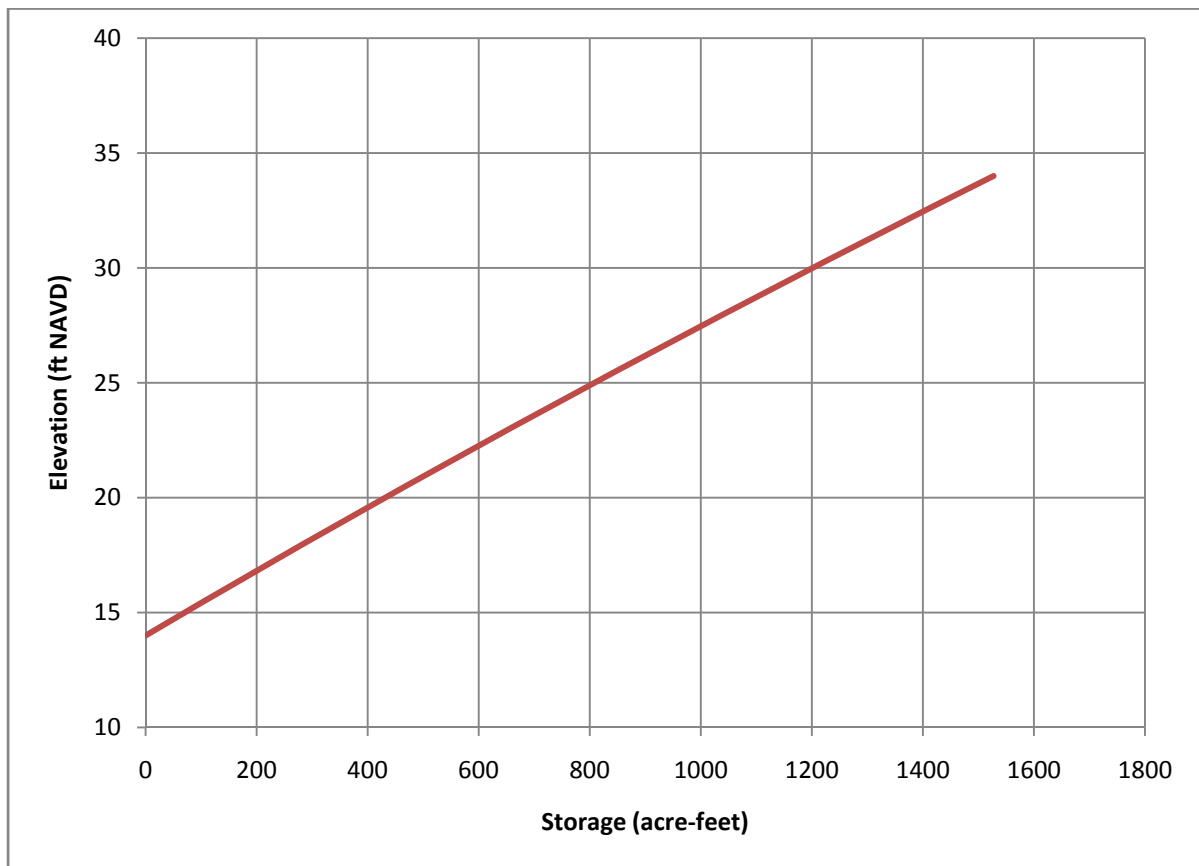


Figure 1. 84 Ash Pond Elevation – Storage Volume Curve

The design top width of the embankment is 12 feet. The design side slopes are 3H:1V on the interior and exterior. The dam height is approximately 32 feet above surrounding grade to the west of the embankment, and approximately 20 feet above surrounding grade to the east of the embankment. Excess water in the reservoir is discharged into the cooling water reservoir through a riser and barrel spillway with a variable overflow elevation. The overflow elevation of the riser is adjusted using 2-foot high sections of interlocking concrete cylinders. The hydrologic design criterion for the storage area is a 100-year event. There is no drainage area to the 84 Ash Pond except the 84 Ash Pond dike.

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4.0 Scope of Investigation

This report summarizes the results of analyses completed to determine the extent of the inundation resulting from a breach of the 84 Ash Pond dam. The analyses extended as far downstream from the impoundment structure in question as significant impacts of a reasonable worst case scenario were determined to propagate. The extent of significant impacts was a site-specific determination, considering factors such as:

- sensitivity of impacted features to high water level (human safety, property damage, emergency services demands, transportation systems, etc.), and
- maximum water level relative to naturally occurring high water levels and fluctuations from precipitation events.

Assessment of the risk of a dam breach occurrence was not part of this work; nor was detailed investigation of the most probable breach location or breach characteristics such as rate of growth, dimensions, and other information that would require more detailed geotechnical information including site-specific materials investigations, testing and analyses. The detailed considerations and analyses required to develop a quantitative descriptive model of the fluidization of the coal combustion products (CCP) stored in this impoundment, the transport and settlement at downstream locations was also not included in the scope of this investigation. Rather, it was assumed that the volume of fluid discharged as a result of a breach behaves as water, a Newtonian fluid in hydraulics terminology. This is a conservative assumption because entrainment of solids in the fluids discharged would cause increased energy losses in the fluid, resulting in slower velocities, quicker flood wave dissipation due to loss of volume due to solids settling and other fluid mechanics considerations.

Recognizing that conservative assumptions regarding breach formation characteristics, conditions at time of breach, along with an assumption that the entire impoundment volume is water would create an unrealistically conservative prediction, the analyses did include an assumption regarding the fraction of the total impoundment volume that would become fluidized and discharged. Also recognizing that this is an assumption, a sensitivity assessment was completed to characterize resultant critical predictions of water levels and timing as a function of the assumed storage volume fluidized.

Data for hydraulic model development came from readily available sources including 3 meter elevation data from the USGS National Elevation Dataset.

5.0 Summary of Methods and Approach

5.1 Hydraulic Analysis

The hydraulic analyses completed for this study were based predominantly on application of the hydraulic model Hydraulic Engineering Center – River Analysis System (HEC-RAS), version 4.1 (USACE HEC, January 2010). HEC-RAS is a general application, one-dimensional model that can perform unsteady flow routing through an open channel system that may also include culverts, bridges, levees, tributaries, storage areas and traversing dams. Unsteady flow analyses deals with flow conditions that vary temporally and spatially.

For this study, the general approach was to define the impoundment as a HEC-RAS storage area and analyze a dam breach using the inline structure option to model the embankment to be breached. An inline structure in HEC-RAS is a structure located perpendicular to the flow direction of the river with flow over the structure being analyzed as a weir; for which a breach scenario can be prescribed.

5.2 Boundary Conditions

The inundation resulting from a breach of the embankment was analyzed for two separate weather conditions. For both weather conditions, the boundaries of the hydraulic model were described using a specified initial pool elevation in the impoundment and a constant stage at the tailwater of the model. The initial pool elevation for the dry weather scenario was set to the maximum operating elevation of 32 feet NAVD. The initial pool elevation for the wet weather scenario was set to the crest elevation of 34 feet NAVD. The tailwater stage for both conditions was set to 9 feet NAVD. The tailwater stage was assumed to be 2 feet below the bank of the borrow pit located in the floodplain of the Northeast Cape Fear River.

5.3 Embankment Breach

The breach parameters were developed pursuant to the empirical equations presented by Froehlich (1995) following the evaluation of 63 dam breaches. The breach width estimates were based on a storage volume equal to 60 percent of the total capacity of the impoundment. It was assumed that 60 percent of the total water and solids volume of the 84 Ash Pond would flow out of the pond. The trapezoidal-shaped breach bottom width was estimated to be 19 feet for the wet weather failure scenario. The breach bottom width was estimated to be 17 feet for the dry weather failure scenario. The bottom elevation of the breach was assumed to be the elevation of the reservoir bottom, which is approximately 14 feet NAVD. Side slopes of 1H:1V were chosen as they represent the upper limit of the typical range of values. The breach development time was estimated at 0.9 hour.

5.4 Flood Wave Routing

The routing of the flood wave from the breach location to the borrow pit located within the floodplain of the Northeast Cape Fear River was accomplished by extracting topographical information from elevation data available in a 3 meter resolution from the USGS National Elevation Dataset. The GIS dataset was converted into a continuous Triangulated Irregular Network (TIN) for the area along the flow paths of the flood wave. The flow path centerline was inferred from the TIN. The cross section lines were then drawn orthogonal to the inferred direction of flow. The topology of the flow path centerlines and geometry of the cross section lines were extracted from the TIN using HEC-GeoRAS version 4.1.1 (USACE HEC, September 2005). HEC-GeoRAS is an extension of ArcGIS developed by the USACE to perform spatial analysis of TINs, and extract geometric information from the TIN for direct import into a HEC-RAS geometry model.

Following the import of the HEC-GeoRAS output file, a storage area element and in-line structure element were incorporated into the model to simulate the impoundment and embankment, respectively. Additionally, a lateral structure and storage area was added to the model to replicate flow that would exit the flowpath and collect within the low lying area located along the eastern portion of the embankment. Also US 421 was incorporated into the model as an inline structure. It was assumed that no culverts would allow flow of the breach wave across US 421. The Manning roughness values for the cross sections located along the flow paths were set to 0.08.

6.0 Model Stability

Hydraulic models of unsteady flows inherently experience problems with stability of the model calculations. HEC-RAS provides a limited number a means to control instability through input parameter selection and model operation control parameters. The breach model was run for a range of inputs related not only to the breach size and rate of development, but other model inputs as well. Doing so provides for development of a more robust model with regard to stability, as well as providing an assessment of sensitivity of the model to the varied inputs.

To increase the stability of the routing model, a pilot channel was added along the entire breach flow path. Pilot channels are one of the available options to prevent the model from going unstable at low flows (USACE HEC, March 2008). The pilot channels were given a width of 4 feet and a Manning roughness value of 0.2. The high Manning value was chosen to restrict flow through the pilot channel during routing of the flood wave. Additionally, a pilot flow of 5 cfs was incorporated to provide baseflow within the model. The magnitude of the baseflow was determined as 0.1 percent of the peak discharge, since increases in flow conditions greater than a 1,000 times the baseflow conditions cause instability. A cross section located approximately 2,700 feet from the embankment that characterized a ridge along the flowpath was converted into an inline structure so that flow over the ridge would be evaluated utilizing weir flow equations rather than channel flow equations in order to increase model stability. Also, additional cross sections were interpolated along the flowpath so that the maximum distance between cross sections was reduced to 50 feet. This was required due the numerous steep drops along the flowpath, resulting in an overestimation of the water surface elevations in the upper portion of the model.

7.0 Sensitivity Assessment

There are several parameters that can be identified as potentially important to determining the prediction of results of a dam breach. Not all, but most, of these are typically inputs to available dam breach models. These parameters have a significant amount of uncertainty in what a representative value might be. In addition to these normal uncertainties, modeling of discharges from impoundments that contain material such as ash or gypsum that may be fluidized by a breach presents additional uncertainties.

It is unlikely that all the contents of the 20-ft deep, 82-acre impoundment would become fluidized in the event of even an extremely large and rapid embankment breach. To assess the impacts of the assumption regarding the fraction of total volume (solids and pore space water) that would be mobilized, various fractions of the total storage volume were assumed to be discharged. The results of four simulations with various fractions of the total storage volume are presented below. Additionally, model sensitivity to breach bottom width, breach development time, and breach side slopes were evaluated. The results of the sensitivity analysis are presented in Tables 2 and 3.

Table 2. Results of Sensitivity Analysis for a Dry Weather Breach

Modification	Peak Discharge Rate (cubic feet per second)	Peak Tailwater Stage (feet NAVD 1988)	Time to Initial Impact 0.4 Miles from Embankment (minutes)
None	4,489	20.4	40
Increased Breach Bottom Width by 50%	5,735	20.9	40
Reduced Manning's n Coefficient by 50%	4,729	19.9	40
Increased Manning's n Coefficient by 50%	4,726	21.1	45
Reduced Breach Development Time to 0.25 hr	5,292	20.4	30
Increased Breach Development Time to 0.75 hr	4,221	20.4	55

Table 3. Peak Breach Discharge versus Discharge Volume for a Dry Weather Breach

Percent of Total Volume	Peak Discharge Rate (cubic feet per second)	Discharge Volume (acre-feet)
100%	5,355	1,193.4
80%	4,996	962.8
60%	4,849	731.0
40%	4,164	497.1

8.0 Summary of Selected Final Analyses

8.1 Assumptions and Selected Inputs

The sensitivity assessment indicates that minor changes in the maximum inundation will result from the modification of the selected parameters, with the most significant alteration in the breach inundation resulting from the increase in Manning's n Coefficient. Increasing the Manning's n Coefficient by 50 percent results in a peak inundation increase of 0.7 feet (21.1 feet NAVD). Increasing the breach bottom width by 50 percent results in a peak discharge rate increase of 1,246 cfs (27.8 percent). The selected HEC-RAS model inputs for the final breach analyses are presented in Table 4.

Table 4. HEC-RAS Model Inputs for Wet Weather Conditions

Input	Value
Breach Development Time (minutes)	54
Breach Bottom Width (feet)	19 feet *
Breach Side Slopes (H:1V)	1
Breach Bottom Elevation (feet NAVD)	14 feet
Breach Progression Rate	Linear
Computation time increment (seconds)	60

* Breach bottom width was estimated to be 17 feet for the dry weather condition.

8.2 Flood Wave Travel Time and Route of Travel

It is important for emergency responders to have an estimate of how much time is available in the event of a dam failure to take action at various downstream locations. The available time is not necessarily dependent on the time of arrival of the maximum water level, but the critical time is often dependent rather on a condition that is typically less clear – when impacts become critical. Perhaps the most apparent example of this is when access to an area becomes inundated, affecting the safety of movement of the public and emergency service workers. A default initial impact of 1 foot of inundation was chosen since this is a value where egress by automobile becomes difficult.

The flood wave travel time was determined for two initial conditions. The first initial condition is representative of typical dry weather conditions where the pool elevation is equal to the maximum operating elevation of 32 feet NAVD. The second initial condition is representative of wet weather conditions where the pool elevation is at 34 feet NAVD and failure of the embankment occurs as a result of overtopping from high inflow. A breach occurring during wet weather conditions will likely inundate US 421 by 1.9 feet. Flood wave travel time for dry weather and wet weather conditions are presented in Tables 4a and 4b.

Table 4a. Flood Wave Travel Time (Dry Weather Conditions)

Location	Distance Downstream (miles)	Peak Inundation Depth (feet)	Time from Start of Breach (minutes)	
			At Initial Impacts	At Peak Elevation
Vacant Lot Adjacent to Embankment	0.1	5.9	25	75
Back Lot of First Commercial Property	0.4	5.6	40	75
US 421	0.9	1.7	65	135
Borrow Pit	1.1	4.6	90	125

Table 4b. Flood Wave Travel Time (Wet Weather Conditions)

Location	Distance Downstream (miles)	Peak Inundation Depth (feet)	Time from Start of Breach (minutes)	
			At Initial Impacts	At Peak Elevation
Vacant Lot Adjacent to Embankment	0.1	6.3	25	70
Back Lot of First Commercial Property	0.4	5.9	40	75
US 421	0.9	1.9	60	135
Borrow Pit	1.1	5.0	85	135

Discharge and stage hydrographs at the embankment are presented for the dry weather condition and the wet weather condition in Figures 2 and 3, respectively. In the dry weather condition, the initial breach flood wave of 6 feet attenuates to 4.6 feet by the time it reaches the borrow pit located in the floodplain of the Northeast Cape Fear River. In the wet weather condition, the initial breach flood wave of 6 feet attenuates to 5.0 feet by the time it reaches the borrow pit located in the floodplain of the Northeast Cape Fear River. Both conditions overtop US 421 by approximately 2 feet.

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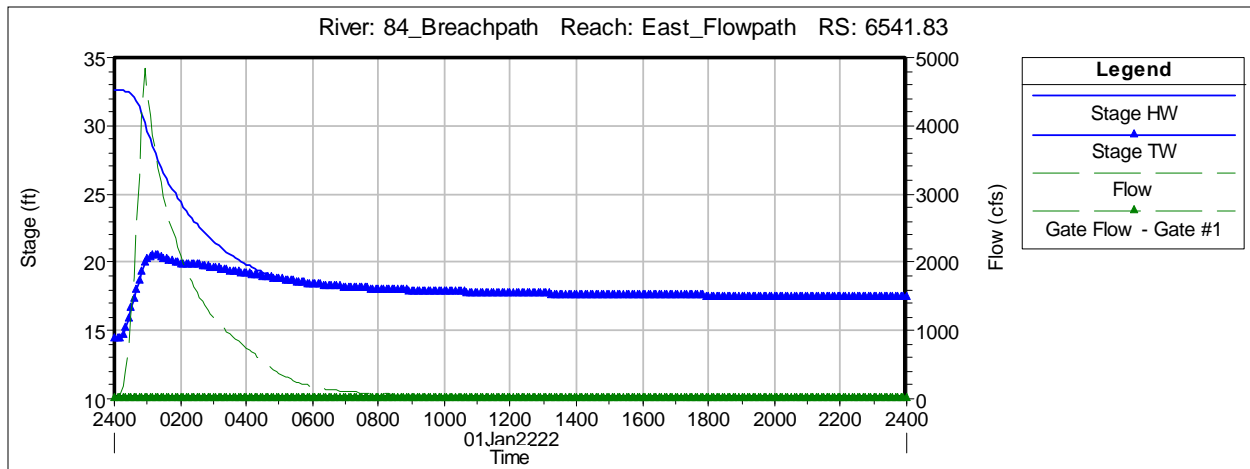


Figure 2. Discharge and Stage Hydrographs at embankment, Dry Weather Breach

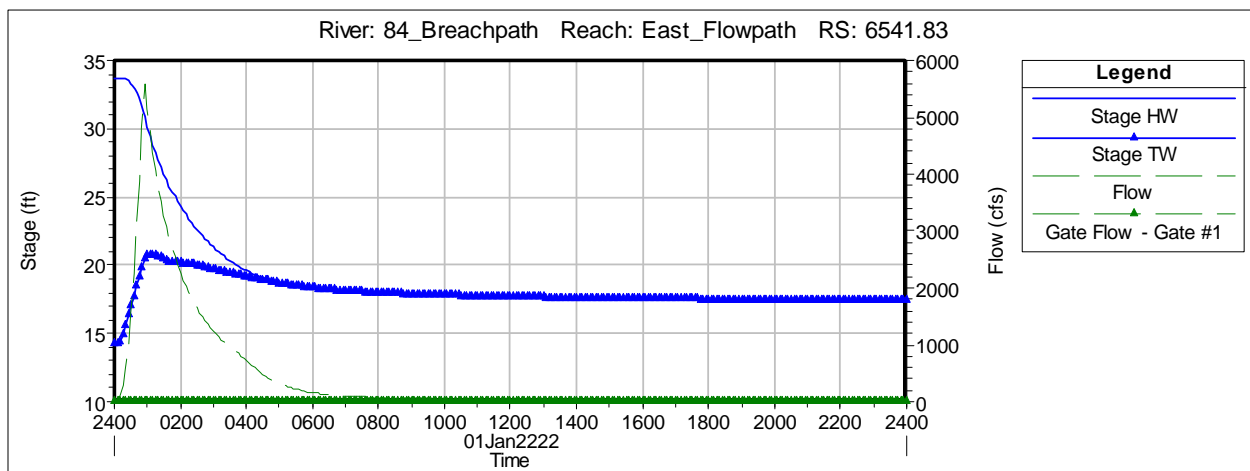


Figure 3. Discharge and Stage Hydrographs at embankment, Wet Weather Breach

Stream profiles depicting the effects along the flowpath from the embankment breach for the dry and wet weather scenarios are provided in Figures 4 and 5. The baseline stream profile is shown as well.

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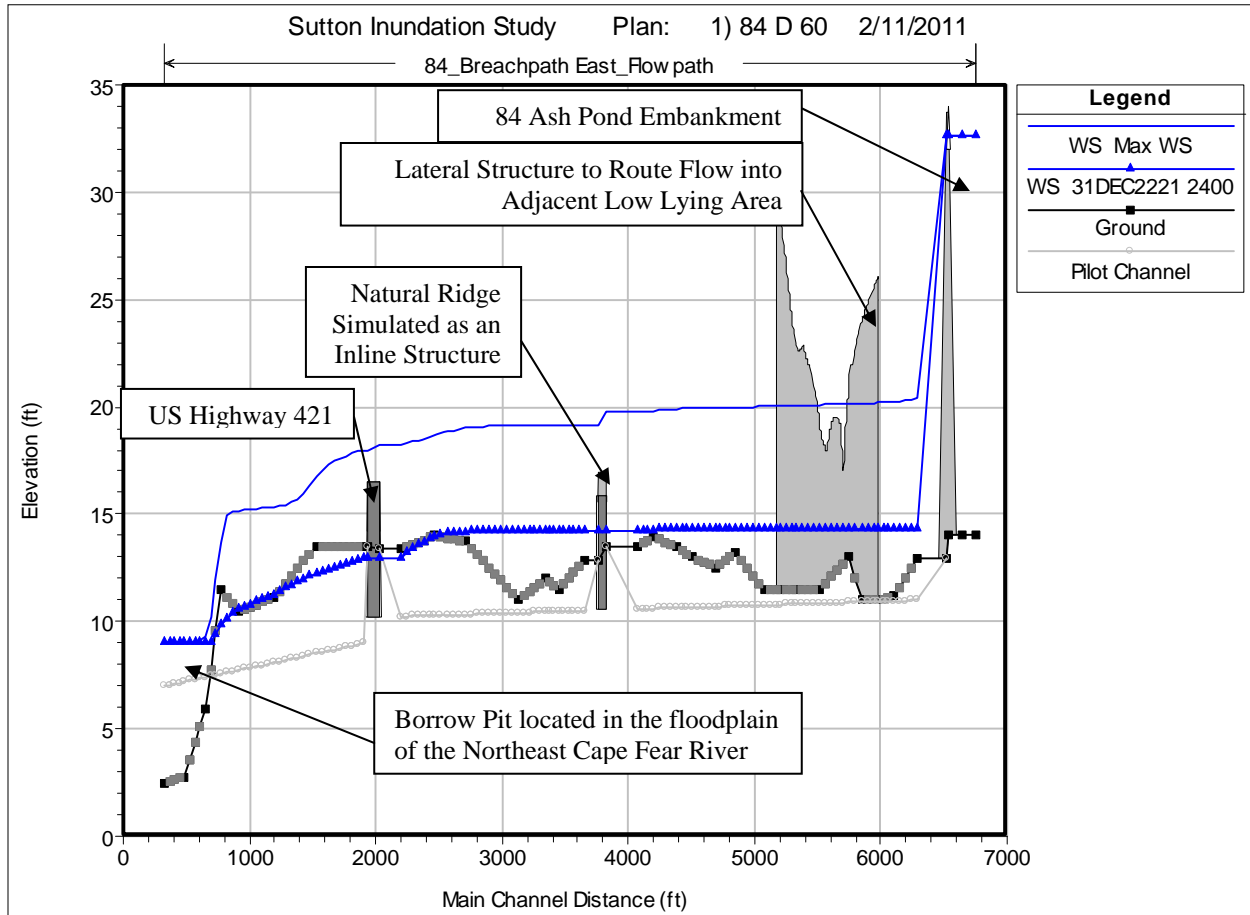


Figure 4. Breach Profile along Flowpath, Dry Weather Breach

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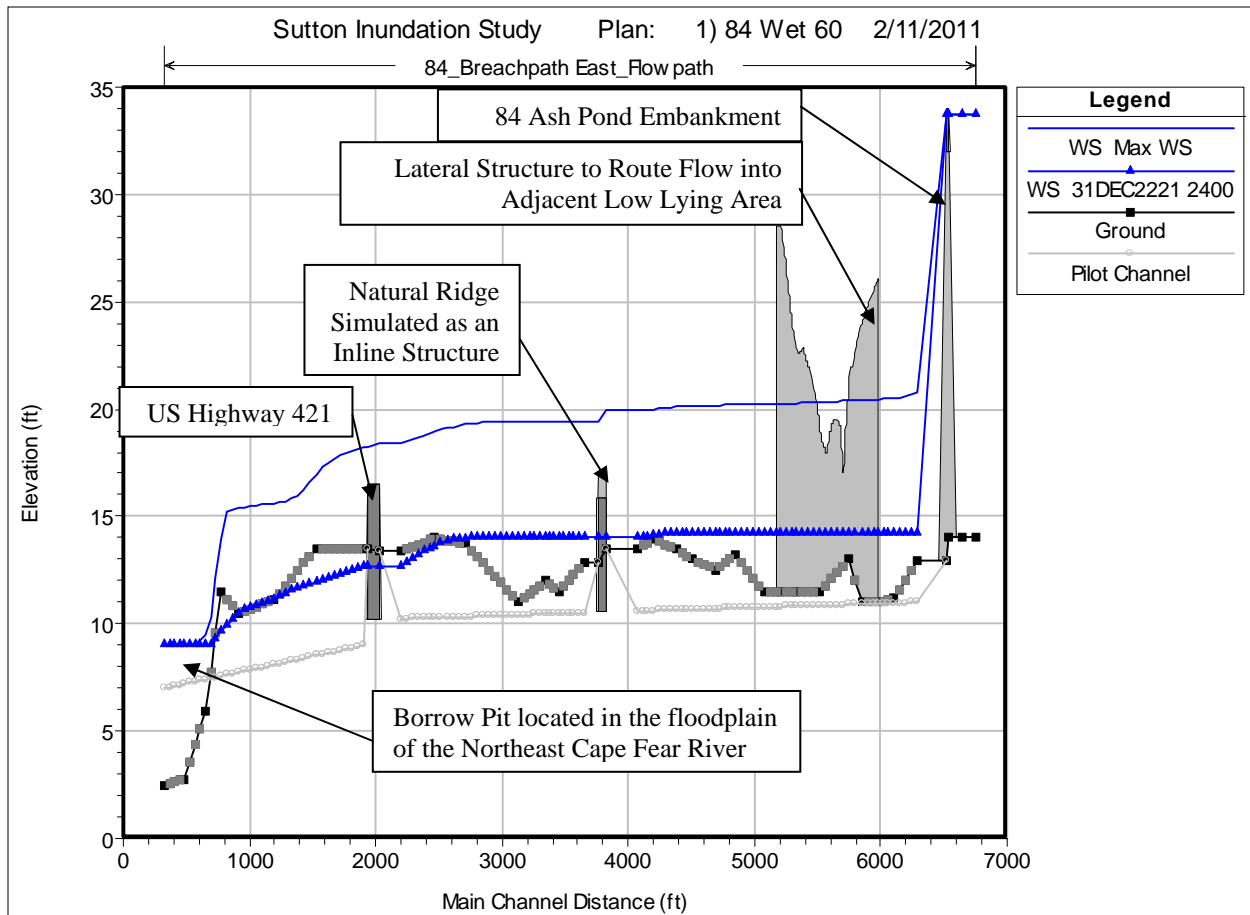


Figure 5. Breach Profile along Flowpath, Wet Weather Breach

8.3 Summary of Breach Analysis

The breach analyses indicate that the breach of the 84 Ash Pond would likely overtop US 421 by approximately 2 feet. Additionally, it is apparent that a breach of the 84 Ash Pond could potentially affect commercial properties located along the flowpath to the east of the embankment. The locations of the properties that could be affected by a potential breach are depicted in the inundation maps provided in the Appendix.

9.0 References

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10.0 Abbreviations

AF	acre-feet
cfs	cubic feet per second
FEMA	Federal Emergency Management Agency
ft	feet
GIS	geographic information system
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HW	headwater (HEC-RAS)
NAVD	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Agency
PMP	Probable Maximum Precipitation
RS	River Station (HEC-RAS)
TW	tailwater (HEC-RAS)
USGS	United States Geological Survey
WS	water surface (HEC-RAS)

APPENDIX

84 Ash Pond – Aerial Inundation Map

84 Ash Pond – Topographical Inundation Map

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Distance From Embankment	0.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	25	25
Peak Time (minutes)	75	70
Peak Elevation (ft NAVD)	20.2	20.5
Normal Pool Elevation (ft NAVD)	14.3	14.2
Inundation Depth (ft)	5.9	6.3

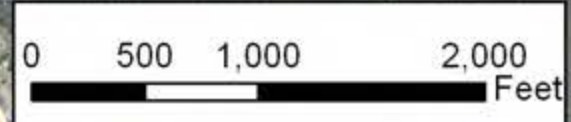
Distance From Embankment	0.4 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	40	40
Peak Time (minutes)	75	75
Peak Elevation (ft NAVD)	19.9	20.1
Normal Pool Elevation (ft NAVD)	14.3	14.2
Inundation Depth (ft)	5.6	5.9

Distance From Embankment	1.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	90	85
Peak Time (minutes)	125	135
Peak Elevation (ft NAVD)	15.2	15.4
Normal Pool Elevation (ft NAVD)	10.6	10.4
Inundation Depth (ft)	4.6	5.0

Distance From Embankment	0.9 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	65	60
Peak Time (minutes)	135	135
Peak Elevation (ft NAVD)	18.2	18.4
Roadway Elevation (ft NAVD)	16.5	16.5
Inundation Depth (ft)	1.7	1.9

Legend

-  84 Ash Pond
-  Wet Inundation
-  Dry Inundation
-  Affected Parcels



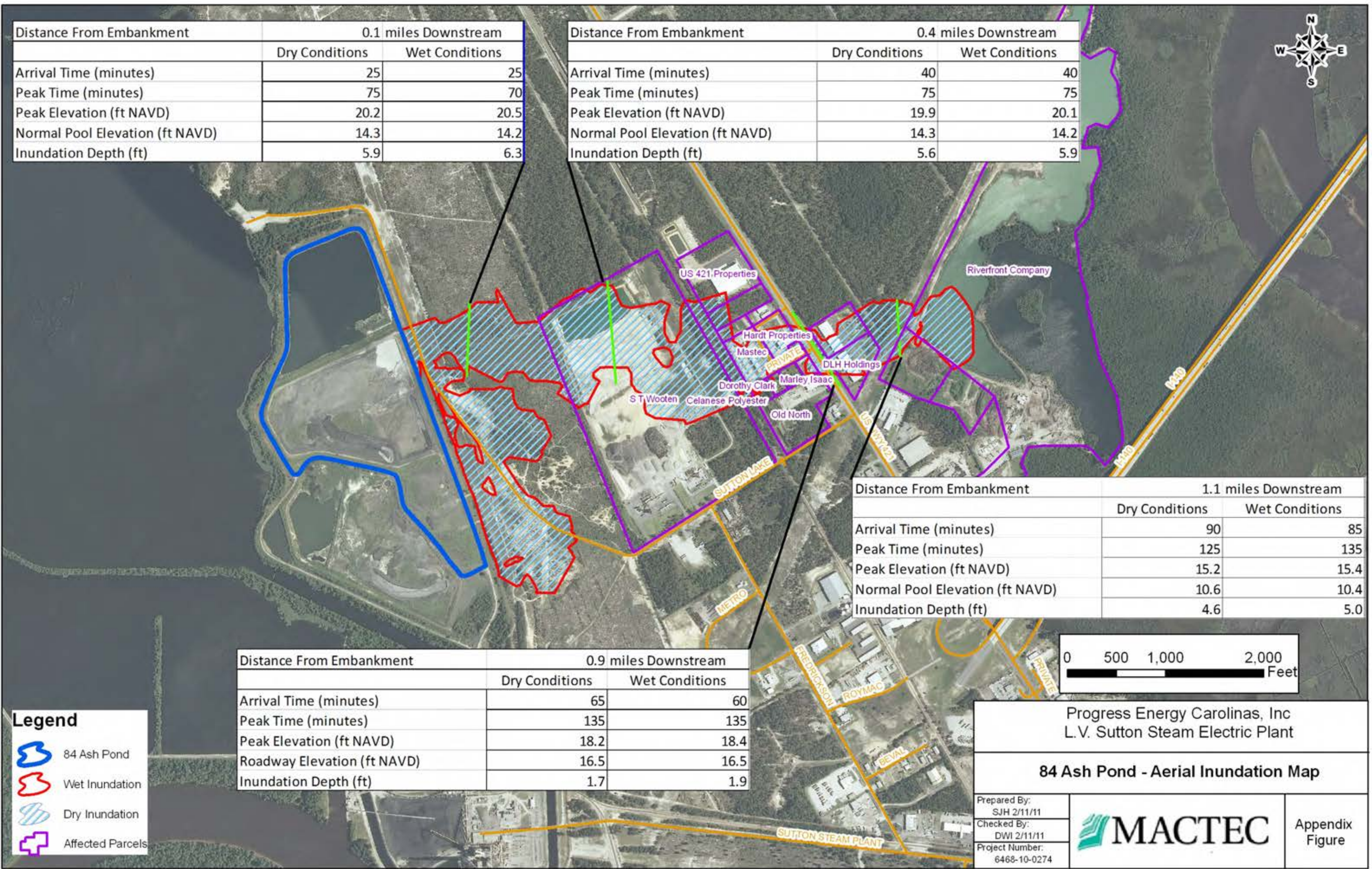
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L.V. Sutton Steam Electric Plant

84 Ash Pond - Aerial Inundation Map

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Project Number:
6468-10-0274



Appendix
Figure




Distance From Embankment	0.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	25	25
Peak Time (minutes)	75	70
Peak Elevation (ft NAVD)	20.2	20.5
Normal Pool Elevation (ft NAVD)	14.3	14.2
Inundation Depth (ft)	5.9	6.3

Distance From Embankment	0.4 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	40	40
Peak Time (minutes)	75	75
Peak Elevation (ft NAVD)	19.9	20.1
Normal Pool Elevation (ft NAVD)	14.3	14.2
Inundation Depth (ft)	5.6	5.9

Distance From Embankment	1.1 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	90	85
Peak Time (minutes)	125	135
Peak Elevation (ft NAVD)	15.2	15.4
Normal Pool Elevation (ft NAVD)	10.6	10.4
Inundation Depth (ft)	4.6	5.0

Distance From Embankment	0.9 miles Downstream	
	Dry Conditions	Wet Conditions
Arrival Time (minutes)	65	60
Peak Time (minutes)	135	135
Peak Elevation (ft NAVD)	18.2	18.4
Roadway Elevation (ft NAVD)	16.5	16.5
Inundation Depth (ft)	1.7	1.9

Legend

-  84 Ash Pond
-  Wet Inundation
-  Dry Inundation
-  Affected Parcels



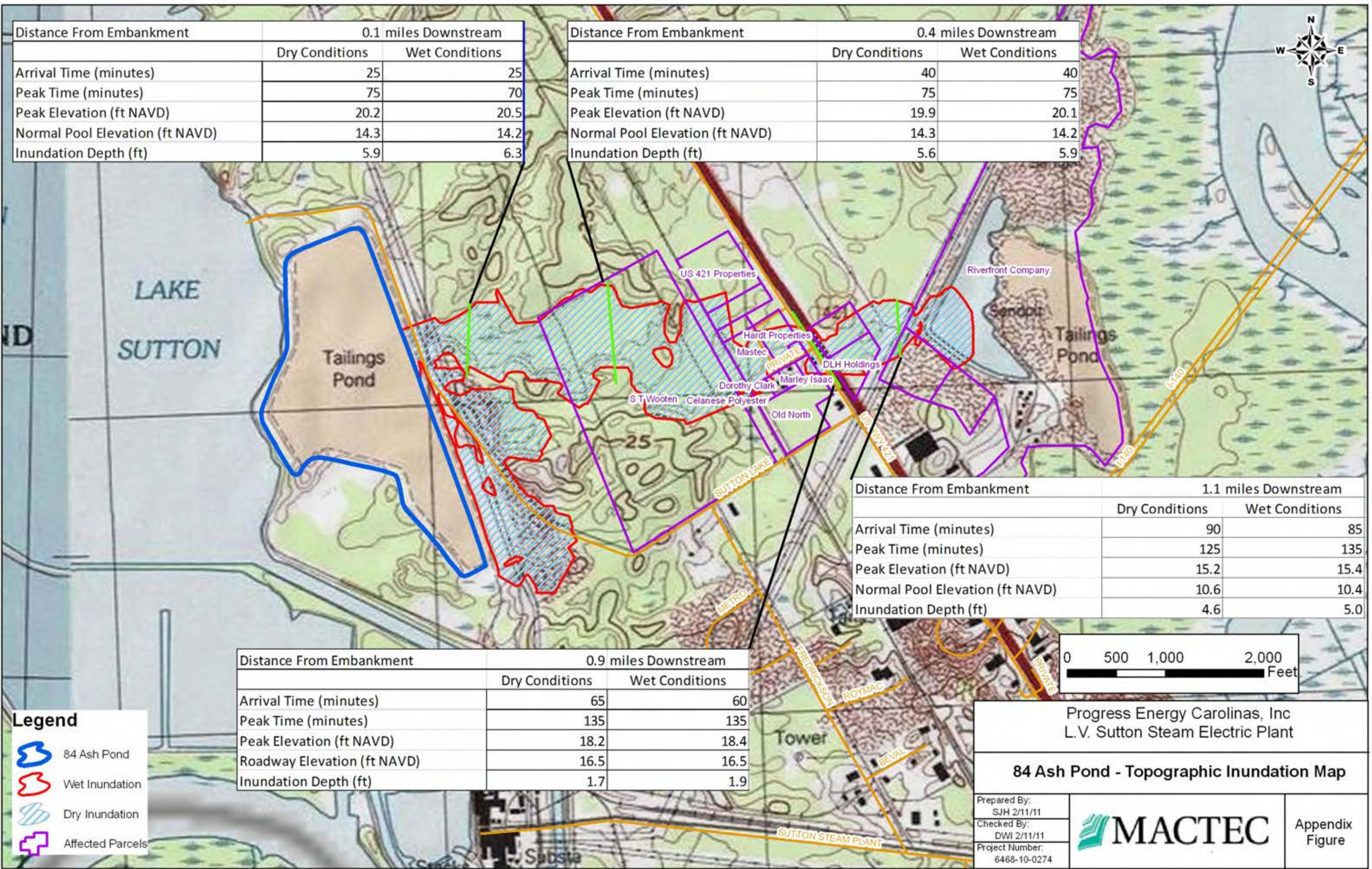
Progress Energy Carolinas, Inc
L.V. Sutton Steam Electric Plant

84 Ash Pond - Topographic Inundation Map

Prepared By:
SJH 2/11/11
Checked By:
DWI 2/11/11
Project Number:
6468-10-0274



Appendix
Figure





engineering and constructing a better tomorrow

February 16, 2011

Mr. Bill Forster
Progress Energy
7001 Pinecrest Road
Raleigh, North Carolina 27613

**SUBJECT: TRANSMITTAL OF COMPLETION REPORT/CERTIFICATION
DIKE BREACH REPAIRS
SUTTON 1984 ASH POND DIKE – NEWHA-005
SUTTON STEAM ELECTRIC PLANT
NEW HANOVER COUNTY, NORTH CAROLINA
MACTEC PROJECT NO6468-11-0312**

Dear Mr. Forster:

MACTEC Engineering and Consulting, Inc. (MACTEC) has provided engineering observation and construction testing services related to implementation of repairs to the small breach area in the 1985 Ash Pond Dike at the Sutton Plant. Plans for the repair plans were prepared by MACTEC under the engineering supervision of J. Allan Tice, P. E. and approved by the North Carolina Department of Environment and Natural Resources, Division of Land Resources (DLR) by letter dated January 21, 2011. The attached Completion Report summarizes construction activities and our observations and testing results. Sets of Record Drawings and a Certificate of Completion are attached to the Completion Report. The Completion Report, the Certificate of Completion and two sets of the Record Drawings are required to be submitted to DLR.

MACTEC appreciates the continued opportunity to provide engineering and consulting services to Progress Energy. If you have any questions or need any additional information, please do not hesitate to contact us.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

A handwritten signature in black ink, appearing to read "J. Allan Tice".

J. Allan Tice, P.E.
Senior Principal Engineer
Registered, North Carolina 6428

Attachments: Completion Report

COMPLETION REPORT
REPAIRS TO DIKE BREACH SECTION
1984 ASH POND DIKE (NEWHA-005)
SUTTON STEAM ELECTRIC PLANT
NEW HANOVER COUNTY, NORTH CAROLINA

PREPARED FOR:
PROGRESS ENERGY CAROLINAS

PREPARED BY:
MACTEC ENGINEERING AND CONSULTING, INC.
J. ALLAN TICE, P. E.



PROJECT INFORMATION

MACTEC Engineering and Consulting, Inc. (MACTEC) has provided engineering observation and construction testing services related to implementation of repairs to the small breach area in the 1985 Ash Pond Dike at the Sutton Plant. Emergency repairs in the breach area were made immediately after the breach, in September, 2010. Plans for a permanent repair were prepared by MACTEC under the engineering supervision of J. Allan Tice, P. E. and approved by the North Carolina Department of Environment and Natural Resources, Division of Land Resources (DLR) by letter dated January 21, 2011. This Completion Report summarizes construction activities and MACTEC's observations and testing results. Appendices contain results of laboratory and field tests. Two sets of Record Drawings and a Certificate of Completion are attached. This Completion Report and its attachments is to be submitted to DLR by Progress Energy.

CONSTRUCTION SUMMARY

Progress Energy notified Mr. Dan Sams of the Wilmington office of DLR that construction was to begin on February 11, 2011. Work commenced on that date. Progress Energy performed the work with internal forces and equipment under the supervision of Mr. Philip Bordeaux. Samples of proposed soil materials were obtained by MACTEC and approved for use. Laboratory test results are included in Attachment B. Mr. Tice met with Mr. Bordeaux on site and reviewed the planned work approach and details with the Progress work force prior to the start of work. Mr. Daniel Atkinson, L.G. and Mr. Chris Beals (MACTEC) were also present. After the plan review and a safety briefing, work began about 9:00 AM. Weather was cold and windy with occasional snow, sleet and rain showers.

Existing silt fencing remaining from the emergency repair in September, 2010 was inspected and found in acceptable condition. Some sections had slipped down the posts; these were re-tied. Loose materials and vegetation in the bottom and on the sides of the breach area were removed off with a bulldozer and a tracked bucket excavator. The bottom was rolled using a drum vibratory roller to create a firm base for further fill placement (Photo 1; photos are in Attachment A). The sides of the breach were roughly stepped and scarified to provide bonding of new and existing fill.

The planned geotextile was placed over the existing riprap plug slope (Photo 2). Sand was shoveled onto the riprap to provide a cushion for the geotextile. Sequential lifts of clay and sand approximately 12-inches thick were placed and compacted (Photo 3). A RamEx roller was used to compact the clay. The vibratory drum roller was used for the sand.

Slight changes were made in the surface completion for the road and crest. The thickness of aggregate base course was increased to 12 inches, the planned geogrid was replaced by the geotextile used elsewhere in the repairs, and available small concrete rubble material was used along with the aggregate base course (Photos 4 and 5). These changes were approved by Mr. Tice and are shown on the Record Drawings.

Work continued February 12 and was completed February 13, 2011. Weather on those days was sunny and cool to mild. Field testing those days was conducted by MACTEC representative Mr. Pete Worth.



MACTEC representatives were on site during all the work documenting the construction activities and performing soil density testing. Copies of the test reports are included in Appendix B. All field density test results showed compaction met the required values either initially or upon retest.

Mr. Tice returned to the site February 13, 2011 to observe the final stages of construction and inspect the completed work. Work was completed in a satisfactory manner and in accordance with the approved plans (Photo 6).

In addition to the breach filling, Progress Energy requested that the access ramp adjacent to the repair area be modified to flatten the side slope as it abutted into the dike repair. This work was not part of the planned dike repair; it is mentioned here as it was done simultaneously. The result was to create a flatter slope for portions of the repair area, which is acceptable from the performance standpoint.

Progress Energy personnel will spread a temporary seed mixture developed based on a soil test to provide cover until the spring when they plan an overall dike reseeding program.

Attachments:

- A – Photographs
- B – Laboratory Test Reports
- C – Field Density Test Reports
- D – Completion Certificate
- E – Record Drawings (4 sheets)

ATTACHMENT A
PHOTOGRAPHS



Photo 1. Breach bottom area after initial preparation.



Photo 2. Placing geotextile across riprap face of emergency plug.



Photo 3. Sand and clay fill nearing top of repair zone.



Photo 4. Placing geotextile in preparation for crest gravel.



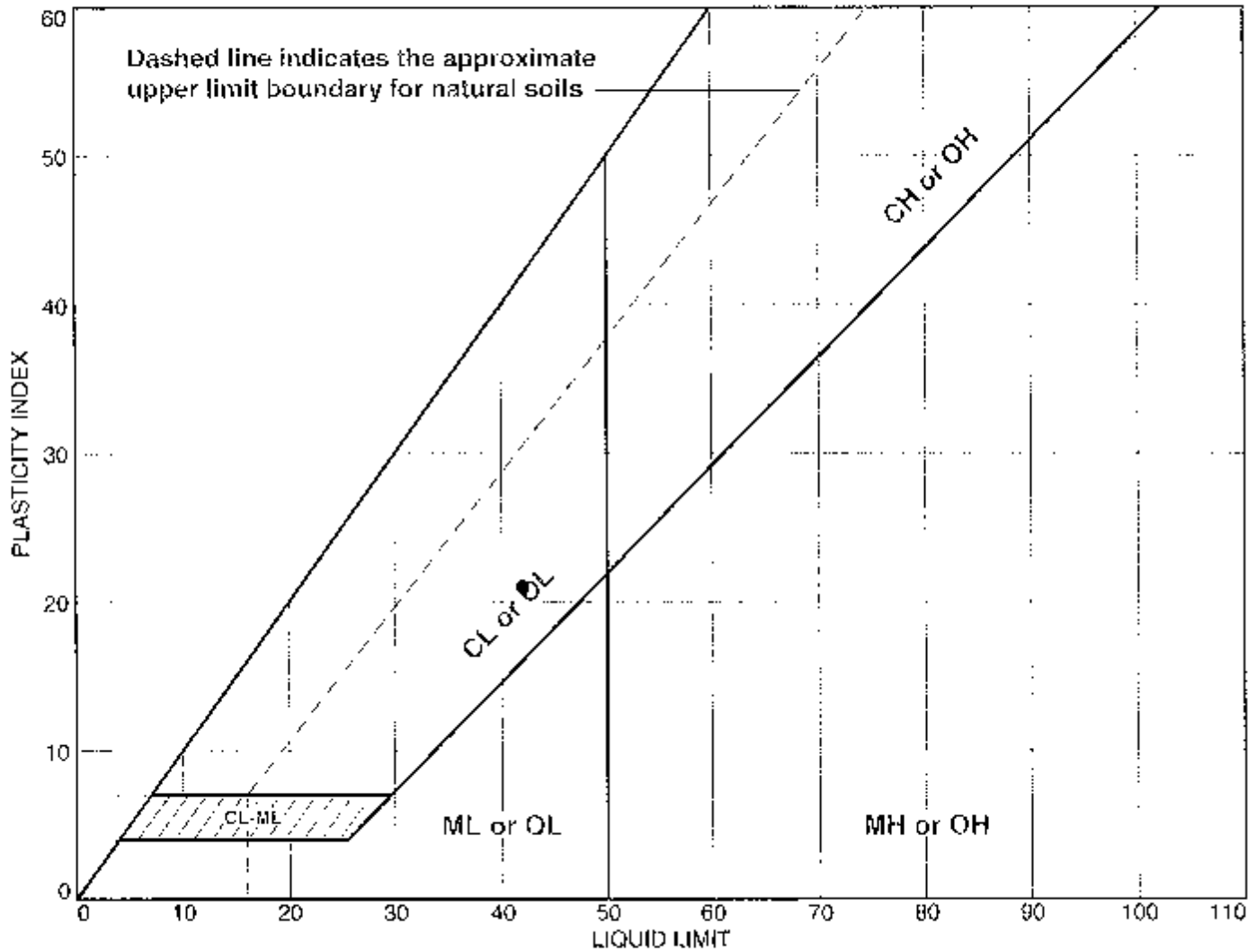
Photo 5. Crest at final grade.



Photo 6. Completed repair slope.

ATTACHMENT B
LABORATORY TEST RESULTS

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D2216-10, D4318-10 Method A



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
•	Boring B-1	11/035	Butk	ND	21	42	21	CL

Note: Electrical Control Valve Mills, P.1 S-2, previously used. Recheck for Section 10.

MACTEC Engineering and Consulting, Inc.

Client: Progress Energy

Project: Sutton Dike Repair

Raleigh, North Carolina

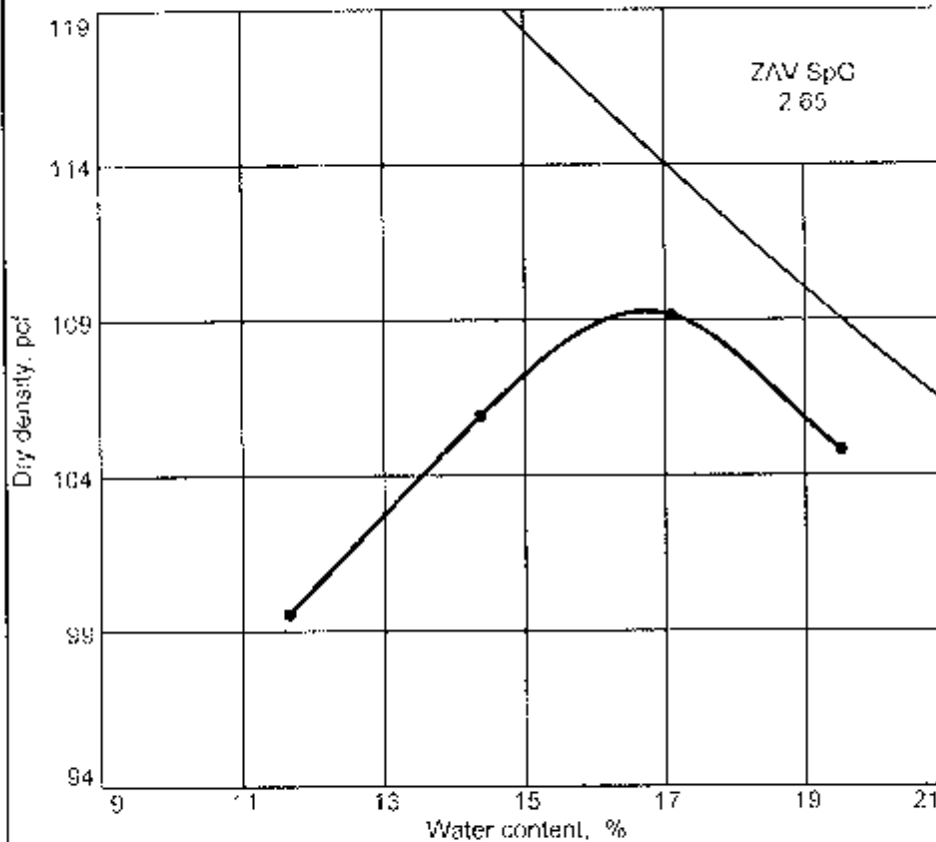
Project No.: 646811031201

Figure

Tested By: CS

Checked by [Signature]

COMPACTION TEST REPORT



Curve No.
10-017

Test Specification:

ASTM D 698-91 Procedure A Standard

Preparation Method Moist
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size 0.3333 cu.ft.

Test Performed on Material

Passing No. 4 Sieve

NM ND **LL** 44 **PI** 23

Sp.G. (ASTM D 854) ND

%>No.4 0.0 **%<No.200** 100

USCS SC **AASHTO** A-7-6(5)

Date Sampled 9/1/00

Date Tested 9/1/00

Tested By CS

TESTING DATA

	1	2	3	4	5	6
WM + WS	307.1	307.2	307.3	307.4		
WM	107.4	107.4	107.5	107.5		
WW + T #1	107.4	107.90	107.90	107.90		
WD + T #1	107.4	107.60	107.60	107.60		
TARE #1	307.10	307.10	307.10	307.10		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	16.7	16.7	16.7	16.7		
DRY DENSITY	107.4	107.9	107.9	107.9		

TEST RESULTS

Maximum dry density = 109.3 pcf

Optimum moisture = 16.7 %

Project No. 64681001-44 Client:

Project: Hope Mills Dam 2010

• Source: Hope Mills Sample No.: PR S-3 Elev./Depth: Bull.

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina

Material Description

Brown Clayey SAND

Remarks:

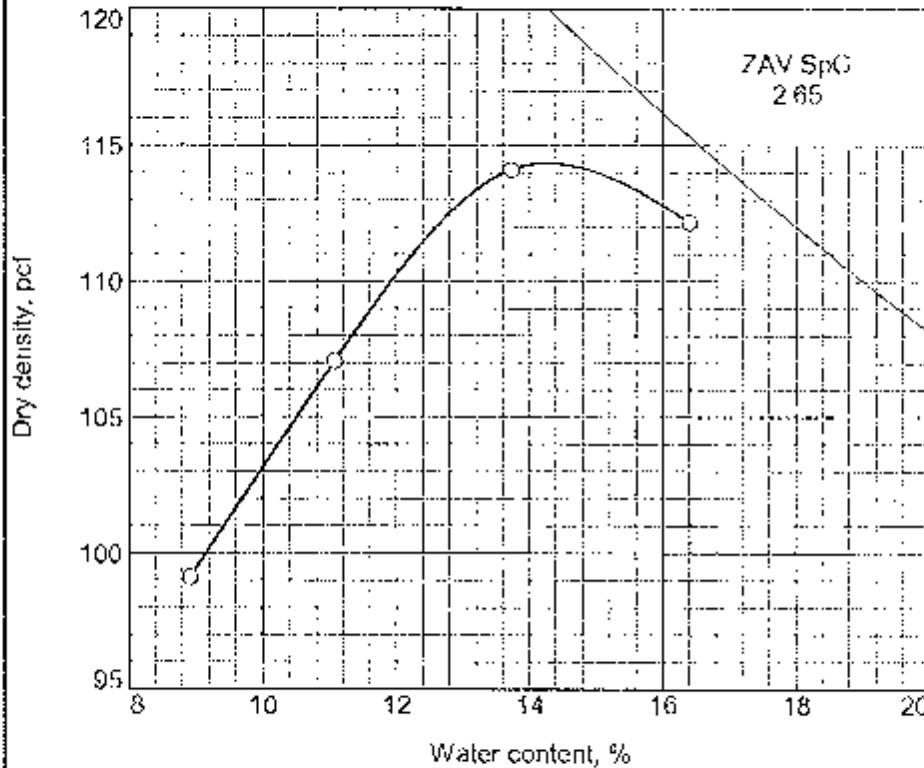
Checked by: TAM

Title: Senior Engineer

Figure

COMPACTION TEST REPORT

Curve No.
10/319-02



Test Specification:
ASTM D 698-07e1 Method A Standard

Preparation Method DRY
 Hammer Wt. 5.5 lb.
 Hammer Drop 12 in.
 Number of Layers three
 Blows per Layer 25
 Mold Size 0.03333 cu. ft.

Test Performed on Material
 Passing #4 Sieve

NM ND LL ND PI ND
 Sp.G. (ASTM D 854) ND
 %>#4 <5% %<No.200 ND
 USCS SC(vis) AASHTO ND

Date Sampled 12/5/2010

Date Tested 12/7/10

Tested By GS

TESTING DATA

	1	2	3	4	5	6
WM + WS	12.85	13.22	13.58	13.61		
WM	9.26	9.26	9.26	9.26		
WW + T #1	1896.2	2086.4	2206.1	2217.6		
WD + T #1	1766.1	1907.9	2010.5	1972.7		
TARE #1	307.6	294.6	294.2	295.5		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.9	11.1	13.7	16.4		
DRY DENSITY	99.1	107.1	114.4	112.2		

TEST RESULTS

Maximum dry density = 114.4 pcf

Optimum moisture = 14.3 %

Project No. 6458100144 Client: Mactec
 Project: Hope Mills Dam Emergency Repair

Sample Source: Import Fill Depth: n/a Sample No.: 10/319-02

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina

Material Description

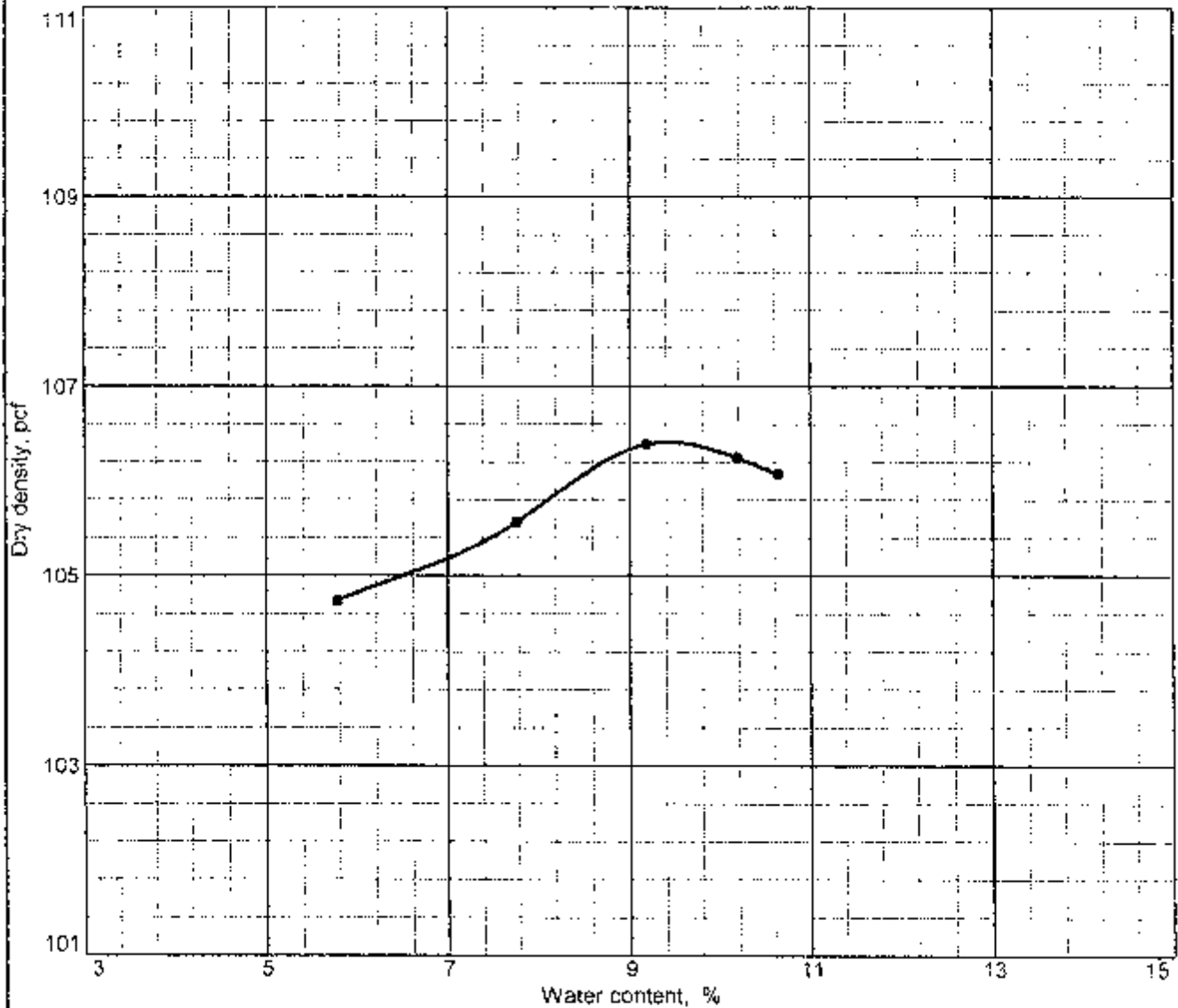
Reddish brown clayey SAND

Remarks:

Checked by: IAM
 Title: Senior Engineer

Figure 10/319-02

COMPACTION TEST REPORT - ASTM D698



Test specification: AASHTO T 99 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
	N/A	N/A	N/A	N/A	N/A	N/A	0.0	N/A

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 106.4 pcf Optimum moisture = 9.4 %	Brown Course Sand
Project No. 646810312 Client: Progress Energy Project: Backfill of Ash Pond <i>lake branch #2444</i> Location: Ditch Site <i>Stonington #2444</i>	Remarks: N/A
COMPACTION TEST REPORT - ASTM D698 LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.	

Plate

ATTACHMENT C
FIELD DENSITY TEST RESULTS

ATTACHMENT D
COMPLETION CERTIFICATE

COMPLETION CERTIFICATION

DIKE BREACH REPAIRS

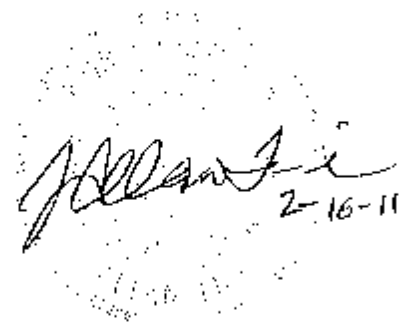
1984 ASH POND (NEWHA-005)

SUTTON PLANT

The work documented in the Completion Report dated February 16, 2011 and on the Record Drawings was performed in accordance with the approved plans and specifications and other requirements. The work was observed by Mr. J. Allan Tice, P. E. and his designated inspection personnel. A final inspection was performed by Mr. Tice on February 13, 2011, and the completed work was found to be satisfactory. Based on the engineering observations, the testing and the final inspection, the repaired dike section is safe with respect to slope stability failure to the best of my knowledge and belief.

Certificate Submitted By:

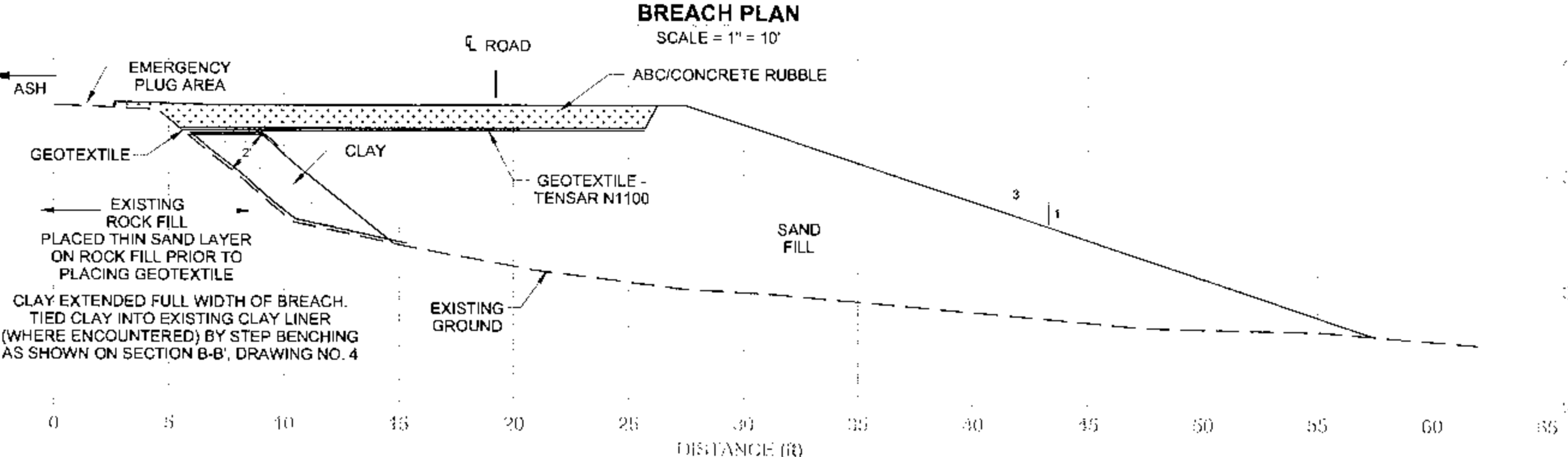
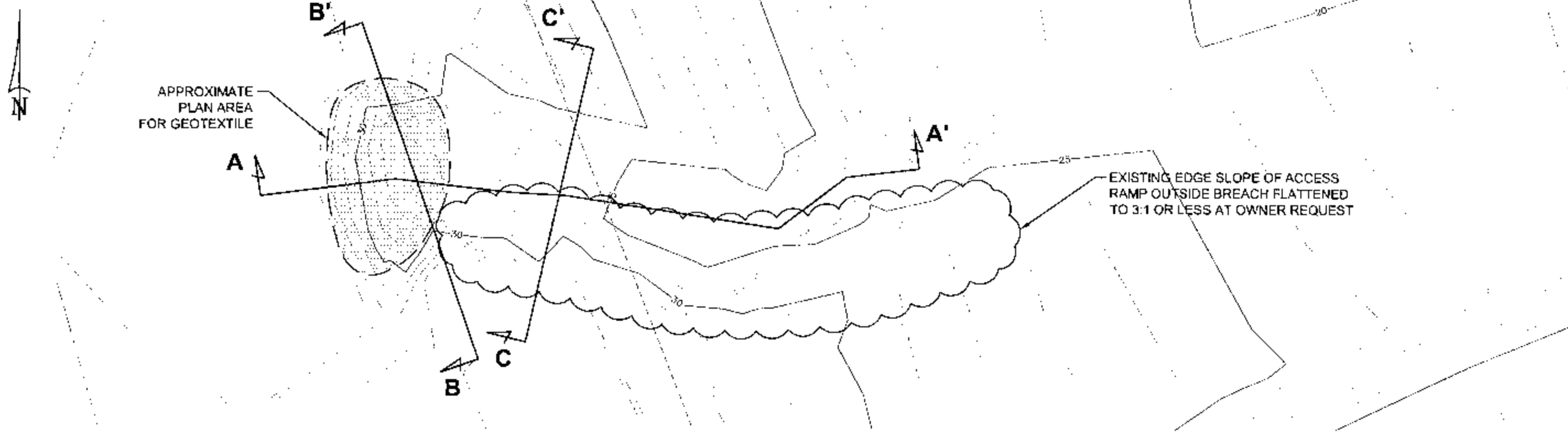
J. Allan Tice, P. E. (NC 6428)
Senior Principal Engineer
MACTEC Engineering and Consulting, Inc.



J. Allan Tice
2-16-11

ATTACHMENT E
RECORD DRAWINGS

Date: 16 Feb 2011 12:00pm
 Project: 6468-10-0025.04
 Drawing: BREACH PLAN AND PROFILE
 Scale: 1" = 10'
 Author: R.R.
 Check: R.R.
 Date: 2-16-11
 Title: BREACH PLAN AND PROFILE



RECORD DRAWING



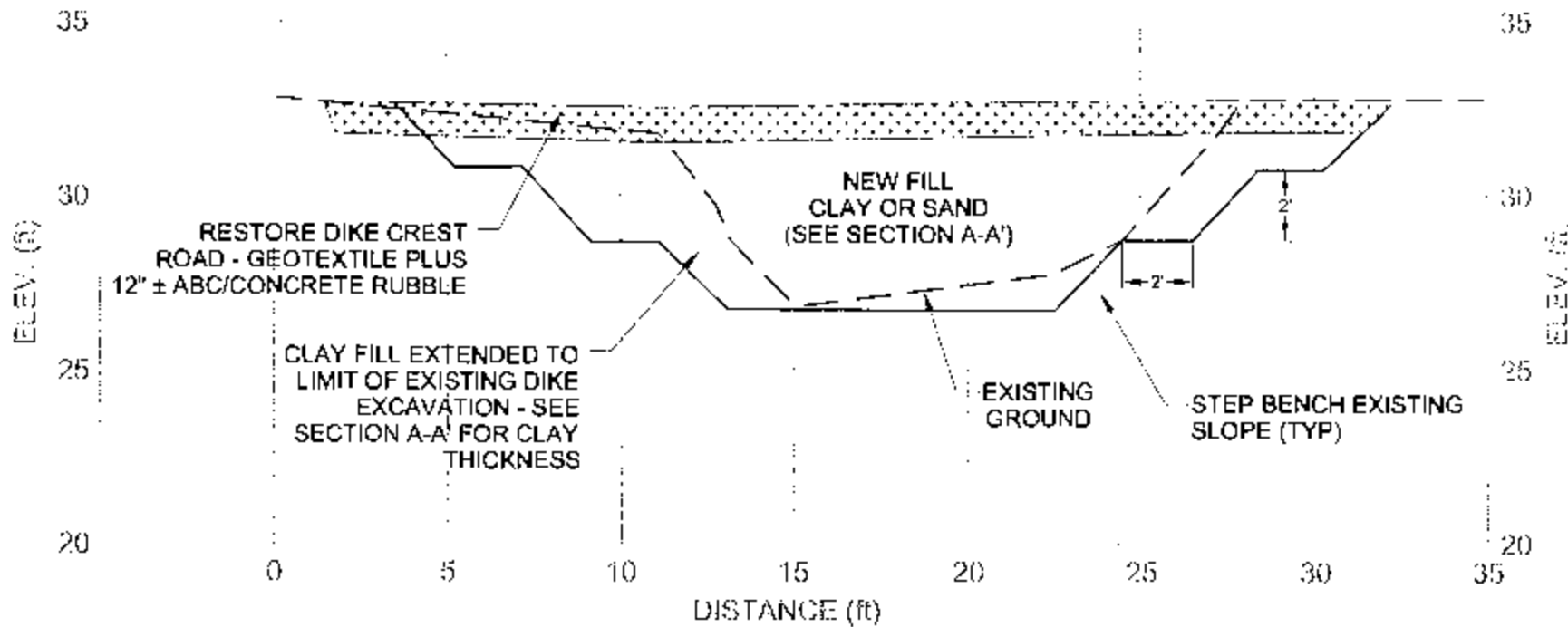
BREACH PLAN AND PROFILE
 1984 ASH POND DIKE (NEWHA-005)
 SUTTON PLANT
 WILMINGTON, NORTH CAROLINA



DRAWN:	R.R.	DATE:	FEBRUARY, 2011
ENG CHECK:	<i>R.R.</i>	SCALE:	AS SHOWN
APPROVAL:	<i>R.R.</i>	JOB No.:	6468-10-0025.04

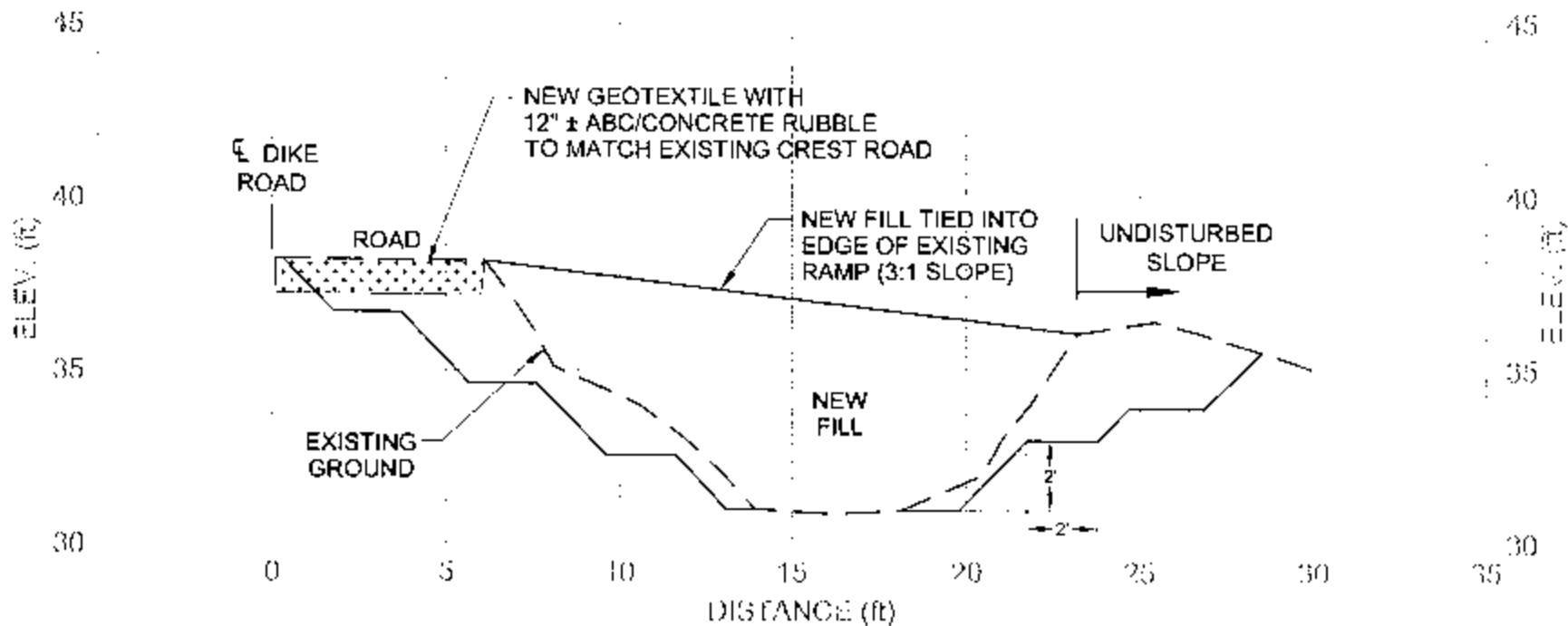
DRAWING
3

REFERENCE: SURVEY INFORMATION FROM MCKIM & CREED, 10-14-10.



SECTION B-B' (CUT PARALLEL TO DIKE CREST)

SCALE = 1" = 5'



SECTION C-C' (CUT PERPENDICULAR TO BREACH AXIS)

SCALE = 1" = 5'

CONSTRUCTION SEQUENCE:

1. REVIEW EXISTING SILT FENCE AND REPAIR AS NEEDED.
2. STRIP VEGETATIVE COVER AND SOFT/LOOSE SOILS FROM AREAS TO RECEIVE NEW FILL. DISPOSE OF STRIPPED MATERIAL IN AN OWNER-DESIGNATED LOCATION WITHIN THE EXISTING ASH STORAGE AREA.
3. PREPARE NEW FILL AREA BY CREATING STEP BENCHES IN EXISTING DIKE FILL AS SHOWN ON THE DRAWINGS. MATERIAL REMOVED TO CREATE STEP BENCHES MAY BE STOCKPILED AND REUSED IN DIKE FILLING WORK IF IT DOES NOT CONTAIN ORGANIC MATERIAL. OTHERWISE, DISPOSE OF REMOVED MATERIAL IN AN OWNER-DESIGNATED LOCATION WITHIN THE EXISTING ASH STORAGE AREA.
4. SUBMIT SAMPLES OF PROPOSED FILL MATERIAL TO ENGINEER FOR APPROVAL. AT LEAST TWO WEEKS IN ADVANCE OF START OF FILLING WORK.
5. PLACE AND COMPACT APPROVED FILL MATERIAL TO CLOSE THE DIKE BREACH AS SHOWN ON THE DRAWINGS.
6. AFTER APPROVAL OF FILL PLACEMENT WORK BY ENGINEER, PREPARE DIKE SLOPE SURFACE FOR SEEDING AND PERFORM SEEDING AS DESCRIBED ON THE DRAWINGS.
7. PLACE NEW GEOTEXTILE AND AGGREGATE BASE COURSE STONE/CONCRETE RUBBLE TO FORM CREST ROAD AS SHOWN ON THE DRAWINGS.
8. ALLOW INSPECTION OF COMPLETED WORK BY REPRESENTATIVES OF NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES, DIVISION OF LAND RESOURCES, DAM SAFETY.
9. AFTER ACCEPTANCE OF WORK BY ENGINEER AND DAM SAFETY, REMOVE EROSION AND SEDIMENT CONTROL MEASURES FROM THE SITE, IF DIRECTED BY OWNER.

MATERIAL AND PLACEMENT REQUIREMENTS:

1. FILL MATERIAL (CLAY): MATERIAL HAVING USCS DESCRIPTIONS OF CL, ML OR CH WITH LIQUID LIMIT BETWEEN 20 AND 60%, PLASTICITY INDEX BETWEEN 15 AND 30% AND >50% PASSING A NO. 200 SIEVE, OR AS APPROVED BY ENGINEER.
2. FILL MATERIAL (SAND): MATERIAL HAVING USCS DESCRIPTIONS OF SP, SM OR SC WITH NO MORE THAN 25% PASSING NO. 200 SIEVE, OR AS APPROVED BY ENGINEER.
3. PLACEMENT: NATURAL GROUND AT BASE OF EXCAVATION INSPECTED BY ENGINEER OR DESIGNATED REPRESENTATIVE AND COMPACTED AS REQUIRED TO FORM A FIRM BASE FOR NEW FILL. PLACE APPROVED FILL IN APPROXIMATE 12-INCH LOOSE LIFTS AND COMPACT WITH VIBRATORY ROLLER OR TAMPERS. COMPACT CLAY TO 92% OF STANDARD PROCTOR (ASTM D 698) MAXIMUM DRY DENSITY WITHIN MOISTURE RANGE OF OPTIMUM -2% TO OPTIMUM + 4%. COMPACT SAND TO 95% OF THE ABOVE STANDARD WITHIN A MOISTURE CONTENT RANGE OF +/- 2% OF OPTIMUM. ALLOW ENGINEER'S REPRESENTATIVE TO PERFORM FIELD DENSITY TESTS ON BEHALF OF OWNER.
4. FILTER FABRIC: TENSAR N1100 OR APPROVED SUBSTITUTE
5. CRUSHED STONE: NC DOT AGGREGATE BASE COURSE (ABC); CONCRETE RUBBLE ALSO USED.
6. GEOTEXTILE/STONE PLACEMENT: LAY OUT GEOTEXTILE OVER AREA OF DIKE CREST ROAD AND PULL TAUT. PLACE APPROXIMATELY 12" OF ABC OVER GEOTEXTILE AND COMPACT WITH VIBRATORY ROLLER TO A GENERALLY DENSE CONDITION. FIELD DENSITY TESTING IS NOT REQUIRED. ADD ADDITIONAL THICKNESS OF CONCRETE RUBBLE AS DESIRED.
7. SEEDING: SEEDING: SPREAD INITIAL SEED MIX (COASTAL WINTER SLOPEMASTER) CONSISTING OF 20% UNHULLED SAHARA BERMUDA, 25% UNHULLED SERICEA LESPEDEZA, 20% GREYSTONE TALL FESCUE, 10% PENSACOLA BAHIA GRASS, 10% DURANA WHITE CLOVER, 10% RYE GRAIN AND 5% WEEPING LOVEGRASS AT RATE OF 75 TO 100 POUNDS PER ACRE. AREA TO BE RESEEDED IN SPRING WHEN PLANNED DIKE SLOPE SEEDING IS DONE.

RECORD DRAWING



SECTIONS
1984 ASH POND DIKE (NEWHA-005)
SUTTON PLANT
WILMINGTON, NORTH CAROLINA



DRAWN:	R.R.	DATE:	FEBRUARY, 2011	DRAWING 4
ENG CHECK:	<i>[Signature]</i>	SCALE:	AS SHOWN	
APPROVAL:	<i>[Signature]</i>	JOB No.:	6468-10-0025.04	

REFERENCE:



North Carolina Department of Environment and Natural Resources
Division of Land Resources
Land Quality Section

James D. Simons, PG, PE
Director and State Geologist

Beverly Eaves Perdue, Governor
Dee Freeman, Secretary

March 8, 2011

Mr. J. Mark Frederick, Plant Manager
801 Sutton Steam Plant Road
Goldsboro, NC 27530

RE: Sutton 1984 Ash Pond Dam
New Hanover County
State Dam ID: NEWHA-005

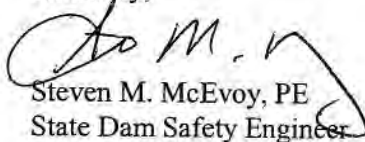
Dear Mr. Frederick:

This is to acknowledge receipt of your "as-built" for repair submittal and application for impoundment dated February 24, 2011, for the subject dam. The submittal was received in our office on February 28, 2011.

Applications for Approval to Impound require a comprehensive field inspection by our Regional Office staff. Upon completion of the field inspection and confirmation by our field staff that the dam has been constructed in accordance with the approved plan and as reported in the as-built submittal, our office will issue Approval to Impound. If significant discrepancies are found to exist, revisions may be required before Approval to Impound can be issued. We endeavor to respond to applications within 60 days of receipt of the application.

Please contact Mr. Dan Sams, P.E., Regional Engineer, Land Quality Section, 127 Cardinal Drive, Wilmington, North Carolina 28405, telephone number (910) 796-7215, or me at telephone number (919) 733-4574 should you have any questions concerning this matter.

Sincerely,



Steven M. McEvoy, PE
State Dam Safety Engineer
Land Quality Section

SMM/rdk

cc: Mr. J. Allen Tice, PE, Design Engineer
Mr. Fred Holt, Progress Energy
Mr. Dan Sams, PE, Land Quality Regional Engineer
Surface Water Protection Supervisor

Filename: NEWHA-005_20110308_RECT-As-Built Repair_Sutton 1984 Ash Pond



Site Name: PEC LV SUTTON Date: 2/17/2011
 Unit Name: 1971 Ash Pond (In-Active) Operator's Name: Kent Tyndall
 Unit I.D.: _____ Hazard Potential Classification: High Significant **Low**
 Inspector's Name: Michael Hannon + Justin Hory - Drewberry

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?		<input checked="" type="checkbox"/>	18. Sloughing or bulging on slopes?		<input checked="" type="checkbox"/>
2. Pool elevation (operator records)?		<input checked="" type="checkbox"/>	19. Major erosion or slope deterioration?		<input checked="" type="checkbox"/>
3. Decant inlet elevation (operator records)?		<input checked="" type="checkbox"/>	20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		<input checked="" type="checkbox"/>	Is water entering inlet, but not exiting outlet?		<input checked="" type="checkbox"/>
5. Lowest dam crest elevation (operator records)?		<input checked="" type="checkbox"/>	Is water exiting outlet, but not entering inlet?		<input checked="" type="checkbox"/>
6. If instrumentation is present, are readings recorded (operator records)?		<input checked="" type="checkbox"/>	Is water exiting outlet flowing clear?	<input checked="" type="checkbox"/>	
7. Is the embankment currently under construction?		<input checked="" type="checkbox"/>	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		<input checked="" type="checkbox"/>	From underdrain?		<input checked="" type="checkbox"/>
9. Trees growing on embankment? (if so, indicate largest diameter below)	<input checked="" type="checkbox"/>		At isolated points on embankment slopes?		<input checked="" type="checkbox"/>
10. Cracks or scarps on crest?		<input checked="" type="checkbox"/>	At natural hillside in the embankment area?		<input checked="" type="checkbox"/>
11. Is there significant settlement along the crest?		<input checked="" type="checkbox"/>	Over widespread areas?		<input checked="" type="checkbox"/>
12. Are decant trashracks clear and in place?	<input checked="" type="checkbox"/>		From downstream foundation area?		<input checked="" type="checkbox"/>
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		<input checked="" type="checkbox"/>	"Boils" beneath stream or ponded water?		<input checked="" type="checkbox"/>
14. Clogged spillways, groin or diversion ditches?		<input checked="" type="checkbox"/>	Around the outside of the decant pipe?		<input checked="" type="checkbox"/>
15. Are spillway or ditch linings deteriorated?		<input checked="" type="checkbox"/>	22. Surface movements in valley bottom or on hillside?		<input checked="" type="checkbox"/>
16. Are outlets of decant or underdrains blocked?		<input checked="" type="checkbox"/>	23. Water against downstream toe?	<input checked="" type="checkbox"/>	
17. Cracks or scarps on slopes?		<input checked="" type="checkbox"/>	24. Were Photos taken during the dam inspection?	<input checked="" type="checkbox"/>	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
9.	Trees + shrubs present on bank adjacent to canal. Removal being coord. w/ NC DENR due to env. concerns.
23.	One side of impoundment abuts a canal leading to the cooling pond. Slope is stable.



Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # NC 0001422
Date 2/17/2011

INSPECTOR Dewberry

Impoundment Name 1971 Ash Pond (clm - active)
Impoundment Company Progress Energy
EPA Region IV
State Agency (Field Office) Address _____

Name of Impoundment _____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update

Is impoundment currently under construction? _____
Is water or cww currently being pumped into the impoundment?

Yes _____ No

IMPOUNDMENT FUNCTION: Receives Coal pile runoff only - former ash pond. ^{and plant stormwater}

Nearest Downstream Town : Name Wilmington
Distance from the impoundment 2.4 mi

Impoundment Location: Longitude W 77.992 Degrees _____ Minutes _____ Seconds _____
Latitude N 34.293 Degrees _____ Minutes _____ Seconds _____
State NC County New Hanover

Does a state agency regulate this impoundment? YES NO _____

If So Which State Agency? NC DENR Dam Safety + Division of Water Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

✓ _____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

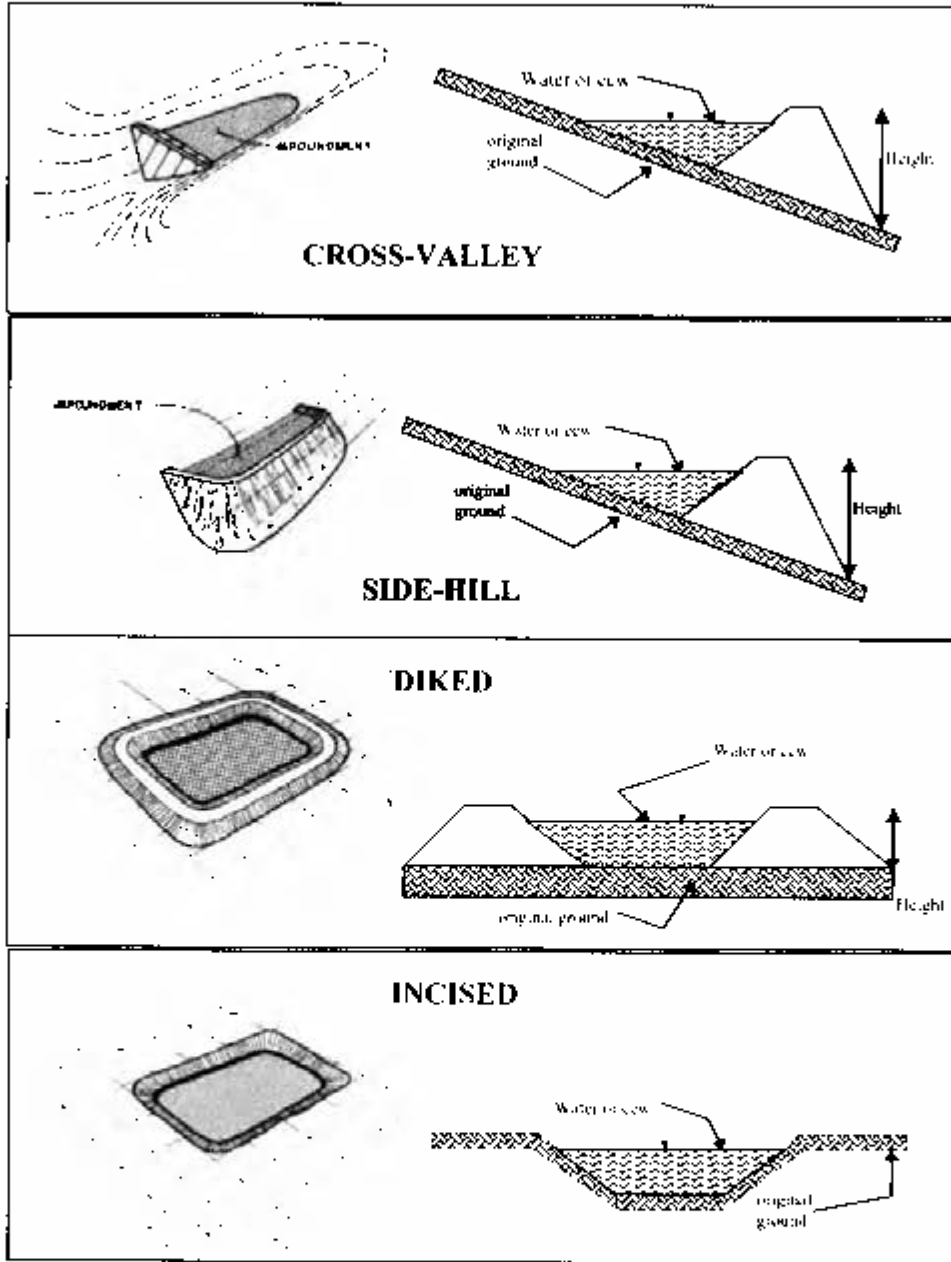
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

*Diked impoundment is contained on PEC property.
No residential or commercial property nearby. Only
potential is for environmental damage to man-made
canal and/or cooling pond.*

CONFIGURATION:



- Cross-Valley
- Side-Hill
- Diked
- Incised (form completion optional)
- Combination Incised/Diked

Embankment Height 24 feet Embankment Material Native Soil
 Pool Area N/A acres Liner N/A
 Current Freeboard 4 feet Liner Permeability N/A

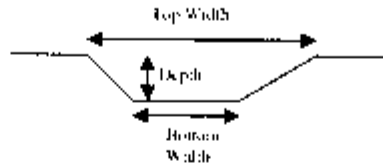
TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

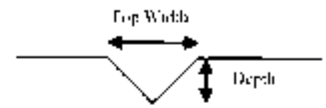
- Trapezoidal
- Triangular
- Rectangular
- Irregular

- depth
- bottom (or average) width
- top width

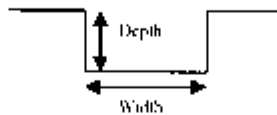
TRAPEZOIDAL



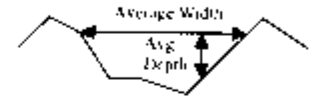
TRIANGULAR



RECTANGULAR



IRREGULAR

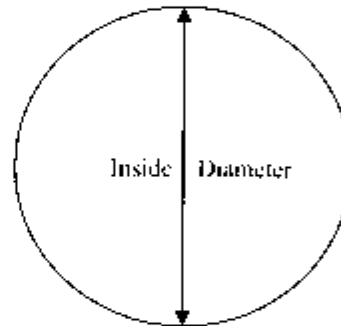


1 **Outlet**

48" inside diameter

Material

- corrugated metal
- welded steel
- concrete *w/welded steel spinner*
- plastic (hdpe, pvc, etc.)
- other (specify) _____



Is water flowing through the outlet? YES NO

N/A **No Outlet**

N/A **Other Type of Outlet (specify)** _____

The Impoundment was Designed By Brown & Root in 1971,
Dickerson raised Ash Pond in 1983



Site Name: PEC LV SUTTON Date: 2/17/2011
 Unit Name: 1984 Ash Pond Operator's Name: Kent Tyndall
 Unit I.D.: _____ Hazard Potential Classification: High Significant (Low)

Inspector's Name: Michael Hanson + Justin Story - Dewberry

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

		Yes	No			Yes	No
1. Frequency of Company's Dam Inspections?	<u>ANNUAL</u> <u>5 YR</u>			18. Sloughing or bulging on slopes?			<input checked="" type="checkbox"/>
2. Pool elevation (operator records)?	<u>26 MSL</u>			19. Major erosion or slope deterioration?			<input checked="" type="checkbox"/>
3. Decant inlet elevation (operator records)?	<u>26 MSL</u>			20. Decant Pipes:			
4. Open channel spillway elevation (operator records)?	<u>N/A</u>			Is water entering inlet, but not exiting outlet?			<input checked="" type="checkbox"/>
5. Lowest dam crest elevation (operator records)?	<u>34 MSL</u>			Is water exiting outlet, but not entering inlet?			<input checked="" type="checkbox"/>
6. If instrumentation is present, are readings recorded (operator records)?	<u>N/A</u>			Is water exiting outlet flowing clear?	<input checked="" type="checkbox"/>		
7. Is the embankment currently under construction?		<input checked="" type="checkbox"/>		21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):			
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?			<u>N/A</u>	From underdrain?			<u>N/A</u>
9. Trees growing on embankment? (If so, indicate largest diameter below)		<input checked="" type="checkbox"/>		At isolated points on embankment slopes?			<input checked="" type="checkbox"/>
10. Cracks or scarps on crest?		<input checked="" type="checkbox"/>		At natural hillside in the embankment area?			<input checked="" type="checkbox"/>
11. Is there significant settlement along the crest?		<input checked="" type="checkbox"/>		Over widespread areas?			<input checked="" type="checkbox"/>
12. Are decant trashracks clear and in place?	<input checked="" type="checkbox"/>			From downstream foundation area?			<input checked="" type="checkbox"/>
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		<input checked="" type="checkbox"/>		"Boils" beneath stream or ponded water?			<input checked="" type="checkbox"/>
14. Clogged spillways, groin or diversion ditches?		<input checked="" type="checkbox"/>		Around the outside of the decant pipe?			<input checked="" type="checkbox"/>
15. Are spillway or ditch linings deteriorated?		<input checked="" type="checkbox"/>		22. Surface movements in valley bottom or on hillside?			<input checked="" type="checkbox"/>
16. Are outlets of decant or underdrains blocked?		<input checked="" type="checkbox"/>		23. Water against downstream toe?			<input checked="" type="checkbox"/>
17. Cracks or scarps on slopes?		<input checked="" type="checkbox"/>		24. Were Photos taken during the dam inspection?	<input checked="" type="checkbox"/>		

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # _____ Comments _____

5. Trench diked interior to primary dike-crest @ 42 MSL w/ normal pool @ 40 MSL. River discharged to primary dike interior.

11. a) 2 areas of minor depression require normal maintenance
b) 1 structural surface erosion may necess ramp scheduled for repair.
c) 3 varment holes noted active maintenance programs underway.



Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # NC0011422
Date 2/17/2011

INSPECTOR D. Berry

Impoundment Name 1984 Ash Pond
Impoundment Company Progress Energy
EPA Region IV
State Agency (Field Office) Address _____

Name of Impoundment _____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update

	Yes	No
Is impoundment currently under construction?	_____	<input checked="" type="checkbox"/>
Is water or cew currently being pumped into the impoundment?	<input checked="" type="checkbox"/>	_____

IMPOUNDMENT FUNCTION: Receives Fly + Bottom ash from all active units

Nearest Downstream Town : Name Wilmington
Distance from the impoundment 2.4 mi

Impoundment Location: Longitude W 77.992 Degrees _____ Minutes _____ Seconds _____
Latitude N 34.293 Degrees _____ Minutes _____ Seconds _____
State NC County New Hanover

Does a state agency regulate this impoundment? YES NO _____

If So Which State Agency? NC DENR Dam Safety + Division of Water Quality

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

✓ _____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

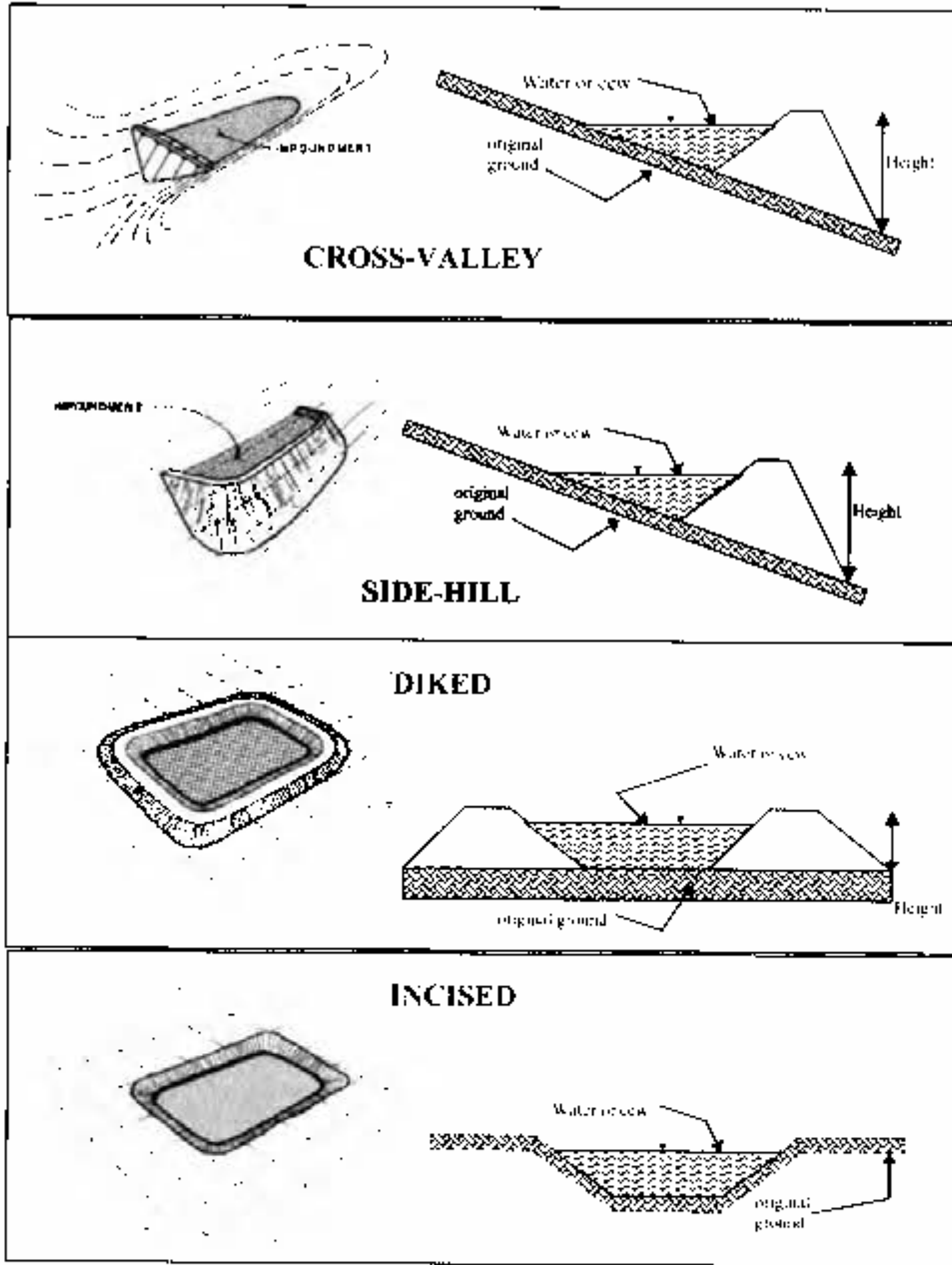
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_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Diked impoundment is contained on PIC property. No residential or commercial property nearby. Only potential is for environmental damage to Swan Creek canal and/or cooling pond.

CONFIGURATION:



- Cross-Valley
- Side-Hill
- Diked
- Incised (form completion optional)
- Combination Incised/Diked

Embankment Height 30 feet Embankment Material Natural Soil
 Pool Area 82 acres Liner Clay
 Current Freeboard 8 feet Liner Permeability 1×10^{-7} cm/sec

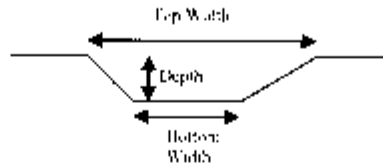
TYPE OF OUTLET (Mark all that apply)

N/A **Open Channel Spillway**

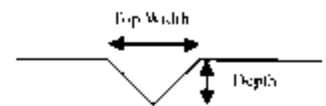
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- depth
- bottom (or average) width
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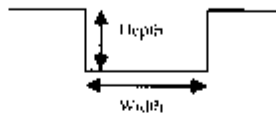
TRAPEZOIDAL



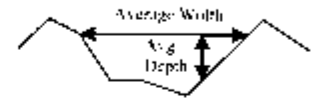
TRIANGULAR



RECTANGULAR



IRREGULAR

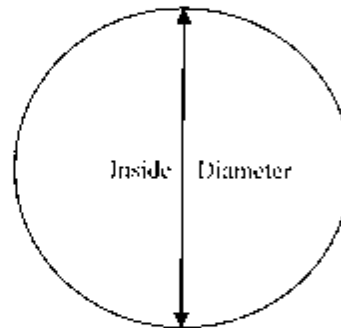


1 **Outlet**

48" inside diameter

Material

- corrugated metal
- welded steel
- concrete w/ welded steel skimmer
- plastic (hdpe, pvc, etc.)
- other (specify) _____



Is water flowing through the outlet? YES NO

N/A **No Outlet**

N/A **Other Type of Outlet** (specify) _____

The Impoundment was Designed By Lindsay and Associates
+ C.P&L staff

Has there ever been a failure at this site? YES NO

If So When? Sept. 2010

If So Please Describe : Overflow of interior dikes during
unusual local rainfall of approximately 20 inches
caused to minor overflow of primary dike
leading to down cut erosion to dike exterior.
Ash was contained on site. Dike has been
repaired under observation and approval of
NCDENR. Repair Report will accompany
full Report on this assessment.

