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Coal Combustion Waste Impoundment

Round 5 - Dam Assessment Report

Jefferies Generating Station (Site # 002)

Santee Cooper
Moncks Corner, South Carolina

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727
July 2010

INTRODUCTION, SUMMARY, CONCLUSION AND RECOMMENDATIONS

The release of over five million cubic yards of coal ash from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land, damaging homes and property, is a wake-up call for diligence on coal combustion waste disposal units. A first step to prevent such catastrophic failure and damage is to assess the stability and functionality of ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the Jefferies Generating Station coal combustion waste (CCW) management units is based on a review of available documents and on the site assessment conducted by Dewberry personnel on June 29, 2010. We found the supporting technical information to be limited (Section 1.1.3). As detailed in Section 1.2 there are several recommendations that may help to maintain a safe and trouble-free operation.

In summary, the Jefferies Generating Station Ash Pond A is rated **POOR** and Ash Pond B is rated **FAIR** for continued safe and reliable operation. These ratings reflect the lack of critical engineering data for the dams that impound these CCW ponds.

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 units) 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 impoundment contents. 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 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 March 2009, the EPA sent 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 waste. 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.

EPA asked utility companies to identify all management units, such as surface impoundments or similar diked or bermed structures and landfills receiving liquid-borne materials, that store or dispose of coal-combustion residuals or by-products, including, but not limited to, fly ash, bottom ash, boiler slag, and flue gas emission control residuals. Utility companies responded with information on the size, design, age, and the amount of material placed in the units so that EPA could gauge which management units had or potentially could rank as having High Hazard Potential. The USEPA and its contractors used the following definitions for this study:

> "Surface Impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling and aeration pits, ponds, and lagoons."
>
> For this study, the earthen materials could include coal combustion residuals. EPA did not provide an exclusion for small units based on whether the placement was temporary or permanent. Furthermore, the study covers not only waste units designated as surface impoundments, but also other units designated as landfills which receive free liquids.
>
> EPA is addressing any land-based units that receive fly ash, bottom ash, boiler slag, or flue gas emission control wastes along with free liquids. If the landfill is receiving coal combustion wastes with liquids limited to that for proper compaction, then there should not be free liquids present and the EPA did not seek information on such units which are appropriately designated a landfill.
>
> In some cases coal combustion wastes are separated from the water, and the water containing de minimus levels of fly ash, bottom ash, boiler slag, or flue gas emission control wastes are sent to an impoundment. EPA is including such impoundments in this study, because chemicals of concern may have leached from the solid coal combustion wastes into the waster waters, and the suspended solids from the coal combustion wastes remain.

The purpose of this report is to evaluate the condition and potential of waste release from **management units that have not been rated for hazard potential classification**. A two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit potential hazard classification (if any) and accepted information provided via telephone communication with a management unit representative.

This evaluation included a site visit. EPA sent two engineers, one licensed in the State of South Carolina, for a one-day visit. The two-person team met with the technical and management representatives of the management unit(s) to discuss the engineering characteristics of the unit as part of the site visit. During the site visit the team collected additional information about the management unit(s) to be used in determining the hazard potential classifications of the management unit(s). Subsequent to the site visit the management unit owner provided additional engineering data pertaining to the management unit(s).

Factors considered in determining the hazard potential classification of the management unit(s) included the age and size of the impoundment, that quantity of coal combustion residuals or by-products that were stored or disposed in the 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). The team considered criteria in evaluating the dams under the National Inventory of Dams in making these determinations.

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 waste 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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TABLE OF CONTENTS

TEXT PHOTOS

DRAFT

APPENDICES

APPENDIX A - REFERENCE DOCUMENTS

Doc 1.1: Jefferies Generating Station Vicinity Map
Doc 1.2: Jefferies Generating Station Jefferies GIS 2006 Aerial
Doc 1.3: Impoundment Drawing 4007-0A
Doc 1.4: Impoundment Drawing AP001-1
Doc 1.5: Boring Log for Pinopolis Tail Canal
Doc 1.6: 2005-2009 Ash Management and Sales
Doc 1.7: Jefferies Generating Station Regional Map Showing the Management Unit(s) in Relationship to Critical Infrastructure
Doc 1.8: NPDES Permit
Doc 1.9: Dike Inspection Procedure
Doc 1.10: Dike Inspection Reports
Doc 1.11: Staff Gauge Readings

APPENDIX B - FIELD OBSERVATION CHECKLISTS

Ash Pond A Dam
Ash Pond B Dam

APPENDIX C - MISCELLANEOUS NOTES AND CORRESPONDENCE

Management of Change Procedure
BMP and EMS Manual Coversheets
Items Requested

1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from the one-day site visit and review of technical and historical documentation provided by Santee Cooper.

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

Ash Pond A Dam and Ash Pond B Dam – No stability analyses of the embankment dams were provided for review, though requested by EPA; presumably such analyses were not available in Santee Cooper's files. On the basis of Dewberry engineers' visual observations and review of limited available information, the embankment dams probably have adequate stability under static loading conditions. See Dewberry's assessment in Section 7.3. Although not critical, it would be advisable for Santee Cooper to verify static stability of the perimeter dike impounding Ash Pond A and Ash Pond B. A strong earthquake is possible in the area. The stability of the dams during strong earthquake is unknown, but the low dam heights, apparent absence of poor foundation soil conditions, and satisfactory static stability performance over 40 years of service are favorable indications that the dams may perform satisfactorily during earthquake. Because of the generally low consequences of failure of these dams, performing detailed seismic stability analyses and liquefaction studies does not appear to be warranted at this time. The outlet structures appear to be in sound and stable condition with no visual evidence of significant deterioration; they should be satisfactory for continued service.

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

Ash Pond A Dam and Ash Pond B Dam – No hydrologic/hydraulic analyses of the ash basins were provided for review, though requested by EPA; presumably such analyses were not available in Santee Cooper's files. On the basis of the 40-year experience record in which there have been no apparent issues with safe containment of water in the basins during significant flooding events, the ash ponds are believed to have substantial hydrologic/hydraulic safety. However, the hydrologic/hydraulic safety should be verified in the near future by documented analysis.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

Supporting technical documents are limited. The original design documentation is limited to one drawing and does not entirely reflect visual observations in the field. No other technical documentation about the design of the existing facility is available. Technical documents to verify the adequacy of the pond storage, outlet structures, and structural stability of the embankments are not available.

The supporting hydrologic/hydraulic documentation for the ash ponds available for review is considered inadequate at this time. Santee Cooper should review and document how apparent off-site drainage is handled and perform analysis as required to document hydrologic safety of the ash ponds.

The lack of supporting structural stability documentation is a concern until studies can be performed.

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

Ash Pond A Damand Ash Pond B Dam - Descriptions provided are appropriate and sufficient.

1.1.5 Conclusions Regarding the Field Observations

Ash Pond A Dam and Ash Pond B Dam – The embankment dams appear well maintained, safe, and structurally sound. There are no apparent indications of any unsafe conditions. The visible parts of the embankment dams and outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability, although visual observations of the spoil bank were severely hampered by the presence of thick vegetation and lack of accessibility. No seepage was observed.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Ash Pond A Dam and Ash Pond B Dam - Maintenance and methods of operation are adequate. There was no evidence of repaired embankments or prior releases observed during the field assessment.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

Ash Pond A Dam and Ash Pond B Dam – The surveillance program is generally adequate. The informal daily drive-by inspections by plant personnel and quarterly formal internal inspections by Santee Cooper engineers are of sufficient frequency and should continue. Informal visual inspections of the spoil bank along the Tailrace Canal are currently conducted from a boat by plant personnel but have been undocumented; these inspections should be performed at a frequency of at least once per quarter and should be documented. Internal inspection of the outlet structures should be performed at a frequency of at least once every 5 years and documented. There is no dam monitoring program in place that includes such instruments as observation wells/piezometers, settlement monitoring points, inclinometers, seepage monitoring points, etc. Such monitoring instruments do not appear to be warranted for these low dams at this time. A program of groundwater quality monitoring and pond discharge monitoring is in place and will continue in accordance with SCDHEC Bureau of Water/Compliance Assurance Division permit requirements.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

Ash Pond A Dam and Ash Pond B Dam – In accordance with EPA criteria Ash Pond A is rated POOR and Ash Pond B is rated FAIR for continued safe and reliable operation. These ratings are influenced by the lack of critical engineering data for the dams that impound these CCW ponds. Implementation of recommendations as presented below would help improve the rating.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

Ash Pond A Dam and Ash Pond B Dam – None appear warranted at this time to satisfy a critical need; however, to eliminate concern about the lack of documentation, it is advised that Santee Cooper perform at least simplified, but conservative, documented analyses to verify static stability of the perimeter dike impounding Ash Pond A and Ash Pond B.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

Ash Pond A Dam and Ash Pond B Dam – It is recommended that Santee Cooper review and document how the apparent off-site drainage toward Ash Pond A is handled and perform hydrologic/hydraulic analysis as may be required to document that the basins can safely store and pass the appropriate design flood.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

Ash Pond A Dam and Ash Pond B Dam – Provide documentation as recommended above in Subsections 1.2.1 and 1.2.2.

1.2.4 Recommendations Regarding the Description of the Management Unit(s)

Ash Pond A Dam and Ash Pond B Dam – None appear warranted at this time.

1.2.5 Recommendations Regarding the Field Observations

Ash Pond A and Ash Pond B Dam – None appear warranted at this time.

1.2.6 Recommendations Regarding the Maintenance and Methods of Operation

Ash Pond A Dam and Ash Pond B Dam – None appear warranted at this time.

1.2.7 Recommendations Regarding the Surveillance and Monitoring Program

Ash Pond A Dam and Ash Pond B Dam – In addition to the informal inspections of the spoil bank from a boat along the Tailrace Canal, it is recommended that more detailed inspections along the spoil bank be performed at least once per quarter and be documented by a written report or checklist. It is further recommended that internal inspection of the outlet structures be performed at a frequency of at least once every 5 years and be documented with a written report.

1.2.8 Recommendations Regarding Continued Safe and Reliable Operation

Ash Pond A Dam and Ash Pond B Dam – No additional recommendations for continued safe and reliable operation appear warranted at this time, other than to periodically review downstream changes that may alter the hazard potential classification or assessment of the consequences of failure of the dams.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

*Fred Tucker, Dewberry
*Anne Lee, Dewberry
Mike Lankford, Santee Cooper
*Denise Bunte-Bisnett, Santee Cooper
*Jane Hood, Santee Cooper
*William Perry, Santee Cooper
*Gaylene Allen, Santee Cooper

*Participated in field dam inspections.

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1.3.2 Acknowledgement and Signature

We acknowledge that the management units referenced herein have been assessed on June 29, 2010.

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Frederic C. Tucker, PE
Registered, SC 6836

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Anne Lee, Civil Engineer

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

2.1 LOCATION AND GENERAL DESCRIPTION

The Jefferies Generating Station (Jefferies GS) is physically located on the east bank of the Tailrace Canal below (south of) the Pinopolis Dam in Berkeley County, South Carolina, approximately 0.8 miles northeast of Moncks Corner. The Jefferies GS is located on Powerhouse Road, Moncks Corner, South Carolina 29461-4306. Lake Moultrie is immediately upstream of Jefferies Generating Station. See Appendix A – Doc 1.1 for location of the Jefferies GS on an aerial map.

The Jefferies GS has two basins in series, which are used for managing coal combustion waste (CCW) and are designated as Ash Pond A (north pond) and Ash Pond B (south pond). The impoundment, formed by a perimeter side-hill dike around the east and south sides, is divided into the two separate units (Ash Ponds A and B) by an internal cross dike. The perimeter dike and cross dike tie into a massive spoil bank on the west side of the basins; the spoil bank was created by dredging of the Tailrace Canal in the 1940s. The spoil bank is typically some 20 feet higher than the ash pond dikes. The east perimeter dike ties into high ground on the north northeast side of Ash Pond A. The power plant is situated on high ground on the north northwest side of Ash Pond A; a Seaboard Coast Line railroad embankment lies between the north end of Ash Pond A and the coal pile at the plant. The ash ponds were essentially developed within a natural ravine and low, swampy area wedged between the spoil bank on the west and high ground to the east, which is much higher than the ash pond dikes. The low, swampy area (Biggin Swamp) extends south from the Ash Pond B perimeter dike. (Note: The terms “dike” and “dam” are used interchangeably in this report, as are the terms “pond” and “basin.”)

Ash Pond A is active and receives fly ash, bottom ash, and boiler slag from coal-fired units at the Jefferies GS. Ash Pond B receives water from Ash Pond A through gravity flow; it serves principally as a “polishing pond” and doesn’t directly receive sluiced ash. See Appendix A – Doc 1.2 for relative locations of the basins on an aerial view map of the Jefferies GS.

Ash Pond A has a surface area of approximately 127 acres. This pond is contained by the high spoil bank on the west side, high ground spanning the northwest to northeast sides, a relatively short section of perimeter dike along the southeast side, and the cross dike on the south side. According to a furnished drawing (Appendix A – Doc 1.3), the design top elevation of the perimeter dike is 20.0 feet and the elevation of the outside toe ditch (swale) is about 7.5 feet at the lowest point next to the perimeter dike at Ash Pond A. Thus, the maximum height of perimeter dike at Ash Pond A is 12.5 feet above the outside toe, although Santee Cooper has listed the maximum height as 20 feet for the Ash Pond A dike. The cross dike is slightly lower than the perimeter dike; it is noted on a furnished drawing (Appendix A – Doc 1.4) to be at an elevation of 19.3 feet at the drainage structure between Ponds A and B. The bottom elevation of Ash Pond B is unknown but appears to have originally been on the order of 5 feet, based on limited spot elevation information on the furnished drawing (Appendix A – Doc 1.3). Thus, the cross dike may approach 15-foot height above the Ash Pond B bottom or higher if Ash Pond B was incised during construction. However, no information was provided that would indicate that the ash ponds were incised.

Ash Pond A is an unlined basin that receives predominantly fly ash and bottom ash. The storage volume varies due to the excavation of ash for retail.

Ash Pond B has a surface area of approximately 42 acres. It is an unlined basin that receives water from Ash Pond A. The basin is designated to contain fly ash, bottom ash, and boiler slag, according to information supplied by Santee Cooper to EPA, but it is currently active as a clarifying cell. The lowest elevation of the toe swale outside the south perimeter dike is 5.4 feet. Thus, the maximum height of the perimeter dike around Ash Pond B is 14.6 feet above the outside toe, although Santee Cooper has listed the maximum height as 10 feet for the Ash Pond B dike; most of the dike length is less than 14.6 feet high above the outside toe.

The spoil bank that impounds the west side of both basins has a top elevation varying from 35 feet to about 50 feet with an average on the order of 40 feet. Thus, it is substantially higher than the ash basin dikes that tie into it. According to furnished information (Appendix A – Doc 1.5), the design dredge elevation in the Tailrace Canal next to the basins is -13 feet, which is 53 feet below the average top of the adjacent spoil bank and 33 feet below the design top of the perimeter dike.

2.2 SIZE AND HAZARD CLASSIFICATION

The Jefferies GS impoundment dikes (dams) are not regulated for dam safety by a federal or state agency, and currently do not have federal or state hazard classifications. Both ash ponds are regulated by the South Carolina Department of Health and Environmental Control (SCDHEC) Bureau of Water/Compliance Assurance Division. Dams owned by the South Carolina Public Service Authority (Santee Cooper) are specifically exempted from state regulation in Section 72-2 *Dam Classifications and Exemptions* of the South Carolina Dams and Reservoirs Safety Act Regulations. Santee Cooper created an internal multi-disciplined team composed of professional engineers with backgrounds specializing in dam safety, environmental services, plan operations, and facility maintenance to evaluate the structural integrity and safety of the impoundments. This task force is also expected to establish hazard ratings for each impoundment using nationally recognized criteria.

In the following paragraphs a hazard potential determination is given on the basis of the Federal Emergency Management Agency (FEMA) hazard potential classification, which has been adopted by USEPA; this classification system and the hazard potential determination and basis are presented on the field observation checklists for the Jefferies GS CCW ponds included in Appendix B.

Ash Pond A Dam – Maximum dam height is 20 feet, according to furnished information, but it appears to be more on the order of 12.5 feet, as previously discussed. The total storage capacity is 982 acre-feet. Other physical data are summarized in Table 2.1. The dam currently has an undetermined hazard potential rating. For reference the SCDHEC criteria for Size Classification and Hazard Potential Classification are presented in Table 2.2 and Table 2.3, respectively. Based on storage capacity, the Ash Pond A Dam has a Small Size Classification. Failure of the dam would discharge CCW into Biggin Swamp or the Tailrace Canal. The failure would not likely cause loss of life, but would cause environmental damage and potential disruption of navigation in the Tailrace Canal, particularly in the event of a breach through the spoil bank. Therefore, per the USEPA classification the Ash Pond A Dam (inclusive of spoil bank) should be given a Significant (Class II) Hazard Potential Classification.

Ash Pond B Dam - Maximum dam height is 10 feet, according to furnished information, but it appears to be more on the order of 14.6 feet, as previously discussed. The total storage capacity is 245 acre-feet. Other physical data are also summarized in Table 2.1. The dam currently has an undetermined hazard potential rating. Based on storage capacity, the Ash Pond B Dam has a Small Size Classification. Failure of the dam would discharge mostly water and some CCW into Biggin Swamp or the Tailrace Canal; the amount of CCW stored in Ash pond B is minor. The failure would not cause loss of life, and it would likely cause relatively minor environmental damage; potential disruption of navigation in the Tailrace Canal is unlikely, even in the event of a breach through the spoil bank. Therefore, per the USEPA classification the Ash Pond B Dam (inclusive of spoil bank) should be given a Low (Class III) Hazard Potential Classification, but it should be reviewed periodically to evaluate status of CCW stored in the basin.

Pertinent physical data are presented in the following Table 2.1.

Table 2.1: Summary of Dam Dimensions and Size*

	Ash Pond A Dam	Ash Pond B Dam
Dam Height	20’ **	10' **
Crest Width	12’	12'
Length	~3500’ ***	~2400’
Side Slopes (inside)	3:1	3:1
Side Slopes (outside)	2:1	2:1
Hazard Classification****	Class II (Significant)	Class III (Low)

**Excludes spoil bank.*
***Based on data in Santee Cooper’s response to EPA’s RFI dated March 9, 2009; review of furnished data indicates 12.5’ for Pond A Dam & 14.6’ for Pond B Dam.*
****Includes cross dike.*
*****Based on available information and USEPA classification*

The SCDHEC Classification System is presented below.

Table 2.2: Size Classification*		
Category	Impoundment Storage (Acre-Feet)	Dam Height (Feet)
Very Small	Less than 50	Less than 25
Small	Less than 1,000 but equal to or greater than 50	Less than 40 but equal to or greater than 25
Intermediate	Less than 50,000 but equal to or greater than 1,000	Less than 100 but equal to or greater than 40
Large	Equal to or less than 50,000	Equal to or less than 100

*Note: Size classification may be determined by either storage or height of structure, whichever gives the higher category.

Table 2.3: Hazard Potential Classification	
Category	Hazard Potential
High Hazard (Class I)	Dams located where failure will likely cause loss of life or serious damage to home(s), industrial and commercial facilities, important public utilities, main highway(s) or railroad(s).
Significant Hazard (Class II)	Dams located where failure will not likely cause loss of life but may damage home(s), industrial and commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important public utilities.
Low Hazard (Class III)	Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

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

The amount of CCW residuals currently stored in the units and maximum capacities are summarized in Table 2.4.

Ash Pond A - Based on information from Santee Cooper, this basin contains predominantly fly ash and bottom ash deposited over 40 years. This basin is currently active and remaining storage volume varies due to the excavation of ash for retail sale (beneficial reuse). A total of 786 acre-feet of fly ash and bottom ash material were contained within Ash Pond A, when last measured (February 4, 2004). The amount of ash produced and removed from 2005 to 2009 is provided, as shown in Appendix A – Doc 1.6. As of 2009, Ash Pond A had an estimated 15 percent remaining in total storage capacity. A normal pool of water is maintained at about elevation 14.4 feet.

Ash Pond B - Based on information from Santee Cooper, this basin is currently active as a clarifying cell ("polishing pond") and contains fly ash and bottom ash deposited over 40 years. A total of 25 acre-feet of fly and bottom ash material were contained within Ash Pond B, when last measured (February 4, 2004). The CCW material in Ash Pond B is presumed to be predominantly fine-grained material that has settled out of the water over the operational life of the facility. A normal pool of water is maintained at elevation 13.0 feet.

Table 2.4: Amount of Residuals and Maximum Capacity of Unit*

	Ash Pond A	Ash Pond B
Surface Area (acre)	127	42
Current Storage Volume (acre-feet)	786	25
Total Storage Capacity (acre-feet)	982	245

*Based on data in Santee Cooper's response to EPA's RFI dated March 9, 2009

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment Dam

The perimeter dam and cross dike embankments are constructed of compacted earth fill. The source and type of soils used for earth fill is unknown. Based on boring information for the Tailrace Canal (Appendix A – Doc 1.5), the spoil bank created by dredging the Tailrace Canal likely consists of predominantly dumped marl with sandy clays and some gravel. The length of the spoil bank forming the west embankment of the basins is approximately 4,650 feet. The total length of the perimeter dam is approximately 4,400 feet. The total length of the cross dike is approximately 1,500 feet. The basin (Ash Pond A) is partially enclosed by the perimeter dam and the basin appears to receive surface runoff from outside the basin area. The size of the offsite drainage area is significant and, based on USGS topographic maps is on the order of 2.5 to 3 times the surface area of Ash Ponds A and B combined. The basic geometric features of the perimeter dam embankment are summarized in Table 2.1.

According to Santee Cooper, the geometry of the dam has not been altered since its original construction in 1970. Gravel surfacing was placed on the perimeter dam crest and on a perimeter road. A representative section of the perimeter embankment dam is shown in Exhibit 1. As shown in this exhibit, there is a 12-foot wide berm and 12-foot bottom width ditch along the toe of the outside slope. No internal drainage measures or toe drains were included in the embankment design for seepage control. The design of the perimeter dam embankment was basic and apparently consisted of one drawing as shown in (Appendix A – Doc 1.3). No geometric or other design information was provided for the cross dike embankment.

2.4.2 Outlet Structures

Ash Pond A - Drainage from the northern part of the basin to the southern part is through excavated interior ditches within the ash. Water ponds at the southern end and passes through outlet works located at the southeast corner of Pond A. The outlet works consist of a concrete skimmer box with reinforced concrete pipe (RCP) conduit through the cross dike to discharge into Ash Pond B. The discharge pipe projects from the embankment into Ash Pond B; surrounding slopes are lined with riprap. The skimmer box is used to block entry of floating ash particles (cenospheres) into Ash Pond B. Inverts of the outlet are shown in Appendix A - Doc 1.4. No information was provided on the size of the RCP conduit; however, based on field estimates is 30 inches I.D.

The water in the southern part of the basin at the time of the site visit was at a level of 14.4 feet, which is 5.6 feet below the perimeter dam crest.

Ash Pond B - The outlet works are located near the southwest corner of the basin and consist of a principal spillway outlet with metal skimmer box. The decant tower is shown (Exhibit 2) to be square in plan view with exterior dimensions of 7.5 feet by 7.5 feet and constructed of reinforced block masonry on a reinforced concrete footing. The outlet pipe is a 36-inch RCP that extends through the south perimeter dam and discharges into a perimeter ditch that leads to a drainage structure that passes through the spoil bank and outfalls into the Tailrace Canal. The invert of the 36-inch diameter RCP at its inlet end in the bottom of the decant tower is 6.8 feet. Exhibit 2 illustrates the outlet details. However, the structure illustrated in this exhibit is not precisely what was observed in the field. The exhibit shows the top of the decant tower at elevation 20 feet, the same as the top of dam elevation, and accessed by a wooden footbridge extending from the dam crest to the top of the decant tower. The top of the decant tower observed in the field is some 8 feet lower and is accessed from the top of the dam with metal steps/landings following down the inside slope to the top of the structure. The inside dimensions of the decant tower in plan view are 4.0 feet by 4.0 feet. The skimmer box is used to block entry of cenospheres into the discharge to the perimeter ditch. According to Santee Cooper, the skimmer box had been repaired in recent years.

The level of water in the basin at the time of the site visit was at elevation 13.0 feet, which is 7.0 feet below the dam crest.

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2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

A regional map showing Jefferies GS and ash ponds in relationship to "critical" infrastructure within a 5-mile radius was provided by Santee Cooper. "Critical" infrastructure includes facilities such as schools and hospitals. There are 7 schools and 2 hospitals located within the 5 mile radius and west of the Tailrace Canal. These facilities are noted on the 5-mile radius map included as Doc 1.7 in Appendix A of this report. All the critical infrastructure is located on topography that is higher than the ash ponds. In general, the land downgradient from the ash basins is the Biggin Swamp.

Based on USGS quadrangles, flood impacts from postulated failure of the ash-pond dams at the Jefferies GS would primarily impact the Biggin Swamp or potentially the Tailrace Canal.

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3.0 SUMMARY OF RELEVANT REPORTS, PERMITS AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT(S)

Ash Pond A – Quarterly inspections are conducted by Santee Cooper. For the period January 2009 through April 2010, no major problems were observed. No significant deterioration was indicated in the documentation reviewed.

Ash Pond B – Quarterly inspections are conducted by Santee Cooper. For the period January 2009 through April 2010, no major problems were observed. No significant deterioration was indicated in the documentation reviewed.

3.2 SUMMARY OF LOCAL, STATE AND FEDERAL ENVIRONMENTAL PERMITS

The Jefferies GS is currently regulated under NPDES Permit No. SC-0001091 (see Doc 1.8 of Appendix A). This permit was effective on March 1, 2003 and expired on February 29, 2008, according to the furnished documentation.

The facilities at the Jefferies GS are regulated for water quality by the South Carolina Department of Health and Environmental Control (SCDHEC) Bureau of Water/Compliance Assurance Division. Groundwater monitoring/sampling is conducted at a number of points (water-quality wells) around Ash Ponds A and B. Santee Cooper indicated that trace amounts of arsenic have been detected in groundwater on site but not at the point of compliance. Water sampling at the outlet structure of Ash Pond B is also conducted to monitor the quality of discharge that reaches the Tailrace Canal. No modifications to any of the monitoring locations are to be made without written approval from SCDHEC.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS (IF ANY)

Ash Pond A- There have been no reported spill/release incidents at this basin.

Ash Pond B - There have been no reported spill/release incidents at this basin.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

No construction records are available. Therefore, little is known of original construction, other than both ponds were constructed at the same time in 1970 and were basically "field fitted" to the site using minimal design information. Essentially, a perimeter dike was constructed in a partial loop to enclose a low area between high ground on the east and the massive Tailrace Canal Spoil Bank on the west. A cross dike was constructed to divide the enclosed area into two cells or basins.

Ash Pond A – The basin was constructed in a natural ravine and low, swampy area located between the spoil bank on the west side and high ground to the east. The basin is bounded on the north side by the Seaboard Coastline railroad embankment, on the east side by high ground and the perimeter dike, which ties in to a point of high ground at the north end of the perimeter dike, and on the south side by the cross dike. The lowest elevation on the basin's floor is unknown. The basin was not lined.

Ash Pond B – The basin was formed within the low, swampy area, with the spoil bank bounding the west side, the cross dike bounding the north side, and the perimeter dike confining the east and south sides. The lowest elevation on the basin's floor is unknown. The basin was not lined.

4.1.2 Significant Changes/Modifications in Design since Original Construction

Ash Pond A – There have been no significant changes/modifications in design since the original construction of the basin.

Ash Pond B – There have been no significant changes/modifications in design since the original construction of the basin. Note that original outlet structure design plans do not match field observations. (Compare Photo BB-7 with Exhibit 2 and see description of outlet works for Ash Pond B in Subsection 2.4.2.)

4.1.3 Significant Repairs/Rehabilitation since Original Construction

Ash Pond A – There have been no significant repairs/rehabilitation made to this basin since the original construction.

Ash Pond B – There have been no significant repairs/rehabilitation made to this basin since the original construction. Relatively minor repairs were made to the metal skimmer box at the outlet within the past 10 years when the skimmer dropped down on one side.

4.2 SUMMARY OF OPERATIONAL HISTORY

4.2.1 Original Operational Procedures

The furnished documents do not include the original operational procedures. Ash Pond A and Ash Pond B are man-made basins that were designed and operated primarily for the disposal of boiler slag, fly ash and bottom ash. It is presumed that original operation was much as it is today with respect to the manner in which the ash is transported and disposed, i.e., by sluicing with water into the basin where the ash particles are allowed to settle out. Santee Cooper indicated that there has always been a market for the fly ash, which was originally dry handled and transferred to the user.

4.2.2 Significant Changes in Operational Procedures since Original Startup

No documents were provided to indicate that basic operational procedures have significantly changed since original startup. Mining of the bottom ash for beneficial reuse was started about 20 years ago when a market for the ash was developed.

4.2.3 Current Operational Procedures

The ash basins are operated and monitored for water quality under a SCDHEC approved NPDES permit.

Ash Pond A operation consists of mixing ash waste (predominantly bottom ash and fly ash) with water at the plant and pumping the slurry to the basin. The CCW slurry is pumped into excavated channels within the basin and gravity settling separates the fine from the coarser materials. Once the channels become full, the ash is excavated to dry it out for beneficial reuse. The water flows through channels excavated in the ash to a pond area at the south end of the basin. At the outlet structure in the southeast corner of Ash Pond A the water flows under a concrete skimmer box (which is used to block any floating debris) around the inlet, then through a circular concrete pipe to Ash Pond B.

Ash Pond B operates mainly as a clarifying pond. Water flows under a metal skimmer box, and into the decant tower near the southwest corner of the basin. Outflow from the pond discharges into a perimeter ditch, which leads to a drainage structure that passes through the spoil bank and outfalls into the Tailrace Canal.

4.2.4 Other Notable Events since Original Startup

Ash Pond A – Based on furnished information and discussions with Santee Cooper personnel, there are no other notable events since original startup of Ash Pond A to report at this time.

Ash Pond B – Santee Cooper personnel indicated that there were some past issues with pH getting too close to the upper limit specified in the NPDES permit, apparently caused by heavy growth of duck weed on the surface of the pond. Grass carp were stocked in the pond to help control the duckweed. Water from the pond is periodically pumped onto the surface of the pond to create a fountain effect (surface disturbance) that helps to inhibit growth of the duck weed. No duck weed was noted on the surface of the pond at the time of the site visit, although it was noted in the toe ditch outside the basin. There are no other notable events since original startup of Ash Pond B to report at this time.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Frederic C. Tucker, PE and Anne Lee collected available data and documents and made field observations during a site visit on June 29, 2010, in company with the participants listed in Section 1.3. The design engineer of record for Ash Pond A and Ash Pond B was not present or available to assist with answering questions about these basins.

The site visit began at 9:30 AM. Weather conditions during the visit were 90 degrees Fahrenheit, sunny, and dry. Photographs were taken of conditions observed. Photographs referenced below are contained at the end of this chapter.

The overall visual assessment is that the earthen embankments that impound Ash Pond A and Ash Pond B are in good condition. No visual signs of imminent instability or inadequacy of the principal structures at these basins that would require emergency remedial action were observed. No evidence of past repairs was observed. No significant findings were noted.

The observations below pertain mainly to the embankments (perimeter dike and cross dike) and outlet works constructed in 1970 to form the two ash ponds. The spoil bank created from dredging the Tailrace Canal in the 1940s forms the west "embankment" of both ponds. As previously described, the spoil bank is massive and, based on old logs of borings made prior to dredging of the canal, the spoil bank appears to consist predominantly of dredged marl, sandy clays and some gravel. Field observation of soils exposed in a nearly vertical cut made in the spoil bank above where the cross dike ties in to it (see Photo BA-9) confirms the generally clayey nature of the material comprising the spoil bank. The bank is about 200 feet wide at its base and on average is twice as high as the dikes. It is covered with a thick growth of trees and underbrush and appears much like a natural feature. Due to the thick vegetative growth, it was generally inaccessible for close observation, except where the dikes tie in. No obvious indications of stability problems, such as large gouges or swaths of overturned trees, etc. were observed along the east side of the spoil bank. The canal (west) side was not viewed. That side is periodically observed from a boat by a Santee Cooper representative who indicated that no seepage, slope disturbances, or other issues have been observed along the canal side of the spoil bank. The Seaboard Coastline railroad embankment that bounds the north end of Ash Pond A is above elevation 30 feet and the ground just on the other side of the railroad is as high as or higher than the perimeter dike around the east and south sides of the basins.

5.2 ASH POND A

5.2.1 Embankment Dam and Basin Area

Crest

The crest around the north end area of Ash Pond A is the railroad bed. The crest around the east and south sides of Ash Pond A is accessible with automobiles. The gravel-surfaced crest of the east embankment was observed to be in good condition. The top of the spoil bank on the west side was observed to be generally wooded and inaccessible. Typical views of the crest around the east embankment are shown in Photos BA-1 and BA-2. Typical views of the grassed crest of the cross dike on the south side of Ash Pond A are shown in Photos BA-3 and BA-4. No major depressions, sags, tension cracks or other signs of significant settlement or mass soil movement were observed, although a slight depression was noted near the middle of the cross dike. No tension cracks which might suggest soil shear failure were observed in the crest or along the edge of the crest.

Outside Slope and Toe

The outside slope of the east embankment of Ash Pond A is visible in Photo BA-5. As shown, the grass on the outside slope typically was observed to be maintained. The lower part of the outside slope of the cross dike was observed to be submerged by the water in Ash Pond B (see Photos BA-3 and BA-4). No areas of significant erosion were observed. No obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed.

The top of the berm along the outside toe of the east embankment below the southeast corner of the pond near the cross dike is shown in Photo BA-6. As shown, the grass on the berm and slope above are maintained; no signs of slope failure or seepage were observed. The perimeter ditch along the outside toe berm of the east embankment is shown in Photo BA-7. The width of the berm was observed to vary somewhat from the 12 feet shown in the typical section (Exhibit 1). No active erosion was observed along the perimeter ditch.

Inside Slope and Basin Area

The inside slope of the Ash Pond A embankment dam was observed to be generally buried with ash or submerged in water. The water surface elevation at the time of the inspection was 14.4 feet. A view of the inside slope of the east embankment near the southeast corner of the basin is shown in Photo BA-8. The lower part of the inside slope of the cross dike was observed to be submerged by the water ponded at the south end of the basin (see Photos BA-3 and BA-4). No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. Clayey soil exposed in a nearly vertical cut in the inside slope of the spoil bank above the cross dike where the cross dike ties-in to the spoil bank is shown in Photo BA-9. A view of the ash surface in the interior of the basin from the north to the south in the northern part of the basin is shown in Photo BA-10; the pool of water located between the cross dike and the southern limit of ash build-up in Ash Pond A is shown in Photo BA-11. The surface of the exposed ash fill is generally covered with tall weeds and low-growing bushes, except for the surface of the central area where ash is actively mined for beneficial reuse; sparse vegetation to no vegetation was observed in areas trafficked with construction equipment and other vehicles. No significant erosion was noted.

Abutments and Groin Areas

No erosion or displacements were observed where the cross dike ties in to the spoil bank. No erosion, displacements, or noticeable seepage (at outside contact) were observed where the east perimeter dike ties in to high ground at the north end.

5.2.2 Outlet Structures

Overflow Structure

There is no overflow structure in Ash Pond A. The inlet end of the circular RCP that extends through the cross dike at the southeast corner of Ash Pond A is shown in Photo BA-12. The concrete skimmer box surrounding the inlet was observed to be in good condition. Water was flowing under the walls of the skimmer box and into the inlet end of the RCP, which appeared to be about 30 inches (I.D.). The RCP structure was discharging the flow into Ash Pond B. There was no sign of clogging and the water exiting the outlet was observed to be flowing clear.

Outlet Conduit

As previously described, the circular RCP extends through the cross dike into Ash Pond B. The outlet pipe is buried all along its length to its outfall end. Riprap lines the surrounding slopes of the outlet location. The outlet end appeared to be in good condition and operating normally. A small build up of vegetation was observed, as seen in Photo BA-13, but there was no sign of clogging and the water exiting the outlet was observed to be flowing clear, as noted above. A fish net was observed just beyond the outlet end of the discharge pipe; Santee Cooper indicated that the fish net was placed to keep the grass carp from migrating out of Ash Pond B into Ash Pond A.

Emergency Spillway (If Present)

There is no emergency spillway.

Low Level Outlet

There is no low level outlet.

5.3 ASH POND B

5.3.1 Embankment Dam and Basin Area

Crest

The crest along the north side of Ash Pond B is the cross dike, discussed above. The crest around the east and south sides of Ash Pond B is accessible with automobiles. The gravel-surfaced crest of the east embankment was observed to be in good condition. The top of the spoil bank on the west side was observed to be generally wooded and inaccessible, except at the south end, where the spoil bank had been graded down to an elevation just above the south perimeter dike elevation. The area was observed to have a well-maintained cover of grass. This area is used as a firing range for the security guards at the station, with the cut bank at the north end of the graded area serving as a back stop for projectiles. Typical views of the embankment crest around the east and south sides are shown in Photos BB-1 and BA-2, respectively. Typical views of the crest of the cross dike to the south are shown in Photos BA-3 and BA-4. No major depressions, sags, tension cracks or other signs of settlement or mass soil movement were observed. No tension cracks which might suggest soil shear failure were observed in the crest or along the edge of the crest.

Outside Slope and Toe

The outside slope of the east and south embankment of Ash Pond B is visible in Photos BB-3 and BB-4, respectively; the toe berm is also visible in these photos. As shown, the grass on the outside slope and berm typically was observed to be maintained. The lower part of the outside slope of the cross dike (relative to Ash Pond B) is submerged by water in Ash Pond A (see Photos BA-3 and BA-4). No areas of significant erosion were observed. No obvious signs of slumps, slides, bulges, tension cracks, seepage, or animal holes were observed.

The perimeter ditch along the outside toe berm of the east embankment is shown in Photo BB-5. The width of the berm here was also observed to vary somewhat from the 12 feet shown in the typical section (Exhibit 1). No active erosion was observed along the perimeter ditch.

Inside Slope and Basin Area

The lower part of the inside slope of the Ash Pond B embankment dam was observed to be submerged in water. The water surface elevation at the time of the inspection was 13.0 feet. Views of the inside slope of the east and south embankment are shown in Photos BB-6 and BB-2, respectively. The lower part of the inside slope of the cross dike (relative to Ash Pond B) was observed to be submerged in water (see Photos BA-3 and BA-4). No slumps, slides, or other signs of shear failure were observed in the visible parts of the slopes above the water level. No significant erosion was noted.

Abutments and Groin Areas

No erosion, displacements, or noticeable seepage (at outside contact) were observed where the south perimeter dike ties into the spoil bank.

5.3.2 Outlet Structures

Overflow Structure

Photo BB-7 shows the top of the overflow structure (decant tower) located near the southwest corner of Ash Pond B. The structure was observed to be in good visual condition. The metal skimmer box surrounding the inlet structure was observed to be in good condition.

Outlet Conduit

The decant tower has a 36-inch diameter RCP bottom discharge pipe that extends through the perimeter embankment dam and outfalls into the perimeter ditch. The outlet is shown in Photo BB-8; it appeared to be in good condition and operating normally. There was no sign of clogging and the water exiting the outlet was flowing clear.

Emergency Spillway (If Present)

There is no emergency spillway.

Low Level Outlet

There is no low level outlet at the decant tower. However, two metal pipe siphons were observed in the field adjacent to each side of the discharge pipe. One is shown on the right side of the RCP outlet pipe in Photo BB-8. The siphons provide a means for draining the pond, if needed.

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5.4 FIELD PHOTOGRAPHS

Photo BA-1: Ash Pond A Beginning of Crest of East Embankment – Viewed South.

Photo BA-2: Ash Pond A - Crest of East Embankment– Viewed South.

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Photo BA-3: Crest of Cross Dike - Viewed East.

Photo BA-4: Crest of Cross Dike - Viewed West.

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Photo BA-5: Ash Pond A Outside Slope and Toe of East Embankment - Viewed North.

Photo BA-6: Ash Pond A Outside Toe of East Embankment- Viewed North.

Photo BA-7: Ash Pond A Perimeter Ditch Downstream of Embankment- Viewed North.

Photo BA-8: Ash Pond A Crest and Inside Slope of East Embankment South End - Viewed North.

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Photo BA-9: Inside Slope of West Embankment at the Cross Dike - Viewed West.

Photo BA-10: Ash Pond A North End Area where Ash is Sluiced into Basin – Viewed South.

Photo BA-11: Ash Pond A Central Area North of Cross Dike where normal pool begins– Viewed South.

Photo BA-12: Ash Pond A: View of Inlet End of the RCP through Cross Dike that Divides Ash Pond A from Ash Pond B.

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Photo BA-13: Ash Pond B: View of outlet end of the RCP through Cross Dike that divides Ash Pond A from Ash Pond B

Photo BB-1: Ash Pond B: Crest of Embankment – Viewed North

Photo BB-2: Ash Pond B: Crest and Inside Slope of Embankment – Viewed West

Photo BB-3: Ash Pond B: Outside Toe of East Embankment- Viewed South.

Photo BB-4: Ash Pond B: Crest and Outside Slope of Embankment – Viewed West.

Photo BB-5: Ash Pond B: Crest and Outside Slope of Embankment at Northeast Corner of Basin Near Cross Dike – Viewed South.

Photo BB-6: Ash Pond B: Inside Slope of Embankment – Viewed East

Photo BB-7: Ash Pond B: Outlet Structure at the Southwest Corner of the Basin.

Photo BB-8: Ash Pond B: Outlet Pipe Discharging Water into the Perimeter Ditch.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Floods of Record

Ash Pond A and Ash Pond B – Flood record information was not provided for these facilities. Hearsay evidence from Santee Cooper personnel is that the water level in the upper pond (Ash Pond A) has never been observed above the top of the walls of the skimmer box around the inlet of the outlet structure, even during Hurricane Gaston in late August 2004. Note that a water level at the top of the skimmer walls would leave more than 3 feet of freeboard at the cross dike and even more freeboard at the perimeter dike. The ash ponds have been in service for 40 years and have experienced many severe rainstorms and a number of hurricanes during that time. Santee Cooper indicated no unusual problems at the pond embankments as a result of such storms during this relatively long period of service.

6.1.2 Inflow Design Flood

No hydrologic/hydraulic analyses were provided for the ash ponds; thus, no inflow design flood was available. Santee Cooper representatives stated that drainage structures at the station are designed for the 25-year frequency, 24-hour duration rainfall event. Presumably, the outlet structures at the ash ponds are designed for at least this event.

The issue of inflow design flood often is not significant for ash ponds that do not receive off-site drainage. Usually sufficient freeboard is available to contain 100 percent of rainfall over the basin area from significant storm events, even up to the probable maximum precipitation (PMP), which is a little over 44 inches at this location (based on HMR-51, all season PMP for 24-hour duration, 10 mi^2). However, there appears from aerial photo and USGS topographic map to be a sizable area of off-site drainage toward Ash Pond A from the northeast side of the pond. An internal berm, assumed to be constructed of ash, appears to direct the off-site drainage along the east side of the basin to the area of ponded water at the south end of Ash Pond A. The internal berm is higher than the east perimeter dike and overgrown with vegetation; the berm is visible in Photo BA-1. The cross-sectional area of the "swale" between the internal berm and the crest of the east perimeter dike is relatively small and does not appear capable of conveying large amounts of storm runoff from the off-site drainage area without overflowing the crest of the dike to the ditch along the outside toe of the dike and into Biggin Swamp. Thus much of the off-site drainage during major storms may actually bypass the ash ponds. The crest at this location is very near the tie-in to high ground at the north end of the east perimeter dike, and the dike section is very low.

As previously mentioned, the SCDHEC Dams and Reservoirs Safety Act Regulations specifically exclude state regulation of dams owned and operated by the South Carolina Public Service Authority (Santee Cooper). The state recognizes Santee Cooper's jurisdiction over its own dams; therefore safety of those dams comes under Santee Cooper's purview, and Santee Cooper has the authority to set the safety standard. Santee Cooper has set up a task force to evaluate the structural integrity and safety of its impoundments and to establish hazard potential ratings for each impoundment using nationally recognized criteria. This task force is expected to set the safety standard for impounding structures such as those at the Jefferies Generating Station. If Santee Cooper's hazard potential ratings and safety standards closely follow those given in the South Carolina dam safety regulations, the Jefferies ash ponds would have spillway design floods as indicated below:

Ash Pond A – Based on Small Size Classification and Significant Hazard Potential Classification, the spillway design flood (SDF) criterion is 100-year frequency to ½ probable maximum flood (1/2 PMF).

Ash Pond B – Based on Small Size Classification and Low Hazard Potential Classification, the spillway design flood (SDF) criterion is 50 to 100-year frequency.

This report's assessment of size and hazard potential classifications is discussed in Section 2.2 of this report.

6.1.3 Spillway Rating

Ash Pond A and Ash Pond B - No spillway rating was provided for the outlet works at either pond.

6.1.4 Downstream Flood Analysis

Ash Pond A and Ash Pond B – No downstream flood analysis has been provided for the ash ponds.

A qualitative analysis based on field observations and review of available data is as follows:

Because of the great height of the spoil bank on the west side of the ash ponds, failure by flood overtopping is not possible; the much lower perimeter dike and cross dike would be overtopped first. Failure of the spoil bank would have to be due to other causes such as shear failure of the spoil materials and/or foundation soils, liquefaction of any very loose or very soft soils in the foundation or spoil bank during earthquake, or excessive seepage and piping (internal erosion) through or under the spoil bank. A breach of the spoil bank (considered an unlikely scenario) at either Ash Pond A or Ash Pond B would release water into the tailrace canal and could release a significant volume of ash into the tailrace canal if the breach is at Ash Pond A.

Ash in the tailrace canal would cause environmental impact and disrupt navigation. The water released into the tailrace canal would be confined by the spoil banks on either side of the canal and, if the breach occurred during a major flood, could potentially travel as a wall of water down the canal to the Cooper River about 2.7 miles downstream. If the breach occurred at any other time, the volume of water normally contained in either pond probably is not sufficient to create a significant wall of water down the tailrace canal. The US highway 17 bridge crosses the canal about 1.2 miles downstream. The Highway 17 bridge is high and likely would not be impacted. The only apparent development along the tailrace canal is a marina and canal-side restaurant on the west bank just beyond the Highway 17 bridge, approximately 1.5 miles downstream. Swamps along the Cooper River beyond the end of the tailrace canal would likely dissipate any remaining flood wave at the end of the tailrace canal, but there is some apparent residential development above elevation 10 feet along the west bank of the Cooper River just beyond the end of the tailrace canal.

The more likely potential release scenarios are breaches through the lower-height dikes that impound the ash ponds. A breach of the cross dike would release water and ash into Pond B from Pond A with the potential consequence of causing a breach of the perimeter dike around Ash Pond B. A breach of the perimeter dike at either Ash Pond A or Ash Pond B would release water into Biggin Swamp where it would be contained in the relatively wide swamp the lies between the spoil bank along the tailrace canal to the west and high ground to the east downstream (south) to the Highway 17 road embankment. The water within the swamp would gradually release to the tailrace canal via drainage structures through the spoil bank. There is no apparent residential or commercial development within this area of the swamp. A breach through the perimeter dike at Ash Pond A could also release ash to the east side of the basins, some of which could make its way into Biggin Swamp to the south and cause some environmental impact.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Ash Pond A and Ash Pond B – An analysis of either facility's ability to safely store and pass the inflow design flood was not provided. Basin elevation-storage curves, spillway rating curves, and a dam break analysis are not available for either basin. The ability of the dike system containing Ash Pond A to store and safely pass runoff from a design storm between the 100-year frequency and ½ PMP is not obvious, due to the apparent offsite drainage into Ash Pond A, the internal drainage within Ash Pond A from the high filled-in area to the low area where the pond of free-standing water is maintained, and the unknown potential of overtopping of the cross dike, which would impact Ash Pond B and the dike that impounds it. Therefore, the available supporting hydrologic/hydraulic documentation for the ash ponds is considered inadequate at this time. Santee Cooper should review and document how the apparent off-site drainage is handled and perform analyses as required to document hydrologic safety of the ash ponds.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Ash Pond A and Ash Pond B – As noted above the ability of the ash basins to safely store and pass the appropriate design flood has not been demonstrated through documented analysis. On the basis of the 40-year experience record in which there have been no apparent issues with safe containment of water in the basins during significant flooding events, the ash ponds are believed to have substantial hydrologic/hydraulic safety. However, the hydrologic/hydraulic safety should be verified in the near future by documented analysis.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Ash Pond A Dam and Ash Pond B Dam – No stability analyses of the embankment dams that impound the ash ponds were provided for review. Any such analyses that may have been performed by designers prior to construction in 1970 are not available. From visual observations in the field the embankment dams appear stable, at least for static loading conditions.

7.1.2 Design Properties and Parameters of Materials

Ash Pond A Dam and Ash Pond B Dam – Soil design properties and parameters were not provided for review.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Ash Pond A Dam and Ash Pond B Dam – Phreatic surface assumptions for the embankment dams were not available for review. From visual observations in the field, the phreatic surface does not crop out on the outside slope of the perimeter dike.

7.1.4 Factors of Safety and Base Stresses

Ash Pond A Dam and Ash Pond B Dam – No computed factors of safety from slope stability analyses on the embankment dams were available for review.

7.1.5 Liquefaction Potential

No liquefaction potential analyses appear to have been performed for the embankment dams that impound the ash ponds. Liquefaction potential is known to have been a concern at the nearby Pinopolis Dam. However, limited available subsurface information, discussed below in Subsection 7.1.6, suggests that foundation soils are of the type that are not normally susceptible to liquefaction.

7.1.6 Critical Geological Conditions and Seismicity

The reviewed documents did not include any information regarding the critical geological conditions and seismicity used in the original design of embankment dams that impound Ash Pond A and Ash Pond B. Minimal subsurface information was provided by the boring log profiles developed during planning and design for the tailrace canal that was excavated in the 1940s (see Doc 1.5 in

Appendix A). The pertinent boring logs show that the virgin soils in the vicinity (along the tailrace canal) generally consisted of an upper layer of sandy clays underlain by what appears to be gravel or sandy gravel in turn underlain by marl; the marl was typically encountered within 5 to 10 feet below the ground surface and was the predominant soil encountered within the 38- to 40-foot depths explored in the vicinity. Standard penetration tests apparently were not conducted, so the consistency and relative density of the soils was not indicated. Nevertheless, the types of soils shown would not typically be susceptible to liquefaction, unless they are very loose or very soft. Marl has relatively good strength and is not normally susceptible to liquefaction.

Seismicity – The site of the ash basins is in an area of high seismic hazard. Based on USGS Seismic-Hazard Maps for Central and Eastern United States, dated 2008, the Jefferies Generating Station, including both Ash Pond A and Ash Pond B, is located in an area anticipated to experience 0.93g or higher peak ground acceleration with a 2-percent probability of exceedance in 50-years.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is absent. However, it does not appear to be critical documentation that is needed at this time for assessment. Structural stability documentation is considered non-critical based on 1) the low height and generally low consequences of failure of the perimeter dike and cross dike that were constructed in 1970, and 2) the good condition of the basins and embankments based on visual observation. Nevertheless, the lack of supporting structural stability documentation is a concern until at least simplified, but conservative, studies can be performed.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

The reviewed documents did not include any information regarding the design loads or the comparison of loads to potential credible loading conditions of the embankment dams impounding Ash Pond A and Ash Pond B. The available design data are impoundment drawings and boring logs for the Pinopolis Tail Canal, as previously discussed.

Overall, the structural stability under static loading conditions of the embankment dams for Ash Pond A and Ash Pond B probably is satisfactory based on the following observations during the June 29, 2010 field visit by Dewberry, available recent dam inspection reports, and the January 2009 to April 2010 dike inspection reports.

- There were no indications of scarps, sloughs, depressions or bulging anywhere along the dam;
- Boils, sinks or uncontrolled seepage was not observed along the slopes, groins or toe; and
- The crest appeared free of major depressions and no significant vertical or horizontal alignment variations were observed.

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Seismic stability of the embankment dams cannot be similarly assessed, because the dams were not experiencing seismic loading at the time of observations. However, the apparent absence of poor foundation soils (based on the limited available subsurface information), low height of the dikes, and satisfactory performance under static loading are favorable indications that the dikes are expected to perform satisfactorily under seismic loading, although it cannot be known without detailed study whether the dikes could withstand the strong shaking that can be expected when an earthquake occurs in this area. Because of the generally low consequences of failure of these dikes, performing detailed seismic stability analyses and liquefaction studies does not appear to be warranted at this time.

The outlet structures appear to be in sound and stable condition with no visual evidence of significant deterioration; they should be satisfactory for continued service.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATIONAL PROCEDURES

Ash Pond A – This basin is currently used for storage and disposal of CCW. Ash waste material is sluiced into the basin. Current on-going operations include mining of fly ash and bottom ash on the northeast portion of the basin for beneficial use. The ash is excavated and placed in windrowed stockpiles to allow the material to drain prior to loading and transport offsite. Undisturbed areas of the basin are covered with tall vegetation.

Ash Pond B – This basin is mainly used as a clearing basin or "polishing" pond prior to discharge of water that drains into it from Ash Pond A. Ash waste material from production operations is not placed in the basin. Special efforts are made to keep the pond free of duck weed and thereby help to keep pH within permit limits.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Maintenance of the impounding embankments and outlet works of both Ash Pond A and Ash Pond B is performed as needed, as determined by routine inspections performed by operating personnel. Vegetation on the embankment slopes and crest is mowed or cut twice a year or whenever it becomes necessary.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATION

8.3.1 Adequacy of Operational Procedures

Operational procedures at both Ash Pond A and Ash Pond B appear to be appropriate and adequate.

8.3.2 Adequacy of Maintenance

No major maintenance issues were observed during the site visit and no major maintenance issues were noted from review of dam inspection reports and checklists. Maintenance of the impounding embankments and outlet works of both Ash Pond A and Ash Pond B appears to be adequate.

9.0 SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Santee Cooper engineers inspect the ash pond embankments following dike inspection procedures, which are presented in Doc 1.7 in Appendix A. Santee Cooper operating personnel make daily observations and engineers conduct quarterly inspections. The quarterly inspections are documented on a quarterly Inspection Checklist. The Inspection Checklists are included for reference in Doc 1.8 in Appendix A.

Miscellaneous Inspections – Santee Cooper personnel make undocumented informal inspections of the spoil bank from a boat in the Tailrace Canal when on the way to make observations at the Pinopolis Dam. Santee Cooper bulk materials personnel, lab testing personnel, and security guards are trained in making daily observations of the ash pond embankments. Bulk materials personnel accompany the engineers during the quarterly inspections.

9.2 INSTRUMENTATION MONITORING

9.2.1 Instrumentation Plan

There is no dam performance monitoring instrumentation in place in the impounding embankments of Ash Pond A and Ash Pond B. Groundwater monitoring wells have been installed at various locations around the basins for compliance monitoring of groundwater quality. Staff gauges have been installed to measure the water surface elevation.

9.2.2 Instrumentation Monitoring Results

There are no dam performance monitoring instruments and, thus, no results of dam monitoring. Staff gauge results for the day of the site visit are included in Doc 1.9 of Appendix A.

9.2.3 Dam Performance Data Evaluation

Ash Pond A and Ash Pond B Dam – Not applicable, since there are no dam performance data to evaluate. In-depth evaluation of groundwater quality monitoring results is beyond the scope of this structural/stability assessment.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Ash Pond A Dam and Ash Pond B Dam – The inspection program is generally adequate based on field observations and the data reviewed by Dewberry.

However, internal inspections of the outlet structures with a remote camera or by personnel using confined-space procedures should be conducted on a frequency of at least once every 5 years. The inspections of the spoil bank from a boat should be documented and conducted on a frequency of at least once per quarter.

9.3.2 Adequacy of Instrumentation Monitoring Program

Ash Pond A Dam and Ash Pond B Dam – There is no dam performance monitoring instrumentation in place. No problem or suspect condition, such as excessive settlement, seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation. In the absence of stability problems or seepage issues, there is no need for performance monitoring instrumentation at this time.

DRAFT

EXHIBIT 1: REPRESENTATIVE SECTION OF PERIMETER EMBANKMENT

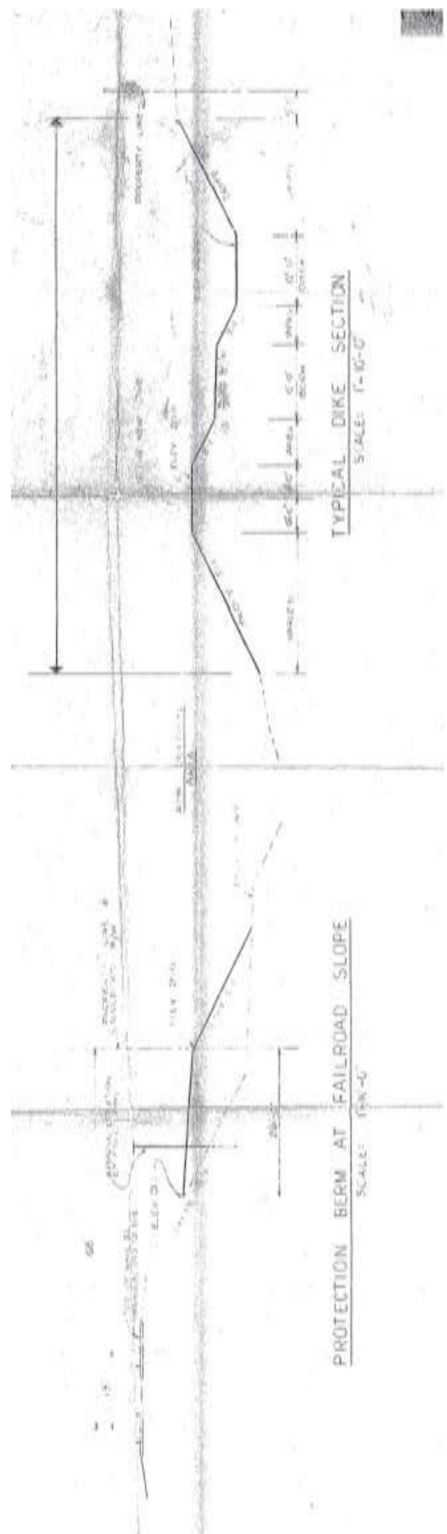
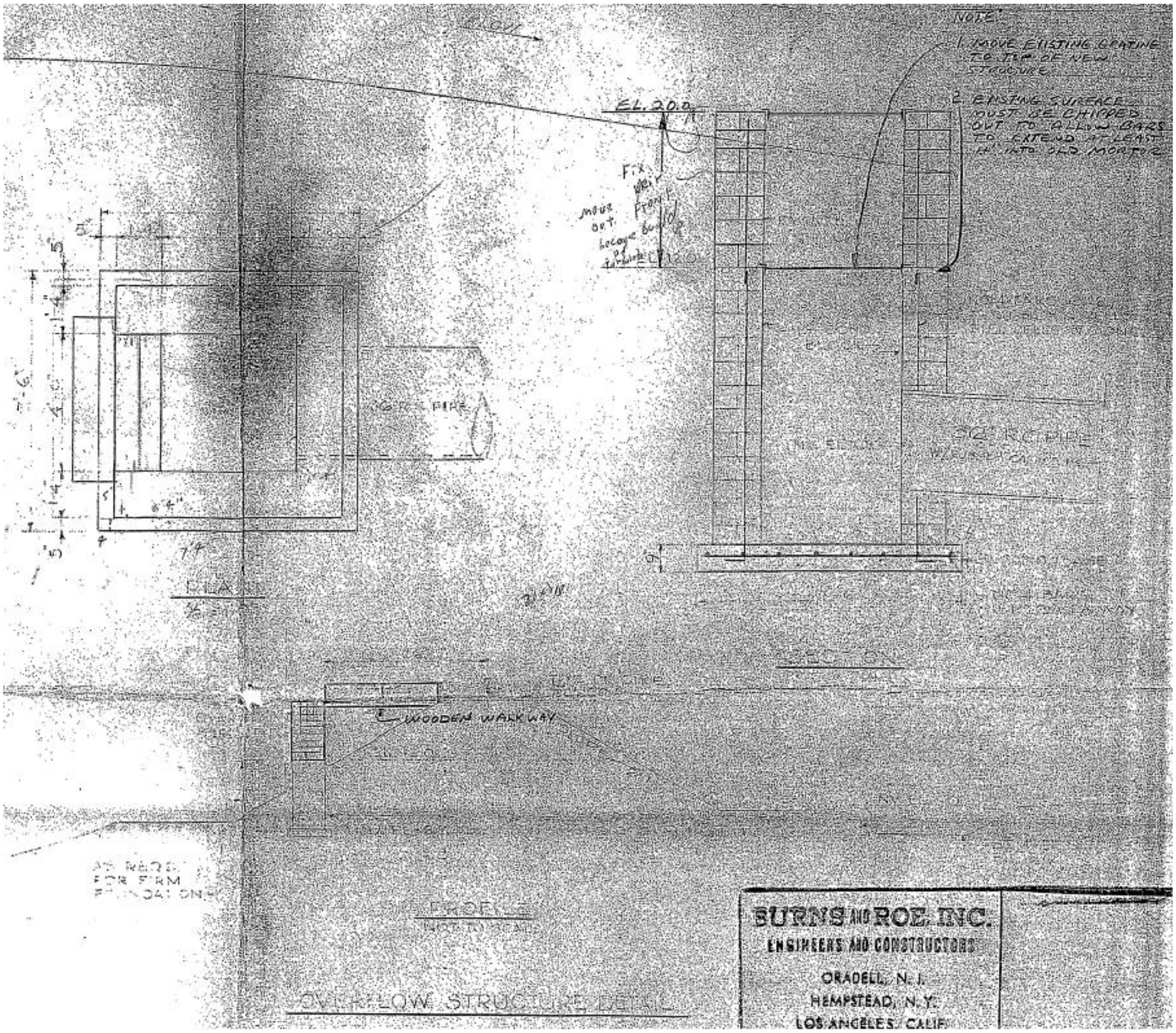
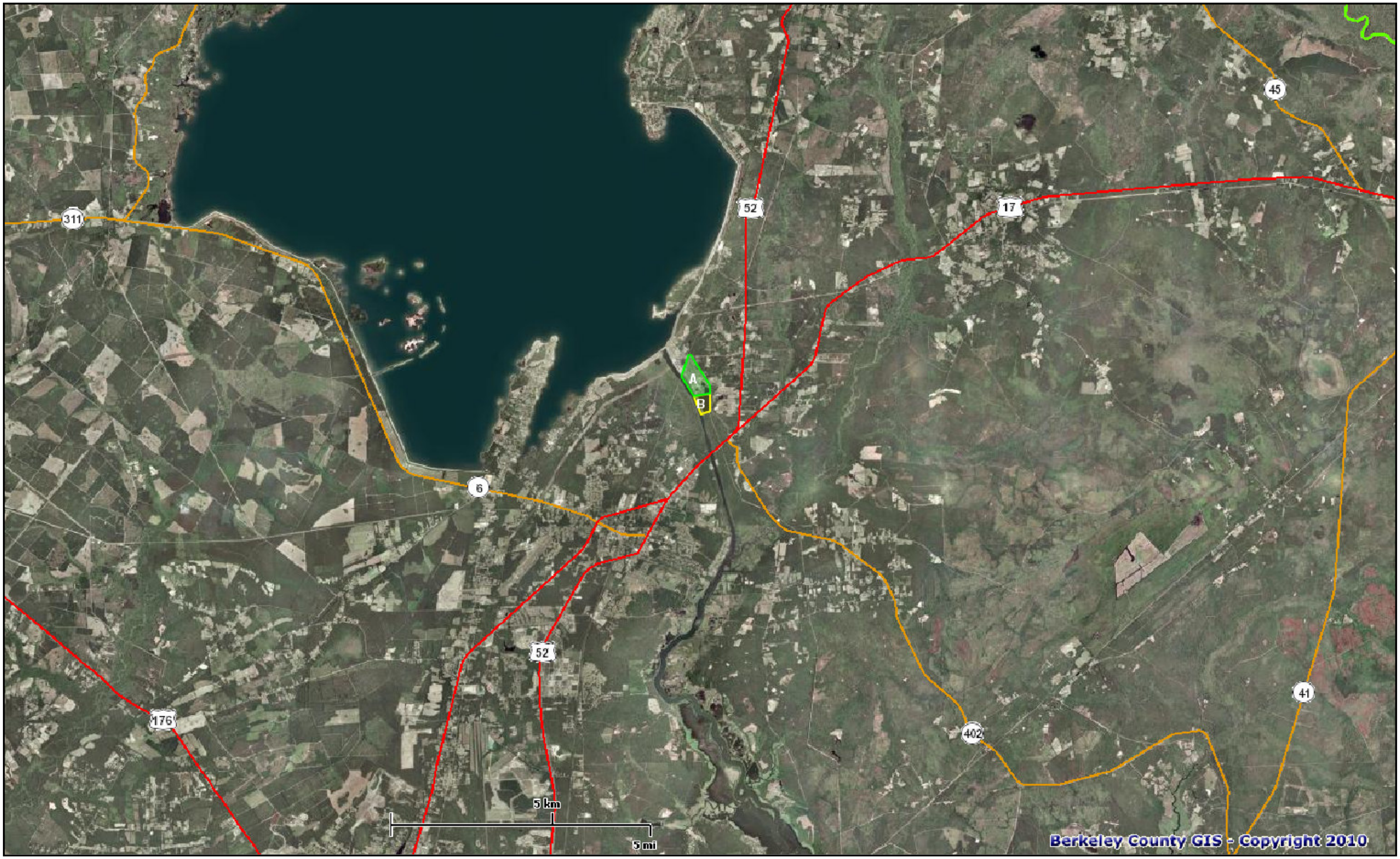


EXHIBIT 2: ASH POND B – OUTLET STRUCTURE DETAILS



Appendix A - Doc 1.1 Jefferies Generating Station Vicinity Map



BERKELEY COUNTY BCGIS GEOGRAPHIC INFORMATION SYSTEM

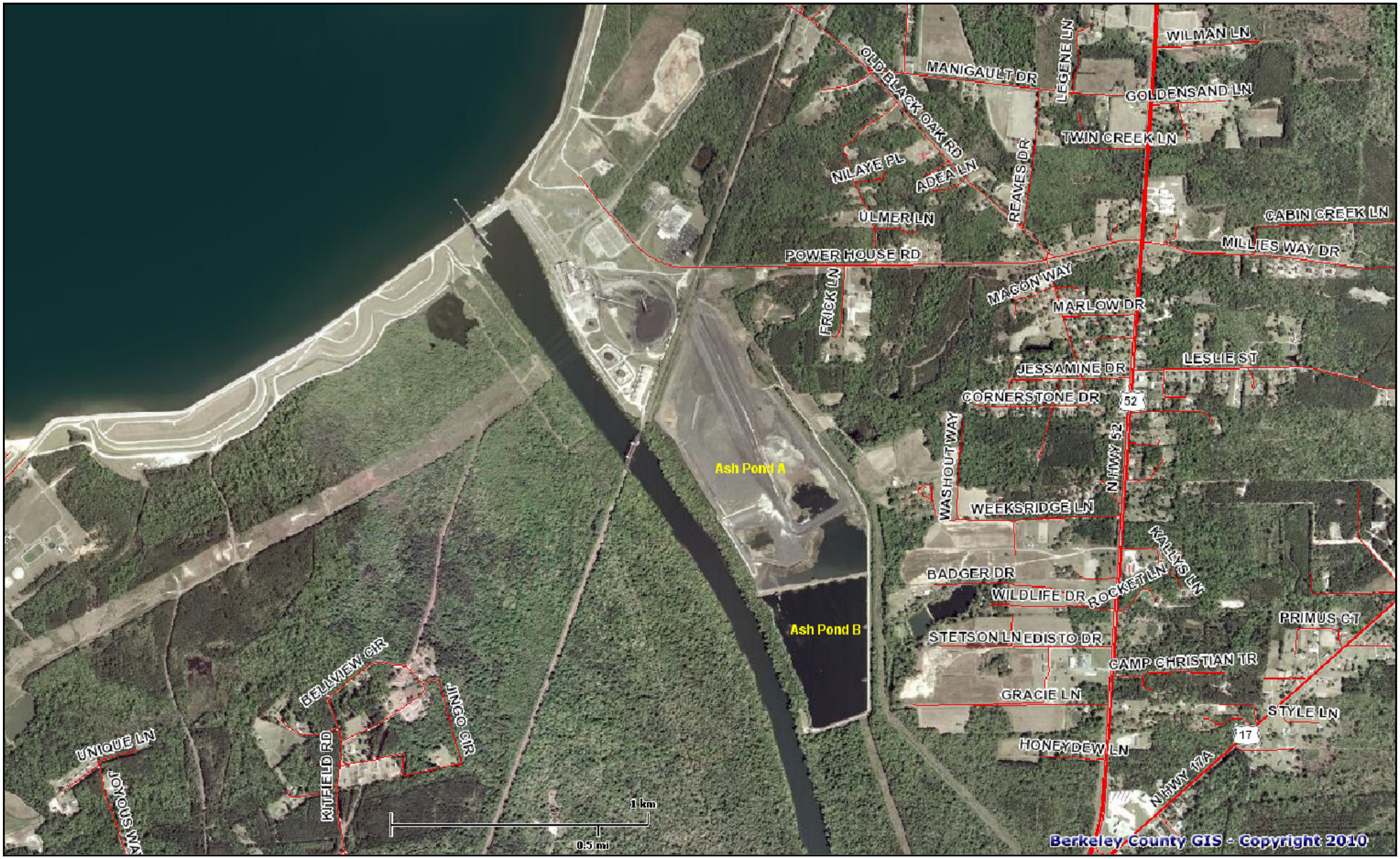
Vicinity Map

The county of Berkeley and its GIS Department disclaims accountability for this product and makes no warranty express or implied concerning the accuracy thereof. Responsibility for interpretation and application of this product lies with the user.

Tuesday, July 20, 2010

N

Appendix A - Doc 1.2 Jefferies Generating Station GIS 2006 Aerial



BERKELEY COUNTY
BCGIS
GEOGRAPHIC INFORMATION SYSTEM

Berkeley County GIS Online Mapping

The county of Berkeley and its GIS Department disclaims accountability for this product and makes no warranty express or implied concerning the accuracy thereof. Responsibility for interpretation and application of this product lies with the user.

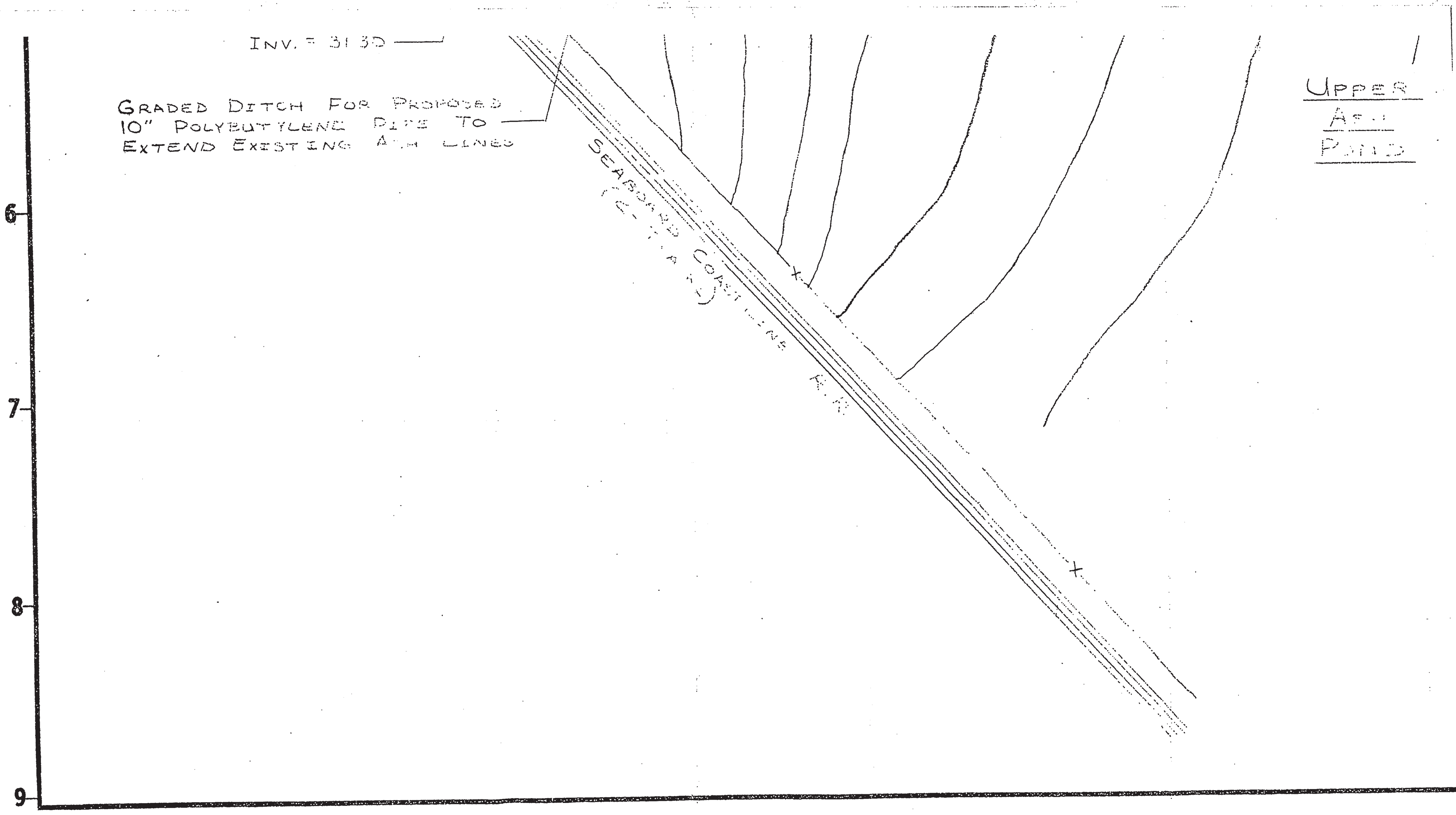
Wednesday, July 28, 2010

N

Appendix A - Doc 1.3 Impoundment Drawing 4007-0A


PROPOSED BERKELEY ELECTRIC CO-OP SUBSTATION
S.C. ROAD NO. S.C.-26
START NEW DIKE
PROPERTY BOUNDARY
CLEARING LIMITS
CLEARING LIMITS
CLEARING LIMITS
℄ DRAINAGE DITCH
℄ DIKE
RR R/W
LEGEND
EXISTING ELEVATIONS
FIN. EL. BTM. OF DITCH
PLAN
PROPERTY LINE
ELEV. 20.0
BERM
DITCH
VARIES
PROTECTION BERM AT RAILROAD SLOPE
SCALE: 1"=10'-0"
TYPICAL DIKE SECTION
SCALE: 1"=10'-0"
OVERFLOW STRUCTURE DETAIL
WOODEN WALKWAY
SPEC. S-2466-39
BURNS AND ROE, INC.
ENGINEERS AND CONSTRUCTORS
ORADELL, N.J.
HEMPSTEAD, N.Y.
LOS ANGELES, CALIF.
W.O. 2466
REVIEWED BY BURNS AND ROE, INC.
APPROVED FOR CONSTRUCTION LOCKWOOD GREENE ENGINEERS, INC.
PLAN AND DETAILS
LOCKWOOD GREENE ENGINEERS, INC.
SPARTANBURG, S.C.
MADE BY
CHECKED BY
APPROVED
SCALE
JOB NO.
DATE
DRAWING NO.
4007-0
FOR CONSTRUCTION
NO. DATE REVISION BY CHK APPR.
JGS Ash Ponds 2/2

Appendix A - Doc 1.4 Impoundment Drawing AP001-1



THE UPPER POND FROM THE LOWER POND:

UPPER POND WATER ELEV. = 14.1'
ELEV. OF TOP OF DIKE = ~ 19.3'
LOWER POND WATER ELEV. = 11.5'
INVERT OF PIPE (UPPER POND) = 12.8'
INVERT OF PIPE (LOWER POND) = 12.7'

ISSUE	REVISION	DATE	SIG.
1	RELOCATED DITCH	12/29/82	A.W.F.

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
SANTEE-COOPER ELECTRIC AND NAVIGATION SYSTEM

JEFFERIES GENERATING STATION

ASH POND
TOPOGRAPHIC MAP OF DRAINAGE PROBLEM

ENGINEERING DEPARTMENT

DATE: 4/13/82
DRAWN: A.W.F.
CHECKED:
APPROVED
SCALE: 1" = 100'
SHEET OF SHEETS
DWG. NO. AP001-1

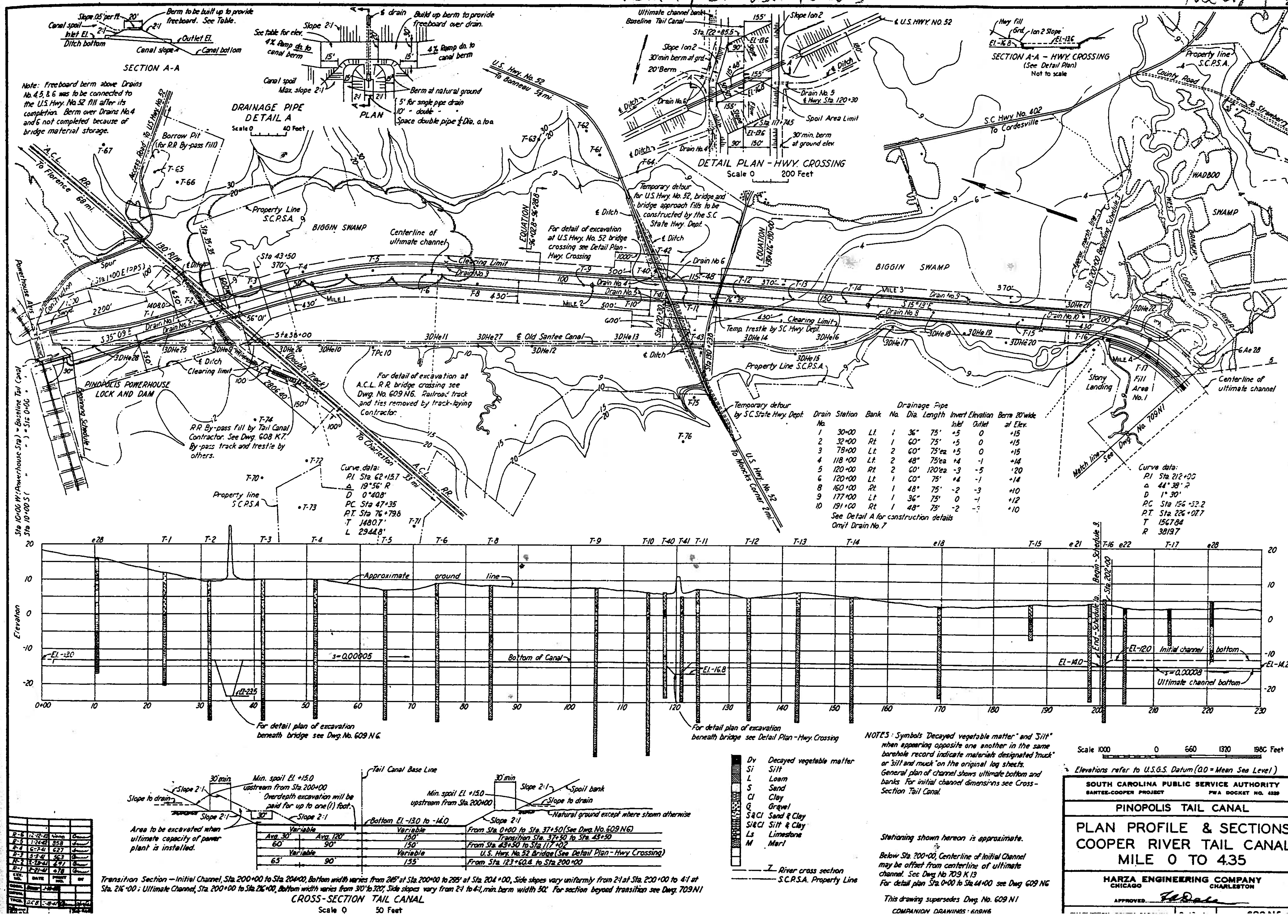
PIEDMONT PRINTMAKERS

JBS 1/2

Appendix A - Doc 1.5 Boring Log for Pinopolis Tail Canal

vicinity of ash ponds

File Copy



Drainage Pipe

Drain No.	Station	Bank	No.	Dia.	Length	Invert Elevation Inlet	Invert Elevation Outlet	Berm 20' wide at Elev.
1	30+00	Lt.	1	36"	75'	+5	0	+15
2	32+00	Rt.	1	60"	75'	+5	0	+15
3	78+00	Lt.	2	60"	75' ea.	+5	0	+15
4	118+00	Lt.	2	48"	75' ea.	+4	-1	+14
5	120+00	Rt.	2	60"	120' ea.	-3	-5	+20
6	120+00	Lt.	1	60"	75'	+4	-1	+14
8	160+00	Rt.	1	48"	75'	-2	-3	+10
9	177+00	Lt.	1	36"	75'	0	-1	+12
10	191+00	Rt.	1	48"	75'	-2	-3	+10

See Detail A for construction details
Omit Drain No. 7

Appendix A - Doc 1.6 2005-2009 Ash Management and Sales

Ash Management and Sales

Jefferies Generating Station

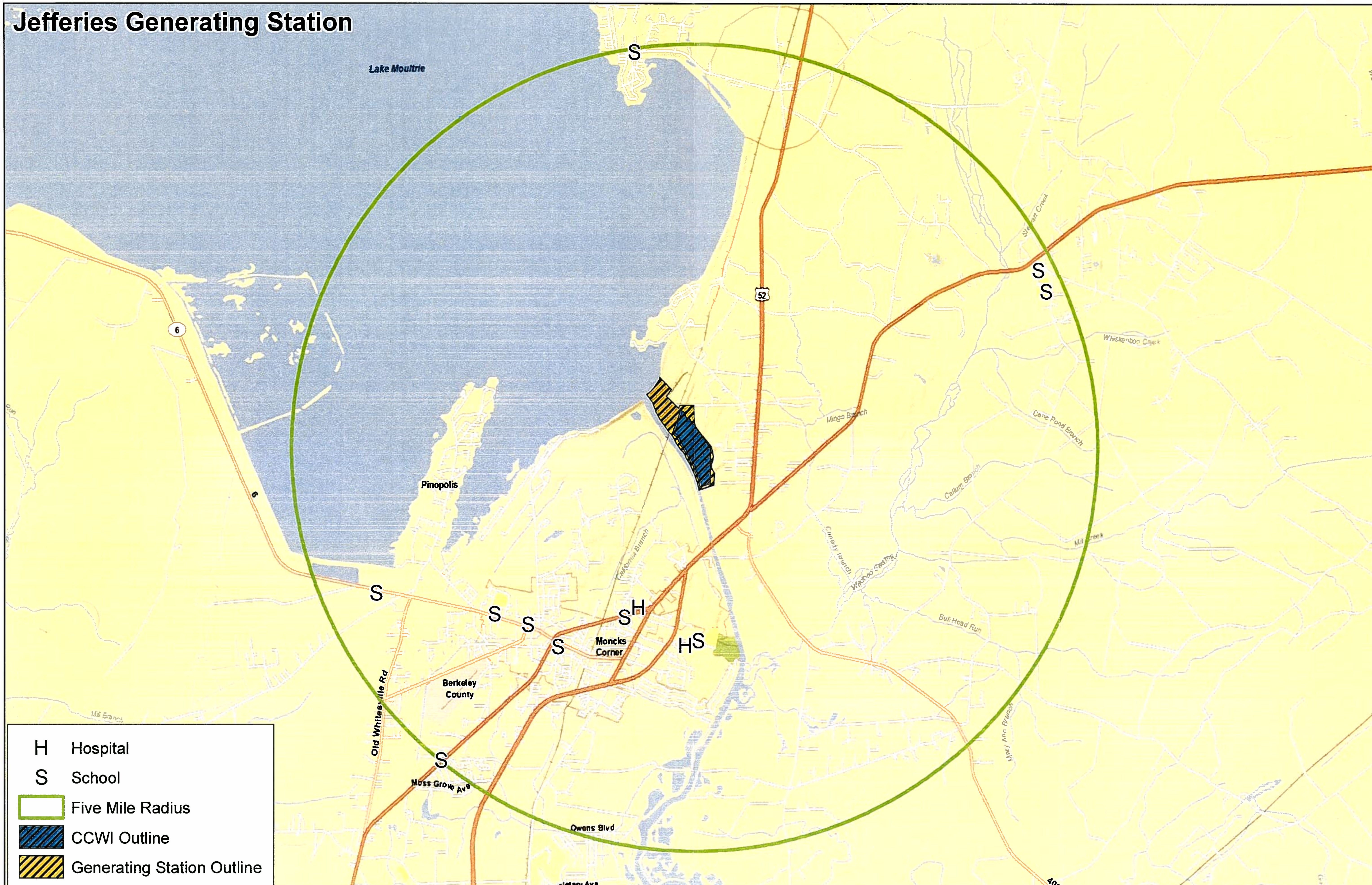
	Ash Produced (T)	Ash Removed (T)	% Sold
2005	84,366	46,908	56%
2006	81,208	36,066	44%
2007	77,346	79,932	103%
2008	60,230	46,672	77%
2009	11,365	32,375	285%
5-yr total	**314,516**	**241,953**	**77%**

Bottom Ash: Normally wet sluiced to the ash pond.
Some is sold after dewatering in the pond.

Fly Ash: Normally wet sluiced to ash pond. In previous years was dry handled and transferred to CBO.
Some is sold after dewatering.

Appendix A - Doc 1.7 Jefferies Generating Station Regional Map Showing the Management Unit(s) in Relationship to Critical Infrastructure

Jefferies Generating Station



Appendix A - Doc 1.8: NPDES Permit

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

National Pollutant Discharge Elimination System Permit

for Discharge to Surface Waters

This Permit Certifies That

South Carolina Public Service Authority
Jefferies Generating Station

has been granted permission to discharge from a facility located at

463 Powerhouse Road
Moncks Corner, SC
Berkeley County

to receiving waters named

Tailrace Canal

in accordance with limitations, monitoring requirements and other conditions set forth herein. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-20 *et seq*., 1976), Regulation 61-9 and with the provisions of the Federal Clean Water Act (PL 92-500), as amended, 33 U.S.C. 1251 *et seq*., the "Act."

Bureau of Water
Jeffrey P. DeBessonet, Director
Water Facilities Permitting Division

Issue Date: January 28, 2003 ***Expiration Date: February 29, 2008***

Effective Date: March 1, 2003 ***Permit No.: SC0001091***

Modification Date: July 1, 2006

Appendix A - Doc 1.9: Dike Inspection Procedure

4.9. Dike Inspection Procedure

4.9.1. Inspections are to be performed annually on the cooling ponds, and quarterly on the ash, slurry, and special waste ponds and documented on the Dike Inspection Report, found in Appendix E - FORMS.

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

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

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

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

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

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

<u>Erosion</u>
Any signs of erosion should be included in the report.

<u>Depressions or Ruts</u>
Depressions and ruts can hold water and make maintenance mowing more difficult or can weaken the soil and cause localized sloughing of the

slope. These should be filled and graded to drain.

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

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

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

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

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

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

4.10. Underground Piping Inspection

4.10.1. SPCC requires that for oil piping, all buried lines are integrity and leak tested upon installation and are visually inspected whenever altered, disturbed, or exposed for signs of corrosion or leaking (40 CFR 112.8(d)(4)). In addition, the route along a buried line should be visually inspected every five years and the following conditions are noted: change in surface contour of the ground, soil discoloration, or noticeable odor (API 570).

4.10.2. In order to document these inspections, the "Underground Piping Inspection Form" attached in Appendix E-Forms, should be completed for each underground line every 5 years. These forms should be maintained on file, and available for inspection at the station.

Appendix A - Doc 1.10: Dike Inspection Reports

FOSSIL & HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION
ASH POND A

DATE: 1/29/10
INSPECTOR: GAYLENE ALLEN
REVIEWED BY: Station Manager
SIGNATURE: [signature]
SIGNATURE: [signature]

FEATURE	OK √	LOCATION & COMMENTS
1. Crest		
Alignment (H)	✓	
Settlement (V)	✓	
Cracks (Measure Dimensions)	✓	
Excessive Vegetation	✓	
Burrows or Ruts	✓	
2. Slopes		
Seepage (Flow, lush grass, clarity)	✓	
Erosion gullies	✓	
Slides (cracks, bulges, scarps)	✓	
Vegetation (trees present, no grass)	✓	
Animal burrows	✓	
Rip-rap displacement	✓	
Freeboard Adequate	✓	
Settlement/Depression	✓	
3. Area Downstream		
Seepage (Flow, lush grass, clarity)	✓	
Boils	✓	
Drainage Ditches	✓	
Drainage Pipes	✓	
Vegetation (trees present, no grass)	✓	
4. Outlet Works		
Inspect Concrete, Metal, and Wood	✓	
5. Overall Condition		
Note any other issues	✓	

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

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services - Jane Hood

Revised 4/15/2009

FOSSIL & HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION

ASH POND B

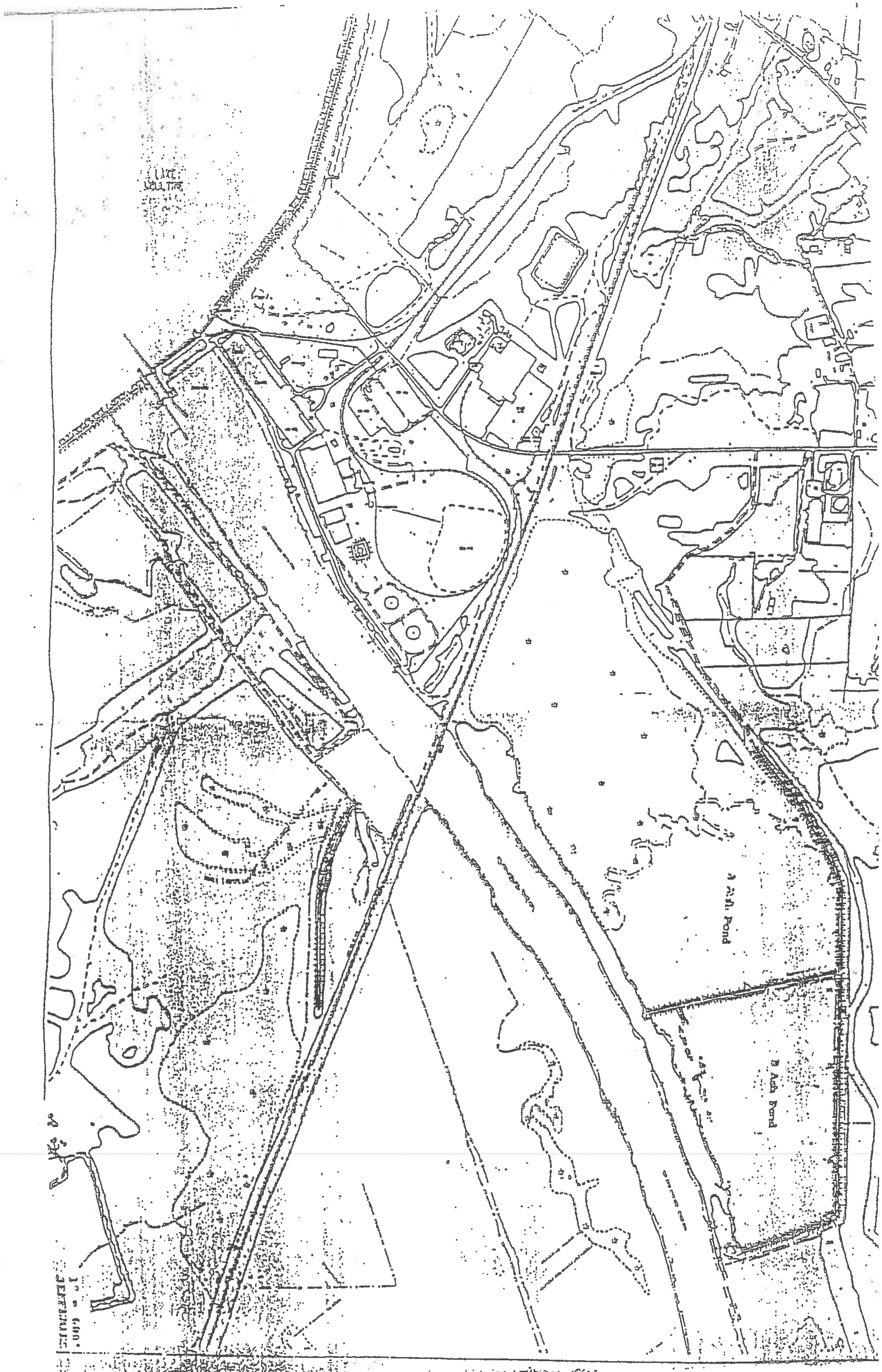
DATE: 1/29/10
INSPECTOR: GAYLENE ALLEN **SIGNATURE:** Gaylene Allen
REVIEWED BY: Station Manager **SIGNATURE:** [signature]

FEATURE	OK √	LOCATION & COMMENTS
1. Crest	√	
Alignment (H)	√	
Settlement (V)	√	
Cracks (Measure Dimensions)	√	
Excessive Vegetation	√	
Burrows or Ruts	√	
2. Slopes	√	
Seepage (Flow, lush grass, clarity)	√	
Erosion gullies	√	
Slides (cracks, bulges, scarps)	√	
Vegetation (trees present, no grass)	√	
Animal burrows	√	
Rip-rap displacement	√	
Freeboard Adequate	√	
Settlement/Depression	√	
3. Area Downstream		
Seepage (Flow, lush grass, clarity)	√	
Boils	√	
Drainage Ditches	√	
Drainage Pipes	√	
Vegetation (trees present, no grass)	√	
4. Outlet Works		
Inspect Concrete, Metal, and Wood	√	
5. Overall Condition	√	
Note any other issues	√	

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

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services - Jane Hood

Revised 4/15/2009


A Ash Pond
B Ash Pond

G.1.a

FOSSIL & HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION
ASH POND A

DATE: 4/30/10
INSPECTOR: GAYLENE ALLEN — **SIGNATURE:** [signature]
REVIEWED BY: Station Manager — **SIGNATURE:** [signature]

FEATURE	OK √	LOCATION & COMMENTS
1. Crest		
Alignment (H)	✓	
Settlement (V)	✓	
Cracks (Measure Dimensions)	✓	
Excessive Vegetation	✓	
Burrows or Ruts	✓	
2. Slopes		
Seepage (Flow, lush grass, clarity)	✓	
Erosion gullies	✓	
Slides (cracks, bulges, scarps)	✓	
Vegetation (trees present, no grass)	✓	
Animal burrows	✓	
Rip-rap displacement	✓	
Freeboard Adequate	✓	
Settlement/Depression	✓	
3. Area Downstream		
Seepage (Flow, lush grass, clarity)	✓	
Boils	✓	
Drainage Ditches	✓	CUT AROUND SECONDARY DITCHES
Drainage Pipes	✓	
Vegetation (trees present, no grass)	✓	
4. Outlet Works		
Inspect Concrete, Metal, and Wood	✓	
5. Overall Condition		
Note any other issues	✓	

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

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services - Jane Hood

Revised 4/15/2009

FOSSIL & HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION
ASH POND B

DATE: 4/30/10
INSPECTOR: GAYLENE ALLEN
REVIEWED BY: Station Manager

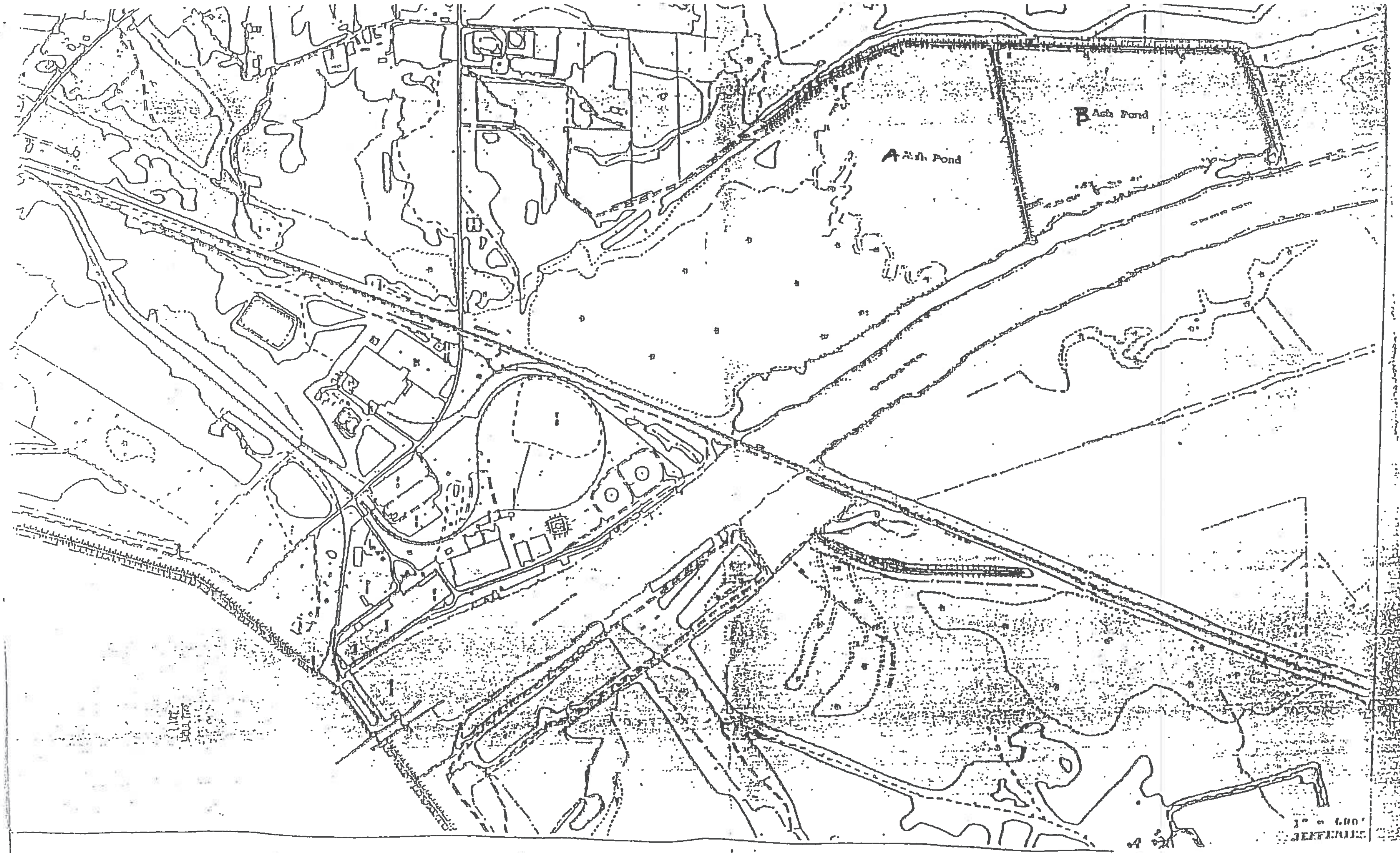
SIGNATURE: Gaylene Allen
SIGNATURE: [signature]

FEATURE	OK √	LOCATION & COMMENTS
1. Crest		
Alignment (H)	√	
Settlement (V)	√	
Cracks (Measure Dimensions)	√	
Excessive Vegetation	√	
Burrows or Ruts	√	
2. Slopes		
Seepage (Flow, lush grass, clarity)	√	
Erosion gullies	√	
Slides (cracks, bulges, scarps)	√	
Vegetation (trees present, no grass)	√	
Animal burrows	√	
Rip-rap displacement	√	
Freeboard Adequate	√	
Settlement/Depression	√	
3. Area Downstream		
Seepage (Flow, lush grass, clarity)	√	
Boils	√	
Drainage Ditches	√	CUT AROUND SECONDARY DITCHES
Drainage Pipes	√	
Vegetation (trees present, no grass)	√	
4. Outlet Works		
Inspect Concrete, Metal, and Wood	√	
5. Overall Condition		
Note any other issues	√	

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

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services - Jane Hood

Revised 4/15/2009



A Ash Pond
B Ash Pond
1" = 600'
JEFFERIES

G-1.a.

FOSSIL AND HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION

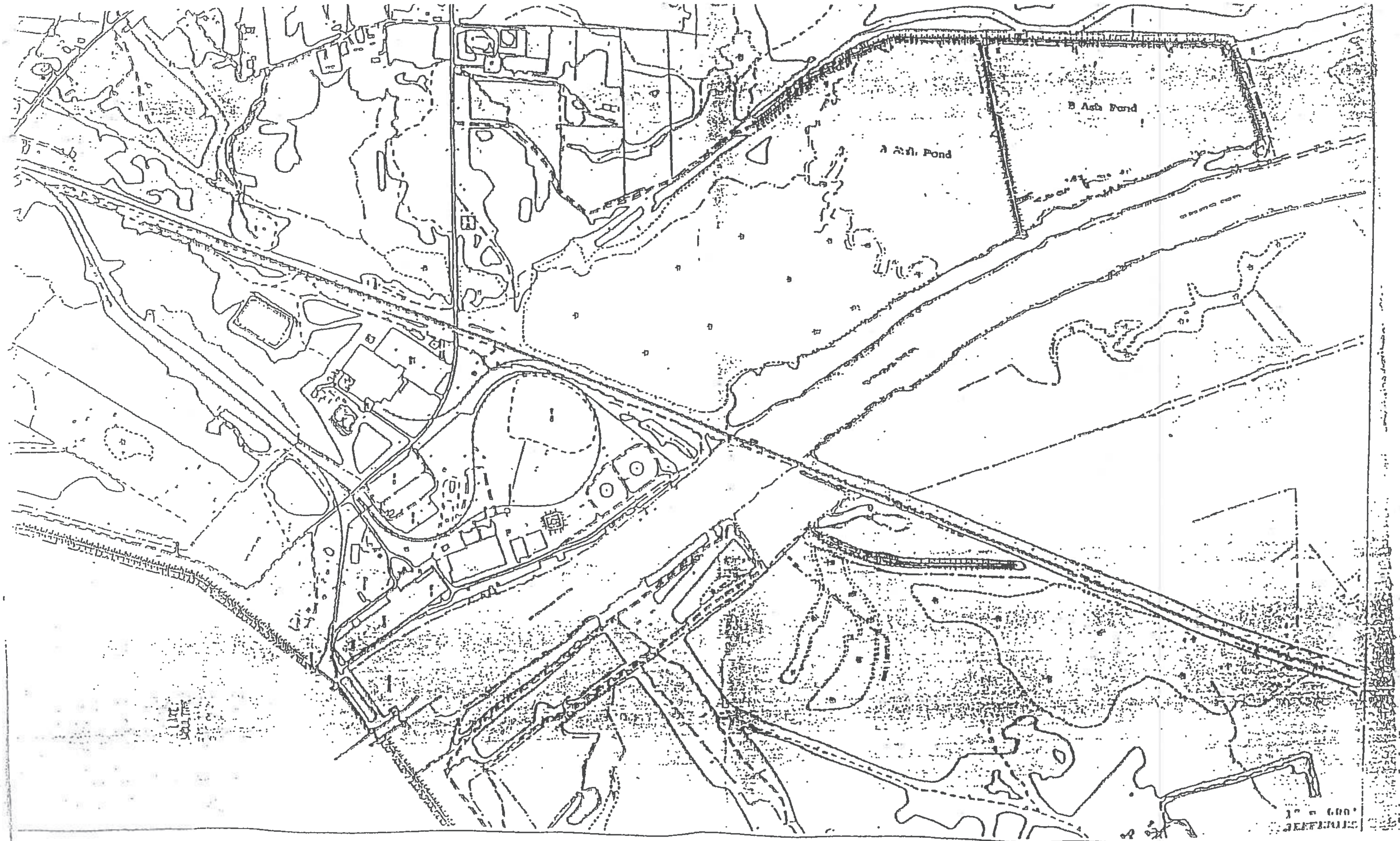
INSPECTION DATE: 10/29/09

INSPECTOR: Gaylene Allen	SIGNATURE: [signature]	
REVIEWED BY : Station Manager	SIGNATURE: [signature]	
	ASH POND – A Quarter 1 2 3 ④	ASH POND - B Quarter 1 2 3 ④	
LEAKS:	None Noted	None Noted	
SEEPAGE:	None Noted	None Noted	
WET SPOTS:	None Noted	None Noted	
AQUATIC WEED GROWTH:	None	None	
SETTLEMENT:	None	None	
EROSION:	None	None	
OVERALL CONDITION OF DIKE:	Good	Good	

NOTE: SHOW LOCATION OF PROBLEM AREAS ON AN ATTACHED DRAWING.

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services – Jane Hood

Revised: 8/11/2006


A Ash Pond
B Ash Pond

G.1.a

FOSSIL AND HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION

INSPECTION DATE: 7/31/09

INSPECTOR: Gaylene Allen | SIGNATURE: Gaylene Allen

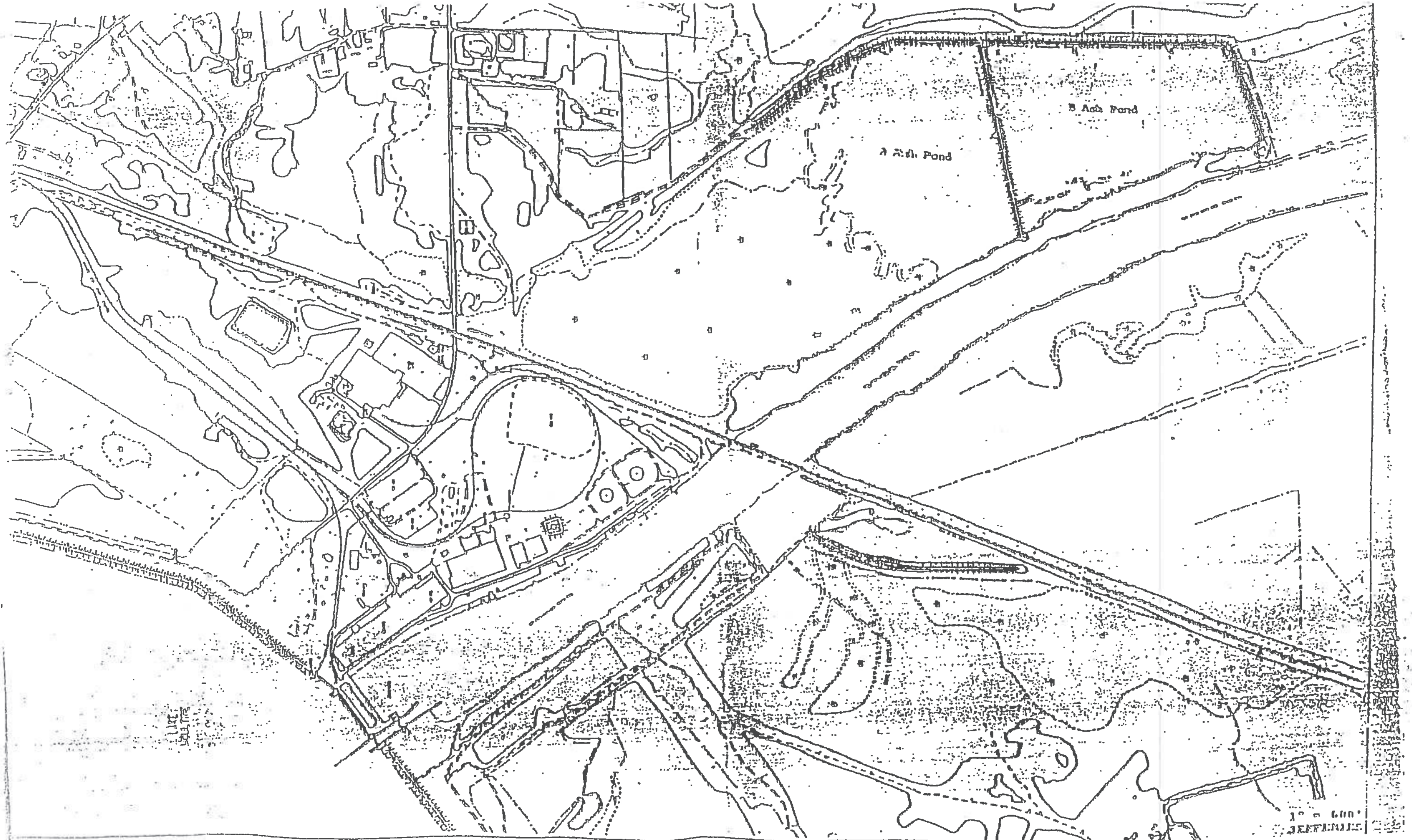
REVIEWED BY : Station Manager | SIGNATURE: [signature]

	ASH POND – A Quarter 1 2 (3) 4	ASH POND - B Quarter 1 2 (3) 4	
LEAKS:	NONE NOTED	NONE NOTED	
SEEPAGE:	NONE NOTED	NONE NOTED	
WET SPOTS:	NONE NOTED	NONE NOTED	
AQUATIC WEED GROWTH:	NONE	NONE	
SETTLEMENT:	NONE	NONE	
EROSION:	NONE	NONE	
OVERALL CONDITION OF DIKE:	GOOD	GOOD	

NOTE: SHOW LOCATION OF PROBLEM AREAS ON AN ATTACHED DRAWING.

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services – Jane Hood

Revised: 8/11/2006


B Ash Pond
A Ash Pond

FOSSIL AND HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION

MPR 5/6/2009

INSPECTION DATE: 4/30/09

INSPECTOR: GAYLENE ALLEN — SIGNATURE: Gaylene Allen

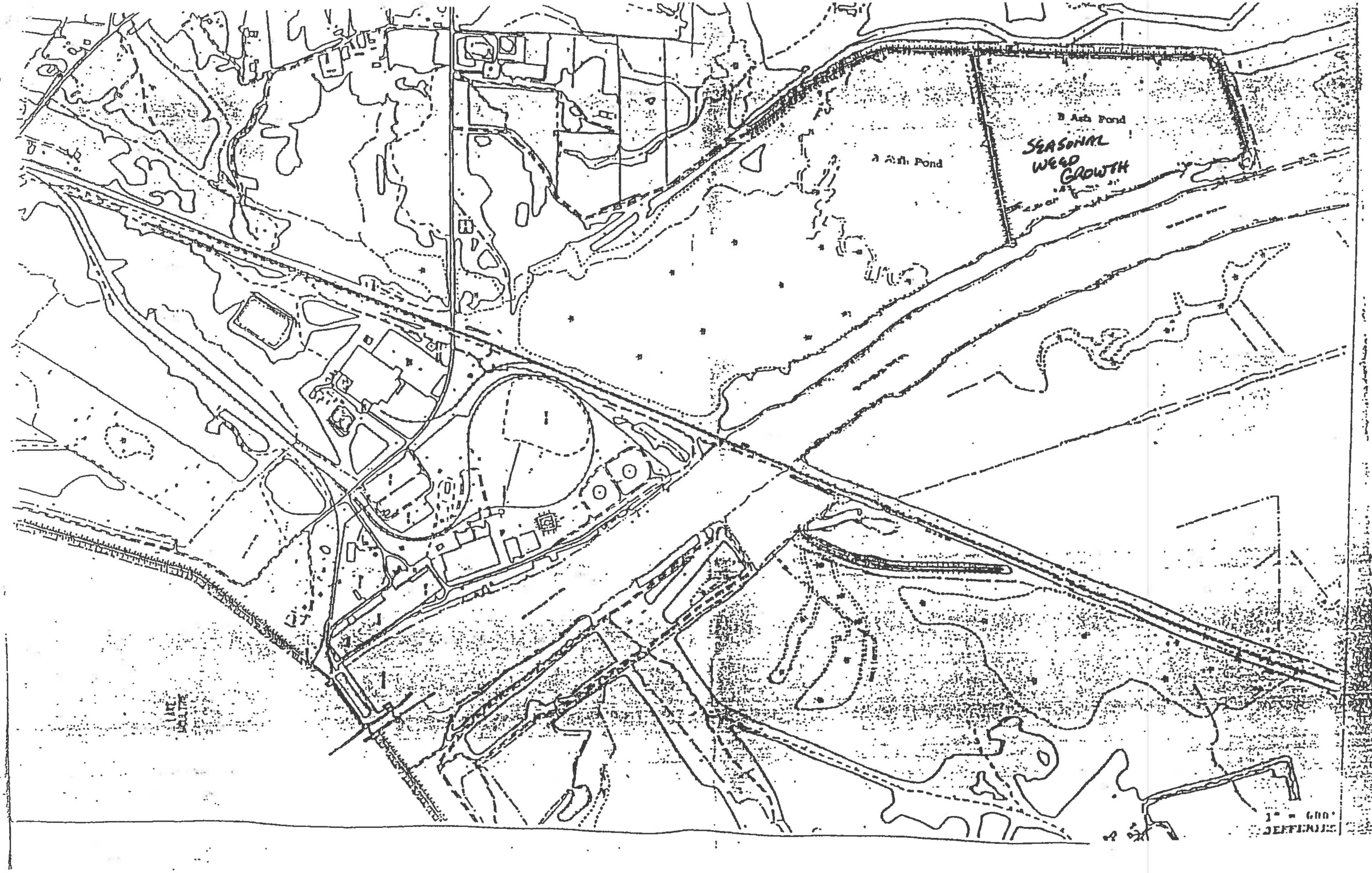
REVIEWED BY : Station Manager — SIGNATURE: [signature]

	ASH POND – A Quarter 1 ② 3 4	ASH POND - B Quarter 1 ② 3 4	
LEAKS:	NONE NOTED	NONE NOTED	
SEEPAGE:	NONE NOTED	NONE NOTED	
WET SPOTS:	NONE NOTED	NONE NOTED	
AQUATIC WEED GROWTH:	NONE	SEASONAL WEED GROWTH	
SETTLEMENT:	NONE	NONE	
EROSION:	NONE	NONE	
OVERALL CONDITION OF DIKE:	GOOD	GOOD	

NOTE: SHOW LOCATION OF PROBLEM AREAS ON AN ATTACHED DRAWING.

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services – Jane Hood

Revised: 8/11/2006



B Ash Pond
A Ash Pond
SEASONAL WEED GROWTH
1" = 600'

5/6

FOSSIL AND HYDRO GENERATION - TECHNICAL SERVICES
DIKE INSPECTION REPORT
JEFFERIES STATION

INSPECTION DATE: 1/30/09

INSPECTOR: Gaylene Allen — SIGNATURE: Gaylene Allen

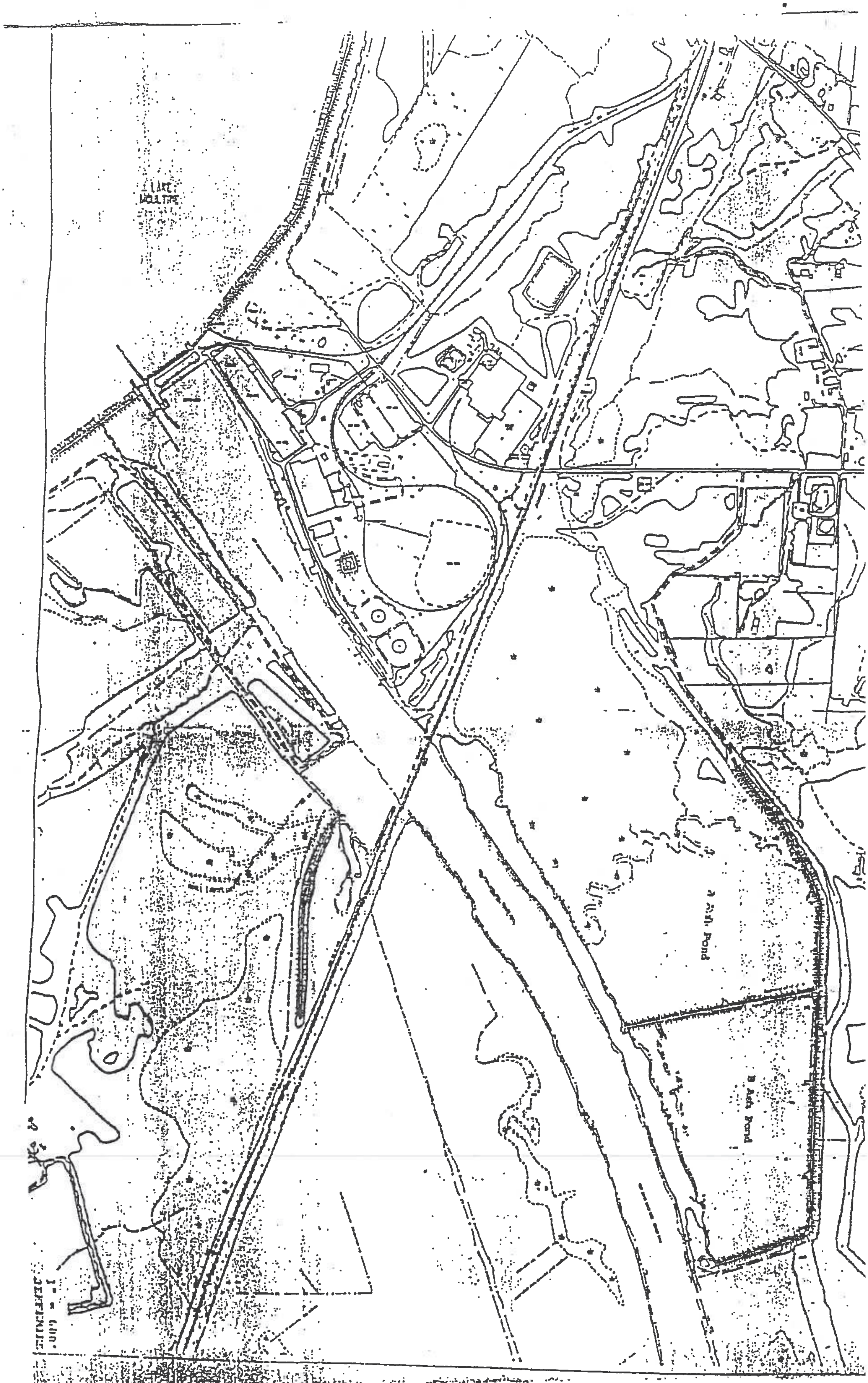
REVIEWED BY : Station Manager — SIGNATURE: [signature]

	ASH POND – A Quarter (1) 2 3 4	ASH POND - B Quarter (1) 2 3 4	
LEAKS:	None Noted	None Noted	
SEEPAGE:	None Noted	None Noted	
WET SPOTS:	None Noted	None Noted	
AQUATIC WEED GROWTH:	None	None	
SETTLEMENT:	None	None	
EROSION:	None	None	
OVERALL CONDITION OF DIKE:	Good	Good	

NOTE: SHOW LOCATION OF PROBLEM AREAS ON AN ATTACHED DRAWING.

Copies: Station Files (original)
Fossil and Hydro Generation Technical Services – Jane Hood

Revised: 8/11/2006


LAKE MOULTRIE
A Ash Pond
B Ash Pond
JEFFERIES

Appendix A - Doc 1.11: Staff Gauge Readings

Jefferies Generating Station (J)
Surface Water Staff Gauges (SW)

Date	Label	Enter Staff Gauge Reading (nearest 0.1')	+	Ref Elev. (ft.)	=	Water Surface Elev (ft)	Location
Dec-09							
12/28/2009	J-SW-APA	2.6	+	12	=	14.6	Ash Pond A - Concrete outlet structure
12/28/2009	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Jan-10							
1/28/2010	J-SW-APA	2.6	+	12	=	14.6	Ash Pond A - Concrete outlet structure
1/28/2010	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Feb-10							
2/28/2010	J-SW-APA	2.5	+	12	=	14.5	Ash Pond A - Concrete outlet structure
2/28/2010	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Mar-10							
3/28/2010	J-SW-APA	2.5	+	12	=	14.5	Ash Pond A - Concrete outlet structure
3/28/2010	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Apr-10							
4/28/2010	J-SW-APA	2.7	+	12	=	14.7	Ash Pond A - Concrete outlet structure
4/28/2010	J-SW-APB	2.1	+	11	=	13.1	Ash Pond B - Concrete outlet structure
May-10							
5/28/2010	J-SW-APA	2.4	+	12	=	14.4	Ash Pond A - Concrete outlet structure
5/28/2010	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Jun-10							
6/28/2010	J-SW-APA	2.4	+	12	=	14.4	Ash Pond A - Concrete outlet structure
6/28/2010	J-SW-APB	2	+	11	=	13	Ash Pond B - Concrete outlet structure
Jul-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure
Aug-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure
Sep-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure
Oct-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure
Nov-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure
Dec-10							
	J-SW-APA		+	12	=	12	Ash Pond A - Concrete outlet structure
	J-SW-APB		+	11	=	11	Ash Pond B - Concrete outlet structure

FIGURE 7
Jefferies Generating Station
Surface Water Monitoring

Appendix B - Jefferies GS Ash Pond A Checklist

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: JEFFERIES GENERATING STA. Date: 6/29/2010

Unit Name: ASH POND A Operator's Name: SANTEE COOPER

Unit I.D.: Hazard Potential Classification: High (Significant) Low

Inspector's Name: FREDERIC C. TUCKER PE & ANNE LEE

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?	QTLY.		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	~144		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	t.b.p.		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?		✓	Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	✓	
7. Is the embankment currently under construction?		✓	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)?	N/A		From underdrain?	N/A	
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways~~, groin or diversion~~ or ditches?		✓	Around the outside of the decant pipe?		✓
15. ~~Are~~ Is spillway ~~or ditch linings~~ deteriorated?		✓	22. Surface movements in valley bottom or on hillside?	N/A	
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?	✓	
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

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.

N/A = Not Applicable or Not a FEATURE.

Inspection Issue # Comments (KEYED TO ITEM NOS. ABOVE)

1. Quarterly formal inspections by Santee Cooper engineers; daily by operating personnel; more frequent drive-bys by security personnel.

3. Decant inlet elevation to be provided (t.b.p.).

5. No formal survey of existing dam elevations. Design elevation = 20'

6. There is no geotechnical instrumentation. Water quality wells monitored for gw contam.

12. There are no trash racks, but there is skimmer wall to retain floating synosphere

23. Pond B on downstream side of divider dike. Drainage ditch w/water parallel to downstream toe of east dike in low swampy area.

EPA FORM -XXXX

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # SC 0001091 INSPECTOR FREDERIC C. TUCKER, PE & ANNE LEE

Date ____________

Impoundment Name ASH POND A JEFFERIES GENERATING STATION

Impoundment Company SANTEE COOPER

EPA Region IV

State Agency (Field Office) Address 2600 BULL STREET COLUMBIA, SC 29201

Name of Impoundment ASH POND A

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update ✓

	Yes	No
Is impoundment currently under construction?		✓
Is water or ccw currently being pumped into the impoundment?	✓	

IMPOUNDMENT FUNCTION: SERVES AS SETTLING BASIN FOR SLUICED CCW. CCW IN POND IS MINED FOR BENEFICIAL REUSE.

Nearest Downstream Town : Name MONCKS CORNER, SC

Distance from the impoundment 1.1 mi (to nearest Town Limit)

Impoundment Location: (AT OUTLET)

Longitude -79 Degrees 58 Minutes 31.5 Seconds

Latitude 33 Degrees 13 Minutes 55.2 Seconds

State SC County BERKELEY

Does a state agency regulate this impoundment? YES ✓ NO ______ FOR WATER QUALITY ONLY

If So Which State Agency? DEPARTMENT OF HEALTH & ENVIRONMENTAL CONTROL (DHEC); BUREAU OF WATER/ COMPLIANCE ASSURANCE DIVISION

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.

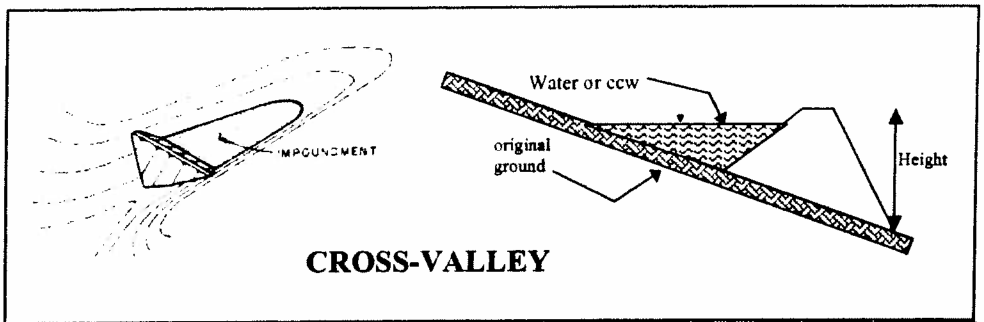
__✓__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

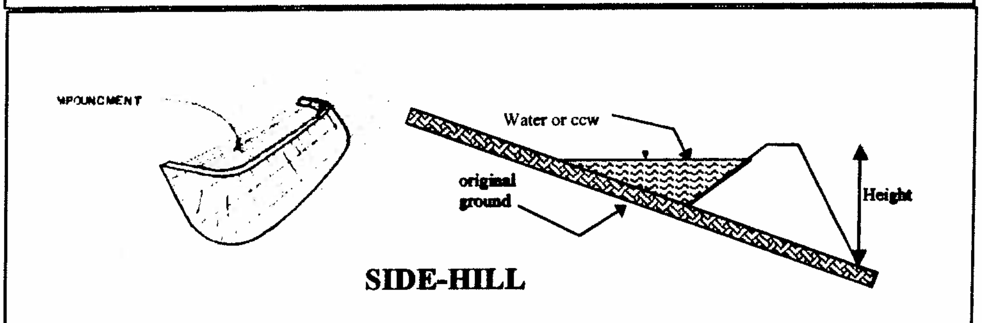
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

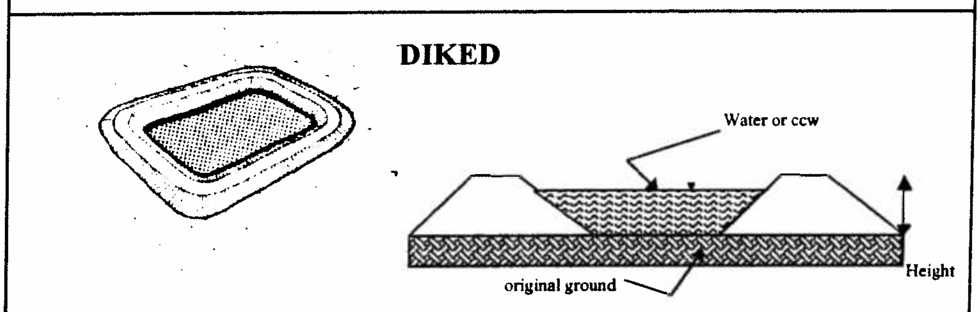
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

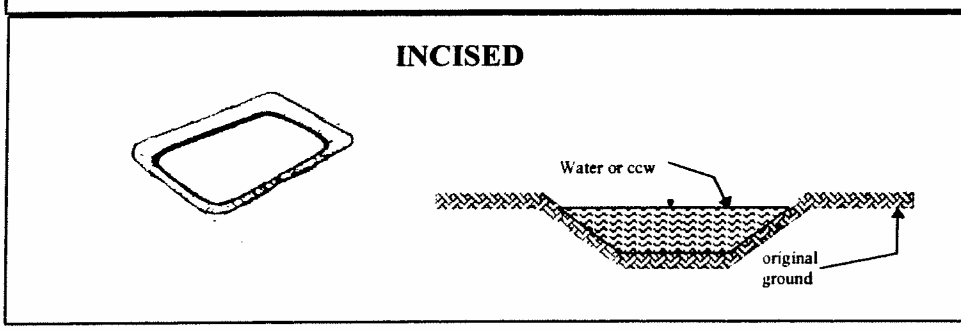
Failure could release CCW into Tailrace Canal below Pinopolis Dam. No probable loss of life.

CONFIGURATION:









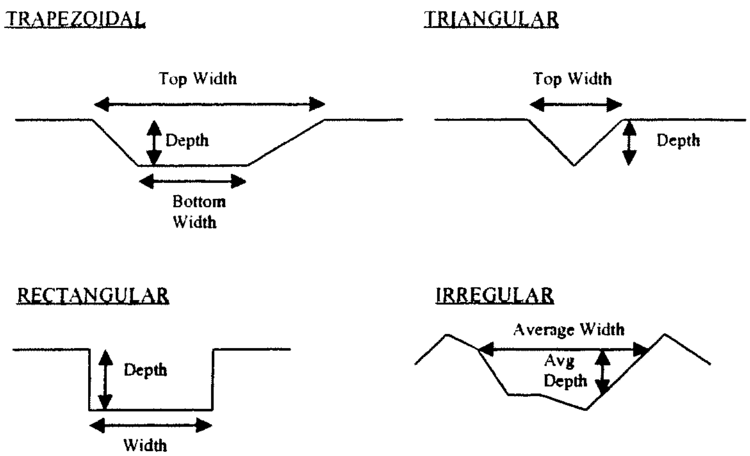
_____ Cross-Valley
✓ Side-Hill - High ground north & northeast sides. east dike ties into high ground; South side is divider dike; west side is massive spoil bank from dredging of Tailrace Canal
_____ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

Embankment Height < 20 feet Embankment Material EARTH
Pool Area 127 acres Liner NONE
Current Freeboard 5.6 feet Liner Permeability —

TYPE OF OUTLET (Mark all that apply)

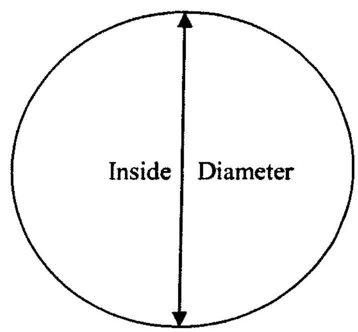
NONE **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width



✓ **Outlet**

Approx 24" or 30" inside diameter (To be Provided)



Material
_____ corrugated metal
_____ welded steel
✓ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES ✓ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By BURNS & ROE / LOCKWOOD GREENE
____

Has there ever been a failure at this site? YES __________ NO ____✓____

If So When? ____________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES _______ NO ✓

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO ✓

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

The available information reviewed during the site visit indicated that the east perimeter embankment was to be constructed on a stripped foundation soil surface. There was no information about the divider dike that forms the south side. The massive spoil bank that forms the west side presumably was placed on natural ground during excavation of Tailrace Canal in the 1940s.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The design Engineer-of-Record was not present during the site visit.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no evidence of previous failures or releases from the impoundment.

Appendix B - Jefferies GS Ash Pond B Checklist

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: JEFFERIES GENERATING STA. Date: 6/29/2010

Unit Name: ASH POND B Operator's Name: SANTEE COOPER

Unit I.D.: Hazard Potential Classification: High Significant (Low)

Inspector's Name: FREDERIC C. TUCKER, PE & ANNE LEE

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?	QTLY		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	~13.0'		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	t.b.p.		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?		✓	Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	✓	
7. Is the embankment currently under construction?		✓	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)?	N/A		From underdrain?	N/A	
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, ~~groin or diversion~~ or ditches?		✓	Around the outside of the decant pipe?		✓
15. ~~Are~~ Is spillway ~~or ditch linings~~ deteriorated?		✓	22. Surface movements in valley bottom or on hillside?	N/A	
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

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.

N/A = Not Applicable or NOT a FEATURE.

Inspection Issue # Comments (KEYED TO ITEM NOS. ABOVE)

1. Quarterly formal inspections by Santee Cooper engineers; daily by operating personnel; more frequent drive-bys by security personnel

3. Decant inlet elevation to be provided (t.b.p.).

5. No formal survey of existing dam elevations. Design elevation = 19.0'

6. There is no geotechnical instrumentation. Staff gage at outlet. Water quality wells monitored for groundwater contamination. (Trace Arsenic detected).

12. There are no trash racks, but there is skimmer wall to retain floating synospheres.

23. Drainage ditch w/ water in swampy area parallel to toe of east and south dikes.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # SC 0001091 INSPECTOR FREDERIC C. TUCKER, PE

Date ____________________

Impoundment Name ASH POND B JEFFERIES GENERATING STATION

Impoundment Company SANTEE COOPER

EPA Region IV

State Agency (Field Office) Addresss 2600 BULL STREET
COLUMBIA, SC 29201

Name of Impoundment ASH POND B

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update ✓

	Yes	No
Is impoundment currently under construction?		✓
Is water or ccw currently being pumped into the impoundment? (WATER DRAINING INTO ASH POND B FROM ASH POND A)	✓	

IMPOUNDMENT FUNCTION: SERVES PRINCIPALLY AS RETENTION POND ("POLISHING POND") FOR WATER DISCHARGED FROM POND A.

Nearest Downstream Town : Name MONCKS CORNER

Distance from the impoundment 0.8 mi (to nearest Town Limit)

Impoundment Location:

Longitude -79 Degrees 58 Minutes 37.9 Seconds

Latitude 33 Degrees 13 Minutes 35.8 Seconds

State SC County BERKELEY

Does a state agency regulate this impoundment? YES ✓ NO ______
FOR WATER QUALITY ONLY

If So Which State Agency? DEPARTMENT OF HEALTH & ENVIRONMENTAL CONTROL (DHEC); BUREAU OF WATER/COMPLIANCE ASSURANCE DIVISION

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.

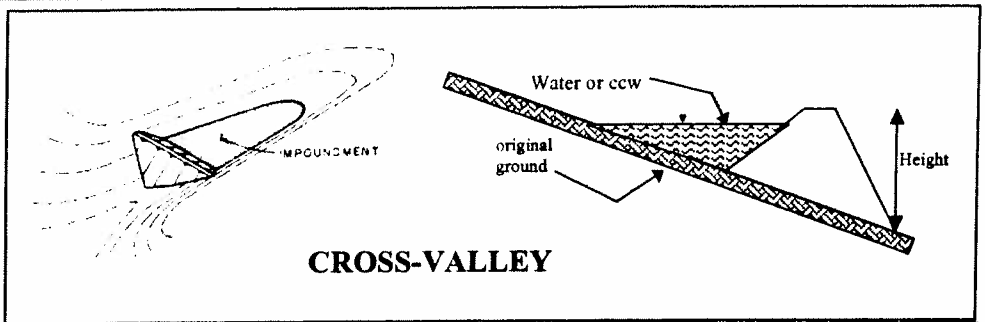
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

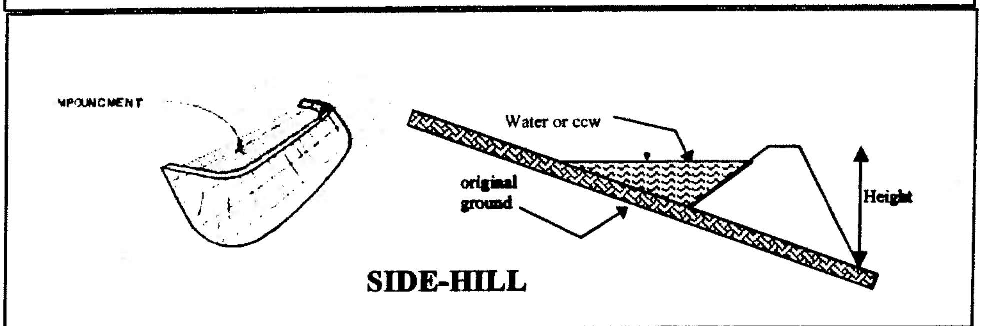
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

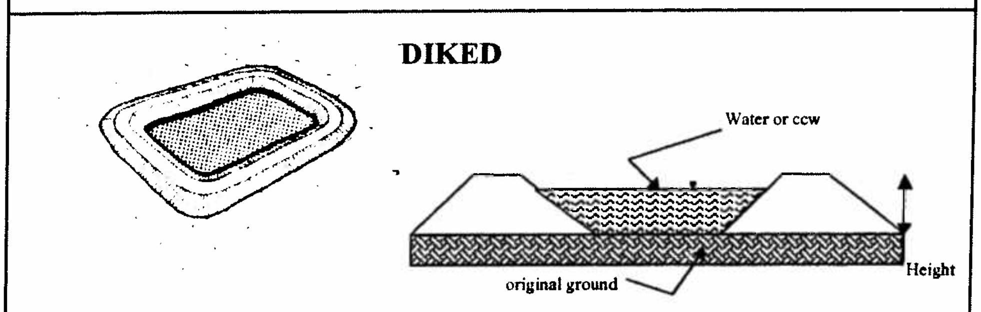
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

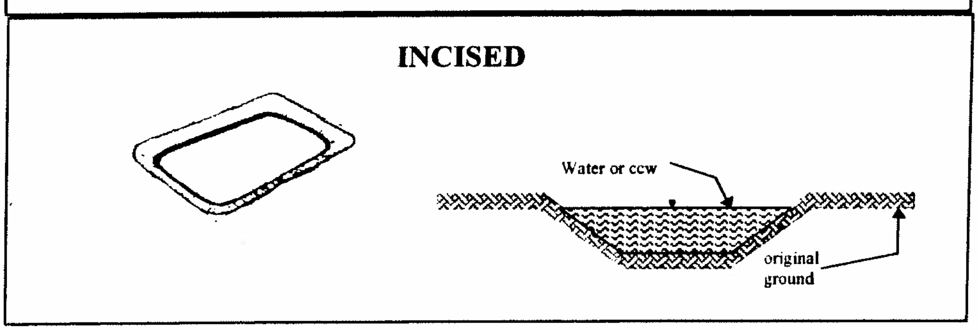
POND B SERVES AS A "POLISHING" POND BEFORE WATER IS DISCHARGED THROUGH PERMITTED OUTLET. NO SIGNIFICANT AMOUNT OF CCW IS STORED IN POND B. THEREFORE, FAILURE WOULD ONLY RELEASE WATER FROM THE SHALLOW (4' NORMAL DEPTH) POND TO THE DOWNSTREAM SWAMP AND INTO THE TAILRACE CANAL BELOW THE PINOPOLIS DAM. NO PROBABLE LOSS OF LIFE.

CONFIGURATION:









_____ Cross-Valley
_____ Side-Hill
__✓__ Diked
_____ Incised (form completion optional)
_____ Combination Incised/Diked

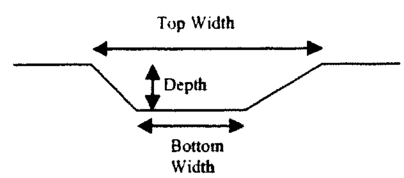
Embankment Height ___10___ feet Embankment Material ___EARTH___
Pool Area ___42___ acres Liner ___NONE___
Current Freeboard ___6___ feet Liner Permeability ___–___

<u>TYPE OF OUTLET</u> (Mark all that apply)

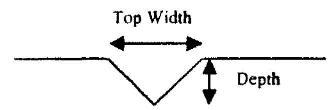
NONE **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

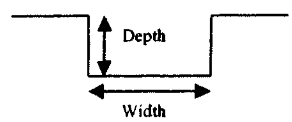
TRAPEZOIDAL



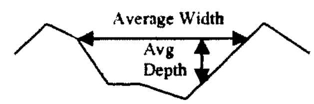
TRIANGULAR



RECTANGULAR

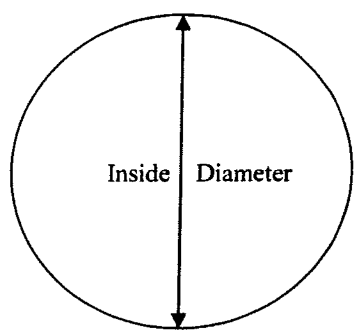


IRREGULAR



✓ **Outlet**

Appears 24" or 30" inside diameter (To be Provided)



Material
_____ corrugated metal
_____ welded steel
✓ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ____________________

Is water flowing through the outlet? YES ✓ NO _______

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By BURNS & ROE / LOCKWOOD GREENE
____

Has there ever been a failure at this site? YES __________ NO ____✓____

If So When? ______________________________

If So Please Describe : ______________________________

Has there ever been significant seepages at this site? YES _______ NO ✓

If So When? ____________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO ✓

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____________________

ADDITIONAL INSPECTION QUESTIONS

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

The available information reviewed during the sit visit indicated that the east and south perimeter embankments were to be constructed on a stripped foundation soil surface. There was no information about the divider dike that forms the north side. The massive spoil bank that forms the west side presumably was placed on natural ground during excavation of the Tailrace Canal in the 1940s.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The design Engineer-of-Record was not present during the site visit.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

There was no evidence of previous failures or releases from the impoundment.

Appendix C - Management of Change Procedure

5.6 *Management of Change*

"Describe a process for ensuring consideration of Environmental Requirements and environmental concerns in the planning, design, and operation of ongoing, new and/or changing processes, equipment, and maintenance activities." (CD Appendix ¶ 5.e.vi.)

Santee Cooper ensures consideration of environmental requirements and environmental concerns in the planning, design, and operation of ongoing, new and/or changing process, equipment, and maintenance activities through a combination of the following:

- An environmental review, which is governed by Santee Cooper's Management of Change process; and
- EMS training to educate Santee Cooper employees, contractors, and on-site service providers about environmental issues and requirements.

5.6.1 *Triggering a Management of Change (MOC) Environmental Review*

A formal environmental review is required for all "significant changes" with potential environmental requirements, impacts, or other concerns. Examples of significant changes or other events that would trigger a formal environmental review include, but are not limited to:

- Any project or activity requiring capital approval;
- Addition of new operations or processes that use equipment or materials whose environmental risks have not previously been assessed and environmental impacts and requirements determined;
- Installation of new equipment, replacement of equipment, or any construction activities that are not "replacement-in-kind" and which has not been assessed previously (e.g., re-routing of piping, emission points, water and wastewater conveyances, and significant earth moving);
- "Non-routine" maintenance activities which have not been assessed previously;
- Any activity that would require a permit modification, new permit, or contradict a condition in an existing permit;
- Any new or changing activity or process (including revising an SOP), where the resulting action will have an impact on the environment or be covered by an environmental requirement (i.e. changes that create a new waste stream, alters a permit condition); and
- Changes in regulatory requirements that will cause a physical modification at the facility, installation of new equipment, or changes in standard operating procedures.

5.6.2 Management of Change Environmental Review Process

Any originator of a potential change ("Originator") consults with the Station or Corporate EMS Coordinator to determine whether they must complete an environmental review, based on examples provided in this manual. Originators may include, but are not limited to, supervision/management in Generation Operations, Maintenance, and Technical Services, the Station Manager, Engineering & Construction Services (E&CS), General Construction Services, or Corporate Environmental Management. This list is not exclusive. Any Santee Cooper employee may originate a change requiring a MOC Environmental Review. Contact the Station or Corporate EMS Coordinator. The originator of the change completes the MOC Environmental Review form, per the instructions in the Appendix to this Manual, and forwards it to his or her supervision.

MOC reviews will require review and approval by the following:

- Originator's Supervision;
- Station EMS Coordinator;
- Generation Technical Services Superintendent; and
- Corporate EMS Coordinator.

After the environmental review is completed and approved, and before the changes are implemented, the Station EMS Coordinator ensures that the changes and any resulting requirements are communicated to appropriate employees, contractors, and on-site service providers. Training occurs for employees as necessary and as identified in the MOC, and all documentation, including SOPs, are updated.

Documentation of all MOC Environmental Reviews will be maintained at the station by the Station EMS Coordinator in the environmental files and by the change Originator with the project files. The Corporate EMS Coordinator will maintain a copy in the Corporate EMS files.

13.13 Policy

ENVIRONMENTAL MANAGEMENT OF CHANGE

MANAGEMENT OF CHANGE PROCESS

Change Identification

A change is identified by an individual. Table 1 Definition of a Change lists various types of changes and whether or not they are covered by the Management of Change (MOC) process.

Any employee can originate a change – although most changes will originate with planners, engineers, supervisors, superintendents, or construction personnel.

Change Initiation

Prior to beginning a project, the originating employee must decide if a project requires an MOC review. If a change requires an MOC, the originator completes the Management of Change Environmental Review Form (SC1039). Capital projects and O&M activities requiring an MOC review should not be approved until the MOC has been authorized.

The Management of Change Environmental Review Form includes:

- Description of the Change – including location, specifics on equipment, and planned implementation dates if known
- Identification of Temporary Changes – Any temporary changes require a removal date
- Potential Effect of the Change – Environmental impacts of the change, when known, should be identified here. Details of the effects and other information known should be provided.

Attach drawings, vendor information, or other instructive information if appropriate.
The MOC originator signs and dates the document.

Environmental Review

The Station EMS Coordinator coordinates a review of the change, and includes the originator and their supervisor, appropriate station personnel, the Generation Technical Services Superintendent, and the Corporate EMS Coordinator. These individuals determine any further actions necessary for the change to proceed.

Actions may include the following:

- Obtain or modify environmental permits
- Notify regulatory agencies
- Train employees, contractors and/or on-site service providers
- Edit Standard Operating Procedures or Operations and Maintenance Manuals
- Modify preventive maintenance (PM) tasks
- Modify Environmental Risk Assessment
- Develop job-specific work instructions
- Edit requirements matrix, training matrix, and other documents

The Station EMS Coordinator notifies the responsible persons of the required actions, and gains agreement on the Target Completion Date.

The originator/Supervisor, the Station EMS Coordinator, the Generation Technical Services Superintendent, and the Corporate EMS Coordinator sign and date the form indicating that the change has been reviewed to determine environmental impacts and all necessary Actions have been listed.

The Station EMS Coordinator or Corporate EMS Coordinator documents all actions in the MOC Tracking Spreadsheet.

Completion of Action List

Individuals who are assigned specific actions communicate with the Station EMS Coordinator indicating the status or completion of their assigned actions. As actions are completed, the Station EMS Coordinator or Corporate EMS Coordinator updates the MOC Tracking Spreadsheet with actual completion dates. The MOC Tracking Spreadsheet is used to track the status of all changes with uncompleted actions.

Authorization for Implementation

Prior to project or activity implementation, the change will be communicated to all affected employees, contractors, and on-site service providers.

The Station EMS Coordinator ensures that this communication has taken place and that all actions required in the Environmental Review are complete. The change is then authorized by the Station EMS Coordinator.

If it becomes necessary to implement a change prior to completion of some actions, the Station EMS Coordinator will determine if this is appropriate, and that this will not cause or have the potential to cause an environmental impact. All changes will be tracked to completion.

Documentation

The completed MOC form for each change, and any associated documentation, is maintained in the station EMS files. A copy of the completed form is sent to the Generation Technical Services Superintendent, the Corporate EMS Coordinator, and to the originator. If the change is associated with a project, a copy will be maintained in the project files. A copy of each completed MOC form will also be posted on the EMS iPort page.

TABLE 1

Definition of a Change

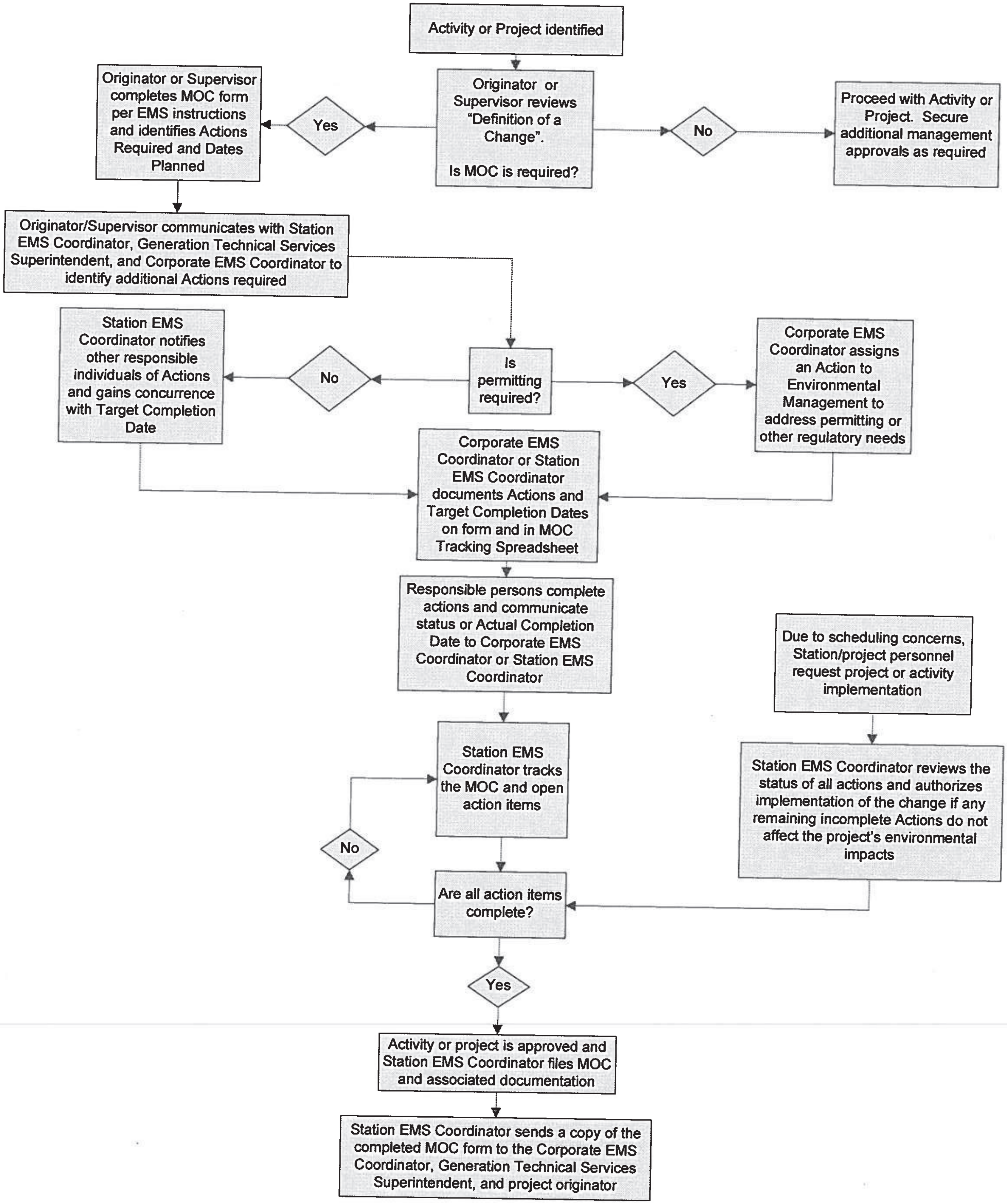
A formal environmental review using the Management of Change process is required for all "significant changes" with potential environmental requirements, impacts, or other concerns.

	Type of Change	MOC Required?
Processes A change to existing processes, work practices, or the use of existing equipment or structures	Activities or projects requiring capital approval	Yes
	Start up or shutdown of existing equipment	No
	Use of existing equipment for a purpose other than that for which it was originally intended	Yes
	Alteration to site, including: - Clearing or grading including road modifications - Modifications to stormwater collection - Change in location of material storage areas for oil, fuel, chemicals, by-products, etc.	Yes
	Activities generating new waste products	Yes
	Pond dredging – routine	No
	Pond dredging – non-routine, changing capacity	Yes
	Change of a pond use or change in inputs to a pond	Yes
	Changes in chemical suppliers	No
	Additions of chemicals not previously used	Yes
	Fuel Change to: – Fuel not currently permitted to burn, or – Fuel currently permitted but outside specifications	Yes
	Changes or additions to Standard Operating Procedures that are intended to improve clarity or format, and do not impact operating practices or have environmental issues	No
	Changes to a Standard Operating Procedure (Operations or Maintenance) that will have an impact on operating practices or has the potential to impact the environment	Yes
	Modifications (permanent or temporary) to controls or alarms in critical processes with impacts to the environment	Yes

	Type of Change	MOC Required?
Equipment Modifications to existing equipment – including rotating equipment, vessels, piping, tanks, containment areas, specialty items, instrumentation, and software – with potential environmental impacts	Identical replacement or replacement-in-kind (such as the same capacity, design conditions, materials of construction, speed, power, grade, internals, service, and operating theory)	No
	Equipment repairs and modifications to equipment that do not deviate from the original design specifications	No
	Equipment modifications not described above	Yes
	Modifications intended to extend the life of the station beyond original life expectancy	Yes
	Modifications that will increase the generating capacity/output of the station	Yes
	Temporary repairs or clamps on process equipment/piping with impacts to the environment	Yes
	Temporary changes to instrumentation or software with impacts to the environment	Yes
	Equipment temporarily out of service, pending return to service, abandonment, or demolition with impacts to the environment	Yes
New additions – including rotating equipment, vessels, piping, tanks, specialty items, instrumentation, software, and chemicals	New chemical being introduced into the process	Yes
	New facility installations (permanent or temporary)	Yes
	New equipment in parallel service	Yes
Maintenance Activities	Activities or projects requiring capital approval	Yes
	Piping or tubing replacement with like materials	No
	Piping changes other than normal repair or replacement-in-kind	Yes
	Repair of existing equipment to return it to its original design specifications	No
	Rerouting of existing piping	Yes
	Alterations or additions to potable water systems or sanitary systems	Yes
	A bypass to an alarm, shutdown, or interlock with impacts to the environment that is not described in existing operating procedures	Yes
	Changes to relief devices (relief valves, rupture disks, etc.) with impacts to the environment	Yes
	Changes to PM intervals on fuel burning or environmental compliance equipment	Yes
	Changes to PM intervals on equipment other than that described above	No
	Changes to or additions of lubricants not previously used	Yes

Santee Cooper Environmental Management System

Management of Change Process Flow



MANAGEMENT OF CHANGE ENVIRONMENTAL REVIEW

Santee Cooper

Station: ____________________ WO#: ____________________

Description of Change:
(Include location, specifics on equipment, and planned implementation date if known)

Is this change Temporary?
- ☐ No
- ☐ Yes- Date of Removal: __________

Is a MOC review required?
- ☐ No - Indicate Reason: __________
- ☐ Yes

Select the potential effect(s) of the change on the environment:	Describe effects and any known details:
☐ Creates a new waste or pollutant emission	
☐ Requires Environmental permits or permit modifications	
☐ Involves the use of chemicals	
☐ Results in a change to an SOP	
☐ Extends the life of equipment	
☐ Changes waste stream/air emission/wastewater levels or characteristics	
☐ Has an environmental impact or potential environmental risk	
☐ Requires pollution control equipment, measures, or procedures	
☐ Increases station capacity	
☐ Other environmental impacts	

Originator: *(Print Name)*	Signature:	Date:

Environmental Review

List any further actions necessary before initiating the change:

Action	Responsible Person	Target Completion Date

Signatures below indicate changes have been reviewed to determine environmental impacts, and all actions have been listed:

Supervisor: *(Print Name)*	Signature:	Date:

Station EMS Coordinator: *(Print Name)*	Signature:	Date:

Generation Technical Services Superint.: *(Print Name)*	Signature:	Date:

Corporate EMS Coordinator: *(Print Name)*	Signature:	Date:

Authorization for Implementation

All actions listed above are complete. If not complete prior to Authorization, this will not cause or have the potential to cause environmental impact. All changes will be tracked to completion.

Station EMS Coordinator: *(Print Name)*	Signature:	Date:

Copies to: Station EMS Coordinator - Original
Generation Technical Services Superintendent
Corporate EMS Coordinator
Originator
Project files, if applicable

US EPA ARCHIVE DOCUMENT

Appendix C - BMP and EMS Manual Coversheets

santee cooper®

Environmental Management System Manual

April 2010

Pollution Prevention Plan
With Best Management Practices (BMPs)
South Carolina Public Service Authority

2010 Revision

Items Requested

- Descriptive Information
    - Impoundment Capacity (Normal & Max) **(included in Santee Cooper response to EPA's Request for Information)**
    - Impoundment Surface Area (Normal & Max) **(included in Santee Cooper response to EPA's Request for Information)**
    - Hazard Classification **(undetermined)**
    - Freeboard (Normal & Min) **(N/A)**
    - Maximum Dam Height **(included in Santee Cooper response to EPA's Request for Information)**
    - Dam Crest Elevation **(N/A)**
    - Crest Width **(N/A)**
    - Upstream Slope Inclination **(N/A)**
    - Downstream Slope Inclination **(N/A)**
    - Spillway Type, Size, & Crest Elevation **(N/A)**
    - Outlet Conduit Type, Size, & Max Flow Capacity **(N/A)**
    - Historical Maximum Pond Elevation **(N/A)**
    - Year Built **(included in Santee Cooper response to EPA's Request for Information)**
    - Design Life **(N/A)**
    - Specific Wastes Permitted in Impoundment **(included in Santee Cooper response to EPA's Request for Information)**
    - Other (describe)
- Regional map including schools, hospitals, etc. **(received from Jay Hudson)**
- Management Unit Drawings
    - Plans **(received from Jay Hudson)**
    - Sections **(received from Jay Hudson)**
    - Elevations **(N/A)**
    - Other (describe)
- Design Information
    - Name of Designer of Record **(included in Santee Cooper response to EPA's Request for Information)**
    - Design Assumptions **(N/A)**
    - Design Analysis **(N/A)**
    - Spillway Design Flood or Design Basis **(N/A)**
    - Slope Stability Factor of Safety **(N/A)**
    - Design Soil Properties and Parameters **(N/A)**
    - Other (describe)
- Permits
    - NPDES SC0001091 **(received from Jay Hudson)**
    - Dam Safety – Operating Permit **(N/A)**
    - Other (describe)

- Subsurface Information
  - Geology **(N/A)**
  - Geotechnical Report **(N/A)**
  - Subsurface Profiles **(N/A)**
  - Other (describe)
- Monitoring Information:
  - Observation Wells/Piezometer Readings **(N/A)**
  - Seepage Readings **(N/A)**
  - Settlement Readings **(N/A)**
  - Alignment Readings **(N/A)**
  - Inclinometer Readings **(N/A)**
  - Time vs Reading Graphs **(N/A)**
  - Other (describe)
    - Staff Gauge Readings **(received from Jay Hudson)**
- Instrumentation Drawings
  - Location Plan **(N/A)**
  - Section Views **(N/A)**
  - Other (describe)
- Operation, Maintenance, & Surveillance
  - Operating Procedures **(N/A)**
  - Maintenace Procedures **(N/A)**
  - Inspection Procedures **(received from Jay Hudson)**
  - Third Party Inspection Reports **(received from Jay Hudson)**
  - Other (describe)
    - Ash Management and Sales **(received from Jay Hudson)**
- Emergency Action Plan **(N/A)**
- Inundation Map **(N/A)**