GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Specific Site Assessment for Coal Combustion Waste Impoundments at Duke Energy Carolinas Lee Steam Station

Williamston, South Carolina

Submitted to:
U.S. Environmental Protection Agency
Office of Resource Conservation and Recovery
5304P
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Washington, DC 20460

Submitted by:
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Project 092881

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List of Acronyms

CCW	coal combustion waste
CMP	corrugated metal pipe
CT	Combustion Turbine
CU	consolidated-undrained
DEC	Duke Energy Carolinas
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GEI	GEI Consultants, Inc.
HMR	Hydrometeorological Report
IDF	inflow design flood
MGD	million gallons per day
MW	Megawatts
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PMP	probable maximum precipitation
RCP	reinforced concrete pipe
USACE	U.S. Army Corps of Engineers
SCDHEC	South Carolina Department of Health and Environmental Control
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

This report presents the results of a specific site assessment of the dam safety of two coal combustion waste (CCW) impoundments at the Lee Steam Station in Anderson County, South Carolina. The Lee Steam Station is owned and operated by Duke Energy Carolinas (DEC). The two impoundments are the Primary Active Ash Pond and the Secondary Ash Basin. These impoundments comprise the active coal combustion waste facility at the Lee Steam Station. The specific site assessment was performed on June 22, 2010.

The specific site assessment was performed with reference to Federal Emergency Management Agency (FEMA) guidelines for dam safety, which includes other federal agency guidelines and regulations (such as U.S. Army Corps of Engineers [USACE] and U.S. Bureau of Reclamation [USBR]) for specific issues. The assessment defaults to state requirements where not specifically addressed by federal guidance or if the state requirements were more stringent.

1.2 Scope of Work

The scope of work between GEI Consultants, Inc. (GEI) and the U.S. Environmental Protection Agency (EPA) for the specific site assessment is summarized in the following tasks:

1. Acquire and review existing reports and drawings relating to the safety of the project provided by the EPA and Owners.
2. Conduct detailed physical inspections of the project facilities. Document observed conditions on Field Assessment Check Lists provided by EPA for each management unit being assessed.
3. Review and evaluate stability analyses of the project’s coal combustion waste impoundment structures.
4. Review the appropriateness of the inflow design flood (IDF), and adequacy of ability to store or safely pass the inflow design flood, provision for any spillways, including considering the hazard potential in light of conditions observed during the inspections or to the downstream channel.
5. Review existing dam safety performance monitoring programs and recommend additional monitoring, if required.
6. Review existing geologic assessments for the projects.
7. Submit draft and final reports.

1.3 Authorization

GEI performed the coal combustion waste impoundment assessment as a contractor to the EPA. This work was authorized by EPA under Delivery Order EP-CALL-001; PR-OSWER-10-00092 between EPA and GEI, dated June 14, 2010.

1.4 Project Personnel

The scope of work for this task order was completed by the following personnel from GEI:

Steven R. Townsley, P.E.	Senior Project Engineer/Task Leader
Mary C. Nodine, P.E.	Project Geotechnical Engineer
Nick Miller, P.E.	Project Water Resources Engineer
Stephen G. Brown, P.E.	Project Manager

The Program Manager for the EPA was Stephen Hoffman.

1.5 Limitation of Liability

This report summarizes the assessment of dam safety of the Primary Active Ash Pond and the Secondary Ash Basin coal combustion waste impoundments at Lee Steam Station, Anderson County, South Carolina. The purpose of each assessment is to evaluate the structural integrity of the impoundments and provide summaries and recommendations based on the available information and on engineering judgment. GEI used a professional standard of practice to review, analyze, and apply pertinent data. No warrantees, express or implied, are provided by GEI. Reuse of this report for any other purpose, in part or in whole, is at the sole risk of the user.

1.6 Project Datum

The project datum was not identified on the documents reviewed by the assessment team.

1.7 Prior Inspections

The embankment dams for the CCW impoundments at Lee Steam Station are inspected monthly by DEC Lee Steam Station personnel, and monthly inspection checklists are completed. Duke Energy engineers complete annual internal inspections. We reviewed the completed inspection checklists from December 2009. A third-party engineering firm performs inspections every 5 years. The most recent third party inspection was completed in November 2008. We reviewed the report for the 2008 inspection. The CCW impoundments are not regulated by state or federal agencies.

2.0 Description of Project Facilities

2.1 General

Lee Steam Station is a coal-fired power plant consisting of three units that generate about 370 megawatts (MW) combined. The power plant is located about 2 miles southeast of the town of Williamston in Anderson County, South Carolina (see Figure 1). The Primary Active Ash Pond is located directly west and upstream (along the Saluda River) of the power plant, and the Secondary Ash Basin is located directly west and upstream of the Primary Active Ash Pond (Figure 2). The two impoundments are separated by a natural ridge that has been raised by a dike, referred to as the “divider dike.” All units are owned and operated by DEC. The first unit went online in 1951.

2.2 Impoundment Dams and Reservoirs

The embankment dams of the Primary Active Ash Pond and the Secondary Ash Basin impoundments have not been assigned a hazard potential by a state or federal agency. Based on the geometry of the impoundments and the facilities downstream, recommended hazard potential classifications for the impoundments have been developed in Section 4.0 of this report. The basic dimensions and geometry of the two CCW impoundments are summarized in Table 2.1.

Both impoundments are used to store fly ash, bottom ash, boiler slag, flue gas emission control residuals and other waste. DEC has identified “other waste” as water treatment, boiler blow down, floor and laboratory drains and drains from equipment cleaning, boiler chemical cleaning wastes, storm water runoff, coal pile runoff, and fire protection and mill rejects. CCW is discharged directly into the Primary Active Ash Pond, where most settling of the solids takes place. The water is then decanted to the Secondary Ash Basin for treatment and discharged to the Saluda River.

The embankments are homogeneous in that they were not constructed with distinct zones of differing soil materials and they lack a system of internal drains, and were constructed of onsite sandy silt material. The dam embankments have crest widths of approximately 14 feet. Upstream slopes are configured at 2H:1V, and downstream slopes vary from 2H:1V to slightly flatter due to various repairs.

Table 2:1: Summary Information for Impoundment Dam Parameters

Parameter	Value	
Dam	Primary Active Ash Pond	Secondary Ash Basin
Height (ft)	64	56
Approximate Length (ft)	1,700	1,200
Average Crest Width (ft)*	14	14
Crest Elevation (ft)	733	733
Design Side Slopes (H:V)	2:1 US/2:1 DS	2:1 US/2:1 DS
Estimated Freeboard (ft) at Time of Site Visit	5.5	27.8
Storage Capacity (ac-ft)* **	779	391
Surface Area (acres)* **	41	23

*Crest width, storage capacity and area values provided by DEC.

** Storage capacity and surface area are based on the reservoir surface elevations in March 2009, when DEC responded to the EPA's RFI (see Appendix D).

2.3 Spillways

Neither of the impoundments have spillways.

2.4 Intakes and Outlet Works

The intake structures located in both the Primary Active Ash Pond and the Secondary Ash Basin consist of reinforced concrete box structures with stop log slots on two sides. One set of slots contains 9- to 12-inch concrete or metal stop logs and the other a full height steel panel. The boxes are connected to 36-inch reinforced concrete decant pipes that extend beneath the adjacent embankments. The pipes are surrounded by skimmers that extend down several feet to keep debris out. Flow through the pipes is controlled by manually adding or removing stop logs into the guides accessible from the outlet towers above. The flow rate of decant water discharging into the pipe at the Secondary Ash Basin is monitored electronically by measuring the height of water that flows over a weir at the inlet.

Decant water from the Primary Active Ash Pond flows through the concrete pipe and discharges via a riprap-lined channel into the Secondary Ash Basin. Decant water from the Secondary Ash Basin flows through the concrete pipe and discharges into a reinforced concrete junction box about 400 feet downstream of the embankment. In the junction box, the water drops 20 feet to another 36-inch reinforced concrete pipe. The pipe discharges at a riprap-lined channel that leads to the Saluda River.

2.5 Vicinity Map

Lee Steam Station is about 2 miles southeast of the town of Williamston in Anderson County, South Carolina, as shown on Figure 1. The CCW impoundments are located adjacent to, and west of, the station.

2.6 Plan and Sectional Drawings

Engineering and as-built drawings for the CCW impoundments were prepared by Duke Power Company. The drawings include repairs and modifications to the dams.

2.7 Standard Operational Procedures

Lee Steam Station is a coal-fired power plant composed of three coal-fired steam turbine electric power generating units that can produce a total combined capacity of 370 MW. Coal is delivered to the power plant by train, where it is then combusted to power the steam turbines. The burning of coal produces several gases which are vented from the boiler; fly ash, which is collected from the exhaust prior to venting to the atmosphere; and coarser bottom ash, which falls to the bottom of the boiler and is removed along with boiler slag. Plant process water is cooled using cooling towers.

Bottom ash, fly ash and other waste are combined at the plant and wet sluiced and pumped into the Primary Active Ash Pond. The CCW is discharged at the south side of the pond, and the waste settles out as the water flows through an internal perimeter channel on the east and north sides of the pond. The channel is periodically dewatered, and solid CCW is excavated and hauled to an onsite state-approved fill.

The Primary Active Ash Pond decant water discharges to the Secondary Ash Basin through a decant structure at the divider dike. Water in the Secondary Ash Basin is treated with carbon dioxide or sulfuric acid before being discharged to the Saluda River via the decant inlet on the north side of the pond. The flow at the decant inlet is monitored by an electric gauge at the weir and is checked and logged weekly.

3.0 Summary of Construction History and Operation

Units 1 and 2 at Lee Steam Station went online in 1951, and Unit 3 went online in 1958. Coal combustion waste was originally placed in a 19-acre ash basin south of the plant that is now retired. The present-day ash ponds were constructed starting in 1974. We reviewed the original design drawings for the ash ponds and dams, though design reports and construction records were not available. The dams were constructed of homogeneous earth fill, which typically consists of micaceous sandy silt. Notes about foundation preparation are not present on the design drawings, but the drawings indicate that the dams were founded on the original ground surface. Organics and topsoil were likely stripped from the ground surface when the dams were constructed. There is no evidence that the dams are underlain by CCW. Based on borings drilled for design of the dams, the subsurface profile consists of 12 to 30 feet of sandy silt overlying bedrock. The original dams were constructed with a system of toe drains and trench drains at the downstream toe.

The Primary Active Ash Pond dam was constructed to El. 725 in 1974. In 1975, the Primary Active Ash Pond dam was raised 8 feet to El. 735, and the Secondary Ash Basin was constructed. The ponds at this time were contiguous. In 1975 and 1976, when there was only a small amount of material impounded behind the dams (35 to 40 feet of freeboard), numerous shallow slides occurred on the dams, mostly on the downstream slope. The slides were attributed to insufficient compaction of the outer portion of the dams. Several methods were employed to repair the dams, depending on the severity of the sliding in a given area. Repairs included flattening the slope and lowering the dam crest to El. 733, constructing five-foot-deep trench drains in the weak surficial layer, and removing and replacing some of the outer material on the downstream slope. The repairs were completed in 1978 and 1979.

In 1978, a temporary divider dike was constructed to divide the Primary Active Ash Pond from the Secondary Ash Basin. The crest of the dike was originally at El. 723, but in 1985, clogged discharge pipes leading from the Primary to the Secondary pond led to overtopping of the divider dike and subsequent sloughing and erosion. The dike was raised in 1985 to a crest elevation of 733 feet, which matched the crest elevations of the dams. The Primary Active Ash Pond decant structure adjacent to the divider dike was also constructed in 1985 to discharge water from the Primary Active Ash Pond to the Secondary Ash Basin.

Design drawings indicate that repairs of sloughing and erosion on the upstream slope of the Primary Active Ash Pond were performed in 1985. These repairs included removal of the loose material and replacement with stone and riprap underlain by a geosynthetic. With the exception of the shallow slides that were repaired in 1978 and 1985, no evidence of prior releases, failures or patchwork construction was observed during the site visit or disclosed by plant personnel.

Sometime after 1995, a dry ash disposal landfill was constructed southwest of the Primary Active Ash Pond. When the landfill came into service, DEC began dredging CCW out of the north end of the Primary Active Ash Pond for permanent storage in the landfill. This dry ash disposal procedure continues today.

4.0 Hazard Potential Classification

4.1 Overview

According to the Federal Guidelines for Dam Safety, the hazard potential classification for the CCW impoundments is based on the possible adverse incremental consequences that result from release of stored contents due to failure of the dam or misoperation of the dam or appurtenances. Impoundments are classified as Less than Low, Low, Significant, or High hazard, depending on the potential for loss of human life and/or economic and environmental damages.

4.2 Primary Active Ash Pond

The Primary Active Ash Pond has a total surface area of 41 acres and a storage capacity of 779 acre-feet, and its dam has a maximum height of 64 feet. Based on current pond heights and storage capacity shown in Table 2.1, the size classification for the Primary Active Ash Pond is "Intermediate" in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

Structures present between the Primary Active Ash Pond dam and the Saluda River include the railroad tracks and embankment, a DEC-operated emergency generation natural gas-powered plant consisting of three Simple Cycle Combustion Turbine (CT) units, and several DEC warehouses. DEC personnel indicated that several people work in the CT plant downstream of the dam during the day. The plant is located in the eastern portion of the downstream area. An uncontrolled release of the CCW impoundment's contents due to a failure or misoperation of the Primary Ash Pond Dam has the potential to inundate the plant buildings, but only if the failure occurs on the east portion of the dam and if it is large enough to also overtop the railroad embankment between the dam and the buildings. In addition, because the plant is operated by DEC and only a small number of people typically occupy the plant buildings, it is likely that there would be sufficient warning to evacuate the building in the event of a dam failure. Therefore, in our opinion, potential for loss of human life due to a failure of the dam is low.

The flood extent in the event of a failure of the Primary Ash Pond Dam would be limited by the downstream railroad embankment. Flood waters that did reach the Saluda River would cause only a small rise in water level. A large quantity of CCW could be discharged into the Saluda River as a result of a dam failure. Some environmental damage to the wetlands adjacent to the river is possible.

Consistent with the Federal Guidelines for Dam Safety and the South Carolina Department of Health and Environmental Control Dams and Reservoirs Safety Act Regulations, we recommend the Primary Active Ash Pond dam be classified as a “Significant” hazard structure due to the low potential for loss of human life and property damage, and the potential for environmental damage if a large quantity of CCW is released to the river.

4.3 Secondary Ash Basin

The Secondary Ash Basin has a total surface area of 23 acres and a storage capacity of 391 acre-feet, and its dam has a maximum height of 56 feet. Based on current pond heights and storage capacity shown in Table 2.1, the size classification for the Secondary Ash Basin is “Intermediate” in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria.

A railroad embankment owned by DEC is located between the Secondary Ash Basin dam and the Saluda River. No other structures are present between the dam and the river. An uncontrolled release of the CCW impoundment’s contents due to a failure or misoperation of the Secondary Ash Basin Dam therefore poses no threat to human life in our opinion.

The flood extent in the event of a failure of the Secondary Ash Basin Dam would be limited by the downstream railroad embankment. Flood waters that did reach the Saluda River would cause only a small rise in water level. A large quantity of CCW could be discharged into the Saluda River as a result of a dam failure. Some environmental damage to the wetlands adjacent to the river is possible.

Consistent with the Federal Guidelines for Dam Safety and the South Carolina Department of Health and Environmental Control Dams and Reservoirs Safety Act Regulations, we recommend the Secondary Ash Basin dam be classified as a “Significant” hazard structure due to the potential for environmental damage if a large quantity of CCW is released to the river.

5.0 Hydrology and Hydraulics

5.1 Floods of Record

Floods of record have not been evaluated and documented for the CCW impoundments at the Lee Steam Station. The National Weather Service local rain gage data reportedly recorded maximum daily rainfall depths ranging from about 5.4 to 9.3 inches in the surrounding areas. The maximum rainfall event of 9.32 inches was recorded on August 26, 1995. These rainfall events are not expected to result in overtopping of the dams under the current normal operating conditions. No documentation has been provided to verify the storm results.

5.2 Inflow Design Floods

Currently there is no hazard classification for the CCW impoundments at the Lee Steam Station. Based on observations during the field inspection, we recommend that both the Primary Active Ash Pond and the Secondary Ash Basin be classified as "Significant" hazard structures (Section 4). The South Carolina Department of Health and Environmental Control Dams and Reservoirs Safety Act Regulations specifies that "Significant" hazard dams be capable of passing a flood event that ranges from the 50 percent probable maximum precipitation (PMP) to the full PMP. The USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-20106 provide the same recommendations for inflow design storms. According to the Hydrometeorological Report No. 51 (HMR 51), the 72-hour PMP at the Lee Steam Station is about 47 inches, so the 50 percent PMP is about 23.5 inches.

5.2.1 Primary Active Ash Pond

The contributing drainage area to the Primary Active Ash Pond is estimated to be approximately 107.4 acres. The water surface in the Primary Active Ash Pond is regulated by a stop log decant structure located in the northwest portion of the pond that discharges to the Secondary Ash Basin. Currently, the Primary Active Ash Pond water level is maintained at an elevation of about 726.0 feet, which provides about 6 feet of freeboard and approximately 260 acre-feet of additional storage capacity using the 1994 storage capacity estimates. Based on the contributing drainage area and the 50 percent PMP of 23.5 inches, the Primary Active Ash Pond would receive approximately 214 acre-feet of storm water, assuming no losses. Flood routing has not been performed to determine the resulting flood water surface elevation in the Primary Active Ash Pond; however the resulting inflow volume indicates the Primary Active Ash Pond has adequate storage capacity to contain the 50 percent PMP event. Based on these results, the Primary Active Ash Pond is expected to meet the regulatory requirements for the 50 percent PMP design flood without overtopping the dam.

5.2.2 Secondary Ash Basin

The contributing drainage area to the Secondary Ash Basin is estimated to be approximately 112 acres. However, runoff to the Primary Active Ash Pond is routed through the decant structure into the Secondary Ash Pond, therefore, the Secondary Ash Basin must be capable of storing and passing the runoff from the contributing drainage area and the discharge from the Primary Active Ash Pond. The water surface in the Secondary Ash Basin is regulated by a stop log decant structure located in the northeast portion of the pond that discharges to the Saluda River. Currently, the Secondary Ash Basin water level is maintained at an elevation of about 705.2 feet, which provides about 27.8 feet of freeboard and about 700 acre-feet of additional storage capacity using the 1994 storage capacity estimates. Based on the contributing drainage area and the 50 percent PMP of 23.5 inches, the Secondary Ash Basin would receive approximately 217 acre-feet of storm water runoff, assuming no losses, plus the additional 214 acre-feet from the Primary Active Ash Pond. Flood routing has not been performed to determine the resulting flood water surface elevation in the Secondary Ash Basin; however the resulting inflow volume indicates the Secondary Ash Basin has adequate storage capacity to contain the 50 percent PMP storm event and the discharge from the Primary Active Ash Pond. Based on these results, the Secondary Ash Basin is expected to meet the regulatory requirements for 50 percent PMP design flood without overtopping the dam.

5.2.3 Determination of the PMF

Not applicable.

5.2.4 Freeboard Adequacy

Freeboard is adequate at both the Primary Active Ash Pond and the Secondary Ash Basin.

5.2.5 Dam Break Analysis

No dam break analysis has been performed for the CCW impoundments at the Lee Steam Station. The CCW impoundments at the Lee Steam Station are located adjacent to the Saluda River, therefore dam break analyses and inundation mapping would be very limited.

5.3 Spillway Rating Curves

Not applicable.

5.4 Evaluation

Based on the current facility operations, recommended hazard classifications, and inflow design floods documents, the Primary Active Ash Pond and the Secondary Ash Basin at Lee Steam Station appear to have adequate capacity to store and pass the regulatory design floods without overtopping the dams.

6.0 Geologic and Seismic Considerations

Boring logs taken by Duke Power Company in 1975 and 1984 at the Lee Steam Station indicate that the predominant overburden soil consists of yellow and brown micaceous sandy silt. Auger refusal, presumably on the underlying bedrock, was encountered in several borings at 12 to 31 feet below ground surface. According to the Geologic Map of the Greenville 1°x2° Quadrangle, the bedrock in the region consists of Lower Cambrian and Late Proterozoic age Sillimanite-mica schist.

We are not aware of any seismic analyses that have been performed on the dams at the Lee Steam Station. According to the 2008 U.S. Geological Survey (USGS) Seismic Hazard Map of South Carolina, the site has a regional probabilistic peak ground acceleration of 0.15g with a 2 percent Probability of Exceedence within 50 years (recurrence interval of approximately 2,500 years).

7.0 Instrumentation

7.1 Location and Type

Instrumentation associated with the impoundments at Lee Steam Station include nine standpipe piezometers installed in sets of three, oriented in cross sections on the downstream faces of the embankments. Two sets (L-1 through L-3 and L-4 through L-6) are located on the Primary Active Ash Pond dam, and the third set (L-7 through L-9) is located on the Secondary Ash Basin dam. The piezometers were installed in 1984, and monthly readings have been taken since their installation.

The flow at the Secondary Ash Basin outlet structure is monitored using a Heise® Meter, which measures the height of the flow over the stoplogs. The reading can be used to derive both the elevation of the water surface in the pond and the rate of flow out of the pond. Readings from the Heise® Meter are recorded weekly.

Flow from the Primary Active Ash Pond to the Secondary Ash Basin is not monitored. The water level in the Primary Active Ash Pond can be measured manually by measuring the height of water over the stop logs.

A location plan and water level data from the piezometers at Lee Steam Station are provided in Appendix C.

7.2 Readings

7.2.1 Piezometers

Digital water level data for piezometers at the CCW impoundments were provided to us starting in 1984. From 1984 through 2001, elevations for the water surface in the impoundments were recorded along with the water levels in the piezometers. From 2002 until 2010, only the water level data from the piezometers are available.

The water levels in piezometers L-1, L-2 and L-3, near the left abutment of the Primary Active Ash Pond dam, have remained relatively steady with time. The water level in piezometer L-3, at the dam toe, rose 6 to 7 feet in December 2005 and February 2010, but returned back to consistent levels in subsequent readings. The cause for these erratic readings is unknown.

The water levels in piezometers L-5 and L-6, the lower two piezometers near the right abutment of the Primary Active Ash Pond dam, have remained relatively steady with time. The water level in piezometer L-4, near the dam crest, fluctuated regularly within several feet until around 2007. From 2007 until August 2009, the water level in L-4 rose steadily, and between December 2009 and April 2010 it rose about 17 feet. In April 2010 the water fell back to within several feet of its previous levels. The cause for the sudden rise in water level in piezometer L-4 is unknown.

The water levels in piezometers L-7, L-8 and L-9, near the center of the Secondary Ash Basin dam, have remained relatively steady with time. These piezometers generally have fluctuated more than those in the other two cross sections. Typically the water levels in the piezometers fluctuate in parallel with one another and stay within about 5 feet of an average value with no steady increasing or decreasing trend. The water levels in L-7 and L-8 are similar to the water levels in the corresponding piezometers near the crest and mid-slope of the Primary Active Ash Pond dam. The water level in piezometer L-9, however, is about 10 feet higher than the water levels in the other two piezometers near the dam toe (El. 675 vs. El. 665). The toe drain at this location is located around El. 665 according to design drawings. This elevated water level may indicate that the toe drain is not functioning properly at this location. Piezometer L-9 is also located just west of the seepage area downstream of the right abutment of the Secondary Ash Basin dam, and the elevated water level may be related to the seepage observed at that location.

7.2.2 Flow Rates

We reviewed flow rate data for discharge from the Secondary Ash Basin from May 2010. An average of 3.345 MGD (2323 gpm) were discharged from the pond on average over the course of the month. Duke Energy personnel indicated that this flow rate has been typical in recent years.

7.3 Evaluation

The instrumentation installed at the Lee Steam Station CCW impoundments is functioning properly, and the frequency of readings is considered adequate. High water levels have been measured in piezometers L-4 (between August 2009 and April 2010) and L-9 (compared with the other piezometers near the dam toe). The cause of these readings should be investigated.

It is our opinion that the Lee Steam Station facility would benefit from additional instrumentation (such as staff gauges) to measure the water surface elevations in the two CCW impoundments. The flow rates at the toe drain outfalls and at the decant structure for the Primary Active Ash Pond should also be regularly monitored. In addition, the seepage condition near the right abutment of the Secondary Ash Basin should be monitored to determine both the quantity of seepage and the turbidity of the water to investigate whether the seepage could compromise the safety of the embankment and to enable record-keeping over time for evaluation of changes in flow rate or turbidity.

8.0 Field Assessment

8.1 General

A site visit to assess the condition of the two CCW impoundments at the Lee Steam Station was performed on June 22 of 2010, by Steven R. Townsley, P.E., and Mary C. Nodine, P.E., of GEI. Terry Taylor, Marcus Pitts, Mike Williams, Alex Papp, Henry Taylor and Alan Stowe of Duke Energy assisted in the assessment. Paul Wilke of the South Carolina Department of Health and Environmental Control was also in attendance.

The weather during the site visit (June 22, 2010) was generally sunny with temperatures around 95 degrees Fahrenheit. The majority of the ground was dry at the time of the site visit.

At the time of inspection, GEI completed an EPA inspection checklist which is provided in Appendix A. Photographs are provided in Appendix B. Field assessment of the CCW impoundments included a site walk to observe the dam crest, upstream slope, downstream slope, intake structures, outlet structures and one of the three toe drain outlets.

8.2 Embankment Dams

8.2.1 Dam Crest

The crests of the CCW impoundment dams appeared to be in good condition. No signs of cracking, settlement, movement, erosion or deterioration were observed during the assessment. The crest appears to be well-drained and no standing water was observed. The dam crest surface is generally composed of gravel road base material that traverses the length of the dam for vehicle access.

8.2.2 Upstream Slope

The upstream slopes of the CCW impoundment dams are protected by grassy vegetation. Riprap is present along the upstream toe along the water line. The upstream slope protection appeared to be in satisfactory condition. The grass was long at the time of our site visit, but Duke Energy personnel indicated that they planned to mow the grass in the next few weeks when the weather became drier. No scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed during the inspection of the CCW impoundments.

8.2.3 Downstream Slope

The downstream slopes of the CCW impoundments have well-established grass growth, which provides some erosion protection. No scarps, sloughs, depressions or other indications of slope instability or signs of erosion were observed during the inspection of the CCW impoundments.

8.3 Seepage and Stability

We observed a seepage area on the natural ground surface downstream of the right abutment of the Secondary Ash Basin dam, around El. 680. The ground surface in the seepage area is soft and wet, with flowing water in some areas. The flowing water was clear, and there were no boils, erosion or other signs of movement in the seepage area. Wetland-type vegetation was present in the seepage area. Duke Energy personnel indicated that there has been seepage in this area for at least 24 years, and that based on their visual monitoring, it has not increased, decreased or otherwise changed markedly over this time period. The seepage has never been measured or analyzed by Duke Energy. It is unknown whether the seepage originates from the Primary Active Ash Pond or the Secondary Ash Basin.

Apart from the seepage area discussed above, we observed no signs of seepage or slope instability during our inspection.

8.4 Appurtenant Structures

8.4.1 Divider Dike

The divider dike separates the Primary Active Ash Pond from the Secondary Ash Basin. The outlet conduit from the Primary Active Ash Pond extends through the divider dike and empties beyond its downstream toe into the Secondary Ash Basin. The divider dike is about 550 feet long with a maximum height of 30 feet.

We observed no signs of movement, instability, or major deterioration on the divider dike. Slope protection consists of grass on both the upstream and downstream slopes, and riprap along the abutment contacts and downstream toe. The slope protection is in good condition.

8.4.2 Outlet Structures

The outlet structures located in the CCW impoundments appeared to be in fair to good condition. The structures were observed to be working properly, discharging decant water downstream. Stop logs used to control the flow appeared to be functional, and the skimmers used to keep debris out of the pipes were in place. The outlet conduits consist of reinforced concrete pipe (RCP) and appear to be in good condition. The concrete drop box at the outlet for the Secondary Ash Basin exhibits some spalling on the edges. The inside of the drop box may also be deteriorating, especially considering the turbulent flow of water inside the drop box.

8.4.3 Pump Structures

No pumps are present at the CCW impoundments.

8.4.4 Emergency Spillway

No spillways are present at the CCW impoundments.

8.4.5 Toe Drains

The toe drain system extends along the abutment contacts and downstream toes of both dams. We observed the riprap along the abutment contacts and covering the intakes to the three drain pipes. The riprap was relatively clear of vegetation and in good condition. We observed the westernmost of three toe drain outfalls. The drain appeared to be functioning properly and was discharging less than 10 gallons per minute at the time of our inspection. The discharge at the toe drain was clear. The drain pipe is made of corrugated metal pipe (CMP) and exhibits minor corrosion. We did not observe the other two drain outfalls, but Duke Energy personnel and the December 2009 inspection report (S&ME) indicate that the discharge quantities are similar.

8.4.6 Water Surface Elevations and Reservoir Discharge

There are no staff gauges at the CCW impoundments, but water surface elevations can be estimated based on the height of water flowing over the top of the stop logs. In the Primary Active Ash Pond, the top of the stop logs are at El. 725.62. The pond elevation at the time of our visit was approximately El. 726 based on measurements by Duke Energy personnel.

Water flowing through the decant structure at the Secondary Ash Basin is measured electronically by a Heise® Meter, which measures the height of water over the top of the stop logs. Readings are taken weekly. At the time of our site visit, 3.22 MGD (2236 gpm) were being discharged from the pond into the Saluda River, and the water surface was at El. 705.2.

9.0 Structural Stability

9.1 Visual Observations

The assessment team saw no visible signs of instability associated with the divider dike or embankments of the CCW impoundments during the June 22, 2010 site assessment.

9.2 Field Investigations

Records of borings completed when the CCW impoundments were designed and constructed were not available. We reviewed boring logs from investigations on the Primary Active Ash Pond dam in 1975. Fourteen borings were drilled in the embankment at this time with hand augers to a maximum depth of about 25 feet. Nine piezometers (L-1 through L-9) were installed on the downstream slopes of the dams in 1984. We reviewed borings logs for the piezometers. Another subsurface investigation was performed in 1984 prior to raising the divider dike. The 1984 investigation included seventeen borings: eight in potential borrow areas (8 to 54 feet deep), four in an ash storage area (4 to 6 feet deep) and five on the divider dike alignment (L-1 through L-5, 11 to 31 feet deep—not related to the 1983 piezometer L-series). Boring logs and a location plan for the 1984 borings are included in the Ash Divider Dike Stability Study (Duke Energy, 1984).

9.3 Methods of Analysis

9.3.1 Embankment Dams

Stability analyses completed at the time the CCW impoundment dams were designed were not available. An Ash Dam As-Built Stability Study was completed in 1983 by Duke Energy using subsurface information collected when piezometers L-1 through L-9 were installed. The calculations for the stability study were provided to us, though they were not summarized clearly in a report that was easy to review.

The 1984 stability study included steady state and both full and partial rapid drawdown analyses for the upstream and downstream slopes at the three cross sections where piezometers were installed. Partial rapid drawdown (El. 728 to El. 718) is considered a more realistic scenario since the impoundments have no low-level outlet. Two cross sections therefore apply to the Primary Active Ash Pond Dam, where piezometers L-1 through L-6 are installed. The third cross section applies to the Secondary Ash Basin Dam, where piezometers L-7 through L-9 are installed. Seismic stability analyses were not performed. The analyses were conducted using the software program LANDSLI. Documentation of the program development and its computational methods was not available.

The piezometric surface for the steady state analyses was estimated using the geometry of the cross sections and the locations of drains based on the drawings. Readings from the piezometers were not taken into account.

Material properties for the embankment fill were estimated using consolidated-undrained (CU) triaxial tests with pore pressure measurements. The triaxial tests were performed on soil samples taken when the piezometers were installed. Both undrained and drained parameters were obtained from the CU tests. Drained parameters were used for steady state seepage analyses. A combination of drained and undrained parameters was used for the rapid drawdown analyses. In some areas of the dam there was apparently ash buildup on the upstream face which was taken into account in the analyses. The ash buildup is beneficial to slope stability due to the surcharge load it provides. The embankment was assumed to be founded on overburden soil overlying hard rock 20 feet below the ground surface.

9.3.2 Divider Dike

The stability of the divider dike was analyzed in 1985, when plans were made to improve the divider dike, making it a permanent structure with a crest at El. 733 (the same as the dam crests). Lab tests performed on samples from the borings drilled along the dike alignment were used to derive soil parameters. Analyses were performed using the slope stability software LANDSLI in addition to another program which is not identified in the calculations. Steady state seepage, rapid drawdown and end of construction load cases were run for the upstream and downstream slopes of the dike.

9.4 Discussion of Stability Analysis and Results

9.4.1 Embankment Dams

Our ability to review the 1984 slope stability analyses of the embankment dams was limited due to poor documentation of the analysis. Based on the available information, the analysis methods and soil parameters generally appear reasonable. The LANDSLI software program used in 1984 is outdated and did not have the capabilities of today's slope stability software, indicating that a more recent analysis might be useful.

We visually compared the piezometric surfaces calculated for the slope stability analyses with recent readings in the piezometers. It appears that in the case of the cross section located on the Secondary Ash Basin dam (piezometers L-7, L-8 and L-9) the piezometric surface used in the stability analysis is unconservative at the toe of the dam (assumed elevation of 662 vs. an elevation of 678 in recent piezometer readings). A precise comparison of the piezometric surface at all piezometer locations is difficult due to the poor quality of the graphics presented in the slope stability calculations. We recommend performing slope stability analyses of the embankment using recent piezometer readings to estimate the location of the steady state piezometric surface.

The minimum factors of safety calculated in the 1984 Ash Dam Stability Study are compared with the minimum factors of safety required by Federal Energy Regulatory Commission (FERC) in Table 9.1.

Table 9:1: Stability Factors of Safety and Guidance Values

Loading Condition	Min. Calculated FOS		Min. Required FOS (FERC)
	Primary Active Ash Pond	Secondary Ash Basin	
Steady State Seepage – Upstream Slope	1.25	1.30	1.5
Steady State Seepage – Downstream Slope	1.50	1.50	1.5
Full Rapid Drawdown (El. 728 to El. 696)	0.81	0.86	1.2
Partial Rapid Drawdown (El. 728 to El. 718)	0.90	1.0	1.2

The factor of safety calculated for steady state seepage on the downstream slope meets the minimum FERC requirement. However, if the piezometric surface were raised to correspond with readings in piezometers L-7, L-8 and L-9, a lower factor of safety would be expected that would not meet the minimum required factor of safety.

Factors of safety calculated for the upstream slopes of the dams were found to be less than the FERC requirements for both steady state seepage and for both full and partial rapid drawdown. The slope stability study documentation recommended berms on the upstream slopes of both dams to increase the factors of safety. We did not see documentation that these berms were constructed. In the Primary Active Ash Pond, the top of the recommended berm would have been at El. 718 to El. 728, so it would have mostly been obscured by the water in the pond (El. ~727.5) when we inspected the dams. In the Secondary Ash Basin, the top of the recommended berm would have been at El. 718, which is about 13 feet higher than the pond elevation at the time of our inspection (El. ~705.2). The dam did not have a berm on the upstream slope during our inspection.

9.4.2 Divider Dike

We did not review the divider dike stability analyses in great detail, but generally the methods and parameters used appear reasonable. The dike was configured such that factors of safety met FERC requirements for all load cases.

9.5 Seismic Stability – Liquefaction Potential

The liquefaction potential at the CCW impoundments has not been previously evaluated based on review of the available documents. Certain conditions are necessary for liquefaction, including saturated, loose, granular soils and an earthquake of sufficient magnitude and duration to cause significant strength loss in the soil. The soils comprising the dam and the foundation are described as micaceous sandy silt. The borings drilled in 1984 for the divider dike study indicate that blowcounts as low as 3 to 4 blows per foot were obtained near the surface in the foundation soil. These soils may be susceptible to liquefaction when subjected to the design earthquake.

9.6 Summary of Results

The 1983 Ash Dam As-Built Stability Study is considered inadequate due to an unconservative piezometric surface, poor documentation and lack of verification that the required repairs were completed to increase the factors of safety on the upstream slopes of the dams. We recommend that revised slope stability analyses be performed using state-of-the-art methods that take into account recent piezometer readings and current cross-section geometry of the dam. Revised analyses should also include pseudo-static seismic analyses and an evaluation of the liquefaction potential of the embankment and foundation soils and a re-evaluation of the upstream steady state seepage and rapid drawdown conditions.

The 1985 static analysis of the divider dike appears adequate. However, it would be beneficial to analyze the divider dike again in conjunction with analyses of the dams in order to confirm results of the 1985 analysis using state-of-the-art software and methods.
A pseudo-static seismic analysis of the divider dike has not been performed and should be included in the updated analyses.

10.0 Maintenance and Methods of Operation

10.1 Procedures

DEC indicated that they have an Operation and Maintenance Manual in which standard operational procedures to inspect, maintain and operate the Lee Steam Station are formally documented. The power plant is manned 24 hours a day, seven days a week. Monthly inspections are performed for the entire ash pond facilities by operations staff to observe the general condition of structures and embankments. Annual inspections are completed by Duke Energy engineers and inspection checklists are completed. Additional inspections of the impoundments are made every 5 years by an independent engineering firm. Dam safety-related inspections have not been previously made by state or federal agencies.

10.2 Maintenance of Impoundments

Maintenance of the CCW impoundments is performed by DEC staff under the guidance of DEC managers and engineers.

10.3 Surveillance

The ash ponds are not regularly patrolled by DEC operations personnel. Plant personnel are available at the power plant and on 24-hour call for emergencies that may arise. The plant has an emergency alarm system that can be set off in the event of an emergency, at which time the control room can order an evacuation and/or summon any other necessary emergency responders.

11.0 Conclusions

11.1 Assessment of Dams

11.1.1 Field Assessment

The dams and outlet works facilities associated with the CCW impoundments at the Lee Steam Station were generally found to be in satisfactory condition. The main issue of potential concern for the CCW impoundments identified in our field assessment was the flowing water and soft, wet soil observed downstream of the right abutment of the Secondary Ash Basin. Duke Energy personnel indicated that the seepage has been present for at least 24 years and has not visibly changed during this time period. The water level in piezometer L-9 (around El. ~675), near the toe of the dam just west of the seepage area, is elevated compared to the piezometers near the toe of the Primary Active Ash Pond (El. ~665). This elevated water level may be associated with the seepage in the area, and may also indicate that the toe drain (located around El. 665) is not functioning properly at this location.

The exterior of the drop box downstream of the Secondary Ash Basin exhibits some degradation. The inside of the box may also be degrading due to turbulent flow.

11.1.2 Adequacy of Structural Stability

The slope stability analyses performed on the as-built dikes in 1984 are considered inadequate due to unconservative piezometric surfaces (based on readings in piezometer L-9), and lack of seismic stability analyses and investigation of liquefaction potential. Readings of piezometer L-4, near the crest of the Primary Active Ash Pond dam, were elevated for several months in the past year, which may also be a symptom of unsafe piezometric conditions in the dam.

The stability analysis of the divider dike is adequate but would benefit from an update using state-of-the-art stability analysis software and methods.

11.1.3 Adequacy of Hydrologic/Hydraulic Safety

Based on the current facility operations, recommended hazard classifications, and inflow design flood documents, the Primary Active Ash Pond and the Secondary Ash Basin at Lee Steam Station appears to have adequate capacity to store and pass the regulatory design floods without overtopping the dams.

11.1.4 Adequacy of Instrumentation and Monitoring

Nine piezometers are installed on the impoundment dams at Lee Steam Station and are monitored monthly. In addition, the discharge rate and pond elevation for the Secondary Ash Basin are monitored weekly. Monitoring of these instruments is considered adequate, but the impoundments are lacking instrumentation to sufficiently monitor seepage in the wet area downstream of the dam, seepage exiting the toe drain system, the elevation of the water surface in the Primary Active Ash Pond and the discharge from the Primary Active Ash Pond into the Secondary Ash Basin.

11.1.5 Adequacy of Maintenance and Surveillance

The CCW impoundments at the Lee Steam Station have fair maintenance and surveillance programs. The facilities are adequately maintained and routine monthly surveillance is performed by Duke Energy staff. Annual inspections are performed by Duke Energy engineers and inspection checklists are completed.

11.1.6 Adequacy of Project Operations

Operating personnel are knowledgeable and are well trained in the operation of the project. The current operations of the facilities are satisfactory.

12.0 Recommendations

12.1 Corrective Measures and Analyses for the Structures

1. We recommend formal monitoring and analysis of the seepage area downstream of the right abutment of the Secondary Ash Basin in order to evaluate whether seepage could potentially compromise the stability of the dam. Monitoring should include installation of a weir and grading to direct seepage toward the weir. The weir should then be monitored monthly in order to establish a baseline measurement of seepage quantity. Continued monitoring will then show whether the seepage quantity changes with time. In addition, we recommend measuring turbidity in the seepage. A large amount of fines in the seepage could indicate piping of material through the dam.

2. We recommend updated stability analyses be performed for both dams and the divider dike. Stability analyses for the dams should include piezometric surfaces based on recent readings of the standpipe piezometers installed on the downstream face. A further evaluation of the upstream slope steady state seepage and rapid drawdown load cases should be performed. Stability analyses should include pseudo-static seismic analyses.

3. The liquefaction potential of the sandy silt comprising the embankment fill and the foundation should be evaluated.

4. The water level in piezometer L-9, near the toe of the Secondary Ash Basin dam, is about 10 feet higher than the water levels in the piezometers at the toe of the Primary Active Ash Pond dam, and is higher than the piezometric surface assumed at this location in the stability analyses performed in 1984. The elevated water level may be caused by the seepage downstream of the right abutment of the Secondary Ash Basin dam, and may indicate that the toe drain in this area is not functioning properly. Stability analyses should specifically investigate whether the elevated water level in this area could compromise the stability of the dam.

5. The water level in piezometer L-4 began rising in October 2009, and was elevated until April 2010. The cause of the elevated water level should be investigated and corrected if necessary, and analyses should be performed to evaluate whether an elevated water level in the vicinity of L-4 could potentially compromise the safety of the Primary Ash Pond Dam.

6. The inside and outside of the drop box downstream of the Secondary Ash Basin should be monitored for continued degradation, and repaired or replaced if necessary.

12.2 Corrective Measures Required for Instrumentation and Monitoring Procedures

1. A weir should be installed near the seepage area downstream of the Primary Active Ash Pond dam in order to monitor quantity and quality of the seepage.

2. The quantity of water flowing from the toe drains at the dam should be measured regularly.

3. A staff gauge or other means of measuring the water level in the Primary Active Ash Pond so the water level in the pond can be recorded regularly. The flow from this pond into the Secondary Ash Basin should also be monitored.

12.3 Corrective Measures Required for Maintenance and Surveillance Procedures

None.

12.4 Corrective Measures Required for the Methods of Operation of the Project Works

None.

12.5 Summary

The following factors were the main considerations in determining the final rating of the CCW impoundments at Lee Steam Station:

- The impoundments were generally observed to be in satisfactory condition in the field assessment.

- A large seepage area is present downstream of the right abutment of the Secondary Ash Basin. The seepage area is monitored visually, but the quantity and turbidity of the seepage are not monitored.

- Hydrologic analyses indicate the dikes can store the regulatory design flood without overtopping.

- Stability analyses completed for the dam in 1984 are inadequate due to unconservative piezometric surfaces and failure to include seismic loading conditions. Upstream steady state seepage and rapid drawdown loading conditions should also be re-evaluated.

- Liquefaction potential for the dike and foundation material has not been evaluated.
- Monitoring of the piezometers in the dams is adequate.
- Additional instrumentation to monitor the seepage downstream of the Secondary Ash Basin and the water surface and discharge flow rate at the Primary Active Ash Pond is recommended. Flow rates at the toe drains should also be monitored.
- Maintenance, surveillance and operational procedures are considered adequate

12.6 Acknowledgement of Assessment

I acknowledge that the management unit(s) referenced herein was personally inspected by me and was found to be in the following condition **(select one only):**

SATISFACTORY

FAIR

POOR

UNSATISFACTORY

SATISFACTORY
No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR
Acceptable performance is expected under all required loading conditions (static, hydrologic, seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR
A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY
Considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.
I acknowledge that the management unit referenced herein:

Has been assessed on June 22, 2010

Signature:

COLORADO REGISTERED PROFESSIONAL ENGINEER
STEVEN R. TOWNSLEY
27730

List of Participants:

Steven R. Townsley, P.E.	Senior Project Engineer/Task Leader, GEI Consultants, Inc.
Mary C. Nodine, P.E.	Project Engineer, GEI Consultants, Inc.
Terry Taylor	Plant Manager, Duke Energy
Marcus Pitts	Environmental Coordinator, Duke Energy
Henry Taylor	Senior Engineer, Duke Energy
Alex Papp	Civil Engineer, Duke Energy
Alan Stowe	Duke Energy
Mike Williams	Duke Energy
Paul Wilke	South Carolina DEQ

13.0 References

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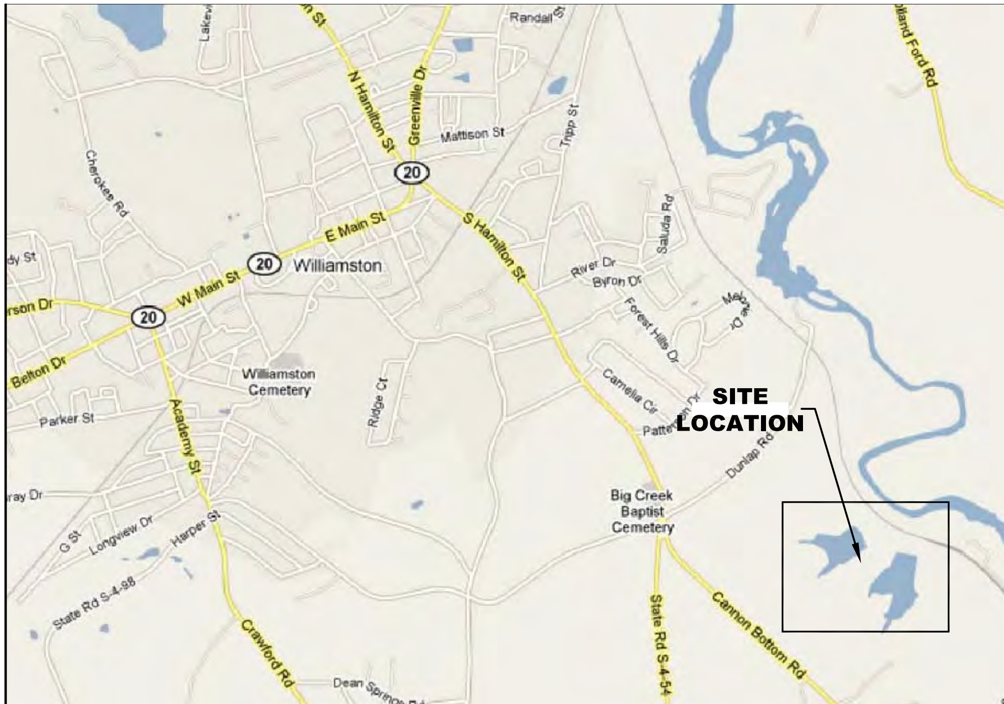
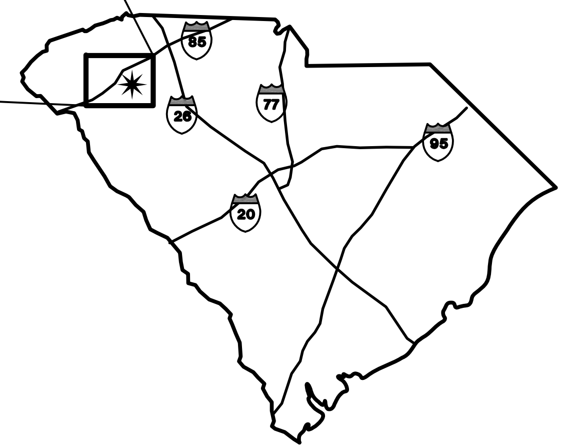
Figures

P:\092880 EPA Ash Ponds\Figures\Duke WS Lee Station\ ACAD-Figure 1 - Vicinity Map.dwg Jul 2010





SOUTH CAROLINA

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Duke Energy W.S. Lee Steam Station	GEI Consultants	SITE VICINITY MAP
Environmental Protection Agency Washington, DC	Project 092880	July 2010 Figure 1

SITE AERIAL MAP

NOT TO SCALE

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Duke Energy W.S. Lee Steam Station	GEI Consultants	SITE AERIAL MAP
Environmental Protection Agency Washington, DC	Project 092880	July 2010 Figure 2

P:\092880 EPA Ash Ponds\Figures\Duke WS Lee Station\ ACAD-Figure 2 - Aerial Map.dwg Jul 2010

Appendix A

Inspection Checklists

June 22, 2010

Site Name: W.S. Lee Station, Belton, SC   Date: 6/22/2010

Unit Name: Primary Active Ash Pond   Operator's Name: Duke Energy

Unit ID: ____________   Hazard Potential Classification: High **Significant** Low

Inspector's Name: Steve Townsley/GEI Consultants, Mary Nodine/GEI Consultants

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?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	726.0		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	725.62		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	NA		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	733		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	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)?		X	From underdrain?	X	
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
12. No trashracks, but skimmer extends down several	
feet around decant structure to keep debris out.	
21. Seepage from underdrains not observed, but	
Duke Personnel indicated similar volume to drain	
at secondary pond (<10 gpm).	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # **SC0002291** INSPECTOR **Steve Townsley/GEI**

Date **6/22/2010**

Impoundment Name **Primary Active Ash Pond, W.S. Lee Station, Belton, SC**

Impoundment Company **Duke Energy**

EPA Region **4**

State Agency (Field Office) Address **South Carolina DHEC, 2600 Bull St, Columbia, SC 29201**

Name of Impoundment **Primary Active Ash Pond**
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New **X** Update ______

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

IMPOUNDMENT FUNCTION: **Fly ash, bottom ash, boiler slag, flue gas emission control rsiduals, and other miscellaneous waste and runoff storage.**

Nearest Downstream Town: Name **Princeton, SC**
Distance from the impoundment **~10 miles**

Impoundment Location:								
	Longitude	34	Degrees	36	Minutes	10	Seconds	59
	Latitude	82	Degrees	26	Minutes	30	Seconds	0
	State	SC	County	Anderson				

Does a state agency regulate this impoundment? YES______ NO **X**

If So Which State Agency?______

<u>HAZARD POTENTIAL</u> (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.

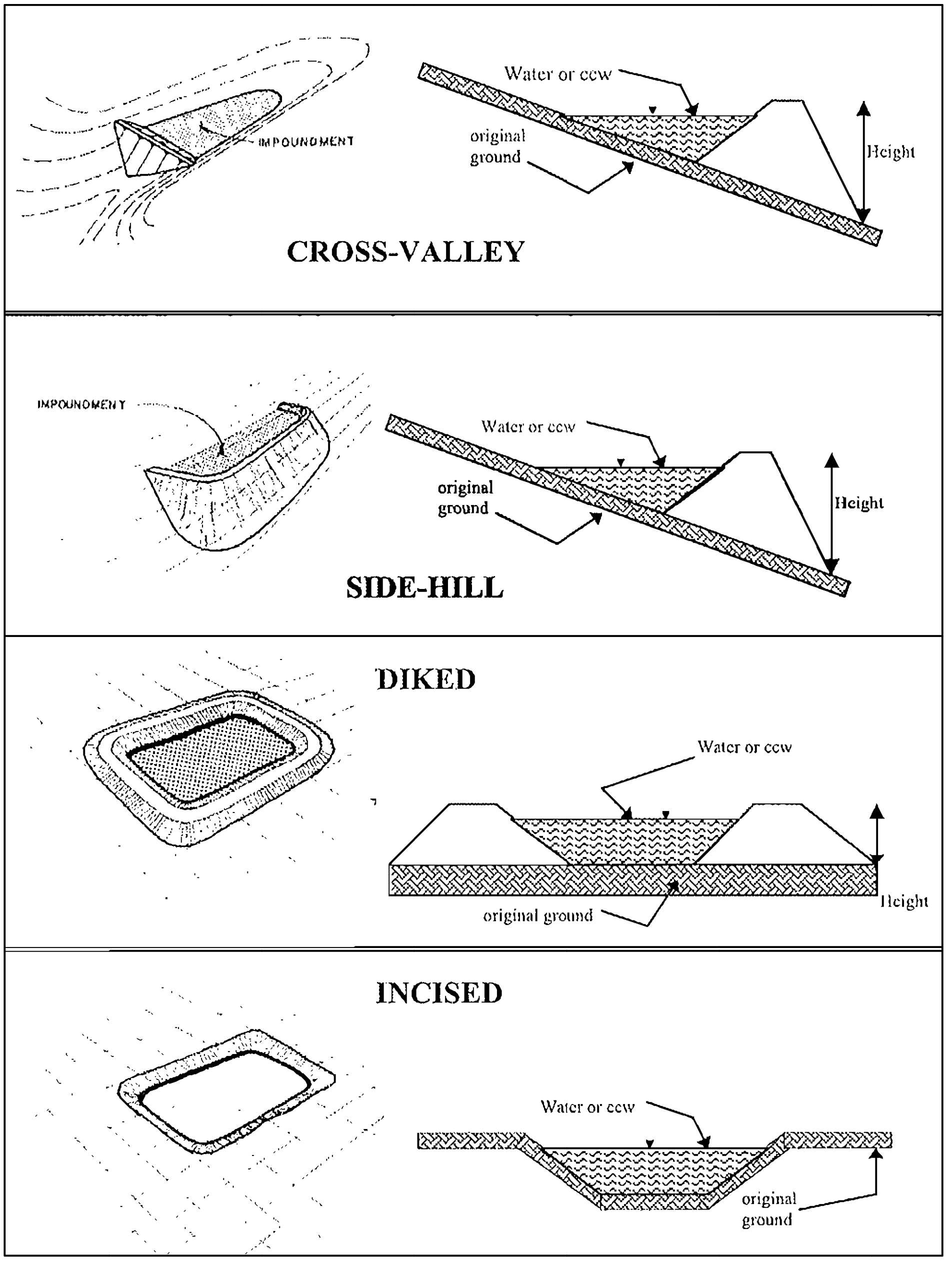
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

A failure of the Primary Active Ash Pond embankment could result in a release of CCW that would flood the railroad tracks, Duke Energy buildings and warehouses just downstream of the dam, and would continue to the Saluda River beyond. Duke personnel indicated that several people work in these buildings regularly. It is likely that in such an event, the people working in these buildings would have sufficient time to vacate the area, so the threat to human life is low. The release of CCW in this area would cause significant economic losses to Duke and environmental damage to wetlands in the vicinity of the river.

CONFIGURATION:



______ Cross-Valley
__X__ Side-Hill
______ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

Embankment Height __64__ feet Embankment Material _Earth____________

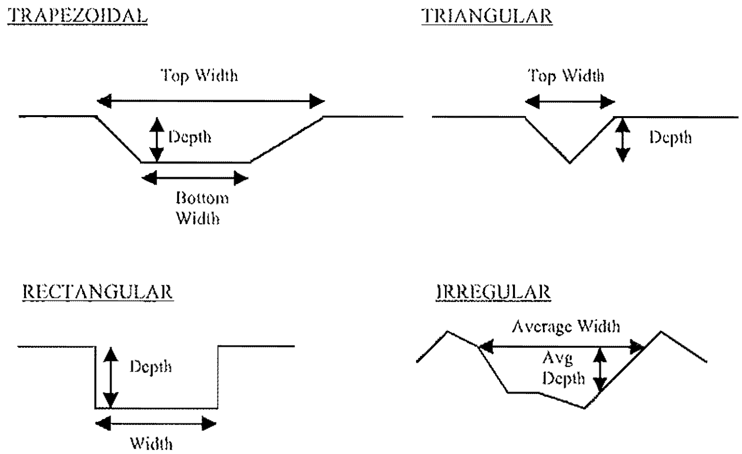
Pool Area_____41_____ acres Liner_NA________________

Current Freeboard __~5.5__ ft Liner Permeability _NA__________

TYPE OF OUTLET (Mark all that apply)

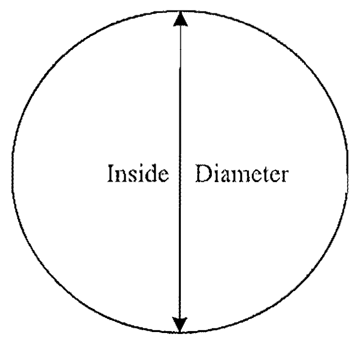
______ **Open Channel Spillway**
Trapezoidal
______ Triangular
______ Triangular

______ Depth
______ Bottom (or average) width
______ Top width



__X__ **Outlet**

__36 in.__ inside diameter



Material
______ corrugated metal
______ welded steel
__X__ concrete
______ plastic (hdpe, pvc, etc.)
______ other (specify ________________

Is water flowing through the outlet? YES __X__ NO______

______ **No Outlet –**

______ **Other Type of Outlet (Specify)** ______________________________________

The Impoundment was Designed By __Duke Power Company__

Has there ever been a failure at this site? YES ______ NO __X__

If So When?____

If So Please Describe:

Has there ever been significant seepages at this site? YES ______ NO__X___

If So When? ____

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__X___

If So which method (e.g., piezometers, gw pumping, …)? ______________________

If So Please Describe: ____

Site Name: W.S. Lee Station, Belton, SC   Date: 6/22/2010

Unit Name: Secondary Ash Basin   Operator's Name: Duke Energy

Unit ID: ____   Hazard Potential Classification: High **Significant** Low

Inspector's Name: Steve Townsley/GEI Consultants, Mary Nodine/GEI Consultants

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?	Annual		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	~705.2		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	704.68		20. Decant Pipes		
4. Open channel spillway elevation (operator records)?	NA		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	733		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	X		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	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)?		X	From underdrain?	X	
9. Trees growing on embankment? (If so, indicate largest diameter below.)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	X	
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sink holes in tailings surface or whirlpool in the pool area		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue #	Comments
12. No trashracks, but skimmer extends down several	**Soft, wet area was observed on downstream slope near**
feet around decant structure to keep debris out.	**right abutment. Duke Energy indicated this area has been**
21. Seepage from underdrain <10 gpm	**soft and wet for at least 24 years and has not visibly**
21. Seepage on downstream slope near right	**changed. Quantity of flow has not been measured.**
Abutment – see Comments	

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # **SC000291** INSPECTOR **Steve Townsley/GEI**

Date **6/22/2010**

Impoundment Name **Secondary Ash Basin, W.S. Lee Station, Belton, SC**

Impoundment Company **Duke Energy**

EPA Region **4**

State Agency (Field Office) Address **South Carolina DHEC, 2600 Bull St, Columbia, SC 29201**

Name of Impoundment **Secondary Ash Basin**
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New **X** Update ______

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

IMPOUNDMENT FUNCTION: **Fly ash, bottom ash, boiler slag, flue gas emission control rsiduals, and other miscellaneous waste and runoff storage.**

Nearest Downstream Town: Name **Princeton, SC**
Distance from the impoundment **~10 miles**

Impoundment Location:

Longitude	**34**	Degrees	**36**	Minutes	**15**	Seconds	**29**
Latitude	**82**	Degrees	**26**	Minutes	**42**	Seconds	**47**
State	**SC**	County	**Anderson**				

Does a state agency regulate this impoundment? YES______ NO **X**

If So Which State Agency?____

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.

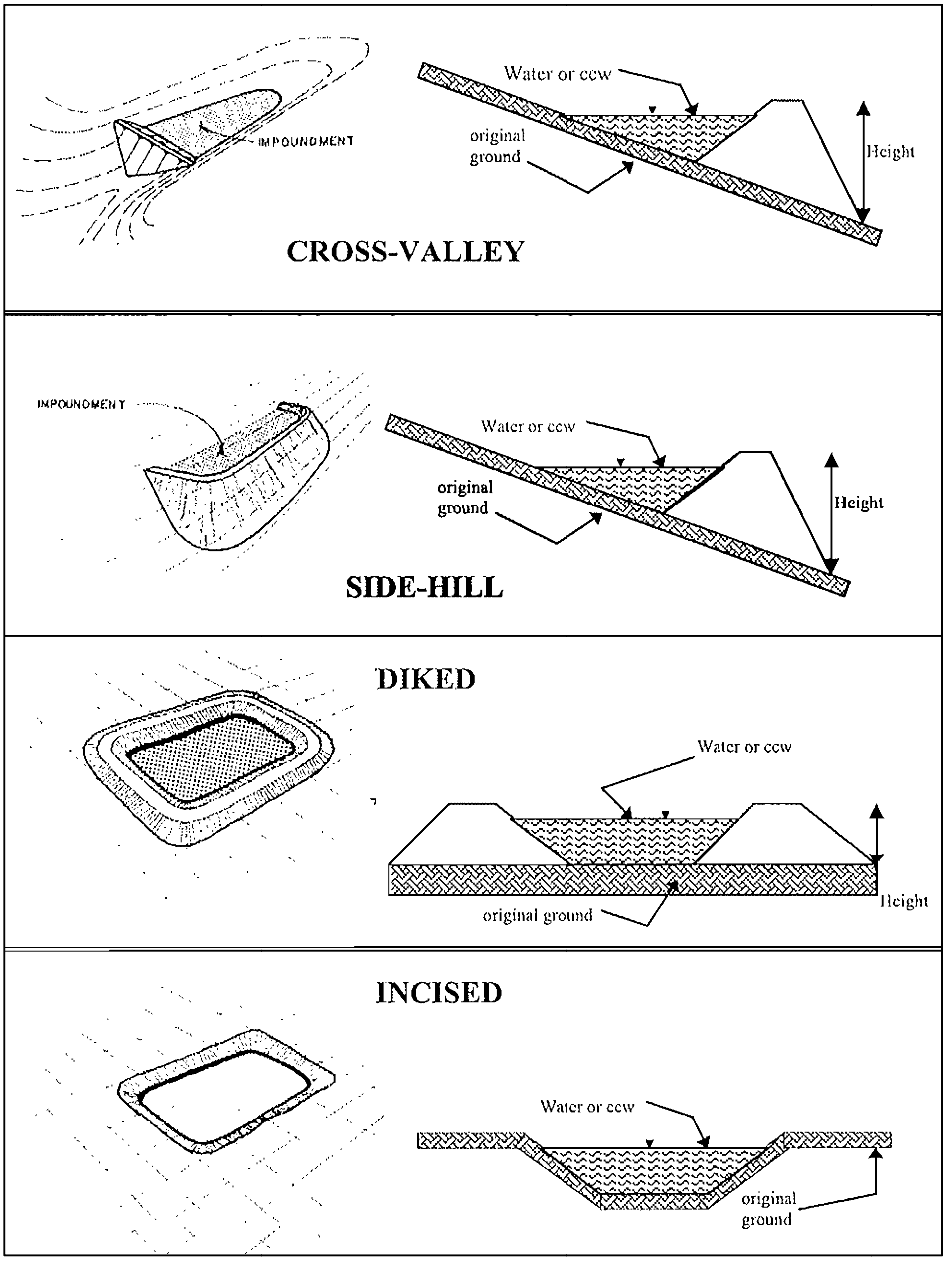
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

A failure of the embankment would result in release of CCW that would flood the downstream railroad and flow into the Saluda River. Such a failure would cause a small rise in river level and would not be expected to flood adjacent property or endanger human life. The main consequences of such a failure would be environmental impact on wetlands around the river and economic losses to Duke Energy.

CONFIGURATION:



______ Cross-Valley
__X__ Side-Hill
______ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

Embankment Height __56__ feet Embankment Material __Earth__
Pool Area __23__ acres Liner __NA__
Current Freeboard __7.8__ ft Liner Permeability __NA__

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**

Trapezoidal

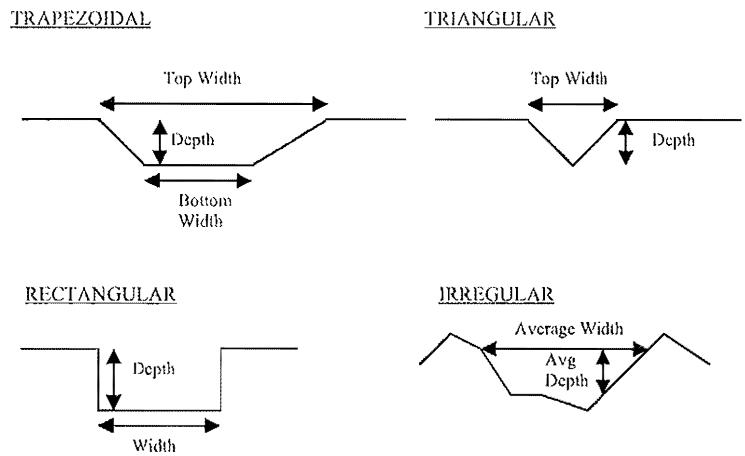
_____ Triangular

_____ Triangular

_____ Depth

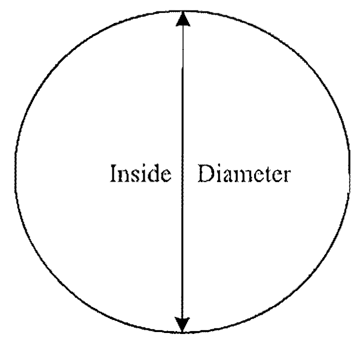
_____ Bottom (or average) width

_____ Top width



__X__ **Outlet**

__36 in.__ inside diameter



Material

_____ corrugated metal

_____ welded steel

__X__ concrete

_____ plastic (hdpe, pvc, etc.)

_____ other (specify _______________

Is water flowing through the outlet? YES __X__ NO _____

_____ **No Outlet –**

_____ **Other Type of Outlet (Specify)** _______________________________

The Impoundment was Designed By __Duke Energy__

Has there ever been a failure at this site? YES ______ NO __X__

If So When? ____

If So Please Describe: ____

Has there ever been significant seepages at this site? YES ___X___ NO______

If So When? Duke Energy informed us that there is a seepage area near the right abutment of the Secondary Ash Basin embankment. We observed this area and noted that the ground is soft and wet. Some flowing water was visible and audible. Duke Energy indicated that the seepage area has been present for more than 24 years (the date it was first noted is unknown) and that they have observed no changes to the area since then. The water observed flowing at the seepage area was clear. There were no visible signs of movement or other disturbance to the embankment near the seepage area. Flow at the seepage area has never been measured.

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__X__

If So which method (e.g., piezometers, gw pumping, …)? ______________________

If So Please Describe:

Appendix B

Inspection Photographs

June 22, 2010

14 Photo Number, Location and Direction

SITE MAP

NOT TO SCALE

N

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Duke Energy W.S. Lee Steam Station	GEI Consultants		PRIMARY ACTIVE ASH POND PHOTOGRAPH LOCATION MAP
Environmental Protection Agency Washington, DC	Project 092880		July 2010

P:\092880 EPA Ash Ponds\Figures\Duke WS Lee Station\ ACAD-photo.dwg Jul 2010

SITE MAP

NOT TO SCALE

14 Photo Number, Location and Direction

N

P:\092880 EPA Ash Ponds\Figures\Duke WS Lee Station\ ACAD-photo.dwg Jul 2010

Assessment of Dam Safety of Coal Combustion Waste Impoundments at Duke Energy W.S. Lee Steam Station	GEI Consultants	SECONDARY ASH BASIN PHOTOGRAPH LOCATION MAP
Environmental Protection Agency Washington, DC	Project 092880	July 2010

Photo 1 – Primary Active Ash Pond Dam : Downstream slope near right abutment.

Photo 2 – Primary Active Ash Pond Dam: Overview from right abutment.

Photo 3 – Primary Active Ash Pond Dam: upstream slope and channel to decant pipe (looking west).

Photo 4 – Primary Active Ash Pond Dam: Piezometers L-1, L-2 and L-3 and toe drain inlet.

Photo 5 – Primary Active Ash Pond Dam: Plant buildings downstream.

Photo 6 – Primary Active Ash Pond Dam: Piezometers L-4, L-5 and L-6 and toe drain inlet.

Photo 7 – Primary Active Ash Pond Dam: Upstream face and channel to decant pipe (looking east).

Photo 8 – Primary Active Ash Pond Dam: downstream face from left abutment.

Photo 9 – Primary Active Ash Pond Dam: Crest from left abutment.

Photo 10 – Secondary Ash Basin: Looking across pond to divider dike.

Photo 11 – Secondary Ash Basin Dam: Upstream slope and left abutment.

Photo 12 – Secondary Ash Basin Dam: Upstream slope looking toward right abutment.

Photo 13 – Secondary Ash Basin Dam: Crest, looking west.

Photo 14 – Secondary Ash Basin Dam: Downstream slope from left abutment.

Photo 15 – Secondary Ash Basin Dam: Railroad embankment downstream of toe.

Photo 16 – Secondary Ash Basin Dam: Piezometers L-7, L-8 and L-9.

Photo 17 – Secondary Ash Basin Dam: Downstream face from left abutment. Note riprap along abutment contact.

Photo 18 – Secondary Ash Basin Dam: Seepage area downstream of right abutment. Note vegetation.

Photo 19 – Secondary Ash Basin Dam: Flowing water in seepage area.

Photo 20- Divider Dike: Crest.

Photo 21 –Divider Dike: Downstream slope.

Photo 22 –Primary Active Ash Pond outlet structure.

Photo 23 –Primary Active Ash Pond outlet structure – stop logs.

Photo 24 –Primary Active Ash Pond outlet structure – channel to Secondary Ash Basin.

Photo 25 – Secondary Ash Basin outlet structure and bridge.

Photo 26 – Secondary Ash Basin outlet works – drop box downstream of dam. Note spalling.

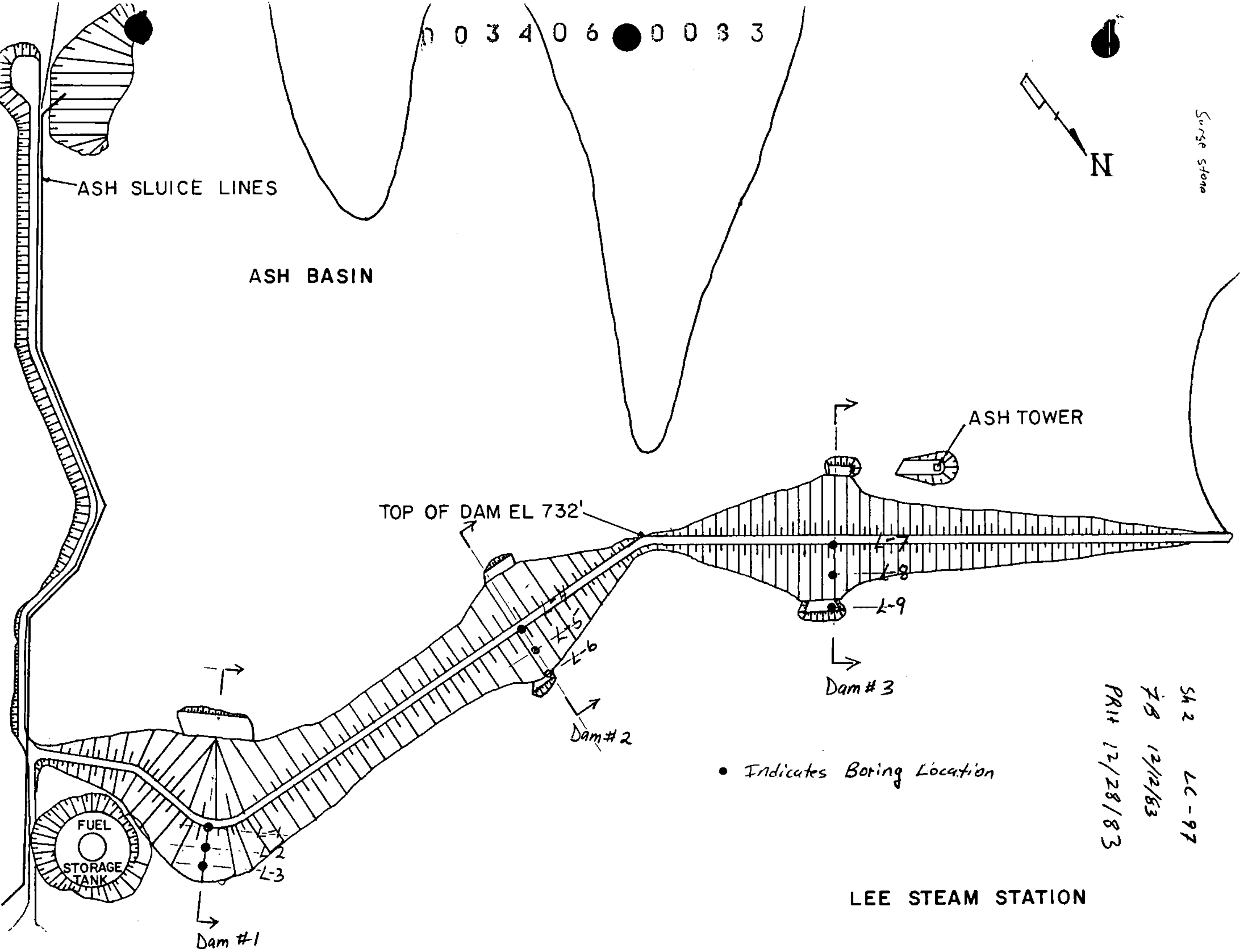
Photo 27 – Secondary Ash Basin outlet works – discharge conduit.

Photo 28 – Secondary Ash Basin outlet works – discharge channel to Saluda River.

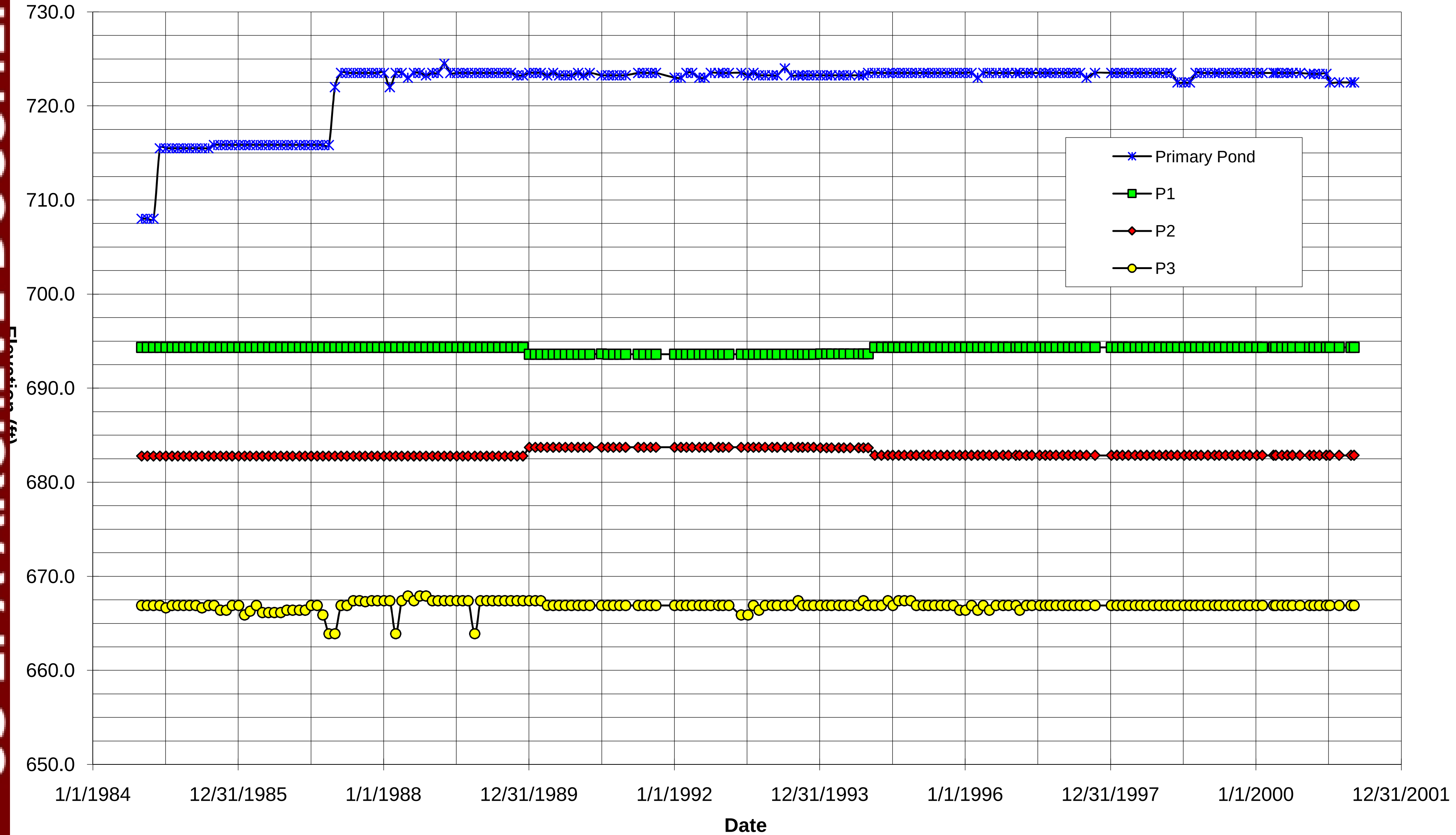
Photo 29 – Secondary Ash Basin toe drain outlet.

Appendix C

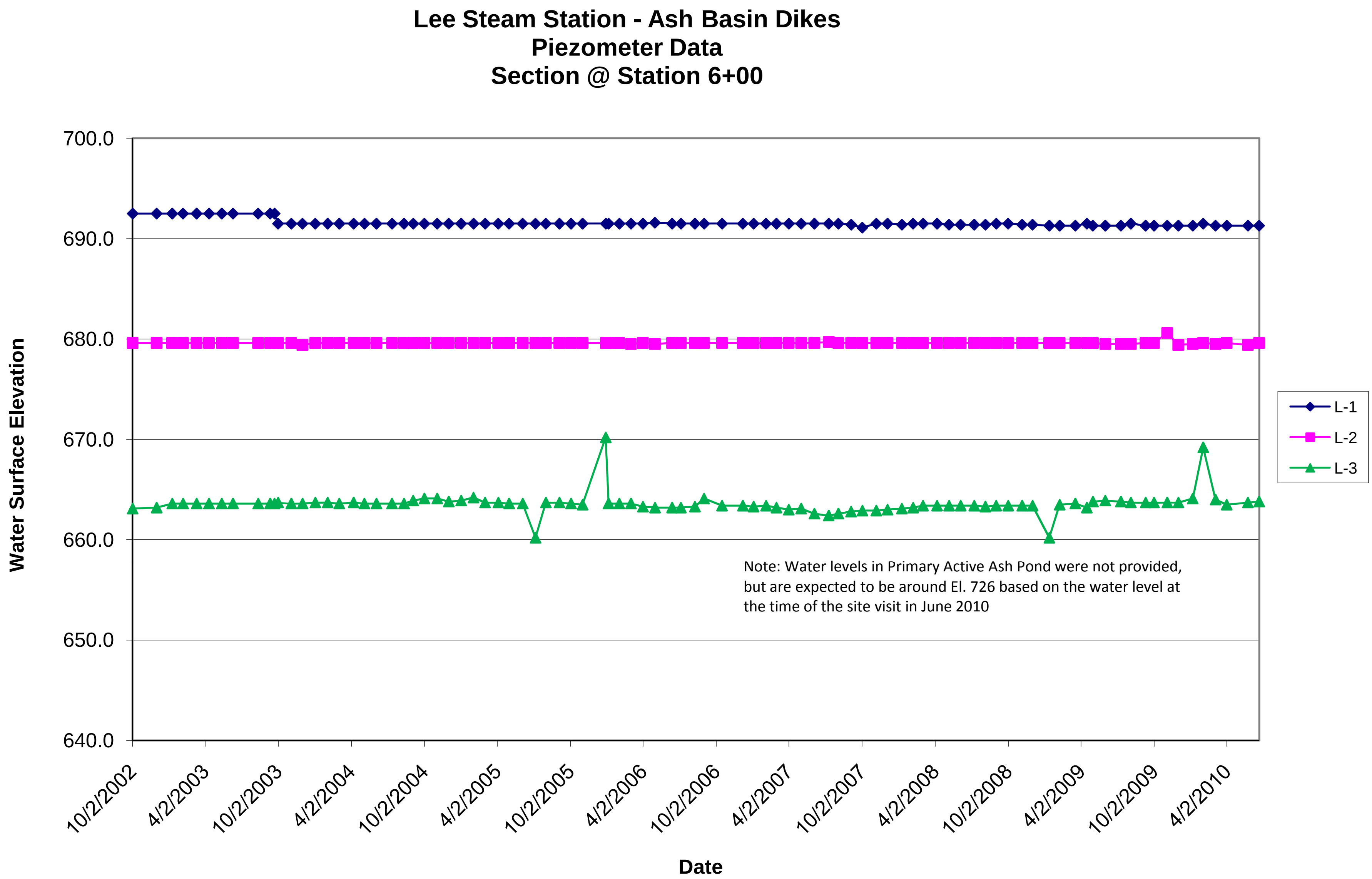
Instrumentation

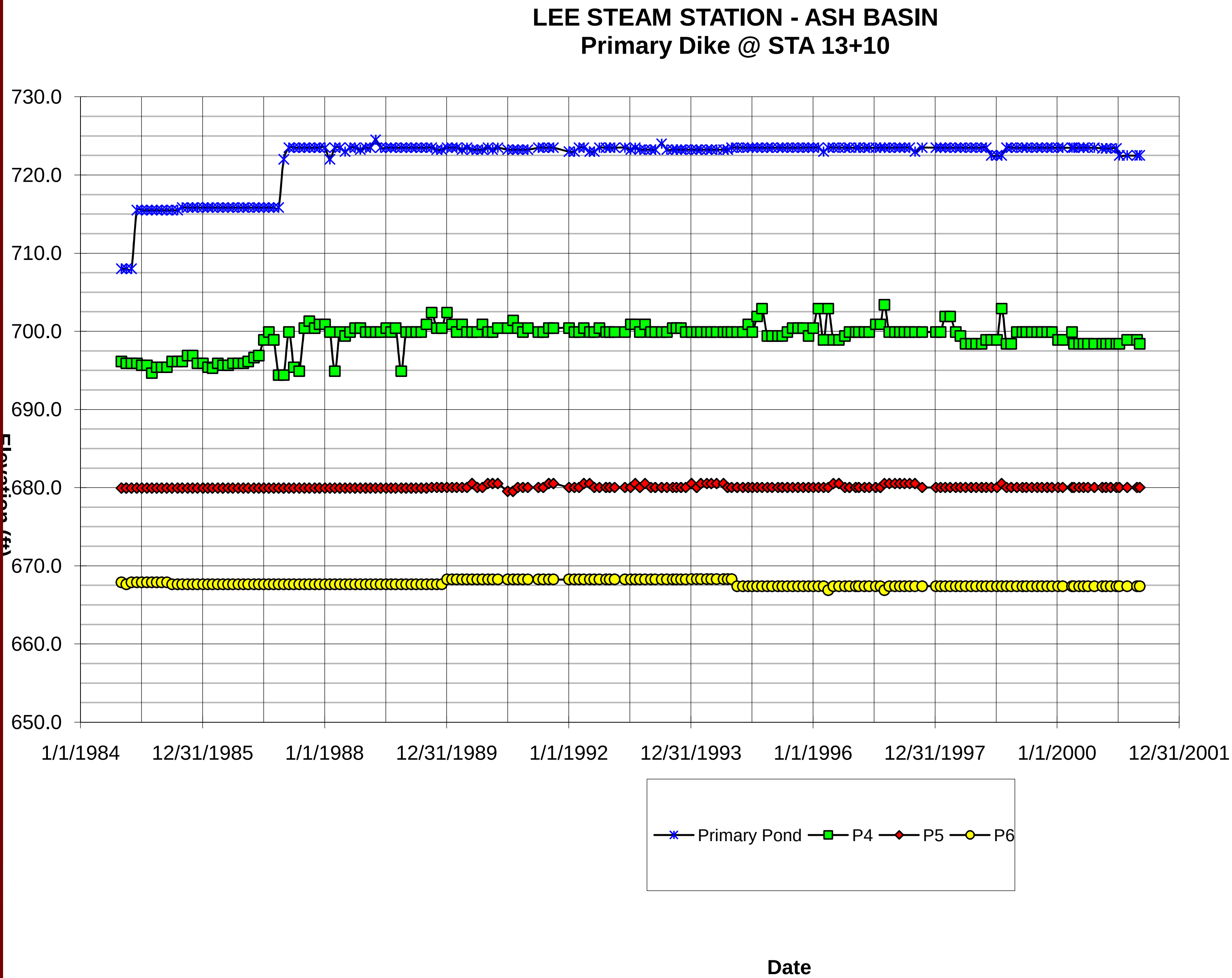

0 3 4 0 6 0 0 3 3
ASH SLUICE LINES
ASH BASIN
N
Surge stone
ASH TOWER
TOP OF DAM EL 732'
L-1
L-2
L-3
L-4
L-5
L-6
L-7
L-8
L-9
Dam #1
Dam #2
Dam #3
FUEL STORAGE TANK
• Indicates Boring Location
Sh 2 LC-97
FB 12/12/83
PR'd 12/28/83
LEE STEAM STATION

LEE STEAM STATION - ASH BASIN
Primary Dike @ STA 6+00

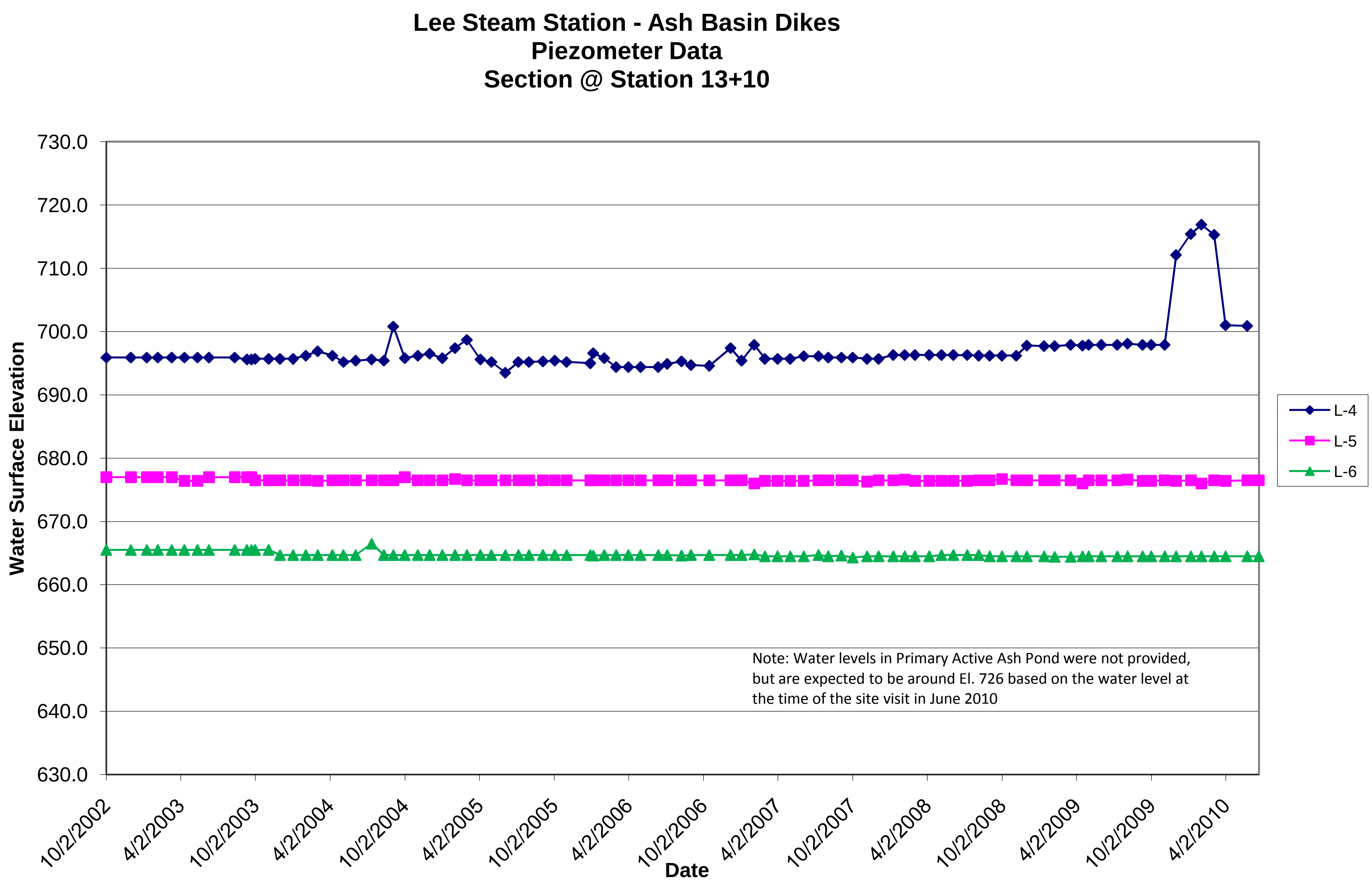


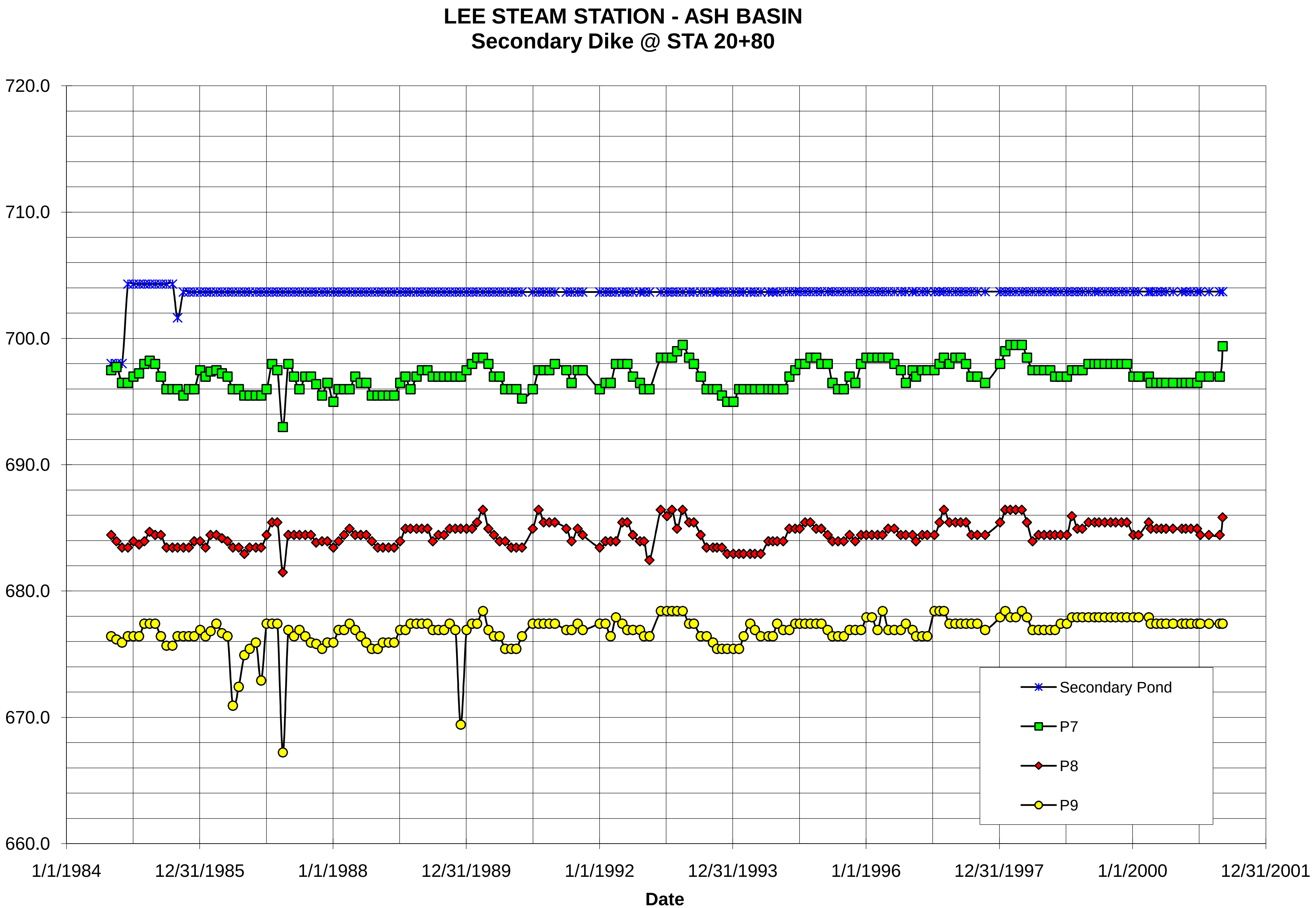
JEKLS Piezometers 5-9-01


Lee Steam Station - Ash Basin Dikes
Piezometer Data
Section @ Station 6+00
700.0
690.0
680.0
670.0
660.0
650.0
640.0
Water Surface Elevation
10/2/2002
4/2/2003
10/2/2003
4/2/2004
10/2/2004
4/2/2005
10/2/2005
4/2/2006
10/2/2006
4/2/2007
10/2/2007
4/2/2008
10/2/2008
4/2/2009
10/2/2009
4/2/2010
Date
L-1
L-2
L-3
Note: Water levels in Primary Active Ash Pond were not provided, but are expected to be around El. 726 based on the water level at the time of the site visit in June 2010

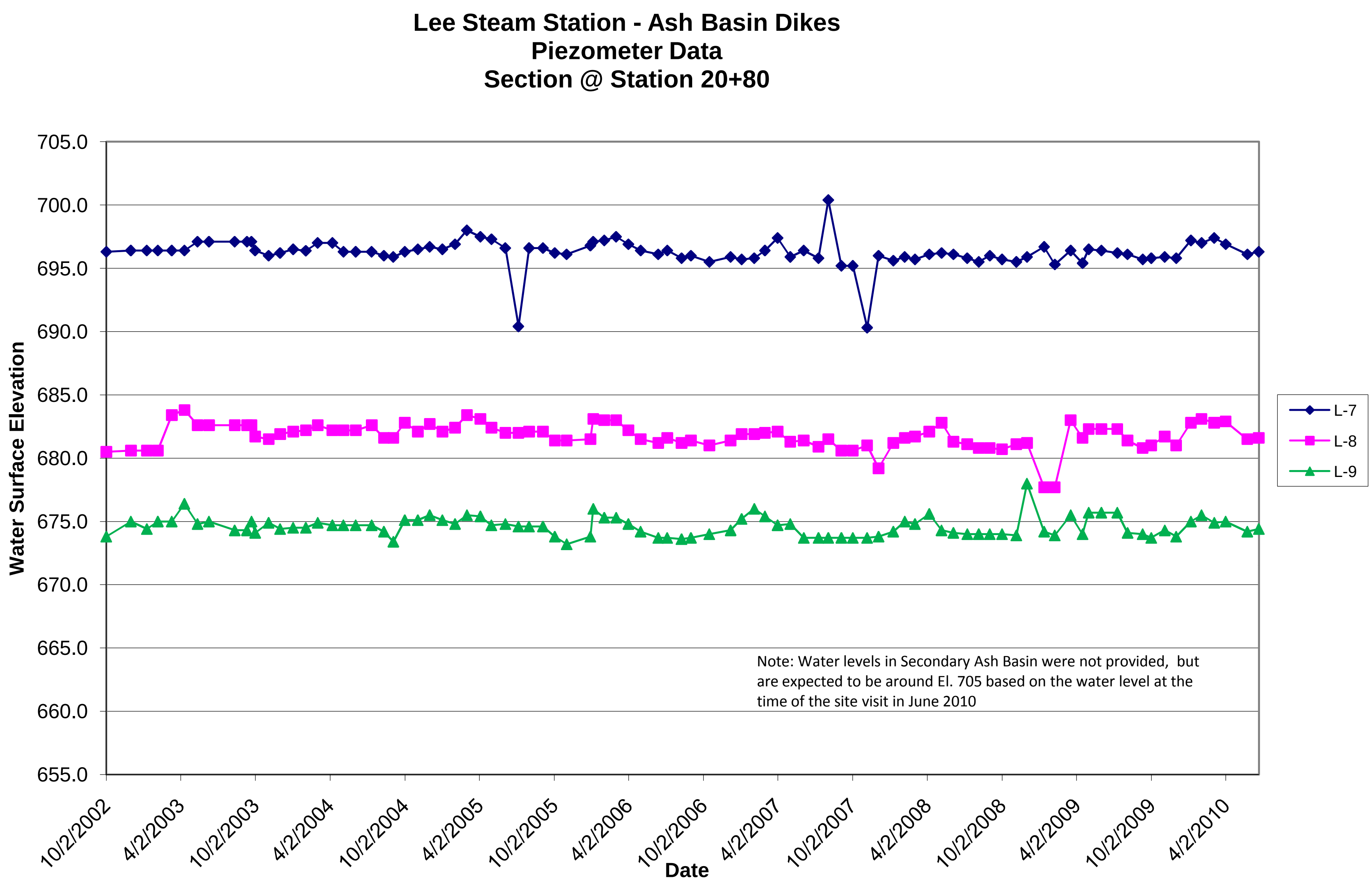


JEKLS Piezometers 5-9-01


Lee Steam Station - Ash Basin Dikes
Piezometer Data
Section @ Station 13+10
Water Surface Elevation
730.0
720.0
710.0
700.0
690.0
680.0
670.0
660.0
650.0
640.0
630.0
10/2/2002
4/2/2003
10/2/2003
4/2/2004
10/2/2004
4/2/2005
10/2/2005
4/2/2006
10/2/2006
4/2/2007
10/2/2007
4/2/2008
10/2/2008
4/2/2009
10/2/2009
4/2/2010
Date
L-4
L-5
L-6
Note: Water levels in Primary Active Ash Pond were not provided, but are expected to be around El. 726 based on the water level at the time of the site visit in June 2010



LEE STEAM STATION - ASH BASIN
Secondary Dike @ STA 20+80
720.0
710.0
700.0
690.0
680.0
670.0
660.0
1/1/1984
12/31/1985
1/1/1988
12/31/1989
1/1/1992
12/31/1993
1/1/1996
12/31/1997
1/1/2000
12/31/2001
Date
Secondary Pond
P7
P8
P9



Lee Steam Station - Ash Basin Dikes
Piezometer Data
Section @ Station 20+80
Water Surface Elevation
705.0
700.0
695.0
690.0
685.0
680.0
675.0
670.0
665.0
660.0
655.0
10/2/2002
4/2/2003
10/2/2003
4/2/2004
10/2/2004
4/2/2005
10/2/2005
4/2/2006
10/2/2006
4/2/2007
10/2/2007
4/2/2008
10/2/2008
4/2/2009
10/2/2009
4/2/2010
Date
L-7
L-8
L-9
Note: Water levels in Secondary Ash Basin were not provided, but are expected to be around El. 705 based on the water level at the time of the site visit in June 2010

Appendix D

Reply to Request for Information under Section 104(e)

Duke Energy Corporation
1000 East Main Street
Plainfield, IN 46168

Via Certified Mail 7008 2810 0000 0830 9284

March 26, 2009

Mr. Richard Kinch
US Environmental Protection Agency (5306P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: CERCLA 104(e) Request for Information
Lee Steam Station
205 Lee Steam Plant Rd.
Belton, South Carolina 29627

Dear Mr. Kinch,

Duke Energy Carolinas, LLC (DEC) hereby responds to the request for information the EPA submitted to the Lee Steam Station, letter dated March 9, 2009, under Section 104(e) of CERCLA, 42 USC § 9604(e), relating to surface impoundments or similar diked / bermed management units which receive liquid-borne material for storage or disposal of residuals or by-products from the combustion of coal. DEC received this request on March 13, 2009, and today's response complies with the 10-business day deadline.

The attached responses are full and complete and were developed under my supervision with assistance from Duke Energy's Engineering and Technical Services group. The following clarifications should be noted for the attached responses.

- The responses in this submittal are for surface impoundments and the associated secondary / clarifying ponds used for temporary or permanent storage of flyash, bottom ash, boiler slag, and flue gas emission control residues at this station (hereinafter "coal combustion by-products").
    - These ponds are also an integral part of the station's wastewater treatment system used to manage wastewater before discharge.
- The response to the questions does not include ponds that are retired / closed and which no longer contain free liquids.
- The response to questions does not include landfill runoff collection ponds or any other miscellaneous ponds / impoundments that are not designed to or do not regularly receive and store coal combustion by-products.
- Where actual measurements could not be collected within the timeframe allotted by EPA, DEC has provided estimates, which are noted as such.
- The criteria that DEC used to identify any spills or unpermitted releases over the last 10 years in the response to Question #9 include the failure of physical pond or impoundment structures (i.e. berms, dikes, and discharge structures); the criteria do not include exceedances of the NPDES discharge limits that have already been reported in the discharge monitoring report.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

If you have any questions regarding today's submittal please contact Richard Meiers at our corporate offices at 317-838-1955.

Sincerely,
Duke Energy Carolina, LLC

Barry E. Pulskamp
Senior Vice President Regulated Fleet Operations

Attachments (3)

Responses to Enclosure A
Inspection Report
Confidential Business Information

cc Terry L. Taylor
Lee Steam Station
General Manager II Regulated Fossil Stations
William M. Pitts
Senior EHS Professional
Richard J. Meiers
Principal Environmental Scientist

Attachment # 1

Response to Questions in Enclosure A

Lee Steam Station

March 25, 2009

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less than Low Hazard Potential, please provide the rating for each management unit and indicate which State or federal regulatory agency assigned that rating. If the unit does not have a rating, please note that fact.

   No State or Federal regulatory agency has assigned a rating relative to the National Inventory of Dams criteria for the management unit at Lee Steam Station. The Ash Basin Dams are currently not classified by the South Carolina Department of Health and Environmental Control (SCDHEC).

2. What year was each management unit commissioned and expanded?

   Primary Active Ash Pond was commissioned prior to 1974 and expanded in 1975.

   Secondary Ash basin was commissioned in 1975.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Management Unit	Primary Pond	Secondary Pond
Contents	1, 2, 3, 4, 5*	1, 2, 3, 4, 5*

* "Other" includes water treatment, boiler blow down, floor and laboratory drains and drains from equipment cleaning, boiler chemical cleaning wastes, storm water runoff, coal pile runoff, fire protection, and mill rejects.

4. Do you have a Professional Engineer's certification for the safety (structural integrity) of the management unit(s)? Please provide a copy if you have one. If you do not have such a certification, do

you have other documentation attesting to the safety (structural integrity) of the management unit(s)? If so, please provide a copy of such documentation.

Annual inspections are performed by Duke Energy Carolinas as required. In addition, Duke Energy Carolinas contracts with an independent consultant to have an inspection performed every 5 years by an independent consultant who uses a qualified licensed professional engineer. The most recent report is attached (Attachment 2).

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)?

The last ash basin dam inspection was performed in March, 2009. A copy of the most recent inspection report created by an independent consultant is also attached (Attachment 2).

Briefly describe the credentials of those conducting the structural integrity assessments/evaluations.

S&ME, one of the Southeast's most respected engineering firms, specializes in geotechnical engineering, construction materials engineering and testing, environmental engineering and occupational health and safety services. S&ME has a long history of providing professional engineering expertise to Duke Energy Carolinas' facilities.

Identify actions taken or planned by facility personnel as a result of these assessments or evaluations.

See page 9 for a list of action items identified in the attached inspection report (Attachment 2). S&ME mailed this report the day this ICR was issued; Duke Energy's Generation Engineering is in the process of developing a work plan and schedule to address the action items.

If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors.

See attached Inspection report (Attachment 2). Duke Energy's Generation Engineering Department provides engineering oversight, review, and documentation of maintenance done and repairs made.

If the company plans an assessment or evaluation in the future, when is it expected to occur?

Duke Energy Carolinas' inspection program requires an annual inspection. We may do these in-house by qualified personnel or we may elect to contract the annual inspections. Monthly visual inspections are conducted by Duke Energy personnel. A visual inspection is also conducted after a significant rainfall. The next 5-year independent inspection will be completed in 2014.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department

which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

There is no regularly scheduled State or Federal inspection of the Lee Ash Pond dikes.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

DEC is not aware of any assessments, evaluations, or inspections conducted by State or Federal regulatory officials at the Lee Steam Station within the past year.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s). Please provide the date that the volume measurement was taken.

The response to this question contains Confidential Business Information, which is of a competitive and commercial nature, pursuant to 40 C.F.R. Part 2. Our response is therefore provided in a separate attachment (Attachment 3), which has been labeled "CBI." DEC requests that EPA treat the information in Attachment 3 as CBI and safeguard it from inadvertent disclosure and contact DEC if EPA receives a request for this CBI.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

There have been no spills or unpermitted releases from any of the management units listed in response #2 over the past ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

Duke Energy Carolinas, LLC is the legal owner and operator at the facility.

Attachment #3

CBI

This attachment contains Confidential Business Information, which is of a competitive and commercial nature, pursuant to 40 C.F.R. Part 2. DEC requests that EPA treat the information in Attachment 3 as CBI and safeguard it from inadvertent disclosure and contact DEC if EPA receives a request for this CBI.

Lee Steam Station
Response to Question # 8

Primary Pond

- 41 acres in total surface area with 779 acre/feet of total storage volume
- The station estimated in January 2009 that the pond was approximately 76% full

Secondary Pond

- 23 acres in total surface area with 391 acre/feet of total storage volume
- The station estimated in January 2009 that the pond was approximately 50% full

The ash basin system maintains at least a capacity for free water volume that is sufficient to handle maximum 24 hour flows including a 10 year 24 hour rainfall event.