Assessment of Dam Safety
Coal Combustion Surface Impoundments (Task 3)
Final Report

Georgia Power Company

Plant Branch

Milledgeville, GA

Prepared for

Lockheed Martin
2890 Woodridge Ave #209
Edison, New Jersey 08837

March 29, 2010

CHA Project No. 20085.2060.1510

I acknowledge that the management units referenced herein:

- Plant Branch Ash Ponds B, C, D and E

Have been assessed on November 23, 2009 and November

STATE OF OHIO
MALCOLM D. HARGRAVES
E-62191
REGISTERED
PROFESSIONAL ENGINEER

Malcolm Hargraves

Signature: Malcolm D. Hargraves
Malcolm D. Hargraves, P.E.
Senior Geotechnical Engineer
Registered in the State of Georgia

Reviewer: ______________________________
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Geotechnical Operations Manager
Registered in the State of Georgia

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1.0 INTRODUCTION & PROJECT DESCRIPTION

1.1 Introduction

CHA was contracted by Lockheed Martin to perform site assessments of selected coal combustion surface impoundments (Project #0-381 Coal Combustion Surface Impoundments/Dam Safety Inspections). As part of this contract, CHA was assigned to perform a site assessment of Georgia Power Company's Plant Branch, which is located in Milledgeville, Georgia as shown on Figure 1 – Project Location Map.

CHA made a site visit on November 23, 2009 and November 24, 2009 to perform visual observations and to inventory coal combustion surface impoundments at the facility, inspect the containment dikes, and to collect relevant information regarding the site assessment. On the date this draft report was published CHA received a package of additional documents from Georgia Power to review. This data will be reviewed and incorporated into the final report.

CHA engineers, Malcolm Hargraves, P.E. and Cody Johnson, were accompanied during the site visit by the following individuals:

Company or Organization	**Name and Title**
Environmental Protection Agency	Craig Dufficy, Environmental Engineer
Georgia Dept. of Natural Resources	Carey Anderson, Environmental Engineer
Georgia Dept. of Natural Resources	Charles Grizzard, Environmental Engineer
Georgia Power Company – Branch	Johnny Howze, Plant Manager
Georgia Power Company – Branch	Sandy Lloyd, Safety and Health Advisor
Georgia Power Company – Branch	Cynthia Dixon, Team Leader - Compliance
Georgia Power Company – Branch	Brenda Southerland, Compliance and Support Mgr.
Georgia Power Company	Rochelle Routman, Environmental Specialist

Company or Organization	Name and Title
Georgia Power Company	Tanya Blalock, Environmental Affairs Manager
Southern Company	Gary McWhorter, P.E., Environmental Engineering
Southern Company	Ron Wood, P.G., Hydro Services
Southern Company	Joel Galt, P.E., Hydro Services Supervisor
Troutman Sanders	Holly Hill, Attorney

1.2 Project Background

Plant Branch has or had at one time five coal combustion waste disposal ponds at the facility, identified as Ash Pond A, B, C, D, and E, respectively. The first pond constructed at the facility, Ash Pond A, was taken out of service in the late 60's and no longer exists. Ancillary facility structures and southern portions of the primary front parking lot now occupy the area that was once Ash Pond A. Of the ponds that remain, the Ash Pond E is under the jurisdiction of the Georgia Department of Natural Resources Environmental Protection Division (EPD) Safe Dams Program (Georgia State ID. 117-002-00108). Ash Pond E is listed on the National Inventory of Dams (NID) identified at GA04576. The Ash Pond D dike has been given Georgia State ID 117-021-02354 and the Ash Pond B dike has the number 117-023-04387. The Ash Pond C dike does not have an ID number at this time.

As indicated by the Georgia Safe Dams program, Ash Pond E has been categorized as a Category I dam by the Georgia Soil and Water Conservations Committee under Georgia Safe Dams Act of 1978. This means improper operation or dam failure would result in the probable loss of human life, as per the Rules of the Georgia Department of Natural Resources Environmental Protection Division Chapter 391-3-8 Rules for Dam Safety, Section 391-3-8-.02(d). Ash Pond E is annually inspected by the Georgia Department of Natural Resources Safe Dams Program engineers.

According to the Georgia Safe Dams program, Ash Ponds B and D have been categorized as Category II dams, meaning improper operation or dam failure would not be expected to result in probable loss of human life. Category II dams are exempt from the Georgia dam safety regulations thereby leaving the design, operation, and maintenance standards up to the owner's discretion for best management practices. According to Georgia Safe Dams personnel, as a Category II dam, the structure is not held to any state recognized design standards.

At this time, no information is available regarding the category classification for Ash Pond C.

1.2.1 State Issued Permits

The State of Georgia issued Permit No. GA0026051 to the Georgia Power Company authorizing discharge under the National Pollutant Discharge Elimination System to Lake Sinclair in the Oconee River Basin in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit. The permit became effective on March 30, 2005 and will expire on February 28, 2010.

1.3 Site Description and Location

The Plant Branch management units are shown on Figure 2A – Photo Site Map Overview. The impoundments at the Plant Branch facility consist of a total of four active ponds (B, D, C, and E) and one closed pond (A). The commissioning and subsequent expansion for each of the five dams at Plant Branch is indicated below:

- Ash Pond A: Commissioned in 1965
- Ash Pond B: Commissioned in 1967
- Ash Pond C: Commissioned in 1971
- Ash Pond D: Commissioned in 1980
- Ash Pond E: Commissioned in 1982; wave wall added to provide additional freeboard in 2004.

A map of the region indicating the location of the Plant Branch station and ash ponds and identifying schools, hospitals, or other critical infrastructure located within approximately five miles down gradient of the ash pond is provided as Figure 3 – Critical Infrastructure Map. Ash Pond E, which contains the largest volume of liquid, is about one mile upstream of Lake Sinclair.

1.3.1 Ash Pond B

Design documents were provided for Ash Pond B. Based upon a review of aerial photographs, the south dike for Ash Pond B is approximately 1,700 feet long.

The impoundment for Ash Pond B was created by construction of a dike across a cove on the south and southwest sides as shown in Figure 2B. Based upon information provided in the Southern Company inspection report for the second quarter of 2009, we understand that the dike was constructed in two phases. The first phase entailed dumping large rock and soil across the opening of a cove to create a rock base approximately 10 to 15 feet above the bottom of the Lake Sinclair cove as shown in Figure 5A-1, forming an initial embankment approximately 650 feet long. The second phase entailed dumping “somewhat smaller” rock and large portions of soil from the plant excavation. Approximately three feet of clayey silt was dumped on top to form a clay cap approximately 80 feet wide. Construction was completed in 1967 creating an impoundment surface area of approximately 75 acres. A sketch shown in Figure 5A-2 indicated that the dike crest is approximately 80 feet across with slopes extending 60 feet out from each edge of the crest on a 1.5/1 slope. A plan view of the completed dike as designed in 1967 is presented in Figure 5A-3.

Currently, a small portion of Ash Pond B is used for the dewatering of bottom ash recovered from the coal power production process. Previously, bottom ash was placed in this pond until sold. The dewatered ash is presently removed for storage or marketing.

1.3.2 Ash Pond C

Ash Pond C is impounded by three dikes on the west, south, and east sides as shown on Figure 2C. The remaining sides of the pond are contained by natural hills. The west dike is approximately 1,300 feet long, the south dike is approximately 1,700 feet long, and the east dike is approximately 1,700 feet long. The drawing indicates that the dikes were to be constructed with a slope of 2H:1V but the “upstream slope may be changed to 1.75H:1V at the discretion of the engineer if suitable foundation conditions are encountered”. The remaining portions of the impoundment are contained by natural ground. A plan view and dike cross-section for the Ash Pond C impoundment is presented in Figure 5B. Available test records related to the method of placement and compaction generally indicated that embankment material met the required 90% maximum standard Proctor dry density. Furthermore, the soil logs of piezometer installations with Standard Penetration test data generally indicate medium stiff to very stiff conditions in the embankment material. An isolated exception was observed in PZ-3 where soft (N = 5 blows per foot) conditions were encountered within the top 10 feet of the embankment surface.

Construction of the impoundment began in 1971 and upon its completion it created a total surface area of 70 acres. Ash Pond C is currently used primarily as a final settlement stage for the fly ash deposition process at Plant Branch.

1.3.3 Ash Pond D

Construction of Ash Pond D began in 1980 and consisted of a dike along the southwest side of the pond as shown in Figure 2D and plan view of the dike presented in Figure 5C. The other sides of the impoundment are contained by natural hills. The dike is approximately 2,300 feet long and constructed with a downstream slope of 2.5H:1V and an upstream slope of 2.25H:1V as shown in Figure 5D. Material for construction of the dike was excavated from the northeastern portion of the pond area. The cross section indicates that the most impervious material was to be placed in the center of the dam; information such as construction test records related to the method of placement and compaction was not provided. Documents detailing technical specifications and quality control procedures, however, indicate that the embankment material was to be compacted to 98% of the maximum standard Proctor dry density and tested every 6,000 square feet per 2-foot elevation rise. In addition, the soil log of a piezometer installation with Standard Penetration test data indicates that the embankment material was generally in a stiff to very stiff condition. The impoundment created a total surface area of 45 acres upon its completion.

A blanket drain was installed below the dike, as shown in Figure 5D. Initial construction also included a trench drain below the highest section of the dike. Finger drains transmit the water collected by the blanket drain into concrete lined drainage channels constructed parallel to the dike toe. The channels also collect surface runoff and outlet through a corrugated metal pipe culvert that conveys the water beneath an access drive and out to a Lake Sinclair drainage feature.

1.3.4 Ash Pond E

The original construction of Ash Pond E began in 1982 and consisted of one main dike along the eastern boundary of the pond which impounds water into a broad valley area as shown in Figure 2E. The dike is approximately 3,600 feet long as shown in Figure 5E and the impoundment created a total surface area of 311 acres. As shown in the section on Figure 5F, the dike was constructed using a slope of 3H:1V on the downstream side of the crest and a slope of 2.5H:1V on the upstream side of the crest. The cross section indicates that the most impervious material was to be placed in the center of the dam with compacted fill on the upstream and downstream slopes. Available information related to the method of placement and compaction indicated that the embankment material generally met the 98% maximum standard Proctor dry density specification the construction specifications required. Quality control procedures required field testing of the embankment material every 6,000 square feet and 2-foot elevation rise.

In 2004, a 4-foot high, reinforced concrete, cantilevered wave wall was installed along the crest of the upstream dike slope. At the abutment locations where the earth dike height was less than 2 feet, grouted rubble mounds were used in lieu of the concrete wall to taper the new construction into the existing ground. The primary purpose of the wave wall was to provide the three feet of freeboard required while passing the ½ PMF (Probable Maximum Flood) event.

It is understood that all fly ash from the coal power production process is pumped to Ash Pond E to allow for ash storage and settlement. From Ash Pond E, water is decanted and discharges via a 36-inch diameter underground pipe into Pond D. Seepage through the embankment is collected through a blanket drainage system where it is discharged directly into a drainage tributary to Lake Sinclair.

1.3.5 Other Impoundments

In addition to the coal combustion waste (CCW) disposal areas described above, CHA also was made aware of one additional impoundment, Ash Pond A, which is no longer in use. Based upon information provided by Georgia Power personnel, construction of the Ash Pond A dike began in 1965 and upon its completion had a surface area of 0.9 acres. It is understood that this pond was filled to capacity and covered with the placement of a soil cover in June 1966. No other information regarding Ash Pond A has been provided to CHA at this time.

1.4 Previously Identified Safety Issues

For the purposes of the EPA site assessment project and according to federal dam safety guidelines, appurtenant hydraulic structures on dams are also included with dam safety considerations. With this understanding, there have been two previously identified dam safety issues involving the release of CCW at Plant Branch, one of which resulted in release of CCW from the Ash Pond C in the last 10 years. The first of these releases was observed and documented in late 1968 on Ash Pond B. In January 1969 grouting procedures were implemented in an effort to alleviate five recognized areas of leakage from Ash Pond B. The second documented release occurred in December 2000 at Ash Pond C, during which a mechanical failure caused water from Ash Pond C to be discharged through the cooling water tunnel system into Lake Sinclair. These incidents are discussed in more detail in Sections 1.4.1 and 1.4.2.

1.4.1 1969 Release – Ash Pond B

As described in a April 1969 report regarding recent completion of the dike and subsequent inspection of the dikes performance,

> "Upon initial inspection, five zones of leakage were observed on the downstream slope at or near lake level. A cascade located at station 3+20 approximately five feet above the lake level and a large flow at the waterline near station 5+20 exhibited the largest flows and greatest concentration of ash of the five zones. Fine ash leaking through the dike has deposited on adjacent beaches (see pictures in the report dated 12-11-68)."

Additionally, the report states, "From the grouting logs and present performance of the dike, the curtain established along the grout line is considered to be as complete as is practicable. Leakage at stations 4+10, 4+30, and 4+70 was completely stopped; while flows at stations 3+20 and 5+20 were reduced to a slight trickle and a very slight bubble, respectively." The grouting program successfully arrested the leakage and was completed by the end of March 1969.

1.4.2 2000 Release –Ash Pond C

On December 1, 2000, a mechanical failure of a hydraulic appurtenance, in this case an isolation valve caused water from Ash Pond C to be siphoned back and discharged through the cooling water tunnel system into Lake Sinclair. Approximately 35,000 gallons of ash laden water was released during this event. Subsequently, a written letter of notification was submitted to the

Georgia EPD on December 08, 2000. It is clearly understood that this failure did not involve overall embankment stability and did not give reason to question the general safety of the impoundment. A copy of the submission provided to CHA indicated that the plume had dissipated in Lake Sinclair downstream of the 441 bridge, and that additional survey in the area did not reveal adverse environmental effects. Georgia Power also indicated that the valve was repaired to prevent a recurrence.

1.5 Site Geology

The *Geologic Map of Georgia* prepared by S.M. Pickering, Jr. McDowell et al. in 1976 for the Georgia Department of Natural Resources indicates that the Plant Branch facilities lie in Piedmont physiographic province above residual soil derived from crystalline metamorphic bedrock. This basement bedrock comprises biotite granitic gneiss, feldspathic biotite gneiss, and amphibolite-hornblende gneiss.

1.6 Bibliography

Georgia Power has provided CHA with copies of correspondences, reports and plans pertaining to the tasks outlined above. A selected list of these items is provided below. As part of our assessment, information and data from these reports and plans were compared with existing site conditions observed during our site visit.

- Lowe, H. D Existing Ash Pond Dike Grouting – (Final Report), April 24, 1969
- Plant Branch Georgia Power Responses to EPA Request for Information under Section 104(c) of the Comprehensive Environmental Response, Compensation, and Liability Act. 42 U.S.C. 9604(e), March 25, 2009
- Galt, Joel. *Plant Branch Dam Safety Surveillance Quarterly Reports*, Southern Company Services, Inc (various reports from 04/2006 to 11/2009).

- Georgia Department of Natural Resources *Annual Dam Inspection*, various reports from 1992 to 2008
- Georgia Power, *Aerial Photographs for Ponds B, C, D, & E*, dates of photographs unknown.
- Hartsfield, Terri H. *Plant Branch Ash Pond Dike Slope Stability Analysis Report*, Southern Company Services, Inc., November 2009.
- Georgia Power/Southern Company, Plant Branch design documents for Ponds B, C, D, and E.
- Wood, R. D. *'B' Dike Piezometer Installation and Pond Cover Verification - Dam Safety and Surveillance Report*, Southern Company Services, Inc., December 2009.
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- David L. Federer and Associates, *Laboratory Testing – Harlee Stream Plant New Fly Ash Pond Dike* [Ash Pond C], Georgia Power, September, 1969.
- Atlanta Testing and Engineering Company, *Summary Soil Lab Testing – Ash Pond D1 Dike Exploration*, Georgia Power/Southern Company, 1978.
- Georgia Power/Southern Company, *Plant Harlee Branch Surveillance Instrumentation Installation/Location Ash Pond D1*, 1986.

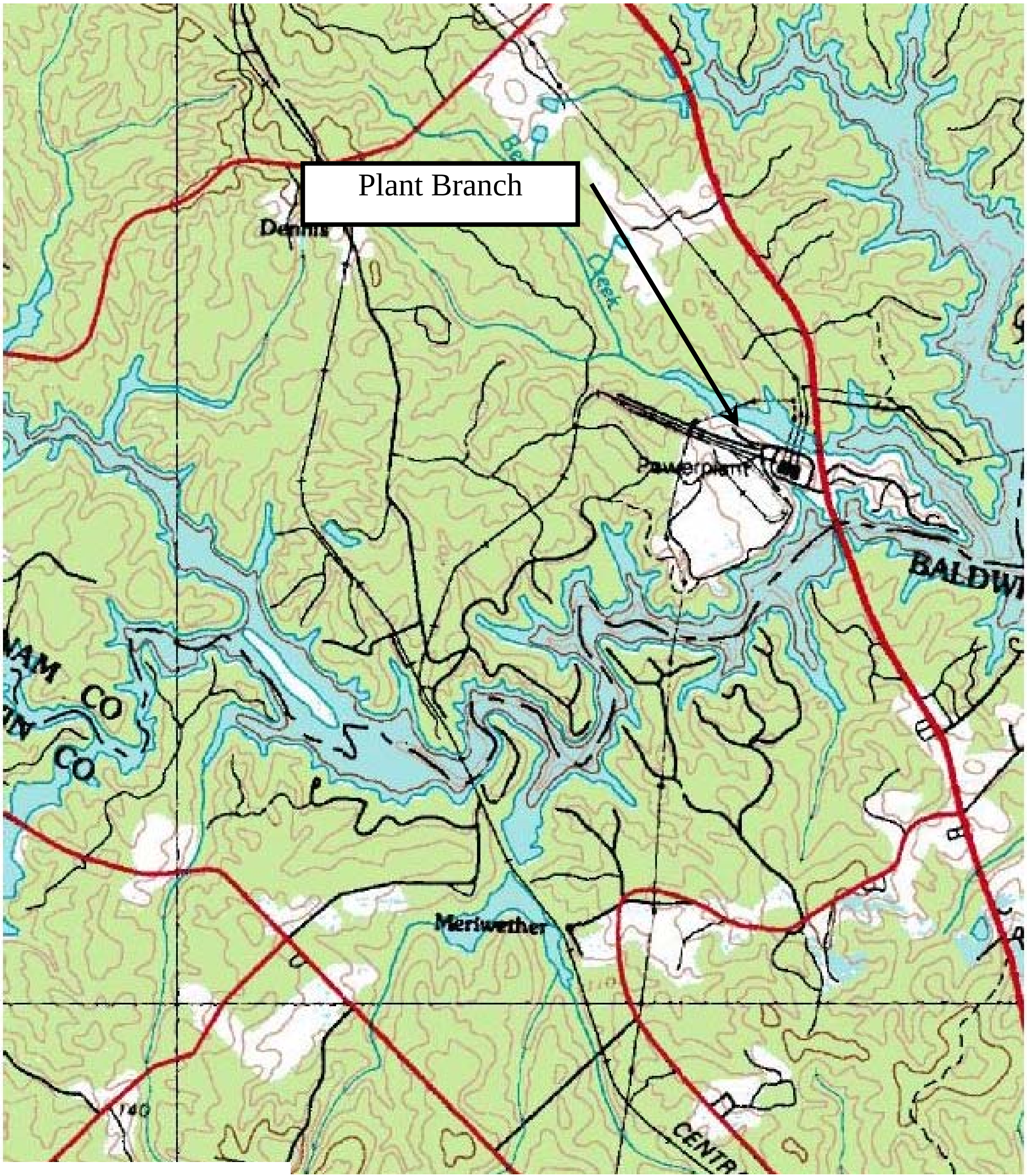

IMAGE DATE: 07/01/1981

N

CHA

Figure 1
Project Location Map

Scale: 1" = 1 mile

Project No.:
20085.2060.1510

Georgia Power
Plant Branch
Milledgeville, GA

Figure 11

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_2-6.DWG Saved: 3/10/2010 12:44:00 PM PLotted: 3/29/2010 1:39:17 PM User: Gray, Timmolyn

IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 17, 2006.

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PHOTO SITE PLAN OVERVIEW

PLANT BRANCH
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PROJECT NO.
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DATE: 03/2010

FIGURE 2A

IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 17, 2006.

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PHOTO SITE PLAN ASH POND B

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FIGURE 2B

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PHOTO SITE PLAN ASH POND C

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FIGURE 2C

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PHOTO SITE PLAN ASH POND D

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FIGURE 2D

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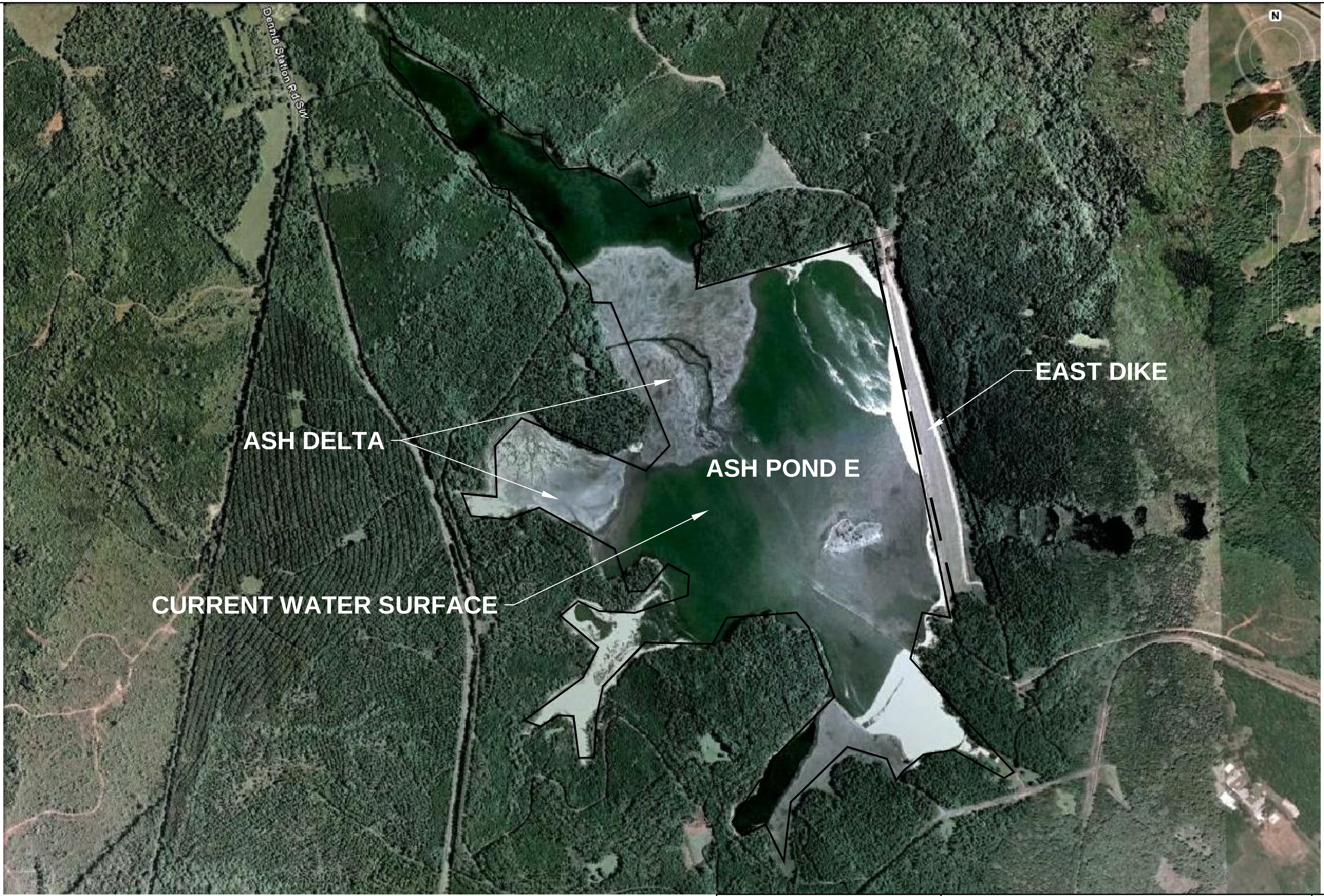

IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 17, 2006.

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PHOTO SITE PLAN ASH POND E

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FIGURE 2E

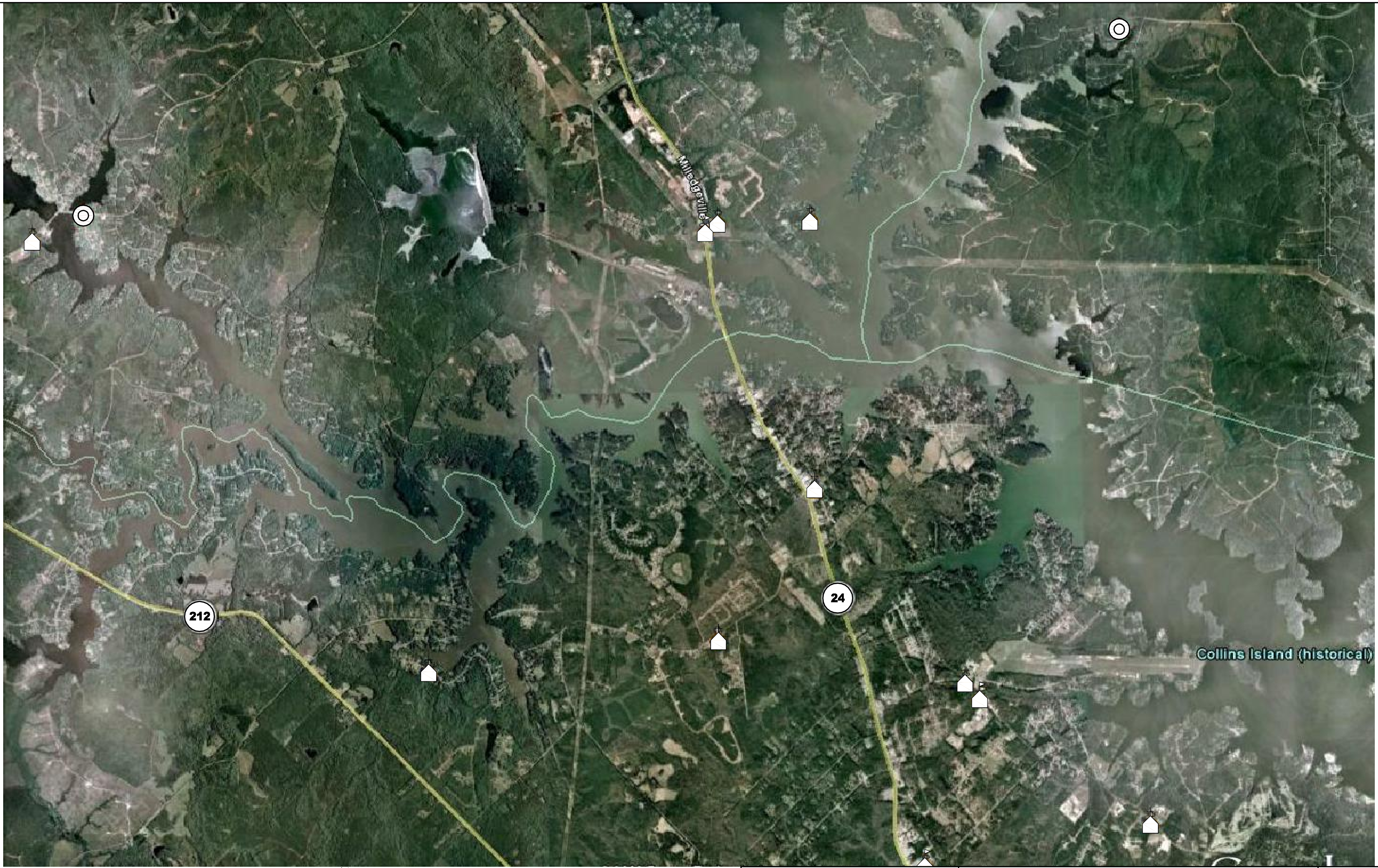

IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED JUNE 17, 2006.

LEGEND

23	STREET, HIGHWAY	⌂	SCHOOL
◎	FIRE DEPARTMENT	⌂	CHURCH

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CRITICAL INFRUSTRUCTURE MAP

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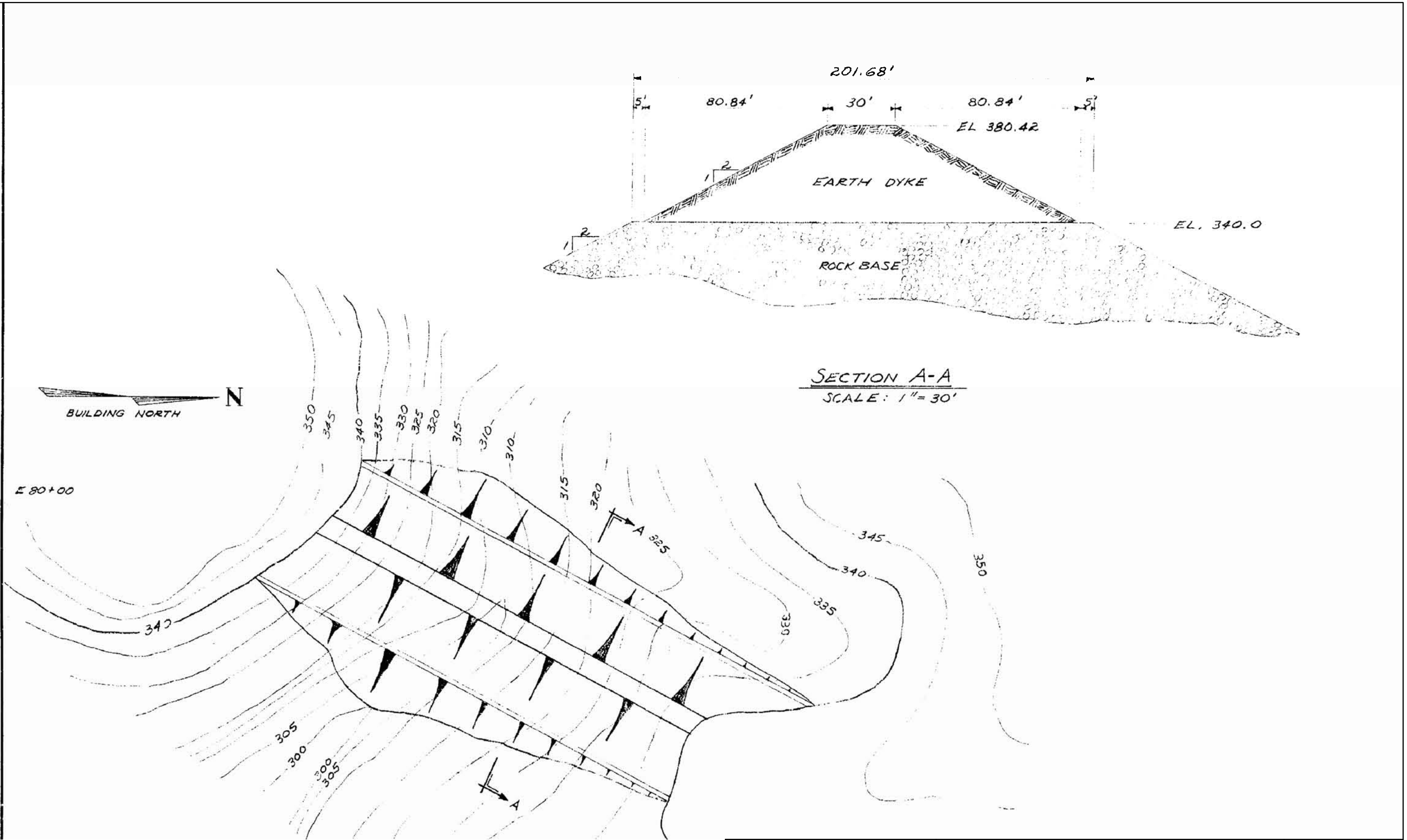
FIGURE 3



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INITIAL POND B DIKE EMBANKMENT

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FIGURE 5A–1	

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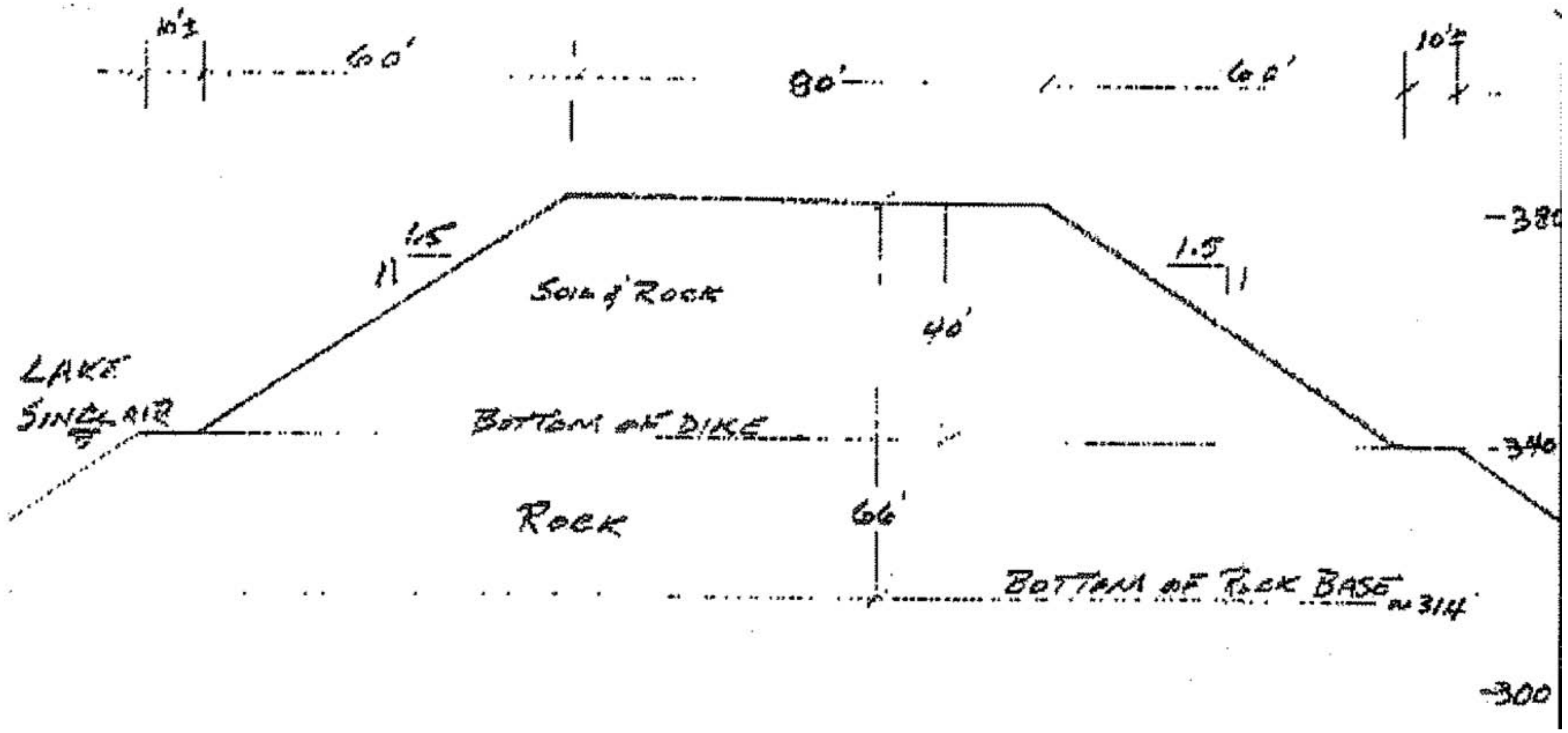

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ASH POND B PRESENT
DIKE CROSS SECTION

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FIGURE 5A-2

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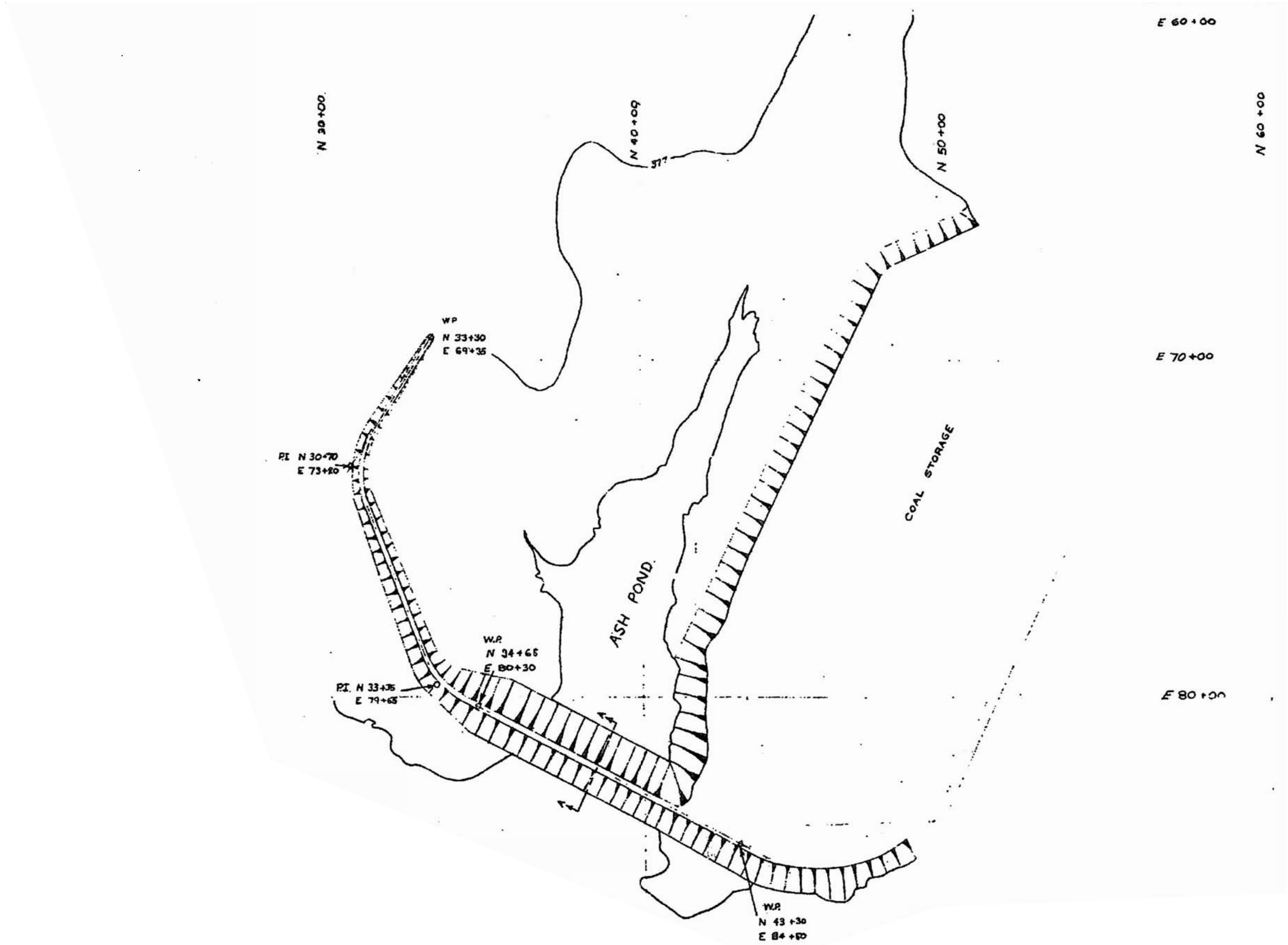

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ASH POND B DIKE PLAN

PLANT BRANCH
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FIGURE 5A-3

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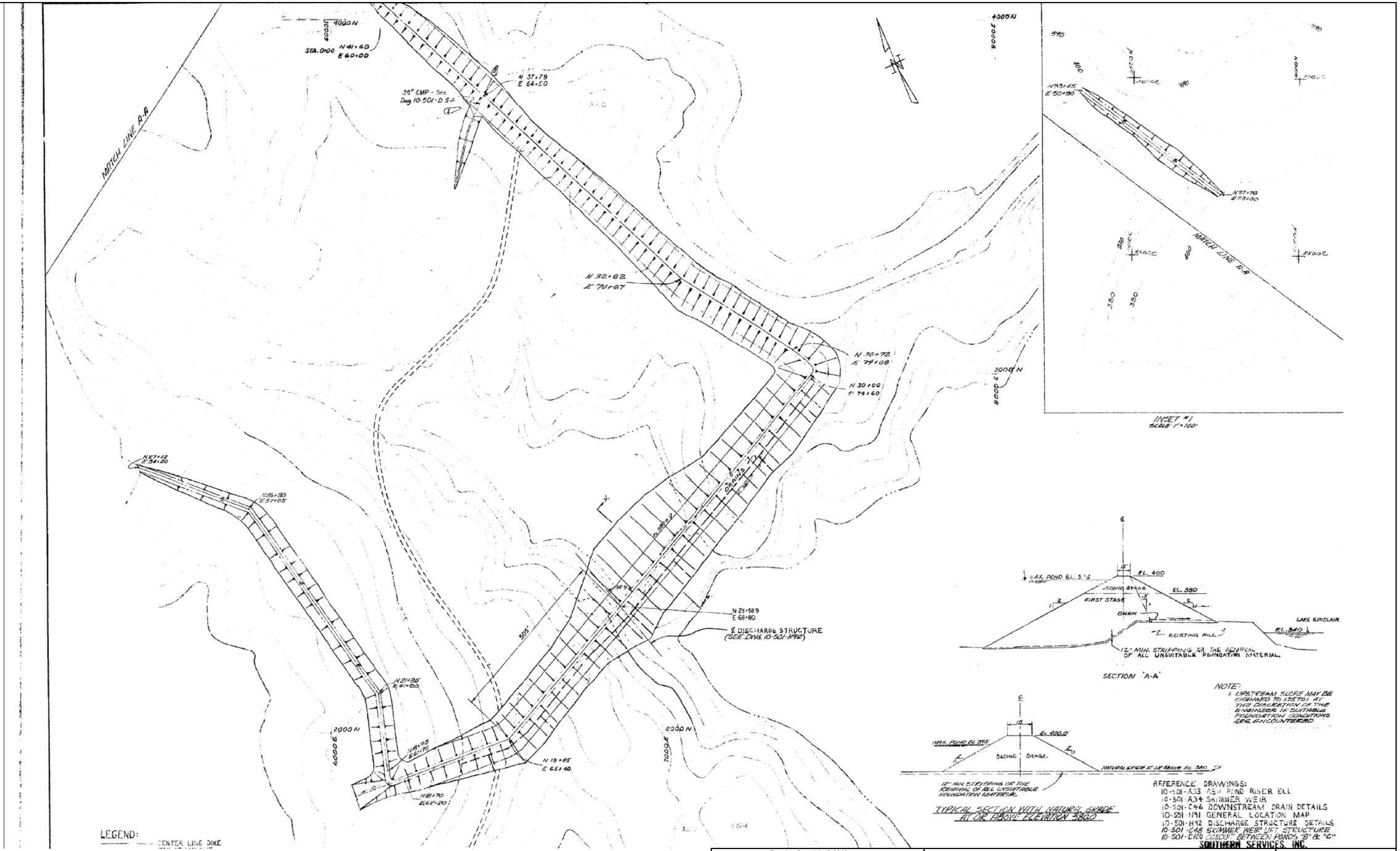

NOTE:
1. UPSTREAM SLOPE MAY BE CHANGED TO 1.75 TO 1 AT THE DISCRETION OF THE ENGINEER IF SUITABLE FOUNDATION CONDITIONS ARE ENCOUNTERED

REFERENCE DRAWINGS:
10-501-A33 ASH POND RISER ELL
10-501-A34 SKIMMER WEIR
10-501-C46 DOWNSTREAM DRAIN DETAILS
10-501-H91 GENERAL LOCATION MAP
10-501-H92 DISCHARGE STRUCTURE DETAILS
10-501-C48 SKIMMER WEIR LIFT STRUCTURE
10-501-C120 CONDUIT BETWEEN PONDS "B" & "C"

SOUTHERN SERVICES, INC.

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ASH POND C DIKE PLAN & CROSS SECTION

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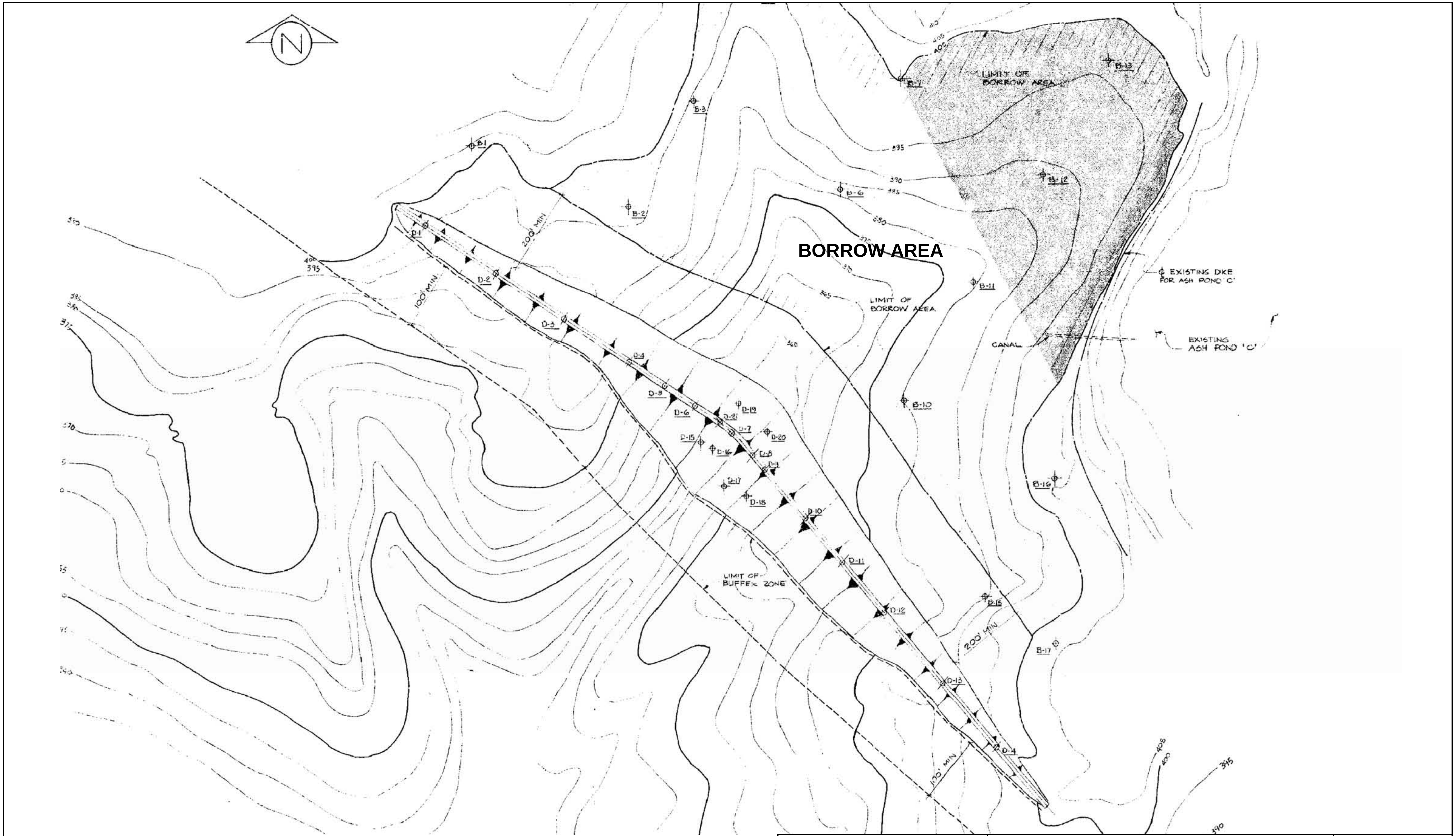
FIGURE 5B



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ASH POND D DIKE PLAN

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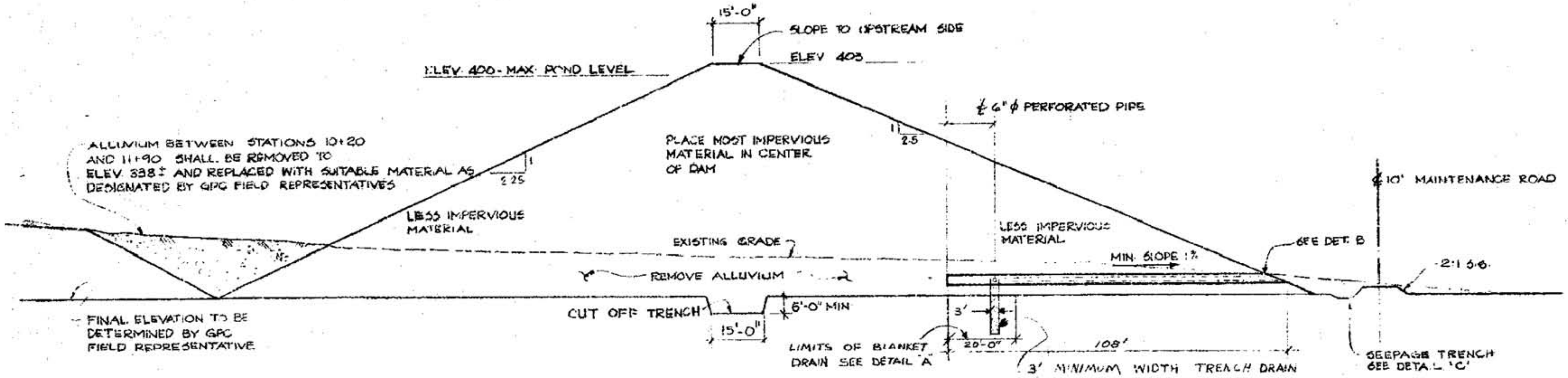
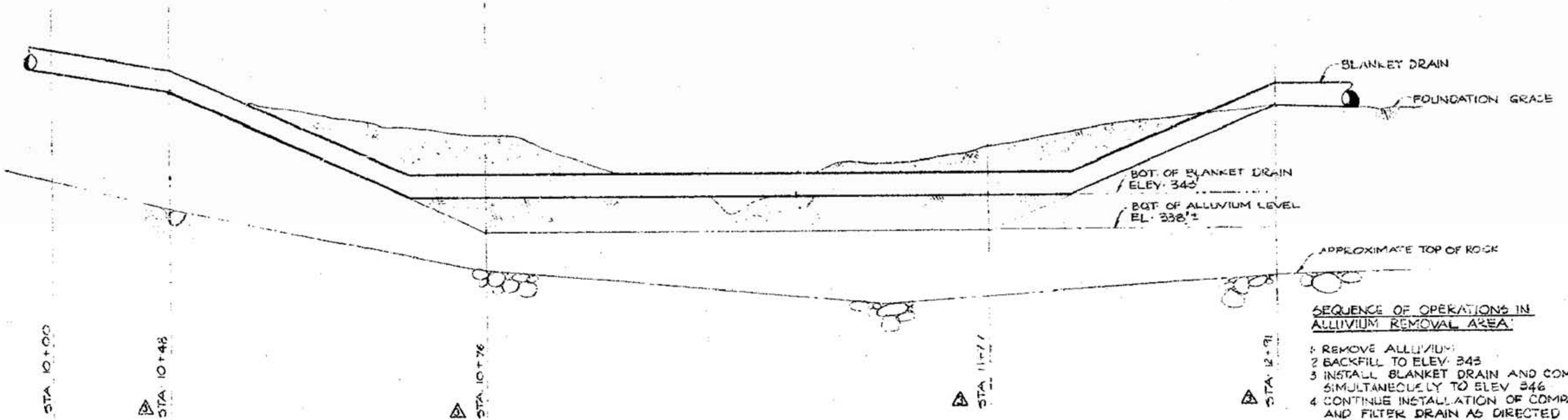
FIGURE 5C



3' MINIMUM WIDTH TRENCH DRAIN SHALL EXTEND FROM STA. 8+50 TO 10+40 AND FROM STA. 12+00 TO 13+00 ONLY. TRENCH DRAIN SHALL BE 10' DEEP FROM 8+50 TO 10+51 AND 9' DEEP FROM STA. 12+75 TO 13+00. △1

BETWEEN STA. 10+51 AND 12+75 THE TRENCH DRAIN EXTENDS DOWN INTO THE PARTIALLY WEATHERED ROCK ZONE UNDERLYING THE DAM. △3

TYPICAL SECTION THRU DAM SHOWING FINGER DRAIN AND REMOVAL OF ALLUVIUM



SEQUENCE OF OPERATIONS IN ALLUVIUM REMOVAL AREA:

1. REMOVE ALLUVIUM
2. BACKFILL TO ELEV. 345
3. INSTALL BLANKET DRAIN AND COMPACTED FILL SIMULTANEOUSLY TO ELEV 346
4. CONTINUE INSTALLATION OF COMPACTED FILL AND FILTER DRAIN AS DIRECTED BY GEORGIA POWER FIELD REPRESENTATIVE.

SECTION ALONG ℄ OF DAM STA. 10+20 TO STA. 11+90 SHOWING REMOVAL OF ALLUVIUM

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ASH POND D DIKE SELECTED SECTIONS

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PROJECT NO. 20085.2060
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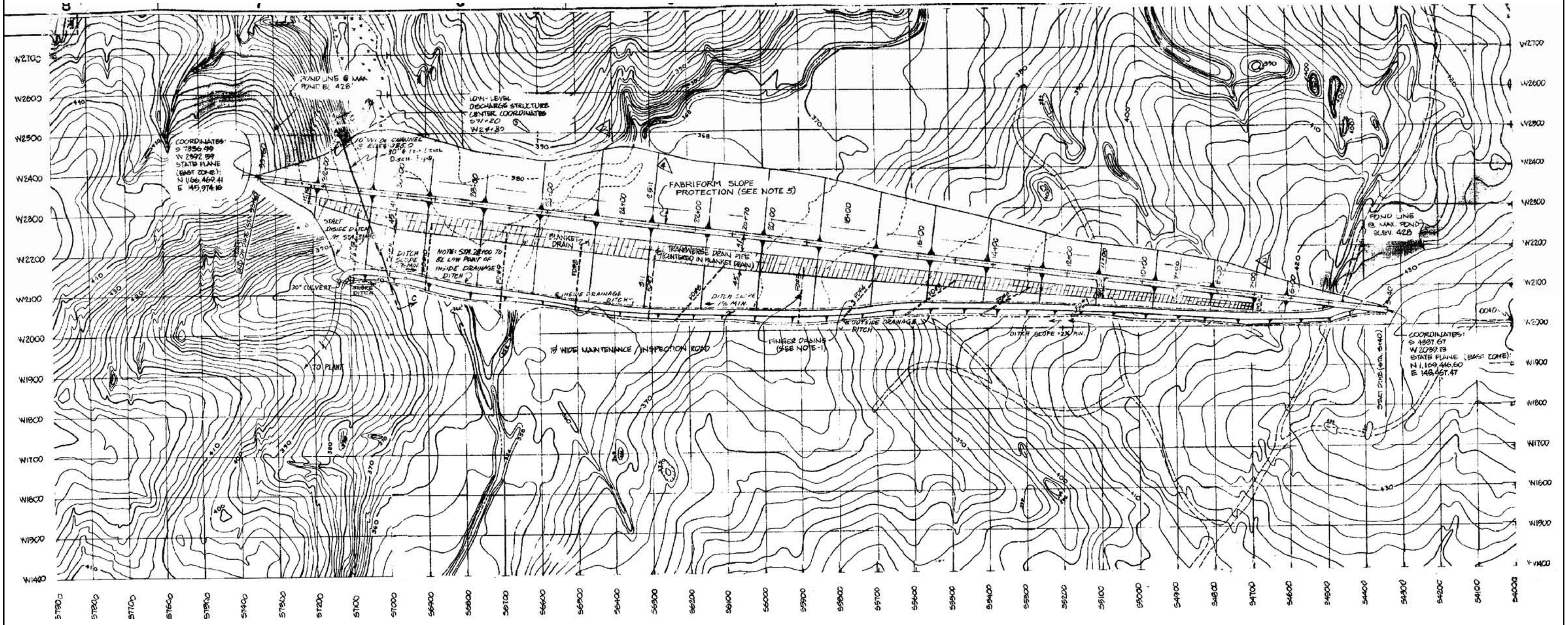
FIGURE 5D



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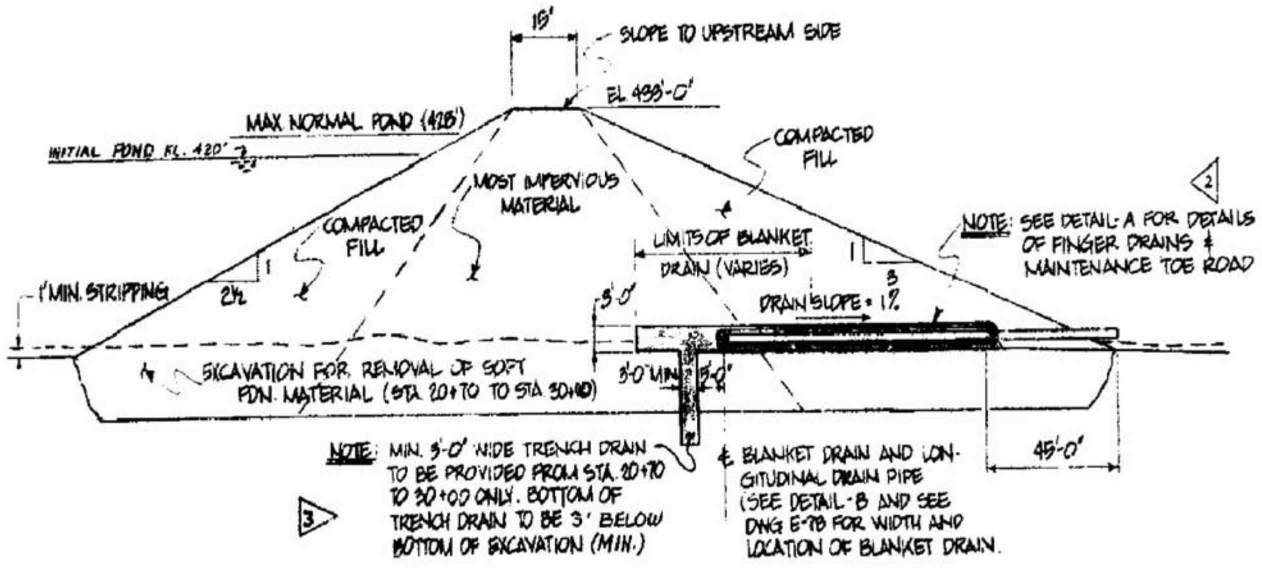
ASH POND E DIKE PLAN

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

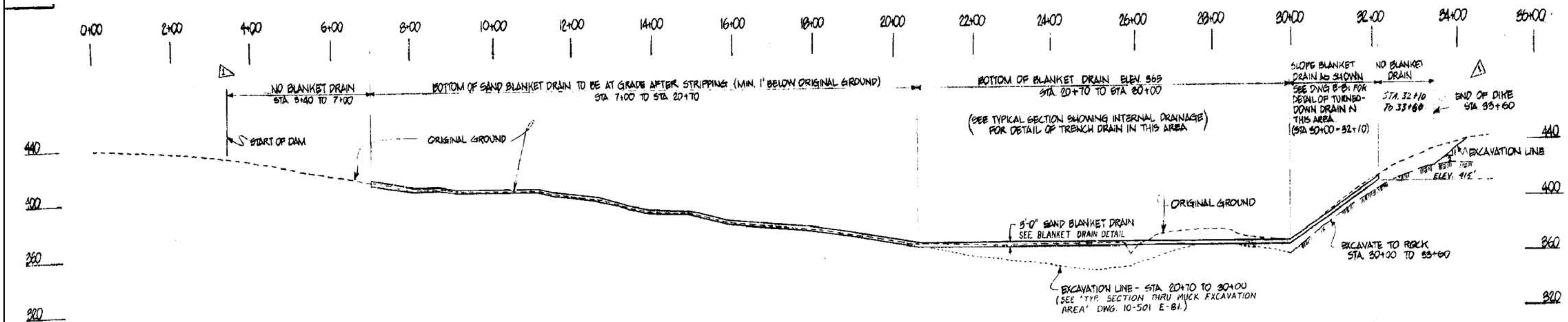
PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 5E



TYPICAL SECTION SHOWING INTERNAL DRAINAGE
NTS



℄ PROFILE ALONG DIKE
WITH BLANKET DRAIN SUPERIMPOSED

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ASH POND E DIKE SECTION AND PROFILE

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 5F

2.0 FIELD ASSESSMENT

2.1 Visual Observations

CHA performed visual observations of all dikes at the Georgia Power Plant Branch Coal Combustion Facility following the general procedures and considerations contained in FEMA's Federal Guidelines for Dam Safety (April 2004), and FERC Part 12 Subpart D to make observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. A Coal Combustion Dam Inspection Checklist Form, prepared by the US Environmental Protection Agency, was completed on-site during the site visit for each ash pond. A copy of the completed form was submitted via email to a Lockheed Martin representative approximately three days following the site visit to Plant Branch. A copy of this completed form is included in Appendix A. A photo log of photos taken during the site visit and Site Photo Location Maps, Figures 4A through 4D, are located at the end of Section 2.

CHA's visual observations were completed on November 23 and 24, 2009. The weather was cloudy and temperatures ranged between 54 to 59 degrees Fahrenheit. Prior to and during the days we made our visual observations, the following approximate rainfall amounts occurred (as reported by Plant Branch personnel).

Table 1 - Approximate Precipitation Prior to Site Visit

Dates of Site Visits – November 23, 2009 & November 24, 2009		
Day	**Date**	**Precipitation (inches)**
Monday	11/16/09	0.00
Tuesday	11/17/09	0.00
Wednesday	11/18/09	0.00
Thursday	11/19/09	0.00
Friday	11/20/09	0.00
Saturday	11/21/09	0.00
Sunday	11/22/09	0.00
Monday	11/23/09	0.67
Tuesday	11/24/09	0.00
Total	**Week Prior to Site Visit (16th-22nd)**	**0.67**
Total	**Month of November (to 11/24/2009)**	**6.22**

It should also be noted that saturated soils were observed throughout the entire Plant Branch facility and assumed to be due to recent rainfall activity.

2.2 Embankments and Crest

As previously described in Section 1.3, the Georgia Power Plant Branch facility utilizes a total of four ash ponds and has one historic ash pond that has been closed. Observations at these ponds and their embankments are described in the following sections.

2.2.1 Ash Pond B

Selected photos of Ash Pond B are included in Photos 65 through 72. Slightly over one-half of the southern area of the original Ash Pond B has been filled with ash, covered with soil, and vegetative cover as shown in Photo 65. This pond is impounded by a dike on the southwest side and natural hills on the remaining sides.

During the site visit, heavy vegetative cover including large trees and large boulders were noted as being present along the downstream edge of the dike and along the toe as shown in Photos 66 through 68. Heavy tree cover was also observed along the east end of the upstream edge of the dike and on top of the filled in area of the pond. Representatives of Georgia Power stated that it was their opinion that due to an “over” constructed dike and the southern portion of the pond being filled with ash and capped, the trees along the edge of the crest would not pose any impact to the stability of the existing dike.

In general, the dike does not show signs of changes in horizontal alignment and the dike did not exhibit obvious signs of distress (i.e. significant sloughing, bulging, or apparent leakage). With exception of the large boulders present along the downstream face of the dike, the embankment is uniform and covered with heavy vegetative cover including trees. The upstream edge of the pond is difficult to differentiate from the filled area of the pond on the south end due to uniform grass cover. An area approximately 500 feet wide by 500 feet long (square), at the southwest end of the pond is currently covered with only grass cover. The remaining portion of Ash Pond B that is filled with ash is covered with both grass and trees.

The north end of Ash Pond B remains in use for disposing and processing sluiced bottom ash (Photo 72). Based upon aerial photo mapping shown in Figure 2B and available site plans, this open pond area at the north end is roughly 1,100 feet from the original impounding dike structure and roughly 900 feet from the now abandoned outlet structure at its closest point. Field data obtained in the filled and capped portion of the pond adjacent to the dike, and submitted after the site assessment was completed, indicated a static groundwater level in excess of 10 feet below the surface. Further discussion of this data and related instrumentation appears in Section 2.4.1 of this document. Based upon this information and the grading of the capped pond area, Georgia Power personnel concluded that the Ash Pond B dike is no longer a liquid waste impounding structure. While one may generally concur with this assertion, the Georgia Department of Natural Resources Environmental Protection Division (EPD) Safe Dams Program and/or the USEPA should be consulted to determine if the dike can be officially declassified as an impounding structure and removed from any such inventory.

2.2.2 Ash Pond C

Ash Pond C is impounded by three main dikes (west, south, and east dikes) and is currently used as the third stage of the fly ash settlement and water recycling process at Plant Branch. Much of Ash Pond C has silted in with ash over the years such that only the south dike actively impounds open water along its entire length as shown in Figure 2C. Based upon aerial photo mapping and available site plans, roughly 900 feet of the west dike has been silted in as measured from its northern extent, leaving about 330 feet of its southern reach to impound open water. There is roughly 700 feet of the east dike actively impounding open water and about 900 feet that has been silted in from the northern end. Selected photos are included in Photos 31 through 64.

In general, the west, south, and east dikes do not show signs of changes in horizontal alignment and the dikes did not exhibit obvious signs of distress (i.e. significant sloughing, bulging, or apparent leakage). According to Georgia Power personnel, the crest is re-graded as needed to fill in tire ruts thereby reducing ponding of storm water on the crest. The embankments are generally uniform and covered with appropriate grass cover which was freshly mowed prior to our site visit. Exceptions on the west and south dikes are described below.

2.2.2.1 Ash Pond C West Dike

During the site reconnaissance of the west dike, a historic discharge system was observed at the south end (Photos 31 and 32). This was originally constructed as the primary outfall via a gravity feed to a treatment facility before the water was recycled or discharged to the lake. It was later replaced with two emergency overflow pipes at this location to provide an emergency outlet should the need arise. This was done around the same time the siphon system conveying water to the plant was installed. Georgia Power indicated that the historic discharge system facility has been decommissioned; however the plant maintains an NPDES discharge permit at this location.

Two areas located along the west dike near the south central portion of the dike were observed to have pooled water and saturated soil (Photo 34). It was not readily discernable if these areas were due to poor drainage from recent rains or seepage. Previous weekly and quarterly inspections by Plant Branch and Southern Company Generation Hydro Services personnel, respectively, did not note seepage areas in these locations.

Several apparent areas of sparse vegetation were noted along the central and northern exterior portion of the west dike (Photo 35). These areas appeared to be caused by mowers slipping down the exterior face of the dike. Additionally, a few rodent burrows were observed along the length of the dike (Photo 37). After noting these burrow locations during the site visit, Georgia Power/Southern Company personnel were observed actively filling these areas.

2.2.2.2 Ash Pond C South Dike

The downstream face of the south dike has been "re-faced" with rip-rap as shown in Photos 55, 57, and 60. It is understood that this has been an on-going process over the at least the past ten years in an effort to alleviate past minor slope sloughing and was implemented in an effort to alleviate future slope scarping or sloughing.

Photo 42 shows beaching erosion as evidenced in the scarping caused by pond water "lapping" along the upstream side of the south dike. The rock rip-rap facing along the edge did not appear to be properly maintained and was scattered. Several stormwater drains were observed on the dike crest which appeared to need maintenance.

Additionally, upon reviewing the south dike from its toe, several "wet" areas approximately three feet in diameter were observed along the east end of the toe as shown in Photo 56. Examination of the "wet" areas indicated that a portion of the drainage system installed below the downstream slope may have been buried beneath recent expansion of the toe along the south dike. As a follow-up to the EPA site assessment visit, Plant Branch and Southern Company further investigated these areas and concluded that,

> "The originally installed foundation finger drains are not the source of the wet areas on the downstream slope of the berm. At areas #1 and #2, excavations indicated an apparent blocked/undrained existing filter/drain was the source of the flowing water on the downstream slope of the berm. At areas #3 and #4, and at two other observed wet areas nearby, it was noted that the most likely cause of the wetness was surface runoff from the top of the berm".

As part of the continue investigation, new drains comprising slotted and socked 4-inch diameter PVC pipe with sand bedding, sand cover, and filter fabric were installed in the locations of the observed wet areas to remedy the situation.

Seepage drains SD1-SD3 were observed to produce clear water as shown in Photos 62 and 63. This water was released directly onto the native soils north of Lake Sinclair

2.2.2.3 Ash Pond C East Dike

“Re-facing” was being performed in a section of the downstream face of the south portion of the east dike as shown in Photo 46. This area is located south of the “recycle water” station, located near the center of the dike. The re-facing of the section on the east dike entailed the same procedures used along the south dike exterior facing. Tall grass was observed along the upstream side of the dike as shown in Photo 49.

Saturated soil and standing water was noted to the north of the “recycle water” station as shown in Photo 50. Georgia Power personnel explained that the standing water was due to improper drainage in this area and that attempts had been made to place small rock over this area; however, due to saturated soils the imported rock was pushed beneath the soil surface by heavy machinery. Attempts to remediate this area were halted until the soil dried enough for future work to proceed.

The visual review of the east dike revealed an area with an irregular grading along the north upstream face of the dike (Photo 53). This surficial irregularity appeared to be created from mowing performed along consistent lines. Additionally, there were a few rodent burrows located along the north portion of the dike’s upstream edge. These rodent burrows were subsequently filled during the EPA site assessment period.

Inconsistencies in the dike’s downstream face were also noted along the south end as shown in Photo 54. These variations in the face of the slope appeared to be either the remnants or initial formation of erosion rills beneath the vegetation currently present on the slope.

2.2.3 Ash Pond D

The visual review of the west dike at Ash Pond D, also called Ash Pond D-1 in documents prepared by others, did not reveal signs of changes in horizontal alignment and the dike did not exhibit obvious signs of distress (i.e. significant sloughing, bulging, or apparent leakage). Selected photos of Ash Pond D are included in Photos 17 through 30.

Upon inspection of the dike from the crest, a widening of the dike was noted along the northern end as shown in Photo 22. Georgia Power personnel indicated that this is due to the buildup of fly ash along the interior edge of the dike which has slowly filled the pond as shown in Figure 2D. Based upon aerial photo mapping and available site plans, roughly 1,400 feet of the Pond D dike structure has silted in and no longer actively impounds water as measured from the northern end of the dike. Only about 600 feet of the dike now retains open water and this section of the dike has developed a stand of aquatic vegetation at the pond-dike interface over time. Additionally, several rodent borrows (Photo 19) were located along the upstream edge of the dike. These rodent burrows were subsequently filled during the EPA site assessment period.

The drainage system for Ash Pond D is comprised of a concrete lined drainage channel along the dike's toe receiving water from the seepage drains at the base of the dike as shown in Photos 23 and 29. Georgia Power personnel indicated that a section of the concrete lined drainage channel located along the north central portion of the dike was inadvertently removed (Photo 26). It was explained by Georgia Power personnel that previous remediation in this area had damaged the concrete lined drainage channel and it had not been restored to its original form. They explained that they maintained this area as necessary to allow for proper drainage. The seepage drains for Ash Pond D were observed to produce clear water. Several of the drains did not appear to discharge water. Information provided by Georgia Power personnel indicated that this was due to the existing grading and plumbing locations for the seepage drainage system.

Along the central portion of the downstream face of the dike, an area roughly 10 feet wide by 20 feet long was observed to be covered with rock (Photo 25). Based upon information provided by Georgia Power personnel, it is understood that the existing rock was installed in an effort to remedy seepage at this location. West of this area and across the existing access drive was an area of rock approximately 25 feet in diameter covered with 2 to 4 inch gravel (Photo 27). It was indicated by Georgia Power personnel that this area was known to be a soft area and had been covered with rock as a means of remediation.

2.2.4 Ash Pond E

The visual review of the dike at Ash Pond E did not reveal signs of changes in horizontal alignment and the dike did not exhibit obvious signs of distress (i.e. significant sloughing, bulging, or apparent leakage). Selected photos of Ash Pond E are included in Photos 1 through 16.

Three “soft” areas of saturated soils were observed east of the lower concrete lined drainage channel. These areas have been previously recognized by members of Georgia Power and they have been delineated using wooden stakes (Photos 5 and 10). These areas are regularly reviewed for any changes during inspections. As indicated by Georgia Power personnel, these areas have remained as originally recognized over at least the last nine years, based upon specific references to these areas in quarterly reports dating to the latter part of 2000. It is also possible that some of these areas may actually be older, based upon non specific references to downstream seeps dating back to the time the impoundment was initially filled in 1985.

The finger drains observed along the toe of the dike appeared to produce clear water and discharged directly in the concrete lined drainage channel as shown in Photo 6. The channel also collects surface run-off.

The wave wall installed along the upstream edge of the dike's crest appeared to be slightly unaligned. Based upon information provided by members of Georgia Power, the wave wall was constructed exactly as it remains today due to the upstream fabriform being slightly out of line. The engineered design required that the footing for the wave wall be installed directly adjacent to the upstream fabriform, which had been installed without proper alignment.

A small area of surficial sloughing was noted on the downstream slope of the access road along the south central portion of the dike, as shown in Photo 8. The area determined to be sloughing appeared to be due to recent rainfall activity.

A few areas along the downstream face and crest of the dike were observed to have sparse vegetation. The majority of these areas appeared to be due to slippage along the face of the dike by mowers as shown in Photos 13 and 14. Several areas were also noted as having a variation in the existing grass on the dike face. Based upon information provided by Georgia Power personnel, these areas were seeded with "rye grass" to provide vegetative cover during the winter months, which would be reseeded with the appropriate grass cover in the spring. With this exception, the remainder of the grass cover appeared to be uniform. Some very minor rutting or tracking was also observed along the face of the dike which also appeared to be due to current mowing practices.

2.3 Outlet Control Structure and Discharge Channel

2.3.1 Normal Operating Pool Outlet Structures

The water at Plant Branch loops in a semi-closed system as described below:

- Fly ash is pumped to Ash Pond E.
- Water is decanted from Ash Pond E and to Ash Pond D. The outlet structure from Ash Pond E is a rectangular reinforced concrete riser structure configured to operate with

stop logs to regulate the pond level (Photo 15). The riser is connected to a buried 36-inch-diameter pipe.

- Water decants from Ash Pond D and flows through an open concrete lined channel (Photo 40) into Ash Pond C. The channel is located along the southeast side of Ash Pond D.
- Water is siphoned from Ash Pond C to the plant (Photos 46, 47, and 48) under normal operations. In cases when Ash Pond C has very high water levels, water can be discharged into Pond B through a manually operated valve in the piping system.
- Bottom ash is sluiced into Ash Pond B.
- Water from Ash Pond C is conveyed to the plant via a vacuum siphon line. It is manually controlled with a valve in the generating facility.

Based upon Drawing E126 prepared by Southern Company in 1995 regarding the Ash Pond C decant structure, we understand that the 42-inch-diameter outlet pipe extending below the dike was filled with concrete and abandoned in place. It is unclear if the drop inlet riser was left in place.

2.3.2 Emergency Outlet Structures

The emergency overflow for Ash Pond E is an earthen formed channel (Photo 16) located along the south east portion of the pond. Vegetation present along the spillway had not been recently cut and appeared to be uniform.

A historic emergency discharge system was observed at the south end of the Ash Pond C west dike. However, this facility has been decommissioned and is no longer in use per Georgia Power personnel.

The emergency spillway for Ash Pond B is an earthen spillway (Photo 70) located along the western boundary of the pond. It primarily functions to collect stormwater runoff from the closed capped portion of Ash Pond B and surrounding terrain. The channel drains directly into a coated corrugated metal pipe located at the southwest corner of the pond that conveys collected water beneath the embankment crest and beyond the dam. From that point water flows across the terrain to the south and discharges directly into Lake Sinclair.

2.4 Monitoring Instrumentation

Monitoring instrumentation on the dikes at Plant Branch includes seepage drains, weirs, piezometers, and deformation monuments. CHA understands that the weirs and piezometers are read monthly by plant personnel and Southern Company reviews the instrumentation data on a monthly basis. Deformation monuments on Ash Pond E are surveyed and reviewed on a semi-annual basis. The following sections present the instrumentation data collected at Ponds B, C, D, and E. CHA was provided with information regarding instrumentation at Ash Pond B installed after the site assessment visit.

2.4.1 Ash Pond B

Pursuant to the site assessment of the Ash Pond B, Southern Company/Georgia Power personnel installed six piezometers, BP-1 through BP-6, to determine soil cover thicknesses over the pond area and ascertain the phreatic surface in the ash and dike. Piezometers BP-1 through BP-4 were installed in what is now the dried, capped and vegetated area of Ash Pond B, while piezometers BP-5 and BP-6 were installed through the old dike area. Soil cover thickness above the old ash surface ranged from 0.6 feet to three feet at the piezometer locations. At the time the piezometers were installed, the measured water levels varied from approximately 17 feet deep in the pond area roughly 400 feet from the dike (BP-4) to approximately 42 feet deep at the dike crest (BP-5). Figure 6A-1 shows the location of instrumentation at Ash Pond B. Periodic water level readings were subsequently taken and are summarized in Figure 6A-2.

2.4.2 Ash Pond C

Instrumentation at Ash Pond C includes six piezometers installed along the dikes and three seepage weirs at the approximate locations shown on Figure 6B. Three piezometers (PZ1 through PZ3) are installed near the center of the south dike and three piezometers (PZ4 through PZ6) are installed near the center of the west dike. Figure 6C shows a plot of Ash Pond C piezometer levels and Figure 6D shows a plot of Ash Pond C seepage weir flow rates from January 1998 through October 2009.

2.4.3 Ash Pond D

There are a total of 16 piezometers installed at Ash Pond D at the approximate locations shown on Figure 7A. Eight piezometers (A1 through G1, and G1A) are located at the toe, five piezometers (H1 through L1) are located on the dike crest, and two piezometers (M1 and N1) are located downstream of the dike. The S1 and SW2 piezometers are located halfway up the slope. Information for Piezometer S2 is provided in the plots, and its location is shown as SW2 on the location plan provided. Figures 7B and 7C show plots of the piezometer levels from January 1998 through October 2009.

The Ash Pond D dike is also monitored by four seepage drains. Figure 7D shows a plot of the flow rates at two of the drains, SD2 and SD3, from January 1998 through October 2009.

2.4.4 Ash Pond E

Nineteen piezometers have been installed at Ash Pond E east dike at the approximate locations shown on Figure 8A. Eight piezometers (PZ1 through PZ8) are located within the dike structure primarily near the center and southern portion of the dike. Eleven piezometers (PZ9 through PZ 19) are located adjacent and east of toe. Figures 8B and 8C show plots of the piezometer levels at Ash Pond E from January 1998 through October 2009.

Figure 8A also shows the location of seven deformation and settlement monuments (SM1 through SM7). Data provided for the instruments, indicates that the maximum settlement along the centerline of the dam appears to be less than approximately 2 inches since periodic monitoring began in 1994. A graphical presentation of this settlement data showing the general trend is depicted in Figure 8D.

Figure 8E shows the location of 12 finger drains (FG1 through FG11, and FG9A) and 10 relief wells (W1 through W10). Flow rate information at the finger drains is provided in Figures 8F and 8G. Flow rate information at the relief wells is provided in Figures 8H and 8I.

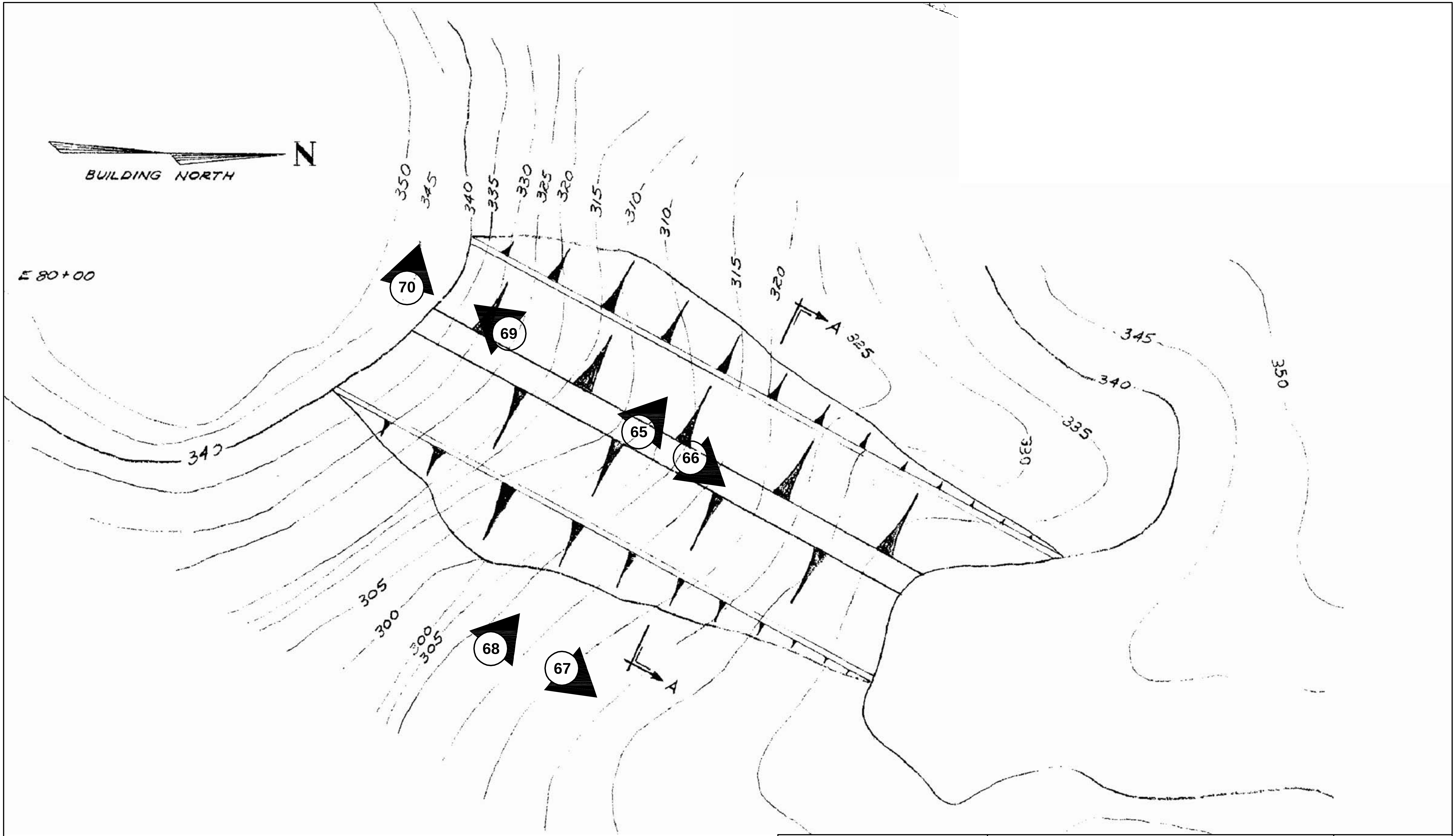

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PHOTO LOCATION PLAN – ASH POND B

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DATE: 12/2009

FIGURE 4A

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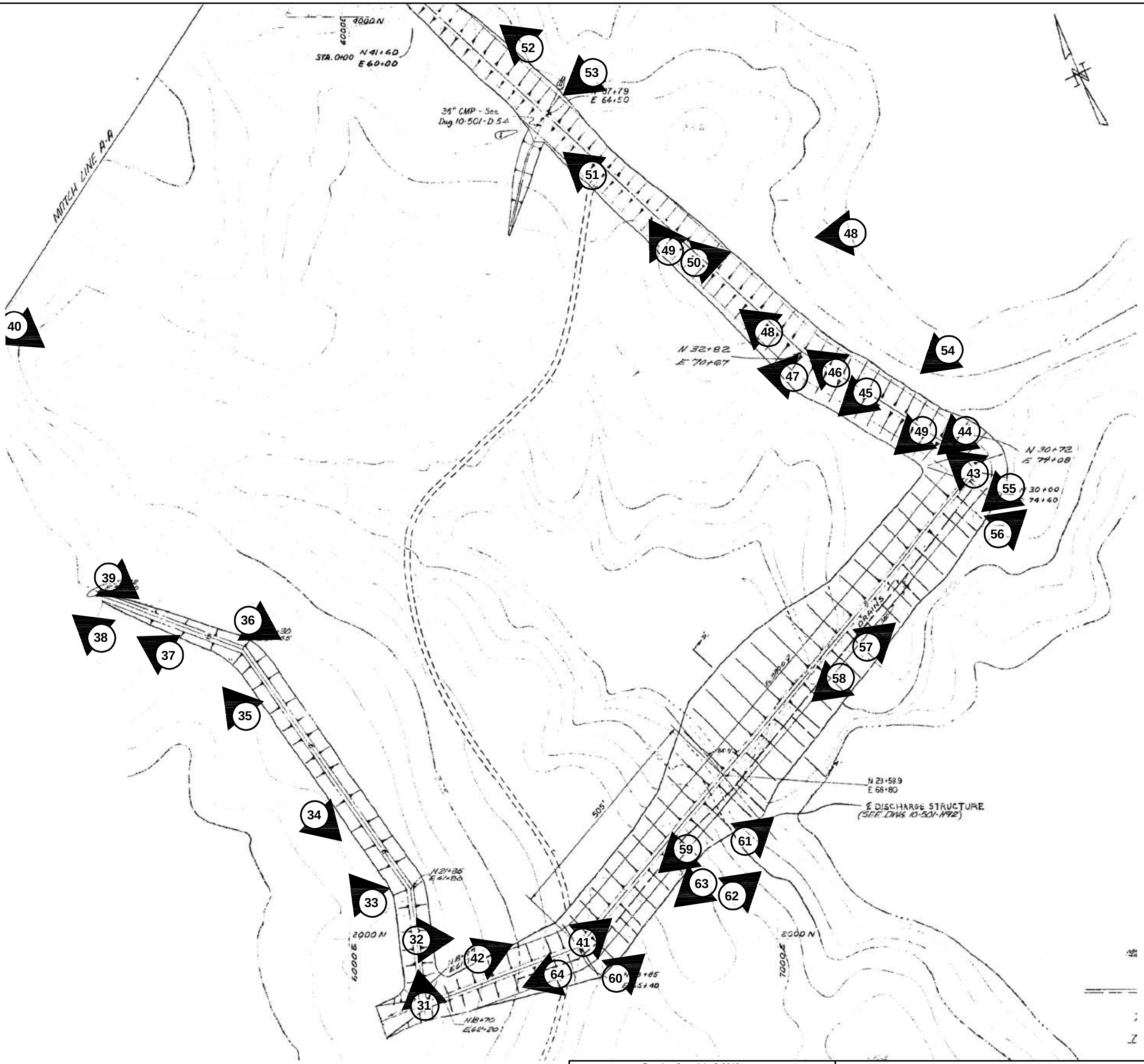

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PHOTO LOCATION – ASH POND C

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DATE: 03/2010

FIGURE 4B

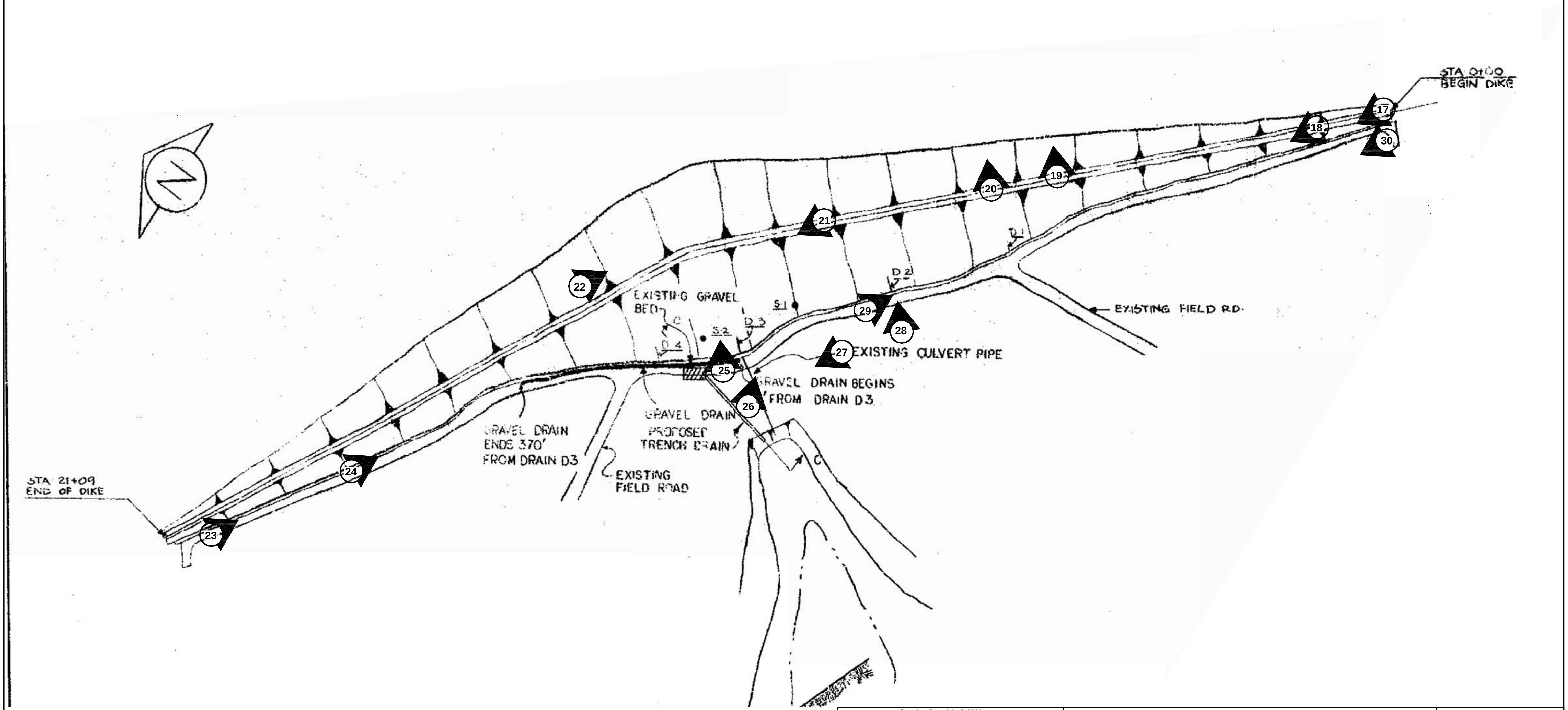

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PHOTO LOCATION PLAN – ASH POND D

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FIGURE 4C

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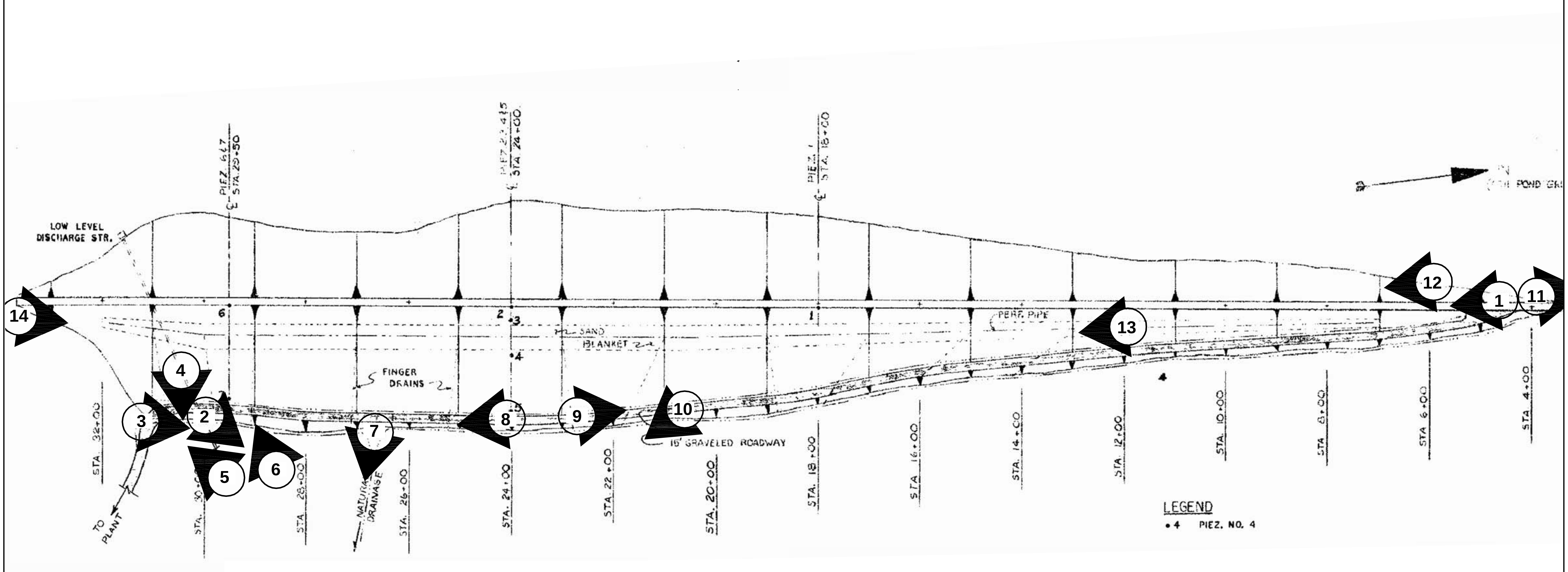

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PHOTO LOCATION PLAN – ASH POND E

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20085.2060

DATE: 03/2010

FIGURE 4D

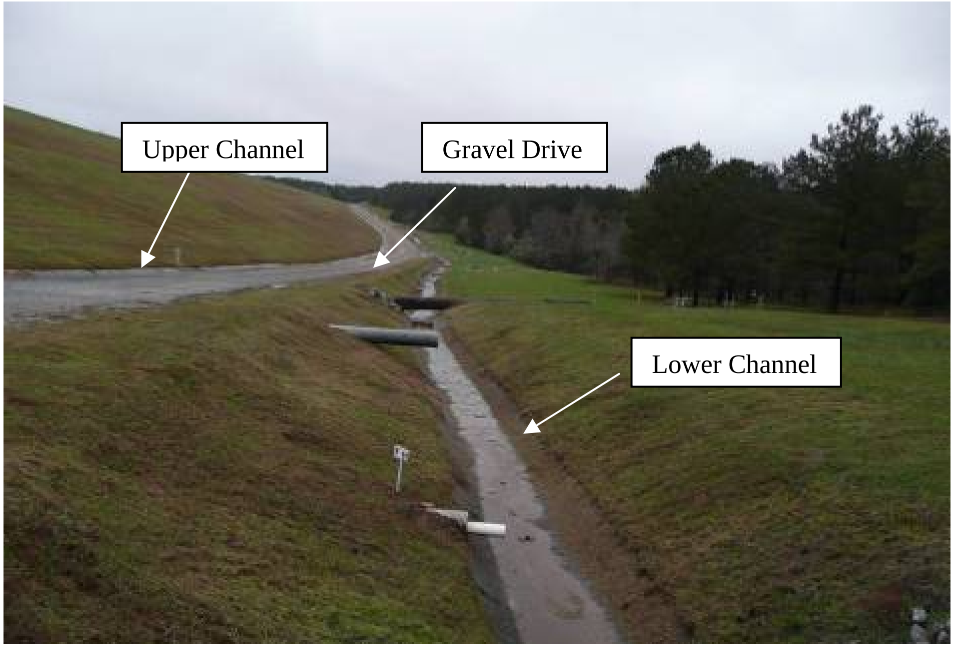
1

Northern end of Ash Pond E dike crest, facing south.

2

Ash Pond E abandoned overflow drain located along southern portion of the dike.
The drain pipe is constructed of welded steel.

3



Ash Pond E, south dike toe, facing north. Drainage system shown.
Upper and lower drainage channels are constructed of a concrete lined channel.

4

Corrugated metal drain pipe located north of Ash Pond E finger drain #11.
Light can be seen at the western most end of the drain pipe, indicating a clear drainage channel from upper channel drain to lower channel drain.

5

Ash Pond E, “soft spot” located south of emergency overflow drain (1 of 3 observed near Ash Pond E). This area has been monitored for nine years by Georgia Power with no additional expansion observed. Perimeter stakes have been placed to aid in monitoring.

6

Ash Pond E finger drain #10. Drainage from finger drains observed to be clear.

7

Ash Pond E, receiving stream for drainage from the blanket drain system.

8

Ash Pond E, sloughing observed along west edge concrete
line channel at the base of the toe, central portion of the dike.

9

Ash Pond E, concrete lined channel drain at the base of the dike (upper channel).

10

Ash Pond E, 3rd observed "soft spot" located east of finger drain #5. Perimeter stakes installed for all soft spots in effort to monitor expansion. No observed expansion for any of the three soft spots in at least nine years, as indicated by Georgia Power.

11

Ash Pond E, north end of dike, facing north.

12

Ash Pond E, north end of dike, facing south.
Shown above, wave wall and rip-rap placement along upstream edge of pond.

13

Ash Pond E, mid-height of dike, northern end of dam facing south. Mower-rutting observed throughout portions of the dike. Rye grass patching observed and indicated to be seasonal grass cover in effort to minimize sparse vegetation.

14

Ash Pond E, south end of dike, facing north.

15

Ash Pond E decant spillway structure.

16

Ash Pond E emergency spillway.

17

Ash Pond D, south edge of dike facing north. Concrete lined drainage channel shown frame left.

18

Ash Pond D, south end of dike facing north. Upstream slope and vegetation in the pond shown frame right.

19

Ash Pond D, animal burrow located along central portion of the dike along the interior edge.
One of several found throughout the length of the dike.

20

Ash Pond D, central portion of the dike facing east.
Interior edge of the dike (pond side).

21

Ash Pond D, central portion facing north east.

22

Ash Pond D, north edge of dike facing south east. Note widened crest of dike.

23

Ash Pond D, north end of dike at edge of toe facing southeast
showing concrete lined drainage channel along toe of dike.

24

Ash Pond D, south central portion of dike facing south east at edge of toe.
Dike seepage remediation shown by arrow.

25

Ash Pond D, central portion of dike at edge of toe. Seepage remediation area shown. Georgia Power personnel indicated that this area was previously remediated and the concrete lined channel was inadvertently razed during remediation

26

Ash Pond D finger drain D-3. .

27

Ash Pond D, central portion of dike, west of toe facing north west.
"Soft area" covered with rock indicated by arrow.

28

Ash Pond D, central portion of dike at edge of toe, facing east into the dike.
Note dike variation in slope elevation possibly due to scarping or sloughing due to mowing patterns.

29

Ash Pond D, central portion of dike along toe facing south east.
Concrete lined channel drain along toe and finger drains shown frame left.

30

Ash Pond D, south end along toe of dike, facing northwest.

31

Southwest edge of Ash Pond C along west dike crest, facing north. Historic discharge facility shown frame right is no longer in use per Georgia Power personnel.

32

Ash Pond C water level indicated by the gauge at the historic discharge facility (395.0').

33

Ash Pond C emergency overflow located on southern portion
of west dike north of historic discharge facility.

34

Central portion of Ash Pond C west dike toe facing south.
One of two "soft spots" indicated by the arrow.

35

Sparse grass cover on north central portion of Ash Pond C west dike toe, facing north.

36

Ash Pond C, upstream dike edge shown at north portion of the west dike, facing south.

37

Ash Pond C, north portion of west dike, rodent burrow observed on upstream side of dike.

38

Ash Pond C, downstream edge of west dike at north end of dike, facing north.

39

Ash Pond C, north end of west dike interior, facing south. Interior edge of dike shown frame left with vegetation present. Exterior edge of dike shown frame right with heavy vegetative cover present past dike toe.

40

Overflow into Ash Pond C from atop the bridge facing southeast.

41

Ash Pond C, west end of south dike facing east.

42

Upstream side of Ash Pond C west end of south dike facing east. Crest run-off drain shown.

43

Ash Pond C, south end of east dike facing north.

44

Ash Pond C, south end of east dike facing west. Southeast corner of Ash Pond C shown.

45

Ash Pond C, south end of east dike. Historic drain shown.

46

Ash Pond C, south central portion of east dike.
Downstream dike re-facing with rip-rap under construction.

47

South central portion of Ash Pond C east dike, upstream slope shown with rip-rap.
Re-cycle water system intake shown frame right.

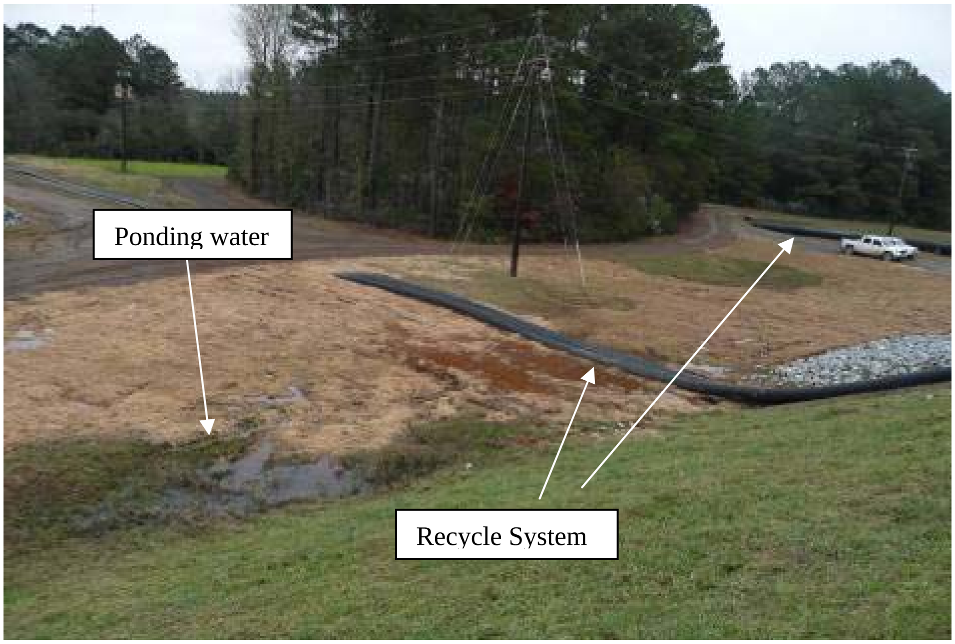
48

Ash Pond C, south central portion of east dike.
Recycle water system shown. This system discharges recycle water to the plant.

49

Central portion of Ash Pond C east dike facing north.
Interior pond edge shown with thick and tall vegetative growth in the ash.

50



Ash Pond C, central portion of east dike facing east, southeast.
Ponding water shown frame left. Recycle system plumbing shown frame right.

51

Ash Pond C, north portion of east dike facing north.

52

Ash Pond C, downstream slope at north end of east dike, facing north.
Stressed vegetation shown frame right.

53

Ash Pond C, north end of east dike along dike toe, facing west. Dike irregularity due to mowing indicated.

54

Downstream slope of Ash Pond C east dike near the south end showing variations in elevation.

55

Ash Pond C, east end of south dike facing west.
Downstream slope shown with rip-rap facing.

56

Ash Pond C, east end of south dike at the toe, facing east. Two saturated areas shown (several located in this area). .

57

Ash Pond C, central portion of south dike along toe facing east.
Water due to rainfall shown frame left.

58

Ash Pond C, central portion of south side facing west. Water due to rainfall shown frame right.

59

Ash Pond C, western central portion of south dike facing west. Saturated soil shown.

60

Ash Pond C, western central portion of south dike facing east. Toe re-faced utilizing rock rip-rap.

61

Ash Pond C, western central portion of south dike, facing east, adjacent south of toe.

62

Ash Pond C seepage drain No. 3 shown. Draining water was observed to be clear.

63

Ash Pond C, west end of south dike. Seepage weir shown.

64

Ash Pond C, west end of south dike facing west. Rock rip-rap facing on dike exterior shown.

65

Ash Pond B, central portion of dike crest, facing north into area of pond filled with bottom ash and covered with topsoil.

66

Ash Pond B, central portion of dike facing east. Downstream slope of dike shown frame right with vegetation present. Interior edge of dike shown frame left with vegetation (tree cover) present along eastern end of the pond.

67

Ash Pond B, central portion of dike along the toe facing east. Heavy vegetative growth present and large boulders present throughout. Lake Sinclair shown frame right.

68

Ash Pond B, central portion of dike facing north, along the toe. Exterior of dike shown with large boulders and vegetative growth.

69

Ash Pond B, west end of dike. Emergency spillway (black pipe in background) and abandoned primary discharge facility shown.

70

Ash Pond B, west end of dike facing north, at emergency spillway and site drainage open channel. Inlet protection for emergency spillway into discharge facility shown.

71

Ash Pond B, north end of pond along eastern edge facing west. Shown is the portion of Ash Pond B unfilled with bottom ash. Ash processing facility shown frame left.

72

Ash Pond B, north end of pond along eastern edge facing south west. Shown is portion of the pond remaining unfilled with bottom ash. Frame left and furthest shows the area of Ash Pond B filled with bottom ash, covered with topsoil, and vegetative cover.

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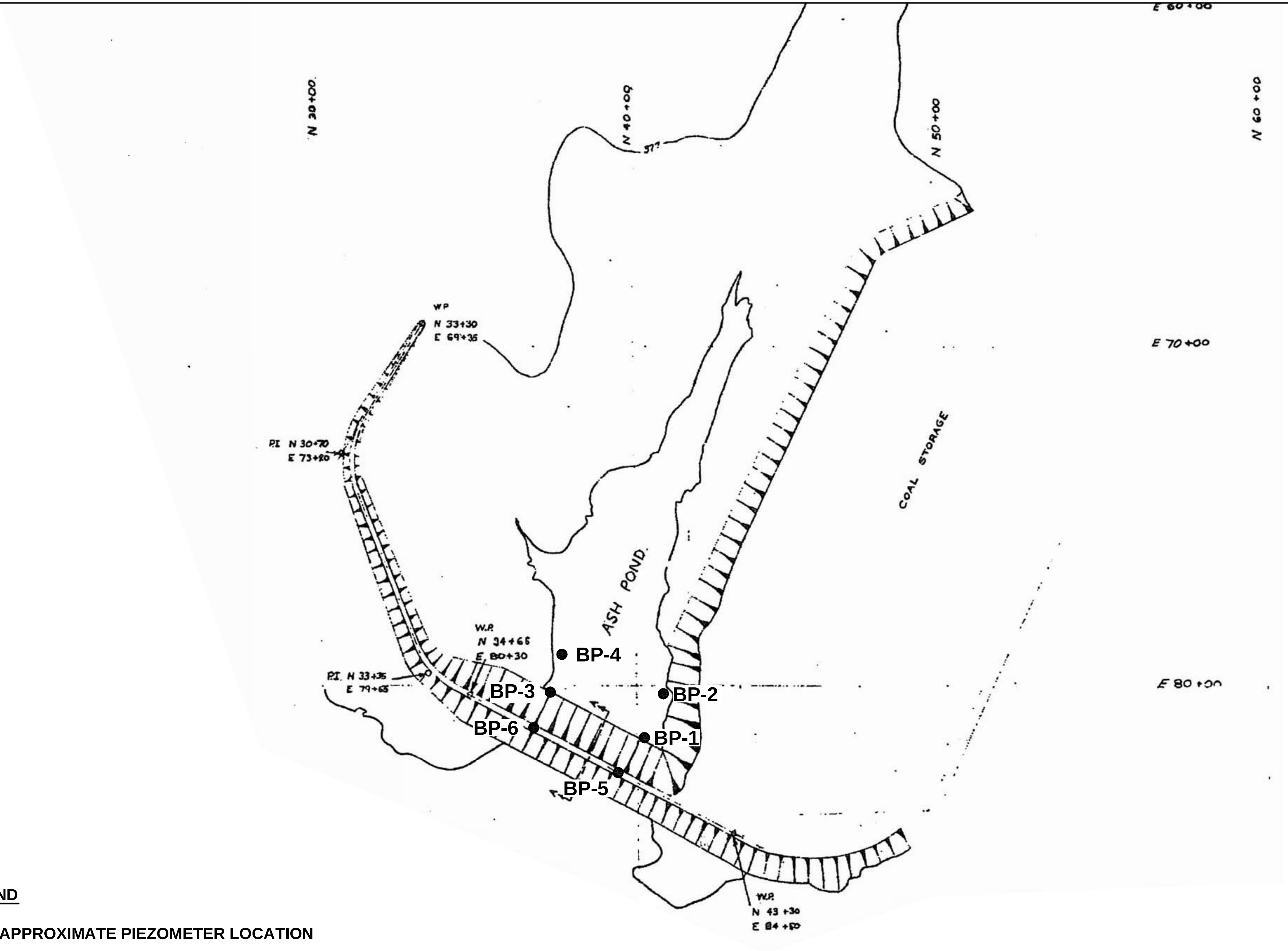

LEGEND

BP-1 ● APPROXIMATE PIEZOMETER LOCATION

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ASH POND B INSTRUMENTATION LOCATION PLAN

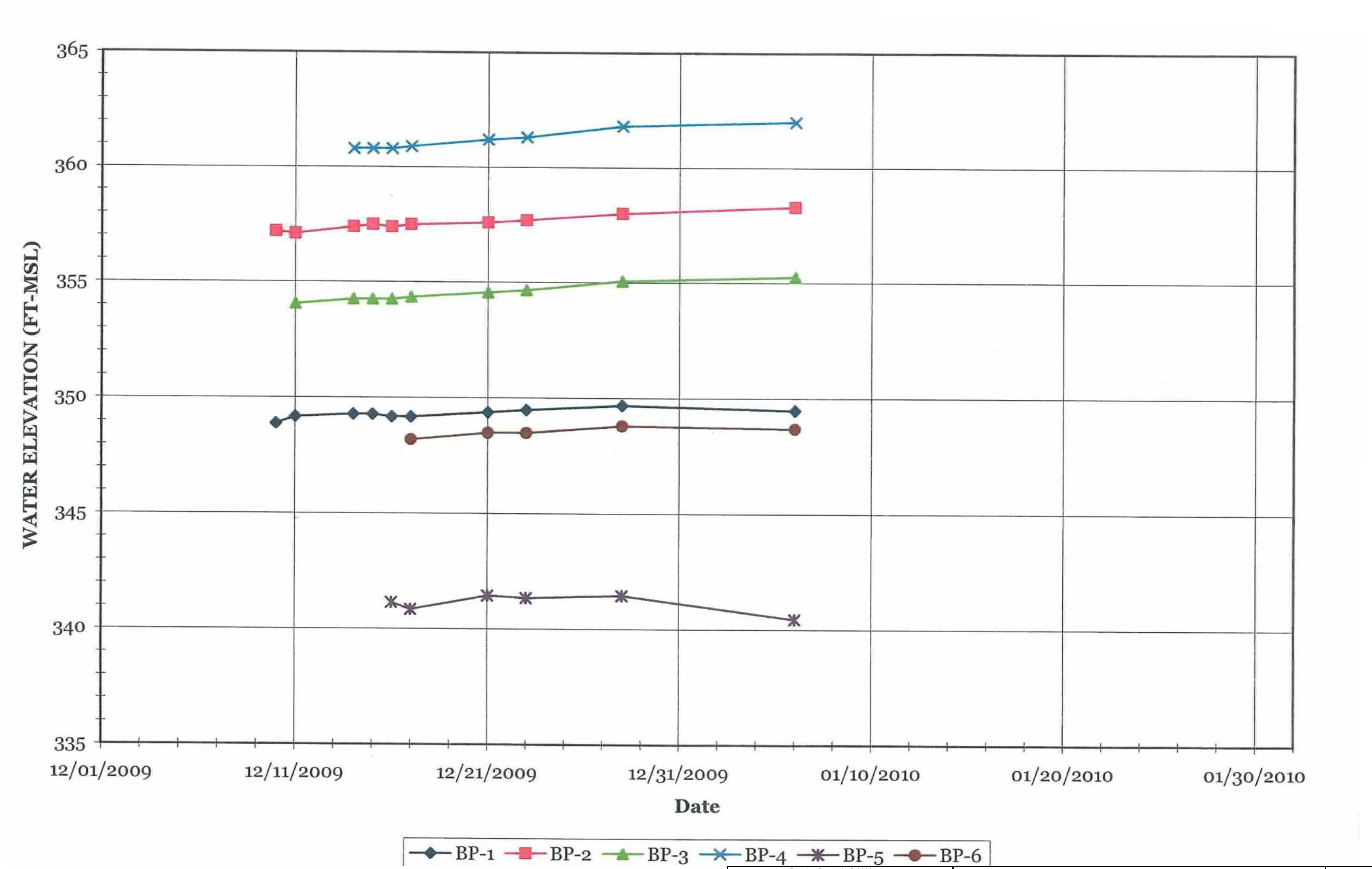
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 6A–1

Branch Pond B Piezometers



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ASH POND B PIEZOMETER LEVEL DATA

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FIGURE 6A-2

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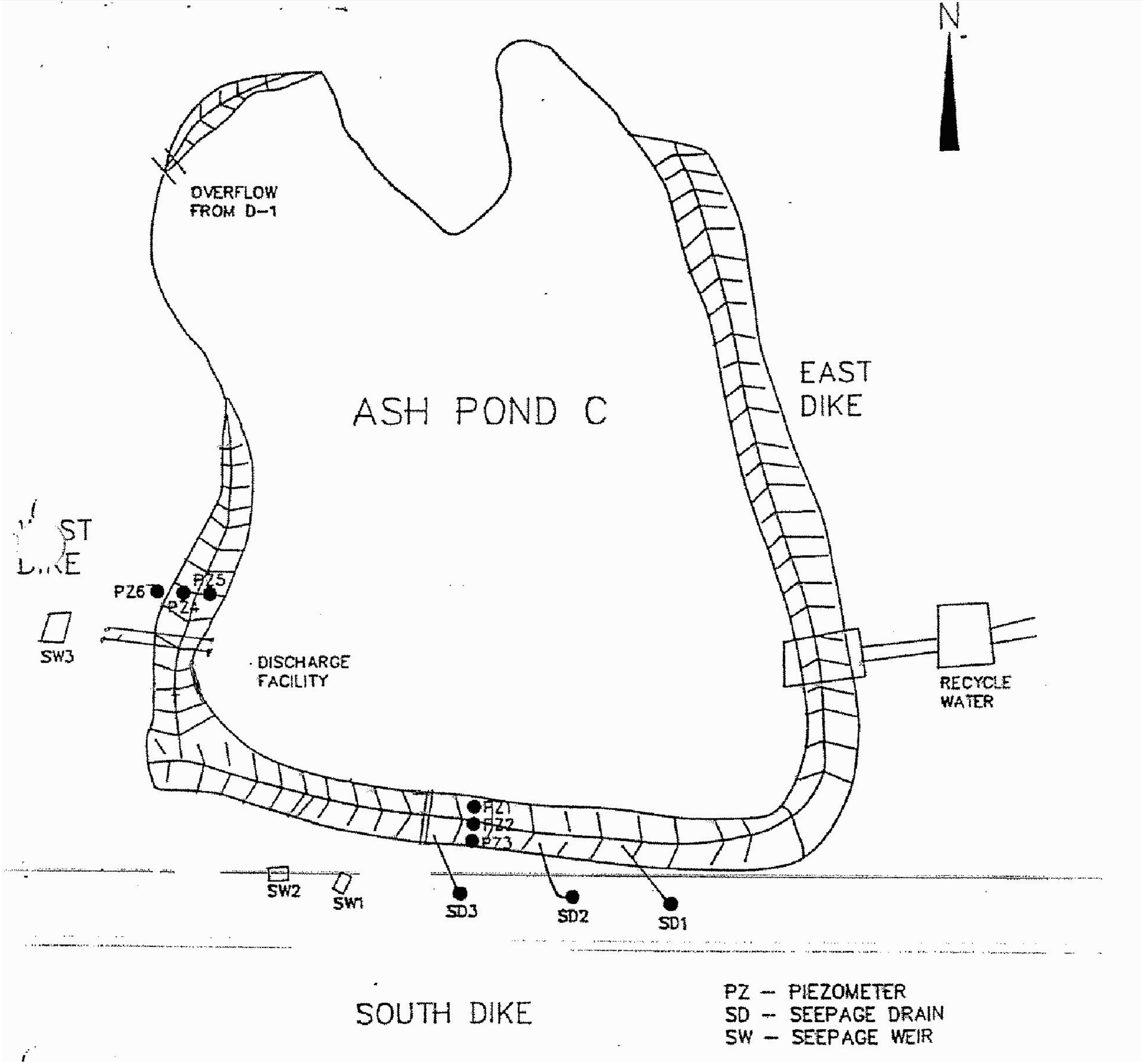

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ASH POND C INSTRUMENTATION LOCATION PLAN

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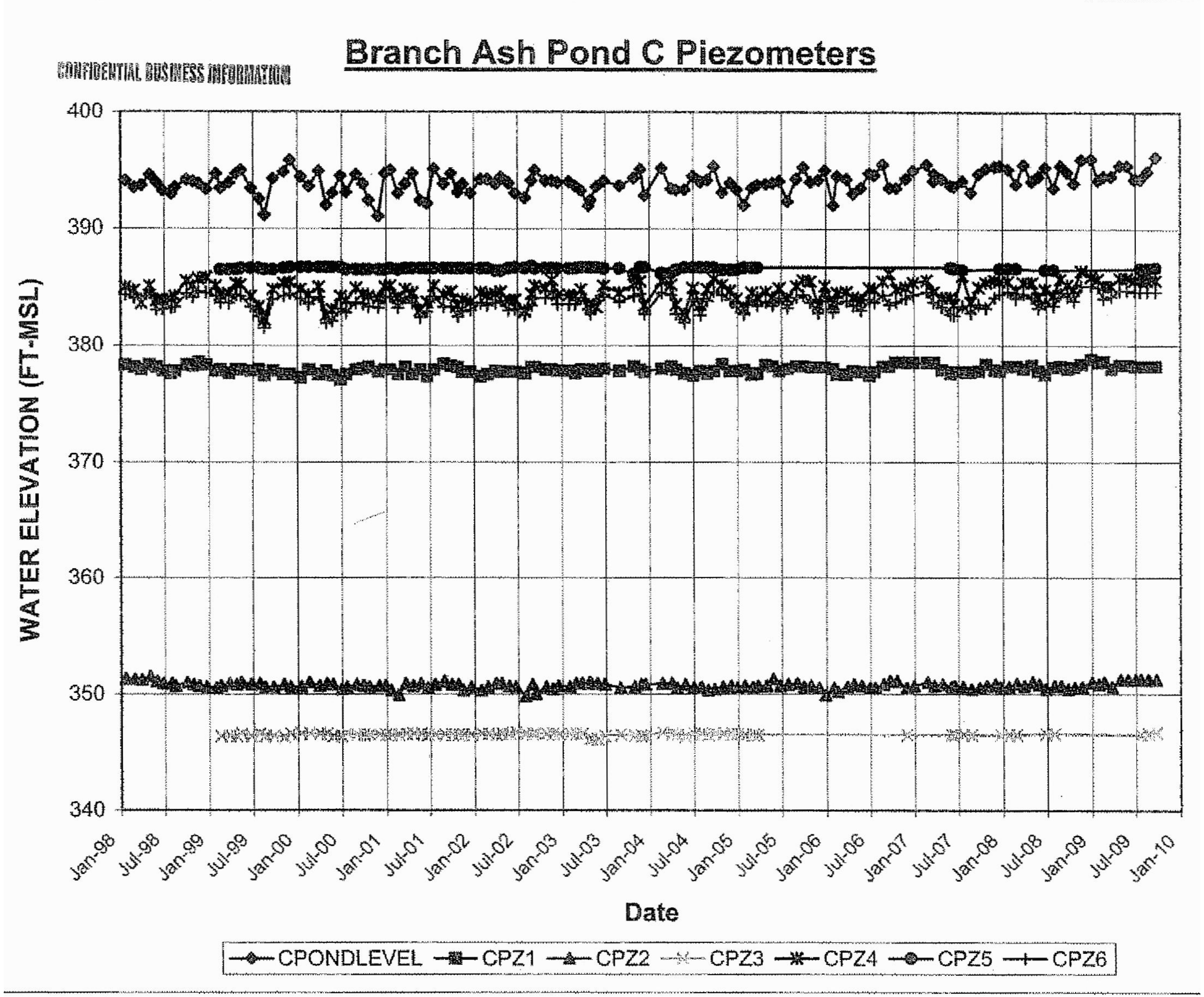
FIGURE 6B



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ASH POND C PIEZOMETER LEVEL DATA

PLANT BRANCH
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20085.2060

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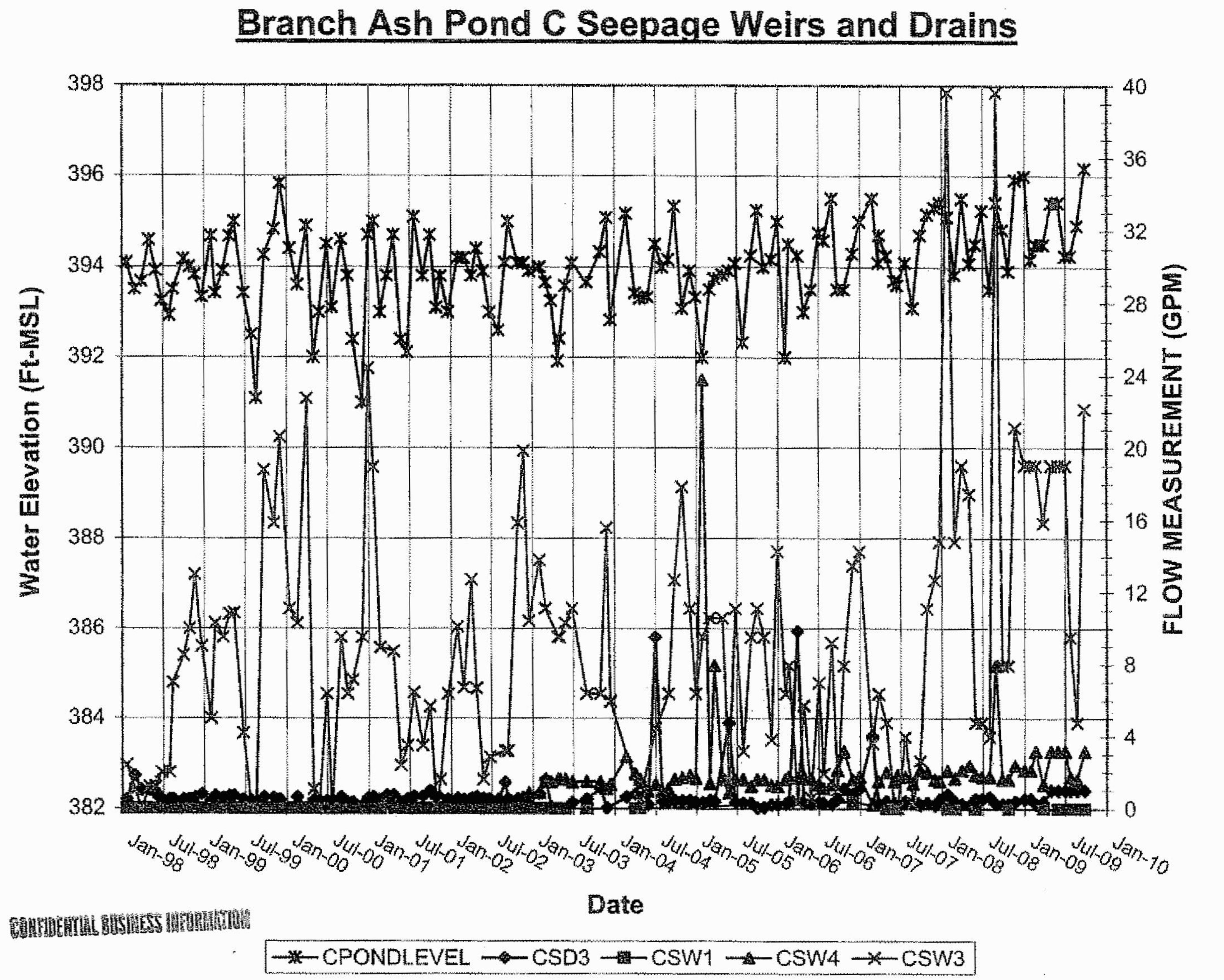
FIGURE 6C



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ASH POND C SEEPAGE WEIR FLOW RATES

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MILLEDGEVILLE, GEORGIA

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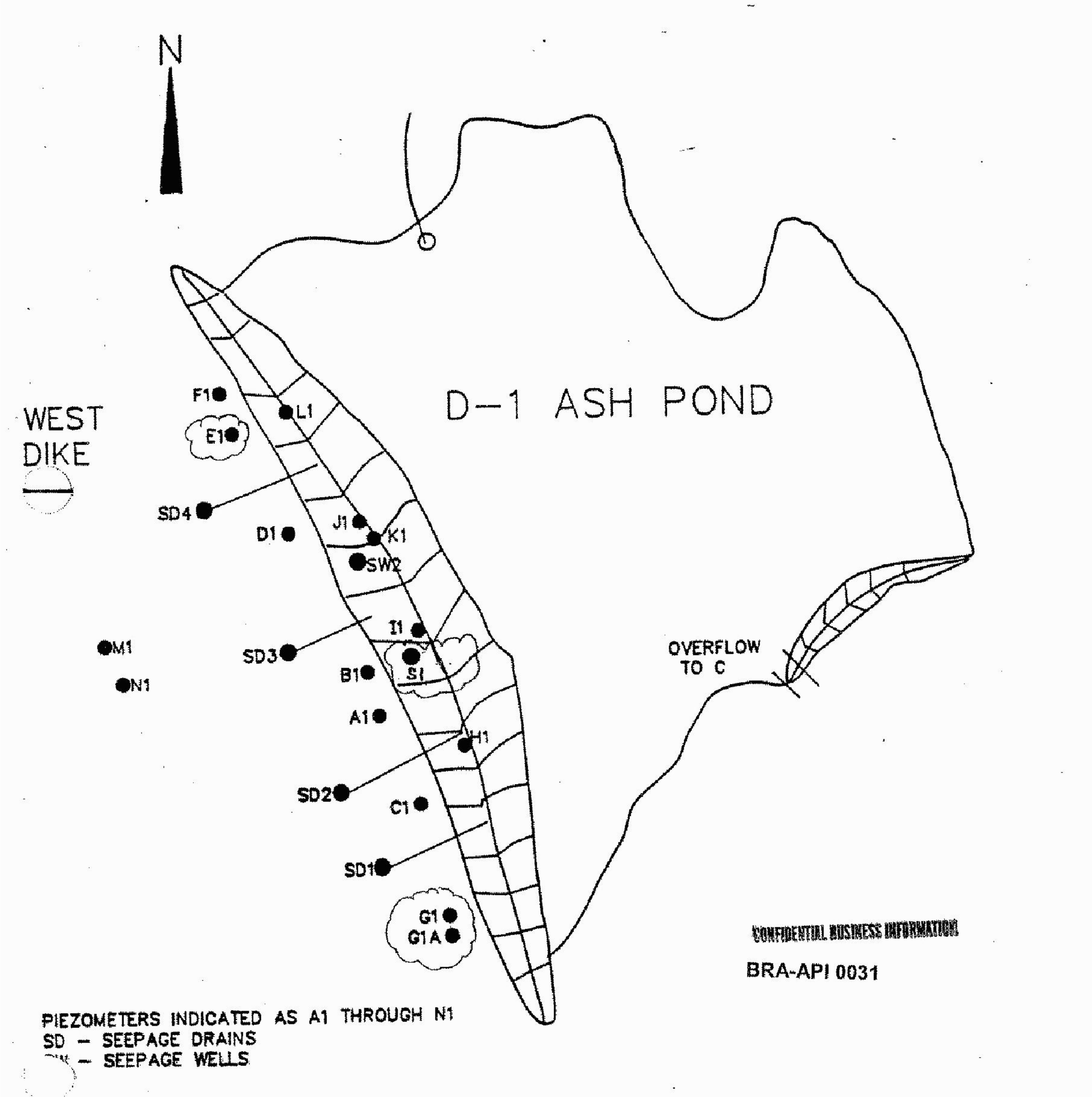
FIGURE 6D



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ASH POND D INSTRUMENTATION LOCATION PLAN

PLANT BRANCH
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FIGURE 7A

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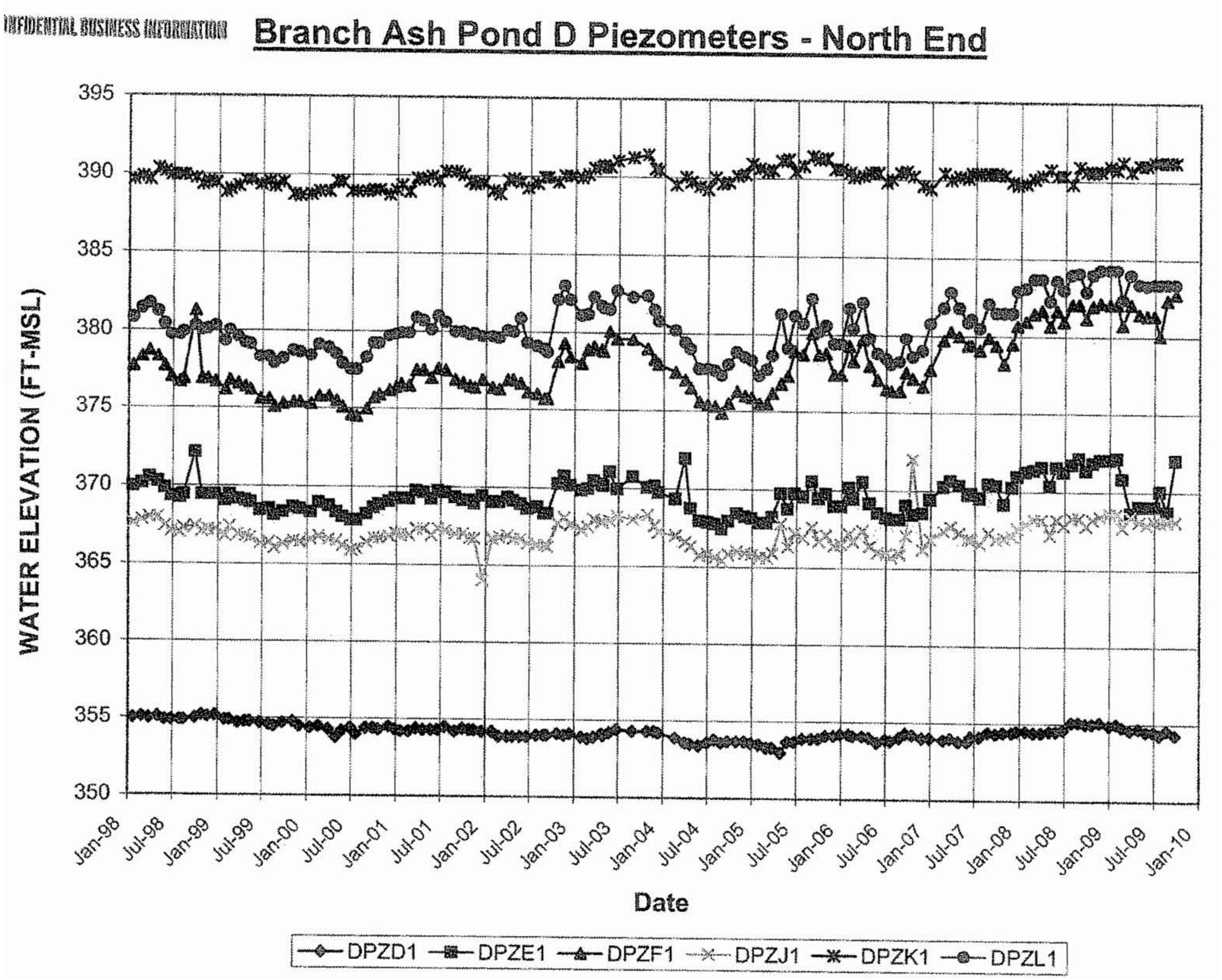

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ASH POND D NORTH END PIEZOMETER LEVELS

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FIGURE 7B

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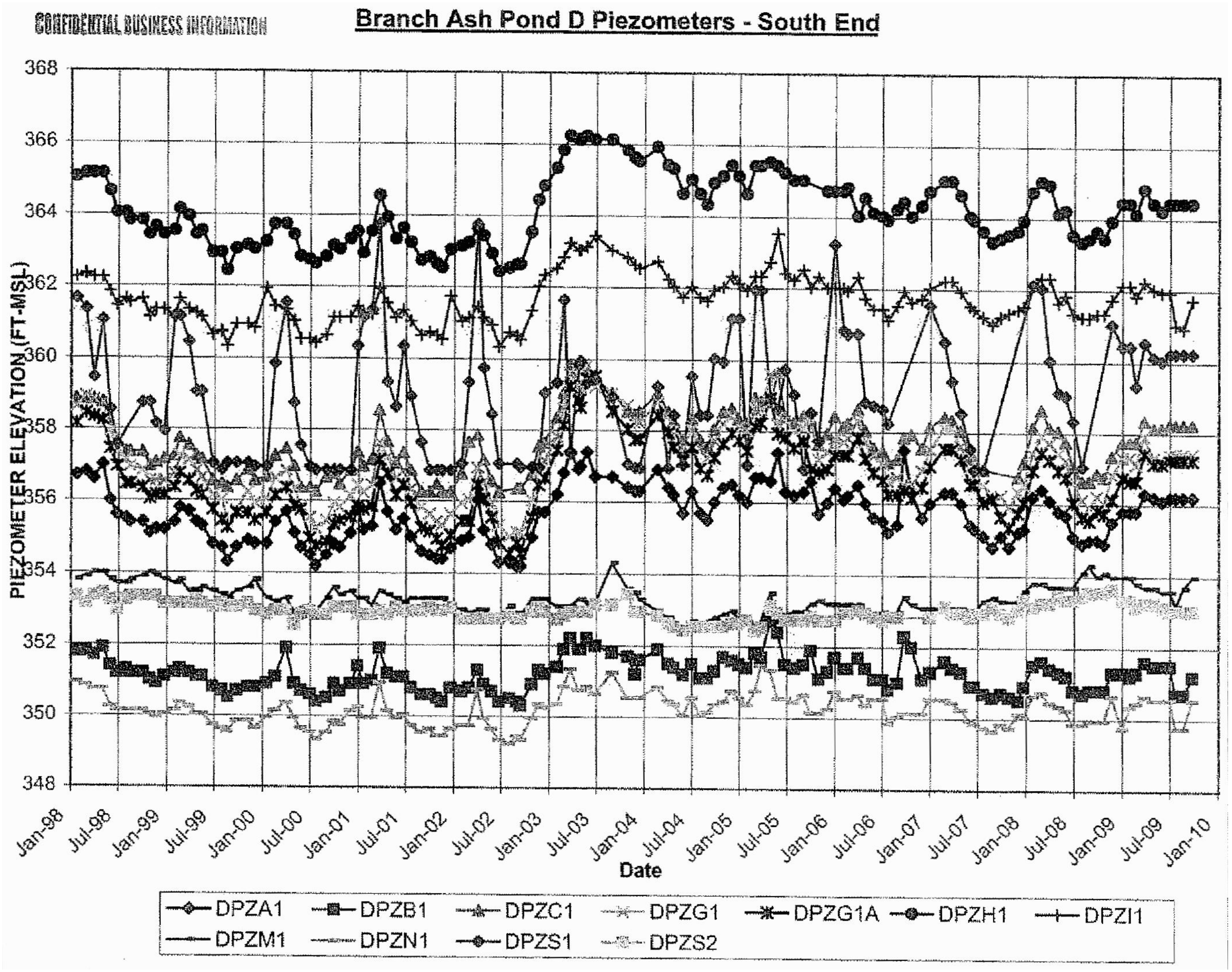

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ASH POND D SOUTH END PIEZOMETER LEVELS

PLANT BRANCH
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FIGURE 7C

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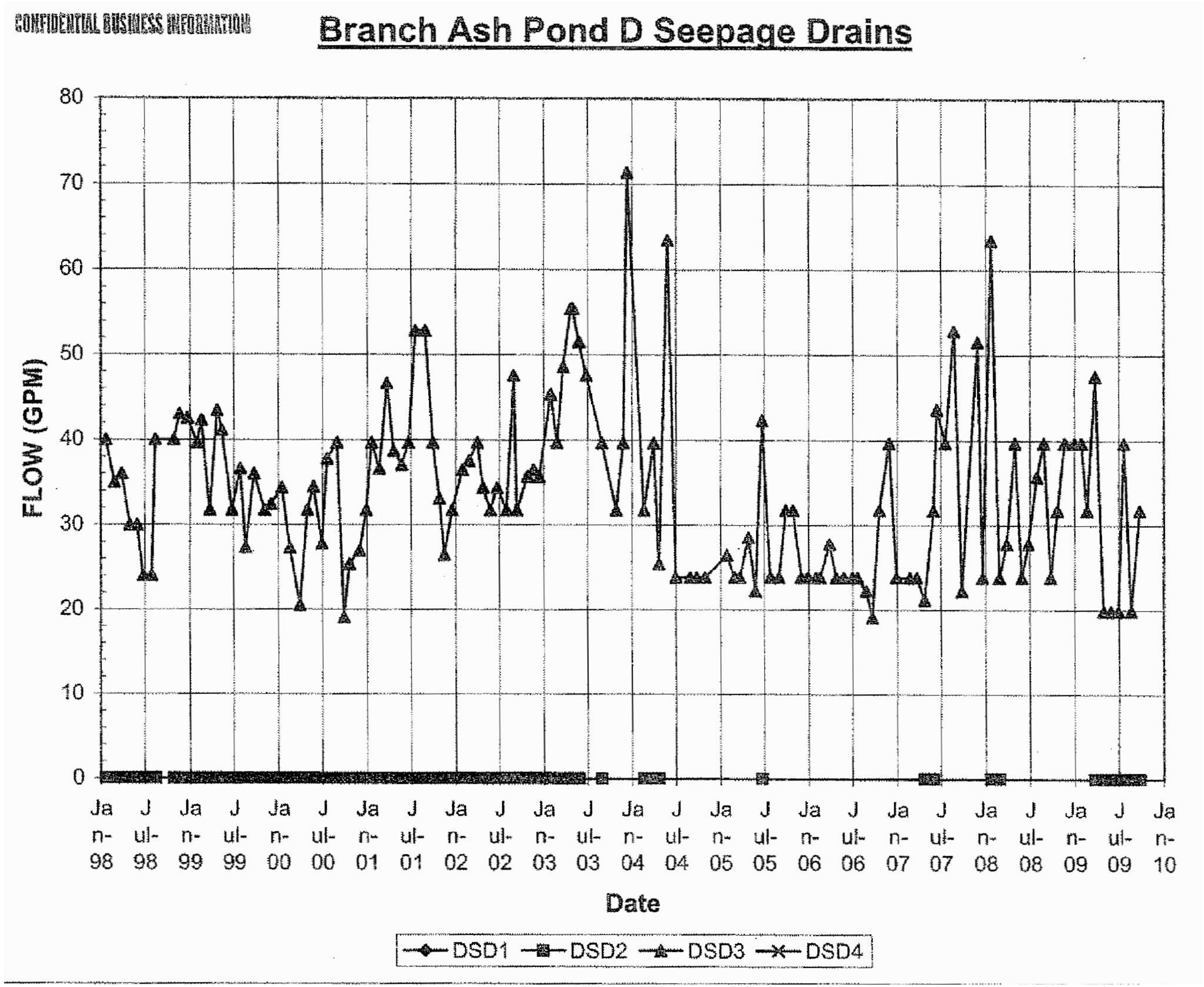

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ASH POND D SEEPAGE WEIR FLOW RATES

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 7D

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Piezometer	Easting	Northing	Top Pipe Elevation	Ground Elevation	Description
1	-2206.41	-5836.62	432.01	432.79	PVC Pipe
2	-2276.85	-6428.30	432.60	432.42	PVC Pipe
3	-2254.60	-6431.38	424.72	424.49	PVC Pipe
4	-2192.62	-6438.63	403.37	402.88	PVC Pipe
5	-2080.49	-6446.85	369.28	368.21	1" Steel Pipe
6	-2340.81	-6971.57	435.48	432.59	PVC Pipe
7	-2161.53	-6989.78	375.47	375.15	PVC Pipe
8	-2082.14	-6456.58	369.70	368.79	1" Steel Pipe
9	-2000.56	-6053.54	377.00	372.08	PVC Pipe
10	-1998.01	-5809.56	381.51	379.54	Metal Pipe
11	-2009.63	-6217.50	373.01	368.09	PVC Pipe
12	-2080.19	-6844.44	367.56	366.17	1" Steel Pipe
13	-2010.16	-5451.03	398.14	396.91	PVC Pipe
14	-2008.94	-5374.95	401.05	399.38	PVC Pipe
15	-1939.39	-5647.84	390.51	386.33	PVC Pipe
16	-1918.99	-5697.22	387.96	384.83	PVC Pipe
17	-1905.87	-5843.05	380.23	375.71	PVC Pipe
18	-1926.21	-6018.95	377.35	373.41	PVC Pipe
19	-1923.71	-6029.22	377.87	373.15	PVC Pipe

References:

1) Plant Harllee Branch Ash Pond E Property Plat. GPC Land Dept. map file no. M-3-20. Aug. 29, 1980.
2) Plant Harllee Branch Ash Pond E Topographic Map. GPC Land Dept. map file no. J-50-20. Feb. 1987.
3) Plant Harllee Branch Ash Pond E Dike PLan. SCS map file no. 10-501 E-78. Jan. 19, 1981.
4) Plant Harllee Branch Ash Pond E - Ash Pond Dike. GPC Land Dept. map file no. H-804-6, Sheets 1 & 2 of 2. June 2003.
5) Plant Harllee Branch Ash Pond E - Ash Pond Dike Wave Wall. GPC Land Dept. Map file no. H-942. March 30, 2005.

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ASH POND E PIEZOMETER & DEFORMATION MONITORING LOCATION PLAN

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO. 20085.2060

DATE: 03/2010

FIGURE 8A

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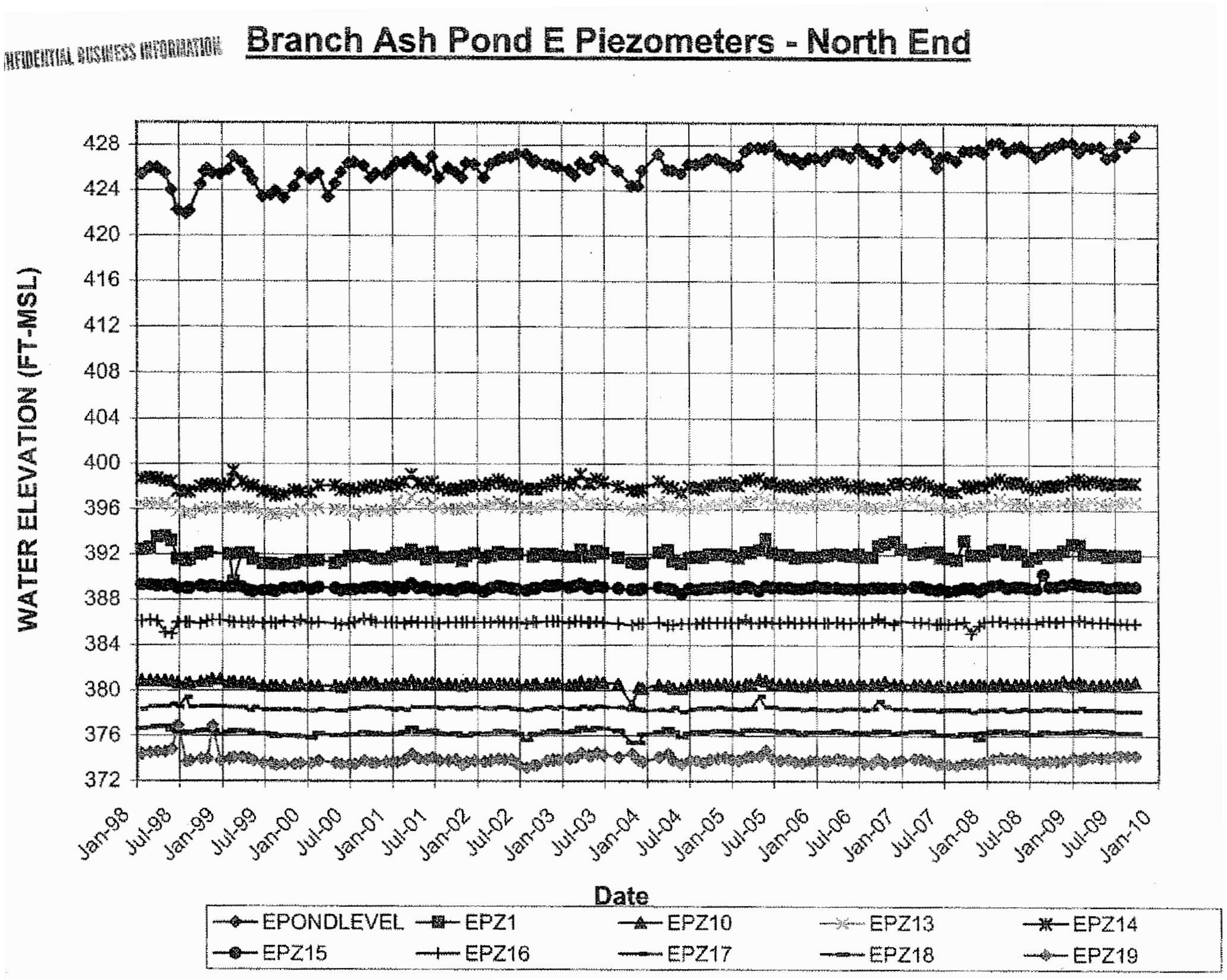

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ASH POND E NORTH END PIEZOMETER LEVELS

PLANT BRANCH
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PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 8B

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_7-9E.DWG Saved: 3/10/2010 12:40:58 PM Plotted: 3/29/2010 1:51:17 PM User: Gray, Timmolyn

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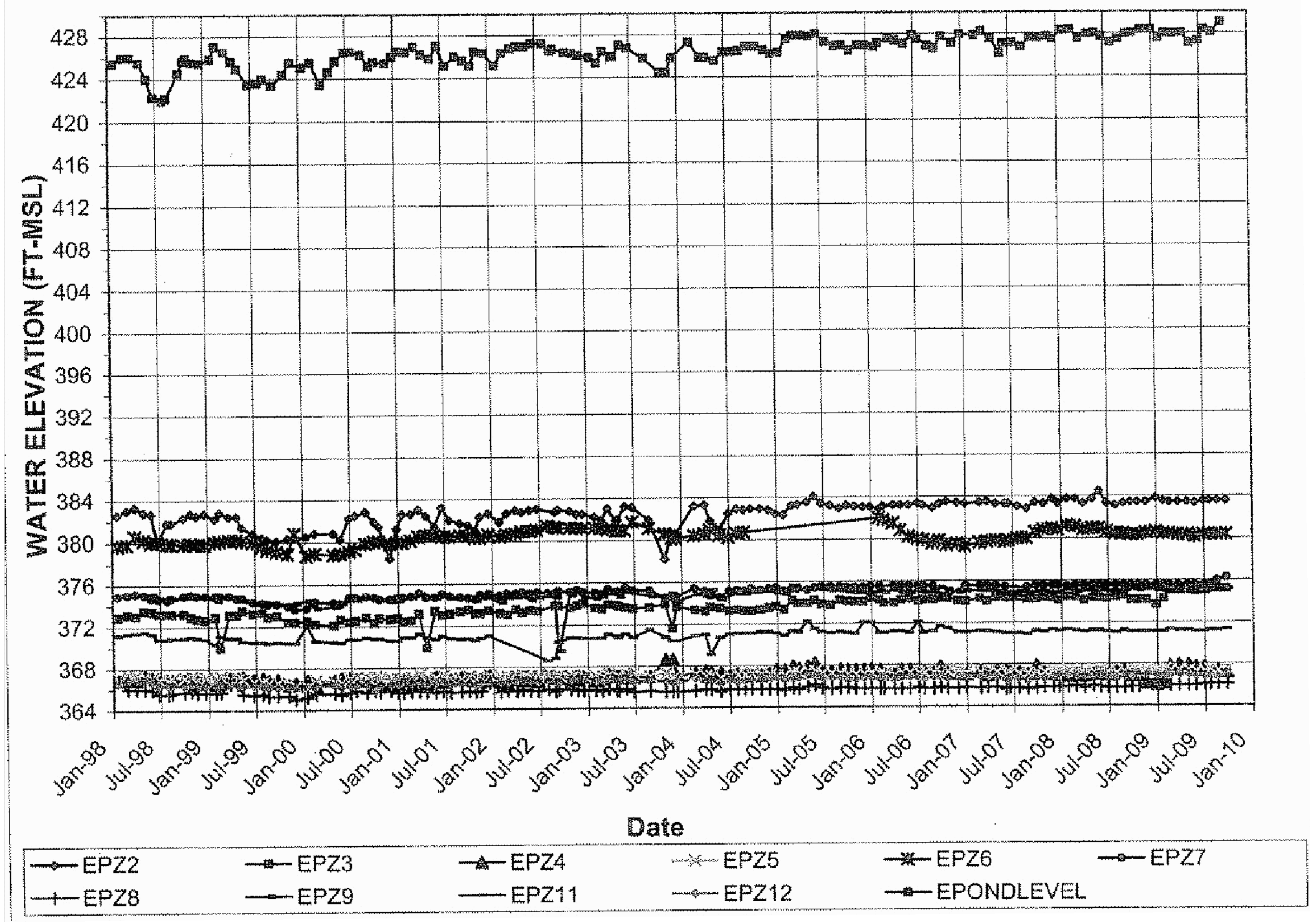
Branch Ash Pond E Piezometers - South End



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ASH POND E SOUTH END PIEZOMETER LEVELS

PLANT BRANCH
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PROJECT NO.
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DATE: 03/2010

FIGURE 8C

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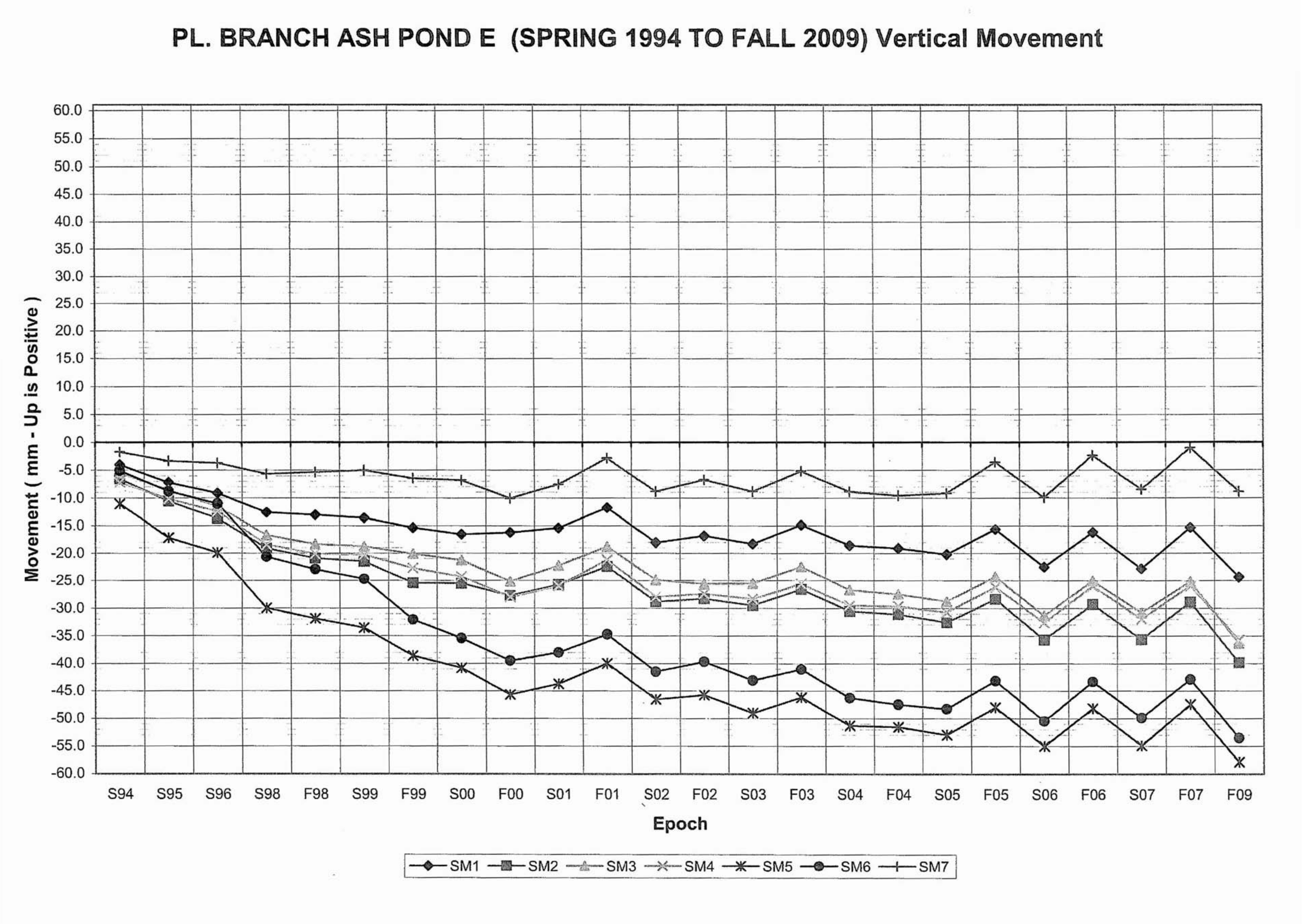

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ASH POND E SETTLEMENT
MONUMENT DATA

PLANT BRANCH
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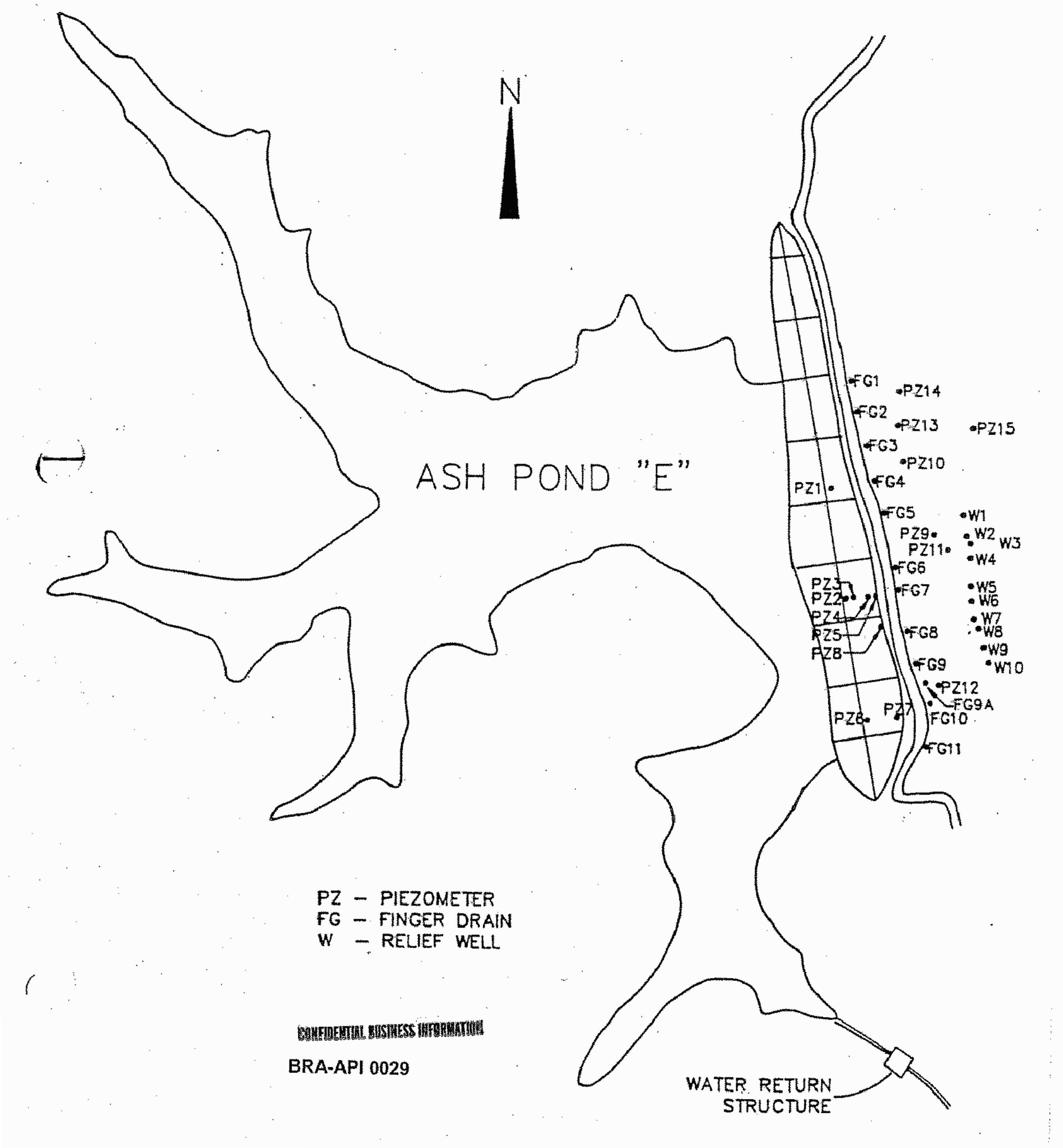
FIGURE 8D



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ASH POND E FINGER DRAIN AND RELIEF
WELL LOCATION PLAN

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FIGURE 8E

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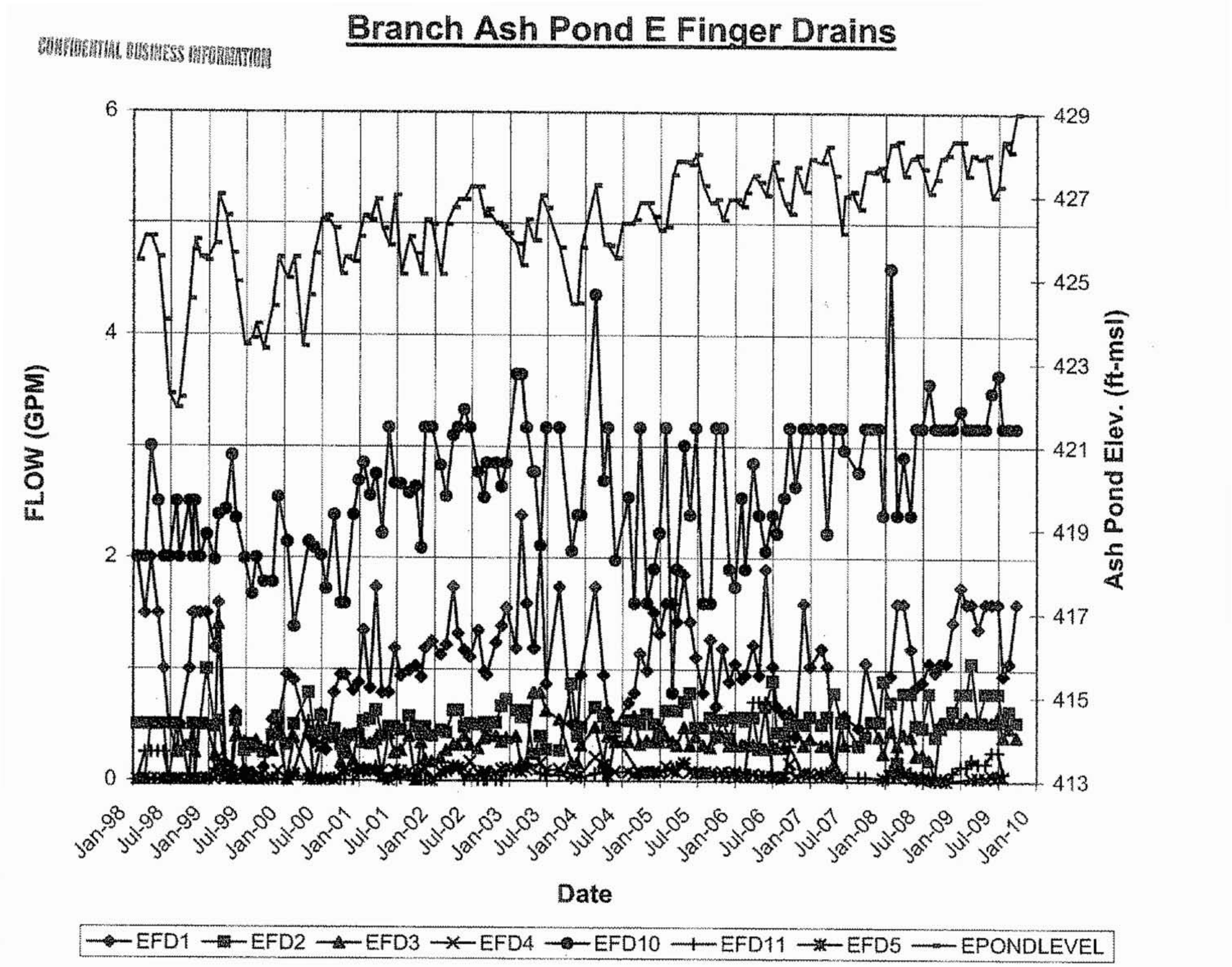

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ASH POND E FLOW RATE AT FINGER DRAINS SHEET 1 OF 2

PLANT BRANCH
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20085.2060

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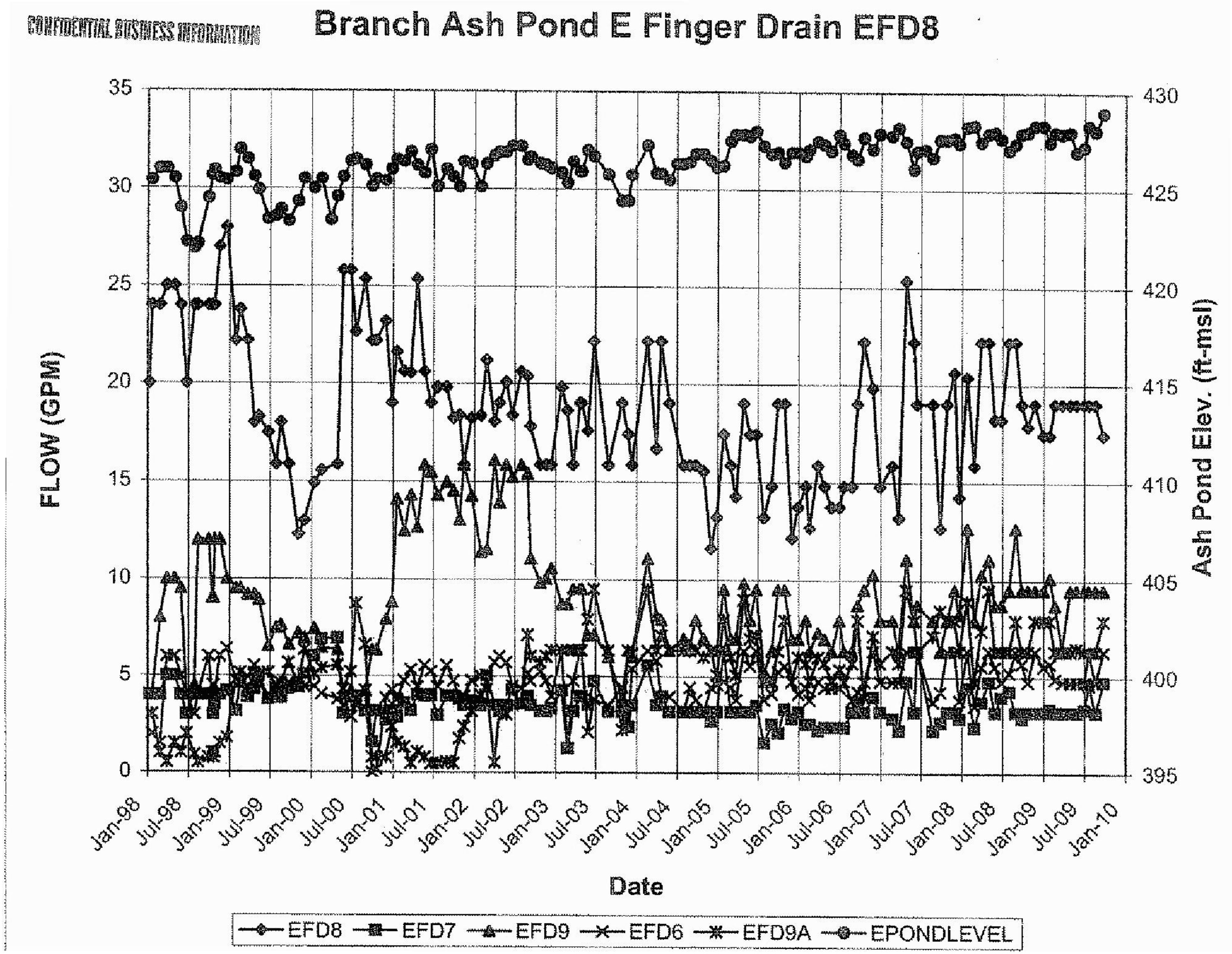
FIGURE 8F

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_7-9E.DWG Saved: 3/10/2010 12:40:58 PM PLotted: 3/29/2010 1:53:10 PM User: Gray, Timmolyn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Branch Ash Pond E Finger Drain EFD8

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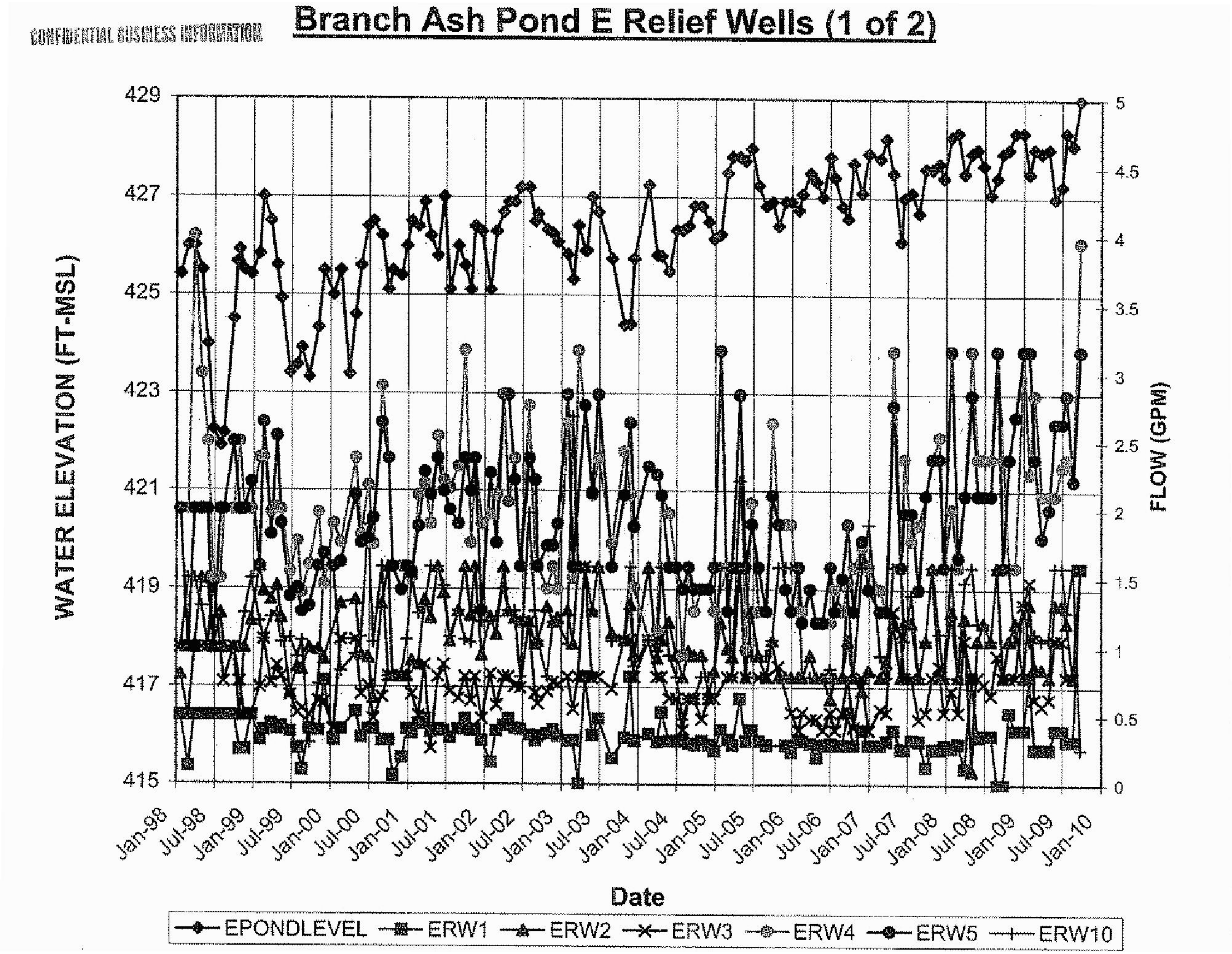
ASH POND E FLOW RATE AT FINGER DRAINS SHEET 2 OF 2

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 8G



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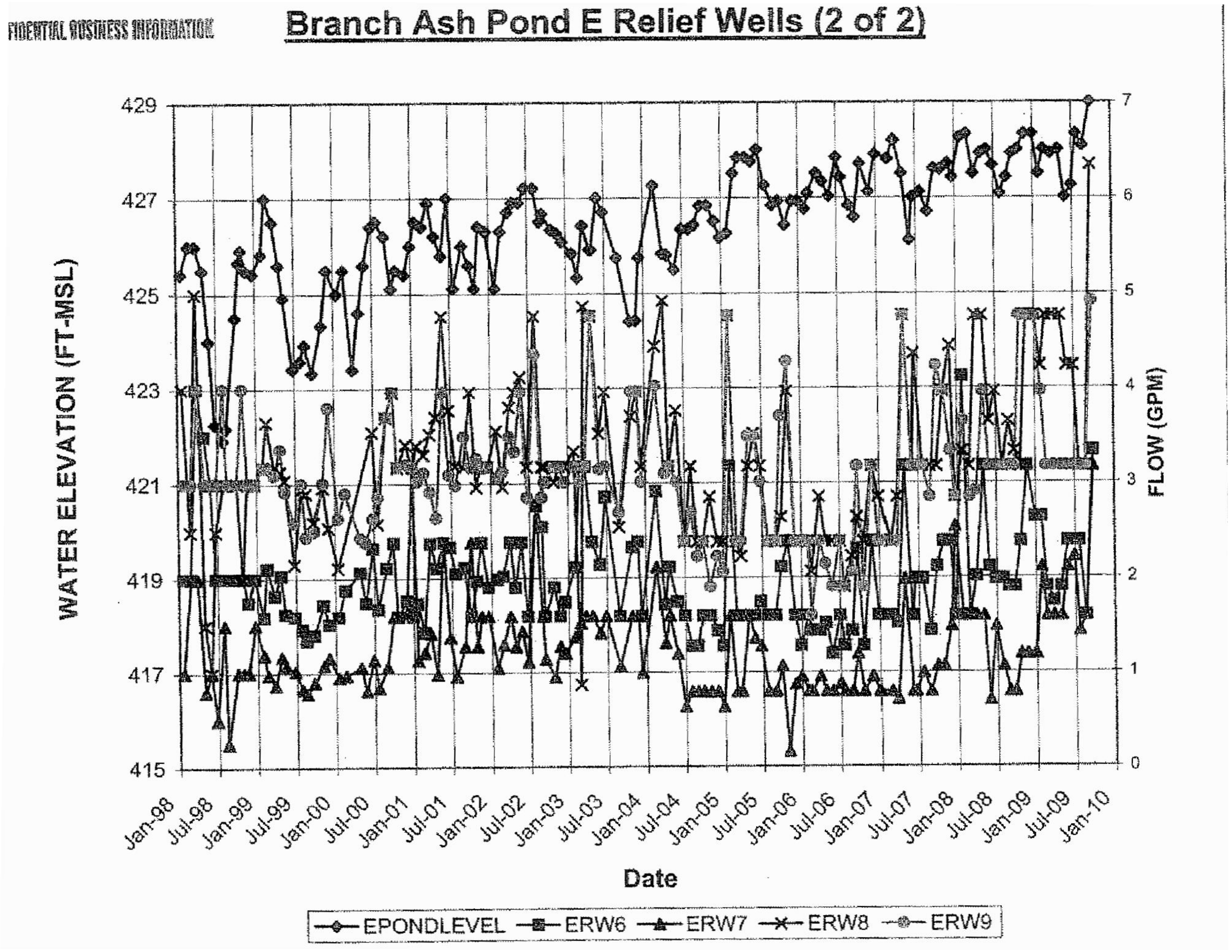
ASH POND E FLOW RATE RELIEF WELLS
SHEET 1 OF 2
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060
DATE: 03/2010
FIGURE 8H



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ASH POND E FLOW RATE RELIEF WELLS
SHEET 2 OF 2
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 8I

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3.0 DATA EVALUATION

3.1 Design Assumptions

It is understood that that Ash Ponds A, B, C, D and E were designed by a Professional Engineer. It is further understood that Ash Ponds B, C, D, and E were constructed under the supervision of a Professional Engineer and are currently inspected by a Professional Geologist who is reviewed by a Professional Engineer. At this time, no supporting documentation is available regarding the construction of Ash Pond A under the supervision of a Professional Engineer and it is not currently inspected due to pond closure.

Design drawings for the dikes at the Ash Ponds indicate that the dikes were intended to impound liquid borne, coal combustion waste (CCW). The required freeboard on the dikes would have been based on hydraulic and hydrology analyses for the impoundment. This historical information was not available at the time this report was written and current operating procedures at the site include only a small area of liquid borne CCW within Ash Ponds B, C, and D. The remaining portions of Ash Ponds B, C, and D contain ash placed under hydraulic conditions.

3.2 Hydrology and Hydraulics

Georgia EPD classifies the dikes at Plant Branch as follows:

- Ash Ponds B and D: Category II structure based on their criteria that a failure at these impoundments would not be likely to result in a loss of life. As a Category II facility, Georgia regulations exempt the dams from the dam safety regulations.
- Ash Pond C: Not classified.
- Ash Pond E: Category I dam based on their criteria that a failure at this impoundment would likely result in a loss of life.

Georgia DNR EPD regulation 391-3-8-.09 (3.f) indicates that Category I dams shall be capable of safely passing a design storm based upon a fraction of the flood developed from the probable maximum precipitation (PMP) hydrograph depending on the sub-classification of the dam as provided in Table 3. Georgia defines the PMP as "the greatest amount of rainfall of a six-hour duration which would be expected for a given drainage basin as determined by Hydrometeorological Report No. 52 published the U. S. Weather Bureau."

Table 2 - Georgia Design Storm

Dam Size	**Size Definition**	**Design Flood**
Small Dam	Storage capacity not exceeding 500 acre-ft and a height not exceeding 25 feet	25% of the PMP
Medium Dam	Storage capacity exceeding 500 acre-ft but not exceeding 1000 acre ft or height exceeding 25 feet but not exceeding 35 feet	33.3%of the PMP
Large Dam	Storage capacity exceeding 1000 acre-ft. but not exceeding 50,000 acre-ft or height between exceeding 35 feet but not exceeding 100 ft	50% of the PMP
Very Large Dam	Storage capacity exceeding 50,000 acre ft or height exceeding 100 ft	100% of the PMP

Appropriate freeboard for wave action shall be considered by an engineer through engineering analysis. The required freeboard must be provided above the maximum reservoir elevation resulting from the inflow due to the design storm. Alternatively, a minimum freeboard of 3 feet shall be provided for earth dams.

As a Class 1 "large" Dam, Georgia regulations require Ash Pond E to safely store or pass 50 percent of the PMP. CHA was provided with hydrologic and hydraulic (H&H) analyses for Ash Pond E, which is summarized in Section 3.2.1 below. Because Ash Ponds B, C, and D are Category II dams per Georgia Safe Dams, these impoundments are exempt from H&H criteria established for Category I dams.

3.2.1 Ash Pond E – Hydrologic and Hydraulic Analyses

CHA reviewed H&H analyses for Ash Pond E as provided by Georgia Power. The 6-hour PMP for the Plant Branch site is 31.1 inches. Therefore, as required for a large dam, Southern Companies has evaluated the storage and flood routing capacity of Ash Pond E for 50% of the 6-hour PMP, or 15.55 inches of rainfall.

Following a 1998 company inspection and review of Ash Pond E, the H&H analyses were updated based on as constructed conditions of the impoundment which included a slightly lower than designed crest, and a slightly higher than designed emergency spillway. At that time, it was determined that based on the current level of deposited ash within the pond, the normal pool elevation of the pond would need to be lowered to allow for the storage needed to safely pass the design storm and have the required three feet of freeboard during the design storm.

In 2002, in order to maintain operations, the normal pool level needed to be raised, which to meet storage and freeboard requirements would require a raising of the dam crest and/or lowering of the emergency spillway. A concrete wave wall was constructed on the upstream side of the crest in 2004, which provides the required freeboard. This wall was not needed to impound stormwater. This wall allowed for normal pool storage at El. 428.

In July 2009, the H&H analyses were re-evaluated because the deposited ash was occupying area previously available for flood storage. With the loss of storage volume, Southern Companies determined that the normal pool needs to be maintained at El. 427.5 to provide three feet of freeboard under the design storm.

3.3 Structural Adequacy & Stability

The Georgia DNR EPD outlines rules and regulations for dam safety in Standards for the Design and Evaluation of Dams (391-3-8-.09). The regulations state that all dams must be stable under all conditions of construction and/or operation of the impoundment. Analyses using the methods, guidelines and procedures of the agencies listed in the regulations yielding the minimum safety factors shown in Table 3 for earthen embankments can be considered as acceptable stability.

Table 3 - Minimum Safety Factors Required

Load Case	Required Minimum Factor of Safety
End of Construction	1.3
Steady State Seepage	1.5
Steady State Seepage with Seismic Loading	1.1
Rapid Drawdown (Upstream)	1.3
Submerged Toe with Rapid Drawdown	1.3

In addition to the state regulations shown above, CHA recommends that the maximum surcharge pool or design flood elevation load case be modeled and analyzed. The US Army Corps of Engineers Engineering Manual (EM) 1110-2-1902 indicates a minimum recommended safety factor equal to 1.4 against failure of the dam during in this loading condition.

Georgia DNR EPD regulation 391-3-8-.09 (3.c) also indicates that dams must be designed to withstand seismic accelerations defined in the most current United States Geologic Services (USGS) Map for Peak Accelerations with a 2% exceedance in 50 years and that the minimum seismic acceleration shall be 0.05g.

CHA reviewed the available design documents related to slope stability for Ash Ponds C, D, and E.

3.3.1 Ash Pond B Stability Analysis

The Ash Pond B dike was constructed with large excavated rock spoil. As discussed in Section 1.4.1, shortly after initial sluicing to the pond, seepage was observed at five locations on the downstream slope. A significant portion of the dike was grouted to mitigate the seepage. A slope stability analysis for the designed or grouted condition was not provided for Ash Pond B dike.

As reported previously in this document, the present configuration of Ash Pond B and the Ash Pond B dike is markedly different from the time the initial construction and subsequent grouting repair was completed. A substantial portion of the pond area has been filled and capped. Field data obtained in the filled and capped portion of the pond adjacent to the dike indicated groundwater levels varying from approximately 17 feet below the present surface in the pond area to approximately 42 feet below the surface at the dike crest. A soil cap varying from 0.6 feet to 3.0 feet in thickness was also evident. These findings, depicted in Figures 9A and 9B, along with the absence of surface water have led Georgia Power to conclude that the Ash Pond B dike is no longer a liquid waste impounding structure. If the Georgia DNR EPD Safe Dams Program and/or the USEPA deems the available data sufficient and acceptable to officially declassify the dike as an impounding structure, then no further work is recommended. Otherwise, CHA recommends that these analyses be performed.

3.3.2 Ash Pond C Stability Analysis

Southern Company Services, Inc. for Georgia Power Company Drawing No. 10-501 H-89-A indicated that the southern dike was constructed in two phases and the upstream slope was constructed above existing fill. Based upon the available documentation, the stability analysis during the design appears to have occurred in two phases with two different sets of soil parameters. Southern Company Services, Inc. for Georgia Power Company Drawing No. 10-501 H-93 presents slope stability information for Ash Pond C on one phase of the analysis while

Georgia Power Company Drawing No. 10-501 E-104 presents the analysis for the other phase based on the configuration of the highest dike cross section (Section A-A). In response to the EPA site assessment efforts, Southern Company reviewed the original dike stability studies and performed a new set of analyses in the Fall of 2009 using updated software (Slope-W^{TM}) and the soil parameters shown on the E-104 drawing noted previously.

Table 4 taken from Drawing No. 10-501 H-93 summarizes the soil parameters used in part one of the original design analysis. Information regarding the selection of the soil parameter values was provided in laboratory and field test data on borrow fill and foundation material, including Q-test and R-test results, sieve analyses, moisture-density curves, and index testing.

Table 4 - Ash Pond C Soil Strength Parameters
(Original Design - Part 1)

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
A	109	0	1,310	Natural soil below west end of south dike
B	126	28.5	460	Natural soil below center of south dike and east dike
C	128	15.5	940	Embankment fill
E	120	30.0	0	Existing fill

Table 5, taken from Drawing No. 10-501 E-104, summarizes the soil parameters used in the second part of the original design analysis and the recent updated analysis. Information regarding the selection of the soil parameter values such as laboratory testing was not provided and it is unclear as to why this second set of data was chosen or what initiated the second part of the stability analysis during the original design. It should be noted that the second part of the original design analysis and the updated analysis do not model the natural soil separately from the “existing fill”. Based upon the information provided, the critical failure surfaces generated during the second design analysis and the corresponding updated analysis were contained in the zone modeled as “existing” fill, justifying this simplification. These analyses also include the impounded fly ash in the cross section, model the new embankment fill as two separate materials, and model the rip-rap surface treatment. Furthermore, the updated analysis also included effects of higher shear strength and unit weight parameters for the “existing fill” to reflect the large percentage of gravel and boulders the soil borings encountered in this material. These values are indicated in the parentheses shown in the following table. Lastly, the updated analysis was limited to variations along the highest section through the south dike, section A-A.

Table 5 - Ash Pond C Soil Strength Parameters
(Original Design Part 2 & Updated Analysis)

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	140	0	0	Rip Rap
2	120	34	200	Embankment fill
3	119	35	0	Embankment fill
4	117 (142)[1]	35 (42)[1]	0	Existing fill
5	90	33	0	Ash

[1] Reflects presence of boulders and gravel in material also included in updated analysis

In the original design, a stability analysis was performed for three cross sections: Section A through the west end of the south dike, Section B through the center of the south dike, and Section C through the south end of the east dike. A note on the drawing indicated that the analysis was performed on a computer using a “hunt” analysis program. Figures 9C and 9D show the analysis cross sections and minimum factor of safety circles for the first part of the original analysis. The computed factor of safety is summarized in the following table for each section.

Table 6 - Ash Pond C Safety Factors
(Original Design Analysis – Part 1)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety		
		A	B	C
End of Construction	1.3	NP	NP	1.36
Steady State Seepage	1.5	3.07	2.79	1.96
Steady State Seepage with Seismic Loading	1.1	NP	NP	NP
Submerged Toe with Rapid Drawdown	1.3	NP	NP	NP
Rapid Drawdown (Upstream)	1.3	NP	NP	1.38

NP: Not performed

In the recently updated work, a stability analysis was performed for four cross sections: Section A-A of the south earth embankment to provide a baseline comparison with the second part of the original design; a steeper 1.6 to 1 portion along Section A-A through the south earth embankment; a revised Section A-A with Lake Sinclair within about 40 feet of the downstream dike toe using the soil properties in the second part of the original design analysis; and the revised Section A-A with higher shear strength parameters for the "existing fill" as mentioned previously. The results of these analyses are noted in Tables 7, 8, and 9 that follow, while Figures 9E through 9L show the cross section and minimum factor of safety circles for the second part of the original design analysis and the updated analysis.

Table 7 - Ash Pond C Safety Factors
(Original Design Analysis Part 2 & Updated Analysis)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety			
		Original – Part 2		Updated	
		Section A-A	1.6 to 1 Section	Section A-A	1.6 to 1 Section
End of Construction	1.3	NP	NP	NA	NA
Steady State Seepage	1.5	2.4	NP	2.17	2.29
Steady State Seepage with Seismic Loading	1.1	1.4	NP	1.65	1.71
Submerged Toe with Rapid Drawdown	1.3	NP	NP	NP	NP
Rapid Drawdown (Upstream)	1.3	NP	NP	NP	NP

NA: Not Applicable, NP: Not performed; Unless otherwise noted, load cases shown are for the downstream slope.

Table 8 - Ash Pond C Safety Factors
(Updated Analysis with Revised "Existing Fill" Shear Strength)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety	
		Revised Section Only	Revised Section and Shear Strength
End of Construction	1.3	NA	NA
Steady State Seepage	1.5	1.68	2.31
Steady State Seepage with Seismic Loading	1.1	1.32	1.77
Submerged Toe with Rapid Drawdown	1.3	NP	NP
Rapid Drawdown (Upstream)	1.3	NP	NP

NA: Not Applicable, NP: Not performed; Unless otherwise noted, load cases shown are for the downstream slope

Table 9 - Ash Pond C Safety Factors
(Updated Analysis, Including Lake Sinclair Bank and Downstream Toe)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety	
		Revised Section Only	Revised Section and Shear Strength
End of Construction	1.3	NA	NA
Steady State Seepage at Downstream Toe	1.5	1.64	NP
Steady State Seepage at Lake Sinclair Bank	1.5	1.12	1.37
Seismic Loading at Downstream Toe	1.1	1.22	NP
Seismic Loading at Lake Sinclair Bank	1.1	0.84	1.03
Submerged Toe with Rapid Drawdown	1.3	NP	NP
Rapid Drawdown (Upstream)	1.3	NP	NP

NA: Not Applicable NP: Not performed; Unless otherwise noted, load cases shown are for the downstream slope

Based upon the available information Southern Company has provided regarding the stability analyses for the Ash Pond C dike, the original and updated analyses show that the embankment was generally designed with the required factors of safety for the load cases considered at the time the particular analyses were performed. An exception is the Lake Sinclair bank/shoreline below the toe of the dike, an area addressed in the updated analysis. In this case, however, the minimum factor of safety is associated with a thin, shallow failure plane and as such would not readily affect the dike stability. Load cases not examined include rapid drawdown cases along the upstream and downstream dike areas, and a surcharge pool or flood condition. Additional comments regarding the rapid drawdown and flood conditions will be provided in Section 4 of this document.

3.3.3 Ash Pond D Stability Analysis

Southern Company provided a copy of Georgia Power Drawing No. 10-501 E-14 presenting the results of a slope stability analysis. The location of the cross section is not indicated with a station number, but the drawing indicates that the section is taken at the maximum height of the dike. Tables 10, 11 and 12 summarize the soil parameters used in the analysis for the end-of-construction and steady state/seismic conditions of the southwest dike at Ash Pond D. Laboratory and field test data regarding the selection of the soil parameter values was provided, including Q-test and R-test results, general sieve data, and soil index values. The cross section in Figure 5D indicates that the "most impervious material" was to be placed in the center of the dam and less pervious material was to be placed up and downstream of this core. However, information on the method of placement and compaction was not described and construction documentation has not been provided. In response to the EPA site assessment efforts, Southern Company reviewed the original dike stability studies and performed a new set of analyses in the Fall of 2009 using updated software (Slope-W^{TM}) and the soil parameters for steady state seepage and seismic load cases shown on the E-14 drawing noted previously.

Table 10 - Ash Pond D Soil Strength Parameters – End of Construction

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	120	16	1,000	Moist upstream fill
2	125	16	1,000	Saturated upstream fill
3	118	15	1,000	Saturated embankment fill
4	130	25	0	Blanket drain sand
5	120	16	1,000	Moist downstream fill
6	125	16	1,000	Saturated downstream fill
7	127	15	1,000	Natural Alluvium
8	120	18	0	Embankment Fill

Table 11 - Ash Pond D Soil Strength Parameters – Steady State and Seismic

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	125	30	0	Saturated upstream fill
2	127	32	0	Saturated dike fill
3	118	32	0	Moist dike fill
4	135	25	0	Blanket drain sand
5	120	30	0	Moist downstream fill
6	125	30	0	Saturated downstream fill
7	125	33	0	Natural alluvium

Figures 10A and 10B show the analysis cross section and minimum factor of safety circles for each loading condition for the original design and updated analyses. The computed factor of safety is summarized in the following table.

Table 12 - Ash Pond D Safety Factors (Original Design Analysis and Updated Analysis)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety	
		Original Design	Updated
End of Construction	1.3	1.4	NA
Steady State Seepage	1.5	1.7	1.56
Steady State Seepage with Seismic Loading	1.1	1.1	1.23
Submerged Toe with Rapid Drawdown	1.3	NA	NA
Rapid Drawdown (Upstream)	1.3	NP	NP

NA: Not applicable, NP: Not performed; Unless otherwise noted, load cases shown are for the downstream slope

Based upon the available information Southern Company has provided regarding the stability analyses for the Ash Pond D dike, the original and updated analyses show that the embankment was generally designed with the required factors of safety for the load cases considered at the time the particular analyses were performed. Load cases not examined include rapid drawdown cases along the upstream slope and a surcharge pool or flood condition. Additional comments regarding the rapid drawdown and flood conditions will be provided in Section 4 of this document.

3.3.4 Ash Pond E Stability Analysis

Tables 14, 15 and 16 summarize the soil parameters used in the analysis for the end-of-construction and steady state/seismic conditions. Q-test results were used for the construction condition, effective strength parameters from R-test results were used for the steady state condition, and total stress parameters were used for the rapid drawdown conditions. A seismic acceleration equal to 0.09g was used to develop the magnitude of the earthquake force in the analysis.

Table 13 - Ash Pond E Soil Strength Parameters – Construction

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	109	8	1,800	Compacted fill – upstream zone
2	95	19	2,100	Compacted fill – center zone
3	83	22	1,400	Compacted Fill – downstream zone
4	92	15	900	Natural clayey sandy silts
5	100	28	0	Natural partially weathered rock
6	100	20	0	Blanket drain sand

Table 14 - Ash Pond E Soil Strength Parameters – Steady State

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	109	36	0	Compacted fill – upstream zone
2	95	30	400	Compacted fill – center zone
3	88	24	800	Compacted Fill – downstream zone
4	92	27	200	Natural clayey sandy silts
5	100	35	0	Natural partially weathered rock
6	100	28	0	Blanket drain sand

Table 15 - Ash Pond E Soil Strength Parameters – Rapid Drawdown

Soil Stratum	Unit Weight (pcf)	Friction Angle (φ in degrees)	Cohesion (psf)	Description
1	109	14	800	Compacted fill – upstream zone
2	95	13	1,000	Compacted fill – center zone
3	85	8	1,700	Compacted Fill – downstream zone
4	92	14	800	Natural clayey sandy silts
5	100	0	30	Natural partially weathered rock
6	100	22	0	Blanket drain sand

Southern Company provided Georgia Power Drawing No. 10-501 E-00080 Sheet 1 and Drawing No. 10-501 E-80 Sheet 2 depicting the cross sections used for the slope stability analyses. These drawings indicate that slope stability analyses were performed in 1980 at two locations: Sta. 25+00, where soil was excavated as part of foundation preparation to form a cut-off, and Sta. 20+00 which is identified as the maximum section without cut-off. The factors of safety are the minimum values obtained using both the simplified Bishop and Fellenius methods. Figures 11A through 11F present the results of the slope stability analysis and the computed factors of safety are summarized in the following table.

Table 16 - Ash Pond E Safety Factors (Original Design and Updated Analysis)

Load Case	Required Minimum Factor of Safety	Computed Factor of Safety			
		Sta. 20+00		Sta. 25+00	
		Original Design	Updated Analysis	Original Design	Updated Analysis
End of Construction	1.3	1.75	NA	1.82	NA
Steady State Seepage	1.5	1.80	1.75	1.66	1.91
Steady State Seepage with Seismic Loading	1.1[1]	1.20	1.28	1.10	1.40
Submerged Toe with Rapid Drawdown	1.3	NA	NA	NA	NA
Rapid Drawdown (Upstream)	1.3[1]	1.29	1.45	1.5	1.64
Surcharge Pool (Flood Event)	1.4[2]	NP	1.62	NP	1.76

[1] Required Factor of Safety for Seismic and Rapid Drawdown was 1.0 and 1.2, respectively, when dike was designed
[2] Not specified in GA Statute 391-3-8-.09; US Army Corps of Engineers standard for new embankments listed here
NA: Not applicable, NP: Not performed; Unless otherwise noted, load cases shown are for the downstream slope

Based upon the available information Southern Company has provided regarding the stability analyses for the Ash Pond E dike, the original and updated analyses show that the embankment was generally designed with the required factors of safety for the load cases considered at the time the particular analyses were performed.

3.3.5 Instrumentation Data Related to Stability Analysis

CHA understands that the piezometers are read monthly by plant personnel and Southern Company reviews the instrumentation data on a monthly basis. The water level data indicated in these piezometers as it relates to dike stability is discussed in the sections that follow for the corresponding impoundment.

3.3.5.1 Ash Pond C Instrumentation

At Ash Pond C, arrays consisting of three piezometers have been installed across the approximate center of the south dike and approximate center of the west dike as shown on Figure 6B. Recent water level measurements in piezometers PZ-1, PZ-2, and PZ-3 near the highest section through the south dike (Section A-A/Section C) indicated that the phreatic surface has a slightly different shape than the design surface shown for the original stability cross section depicted in Figure 9C. This revised surface, shown in Figure 9M, was established with data taken after the November site assessment and used in the updated analyses. Instrumentation data is not available for comparison with the design phreatic surfaces at Sections A and B which are located on the west end of the south dike and at the south end of the east dike.

3.3.5.2 Ash Pond D Instrumentation

Sixteen open-stand-pipe piezometers have been installed along the Ash Pond D southwest dike. In general, they indicate a water level that maintains about a 1 to 3 foot fluctuation across the dike over the 12-year period. Exceptions were noted in piezometers DPZF1 and DPZL1, located near the northern extremity of the dike, where a 3 to 5 foot upward trend was recorded over the last 2 years, and in piezometer DPZS1, located near the center of the dike near the maximum dike section height, where periodic fluctuations on the order of 5 to 6 feet have been observed on roughly a yearly basis. Recent data appears to suggest a partial decrease in the phreatic surface level assumed for the design between the crest and the approximate location of the blanket drain below the downstream face. However, because the available data is actually offset from the maximum cross section, the phreatic surface also appears to be above the slope surface below the bottom third of the dike section where data from piezometers DPZI1, DPZS1, and DPZB1 has been plotted (Figure 10C). Since these piezometers were closest to the maximum cross section, the phreatic surface they indicated was projected to the maximum dike cross section Southern Company analyzed in the aforementioned updated stability study for Pond D. Barring additional information along the maximum section that would indicate otherwise, this is likely a conservative assumption because it would indicate a less functional blanket drain that does not pull the phreatic surface down to the elevation of the drain.

3.3.5.3 Ash Pond E Instrumentation

Fifteen open-stand-pipe piezometers have been installed to monitor the water level within and downstream of the Ash Pond E west dike. Piezometers EPZ2 through EPZ5 and EPZ8 were installed across the dike at approximately Sta. 24+00 (Sta. 20+75 per the wave wall drawings), the section analyzed in the original design and updated stability study. A review of this data indicates that the phreatic surface decreases through the downstream slope of the dike from about El. 384 near the crest to about El. 366 near the toe. Piezometers EPZ3 and EPZ4 were set in the embankment fill and at the elevation of the sand drain to measure the effectiveness of the sand drain pore pressure dissipation through the dike, while piezometers EPZ2, EPZ5, EPZ8 were set below the dike in the bedrock and residual soil to measure the behavior of the water pressure in the foundation material. Piezometers set in the embankment indicate water levels below the phreatic surface used in the original design and the updated analysis, suggesting that the sand drain is working as desired and that the design is conservative with respect to the assumed ground water levels. Piezometers in the foundation materials indicate that the pore pressures are also dissipating as water traverses beneath the dike, another desirable sign of effective embankment performance and overall stability. Figure 11G shows the assumed phreatic surface used in the original design and updated analysis, along with the recent phreatic surfaces measured in piezometers EPZ2 through EPZ5.

3.4 Foundation Conditions

Limited design documentation has been provided for Ash Pond B. Information regarding the geotechnical conditions encountered in the dike foundations, pertinent foundation preparation requirements, and construction specifications was provided for Ash Pond C, D, and E as discussed in the sections that follow.

3.4.1 Ash Pond C Foundation Conditions and Construction

Construction drawings for Ash Pond C indicate that fill for the downstream side of the south dike was placed above "existing fill" adjacent to Lake Sinclair. Based upon site development information obtained via communications with Southern Company personnel, this existing fill was similar in origin to that of Pond B, which consisted of boulders, gravel, construction debris and soil overburden spoil from excavations made on the facility property. This was confirmed with soil borings that encountered large boulders and gravel encountered during drilling in this material, leading to higher shear strengths being assigned to this material when the updated stability analysis was performed. Other borings advanced along the centerline of the east and west dikes generally indicated medium stiff to very stiff residual soil consisting of clay, clayey silt, and sandy silt in the foundation. An exception was noted in the foundation material encountered in the south east corner of the dike, where a roughly 4-foot thick layer of very loose silt and associated groundwater was encountered below approximately 6 feet of stiff clayey silt. The construction drawings indicate removal of at least 12 inches of material or removal of "all unsuitable foundation material" within the footprint of the three dikes prior to fill placement. It is unclear whether this loose, wet silt was removed during construction.

3.4.2 Ash Pond D Foundation Conditions and Construction

A boring location plan was provided for Ash Pond D showing the location of 21 borings within the footprint of the dike and 17 borings within the pond area. In the dike foundation, the borings encountered granular and cohesive residuum comprising medium compact silty and clayey sand, very stiff to hard silt and clayey silt, and stiff high plasticity clay. Partially weathered bedrock was encountered in the borings below this residual soil. Soil identified as alluvium was also encountered above these residual materials in a localized valley area along the dike footprint where the maximum dike section is located. This alluvium included granular soil such as silty and clayey sand, and cohesive soils such as high plasticity clay, silty clay, and silt. Field testing in this alluvium indicated generally medium compact to compact conditions in the granular soils and stiff to hard consistencies in the cohesive soils component. Isolated areas of the alluvium were, however, very loose to loose or soft, and deemed unsuitable for the dike foundation. Construction drawings for Ash Pond D indicate that the natural alluvium was to be removed to approximately El. 338 between Sta. 10+20 and Sta. 11+90, which corresponds to the low area of the valley.

3.4.3 Ash Pond E Foundation Conditions and Construction

Subsurface profile information below the Ash Pond E dike indicates that subsurface conditions generally consisted of sandy silty clay overlying sand overlying partially weathered rock. The sandy silty clay was soft within the low point in the valley. Construction drawings for Ash Pond E indicate that soft foundation material was to be removed between Sta. 20+20 to Sta. 30+10 which corresponds to the natural low point in the valley prior to construction. The drawing also indicates construction of a cut-off trench extending to "hard rock" at the south abutment.

3.5 Operations & Maintenance

CHA has not been provided with a copy of an Operation, Maintenance, and Inspection (OM&I) Manual or Emergency Action Plan (EAP) for Plant Branch. Based on conversations during our site visit, we understand that Plant personnel visually inspect the dikes daily, weekly, and monthly and quarterly reports are generated from water quality, piezometric levels, volumetric flows, and engineering inspections where applicable.

3.5.1 Inspections by Georgia Department of Natural Resources

Georgia Power provided copies of the Georgia Department of Natural Resources annual inspection reports for the period between 1992 and 2008. Ash Ponds B and D are classified as "Category II" dams by the Georgia DNR; therefore these dikes are not inspected by the state. The following recommendations regarding Ash Pond E were contained in the 2008 report:

- Clean out sediment that has collected in the concrete drainage channels.
- Continue to mark and monitor the wet areas at the toe.
- Vegetation on the fabriform upstream slope protection should be periodically removed.
- Standing water was observed on the upstream side of the wave wall. Drainage should be provided through the wall to reduce the potential for water seepage through the crest.
- Additional grass is needed on the downstream slope near the crest.

Georgia Power has indicated all of the action items the Georgia Department of Natural Resources recommended have been completed.

3.5.2 Inspections by Southern Company

Quarterly inspection of the dikes at Ash Ponds B, C, D, and E are part of a comprehensive dam safety program run by Southern Company Generation Hydro Services (letter to EPA March 25, 2009). CHA was provided with copies of quarterly inspection reports generated for the period between the first quarter of 2006 and fourth quarter of 2009. Reports were not generated for every quarterly inspection within the period. In the cases where reports were not available, inspections were conducted and the results communicated to appropriate personnel within Southern Company Generation Hydro Services/Georgia Power, but a final report not generated.

The report for the second quarter of 2009 describes sloughs that occurred on the Ash Pond C dike on March 30, 2009 and April 5, 2009 similar to previous surface sloughs that have occurred since construction in 1970. It was concluded that the sloughs were surface features that did not present an immediate danger to the stability of the dike. After the disturbed soil was removed, a filter fabric was placed on the exposed surface and the void was filled with about 6 inches of gravel and 1 to 2 feet of larger surge stone or rip rap.

The report for the second quarter of 2009 also recommended removal of excess material (i.e. rocks, debris, etc.) near the top of the downstream slope at Ash Pond B. The purpose of the recommendation was to reduce the occasionally over-steepened upper portion of the downstream dike slope and to restore these areas as much as possible to the original slope. The third quarter report for 2009 indicated that this work had been completed.

The following recommendations were made in the inspection report for the fourth quarter of 2009 following their site visit on October 27, 2009:

- At Ash Pond C, “wash-outs from heavy rains have occurred around several drains on the upstream crest and slope. These should be repaired.”
- At Ash Pond D, soil and debris that has washed into the low point of the concrete ditch adjacent to seepage drain DSD3 should be cleared.
- Continue monitoring of small seepage areas adjacent to RW-1 as a precaution.

In the inspection report for the fourth quarter of 2009, Southern Company indicated that the instrument measurements have continued to track within historical limits and indicating acceptable performance of the embankments and various surveillance systems. All piezometers are read by plant personnel at least monthly.

3.5.3 Inspections by Engineering Consultants

Southern Company did not provide inspection reports prepared by outside engineering consultants. No outside engineering consultants have been used for the dam safety and inspection work at this facility.

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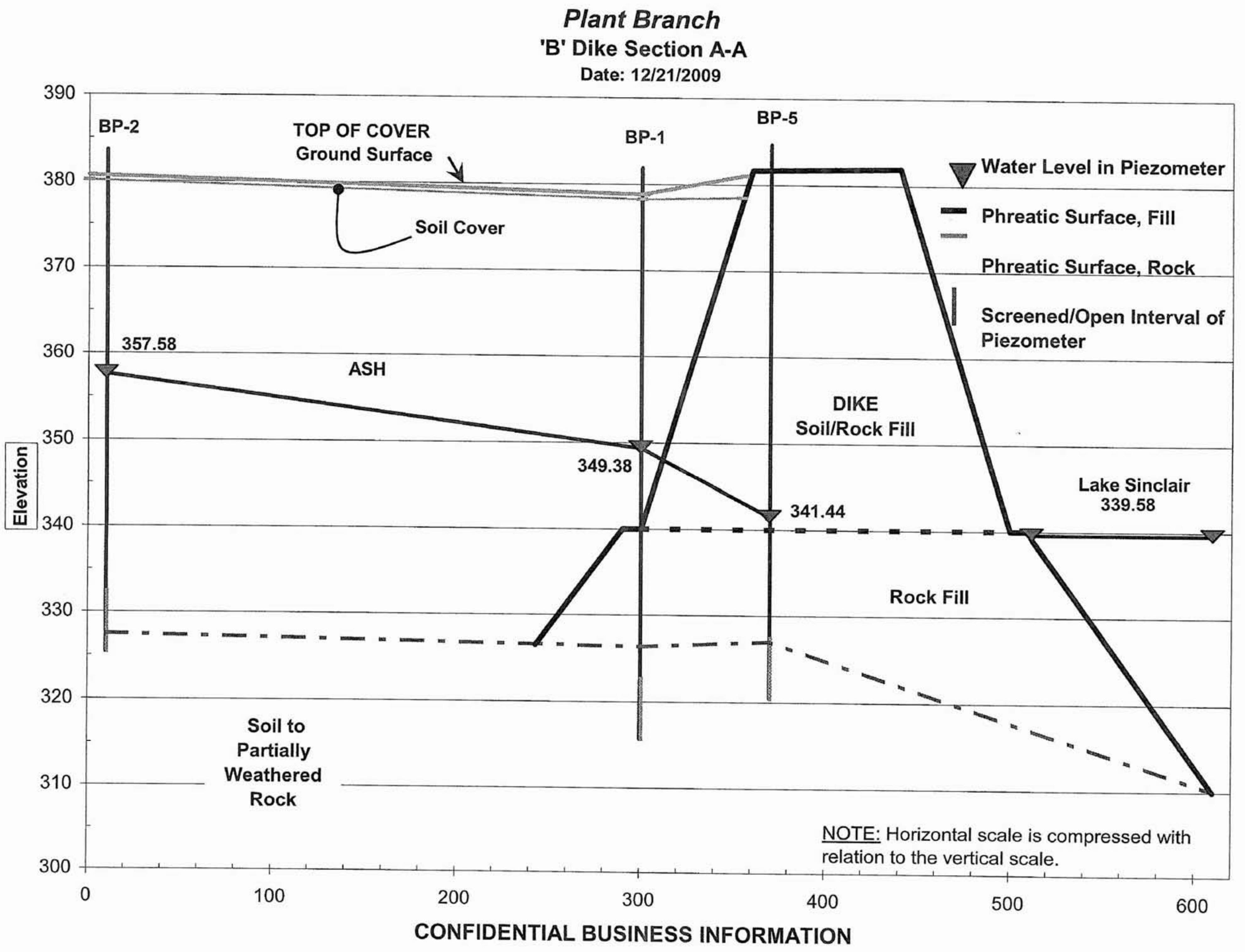

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ASH POND B SOIL AND GROUNDWATER
PROFILE – SECTION A–A
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

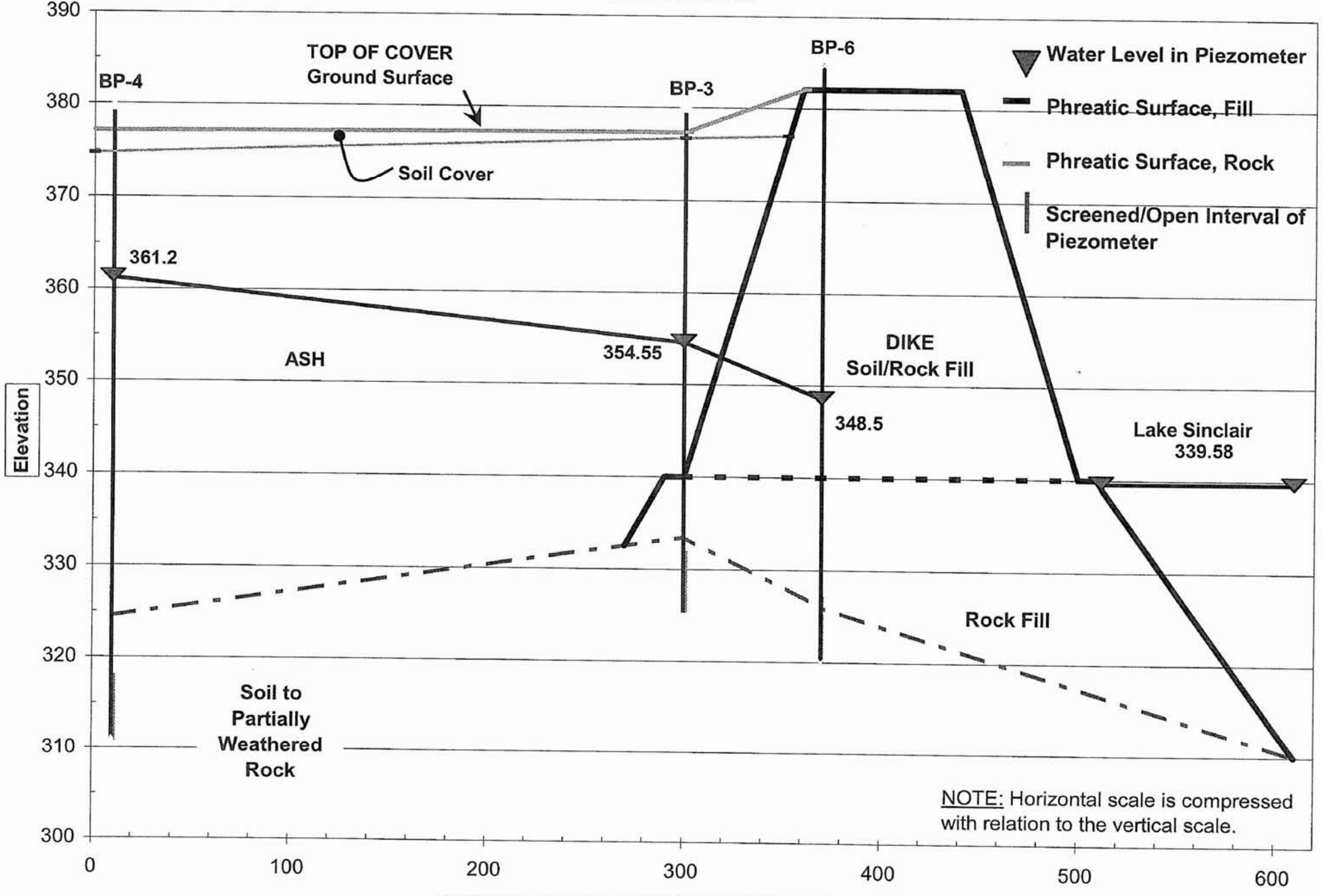
PROJECT NO.
20085.2060
DATE: 03/2010
FIGURE 9A

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_7-9E.DWG Saved: 3/10/2010 12:40:58 PM PLotted: 3/29/2010 1:54:27 PM User: Gray, Timmolyn

Plant Branch

'B' Dike Section B-B

Date: 12/21/2009



CONFIDENTIAL BUSINESS INFORMATION

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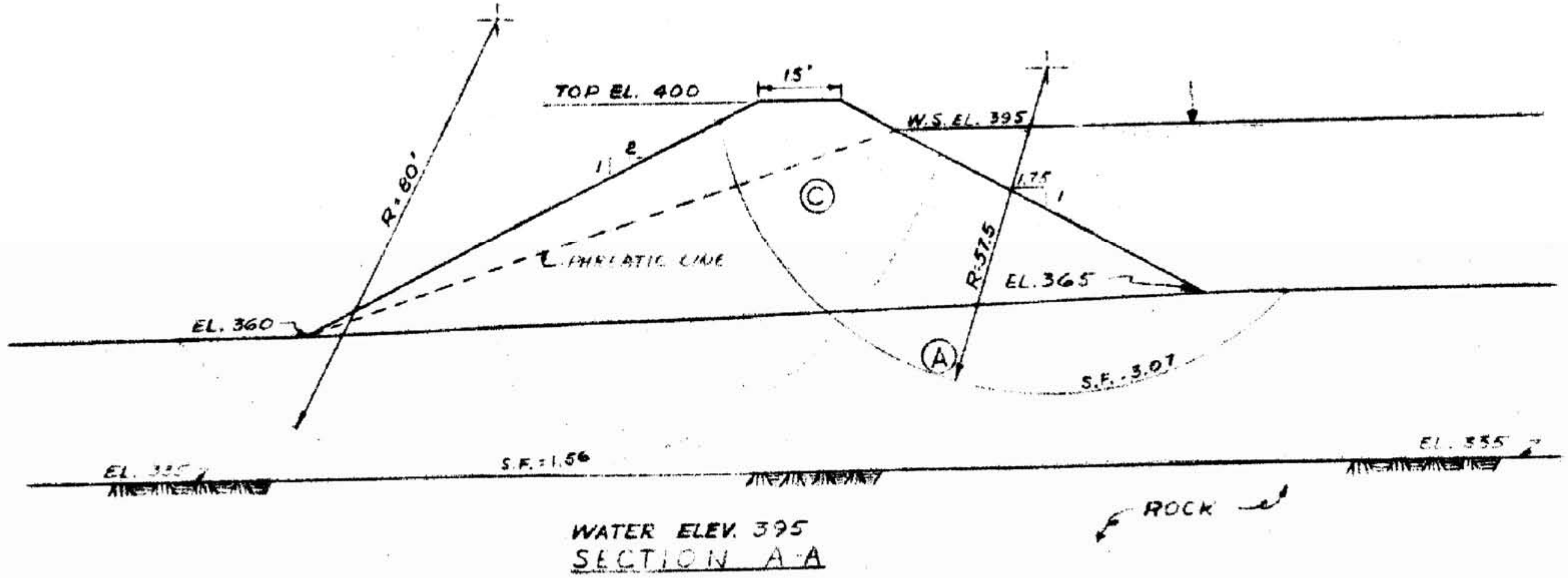
ASH POND B SOIL AND GROUNDWATER
PROFILE – SECITON B–B

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

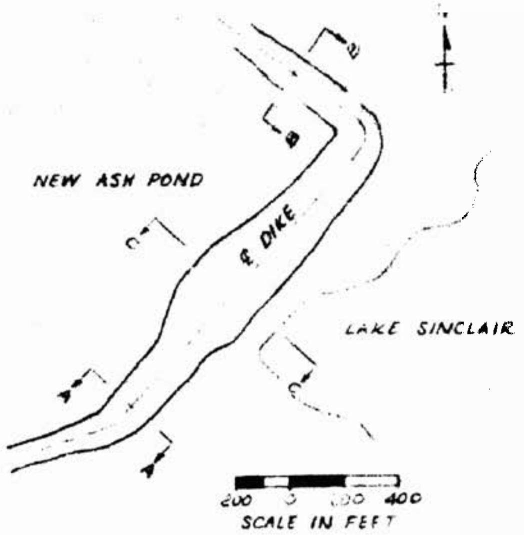
PROJECT NO.
20085.2060

DATE: 03/2010

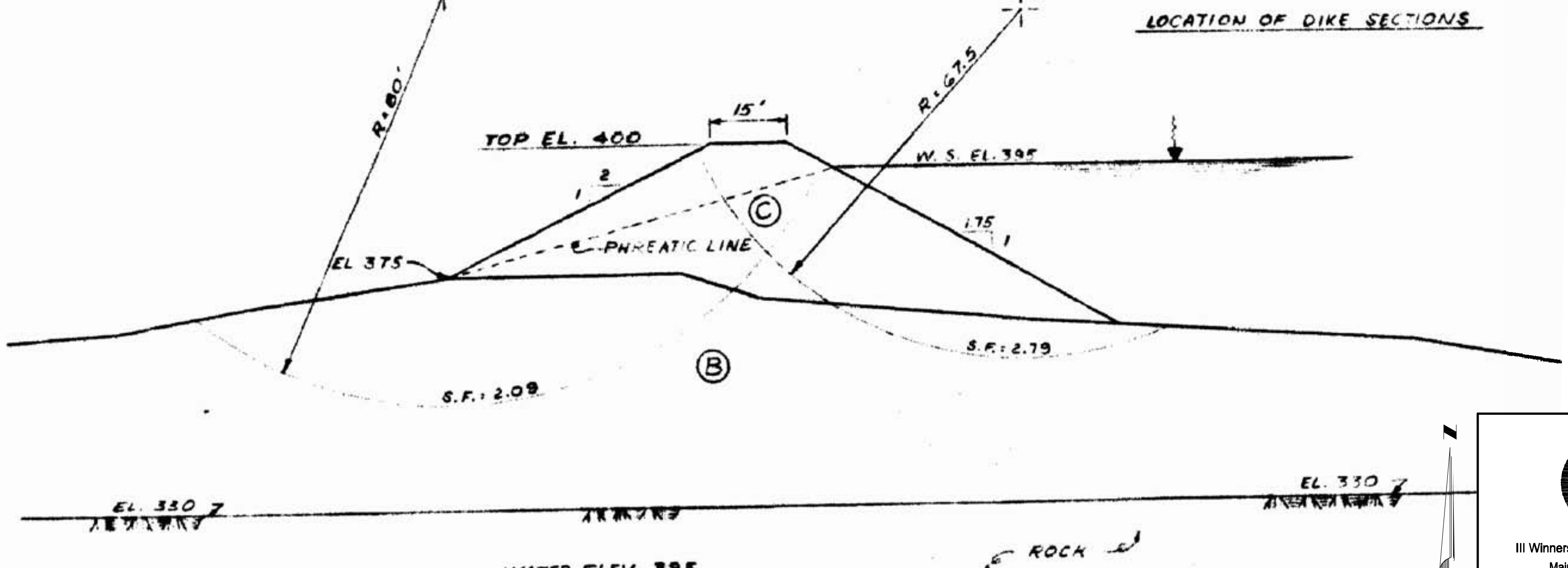
FIGURE 9B



WATER ELEV. 395
SECTION A-A



LOCATION OF DIKE SECTIONS



WATER ELEV. 395
SECTION B-B

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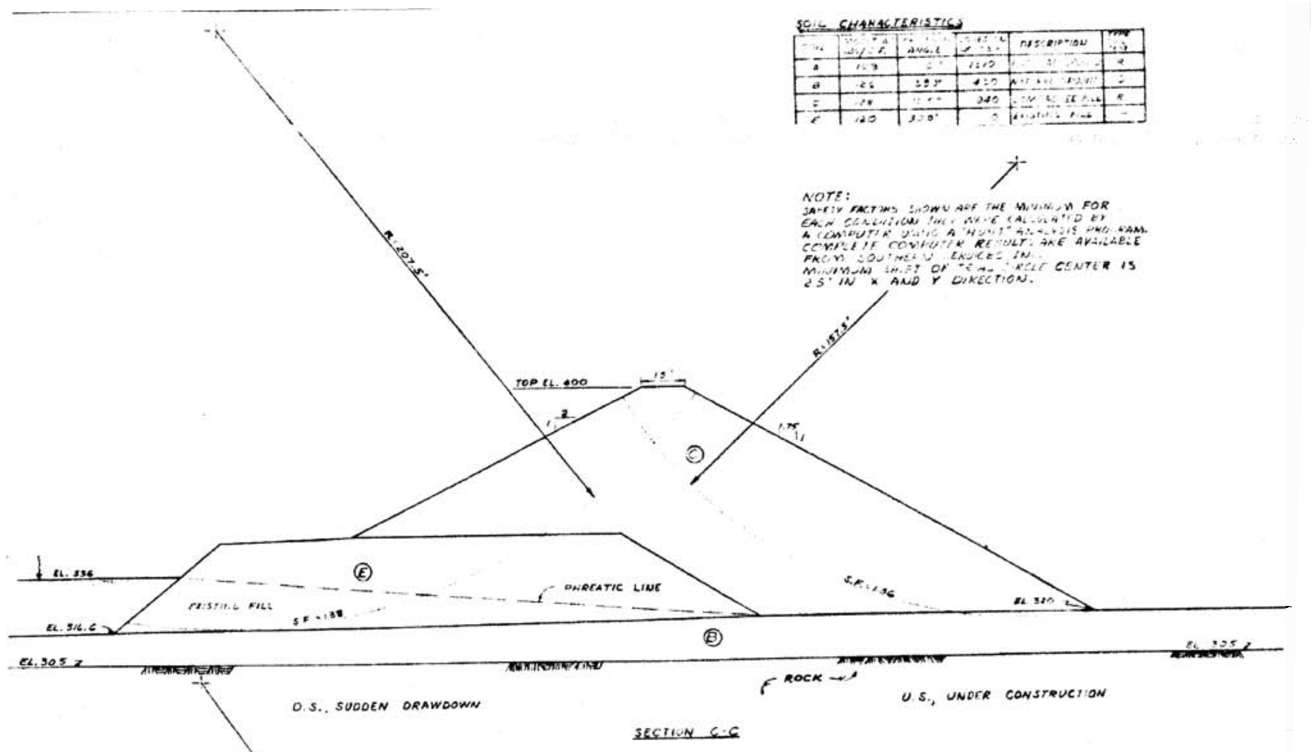
ASH POND C ORIGINAL STABILITY
ANALYSIS – PART 1 SECTION A AND B
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 9C

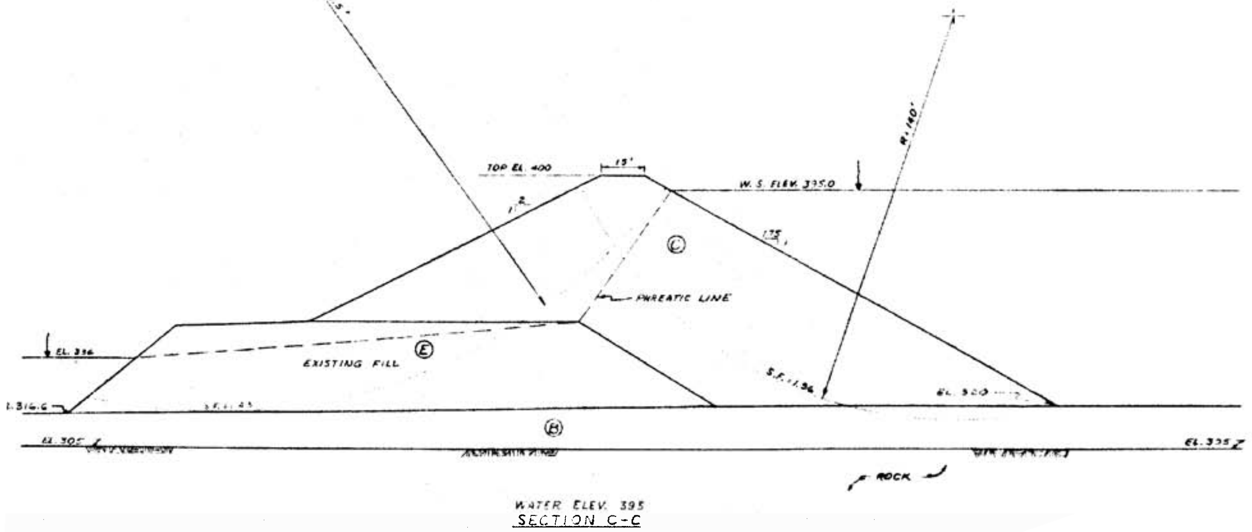
File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_7-9E.DWG Saved: 3/10/2010 12:40:58 PM PLotted: 3/29/2010 1:55:10 PM User: Gray, Timmolyn



[illegible]	[illegible]	[illegible] ANGLE	[illegible]	DESCRIPTION	[illegible]
A	129	[illegible]	1210	[illegible]	R
B	126	39.5°	410	NATURAL GROUND	[illegible]
C	128	[illegible]	340	COMPACTED FILL	R
E	120	32.0°	0	EXISTING FILL	[illegible]

NOTE:
SAFETY FACTORS SHOWN ARE THE MINIMUM FOR EACH CONDITION THEY WERE CALCULATED BY A COMPUTER USING A "HUNT" ANALYSIS PROGRAM. COMPLETE COMPUTER RESULTS ARE AVAILABLE FROM SOUTHERN SERVICES INC.
MINIMUM SHIFT OF TRIAL CIRCLE CENTER IS 25' IN X AND Y DIRECTION.

END OF CONSTRUCTION



STEADY STATE SEEPAGE

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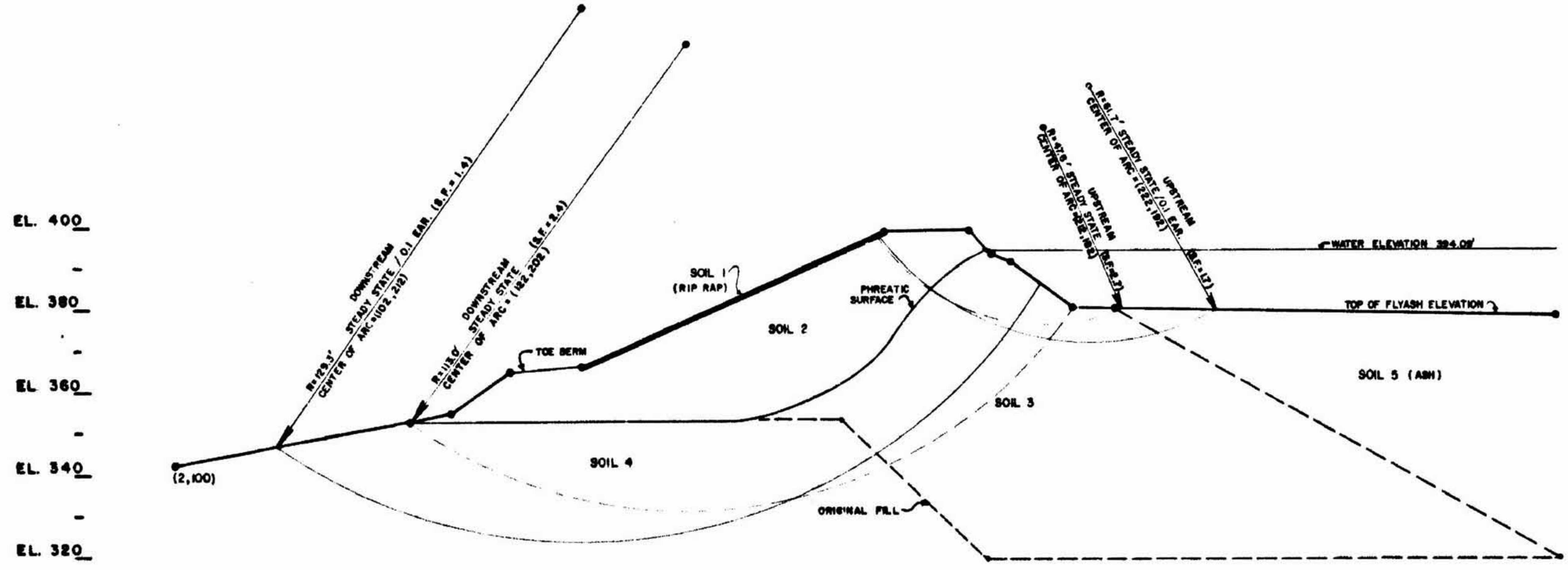
ASH POND C ORIGINAL STABILITY
ANALYSIS – PART 1 SECTION C

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 9D



SOIL PARAMETERS			
	DENSITY	COHESION	PHI ANGLE
SOIL 1	140	0	40
SOIL 2	120	200	34
SOIL 3	119	0	35
SOIL 4	117	0	35
SOIL 5	90	0	33

SECTION A-A

SOUTH EARTH EMBANKMENT

SCALE 1"=20'

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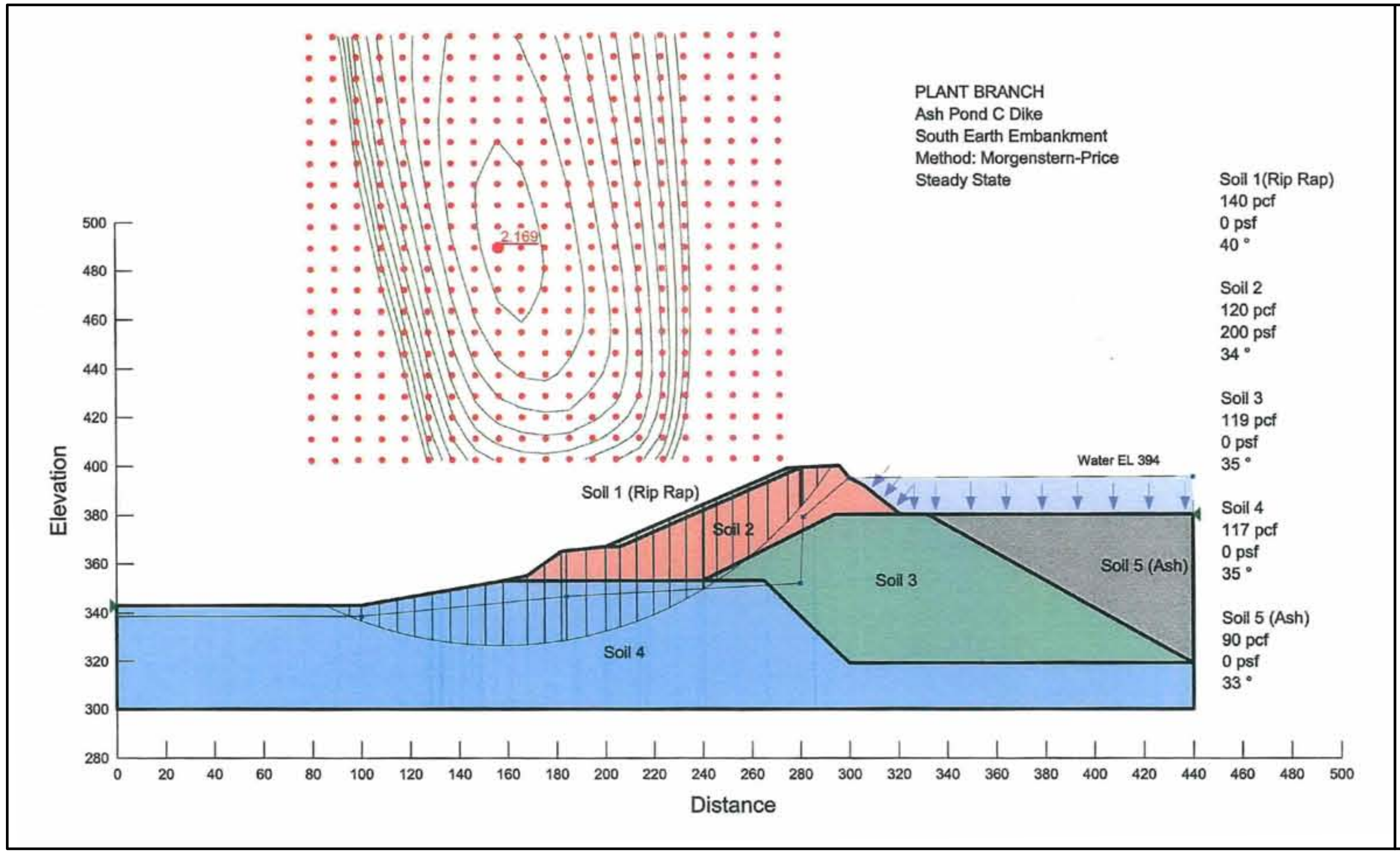
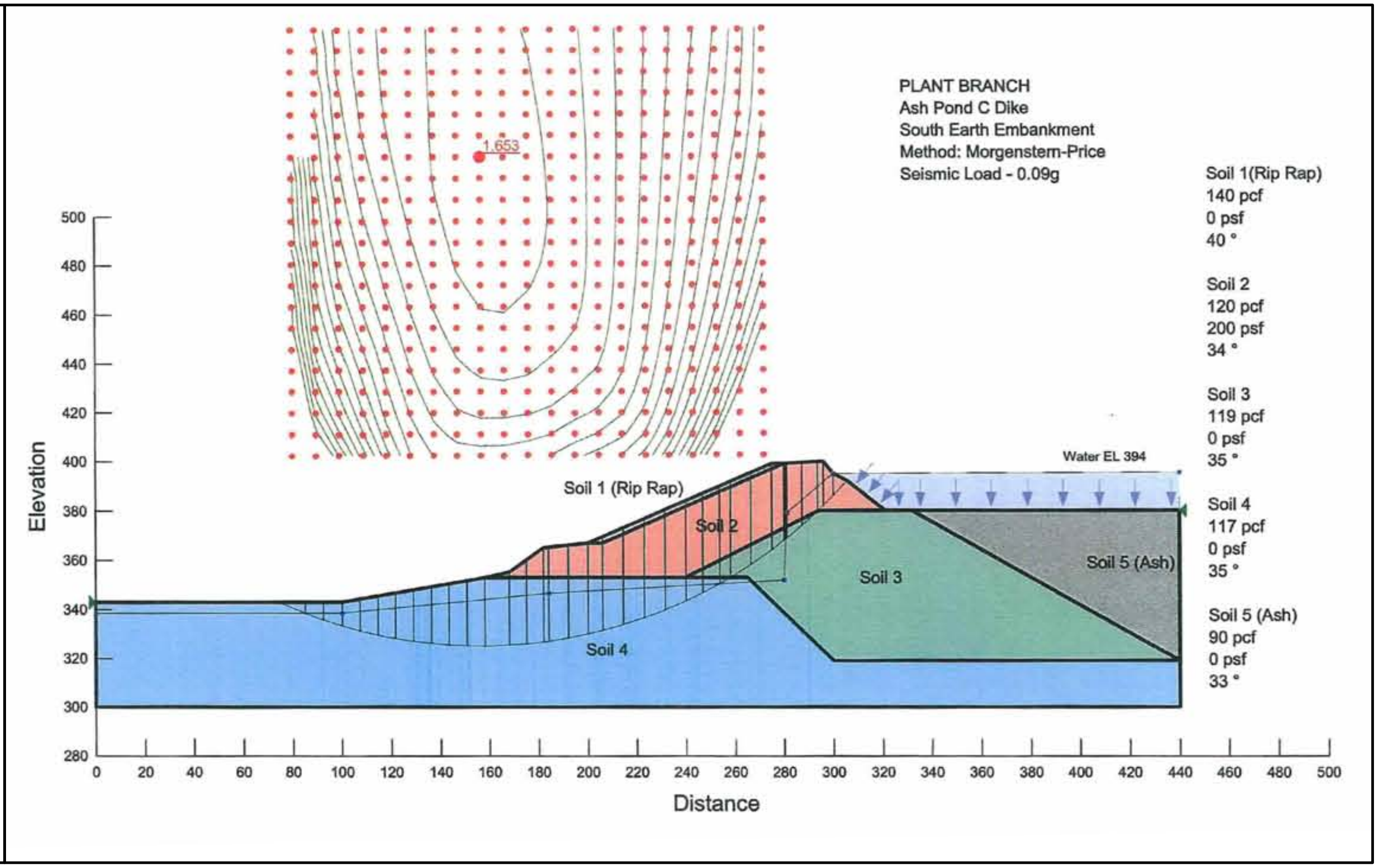
ASH POND C ORIGINAL STABILITY
ANALYSIS – PART 2 SECTION A–A
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060
DATE: 03/2010
FIGURE 9E

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH–FIGURES_7–9E.DWG Saved: 3/10/2010 12:40:58 PM PLotted: 3/29/2010 1:55:42 PM User: Gray, Timmolyn

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM Plotted: 3/29/2010 1:56:39 PM User: Gray, Timmolyn





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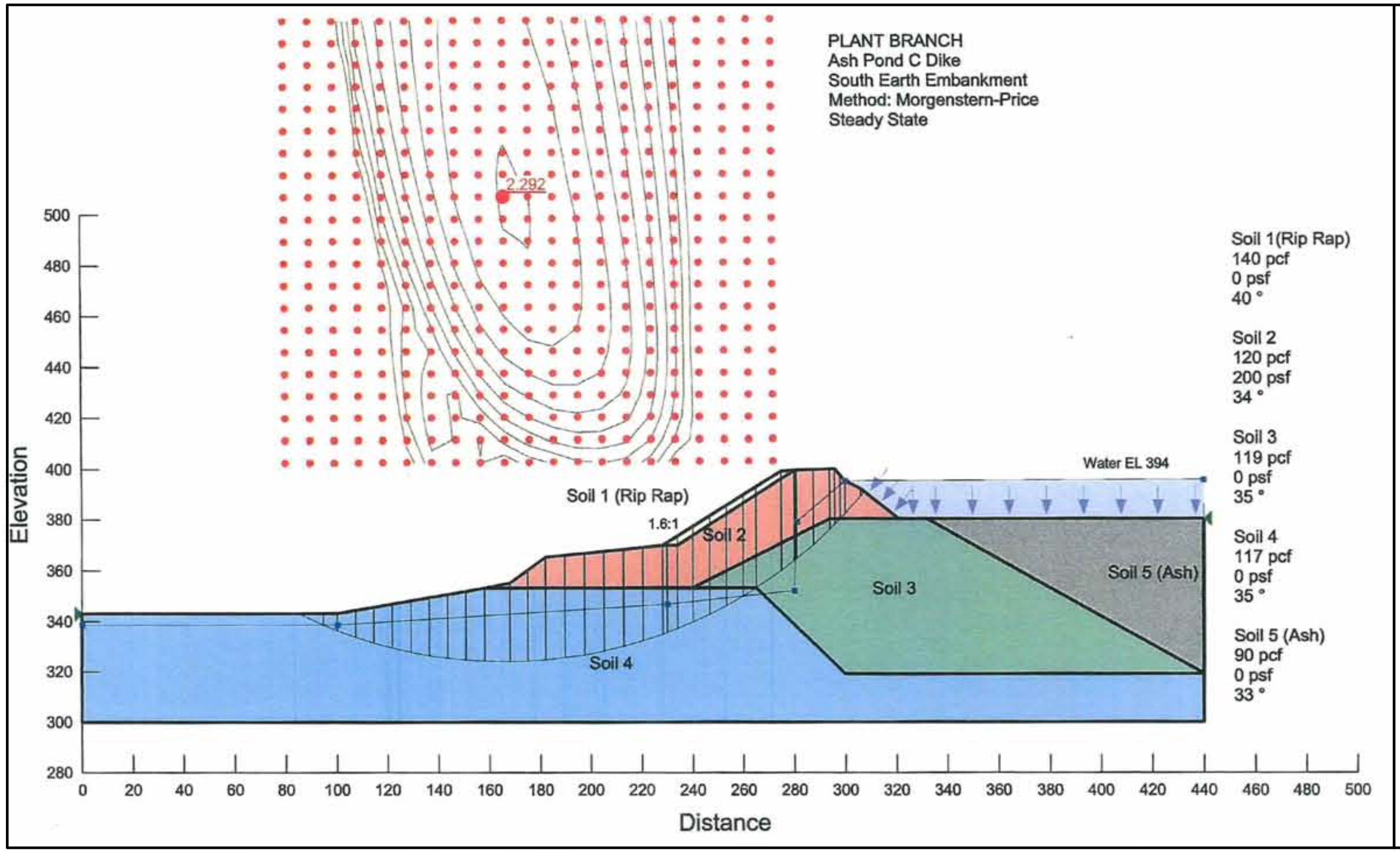
ASH POND C 2009 ANALYSIS SECTION
A-A STEADY STATE & SEISMIC
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

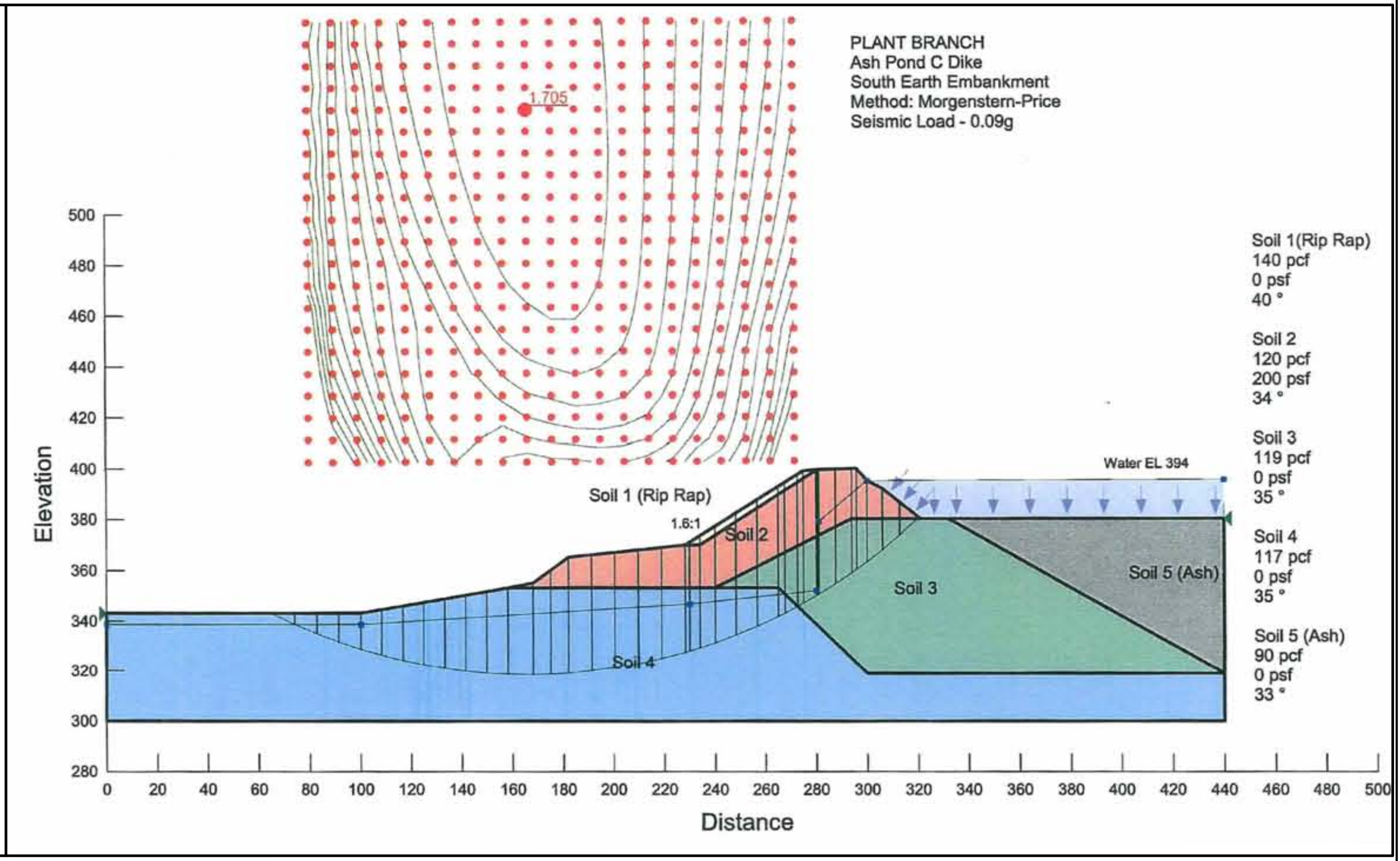
PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 9F



1.6:1 SECTION - STEADY STATE



1.6:1 SECTION - SEISMIC

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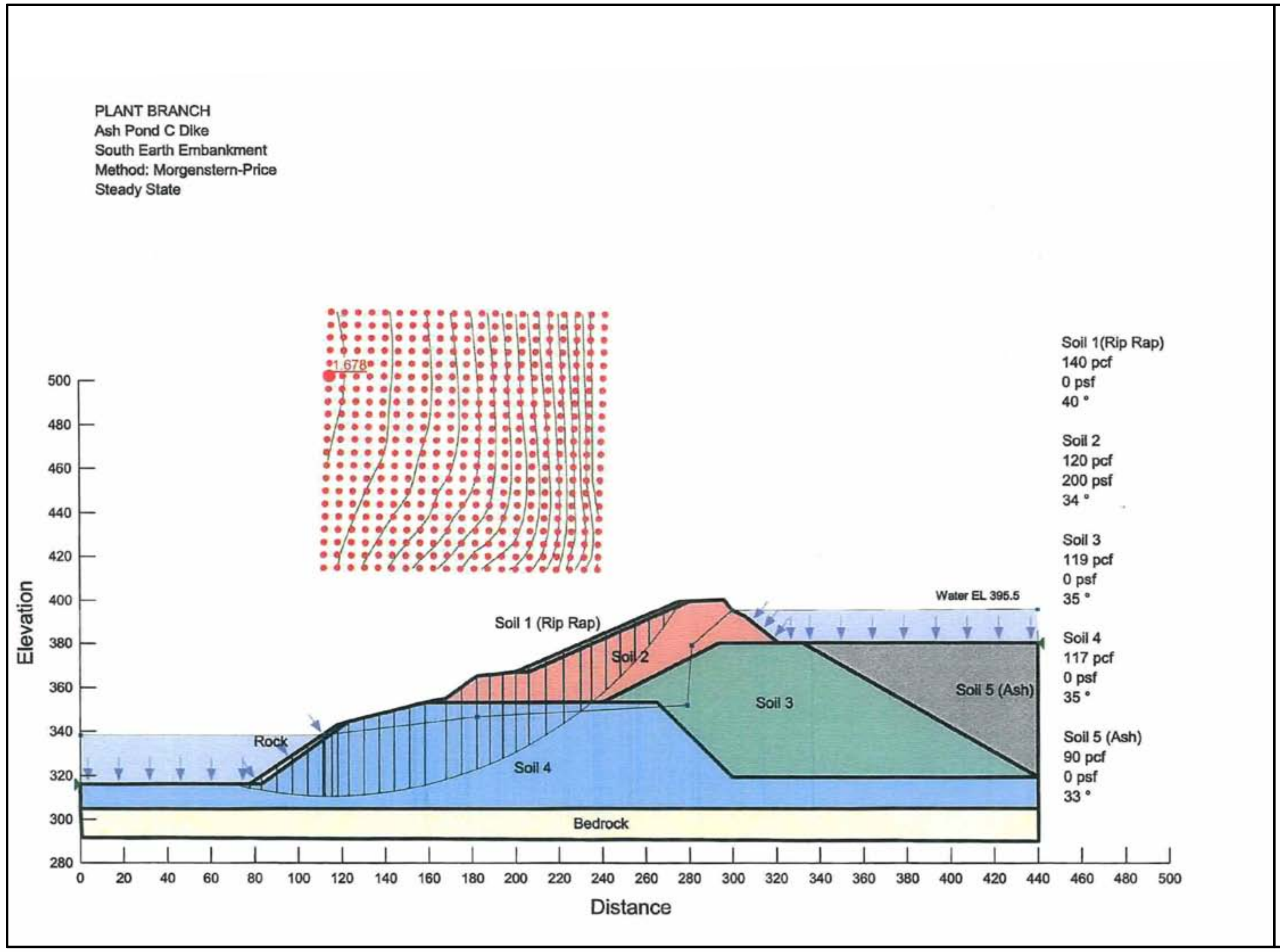
ASH POND C 2009 ANALYSIS 1.6 TO SECTION 1
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

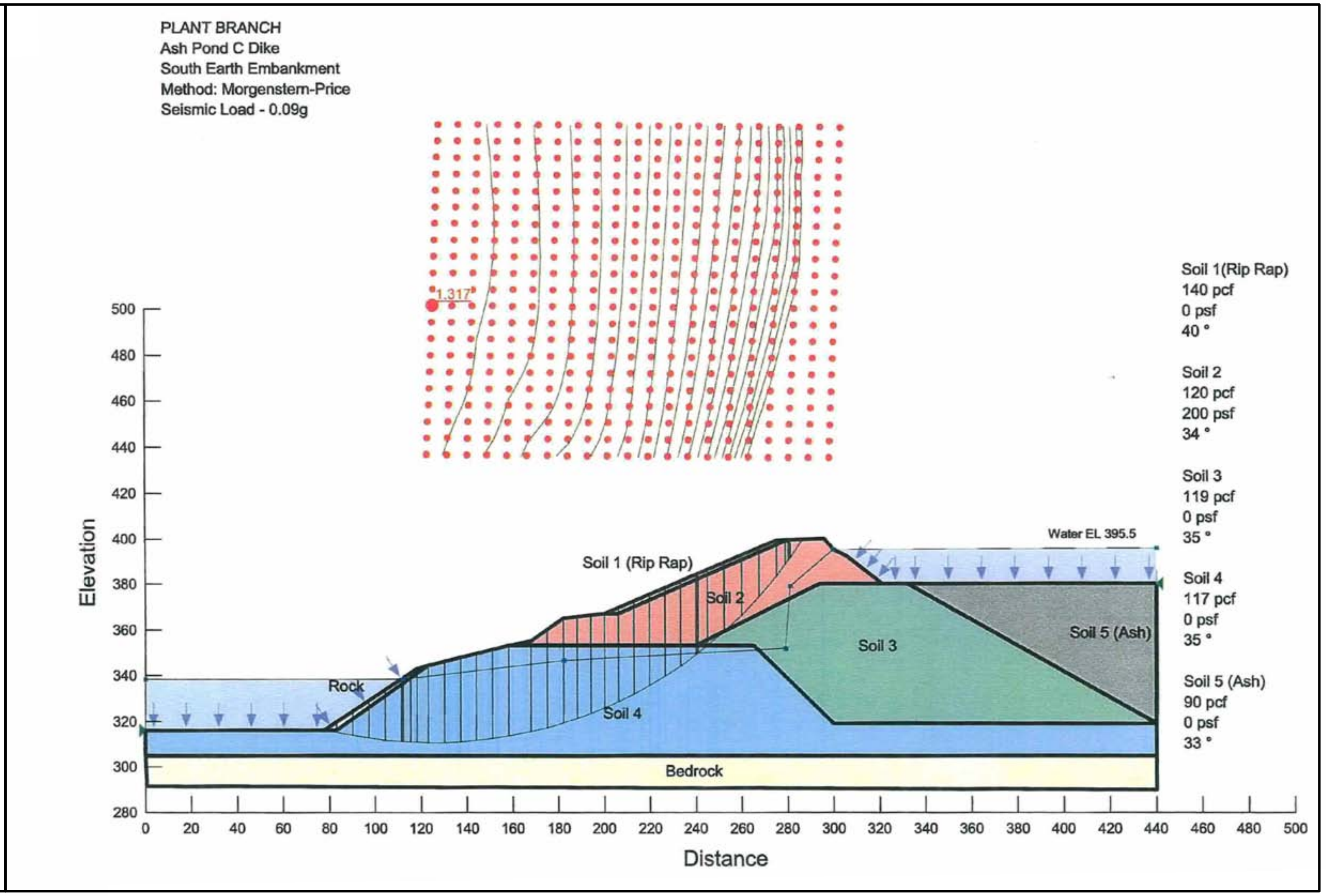
PROJECT NO.
20085.2060
DATE: 03/2010
FIGURE 9G

1.6:1 SECTION - STEADY STATE



REVISED SECTION A-A - STEADY STATE

1.6:1 SECTION - SEISMIC



REVISED SECTION A-A - SEISMIC

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ASH POND C 2009 ANALYSIS – REVISED
SECTION A–A

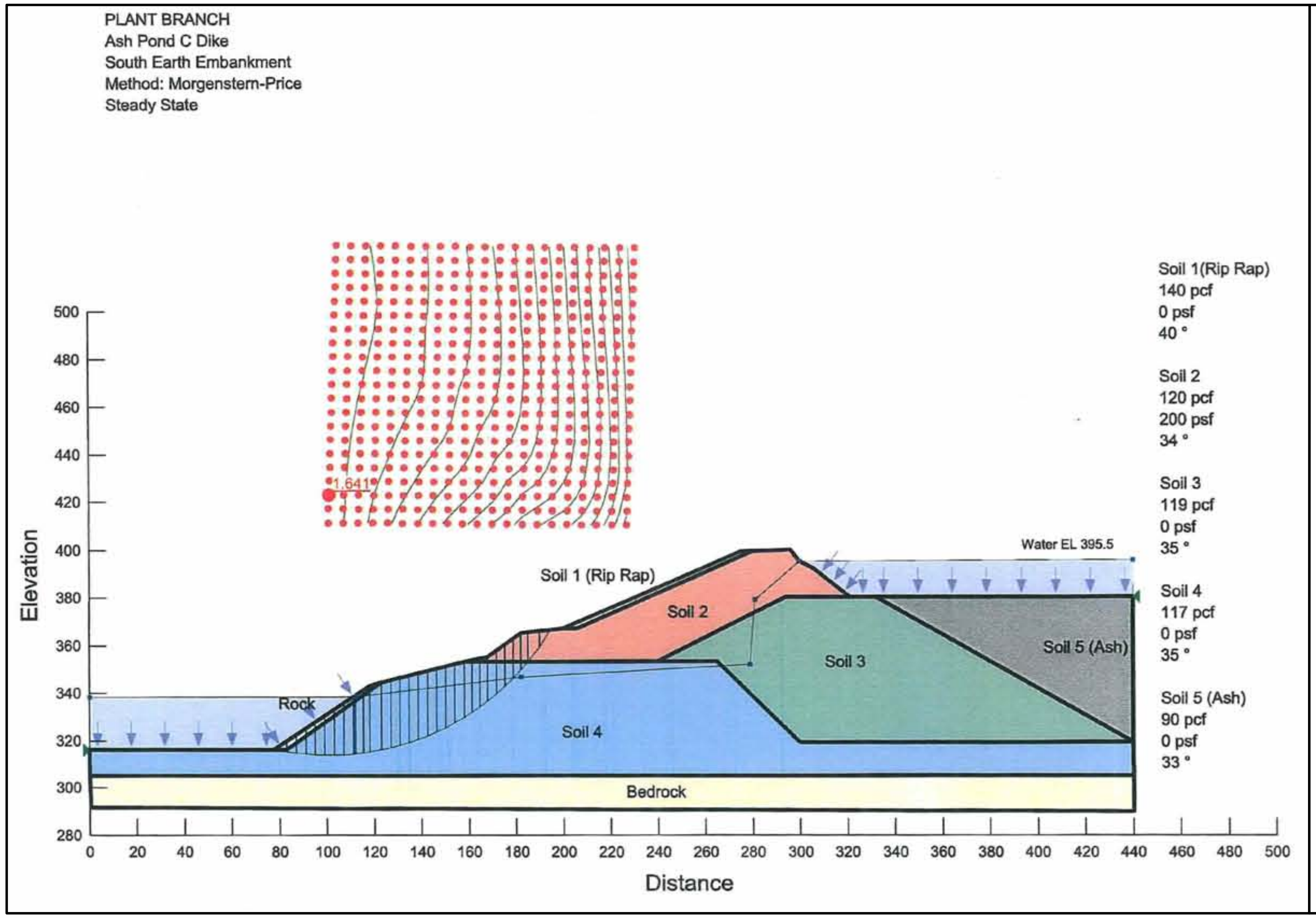
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

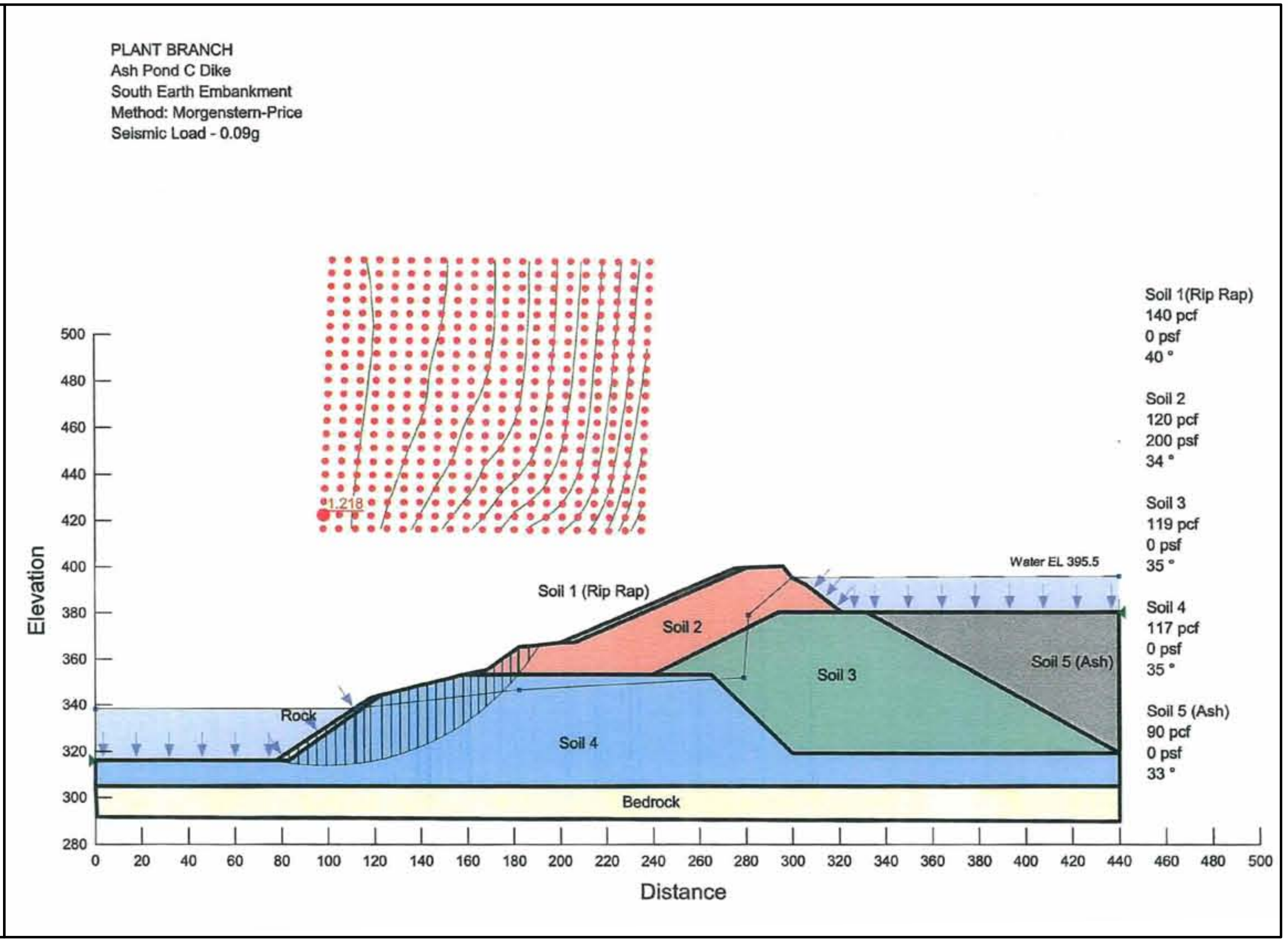
DATE: 03/2010

FIGURE 9H

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM Plotted: 3/29/2010 1:58:57 PM User: Gray, Timmolyn



DOWNSTREAM TOE - STEADY STATE



DOWNSTREAM TOE - SEISMIC

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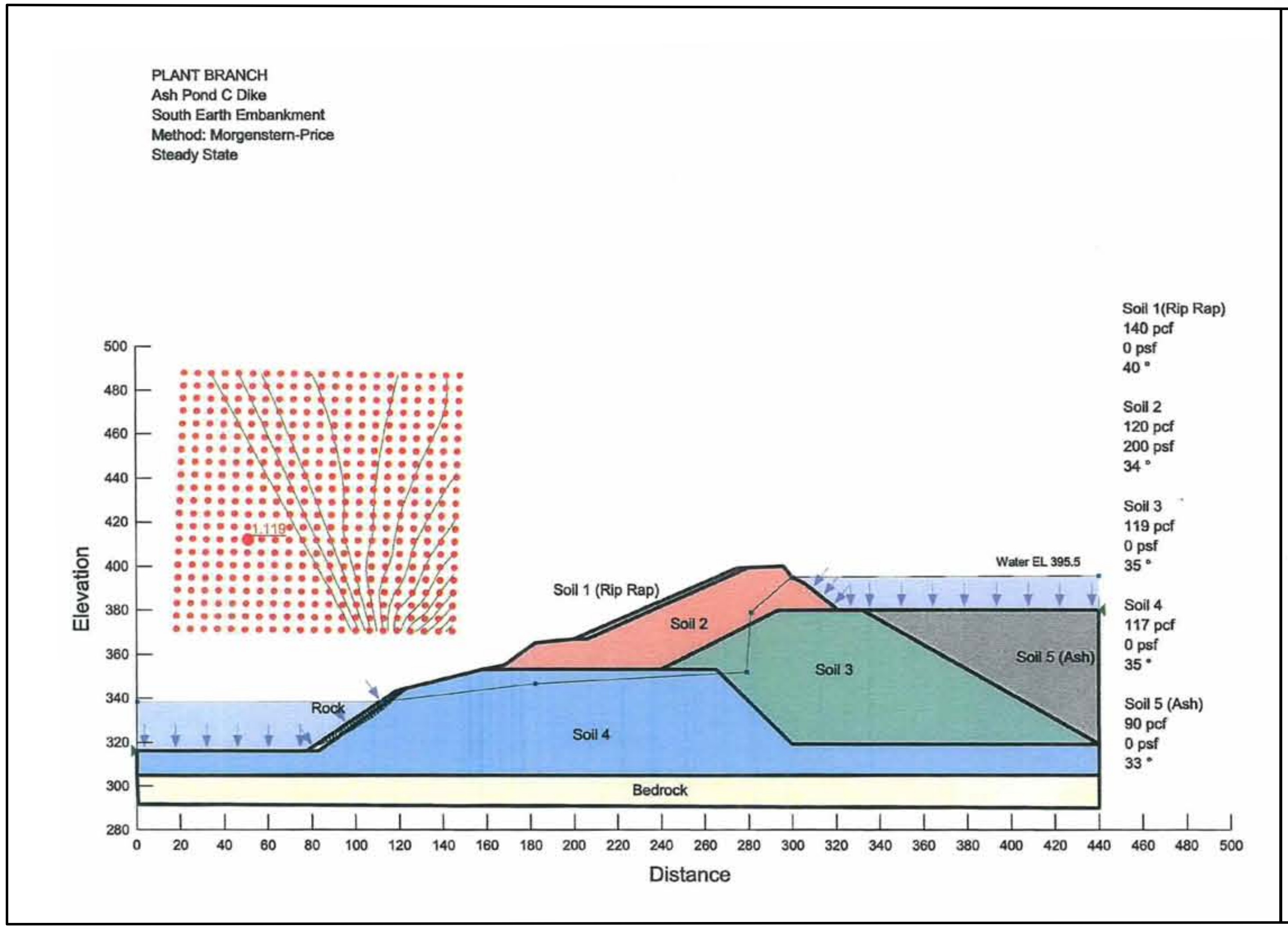
ASH POND C 2009 ANALYSIS – REVISED
SECTION A–A

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

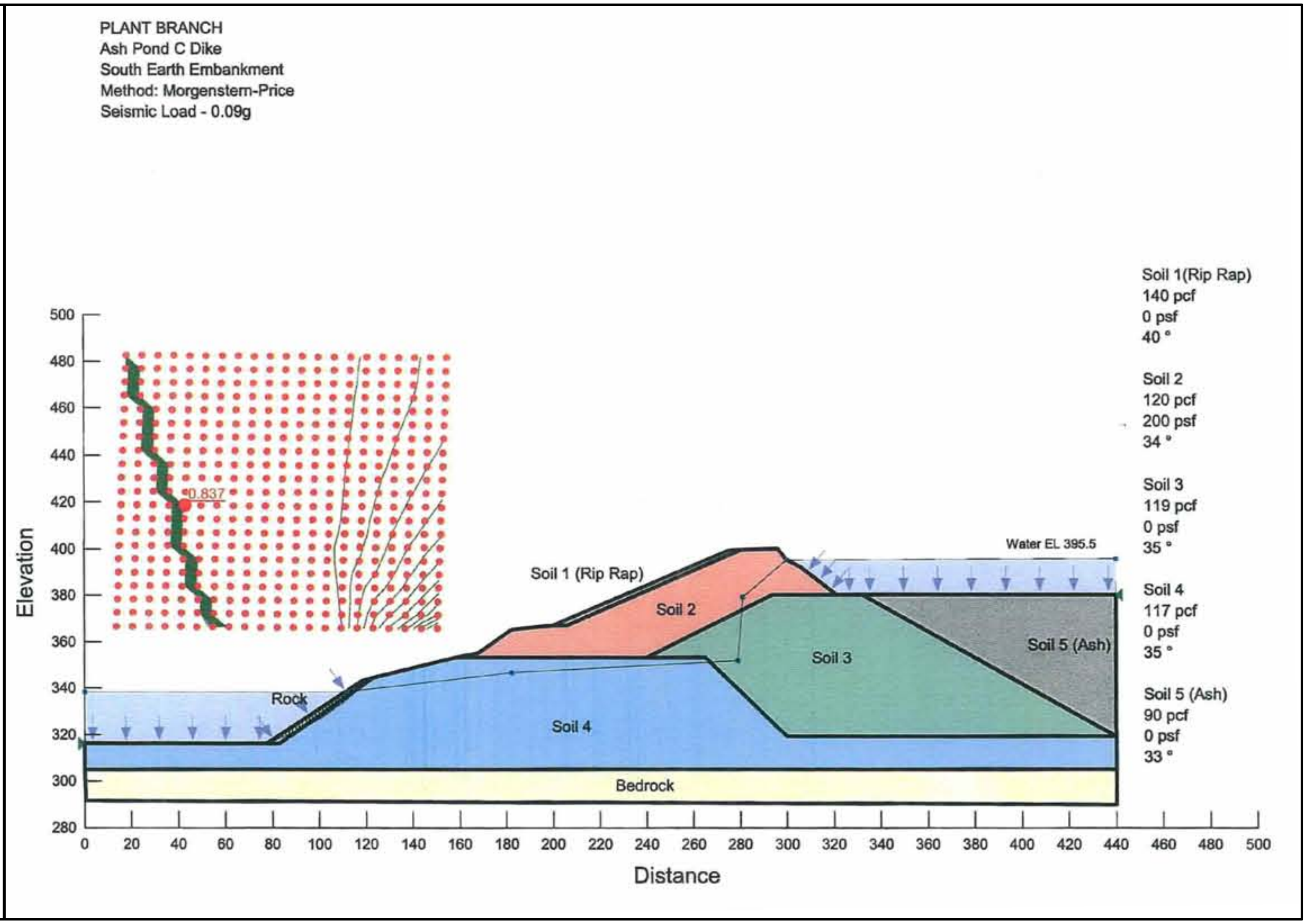
PROJECT NO. 20085.2060

DATE: 03/2010

FIGURE 9I



LAKE SINCLAIR BANK - STEADY STATE



LAKE SINCLAIR BANK - SEISMIC

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ASH POND C 2009 ANALYSIS – REVISED
SECTION A–A

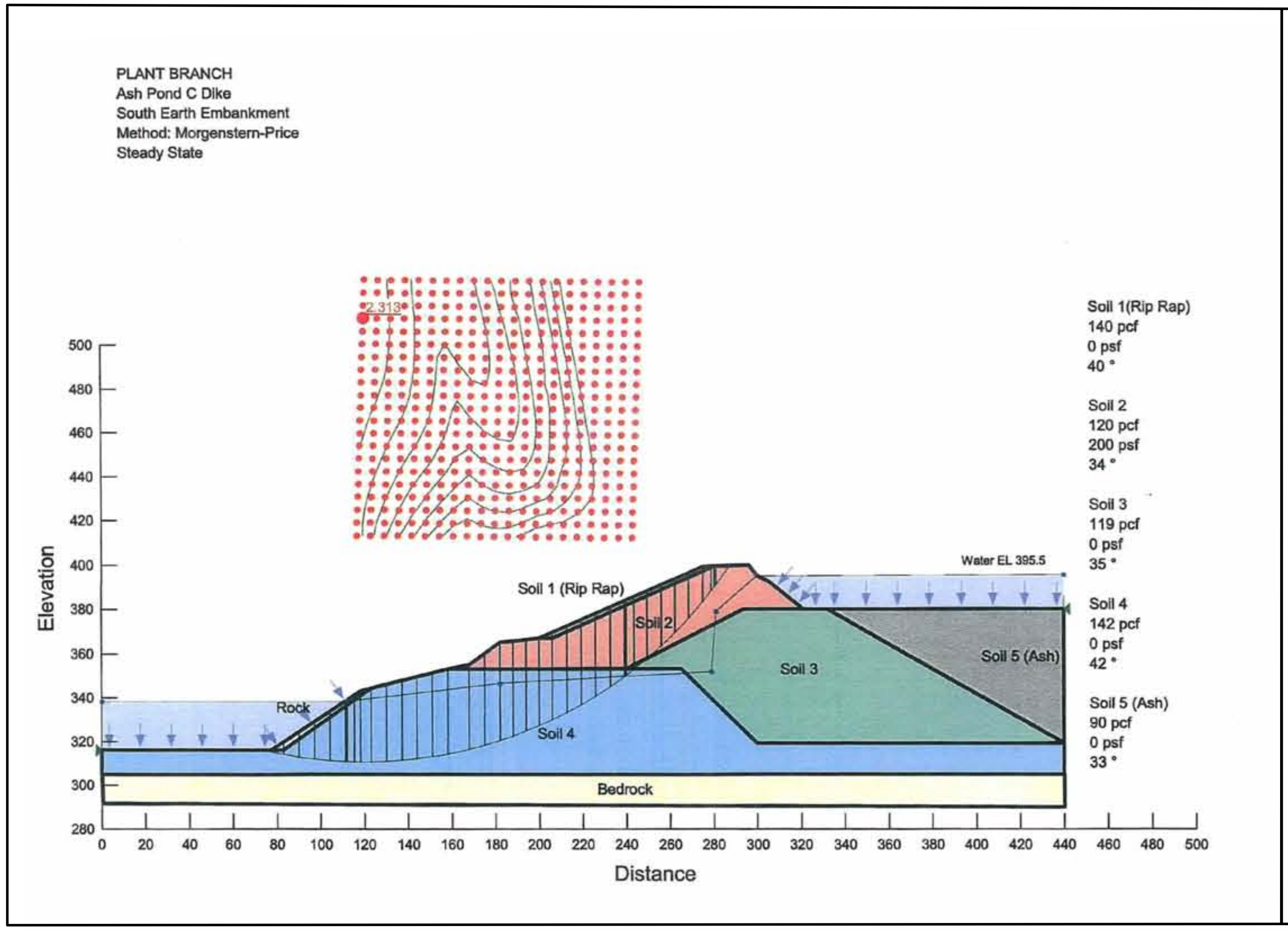
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

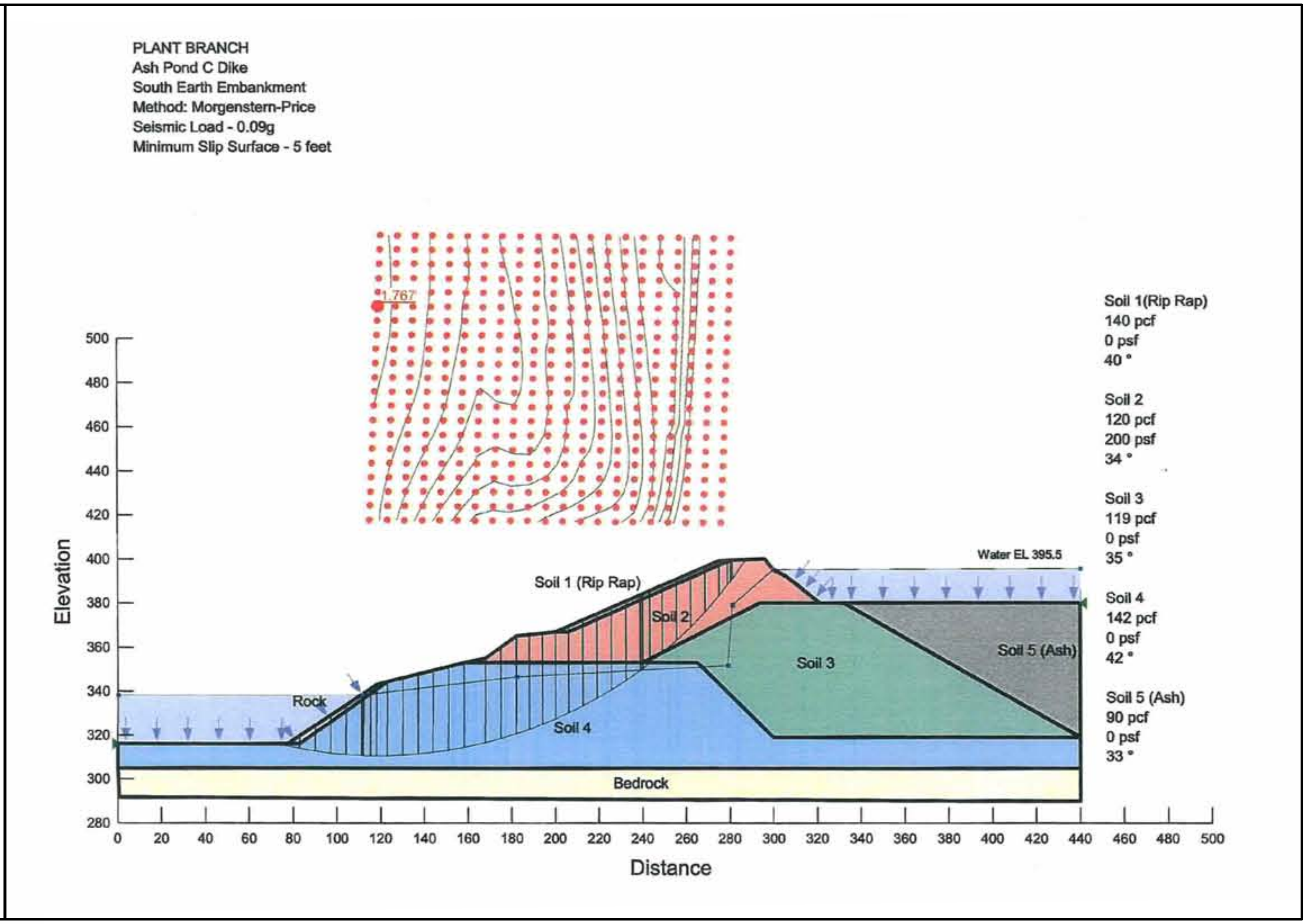
DATE: 03/2010

FIGURE 9J

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM Plotted: 3/29/2010 2:00:15 PM User: Gray, Timmolyn



REVISED SHEAR STRENGTH - STEADY STATE



REVISED SHEAR STRENGTH - SEISMIC

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ASH POND C 2009 ANALYSIS – REVISED
SECTION A–A

PLANT BRANCH
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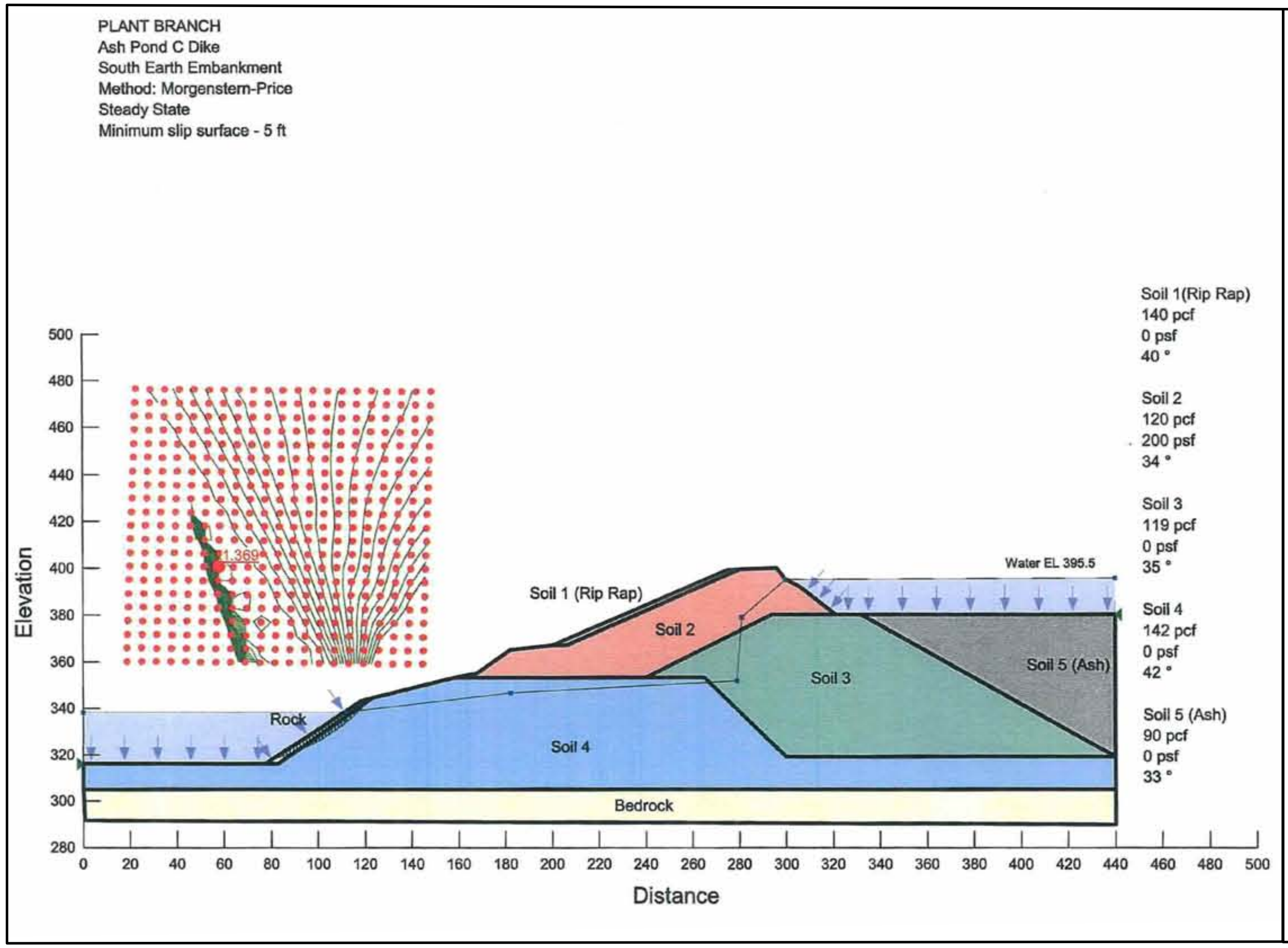
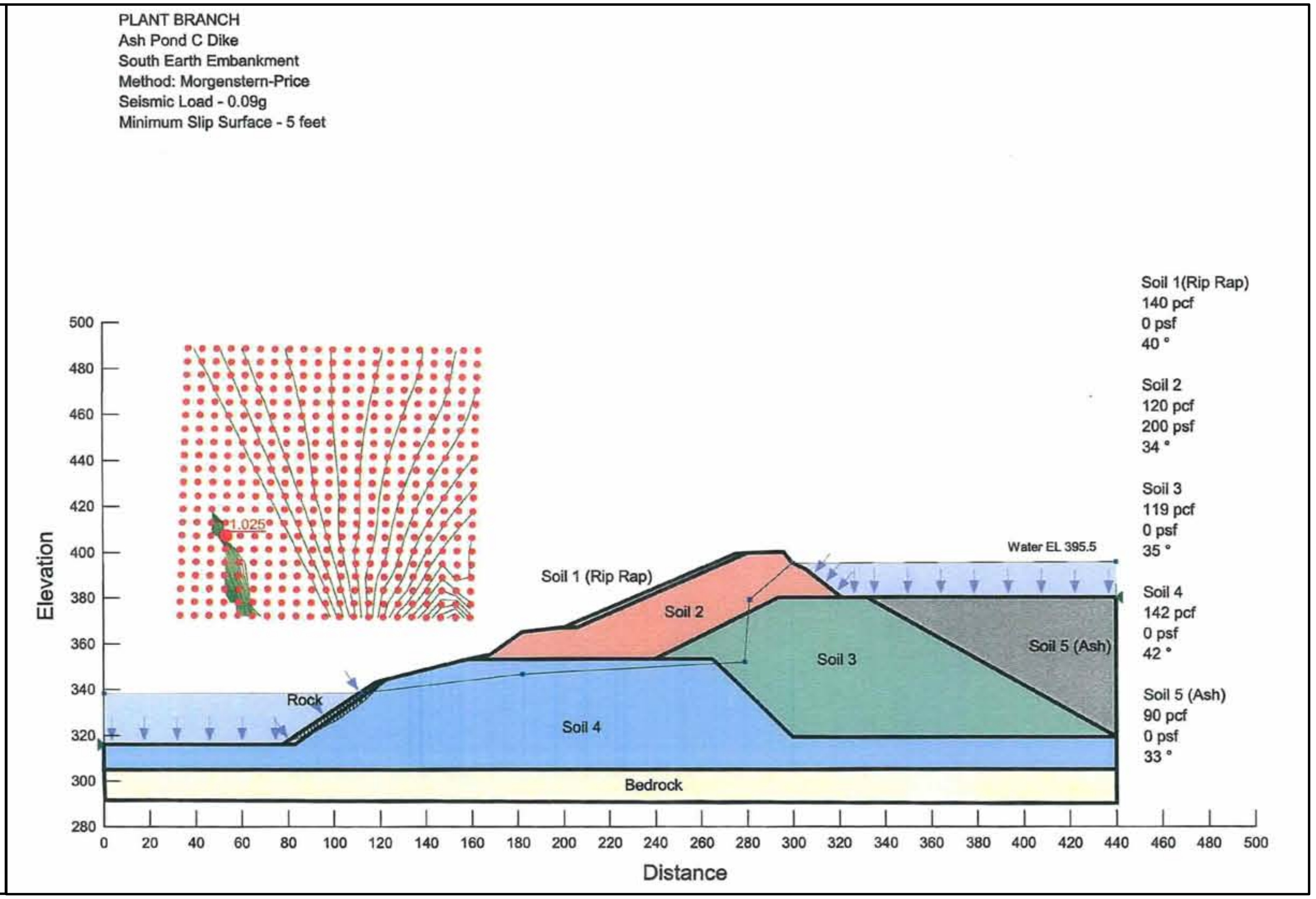
FIGURE 9K



LAKE SINCLAIR BANK WITH REVISED SHEAR STRENGTH - STEADY STATE



LAKE SINCLAIR BANK WITH REVISED SHEAR STRENGTH - SEISMIC

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ASH POND C 2009 ANALYSIS – REVISED
SECTION A–A

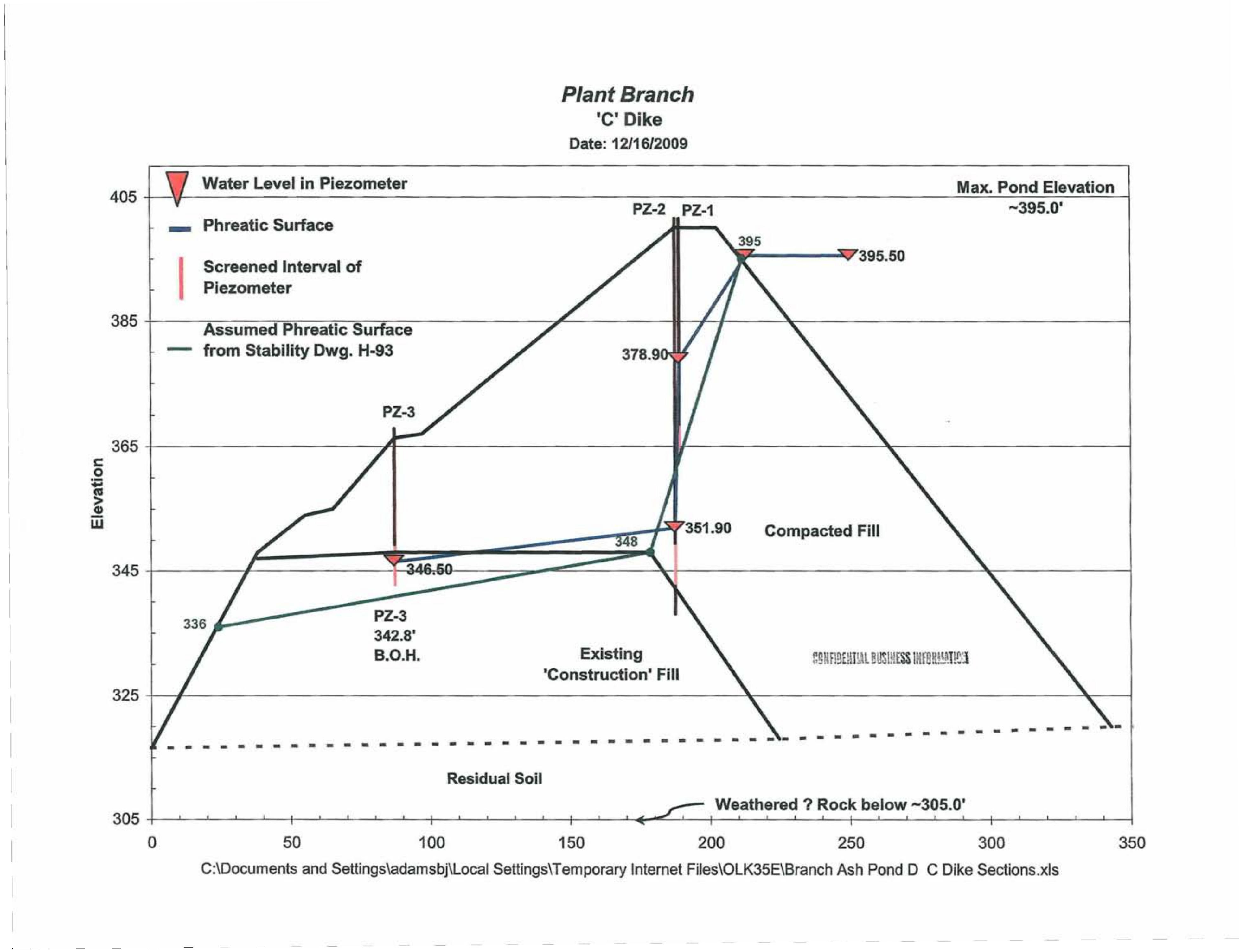
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 9L

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM Plotted: 3/29/2010 2:01:36 PM User: Gray, Timmolyn



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ASH POND C PHREATIC SURFACES
ORIGINAL AND 2009 ANALYSES

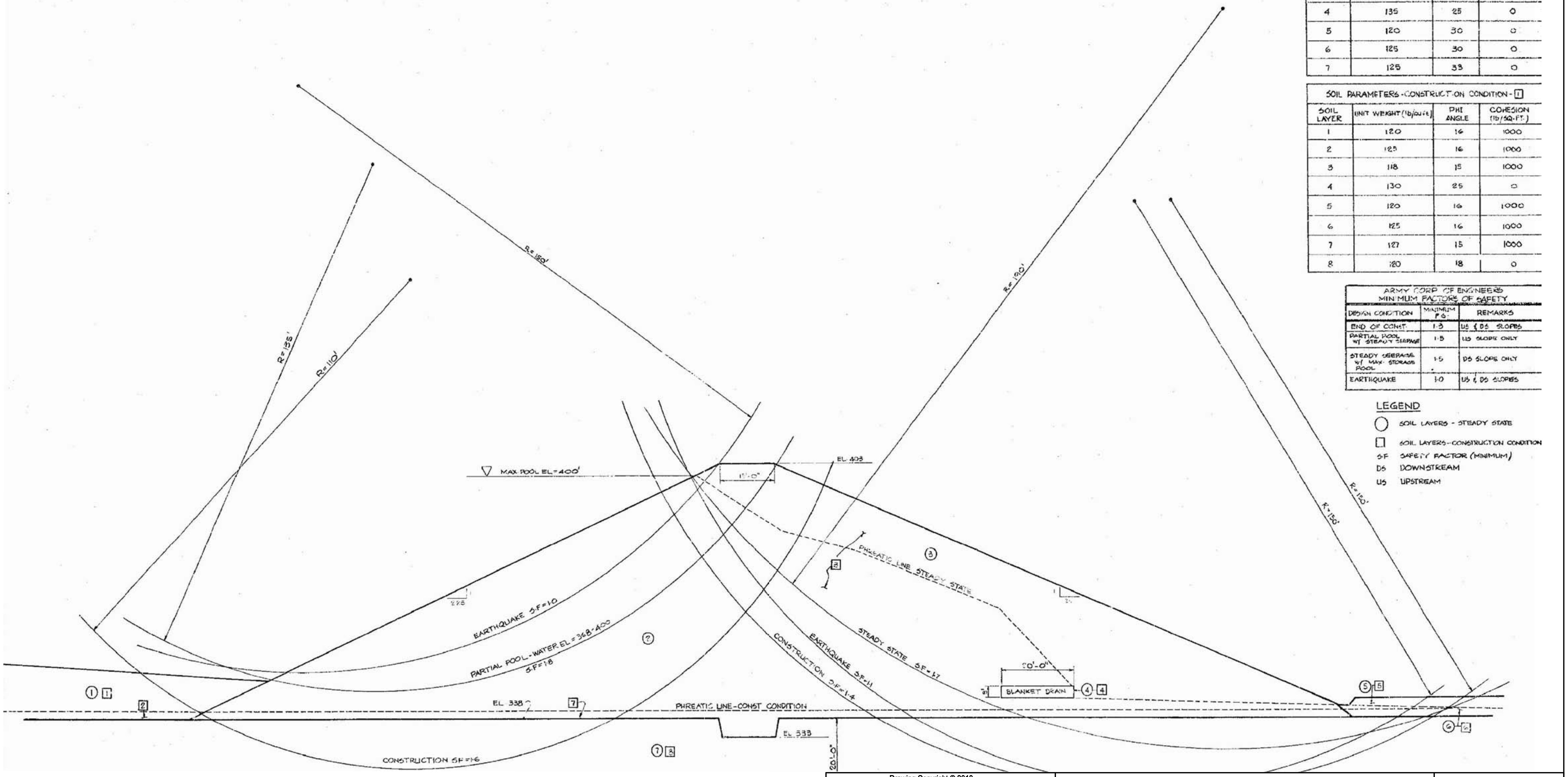
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 9M

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM PLotted: 3/29/2010 2:02:11 PM User: Gray, Timmolyn



SOIL PARAMETERS-STEADY STATE AND EARTHQUAKE CONDITION ①

SOIL LAYER	UNIT WEIGHT (lb/cu.ft.)	PHI ANGLE	COHESION (lb/sq.ft.)
1	125	30	0
2	127	32	0
3	118	32	0
4	135	25	0
5	120	30	0
6	125	30	0
7	125	33	0

SOIL PARAMETERS-CONSTRUCTION CONDITION-1

SOIL LAYER	UNIT WEIGHT (lb/cu.ft.)	PHI ANGLE	COHESION (lb/SQ.FT.)
1	120	16	1000
2	125	16	1000
3	118	15	1000
4	130	25	0
5	120	16	1000
6	125	16	1000
7	127	15	1000
8	120	18	0

ARMY CORP OF ENGINEERS MINIMUM FACTORS OF SAFETY

DESIGN CONDITION	MINIMUM F.S.	REMARKS
END OF CONST.	1.3	US & DS SLOPES
PARTIAL POOL W/ STEADY SEEPAGE	1.5	US SLOPE ONLY
STEADY SEEPAGE W/ MAX. STORAGE POOL	1.5	DS SLOPE ONLY
EARTHQUAKE	1.0	US & DS SLOPES

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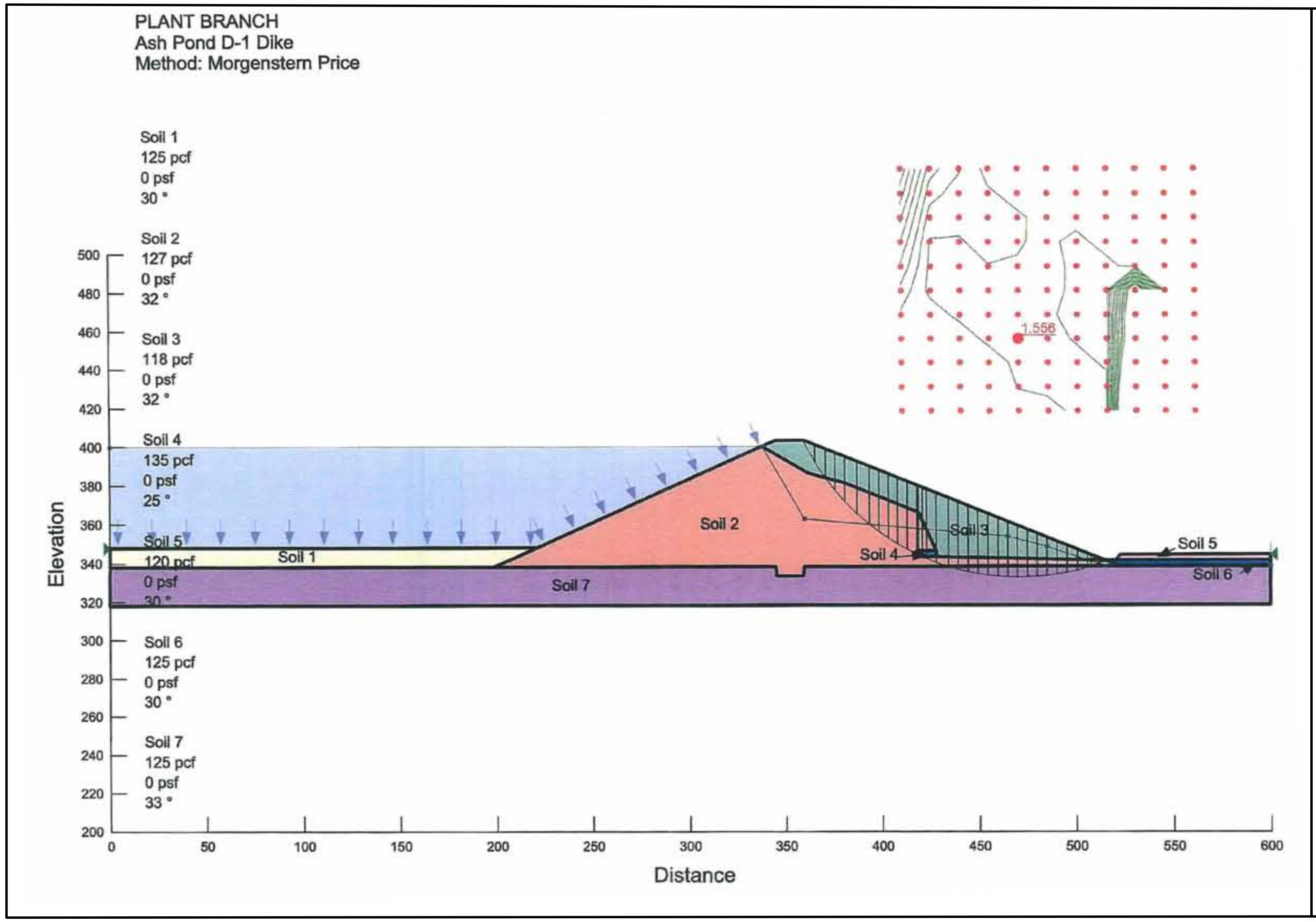
ASH POND D STABILITY ANALYSIS

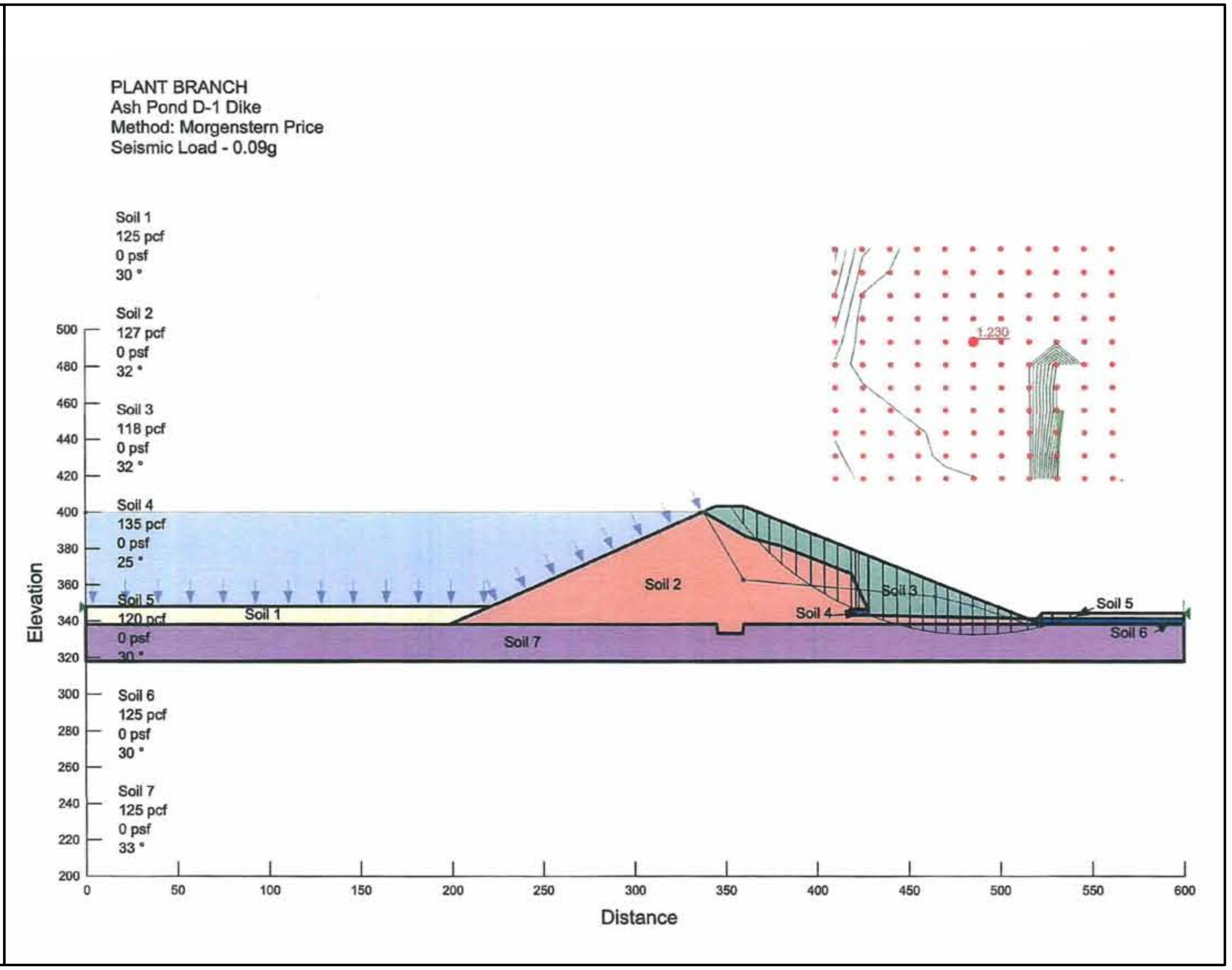
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 10A





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ASH POND D 2009 ANALYSIS

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 10B

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM PLotted: 3/29/2010 2:03:01 PM User: Gray, Timmolyn

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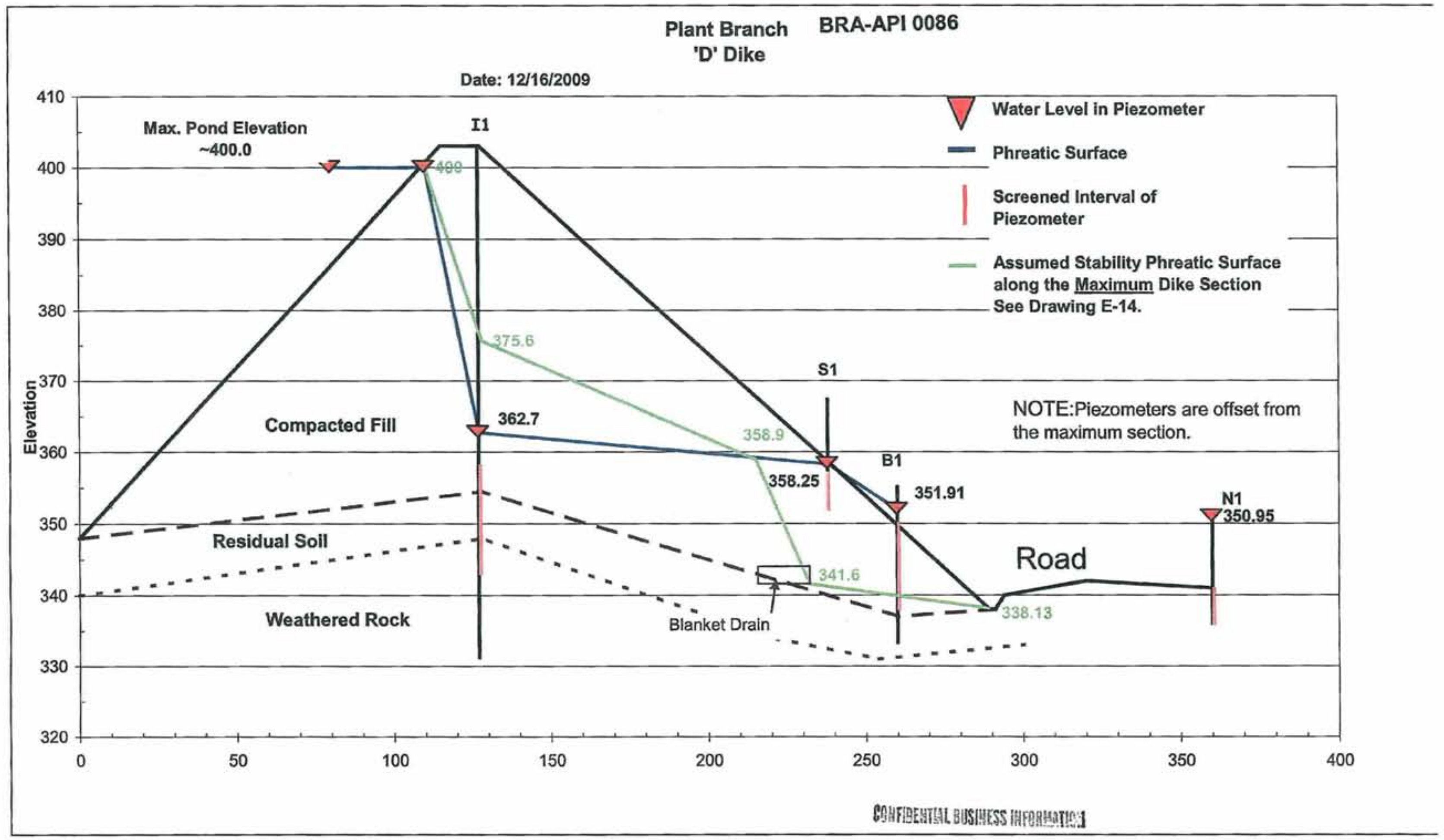

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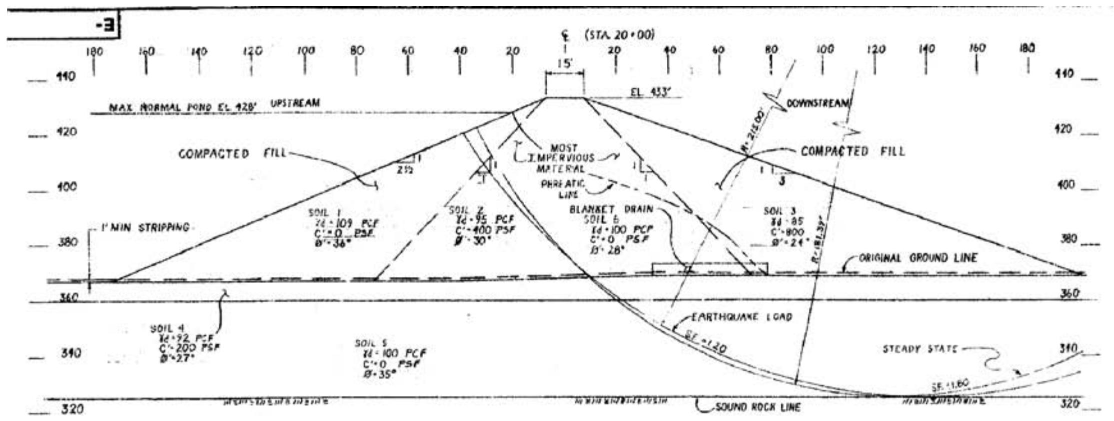
ASH POND D PHREATIC SURFACES
ORIGINAL AND 2009 ANALYSES
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

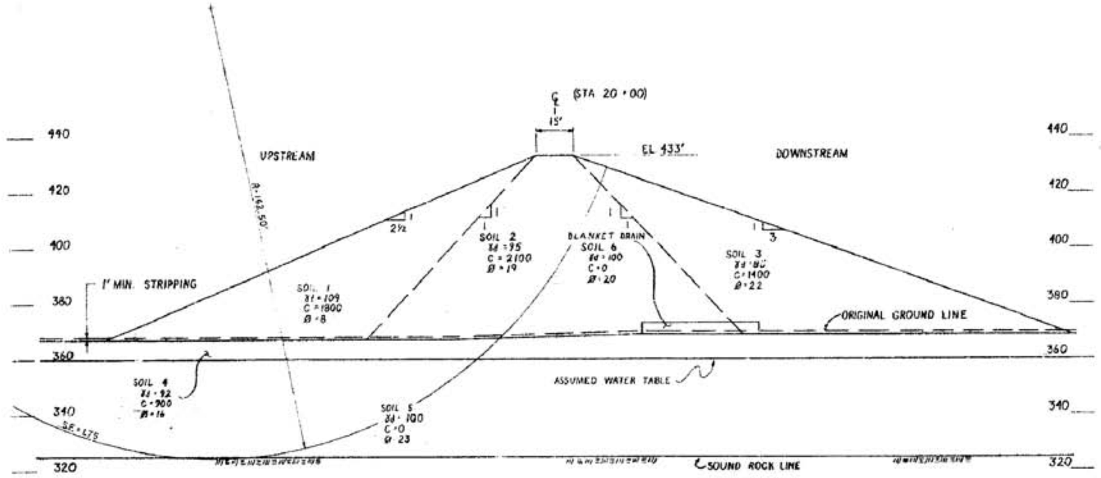
PROJECT NO.
20085.2060

DATE: 03/2010

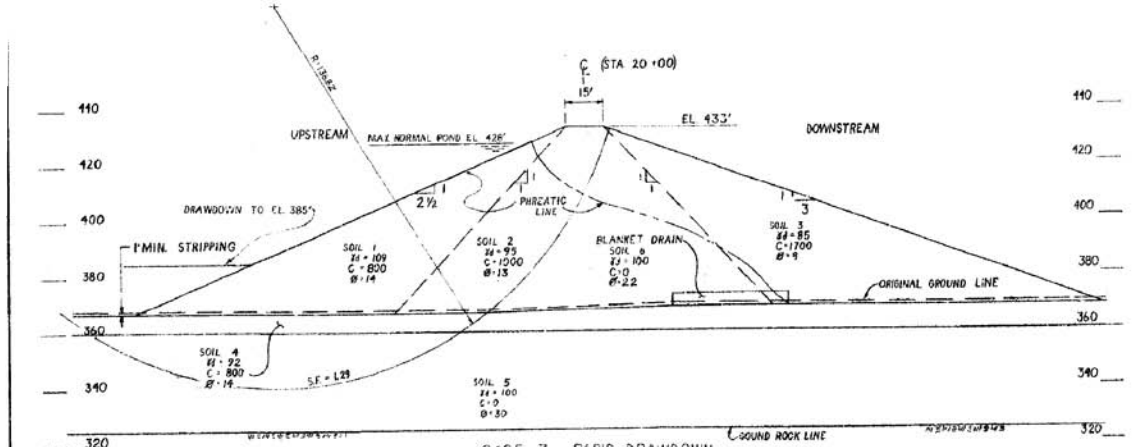
FIGURE 10C



CASE I - - STEADY STATE
SECTION AT STA. 20+00
(MAXIMUM SECTION WITHOUT CUT-OFF)



CASE 2 - - CONSTRUCTION
SECTION AT STA 20+00
(MAXIMUM SECTION WITHOUT CUT-OFF)



CASE 3 - RAPID DRAWDOWN
SECTION AT STA 20+00
(MAXIMUM SECTION WITHOUT CUT-OFF)

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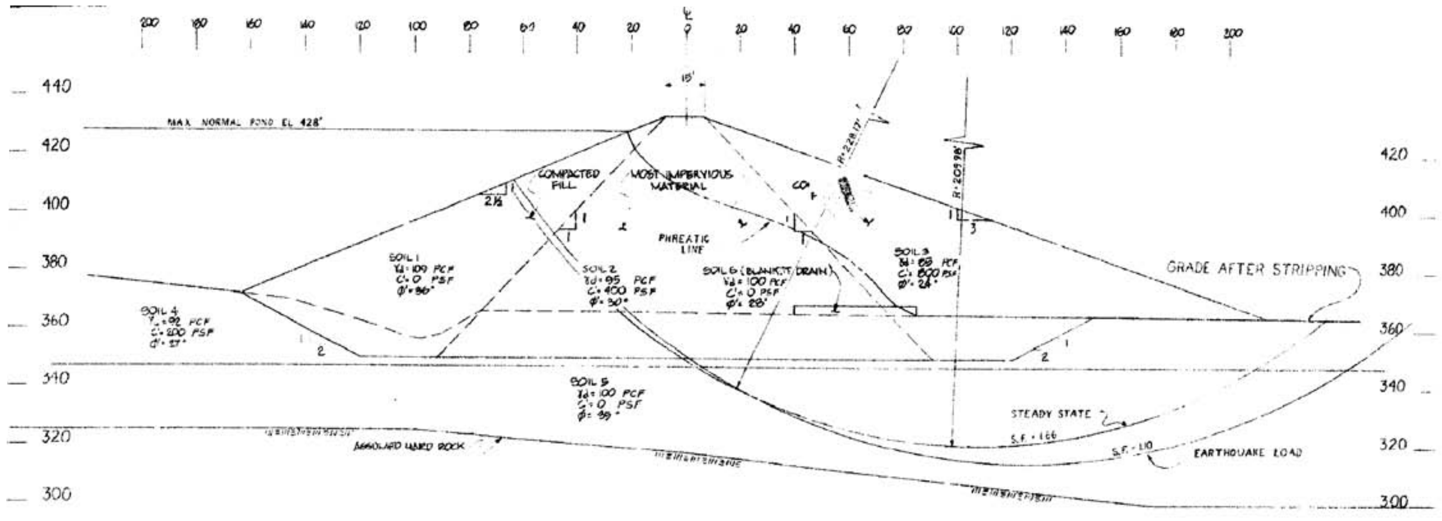
ASH POND E ORIGINAL STABILITY ANALYSIS AT STA. 20+00

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

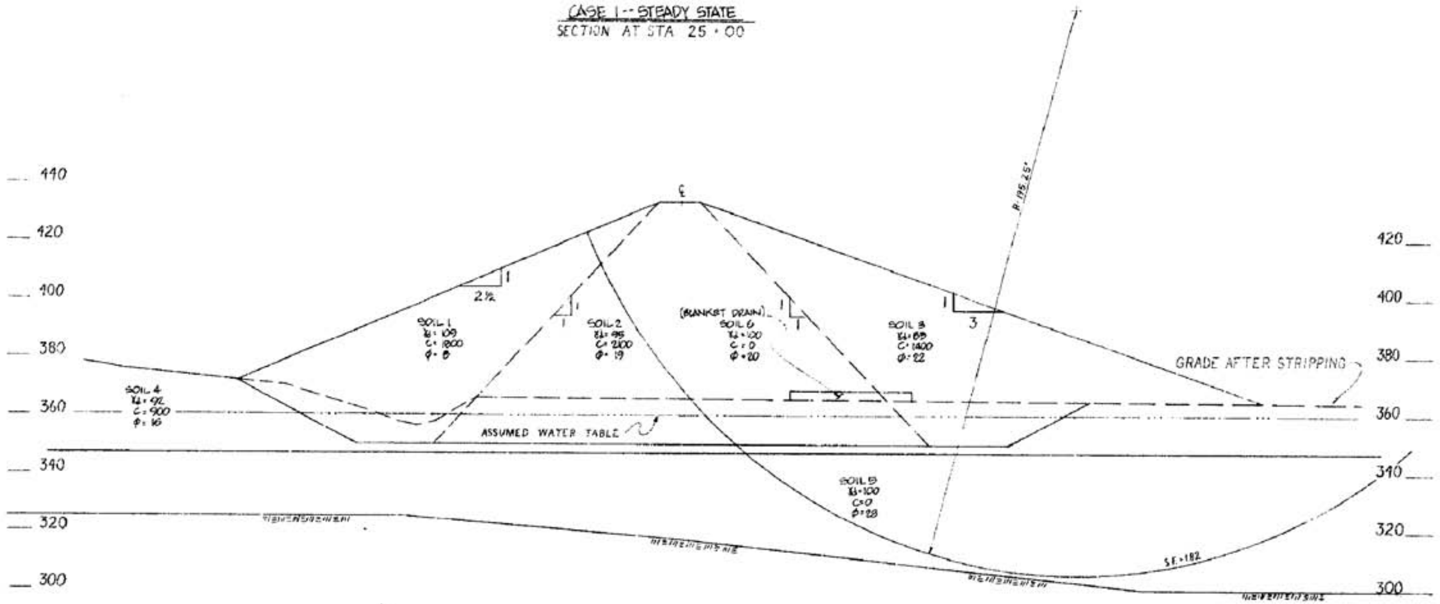
PROJECT NO.
20085.2060

DATE: 03/2010

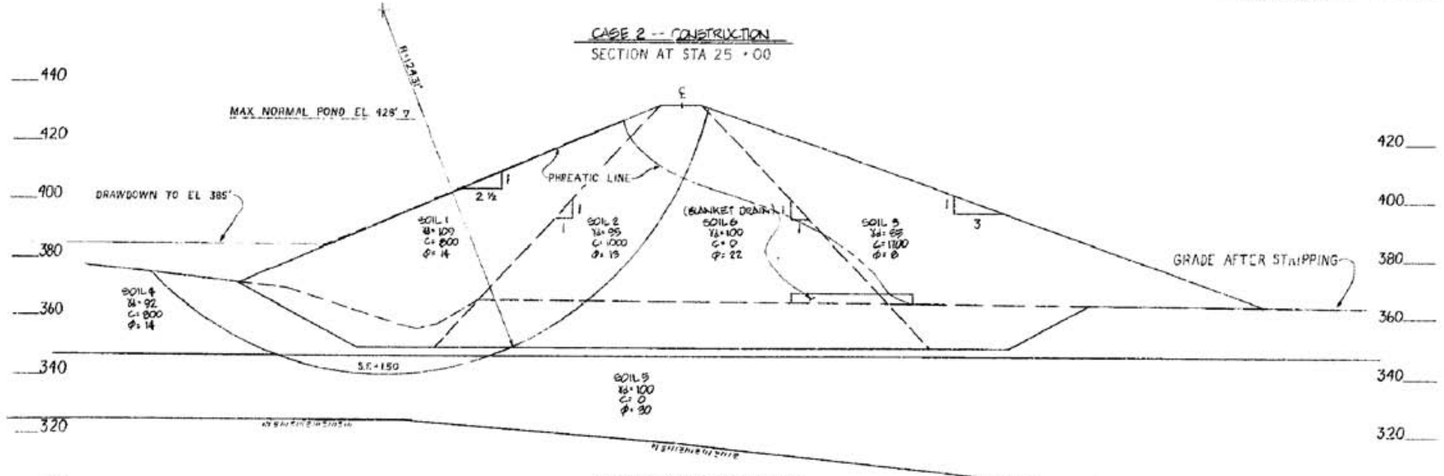
FIGURE 11A



CASE 1 -- STEADY STATE
SECTION AT STA 25+00



CASE 2 -- CONSTRUCTION
SECTION AT STA 25+00



CASE 3 -- RAPID DRAWDOWN
SECTION AT STA 25+00

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ASH POND E ORIGINAL STABILITY ANALYSIS AT STA. 25+00
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO. 20085.2060
DATE: 03/2010
FIGURE 11B

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM PLotted: 3/29/2010 2:04:49 PM User: Gray, Timmolyn

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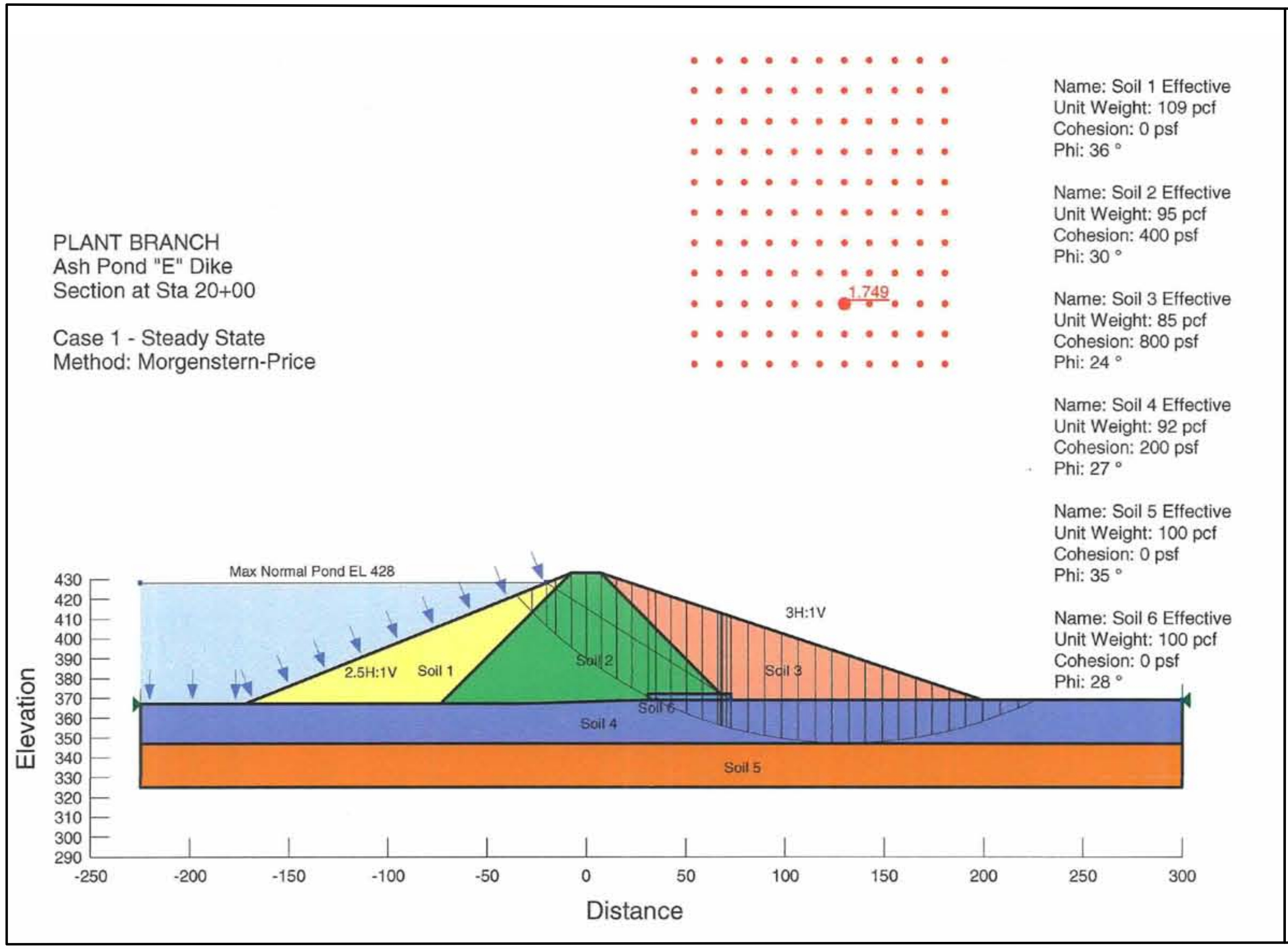


PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 20+00

Case 1 - Steady State
Method: Morgenstern-Price

Name: Soil 1 Effective
Unit Weight: 109 pcf
Cohesion: 0 psf
Phi: 36 °

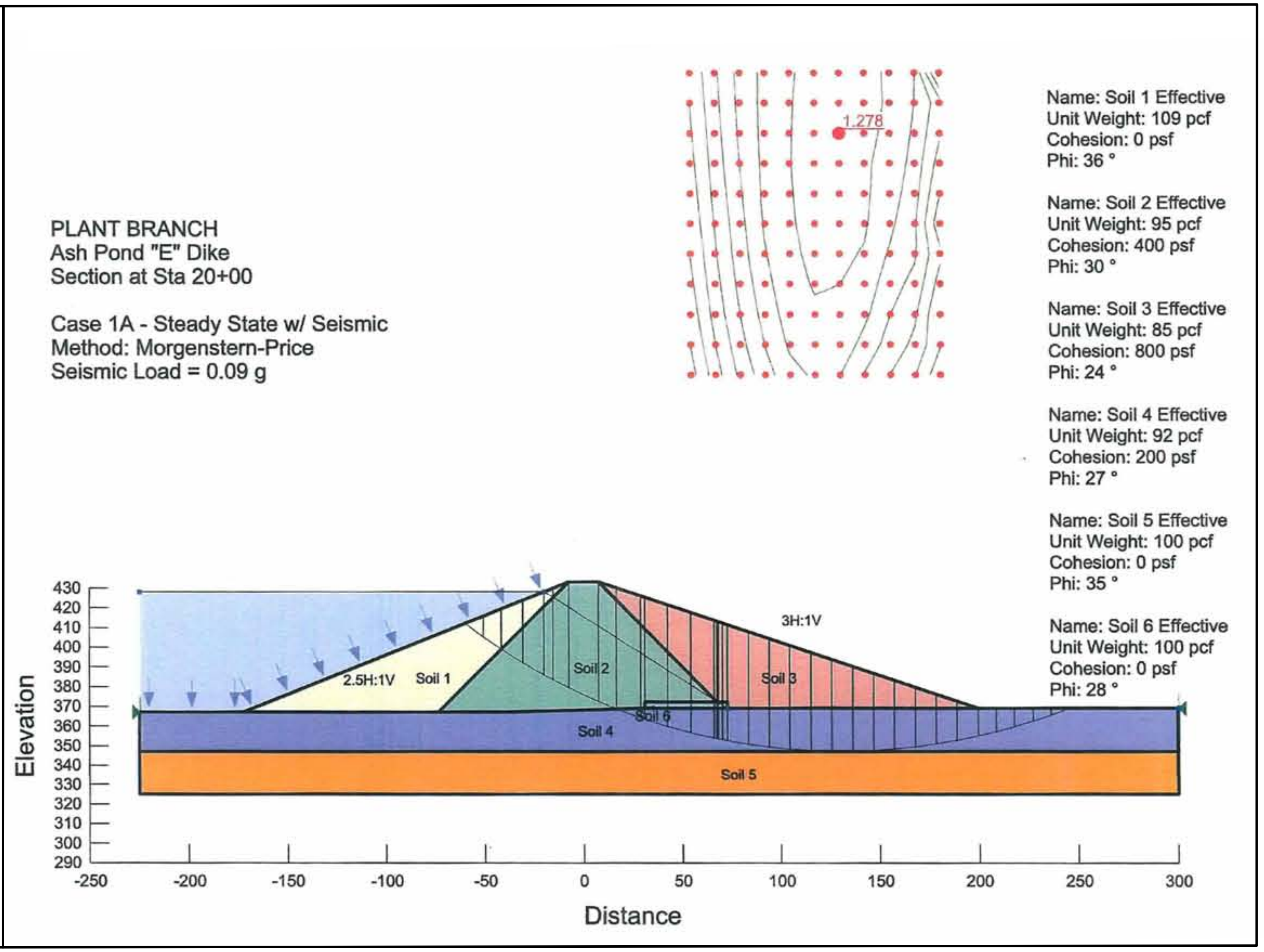
Name: Soil 2 Effective
Unit Weight: 95 pcf
Cohesion: 400 psf
Phi: 30 °

Name: Soil 3 Effective
Unit Weight: 85 pcf
Cohesion: 800 psf
Phi: 24 °

Name: Soil 4 Effective
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 27 °

Name: Soil 5 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 35 °

Name: Soil 6 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 28 °



PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 20+00

Case 1A - Steady State w/ Seismic
Method: Morgenstern-Price
Seismic Load = 0.09 g

Name: Soil 1 Effective
Unit Weight: 109 pcf
Cohesion: 0 psf
Phi: 36 °

Name: Soil 2 Effective
Unit Weight: 95 pcf
Cohesion: 400 psf
Phi: 30 °

Name: Soil 3 Effective
Unit Weight: 85 pcf
Cohesion: 800 psf
Phi: 24 °

Name: Soil 4 Effective
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 27 °

Name: Soil 5 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 35 °

Name: Soil 6 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 28 °

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ASH POND E 2009 ANALYSIS STA 20+00
STEADY STATE & SEISMIC

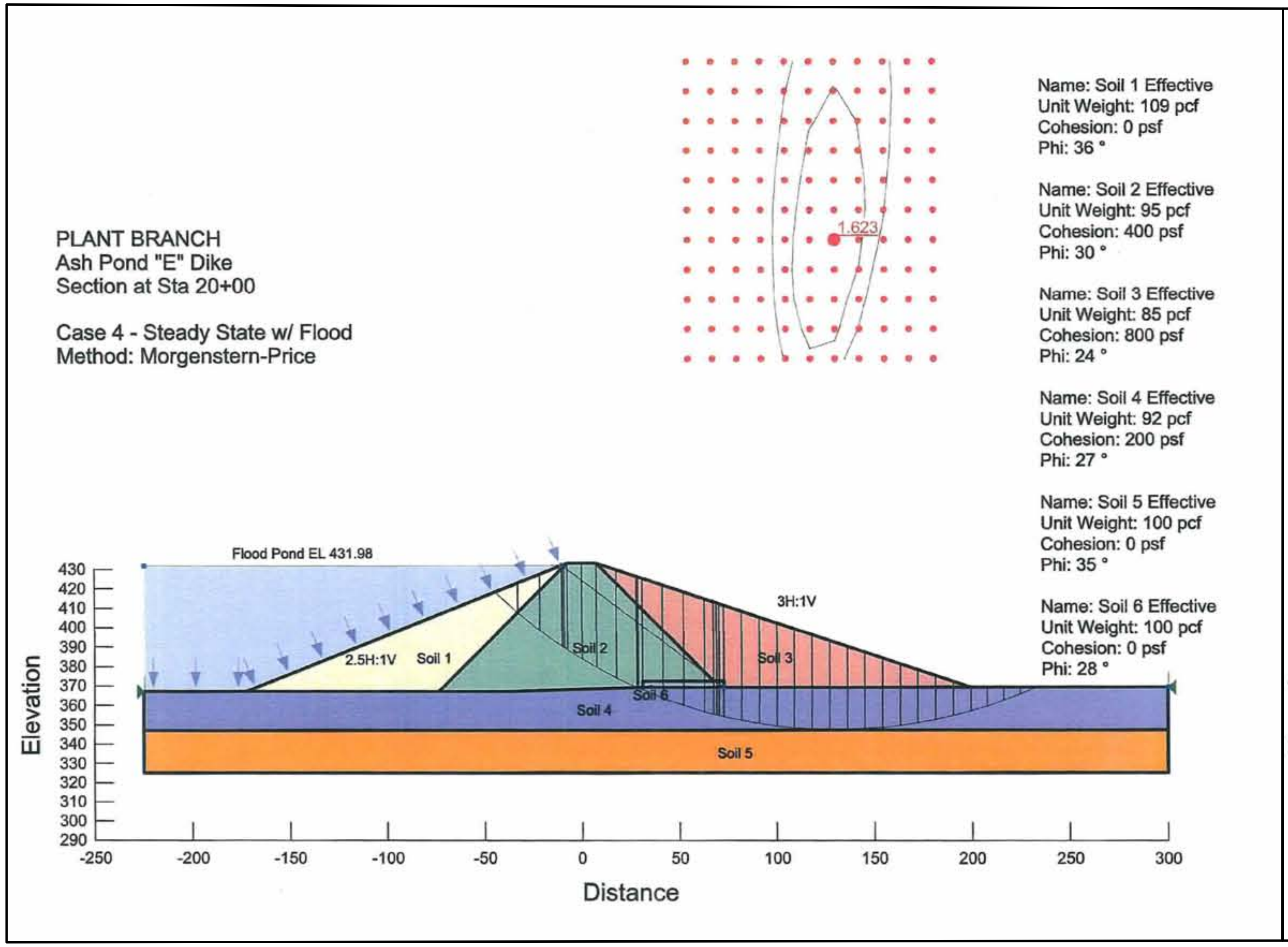
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

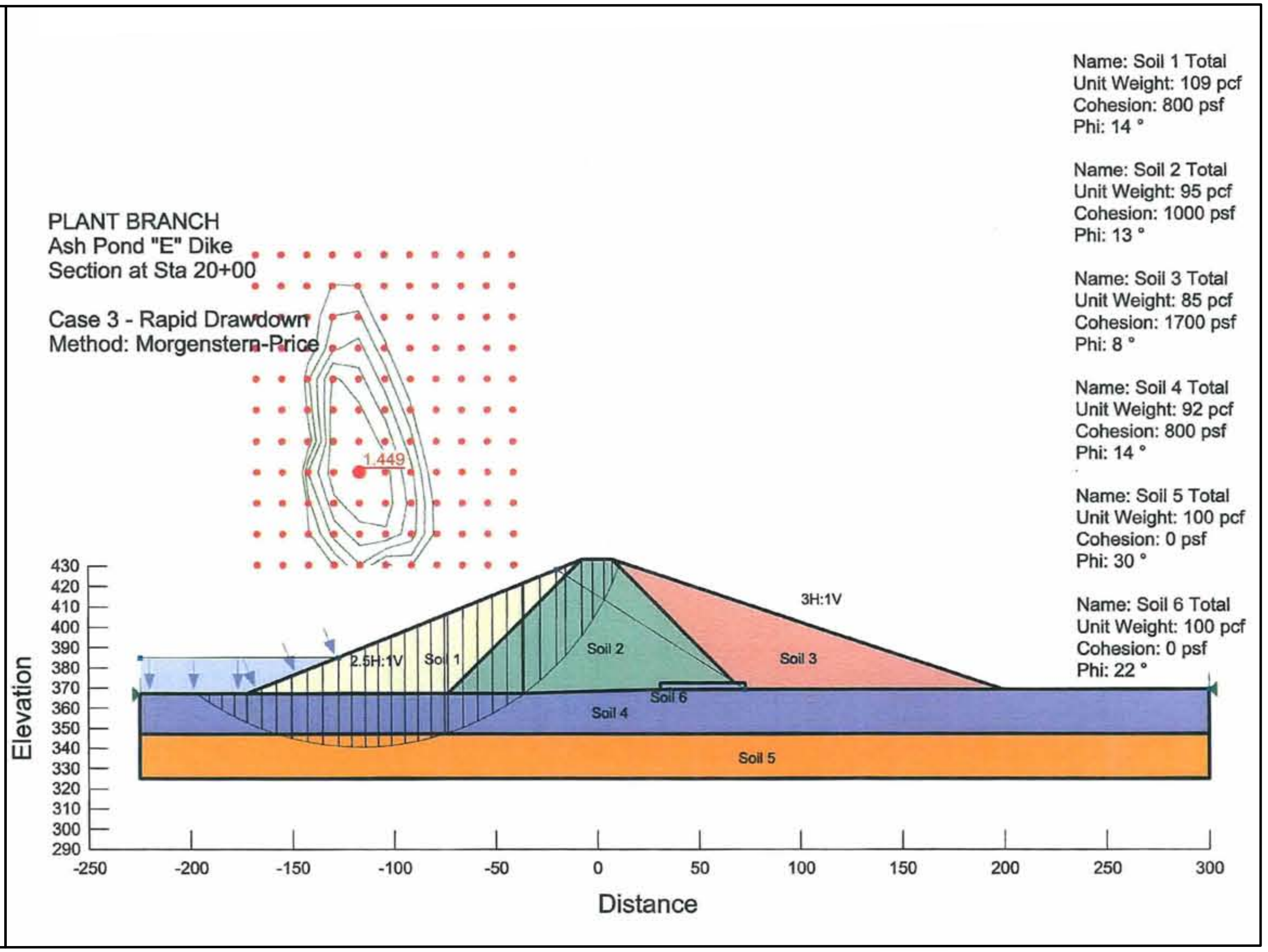
PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 11C

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM PLotted: 3/29/2010 2:06:13 PM User: Gray, Timmolyn





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ASH POND E 2009 ANALYSIS STA. 20+00
RAPID DRAW-DOWN & FLOOD

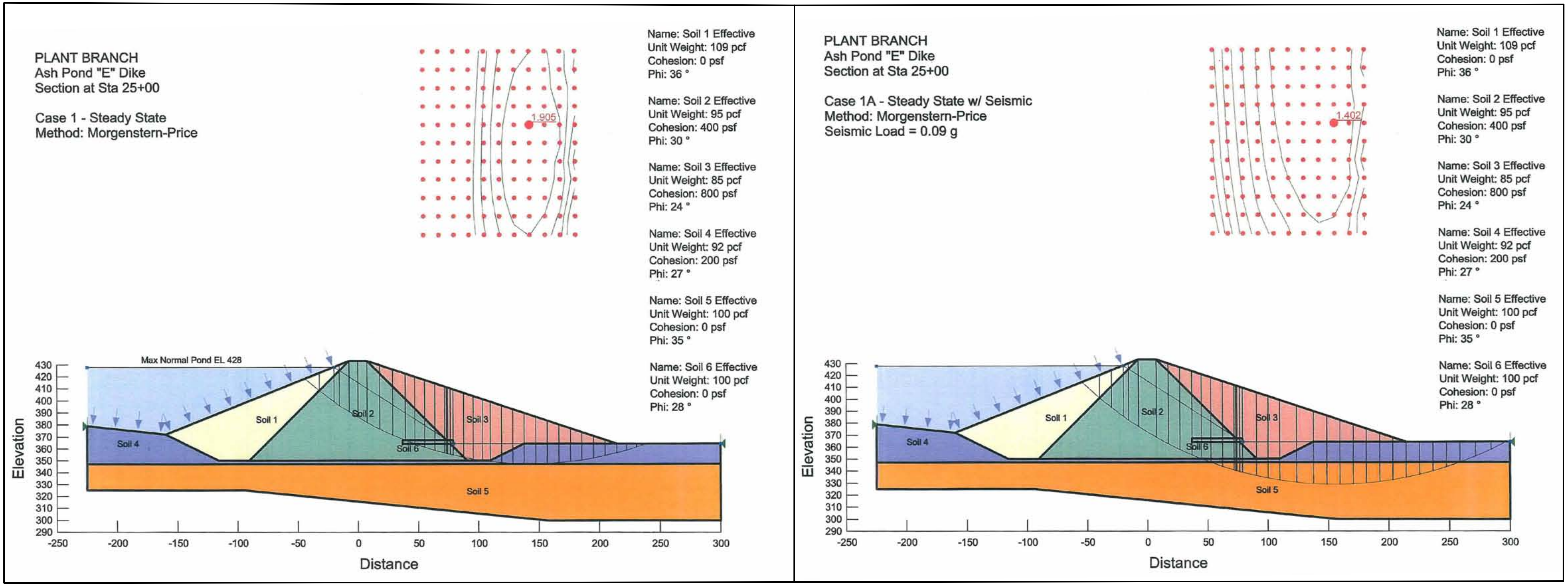
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 11D

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM PLotted: 3/29/2010 2:07:03 PM User: Gray, Timmolyn


PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 25+00

Case 1 - Steady State
Method: Morgenstern-Price

PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 25+00

Case 1A - Steady State w/ Seismic
Method: Morgenstern-Price
Seismic Load = 0.09 g

N

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ASH POND E 2009 ANALYSIS STA. 25+00
STEADY STATE & SEISMIC

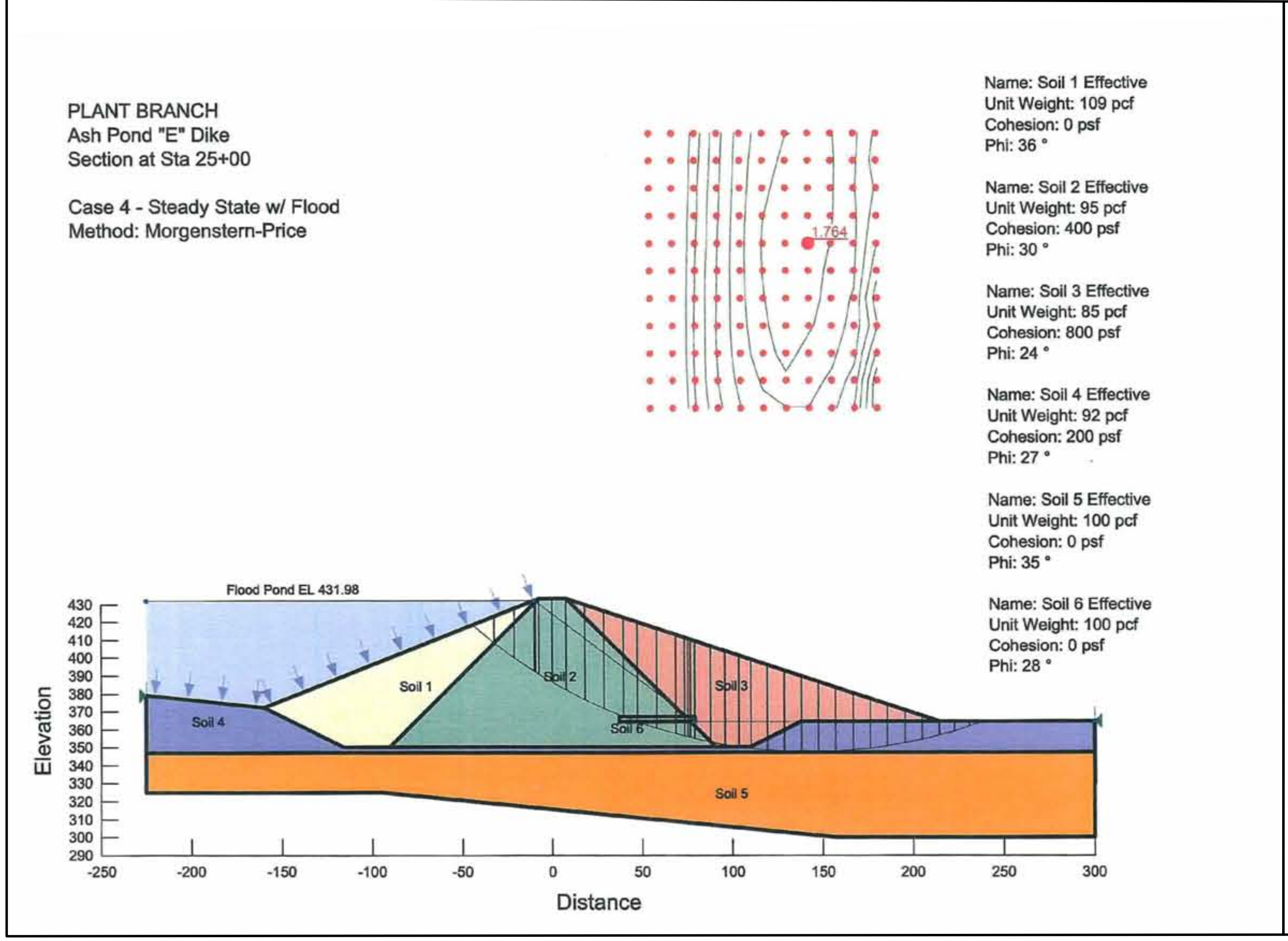
PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 11E

File: K:\20085\CADD\ACAD\FIGURES\2060 GEORGIA POWER, PLANT BRANCH\PLANT BRANCH-FIGURES_9F-11.DWG Saved: 3/10/2010 1:34:30 PM Plotted: 3/29/2010 2:07:54 PM User: Gray, Timmolyn



PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 25+00

Case 4 - Steady State w/ Flood
Method: Morgenstern-Price

Name: Soil 1 Effective
Unit Weight: 109 pcf
Cohesion: 0 psf
Phi: 36 °

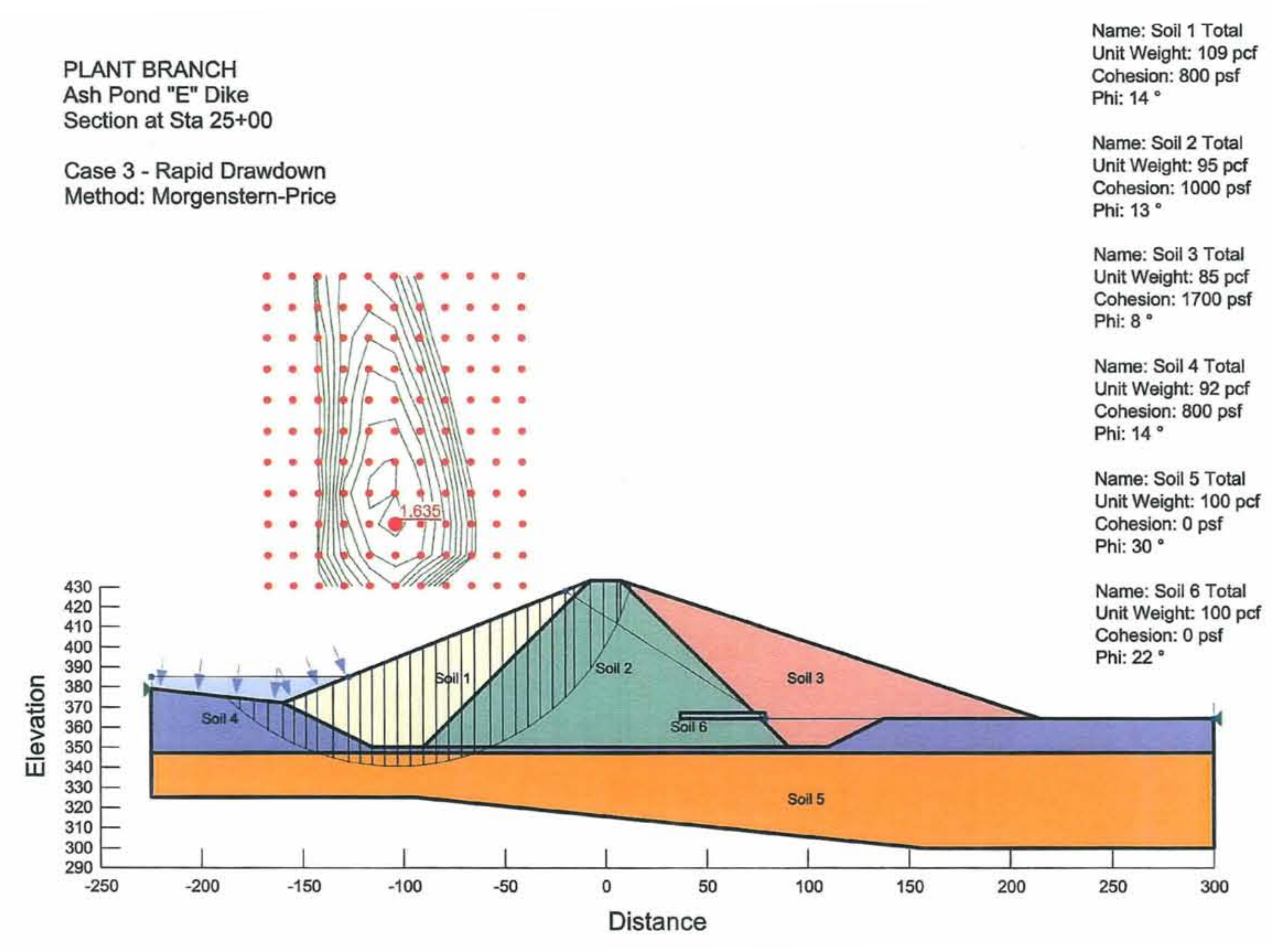
Name: Soil 2 Effective
Unit Weight: 95 pcf
Cohesion: 400 psf
Phi: 30 °

Name: Soil 3 Effective
Unit Weight: 85 pcf
Cohesion: 800 psf
Phi: 24 °

Name: Soil 4 Effective
Unit Weight: 92 pcf
Cohesion: 200 psf
Phi: 27 °

Name: Soil 5 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 35 °

Name: Soil 6 Effective
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 28 °



PLANT BRANCH
Ash Pond "E" Dike
Section at Sta 25+00

Case 3 - Rapid Drawdown
Method: Morgenstern-Price

Name: Soil 1 Total
Unit Weight: 109 pcf
Cohesion: 800 psf
Phi: 14 °

Name: Soil 2 Total
Unit Weight: 95 pcf
Cohesion: 1000 psf
Phi: 13 °

Name: Soil 3 Total
Unit Weight: 85 pcf
Cohesion: 1700 psf
Phi: 8 °

Name: Soil 4 Total
Unit Weight: 92 pcf
Cohesion: 800 psf
Phi: 14 °

Name: Soil 5 Total
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 30 °

Name: Soil 6 Total
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 22 °

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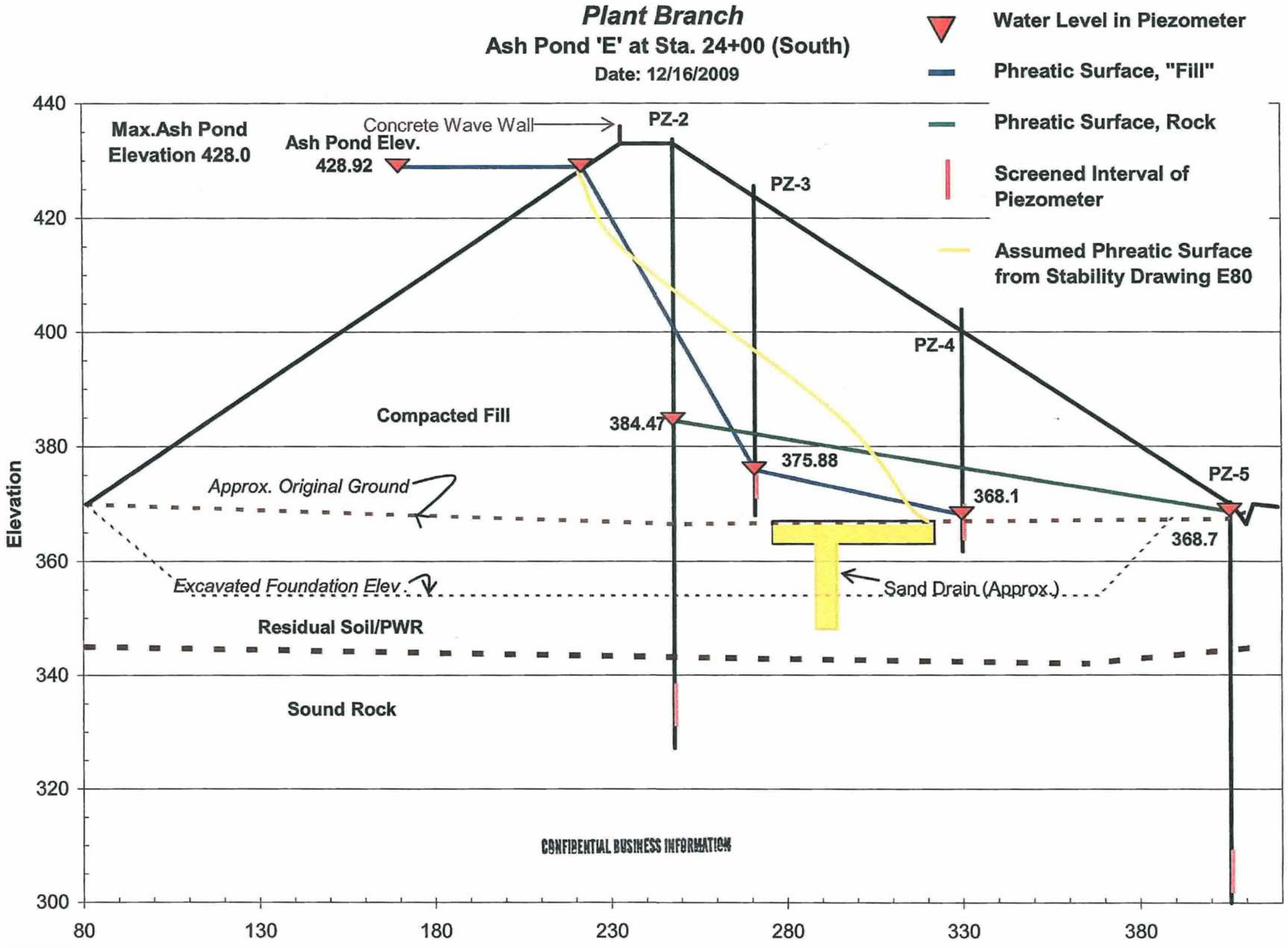
ASH POND E 2009 ANALYSIS STA. 25+00
RAPID DRAW-DOWN & FLOOD

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 11F



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ASH POND E PHREATIC SURFACES
ORIGINAL AND 2009 ANALYSES

PLANT BRANCH
MILLEDGEVILLE, GEORGIA

PROJECT NO.
20085.2060

DATE: 03/2010

FIGURE 11G

4.0 CONCLUSIONS/RECOMMENDATIONS

4.1 Acknowledgement of Management Unit Condition

4.1.1 Acknowledgement of Management Unit Condition – Ash Ponds C, D and E

I acknowledge that the management units referenced herein (Ash Ponds C, D, and E) were personally inspected by me and were found to be in the following condition: **Satisfactory.** This indicates that there is no existing or potential safety deficiencies recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) and that minor maintenance items may be required.

4.1.2 Acknowledgement of Management Unit Condition – Ash Pond B

I acknowledge that the management unit referenced herein (Ash Pond B) was personally inspected by me and was found to be in the following condition: **Fair.** This indicates acceptable performance is expected under required loading conditions in accordance with applicable safety regulatory criteria; however some additional analyses should be performed and documented to verify that these criteria are met. Based upon recent data and subsequent analysis, Georgia Power has concluded that the Ash Pond B dike is no longer a liquid waste impounding structure. If the Georgia Department of Natural Resources Environmental Protection Division Dam Safety Program (GADNR-EPD Dam Safety Program) and/or the USEPA concurs with this assertion, deems it appropriate to declassify the Ash Pond B dike, and no longer consider it a dam, then it can be removed from the inventory. Under these conditions additional analyses and documentation beyond that required to declassify or decommission the dike would not be necessary.

CHA presents the following recommendations for maintenance and updating of analyses to bring these facilities to satisfactory condition.

4.2 General Condition Monitoring and Maintenance

The following recommendations are based upon observations and review of data provided to CHA. Recommendations provided by the state, utility company, and other consultants should also be implemented.

4.2.1 Ash Pond B

Visually, the downstream slope of the southwest dike at Ash Pond B was found to be in fair condition. Observations could not be made of the upstream slope due to the infilling of the pond with ash and subsequent soil cap. Should the Georgia DNR-EPD Dam Safety Program and/or the USEPA determine that the Ash Pond B dike cannot be decommissioned, a few areas were observed that warrant monitoring on a routine basis to confirm that changes are not occurring or if periodic maintenance is required. These areas are as follows:

- Brush and trees have grown in the downstream face of the embankment. CHA recommends that the trees should be cut. The resulting stumps should be monitored for decay.

4.2.2 Ash Pond C

Ash Pond C is impounded by three main dikes (west, south, and east dikes). Visually, the downstream and upstream slopes were found to be in satisfactory condition. A few areas were observed that warrant monitoring on a routine basis to confirm that changes are not occurring or if periodic maintenance is required. These areas are as follows:

- Grading along the west dike near the south central portion of the dike should be reviewed to promote positive drainage of storm water.

- Saturated soil conditions were also noted north of the recycle water pump station. We understand the Georgia Power has placed rock in this area previously and the wet conditions have continued. CHA recommends that Georgia Power consult with a geotechnical engineer to develop recommendations for this area.
- New drains installed in the wet areas observed on the south dike should continue to be monitored and included with the monthly routine data collection process.
- Non-uniform grading was observed on the upstream slope of the east dike which may be the result of erosion rills. This area should be closely monitored.
- Erosion due to water "lapping" the surface was observed on the upstream side of the south dike. CHA recommends improvements to the erosion protection along the water's edge. Georgia Power has indicated that this has been completed since CHA's site visit.

4.2.3 Ash Pond D

Ash Pond D is impounded by a dike along the southwest edge of the pond. Visually, the downstream and upstream slopes of the southeast dike were found to be in satisfactory condition. A few areas were observed that warrant monitoring on a routine basis to confirm that changes are not occurring or if periodic maintenance is required. These areas are as follows:

- Surface irregularities as a result of mowing activities on softened soils or possible long term creep activity should be graded and reseeded as needed. Mowing patterns can be altered to avoid repeated rutting in the same areas and maintenance activities on the slope utilizing heavy equipment should be limited after periods of rain until the soil has had ample opportunity to dry.

4.2.4 Ash Pond E

Ash Pond E is impounded by a dike along the east edge of the pond. Visually, the downstream and upstream slopes of the dike were found to be in satisfactory condition. A few areas were observed that warrant monitoring on a routine basis to confirm that changes are not occurring or if periodic maintenance is required. These areas are as follows:

- Three soft areas have been identified by Southern Company east of the lower concrete lined drainage channel. CHA recommends continued monitoring of these locations for changes.
- Sloughing and surface irregularity due to recent rain was noted along the southern end of the downstream slope and sparse vegetation due to mowing activities was also observed. Measures should be implemented to reduce the potential for progressive erosion in these areas.

4.3 Animal Control

Evidence of animal burrows was observed on the upstream and downstream side of several of the dikes. CHA observed Southern Company personnel filling some of burrows during the site assessment period, and Southern Company has indicated that this repair activity has been completed. CHA recommends continued vigilance by Southern Company personnel to make note of areas disturbed by animal activity, trap the animals, and make repairs to areas to protect the integrity of the dikes.

4.4 Site Plan and Instrumentation

CHA recommends that survey plans with elevation contour information be prepared for each pond and dike area. The plans should include, at a minimum, the location of the constructed dikes, limits of existing ponds, water level in the ponds, location of instrumentation, and location and elevation of normal operation and emergency spillways. These plans should include stationing from the design documents to assist in a comparison of the design and as-built conditions.

4.5 Hydrologic and Hydraulic Recommendations

CHA recommends that a hydrologic and hydraulic analysis be performed for each of the active ponds. Ash Ponds B, C, and D are not regulated by Georgia EPD, therefore there are no specific hydrologic and hydraulic design guidelines. CHA suggests the impoundment be evaluated for susceptibility to overtopping during a reasonable design storm.

CHA recommends that Georgia Power continue to evaluate the available flood storage as deposited ash elevations change within the pond.

4.6 Stability Recommendations

CHA was provided with slope stability analysis from the construction documents and recent analyses for Ash Ponds C, D, and E. A slope stability analysis was not available for Ash Pond B. Due to a historical development and present condition unique to each pond and its impounding dike, recommendations for additional study, if any, have been rendered as noted in the following sections.

4.6.1 Ash Pond B

Ash Pond B and the dike have changed significantly from the time they were completed, with a large portion of the pond adjacent to the dike being filled and capped. Recent investigation in the capped areas has led Georgia Power to conclude that the Ash Pond B dike is no longer a liquid waste impounding structure. If the Georgia Department of Natural Resources Environmental Protection Division (EPD) Safe Dams Program deems the available data sufficient and acceptable to officially declassify the dike as an impounding structure, then no further work is recommended. Should, however, the state elect not to declassifiy the dike as an impounding structure, CHA recommends that at least a rudimentary geotechnical exploration program be undertaken and a corresponding slope stability analysis performed.

4.6.2 Ash Pond C

The original and updated analyses show that the Ash Pond C embankment was generally designed with the required factors of safety for the load cases considered at the time the particular analyses were performed. An exception is the Lake Sinclair shoreline below the toe of the dike, where it has been demonstrated that the minimum factor of safety is associated with a thin, superficial failure plane. Since the failure surface with the minimum factor of safety is below accepted standards, CHA suggests that this area be investigated to determine where the failure surface with an acceptable safety factor lies with respect to the dike geometry. In this way one can ascertain how such a failure would affect gross dike stability.

Load cases not examined for the Ash Pond C dike include rapid drawdown conditions for the downstream toe at the aforementioned Lake Sinclair shoreline and the upstream slope, and a surcharge pool or flood condition. CHA recommends that a stability analysis considering these loading conditions be performed so that the embankment performance under such loading cases can be anticipated and properly managed.

4.6.3 Ash Pond D

The original and updated analyses show that the Ash Pond D dike embankment was generally designed with the required factors of safety for the load cases considered at the time the particular analyses were performed. CHA recommends that a stability analysis be performed for rapid drawdown and a surcharge pool or flood condition.

4.6.4 Ash Pond E

No further analyses recommended.

4.7 Inspection Recommendations

CHA recommends that Georgia Power and Southern Company continue the piezometer monitoring and inspections that have been implemented for the Ash Ponds. This type of inspection allows for proactive responses to developing situations, which can reduce the risk of damaging releases or failures from occurring.

5.0 CLOSING

The information presented in this report is based on visual field observations, review of reports and this limited knowledge of the history of the Plant Branch Ash Ponds. The recommendations presented are based, in part, on project information available at the time of this report. No other warranty, expressed or implied is made. Should additional information or changes in field conditions occur, the conclusions and recommendations provided in this report should be re-evaluated by an experienced engineer.

APPENDIX A

Completed EPA Coal Combustion Dam Inspection Checklist Forms

&

Completed EPA Coal Combustion Waste (CCW) Impoundment Inspection Forms

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Plant Branch Generation Station

Date: November 24, 2009

Unit Name: Ash Pond B

Operator's Name: Georgia Power

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Malcolm D. Hargraves P.E./Cody Johnson

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?	see note		18. Sloughing or bulging on slopes?		x
2. Pool elevation (operator records)?	376 see note		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	372		20. Decant Pipes:	■	■
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?	see	note
5. Lowest dam crest elevation (operator records)?	380		Is water exiting outlet, but not entering inlet?	see	note
6. If instrumentation is present, are readings recorded (operator records)?	n/a		Is water exiting outlet flowing clear?	see	note
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)?	n/a		From underdrain?	n/a	
9. Trees growing on embankment? (If so, indicate largest diameter below)	x		At isolated points on embankment slopes?	see	note
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?	see	note
11. Is there significant settlement along the crest?		x	Over widespread areas?	see	note
12. Are decant trashracks clear and in place?	x		From downstream foundation area?	see	note
13. Depressions or sinkholes 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?	see	note
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?	see	note	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 n/a = not applicable/available

1 Plant personnel visually inspect daily and weekly; monthly and quarterly reports are generated for water quality, piezometric levels, volumetric flows, and engineering inspections where applicable.

2, 3 Ground surface estimated from historic documents and photos. Pond is dry and forested near dam and decant.

9 Downstream slope is heavily vegetated with brush and 8 to 12 inch diameter trees growing among large rock.

16, 20 Decant outlet not active. Water recycled through plant to sluice ash or released to lake via valve in plant.

21 Seeps cannot be readily observed due to rain at time of site assessment. Old outlet through dike has been abandoned and sealed.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # GA0026051 INSPECTOR Hargraves\Johnson
Date November 24, 2009

Impoundment Name Ash Pond B
Impoundment Company Georgia Power
EPA Region 4
State Agency (Field Office) Addresss Northeast District Regional EPD Office
745 Gaines School Rd.; Athens, GA 30605
Name of Impoundment Ash Pond B
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update x

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

IMPOUNDMENT FUNCTION: Bottom ash disposal

Nearest Downstream Town : Name Milledgeville, GA
Distance from the impoundment 9.0 miles (via lake/river)

Impoundment Location:	Longitude	83	Degrees	18	Minutes	11.8	Seconds
	Latitude	33	Degrees	11	Minutes	29.5	Seconds
	State	Georgia	County	Putnam			

Does a state agency regulate this impoundment? YES x NO ______

If So Which State Agency? Georgia Dept. of Nat. Resources - Envir. Protection Division

<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.

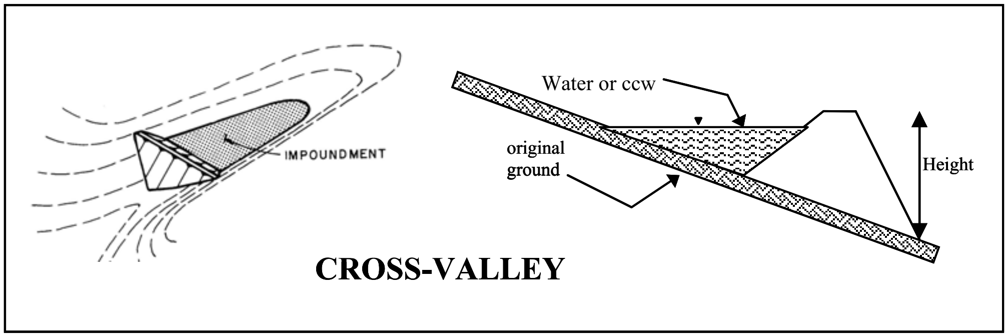
x______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

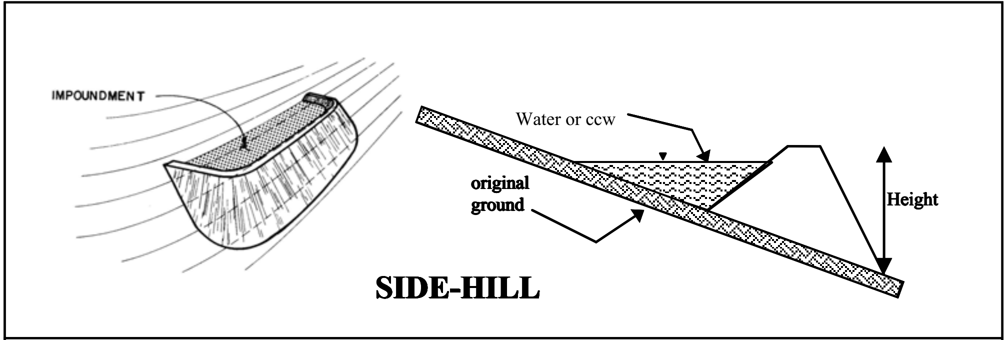
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of dike and subsequent erosion would impact Lake Sinclair.

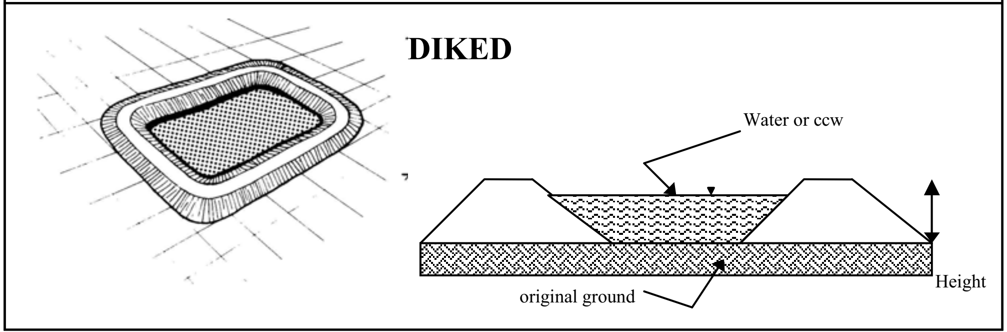
CONFIGURATION:



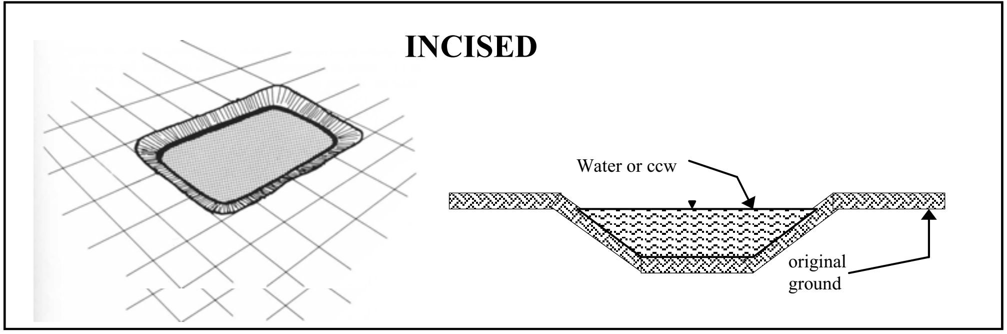
CROSS-VALLEY



SIDE-HILL



DIKED



INCISED

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

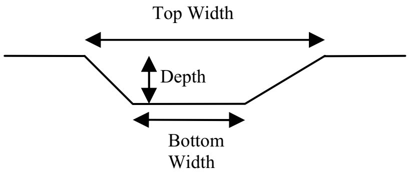
Embankment Height 80 (max.) feet   Embankment Material Earth/rock fill
Pool Area 75 acres   Liner none
Current Freeboard n/a feet   Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

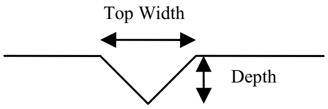
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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

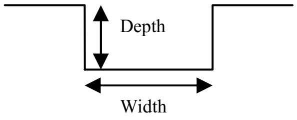
TRAPEZOIDAL



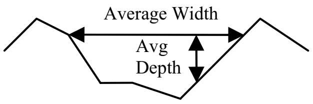
TRIANGULAR



RECTANGULAR

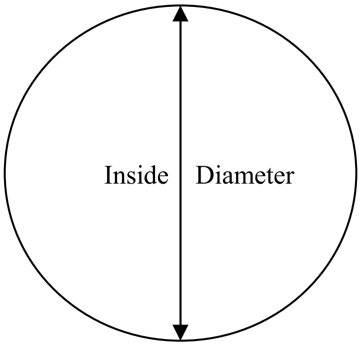


IRREGULAR



x_____ **Outlet**

36"___ inside diameter



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

Is water flowing through the outlet? YES _______ NO x_______

_____ **No Outlet**

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

The Impoundment was Designed By Georgia Power
____

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? November to December 1968

IF So Please Describe:

Upon initial filling and commencing ash sluicing activities, five leakage/seepage zones were observed near lake (Lake Sinclair) level on the downstream slope of the dam. The largest of these seepages was referred to as a cascade at Station 3+20 in the available documentation. The documentation also notes that these seeps transported ash into Lake Sinclair where it was subsequently deposited on nearby beaches. After attempts to arrest the seepage with a dumped soil blanket on the upstream slope failed, a grouting program was planned and implemented in January of 1969. In this program, a grout curtain with primary, secondary, and tertiary (where required) holes was installed on the crest along the upstream slope of the dam. An abandoned discharge pipe was also grouted closed during the grout curtain installation because it intersected the curtain line. The grouting program successfully arrested the leakage and was completed by the end of March 1969.

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 :

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Plant Branch Generation Station

Date: November 24, 2009

Unit Name: Ash Pond C

Operator's Name: Georgia Power

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Malcolm D. Hargraves P.E./Cody Johnson

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?	see note		18. Sloughing or bulging on slopes?	x	
2. Pool elevation (operator records)?	395		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	397		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?	see	note
5. Lowest dam crest elevation (operator records)?	400		Is water exiting outlet, but not entering inlet?	see	note
6. If instrumentation is present, are readings recorded (operator records)?	x		Is water exiting outlet flowing clear?	see	note
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)?	n/a		From underdrain?	x	
9. Trees growing on embankment? (If so, indicate largest diameter below)		x	At isolated points on embankment slopes?	see	note
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?	see	note
11. Is there significant settlement along the crest?		x	Over widespread areas?	see	note
12. Are decant trashracks clear and in place?	x		From downstream foundation area?	see	note
13. Depressions or sinkholes 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?	see	note
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?	see note	
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 n/a = not applicable/available

1 Plant personnel visually inspect daily and weekly; monthly and quarterly reports are generated for water quality, piezometric levels, volumetric flows, and engineering inspections where applicable.

3, 5 Elevations are estimated from historic documents and photos.

16, 20 Decant outlet inactive; water siphoned to plant. Buttress covers newer toe drains impacted by mowing.

18 Mowing has caused deformation in grass slopes.

21 Seeps cannot be readily observed due to rain. Old outlet is inactive - water siphons to plant.

23 Portion of impoundment abuts Lake Sinclair. Lake Sinclair somewhat downstream of toe.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # GA0026051

INSPECTOR Hargraves\Johnson

Date November 24, 2009

Impoundment Name Ash Pond C

Impoundment Company Georgia Power

EPA Region 4

State Agency (Field Office) Addresss Northeast District Regional EPD Office
745 Gaines School Rd.; Athens, GA 30605

Name of Impoundment Ash Pond C

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

New ________ Update x

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

IMPOUNDMENT FUNCTION: Currently polishing pond

Nearest Downstream Town : Name Milledgeville, GA

Distance from the impoundment 9.4 miles

Impoundment Location:

Longitude	83	Degrees	18	Minutes	19.9	Seconds
Latitude	33	Degrees	11	Minutes	12.7	Seconds
State	Georgia	County	Putnam			

Does a state agency regulate this impoundment? YES ______ NO x

If So Which State Agency? Georgia Dept. of Nat. Resources - Envir. Protection 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.

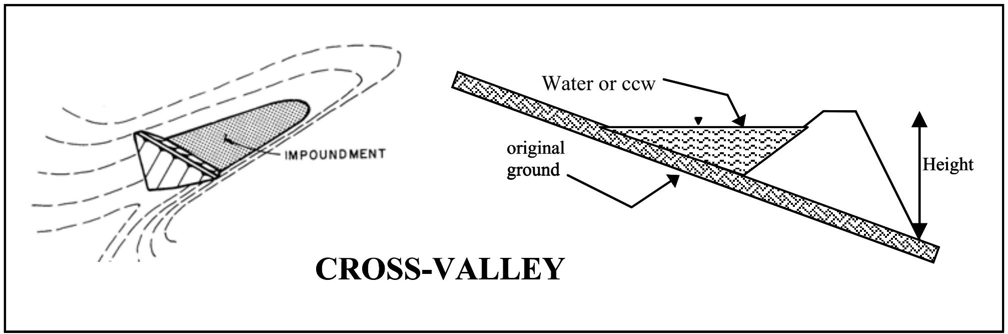
x______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

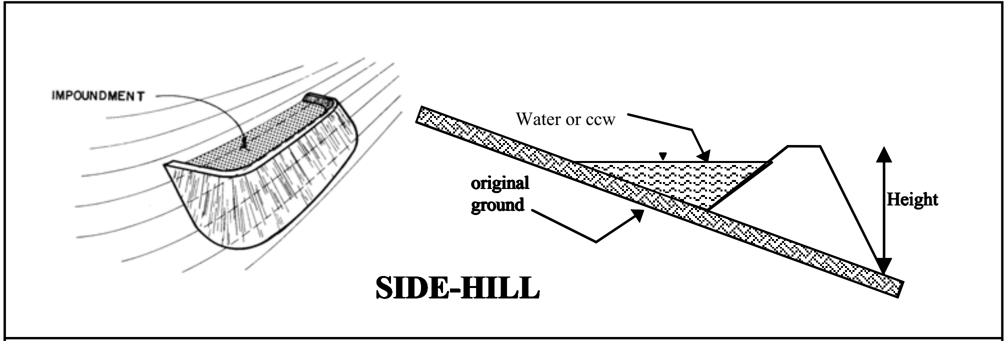
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of dike would impact Lake Sinclair.

CONFIGURATION:

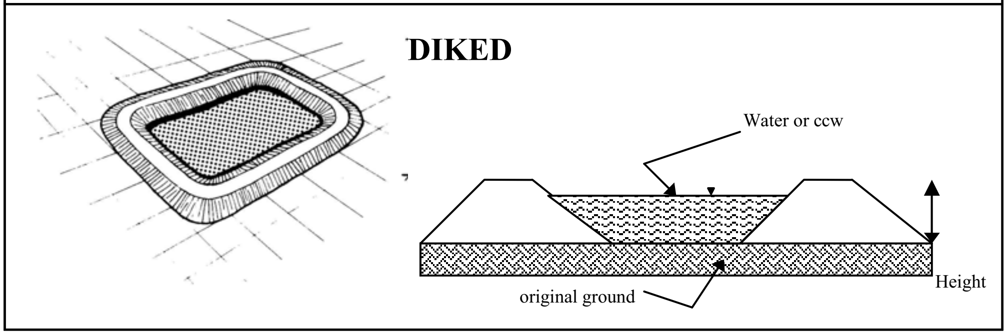


CROSS-VALLEY

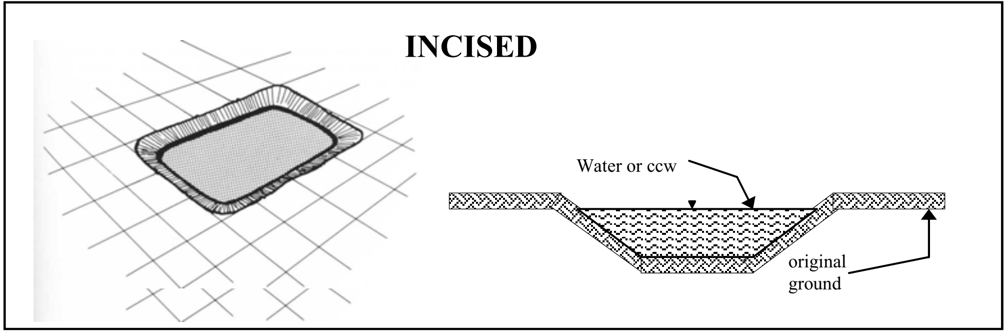


SIDE-HILL

DIKED



INCISED



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

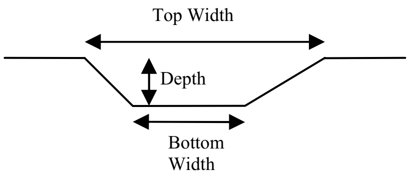
Embankment Height 83 feet Embankment Material Earth fill
Pool Area 70 acres Liner none
Current Freeboard 5 feet Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

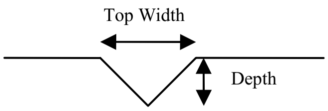
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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

TRAPEZOIDAL



TRIANGULAR



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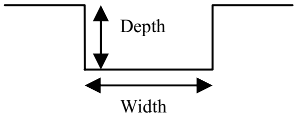
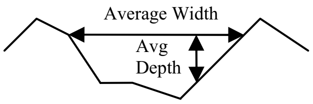
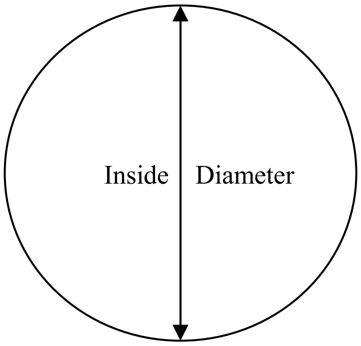


IRREGULAR



x _____ **Outlet**

30" _____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
x _____ other (specify) fiberglass (not active)

Is water flowing through the outlet? YES x (below) NO _______

_____ **No Outlet**

x _____ **Other Type of Outlet** (specify) Two 36" dia. HDPE siphons to plant

The Impoundment was Designed By Georgia Power

Has there ever been a failure at this site? YES x NO ____________

If So When? December 8, 2000

If So Please Describe :

The failure was mechanical in nature. An isolation valve on a siphon line malfunctioned, causing water to be siphoned from Pond C back through the cooling tower intake complex and discharge tunnel into Lake Sinclair. The failure did not involve dike or geologic instability.

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

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 x________

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

If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Plant Branch Generation Station

Date: November 24, 2009

Unit Name: Ash Pond D

Operator's Name: Georgia Power

Unit I.D.:

Hazard Potential Classification: High [✓ Significant] Low

Inspector's Name: Malcolm D. Hargraves P.E./Cody Johnson

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?	see note		18. Sloughing or bulging on slopes?	x	
2. Pool elevation (operator records)?	400		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	n/a		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	400/401		Is water entering inlet, but not exiting outlet?		n/a
5. Lowest dam crest elevation (operator records)?	403		Is water exiting outlet, but not entering inlet?		n/a
6. If instrumentation is present, are readings recorded (operator records)?	x		Is water exiting outlet flowing clear?		n/a
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)?	n/a		From underdrain?	x	
9. Trees growing on embankment? (If so, indicate largest diameter below)		x	At isolated points on embankment slopes?	see	note
10. Cracks or scarps on crest?		x	At natural hillside in the embankment area?	see	note
11. Is there significant settlement along the crest?		x	Over widespread areas?	see	note
12. Are decant trashracks clear and in place?	n/a		From downstream foundation area?	see	note
13. Depressions or sinkholes 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?		n/a
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 n/a = not applicable/available

1 Plant personnel visually inspect daily and weekly; monthly and quarterly reports are generated for water quality, piezometric levels, volumetric flows, and engineering inspections where applicable.

2, 4 Pond D outlets via culvert and open channel to Pond C. Pond D has an emergency spillway at El. 401

18 Mowing has caused deformation in grass slopes.

21 Two seeps in downstream foundation or hillside area were previously delineated by Georgia Power; otherwise new seeps cannot be readily observed and are likely obscured due to recent rain at time of site assessment. Underdrain seepage was clear.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # GA0026051 INSPECTOR Hargraves\Johnson
Date November 24, 2009

Impoundment Name Ash Pond D
Impoundment Company Georgia Power
EPA Region 4
State Agency (Field Office) Addresss Northeast District Regional EPD Office
745 Gaines School Rd.; Athens, GA 30605
Name of Impoundment Ash Pond D
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update x

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

IMPOUNDMENT FUNCTION: Fly ash, pyrite, bottom ash disposal - currently polishing pond

Nearest Downstream Town : Name Milledgeville, GA
Distance from the impoundment 10.7 miles (via lake/river)
Impoundment
Location: Longitude 83 Degrees 18 Minutes 19.9 Seconds
Latitude 33 Degrees 11 Minutes 12.7 Seconds
State Georgia County Putnam

Does a state agency regulate this impoundment? YES x NO ______

If So Which State Agency? Georgia Dept. of Nat. Resources - Envir. Protection 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.

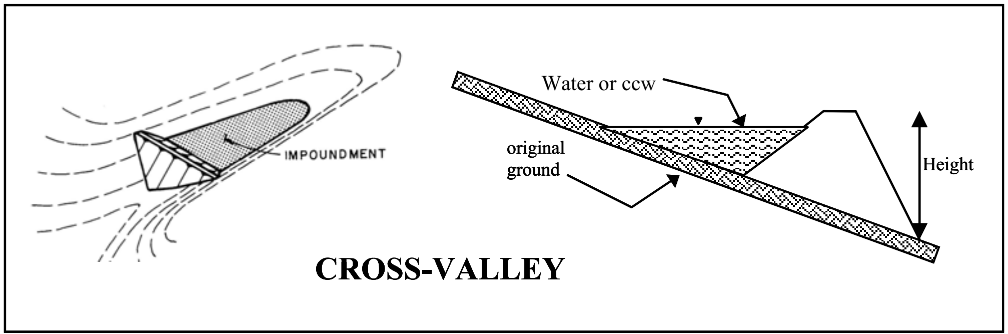
x______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

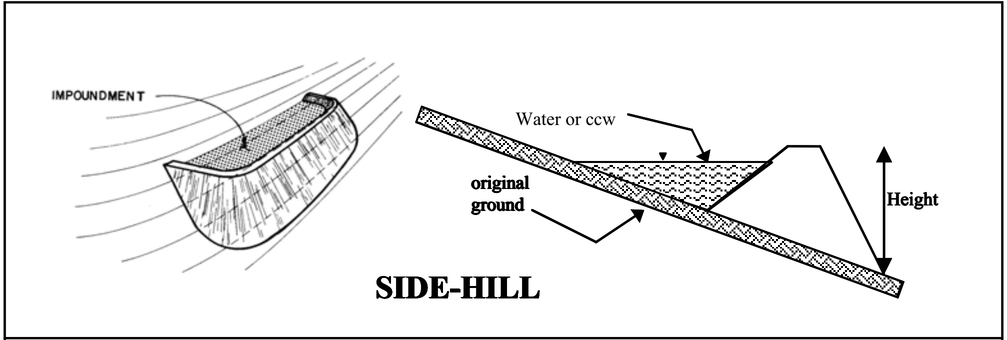
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of dike would impact Lake Sinclair.

CONFIGURATION:

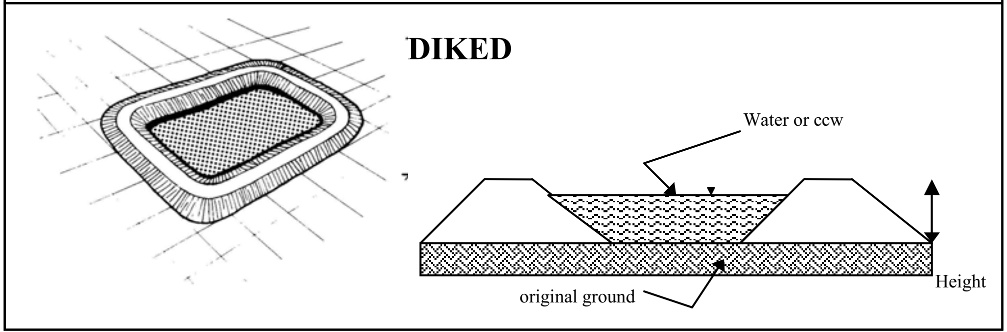


CROSS-VALLEY

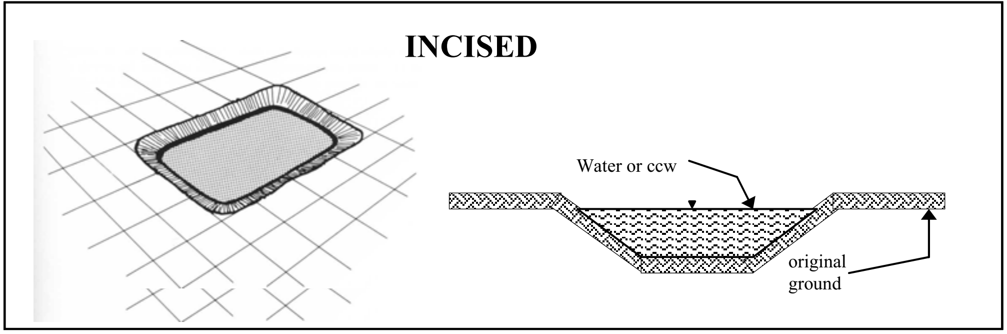


SIDE-HILL

DIKED



INCISED



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

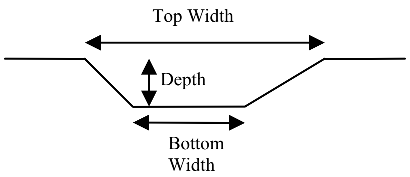
Embankment Height 63 feet Embankment Material Earth fill
Pool Area 45 acres Liner none
Current Freeboard 3 feet Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

x **Open Channel Spillway**
x Trapezoidal
____ Triangular
____ Rectangular
____ Irregular

2 depth
20 bottom (or average) width
28 top width

TRAPEZOIDAL



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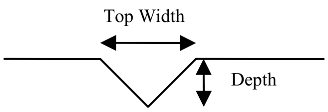
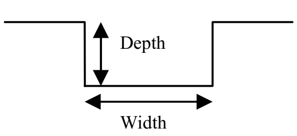
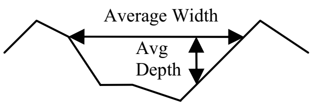


RECTANGULAR

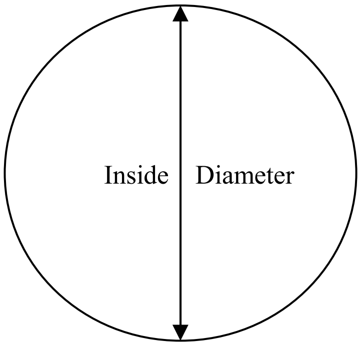


IRREGULAR



x **Outlet**

____ inside diameter



Material
____ corrugated metal
____ welded steel
____ concrete
____ plastic (hdpe, pvc, etc.)
x other (specify) concrete lined to open channel

Is water flowing through the outlet? YES x NO ____

____ **No Outlet**

____ **Other Type of Outlet** (specify) ____

The Impoundment was Designed By Georgia Power

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? ___________________________

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 x________

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

If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Plant Branch Generation Station

Date: November 24, 2009

Unit Name: Ash Pond E

Operator's Name: Georgia Power

Unit I.D.:

Hazard Potential Classification: [✓ High] Significant Low

Inspector's Name: Malcolm D. Hargraves P.E./Cody Johnson

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?	see note		18. Sloughing or bulging on slopes?		x
2. Pool elevation (operator records)?	429		19. Major erosion or slope deterioration?		x
3. Decant inlet elevation (operator records)?	429		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	430		Is water entering inlet, but not exiting outlet?		n/a
5. Lowest dam crest elevation (operator records)?	433/434		Is water exiting outlet, but not entering inlet?		n/a
6. If instrumentation is present, are readings recorded (operator records)?	x		Is water exiting outlet flowing clear?		n/a
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)?	n/a		From underdrain?	x	
9. Trees growing on embankment? (If so, indicate largest diameter below)		x	At isolated points on embankment slopes?	see	note
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?	see	note
12. Are decant trashracks clear and in place?		x	From downstream foundation area?	x	
13. Depressions or sinkholes 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?		n/a
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?	see	note	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 n/a = not applicable/available

1 Plant personnel visually inspect daily and weekly; monthly and quarterly reports are generated for water quality, piezometric levels, volumetric flows, and engineering inspections where applicable.

4, 5 Pond has an emergency spillway at El. 430 and a concrete wave screen on the crest extending to El. 434.

12 Cenospheres have flooded the decant riser under the trash rack and have not been harvested.

16, 20 Outlet is submerged and not observed; conveys water to Pond D.

21 Three seep areas in the downstream and hillside foundation areas have been monitored over time by Georgia Power. Recent rains prior to site visit would have obscured new seep areas. Underdrain seepage was clear.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # GA0026051 INSPECTOR Hargraves\Johnson
Date November 24, 2009

Impoundment Name Ash Pond E
Impoundment Company Georgia Power
EPA Region 4
State Agency (Field Office) Addresss Northeast District Regional EPD Office
745 Gaines School Rd.; Athens, GA 30605
Name of Impoundment Ash Pond E
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update x

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

IMPOUNDMENT FUNCTION: Fly ash disposal

Nearest Downstream Town : Name Milledgeville, GA
Distance from the impoundment 11.6 miles (via lake/river)
Impoundment
Location:

Longitude	83	Degrees	19	Minutes	35.0	Seconds
Latitude	33	Degrees	12	Minutes	15.0	Seconds
State	Georgia	County	Putnam			

Does a state agency regulate this impoundment? YES x NO ______

If So Which State Agency? Georgia Dept. of Nat. Resources - Envir. Protection 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.

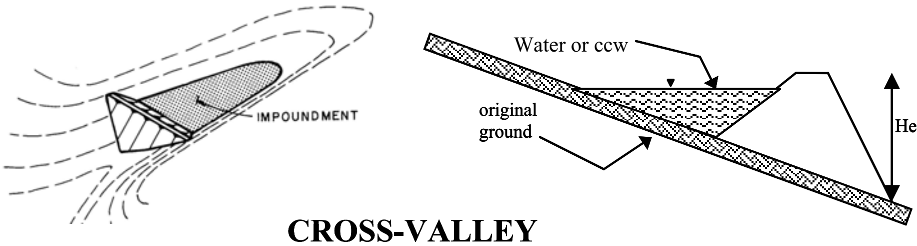
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

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

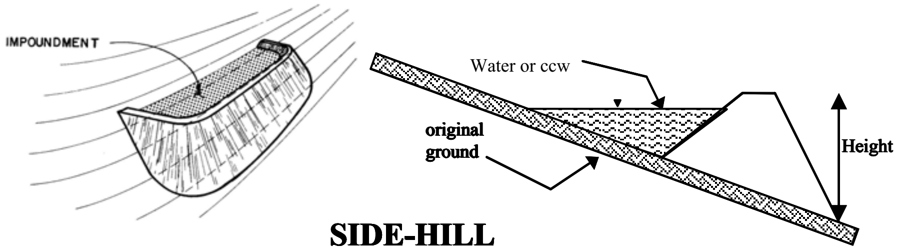
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Failure of dike would impact Lake Sinclair, some lake front residences, and the power plant.

CONFIGURATION:

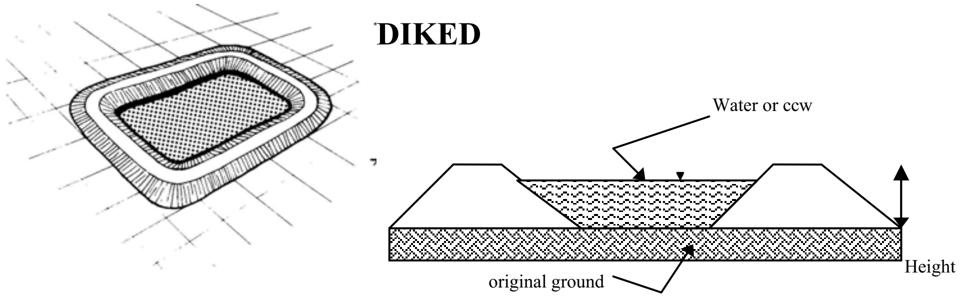


CROSS-VALLEY

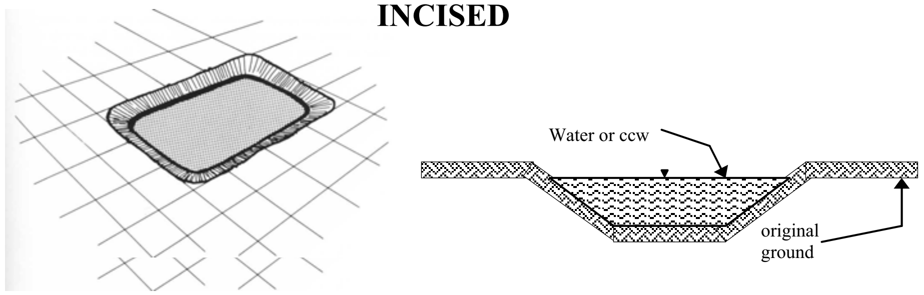


SIDE-HILL

DIKED



INCISED



x_____ Cross-Valley

______ Side-Hill

______ Diked

______ Incised (form completion optional)

______ Combination Incised/Diked

Embankment Height 73 feet Embankment Material Earth fill

Pool Area 311 acres Liner none

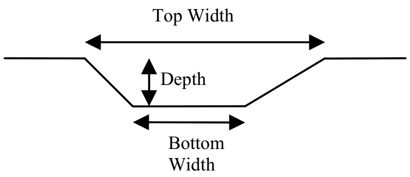
Current Freeboard 4 feet Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

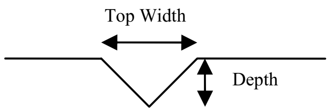
x ____ **Open Channel Spillway**
x ____ Trapezoidal
____ Triangular
____ Rectangular
____ Irregular

1 ____ depth
150 ____ bottom (or average) width
____ top width

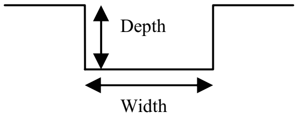
TRAPEZOIDAL



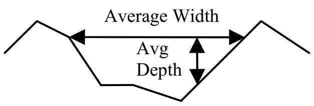
TRIANGULAR



RECTANGULAR

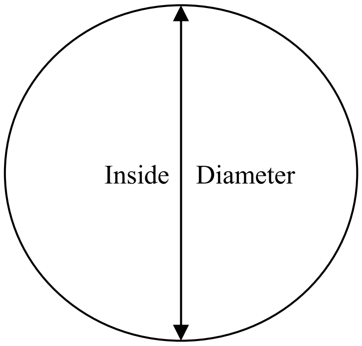


IRREGULAR



x ____ **Outlet**

36" ____ inside diameter



Material
____ corrugated metal
x ____ welded steel
____ 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 Georgia Power ____________________

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? ____________________________

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 x________

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

If so Please Describe :